University of Nairobi

Department of Diplomacy and International Studies

Sustainable Development through Energy Cooperation in Africa: A Comparative Analysis of Eastern and Southern African Power Pools

By

Zerubabel Getachew Tefera

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DECLARATION

This dissertation is my original work and has not been presented at any other University.

SIGN:

Date: May 2022

Zerubabel Getachew Tefera

This dissertation has been submitted for examination with our approval as University of Nairobi supervisors.

SIGN:

Date: May 2022

Prof. Amb. Maria Nzomo

SIGN:

Date: May 2022

Professor Kuruvilla Mathews

DEDICATION

To my wife, Hiwot Moges, to my sons Beakal and Brook, and my parents Mistre Hailu and Negash Zeleke - all for their blissful presence in my life that always spark undying inspiration and purpose.

ACKNOWLEDGEMENTS

The study becomes a success with unwavering guidance, assistance, encouragement, and contribution of several personalities to whom I am forever thankful.

First, I wish to acknowledge the guidance, contribution, encouragement, and thorough follow-up of my supervisors, Prof. Maria Nzomo and Prof. Kuruvilla Mathews.

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ABSTRACT

Energy is one of the critical factors to achieve sustainable development. Africa's development vision, as contained in African Union Agenda 2063, requires, inter alia, the provision of affordable, durable, and reliable energy. However, unsymmetrical resource, capital, and technological endowments at the global and regional level call on countries to increasingly cooperate and integrate their energy systems. Fittingly, the African Union's First Ten Years Implementation Plan (2014 – 2023) identifies regional energy cooperation through the implementing regional power pooling as a remedy to alleviate energy poverty and achieve socioeconomic development in the continent. Half a century after Africa embraces energy trade and two decades after instituting Regional Power Pools (RPPs), energy poverty remains to be a critical challenge undermining Africa's development. The study examined the roles of RPPs in fostering energy cooperation for socioeconomic development in Eastern and Southern Africa. In doing so, the study compares the state of energy cooperation by examining the implementation of power pooling in the two regions. The study targeted 100 leaders and senior experts from the regional power pools, regional economic communities, financial institutions, scholars, the African Union, and the United Nations. Qualitative data were analysed thematically, while quantitative data was analysed via descriptive and inferential analysis. Simple linear regression models were used to test the hypotheses. The study utilises the theory of liberal institutionalist theory of international relations to analyse the roles of regional power pools in addressing the cross-border challenge of energy security. From the findings, energy cooperation has been confirmed as the viable approach to energy security in Africa; in Eastern Africa, weak power pool arrangement has contributed significantly to the prevailing energy insecurity whereas strong regional power pool in Southern Africa contributes to energy security, thus depicting that strong regional power pool is a key predictor of energy security in the region; the study could not confirm that the challenges and opportunities are similar; and the existence of bilateral electricity trading arrangements does not necessarily undermine the development of regional energy trade. The study concludes that the institutionalised attempt to energy security in Africa can address most of Africa's energy security challenges. However, Africa must embrace the role of these energy cooperation institutions by pursuing a deliberate policy to strengthen them so that its overall integration project, as stipulated in the African Union Agenda 2063, can be materialised.

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List of Abbreviations

ASEAN – Association of Southeast Asian Nations

AU – African Union

AUDA – African Union Development Agency

CAP – Common African Position

CAPP – Central Africa Power Pool

COMESA – Common Market Eastern and Southern Africa

EAC – East African Community

EAPP – Eastern African Power Pool

ES – Energy Security

EU – European Union

FP – Foreign Policy

GDP – Gross Domestic Product

GDP – Gross Domestic Product

GW – Gigawatt

IEA – International Energy Agency

IGAD – Intergovernmental Authority on Development

IRIM – IGAD Regional Infrastructure Masterplan

KWh – Kilowatt hour

MDG – Millennium Development Goals

NEPAD – New Partnership for Africa's Development

OAU – Organization of African Unity

OPEC – Organization of the Petroleum Exporting Countries

OPEC – Organization of the Petroleum Exporting Countries

PAP – Priority Action Plan

PIDA – Programme for Infrastructure Development in Africa

RPP – Regional Power Pool

SADC – Southern Africa Development Cooperation

SAPP – Southern Africa Power Pool

SDG - Sustainable Development Goals

STC – Specialised Technical Committee

TWh – Terawatt Hour

UN – United Nations

UNECA – United Nations Economic Commission for Africa

UNEP – United Nations Environment Program

WAPP – Western Africa Power Pool

WCED – World Commission on Environment and Development

Chapter One

Introductory Chapter

1.0 Background of the Study

Energy, the "master resource"[1] is an important facilitator of global economic development and a crucial factor in international relations. Provision of energy at a reasonable price is both a necessity and a prerequisite for economic growth and prosperity of any nation. The United Nations agenda 2030 and its Seventh Sustainable Development Goal, and the African Union agenda 2063 recognise the centrality of access to energy for the realisation of the ambitions enlisted in the documents.

The asymmetric distribution of natural resource, financial, and technological capability to utilise resources, hinder countries from availing affordable, sustainable, and reliable energy through the utilisation of domestic sources alone. Such reasons call on nations to increasingly integrate their energy supply chains to international and regional energy markets. As a result, ensuring access to affordable energy becomes one of the fundamental manifestations of foreign relations. Nevertheless, the viability of energy interdependence is determined by not only economic factors but also political calculations. Also, the strategic nature of energy resources makes energy one of the manifestations of national security. However, as much as energy is a strategic resource, the unattainability of energy independence, at least economically, makes a compelling case for energy cooperation. Considering the economic need and the configuration of energy supply chains in the world, interdependence, not independence, describes the state of energy dynamics in the world.[2] Therefore, if economics and geopolitics permit, energy cooperation and interdependence among nations is the ultimate and sustainable path towards ensuring energy security (ES). Energy cooperation takes regional and global forms. While international markets administer oil and natural gas, regional power pool systems govern electricity—the study centres around the contribution of institutions such as power pools in promoting energy cooperation.

[1] Robert L. Bradley and Richard W. Fumer, *Energy: The Master Resource* (Dubuque: Kendal/Hunt Publishing, 2004), xiii

[2] Robert Brice, *Gusher of Lies: The Dangerous Delusions of Energy Independence* (New York: Public Affairs, 2008)

The regional approach to energy cooperation through power pools is an arrangement where electric outputs from different utilities in a certain region are linked together and dispatched according to prior agreements. Regional power pooling arrangements have been in operation in several parts of the world. The first regional power pool arrangement was established in the United States when power utilities in Pennsylvania, New Jersey, Maryland (PJM) agreed to coordinate the wholesale electricity in 1927.[3] In Europe, Nordel, a joint board composed of Denmark, Finland, Norway, and Sweden, introduced a regional power pool in 1963 to enhance cooperation in the production and transmission of power.[4] Thus, the need to promote energy cooperation among pool members was the driving factor for the creation of PJM and Nordel regional pools.

Africa accounts for less than 5 per cent share of global energy production.[5]Cognizant of the linkages between energy supply and development, the African Union Agenda for 2063, a strategic document to deliver sustainable development in the continent, recognises the establishment of regional power pools as one of the strategic objectives to enhance access to energy by foster energy cooperation in Africa.

Accordingly, five regional power pools (RPPs)–Southern Africa Power Pool (SAPP) in the South, Eastern Africa Power Pool (EAPP), Western Africa Power Pool (WAPP) in the West, Northern Africa Power Pool (NAPP) in the North, and Central Africa Power Pool (CAPP) in Central Africa - have been organized to stimulate energy cooperation and interdependence in the continent. The Regional Power Pools (RPPs) are created to secure power supply for member states, facilitating the development of the electricity market, optimising the employment of natural energy resources, enhancing access to electricity, reducing electricity cost, and creating a conducive environment for investment. The study focuses on regional power pools in Eastern and Southern Africa.

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[3] Economic Consulting Associates, The Potential of Regional Power Sector Integration: Literature Review, (Washington: World Bank, 2011), 49

[4] Luis Mundaca, Carl Dalhammar, and David Harnesk, "The Integrated NORDIC Power and the Deployment of Renewable Energy Technologies: Key Lessons and Potential Implications for the Future ASEAN Integrated Power Market," in *Energy Market Integration in East Asia,* ed. Kimura S., H. Phoumin, and B. Jacobs, (Jackarta: EIRI, 2013), 33

[5]UNEP, *Atlas of Africa Energy Resources,* (Nairobi: UN Environment, 2017), 1

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Energy is one of the critical factors to achieve sustainable development. Africa's development vision, as contained in African Union Agenda 2063, requires, inter alia, the provision of affordable, durable, and reliable energy. However, unsymmetrical resource, capital, and technological endowments at the global and regional level call on countries to increasingly cooperate and integrate their energy systems. Fittingly, the African Union's First Ten Years Implementation Plan (2014 – 2023) identifies regional energy cooperation through the implementing regional power pooling as a remedy to alleviate energy poverty and achieve socioeconomic development in the continent. Half a century after Africa embraces energy trade and two decades after instituting Regional Power Pools (RPPs), energy poverty remains to be a critical challenge undermining Africa's development. The study examined the roles of RPPs in fostering energy cooperation for socioeconomic development in Eastern and Southern Africa. In doing so, the study compares the state of energy cooperation by examining the implementation of power pooling in the two regions. The study targeted 100 leaders and senior experts from the regional power pools, regional economic communities, financial institutions, scholars, the African Union, and the United Nations. Qualitative data were analysed thematically, while quantitative data was analysed via descriptive and inferential analysis. Simple linear regression models were used to test the hypotheses. The study utilises the theory of liberal institutionalist theory of international relations to analyse the roles of regional power pools in addressing the cross-border challenge of energy security. From the findings, energy cooperation has been confirmed as the viable approach to energy security in Africa; in Eastern Africa, weak power pool arrangement has contributed significantly to the prevailing energy insecurity whereas strong regional power pool in Southern Africa contributes to energy security, thus depicting that strong regional power pool is a key predictor of energy security in the region; the study could not confirm that the challenges and opportunities are similar; and the existence of bilateral electricity trading arrangements does not necessarily undermine the development of regional energy trade. The study concludes that the institutionalised attempt to energy security in Africa can address most of Africa's energy security challenges. However, Africa must embrace the role of these energy cooperation institutions by pursuing a deliberate policy to strengthen them so that its overall integration project, as stipulated in the African Union Agenda 2063, can be materialised.

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Africa accounts for less than 5 per cent share of global energy production.[5]Cognizant of the linkages between energy supply and development, the African Union Agenda for 2063, a strategic document to deliver sustainable development in the continent, recognises the establishment of regional power pools as one of the strategic objectives to enhance access to energy by foster energy cooperation in Africa.

Accordingly, five regional power pools (RPPs)–Southern Africa Power Pool (SAPP) in the South, Eastern Africa Power Pool (EAPP), Western Africa Power Pool (WAPP) in the West, Northern Africa Power Pool (NAPP) in the North, and Central Africa Power Pool (CAPP) in Central Africa - have been organized to stimulate energy cooperation and interdependence in the continent. The Regional Power Pools (RPPs) are created to secure power supply for member states, facilitating the development of the electricity market, optimising the employment of natural energy resources, enhancing access to electricity, reducing electricity cost, and creating a conducive environment for investment. The study focuses on regional power pools in Eastern and Southern Africa.

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[5]UNEP, *Atlas of Africa Energy Resources,* (Nairobi: UN Environment, 2017), 1

The Eastern African Power Pool, headquartered in Addis Ababa, is a regional power pool established in 2005 and comprises of EAC, IGAD, SADC, and Maghreb Union countries. In EAPP, the 370 million people, with a regional average electricity consumption growth rate of 7.6% per annum, and average economic growth of 5.4% from 2012 to 2040 [6]have to be supplied with affordable, reliable, and sustainable energy calling for an integrated and interdependent approach. In this regard, the primary purpose of EAPP is to provide North-Eastern Africa with energy at a reasonable price, by coordinating energy resources, to improve access to electricity, to foster energy cooperation, and to promote regional integration (RI).[7]

The Southern African Power Pool, created in 1995 by the Southern African Development Cooperation, is the oldest regional power pool in Africa. The SAPP covers power utilities of SADC member states, save for Madagascar and Seychelles. Several legal frameworks manage the operation of SAPP. The SAPP aims at cooperating and coordinating the regional electricity planning and operation, facilitating energy trade in the region, promoting regional cooperation in power projects development, increasing energy access in rural areas, and attracting investment.[8]

Energy is a "key resource" for economic development. Particular to the African context, the RPPs are not the only prerequisite to economic development but also to RI. If Africa has to break from the poverty trap, it has to find a viable solution to the prevailing energy poverty. Energy interdependence enhances access to affordable and sustainable energy and create opportunities for economic integration. In this connection, Africa has established RPPs, one form of regional energy interdependence, to address the challenges of energy poverty. The study assesses the roles of regional pools in the attainment of the energy dimension of the sustainable development in Africa.

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[6] International Energy Agency, *World Energy Outlook,* (Paris: OECD/IEA, 2011), 83

[7] Elke Verhaeghe and Sean Woolfrey, "Understanding COMESA and the Eastern African Power Pool: Incentive Based Institutional Reforem," *Political Economy Dynamics of Regional Organizations,* (March 2017): 5

[8] Dudu Hadebe,D. et al., "Scaling Up Renewables Through Regional Planning and Coordination of Power Systems in Africa – Regional Power System Planning to Harness Renewable Resources and Diversify Generation Portfolios in Southern Africa" *Current Sustainable Renewable Energy Reports,* (October 2018): 225

2.0 Statement of the Problem

Energy is indeed an enabler and a 'master resource' to achieve sustainable development. Sustainable Development Goals (SDGs) in Africa, as in many countries around the world remain a mirage, despite their instrumental importance in the attainment of human development, security, and human rights. Africa's development vision, as contained in African Union Agenda 2063, requires, inter alia, the provision of affordable, durable, and reliable energy. Accordingly, the African Union's First Ten Years Implementation Plan (2014 – 2023) identifies regional energy cooperation through the operationalisation of Regional Power Pools as a viable remedy to alleviate energy poverty and achieve socioeconomic development. However, deficit energy remains to be a critical challenge undermining Africa's development. Africa lags in production and consumption of energy as compared to the globe.

In particular, the general lack of utilization of energy resources to advance sustainable development in Africa is visible and yet in my view the identification of Regional Power Pools could serve as the most feasible solution to address the rampant energy insecurity by fostering energy cooperation. Furthermore, only few studies have addressed the challenges and opportunities of operationalisation of Regional Power Pools in the African context. Also, there are no attempts made to compare and contrast the state of energy cooperation, the challenges, and the specific enablers in the existing Regional Power Pools in order to draw practical lessons for policymakers. Besides, there are only a handful of academic studies that problematise Regional Power Pools in the African context.

The study seeks to fill this knowledge gap by examining the role of RPPs in fostering energy cooperation for socioeconomic development in Eastern and Southern Africa. In doing so, the study compares the state of energy cooperation by examining the implementation of power pooling in the two regions.

3.0 Research Questions

The study focuses on the following questions:

1. How does energy cooperation contribute to the attainment of sustainable development in Africa?
2. How do the Southern African and Eastern African Power Pools ensure energy security in their respective regions?
3. What are the similarities and differences in implementation, challenges, and opportunities of Eastern and Southern Power Pools?

4. What is the role of bilateral energy trade in the development of regional energy market?

4.0 General Objective

The general objective of the research is to study the contribution of power pools to achieve sustainable development by fostering energy cooperation in Africa and, in particular in Eastern and Southern Africa.

5.0 Specific Objectives

The research has the following specific objectives:

1. To evaluate the role of energy cooperation for sustainable development in Africa.
2. To analyse and compare the role of RPPs, particularly the EAPP and SAPP, in fostering energy cooperation and addressing ES in their respective sub-regions.
3. To analyse challenges and opportunities in the implementation of power pooling in Eastern and Southern Africa Power Pools.
4. To examine the role of bilateral energy trade in the development of RPPs in general and in the Eastern and Southern Africa Power Pools in particular.

6.0 Review of Relevant Literature

The following section brings literature relevant to the objectives of the study. The section domiciles the energy factor in international studies and covers relevant discussions on energy security, energy cooperation, energy trade, and institutions in view of establishing a platform on which the study capitalises on and identifying gaps which the same study attempts to fill.

The Energy Factor in International Relations

The energy factor has been shaping world politics since at least World War I. When Winston Churchill decided to change United Kingdom's navy power source from coal from the mines of Wales to Persian oil, ES was introduced into international political discourse.[9] Since then, ES has been continuously shaping international relations which in turn shapes the conceptualisation and pursuit of energy security. The relationship between energy and foreign policy (FP) is relative and the place of a nation on the energy import-export spectrum defines its foreign relations.

[9] Volkan Ediger and John Bowlus, "A Farewell to King Coal: Geopolitics, ES, and the Transition to Oil," *The Historical Journal*, (June 2018): 4

Nonetheless, all policies uphold "*energy security*" for it plays an integral role in the security of the state.[10]The concept of security has numerous and competing interpretations, but the definition provided by Ayoob,[11] as any threat that weakens states is relevant and operational in this context. Bringing the energy factor into Ayoob's operational definition, ES is the external and internal vulnerabilities that threaten the supply of sustainable and reliable energy with a potential to affect the efficacy of the state to deliver on its mandate. However, the attempt overlooks essential elements of ES, such as availability, reliability, affordability, and sustainability. Buzan also captured some essence of ES in his environment and economic sector assessment as a matter of depletion of natural resources, forms of pollution, and scarcities or uneven distributions.[12] The conceptualisation, heavily influenced by the theory of securitisation, overlooks the strategic nature of energy. However, analysing the impact of the Gulf Oil Crisis in the 1970s on the safety and security of many countries depicts a different story, the fall of the Ethiopian monarchy is a case in point. ES, thus, can define not only the prosperity of the nation but also its existence.

The Gulf Oil Crisis not only brings the energy factor into international relations but also anchors the conceptualisation of ES in favour of oil. Books including but not limited to "*Energy Resources and Their Control: Selected United States Documents and Studies*" and "*Energy in the 1980s: A Royal Society Discussion*" written in the global north in the aftermath of the crisis show the special attention given to oil. However, books such as "*The End of Oil: On the Edge of a Perilous New World" and "Out of Gas: The End of the Age of Oil*" written after the end of the World War II help the conceptualisation of ES to include other sources of energy. In this regard, "*Energy Security,*"[13] the work of Adrian Gheorghe and Liviu Muresan, provides a comprehensive viewpoint on ES beyond the nineteen-century oil politics. The book discusses topical questions concerning sustainability and flexibility of energy systems. The significant contribution of this book is that it analyses the ES problems within the global security debates and attempts to define the concept of ES, which lacks a universal definition, by analysing

[10] Linda Miller, "ES and FP: A Review Essay," *International Security*, (Spring 1977): 119

[11] {Citation}

[12] Barry Buzan, Ole Waever, and Jaap Wilde, *Security: A New Framework for Analysis*, (London, Lynne Rienner Publisher, 1998), 74

[13] Adrian Gheorghe and Liviu Muresan, *ES: International and Local Issues, Theoretical Perspectives and Critical Energy Infrastructures*, (Berlin: Springer, 2011), 1

energy needs of producers, consumers, transit states, and institutions. In so doing, the book argued that not only the economics of energy supply but also the rationale in the context of economic development help to provide a common denominator in understanding ES.

Additionally, "*Emerging Threats to Energy Security and Stability*" edited by McPherson, Wood and Robinson, contribute towards a contemporary understanding of ES threats. According to the authors, a significant increase in energy demand mainly from the emerging economies is disrupting the energy market threatening ES impacting developing economies. The book argues that energy cooperation and interdependence can solve the challenges as mentioned earlier to ES, but protectionism and securitisation undermine the process.

Daniel Yergin's article entitled "*Ensuring Energy Security*"[14] explores factors affecting global energy interdependence within the existing energy markets and points out that non-market factors such as fears of supply disruption and politics-oriented decision making are significant challenges. Additionally, rising energy demands resulting from China and India, including their mercantilist state-to-state approach pursued by China and transnational oriented approach by India, is undermining the energy cooperation under the existing multilateral energy institutions, contributing towards the ES dilemma. The article recommends that diversity of energy sources and supplies, sufficient investment in the energy sector, and global political stability could best ensure ES. The vital contribution of Yergin's approach is the inclusion of the entire energy supply chain, investment, and the political-economic impacts of emerging economies on the conceptualisation and pursuit of ES.

ES is a significant component of national security. The ES of an energy-producing state revolves mainly around securing a long-term and stable market whereas the ES of a consuming state is anchored on ensuring a reliable and affordable supply of energy. In this case, energy serves as both an objective and an instrument of FP. The following part examines how the United States and Russia address their challenges of ES using empirical evidence. Ensuring a reliable supply of energy is a significant determinant of the FP objective of the United States. In the US, the grand debate concerning ES vis-à-vis FP decision making revolves around approaches of energy independence and energy interdependence. "*Energy and Security: Toward a New Foreign Policy Strategy*,"[15]examines the influence of energy numerous

[14] Daniel Yergin, "Ensuring ES," *Foreign Affairs*, (March/April 2006): 69

[15] Jan Kalicki and David Goldwyn, "Energy and Security: Towards a New FP Strategy," review of *Foreign Affairs*, by Richard Cooper, November/October 2005, 138

decision-making processes in the United States and argues that the US should consider developing a cohesive energy policy, integral to its FP and like its national security. Also, "*Rethinking Energy Statecraft: The United States Foreign Policy and the Changing Geopolitics of Energy*[16]" argued for the need to craft new energy statecraft that embraces multilateral mechanisms to revitalise the global energy governance and promotion of investments in the international energy market.

In Russia, the notion of energy in its foreign relations is anchored on the utilisation of energy relations to achieve other FP objectives. Energy is more an instrument than a purpose in the conduct of international relations by the Russian Federation. "*Oil, carrots, and sticks: Russia's energy resources as a FP tool*"[17] explores the utilisation of energy as its FP leverage in its international relations with countries located in its immediate periphery. The article found out that Russia favours certain countries with massive subsidies and targets others by supply disruption and punitive pricing in the pursuit of its FP goals. Similarly, the European Parliament issued a report entitled "*Energy as a tool of the Foreign Policy of Authoritarian States, in particular, Russia*"[18] explaining how Russia uses its energy resources in its political manoeuvring against the European Union. The report argues that Russia manipulates energy dependencies to exert its geopolitical influence, including in Europe.

The above discussion on the US, Russia, and the EU presents the twentieth-century scenarios. One of the manifestations of international energy order after the end of the Cold War is the emergence of China and India as a viable force capable of affecting the global energy market. Blazevic's work entitled "*Defensive Realism in Indian Ocean*" shows how China and India seek to maximise their power and influence to meet their ES through domination and hegemony in their immediate vicinity. On the one hand, in pursuit of ES, China boosts its naval presence in the Indian Ocean and forges a strategic relationship with energy-rich countries such as Pakistan, Sri Lanka, Myanmar, and some African countries as a vital measure to ensure its ES.

On the other hand, India perceived China's strategic move as a hegemonic move to maximise power and opted to counter China's naval dominance by developing its maritime capabilities

[16] Morgan Bazilian, Benjamin Sovacool, and Todd Moss, "Rethinking Energy Statecraft: United States FP and the Changing Geopolitics of Energy," *Global Policy*, (September 2017), 423

[17] Randell Newnham, "Oil, Carrot, and Sticks: Russia's Energy Resources as a FP Tool," *Journal of Eurasian Studies*, (July 2011), 135

[18] Rem Korteweg, *Energy as a tool of FP of authoritarian states, in particular Russia*, (Brussels: European Union, 2018), 4

and by entering a defence cooperation arrangement with the US. The article provides a piece of empirical evidence on how the emerging markets affect the health of the energy market and the maturing energy cooperation and interdependence. Albeit the observed realism across the Indian Ocean, the bulk of literature and practices still show the prevalence of structured energy interdependence and cooperation in the world.

Energy Cooperation, Interdependence, and Institutions

Many publications with empirical findings show that energy cooperation and interdependence can best describe contemporary global energy relations and presents a viable solution to ES problematisation. Robert Bryce's book entitled "*Gusher of Lies: The Dangerous Delusion of Energy Independence*"[19]argues that achieving independence in the energy spectrum is unthinkable as the global energy relations are highly interdependent. Energy policy decision making, as an integral part of a FP decision, the book recommends, should embrace the free market, globalisation, and interdependence than power maximisation, protectionism, and isolationism. The book made an essential contribution to mainstreaming energy cooperation in ES problematisation. Energy cooperation needs fertile ground to develop. Joseph McMillan's article in *Strategic Forum* entitled "*ES in South Asia: can interdependence breed stability?*"[20] discussed these conditions in detail. The report argued that energy intensity, soaring prices, and increasing foreign dependence are making energy interdependence indispensable and inevitable. However, for interdependence to flourish, political will has to pave the way.

Jochen Prantl's work on "*Cooperation in the Energy Security Regime Complex"*[21] examines how interdependence can flourish in security regimes. The paper argues that if competition dominates the process of ensuring ES, it becomes a zero-sum game leaving no or little room for cooperation. However, building an ES regime on issues of mutual interest is indispensable in making interdependence work. ES regimes are manifestations of institutionalised energy cooperation mechanisms, set rules and regulations, they correct market failures, and provide adequate information for energy decision making. Though the article did not mention RPPs, the description of the ES regime as a single authority, established to set rules and regulations,

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[19] Robert Brice, *Gusher of Lies: The Dangerous Delusions of Energy Independence*, (New York: Public Affairs, 2008), 80

[20] Joseph McMillan, "Energy Security in Southeast Asia: Can Interdependence Breed Stability?" *Strategic Forum*, (September 2008), 5

[21] Jochen Prantl, "Cooperation in the Energy Security Regime Complex," *Asia Security Initiative Policy Series*, (August 2011): 15

correct market failures, and provide adequate information for energy decision making also matches the functions of an operational regional power pool. "*Multilateral Organisations and the Limits to International Energy Cooperation"*[22] further discusses the development and dynamics of energy cooperation involving several actors in the world. The article argues that the establishment of a wide range of international institutions is mainly to facilitate intergovernmental energy cooperation, but with no significant success because of the challenges posed by energy price volatility, protectionism, and securitisation. This article reinforces the earlier assertion that political will and mutual trust are the fundamental factors affecting the attainment of energy cooperation.

In general, the rationale, prerequisites, and importance of institutions in the attainment of energy cooperation and interdependence have been discussed. The driving factors for energy cooperation are unattainability of energy independence and the social, economic, and political benefits. The prerequisites for energy cooperation are political will and mutual trust.

Energy Cooperation, Economic Development, and Regional Integration in Africa

The underdeveloped nature of the concept of ES makes it challenging to trace its evolution and interlinkages with international relations or FP in Africa. Most of the authors on these issues are non-Africans, and most of the materials consulted focus on fundamental energy players such as the United States, Russia, the European Union, and Organisation for Petroleum Exporting Countries. The themes of ES and FP are too important to be left unstudied, especially for Africa, whose 2063 Development Agenda requires a massive amount of energy that can only be available through a cooperative environment. In this regard, the study will endeavour to produce knowledge which is Afro-centric by employing a regional level analysis.

The United Nations Environment Program published an "*Atlas of Africa Energy Resources*"[23] intending to provide standardised data for the public and policymakers. The atlas discussed the interlinkages between energy, the environment, and economic development; the innumerable energy resources in Africa; the importance of regional energy integration and local power pools. Accordingly, the findings include the centrality of energy for economic growth and poverty reduction. Power pools are vital drivers of energy integration and sustainable development, and there is an adequate political commitment to the establishment and

[22] Jeffery Wilson, "Multilateral Organizations and the Limits to International Energy Cooperation," *New Political Economy,* (2014): 86

[23]UNEP, *Atlas of Africa Energy Resources,* (Nairobi: UN Environment, 2017)

development of RPPs. The atlas provided organised data, though secondary, which the proposed thesis used in developing the statement of the problem and designing different data collection methods.

African Economic Outlook[24] examines the contribution of RI to economic growth and development in Africa. The report acknowledged that lack of energy is a significant hurdle to socioeconomic development in Africa. Considering the economics of RI, the report also recognised the crucial role RPPs could play in fostering cross-border electric trade. However, regional electricity markets, which encourage cross border electric trade, are undeveloped in Africa, the report concluded. The report also identified weak infrastructure as the primary obstacle to the development of regional electricity markets in Africa. The report is relevant for the research questions related to identifying linkages between energy, development, and international studies, examining the role of energy cooperation and sustainable development in Africa; and analysing the position of power pools in fostering energy cooperation in Africa. However, the report did not link the energy factor with the African Union Agenda 2063[25] and the African Union's First Ten Years Implementation Plan (2014 – 2023).[26]These documents identify energy cooperation through the operationalisation of RPPs as a viable remedy to alleviate African energy poverty and achieve socioeconomic development, and this thesis will provide the linkages in the proposed Chapter Three.

The work of Orvika Rosnes and Haakon Vennemo entitled "*Powering Up: Costing Power Infrastructure Investment Needs in Southern and Eastern Africa*"[27]argues that different natural resource endowment, the ability to produce energy at the least cost, and the relative capability to produce more energy are the pulling factors behind regional power trade. In EAPP, the possible pattern of trade would be the development of hydropower making Ethiopia and Sudan become major power exporters. In contrast, the benefit-sharing package allows Egypt to save 2% of its GDP and Ethiopia to gain 6% of its GDP. The paper also underscores the need for substantial investment to exploit the vast hydropower potential to meet the electrification

[24]UNECA, Economic Report on Africa, (Addis Ababa, 2011)

[25] African Union, *African Union Agenda 2063: The Africa We Want*, (Addis Ababa: African Union Commission, 2013)

[26] African Union, *African Union's Ten Years Implementation Plan*, (Addis Ababa: African Union Commission, 2014), 38

[27] Orvika Rosnes and Haakon Vennemo, *Powering Up: Costing Power Infrastructure Investment Need in Southern and Eastern Africa*, (Vantaa: Econ Poyry, 2008), 12

objective across the EAPP region. Similar patterns also exist in the SAPP region where the Democratic Republic of Congo and Mozambique would become the significant hydropower exporters to, and Angola, Botswana, Lesotho, Malawi, and Namibia would become considerable importers. The other important work of the African Development Bank, "*Energy Sector Capacity Building Diagnostic & Needs Assessment Study,*"[28]provides a brief history of the development of RPPs in Africa, including EAPP and SAPP, and a brief account of each regional power market.

The European Centre for Development Policy Management (ECDPM) produced a paper on "*African Power Pools Regional Energy, National Power"*[29] that tried to examine the constitutive elements of RPPs and challenges of energy cooperation through institutions such as power pools in Africa. The discussion paper concluded that SAPP is relatively successful in line with the assumption of the proposed study but claimed that it is because of the hegemonic role played by South Africa.[30] The paper further claimed that bilateral electric trades between member states is a challenge to regional energy markets and recommended that enormous investment and trust will foster energy cooperation. The discussion paper has a methodological deficiency because it reached the conclusions mentioned above based on only secondary data sources. The current study will fill this gap by employing exploratory research that aims at reaching out to major players, both practitioners and academicians, in the field, to obtain primary data.

The World Bank Group also produced a study entitled "*Africa's Power Infrastructure Investment, Integration, Efficiency*,"[31] as part of a series designed to build knowledge on infrastructure in Africa. The technical volumes, in general, aim at providing a reference material with a rich empirical foundation for economic policy decision making on the infrastructure sector in Africa. The report mainly focused on potential power sector projects in African power pools, including EAPP and SAPP. The report underlined the centrality of cross-border trade in general and electric trade to stimulate investment and recommended that

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[28] African Development Bank, *Energy Sector Capacity Building Diagnostic and Needs Assessment Study*, (Tunis: African Development Bank, 2013), 26

[29] Alfonso Medinilla, Bruce Byiers, and Karim Karaki, "African Power Pools: Regional Energy, National Power," *Political Economy Dynamics of Regional Organization in Africa*, (February 2019): 18

[30] Medinilla, Byiers, and Karaki, "African Power Pools: Regional Energy, National Power," 21

[31] Vivien Foster and Cecilia Briceno-Garmendia ed., *Africa's Power Infrastructure Investment, Integration, Efficiency*, (Washington: The World Bank, 2011), 50

international financial institutions are better situated than private sector finance to availing adequate investment for regional electric infrastructure mainly due to risks associated with enforceability of bilateral trade agreements. The study, unlike ECDPM's assertion, did not denounce the role of bilateral electric trade agreements as a hindrance to regional electric markets. Instead, the study suggested that bilateral cross-border power transactions are building blocks to regional electric markets.

The United Nations Economic Commission for Africa (UNECA) produced a study entitled "*Assessing Power Pooling Arrangement in Africa"*[32] to evaluate the efficacy of bilateral and regional electric markets in Africa. The study provided a history of cross-border electricity trade in Africa and the experience of regional power pool arrangements in the western hemisphere. The study concluded that bilateral electricity exchange arrangements are the building blocks for the development of potential power pools, like the World Bank study entitled "*Africa's Power Infrastructure Investment, Integration, Efficiency*."[33] The timing of the study in 2004 when there was only one regional power pool, the SAPP, contributed to the above assertion. The study found out that SAPP has evolved from long-term bilateral electric trade and further recommended that the practice can guide the development of other power pools in Africa.

The Infrastructure Consortium for Africa produced a report in 2016 entitled "*Updated Regional Power Status in Africa Power Pools"*[34] to examine the possibility of the attainment of a functional regional power pool for Eastern Africa between 2020 – 2025 and the emergence of the interconnection between EAPP and SAPP. The report also identified a lack of adequate infrastructure, inadequate legal framework, financial distress, and lack of political will as the primary challenges of operationalising power pools in Africa. The lack of political will, identified as a hindrance in this updated report, was recognised as non-existent in the "*Atlas of Africa Energy Resources"* published by the United Nations Environment Program. The proposed study, which focuses on a comparative analysis of the success stories, challenges,

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[32] UNECA, *Assessment of Power Pooling Arrangement in Africa*, (Addis Ababa: UNECA, 2004), 68

[33] Briceño-Garmendia C., and Vivien F., *Africa's Power Infrastructure Investment, Integration, Efficienc*, 49

[34] Infrastructure Consortium for Africa, *Updated Regional Power Status in Africa Power Pools*, (Abidjan: African Development Bank, 2016), 37

and opportunities of operationalisation of RPPs in Eastern and Southern Africa will determine whether there is an adequate political will or not.

Gaylor Montmasson-Clair and Bhavna Deonarain produced an article entitled "*RI in Southern Africa: A Platform for Electricity Sustainability"*[35] that reviews the overall performance of the SAPP from an electric sustainability perspective. The article utilised concepts of electricity security, electricity equity, and environmental sustainability to assess the viability of electric supply in Southern Africa. It showed that the energy landscape in the SAPP region had been rapidly developing and integrating with an economy-wide transition to sustainability, with energy at its centre. The article concludes that inadequate regional trading mechanism; unfounded attempts to attain energy independence; preference to a bilateral approach than a regional platform in striking long-term supply agreements; and lack of adequate transmission infrastructure, are major impediments for the operationalisation of SAPP.

Stockholm Environment Institute published a report entitled "*Powering Africa: Unlocking Opportunities for Energy Development in Southern Africa."*[36] This paper highlighted the prevailing energy insecurity in SAPP and explored new approaches to overcome the challenges of energy insecurity in Southern Africa. The report indicated that investment in electricity infrastructure is too little to meet the increasing electricity demand for unprecedented economic growth. As a result, access to electricity remained low, and energy sources are not diversified. The report argued that regional power trade, through the SAPP, has the potential to solve the challenge if historical, political, and economic barriers can be sustainably addressed. The report also indicated that regional projects and linking such projects to industrial development objectives could help to ensure benefit-sharing beyond the energy sector. However, Medhane Tadesse's work entitled "*Turning Conflict to Cooperation: towards an Energy-led Integration in the Horn of Africa"*[37]rejects this assertion. The book begins by analysing the pattern of regional and civil wars in North-Eastern Africa. The proceeding part discusses how juridical

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[35] Gaylor Montmasson-Clair and Bhavna Deonarain, "RI in Southern Africa: A Platform for Electricity Sustainability," *Trade and Industrial Policy Strategies*, (October 2017): 54

[36] Oliver Johnson, *Powering Africa: Unlocking Opportunities for Energy Development in Southern Africa*, (Stockholm, Stockholm Environment Institute, 2018), 4

[37] Medhane Tadesse, *Turning Conflict to Cooperation: towards an Energy-led Integration in the Horn of Africa*, (Addis Ababa: Friedrich-Ebert Stiftung, 2004), 125

statehood, a characteristic feature of the states in North-Eastern Africa, affects FP decision making and its impact on inter-state relations. Then the book explains the nature of conflict in the region further to suggest a mechanism to turn the prevailing conflict into cooperation. Finally, the author argued for the prospect of economic integration and energy as a champion of regional peace in North-Eastern Africa. The book is highly influenced by the liberal international relations theory which underlines the centrality of energy needs of states in Africa to foster cooperation. The proposed study, which will use liberal institutionalism, will provide a more comprehensive and complementary analysis on the drivers of energy cooperation in Africa.

Energy Cooperation and Mainstream Theories of International Relations: A Review

The theoretical literature review part focuses on identifying the existing international relations theories on the concepts of ES, energy cooperation, and interdependence; and assesses their relevance or inadequacy to explaining the research questions before introducing the proposed theoretical framework for the study.

ES, cooperation, and interdependence studies at the global level often utilise realism or liberalism in explaining research problems. Realism is the *oldest theory*[38]in international relations that anchors its analysis of international politics on egoism, anarchy, and states[39]. Consequently, rationality and state-centrism appeared to be the core foundations of the realist theory of international relations[40]. Countries gain power for self-preservation or nations further increase their capabilities to project power[41]. Energy, as a significant source of abilities and a threat to the survival of the state, creates a security dilemma[42] among energy producers and consumers; and among consumers alone[43]. The ES dilemma between producers and consumers highlights the divergent interests of producers, which prioritise stable market at reasonable energy prices, and consumers, anchored on inexpensive energy supply. The European Union

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[38] Jack Donnelly, “Realism,” in *Theories of International Relations*, ed. Scott Burchil et al. (New York: Palgrave, 2005), 29

[39] Robert Gilpin, “The Richness of the Tradition of the Tradition of Political Realism,” *International Organizations*, (Spring 1984): 288

[40] Sean Molloy, “Realism: A Problematic Paradigm,” *Security Dialogue*, (March 2003): 75

[41] Donnelly, “Realism,” 38

[42] Andrew Monaghan, “Russia-EU Relations: An Emerging ES Dilemma,” *Pro et Contra*, (July 2006): 6

[43] Robert Skinner, “ES and Producer-Consumer Dialogue: Avoiding a Maginot Mentality,” paper presented for *Government of Canada Energy Symposium* (Ottawa: Oxford Energy, 2005): 21

and Russia ES dilemma can best illustrate the ES dilemma between producers and consumers[44]. On the other hand, the Peoples Republic of China's aggressive ES policy has created a security dilemma among other consumers, especially the US, India, and Japan.

Therefore, given energy is a strategic resource and globalisation and the free market cannot guarantee ES, the realist approach is gaining prominence in energy[45]. Realists argue that energy can be a cause for war because its strategic values are increasing, energy independence is becoming unattainable,[46] conflict-prone or sensitive regions are homes to a significant portion of world's energy supply, [47] and energy is a finite resource.

Realism's ES discourse mainly focuses on oil and conflict over the resource. However, realism may not elucidate the evolution of regional electric pools in Europe and their proliferation in Africa. Also, realism's utmost focus on oil and natural gas limits its explanatory power on renewable resources which are the fundamental energy sources for the Eastern and Southern African RPPs. Thus, the study will not employ the realist theory of international relations.

The literature review identified mercantilist barriers as challenges to ES and the liberal theory of international relations identifies such protectionist measures as causes of conflict in the world. Thus, the liberal theory argues that interdependence and cooperation are likely, and if states allow international regimes and institutions to facilitate the process, conflict is avoidable[48]. Thus, free markets and interdependence undermine the viability of war to ensure ES. Is war the plausible approach to ES? Realists may argue that ES must be achieved at all costs, even if it means through war, considering the reliance of national economies on the

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[44] Pami Aalto, "The EU-Russia Energy Dialogue and the Future of European Integration: From Economic to Politico Normative Narratives," in *The EU-Russia Energy Dialogue: Europe's Future ES*, ed. Pami Alto (Bodmin: Ashgate Publishing Limited, 2008), 65

[45] Gal Luft and Anne Korin, "ES: In the Eyes of the Beholder," in *ES Challenges for the 21st Century*, ed. Gal Luft and Anne Korin (California: ABC-CLIO, 2009), 4

[46] Robert Brice, *Gusher of Lies: The Dangerous Delusions of Energy Independence*, 42

[47] Michael Klare, *Rising Powers, Shrinking Planet: The New Geopolitics of Energy* (Oxford: Oneworld, 2008), 13

[48] Scott Burchill, "Liberalism," in *Theories of International Relations*, ed. Scott Burchill (New York: Palgrave Macmillan, 2001), 64

supply of energy. However, liberals believe that the energy war is old-fashioned[49] for three crucial reasons. Firstly, war is futile to ES because it damages the hardly installed infrastructure and energy value chain creating further energy insecurity. For instance, after the US invasion of Iraq, the latter country lacks political stability thus affecting the reliable supply of energy to the global market. Also, conflict arises when actors have divergent interests and compromise is off the table. When we look at the energy interests of nations, they are not divergent to induce war because all countries want affordable, sustainable, and reliable energy sources.

Moreover, countries are relegating war to pursue international economic interests, especially after the end of the cold war[50]. Furthermore, all countries, including significant oil-exporting nations in the world, are not energy independent[51]. Thus, energy will be traded regionally and globally breeding cooperation and interdependence. The current reality shows that the volume of energy trade in the world will increase by more than double by 2030.[52] Also, global energy infrastructures like pipelines, tankers, ports, refineries[53], and institutions such as RPPs are strengthening the interdependence in the energy sector. Therefore, energy interdependence is the current reality which must be taken into consideration when crafting a country's foreign and energy policies.

Liberalism's ES discourse mainly focuses on the indispensability of cooperation. Liberalism can best explain the establishment of international energy regimes such as the IEA and the OPEC. However, it may not fully explain the evolution of regional electric pools in Africa because of its misgivings on the role of the state. Also, its mainstream nature influences its use to be more focused on traditionally strategic sources of energy such as natural gas and oil and limits its explanatory power on renewable resources, which are the fundamental energy sources for the Eastern and Southern Africa power pools. Thus, the study will not depend on liberalism theory of international relations.

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[49] Christopher Fettweis, "No Blood for Oil: Why Resource Wars Are Obsolete," in *ES Challenges for the 21st Century*, ed. Gal Luft and Anne Korin (California: ABC-CLIO, 2009), 72

[50] Joseph Nye and Sean Lynn-Jones, "International Security Studies: A Report of a Conference on the State of the Field," *International Security* (Spring 1988): 26

[51] Frank Verrastro and Sarah Laaislaw, "Providing ES in an Independent World," *The Washington Quarterly* (Autumn 2007): 95

[52] International Energy Agency, *World Energy Outlook* (Paris: OECD/IEA, 2006), 36

[53] Verrastro and Laaislaw, "Providing ES in an Interdependent World," 100

The review of related literature indicates that most of the authors on ES, energy cooperation and energy interdependence are non-Africans, and the books and journals mainly focus on global energy relations overlooking the development of power pools in Africa. The globalist scope of these studies requires the utilisation of mainstream international relations theories such as realism and liberalism. The scope of the proposed study, which is regional, and its focus on Africa, calls for the consideration of other theories. In so doing, the study reviewed two critical works by Lisa Rothkegel and Elijah Chizamusoka Sichone, African scholars, who utilised theories of international relations other than realism and liberalism, in their endeavour focused on RPPs in Africa.

Lisa Rothkegel's thesis entitled "*The Power of Power: Regime Dynamics and the Southern African Power Pool*"[54] is one of the few studies conducted under the international studies field of study on RPPs. The study investigates the emergence of norms and rules of the energy market in Southern Africa. Rothkegel used the regime theory to identify the type of electric regime and the degree of efficacy of the SAPP. The study concluded that SAPP is enfeebled. Regime theory argues that institutions affect the behaviour of states. Though the regime theory may be capable of explaining the action of the SAPP member states after the establishment of the power pool, because member states played the primary role in the evolution of SAPP, this theory falls short of providing a complete analysis.

Elijah Chizamusoka Sichone's thesis on "*Exploiting renewable energy opportunities through integrated regional power systems: Analysis of institutional perspectives on barriers in Southern Africa*," in the field of Economic and Management Science, is the other important work with a clear theoretical framework.[55] The study aimed to highlight institutional challenges to renewable energy development. The institutional theory of international trade was used in this study. The major finding of this study was that institutional elements were generally inadequate to contribute towards the promotion of renewable energy in Southern Africa. The problem statement determined the selection of the theoretical framework. Thus, the main

[54] Lisa Rothkegel, "*The Power of Power: Regional Dynamics and Southern African Power Pool*," (MA Thesis, Stellenbosch University, 2013), 64

[55] Elijah Sichone, "*Exploiting Renewable Energy Opportunities through Integrated Regional Power Systems: Analysis of Institutional Perspective on Barriers in Southern Africa*," (MA Thesis, Stellenbosch University, 2018), 80

contribution of Sichone's thesis for the proposed research is the assertion that the problem statement and research questions determine the selection of a theoretical framework.

Liberal intergovernmentalism would also be an appropriate theory. Andrew Moravcsik attempted to improve the theory of liberal intergovernmentalism to expound the process of RI in the European context.[56] Because RI process is the combination of interest aggregation by the participating states and the outcome of the bargaining process and liberal intergovernmentalism, a combination of liberal and intergovernmentalism theories[57], is relatively the better theory in elucidating the process of RI. Though the model was developed mainly to explain the RI process in Europe, its application in numerous studies shows that it can be used to study the same process in Africa. For instance, a study conducted to utilise European integration theories to explain African integration realities argues that liberal intergovernmentalism explains most parts of African integration. The study compares federalism, neo-functionalism and liberal intergovernmentalism theories of RI. It concludes that the main driving force behind cooperation and integration in the African context is national interests showing that liberal intergovernmentalism might yield the most explanatory power.[58]

Another study conducted to explain the process of regional economic integration in the East African Community also observes that liberal intergovernmentalism offers a more plausible explanation of the East African integration. The study compares the liberal intergovernmentalism theory with the constructivist approach and concludes that states take the lead in the African integration process. Thus, the theory of intergovernmentalism, unlike the constructivist approach that evades the relative importance of the state, provides a better explanation because it anchors its analysis on the influences of policy and bargaining outcomes.[59] The liberal intergovernmental theory has a considerable bias towards RI. Thus, the

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[56] Andrew Moravcsik, "Negotiating the Single European Act: National Interest and Conventional Statecraft in the European Community," *International Organizations* (Winter 1991): 25

[57] Andrew Moravcski, "Preferences and Power in the European Community: A Liberal Intergovernmental Approach," *Journal of Common Market Studies* (December 1993): 482

[58] Stefan Michel, "*European Integration Theories and African Integration Realities: Federalism, Neofunctionalism, and Liberal Intergovernmentalism in African Integration*" (MSc Thesis, Leiden University, 2012), 49

[59] Mwita Chacha, "The New Community: Liberal Intergovernmentalism and East African Integration," presents at *Annual Meeting of American Political Science Association* (August 2009): 29

proposed thesis will not utilise this theory because the main objective of the research is the role of institutionalised energy cooperation, RPPs, for the attainment of sustainable development, not RI.

In general, classical realism, liberalism, and liberal intergovernmentalism theories of international relations are found to be less feasible to examine the contribution of RPPs in promoting energy cooperation in the Eastern and Southern African regions for three significant reasons. First, the theories are grand theories conceptualised and developed based on international relations at the global level, but the scope of the study is regional. Second, the theories are mainstream, often focusing on the global energy market, but the research focuses on regional power trade. Third, these theories are not Afro-centric, whereas the study focuses on Africa. Fourth, the literature reviewed demonstrates that liberal institutionalism can explain the African context better; its inclination towards RI made it less feasible to deliver on the research objectives.

Gaps in Empirical Literature

The study identified numerous gaps in the empirical literature as follows. The gaps are anchored on the scope, methodology, and validity of conclusions of the reviewed documents. Most of the literature reviewed is globalist and generalist in nature. Studies on energy cooperation and ES overemphasise the traditional and mainstream sources of energy. These studies disregard hydro, wind, and solar power; overstress the role of global institutions such as the OPEC and IEA, disregarding regional institutions such as power pools. These studies also overlook Africa in their analysis and overstate the importance of reliability of energy supplies without paying much attention to the availability of energy. In other words, most of the studies on ES overemphasise reliability, one of the pillars of ES, rather than pursuing a comprehensive approach to ES by including availability, affordability, and sustainability factors into their studies. Also, most of the studies use secondary data sources, some of which are primarily quantitative, and there have been no comparative studies identified so far.

Besides, some of the conclusions and recommendations of these studies contradict each other. Among others, the following four contradictions are major. First, on the importance of hegemonic power to nurture energy cooperation. One study argues that the role of hegemonic power is critical in fostering energy cooperation while another study dismisses the importance of hegemonic power. Second, one study suggested that energy alone can create interdependence and cooperation, whereas another study strongly recommended the importance of additional benefit-sharing package. Third, some studies concluded that bilateral and regional power trade are complementary, where other studies claim that they are mutually exclusive. Fourth, though all studies underscore the importance of a political will to foster energy cooperation, these studies differ, for instance, in determining the existence of adequate political will to promote energy cooperation in Africa. Therefore, this research attempted to fill the scope and methodological gaps as well as mend the contradictions by incorporating the relevant issues into the instruments of data collection.

7.0 Theoretical Framework

The increased acknowledgement of the importance of energy and the unattainability of energy independence drove states to engage in energy cooperation. African states are no different. Energy, by way of RPPs, is one of the cooperative arrangements in Africa, as per the African Union Agenda 2063. However, as the problem statement indicated, a few academic studies are problematising RPPs. The theoretical framework selected for the study is the liberal institutionalist theory of international relations.

Energy Cooperation: A Liberal Institutionalist Approach

The study focused on institutionalised energy cooperation, the role of RPPs in fostering energy cooperation, and their contribution to sustainable development in Africa. Thus, the theory of liberal institutionalism, which provides a peculiar perspective on the role of institutions in an increasingly interdependent world, to delivering on the research objectives, has been proposed as a theoretical framework for several reasons.

After the end of World War II, states began to realise that they are increasingly incapable of addressing global challenges unilaterally. The environment of growing interdependence and cooperation breeds the "*trading state*" in place of an "*independent and self-sufficient state*."[60] The post-war period witnessed the establishment of institutions such as the United Nations to encourage cooperation and interdependence and discourage protectionism. These institutions pave way for the development of a rules-based international system whereby the behaviour of actors is managed by sets of rules, norms, and regimes. The formation of the United Nations underscores the growing confidence of states over the ability of institutions to manage international relations. It is also the product of the realisation that institutions are paramount in dealing with multifaceted challenges such as the environmental degradation[61] and energy

[60]Scott Burchill, "Liberalism," 65

[61]Steven Slaughter, "Liberalism and the Foundations of Global Environmental Governence," presented at *European Consortium for Political Research Annual Joint Session* (Grenoble, April 2001): 12

crisis[62] requiring concerted efforts of the sovereigns. Therefore, the world was undoubtedly entering into an era of interdependence and institutionalised cooperation.

Energy is not different. States realised the inadequacy of their will and power to address global and national energy challenges unilaterally and opted for a more cooperative framework. Numerous international energy institutions have emerged to manage global energy relations and ES concerns of producers and consumer states. To regulate international energy relations, states established international institutions such as the OPEC, IEA, IEF, and UN-Energy manage. Besides these global institutions, there were also regional institutional attempts in several parts of the world to address ES challenges. African, Asian, and European countries established numerous regional institutions to promote energy cooperation and interdependence in their quest for ES. The regional power pool arrangements in Africa are a case in point. Thus, the liberal institutionalist theory of international relations whose founding blocks are states, institutions, and interdependence[63] can adequately explain the institutional approach states chose to address global energy challenges.

The theory of liberal institutionalism recognises states as the key actors in an increasingly interdependent and anarchic world. The literature on the establishment of RPPs in Africa shows the importance of states in the process. States establish the respective power pools in Africa before all else. The theory of liberal institutionalism also asserts the role of institutions in creating and managing interdependence in global affairs. International institutions tame the "behaviour of states" interaction towards cooperation in the anarchic international system.[64] Amid anarchy, states opt to cooperate and ensure their ES under the umbrella of institutions. The highlight will enable the researcher to be able to show the role of institutions such as the two RPPs in fostering, taming, and managing energy cooperation in their respective regions. Institutions are "*persistent and connected sets of rules that prescribe behavioural roles, constrain activity, and shape expectations*."[65] Thus, regional or international institutions help

[62]Stockholm International Peace Research Institute, *Oil and Security* (New Jersey: Humanities Press, 1974), 64

[63]Andrew Moravcsik, "Liberal Intergovernmentalism and Integration: A Rejoinder," *Journal of Common Market Studies* (December 1995): 621

[64]David Forsythe, "Neoliberal Institutionalism," in *International Organizations and Global Gobernance*, ed. Thomas Weiss and Rorden Wilkinson (London: Routledge, 2014), 128

[65]Robert Keohane, "Neoliberal Institutionalism: A Perspective on World Politics," in *International Institutions and State Power: Essays in International Relations Theory*, ed. Robert Keohane (Boulder: Westview Press, 1989), 78

states to address shared obstacles through embracing and pursuing cooperation by improving predictability, defining expectations, monitoring progress, providing a platform for discussion, and punishing deviation from shared goals.[66] Liberal institutionalism argues that states should establish institutions both at national and international levels to pursue areas of common interest. The establishment of international institutions such as OPEC and IEA, and regional institutions such as RPPs are therefore to address energy challenges by embracing cooperation and interdependence.

The emergence of international institutions in the management of international energy relations is the product of age-old competition between energy-producing and consuming countries. The First Oil Crisis in 1973 was a deliberate and politically motivated, economically rationalised supply disruption by OPEC on western industrial countries, leading to a global energy crisis. The embargo caused economic shocks on energy importing countries and forced them to reassess their energy situation both at the domestic and international level. At the national level, the oil-importing countries took numerous measures, including shifting to more energy-efficient technologies to mitigate their oil dependence on foreign sources. At the global level, oil-importing and industrialised countries established IEA; an institution tasked to enhance members' ES through energy cooperation. The establishment of institutions such as OPEC and IEA inculcate structure, cooperation, and interdependence in international energy relations. The establishment of these institutions is a crucial achievement for liberal institutionalists because the world decides to tackle pressing ES issues by embracing interdependence and cooperation anchored on the role of institutions. The liberal institutionalists observed the state's capability to identify transboundary issues and the will to cooperate and solve issues of common concern under an institutional umbrella regardless of the strength of the institution. The oil-importing countries made oil embargo challenging to implement as they attempted to address unprecedented oil shortage by agreeing to supply the shortage from the strategic reserve managed by IEA.[67] Since establishment, the IEA was successful in influencing the behaviour of oil-producing countries up to the Second Oil Crisis in 1979. Nevertheless, the IEA failed to promote the interest of its members during the 1979 oil crisis. Therefore, IEA

[66]Robert Keohane and Joseph Nye, "Power and Interdependence in the Information Age," *Foreign Affairs* (September-October 1998): 86

[67]Robert Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (New Jersey: Princeton Press, 1984), 81

provides an excellent example in extrapolating how institutions successfully manage global energy relations.

The evolution of energy-related institutions across time shows that the nature and magnitude of challenges change, but the state's belief in the ability of institutions to sustainably manage the challenges remains the same. The proposed study will further investigate the role of regional institutions such as Eastern and Southern African Power Pools in tackling ES challenges and the development of energy-related norms and rules in their respective regions.

Liberal institutionalists assert that institutions exist because states sanction them and the power relations among member states determine the nature or strength of the institutions.[68]Institutions provide information, reduce transactional cost, and make commitments by member states credible – whether these institutions have a crucial impact on the situation or not.[69]RPPs are institutions expected to facilitate energy cooperation. In this regard, the study will bring about the contribution of the RPPs in the attainment of ES in Eastern and Southern Africa. If the study finds out that the impact of these regional institutions concerning ES is different, it will factor in other variables to explain the discrepancy. Since the liberal institutionalist theory presumes that prevailing conditions affect the impact of institutions on the behaviour of states and the situation, the study would capitalise on this flexibility to further its analysis into explaining the underlying conditions.

The study considered the use of the liberal institutionalist theory for it treats institutions as both dependent and independent variables in social science research designs.[70] Institutions can be dependent variables if the study's focus is on the context they evolve from and independent variables if the study wishes to bring about their effect on the behaviour of actors. Considering the argument, RPPs can be treated as both independent and dependent variables depending on research objectives. In this study, RPPs will be treated as independent variables. The study presumes that sustainable development in Africa depends on the provision of adequate energy supply, which in turn partly depends on the energy cooperation whose institutionalised attempts in Africa are RPPs.

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[68]Keohane, *International Institutions and State Power: Essay in International Relations Theory*," 34

[69]Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy*," 90

[70]Robert Keohane and Lisa Martin, "The Promise of Institutionalist Theory," *International Security* (Summer 1995): 46

In general, the study proposed the theory of liberal institutionalism as its theoretical framework due to its recognition of the centrality and rationality of states. It was further enhanced by its widespread applicability in energy cooperation studies; and its flexibility in accommodating external variables to explain the rationale behind the magnitude of institutions in managing behaviours.

8.0 Justification

The development of RPPs is a recent phenomenon in Africa with few academic and practical materials. The review of empirical literature showed that most of the documents reviewed are reports of international organisations. There is a lack of sufficient academic studies that serve as a foundation for policy recommendations. Thus, the primary contribution of the study was on the new body of knowledge created by the research that shows not only the role of RPPs in fostering energy cooperation but also the role of energy interdependence in the realisation of the African Union Agenda 2063. Second, the study further filled the gaps identified in the empirical and theoretical literature. The gaps mostly relate to the nature of the reviewed documents, the methodology, and the validity of conclusions. While addressing gaps identified, the study contributed towards improving knowledge in RI and energy cooperation studies, particularly in the African context. The study also added an academic voice to the regional level of analysis of RI studies in Africa. Besides, the study used primary data, largely qualitative within a comparative analysis to examine contradictions in the findings of the reviewed literature to improve knowledge with more valid and generalisable conclusions.

Also, the outcome of the study may be of interest to policymakers because it will be suitable for policy manipulation. Findings of the study may help national and regional energy policymakers to understand the essential drawbacks and opportunities, including policy challenges, at the regional level, and help them conceptualise the causes for such hitches so that lessons are drawn to improve on practice.

9.0 Research Hypotheses

1. Energy cooperation leads to sustainable development in Africa.
2. Weak Regional Power Pools lead to energy insecurity in Eastern Africa, and strong regional power pool results in ES in Southern Africa.
3. The challenges and opportunities of African power pools are identical in Eastern and Southern Africa.
4. Bilateral energy trades hamper the development of a regional power pool.

10.0 Research Methodology

The purpose of this section is to outline the design of the research. It explains and tries to justify the research method and methodologies of the study. The outline includes components of research design.

10.1. Research Design

To determine the suitable research design, the researcher considered three main elements as suggested by Creswell (2013)[71], which encompasses philosophical orientation on what specifically institutes knowledge assertions, general processes, techniques of inquiry, extensive stages of gathering data, analysis, and writing of the report. The study examined the role of RPPs in fostering energy cooperation by comparing the pull and push factors contributing to the realisation of institutionalised energy cooperation in Eastern and Southern Africa. The research was interested with "that which works" as well as an explanation to the problem examined. Among the two major philosophies in research, positivism and phenomenological paradigms, the researcher chose positivism as the philosophical underpinning of the study because positivism allows using the data to objectively analyse the existing relationships among the variables under study and that literature was used to draw the study hypotheses.

Based on the philosophical foundation, mixed research design was adopted in the study. The research design allowed the researcher to pursue both qualitative and quantitative methods and to explore the multifaceted energy relations in the respective power pools characterised by their complexity due to the involvement of social, political, and economic factors. The study undertook an in-depth comparative and case study analysis in answering the research questions. The researcher preferred mixed research design for three significant reasons. First, it is a preferred methodology when a comprehensive and detailed investigation is needed[72]. Second, it allows intensive investigation and creative analysis of data[73]. Third, it is suitable for a research area where little is known.[74] All these three aspects are enabled through a process of triangulation of various study instruments.

[71] Creswell, *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*

[72]Winston Tellis, "Application of Case Study Methodology," *The Quarterly Report*, (September 1997): 8

[73] Joe Hair, et al., *Essentials of Business Research Methods* (New York: Routeledge, 2016), 33

[74]Kathleen Eisenhardt, "Building Theories from Case Study Research," *The Academy of Management Review* (October 1989): 548

The comparative research design involves a decision over what and how to compare[75]. In this regard, the unit of observation will be RPPs, and the unit of variation will be energy cooperation. The study utilised units of measurement that will include access to electricity; affordability; reliability; sustainability; availability; the percentage of regional power trade from the total energy consumption; the number of bilateral and regional power trade agreements; adequacy of generation capacity; and regional apparatus for dispute resolution. The literature review helped in identifying the units of measurement.

The choice of EAPP and SAPP was deliberate for three significant reasons. First, EAPP and SAPP are two of the four RPPs in Africa. Second, the overlapping membership of the DRC and Tanzania will allow assessing the efficacy of the respective RPPs. Third, the EAPP and SAPP are planned to grow into a single regional power pool, and comparative analysis of the two RPPs will enable the proposed research to identify the gaps in the process and provide recommendations for the successful realisation of greater integration. Fourth, SAPP, being the oldest RPP, and EAPP, being the youngest RPP, will allow the research findings to consider the evolution of power pools in Africa and generalizability.

Also, the study followed an international comparative analysis and enabled us to understand and explain similarities and differences between the two RPPs. Such awareness will allow us to increase the generalizability of findings and to deepen our understanding of the pull and push factors in the operationalisation of RPPs. The rationale for using an international comparison is that of evaluating the role of RPPs to address ES in Eastern and Southern Africa. As a design option, a comparative case study is proposed to be considered for two primary reasons. First, the comparative case study provided the most suitable way to observe and investigate two or more cases to compare their features in different settings, with the use of identical research instruments. Second, it increased the likelihood of generalizability as well as the reliability and validity of the results.

10.2. Study Site

The research was conducted in the Eastern and Southern Africa sub-regions. The researcher visited and collected data from the headquarters of the Eastern Africa Power Pool in Addis

[75] Delwyn Goodrick, "Comparative Case Studies," *Methodological Briefs: Impact Evaluation* (September 2014): 12

Ababa, Ethiopia, that of the Southern Africa Power Pool in Harare, Zimbabwe, and from selected power pool member countries listed in the sample frame.

10.3. Target population

The research mainly targeted leaders and senior experts from the EAPP, SAPP, selected river basin institutions, regional economic blocks, the ADB, the academia, UNEP, UNECA, and the AU. The targeted participants were those with sufficient and recent experience in leading, coordinating, and supporting the realisation of the power pooling mechanisms in both regions. It was not difficult for the researcher to find the relevant research participants that can serve the purpose of this research project.

10.4. Sampling Frame

This comparative study utilised both qualitative and quantitative methods. Also, purposive sampling was used to identify the sample with an emphasis on providing a wealth of information regarding the research questions. In purposive sampling, the researcher chooses research participants and cases depending on the quality of information they provide to achieve the research objectives[76]. The researcher selected prospective research participants purposefully, which means those with relevant information were picked to answer the interview questions and help to appropriately formulate the intended questions. Thus, the researcher chose the prospective participants from two major categories of the significant energy players in EAPP and SAPP.

The sampling frame and selection depended on the access the research has on the population[77]. In those cases, a single-stage sampling procedure purposive sampling was adopted. Accordingly, for this study, the researcher established preliminary communication with the majority of the agencies identified for the research. Purposive sampling was essential in listing to determine not only the study population but also the key informants from the target population. The study employed the formulae proposed by Cochran to compute the sample size. Cochran argued that the formula is more critical since it can be used to calculate both sample of population greater and/or less than 10000, that is for unknown population.

[76]John Creswell, *Qualitative Inquiry and Research Design: Choosing Among Five Approaches* (Thousand Oaks: Sage, 2007), 42

[77]Creswell, *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*, 118

The sample size is computed as follows:

$$n = \frac{z^2 Pq}{\emptyset^2}$$

Where:

n= Required sample size

Z= confidence level at 95% that corresponds to the standard critical value of 1.96

P= estimated the proportion of an attribute for a conservative sample size estimate or population standard deviation at 0.5

Q= as 1-p which means that population proportion with characteristics unmeasured (1-0.5) =0.5

Ø=Margin of error as a measure of precision at 9.8% with a standard value of 0.098

$$n = \frac{z^2 P(1-P)}{\emptyset^2}$$

$$n = \frac{(1.96)^2 * 0.5(1-0.5)}{0.098^2}$$

$$\boldsymbol{n = 100}$$

The study further proposes the proportional representation of the study population as follows:

Study Population	**Sample Population**	**Percentage distribution of the sample**
EAPP	5	5%
SAPP	5	5%
African Union and the African Union Commission	5	5%
Financial Institutions Africa Development Bank Trade and Development Bank **Energy and Environment Partnership Trust Fund**	5	5%

UN Agencies	10	10%
Regional Economic Communities Intergovernmental Authority on Development (IGAD) East African Community Southern Africa Development Cooperation (SADC)	6	4%
Development Partners **The Sustainable Development Goals Centre for Africa** **Others**	4	4%
Tanzania	13	13%
South Africa	13	13%
Ethiopia	13	13%
Kenya	13	13%
Zimbabwe	13	13%
Total	100	100%

Table 1 Study Population

The percentage distributions of samples from individual countries are much higher than the institutions to strengthen the empirical nature of the study. The two regional economic communities, IGAD and SADC, were included in the study because they will provide practical information on the role of the RPPs to the socioeconomic development of the respective regions. The sample also includes members of the individual RPPs for several reasons. First, South Africa and Ethiopia are the drivers of the two RPPs. Second, Zimbabwe and Kenya are in the list because there is an opportunity to gather data without incurring extra cost since the researcher lives in Kenya and plans to visit Ethiopia and Zimbabwe as the seat of the respective power pools. Tanzania makes it into the study because it plays a unique role as a 'transit state' between EAPP and SAPP for the planned integration. In these countries, the researcher will gather primary data from key energy players.

10.5. Data collection methods

Typically, case studies allow combining different methods to gather data. These include interviews, questionnaires, document analysis, and focus group discussions[78]. The researcher facilitated the process of data collection, and the research process treated the research participants as subjects of the study[79] to permit the researcher to understand and embrace the participant's view of the phenomenon. The study utilised questionnaires to collect primary data from the research participants. The researcher provided the questionnaire in person while visiting the research participants listed above or sent the questionnaire through electronic email for some research participants that are not physically accessible. The data collected from the questionnaire provided the data for the descriptive part of the analysis.

10.5.1. Questionnaire

The study utilised questionnaires as a method of data collection for primary data sources because of cost-related and administration advantages.[80] The proposed study covered a wide range of issues of institutionalised energy cooperation and sustainable development. Thus, the questionnaire was detailed and covered a range of issues. The study primarily combined "drop-off, pick up later" and web-based questionnaire.

The questionnaires had closed and open-ended questions. The open-ended questions provided with unrestricted information.[81]Some of the questions in the questionnaire provided answers in terms of a scale. The study utilised a Likert scale whereby the research participant is provided with possible responses arranged on a scale of "strongly agree" to "strongly disagree."[82]

The researcher conducted a pilot test before administering the questionnaire in the field. The question of the appropriate sample size arose. According to Issac, Michael and Hill, a sample size of 10-30 participants has several practical advantages such as simplicity, easy

[78]Abbas Tashakkori and John Creswell, "Exploring the Nature of Research Questions in Mixed Methods Research," *Journal of Mixed Methods Research* (July 2007): 214

[79]Martyn Hammersley, *The Politics of Social Research* (California: Sage, 1995), 52

[80]David Wilkinson and Peter Birmingham, *Using Research Instrument: A Guide for Researchers* (New York: RoutledgeFalmer, 2003), 8

81Ranjit Kumar, *Research Methodology* (London: Sage, 2011), 126

[82]David Colton and Robert Covert, *Designing and Constructing Instruments for Social Research and Evaluation* (San Francisco: John Wiley & Sons, 2007), 132

computation, and the ability to do hypotheses testing. On the other hand, studies including Hertzog suggested various solutions for a suitable size depending on the purpose of the pilot study. The author recommended a sample size of 10-15 per group at times being sufficient. However, for questionnaire or other instrument development, the study recommended 25-40 whereas 30-40 per group was suggested for pilot studies comparing groups.

Since the study required accurate and precise estimation of the parameters from the pilot, samples that are both representative of the population and appropriately large were selected. The implication is that these participants served as an accurate representation of the study population of interest. In this case, the study conducted a pilot test on 20 respondents who were randomly selected from a pool of energy experts from across the African continent who attended training on "*Global Diplomacy for Energy Transition in Africa,"* which coincided with the study period. The pilot was meant to confirm the amount of time needed to complete the survey, to examine the clarity of the questions, and to validate the questionnaire.

10.5.2. The Interview Process

The research participants were drawn from Ethiopia, Kenya, Tanzania, and Zimbabwe. They were contacted through the support of the Ministry of Foreign Affairs of Ethiopia and the Ethiopian Embassies in the countries mentioned above. Some of the participants were met and interviewed in their respective offices and others through web-based tools such as Skype, Zoom, and Google Meet. A general structure of the interview process was developed to provide clarity and a sense of direction to the research participants without losing flexibility. The participants were encouraged to bring out their actual experiences on the topic of discussion uninterrupted without ignoring the time factor. Since the research involved international governmental organisations, whose working language is English, the interviews were conducted accordingly without any need for translation.

The researcher recorded 70 per cent the interviews using audio recording instruments, subject to 'no objection' from the research participant, and converted the recorded tape into a digital file, stored it in a password-protected computer file, and erased the recorded tape. When memos were the only modes of recording, 30%, the researcher transcribed the handwritten data into a softcopy file, stored it in a password-protected file, and destroyed the written data. The researcher stored the collected data replacing the names of participants with codes in password-protected computer encrypted using open-source encryption software called "Truecrypt."

10.5.3. Document Analysis

Content analysis was the other crucial form of data collection in this study. It is composed of dissecting the contents of books, magazines, newspapers, and audio materials[83]. The research consulted documents and official reports related with power pools, Eastern and Southern Africa Power Pools, energy cooperation and interdependence; legal documents, declarations, conventions, reports, magazines, newspaper articles, and communique published by the respective institutions such as EAPP, SAPP, AU, IGAD, SADC, and the UNECA. The researcher examined and interpreted data to gain understanding, meaning and develop knowledge.[84] In terms of its applicability, case studies utilise document analysis[85] to formulate the interview questions and design the questionnaires.

10.5.4. Focus Group Discussions

The study conducted two focus group discussions with the EAPP, SAPP, and African Union with a maximum of six participants per group. Participants for the discussions were selected purposively. The focus group discussions were conducted before the interview process to develop shared knowledge on the phenomenon under investigation.

10.6. Reliability, Validity, and Generalizability of Data Collection Instruments

Validation, as a process, involves crafting appropriate instruments of data collection and continuously checking the authenticity of the raw data. In doing so, the researcher consulted the dissertation supervisor, and lecturers at the University of Nairobi while developing instruments of data collection, such as the questionnaire and interview guide. Also, the study used data triangulation and within-method triangulation approaches to boost the validity of the research. For instance, the researcher used identical questions to authorities at EAPP and SAPP to find out challenges concerning the successful realisation of the institutionalised energy cooperation in Africa. However, reliability and validity could not be wholly achieved in the study because the study was not conducted in a controlled environment. In qualitative studies, reliability refers to the extent to which the results of the study are immune from an unintended

[83]C R Kothari, *Research Methodology: Method and Techniques* (New Delhi: New Age International Publisher, 2004), 110

[84]Anselm Strauss and Juliet Corbin, *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory* (London: Thousand Oaks, 2008), 4

[85]Robert Yin, *Qualitative Research from Start to Finish* (New York: Guilford, 2016), 156

situation in their production process.[86] The study employed different methods of data collection to ensure the reliability of the findings. For instance, in explaining the push and pull factors to energy cooperation in EAPP and SAPP, the study used questionnaires, interviewing, document analysis, and focus group discussions.

Since the research aimed at comparing the pull and push factors contributing to the realisation of institutionalised energy cooperation in Eastern and Southern Africa, the findings produced a systematic knowledge that allows generalisations, hence achieving external validity. The research built generalisable knowledge on the role of RPPs in fostering energy cooperation in Africa. In doing so, the study chose EAPP and SAPP. The justification provided for the selection of EAPP and SAPP earlier in this section will contribute to the realisation of external validity.

10.7. Data Analysis and Presentation

Data analysis involved organising and explaining the data set across patterns, themes, and regularities comparatively. The study had largely qualitative data, but the researcher generated some quantitative data as well. The study utilised descriptive statistics to summarise the data. The information collected from the research participants was organised into themes in such a way that allowed interpretation, comparisons, and generalisations. The process revolved around the research questions.

Data were summarised into graphs, charts, and tables using statistical tools. The study also presented the data set using percentages, mean, and standard deviations. Further, the study computed composite indices for the constructs that were used in estimation of regression models. They were used to test the hypotheses as stated in the study variables. These analyses assisted the attainment of a comparative conclusion on the role of RPPs in promoting energy cooperation in EAPP and SAPP.

11.0 Scope and limitations of the study

The research was only devoted to energy relations dynamics in Eastern and Southern Africa power pools. In doing so, the paper focused on RPPs assessing the state of energy cooperation in Eastern and Southern African in line with the objectives of the study.

Several challenges emanated from both the research participants and the researcher. One of such problems was the crowded schedules of research participants. To ease such challenges,

[86]Robert Yin, *Qualitative Research from Start to Finish, 182*

the researcher attempted to make appointments in due time. Also, inspiring the participants to talk freely about the topic of discussion and to trust the process was difficult because of the strategic and political nature of energy as a resource. It required the researcher to be tactful, creative, and friendly.

The second challenge was a bias emanating from both the researcher and the research participants. The best way to manage the bias originating from the behaviour of the researcher was to identify, acknowledge, and control the bias. In this study, one of the possible sources of bias is the researcher's familiarity with the research problem. The researcher continuously checked for such a bias carefully throughout the progression of the study, particularly during the final phase of the study.

Lastly, the researcher found it difficult to obtain adequate academic material on the EAPP and the role of power pools in the attainment of sustainable development in Africa because the areas are not much researched. Thus, the study focused on building a systematic knowledge to fill the gap.

12.0. Definition of Key Terms

1. **Sustainable Development**: is the amalgam of ideas related to economic development, equity, and environmental protection. As seen through these ideas, Sustainable Development is a socio-economic advancement that ensures equity and consideration of upcoming generations and the environment's needs. In short, the concept of Sustainable Development is the continuous pursuit of balancing the environmental, social, and economic pillars of sustainability in the attainment of economic development.
2. **Energy Security**: is the function of four interrelated variables, namely availability, reliability, affordability, and sustainability. *Availability* in energy security dynamics consists of three interrelated factors. These are the physical endowment, technology to exploit, and the availability of capital investment for exploration and utilisation. Before all the complex security issues follow, energy sources should exist and be converted into commodities. It is only after its existence that discussions over access, trade, cooperation, and institution follow. *Reliability*, in simple terms, is the degree to which energy supply is not episodic. The extent to which energy produced reaches its end users uninterruptedly defined the extent of reliability in energy security. The *affordability* dimension of energy security also determines equitable access to energy

services. The *sustainability* element of energy security brings issues related to sustainable development and the environment into analysis. It also advocates for the balance between harvesting energy resources and regeneration and between emission and the ability of the ecosystem to capture.

3. **Power Pools**: are the sum of grid systems of wires through which electricity is produced and transmitted to a given region. If a power pool is the sum of electric grids, understanding the smallest unit, a grid, comes before understanding the network of grids.
4. **Bilateral Energy Trade** modalities are conceived as cooperative, long term, and electricity price is set for the contract period, usually expressed in years, or left open-ended.
5. **Regional Energy Trade** are competitive regional markets operate on a short-term basis and have requirements such as pre-established infrastructure, harmonised policy, market facilitator, regulator, and system operator that can manage transactions on a real-time basis.

13.0. Ethical Considerations

Before commencing the data collection process, the researcher informed all research participants about the purpose and methodology of the study and the possible risks and benefits associated with their involvement in the research project so that they can know the relevant details about the project before they decide to participate. The researcher sent a written statement about the research project to each participant and provided him or her with the opportunity to ask questions and put their agreement signatures upon their satisfaction. For issues, doubts, or inconveniences they might have had, the researcher provided his contact details and those of the Institute of Diplomacy and International Studies. The researcher also followed all advisable procedures to maintain the confidentiality of the respondents, their data, and the interview details. During the analysis process, the researcher was careful to preserve the originality of the meaning of the research participants' data and tried to develop a level of analytical sensitivity that will allow him to stay open-minded and contain the impact of preconceived ideas.

14.0. Chapter Outline

Seven chapters comprises this dissertation. The first chapter provided components of the research proposal. It is merely trying to answer what is the subject and object of the study, why the study is being conducted, and how the researcher plans the study.

The second chapter, titled "Energy and Sustainable Development in Africa" linked energy cooperation and sustainable development in the context of international studies. It also discussed African agencies in international energy relations and governance. It also showed the rationale behind the establishment of RPPs in Africa and assessed the expected contribution of these institutions towards the realisation of sustainable development as it is stipulated in the African Union Economic Development Agenda 2063.

Chapter three, "Comparative Analysis of Energy Security in Eastern and Southern Africa Regional Power Pools," compared the state of operationalisation of the Eastern and Southern Africa Power Pools. The comparison is made based on factors of ES, such as access, affordability, reliability, and sustainability, to determine the status of ES in the respective sub-regions.

Chapter four, "Comparative Analysis of Challenges and Opportunities of Implementing Energy Cooperation in Eastern and Southern Africa Regional Power Pools" identified and compared success stories, challenges, and opportunities in EAPP and SAPP in light of fostering institutionalised energy cooperation and their contribution towards ensuring the ES of the region vis-à-vis development.

Chapter five, entitled "The Role of Bilateral Energy Trade for the Realization of Regional Energy Market," examined the role of bilateral energy trade in the development of RPPs in North-eastern and Southern sub-regions of Africa. The existence, contribution, and nature of bilateral energy trade arrangements were assessed, analysed, and compared vis-à-vis fostering institutionalised regional energy cooperation for sustainable development in the respective regions.

Chapter six, "Comparative Analysis of Institutionalised Energy Cooperation in Eastern and Southern Africa," provided a presentation of data gathered throughout the study, as well as an analysis of the same data. Chapter Seven, "Summary, Conclusions, and Recommendations," presented the overall conclusions that tie together and consolidate data findings and analysis as well as recommendations.

Chapter Two

Energy and Sustainable Development in Africa

2.0. Introduction

The pursuit of energy plays a critical role in the survival of humankind on Earth – the quest is also threatening humanity's continued survival as the world faces the dangers of climate change. Energy is a critical input in human development whose transformation yields are work done. Energy is also a crucial factor in the global economic relations accounting for 13 per cent of international trade.[87] The United Nations, the highest norm-setting institution, recognises the centrality of energy as an input to economic development by dedicating a specific goal, Goal 7, in its 2030 Agenda on Sustainable Development (SD). Similarly, through its fifty-year development plan known as Agenda 2063, the African Union also recognises the significance of providing affordable and sustainable energy to realise the ambitions enlisted in the documents. The relationship between energy and the three dimensions of SD, social, economic, and environmental, needs to be further examined to explore the prevailing nexuses. Thus, looking at how energy plays in the attainment of SD in Africa is the primary objective of this chapter.

The chapter has two thematic areas. The first theme brings discussions on energy and SD at the global level. It begins by analysing the role of energy in a society, an economy, and international politics. It, then, deliberates on the evolution of SD as a practice, concept, and later as a norm in the international intergovernmental treaty-making process. The second theme brings the discussion to an African context. In so doing, it begins by deciphering how SD and energy are conceived in the African Union Agenda 2063. Economic development and energy access will then highlight the strong interlinkages between energy access and economic development in Africa. Afterwards, the remaining parts of the section demonstrate how Africa embraces a regional approach to energy sector development. In this section, the discussion focuses on regional power trade and integration and how such a system enhances energy access in the continent and further contributes to the attainment of SD, including implementing the AU Agenda 2063.

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[87] UNIDO, 'Energy-Related Issues from the Trade and Development Perspective' (UNIDO, March 2009), https://unctad.org/system/files/official-document/cid2_en.pdf.

2.1. Sustainable Development: An Evolution of a Concept

Sustainable development has been evolving for considerably a very long time. [88] The concept can be traced back to the Chinese classical philosophy entitled "*Heaven and People in One*" approximately a thousand years before Christ. For the emperors of the Western Zhou Dynasty, human beings should not overexploit natural resources.[89] Also, religion has taught humanity the importance of the environment to their existence. The Bible and the Quran have numerous passages emphasising the supposed relationship between humankind and the surrounding environment.

Meanwhile, the world is rich with indigenous traditions, values, and know ledge guiding lifestyles. For instance, unlike the teachings of the Abrahamic religions, the African tradition dictates that man needs to respect the "laws of nature, moral, mystical order" to survive.[90] In light of this, traditional wisdom is regarded as one of the critical sources of the concept of sustainability.[91] In general, it can be argued that humankind has been aware of the intricate relationship between his survival and the environment, and the concept of sustainability is as old as consumption.

Apart from the theological, philosophical, and traditional roots of SD, the first thinker to have articulated the concept of SD is the 18th century English economist Thomas Robert Malthus. Malthus argued that any growth is limited to its resource bases, and there is a clear limit to humankind's economic growth due to resource scarcity. Malthus's idea of '*limits to growth*' led him to his theory of population which states that had a population not been restrained by depravity and misery, humanity would have been in grave danger.[92] Through his theory of population and environmental limits, Malthus underscored that overutilisation of natural

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[88] Longyu Shi et al., 'The Evolution of Sustainable Development Theory: Types, Goals, and Research Prospects', *Sustainability* 11, no. 24 (13 December 2019): 7158, https://doi.org/10.3390/su11247158.

[89] Tomislav Klarin, 'The Concept of Sustainable Development: From Its Beginning to the Contemporary Issues', *Zagreb International Review of Economics and Business* 21, no. 1 (1 May 2018): 67–94, https://doi.org/10.2478/zireb-2018-0005.

[90] Mbiti, J.S. 1996. African views of the universe. In *This Sacred Earth*, R.S. Gottlieb (ed). New York: Routledge.

[91] Desta Mebratu, 'Sustainability and Sustainable Development', *Environmental Impact Assessment Review* 18, no. 6 (November 1998): 493–520, https://doi.org/10.1016/S0195-9255(98)00019-5.

[92] John Blewitt, *Understanding Sustainable Development*, Third edition (London ; New York: Routledge, Taylor & Francis Group, 2018).

resources, if not curbed by the concept of sustainability, will undoubtedly impact humankind's ability to survive in the planet.[93]

As the above paragraphs stipulate, SD can be conceptualised as the amalgam of ideas related to economic development, equity, and environmental protection. As seen through these ideas, SD is a socio-economic advancement to ensure equity and consideration of upcoming generations and the environment's needs. In essence, the concept of SD emanates from its constitutive drive to balancing environmental, social, and economic pillars of sustainability. Thus, human development which maintains the ecological balance, respects human rights, promotes equity and equality, preserves cultural identity, respects cultural variations, tolerates religious and racial differences, and maintains natural, social, and human capital, is regarded to have met the sustainability pillars of development. [94]Thus, SD is the continuous pursuit of balancing the environmental, social, and economic pillars of sustainability in the attainment of economic development.

After the successful conceptualisation of sustainability, the world attempted to capture its essence through several initiatives that also, in turn, contribute towards the development of the concept of sustainability itself. SD is a straightforward goal attached to the utilisation of resources; SD was a poverty eradication goal; and SD is for all, by all, and leaving no one behind.

Humankind realised that some of the crucial resources needed for survival are exhaustible, thus calling for restricted utilisation.[95] Cognizant of the limited renewable nature of animal resources, the Yin Dynasty in China advocated sustainability in utilising resources as early as in the second millennium BC.[96] Similarly, in its strategy published in the 1980s, the International Union for Conservation of Nature captured SD in terms of "conservation of living resources."[97] Meanwhile, in World War II's immediate aftermath, the world registered

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[93] 'An Introduction to Sustainable Development by Peter P. Rogers, Kazi F. Jalal, John A. Boyd (z-Lib.Org).Pdf', n.d.

[94] Klarin, 'The Concept of Sustainable Development'.

[95] Zhou, H. The simple thought of sustainable development and practice in ancient China. Li Lun Dao Bao **2009**,
12, 39–44.

[96] Klarin, 'The Concept of Sustainable Development'.

[97] IUCN. World Conservation Strategy: Living Resource Conservation for Sustainable Development; IUCN: Gland, Switzerland, 1980.

considerable development progress as infant mortality fell; human life expectancy increased; literacy improved; agricultural production increased. The same development also resulted in growing economic inequalities, increase in the number of people without accessing social services such as water, modern energy services, and growing environmental concerns such as desertification, deforestation, climate change, thus threatening the survival of species in the planet, humankind included. The existing anomaly helped identify the linkages between economic prosperity and environmental concern and the direct two-way relations between poverty and the environment. In this context, the UN organised the conference on the Human Environment in 1972 in Stockholm to address the growing conflict between economic development and environmental concerns.[98] A similar concern about the growing trend of international economic development at the environment's expense also led to establishing the World Commission on Environment and Development in 1983.[99] The international community mainly tasked the Commission to assess environmental and development issues and propose the way forward.

Apart from banking on sustainable resources use, the UN conferences on environment and development contributed towards introducing and mainstreaming environmental issues into SD discourse. In general, in its preliminary stage, SD mostly focused on sustainable utilisation of natural resources and environmental protection.[100] The United Nations Conference on the Human Environment, the World Commission on Environment and Development, the United Nations Conference on Environment and Development, the Rio Declaration on Environment and Development, the United Nations Conventions on Climate Change, Biodiversity, and the Addis Ababa Action Agenda are the primary institutional mechanisms that contributed towards the evolution and mainstreaming of SD.

In this regard, the UN Conference on Human Environment held in Stockholm was the first institutional mechanism to recognise the interlinkages between environment and development, one of the pillars of sustainability, taking the concept of SD to the next level. Apart from mainstreaming the environmental dimension of SD in the UN system, the conference instituted

[98] Andronico O Adede, 'The Treaty System from Stockholm (1972) to Rio de Janeiro (1992)' 13, no. 1 (September 1995): 17.

[99] Erling Holden, Kristin Linnerud, and David Banister, 'Sustainable Development: Our Common Future Revisited', *Global Environmental Change* 26 (May 2014): 130–39, https://doi.org/10.1016/j.gloenvcha.2014.04.006.

[100] Lele, S.M. Sustainable development: A critical review. World Dev. **1991**, 19, 607–621

the implementation of the environment pillar of SD by creating environmental agencies or ministries in government structures worldwide.[101] The next significant momentum was the World Commission on Environment and Development report, led by the former Prime Minister of Norway Gor Harlem Brundtland in 1987. The report titled "Our Common Future", among others found out that environmental issues are so interrelated that they are better addressed by following a comprehensive policy other than creating independent environmental agencies alone.[102] The call for a comprehensive global policy on the relationship between socio-economic development and environment led to a series of intergovernmental conferences that have contributed immensely to the realisation of the three pillars of SD: social, economic, and environmental. Among the intergovernmental processes, the successive UN Conferences on Environment and Development held in Brazil in 1992 and 2012 are the major ones. These intergovernmental conferences developed normative tools in forms of instruments and institutions that made a significant contribution towards the development and consolidation of the concept of SD.

The Stockholm conference adopted the United Nations Stockholm Declaration on the Human Environment laying foundational principles on environmental protection and development. It also established the first international intergovernmental organisation focused on environmental protection, the United Nations Environment Programme (UNEP), the only UN headquarters located in Nairobi, Kenya. Similarly, the World Commission on Energy and Development (WCED) issued a report known as the Brundtland Report or Our Common Future, laying a solid foundation for conceptualisation and SD articulation. In general, the adoption of the Stockholm Declaration, the Brundtland Report, and UNEP's establishment are milestone achievements for several reasons, per the maxims of liberal institutionalism. First, the intergovernmental process manifested the state's ability to cooperate on transboundary issues. Second, the meeting also agreed to establish another crucial institution, UNEP, as the highest decision-making authority on the environment. Third, the meeting adopted the Stockholm Declaration and Brundtland Report to influence future deliberations on environment and development through its principles and norms. In general, the instruments show that the international community started to work towards achieving robust regulatory frameworks in pursuit of a common goal, economic development, and environmental

[101] Paolo Galizzi, 'From Stockholm to New York, via Rio and Johannesburg: Has the Environment Lost Its Way on the Global Agenda?' 29, no. 5 (2005): 59.

[102] Holden, Linnerud, and Banister, 'Sustainable Development'.

protection. More importantly, the Brundtland Report showed that the international development pattern in World War II's immediate aftermath was neither inclusive nor environment friendly. The report pinpointed those human activities that create an interlocking crisis in all economic sectors with clear ramifications on society and the environment. Thus, the report concluded that the world needed a new variant of economic development, capable of sustaining humanity's progress in the long term. The report called the new variant of international economic development a 'Sustainable Development.' The Brundtland Report conceptualised SD as the ability to "meet the needs of the present without compromising the ability of future generations to meet their own needs." As a theory of both development and change, SD recognises the limits of human development, stresses the urgency to end poverty, and underscores the centrality of participatory decision-making at all levels. It also identifies the harmonisation of ecology and population growth and conceives itself as a process whose outcome is dependent on political will.

Among the numerous United Nations conferences, the Millennium Summit in 2000 attempted to codify the overarching goals of SD in poverty and hunger eradication at its core and including other targets such as enhancing literacy and promoting gender equality and women empowerment. [103] The Millennium Development Goals (MDGs) were designed as a charity package for the world's poor to be delivered in fifteen years. The MDGs were the first codified and time-bound SD goals.[104] Despite the considerable progress and achievements, the MDG era of SD has numerous gaps. First, the goals were not comprehensive enough.[105] For instance, MDGs were not designed to reduce conflicts, one of the primary challenges to human development. Second, MDGs did not have a mechanism by which the balanced implementation of goals can be tracked.[106] Consequently, some of the goals were achieved before the end of the period, but others could not be completed even after the end.

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[103] Asadullah, M.N.; Savoia, A. Poverty reduction during 1990–2013: Did Millennium Development Goals adoption and state capacity matter? World Dev. **2018**, 105, 70–82.

[104] Sakiko Fukuda-Parr, 'From the Millennium Development Goals to the Sustainable Development Goals: Shifts in Purpose, Concept, and Politics of Global Goal Setting for Development', *Gender & Development* 24, no. 1 (2 January 2016): 43–52, https://doi.org/10.1080/13552074.2016.1145895.

[105] Amir Attaran, 'An Immeasurable Crisis? A Criticism of the Millennium Development Goals and Why They Cannot Be Measured', *PLoS Medicine* 2, no. 10 (13 September 2005): e318, https://doi.org/10.1371/journal.pmed.0020318.

[106] Attaran.

Similarly, the implementation of MDGs in different parts of the world, among the developed and the developing, and between urbanites and rural dwellers was unbalanced.[107] The implementation of MDGs in the South American region, in richest regions, and among urbanites fared much better than in Africa, the most impoverished regions, and rural dwellers. On another account, the MDGs, the first codified SD goals, lost traction as the goals had nothing to say regarding sustaining achievements and guaranteeing SD.

The Millennium Development Goals (MDGs) lifted more than one billion people from extreme poverty, reduced preventable death and illness, and increased education access.[108] However, as explained above, the progress was not sustainable or equitable; in others, progress stalled or reversed due to several factors, including exclusionist policies.[109] A new deal was necessary, and the United Nations delivered the renewed Agenda 2030 and its seventeen SD Goals (SDGs). The SDGs, like MDGs, codified of SD in seventeen goals. However, unlike MDGs, SDGs apply to all governments of the world regardless of their economic status.[110] Capitalising on the lessons learned from MDGs' implementation, the SDGs invited all state and non-state actors to implement its goals. They underscored the indivisibility of the seventeen goals because they are intractably linked.[111]The intergovernmental processes in the United Nations' auspice have played a significant role in making SD as the international community's modus operandi. The following part provides an account of Africa's conceptualisation of energy and sustainable development. The remaining part focuses on establishing a genuine link between energy and SD and how the intergovernmental processes captured the linkages.

2.2. Energy and Human Development

The central theme of the thesis revolves around energy and development. In light of this, it is paramount to conceptualise the nexus between energy and human development. Humanity

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[107] World Bank and International Monetary Fund, *Global Monitoring Report 2013: Rural-Urban Dynamics and the Millennium Development Goals* (The World Bank, 2013), https://doi.org/10.1596/978-0-8213-9806-7.

[108] Fukuda-Parr, 'From the Millennium Development Goals to the Sustainable Development Goals'.

[109] Ranjula Bali Swain, 'A Critical Analysis of the Sustainable Development Goals', 2017, 341–55, https://doi.org/10.1007/978-3-319-63007-6_20.

[110] Walter Leal Filho et al., 'Reinvigorating the Sustainable Development Research Agenda: The Role of the Sustainable Development Goals (SDG)', *International Journal of Sustainable Development & World Ecology* 25, no. 2 (17 February 2018): 131–42, https://doi.org/10.1080/13504509.2017.1342103.

[111] Mark Stafford-Smith et al., 'Integration: The Key to Implementing the Sustainable Development Goals', *Sustainability Science* 12, no. 6 (November 2017): 911–19, https://doi.org/10.1007/s11625-016-0383-3.

evolves on energy; the continuous mastery over nature from discovering fire to nuclear fusion summarises the significant part of humankind's evolution and development on Earth. As any living cell is dependent on its ability to convert and consume energy; so is humankind. Human evolution and history are the outcomes of the quest to control diverse natural sources and convert them to several forms of energy such as heat, light, and motion to support society's well-being, development, and security.[112] The level of sophistication among human civilisations differs per the amount and diversity of energy harnessed and consumed.[113]

The discovery of fire was an essential milestone for humankind. Early humans used fire to light and warm up caves, to cook, and to preserve food. Thus, as cooking diminishes perishability of the food for future consumption, early humans find ample time to interact more with the physical environment leading to their mastery of it.[114] The development of agriculture and transportation, essential manifestations of human domination of the physical environment, introduced other energy sources.[115] The discovery and continuous development of energy sources significantly boosts livelihoods and qualities associated with it. In turn, the enormous human development related to the utilisation of more energy sources ends up demanding more energy paving the way to discover new energy sources.

The nexus between energy and development became precise with the Industrial Revolution's success because, without appropriate innovations in the energy sector, there would be no industrial revolutions.[116] The invention of the steam engine powered by coal brought human civilisation to its new industrial phase. As George Orwell observed, the coal miner played a decisive role in human development and subsistence only next to a farmer.[117] The successful utilisation of energy played a critical role in human development and innovations related to the

[112] Vaclav Smil, *Energy and Civilization: A History* (The MIT Press, 2017), https://muse.jhu.edu/book/52007.

[113] Leslie A. White, 'Energy and the Evolution of Culture', *American Anthropologist, New Series* 45, no. 3, (1943): 335–56.

[114] 'Renewable Energy for Unleashing Sustainable Development: Blending Technology, Finance and Policy in Low and Middle Income Economies | Emanuela Colombo, Diego Masera, Stefano Bologna (Auth.), Emanuela Colombo, Stefano Bologna, Diego Masera (Eds.) | Download', accessed 11 July 2020, https://b-ok.africa/book/2300743/42e1ad.

[115] Per Högselius and Arne Kaijser, 'Energy Dependence in Historical Perspective: The Geopolitics of Smaller Nations', *Energy Policy* 127 (April 2019): 438–44, https://doi.org/10.1016/j.enpol.2018.12.025.

[116] Astrid Kander and Kander, Astrid, 'The Role of Energy in the Industrial Revolution and Modern Economic Growth', January 2011, 37.

[117] George Orwell, 'The Road to Wigan Pier' (Victor Gollancz, 1937).

efficient utilisation of coal leading to one of the most outstanding achievements of humanity, the Industrial Revolution.

The scale of industrialisation brought about by coal led to the discovery of oil. The adaptable, flexible, high energy concentration and affluence of use associated with hydrocarbons make them the most preferred energy source of the twentieth century. The demand for fossil fuels grows significantly with the expansion of the transportation sector and the growing demand for electricity for household and industrial use in the twentieth century.[118] The same way the coal-led industrial revolution resulted in the discovery of oil; the discovery of oil and the human development associated with it led to discovering other energy sources. Late twentieth century registered the harnessing of nuclear fission, more adaptable, more flexible, with utmost energy concentration, and ease of use than oil. The vicious circle of demand, discovery, and utilisation has continued from the beginning of human civilisation.

The energy – human development nexus brings both joys of human development and concerns over associated environmental degradation and depletion of energy sources. In the second half of the twentieth century, humans realised that the civilizational gains from harnessing energy resources would come to an end or be lost if environmental concerns continued to be disregarded from energy-related decision making. Sustainability of energy sources became the driving factor in the energy sector. The sustainability factor emboldens renewable energy sources of this century in the energy systems because of their unique capability to stimulates socio-economic development without compromising the environmental capital.

The place of energy in human civilisation is so paramount that it is not an exaggeration to consider energy as a constitutive element of societal development. Societies in different parts of the world have distinct civilizational attributes associated with harnessing or controlling energy resources. Energy and human development had strong relations that energy's link with the environment was almost negligible for a considerable amount of time. The environmental concerns associated with energy production and utilisation such as ozone depletion and acid rain facilitated the gradual awareness of the interaction between energy and other elements, including the environment. Eventually, humankind realised that the energy factor from its production to end-use is linked to and recognised as a primary cause of several environmental challenges. The realisation also contributed to the emergence of sustainability as a

[118] Daniel Yergin, *The Quest: Energy, Security, and the Remaking of the Modern World* (New York: Penguin Press, 2011).

distinguishing feature in economic development.[119] In so reframing, the pursuit of SD becomes an attempt to harness energy resources for human development with minimum impact on the environment.

Human development needs energy, and SD depends on the provision of clean and reliable energy supplies. The interaction between SD and sustainable energy has become of importance to humankind. The provision of adequate and reliable energy is necessary for human development to follow in general and to ensure SD. Societies should access and utilise energy sources that are reliable, safely utilisable, and affordable to ensure their subsistence. Thus, the utilisation of sustainable energy allows societies to derive maximum benefits associated with human development while reducing adverse impacts on the environment. Considering this, acquiring an adequate supply of energy to the overall achievement of economic development becomes the overarching objective of nations to make energy part of domestic and international politics.

2.2.1. Energy and Politics

On the other hand, the relationship between energy and politics is subject to interpretations and debate, [120] unlike energy's relations with society, economy, and environment. Should we treat energy and politics separately, or they are inexorably linked? The critical contribution of energy to human development informs the core of the separationists' argument that the boundary between energy and politics should be kept impermeable. The strategic nature of energy may invite competition over control and utilisation culminating in tragedy.[121] The United States' war on terror in the Middle East is often criticised and associated with promoting its core energy interest. History also recorded that the British government's decision to switch its energy source from coal to oil contributed to the Royal Navy's efficiency and the eventual victory during World War I.[122] During World War II, ensuring one's access to an adequate oil supply and disrupting the enemy's energy supply chains was both the goal and determining

[119] İbrahim Dinçer and Marc Rosen, *Exergy: Energy, Environment, and Sustainable Development* (Amsterdam ; Boston: Elsevier, 2007).

[120] Brenda Shaffer, *Energy Politics* (University of Pennsylvania Press, 2010), https://muse.jhu.edu/book/1162.

[121] Richard N. Cooper, Jan H. Kalicki, and David L. Goldwyn, 'Energy and Security: Toward a New Foreign Policy Strategy', *Foreign Affairs* 84, no. 6 (2005): 138, https://doi.org/10.2307/20031791.

[122] Jochen Prantl, 'Cooperating in the Energy Security Regime Complex', no. 18 (n.d.): 22.

factor in winning campaigns.[123] As the victors of the two world wars embrace free trade as the modus operandi of the new world order denouncing protectionism as the evil associated with wars, energy becomes a universal commodity governed by markets and institutions.

The United States and Europe attempted to pursue a market-led approach to manage international energy relations. Private companies from the United States and Europe, commonly known as the Seven Sisters, controlled the production, transmission, and distribution of energy resources.[124] The market and institutions proved to have contributed towards enhancing the affordability of energy supplies in the developed world. However, the socialist lash in the 1970s resulted in the nationalisation of numerous oil fields in Europe and the Middle East, diminishing markets, and international institutions' role.[125] The OPEC oil embargo of the early 70s proved that markets and institutions are incapable of securing the uninterrupted flow and stability in energy price. Those who wish to keep energy and politics separate denounce energy utilisation as a foreign policy tool. It brings geopolitics into play leading to unnecessary wars, supply disruptions, price hikes, and human development reversal.

On the other hand, the unionists argue that energy and politics are so inexorably linked that separation is a futile exercise for several reasons. First, access to energy determines the state and the future of its economy, security, and livelihood, which politics govern as its primary objective.[126] Second, since most countries are not energy self-sufficient, disruption affects both international and domestic politics. The Oil Embargo in the 1970s disrupts global peace and security and contributes to numerous regime changes, including the deposition of the Ethiopian Emperor.[127] Political risk assessment is also one of the top criteria determining any energy-

[123] Morgan Bazilian, Benjamin Sovacool, and Todd Moss, 'Rethinking Energy Statecraft: United States Foreign Policy and the Changing Geopolitics of Energy', *Global Policy* 8, no. 3 (September 2017): 422–25, https://doi.org/10.1111/1758-5899.12461.

[124] Stuart Harris, 'Global and Regional Orders and the Changing Geopolitics of Energy', *Australian Journal of International Affairs* 64, no. 2 (April 2010): 166–85, https://doi.org/10.1080/10357710903544080.

[125] Francis McGowan, 'Putting Energy Insecurity into Historical Context: European Responses to the Energy Crises of the 1970s and 2000s', *Geopolitics* 16, no. 3 (July 2011): 486–511, https://doi.org/10.1080/14650045.2011.520857.

[126] David A. Deese, 'Energy: Economics, Politics, and Security', *International Security* 4, no. 3 (1979): 140–53.

[127] James D. Hamilton, 'Historical Causes of Post-war Oil Shocks and Recessions', *The Energy Journal* 6, no. 1 (1985): 97–116.

related projects' feasibility, further influencing energy availability.[128] Therefore, the nexus between energy and politics is both vivid and complex. Energy trends and international politics are interconnected, making the pursuit of ensuring energy security an integral part of states' national security, determining both domestic and foreign policies.

2.2.2. Energy and Economy

Energy is an integral part of the economy and an enabler to the attainment of economic development. There is a positive association between energy use and the size of its economy. The United States, China, and Japan, the three largest economies globally, consume almost half of the world's energy.[129] There is also a positive connexion between energy consumption and economic well-being of a nation. In short, any improvement in the Gross Domestic Product (GDP) or rise in the material living standards of developing countries as stipulated in SD goals requires substantial growth in energy use.

Energy has a multifaceted impact on the macroeconomic performance of economies. For instance, energy price rise causes GDP loss, recession[130], inflation, and unemployment[131]. In this context, energy is a crucial ingredient of economic growth and a significant environmental pressure source. Thus, energy issues become an integral part of SD policy. Following the relations explained above, the policy objective revolves around maximising the economic virtues of increased energy use and minimising the impact on the environment.

2.2.3. Energy, Human Security, and Social Goods

The amount and nature of energy use are closely related to the state of human security and one's status in society. The attainment of the social dimension of SD involves energy issues about equity and human necessities. Apart from being one of the social services itself, energy is a prerequisite to providing other social services such as food, health care, education, and water. With adequate energy supply, communities can access social services adequately, and an inadequate supply of energy contributes to the prevalence of abject poverty. An African mother's daily life can summarise the intricate relations between energy and attainment of the social dimension of SD. Any Sub-Saharan African woman wakes up early in the morning and

[128] Gal Luft and Anne Korin, eds., *Energy Security Challenges for the 21st Century: A Reference Handbook*, Contemporary Military, Strategic, and Security Issues (Santa Barbara, Calif: Praeger Security International, 2009).

[129] Harris, 'Global and Regional Orders and the Changing Geopolitics of Energy'.

[130] Hamilton, 'Historical Causes of Postwar Oil Shocks and Recessions'.

[131] Mark A Hooker, 'OIL AND THE MACROECONOMY REVISITED', n.d., 24.

travels a long distance to fetch water and firewood and spends the rest of the day cooking – apart from the heavy burden, extreme indoor pollution from her kitchen affecting her well-being. The adequate provision of modern and clean energy to the woman's village enables her to efficiently deliver productive work. It makes her time to engage in productive activities and saves her from several respiratory diseases.[132]

Energy is a unique factor in the social dimension of development. Energy use and socio-economic status are directly related, and energy has a tremendous marginal utility.[133] An increase in energy use has a significant impact on human development, especially for developing nations that consume little energy per capita.[134] Also, a decent quality of life demands a certain amount of energy use without which deprivation follows.[135] The social dimension of SD underscores that energy scarcity should be seen and pursued at a unit level, not only at the national level. A nation may ensure the provision of energy to its economy without impacting the environment. Still, SD could not have been achieved if individuals are deprived of sustainable energy sources. Also, the quality of energy available counts in the social pillar of SD concerning energy. Developing nations are at the bottom of the list in terms of energy use and their energy quality. Most developing countries' citizens use agriculture waste, fuelwood, and dung as their primary energy source, whereas the industrialised countries use a higher quality of energy. The same can be replicated between the rural and urban areas in the same country; energy use in rural areas tend to be associated with lower quality than the urban centres. Also, within the urban centres, the quality of energy in use speaks volumes on the community's socio-economic status. Poor urbanites tend to use low quality energy such as kerosene compared with the well-to-dos who use high-end energy sources such as electricity.[136] The quality of energy sources can be derived from the amount of service gained from a unit

[132] Barbara D. Saatkamp, Omar R. Masera, and Daniel M. Kammen, 'Energy and Health Transitions in Development: Fuel Use, Stove Technology, and Morbidity in Jarácuaro, México', *Energy for Sustainable Development* 4, no. 2 (August 2000): 7–16, https://doi.org/10.1016/S0973-0826(08)60237-9.

[133] Robert Lee Bradley and Richard W. Fulmer, *Energy: The Master Resource: An Introduction to the History, Technology, Economics, and Public Policy of Energy* (New York: HarperCollins, 2004).

[134] Sanya Carley and Sara Lawrence, *Energy-Based Economic Development* (London: Springer London, 2014), https://doi.org/10.1007/978-1-4471-6341-1.

[135] Vaclav Smil, *Energy In World History* (Westview Press, 1994).

[136] David I Stern, 'The Role of Energy in Economic Growth', *The Energy Journal*, November 2010, 57.

and the negative impacts such as the direct health impact associated with it.[137] Thus, coal, oil, and electricity are preferable sources of energy in increasing order. Thus, empowering as many people as possible to climb the energy ladder is one of the significant determinants of assessing the social dimension of SD.

The social dimension of SD transcends macroeconomic indicators as it looks beyond the amount of available energy into the quality and the composition of the end-user. The human development aspect of SD, a typical meter of human security as stipulated in series of Human Development Indexes, highlights the social element of SD as it brings to light the mode and magnitude of access to the resource by the most deprived. Analogous to this, the energy factor in the attainment of SD focuses on the distribution of energy within societies. In this regard, the most deprived section of the society demands and deserves a deliberate and enabling government intervention to energise their pursuit of necessities. In short, the attainment of energy security is directly related to the realization of human security in today's world.

2.2.4. Energy and the Environment

Energy production and consumption are primary causes of the environmental catastrophes the world has been witnessing. Science identifies that energy and its value chain have affected the well-being of the environment in the twentieth century; it is only now that such assertions are making it well into a few policy circles. The International Panel on Climate Change reported that the energy sector, partly through fossil fuel use, is responsible for the two-third greenhouse gas emission and called for more investment in energy efficiency and renewable energy resources.[138] On the other hand, hydropower development, considered renewable energy, has significant ecological and social impacts as large reservoirs cause displacement and greenhouse gas emissions.[139]

In terms of SD, energy, from production to use, is a significant environmental challenge source. The extraction and utilisation of fossil fuels is a significant source of climate change. Still, the relationship between energy and environment is more comprehensive or broader than just

[137] Christine W. Njiru and Sammy C. Letema, 'Energy Poverty and Its Implication on Standard of Living in Kirinyaga, Kenya', *Journal of Energy* 2018 (14 November 2018): 1–12, https://doi.org/10.1155/2018/3196567; Saatkamp, Masera, and Kammen, 'Energy and Health Transitions in Development'.

[138] IPCC, 'Global Warming of 1.5 ºC', Annual, 2019, https://www.ipcc.ch/sr15/.

[139] Holly Sims, 'Moved, Left No Address: Dam Construction, Displacement and Issue Salience', *Public Administration and Development* 21, no. 3 (2001): 187–200, https://doi.org/10.1002/pad.165.

hydrocarbons and climate change. Thus, we cannot treat the pursuit of economic development and the pursuit of energy security separately in the context of SD.

2.3. The Africa We Want: Sustainable Development and Energy in Africa

The formation of Organization of African Unity (OAU), as it was created in 1963, lies in its resolution and success in fighting the evils of slavery, colonialism, and apartheid. The charter of OAU mentioned economic development rarely and only in terms of advocating for the need to "*harness natural and human resource for the advancement of its people*" to achieve "*general progress of Africa*" and "*a better life for the people of Africa*."[140] Under the leadership of His Imperial Majesty Haile Selassie, the thirty-two African Countries established the OAU on the 25th of May 1963 "*to promote the unity and solidarity of African countries, defend state sovereignty, and eradicate colonialism in all its forms*."[141] Decolonisation and maintenance of the newly independent African states' independence and territorial integrity were its primary objectives. These political and security objectives shape the organisation's charter and its activities for half a century since the establishment diminishes the charter's focus on economic and human development strides.

After enjoying two decades of political independence and failing to stabilise or register economic development, including the ill-advised structural adjustment policy by the World Bank, African leaders realised that the continental organisation is not fit to tackle the complex challenges facing the continent. At the Sirte Summit (1999), the OAU adopted a declaration to transform the OAU to the African Union (AU) to facilitate the creation of united Africa to meet new social, political, and economic challenges.[142] The constitutive act of the AU, adopted in Lomé Summit in 2000, though relying heavily on the achievements and structures of the OAU, exhibited a significant departure from its predecessor as it embraced economic development to promote sustainability at the economic, social, and cultural levels. SD, in its three pillars, has made it into the charter. The global policy documents on SD, outcome documents of

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[140] OAU, 'OAU Charter' (1963), https://au.int/sites/default/files/treaties/7759-file-oau_charter_1963.pdf.

[141] OAU.

[142] African Union, 'Sirte Declaration' (1999), https://archives.au.int/bitstream/handle/123456789/2475/1999_Sirte%20_Decl_%20E.pdf?sequence=1&isAllowed=y.

Stockholm, Rio, and Johannesburg, mainstreamed SD, as witnessed in the explicit mention of SD in the AU's constitutive act.

The same rationale behind the transformation of OAU to AU, refocusing and reprioritising Africa's agenda towards social and economic development issues, also contributed to the inception of a continental development plan named "Africa We Want." On the 25th of May 2013, half a century after the establishment of OAU, the heads of state and government signed the declaration laying the ground for Agenda 2063: The Africa We Want. Agenda 2063 is a framework that aims at delivering SD and unity under the auspices of Pan-Africanism and African renaissance within half a century. The Agenda is a manifestation of realigning Africa's focus from the "*struggle against apartheid and the attainment of political independence towards inclusive social and economic growth and development, regional integration, democratic governance and peace and security*."[143]

Agenda 2063 is also a human development framework for two reasons. First, it begins with "We the people of Africa," borrowing from the United Nations Charter with adjustment. It reaffirms Africa's commitment towards building an "*integrated, prosperous and peaceful Africa, driven by its citizens*."[144] Also, adopting the AU Agenda 2063 passed through a series of popular participation which lasted for eighteen months. Second, the evolution of the AU Agenda 2063 was also informed by relevant instruments such as the Lagos Plan of Action for Economic Development[145] of the 1980s and the new philosophy for African development enshrined in the New Partnership for Africa's Development anchored in human development and championed by the late Prime Minister of Ethiopia Meles Zenawi and the former Presidents of Nigeria and South Africa Thabo Mbeki and Olusegun Obasanjo. In general, Agenda 2063 constitutes Africans' aggregate desire to achieve social, political, and economic objectives of forging 'the Africa We want.' Its aspirations are social, political, economic, security, and cultural. Its vehicles are strong leadership, good governance, and democratic values. Its success is anchored on regional integration. Its implementation will be guided by five successive decades of action plans. In short, Agenda 2063 is Africa's drive to achieve social and economic

[143] African Union and Commission, *Agenda 2063: The Africa We Want.*, 2015.

[144] African Union and Commission.

[145] OAU, 'Lagos Plan of Action | AUDA-NEPAD' (1980), https://www.nepad.org/publication/lagos-plan-of-action.

development in cognisance of the environment and the environment as a vehicle to achieve human development.

The concept of SD has evolved significantly at the international stage before its explicit mention in documents such as the Sirte Declaration or the Agenda 2063. However, this does not mean that the notion of SD is alien to the African mind-set, nor Africa does not contribute to the evolution of the concept of SD. As an active and responsible international actor, Africa actively participated in all the international intergovernmental processes such as Stockholm and Rio, hosted the Johannesburg Summit thus contributing significantly to the development of the term SD and its realisation principles. Therefore, it is natural to expect that while developing the African Union Agenda 2063, Africa capitalised on SD conceptualisations' gains, the concept it contributed to its constitution. In general, Africa's active participation in the intergovernmental process assisted the evolution of SD both as a concept and practice through its Agenda 2063 and continued developing the idea of SD further.

2.3.1. Agenda 2063 and the Social, Economic and Environmental Sustainability

This sub-section will analyse how the African Union Agenda 2063 captures the three pillars of sustainability. In so doing, the AU Agenda 2063 will be compared with the post-2015 agenda for SD as captured in seventeen SD Goals (SDGs).

As a concept and practice, SD is the amalgam of concepts related to economic development, equity, and long-term ecological assessments, putting future generations' needs into consideration.[146] In essence, the idea of SD emanates from its constitutive ambition to balancing environmental, social, and economic pillars of sustainability.[147] Thus, an economic development that maintains the ecological balance respects human rights, promotes equity and equality, preserves cultural identity, respects cultural variations, tolerates religious and racial differences, and supports natural, social and human capital is regarded to have met the three widely used sustainability pillars of development. Declared after the SD is championed and mainstreamed, the African Union Agenda 2063 was undoubtedly informed by it. However, few studies assessed the AU Agenda 2063 in terms of the three bottom lines of SD – the economic, environmental, and social pillars.

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[146] Klarin, 'The Concept of Sustainable Development'.

[147] 'Three Pillars of Sustainability: In Search of Conceptual Origins', ResearchGate, accessed 18 July 2020, https://www.researchgate.net/publication/327404334_Three_pillars_of_sustainability_in_search_of_conceptual_origins.

Agenda 2063 has an excellent social sustainability element and advocates promoting human rights, equality, cultural identity and diversity, race, and religion in development interventions.[148] Several aspirations, goals, and priority areas in Agenda 2063 uphold the social pillar of SD. Aspiration 1 (A1) of the AU Agenda 2063 envisages a "prosperous Africa based on inclusive growth and SD"[149] and streamlines its scope into six goals and seventeen priority areas exhibiting social sustainability. Goal 1 on "high standards of living" and Goal 2 on "well-educated citizens and skills revolution underpinned by science, technology and innovation" of A1 are manifestations of the social dimension of SD. The priority areas associated with these goals focus on social security and protection of individuals, including persons with disabilities, and education to ensure human rights and equality respected; cultural identity preserved; cultural diversity, race and religion respected**.** Also, Goal 11 of Aspiration 3 on "democratic values, practices, universal principles for human rights, justice and the rule of law entrenched," aiming at consolidating democratic gains and promoting good governance, human rights, and the rule of law are manifestations of the social dimension of SD.

The social dimension of SD also advocates for the stability of social norms.[150] Social sustainability dictates the social maintenance system by reducing their vulnerability and increasing their resilience in the interaction of development and social norm. [151] The preservation and restoration of culture in the implementation of Aspiration 5 of the African Union Agenda 2063 is a case in point. Aspiration 5 dictates that the preservation and restoration of African heritage begins with repatriating Africa's stolen culture, heritage, and artefacts so that they play a prominent role in forging a common identity and destiny and facilitating a Pan-African method and the African revival. Human well-being principles as indicated in Aspiration 1 and democratic government as stipulated in Aspiration 3 call for social sustainability whose attainment demands capabilities, social capital, and institutions.[152]

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148 African Union and Commission, *Agenda 2063*.

149 African Union, 'Agenda 2063: The First Ten Year Implementation Plan', 2013.

150 Johnathan Harris et al., *A Survey of Sustainable Development: Social and Economic Dimensions* (London: Island Press, 2001).

151 Roland Bardy, Arthur Rubens, and Maurizio Massaro, 'The Systemic Dimension of Sustainable Development in Developing Countries', *Journal of Organisational Transformation & Social Change* 12, no. 1 (April 2015): 22–41, https://doi.org/10.1179/1477963314Z.00000000033.

152 Markku Lehtonen, 'The Environmental-Social Interface of Sustainable Development: Capabilities, Social Capital, Institutions', *Ecological Economics* 49, no. 2 (June 2004): 199–214, https://doi.org/10.1016/j.ecolecon.2004.03.019.

In so achieving, institutions have been entrusted to play a significant role. Goal 12 of the same aspiration explicitly mentions institutions' centrality to fulfil all the aspirations mentioned in the African Union Agenda 2063. In general, Aspiration 3 envisages that institutions are the critical success factor ensuring broad participation of the public in the implementation of the ambitions as stated in the African Union Agenda 2063.

Economic sustainability, the second pillar of sustainability, advocates preserving natural, social, and human capital required for improving living conditions. Goal 1 on 'high standards of living,' Goal 3 on "healthy and well-nourished society," Goal 4 on "transformed economies and jobs," Goal 5 on "modern agriculture for increased productivity and production," and Goal 6 on "blue/ocean economy" of Aspiration 1 represent the economic dimension of Agenda 2063. Also, Aspiration 2 foresees an "integrated continent, politically united, and based on Pan-Africanism and African Renaissance ideals." Economic integration has become the pathway for the much sought-after political integration. The sustainability of both integrations depends on the ambitious connectivity projects, including regional power pools. Interconnections through power grids, train, road, and air services were designated as preconditions to Africa's accelerated integration, technological transformation, and development, in short, the goal of the African Union Agenda 2063. As comprehensive as it looks, Goal 10 on building "world-class infrastructure in Africa" with a priority to boost "communications and infrastructure connectivity" is also designed to maintain the natural and social capital required to ensure the economic sustainability of the African Union Agenda 2063.

The third dimension, environmental sustainability, is anchored on maintaining "the quality of the environment suitable for economic activities and quality of life of people".[153] A1 introduces "environmentally sustainable climate and climate-resilient economies and communities" as its Goal 7, to represent the long-term ecological consideration of the African Union Agenda 2063. In general, A1 covers the three-layered bottom-line criteria of SD. The explicit usage of terms such as "SD," "environmental sustainability" indicates that Agenda 2063 was indeed highly informed by the principles of SD.

The attainment of SD at large and Agenda 2063 requires inclusivity, transparency, and accountability.[154] Institutions guarantee inclusive and participatory decision making at different

[153] Mebratu, 'Sustainability and Sustainable Development'.

[154] Babatunde Fagbayibo, 'Nkrumahism, Agenda 2063, and the Role of Intergovernmental Institutions in Fast-Tracking Continental Unity' 53, no. 4 (May 2018): 629–42.

levels, public access to data, protection of fundamental rights, and non-discriminatory policies. Thus, institutions, encompassing a range of structures and norms, are critical enablers of equity and are essential to achieving SD because it is, if not only, through institutions that critical aspects of the social dimension of SD can be guaranteed.

2.3.2. Africa and the United Nations Agenda for SD 2030

At the outset, it should be clear that while the two documents share multiple values, principles, and ambitions, their scope is different. Agenda 2063 is a continental framework for achieving social, political, and economic objectives of forging 'the Africa We want' whereas the United Nations SD Goals outlines the post-2015 international development agenda. Though Agenda 2063 is a regional instrument, it reaches beyond social, economic, and environmental objectives and includes political aspirations. On the other hand, though an international tool, SDGs only aspire to guide global development by using the triple bottom line concepts of sustainability.

Agenda 2063, adopted in 2013 by the Assembly of the African Union, and Agenda 2030, adopted in 2015 by the United Nations General Assembly, are two of the most effective actions guiding international development in the twenty-first century. These documents followed a methodical intergovernmental negotiation process and contributed to mainstreaming the concept and practice of SD. While Agenda 2063 is a broader plan of action, Agenda 2030 has a wider geographic area of implementation. Agenda 2063 is Africa's development plan of activity between 2013 and 2063, whose performance is subdivided into five ten-year plans. Agenda 2063 envisions an integrated, prosperous, and peaceful Africa.

On the other hand, Agenda 2030 is a plan of action "for people, planet and prosperity" designed for fifteen years guiding the international development agenda between 2015 and 2030. Agenda 2063 consists of seven overarching aspirations, thirty-four priority areas, twenty goals, one hundred and seventy-four targets, and two hundred indicators. Agenda 2030 comprises seventeen goals, one hundred and sixty-nine targets, and two hundred and thirty-two indicators.

The modus operandi of international development, the Millennium Development Goals, came to an end in 2015, calling on the international community for re-engagement in crafting the next development agenda. The intergovernmental process provided for the international community to arrive at a common understanding of the challenges and aspirations by rectifying MDGs' weaknesses. Unlike the MDGs, the international community designed the new development goals in an inclusive and participatory manner. Africa, which celebrated its continental organ's fiftieth anniversary, the OAU, was relatively in a more organised and superior position to influence and shape the post-2015 development agenda's evolution.

With a comprehensive development plan towards a peaceful, integrated, and prosperous continent, Agenda 2063, Africa viewed the evolution of post-2015 development plan as a recalibration of MDGs and as a means of implementing its Agenda. The adoption of "The Africa We Want", a plan of action outlining Africa's development between 2013 and 2063, created a unique opportunity for Africans to develop a Common African Position (CAP), the first of its kind, on the post-2015 international development agenda. The CAP, a document outlining Africa's priority areas, challenges, and aspirations for the post-2015 development agenda, resulted from a collaboration between the AU and the United Nations Economic Commission for Africa. The CAP was the first document whereby Africans expressed their interest in a unified document in the intergovernmental processes of mainstreaming SD starting from the 1972 Stockholm Convention on Human Environment.

The adoption of CAP on the post-2015 international development plan by the African Union created Africa's opportunity to influence SD Goals' formation. As a result, there is a substantial similarity between the two Agendas regarding their goals, targets, and indicators. The convergence between the SDGs of Agenda 2030 and Aspirations of Agenda 2036 is most substantial if one considers the similarities between SDG 2 and Goal 5 of Aspiration 1 on "ending hunger and achieving food security"; SDG 5 and Aspiration 6 on "achieving gender equality and empowering all women and girls"; SDG 7 and Aspiration 7 on "ensuring access to affordable, reliable, sustainable and modern energy for all"; and Goal 16 and Aspiration 3 on "promoting peaceful and inclusive societies" for SD, and providing access and justice for all. In general, the six pillars that distinguish the CAP, "*structural economic transformation and inclusive growth, science, technology and innovation, people-centered development, environmental sustainability, peace and security, and finance and partnerships,*"[155] are well captured in the post-2015 development agenda, particularly in the seventeen SD goals.

[155] African Union, 'The Common African Position', Position Paper, 2015, https://au.int/sites/default/files/documents/32848-doc-common_african_position.pdf.

2.3.3. The Place of Energy in Africa's Agenda 2063

Energy, the "master resource"[156] is a crucial factor in international relations and an important facilitator of global economic development. Provision of energy at a reasonable price is necessary and a prerequisite for any nation's economic growth and prosperity. The United Nations agenda 2030 and its Seventh SD Goal, and the African Union agenda 2063 recognise the centrality of affordable energy towards realising the ambitions enlisted in the documents.

Africa accounts for less than five per cent share of global energy production.[157] Cognizant of the linkages between energy supply and development, the African Union Agenda for 2063, a strategic document to deliver SD in the continent, recognises the strategic importance of energy in achieving the aspirations outlined in Agenda 2063. The Agenda recognises the urgency to utilise energy resources to ensure "modern, efficient, reliable, cost-effective, renewable and environmentally friendly energy,"[158] including strengthening regional energy pools.

The first two aspirations of Agenda 2063 introduced the energy dimension of the Africa We Want. Aspiration 1, in its Goal 1 and Goal 7, presents the energy dimension of the Agenda 2063. Energy is captured as one of the targets in the pursuit of "*environmentally sustainable and climate-resilient economies and communities*." Agenda 2063 advocated for renewable energy-based SD empowering Africans to build prosperous societies and decrease susceptibility to climate change. The overall objective of the energy dimension of the Agenda 2063 is to utilise diversified energy sources, mostly renewable energy, in fostering economic growth and energy poverty eradication in the continent and using the same resource as Africa's primary export item to the international market. The continent's energy mix will favour renewable energy resources as its percentage share in total energy production will be more than 50 per cent.[159]

In terms of transmission, the Agenda emphasises regional power pools' centrality in powering Africa's transition to inclusive and sustainable economic transformation. Aspiration 2, through

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[156] Robert L. Bradley and Richard W. Fumer, *Energy: The Master Resource* (Dubuque: Kendal/Hunt Publishing, 2004), xiii

[157]UNEP, *Atlas of Africa Energy Resources,* (Nairobi: UN Environment, 2017), 1

[158] African Union and Commission, *Agenda 2063*.

[159] African Union, 'Agenda 2063: The First Ten Year Implementation Plan', 2.

its Goal 10, aims at building “world-class infrastructure in Africa” with a priority to boost “communications and infrastructure connectivity,” which are prerequisites to economic integration. Economic integration as a vehicle for achieving the ultimate goal of Agenda 2063, political integration, was envisioned through ambitious connectivity projects, including the development of regional power pools.

The African Union Agenda 2063 envisioned an inclusive and SD led prosperity in Africa and its primary goal to bring about better living conditions to Africans. Also, employment creation, eradicating hunger, and rendering quality services were identified as the priority areas of the African Union Agenda 2063. In its first ten-year implementation plan (2013-2023), the African Union planned to boost electricity supply by fifty per cent, enhance access to electricity by fifty per cent of 2013 levels, and increase energy efficiency by thirty per cent.[160] Besides, Goal 7 on enhancing environmental sustainability and climate resilience also plans to boost the share of renewable energy in total energy production by at least ten per cent, to equip urban buildings with energy-smart technologies, and to operate fifteen per cent of urban mass transportation on renewable energy sources by 2023.

Aspiration 2 of the Agenda 2063 of forging a political integration in Africa based on the epitomes of “Pan-Africanism and African Renaissance” stated the need to address the continent’s infrastructure gap in its Goal 10, including through enhancing communication and infrastructure connectivity and electric interconnection as one. In the first ten-year implementation plan of the Agenda 2063, the AU planned that regional power pools would boost the continent’s power generation capacity by fifty per cent, and the INGA dam will be operational by 2023. In particular, regional power pools were expected to be fully functional by 2020; the INGA Dam construction will be completed by 2025, and electricity production and transmission will increase by fifty per cent compared to the 2012 statistics.[161] In 2020, PIDA projects would enhance the electricity generation by 42000 MW of renewable energy from hydro, and other initiatives and Power Africa would add 10000 MW into the African grid system.[162] These flagship projects indicate that energy has been considered a primary driver of SD as envisioned in the Agenda 2063.

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[160] African Union, ‘Agenda 2063: The First Ten Year Implementation Plan’.

[161] ‘Africa Power Vision | AUDA-NEPAD’, accessed 2 July 2020, https://www.nepad.org/programme/africa-power-vision.

[162] ‘Sustainable Energy for All (SE4ALL) | AUDA-NEPAD’, accessed 2 July 2020, https://www.nepad.org/programme/sustainable-energy-all-se4all.

2.4. Energy and Development in Africa

The availability of cheap, reliable, and sustainable energy determines the world's economic and human development. It is because energy services affect the economic, social, and economic dimensions of sustainability. The level of energy consumption determines the level of economic development of a particular country and the social class one belongs to within the country. This section attempts to examine the linkages between access to energy and SD in Africa. It does so by examining the state of social and economic development, energy consumption, and energy production in the continent and its implications for SD.

Africa has tremendous energy potential. Africa has 7 per cent of the world's oil resources,[163] 13 per cent of the gas resources[164], 20 per cent of the uranium resources[165], and 40 per cent of the manganese reserves.[166] Africa is also blessed with plentiful renewable energy resources. Africa's solar potential could supply about 660 000 TWh of electricity annually to the continent, one third and one-fifth of which is found in Eastern and Southern Africa.[167] Hydro is the most developed renewable, has a potential of 35 GW across Africa.[168] Ethiopia is home for 4 GW hydropower capacity. It will be home for the largest hydropower station in Africa when the 6 GW Grand Ethiopian Renaissance Dam comes to completion. South Africa has installed hydropower capacity of 4 GW with the recent 1.3 GW Ingula plant.[169] With an installed capacity of 5 GW, Wind has the potential to provide additional 460,000 TWh annually.[170] Though concentrated in the East Africa Rift System, Geothermal, where total potential could be as much as 15 GW, is the other crucial renewable energy resource in Africa. Kenya, where geothermal energy is highly utilised, has an installed capacity of almost 700 MW.

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[163] Morgan Bazilian et al., 'Energy Access Scenarios to 2030 for the Power Sector in Sub-Saharan Africa', *Utilities Policy* 20, no. 1 (March 2012): 1–16, https://doi.org/10.1016/j.jup.2011.11.002.

[164] *Atlas of Africa Energy Resources* (Nairobi, Kenya: United Nations Environment Programme, 2017).

[165] AFREC, 'Africa Energy Balance', Annual (Algiers: African Energy Commission, 2019).

[166] IEA, 'World Energy Outlook', Annual (Paris: International Energy Agency, 2020).

[167] 'Africa Energy Outlook 2019', World Energy Outlook Special Report (Paris: International Energy Agency, 2019).

[168] 'Africa Energy Outlook 2019'.

[169] IEA, 'World Energy Outlook'.

[170] IRENA, 'Africa 2030: Roadmap for a Renewable Energy Future' (Abu Dhabi, 2015).

With such an enormous resource base, it is incomprehensible that Africa's energy sector could not provide the economy with an adequate supply of energy. The energy factor is missing from both the social and economic dimensions of development and from SD. In 2016, the global average for the primary energy consumption per unit of GDP, energy intensity, was 1.43 KWh. Still, most sub-Saharan African countries' energy intensity is close to 0.5 KWh, save for South Africa whose energy intensity factor is close to 2.3 KWh.[171] In other words, Africa lacks one of the primary economic inputs, energy.

Similarly, in 2019 the energy use per capita of Africa was close to 4200 KWh whereas the world's average was 21,000 KWh showing energy poverty in the continent.[172] The most telling story of energy poverty in Africa is when one looks at the number of people living without electricity globally, and how many among those reside in Africa. In 2016, 70 per cent of the global population living without access to electricity resided in Africa. Similarly, the number of people without access to electricity declined to 580 million in 2019, mainly due to the progress made in African countries, particularly Kenya, Rwanda, and Ethiopia.[173]

Energy, both as an economic input and output, is a central element in Africa's economic outlook, the same way it is for the rest of the world, and lack of it hinders social and economic development. Looking at the telling statistics above, it is by no means a surprise to see Africa scoring low in almost all of the socio-economic indicators and lags behind in implementing the SDGs. Africa has 1.3 health workers per thousand population.[174] More than 63 billion Africans have no access to essential water services.[175] The unemployment rate in Africa stands at 7 per cent, but 70 per cent of employment is in the informal sector.[176] In 2020, 90 per cent of people living below the poverty line, and almost 50 per cent of newly food-insecure people live in

[171] Manfred Hafner et al., *Renewables for Energy Access and Sustainable Development in East Africa*, SpringerBriefs in Energy (Cham: Springer International Publishing, 2019), https://doi.org/10.1007/978-3-030-11735-1.

[172] Africa Development Bank, 'African Economic Outlook 2019', Annual (Africa Development Bank, 2019).

[173] 'Africa Energy Outlook 2019'.

[174] 'GHO | Global Health Observatory Data Repository (African Region)', WHO (World Health Organization), accessed 25 December 2020, https://apps.who.int/gho/data/node.main-afro.

[175] Africa Development Bank, 'African Economic Outlook 2019'.

[176] OECD et al., *African Economic Outlook 2013: Structural Transformation and Natural Resources*, African Economic Outlook (OECD, 2013), https://doi.org/10.1787/aeo-2013-en.

Africa.[177] In the Corona Pandemic context, the globe is suffering, and the economic and social impact of the pandemic on the African continent will be devastating. The pandemic pushes nearly 110 million African children and youth out of school. It tests the already brittle health care systems and poses a significant risk of marginalising women; when the pandemic is behind us, 23 million Africans will fall below the poverty line, and food insecurity will nearly double.[178] As Africa fights the pandemic through a series of lockdown measures, the resulting slow economic activity will rob thousands of Africans jobs, further exacerbating the social and economic situation in the continent. Africa lags behind in achieving SD. It can be argued that availing energy to its economy and its population will play a significant role in attaining SD in the continent.

Power sector development is a prerequisite for SD in Africa.[179] Energy and development are two sides of the same coin, and lack of energy impedes Africa's socio-economic development.[180] Increased access to reliable and affordable energy services is, therefore, a critical factor for achieving SD.[181] Energy is an enabler and a 'master resource' to achieve SD. As contained in the African Union Agenda 2063, Africa's development requires affordable, durable, and reliable energy. Accordingly, the African Union recognises energy cooperation through regional power pools as a viable remedy to alleviate African energy poverty and achieve socio-economic development. The next part will examine the rationale and practice of regional energy cooperation in Africa.

2.5. The Development of Regional Approach to Energy Cooperation in Africa

In contemporary international energy relations, states pursue cooperation and interdependence as a viable solution to address the ES problem. In SD, an energy policy that revolves around

[177] 'Global Report on Food Crises: 135 Million in 55 Countries Faced Acute Hunger in 2019 | IFPRI : International Food Policy Research Institute', accessed 10 December 2020, https://www.ifpri.org/blog/global-report-food-crises-135-million-55-countries-faced-acute-hunger-2019.

[178] The Sustainable Development Goals Center for Africa and Sustainable Development Solutions Network, 'Africa SDG Index and Dashboards Report', 2020.

[179] I.M. Bugaje, 'Renewable Energy for Sustainable Development in Africa: A Review', *Renewable and Sustainable Energy Reviews* 10, no. 6 (December 2006): 603–12, https://doi.org/10.1016/j.rser.2004.11.002.

[180] UNECA, Economic Report on Africa, (Addis Ababa, 2011)

[181] David McCollum et al., 'SDG7: Ensure Access to Affordable, Reliable, Sustainable and Modern Energy for All', 2017.

energy independence is both impractical and inconceivable.[182] Thus, markets and institutions influence energy policy decision-making more than power maximisation and isolationism.[183] However, energy cooperation is not a natural state of affairs; it has to be cultivated. With the increasing role of energy as an economic input, soaring energy prices, and the growing influence of institutions, energy cooperation and interdependence become an indispensable tool to ensure energy security.[184] Energy is central to SD. Thus, energy cooperation drives energy integration and SD in different parts of the world, including Africa.[185] Factors such as various natural resource endowment, the ability to produce energy at the least cost, and the relative capability to have more energy are the pulling factors behind energy cooperation as expressed through regional power trade. [186] Considering this, institutions such as RPPs could play a significant role in fostering cross-border electric trade. [187]

Regional energy cooperation offers affluent prospects. Beyond sharing resources, the considerable economies of scale boost capacities, including generating investment capital.[188] Other benefits include access to buffer stocks in times of energy crisis and managing price volatility in the long run. However, such cooperation and economic integration requires the pooling of sovereignty, competent regional institutions, a significant investment, and a high collective mutual trust level.[189] In light of such an understanding, the African Union and its member states pursue energy cooperation as a viable route to avail affordable, reliable, and sustainable energy for implementing Agenda 2063 and beyond.

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182 Prantl, 'Cooperating in the Energy Security Regime Complex'.

183 Robert Brice, *Gusher of Lies: The Dangerous Delusions of Energy Independence*, (New York: Public Affairs, 2008), 80

184 Joseph McMillan, "ES in Southeast Asia: Can Interdependence Breed Stability?" *Strategic Forum*, (September 2008), 5

185 UNEP, *Atlas of Africa Energy Resources,* (Nairobi: UN Environment, 2017)

186 Orvika Rosnes and Haakon Vennemo, *Powering Up: Costing Power Infrastructure Investment Need in Southern and Eastern Africa*, (Vantaa: Econ Poyry, 2008), 12

187 'Economic Report on Africa 2011: Governing Development in Africa: The Role of the State in Economic Transformation', March 2011, https://repository.uneca.org/handle/10855/1154.

188 Dambudzo Muzenda, 'Increasing Private Investment in African Energy Infrastructure', *Ministerial and Expert Roundtable of the NEPAD/OECD Africa Investment Initiative*, November 2009.

189 Daniel Yergin, 'Ensuring Energy Security', 28 January 2009, https://www.foreignaffairs.com/articles/2006-03-01/ensuring-energy-security.

The implementation of Agenda 2063 builds upon existing institutions, initiatives, infrastructure, and systems. Implementation of the energy dimension of the Agenda 2063 requires the active participation of regional institutions with the ultimate objective of promoting energy cooperation as the *modus operandi*. Thus, regional institutions such as the African Union Energy Commission (AFREC), the African Union Development Agency (AUDA), and the Africa Union Commission on Infrastructure and Energy (AUCIE) work to implement the energy dimension of Agenda 2063, mainstreaming energy cooperation as one. AFREC, under AUCIE, is mandated to coordinate, commercialise, and integrate energy resources in Africa. In contrast, AUDA corresponds and executes major regional projects to realise Agenda 2063, including its energy dimension. The other most crucial institution, Commission on Infrastructure and Energy is one of the nine commissions of the AU mandated to overlook infrastructure and energy resources in the continent. The combination of 'infrastructure' and 'energy' in the Commission's establishment shows that the African Union intends to address the energy problem through infrastructure development.[190] Thus, it can be argued that one of the primary challenges to energy security in Africa, as identified and targeted by the African Union, is the infrastructure deficit.[191] Similarly, the development of energy markets in Africa and the emergence of interconnection between the regional power pools such as EAPP and SAPP depends on Africa's ability to install adequate infrastructure. [192] Therefore, addressing the infrastructure gap contributes to both energy security and SD attainments in Africa.

Implementation of Agenda 2063 hinges on Africa's ability to install adequate infrastructure at its disposal for it catalyses regional trade and integration. In response, the African Union adopted the Programme for Infrastructure Development in Africa (PIDA) to coordinate and prioritise infrastructural projects under Priority Action Plan (PAP). The first PIDA Priority Action Plan (PIDA PAP 1), which the First Ten-Year Implementation Plan of the Agenda 2063 builds on, has over four hundred sub-regional projects on numerous thematic areas, including energy. Among the many energy-related projects, the Continental Transmission Masterplan Development aims to create a regional electricity market, which will enable electricity trade

[190] Desta Mebrhatu, Energy and Sustainable Development in Africa, Physical, 11 December 2020.

[191] 'Economic Report on Africa 2011'.

[192] Infrastructure Consortium for Africa, *Updated Regional Power Status in Africa Power Pools*, (Abidjan: African Development Bank, 2016), 37

between power pools in different sub-regions of Africa and between Africa and Europe, the Middle East and Asia. In so doing, the AUDA-NEPAD considers a road map to introduce a competitive electricity market in Africa through the development of a stable and reliable interconnected grid system.[193] The grid systems are dispersed following the sub-regional pattern of organisation in Africa. According to the masterplan, low cost and reliable electricity supply are critical for Africa's growth and development through regional and inter-regional trade in electricity and greater cooperation between utilities and regulators.[194] In EAPP, the possible trade pattern would be developing hydropower and geothermal energy in Ethiopia and Kenya, making them major power exporters. At the same time, Egypt becomes a net importer in the benefit-sharing package and Ethiopia becomes a new exporter gaining 2 per cent gain 6 per cent of their respective GDPs.[195] Similar patterns also exist in the SAPP. The Democratic Republic of Congo and Mozambique would become the significant hydropower exporters to Angola, Botswana, Lesotho, Malawi, and Namibia.[196] Similarly, the African Union Agenda 2063 and the African Union's First Ten-Year Implementation Plan (2014 – 2023) identify energy cooperation through the operationalisation of RPPs as a viable remedy to alleviate African energy poverty and achieve socio-economic development.

The role of regional economic communities in the realisation of the pattern of regional electricity trade is paramount. For instance, the IGAD region is also implementing the IGAD Regional Infrastructure Masterplan (IRIMP) covering several sectors, including energy and transboundary water resources in the framework similar to PIDA. IRIMP identifies priority infrastructure projects for a period between 2020 and 2040.[197] Ongoing projects such as the construction of Grand Ethiopian Renaissance Dam (6,000MW), the construction of Kenya – Ethiopia 500kv transmission line (1045km), the Ethiopia - Djibouti Power Interconnection

[193] Simbini Tichakunda, Energy and Sustainable Development in Africa, Microsoft Teams, 15 November 2020.

[194] Alfonso Medinilla, Bruce Byiers, and Karim Karaki, 'African Power Pools: Regional Energy, National Power' (ECDPM, February 2009).

[195] Kudakwashe Ndhlukula, Tijana Radojičić, and Simbarashe Mangwengwende, 'Analysis of Infrastructure for Renewable Power in Eastern and Southern Africa' (IRENA, 2015).

[196] Orvika Rosnes and Haakon Vennemo, *Powering Up: Costing Power Infrastructure Investment Need in Southern and Eastern Africa*, (Vantaa: Econ Poyry, 2008), 12

[197] NEPAD, AU, and AfDB, 'PIDA: Interconnecting, Integrating, and Transforming a Continent: The Regional Infrastructure That Africa Needs to Integrate and Grow through 2040', November 2011.

Project –230kv and 500kv, and the Ethiopia-Sudan Power Systems Interconnection – 230kv and 500kv, are part of the energy dimension of the master plan. Similarly, the EAC is also implementing several PIDA projects, including the North-South Power Transmission Corridor,[198] the Uganda-Kenya Petroleum Product Pipeline,[199] and Ruzizi III.[200]

In general, institutional mechanism and regional approaches are the primary drivers of implementing the African Union Agenda 2063 in general and SD, particularly in Africa. When it comes to implementing the same Agenda's energy dimension, energy cooperation in the form of energy trade plays a central role. In so doing, the respective parts of regional economic communities and regional power pools, are indispensable. Ensuring energy security and driving the SD agenda in the African continent requires the careful installation of regional energy trade along sub-regional lines through active participation of regional power pools.

2.7. Conclusion

Energy is the bedrock of any society, a fuel to the economy, and a crucial currency in international politics. In human development, energy is an essential and necessary condition for attaining economic development, including SD. The correlation between energy and development has been captured in the development of SD, first as a concept and later as a norm. In this regard, several intergovernmental treaty-making processes capture the correlation and put forward many recommendations on how to govern best the interaction between energy, economic development, and the environment, the latest sustainability.

Africa has been an active player in the evolution of SD, both as a concept and practice. African traditional communities have practised sustainability as a way of life, and African states have actively participated in the evolution of SD in the United Nations' auspice, including crafting the first-ever Common African Position during the post-2015 development agenda negotiation. Africa also embraced the principles and practices of SD in its fifty-year social, economic, and political masterplan known as the African Union Agenda 2063. Agenda 2063 recognises the centrality of regional energy integration to achieve its objectives, including SD. As the regional approach to energy security revolves around energy trade and integration, where institutions

[198] 'North–South Power Transmission Corridor | AUDA-NEPAD', accessed 26 June 2020, https://nepad.org/project/north-south-power-transmission-corridor.

[199] EAC, 'Projects and Programmes', accessed 26 December 2020, https://www.eac.int/energy/fossil-fuels/projects-and-programmes.

[200] 'East African Community (EAC) | AUDA-NEPAD', accessed 26 December 2020, https://www.nepad.org/taxonomy/term/111.

play a significant role. In this regard, Africa saw the proliferation of five regional power pools, including the Eastern and Southern Africa Regional Power Pools, whose objective is to facilitate energy trade and integration to ensure energy security. The next chapter will deliberate on Eastern and Southern Africa Power Pools' role in ensuring energy security in their respective regions.

Energy is the bedrock of a society, a fuel to an economy, a crucial currency in international politics, and a key ingredient to sustainable development. As per the data analysed in this study and supported by literature, the African continent has tremendous energy potential that can energise SD. Nevertheless, access to energy in the continent is the lowest compared to any other region in the globe. Considering the distribution of energy resources and capabilities to harness them, Africa embraced a path to energy cooperation and interdependence. In so doing, the continent pursued a regional approach to energy sector development through its Union, regional economic communities, and power pools. The regional approach to energy security revolves around energy trade and integration, where institutions play a significant role.

According to Keohane[201] the establishment of institutions[202] is crucial in the achievement of liberal institutions because the world decides to tackle pressing energy security issues by embracing interdependence and cooperation anchored on the role of institutions. The implementation of the energy dimension of the AU Agenda 2063 requires the active participation of regional institutions with the ultimate objective of promoting energy cooperation as the modus operandi. Thus, regional institutions such as the African Union Energy Commission (AFREC), the African Union Development Agency (AUDA), and the Africa Union Commission on Infrastructure and Energy (AUCIE) work to implement the energy dimension of the AU Agenda 2063, mainstreaming energy cooperation as one. The emergence of regional energy-related institutions, such as power pools demonstrates Africa's unwavering belief in the capability of institutions to energy security. In so achieving, institutions have been entrusted to play a significant role. For example, Aspiration 1 of the AU Agenda 2063 explicitly mentions institutions' centrality to fulfil all the sustainable development objectives, including energy security. However, such cooperation and economic integration requires the pooling of sovereignty, competent regional institutions, a significant

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[201] Robert O. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton, N.J: Princeton University Press, 1984).

[202] Institutions such as OPEC and IEA.

investment, and a high collective mutual trust level.[203] In light of such an understanding and as stipulated in the AU Agenda 2063, the African Union and its member states pursue energy cooperation as a viable route to avail affordable, reliable, and sustainable energy to attain the continent's development vision, sustainable development as one. The role of regional institutions in implementing regional projects and administering emerging relations is paramount. Regional institutions – tamed national rivalries, distrust, and disunity – contribute to developing the political will.[204] In this respect, political will plays a vital role in forging energy integration. Lack of it translates into delays and constraints that thwart all the promises of regional energy integration.[205] Furthermore, achieving sustainable energy integration requires coordination among entities in the energy value chain. Regional institutions are needed as market operators, system operators, and regional regulators to bridge the gap between national institutions involved in regional energy integration.[206] In general, the study therefore concludes by affirming that energy cooperation leads to sustainable economic development in Africa and further concludes that institutions play a paramount role in the process.

Capitalising on such deliberations, the next chapter will focus on analysing the nexus between energy cooperation and energy security. In so doing, the chapter will analyse the roles of two distinct power pools, namely the Southern and Eastern Africa Power Pools, as energy cooperation platforms or institutions, for the attainment of energy security in their respective sub-regions.

[203] Daniel Yergin, 'Ensuring Energy Security', 28 January 2009, https://www.foreignaffairs.com/articles/2006-03-01/ensuring-energy-security.

[204] M. P. Niyimbona, 'The Challenges of Operationalizing Power Pools in Africa', *UNDESA Seminar on Electricity Interconnection*, 19 June 2005.

[205] UNECA, 'Assessment of Power Pooling Arrangement in Africa' (UNECA, 2004).

[206] Anton Eberhard et al., *Africa's Power Infrastructure: Investment, Integration, and Efficiency* (Washington, D.C: The World Bank, 2011).

Chapter Three

Energy Cooperation for Energy Security in Africa: A Comparative Analysis of Eastern and Southern Africa Regional Power Pools

3.0. Introduction

Access to energy determines the state of the economy, development, and security of a nation. Ensuring uninterrupted access to energy is a determinant and a manifestation of a nation's national security objective. The combination of factors, including physical endowment, access to appropriate technology, access to finance, and infrastructure, determines a nation's energy security that further informs domestic and foreign policies. The contemporary energy map of the world shows that energy resources are unevenly distributed. The Middle East region contributes 64 per cent of the oil reserve[207]; Russia possesses 18 per cent of the world's natural gas reserve;[208] Africa has 13 per cent of the gas reserves[209,] 20 per cent of the uranium resources[210], and 40 per cent of the manganese reserves[211]; and the United States has 22 per cent of proven coal reserve[212]. On the other hand, the global energy demand growth forecast between 2020 and 2030 is 12 per cent,[213] and the demand mainly comes from the industrialised

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[207] OPEC, 'OPEC Annual Statistical Bulletin 2020', Annual Report (Vienna, Austria: OPEC, 2020).

[208] 'Russia Holds 18pct of Total Global Proven Gas Reserves', accessed 17 February 2021, https://www.aa.com.tr/en/energy/general/russia-holds-18pct-of-total-global-proven-gas-reserves/20579.

[209] *Atlas of Africa Energy Resources* (Nairobi, Kenya: United Nations Environment Programme, 2017).

[210] AFREC, 'Africa Energy Balance', Annual (Algiers: African Energy Commission, 2019).

[211] IEA, 'World Energy Outlook', Annual (Paris: International Energy Agency, 2020).

[212] 'How Much Coal Is Left - U.S. Energy Information Administration (EIA)', accessed 17 February 2021, https://www.eia.gov/energyexplained/coal/how-much-coal-is-left.php.

[213] IEA, 'World Energy Outlook'.

countries and emerging economies in Africa, China, and India. Therefore, ensuring global energy security requires devising a clear strategy to supply the growing demand from the different natural resource endowments as highlighted above. The strategy should be driven by embracing cooperation and interdependence and avoiding the elusive dream of '*energy self-sufficiency.*'[214]

Energy security strategies evolve the same way international relations does. During World War II, Winston Churchill realised that Britain must enhance its navy's speediness to win the war, and it required altering the energy source of the British Navy from coal fields in Wales to oil fields in the Middle East.[215] In so doing, Churchill realised that his navy had become vulnerable for it depends on a foreign energy source and indoctrinated the concept of diversification of energy sources as a viable energy security strategy. Churchill's doctrine on diversification led to the concept of diversification in energy resources. On the other hand, President Carter reemphasised the importance of brute force in defending the American energy interest in the Persian Gulf.[216] Energy security strategies, as observed, range from employing brute force to embracing interdependence and institutions.

In contemporary international energy relations, states pursue interdependence as a viable approach to addressing energy security challenges. Meanwhile, it is worth noting that the level of energy cooperation varies depending on the kind of energy resource in play. While the global market and institutions administer oil, regional markets administer natural gas and electricity. The International Energy Agency (IEA), Organisation for Petroleum Exporting Countries (OPEC), International Renewable Energy Agency (IRENA), and several Regional Power Pools (RPP) in Europe and Africa are cases in point.

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[214] 'Energy Self-Sufficiency: A Realistic Goal or a Pipe Dream? - Our World', accessed 17 February 2021, https://ourworld.unu.edu/en/energy-self-sufficiency-a-realistic-goal-or-a-pipe-dream.

[215] Daniel Yergin, *The Quest: Energy, Security, and the Remaking of the Modern World* (New York: Penguin Press, 2011).

[216] Daniel Yergin, 'Ensuring Energy Security', 28 January 2009, https://www.foreignaffairs.com/articles/2006-03-01/ensuring-energy-security.

Africa is home to 600 million people living without electricity access[217] despite possessing – 7 per cent of the world's oil resources,[218] 13 per cent of the gas resources[219], 20 per cent of the uranium resources[220], and 40 per cent of the manganese reserves.[221] Its renewable energy resources are also in abundance – its solar and hydro potential could supply about 660 000 TWh[222] and 35 GW of electricity.[223] In short, Africa remains energy-poor amid plenty. Energy, both as an economic input and output, is central to Africa's economic outlook, the same way it is for the rest of the world, and lack of it hinders social and economic development. Looking at the statistics above, it is by no means a surprise that Africa scores low in almost all socio-economic indicators and lags in implementing the Sustainable Development Goals. The Covid-19 pandemic makes the situation worse.

The Corona pandemic is ravaging the globe, and Africa is no different. Given its relatively weak economic and social structures, the impact of the pandemic on Africa will be devastating. '*After*' the pandemic, 23 million more Africans will fall below the poverty line, and the number of people living on food aid will double.[224] As Africa fights the pandemic through a series of lockdown measures, the resulting slow economic activity is rolling back the gains of economic growth and further exacerbating the social and economic hardships in the continent. The pandemic will also have a direct impact on the energy sector. In sub-Saharan Africa, 30 million additional people can no longer afford essential electricity services[225] as energy investment decreased by 30%.[226] Therefore, energy poverty continues to be a severe obstacle to Africa's

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[217] 'Africa Energy Outlook 2019', World Energy Outlook Special Report (Paris: International Energy Agency, 2019).

[218] Morgan Bazilian et al., 'Energy Access Scenarios to 2030 for the Power Sector in Sub-Saharan Africa', *Utilities Policy* 20, no. 1 (March 2012): 1–16, https://doi.org/10.1016/j.jup.2011.11.002.

[219] 'Atlas of Africa Energy Resources'.

[220] AFREC, 'Africa Energy Balance'.

[221] IEA, 'World Energy Outlook'.

[222] 'Africa Energy Outlook 2019'.

[223] 'Africa Energy Outlook 2019'.

[224] The Sustainable Development Goals Centre for Africa and Sustainable Development Solutions Network, 'Africa SDG Index and Dashboards Report', 2020.

[225] 'The Covid-19 Crisis Is Reversing Progress on Energy Access in Africa – Analysis', IEA, accessed 12 January 2021, https://www.iea.org/articles/the-covid-19-crisis-is-reversing-progress-on-energy-access-in-africa.

[226] 'Africa Energy Outlook 2019'.

economic and human development. Africa must ensure its energy security to sustainably develop.

Africa's energy security doctrine emanates from its challenges, potential, and its political history – colonialism. The presence of inter-Africa electric trade before independence and the uneven distribution of energy resources across the continent have contributed to developing a regional approach to energy cooperation through instituting regional power pools. Africa's development blueprint, the African Union Agenda 2063, recognises the regional power pool as one of the strategic pillars to foster energy cooperation in Africa. Accordingly, five RPPs have been organised along the five sub-regions of Africa to stimulate energy cooperation and interdependence in the continent. The RPPs are created to secure power supply for member states, facilitating the development of the electricity market, optimising the employment of natural energy resources, enhancing access to electricity, reducing electricity cost, and creating a conducive environment for investment. This chapter will focus on analysing Eastern and Southern Africa Regional Power Pools' efficacy in fostering energy cooperation and ensuring energy security in their respective sub-regions.

The first part introduces the concept of energy security in sustainable development and explains the evolution of regional power pools in Africa in general and in Eastern and Southern Africa in particular. The second part discusses the role of regional power pools in fostering energy cooperation and ensuring energy security in their respective sub-regions. In so doing, it utilises the institutionalist theory of international relations. The third part brings the comparative analysis of EAPP and SAPP using *availability, reliability, affordability, and sustainability* variables of energy security as indicated in the research proposal and other variables highlighted in the above theoretical discussion. Finally, the chapter will assess the correlation between energy security, energy cooperation, and regional power pools in Africa.

3.1. Energy Security for Sustainable Development

Without steam and oil, there would be no mechanisation and mass production, and without electricity, there will be no computation, automation, and the internet – without energy, in short, there is no industrial revolution. Energy security (ES) seems an elusive concept, but its impacts are vivid to modern life. For example, power blackouts affected a total of 1 billion across 29 Indian states in July 2012[227] and 2.6 million Americans living in Texas in February

[227] 'The 10 Worst Blackouts of the Last 50 Years', accessed 23 February 2021, https://www.power-technology.com/features/featurethe-10-worst-blackouts-in-the-last-50-years-4486990/.

2021,[228] killing scores of people. On the other hand, Africa is home to 600 million people who have no access to energy.[229] Therefore, ES means reliability for some and availability for the others – ES means different things to different actors – it almost lies in the "*eyes of the beholder."*[230]

The actor's economic status, energy situation, and preferred course of action determines the actor's predisposition in defining or conceptualising energy security and related challenges. The ES understanding and challenges of energy exporting countries are different from energy importing ones, while *"security of demand"* anchors the ES focus of the earlier group, *"security of supply."* If the European Union focuses on *"security of supply"* and Russia focuses on *"security of demand,"* what will Ukraine's focus be on as an important energy transit state? What will be the role of Uganda and Kenya in the upcoming electricity trade between Ethiopia and Rwanda? What will be Tanzania's and Democratic Republic of Congo's role in the proposed inter-regional power pool trade between Eastern and Southern Africa Power Pools? What are the roles of energy-related institutions such as regional power pools in the ES equation of a country or a region? These questions raise pertinent issues that must be addressed to develop a comprehensive or at least an overarching conceptualisation of ES.

The increased acknowledgement of the importance of energy and the unattainability of energy independence puts energy in the context of international relations and as one of the strategic and foreign policy objectives of states. The prevailing interdependence in international energy relations has become broad and complex simultaneously, thus elevating ES as one of the crucial variables in the management of international relations, particularly in international energy relations and the risks associated with it.[231]

3.1.1. Evolution of Energy Security in International Relations

Coal singlehandedly defined the notion of ES in the 19th century. Controlling coal fields and securing the supply routes were the pillars of ES. In the 20th century, the introduction of oil into the commercial energy mix and the decision by Winston Churchill to change the energy

[228] 'Texas Blackout: Death Toll Mounts While Food and Water Are Impacted', EcoWatch, 18 February 2021, https://www.ecowatch.com/texas-blackout-power-grid-2650610100.html.

[229] 'Africa Energy Outlook 2019'.

[230] Gal Luft and Anne Korin, eds., *Energy Security Challenges for the 21st Century: A Reference Handbook*, Contemporary Military, Strategic, and Security Issues (Santa Barbara, Calif: Praeger Security International, 2009).

[231] Yergin, *The Quest: Energy, Security, and the Remaking of the Modern World*.

source of the British navy from coal to oil marked the new era of ES. The decision to depend on an energy source found overseas in the Persian Gulf was not appreciated by many of Churchill's colleagues, for it increased Britain's vulnerability. Churchill's response to such a concern was – diversity and diversity alone.

Oil won both world wars[232] and continued to play a central role in the economy. After World War II, many oil-producing countries gained independence from the European colonizers, establishing the consumer-producer divide in ES. The Seven Sisters, a western conglomerate of energy producers, transistors, and distributors, controlled the entire energy value and supply chain across the globe. The industrialised west was both in control of the production and consumption of oil – the price of energy always reflected the interest of the consumers. The socialist lash in the Middle East and the establishment of OPEC completed and strengthened the ES divide as producers and consumers. For the first time in history, the Industrialised West became dependent on energy imported from elsewhere.[233] The creation of OPEC and the nationalisation of oil fields in major oil-exporting countries contributed to the Industrialised West's declining influence in singlehandedly determining oil prices in the global market. As a result, the oil prices started to reflect more the interest of OPEC and its members. The height of OPEC's influence in the global energy market reached its peak in 1973 when it pushed the price of oil by 200 per cent and placed an embargo on the United States, the Netherlands, Portugal, Rhodesia (today's Zimbabwe), and South Africa in retaliation for their support to the State of Israel in the Yom Kippur War.[234] The embargo signified the attempt by oil-producing countries to employ energy as their foreign policy tool. The oil crisis was soon translated into an economic crisis –it affected the embargoed countries and numerous developing countries. The 1973 oil crisis triggered an institutional response from the West. The OECD established the International Energy Agency (IEA) in 1974 mainly to coordinate its members' response to future disruptions.[235] IEA worked to ensure a dynamic oil market whereby no single actor is dominant enough to determine oil prices. One of the most oil import-dependent and hardly hit countries, the United States, manipulated IEA to consolidate its influence in the Persian Gulf.

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[232] Yergin, 'Ensuring Energy Security'.

[233] Luft and Korin, *Energy Security Challenges for the 21st Century*.

[234] James D. Hamilton, 'Historical Causes of Postwar Oil Shocks and Recessions', *The Energy Journal* 6, no. 1 (1985): 97–116, http://www.jstor.org/stable/41322100.

[235] Ann Florini, 'The International Energy Agency in Global Energy Governance: The IEA in Global Energy Governance', *Global Policy* 2 (September 2011): 40–50, https://doi.org/10.1111/j.1758-5899.2011.00120.x.

Its 39th President, Jimmy Carter, vowed to use military force to protect the energy interests of the United States, which later became known as the Carter Doctrine.[236] Carter's threat to use force signified the elevation of energy as one of the major foreign policy and national security objectives of states. In general, the 20th century witnessed the elevation of energy as one of the strategic commodities in global markets and international relations. The period also witnessed the creation of two of the prominent institutions, OPEC, and IEA, that helped pioneer the governance of international energy relations. In terms of conceptualising energy security, the period witnessed the emergence of two of the fundamental energy security doctrines, Churchill's Doctrine on diversification and Carter's Doctrine on the militarisation of energy security. In terms of energy cooperation, the period witnessed the proliferation of energy trade, energy markets, and institutions managing the production, transmission, and energy consumption. Thus, the 20th century laid the foundation for the evolution of energy cooperation and energy security as concepts and practices.

The 21st century has three distinct features: the emergence of new centres of demand, technological advancement, and expansion of energy sources. The developed West had controlled the demand side of the energy dynamics for a long time in the 20th century. However, the 21st century witnessed unprecedented economic growth in Asia, Africa, and South America, creating new economic centres. The economic miracle of the Asian tigers – China, South Korea, Singapore, and Taiwan – and India was significant enough to alter the balance of energy demand towards the East. As a result, the West lost control over the global energy demand. The period also witnessed a proliferation of several technologies availing energy from sources once thought uneconomic or impossible. Technological innovations increased the output from various oil fields and made possible energy from non-conventional sources, renewable sources such as solar, wind, and geothermal. Technological advancements also contributed towards bringing energy efficiency as one of the dimensions of energy security. Following the successful conclusion of the series of conferences on environment and economic development under the auspices of the United Nations, the introduction of *sustainability* in both energy production and consumption as an additional element of energy security was the highlight of the 21st century. The growing concern over the energy sector's contribution to climate change made the final push for sustainability or *acceptability* of energy systems to become a variable in conceptualising energy security. The creation of the International Renewable Energy

236 Hugh C. Dyer, Maria Julia Trombetta, and Edward Elgar Publishing, eds., *International Handbook of Energy Security* (Cheltenham, UK ; Northampton, MA, USA: Edward Elgar, 2013).

Agency (IRENA) to facilitate cooperation, advance knowledge, and promote the adoption and sustainable use of renewable energy is the institutionalisation of such alteration. In general, ES evolved in line with the dynamics of the global economy and states chose the institutional approach to energy security and in the overall management of global energy relations.

3.1.2. Energy Security: Contextualising the term into the Study

Energy security plays an integral role in the security of the state.[237] The concept of security has numerous and competing interpretations, but the definition provided by Ayoob[238], as any threat that weakens states, can be operational in this context. In case one brings the energy factor into Ayoob's operational definition, ES is the external and internal vulnerabilities that threaten the supply of sustainable and reliable energy with the potential to impede the ability of the state to deliver on its mandate. Buzan also captured some essence of ES in his environment and economic sector assessment as a matter of depletion of natural resources, forms of pollution, and scarcities or uneven distributions.[239] The conceptualisation, heavily influenced by the securitisation theory, did not capture energy's strategic political and social attributes. Analysing the impact of the Gulf Oil Crisis in the 1970s on the safety and security of many countries depicts a different story; the fall of the Ethiopian monarchy is a case in point. ES, thus, can define not only the economic prosperity of the nation but also its existence. Though the above two conceptualisations attempt to frame energy in the analytical frameworks of security, they do not bring out the constitutive elements of energy security and its relations with the overall national security framework.

ES is a significant component of a state's national security, and the place of a state in the energy market, producer, transit, or consumer, determines its energy security consciousness and perspective. The ES of the energy-producing countries revolves mainly around securing a long-term and stable market, whereas the ES of a consuming state anchors on ensuring a reliable supply of energy. Developed nations and developing ones have a completely different approach to ES. Developed nations, whose energy consumption per capita is close to 8000 kWh per

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[237] Linda Miller, "ES and FP: A Review Essay," *International Security*, (Spring 1977): 119

[238] Mohammed Ayoob and Samuel F. Wells, 'The Security Problematic of the Third World', ed. Edward E. Azar et al., *World Politics* 43, no. 2 (1991): 257–83, https://doi.org/10.2307/2010473.

[239] Barry Buzan, Ole Waever, and Jaap Wilde, *Security: A New Framework for Analysis*, (London, Lynne Rienner Publisher, 1998), 74

capita,[240] are more focused on ensuring reliability and sustainability of the supply of energy, whereas developing countries, home to close to 800 million people without access to electricity[241], primarily focuses on ensuring access and affordability.

The conceptualisation of energy security also evolves across time from focusing only on access to including the *sustainability* factor in the equation. Before sustainable development became the *modus operandi* of international development dialogue, energy was a commodity that had to be available at an affordable price. In this regard, coal and oil were considered the ultimate sources of energy. The introduction of sustainability into the energy security conceptualisation highlighted the need to consider the environment in the production and consumption of energy resources and the need to shift from hydrocarbons to embracing diversification. The evolution also witnessed the emergence of principles such as diversification, sustainability, efficiency, and markets as factors capable of affecting the state of energy security of the state. Though diversification of energy suppliers had been one of the driving factors of the early 20th century principles of security of energy supplies, diversity of energy resources and energy efficiency aiming at enhancing the sustainability of the supply chain was a recent introduction. Also, the proliferation of different institutions mandated to govern international energy relations, a 21st century development, contributed to developing the concept of energy security both as a concept and a practice. Several of these institutions, such as the IEA and International Energy Council (IEC), came up with certain conceptual definitions of and policy to ensure energy security, thereby contributing to the evolution of the concept of energy security. Therefore, energy security has been an evolving concept and the dynamics of relations between consumers and producers, sometimes through their institutions, guide its evolution.

Energy security, as discussed above, has evolved significantly since the day W. Churchill opted for oil from the Persian Gulf to Coal from Wales fields to enhance the mobility of the British navy. However, there is still no consensus definition of energy security because ES means different things to different actors depending on their economy, technological development, and distance from the energy source. As indicated above, some prioritise '*demand'* and others securitise '*supply*.' There are several scholarly articles and institutional whitepapers that attempt to conceptualise and define energy security. Though none managed to successfully

[240] 'Electric Power Consumption (KWh per Capita) - OECD Members | Data', accessed 29 April 2021, https://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC?locations=OE.

[241] 'Access to Electricity – SDG7: Data and Projections – Analysis', IEA, accessed 29 April 2021, https://www.iea.org/reports/sdg7-data-and-projections/access-to-electricity.

bridge the multi-dimensional divide and provide *the* definition of energy security, the attempts developed several overarching dimensions in defining energy security. The following paragraphs present the selected works of scholars and institutions on energy security.

Cherp and Jewell[242] assert three sides to ES, "*sovereignty, robustness, and resilience*." The definition attempts to capture the security of energy supply from externalities such as attacks on energy infrastructure, regime change in energy-rich countries, and climate change. The definition captures the reliability and sustainability aspects of energy security but overlooks the access and affordability sides of ES. Savacool[243] developed several dimensions, including "*public policy, diversification, sustainable development, energy poverty, industries, and maritime issues*", in defining the variable of ES and Kuzemko[244] argued that ES is just the function of "*security of supply, security of demand, and security of the technology*." In general, observing the previous attempts to conceptualise ES, it can be argued that most of the attempts follow the classification of ES variables by clustering ES concerns of the industrialised countries into themes and dimensions.

Ange[245] *et al.* identified several dimensions of energy security after reviewing *eighty-three* definitions from *one hundred and four* publications between 2001 and 2014. According to their observation, the dimensions include ''*availability, infrastructure, price, environment, societal effect, governance, and efficiency*." The first three dimensions of ES, such as availability, infrastructure, and price, were frequent in the papers published in the first seven years of the period, and the remaining environment-related dimensions started to flock as a defining variable of energy security following the mainstreaming of sustainable development in global development dialogue.

Similarly, Savacool and Brown[246] reviewed ninety-one publications between 2003 and 2008

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[242] Aleh Cherp and Jessica Jewell, 'The Concept of Energy Security: Beyond the Four As', *Energy Policy* 75 (December 2014): 415–21, https://doi.org/10.1016/j.enpol.2014.09.005.

[243] Caroline Kuzemko, 'Politicising UK Energy: What "speaking Energy Security" Can Do', *Policy & Politics* 42 (1 April 2014), https://doi.org/10.1332/030557312X655990.

[244] Kuzemko.

[245] B.W. Ang, W.L. Choong, and T.S. Ng, 'Energy Security: Definitions, Dimensions and Indexes', *Renewable and Sustainable Energy Reviews* 42 (February 2015): 1077–93, https://doi.org/10.1016/j.rser.2014.10.064.

[246] Benjamin K. Sovacool and Marilyn A. Brown, 'Competing Dimensions of Energy Security: An International Perspective', *Annual Review of Environment and Resources* 35, no. 1 (2010): 77–108, https://doi.org/10.1146/annurev-environ-042509-143035.

and identified four frequently used variables in conceptualising and defining energy security. These variables are "*availability, affordability, efficiency,* and *environment",* which Jonathan Elkind[247] and Kurt[248] *et al.* reconfigured as "*availability, affordability, reliability,* and *sustainability."* The reconfiguration is suitable for this study for many reasons. First, it avoids the producer-consumer divide and provides a holistic definition of energy security, covering production, transmission, and consumption issues. Second, the four dimensions align with sustainable development and its pillars – the availability, reliability and affordability aspects cover the social and economic pillar, and the sustainability pillar covers the environmental dimension of sustainable development.

In addition to the above-mentioned scholarly works, several institutions contribute towards the evolution of ES as a concept by providing definitions. The World Bank Group defined ES as "*ensuring countries can sustainably produce and use energy at a reasonable cost to facilitate economic growth, poverty alleviation, and improve the quality of peoples' lives by broadening access to modern energy services."*[249] The definition encompasses three of the ES elements, access, affordability, and sustainability and is in line with the pillars of sustainable development.

The IEA defined ES as "*on the basis of continuous availability and affordability recognising several aspects such as economic development, environmental need, among others,"*[250] capturing all four elements of ES – access, affordability, reliability, and sustainability – and is in alignment with the economic and environmental pillars of sustainable development. The social pillar of sustainable development is hardly noticeable in the definition partly because the IEA is constituted to manage the international oil market on behalf of the Organisation for Economic Cooperation and Development (OECD), whose members are industrialised and access to energy is not a major concern.

[247] Luft and Korin, *Energy Security Challenges for the 21st Century*.

[248] Bert Kruyt et al., 'Indicators for Energy Security', *Energy Policy* 37, no. 6 (June 2009): 2166–81, https://doi.org/10.1016/j.enpol.2009.02.006.

[249] World Bank, 'Energy Security Issues', Text/HTML (Washington, December 2005), https://documents.worldbank.org/en/publication/documents-reports/documentdetail/464811468175435408/Energy-security-issues.

[250] Florini, 'The International Energy Agency in Global Energy Governance'.

European Commission[251] defines its Energy Security strategic paper as "*a stable and abundant supply of energy"* for Europe's prosperity and security. The definition also encapsulates specific objectives of "*mitigating security of supply challenges such as enhancing energy efficiency, moderate demand, developing technologies, increasing production, diversification of supply and route, strengthening emergency response mechanisms, and safeguarding critical infrastructures.*"[252] The strategy begins by identifying supply reliability as a major energy security challenge and puts forward action points in this regard. Thus, the European energy security challenge focuses on reliability. EU's international agenda often revolves around sustainability and responsible consumption and production, but its energy security underpinning lacks sustainability.

The other region worth exploring is Asia. The region identified climate change as a primary energy security challenge and took cognisance of it when defining energy security. Thus, for Asia ensuring energy security is not only ensuring access and reliability but also ensuring its energy system is sustainable in such a way that "*procuring energy does not leave the world vulnerable to catastrophic environmental damage*."[253]

In general, as noted at the outset of the chapter, energy security means different things to different actors, and context provides both the background and the explanation. Some scholars and regions focus on access, and others still go for sustainability. The prioritisation reflects the specific energy security challenge of the actor, defining the constitutive elements of energy security and the remedies to it. The study partly focuses on Africa's energy security challenges and embraces energy cooperation to sustainable development in the continent. With such a background, the next part delves into defining the constitutive elements and approaches of Africa's energy security.

[251] Nataliya Esakova, *European Energy Security* (Wiesbaden: VS Verlag für Sozialwissenschaften, 2012), https://doi.org/10.1007/978-3-531-19201-7; Mehdi Parvizi Amineh and Yang Guang, eds., *The Globalization of Energy: China and the European Union*, International Comparative Social Studies, v. 21 (Leiden [The Netherlands] ; Boston: Brill, 2010).

[252] Esakova, *European Energy Security*.

[253] Nigel Lucas, 'Energy Security in Asia: Prospects for Regional Cooperation', *SSRN Electronic Journal*, 2014, https://doi.org/10.2139/ssrn.2511134.

3.2. Regional Power Pools as Energy Cooperation Institutions

3.2.1. Contextualising Regional Power Pooling

Power pools are the sum of grid systems of wires through which electricity is produced and transmitted to a given region. If a power pool is the sum of electric grids, understanding the smallest unit, a grid, comes before understanding the network of grids. A power grid involves the movement of electricity from its production to end-use through complex transmission lines. Thus, the grid system is composed of the generation, transmission, and distribution of electricity. Generation consists of energy production sites such as dams, geothermal stations, coal-fired plants, wind turbines, or solar panels – tasked with producing power and converting it to electric energy. The electric energy will then be transported to a *transformer* that converts it to a high voltage suitable for long-distance transmission. Transmission, often called electric superhighways, moves the bulk of electrical energy from transformers to *stations* whereby the high voltage electricity will be converted to its lower form for distribution. Distribution involves the delivery of electricity for household and commercial uses. The following diagram shows the components of a grid system.

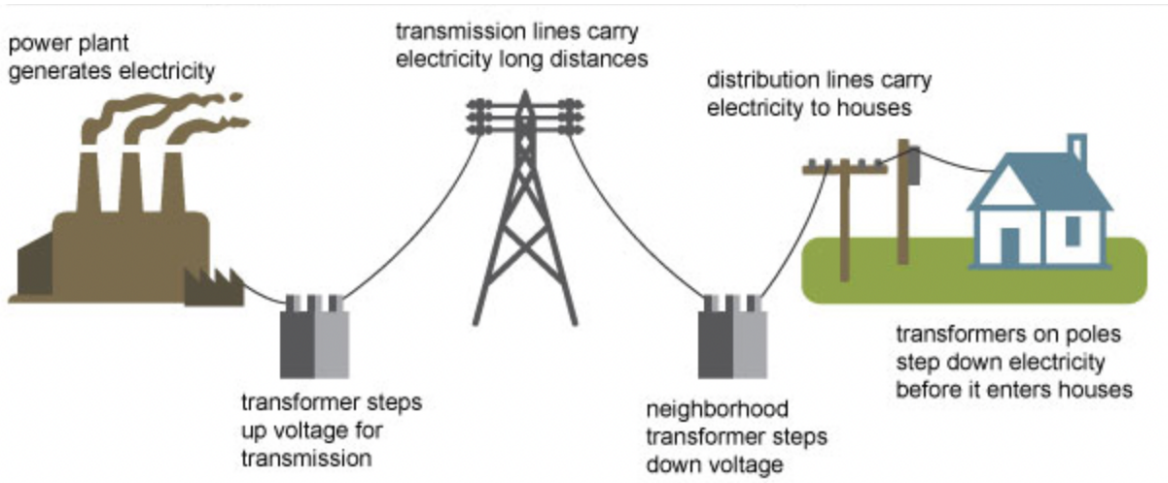

Figure 1The grid system[254]

A power pool is formed when "*two or more* [grid systems] *coordinate their transmission and generation"*[255]or when " [grid systems] *are tied together by coordination arrangements for the*

[254] 'Delivery to Consumers - U.S. Energy Information Administration (EIA)', accessed 23 April 2021, https://www.eia.gov/energyexplained/electricity/delivery-to-consumers.php.

[255] Curtis Cramer and John Tschirhart, 'Power Pooling: An Exercise in Industrial Coordination', *Land Economics* 59, no. 1 (February 1983): 3, https://doi.org/10.2307/3145873.

operation and planning of their generation facilities and transmission networks as if they were a single system.”[256] In short, a regional power pool is an arrangement between interconnected electric systems that are planned and operated to supply power most reliably and economically for their combined load requirements. A power pool can also be understood as an arrangement where outputs from several generation sites are “*pooled*” together, scheduled according to pre-determined criteria, and dispatched according to the “*merit order*” to meet the energy demand.

In almost all cases, individual grid systems in a power pool represent national utilities governed by national laws and regulations. Especially in Africa, where the state dominates the energy system, power pools provide another platform where sovereigns interface. In the past, governments alone controlled the entire energy system from generation to distribution. The state formulates an energy policy, determines the generation need and type, allocates investment for the grid system, distributes electricity to end-users, collects revenue, and caters for reserve capacity. Such a business model proved inefficient in ensuring energy security and called for the liberalisation of the energy sector.[257] Accordingly, recent power sector reforms introduced the separation of these sub-sectors and the introduction of the private sector in several energy sectors in Africa.

Kenya is a case in point. In Kenya, the power sector has been undergoing restructuring and reform since the mid-1990s, culminating in the Energy Act 2006.[258] In 1996, the Government of Kenya officially liberalized power generation as part of the power sector reforms. As a result, Kenya Electricity Generating Company PLC (KenGen)[259], which remained entirely state-owned, became responsible for the generation assets; Kenya Electric Transmission Company Limited (KETRACO)[260] became mandated to plan, design, construct, own, operate and maintain the high voltage national electricity transmission grid; Kenya Power[261] maintains the

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[256] UNECA, ‘Assessment of Power Pooling Arrangement in Africa’ (UNECA, 2004), 13.

[257] Livia Ilie, Alexandra Horobet, and Corina Popescu, ‘Liberalization And Regulation In The Eu Energy Market’, *University Library of Munich, Germany, MPRA Paper*, 1 January 2007.

[258] Catrina Godinho and Anton Eberhard, ‘Learning from Power Sector Reform Experiences: The Case of Kenya’, n.d., 53.

[259] ‘KenGen: Who We Are’, KenGen, accessed 3 March 2021, https://www.kengen.co.ke/index.php/our-company/who-we-are.html.

[260] ‘Our Organization | Kenya Electricity Transmission Co. Ltd’, accessed 3 March 2021, https://www.ketraco.co.ke/about-us/our-organization.

[261] ‘Who We Are | Kplc.Co.Ke’, accessed 3 March 2021, https://www.kplc.co.ke/content/item/14/about-kenya-power.

power distribution and transmission network and retails electricity to its customers; the Energy & Petroleum Regulatory Authority (EPRA)[262] reviews electricity tariffs and enforces safety and environmental regulations in the power sector as well as safeguarding the interests of electricity consumers established as the sub-sector regulator. Also, the number of private investors in the energy sector has grown significantly. Today, the private sector's contribution to Kenya's installed capacity has reached 30 per cent from 15 power plants.[263]Similar arrangements are found in almost all countries that embraced the liberalisation of the power sector.

The liberalization practices in the energy sector pose both a challenge and an opportunity to develop regional power pools. Since power pooling involves integrating national grid systems, the process becomes complicated as the number of actors within the state structure increases. On the other hand, privatization strengthens the utilization of division of labour and comparative advantage approach to decision-making within a system, which encourages states to analyse the feasibility of regional power pools using similar and favourable approaches. In general, the overall process of establishing and managing power pools calls for solid institutions capable of managing the transition from fragmented systems dominated by national policies to an integrated regional system.[264]

Power pools as regional institutions are expected to harmonise infrastructure developments, including investment decisions aimed at boosting energy generation and transmission capacities. In so doing, regional power pools, as regional institutions, bring the respective masterplans of member states to develop a unified plan capable of reflecting regional priorities. The formation and operationalisation of regional competitive electricity markets, within regional power pools also requires harmonisation of soft infrastructures. Therefore, regional power pools should serve as platforms whereby national laws, regulation, and grid codes are harmonized. Since regional power pools are horizontally linked national grid systems, each national system represents its national laws and regulations designed based on national realities

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[262] 'Electricity', *Energy and Petroleum Regulatory Authority* (blog), accessed 3 March 2021, https://www.epra.go.ke/services/electricity/.

[263] 'Kenya - Electrical Power Systems | Privacy Shield', accessed 23 April 2021, https://www.privacyshield.gov/article?id=Kenya-electrical-power-systems.

[264] Alberto Tita, 'Global Energy Institutions. Russia at the IEA Can Tip the Scale, Assuring Enhanced Governance', *The Journal of World Investment & Trade*, 2012, 972–96, https://doi.org/10.1163/22119000-01306004.

to meet national ambitions. Therefore, if power pools are to discharge their constitutive role of coordinating the planning and operations of the pooled system, they must find a way of enabling their respective participants to reach a consensus plan, which is often called a regional master plan. Most of the research participants, 48 per cent and 40 per cent strongly agreed and agreed, respectively, that regional power pools play a significant role in harmonizing regulations, standards, and technical guidelines as compared to the 8 per cent and 4 per cent that strongly disagreed and disagreed, respectively. The data shows that regional power pools harmonise policies, laws, and standards by working closely with national utilities, which 71 and 100 per cent of the respondents in Eastern and Southern Africa, respectively, verify.

As discussed in the previous chapter, energy is inexorably linked to the politics, economy, and international relations of a nation. The argument mentioned above for ensuring energy security, *the master resource*, requires establishing strong institutions called regional power pools. The transfer of a considerable amount of sovereignty from state actors to the power pools is but one prerequisite for the successful realisation of the ambitions enlisted in the constitutive documents of the respective regional power pools.

Decision-making mandate and the ability to enforce decisions are important elements that determine the strength of institutions, regional power pools in this case.[265] The more participating states cede sovereignty to regional institutions, the more robust these institutions become to achieving their constitutive objectives.[266] As argued by Keohane,[267] states should identify transnational challenges so that they are motivated to establish international institutions capable of addressing them. Issues about the absence of authority in international relations and limits on states' freedom of action should be addressed before institutions are born; two peculiar factors can alleviate these challenges – prior existence of institutions and '*shock*'.[268] Keohane and Cooper et al. argued that the presence of prior institutions in the given region has a positive effect on states to continue to believe in and advocate for institutions

[265] Robert O. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton, N.J: Princeton University Press, 1984).

[266] Scott Cooper et al., 'Yielding Sovereignty to International Institutions: Bringing System Structure Back In', *International Studies Review* 10, no. 3 (2008): 501–24, https://www.jstor.org/stable/25481990.

[267] Robert Keohane and Helen Milner, *Internationalization and Domestic Politics | Robert O. Keohane, Helen V. Milner | Download* (Cambridge: Cambridge University Press, 1996), https://book4you.org/book/975057/8f26ab.

[268] Cooper et al., 'Yielding Sovereignty to International Institutions'.

because the practice can help "*build trust*" among states and on institutions, bolster or enlarge existing institutions, reduce *"uncertainties*" and "*negotiation costs*."

In Africa, the establishment of institutions can be dated back to the establishment of the Organisation of African Unity in 1963 in Addis Ababa. Africa started with a giant and authoritative institution whose solemn declarations, for example, the 1964 Cairo declaration on "*respect the borders existing on their achievement of national independence,*" unite her members.[269] The Abuja Treaty also introduces regional economic communities in the African political landscape. The Intergovernmental Authority on Development (IGAD), the East African Community (EAC), the Southern Africa Development Cooperation (SADC), and the Common Market for Eastern and Southern Africa (COMESA) are of particular interest to the Eastern and Southern Africa regions, which this study interrogates. Accordingly, countries in the Horn of Africa identified "*drought and development"* as the transnational challenges ravaging the region and created the then Intergovernmental Authority on Drought and Development (IGADD), which later became IGAD. EAC was created to lead the process of economic and political integration of Eastern Africa countries, whereas SADC was established to facilitate regional economic integration, peace, and security, in line with the provisions of the Abuja Treaty.

The establishment and development of these regional institutions have comparable effects, as similarly argued by Cooper et al. (2008), on states in Eastern and Southern Africa. For instance, it can be argued that the establishment of the SAPP in 1996 is the result of the '*shock*' of the catastrophic drought of the early 1990s. Similarly, as Cooper et al. argued, the existence of successful institutions such as SADC "*build trust*" among Southern Africa states and led to the bolstering of SADC by placing the newly established SAPP answerable to SADC's Infrastructure Directorate. Though the constitutive mandates of EAPP and SAPP are almost identical, especially in their role to facilitate regional trade and to work closely with regional economic communities, the same cannot be said for EAPP because it has no genuine working relationship with its parallel regional economic community, COMESA, IGAD, or EAC. Many believe that EAPP needs COMESA as its political overcoat alone.[270] EAPP's membership

[269] Organization of African Unity, 'Resolutions Adopted by The First Ordinary Session of the Assembly of Heads of State and Government held In Cairo, UAR, FROM 17 TO 21 JULY 1964' (1964).

[270] Hailu Yohannes, Energy and Sustainable Development in Africa, Google Meet, 11 January 2020.

scattered all over EAC, IGAD, SADC, and the Arab Maghreb Union makes it impossible to pursue the same line of Cooper's argument.

Be the argument as it may if the EAPP and SAPP are regional institutions working to promote energy trade and integration in their respective regions – what are we expecting from these institutions? Why are we much concerned about harmonisation and authoritativeness? The following section will explain the benefits of regional power pools.

3.2.2. The Benefits of Regional Power Pools for Regional Energy Security and Cooperation

Energy system integration or power pooling is an institutionalised mechanism to ensure energy security by integrating national utilities of participating states. The search for more reliability and security of electricity supply has been the determining factor in building most of the existing power system interconnections between neighbouring countries around the world. Nevertheless, the overall benefit of regional power pools goes beyond the reliability aspect of energy security.

Regional power pools help participants save production and operation cost, enhance grid reliability, ensure "*security of supply*," and achieve optimal energy mix.[271] The potential to save production and operational costs are derived from cutbacks in "*operational costs,*[272]*"* *"investment costs from additional generation,*[273]*"* and *"reserve capacity sharing*[274]*."* Regional power pools provide an opportunity to share operational reserves and installed capacity, thereby avoiding additional investment in generation infrastructure.[275] Interconnected systems also have lower operating costs and are more dependable because of the high level of coordination in the electricity exchange.[276] This is particularly true in Eastern and Southern Africa, where economies are small and fragmented. With power pooling arrangements, fragmented systems can be operated as part of a more extensive regional interconnection,

[271] UNECA, 'Assessment of Power Pooling Arrangement in Africa'.

[272] Cramer and Tschirhart, 'Power Pooling'.

[273] Economic Consulting Associates, 'The Potential of Regional Power Sector Integration: South African Power Pool (SAPP) Transmission & Trading Case Study' (London, October 2009).

[274] Deloitte, 'The Roadmap to a Fully Integrated and Operational East African Power Pool' (Deloitte, 2015).

[275] UNECA, 'Assessment of Power Pooling Arrangement in Africa'.

[276] 'Power Pools: How Cross-Border Trade in Electricity Can Help Meet Development Goals', accessed 25 April 2021, https://blogs.worldbank.org/trade/power-pools-how-cross-border-trade-electricity-can-help-meet-development-goals.

thereby achieving economies of scale. With the larger market size and scope of interconnection, participating utilities share the responsibility of providing operational reserve to all. Extensive generation facilities become more feasible considering the better quality of the energy production and considerably low construction costs concerning the market size it operates within and attracts private sector investment.[277] For example, in Eastern Africa, Ethiopia has clearly outlined that it is constructing the Grand Ethiopian Renaissance Dam to export electricity to the EAPP countries and given the small size of Ethiopia's economy at the time of the commencement of the project in 2011, the dam would not have passed pre-feasibility assessment had it targeted the local market alone. In addition, economies of scale associated with the regional energy market also contribute to the increase in private sector investment in geothermal energy production in Kenya.

Also, reducing operating and investment costs can be achieved by deploying and implementing the cheapest plants and projects as a priority, respectively, further encouraging the attainment of the optimal energy mix. Regional power pools also provide an opportunity to utilise the opportunities of complementarity in the regional generation mixes. The complementarity principle informed SAPP's operation and its establishment, as harmonising hydro with thermal systems was one of its constitutive objectives. The hydro-thermal generation mix in Southern Africa helped reduce overall operating costs as hydro often replaces thermal in an off-peak period to save fuel and reduce costs associated with a thermal system due to hydropower import in "*peak or high-cost periods*" and "*export in off-peak or low-cost periods*."[278] Such complementary energy mix utilisations encourage and prioritise the development of more environment-friendly or sustainable sources of energy.[279]

The gains of regional power pools can further be contextualised based on the participating countries' economic development. Especially in Europe and America, where most of the members are industrialised countries, regional power pools are established mainly to diminish investment and operational costs through the emergence of a competitive energy market and the development of an optimal energy mix.[280] In the southern hemisphere, home to the developing countries, regional power pools are created mainly to address two of the daunting challenges of the energy sector, investment for both production and transmission. In other

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[277] Deloitte, 'The Roadmap to a Fully Integrated and Operational East African Power Pool'.

[278] UNECA, 'Assessment of Power Pooling in Africa' (Addis Ababa, 2003).

[279] Cramer and Tschirhart, 'Power Pooling'.

[280] 'Power Pools: How Cross-Border Trade in Electricity Can Help Meet Development Goals'.

words, the creation of substantial regional markets by respective regional power pools bringing together developing economies is also a risk-sharing approach to make the investment environment in the energy sector more attractive to financiers.

3.3. Energy security, Energy Cooperation, and Regional Power Pools

This section focuses on the dynamics between energy security, energy cooperation, and regional power pools. As captured in the following diagram, the overall argument is that energy cooperation is the most feasible approach to energy security, and regional power pools are the best alternative to forge regional energy cooperation.

Figure 2Relationship between RPPs, Energy Cooperation, and Energy Security

Energy security means different things to different actors. As the previous section demonstrates, energy security is conceived differently in different countries at different economic development stages. Developing countries focus on access and affordability while developed countries emphasise reliability and sustainability. In the European Union, energy security dynamics revolve around diversification of energy sources and resources, decarbonising the energy sector, enhancing energy efficiency, and championing energy transition to renewable energy resources.[281] In Africa, ensuring the availability of energy dominates the energy security policy debates and formulations.[282] In Eastern and Southern Africa, particular factors such as enhancing energy generation capacity and building adequate transmission infrastructure between generation sites and load centres have shaped the energy

[281] European Commission and Directorate-General for Communication, *The European Green Deal: Delivering Step by Step.*, 2020, https://op.europa.eu/publication/manifestation_identifier/PUB_NA0420124ENN; Esakova, *European Energy Security*.

[282] I.M. Bugaje, 'Renewable Energy for Sustainable Development in Africa: A Review', *Renewable and Sustainable Energy Reviews* 10, no. 6 (December 2006): 603–12, https://doi.org/10.1016/j.rser.2004.11.002; Ivan Mbirimi, 'Regional Energy Security Dynamics in Southern Africa', n.d., 34.

security discourse.[283] Despite the difference in focus and scope, energy security as a tool for enhanced energy security is one of the constant factors in energy security discourse worldwide. European Union's Green Deal[284] builds on regional cooperation to achieve energy transition and energy security, and the African Union Agenda 2063[285] stresses the centrality of regional energy cooperation for sustainable development.

Therefore, it can be argued that energy cooperation is the most plausible approach towards energy security. In Africa, bilateral energy trades has shaped energy cooperation since the 1950s. There have been bilateral energy trade agreements between the then Zaire (now the Democratic Republic of Congo, DRC) and Zambia in the late 1950s[286]; Zambia and Zimbabwe in the 1960s[287]; Ghana and Togo in 1972; Ghana and Benin in 1973; Mozambique and Zimbabwe; Mozambique and South Africa in 1975; and Senegal, Mali, and Mauritania in the 1980s. The energy cooperation regime in Western Africa exhibited a more regional character along the Akosombo and Senegal River Basins.[288] In Africa, including in the aforementioned basins, regional energy cooperation was primarily administered by bilateral contracts. Even after establishing regional mechanisms, regional economic communities, and regional power pools, bilateral power purchase agreements administer a significant portion of Africa's energy trade. Confirming this assertion, most of the respondents (71.4 per cent) agreed that energy cooperation is best forged with bilateral energy trade mechanisms in Africa.[289] In short, Africa pursues energy cooperation mainly because energy cooperation provides a comprehensive solution to tackle its energy security challenges. Challenges associated with market size and investment are believed to be addressed by mainstreaming energy cooperation in a region.

For instance, whether bilateral or regional, energy cooperation between countries converts small and fragmented energy markets to a unified and large market. It also means that energy

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[283] Yohannes G. Hailu, *Energy Access and Security in Eastern Africa: Status and Enhancement Pathways* (Kigali, Rwanda: United Nations Economic Commission for Africa, Subregional Office for Eastern Africa, 2014); Mbirimi, 'Regional Energy Security Dynamics in Southern Africa'.

[284] European Commission and Directorate-General for Communication, *The European Green Deal*.

[285] African Union and Commission, *Agenda 2063: The Africa We Want.*, 2015.

[286] Alisson Chikova, Energy Cooperation and Sustainable Development in Africa, Zoom Meeting, 20 November 2020.

[287] UNECA, 'Assessment of Power Pooling in Africa'.

[288] Medinilla, A. 2017. The International Congo Ubangui Sanga Commission (CICOS): Going with the flow - from navigation to climate finance in less than 20 years? ECDPM policy brief, December 2017.

[289] {Citation}

produced in participating countries accesses a relatively broader market now compared to the pre-cooperation era. Larger regional markets also attract investment, for they enjoy economies of scale. In short, as is the case globally, energy cooperation is the most plausible alternative to energy security in Africa.

Africa started to prioritise energy in its development space in the early days of post-independence. The bilateral energy trade schemes inherited from the colonial economic integration model contributed to Africa's recognition of greater regional energy cooperation to achieve social and economic development. Also, as discussed above, most of the pressing challenges of the energy sector could be addressed by embracing energy cooperation. However, there were no institutional mechanisms by which regional energy cooperation could be championed. In the 1980s and 1990s, several meetings took place at ministerial and presidential levels to discuss regional economic integration and energy integration in different parts of Africa. Several regional economic communities were established during this period. – IGADD was established in 1986, SADC in 1992, EAC in 1999, ECOWAS in 1975, and COMESA in 1994. The relative success in establishing these regional institutions coupled with the energy crisis of the early 1990s led to the establishment of the first-ever regional power pool in Southern Africa, SAPP.

In the early 2000s, the need for energy cooperation reached a level of urgency, and three other power pools in West, Central, and East Africa were established to interconnect the fragmented energy market in the continent. In addition to the benefits discussed in the previous part of this chapter, regional power pools play a significant role in institutionalising energy cooperation's role to achieve energy security. Regional power pools, in general, laid an institutionalised foundation for the proliferation of energy cooperation in Africa.

Apart from providing investors access to regional markets and thereby attracting investment, regional power pools can facilitate regional energy cooperation. Given the low generation capacity, low transmission coverage, and almost negligible harmonisation trend in the African energy sector, regional power pools are the critical, if not the only, institutions that help Africa overcome technical and political challenges of energy cooperation. Regional power pools help joint regional planning, particularly in the transmission networks and, to some extent, generations. For instance, both EAPP and SAPP developed a regional master plan to develop generation and transmission capacities. The master plan not only guides regional generation and transmission developments but also attracts and redirects investment. Thus, regional power pools provided clarity, at least at the planning stage, what regional cooperation on energy infrastructure development could look like through a joint conversation which would have been difficult without institutions such as regional power pools.

Regional power pools also play a crucial role in policy and grid code harmonisation. Countries have respective laws, regulations, and quality standards, and these standards are not always comparable. This proved to be one of the significant challenges discouraging cooperation in the energy sector. In short, regional energy cooperation or trade cannot be achieved without harmonised standards and grid code. In this regard, regional power pools play a significant role in providing a platform where participating states would discuss and develop a mutually agreed regional quality and standard, usually referred to as a regional grid code. EAPP, for instance, developed its regional Interconnection Grid Code setting out the technical rules necessary for a safe, reliable, secure, and efficient operation of the grid system. EAPP also established an Interconnection Code Compliance Program, with the financial support from the Power Africa initiative of the United States Government, aiming at "*making Interconnection Code mandatory"* and *to assist members to determine what is needed to ensure compliance."* EAPP has successfully campaigned for Ethiopia and Kenya to comply with the regional master plan prioritising the Ethiopia – Kenya 400KV transmission line.

Similarly, the study found out that 60 per cent of the respondents from the SAPP region indicated that the amount of investment in their country's national grid is in line with the grid code as advised by SAPP. Therefore, regional power pools play a critical role in the emergence of technical harmonisation in their respective regions, further creating an enabling environment for energy cooperation to flourish. Also, it can be argued that regional power pools through regional grid masterplan and devoted programs are influencing the decision-making process in their respective regions.

The development and operationalisation of the regional energy market are some of the manifestations of regional cooperation. In this regard, regional power pools play a crucial role in diversifying the nature of regional markets. Bilateral energy trade existed well before the introduction of regional power pools in Africa. Nevertheless, regional power pools are singlehandedly responsible for the development of institutionalised and multiparty regional trade. The development of variants of institutionalised and multiparty energy trade such as the Short-Term Energy Markets (STEM), Day-Ahead Markets (DAM), Month Ahead Markets (MAM) in Southern Africa is directly associated with SAPP. In SAPP, the introduction of the DAM has pushed the limits of energy trading from cooperative to competitive electricity market. The difference between cooperative and competitive energy markets is that the cooperative trade patterns involve bilateral power purchase agreement that is long-term with a fixed price.

In contrast, competitive trading involves an auction type trading whereby generators and utilities submit their priced intention to sell and buy electricity to the market operator in advance of the delivery of the trades. In 2019 the percentage share of competitive energy trade in SAPP reached 30 per cent from the overall energy traded in the region. SAPP showed that regional energy trade could flourish in Africa and transform energy markets from cooperative to competitive markets.

The study also found out that when it comes to energy cooperation, most of the research participants (70 per cent) agreed that in the pre-power pool era as well as in the early days of regional power pools (before all the members are interconnected), energy cooperation is best forged with bilateral energy trade mechanisms in Africa. In the EAPP region, the bilateral electricity trade agreements are the only constitutive elements of the energy market 15 years after the establishment of the regional pool and in Southern Africa, 25 years after the establishment of SAPP, bilateral power purchase agreements dominate the energy trade in the region with 70 per cent market share.

Successful realisation of regional energy security objectives requires a cooperative environment whereby regional or regional policy alternatives get the priority or upper hand in implementation. However, implementing the regional policy framework often faces two dilemmas. First, there are competing priorities to energy security, pursuing national or regional priorities. Countries often fall into the trap of prioritising nationalistic projects to regionally approved projects. They often do so because they want to address their energy security needs with their resources. Second, even with a widespread perception, 70 per cent of the respondents agreed that regional pools boost the level of grid interconnection among members, countries often tend to focus more on developing their generation facilities to developing their transmission lines in their investment decisions. These seemingly different dilemmas influence one another. It is because countries desire to become energy self-sufficient that they focus more on national projects and generation; had they genuinely believed in energy cooperation and interdependence or believed that energy is a commodity, they would have understood that developing transmission infrastructure solves energy access challenges the same way, if not in a more sustainable manner, enhancing generation capacity.

These two dilemmas are evident in Eastern and Southern Africa. An investment decision, for example, by the Government of Kenya to expedite the 400 MW Ethiopia – Kenya high voltage transmission line, which allows Ethiopia to sell cheap electricity to Kenya and beyond, shows not only the prioritization of transmission over a generation in policy decisions but also stipulates the prioritization of regional and long-term approach over nationalistic and short-term orientation. In southern Africa, the decision by South Africa to pursue the Medupi coal-fired power plant with the capacity of 4764 MW is criticized for being short-sighted for it discourages the regional approach to energy development in the region that anchors on the development of renewable resources in the Democratic Republic of Congo, Mozambique, and Zambia.

The two cases demonstrate that the dilemma between going regional (cooperation) or staying nationalistic (self-reliance) and preference for generation or transmission continuously shapes the state of energy security and energy cooperation in Africa. The establishment of regional power pools in part shows that energy cooperation, interdependence, and regional approach to energy security has gained the upper hand in energy security policymaking in Africa. In particular, the establishment of regional power pools in the five subregions of Africa and the explicit pronunciation of the regional approach to energy sector development in the African Union Agenda 2063 shows that Africa is embracing a regional approach to energy security.

3.4. Comparative Analysis of Energy Security in Eastern and Southern Africa

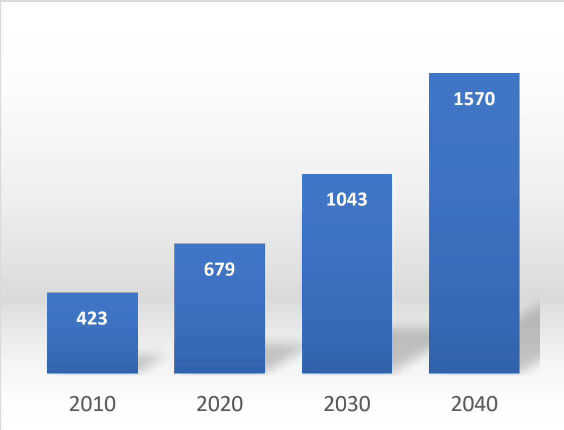
The section begins with presenting the state of energy security in Africa in general and in Eastern and Southern Africa in particular. Then, it analyses the energy security situation in Eastern and Southern Africa in line with the energy security variables such as availability, reliability, affordability, and sustainability as suggested in Chapter 1. The discussions in the section also identify the potential and actual roles of power pools in Eastern and Southern Africa in actualising energy security in their respective sub-regions in Africa.

3.4.1. The State of Energy Security in Africa

In recent decades, African energy demand has been steadily rising, and the average energy consumption per person has remained below the world average.[290] The average electricity

[290]Our World in Data, 2020, (https://ourworldindata.org/grapher/per-capita-electricityconsumption?tab=chart&time=2000..latest&region=Africa)

consumption in Africa reached 665 kWh in 2019, but the overall consumption is still negligible compared to the global and Asian averages of 3358 kWh and 2 300 kWh, respectively.[291] Africa's energy demand will exponentially increase to 1570 TWh in 2040 (See the following graph) due to several factors, including population growth, high economic growth, and massive electrification programmes aiming at boosting energy access, contributing to the significant electricity demand increase registered since the beginning of the twenty-first century.[292]



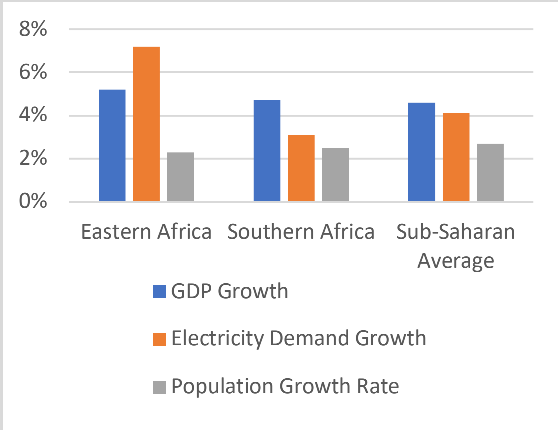


Chart 1Electricity demand projection in Africa in TWh.

Chart 2GDP, Population, and Electricity demand in Africa

In the EAPP region, the electricity consumption per capita is lower than the SAPP region and in both regions Egypt and South Africa consume more than double the consumption of their neighbours as observed in the following graph. The graph also shows the relationship between electricity consumption and GDP per capita of the selected countries.

[291] 'Africa Energy Outlook 2019'.

[292] McKinsey, outlook, and

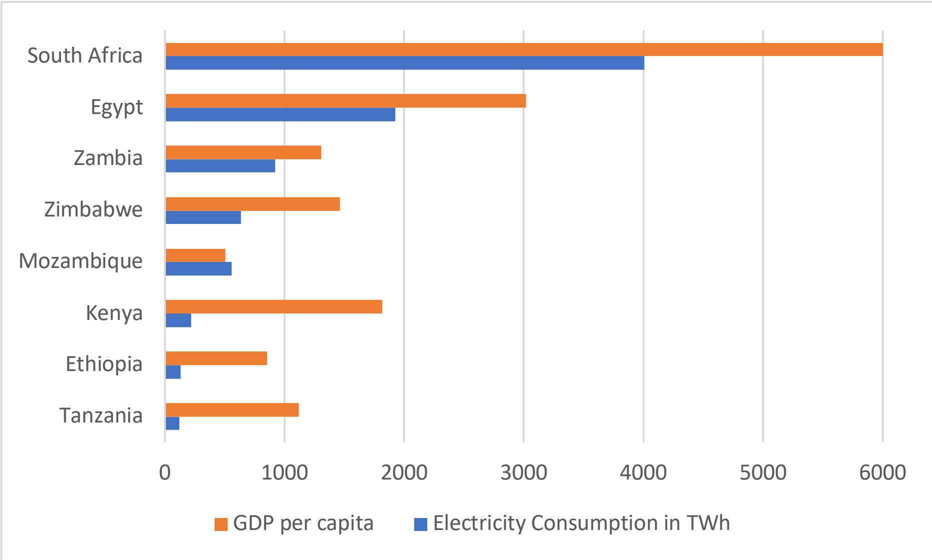


Chart 3 Electric consumption and GDP per capita of selected EAPP and SAPP countries in 2019

The graph illustrates that from EAPP and SAPP regions, only Egypt and South Africa have an electricity consumption per capita of more than 1000 kWh. The critical factor worth noting here is that the level of economic development in the two countries mentioned are superior to the others. As chapter two demonstrates, energy, as both an input to and output of the economy, is a prerequisite to economic development and in most cases, as observed in the graph, the energy consumption per capita of members of EAPP and SAPP are much related to their GDP per capita. The low energy consumption levels in Africa are the result of the failure of the energy sector and underdeveloped regional markets.[293]

Regional energy trade remains low and is realised through bilateral contracts between national utilities. The state of the regional energy market is in its infancy and underdeveloped. Almost all energy trades in Africa are under bilateral schemes, and a limited number of countries take part. Many countries, for example, such as Eritrea, South Sudan, Somalia, Mauritius, Seychelles, and Madagascar are not members of their respective regional power pools and others, such as Angola, Malawi, and Tanzania, even if they are part of the power pools, they do not operate within the regional framework. The situation is highly associated with the inadequate generation capacity and insufficient transmission interconnections in the continent. The transmission constraint keeps many countries from the regional market and hinders active trading countries from utilizing their demand and supply potentials.

[293] Bazilian et al., 'Energy Access Scenarios to 2030 for the Power Sector in Sub-Saharan Africa'.

The generation and interconnection constraints are highly associated with a lack of adequate investment. Interconnection infrastructures are owned solely by respective states, which lack the financial muscle to advance development. The incomplete liberalization of the energy sector, thus, hampers energy security in Africa. Most African countries have opened their generation sub-sector for private investment to utilize their respective resources, but the transmission constraint that limits the private investors' access to the regional market discourages private investment in generation. The situation creates a condition whereby states coordinate their resources to develop cross-border interconnections, but the energy sector priority still lies in enhancing domestic generation capacity than regional interconnections. Even when states manage to pull interconnection projects, for instance, the Zimbabwe, Zambia, Botswana, and Namibia regional transmission line (ZiZaBoNa), they fail to mobilise adequate financial resources. In this regard, the contribution of international financiers and development partners become crucial. For example, the involvement of the African Development Bank in the Ethiopia – Kenya transmission interconnection is a case in point. Similar financing arrangements are also observed in the Cameroun – Chad and Guinea - Mali interconnections in Western Africa. Regional projects tend to attract development partners and international financiers more than unilateral projects because they want to tap into the potential of regional energy integration. The following section will analyse the role of regional power pools in ensuring energy security in Eastern and Southern Africa.

3.4.2. Regional Power Pools and Energy Security in Eastern and Southern Africa: Regional Power Pools and Availability

As the last part demonstrated, energy security means different things to the actors and institutions involved in conceptualising and defining ES. Africa's understanding of energy security emanates from its energy situation, resource-rich but energy-poor; major energy exporter despite dependence on imported energy; and energy price not reflecting the market affecting both affordability and investment. If a single word can summarise the energy security challenge of Africa, it must be the accessibility dimension, the combination of availability and affordability aspects of ES. However, considering the numerous outages and related economic impacts and the need to accommodate the global agenda on energy transition – reliability and sustainability elements of energy security should be included. Thus, this study argues that energy security definition and conceptualisation in Africa should focus on access, reasonable price, reliability, and sustainability. Johnathan Elkind provided a comprehensive account in his choice of four constitutive elements such as availability, affordability, reliability, and sustainability.[294]

As established in the previous part of this chapter, regional energy integration can address numerous challenges associated with respective national energy systems. In Africa, regional power pools are the desired institutions to forge regional energy integration because they can reduce investment requirement, enhance energy system resilience by availing a mix of complementary energy resources, and enable participants to benefit from creating economies of scale in energy production. In general, the state of energy security in Africa is worrisome, and regional power pools-led energy integration is the most plausible way to ensure energy security for sustainable development. The following section delves into comparatively analysing EAPP's and SAPP's potential and contribution to enhancing energy security in their respective sub-regions.

3.4.2.1. Electricity Availability in Eastern and Southern Africa: Analysing the Role for EAPP and SAPP

Availability in energy security dynamics consists of three interrelated variables. These are the physical endowment, technology to exploit, and the availability of capital investment for exploration and utilisation.[295] Before all the complex security issues follow, energy sources should exist and be converted into commodities. It is only after its existence that discussions over access, trade, cooperation, and institution follow.

The combination of resource, technology, and capital is the trinity that avails energy. Nationalistic policies, exhaustion, poor infrastructure, and lack of access to finance and technology are challenges that exacerbate energy deficit in a certain country or region.[296] In this regard, the energy market can play a crucial role in availing adequate energy. Without proper functioning regional energy markets and without a formal agreement legalising, instituting, and facilitating the process of regional energy integration, warranting the availability element of energy security in Africa is difficult, if not impossible. In short, without the active participation of regional power pools, Africa cannot avail adequate energy for its economy and households.

In most cases in Africa, energy consumption rates are low, and there is a significant generation

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[294] Carlos Pascual and Jonathan Elkind, eds., *Energy Security: Economics, Politics, Strategies, and Implications* (Washington, D.C: Brookings Institution Press, 2010).

[295] Pascual and Elkind, 123.

[296] Cherp and Jewell, 'The Concept of Energy Security'.

and transmission deficit. Regional power pools are constituted to address these challenges. Regional power pools can play a crucial role in addressing several of the availability challenges mentioned above by encouraging trade, investment, and joint planning in a region, thereby ensuring energy security.

Domestic demand for electricity, trade, and reserve demand constitutes the overall energy demand in Eastern Africa. The electricity demand from businesses, industries, and households represents the domestic demand, while the prior or emerging electricity trade agreements in the region inform demand for electricity trade. The reserve demand is a capacity needed to maintain a reliable supply of electricity to end-users. All three aspects of demand contribute to the ride in electricity demand in the EAPP region. Demand is rising amid substantial electrification access deficits.

More than two-thirds of people without access to electricity today live in sub-Saharan Africa, and half of the people live in Nigeria, the Democratic Republic of Congo, Ethiopia, Tanzania, and Uganda,[297] which are EAPP members, save for Nigeria. Meanwhile, the rate of electrification grew from 1 per cent in 2014 to 4 per cent in 2018 and Ethiopia, Kenya, Rwanda, and Tanzania represent much of the success stories.[298] In particular, Kenya has a remarkable success story of reaching 75 per cent in 2018 from 25 per cent access rate in 2013 due to its electrification, its policy decision to decentralize the energy sector by providing tax incentives to the private sector, and its effective mobile payment scheme.[299] Despite the success stories, the region remains energy-poor, and the success stories are not evenly distributed across the region.

Meanwhile, electricity demand is expected to grow from 58 GW in 2020 to 95 GW in 2030,[300] its drivers, like the cases in the rest of Sub-Saharan Africa, are economic growth and electrification programmes. However, the energy sector cannot ensure the security of electricity supply both to the suppressed demand and the new demand.[301] According to EAPP's prediction, most EAPP members will continue to face electricity shortages until 2025,

[297] 'Africa Energy Outlook 2019'; AFREC, 'Africa Energy Balance'.

[298] AFREC, 'Africa Energy Balance'.

[299] EAPP, 'EAPP Power Balance', December 2020; AFREC, 'Africa Energy Balance'.

[300] EAPP, 'EAPP Regional Power System Masterplan' (EAPP, 2014).

[301] LDC Environment Centre, 'Taking Action on Suppressed Demand', Technical Report (Kampala, Uganda, July 2012).

including magical Kenya, if they do not embrace regional electricity trading.[302] Even regional trade cannot solve the deficit in the short run because there is no adequate generation and transmission infrastructure to facilitate trade. However, after the entire EAPP region is interconnected and pipeline projects are completed in 2025, energy trade will supply a significant portion of the energy deficit in the region. Kenya and Sudan, for example, will be able to cover their electricity deficit by importing electricity from Ethiopia and Egypt.[303] The EAPP region will have a positive energy balance in 2030 after the completion of generation and transmission projects.[304] Nevertheless, such a scenario depends on the realisation of regional energy trade.[305] Therefore, as facilitated by the EAPP, energy trade is poised to supply the growing electricity demand in Eastern Africa.

Additionally, EAPP countries are expected to cater for their respective reserve demand. Many energy economic models suggest that national utilities should have a 15 per cent reserve capacity computed from their respective peak demand.[306] In most East African cases, given the energy deficit and lack of adequate investment in the region's energy sector, maintaining a healthy reserve margin of 15 per cent is not on the priority list of decision making.[307] In other words, East African countries cannot meet their reserve capacity needs from domestic energy sources alone, and the situation encourages the pursuit of regional arrangements and regional power pools, whereby members can share their reserve capacity. Maintaining a 15 per cent reserve margin for East African economies is burdensome, and regional power pools facilitate the sharing of such a burden. Also, EAPP provides access to several energy sources – natural gas in the north, hydro in the middle, and the mix of geothermal, hydro, and natural gas in its southern tip – to further incentivise the pursuit and role of regional power pools. Thus, EAPP has an indispensable role in ensuring its region has a healthy capacity reserve.

Therefore, in the East African region, lack of available energy hampers access to electricity, security of supply, and regional energy trade. EAPP is best positioned to intensify the massive

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[302] EAPP, 'EAPP Master Plan' (EAPP, 2017).

[303] EAPP, 'EAPP Power Balance'.

[304] EAPP; AFREC, 'Africa Energy Balance'.

[305] Gebrehiwot Zelalem, Energy and Sustainable Development in Africa, Physical, 11 June 2020.

[306] Muhammad Hassan et al., 'Co-Optimization of Energy and Reserve Capacity Considering Renewable Energy Unit with Uncertainty', *Energies* 11, no. 10 (20 October 2018): 2833, https://doi.org/10.3390/en11102833.

[307] Desta Mebrhatu, Energy and Sustainable Development in Africa, Physical, 11 December 2020.

electrification programmes to ensure the growing demand is met and facilitate sharing the capacity reserve.

On its part, the SADC region has made significant strides in establishing regional infrastructure in the electricity sub-sector, as evidenced by the interconnection of nine of SADC member states to the regional power pool, the Southern Africa Power Pool (SAPP). The interconnection of these member states has optimized power system production and trade. The regional master plan study conducted in 2012 states that the region has a lower electricity access rate, 24 per cent, compared to the 36 per cent and 44 per cent, in EAPP and WAPP regions, respectively.[308] As envisioned in the Regional Energy Access Strategy and Action Plan, the region plans to reduce the number of people without electricity by 50 per cent successively until it attains universal access by 2027.[309] In this regard, the role of regional energy trade, both through bilateral and regional mechanisms, has been prioritized to enhance electricity generation and transmission connectivity.

Seven years down the line, in 2019, the report released by SADC showed that access to electricity reached 50 per cent.[310] The African energy outlook report substantiated the progress by projecting that SADC region's electricity access to reach 60 per cent by 2030.[311] However, the progress is not evenly shared by all SADC member states. Table 1 below shows electricity access situation in the SAPP region.

Table 2 Electricity access situation in SAPP region

Variables	South Africa	Botswana	Zimbabwe	Zambia	Mozambique
Population	57,792,520	2,254,126	14,439,018	17,351,822	29,495,962

[308] SADC, 'Regional Infrastructure Masterplan' (Gaborone, 2012), https://www.sadc.int/files/7513/5293/3530/Regional_Infrastructure_Development_Master_Plan_Executive_Summary.pdf; SADC, 'Regional Infrastructure Master Plan: Energy Sector Plan' (Gaborone: SADC, August 2012).

[309] SADC, 'Regional Infrastructure Master Plan: Energy Sector Plan'.

[310] Southern African Development Community and Southern African Research and Documentation Centre, eds., *SADC Regional Infrastructure Development: Short Term Action Plan Assessment 2019* (Gaborone : Harare: SADC; Southern African Research and Documentation Centre, 2019).

[311] 'Africa Energy Outlook 2019'.

Population with access to electricity	52,591,193	1,465,182	5,919,997	6940729	9,143,748
Share of population with access to electricity	91.23%	64.8%	41%	39.8%	31%
Share of SADC population	16.8%	0.7%	4.12%	5%	8.6%
Share of SADC population with access to electricity	15.2%	0.4%	1.72%	2%	2.7%

The above table shows that South Africa, with the highest number of people with access to electricity and 17 per cent of SADC's population, covers 15 per cent of the population accessing electricity in the region in 2018. Mozambique, on the other hand, though it has almost 9 per cent of SADC's population, only covers close to 3 per cent of the population accessing electricity in the region in the same year. Similarly, Zambia's and Zimbabwe's population with access to electricity, 39 per cent and 41 per cent, respectively, fall short of the regional average of 50 per cent. Therefore, access to electricity in the SAPP region has improved significantly, but all member states do not equally share the progress.

Meanwhile, the SAPP region also exhibits varying energy balance. While Zimbabwe suffers from an electricity deficit of 994 MW, Mozambique and South Africa enjoy surplus electricity of 625 MW and 1632 MW in 2017, respectively.[312] In addition, the regional Energy Plan indicated that with an average electricity demand increase of 5 per cent to 8 per cent, the region would suffer from an electricity deficit between 3 GW to 84 GW between 2017 and 2027.[313]

[312] SAPP, 'SAPP Pool Plan' (SAPP, 2017).

[313] SADC, 'Regional Infrastructure Master Plan: Energy Sector Plan'.

However, as is the case with access to electricity and the electricity deficit in 2017, there will be countries with excess electric power. As argued in the last part of this chapter, such regional electricity availability discrepancies incentivize regional power trade under SAPP.

The SADC region has been pursuing regional energy integration through SAPP with many success stories. As the following graph illustrates, SAPP's operating balance starts to show a positive outlook in 2018 and 2019 from the successive negative balance in 2013, 2015, and 2016.

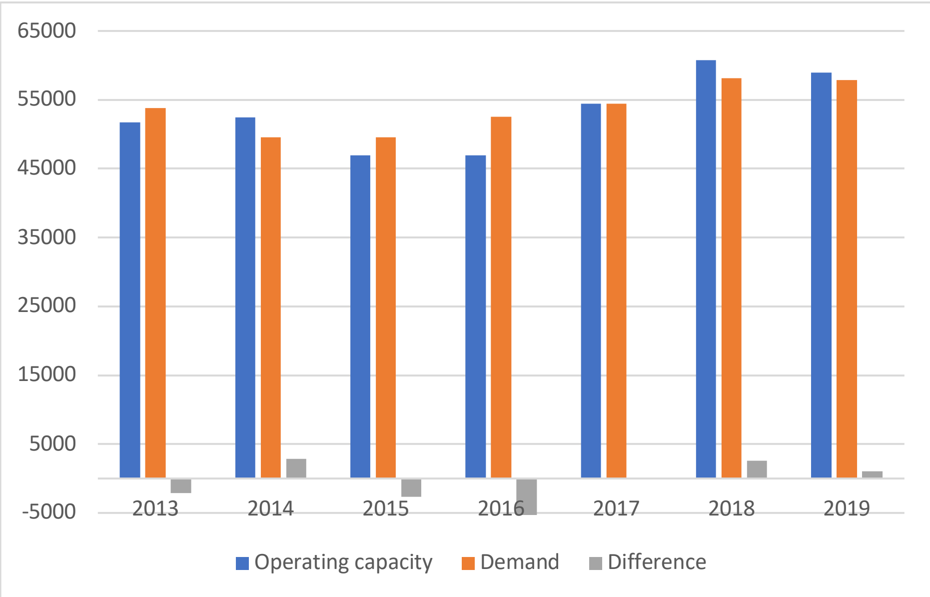

Chart 4Energy balance in SAPP

The contribution of energy trade, both bilateral and regional, is helping participating countries attain a positive operating balance. Energy trade in the region increased to 14500 MW in 2018 from 500 MW in 2012 as SAPP's operating capacity reaches 24 per cent compared to 1 per cent in 2012.[314] SAPP's operation balance reached a 1045 MW[315] surplus in 2019 from a negative balance of 2131 MW[316] in 2013. Also, the percentage of electricity trade in total electricity demand in the SAPP region has reached 11 per cent compared to less than 2 per cent

[314] Southern African Development Community and Southern African Research and Documentation Centre, *SADC Regional Infrastructure Development*.

[315] SAPP, 'SAPP Annual Report', Annual Report (Harare: Southern Africa Power Pool, 2019), http://www.sapp.co.zw/sites/default/files/SAPP%20ANNUAL%20REPORT%202019.pdf.

[316] SAPP, 'SAPP Annual Report', Annual (Harare: Southern Africa Power Pool, 2013), http://www.sapp.co.zw/sites/default/files/2013%20Annual%20Report%20New%20%283%29.pdf.

in EAPP.[317] The statistics show that regional energy trade flourishes in Southern Africa, thereby enhancing electrification access as SAPP plays a crucial facilitation role.

The SAPP region has an anticipated demand of 96000 MW by 2027, and availing such humongous electricity demands a considerable investment of US$122 billion in generation and US$3 billion in transmission.[318] However, as Castellano[319] computed, regional energy integration, championed by regional power pools, can save US$40 billion in Africa up to 2040, and the SAPP regional plan confirmed that the region could save US$48 billion[320] under a complete regional energy integration scenario. Therefore, the regional approach pioneered in Africa by SAPP has significantly reduced the capital investment need to avail adequate energy for the growing demand, thereby contributing to energy security in the SADC region.

Therefore, SAPP has proved that regional power pools are best suited to address the availability element of energy security through implementing regional energy integration and utilising its benefits. Considering this, the creation of the Project Implementation Unit (PAU) in SAPP has played a significant role in SAPP's success. The PAU, established in 2015, is tasked with expediting technical studies, mobilising funds, and identification and following-up of regional priority projects, which has enhanced the implementation of generation and transmission projects.[321] PAU significantly addresses challenges related to lack of coordination, bankability, and efficient preparation and implementation of infrastructural projects.[322] Similarly, SAPP is establishing the Regional Transmission Infrastructure Financing Facility (RTIFF) to promote transmission investment in the SADC region to mobilise adequate resources for the numerous interconnection projects as identified by the PAU.

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[317] 'Africa Energy Outlook 2019'.

[318] SADC, 'SADC Energy Monitor' (Gaborone: SADC, 2018), https://www.sadc.int/files/5515/6837/8450/SADC_ENERGY_MONITOR_2018.pdf.

[319] Antonio Castellano et al., 'Brighter Africa: The Growth Potential of the Sub-Saharan Electricity Sector' (McKinsey & Company, February 2015), https://www.norfund.no/app/uploads/2020/02/McKinsey-Brighter-Africa-The-growth-potential-of-the-sub-Saharan-electricity-sector-2015-PDF.pdf.

[320] Economic Consulting Associates, 'The Potential of Regional Power Sector Integration: The Southern African Power Pool Case Study' (ESMAP, October 2009).

[321] World Bank, 'Southern African Power Pool Program for Accelerating Transformational Energy Projects Additional Financing', Project (Washington, D.C: The World Bank Group, 10 June 2019), http://documents1.worldbank.org/curated/zh/309691562607404024/pdf/Africa-Southern-African-Power-Pool-Program-for-Accelerating-Transformational-Energy-Projects-Additional-Financing.pdf.

[322] SAPP, 'SAPP Annual Report', 2019.

3.4.2.2. Electricity Reliability in Eastern and Southern Africa: Analysing the Role for EAPP and SAPP

Ensuring a reliable supply of electricity is one of the major tasks of utilities. Interruptions affect the productivity and efficiency of national economies[323] and undercut the financial feasibility[324] of the electricity sub-sector. Reliability, in simple terms, is the degree to which energy supply is not episodic.[325] The extent to which energy produced reaches its end users uninterruptedly defined the extent of reliability in energy security. Factors such as natural disaster, poor maintenance of transmission infrastructure, underinvestment, deliberate attacks on the grid system, and political interventions make up potential threats against reliability.[326] In addition, natural disasters such as heatwaves and thunderstorms have also affected the unremitting supply of electricity.[327] Being one of the hottest regions of the world, Africa suffers from the heatwaves, but the impact on human health and development is yet unknown due to inadequate information.[328] However, considering the impact of bad weather, including heatwaves, globally, the impact is felt in Africa.[329] Therefore, the reliability challenge to energy security consists of natural and human-made factors. In response to these challenges and ensuring a reliable supply of electricity, states primarily follow several approaches, including diversification of energy suppliers and sources. Diversification in suppliers provides states with

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323 Chenghong Gu et al., 'Impact Analysis of Electricity Supply Unreliability to Interdependent Economic Sectors by an Economic-Technical Approach', *Renewable Energy* 122 (1 July 2018): 108–17, https://doi.org/10.1016/j.renene.2018.01.103.

324 James Dzansi, Brittany Street, and Steve Puller, 'Why Reliability Matters in Expanding Access to Electricity in Sub-Saharan Africa', *International Growth Centre* (blog), 28 February 2019, https://www.theigc.org/blog/why-reliability-matters-in-expanding-access-to-electricity-in-sub-saharan-africa/.

325 Massoud Amin, 'Challenges in Reliability, Security, Efficiency, and Resilience of Energy Infrastructure: Toward Smart Self-healing Electric Power Grid', https://massoud-amin.umn.edu/sites/massoud-amin.umn.edu/files/2020-03/changes-in-reliability.pdf; Pascual and Elkind, *Energy Security*, 125.

326 Luft and Korin, *Energy Security Challenges for the 21st Century*, 11; Pascual and Elkind, *Energy Security*, 126.

327 Juan A. Añel et al., 'Impact of Cold Waves and Heat Waves on the Energy Production Sector', Perspective, 8 (October 2017): 13, https://doi.org/10.3390/atmos8110209.

328 'Climate Science's Blind Spot for Heat Waves in Southern Africa', *The Mail & Guardian* (blog), 5 August 2020, https://mg.co.za/africa/2020-08-05-climate-sciences-blind-spot-for-heat-waves-in-southern-africa/.

329 'California Issues 1st Rolling Blackouts Since 2001 As Heat Wave Bakes Western U.S. : NPR', accessed 10 May 2021, https://www.npr.org/2020/08/15/902781690/california-issues-first-rolling-blackouts-since-2001-as-heat-wave-bakes-western-.

several alternatives, and diversification of energy sources boosts the energy mix so that the reliability factor of energy security can be enhanced.

In Africa, blackouts, brownouts, and rationing are frequent features of the energy sector. The economic cost of the unreliable supply of electricity is beyond compare.[330] For example, in Eastern and Southern Africa, electricity rationing, and blackouts have impeded economic development in Ethiopia[331] and Zambia[332], respectively. It is not surprising to observe that the EAPP region is ranked at the bottom in the World Economic Forum's electricity reliability index.[333] The graph below shows how EAPP countries rank in the index, seven representing extremely reliable and 1 being extremely unreliable.

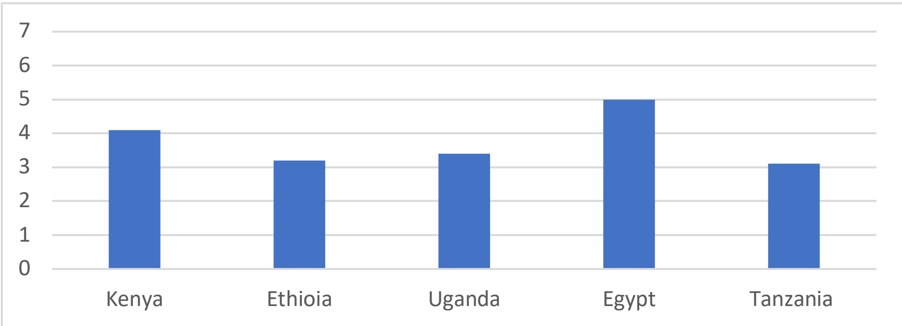

Chart 5Electricity reliability in EAPP region

The graph clearly shows that the electricity reliability of national utilities in the EAPP region is low, save for Egypt. Regional power pools, by design, play a significant role in addressing the reliability challenge to energy security by creating a band of producers, thereby enhancing both diversifications of supply and sources. The EAPP region has a diverse generation mix of natural gas in the north, hydro in the middle, and the mix of geothermal, hydro, and natural gas

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[330] Musiliu O. Oseni and Michael G. Pollitt, 'The Economic Costs of Unsupplied Electricity: Evidence from Backup Generation among African Firms', *Energy Policy Research Group*, November 2013, https://www.eprg.group.cam.ac.uk/wp-content/uploads/2013/12/1326-PDF.pdf; 'Costs of Unreliable Electricity to African Firms', *Energy For Growth* (blog), accessed 10 May 2021, https://www.energyforgrowth.org/memo/costs-of-unreliable-electricity-to-african-firms/.

[331] Morris Kiruga, 'Growth Prospects Hurt as Ethiopia Struggles to Keep the Lights On', *The Africa Report*, 30 May 2019, https://www.theafricareport.com/13533/growth-prospects-hurt-as-ethiopia-struggles-to-keep-the-lights-on/.

[332] Chenai Mukumba and Bwalya Mukuka, 'The Energy Crisis and Its Impact on the Economy', *CUTS International*, 2016, 5.

[333] World Economic Forum, 'Electricity Reliability Index' (WEF, 2018), http://reports.weforum.org/pdf/gci-2017-2018-scorecard/WEF_GCI_2017_2018_Scorecard_EOSQ064.pdf.

in its southern tip, further incentivising regional electricity trade.[334] EAPP, integrating the fragmented electric systems and facilitating trade among its participants, can enhance electricity reliability in the region by addressing reliability challenges that relate to the reliability of energy sources.[335] For example, the existing bilateral electricity trade between Egypt and Sudan, Ethiopia and Sudan, and Kenya and Uganda exhibit reliability. The following table shows the electricity reliability of bilateral electricity trade in the EAPP region between October and December 2020.[336]

Table Reliability of regional interconnections in EAPP region

Regional Interconnections	**Total Energy in MW**	**Avaiability in Percentage**	**Number of Outages**	**Reliability**
Libya-Egypt	160	98.4	4	99.7
Egypt-Sudan	81	99.8	3	99.9
Sudan-Ethiopia	188	88.3	20	87.8
Kenya-Uganda	107	99.8	4	100

The table shows that bilateral interconnections in the EAPP region have a strong reliability index. The Kenya – Uganda interconnection is the most reliable interconnection with only four outages, 99.8 per cent availability and 100 per cent reliability and Ethiopia – Sudan interconnection is the least reliable interconnection with 20 outages, 88 per cent availability, and 88 per cent reliability. However, the interconnections enabled participants to trade almost 530,000 MWh of electricity, 95.4 per cent of the trade per the bilateral agreement.[337] Therefore, it can be argued that regional interconnections supply reliable electricity, and once EAPP completes its overall interconnection and reaches the level of a fully-fledged competitive electric market, the overall reliability of the grid system will be significantly enhanced.

As the above account on EAPP demonstrates, maintaining a reliable electricity supply is problematic in Africa where there is inadequate infrastructure development. The SAPP region

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[334] EAPP, 'EAPP Regional Power System Masterplan'.

[335] Zelalem, Energy and Sustainable Development in Africa.

[336] EAPP, 'EAPP Interconnection Performance Report', Quarterly (Addis Ababa: EAPP, December 2020).

[337] EAPP.

faces a similar reliability challenge associated with senile infrastructure inherited from the colonial era. The following graph shows how SAPP countries rank in the index, seven representing extremely reliable and 1 being extremely unreliable.

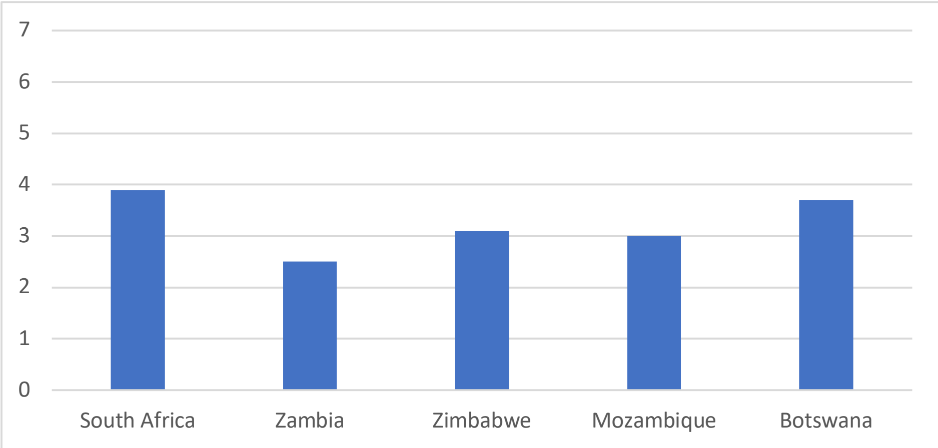

Chart 6Reliability index in SAPP region

The graph clearly shows that the electricity reliability of national utilities in the SAPP region is low. Regional power pools, by design, play a significant role in addressing the reliability challenge to energy security by creating a band of producers, thereby enhancing both diversifications of supply and sources. In this regard, the establishment of SAPP, following the drought year of 1992, has a lot to do with enhancing reliability by supplementing the thermal-based energy system in the southern part of SADC by the hydro-based energy system in its northern part.[338] In such a way, SAPP creates a considerable reliable electricity market. Nevertheless, SAPP encounters numerous interconnection disturbances, as shown in the following two graphs.

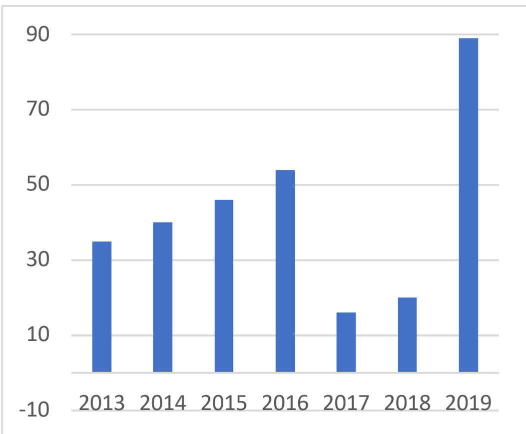

Chart 7 Interconnection disturbance in SAPP region

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[338] UNECA, ‘Assessment of Power Pooling Arrangement in Africa’.

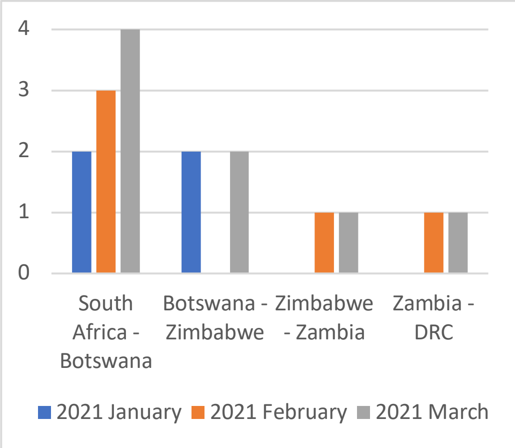

Chart 8Interconnection disturbance in SAPP market between January and March 202

The SAPP regional market also suffers from numerous disturbances. The pool recorded its worst disturbance during the Cyclone Idea disaster in 2019. The cyclone damages, among others, 2 generation sites, 1345 Kms of transmission line, and 10,216 km of distribution lines damaging electric infrastructure worth $US 450 million.[339]

Concerning disturbances on regional interconnections, for the period between January and March 2021, the South Africa – Botswana interconnection has registered the highest number of disturbances, mainly due to climatic conditions and technical failures. Given the progressively high level of energy trade in the region, almost 14500 MW in 2018, and the $US 3 billion transmission line investment need, the magnitude of disturbances is insignificant. The reliability analysis in the EAPP region indicates that regional power pools can enhance the reliability of electricity supply and similar analysis in the SAPP region illustrates those regional markets ensure a more reliable supply of electricity.

3.4.2.3. Electricity Affordability in Eastern and Southern Africa: Analysing the Role for EAPP and SAPP

Affordability is often associated with energy poverty which is evident in Africa, where many have no access to electricity because energy price is high relative to disposable income.[340] The affordability dimension of energy security also determines equitable access to energy

[339] Government of Mozambique, 'Mozambique Cyclone Post Disaster Need Assessment' (Maouto, 2019), https://www.ilo.org/wcmsp5/groups/public/---ed_emp/documents/publication/wcms_704473.pdf.

[340] Africa Development Bank, 'African Economic Outlook 2019', Annual (Africa Development Bank, 2019).

services.[341] A study conducted to determine energy use equity by comparing the electricity usage concerning income concludes that "*people living below the international poverty line pay proportionally more for energy, hindering the accumulation of wealth needed to make investments to escape their poverty*" and in some unique cases such as Kenya, the percentage share of electricity usage of the high-income earners is half of the overall electricity provided for residential electricity.[342] Though the price of electricity in Africa is relatively high compared to the disposable income, the energy market is often under government control and subsidy in most developing countries that the price does not reflect the market.[343] Compared with household income, the price of electricity is still high even when the state intervenes to lower the price of electricity service.

The price of electricity has broad implications for both consumption and investment. Lowering the price through government interventions such as subsidies has two implications. First, demand will increase sharply as social groups who could not afford electricity will start consuming, and those who are already consuming will increase their consumption.[344] On the other hand, the investment will decline because the profit is expected to fall significantly, making the energy market less attractive to investors.[345] It also has a far-reaching consequence. Literature has it that high energy prices are one of the most dominant factors driving investment in energy-efficient technologies as companies will no longer show interest in investing in such technologies affecting the development of the energy sector in general.[346]

Therefore, getting the price right remains the feasible way to solve energy security challenges related to affordability and beyond. As market operators involving numerous producers and consumers, regional power pools play a crucial role in getting the right price reflective of the

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[341] Manfred Hafner et al., *Renewables for Energy Access and Sustainable Development in East Africa*, SpringerBriefs in Energy (Cham: Springer International Publishing, 2019), https://doi.org/10.1007/978-3-030-11735-1.

[342] Sovacool and Brown, 'Competing Dimensions of Energy Security'.

[343] Yohannes G. Hailu, *Energy Access and Security in Eastern Africa*.

[344] World Bank, 'Energy Security Issues'.

[345] Zelalem, Energy and Sustainable Development in Africa.

[346] Anton Eberhard et al., *Africa's Power Infrastructure: Investment, Integration, and Efficiency* (Washington, D.C: The World Bank, 2011).

regional market.[347] In this regard, the contribution of bilateral electricity trade agreements is minimum because the price, in such agreements, is fixed, and the parties involved are no more than the seller and the buyer, discouraging competition by design.[348] On the other hand, the contribution of regional markets, as operated by regional power pools, will enable regional markets to determine the price of electricity. Regional markets are organised as short-term electricity markets involving electricity trade daily, weekly, and monthly. In such market operations, participants submit bids and offers before the close of the market and the market operator matches offers and bids and publishes the results. The process encourages competition and the regional market, as operated by the regional power pool, determines the price of electricity. In so doing, the electricity market will become more competitive, be resilient to price volatility and encourage new investment, thereby enhancing the overall energy security situation in the participating countries.

The other factor that determines affordability is the cost-reflective tariff. Without setting an electricity tariff that reflects both the cost of generation and supply, the electricity sector fails to recover the investment, further discouraging new investment and pressuring the public sector. One of the widely mentioned challenges associated with tariff setting is its highly politicized nature that labels tariff increment as an unpopular political move. Low tariffs are costing Africa $3.62 billion a year,[349] equal to the capital investment needed to finance transmission in the SAPP region. As a result, the sector becomes unattractive to investment. Pro-poor policy directions are often mentioned as the rationale behind the low tariff structure; however, African poor are paying a higher price relative to their household income.[350] The low tariff structure also impedes the development of regional power trade, as observed in the SAPP region. Between 2000 – 2012, South Africa's tariff was $US 2.33 and $US 1.7 per kWh for domestic and regional markets, respectively, discouraging investment in the region given the regional average cost of producing electricity was $US 7.5, for hydro, and $US 22 for coal.[351]

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[347] Musiliu O. Oseni and Michael G. Pollitt, 'The Promotion of Regional Integration of Electricity Markets: Lessons for Developing Countries', *Energy Policy* 88 (1 January 2016): 628–38, https://doi.org/10.1016/j.enpol.2015.09.007.

[348] Simbini Tichakunda, Energy and Sustainable Development in Africa, Microsoft Teams, 15 November 2020.

[349] Anton Eberhard et al., *Africa's Power Infrastructure: Investment, Integration, and Efficiency*.

[350] OECD et al., *African Economic Outlook 2013: Structural Transformation and Natural Resources*, African Economic Outlook (OECD, 2013), https://doi.org/10.1787/aeo-2013-en.

[351] Economic Consulting Associates, 'The Potential of Regional Power Sector Integration: The Southern African Power Pool Case Study'.

As a result, the region suffers from low investment in the energy sector, becoming unable to deliver electricity to its population. Therefore, unreflective tariffs affect electricity affordability, access, and equity, associated with the lack of a regulatory framework at national and regional levels. The development of regulatory institutions at the national level is also not uniform – some countries have electricity regulatory institutions, some have comprehensive energy regulators, some have multisectoral regulators, and others do not have one.

Nevertheless, the regions have recognized the dire need of instituting cost-effective electricity tariffs to meet the growing regional energy demand because, without it, the massive investment requirement could not be met. Consequently, they have embarked on instituting regional regulatory structures. EAPP has established a forum consisting of nominees of respective regulatory institutions of its members to facilitate the creation of an Independent Regulatory Board in 2012.[352] SADC established the Regional Energy Regulatory Association[353] in 20002. The underdevelopment of a regional regulatory mechanism with the ultimate task of harmonising regulatory frameworks in both power pools is mainly due to the politicized nature of tariff setting and regulation.[354]

3.4.2.4. Electricity Sustainability in Eastern and Southern Africa: Analysing the Role of EAPP and SAPP

The sustainability element of energy security brings issues related to sustainable development and the environment into analysis. Considering the Brundtland view of sustainability, current energy production and use are expected to consider the "*resource needs of the future generation.*" [355] Sustainability also advocates for the balance between harvesting energy resources and regeneration and between emission and the ability of the ecosystem to capture.[356]

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352 'Independent Regulatory Board', *Eastern Africa Power Pool* (blog), accessed 16 May 2021, http://eappool.org/independent-regulatory-board/.

353 Southern African Development Community and Southern African Research and Documentation Centre, *SADC Regional Infrastructure Development*.

354 L. Musaba, 'The Development of the SAPP Competitive Electricity Market', in *Proceedings of the Inaugural IEEE PES 2005 Conference and Exposition in Africa* (Inaugural IEEE PES 2005 Conference and Exposition in Africa, University of KwaZulu-Natal, Durban, South Africa: IEEE, 2005), 188–94, https://doi.org/10.1109/PESAFR.2005.1611812.

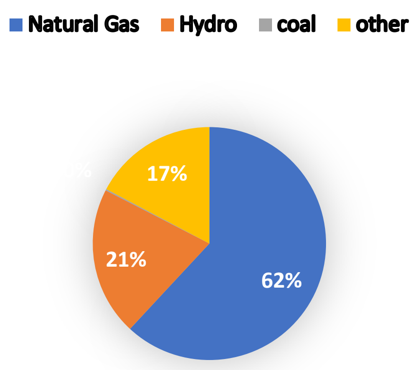
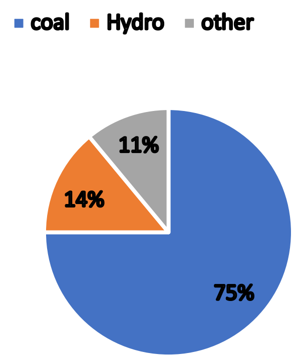
355 United Nations, 'Our Common Future' (United Nations, 1987).

356 Marilyn A. Brown and Benjamin K. Sovacool, 'Developing an "energy Sustainability Index" to Evaluate Energy Policy', *Interdisciplinary Science Reviews* 32, no. 4 (December 2007): 335–49, https://doi.org/10.1179/030801807X211793.

In this regard, sustainability encourages the utilisation of renewable energy resources because they have a relatively lesser environmental impact and are aligned with sustainability.[357] Elkind also added the idea of protecting energy sources from climate variations under the umbrella of the sustainability dimension of energy security.[358] Climate change is a crucial factor in the energy security dynamics of Eastern and Southern Africa because climate-vulnerable hydropower dominates electricity generation in the majority of EAPP and Northern SAPP regions.

Renewable energy capacity in Africa increased from 28 GW to 50 GW, hydropower being the largest contributor as its capacity increased from 26 GW to 35 GW between 2010 and 2018, although its share in the overall generation mix has remained at 15 per cent. The development of other renewable sources such as wind and solar is also encouraging. A similar trend is observable in the EAPP and SAPP regions. The following table compares the generation mix shifts in the EAPP and SAPP regions between 2015 and 2025.

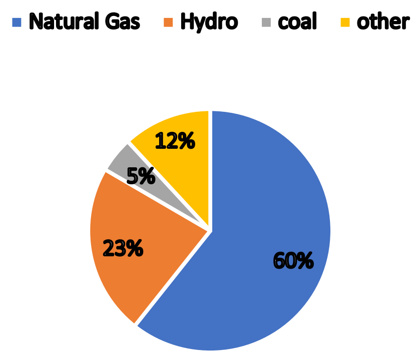
Table 3 Energy mix scenario for EAPP and SAPP regions

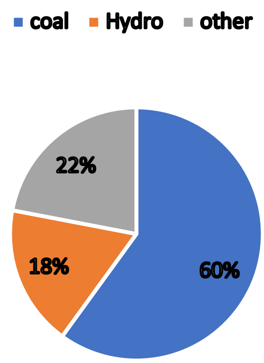
<table>
<tr><th></th><th>EAPP Region</th><th>SAPP Region</th></tr>
<tr><td>2015</td><td>
</td><td>
</td></tr>
</table>

[357] Gaylor Montmasson-Clair and Bhavna Deonarain, ‘Regional Integration in Southern Africa: A Platform for Electricity Sustainability’, n.d., 65.

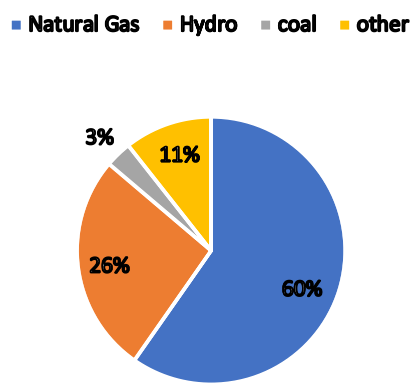
[358] Pascual and Elkind, *Energy Security*.

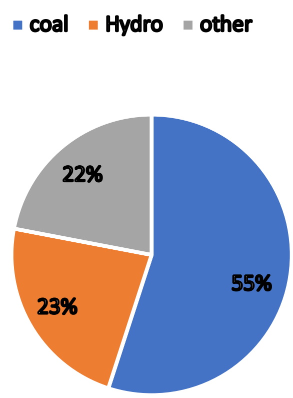
2020





2025





The table illustrates that the contribution of renewable energy resources will continue to increase.[359] Between 2015 and 2025, the percentage share of coal in the energy mix will reduce from 75 to 55 in the SAPP region but will increase from less than 1 per cent to 3 per cent in the EAPP region.[360] Nevertheless, national initiatives champion the renewable energy revolution in these regions. The development of wind power, particularly in South Africa, is a case in point. The Renewable Energy Independent Power Producer Procurement Programme (REIPPP) and the Loeiresfotein and Khobab wind power development projects made South Africa a success story in the promotion of renewable energy. Similarly, Ethiopia and Kenya are decentralising and privatising their energy sector to incentivize Independent Power Producers (IPPs) to boost the contribution of wind power in their national energy mix.

[359] Hafner et al., *Renewables for Energy Access and Sustainable Development in East Africa*.

[360] Bugaje, 'Renewable Energy for Sustainable Development in Africa'.

Therefore, the development of renewable energy resources is highly associated with the increase in the participation of the private sector whose potential both regional power pools have not yet tapped.[361]

However, guided by the1996 SADC Protocol on Energy[362] that encourages the utilization of renewable energy, SAPP has created an environmental sub-committee, among other committees, to ensure sustainability in regional energy generation and transmission project planning and implementation.[363] EAPP has yet to include sustainability in its overall operation. Therefore, regional power pools have a crucial role to play in mainstreaming the sustainability element into the energy markets.

3.5. Findings and Conclusion

At the outset, the chapter indicated that its primary objective is to analyse Eastern and Southern Africa Regional Power Pools' potential and efficacy in fostering energy cooperation and ensuring energy security in their respective sub-regions. However, since the concepts of energy security and regional power pools are not much explored in social science studies, in particular in international studies, a detailed account was needed before embarking on analysing their relationship in the context of ensuring sustainable development in Africa.

In so doing, the chapter discussed energy security in its relevance for sustainable development, explains the evolution and role of regional power pools in fostering energy cooperation and ensuring energy security in their respective sub-regions in Africa, and analyses their potential and contribution to energy security in Eastern and Southern Africa. The analysis contained in the chapter utilises the institutionalist theory of international relations and the four elements of energy security such as availability, reliability, affordability, and sustainability, as proposed in the first chapter. The following are the major conceptualisations and findings.

Concerning the evolution of energy security as a concept and practice, the study finds that the 20th century laid a foundation for the development of international and regional energy cooperation, energy trade, regional energy markets, and institutions managing the production,

[361] Tichakunda, Energy and Sustainable Development in Africa.

[362] Dudu Hadebe et al., 'Scaling Up Renewables Through Regional Planning and Coordination of Power Systems in Africa—Regional Power System Planning to Harness Renewable Resources and Diversify Generation Portfolios in Southern Africa', *Current Sustainable/Renewable Energy Reports* 5, no. 4 (December 2018): 224–29, https://doi.org/10.1007/s40518-018-0119-3.

[363] {Citation}

transmission, and energy consumption. Also, the successful conclusion of the series of United Nations conferences on environment and development in the 21st century underscores the mainstreaming of *sustainability* as an additional element of energy security. Therefore, energy security, though an evolving concept, takes shape during these periods.

The chapter demonstrates that energy security means different things to different actors, and context provides both the background and the explanation. Therefore, in exploring the African context, the study needed to show the difference between the competing definitions of energy security and explains the rationale behind the chosen framework. Accordingly, the chapter argues that the study employed the four elements of energy security: availability, reliability, affordability, and sustainability because of their affinity and comparability with the variables under interrogation in the overall study such as energy cooperation and sustainable development and Africa's energy security challenges.

The other concept that was discussed was regional power pools. The chapter presents a working definition of regional power pools as an institutionalised mechanism designed to promote energy cooperation and ensure energy security. Also, it offered a detailed account of the benefits associated with regional power pools. After the chapter established the concepts of energy security and regional power pools, it analysed the dynamics between energy security, energy cooperation, and regional power pools. Accordingly, the chapter finds out that energy cooperation is the most feasible approach to energy security, and regional power pools are the most desirable institutional setups to forge regional energy cooperation. Also, the study finds out that the establishment of regional power pools in part demonstrates that energy cooperation, interdependence, and regional approach to energy security is gaining the upper hand in energy security policymaking in Africa.

Then, the chapter comparatively analysed EAPP's and SAPP's potential and actual contribution to enhancing energy security in their respective sub-regions using the four elements of energy security. Considering the availability element, EAPP is best positioned to support the massive electrification programmes and ensure the growing demand is met with adequate supply. However, the study concludes that lack of available energy in the EAPP region hampers access to electricity, security of supply, and regional energy trade. In this regard, the EAPP has done little to overcome the energy deficit in its region and contribute towards increasing access to energy. On the other hand, SAPP has proved that regional power pools are best suited to address the availability element of energy security by implementing regional energy trade and integration in Southern Africa.

Considering the reliability element of energy security, analysis on both EAPP and SAPP demonstrated that maintaining a reliable electricity supply is problematic where there is inadequate infrastructure development. However, the reliability analysis in the EAPP region indicates that regional energy trade can enhance the reliability of the electricity supply. Still, EAPP did not capitalise on success stories of the existing reliable bilateral energy trade mechanisms to regional success. A similar analysis of the Southern Africa region illustrates that SAPP managed to capitalise on the current bilateral energy trade arrangements to develop Africa's first competitive regional market, thereby ensuring a more reliable supply of electricity for the region.

Considering the affordability factor, analysis on both EAPP and SAPP recognised the dire need of instituting cost- effective electricity tariffs to meet the growing regional energy demand because, without it, the massive investment requirement could not be met. Also, the underdevelopment of regional regulatory mechanisms in both regions and the politicisation of the tariff regime hampered both equity and affordability of energy. There is an encouraging institutional mechanism in EAPP to institute a regional regulatory board, but a similar attempt in Southern Africa is attributed to SADC, not SAPP. Nevertheless, both EAPP and SAPP have not done much to ensure energy affordability in their respective regions.

Considering the sustainability factor, analysis of both EAPP and SAPP recognised regional power pools could enhance sustainability by prioritising and incentivising the development of renewable energy sources. In the EAPP region, it is national initiatives that registered the encouraging development of renewable energy resources, not EAPP. However, SAPP has played a tremendous role in championing sustainability in energy resource development by instituting a dedicated environmental sub-committee in its structure mandated with ensuring the sustainability of the energy systems in the region.

The previous chapter concluded that energy is one of the key inputs to development and energy cooperation is the most plausible approach to ensure affordable, reliable, and sustainable energy. This chapter assesses the efficacy of regional power pools, regional and institutionalised forms of energy cooperation, in Eastern and Southern Africa. Accordingly, the chapter concludes that EAPP did not impact its region as expected from a regional power pool in availing reliable, affordable, and sustainable energy to the growing demand in its expanse. On the other hand, though SAPP has a long way to ensure affordability in its region, it avails reliable and sustainable energy to its constituency. As contained in the second research hypothesis, the weakness of EAPP leads to energy insecurity in Eastern Africa, and the strength of SAPP contributes to enhanced energy security in Southern Africa. Be this as it may, the analysis shows that the relative success stories with respect to enhancing access to energy in both regions can significantly associated with national efforts, not necessarily regional cooperation mechanisms.

The 2030 SDG implementation dashboard for Africa[364] and the First Continental Report on the implementation of Agenda 2063,[365] prepared respectively by the Sustainable Development Centre for Africa and the African Union support the conclusion made. These reports measure the achievements in implementing their objectives such as SDG's and AU Agenda 2063 goals by developing an index which they use to evaluate performance. In this regard, the 2030 SDG implementation dashboard for Africa showed that the overall performance of Southern Africa and Eastern Africa in the implementation of the SDG 7 on availing clean energy stood at 56 per cent and 50 per cent, respectively. Similarly, the Continental Report on the implementation of Agenda 2063 captured those Southern and Eastern African regions register low level of achievement, 25 per cent and 39 per cent respectively, against their target of increasing access to electricity, as the entire continent stood at 26 percent.[366]

The data indicates that the Eastern African region seems to have registered a higher rate of implementation on both counts; however, the progress does not emanate from energy cooperation at the regional level rather from individual achievements such as Uganda's 176 per cent and Ethiopia's 200 per cent of progress. Further, the same report showed that Goal 1 on delivering quality electric service and Goal 10 on building inter-continental integrative infrastructure of the AU Agenda 2063 are at the progress rate of 80 per cent and 29 percent thereby confirming the argument that the countries perform better when it comes to achieving individually as contained in Goal 1 but registered low level of implementation in Goal 10 that requires collective effort and cooperation, partly through the respective power pool.

The chapter assessed the contribution of EAPP and SAPP in ensuring energy security and it came across some similarities and differences in how these power pools impacted the state of energy security in their respective sub-regions. The next chapter looks further into the

[364] The Sustainable Development Goals Center for Africa and Sustainable Development Solutions Network, 'Africa SDG Index and Dashboards Report', 2020.
[365] AU and AUDA, 'First Continental Report on the Implementation of Agenda 2063' (Addis Ababa, February 2020), https://au.int/sites/default/files/documents/38060-doc-agenda_2063_implementation_report_en_web_version.pdf.
[366] AU and AUDA.

challenges and opportunities in the implementation of regional power pooling in Eastern and Southern Africa.

Chapter Four

Challenges and Opportunities in the Implementation of Eastern and Southern Africa Power Pools

4.0. Introduction

The chapter presents a comparative analysis of the challenges and opportunities in the implementation of the EAPP and the SAPP. It is composed of four parts – the first part focuses on the status of operationalisation of the EAPP and the SAPP. The discussion will be based on the existence of adequate generation and transmission capacity and the level of policy harmonisation. The second part discusses the opportunities of power pool led regional energy integration. Africa's regional approach to energy security, its fruits, and the role of regional economic communities will constitute the opportunities. The third part focuses on the challenges associated with operationalising power pools and identifies which challenges are peculiar to the respective power pools. The last part presents conclusions on the state of operationalisation, challenges, and opportunities of the EAPP and SAPP.

4.1. Implementing Regional Power Pooling Africa

Power pooling is an arrangement where outputs from several generation sites are "*pooled*" together, scheduled according to pre-determined criteria, and dispatched according to the "*merit order*" to meet the energy demand to its geographic extent.[367] The successful operationalisation of power pooling involves several tasks, from availing energy for trade, establishing and running the market to maintaining the system's smooth operation involving several generation, transmission, and distribution companies operating in different jurisdictions.[368] Therefore, aspirants of power pooling establish an institution called a power pool to facilitate the mentioned tasks.

[367] UNECA, 'Assessment of Power Pooling Arrangement in Africa' (UNECA, 2004).

[368] Amarquaye Armar et al., 'Building Regional Power Pools: A Toolkit' (World Bank, 2009).

Power pools, then, become regional institutions created to plan and harmonise generation and transmission capabilities needed for regional energy trade, forge electricity markets where participants trade, and monitor and rectify faults in the pool.[369] In short, power pools are regional planners, market operators, and system operatives. The planning task covers developing a regional masterplan on generation and transmission based on the plans of respective members and the electricity demand forecast of their respective region. The outcome of the planning task will be implemented by the power pools, regional economic communities, and member states so that there will be adequate generation and transmission capacity to trade electricity.

Successful power pooling also requires the harmonisation of laws and regulations. One of the technical manifestations of such a need is the presence of different grid codes. Countries have respective quality standards, called grid code, that are not always comparable, hampering power pooling. In this regard, power pools play a significant role in providing a platform where participating states discuss and develop a mutually agreed regional grid code expressed in regional masterplans. Successful operationalisation of power pooling requires adequate generation and transmission capacity, grid interconnection, a legal framework for electricity trade, and regulatory mechanism, which are the constitutive objectives of power pools.[370] Based on their particular roles in installing adequate generation and transmission capacities in their geographic vicinity and harmonising policy frameworks of their member countries, how do the regional power pools in Eastern and Southern Africa compare?

One of the prerequisites of regional energy trade, bilateral or competitive, is the availability of electricity as a commodity ready to be traded. As discussed in Chapter Three, there is a significant generation and transmission deficit. Power pools can play a crucial role in addressing these challenges by encouraging trade and investment. In Africa, where the energy systems and markets are fragmented, power pools play a pivotal role to form more significant markets capable of attracting investments.

Most states in Eastern and Southern Africa, with massive energy resources capable of delivering on regional benefits, plan their generation projects based on the demand projections

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369 Energy Regulators Regional Association, 'Market Operator (Regulatory Oversight)', December 2007.

370 Africa Union Commission, 'First Progress Report of the Chairperson of the Commission on Harmonisation of Regulatory Framework for the Electricity Market in Africa' (MEETING OF THE PERMANENT REPRESENTATIVES' COMMITTEE ADDIS ABABA, Addis Ababa, Ethiopia, 15 May 2018), http://www.peaceau.org/uploads/cp-report-to-prc-electricity-harmonised-regulatory-framework.pdf.

of their national economies[371] because of the transmission deficit. The projects are usually insignificant compared to the prevailing energy challenges. Even when the projects have massive generation capacities, they will not find adequate investment because they remain unfeasible without a regional market that operates on hard currency. Therefore, regional markets can unlock big generation projects that, in turn, feed the markets. The other important task in such an endeavour is harmonising the generation and transmission infrastructure development ambitions of participating members. Power pools, as regional institutions, harmonise infrastructure developments in respective regions by merging the respective masterplans of member states to develop a unified plan capable of reflecting regional priorities, usually referred to as regional masterplans. Power pools help national utilities transcend jurisdictions and be involved in regional planning and, in so doing, inculcate regional cooperation in planning.[372] The immediate output of developing a regional masterplan is a list of identified generation and transmission projects presented in their order of priority or relevance to regional energy integration. After developing regional masterplans, the next plausible steps become resource mobilisation and implementation of the prioritised projects. Especially in Africa, where finance and implementing capacity is lacking, power pools are expected to fill the gaps. The process is captured in the following chart.

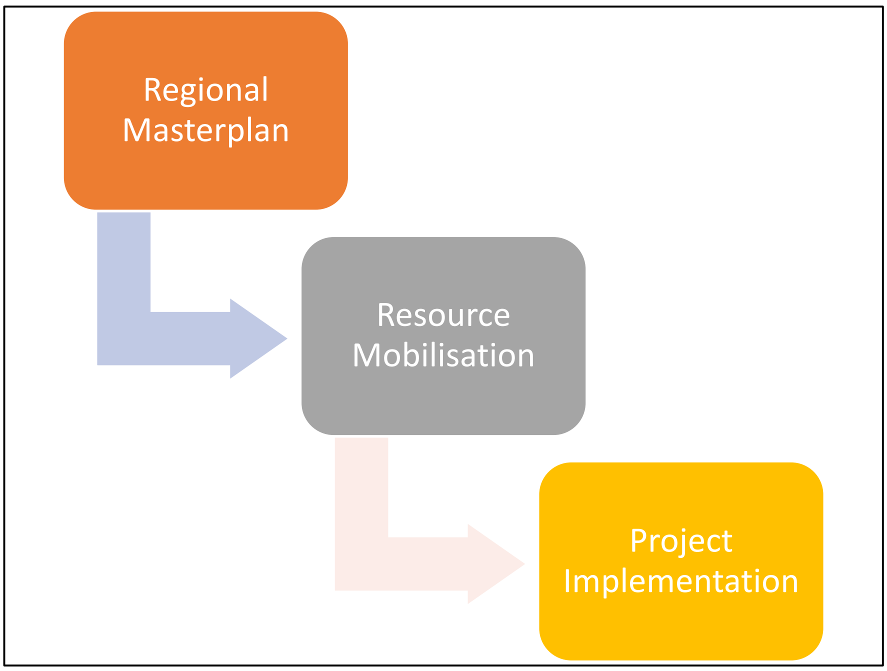

Chart 9Operationalisation of Power Pools

[371] Simbini Tichakunda, Energy and Sustainable Development in Africa, Microsoft Teams, 15 November 2020.

[372] Yohannes, Energy and Sustainable Development in Africa.

The chart shows that power pools are tasked with developing regional masterplans, soliciting resources, and assisting in implementing regional projects that avail adequate energy for their respective regions. The following part will use these criteria to assess the contribution of EAPP and SAPP to enhancing generation and transmission capacity in their respective regions.

One of the functions of power pools is to harmonise infrastructure development, including investment decisions to boost energy generation and transmission capacities. In so doing, regional power pools, as regional institutions, bring the respective masterplans of member states to develop a unified plan capable of reflecting regional priorities, which also require harmonisation of soft infrastructures. Regional power pools should serve as platforms whereby national laws, regulations, and grid codes are harmonised.[373] Since regional power pools are horizontally linked national grid systems, each national system represents national laws and regulations based on national realities to meet national ambitions. Therefore, if power pools are to discharge their constitutive role of coordinating the planning and operations of the pooled system, they must find a way of enabling their respective participants to reach a consensus plan, which is often called a regional master plan. A regional master plan, prepared by the power pool, with regional priorities endorsed by member states is a prerequisite for the enhancement of generation capacity available for trade in the region. The EAPP released its first master plan in 2011 to identify *"power generation and interconnection projects . . . in the short-to-long term.*" The study covered all EAPP member countries, with Libya and South Sudan joining the pool. The latter got independence the same year the master plan was released.

The first master plan prioritised six interconnectors connecting Egypt, Sudan, Ethiopia, Kenya, Uganda, and Tanzania. The master plan has helped to secure financing for Ethiopia-Kenya and Kenya-Tanzania transmission lines. The EAPP has conducted an update to its first master plan of 2014 to include Libya and South Sudan with the objective of "*analysing the benefits of regional cooperation and recommending a package of new regional transmission lines*." Accordingly, the new master plan identified the transmission line connecting Egypt, Sudan, and Ethiopia as a priority project.

[373] Rashid Ali Abdallah, 'Harmonised Regulatory Framework for Electricity Market in Africa' (1st Ordinary Session of the Africa Union's STC on Transport, Transcontinental and Interregional Infrastructure, Energy and Tourism, Lome, Togo, 21 March 2018).

The SAPP embarked on preparing a regional master plan in 2017. The power pool developed the regional master plan based on inputs from its members. The master plan identifies generation and transmission projects of regional importance. Accordingly, the pool master plan identified six-generation priorities in Zambia, Zimbabwe, Mozambique, DRC, and Tanzania. The pool master plan also identified an interconnection for Mozambique and three transmission projects connecting DRC with Angola, Zambia, and South Africa. Both the EAPP and the SAPP have championed regional masterplans, mainly informative of the regional priority energy development projects.

The masterplans are essential in mapping the infrastructure for generation and transmission of power in the region and recommend the capacity needed for the envisioned regional electricity market. For instance, the EAPP's master plan proposed that the region needs an additional 22,196 MW and the SAPP pool plan proposed adding 18,475 MW of transmission interconnection into their existing networks, respectively. The following charts summarise the interconnection status in the EAPP region.

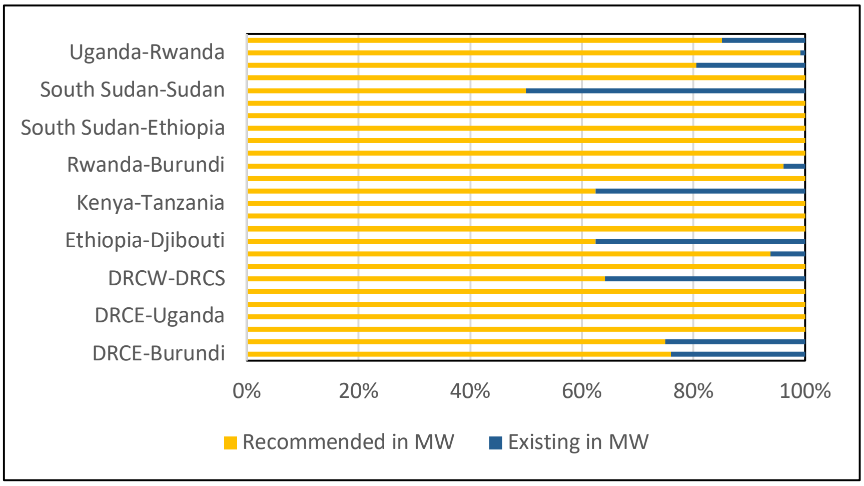

Chart 10Existing Interconnections V Recommended Interconnections in EAPP

As the above chart indicates in 'blue,' the status of implementation of the EAPP proposed interconnection remains very minimum. Also, the low level of implementation of the interconnection projects can further be elaborated as the status of operationalisation in the region remains at 8 per cent, and regions committed to construct 27 per cent and they are yet to embark on the construction of the remaining 65 per cent.

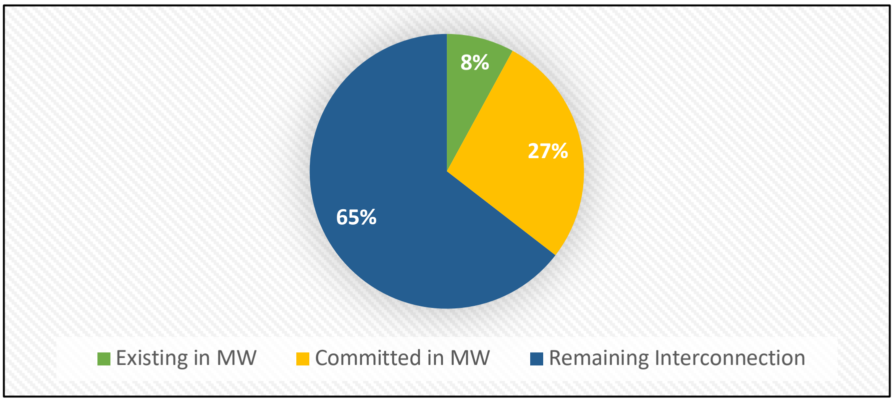

Chart 11EAPP Interconnection Status

The transmission challenge is significant in the EAPP. Fifteen years after its establishment, the EAPP's member states are not interconnected by transmission lines. In 2020, the EAPP region was made up of the five interconnections that will gradually be reduced to three in 2025, as shown in the following pictures.

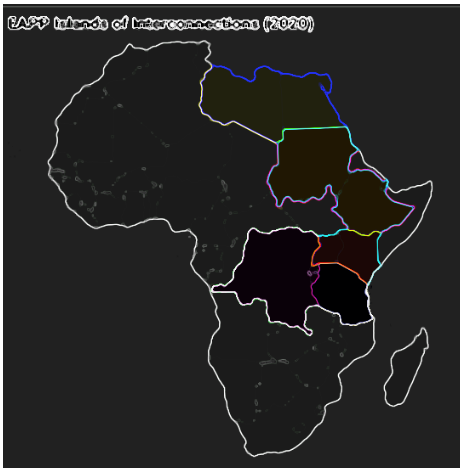

Figure 1 Interconnected Systems in EAPP (2020)

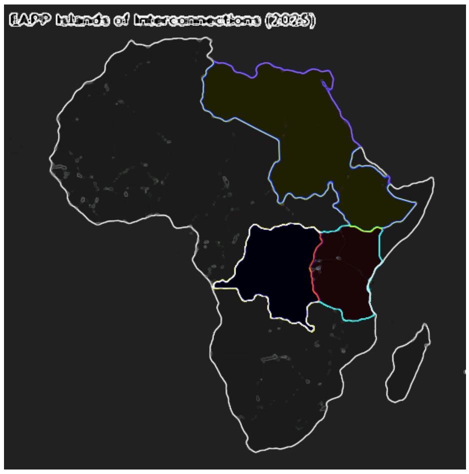

Figure 2 Interconnected Systems in EAPP (2025)

Figure 2 shows that Libya-Egypt, Sudan-Ethiopia-Sudan, Uganda-Kenya, Eastern DRC-Burundi-Rwanda, and the Tanzanian grid systems constituted the EAPP grid in 2020, and figure 2 shows the eventual power system integration resulting in the reduction of the three islands. The transmission constraints hamper the development of the electricity market in the EAPP region. The region only trades electricity on a long term and cooperative modality using the transmission lines built by the trading countries. The region continues to face electricity shortages. According to the regional master plan, enhanced regional trade will cover a sizable portion of the electricity deficit in the EAPP, as shown in the following chart.

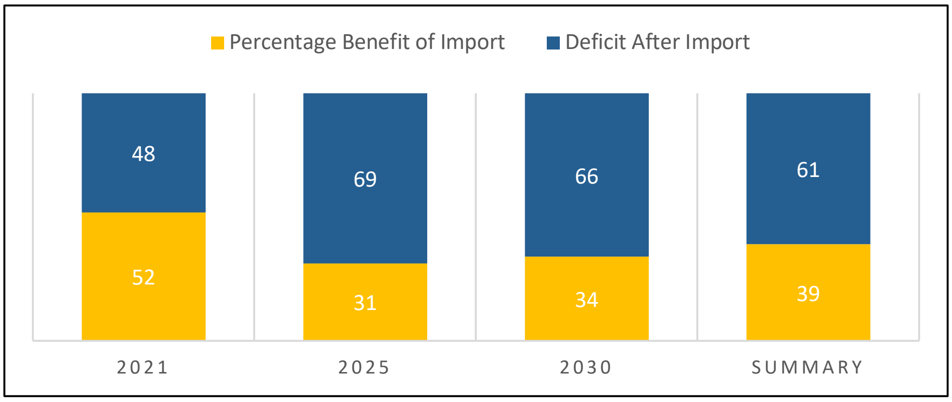

Chart 12 ***Benefits Electricity Trade in EAPP (%)***

On the other hand, the SAPP has a much-developed transmission network connecting all its members except Angola, Malawi, and Tanzania. The SAPP has inherited some regional interconnections from the colonial era and has benefited from the comparatively better political will from its participating states. Also, the Southern Africa region had started to cooperate on energy long before the establishment of the SAPP. Additionally, the energy crisis of the early 1990s had created adequate awareness on the need to embrace regional mechanisms and the centrality of an institution facilitating or moderating energy trade regionally – one of the constitutive objectives of the SAPP. Therefore, when the SAPP was established in 1995 – the Southern Africa region was adequately sensitised, connected, and ready to embrace energy cooperation.

In general, the presence of a master plan is expected to have a positive impact on the operationalisation of the respective power pools. In this regard, both the EAPP and the SAPP have adopted their respective master plans. However, when we consider the adequacy in generation and transmission capacities, the level of operationalisation of the EAPP is much lower than that of the SAPP. The study argues that the master plans need implementation, and the successful implementation requires institutional capability, adequate investment, and innovative financing.

Considering this, the creation of the Project Advisory Unit (PAU) has played a significant role in the SAPP's success. The PAU, established in 2015, is tasked with expediting technical studies, mobilising funds, and identification and following-up of regional priority projects, which has enhanced the implementation of generation and transmission projects.[374] The PAU significantly addresses challenges related to lack of coordination, bankability, and efficient preparation and implementation of infrastructural projects.[375] Similarly, the SAPP is establishing the Regional Transmission Infrastructure Financing Facility (RTIFF) to promote transmission investment in the SADC region to mobilise adequate resources for the numerous interconnection projects as identified by the PAU. In short, it can be argued that regardless of the rate of progress or the complexities arising from the process of implementing power pooling, institutions play a significant role.

Institutions facilitate the development and operationalisation of a rule-based international system whereby actors' behaviour is managed by a set of rules, norms, and regimes. Concerning global energy relations, international institutions such as the IEA, OPEC, and IEF govern and regulate international energy relations, or the oil market to be more specific. At the regional level, as the transaction becomes electricity, power pools become the institutions that govern the market, save for long-term bilateral electricity trade, which is managed by the participating states.

Establishing regional power pools requires defining a legal and regulatory mandate. The more participating states cede sovereignty to power pools, the more robust these institutions become to achieving their constitutive objectives.[376] States express their willingness to cede part of their sovereignty through the intergovernmental and the inter-utility memorandums of understanding (IGMOU and IUMOU). According to the World Bank's Toolkit[377] on establishing power pools, while the IGMOU "grants permission for the utilities to make a contract and to provide guarantees regarding obligations resulting from an interconnection contract," the IUMOU "defines ownership of assets and other rights, and key principles to be

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[374] World Bank, 'Southern African Power Pool Program for Accelerating Transformational Energy Projects Additional Financing', Project (Washington, D.C: The World Bank Group, 10 June 2019), http://documents1.worldbank.org/curated/zh/309691562607404024/pdf/Africa-Southern-African-Power-Pool-Program-for-Accelerating-Transformational-Energy-Projects-Additional-Financing.pdf.

[375] SAPP, 'SAPP Annual Report', 2019.

[376] Scott Cooper et al., 'Yielding Sovereignty to International Institutions: Bringing System Structure Back In', *International Studies Review* 10, no. 3 (2008): 501–24, https://www.jstor.org/stable/25481990.

[377] Armar et al., 'Building Regional Power Pools: A Toolkit'.

followed on technical planning, operations, and commercial aspects of regional power system integration." [378]

In this regard, the ministers responsible for energy and their relevant utilities in the EAPP and the SAPP member states negotiated and signed the IGMOU and IUMOU that established the respective power pools. Though the SAPP's constitutive agreements, IGMOU and IUMOU, were signed in 1995, both documents were revised in 2006 and 2007, respectively.[379] The review took cognisance of the restructuring in SADC, the introduction of Independent Power Producers (IPP), and energy sector liberalisation progress in its member countries. The EAPP member states signed IGMOU and IUMOU in 2005 and have not been revised. The EAPP and the SAPP were established before the publication of the World Bank's toolkit on establishing power pools, but the IGMOUs and IUMOUs have exhibited the recommendation set by the toolkit. The following tables present memberships of the EAPP and the SAPP.

Table 4 SAPP Membership

Member States	Utilities
Burundi	Régie de Production des Eaux et de d'Electricité (REGIDESO) Société Nationale d'Electricité (SNEL)
Djibouti	Electricité de Djibouti
DRC	Société Nationale d'Electricité (SNEL)
Egypt	Egyptian Electricity Holding Company (EEHC)
Ethiopia	Ethiopian Electric Power Corporation (EEPCO)
Kenya	Kenya Electricity Generation Company (KenGen)
	The Kenya Electricity Transmission Company (Ketraco)
	Kenya Power and Lighting Company (KPLC)
Libya	General Electricity Company of Libya (GECOL)
Rwanda	Electricity Water and Sanitation Agency (EWSA)

[378] Armar et al.

[379] UNECA, 'Assessment of Power Pooling Arrangement in Africa'.

Sudan	National Electricity Corporation (NEC)
Tanzania	Tanzania Electric Supply Company Ltd (TANESCO)
Uganda	Uganda Electricity Transmission Company Limited (UETCL)

Table 1 EAPP Membership

Table 1 presents the countries and utilities constituting the EAPP. All the utilities are nationally owned. Whereas all the other members are represented by one entity, three entities comprising one each for generation, transmission, and distribution represent Kenya because, as discussed in Chapter 3, Kenya has scored considerable progress in liberalising its energy sector. Though the other EAPP member states are also embarking on liberalising their respective energy sectors, they have not reached that level of maturation. The status of electricity trade is limited to the bilateral and long-term contracts as observed in the Egypt-Libya, Ethiopia-Sudan, Ethiopia-Djibouti, and Kenya-Uganda interconnections. The region is yet to embrace competitive electricity markets. The EAPP had five interconnected systems in 2020, and with the finalisation of the interconnection between Ethiopia and Kenya, it will reduce the islands of interconnections to three.

Member States	Utilities	Status
Angola	Rede Nacional de Transporte de Electricidade	Non-Operating
Botswana	Botswana Power Corporation	Operating
DRC	Societe Nationale d'Electricite	Operating
Lesotho	Lesotho Electricity Corporation	Operating
Malawi	Electricity Supply Corporation of Malawi	Non-Operating
Mozambique	Electricidade de Mozambique	Operating
	Mozambique Transmission Company	Observer
	Hidroelectrica de Cahora Bassa	Observer
Namibia	Nam Power	Operating
RSA	Eskom	Operating

Eswatini	Eswatini Electricity Company	Operating
Tanzania	Tanzania Electricity Supply Company Ltd	Non-Operating
Zambia	ZESCO Limited	Operating
	Copperbelt Energy Cooperation	Independent Transmission Company
	Lunsemfwa Hydro Power Company	Independent Power Producer
	Ndola Energy Corporation	Independent Power Producer
Zimbabwe	Zimbabwe Electricity Supply Authority	Operating

Table 2 shows that the SAPP has diversified membership and status. Unlike the EAPP, national utilities and private generation and transmission companies constitute the SAPP. Though bilateral contracts dominate the electricity trade, the SAPP introduced a competitive electricity market in 2001, with a market share reaching 32 per cent in 2019 from 6 per cent in 2015. The status of liberalisation is at the moderate stage whereby two member states are represented by generation, transmission, and distribution companies. The status of privatisation is also encouraging as the SAPP accommodates five generation and transmission utilities as operating and observing members. The SAPP is better connected than the EAPP, as the entire SADC region is under one grid, save for Angola, Malawi, and Tanzania. The SAPP is planning to integrate the power systems of these three countries between 2021 and 2024 with the completion of Zambia-Tanzania, Mozambique-Malawi, Angola-DRC, and Angola-Namibia interconnections. In addition, Ethiopia-Kenya-Tanzania, and Tanzania-Malawi-Mozambique interconnections, understudy, will eventually connect the EAPP with the SAPP.

After the signing of the IGMOUs and IUMOUs, the power pool's main task becomes crafting an organisational structure that fits the purpose of the power pools. This becomes the next task in operationalising the power pools. The organisational structure should reflect distinctive and mutual responsibilities required to operate the pool.[380] The power pools, progressing towards their full operationalisation, would gradually develop capabilities to harmonise operational

[380] Gebrehiwot Zelalem, Energy and Sustainable Development in Africa, Physical, 11 June 2020.

codes and develop a commercial framework for the envisioned power trade. As much as the commercial framework is an essential element in all stages of the electricity trade – from long-term bilateral contracts to multilateral cooperative to multilateral competitive – the framework should serve the purpose of the prevailing electricity trade.

Bilateral contracts usually follow mutual sharing of commercial information, and there would be no complexity because avoidance of costs and sharing of benefits are the guiding principles of the trade. Also, the bilateral contracts enjoy political will at the highest level, the probability of encountering complexities remains minimum. Most bilateral contracts in the EAPP and the SAPP region exhibit such patterns. However, the likelihood of complexities arises as the region embraces multilateral electricity trading patterns. Multilateral electricity trade patterns increase the transaction costs of reaching guiding principles for the trade because the electricity trade requirements involve more than two actors, and the process requires thorough verification. And when the multilateral electricity trade involves a mixture of national utilities and the private sector in a competitive electricity market, the level of complexity reaches its highest point.[381] Thus, the need to institute commercial codes arises more as regions move towards multilateral and competitive markets.

As much as commercial codes help to alleviate the complexities and related transactional costs in the development of regional electricity markets, power pools, as the preferred institutions in the governance of regional power trade, become instrumental in creating the commercial framework. In so doing, power pools emerge as institutions that reduce transactional costs and uncertainties and build mutual trust, especially when the region faces high transaction costs as they start to embrace regional energy trade. In this regard, both the EAPP and the SAPP have played an instrumental role in developing a regional market development roadmap and market design for multilateral electricity trades in their respective regions. However, since the SAPP has numerous multilateral cooperative and competitive markets, credit to the fair progress in liberalising and privatising its energy sector, it has additional instruments as its constitutive governance. The SAPP's Agreement Between Operating Members sets rules for operation and pricing and the Operating Guideline that sets standards for cross-border electricity trade. In this regard, the SAPP has proved its ability to adapt as the transaction costs evolve and as the region moves from bilateral and long-term energy trade contracts to regional and competitive markets.

[381] Chikova, Energy Cooperation and Sustainable Development in Africa.

4.2. Opportunities for Operationalizing Power Pools in Africa

Africa has numerous opportunities for energy security and operationalises its power pools scattered around the continent. Mainstreaming of a regional approach to energy security that gave birth to the five power pools, the Inter-Continental Transmission Master Plan, the African Single Electricity Market, and the presence of regional economic communities working closely with power pools have been identified as opportunities based on the data collected from the EAPP and the SAPP regions, senior energy experts working in intergovernmental institutions, and literature on the same topic. The following part discusses these opportunities in light of operationalising power pools in Africa.

4.2.1. Africa's Regional Approach: A Prospect for Energy Integration

Africa's energy security demands a regional approach to energy integration.[382] In Africa, the combination of small market size, low level of investment, poor management and maintenance of existing infrastructure, inadequate and inappropriate tariffs, and poor revenue collection contribute to Africa's energy sector's looming crisis. Africa pursues a regional approach to energy development and trade to tackle these challenges and ensure energy security.

Regional power integration is essential for the overall development of the energy sector in Africa for several reasons. First, regional energy trade provides clean and affordable energy to meet the demand and improve the continent's prospect for sustained growth and development.[383] Second, it increases bilateral and regional trading in energy resources, increases sustainable energy availability for the regional market, addresses the infrastructural gap, reduces production cost, and encourages the private sector.[384] Third, it reduces short term operational, minimises long term investment costs, improves reliability and security of supply, increases access to electricity, minimises environmental impacts, reduces fiscal burden on the government, and cultivates interdependence and integration among members contributing to the realisation of the AU Agenda 2063.[385] In short, regional energy integration, trade, or

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[382] Andrew Barnett, Mike Stockbridge, and William Kingsmill, 'Political Economy of Africa's Power Sector', *The Policy Practice*, May 2015, 11.

[383] Carlos Pascual and Jonathan Elkind, eds., *Energy Security: Economics, Politics, Strategies, and Implications* (Washington, D.C: Brookings Institution Press, 2010).

[384] Dambudzo Muzenda, 'Increasing Private Investment in African Energy Infrastructure', *Ministerial and Expert Roundtable of the NEPAD/OECD Africa Investment Initiative*, November 2009.

[385] Victoria R. Nalule, *Energy Poverty and Access Challenges in Sub-Saharan Africa: The Role of Regionalism* (Cham: Springer International Publishing, 2019), https://doi.org/10.1007/978-3-319-95402-8.

cooperation is Africa's plausible and preferred path to energy security and sustained economic and social development.

Regional energy trade in the context of regional integration, a critical objective of Agenda 2063, requires designing and implementing regional programs considering the relations between the countries involved and the region's political economy. Developing regional programs to foster regional energy integration requires an agreed division of labour between regional and national institutions and harmonised and sequenced regional and national objectives. The role of regional institutions in implementing regional projects and administering emerging relations is paramount. Regional institutions help tame national rivalries, distrust, disunity, political systems, and corruption and contribute to developing the political will.[386] In this aspect, political will plays a vital role in forging energy integration. Lack of it translates into delays and constraints that thwart all the promises of regional energy integration.[387] Achieving sustainable energy integration also requires coordination among entities in the energy value chain. Regional institutions are needed as market operators, system operators, and regional regulators to bridge the gap between national institutions involved in regional energy integration.[388] In most cases, regional energy integration follows several overlapping phases, including agreement among participating countries, allocating adequate financial resources, developing institutional infrastructure, developing physical infrastructure, and addressing regional power trade so that the integration process is complete.[389]

However, the benefits of regional energy integration can be reaped with appropriate and relevant governance structures in place. As argued above, effective energy integration governance in Africa requires a competent institutional system capable of governing markets and infrastructure.[390] The AU has significantly contributed to the overall energy governance and particularly to the governance of energy integration. It has mainstreamed the regional

386 M. P. Niyimbona, 'The Challenges of Operationalizing Power Pools in Africa', *UNDESA Seminar on Electricity Interconnection*, 19 June 2005.

387 UNECA, 'Assessment of Power Pooling Arrangement in Africa'.

388 Anton Eberhard et al., *Africa's Power Infrastructure: Investment, Integration, and Efficiency* (Washington, D.C: The World Bank, 2011).

389 Hugh Rudnick and Constantin Velasquez, *Taking Stock of Wholesale Power Markets In Developing Countries: A Literature Review* (World Bank, Washington, DC, 2018), https://doi.org/10.1596/1813-9450-8519.

390 UNECA, 'Opportunities to Harmonize Regulatory Systems for Infrastructure Development: The Case of Power Pools for Service Delivery and Structural Transformation in Africa'.

approach and created legal, policy, and institutional infrastructure that will likely govern regional energy integration in Africa. In line with the regional approach, the AU has embarked on initiatives such as the Integrated Continental Transmission Network, the Harmonised Regulatory Framework for the Electricity Market, and the African Single Electricity Market, discussed below, to govern infrastructure and market components of the energy sector in Africa.

4.2.2. The Integrated Continental Transmission Network and African Single Electricity Market

The Integrated Continental Transmission Network (ICTN), championed by AUDA-NEPAD, is a crucial project in realising regional energy integration in Africa. ICTN aims to integrate national utilities with their respective PPs and gradually interconnect all national utilities to the one African grid by integrating all PPs in Africa. The project will facilitate Africa's economic and physical integration, thereby implementing the energy dimension of the AU Agenda 2063. The successful realisation of ICTN has a domino effect on the successful realisation of continental energy trade, as captured in the AfSEM initiative. Regional energy infrastructure integration is a critical success factor for energy trade within the five sub-regions of Africa and the envisaged continental energy market. The benefits of the ICTN do not stop here; it will also enable the energy trade beyond the African land mass; and the transmission network will create an opportunity for Africa to trade its surplus energy to Europe and Asia (Middle East). ICTN considers the regional transmission master plan developed by respective power pools to assess Africa's power generation needs to ensure that the projected demand is adequately supplied.

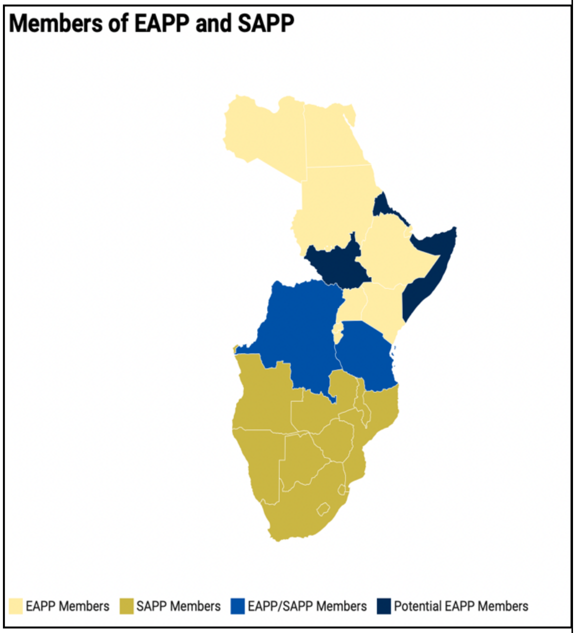
The other important milestone achieved is establishing a Harmonised Regulatory Framework for the Electricity Market to facilitate the development of regional and continental electricity market to energy security in Africa. The regulatory framework, like the ICTN, encourages private sector investment and facilitates resource mobilisation, thereby playing a vital role in establishing and operationalising regional and continental energy markets.[391] The launching of ICTN and the harmonised regulatory framework has paved the way for the AU's initiative to create the largest electricity market globally, the African Single Electricity Market (AfSEM). The ambitious initiative will integrate the energy systems of 55 AU member states into one grid system. The operationalisation of AfSEM in 2040 will contribute to the realisation of an "*integrated and prosperous*" Africa, as enshrined in the AU Agenda 2063. In this regard, the

[391] Africa Union Commission, 'First Progress Report of the Chairperson of the Commission on Harmonisation of Regulatory Framework for the Electricity Market in Africa'.

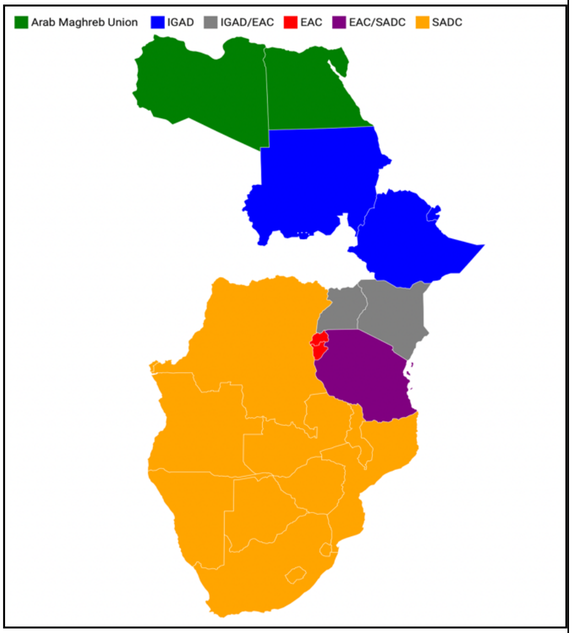
contribution of its Infrastructure and Energy Commission and its Development Agency is worth noting. AU's initiatives to establish frameworks that govern energy infrastructural and market integration are the prospects in ensuring energy security for the realisation of the energy dimension of its 2063 Agenda.

4.2.3. Regional Economic Communities and Power Pools

Implementation of the energy dimension of the African Union Agenda 2063 hinges on Africa's ability to install adequate generation, transmission, and market infrastructures at its disposal for it catalyses regional trade and integration. In the energy dimension, energy cooperation in the form of energy trade in cooperative and competitive markets plays a central role. In so doing, the respective parts of regional economic communities and regional power pools are indispensable. Ensuring energy security and driving the sustainable development agenda in the African continent requires the careful installation of regional energy trade along sub-regional lines through active participation of regional power pools. In this regard, the synchronisation between regional economic communities and power pools is indispensable. Two of the sub-regions that create a perfect alignment between their regional economic communities and their power pools are Western and Southern Africa. The Economic Community of Western African States (ECOWAS) and the Southern Africa Development Cooperation (SADC) have a direct working relationship with their respective power pools- Western Africa Power Pool and SAPP, respectively. The following map shows the relationship between the power pools, the EAPP and the SAPP, and the regional economic communities, Arab Maghreb Union, IGAD, EAC, and SADC.



Map 1Memberships of EAPP and SAPP



Map 2Power Pools and Regional Economic Communities

Map 1 shows the membership structure of the EAPP and the SAPP, Tanzania and DRC being members of the two power pools. The Second Map illustrates how members of the two power pools relate to the adjacent regional economic communities. The EAPP members are also members of the Arab Maghrib Union, IGAD, EAC, and SADC, whereas all the SAPP members are SADC members. In this part, we discuss opportunities for the operationalisation of power pools, and we will delve into analysing the SAPP-SADC relations. SADC created the SAPP as its specialised agency for energy under the SADC's Directorate of Infrastructure and Service. The membership, as well as the clear reporting lines (see the chart below) that link SADC and SAPP, has played an instrumental role in the operationalisation of power.[392] SADC provides political leadership and overall direction on regional energy projects which the SAPP implements.[393] SADC is responsible for the development of the regional development

[392] Chikova, Energy Cooperation and Sustainable Development in Africa; Tichakunda, Energy and Sustainable Development in Africa; Yohannes, Energy and Sustainable Development in Africa.

[393] Chikova, Energy Cooperation and Sustainable Development in Africa.

masterplan, regional infrastructural policy, and regional energy policy, and the SAPP implements the energy dimension of such conceptualisations.

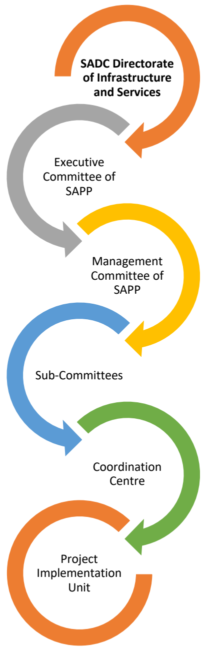


Chart 13Energy Governance in Southern Africa

In short, the genuine link between SADC and the SAPP has helped the latter to be in an advanced stage of operationalisation than the other power pools in Africa. As Chart 8 illustrates, there is clear communication from the smallest technical unit, the Project Advisory Unit in the SAPP, to the Directorate of Infrastructure and Services in SADC.

In general, Africa attempts to mainstream the regional approach to energy cooperation and security, the AU-championed Inter-Continental Transmission Master Plan and the African Single Electricity Market, and in the case of Southern Africa, the clear division of labour as well as a genuine link between the regional economic community and power pools are regarded as the opportunities in operationalising power pools in Africa.

4.3. Challenges of Operationalising Power Pools in Africa

4.3.1. Regional Energy Integration Governance in Africa

There are numerous energy-related institutions, both regional and sub-regional, governing energy relations in Africa. Unlike other parts of the world, Africa seems to have an integrated institutional governance framework at its disposal; however, governance and leadership are mentioned as primary challenges to regional energy integration.

One peculiar feature of energy governance in Africa is recognising and embracing regional energy integration as a critical driver for regional integration in the AU Agenda 2063. Regional energy integration offers affluent prospects. Beyond sharing resources, the considerable economies of scale boost capacities, including generating investment capital.[394] Other benefits include access to buffer stocks in times of energy crisis and managing price volatility in the long run. Thus, the AU and its member states pursue energy cooperation as a viable route to avail "*affordable, reliable, and sustainable energy"*[395] for implementing Agenda 2063 and beyond. Such endeavours require the pooling of sovereignty, competent regional institutions, a significant investment, and a high collective trust level.[396] In short, the attainment of the overall goal of political and economic integration, including energy integration, necessitates instituting relevant governance structures.[397]

The implementation of Agenda 2063 builds upon existing institutions, initiatives, infrastructure, and systems. Implementation of the energy dimension of the AU Agenda 2063 requires the active participation of regional institutions with the ultimate objective of promoting energy cooperation as a modus operandi. Thus, regional institutions such as the African Union Energy Commission (AFREC), the African Union Development Agency (AUDA), the Africa Union Commission on Infrastructure and Energy (AUCIE), regional economic communities, and regional power pools play a vital role in governing the implementation of the energy dimension of the AU Agenda 2063 and governing regional energy cooperation as one. Before delving into the specific functions of these institutions to analyse the African energy governance architecture, it is crucial to highlight the issues that need to be governed.

4.3.1.1. Components of Regional Energy Integration Governance in Africa

When we think of energy governance in Africa, we must place it in the context of the state of the energy sector in the continent and the challenges associated with it. In recent years, African energy demands have been steadily rising, and the average energy consumption per person has remained below the world average. The average electricity consumption in Africa reached 665

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[394] Muzenda, 'Increasing Private Investment in African Energy Infrastructure'.

[395] African Union and Commission, *Agenda 2063: The Africa We Want.*, 2015, 20; African Union, 'Agenda 2063: The First Ten Year Implementation Plan', 2013.

[396] Daniel Yergin, 'Ensuring Energy Security', 28 January 2009, https://www.foreignaffairs.com/articles/2006-03-01/ensuring-energy-security.

[397] Yohannes, Energy and Sustainable Development in Africa.

kWh in 2019, but the overall consumption is still negligible compared to the global and Asian standards of 3358 kWh and 2 300 kWh, respectively.[398] Africa's energy demands will exponentially increase to 1570 TWh in 2040 due to several factors, including population growth, high economic growth, and massive electrification programmes aiming at boosting energy access, contributing to the significant electricity demand increase registered since the beginning of the twenty-first century.[399] The low energy consumption levels in Africa result from the failure of the energy sector and underdeveloped regional markets.[400]

Regional energy trade remains low and is realised through bilateral contracts between national utilities. The state of the regional energy market is in its infancy, undeveloped, and lacks appropriate governance. Almost all energy trades in Africa are under bilateral schemes, and a limited number of countries take part. The situation is highly associated with inadequate generation capacity, insufficient transmission interconnections, and a lack of appropriate energy market governance in the continent. The generation and transmission constraints keep countries away from participating in the regional market and hinders active trading countries from utilising their market potentials. The generation and interconnection constraints are highly associated with a lack of adequate investment. For instance, interconnection infrastructure, the distribution sub-sector, is owned solely by respective states, which often lack the financial muscle to advance development. The incomplete liberalisation of the energy sector, thus, hampers energy security in Africa. Most African countries have opened their generation sub-sector for private investment but maintained their monopoly over the transmission sector, limiting the role of the private sector investment. The transmission interconnection remains undeveloped, restricting access to regional markets that further discourages private investment in generation. The situation creates a condition whereby states coordinate their resources to develop cross-border interconnections, but the energy sector prioritises enhancing domestic generation capacity over regional interconnections. Even when states manage to pull interconnection projects, such as Zimbabwe, Zambia, Botswana, and Namibia regional transmission line (ZiZaBoNa), they fail to mobilise adequate financial resources. In this regard, the contribution of international financiers and development partners become crucial. For example, the involvement of the African Development Bank in the Ethiopia – Kenya

[398] 'Africa Energy Outlook 2019'.

[399] McKinsey, outlook, and

[400] Morgan Bazilian et al., 'Energy Access Scenarios to 2030 for the Power Sector in Sub-Saharan Africa', *Utilities Policy* 20, no. 1 (March 2012): 1–16, https://doi.org/10.1016/j.jup.2011.11.002.

transmission interconnection. Similar financing arrangements are also observed in the Cameroun – Chad and Guinea - Mali interconnections in Western Africa. Regional projects tend to attract development partners and international financiers more than unilateral projects because they want to tap into the potential of regional energy integration.

The other daunting challenge of the energy sector in Africa is the tariff structure. Without setting an electricity tariff that reflects the cost of generation and supply of energy, the industry will fail to recover the investment, further discouraging new investments and pressuring the public sector. The electricity tariff in most of Africa is low due to the massive subsidy by respective governments. One of the widely mentioned challenges associated with tariff setting is its highly politicised nature that labels tariff increment as an ostracised political move. Low tariffs cost Africa \$3.62 billion a year,[401] equal to the capital investment needed to finance transmission in Southern Africa. As a result, the sector becomes unattractive to investment, and the process of regional energy integration becomes prevaricated. The challenges discussed above, markets and investment, are mainly associated with – the lack of a regulatory framework at national and regional levels – governance.

The state of energy security is problematic as more than 75 per cent of people living without electricity are Africans.[402] Effective regional energy markets and adequate investments, among other opportunities, can enhance energy security in Africa. Thus, regional energy governance becomes the critical success factor to energy security in Africa. The following diagram summarises the proposed logic of energy governance for energy security in Africa.

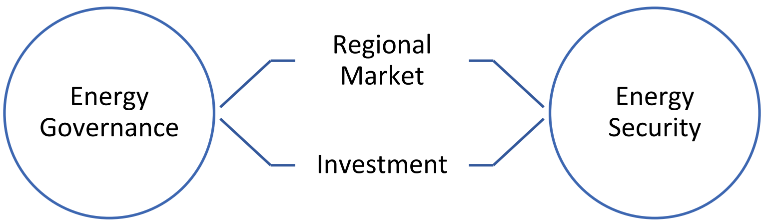

Chart 14 Components of Energy Governance for Energy Security in Africa

[401] Anton Eberhard et al., *Africa's Power Infrastructure: Investment, Integration, and Efficiency*.

[402] 'Africa Energy Outlook 2019'.

4.3.1.2. Regional Institutions and Regional Energy Governance in Africa

Cognizant of the linkages between energy supply and development and the state of energy security in Africa, the AU and its member states recognise and embrace regional energy integration to utilise energy resources to ensure "*modern, efficient, reliable, cost-effective, renewable and environmentally friendly energy*"[403] to fulfil the aspirations outlined in Agenda 2063. Aspiration 1, in its Goal 1 and Goal 7, presents the energy target of the AU Agenda 2063 as the pursuit of "*environmentally sustainable and climate-resilient economies and communities*." In its First Ten-Year Implementation Plan (F10YIP), between 2013 and 2023, the African Union planned to boost electricity supply by 50 per cent, enhance access to electricity by 50 per cent, and increase energy efficiency by 30 per cent.[404] The AU Agenda also emphasises the centrality of regional energy markets in powering Africa's transition to inclusive and sustainable economic transformation. Aspiration 2, through its Goal 10, aims at building "world-class infrastructure in Africa" with a priority to boost "communications and infrastructure connectivity," which are prerequisites of regional energy integration. Also, the F10YIP indicated that regional power pools would have been fully functional by 2020; the INGA Dam construction will be completed by 2025, and electricity production and transmission will increase by 50 per cent compared to the 2012 statistics.[405]

The paper, thus far, identified market and investment as two of the most pressing challenges of the energy sector in Africa; tracked energy objectives of the AU Agenda 2063; and underlined the importance of regional energy governance to address the challenges and achieve the aspirations. Now, we can interrogate the different institutions involved in governing energy relations to ensure energy security in Africa:

i. ***The African Union*** is an organisation created by African countries to coordinate the attainment of the political and economic integration of the continent. It has four institutions working on energy governance such as the Energy Sub-Committee under the Specialised Technical Committee on Transport, Infrastructure, Intercontinental and Integrational Infrastructure, Energy and Tourism; the AU Infrastructure and Energy Commission (AUIEC); the African Energy Commission (AFREC); and African Union Development Agency (AUDA).

a. **Energy Sub-Committee under the Specialised Technical Committee on Transport, Infrastructure, Intercontinental and Interregional Infrastructure, Energy, and Tourism**

403 African Union and Commission, *Agenda 2063*.

404 African Union, 'Agenda 2063: The First Ten Year Implementation Plan'.

405 'Africa Power Vision | AUDA-NEPAD', accessed 2 July 2020, https://www.nepad.org/programme/africa-power-vision.

(STCTIIET or for convenience STC-E) interprets AU policies; develops regulations; and endures the implementation of Assembly decisions on Energy.

b. ***The African Union Infrastructure and Energy Commission (AUIEC)*** oversees the energy dimension of implementing the AU Agenda 2063. Its primary task includes building soft infrastructure or enabling a political and legal environment for the sustainable development of the energy sector in Africa.

c. ***AFREC*** is the specialised African Union agency on energy tasked to coordinate Africa's energy resource development, harmonise energy-related policies and regulations, facilitate energy trade across the continent, provide policy guidance to achieve energy transition, and produce and disseminate energy-related data.

d. ***AUDA*** coordinates the implementation of priority infrastructural projects in line with the AU Agenda 2063. Concerning energy development, its primary mandate includes building generation facilities and transmission infrastructures in line with the attainment of an integrated continent by 2063.

ii. ***Regional Economic Communities (RECs)*** coordinate the AU Agenda 2063 in their respective sub-regions, including its energy dimension.

a. ***Common Market for Eastern and Southern Africa (COMESA)*** has an energy programme that aims at enhancing regional cooperation in energy development and energy trade. The stated mandates include policy and regulatory harmonisation, promotion of regional energy trade, and development of regional energy infrastructure in Eastern and Southern Africa.

b. ***Eastern Africa Community (EAC)*** provides policy alternatives on energy conservation and energy efficiency, facilitates energy trade, attracts investments, and enhances regional connectivity between its members.

c. ***Southern Africa Development Cooperation (SADC)*** has an active portfolio on energy guided by the Regional Infrastructure Development Master Plan, Energy Sector Plan, Protocol on Energy, and Regional Indicative Strategic Development Plan. Its mandates include facilitation of regional cooperation on energy, harmonisation of tariff-related policies throughout the region, and creation of an enabling environment for the provision of the security, reliability, and sustainability of the energy supply in its territory. It also creates the Southern Africa Power Pool and the Association of Energy Regulators in the region.

d. ***Intergovernmental Authority on Development (IGAD)*** is one of the most ambitious RECs in Africa. Though its constitutive mandate does not explicitly mention energy, it has launched several energy-related initiatives, often unimplemented. It also aims at "*strengthening a* *regional energy network and eventually facilitating power-sharing between the Horn countries*."[406] Most of these projects are donor-driven.

e. ***Economic Community of Western African States (ECOWAS)***[407], alongside SADC, is one of the RECs that has performed well on energy-related activities. Its mandates include designing and implementing energy-related projects, coordinating and harmonising policies and regulations affecting the energy sector, and engaging directly in projects that aim at supplying electricity, rehabilitating systems, maintenance of power generation plants, and other activities such as procurement of distribution-related materials for utilities of its member states. It established the Western Africa Power Pool as its specialised institution to facilitate regional energy integration and the regional energy market.

iii. **Regional power pools**: Africa has five regional power pools established in Northern, Western, Central, Eastern, and Southern sub-regions. They are mandated to integrate the grid system of participating countries to forging regional energy markets to ensure energy security by addressing sectoral challenges through economies of scale and risk-sharing.

iv. **Financial Institutions**:

a. ***The African Development Bank's (AfDB)*** engagement in the African energy sector is guided by its energy sector policy published in 2012. The Bank's policy outlined that AfDB's engagement in Africa aims to achieve energy security, energy access, sustainability, enhancing energy investment, and "*enhancing governance at the national level.*" Its development intervention is centred around critical drivers of change in the African energy sector, such as transmission, regional cooperation, and energy efficiency. The AfDB's focus on regional energy integration is evident in the Bank's portfolio investment that a quarter of its 415 projects since 1967 are on regional transmission interconnection.

b. ***The Trade and Development Bank (TDB),*** often referred to as a COMESA bank due to its dedicated service to Eastern and Southern Africa countries, is another notable financial institution working in Africa's energy sector, focusing on the private sector. It has pursued successful innovative mechanisms that enable the private sector to access debt financing, including the recently launched Small and Medium Enterprises Off-Grid Facility.

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406 AfDB, 'Multinational - Intergovernmental Agency on Development (IGAD) Regional Infrastructure Master Plan (IRIMP) Project' (AfDB, June 2016), https://projectsportal.afdb.org/dataportal/VProject/show/P-Z1-KE0-016.

407 'Energy | Economic Community of West African States(ECOWAS)', accessed 3 June 2021, https://www.ecowas.int/ecowas-sectors/energy/.

The earlier part establishes that the African Union, regional economic communities, regional power pools, and financial institutions contribute to the governance of regional energy integration, energy markets and investment in Africa. However, the prevailing governance system, informed by the mandates of these institutions as elaborated above, is rudimentary, fragmented, and ineffective. The governance structure in place has internal contradictions due to overlapping mandates, ambiguity due to unstructured relations between the institutions, and no champion for it lacks a custodian for energy integration in Africa.

4.3.1.3. Fragmented Energy Governance at the African Union Level

The African Union governance for energy integration has two components. The first being the political decision-making structure at the African Union level and the second one being the implementation mechanism at the African Union Commission level. As discussed above, the AU and STC-E represent the political decision-making structure while AUIEC, AFREC, and AUDA constitute the technical implementation mechanism. There exists a logical linkage between the two systems of governance; the African Union Commission serving as the secretariat for the AU creates clarity of the existing bridge between the political governance and implementation of the decision taken at the higher level. The following diagram shows the interrelation between these institutions.

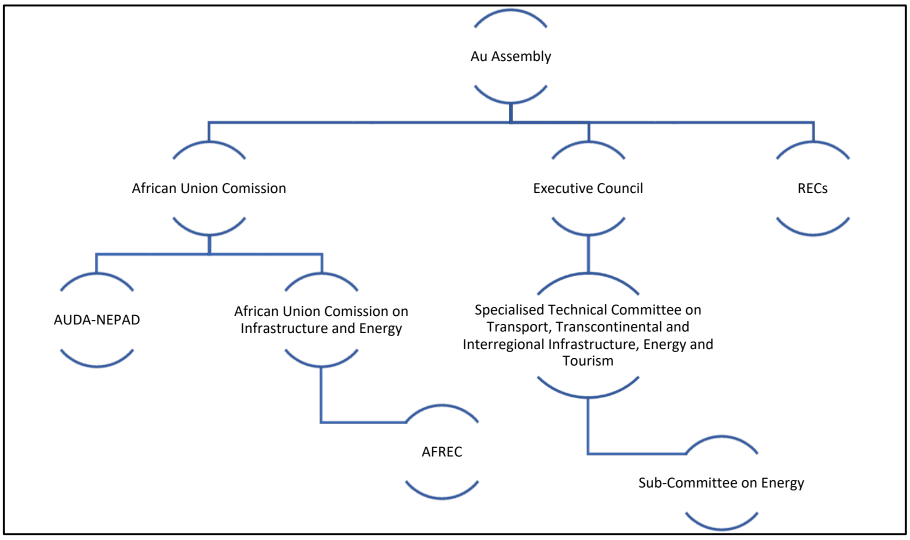

Chart 15Energy Governance at the AU Level

The political governance structure at the AU is composed of member states, whereas the technical implementation unit is constituted by commissioners and staff of the AUC. According to the Constitutive Act of the AU, the AU Assembly, composed of the 55 African member states represented by heads of government and state, is the highest decision-making organ in Africa; the Executive Council (EC), composed of foreign ministers of the AU member states drafts decisions for the AU Assembly based on inputs from the STC, and coordinates the cooperation between RECs, AfDB, and UNECA; the STC, composed of the responsible line ministries of AU member states prepares and coordinates AU projects for EC's approval and follow-up the implementation of AU decisions.[408] Energy does not have a dedicated STC, and it is placed under the STC with other thematic areas such as Transport, Infrastructure, Intercontinental and Integrational Infrastructure, and Tourism. Thus, energy governance at the ministerial level falls under the Sub-Committee on Energy led by the Second Vice Chairperson of the STC-TIIET. The overall governance structure is clear and structured. Nevertheless, the place of energy in the comprehensive governance system does not show the centrality of energy for Africa's renaissance. It fails to transport the recognition and urgency provided by the AU Agenda 2063 into governance.

As section 4.1. argues, if Africa's energy integration governance contributes to energy security in the continent, it must successfully govern energy markets, and infrastructure investment and the governance must not be in silos or fragmented. Nevertheless, considering the respective mandates of AUCIE, AUDA – NEPAD, and AFREC, one can observe overlapping mandates and disjointed governance. The AUC and its specialised agencies lend technical governance or implement the decisions taken at the AU level under the supervision of the STCs. Organs of the AUC, such as AUCIE, AUDA – NEPAD, and AFREC, implement the energy dimension of the implementation of the AU Agenda 2063. The division of labour among these institutions lacks clarity, and the overall governance is disjointed, thus weakening energy governance in Africa.

[408] African Union, 'Constitutive Act of the African Union' (2000), https://au.int/sites/default/files/pages/34873-file-constitutiveact_en.pdf.

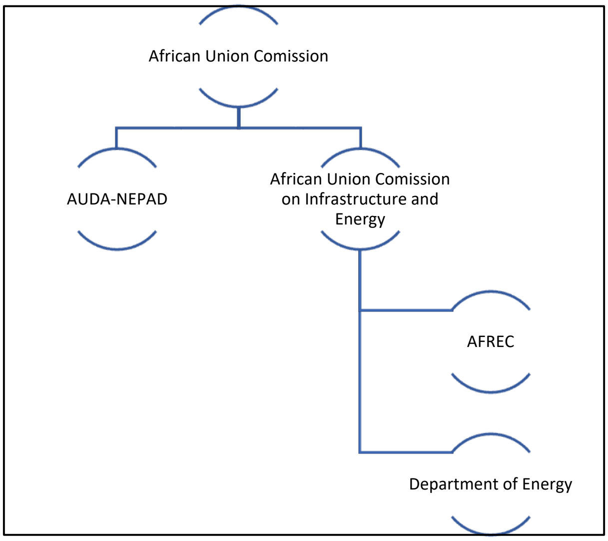

Chart 16Major Institutions Governing Energy Relations

AUCIE and AFREC have been mandated to establish rules, regulations, and mechanisms for energy trade in Africa. AUDA-NEPAD has been directed to implement priority infrastructural projects, including energy infrastructure, in line with the AU Agenda 2063. However, AUCIE is one of the nine commissions of the AUC mandated to oversee infrastructure and energy resources in the continent. The combination of 'infrastructure' and 'energy' in the Commission's establishment shows that the African Union intends to address energy issues through infrastructure development.[409] However, apart from the oversight role of the Department of Energy under the AUCIE over Programme for Infrastructural Development in Africa, there exists no clear reporting mechanism between AUCIE and AUDA-NEPAD for the latter report to the AU directly. In addition, AFREC is also mandated to "identify, develop, and launch energy projects that promote African integration, including through mobilising financial resources" in line with its primary task of coordinating energy resource development in Africa. Therefore, this paper argues that the energy infrastructure governance in Africa is fragmented along with the different institutions under the AUC. Thus, as much as Africa identified infrastructure investment or infrastructure deficit as one of the primary challenges to energy security in the continent,[410] it has a fragmented and disjointed governance structure that is not fit for the purpose.

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[409] Mebrhatu, Energy and Sustainable Development in Africa.

[410] 'Economic Report on Africa 2011: Governing Development in Africa: The Role of the State in Economic Transformation', March 2011, https://repository.uneca.org/handle/10855/1154.

Governments will support regional integration projects considering the contribution of energy trade to energy security. As argued above, Africa's lack of appropriate energy market governance undermines the potential benefit of regional energy trade. Governing energy markets, the second pillar of energy governance in Africa, has increasingly become problematic because of the multiplicity of institutions and the resulting fragmentation. From the above list of relevant institutions, AFREC, AUCIE, RECs, PPs, and financial institutions play a critical role in developing energy trade in Africa. However, the plethora of institutions could not render functioning energy markets in the continent – lack of coordination among the institutions, absence of an energy market governance champion, and the prevalence of sovereignty over cooperation in major decisions regarding energy markets characterise the existing inchoate energy market governance in Africa. AUC's commissions on Trade and Industry (AUTIC) and Infrastructure and Energy are the primary drivers of energy market governance in Africa. Energy trade facilitation is also one of the functions of AFREC. Respective RECs and Power Pools are also major players in the regional energy trade in Africa. The division of labour between AUTIC and AUCIT seems to have worked well considering the success stories regarding launching the Africa Continental Free Trade Area (AfCFTA) and Africa Single Electricity Market (AfSEM).

AfCFTA created a single African market, and the electricity trade is part of the trade-in services.[411] Though regional mechanisms such as RECs and PPs have been governing electricity trade, the AfCFTA will revolutionise governance of electricity trade in Africa by "*expanding these efforts [continentally] and pursuing energy development to relieve the infrastructure restraint*."[412] The AUCIE, capitalising on AfCFTA, has brought a revolution to the energy sector when it forges AfSEM as "*an energy governance system.*"[413] According to the Commissioner of Infrastructure and Energy of the African Union, AUC held extensive consultations with AU member states and regional energy market

[411] International Trade Centre, 'A Business Guide to African Continental Free Trade Area Agreement' (Geneva: International Trade Centre, 2018), https://www.intracen.org/uploadedFiles/intracenorg/Content/Publications/AfCFTA%20Business%20Guide_final_Low-res.pdf.

[412] 'Impact Of AfCFTA On Africa's Energy Sector', *CIO East Africa* (blog), accessed 2 June 2021, https://www.cio.co.ke/impact-of-afcfta-on-africas-energy-sector/.

[413] 'Press Release', Virtual PIDA Information Centre, accessed 2 June 2021, https://www.au-pida.org/news-category/press-release/.

governance structures such as RECS and PPs in establishing AfSEM.[414] The new energy governance system will attract more investment and unravel Africa's energy potentials. In so doing, the AU followed a market-based approach to govern energy integration in the continent. Looking at the proposed governance structure, fundamental governance components such as infrastructure and regulation will come under the AfSEM (see the diagram below).

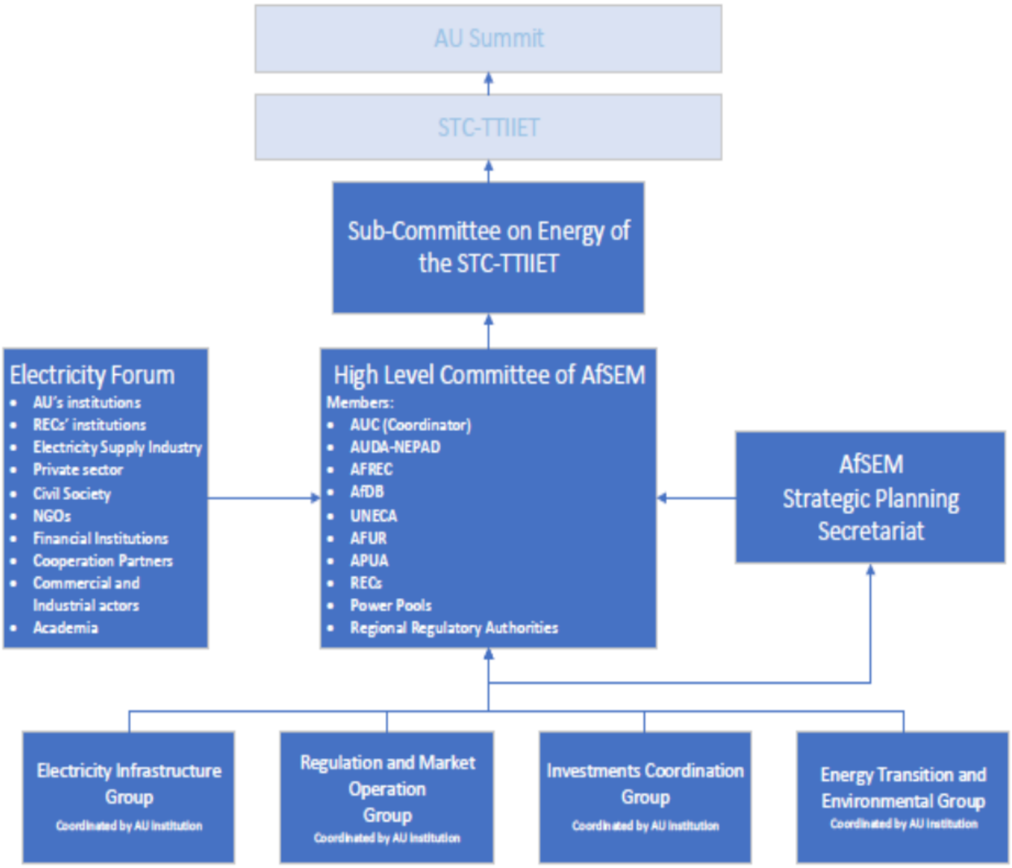


Chart 17Proposed Organisational Structure for AfSEM

The proposed governance structure of AfSEM, the entity that AU hailed as "Africa's energy governance system," appears problematic for several reasons. First, as indicated earlier, AfSEM should have been equipped to gradually integrate the existing fragmented and small regional or bilateral energy markets into a single energy market, in line with its nomenclature. However, elevating it to the status of the overall energy governance body for the continent will weaken the other most crucial component of

[414] African Union, 'African Union to Launch the African Single Electricity Market (AfSEM)', African Union, 1 December 2020, https://au.int/en/pressreleases/20201201/african-union-launch-african-single-electricity-market-afsem.

energy governance in Africa, infrastructure/investment. As much as the market plays a vital role in addressing infrastructural development, they cannot singlehandedly govern energy infrastructure development. The latter needs the involvement of public, private, and public-private-partnership financing modalities. Second, the proposed Working Group on Regulation and Market Operation is self-contradictory. Market operators are responsible for governing the electricity market using rules established by regulators, a crucial task in an energy market but subject to supervision by the regulators.[415] Also, regulatory mechanisms are expected to be independent, even from market operators, and transparent so that they deliver on their mandate of protecting electricity end-users and investors from abuse and ensuring the electricity trade follows the established rules.[416] Thirdly, the structure overlooks the critical roles of RECs and PPs in developing the energy sector, the evolution of regional energy integration, and the development of regional electricity marketing mechanisms.

The role of RECs in the realisation of the pattern of regional electric integration is paramount. For instance, the IGAD region is also implementing the IGAD Regional Infrastructure Masterplan (IRIMP) covering several sectors, including energy and transboundary water resources, in a framework like PIDA. Ongoing projects such as the construction of the Grand Ethiopian Renaissance Dam (6,000MW), Kenya – Ethiopia Transmission Line Project, the Ethiopia - Djibouti Power Interconnection Project, and the Ethiopia-Sudan Power Systems Interconnection Projects are part of the energy dimension of the master plan. Similarly, the EAC is also implementing several PIDA projects, including the North-South Power Transmission Corridor,[417] the Uganda-Kenya Petroleum Product Pipeline,[418] and Ruzizi III.[419]

Lastly, the proposed Electricity Forum and High-Level Oversight Committee structures are cumbersome given the participation of all available institutions and the lack of clear roles for each of them. Therefore, as much as creating a single electricity market in Africa is a milestone in regional energy integration endeavour as it governs electricity markets, elevating it to the position that it is mandated to govern the complete energy integration and energy relations in Africa is ill-advised.

[415] Energy Regulators Regional Association, 'Market Operator (Regulatory Oversight)'.

[416] UNECA, 'Opportunities to Harmonize Regulatory Systems for Infrastructure Development: The Case of Power Pools for Service Delivery and Structural Transformation in Africa'.

[417] 'North–South Power Transmission Corridor | AUDA-NEPAD', accessed 26 June 2020, https://nepad.org/project/north-south-power-transmission-corridor.

[418] EAC, 'Projects and Programmes', accessed 26 December 2020, https://www.eac.int/energy/fossil-fuels/projects-and-programmes.

[419] 'East African Community (EAC) | AUDA-NEPAD', accessed 26 December 2020, https://www.nepad.org/taxonomy/term/111.

4.3.2. Other Challenges

The following section presents challenges related to the regulatory mechanism and the synchronisation between regional economic communities and power pools.

4.3.2.1. Absence of a Regional Regulator

Chapter 3 discussed the rationale behind establishing regional regulatory institutions as frameworks whereby different legal and regulatory systems of the participating states can be harmonised, and any tariff-related barriers can be removed. Also, the prevailing unreflective tariffs that impacted electricity affordability, access, and equity negatively is the outcome of lack of a regulatory framework at national and regional levels. In this regard, regional regulatory mechanisms are paramount, but instituting them has been a daunting challenge for both the EAPP and the SAPP regions. The challenge has two faces: first, different states have different scopes for their regulatory agencies, and second, there are a plethora of regional regulatory institutions in the EAPP and the SAPP regions.

As table 3 illustrates, North-Eastern and South African countries have different sets of regulatory agencies; nine countries focus on energy regulation while seven countries emphasize on electricity regulations; three countries have mandated their regulatory institutions to oversee energy and water; three others do not even institute one. Therefore, the discrepancy and mismatch on the mandate of the regulatory institutions make it difficult, if not impossible, for the development of the regional regulatory mechanism.

Table 5 Regulatory Institution in SAPP and EAPP Regions

Scope of Regulatory Body			
None	Energy	Energy and Water	Electricity
Libya Djibouti DRC	Botswana Eswatini Ethiopia Kenya Malawi South Africa Uganda	Tanzania Lesotho Burundi	Angola Mozambique Namibia Rwanda Sudan Egypt Uganda

	Zambia Zimbabwe		

On the other hand, there are attempts to forge regional mechanisms in the EAPP, the SAPP, EAC, and COMESA platforms. However, the resulting frameworks do not have the mandate or capacity to function as a regional regulator capable of regulating regional electricity or energy trades, whether the trade mechanism is bilateral or regional. They are mere information and experience sharing platforms. The EAPP has established a forum consisting of nominees of respective regulatory institutions of its members to facilitate the creation of an Independent Regulatory Board in 2012.[420] SADC, not the SAPP, established Regional Energy Regulatory Association,[421] not a regional regulatory organ, in 2002. The underdevelopment of regional regulatory mechanisms with the ultimate task of harmonizing regulatory frameworks in both power pools is due to the politicized nature of tariff setting and regulation.[422] Table 4 elucidates the four regional regulatory associations in North-Eastern and Southern Africa.

420 'Independent Regulatory Board', *Eastern Africa Power Pool* (blog), accessed 16 May 2021, http://eappool.org/independent-regulatory-board/.

421 Southern African Development Community and Southern African Research and Documentation Centre, *SADC Regional Infrastructure Development*.

422 Musaba, 'The Development of the SAPP Competitive Electricity Market'.

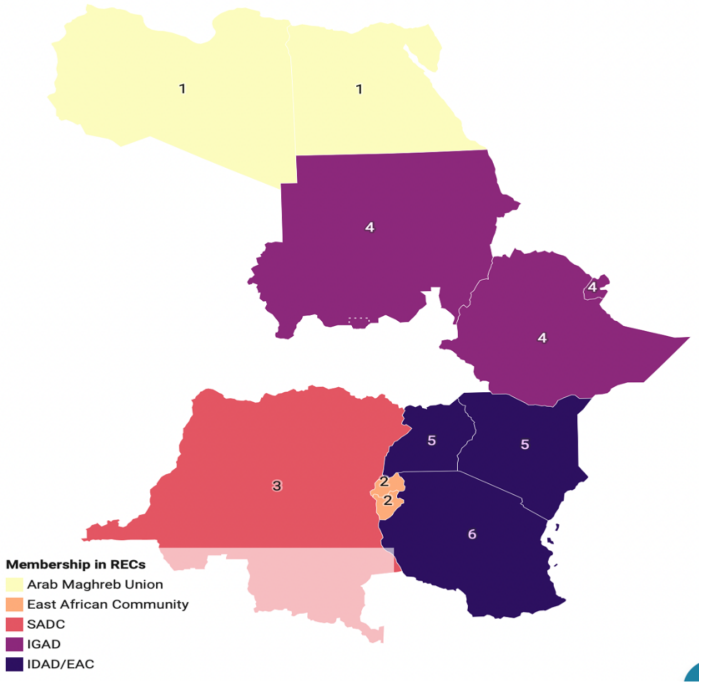
Table 6 Regional Regulatory Associations in EAPP and SAPP Regions

EAPP's IRB	EREA	RAERESA	RERA
Egypt	Tanzania	Egypt	Angola
Ethiopia	Uganda	Ethiopia	Eswatini
Kenya	Burundi	Kenya	Lesotho
Tanzania	Kenya	Malawi	Malawi
Rwanda	Rwanda	Rwanda	Mozambique
Sudan		Sudan	Namibia
Uganda		Uganda	South Africa
Burundi		Zimbabwe	Tanzania
		Seychelles	Zambia
		Madagaskar	Zimbabwe

Therefore, there exists a dire need of instituting a regional regulatory framework that can regulate the electricity markets so as to infuse cost-reflective electricity tariffs in those markets to meet the growing regional energy demand because, without it, the massive investment gap could not be bridged.

4.3.2.2. Regional Economic Communities and the EAPP

The discussion above brought the alignment in membership between the SAPP and SADC as an opportunity in the operationalisation of the former. The alignment created a genuine reporting link and a clear division of labour that enabled a synchronised implementation of the energy agenda of the Southern Africa region. However, the same cannot be extrapolated for the EAPP region, whose membership is scattered over the Arab Maghreb Union, IGAD, EAC, and SADC.



Map 3EAPP and RECs

Map 3 illustrates that among the members of the EAPP, Libya and Egypt are members of the Arab Maghreb Union; Sudan, Djibouti, and Ethiopia are members of IGAD; Kenya and Uganda are members of both EAC and IGAD; Burundi and Rwanda are members of the EAC; DRC a member of SADC, and Tanzania a member of EAC and SADC. The fragmentation has precluded the benefits of having a political umbrella institution capable of solving any policy level challenges and has contributed to the low level of operationalization of the EAPP. Though COMESA has been identified as its "political cover," the highest decision-making authority in the EAPP lies within the Council of Ministers.

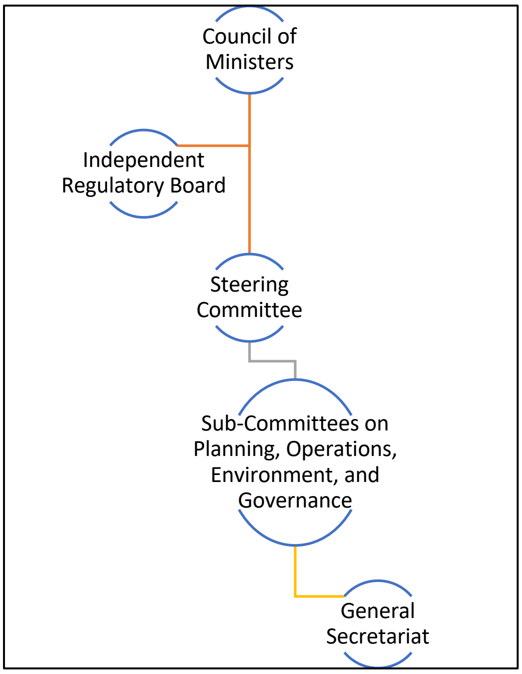


Chart 18EAPP's Organisational Structure

Chart 13 demonstrates that the highest decision-making entity for the EAPP is the Council of Energy Ministers (COM) that established the power pool by signing the IGMOU. Even though COMESA is regarded as the "political cover" of the EAPP, the organogram ends with the COM, and it does not show COMESA as the policy level decision-making institution. In short, there is no regional economic community that works together with the EAPP. The presence of at least three regional economic communities, such as EAC, AMU, and IGAD, creates a lacuna in policy-level decision-making, thereby upsetting the operationalization of the EAPP. Therefore, the absence of a regional economic community capable of providing a policy direction in the EAPP is a challenge contributing to the limited level of operationalization.

4.4. Findings and Conclusion

At the outset, the chapter revealed that its primary objective was to analyse the implementation, challenges, and opportunities of the Eastern and Southern Africa Power Pools. The first part focused on the status of operationalisation of the Eastern and Southern Africa Power Pools. In this regard, the chapter finds out that power pools play a significant role in providing a platform to develop regional masterplans for generation and transmission. The chapter also asserts that successful operationalisation of power pooling requires adequate generation and transmission capacity, grid interconnection, a legal framework for electricity trade, and regulatory mechanism, which are the constitutive objectives of power pools.

The study found out that the regional masterplan has a constructive impact on the operationalisation of the respective power pools. Though the EAPP and the SAPP developed their regional generation and transmission master plans, the level of operationalisation of the EAPP is much lower than that of the SAPP. In this connection, the study argues that the relative better operationalisation of the SAPP is due to the creation of the Project Implementation Unit (PAU) and the Regional Transmission Infrastructure Financing Facility (RTIFF) that have played a significant role in the SAPP's success. The PAU expedites project planning and implementation of generation and transmission projects while the RTIFF mobilises resources for the numerous interconnection projects that are identified by the PAU. Therefore, the study concludes that the development of a regional generation and transmission masterplan or cooperation in regional planning is one of the major prerequisites of the operationalisation of power pools, whose implementation determines the level of operationalisation of power pools.

Regarding the discussions on the opportunities for the operationalisation of power pools, the study found out that Africa's regional approach to energy security created the five power pools, the Inter-Continental Transmission Master Plan, the African Single Electricity Market, and the presence of active regional economic communities as opportunities for the successful operationalisation of power pools. The launching of these initiatives shows that there is adequate political will at the continental level. In this regard, the study concludes that the regional approach to energy security is the most feasible approach to Africa's energy challenges. Also, the Southern Africa experience illustrates those opportunities associated with the regional approach to energy security can be best utilised when power pools and regional economic communities work closely.

Expounding on the challenges, the study confirmed that governance and leadership are primary challenges to regional energy integration. In this regard, the study developed a conceptual framework that encapsulates the governance question in Africa's energy challenges. Recognising the centrality of governance, the study argues that governing markets and infrastructure investments constitute energy governance in Africa. In this regard, the study found that energy governance in Africa has three critical challenges to address – mandate overlapping, unclear division of labour, and a fragmented and disjointed governance structure that is not fit for purpose.

The study finds that energy governance in Africa has three critical challenges to address. First, considering the respective mandates of AUCIE, AUDA – NEPAD, and AFREC, one can observe mandate overlapping and rambling implementation at the AUC level. The division of labour among these institutions lacks clarity, and the overall governance is disjointed, thus weakening the emerging energy governance in Africa. Second, the paper argues that Africa's energy governance structure must successfully govern energy markets and infrastructure investment in an integrated manner. However, the energy infrastructure governance mandate lies within the mandates of different institutions under the AUC. Thus, as much as Africa identified the infrastructure investment deficit as one of the primary challenges to energy security in Africa, it has a fragmented and disjointed governance structure that is not fit for purpose. Energy market governance is also increasingly becoming problematic because of the lack of coordination among the multiplicity of institutions involved. In particular, the disjointed relations between the AUC, RECs, and regional power pools hamper energy market governance in Africa.

The newly established AfSEM with the ambition of establishing and governing a single electricity market in Africa also faces similar challenges. AfSEM is a milestone in Africa's regional energy integration endeavour as it governs electricity markets. Mandating it to govern Africa's all-encompassing energy integration and energy relations is ill-advised. The other prominent challenge is the lack of a regulatory framework at national and regional levels. When it comes to regional regulatory mechanisms, the challenges are, states have different scopes for their regulatory agencies, and there is a plethora of regional regulatory mechanisms in the EAPP and the SAPP regions. Therefore, there exists a dire need for instituting a regional regulatory framework that can regulate the electricity markets to infuse cost-reflective electricity tariffs in those markets to meet the growing regional energy demand because, without it, the massive investment gap could not be bridged.

Nevertheless, Africa's pursual of a regional approach to its energy challenges is on track. In this regard, the contribution of AU in providing a framework for the development of soft and hard infrastructures, the roles of RECs in coordinating the same regionally, and the roles of regional power pools in the establishment of regional markets are encouraging. In particular, the overall governance structure at the AU level is clear and structured, contributing to its robust performance in the overall energy governance and particularly to the governance of energy integration. The Union has mainstreamed the regional approach and created legal, policy, and institutional infrastructure that will likely govern regional energy integration in Africa. In line with the regional approach, the AU's initiatives such as the Integrated Continental Transmission Network, the Harmonised Regulatory Framework for the Electricity Market, and the African Single Electricity Market constitute Africa's emerging energy governance structures. In this regard, the contributions of its Infrastructure and Energy Commission and its Development Agency are worth noting. The launching of these initiatives shows that there is adequate political will at the continental level.

In conclusion, the SAPP region has all forms of electricity trade, ranging from bilateral cooperative to regional competitive markets – thus, the SAPP is better operational than the EAPP. Considering the challenges and opportunities of power pools, not all challenges faced by the EAPP and the SAPP are identical. For instance, the EAPP and the SAPP benefited from the regional approach Africa pursued, the development of the Integrated Continental Transmission Network, and the African Single Electricity Market. Nevertheless, considering the relationship between the power pools and the respective regional economic communities, for Southern Africa, it is an opportunity whereas the same relation becomes a challenge in the EAPP region. Also, the EAPP and the SAPP share the energy governance challenges at the continental level and the lack of regulatory mechanism at the regional level. Therefore, the study could not be able confirm that the challenges and opportunities are similar in the EAPP and the SAPP.

In analyzing the challenges and opportunities of implementing power pooling in Eastern and Southern Africa, the study came across some interesting patterns in how bottom-up approach, or the vice-verse impact the development of regional power trade in Africa. The next chapter looks deeper into analysing whether bilateral energy trade encourages the development of regional power pooling or it discourages countries from pursuing a more competitive energy trade.

Chapter Five

The Role of Bilateral Energy Trade in the Realisation of Regional Energy Trade

5.0 Introduction

In the initial stage of the study, literature and key players of the energy sector, in particular those focusing on power pooling, had diverging views on the relationship between bilateral cooperative and regional competitive electricity trades. Some argue that bilateral electricity trade hampers the development of regional market as the former discourages countries from embracing the later because of the simplicity and flexibility bilateral trade provides for its participants. On the other hand, others argue that bilateral electricity trade can serve as a building block for the development of regional power trade. The viewpoint is that bilateral electricity trade sensitises countries the on the benefits of energy trade, interdependence, and integration. Considering the long history of bilateral power trade and the recent and strong push for a regional electricity trade in Africa, the study sought to evaluate the relationship between these two approaches to electricity trade as its last but not least objective.

In so doing, chapter analyses the role of bilateral electricity trade for the development of regional electricity trade. It is composed of four parts – the first part presents an analysis of the benefits of regional electricity trade in Africa. The second part examines the evolution of bilateral and regional electricity trade through power pooling in Africa. In so doing, it appreciates the development of regional markets in Asia, Europe, and South America before delving into analysing the evolution of regional electricity markets in Africa. The third part analyses the potential and expected contribution of bilateral electricity trade to develop regional markets. The fourth part analyses the roles of bilateral trading arrangements in Eastern and Southern Africa to develop the EAPP and the SAPP. The last part presents conclusions on the role of bilateral trade in the EAPP and the SAPP to realise regional markets.

5.1 The Benefits of Regional Electricity Trade in Africa

In Africa, the combination of small market size, low level of investment, poor management and maintenance of existing infrastructure, inadequate and inappropriate tariff, and poor revenue collection contribute to Africa's energy sector's looming crisis.[423] A regional approach to energy development and trade is expected to remedy these challenges and ensure energy security in Africa.

Apart from its potential to address the mentioned challenges, regional energy trade, to start with, improves reliability, including providing an opportunity for member utilities to share costs associated with reserve energy.[424] Second, regional interconnection allows the individual system to reduce generation capacity requirements or postpone investments to expand the power supply.[425] It provides a platform to share outputs among participants. Third, regional interconnections flatten the regions' load curve instead of the seesaw nature of individual units that would have demanded investment to supply power during a few peak demand hours.[426] Such interconnections also allow the participants to utilise their comparative time advantage in a day or a year. Fourth, regional interconnections will enable the reduction of a unit cost of new generation and transmission capacity gradually declines increase in economies of scale.[427] Fifth, regional interconnections allow the utilisation of several energy resources, enhancing complementarity, particularly useful in times of crises such as drought years.[428] Sixth, regional interconnections allow inexpensive and lower environmental impact power to be sold to the system.[429] Seventh, regional interconnections allow planned outages so that power plants can

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[423] M. P. Niyimbona, 'The Challenges of Operationalizing Power Pools in Africa', *UNDESA Seminar on Electricity Interconnection*, 19 June 2005.

[424] Economic Consulting Associates, 'The Potential of Regional Power Sector Integration: South African Power Pool (SAPP) Transmission & Trading Case Study' (London, October 2009).

[425] Musiliu O. Oseni and Michael G. Pollitt, 'The Promotion of Regional Integration of Electricity Markets: Lessons for Developing Countries', *Energy Policy* 88 (1 January 2016): 628–38, https://doi.org/10.1016/j.enpol.2015.09.007.

[426] Alfredo Behrens, 'Regional Energy Trade and Its Role in South America', *Energy Policy* 18, no. 2 (March 1990): 175–85, https://doi.org/10.1016/0301-4215(90)90143-R.

[427] UNIDO, 'Energy-Related Issues from the Trade and Development Perspective' (UNIDO, March 2009), https://unctad.org/system/files/official-document/cid2_en.pdf.

[428] Oseni and Pollitt, 'The Promotion of Regional Integration of Electricity Markets'.

[429] World Energy Council, *Regional Energy Integration in Africa: A Report of the World Energy Council.* (London: World Energy Council, 2005).

be maintained sustainably.[430] In general, regional energy integration has numerous advantages that can significantly address energy challenges in Africa.

5.2 Regional Energy Trade in Eastern and Southern Africa: From Bilateral Cooperative to Regional Competitive Electricity Markets

Energy trade is a pre-independence state of affairs in Africa. The Algeria-Tunisia cross border electric interconnection was the first of its kind in Africa during the early 1950s.[431] Other interconnections include the Nseke (DRC) – Kitwe (Zambia) interconnection to supply power to the copper mines; the Kenya – Uganda interconnection from the Owen Dam; the Zambia – Zimbabwe interconnection from Kariba South Hydropower Station; Ghana – Togo/Benin interconnection grid from the Akosombo hydropower station; the DRC – Congo from Inga I; and the Ivory Coast – Ghana interconnection.[432] All of these interconnections are under a bilateral arrangement,[433] which dominates regional cooperation arrangements.[434]

In most energy cooperation cases, regional energy cooperation is based primarily on cheap and reliable hydropower energy without any supplement from other sources. The hydropower dams in Eastern and Southern Africa have been the sources of regional energy trade. For example, in Eastern Africa, the Kenya –Uganda, the Ethiopia – Djibouti, the Ethiopia – Sudan, Ethiopia – Kenya, and Kenya – Tanzania interconnections; in Southern Africa, the Northern SAPP interconnections involving Zambia, Zimbabwe, DRC, and Mozambique are hydro-based.[435]

However, reliance on hydropower generation is naturally vulnerable to climate change because power generation depends on the water level at the reservoir, and as a result, numerous crises

[430] Dudu Hadebe et al., ‘Scaling Up Renewables Through Regional Planning and Coordination of Power Systems in Africa—Regional Power System Planning to Harness Renewable Resources and Diversify Generation Portfolios in Southern Africa’, *Current Sustainable/Renewable Energy Reports* 5, no. 4 (December 2018): 224–29, https://doi.org/10.1007/s40518-018-0119-3.

[431] UNECA, ‘Assessment of Power Pooling in Africa’ (Addis Ababa, 2003).

[432] Economic Consulting Associates, ‘The Potential of Regional Power Sector Integration: South African Power Pool (SAPP) Transmission & Trading Case Study’.

[433] Hailu Yohannes, Energy and Sustainable Development in Africa, Google Meet, 11 January 2020.

[434] IRENA, ‘Innovation Landscape Brief: Regional Markets’ (Abu Dhabi: IRENA, 2019).

[435] World Energy Council, *Regional Energy Integration in Africa*; UNECA, ‘Assessment of Power Pooling Arrangement in Africa’ (UNECA, 2004).

have occurred. For instance, the Akosombo Hydropower Dam's power crisis in 1995[436]and the Kenya – Uganda Power Trade Agreement review with a diminished amount show the vulnerability of hydro-dominated power markets.[437]In addition, in Southern Africa, the hydro-based energy trading system involving Zambia and Zimbabwe collapsed due to the Great Drought between 1991 and 1992.[438]

As observed, the lack of a diversified energy system is one of the most pressing energy security challenges whose solution hinges on the extent to which a state or a region embraces energy mix or diversity in energy systems. A diversified energy system incorporates and prioritises several energy resources based on the least-cost approach to mitigate the risk of potential disruption of a source by the others. Reliability emanates from mixing energy sources in producing energy or diversification. Therefore, a diversified energy supply chain is indispensable in tackling reliability as an energy security challenge.[439] In the specific cases mentioned above in Eastern and Southern Africa, supplementing the hydro-dominated power sector with a diversified energy mix, especially renewable energy, will minimise climate-related exposure and provide extra energy for export to neighbouring countries.[440] Considering the pattern of bilateral electricity trade in the mentioned cases, the trade is unidirectional from where there is a hydropower surplus to where there is an electricity shortage, thereby calling for a regional mechanism that brings together different countries with different and complementary resource endowments.

In Africa, energy trade started in bilateral and long-term forms, and these interconnections were largely hydropower based, which are vulnerable to climate variations inducing crises all over the continent. Embracing energy mix was the ultimate solution to overcome challenges related to the hydropower dominated power system failures. With the development of renewable

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[436]Emmanuel Obeng Bekoe and Fredrick Yaw Logah, 'The Impact of Droughts and Climate Change on Electricity Generation in Ghana', 2013, 12.

[437]Alfonso Medinilla, Bruce Byiers, and Karim Karaki, 'African Power Pools: Regional Energy, National Power' (ECDPM, February 2009).

[438] Economic Consulting Associates, 'The Potential of Regional Power Sector Integration: The Southern African Power Pool Case Study' (ESMAP, October 2009).

[439] Xianguo Li, 'Diversification and Localization of Energy Systems for Sustainable Development and Energy Security', *Energy Policy* 33, no. 17 (November 2005): 2237–43, https://doi.org/10.1016/j.enpol.2004.05.002.

[440]'Renewable Energy Sources and Climate Change Mitigation: Special Report of the Intergovernmental Panel on Climate Change', *Choice Reviews Online* 49, no. 11 (1 July 2012): 49-6309-49–6309, https://doi.org/10.5860/CHOICE.49-6309.

energy technologies – wind, solar, and geothermal become the supplementary resources that optimise the energy mix. Since these resources are in different countries, even when found in the same region, an institutional arrangement, a power pool, is needed to implement regional energy trade and maximise its benefits. In general, energy diversification led energy security is the primary driver of the regional approach in Africa.[441] How did the rest of the world respond to similar instances? How did power pooling or regional energy cooperation emerge in the world?

5.1.1 Development of Regional Electricity Markets in Other Parts of the World

The Electricity Act of 1989, establishing the England-Wales Electric Pool, set out rules for establishing the energy market and privatising entities associated with energy production, transmission, and distribution.[442] However, with its "golden share" right, the government allowed it to prevent mergers and acquisitions without its approval, and to continue to control the energy sector. Thus, the emergence of the electric pool in England and Wales was accompanied by the proliferation of institutions capable of shaping the electric trade's emergence. The new energy market and the privatisation related to it result in the proliferation of multiple companies specialising in the generation, grid, and regional electric distribution.

In North America, challenges associated with the reliability of energy supply, especially the 1965 blackout, led to the development of power pools.[443] In response to the outage, regional councils were established to boost the electricity supply and reduce utility service costs in the United States. Similarly, the 1992 Energy Policy Act introduced Independent Power Producers (IPPs), Independent System Operators (ISOs), and regional transmission organs and the Federal Energy Regulation Commission.[444] The establishment of regional institutions was one of the constitutive elements of the emergence of regional power pools in North America. Similarly, the history of the regional power pool in Europe also demonstrates the importance of regional institutions in the process. For instance, the Nord pool was established as an association of electric cooperation after Norway adopted a market-oriented energy act in 1991, resulting in adopting an electric power market in 1995.

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[441] UNIDO, 'Energy-Related Issues from the Trade and Development Perspective'.

[442] Abimbola Odubiyi and Inno Davidson, 'England and Wales Electricity Industry – Experiences in Deregulation', *Journal of Engineering, Design and Technology* 3 (1 March 2005): 24–29, https://doi.org/10.1108/17260530510815312.

[443] David M Newbery, 'Pool Reform and Competition in Electricity', 1999, 35.

[444] Oseni and Pollitt, 'The Promotion of Regional Integration of Electricity Markets'.

The development of the regional energy market in South America shares some similarities with that of Africa. First, countries in South America and Africa emerged from authoritarian regimes when they sought to address their energy security challenge by focusing on developing energy supply sources within their boundaries, overlooking regional options.[445] Second, rivalry and the mutual distrust among them delayed broader cooperation in long term energy projects.[446] However, regional cooperation, including regional trade in electricity and natural gas, leads to a sustainable energy supply at economical costs and promotes regional integration by breeding interdependency amongst the countries involved. These achievements highlight the indispensable role of institutions.

Cross border trade in electricity in the South Asia region also shares similar characteristics with Africa.[447] Underinvestment-related challenges such as electricity shortage, poor access to electricity, unreliable supply, and poor infrastructure, characterizes the energy sector's state. The challenges require attracting investment, improving management, and taking advantage of regional trade. The South Asian electric market developed in the framework of regional integration from the South Asia free trade area to regional energy cooperation by developing a robust regional mechanism for cross border regulators coordination.

In short, the regional approaches to energy cooperation and power pooling arrangement in Europe, North America, South America, and South Asia demonstrate that strong institutions and legal frameworks are the prerequisites to the establishment and operationalisation of regional power pools. Hence, ensuring energy security and driving the sustainable development agenda in Africa requires embracing regional energy diversification and installing energy trade along regional lines through the active participation of institutions such as regional power pools. Regional institutions help tame national rivalries, distrust, disunity, political systems, and corruption and contribute to developing the political will.[448] In this aspect, political will

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[445] Behrens, 'Regional Energy Trade and Its Role in South America'.

[446] Trevor Byer, Enrique Crousillat, and Manuel Dussan, 'Latin America and the Caribbean Region Energy Sector – Retrospective Review and Challenges', ESMAP Technical Paper (Washington: The World Bank, 2009).

[447] Sumit Saroha and Rohit Verma, 'Cross-Border Power Trading Model for South Asian Regional Power Pool', *International Journal of Electrical Power & Energy Systems* 44, no. 1 (January 2013): 146–52, https://doi.org/10.1016/j.ijepes.2012.07.007.

[448] Niyimbona, 'The Challenges of Operationalizing Power Pools in Africa'.

plays a vital role in forging energy integration. Lack of it translates to delays and constraints that thwart all the promises of regional energy integration.[449]

5.1.2 Evolution of Regional Electricity Markets in Eastern and Southern Africa

Achieving sustainable energy integration requires coordination among entities in the energy value chain. As market operators, system operators, and regional regulators, regional institutions to bridge the gap between national institutions involved in regional energy integration are the precondition for the existence and development of regional energy trade.[450] In most cases, regional energy integration follows several phases, including agreement among participating countries to establish power pools and determine the game rules in the forms of IGMOU and IUMOU, as Chapter Four explained. Other phases include allocating financial resources, developing institutional and physical infrastructure.[451]

In this regard, the establishment of the SAPP is a case in point. After the drought in the early 1990s, SADC proposed expanding the trade arrangement to include more hydropower from the Democratic Republic of Congo and thermal energy from South Africa to enhance the energy mix. Accordingly, it created an institution called the SAPP through the signing of the IGMOU and IUMOU. As a regional institution designed to provide a platform for energy cooperation and trade, the SAPP was formed with one of its objectives being connecting the northern part of the region where hydropower is dominant with that of the southern part where thermal energy is the primary energy source. Save for the energy crisis, the EAPP has also been created the same way.

In addition to creating relevant institutions, power pooling requires careful consideration of several factors necessary for establishing the regional institution. First, power pooling or forging a regional grid interconnection needs a harmonised grid code and appropriate technological standard between participating countries.[452] The technology and criteria used in the energy interconnection should be similar or comparable to make the interconnection work.

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[449] UNECA, ‘Assessment of Power Pooling Arrangement in Africa’.

[450] Anton Eberhard et al., *Africa’s Power Infrastructure: Investment, Integration, and Efficiency* (Washington, D.C: The World Bank, 2011).

[451] Hugh Rudnick and Constantin Velasquez, *Taking Stock of Wholesale Power Markets In Developing Countries: A Literature Review* (World Bank, Washington, DC, 2018), https://doi.org/10.1596/1813-9450-8519.

[452] United Nations, ‘Multidimensional Issues in International Electric Power Grid Interconnections’ (New York, 2006).

Second, international interconnections require careful consideration and subsequent decisions related to the price of the electricity, national contribution to interconnection costs, and the impact of electricity import or export on the local economy.[453] The participating states should have an overall understanding of the costs and benefits associated with electric interconnections. Third, regional interconnections require participating countries to adapt their national laws to regional and international standards and determine jurisdiction for dispute settlement.[454] Fourth, successful global interconnections require sustainable management of political risks and rivalries between participating countries. Fifth, social dimensions of the interconnections, such as who benefits or sacrifices, should be mapped. Also, the environmental impact of the international grid interconnections should be assessed and mitigated. Considering the requirements mentioned above, the role of power pools is indispensable. Thus, the study argues that the transition from bilateral to regional electricity trading requires establishing a regional institution called a power pool.

5.3 The Role of Bilateral Electricity Trade to the Development of Regional Electricity Trade in Africa

In Africa, bilateral and long-term energy trade contracts are the pioneers of electricity trade, though they are unreliable because they lack diversification or the energy mix. The proposed regional mechanism to overcome overdependence on a single energy source, usually hydropower, requires embracing regional energy trade. The transition from bilateral to regional marketing mechanisms requires institutional, physical, and market infrastructures.[455] For instance, forging institutional infrastructures necessitates harmonisation of the regulatory environment, grid code, market rules, competitive access to markets, legal arrangements for short-term power purchase agreements, and overall operations. Availing adequate transmission lines for the regional electricity trade and instituting short-term electricity markets, for example, day-ahead markers, are also needed. The dynamic and multidimensional transition is expected to unfold in a situation where bilateral contracts dominate. This part examines the dynamics between bilateral and regional or cooperative and competitive electricity markets and analyses the dynamics in the EAPP and the SAPP regions to determine if bilateral trading

[453] IRENA, 'Innovation Landscape Brief: Regional Markets'.

[454] Ioannis N. Kessides, *Reforming Infrastructure: Privatization, Regulation, and Competition*, World Bank Policy Research Report (Washington, DC: The World Bank [u.a.], 2004).

[455] UNECA, 'Opportunities to Harmonize Regulatory Systems for Infrastructure Development: The Case of Power Pools for Service Delivery and Structural Transformation in Africa' (UNECA, 2017).

arrangements are building blocks to the evolving regional and competitive market or not. Before delving into the analysis, it is crucial to conceptualise the different modes of electricity trade such as cooperative, competitive, bilateral, long-term, and regional electricity markets.

The cross-border electricity trade is either long-term and cooperative or short-term and competitive. The cooperative markets are primarily bilateral and do not need thorough follow-up because the price is set for the contract period, usually expressed in years.[456] A joint committee will handle any disturbance in the trade. Such bilateral contracts have no deadlines and typically take place before completing the infrastructure needed for the transaction. The participants take ample time to ensure the contract is in line with their national laws and regulations. [457] The bilateral electricity trade agreements are contracted for a more extended period or, in some cases, open-ended and governed by a joint committee.[458] The contracts are drafted in such a way that takes into consideration the national laws of the trading states. When such agreements are among three or more interconnected electrical systems that are planned and operated to supply power for their combined load requirements, the arrangement becomes multilateral yet cooperative.

On the other hand, competitive regional markets involve producers with a pre-determined amount and price of electricity they are selling for a certain period and consumers with their sets of electricity demands and prices that they are willing to pay for the service.[459] The trade usually operates on a short-term basis, either monthly, daily, or hourly requiring pre-established infrastructure. The infrastructure requirement includes adequate generation and transmission capacities and a trade facilitator, a power pool. Successful power pooling also involves the harmonisation of these laws and regulations before their implementation. One of the technical manifestations of such a need is the presence of respective quality standards, called grid code, that are not always comparable, thereby demanding harmony before the power pooling.[460] The complexity of the energy exchanges, especially arrangements for pricing and settling commercial transactions on a real-time basis, increases dramatically when a

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[456] Yohannes, Energy and Sustainable Development in Africa.

[457] Yohannes.

[458] Gebrehiwot Zelalem, Energy and Sustainable Development in Africa, Physical, 11 June 2020.

[459] Amarquaye Armar et al., 'Building Regional Power Pools: A Toolkit' (World Bank, 2009).

[460] François Lévêque, ed., *Competitive Electricity Markets and Sustainability* (Cheltenham, UK ; Northampton, MA: Edward Elgar, 2006).Fereidoon P. Sioshansi, ed., *Competitive Electricity Markets: Design, Implementation, Performance*, Transferred to digital Printing (Amsterdam Heidelberg: Elsevier, 2009).

competitive market regime is introduced. In short, power pools, in addition to their constitutive objectives, also play a crucial role in the development of regional electricity markets.

5.3.1 Bilateral Electricity Trade as Enablers of Regional Electricity Market

Based on the nature of the different electricity trades, the study identifies three significant contributions of bilateral electricity trade for the development of competitive regional markets. First, the benefit of bilateral electricity trade arrangement is that it can serve as a platform on which participants exercise the dynamics of electricity trade. The strategic nature of energy, both as an economic input and output, has discouraged countries from engaging in energy trade. Countries perceive 'import dependency' as a source of dilemma and vulnerability. The following assertion by a Sudanese senior security analyst on the potential energy trade between Sudan and Ethiopia in 2010 is worth noting:

> "*It is one thing for Ethiopia to import all this fuel from Sudan, it's another thing for us to import all that power from across the border [...] They can easily diversify out of our fuel if they needed to; it will cost them lots of money, but they can do it in a crisis. We would be on our knees: they could switch off the lights, and there is nothing we could do about it.*"[461]

In the first part of the quotation, the analyst underlined the challenges associated with the nature of energy in transactions. In his opinion, Ethiopia will not be entirely dependent on Sudanese oil because the former can ensure the security of the supply of oil from international markets because oil is a global commodity in times of crisis. The analyst continues, the same cannot be said for Sudan because electricity is a regional commodity that can only be purchased within a predefined bilateral arrangement from a single source. Ethiopia and Sudan started to trade in electricity in 2011.[462] The bilateral relations between the two countries exhibited their highest and lowest point – its highest point was when Ethiopia and Sudan forced Egypt to sign the Declaration of Principle on the Grand Ethiopian Renaissance Dam and its lowest point was the Sudanese invasion of the disputed border areas under effective Ethiopian administration.[463] Nevertheless, the electricity trade remains intact. In this regard, a decade of electricity trade

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[461] Harry Verhoeven, 'Black Gold for Blue Gold? Sudan's Oil, Ethiopia's Water and Regional Integration', *Undefined*, 2011, https://www.semanticscholar.org/paper/Black-Gold-for-Blue-Gold-Sudan%27s-Oil%2C-Ethiopia%27s-Verhoeven/ce302106db31a395a9c33eb069fead6578cecf17.

[462] The Africa Report, 'Ethiopia to Start Power Supply to Sudan after Djibouti', *The Africa Report.Com*, 21 June 2011, https://www.theafricareport.com/8638/ethiopia-to-start-power-supply-to-sudan-after-djibouti/.

[463] Mike Harrison and Frances Kerry, 'Sudan and Ethiopia Trade Accusations in Border Conflict | Reuters', *Thomson Reuters*, 20 February 2021, https://www.reuters.com/article/us-sudan-ethiopia-idUSKBN2AK0LE.

between Ethiopia and Sudan has shown that countries can trade electricity without fear of unreasonable interruptions. Therefore, bilateral electricity trade, indeed, provides a stage where participants ascertain the dynamics of electricity trade and develop confidence over it.
In addition, such fears of electricity dependence on a single seller also contribute to the development of competitive regional markets. As discussed above, a competitive market structure provides more than two sellers and buyers, and the market participants submit their bids and requests for the power pool without necessarily targeting anyone.[464] As much as the market design is competitive, it is also full of options. For instance, the possible regional competitive market structure in Eastern Africa may include all the EAPP countries, and Sudan's daily electricity needs might be supplied from Ethiopia, Egypt, and Kenya. Therefore, practical concerns associated with bilateral electricity trade led to the championing of competitive regional markets in a particular region.

Secondly, bilateral electricity trade infrastructures can also help the development of regional competitive electricity trade. The previous chapter thoroughly discussed the importance of capital investment on transmission infrastructure for the development of electricity trade, be it bilateral or regional. Transition to regional competitive electricity would necessarily require more capital investment in the long run, but it can utilise the existing surplus transmission capacities.[465] Almost all cross-border electricity interconnections are related to bilateral electricity trade agreements, and in most cases, they operate below their capacities. In this regard, the transmission infrastructure of bilateral electricity trade provides an opportunity for exercising competitive regional markets without additional capital investment.

Thirdly, energy trade started in bilateral and long-term forms, and these interconnections were largely hydropower based, which are vulnerable to climate variations inducing crises all over the continent. Diversifying energy resources becomes the ultimate solution to overcomes challenges related to dependence on hydropower dominated power systems. In so doing, with the development of renewable energy technologies – wind, solar, and geothermal become the supplementary resources that optimise the energy mix. Since these resources are in different

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[464] L. Musaba, 'The Development of the SAPP Competitive Electricity Market', in *Proceedings of the Inaugural IEEE PES 2005 Conference and Exposition in Africa* (Inaugural IEEE PES 2005 Conference and Exposition in Africa, University of KwaZulu-Natal, Durban, South Africa: IEEE, 2005), 188–94, https://doi.org/10.1109/PESAFR.2005.1611812.
[465] Musaba.

countries, even when found in the same region, their development will eventually contribute towards the development of competitive regional markets in Africa.

In general, bilateral electricity trade arrangements sensitise participants on the dynamics of electricity trade; lend their transmission infrastructure for exercising competitive regional markets without additional capital investment; the energy mix solution to the notable weakness of bilateral electricity trade, dependence on one energy source, will eventually contribute towards the development of competitive regional markets in Africa.

5.4. Comparative Analysis of the Role of Bilateral Electricity Trade for the Development of a Regional Electricity Market in Eastern and Southern Africa

The last part discussed the importance of bilateral electricity trade for the development of competitive regional markets in Africa. What are the benefits of this in Eastern and Southern Africa? This section will present the comparative analysis of the roles of bilateral electricity trade for the development of the competitive regional market in the EAPP and the SAPP.

5.4.1. Analysis of the Role of Bilateral Electricity Trade for the Development of Regional Electricity Market in Southern Africa

Energy cooperation contributes to the positive operating balance of most participating countries. Even though most of the energy trade is on a long-term and bilateral basis, the trade increased to 14500 MW in 2018 from 500 MW in 2012 as the SAPP's operating capacity reached 24 per cent compared to 1 per cent in 2012.[466] The SAPP's operation balance reached a 1045 MW[467] surplus in 2019 from a negative balance of 2131 MW[468] in 2013. Also, the percentage of electricity trade and total electricity demand in the SAPP region has reached 11 per cent compared to less than 2 per cent in the EAPP.[469] The statistics show that regional trade, as facilitated by the SAPP, is flourishing, in turn, spurring the operational balance or generation

[466] Southern African Development Community and Southern African Research and Documentation Centre, eds., *SADC Regional Infrastructure Development: Short Term Action Plan Assessment 2019* (Gaborone: Harare: SADC ; Southern African Research and Documentation Centre, 2019).

[467] SAPP, 'SAPP Annual Report', Annual Report (Harare: Southern Africa Power Pool, 2019), http://www.sapp.co.zw/sites/default/files/SAPP%20ANNUAL%20REPORT%202019.pdf.

[468] SAPP, 'SAPP Annual Report', Annual (Harare: Southern Africa Power Pool, 2013), http://www.sapp.co.zw/sites/default/files/2013%20Annual%20Report%20New%20%283%29.pdf.

[469] 'Africa Energy Outlook 2019', World Energy Outlook Special Report (Paris: International Energy Agency, 2019).

capacity of the region. The following graph show how the SAPP's operating capacity has been increasing steadily since 2014.

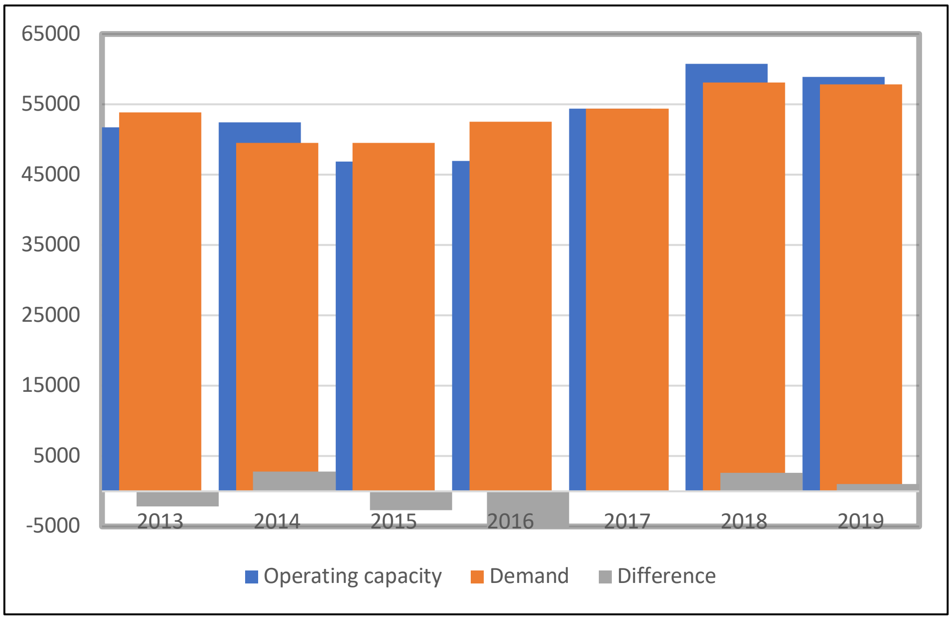

Chart 19Energy balance in SAPP

Capitalising on such fertile ground, the SAPP has transformed the existing and dominant long-term bilateral markets into competitive markets since 2001. The launching of a competitive market in the SAPP was one of the milestones in electricity trade in Africa for several reasons. First, it shows that the region has reached an acceptable level of market liberalisation for attracting private sector investment.[470] As discussed in the previous chapter, market liberalisation has a positive impact on attracting foreign direct investment in the energy sector, which will enhance generation and transmission capacities. Second, the launch and gradual operationalisation of the competitive market shows that trust and confidence among participating states have reached an appreciable state.[471] Trust and confidence are some of the critical prerequisites of bilateral and regional energy trade. The successful conduct of long-term bilateral contracts has played a crucial role in inculcating mutual trust and confidence between trading parties. Also, the role of the regional economic community, SADC, is worth noting. SADC has played a significant role as a political umbrella of the SAPP and provided

[470] Alisson Chikova, Energy Cooperation and Sustainable Development in Africa, Zoom Meeting, 20 November 2020.

[471] Desta Mebrhatu, Energy and Sustainable Development in Africa, Physical, 11 December 2020.

continued support and leadership. The following chart shows the growing contribution of the competitive electricity market in the SAPP region.

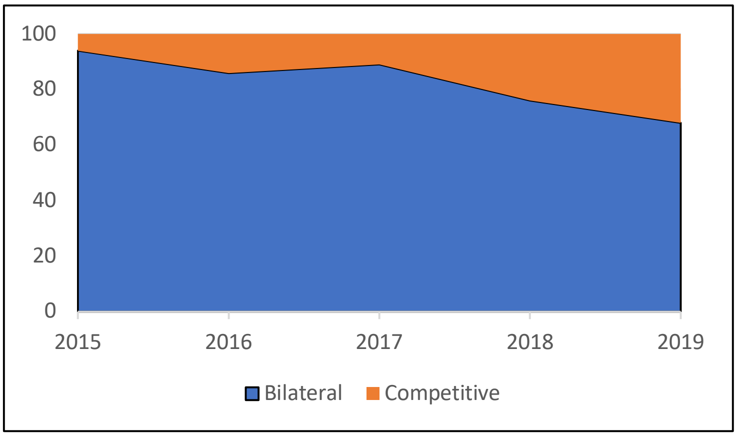

Chart 20The share of Bilateral and Competitive Electricity Trade in the SAPP's Energy Market

The competitive electricity market in the SAPP is increasingly becoming operational and gaining momentum. Before delving into analysis, it is pertinent to discuss the steps involved in the competitive market, highlighting the role of the SAPP as a market operator.[472] The first process consists of determining the availability of transmission interconnection for the competitive market. Since all interconnection capacity is built for bilateral and long-term energy trade contracts, transmission usage for the day, week, and month will be considered to determine available transmission capacity for the competitive market.[473] Therefore, the capacity that will not be utilised by the bilateral contract will be dedicated to the competitive market, and the SAPP notifies the available capacity for participants daily. Since regional electricity trade involves several states, agreeing on the exchange rate is important. In this regard, the SAPP sends a notification on the exchange rate for the day for all participants.

The first two steps constitute the preparatory phases for the competitive market. In the next step, electricity trading parties submit bids and offers to the SAPP before the closure of the market, usually at nine o'clock. The SAPP, having received the bids and offers, matches the available bids with the offers and publishes the outcome. If any trading party has a complaint, it must submit its claims to the SAPP within an hour after the publication of the results. The process of trading in electricity in a competitive market faces numerous challenges, including

[472] Chikova, Energy Cooperation and Sustainable Development in Africa.

[473] Sioshansi, *Competitive Electricity Markets*.

generation and transmission constraints.[474] The following three charts summarise the progress as well as the challenges associated with the competitive electricity market in the SAPP region. Since its launch in 2001, the total amount of electricity sold in the SAPP's competitive market has shown a steady increase. Factors such as the growing confidence in the competitive market and enhanced access to transmission infrastructure have contributed to the increase in the volume of electricity trade in the market.[475]

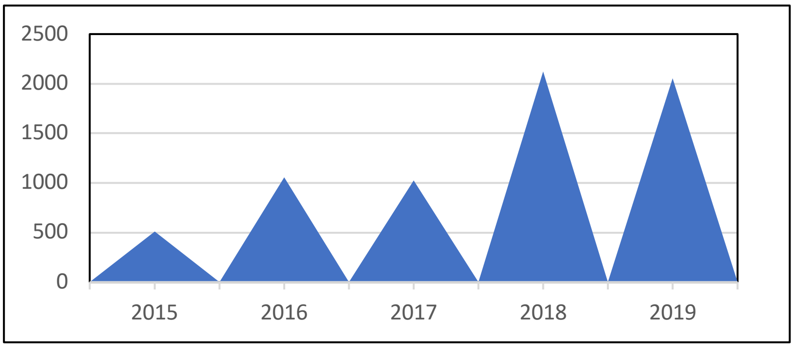

Chart 21 Total Competitive Electricity Trade in GWh

As the following graph indicates, transmission constraint is one of the major factors limiting the growth of the competitive electricity market in the SAPP region. The transmission constraint is the amount of matched electricity that could not be traded due to a lack of access to the regional interconnection. The transmission constraint looked dire in the period running to 2017 and seems to have been addressed in 2018 and 2019. The swift increase in access granted to the competitive market between 2018 and 2019 might explain the boost in the volume of total electricity trade in the competitive market in the same years.

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[474] Laszlo Loveiis, 'The Single-Buyer Model: A DangerousPath toward Competitive Electricity Markets' (Washington, D.C: The World Bank), accessed 27 June 2021, https://openknowledge.worldbank.org/bitstream/handle/10986/11409/multi0page.pdf?sequence=1&isAllowed=y.

[475] Musaba, 'The Development of the SAPP Competitive Electricity Market'.

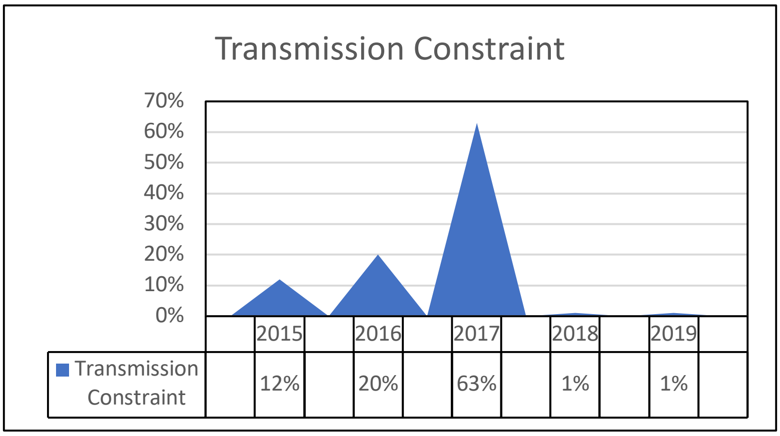

Chart 22 Transmission Constraints in the SAPP

The SAPP's competitive electricity market operates on the remaining transmission capacity after the bilateral trade contracts are accommodated. As illustrated, the SAPP has successfully utilised the unused bilateral transmission capacity for the development of its short-term electricity market. In so doing, the participating states experienced the pros and cons of a competitive electricity market without additional investments. As a result, the competitive electricity market's access to the SAPP's transmission has been increasing since 2015. In 2018 and 2019, close to 99 per cent of short-term electricity trade requests accessed the SAPP's international grid interconnection (see the above chart).

5.4.2. Analysis of the Role of Bilateral Electricity Trade for the Development of Regional Electricity Market in the EAPP region

In general, bilateral electricity trade arrangements sensitise participants on the dynamics of electricity trade; lend their transmission infrastructure for exercising competitive regional markets without additional capital investment; the energy mix solution and the notable weakness of bilateral electricity trade. Dependence on one energy source, will eventually contribute towards the development of competitive regional markets in Africa.

The EAPP, in similar suit, attempted to introduce a regional electricity market or "shadow electricity trade," as it names it, on the Ethiopia-Sudan and Kenya-Uganda interconnections with 230kv and 130kv, respectively.[476] The capacity of the Ethiopia-Sudan transmission line is 200 MW, while the bilateral electricity trade between the countries is 100 MW covering only half of the capacity. The EAPP is proposing to utilise the remaining 50 per cent of the transmission capacity for initiating a competitive regional market. Therefore, the study argues that bilateral electricity trade infrastructure can help the development of regional competitive

[476] Zelalem, Energy and Sustainable Development in Africa.

electricity trade by being a platform within which competitive regional markets can develop without incurring any capital investment on transmission infrastructure.

5.5. Conclusion: What Role for Power Pools?

At the outset, the chapter indicated that its primary objective is to analyse the role of bilateral electricity trade for the development of regional electricity trade in Eastern and Southern Africa. It began with an analysis of the benefits of regional electricity trade in Africa. Accordingly, the study found out that regional energy trade has tremendous benefits for energy security, including improving reliability, reducing the generation capacity requirement of countries for share outputs among participants, flattening the regions' energy load curve, allowing the participants to utilise their comparative advantage, and enhancing complementarity, particularly in an optimal energy mix scenario. In general, regional energy integration has numerous opportunities for availing affordable, reliable, and sustainable energy in Africa.

The second part examined the evolution of bilateral and regional electricity trade through power pooling in Africa. In so doing, it reviewed the evolution of electricity trade in Africa, appreciated the development of regional markets in the rest of the world, analysed the evolution of regional electricity markets in Africa, and explained the centrality of institutions in developing regional energy trade/markets. Accordingly, it found out that energy trade is a pre-independence state of affairs, bilateral and long-term in nature, and largely hydropower based, which is vulnerable to climate variations. It also found out that the development of regional energy trade or power pooling in Africa began with embracing energy mix, as observed in Southern Africa. Then, the chapter moved on to underpinning the success factors for the realisation of regional energy trade in the rest of the world.

Accordingly, the chapter found out that regional approaches to energy cooperation and power pooling arrangements in the rest of the world demonstrate that strong institutions and legal frameworks are the prerequisites for the development and mainstreaming of regional power trade. Regional institutions, with a special focus on power pools, are regarded as vehicles for regional energy trade for they tame national rivalries, reduce transaction costs, facilitate energy trade agreements, and "help governments pursue their interests, especially energy security, through cooperation."[477] In this regard, the study underscored that the role of power pools as energy cooperation institutions is indispensable.

The third part analysed the potential and expected contribution of bilateral electricity trade for the development of regional markets. It started by introducing the characteristics of bilateral and regional energy trades. In this regard, the bilateral energy trade modalities are conceived as cooperative, long term, and do not need thorough follow-up because the electricity price is set for the contract period, usually expressed in years, or left open-ended. On the other hand, competitive regional markets operate on a short-term basis and have requirements such as pre-established infrastructure, harmonised policy, market facilitator, regulator, and system operator that can manage transactions on a real-time basis. In this regard, power pools are identified as a crucial player in the development of regional electricity markets.

Describing the nature of and dynamics between bilateral and regional electricity trades, the study identified three positive contributions of bilateral electricity trade for the development of regional electricity trade. First, the benefit of the bilateral electricity trade arrangement is that it can serve as a platform on which participants exercise the dynamics of electricity trade and develop confidence in it. Secondly, the study found that energy infrastructures built for bilateral electricity trade help in the development of regional competitive electricity trade. In Eastern and Southern Africa, the transmission interconnections are built for bilateral electricity trade agreements and usually operate below their capacities. Therefore, instituting regional electricity trade has become possible without additional capital investment. Thirdly, the energy mix solution proposed to address challenges of overdependence on hydropower dominated power system are observed to have contributed to the development of competitive regional markets, especially in Southern Africa.

Then, the chapter analysed the development of the regional electricity market in the EAPP and the SAPP regions. In this connection, the chapter illustrated that the SAPP has successfully utilised the "unused" bilateral transmission capacity to develop its short-term electricity market. The chapter also captured similar attempts in the Eastern Africa region, where the EAPP has embarked on a regional electricity market or "shadow electricity trade," as it wishes to name it, which is regional in nature.

477 Robert O. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton, N.J: Princeton University Press, 1984).

Therefore, the chapter concludes that bilateral electricity trade is one vehicle that can be used for the development of a competitive electricity market in Eastern and Southern Africa. Bilateral cooperative and competitive regional markets are complementary, there are enough opportunities for both modes of electricity trading, and both can be pursued without closing out each other. In most cases, the underdeveloped nature of regional markets convinces governments to pursue bilateral energy agreements. However, with the availability of adequate regional energy market mechanisms, such as in the SAPP, governments are observed to have actively participated as the power pools progress, and real markets are operationalised. Also, given the provisions under AfCFTA, there will be no conflict between bilateral and multilateral agreements, and bilateral energy trade can serve as a building block to regional energy trade. Bilateral energy trade arrangements have the potential to champion regional energy trade by sensitising countries on the efficacy and need for cooperation and how to pursue it. However, in regions where power pools are weak, such as in the EAPP, the contribution of the bilateral electricity trade for the development of regional competition is negligible.

In Africa, energy trade started in bilateral and long-term forms, and these interconnections were largely hydropower based, which are vulnerable to climate variations inducing crises all over the continent. Embracing energy mix was the ultimate solution to overcoming challenges related to the hydropower dominated power system failures. In so doing, the development of renewable energy technologies – wind, solar, and geothermal become the supplementary resources that optimise the energy mix. Since these resources are in different countries, even when found in the same region, an institutional arrangement, a power pool, is needed to institute competitive regional markets to maximise its benefits. Nevertheless, power pools, as sizable as their contributions to mainstreaming regional energy cooperation are, are not the only institutions for the successful realisation of regional energy integration in Africa.

In line with the traditions of the institutionalist theory of international relations, institutions can help address transboundary issues of mutual concern. Energy is one such issue. Considering the regional approach to economic development, energy sector development included, Africa has pursued regional institutions, by virtue and design. These regional institutions are mandated to play a central role in forging energy cooperation and integration in Africa. The regional economic communities (RECs), regional financial institutions, and regional power pools are the specific institutions, often with complementary mandates, that Africa has entrusted for the successful realisation of the mentioned energy integration objectives. Regional economic communities (RECs) contribute to fostering regional energy cooperation, cooperative or competitive, by promoting regional trade, encouraging energy integration, and inculcating regionalism in developing the energy sector. Regional financial institutions also play a key part by promoting innovative financing mechanisms to fill the investment gap and by prioritising finance for regional energy projects.

Above all else, power pools play a key role in developing and mainstreaming regional energy trade. First, power pools provide a platform where respective energy trade policies and practices are harmonised. Second, power pools sensitise their members about the benefits and management of regional cooperative and competitive markets. In so doing, regional institutions, as argued by institutionalist theorists, reduce the transaction cost of forging regional energy trade. However, the level of delivery of the mentioned institutions on such crucial mandates is what is creating the difference.

As discussed above, the analysis of the development of regional energy trade in the SAPP region showed that it is possible to capitalise on long-term bilateral electric trade to forge regional electricity trade. The SAPP's experience provided new and significant learning practices that can guide the development of regional energy trade in the EAPP region and other power pools in Africa. The experience from Southern Africa also demonstrates that those regional economic communities, SADC in this context, can assist the development of regional energy trade by working closely and in a predefined manner. Also, in the EAPP's region where bilateral trade covers the entire volume of electricity trade, regional financial institutions, precisely the AfDB, played a significant role in encouraging the development of energy infrastructure that promoted regional energy cooperation. Therefore, the study argues that the existence of bilateral electricity trading arrangements does not necessarily undermine the development of regional energy trade. Or bilateral/cooperative and regional/competitive markets are not mutually exclusive; both can coexist. The development of regional energy markets, however, requires an active role from all the mentioned institutions, but power pools have the lion's share in the exercise.

CHAPTER SIX

TOWARDS SUSTAINABLE DEVELOPMENT THROUGH ENERGY COOPERATION IN AFRICA: EMPIRICAL ANALYSIS

6.1 Introduction

The purpose of the study was to examine the RPPs' contribution to foster energy cooperation by exploring the challenges and opportunities in realising institutionalised energy cooperation in Eastern and Southern Africa. The ultimate focus is to draw lessons and develop a framework interlinking RPPs as a viable solution to energy security (ES) via energy cooperation in Africa. Data composed was collated, and reports were produced. Findings from open-ended questions were also presented in prose. This chapter critically presents, analyses, and discusses the results of the study.

The chapter examines key themes and seeks to assess the hypotheses in relation to set specific objectives. Specific research objectives include: to examine the role of energy cooperation for sustainable development in Africa, to analyse and compare the role of RPPs in fostering energy cooperation and addressing energy security in their respective sub-regions, to compare the operationalisation, challenges, and opportunities of Eastern Africa and Southern Africa Power Pools, and to examine the role of bilateral energy trade in the development of RPPs in general and in the Eastern Africa and Southern Africa Power Pools in particular. To achieve this, questionnaires were designed using the Likert scale. Respondents were asked to rate their opinions on the respective statements according to their level of knowledge on a scale of 1 to 5. Where, "1=Strongly Disagree", "2= Disagree", "3= Neutral", "4= Agree", "5= Strongly Agree". The approach enabled the researcher to compute the composite indices which were used in the testing of hypotheses.

The responses from the key informant interviews (KIIs) and focused group discussions (FGDs) were synthesised and integrated for triangulation purposes. As for the FGDs, the researcher, in collaboration with the University of Nairobi, organised a webinar dubbed *"Energy Integration for Post-Covid Economic Recovery and Sustainable Development in Africa."* Apart from The United Nations Environment Programme (UNEP) Africa Office, together with the University of Nairobi (UoN), other partners who were in attendance included the African Union Commission, United Nations Economic Commission for Africa (UNECA), the EAPP, the SAPP, the East African Centre for Renewable Energy and Energy Efficiency (EACREEE), Trade and Development Bank, African Development Bank, Tulu-Moye Geothermal, and GET.invest. These are among the key players in the energy sector in Africa and beyond. To present the findings of the qualitative data, the researcher used frequency tables, figures, and thematic analysis.

The study targeted 100 leaders and senior experts from the EAPP, the SAPP, selected river basin institutions, regional economic blocs, the ADB, the academia, UNEP, UNECA, and the AU. Those who completed and submitted back their responses were 91 study participants making a response rate of 91%. This response rate is high as it exceeds the recommended rate of above 50% or 70%.[478]

6.2 Demographic Characteristics

The study assessed the demographic factors characterising the respondents. To achieve the research objectives and respond accordingly to the research hypotheses, the study targeted mainly leaders and senior experts from the EAPP, the SAPP, selected river basin institutions, regional economic clocks, the ADB, the academia, UNEP, UNECA, and the African Union. Specifically, the following categories of the respondents were sought energy experts working in regional and sub-regional institutions, energy experts working in the EAPP and SAPP member countries, and energy experts working in Tanzania. The demographic characteristics explored included the respondent's sex, age, education levels, organisation, and nationality.

6.2.1 Sex

Figure 6.1 shows the respondents' gender. It can be observed that most (62%) of the respondents were male, while females formed 38% of the sampled population. This shows that men dominate the energy industry in Africa.

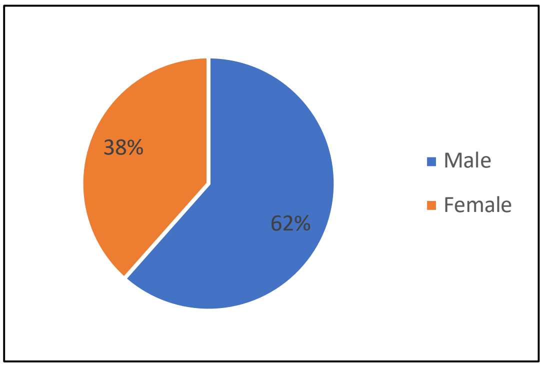

Figure 6.1: Sex

6.2.2 Age

Figure 6.2 shows the respondents' age in years. The findings revealed that 33 (36%) respondents were aged between 45-55 years. They were closely followed by 31 (34%) respondents who were 55 years and above. These two categories formed the majority that is 70% of the entire sample. The rest were distributed in the other age categories. For example, 14 respondents and 12 respondents were aged between 35- 45 years and 24-35 years

[478] C. R. Kothari, *Research Methodology: Methods and Techniques*, Fourth multi colour edition (New Delhi: New Age International (P) Limited, Publishers, 2004).

respectively. Only one respondent was aged between 18 and 25 years. This distribution implies that the industry has an experienced workforce.

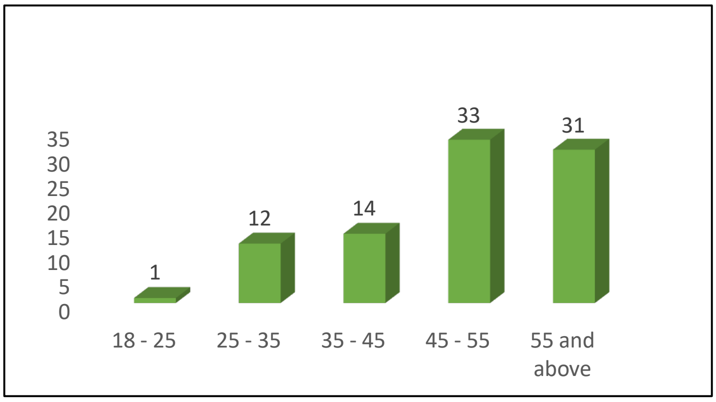

Figure 6.2: Age

6.2.3 Level of Education

Figure 6.3 shows the respondents' level of education. The results revealed that 50 (55%) of the respondents had a master's level of education. Those who had bachelors were 25 (27%) respondents followed by 10 (11%) respondents who had PhD and above. This characteristic means that the top management of the energy sector in Africa is dominated by individuals who have a postgraduate level of education, and therefore high-quality management skills. It means that the respondents could respond intuitively on issues regarding RPPs and institutions created to endure energy security.

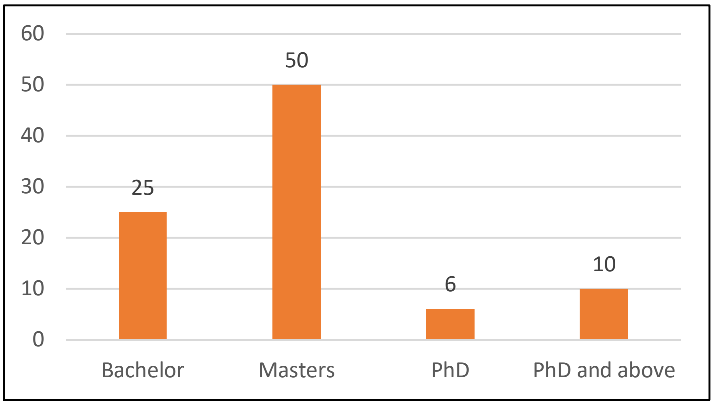

Figure 6.3: Level of Education

6.2.4 Organization

Table 6.1 shows the respondents' organisation. Respondents were distributed across governmental, intergovernmental, business, academia, international non-governmental/civil society, local/governmental/civil society, and civil societies. From the findings, it was revealed that over three quarters, 77 (84.6%) of the respondents were mainly from four organisations. The organizations include governmental (26%), intergovernmental (24%), business (14%) and academia (20%). This means that other organisations like international non-governmental/civil society, local/governmental/civil society, and civil societies, do not actively participate in matters regarding energy cooperation. Even if they participate, they are in the off-grid or smart grid energy business which forms a small portion of the energy supplied in Africa and relatively detached from the grid-based system the study is anchored on. It implies that the sector has stakeholders who have the capacity and technical know-how on the generation, transmission, and distribution of energy at the core of this study.

Table 7 Organizations Involved in the Study

Organisation	Freq	Per cent
Governmental	24	26.37
Intergovernmental	22	24.18
Business	13	14.29
Academia	18	19.78
International Non-Governmental/Civil Society	6	6.59
Local Non-Governmental/Civil Society	4	4.40
Civil Society	4	4.40
Total	**91**	**100**

6.2.5 Regional Power Pool

Figure 6. 4 shows the respondents' RPP. Respondents were distributed across the regions, including the EAPP, the SAPP, or other regions. The results revealed that the majority, 40 (44%) of respondents, were from the EAPP region, whereas 28 (31%) of the respondents were from the SAPP. In addition, 11 % of the respondents are from countries that are members of the EAPP and SAPP. The responses from overlapping memberships enhanced the objectivity of the comparison on the contribution of the contribution of the two power pools to the realisation of regional energy cooperation in their respective regions. The study also incorporated responses from countries that are power pool members in other parts of Africa, 14 %, to enhance the generalisability of its findings.

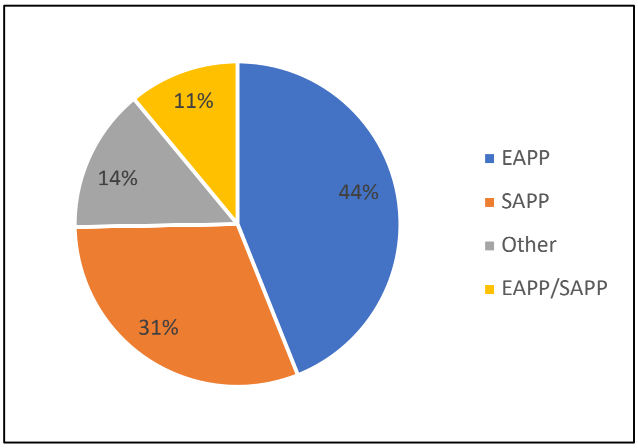

Figure 6.4: Distribution of respondents across the power pools

6.3 Energy cooperation and sustainable economic development in Africa

The section analyses the respondents view on the role of energy for sustainable development and if energy cooperation is the preferred approach to provide adequate, affordable, and sustainable energy. As indicated in the literature, a significant rise in energy demand without any notable increase in the supply side disrupts the energy market, thus threatening energy security and consequently impacting developing economies. On this basis, energy cooperation and interdependence have been promoted as a panacea of solving the energy security challenges and contribute for the attainment of sustainable development. The study sought the extent to which energy cooperation played a big role in enhancing sustainable economic development in the respondents' opinion as captured in the first research question. The hypothesis was stated as; “energy cooperation leads to sustainable development in Africa.”

Figure 6.5 shows findings regarding the respondents' views on the fact that energy is a prerequisite for sustainable economic development. Over three quarters (76%) of the respondents strongly concurred that energy is a prerequisite for sustainable economic development. Only 8% strongly disagreed with the statement.

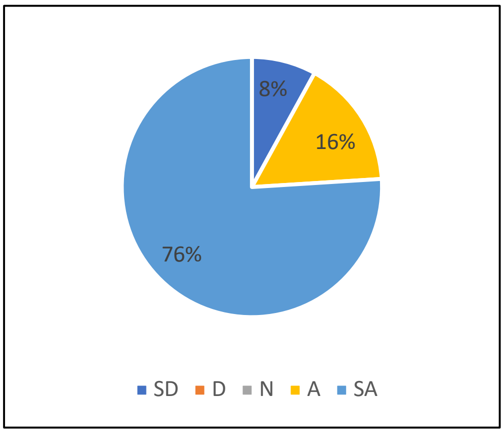

Figure 6.5: Energy is a prerequisite for sustainable economic development

Figure 6.6 shows results regarding the respondents' views on the fact that Africa’s economy is supplied with adequate energy. About 52% of the respondents disagreed or differed on the adequacy of energy supply for Africa’s economy, respectively. Only 8% strongly agreed with the statement, with 12% being neutral and 4% agreeing with the statement.

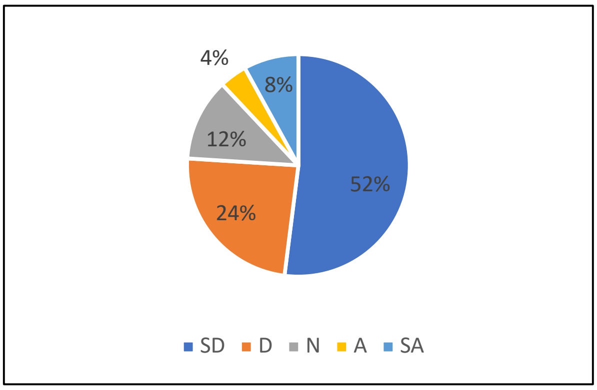

Figure 6.6 Africa’s economy is supplied with adequate energy

Figure 6.7 indicates findings regarding the respondents' views on the fact that Africa can meet all the energy it needs (agriculture, transport, industry, commercial, households, among others) from its indigenous resources. The responses, as can be observed, were distributed almost equally. Over half, that is 52% of the respondents, concurred with the assertion. On the other hand, 48% of the respondents strongly disagreed with the statement, with only 4% being neutral. It can be inferred from these responses that Africa has adequate energy resources for its use.

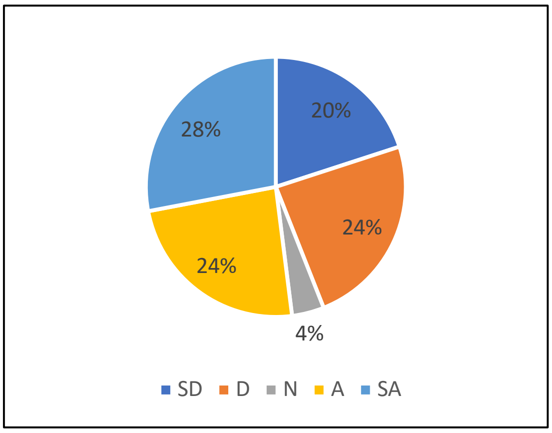

Figure 6.7: Africa can meet its energy demands from their indigenous resources

Figure 6.8 indicates findings regarding the respondents' views on the fact that energy cooperation/integration is necessary for energy security and socio-economic development in Africa. From the results, 96% of the respondents concurred with that fact. On the other hand, only 4% of the respondents strongly disagreed that energy cooperation/integration is necessary for socio-economic development in Africa.

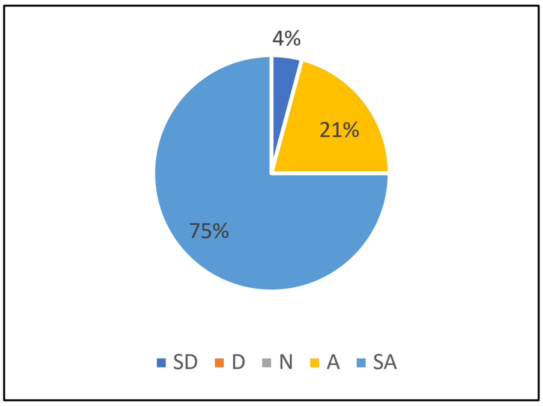

Figure 6.8: Energy cooperation is necessary for socio-economic development in Africa

Figure 6.9 indicates findings regarding the respondents' views on the fact that energy cooperation/integration is flourishing in Africa. From the results, 56% of the respondents believed that energy cooperation/integration is flourishing in Africa, whereas 28% of the respondents differed with that fact. Those who strongly disagreed with the statement were 4%. About 12% of the respondents were neutral that energy cooperation/integration is flourishing in Africa.

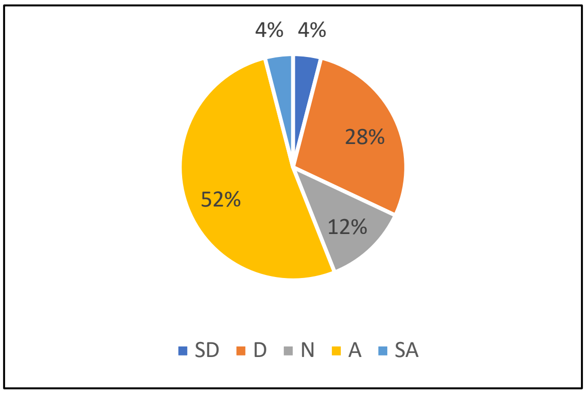

Figure 6.9: Energy cooperation is flourishing in Africa

The study further analysed data presented into means and standard deviation to determine which factors supported the hypothesis that energy cooperation led to sustainable economic development. The results are as shown in Table 6.2.

Table 6.2: Energy cooperation and Sustainable Economic Development

Statement/Question	**Mean**	**STD**
Energy is a prerequisite for sustainable economic development	4.52	1.122497
Africa’s economy is supplied with adequate energy	1.92	1.255654
Africans can meet all the energy they need (agriculture, transport, industry, commercial, households, among others) from their indigenous resources.	3.16	1.572683
Energy cooperation/integration is necessary for socio-economic development in Africa	4.625	.8753881
Energy cooperation/integration is flourishing in Africa	3.24	1.051982
Average mean score	**3.493**	**1.175641**

From the table above, the statements, that is; energy is a prerequisite for sustainable economic development, and energy cooperation/integration is necessary for socio-economic development in Africa, had the highest means that is 4.52 and 4.625 respectively. The means were also more than the average mean score (Mean=3.49), implying that the energy factor contained in these statements positively impacted sustainable economic development. Their standard deviations were 1.1 and 1.3, respectively, implying some variation in the responses. On the other hand, the statement which stated that energy cooperation/integration is flourishing in Africa had a mean of 3.24 with a standard deviation of 1.1, whereas the statement; Africans can meet all the energy it needs (agriculture, transport, industry, commercial, households, among others) from their indigenous resources had a mean of 3.16 with a standard deviation of 1.6. In addition, the statement that is Africa's economy is supplied with adequate energy had a mean of 1.92 with a standard deviation of 1.3. These last three statements had their respective means being less than the average mean score, implying that they negatively supported the fact that energy cooperation impacted sustainable economic development.

From the findings presented in Table 6.2 above on whether Africa's economy is supplied with adequate energy, interviews conducted saw most respondents either disagreeing or strongly disagreeing with the statement. The study further requested the respondents to identify the major causes of inadequate energy access in Africa. Several themes emerged, including political, institutional, and financial constraints, poor legal framework, and insufficient capacity (inadequate skills). One of the respondents said that,

> *"Lack of investment in new energy infrastructure and lack of ability to prepare projects for funding as well as political will largely contribute to inadequate energy access in Africa."*

Another respondent believed that,

> *"There is inadequate capacity, mismanagement, inadequate skills, as well as corruption."*

While a key informant stated that,

> *". . . there is lack of funds by the National Governments and also lack of a conducive and enabling framework to attract international capital."* (KII, 06)

However, some respondents had cross-cutting issues. For example, one respondent said that

> *". . . there is lack of financial capability to generate, distribute, and connect to end-users, lack of coordinated effort within the continent to tap into the existing potential, issue of low demand due to smallness of most African economies - at night available power is idle, some countries do not have natural resources to generate power, political instability among others."*

From the literature, the findings obtained herein are reaffirmed in a study conducted by Yergin[479] on factors affecting global energy interdependence within the existing energy markets. It was also revealed non-market determinants, including fears of supply disruption and politics-oriented decision making, were significant challenges.

Following the interview conducted on the key informants, the researcher was interested in elucidating the challenges of the realisation of the energy dimension of AU 2063. The key informant noted that,

> *"Those are complex; there are multiple challenges; let me address it from the context of continental masterplan perspective; first, most of our energy sources are concentrated in specific regions; and those regions have very low electricity demand, so if you are to develop those resources, they would deem unthinkable because there is no proven demand from those areas; for example, 25,000 MW hydropower potential in Ethiopia as well as the 100,000 MW of hydropower potential in DRC" (KII, 01)*

If those countries are to develop the resources, it would only make sense in the context of regional and continental markets. However, in a situation where most of the regional markets are not well established, it is difficult to come up with bankable projects unless those markets are well structured and developed. The same key informant affirmed that,

> *"…that is why we are working towards operationalisation of regional markets that we can be able to exploit all our energy resources for economic development in the continent; second, the policy and legal framework within the countries, as you would appreciate, in most cases utilities are bundled and does not allow for private sector participation; and in some cases, those utilities are charging sub-economic tariffs making them un-creditworthy and unable to attract the necessary capital to invest in the energy sector"* (KII, 01)

There must be some energy sector reforms to unbundle those utilities with vertical integration and forge horizontally integrated systems that encourage the private sector to participate in power generation and transmission. With a single buyer and vertically integrated energy systems, the private sector, especially foreign investment, will not be encouraged to participate unless governments guarantee. Nevertheless, if governments guarantee in a "*take or pay*"

[479] Daniel Yergin, *The Quest: Energy, Security, and the Remaking of the Modern World* (New York: Penguin Press, 2011).

process and so if the grid is unreliable, the governments will shoulder the cost of production and transmission, thereby creating a fiscal burden on themselves. These challenges hinder the growth of the energy sector in Africa. Regional energy integration, preferably through power pools, encourages the private sector investment to alleviate the mentioned challenges.

In contrast to the information and communication sector, especially before the advent of the mobile telephony sector, fixed lines made it difficult for people to access telecommunication due to the monopolies. However, as soon as the governments opened the sector to private investor participation, the private investors sign direct contracts with their customers. There was a revolution in the sector, and everyone got access to a mobile telephone and broadband internet because of the sector's opening. However, the energy sector is a bit different from the telecom sector. An appropriate balance should be kept between encouraging private investment with the objectives of the public sector. The telecom sector mainly targets the local market, whereas the energy sector, with the advent of regional integration, targets regional markets. Above all, Africa must find a way to ease its dependence on international financiers. It is on this basis that the key informant observed that,

> *"I think the same has to be done in the energy sector so that we can then bring in the private sector investment, innovation, competition in the sector so that we would be able to build a sustainable sector; however, there are a lot of political issues to be considered but I think we need to reach a level where we can balance private sector interest and public sector interest so to attract investment into the sector; the way we are financing the energy sector; borrowing money from the international financial market comes with all its conditions and yet our power purchase agreement is denominated in local currencies; so we have to depend on our export earnings to be able to pay up these loans; so instead of taking advantage of the required investment in infrastructure and energy to develop our capital markets."*
> (KII, 01)

The study probed the major impact of inadequate energy access in Africa. From the findings, respondents believed that insufficient access to energy could cause poverty or poor living standards. This could be associated with the fact that livelihood depends on energy. Specific impacts as presented by the respondents include poor standards of living (poverty, environmental degradation), low economic development, and high cost of energy[480]. The study

[480] Via principle of demand and supply

specifically evaluated views of respondents on such issues, and one of the respondents was of the view that,

> "*…the privileged have access to energy (wealthy, urban, business-oriented groups, for example), and the rest will have to wait for their time. The correlation between increased energy availability and distribution and economic development exists but still needs more research to make it sound. Related to that: in my opinion, and visible in the Nile Basin, the correlation energy-development is still incipient and used for political purposes, which beats the purpose.*"

The challenges mentioned above, almost all respondents assert, can be addressed by embracing energy interdependence and integration.[481] Energy interdependence has become a viable alternative towards affordable and sustainable energy, considering the unattainability of supplying energy using domestic resources and the opportunities for economic integration.[482] The respondents were requested to provide alternative solutions that the states should follow to provide adequate energy supply for their economies. As revealed in several pieces of literature, several alternatives could be pursued to energy security.

By way of suggesting a solution to the prevailing energy poverty and based on the findings in Table 6.2, the study established that energy is a prerequisite for sustainable economic development and the fact that energy cooperation/integration is necessary for socio-economic development in Africa. These statements recorded significant mean values, which were above the average mean score. On the same basis, this study has provided several suggestions as presented by the respondents and merged them into key themes. First, there is an option to work with an off-grid alternative. The second alternative is to embrace regional trading mechanisms, regional energy cooperation, and resource mobilisation. The third aspect is an attempt to 'go green' or embrace renewable energy resources. Lastly, some respondents believed that there is a need for states to adopt innovative business models, embrace research and development, evaluate their distribution channels, and pursue a deliberate policy to encourage private sector investment.

From the findings, one of the key informants asserted that,

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[481] Robert Bryce, 'Energy Security Means Energy Interdependence', 24 September 2009, 15.

[482] World Energy Council, *Regional Energy Integration in Africa: A Report of the World Energy Council.* (London: World Energy Council, 2005).

"*… there is need for inter-country cooperation to tap into those with huge potential in this area like Ethiopia, Congo; explore green energy* solutions *such as geothermal for countries like Kenya, wind energy, solar, nuclear among other green solutions… go for innovative financing alternatives such as green bonds*." (KII, 06)

Indeed, energy interdependence has been championed as a suitable panacea to energy security, especially when it widens opportunities for energy trading. The study further revealed from another respondent that,

"…for a strong economic and industrial development, classical solutions would be needed (local industrial production of energy equipment*, development of transmission and distribution). Innovative solutions like small grids and similar (and accompanying financing schemes) can be suitable for smaller and/or remote areas...."*

The respondent was still of the view that,

"*…major shift in economic activities requires stable and reliable, competitive energy and electricity supply.*"

Literature demonstrates that there are daunting challenges to regional energy integration in Africa. On this basis, the study sought to understand from the respondents the alternative solutions that Africa should use to provide adequate energy supply for their economy if indigenous resources cannot adequately supply energy to their economies. The respondents believed that the states could adopt a regional approach (market and investment), invest in renewable energy, invest in energy infrastructures, and embrace energy integration through power pools (energy trade, cooperation, importation), among other measures.

One of the respondents said that,

"The natural resources wealth of Africa is immense. Investment in infrastructure has to take place, to support and stimulate economic activity."

Another respondent asserted that,

"Well, energy markets are not just regional... although other parts of the world show it (Europe and in particular Northern European countries)."

The same respondent went on to pose a question,

"…Is Africa prepared for that? Anyway, without continental and regional effective cooperation, it is expected that nothing will move fast in the short-term period?"

From the key informant interview, the study sought to explore the role of energy in the realisation of Africa's Agenda 2063. Just like the above respondents, the study participant reiterated by asserting that,

"All infrastructures are essential for economic development, but energy is the driver of industrialisation and economic development, and without energy, I don't think we can meet most of our aspirations; the things that need to be done; energy is critical to what we want to achieve in Africa, economic development, industrialisation, employment creation, for operationalisation the AFCFTA, because if we don't produce goods and services there is nothing to trade; it is essential for all economic competitiveness…" (KII, 07).

However, the respondent suggested that energy must be affordable, reliable, and sustainable in terms of supply. Available statistics show that there is a correlation between energy consumption per capita and the poverty level. In most developed countries, there is higher energy consumption per capita, whereas most Africans have low energy consumption per capita. Therefore, from the preceding discussions, there is a need to have affordable and reliable energy for industrialising the continent.

For the successful realisation of the AU Agenda 2063 and beyond, regional cooperation in planning and implementing energy programs is required. There has been a keen interest to prioritise energy in the development space at the country level that many African countries have increased investment in the electric sector.[483] Compared to the 21st century, there was limited investment in the energy sector in many parts of the continent because energy was not yet regarded as a critical priority for development. However, several factors, including the series of United Nations conferences on environment and development, have contributed to the prioritisation of energy investment witnessed in the 21st century.

Similarly, as much as regional energy cooperation is dubbed as the approach Africa must pursue to energy security, the absence of a regional framework hinders its implementation. Ministerial and inter-ministerial meetings, for example, in several parts of Africa, had started. Several discussions on regional energy cooperation were registered at the heads of state level

[483] Anton A. Eberhard, ed., *Africa's Power Infrastructure: Investment, Integration, Efficiency*, Directions in Development. Infrastructure (Washington, D.C: World Bank, 2011).

in the EAC and SADC regions, and these discussions recognised the need for a regional cooperation framework. Though the SADC region embarked on a regional energy integration project in the late 1990s, it is only in the 2000s that issues pertaining to energy cooperation or power pooling started to come out seriously in different parts of Africa, often to interconnect the different energy markets in the continent. On the role of regional power pools in the attainment of energy cooperation in Africa, a key informant explained:

> *"In terms of the critical role [power pools] are playing, one is an investment. The first thing investors consider before agreeing to invest in the energy sector, for instance, on generation, is the availability of a large market, preferably regional ones, to absorb the produced energy. In this regard, encourage private sector investment as RPPs facilitate access to regional markets. Other contributions include joint regional planning, particularly in the transmission networks and, to some extent, generations. An example could be EAPP and SAPP where a transmission masterplan connects Eastern DRC to Egypt as one regional market."* *(*KII, 05*)*.

On the question of infrastructure, the researcher posed the same to one of the FGDs with a key interest of understanding how Africa's regional integration in the energy sector can bring radical change in intra- regional economic communities and intra-Africa trade that leads to sustainable economic growth. Most of the investments are geared towards enhancing the generation capacities of the respective countries, with little attention to the development of regional transmission networks. The FGD noted that,

> *"In terms of energy, African countries over the past years have focussed too much on generation, but what lacks is the proper transmission and distribution infrastructure for energy access to places where it is needed."* (FGD, 01).

The development of regional transmission networks also requires harmonisation for the successful realisation of power pooling objectives. The FGD indicated that the RPPs are now geared towards harmonising grid codes since countries have different sets of rules, qualities, and standards. So, model regional grid codes and compliance programs were developed by some of the RPPs, and countries to accept some of those standardisation and harmonisation issues. One research participant also asserted that:

"If you go regional, you cannot do that because how do you transfer power from country A to country B if they do not have at least comparable quality standards and grid code" (KII, 05)

As the second chapter noted, "energy is the bedrock of any society, a fuel to an economy, and a crucial currency in international politics." Energy plays an essential role in sustainable development. As per the data analysed in this study and supported by literature, the African continent has tremendous natural resources to energise sustainable development. Nevertheless, access to energy in the continent is the lowest compared to any other region globally. Considering the distribution of energy resources and capabilities to harness them, Africa embraced a path to energy cooperation and interdependence. In so doing, the continent pursued a regional approach to energy sector development through its Union, regional economic communities, and power pools. The regional approach to energy security revolves around energy trade and integration, where institutions play a significant role.

According to Keohane,[484] the establishment of institutions is a crucial achievement for liberal institutionalists because the world decides to tackle pressing energy security issues by embracing interdependence and cooperation anchored on the role of institutions. The implementation of the energy dimension of the AU Agenda 2063 requires the active participation of regional institutions with the ultimate objective of promoting energy cooperation as the modus operandi. Thus, regional institutions such as the African Union Energy Commission (AFREC), the African Union Development Agency (AUDA), and the African Union Commission on Infrastructure and Energy (AUCIE) work to implement the energy dimension of the AU Agenda 2063, mainstreaming energy cooperation as one. The emergence of regional energy-related institutions, such as power pools, demonstrates Africa's unwavering belief in the capability of institutions to realize energy security. Institutions have been entrusted with a significant role. For example, Aspiration 1 of the AU Agenda 2063 explicitly mentions institutions' centrality to fulfil all the sustainable development objectives, including energy security. However, such cooperation and economic integration requires the pooling of sovereignty, competent regional institutions, a significant investment, and a high collective mutual trust level.[485] In light of such an understanding, the African Union and its

[484] Robert O. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton, N.J: Princeton University Press, 1984).

[485] Daniel Yergin, 'Ensuring Energy Security', 28 January 2009, https://www.foreignaffairs.com/articles/2006-03-01/ensuring-energy-security.

member states pursue energy cooperation as a viable route to avail affordable, reliable, and sustainable energy for implementing Agenda 2063 and beyond. The role of regional institutions in implementing regional projects and administering emerging relations is paramount. Regional institutions – taming national rivalries, distrust, and disunity – contribute to developing the political will.[486] In this aspect, political will plays a vital role in forging energy integration. Lack of it translates into delays and constraints that thwart all the promises of regional energy integration.[487] Also, achieving sustainable energy integration requires coordination among entities in the energy value chain. Regional institutions are needed as market operators, system operators, and regional regulators to bridge the gap between national institutions involved in regional energy integration.[488] Therefore, the study concludes by affirming the set hypothesis that energy cooperation leads to sustainable economic development in Africa and that institutions play a paramount role in the process.

6.4 Regional Power Pools and Energy Security in Africa

The previous section analysed the relationship between energy and sustainable development and concluded by confirming the crucial role energy plays in attaining sustainable development. It also affirms that energy cooperation or integration is the most feasible approach to ensure adequate supply of energy at a reasonable price to effect sustainable development. From the first objective, the study concluded that institutions are sustainably significant in managing pressing energy security issues by embracing and mainstreaming interdependence and cooperation. Capitalising on such a background, this section analyses the respondents view on the role of institutions, in particular power pools such as EAPP and SAPP, in tackling energy security challenges and the development of energy-related norms and rules in their respective regions.

From the literature, it was asserted that building an energy security regime on issues of mutual interest is indispensable in making interdependence work. It was further claimed that energy security regimes, as manifestations of institutionalised energy cooperation mechanisms, set rules and regulations, correct market failures, and provide adequate information for energy decision making. In this case, therefore, two research questions posed include seeking to

[486] M. P. Niyimbona, 'The Challenges of Operationalizing Power Pools in Africa', *UNDESA Seminar on Electricity Interconnection*, 19 June 2005.

[487] UNECA, 'Assessment of Power Pooling Arrangement in Africa' (UNECA, 2004).

[488] Anton Eberhard et al., *Africa's Power Infrastructure: Investment, Integration, and Efficiency* (Washington, D.C: The World Bank, 2011).

understand how the two regional institutions (the EAPP and the SAPP) ensure energy security in Africa.

To achieve this, the study in the methodology articulated the interlinkage between institutions, energy cooperation and energy security. It is argued that the formation of various international institutions is mainly to facilitate intergovernmental energy cooperation, but with no significant success due to the challenges posed by energy price volatility, protectionism, and securitisation. The study examined how the respective regional power pool(s) contributed to energy cooperation with a view to ensuring securitisation.

Figure 6.10 shows the results of the views of the study participants on whether regional power pools enhance/facilitate access to electricity in Africa. From the findings, over three quarters, that is 77% of the respondents, agreed in both forms that regional power pools enhance access to electricity in Africa. About 9% disagreed and strongly disagreed in equal measure. Only 5% were neutral on the statement.

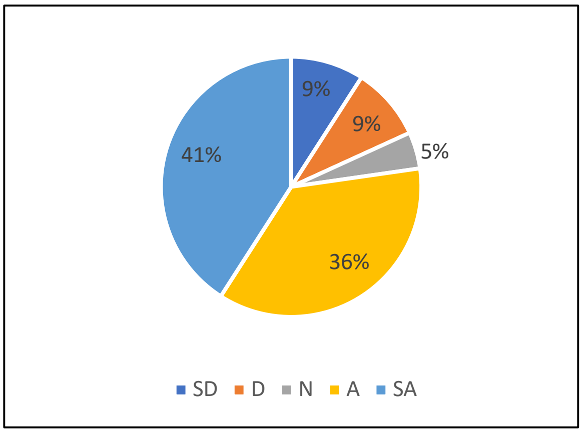


Figure 6.10: Regional power pools facilitate access to electricity in Africa

Figure 6.11 indicates data on the views of the study participants on whether regional power pools play a significant role in harmonising regulations, standards, and technical guidelines to provide affordable, reliable, and sustainable energy to the nation. The study revealed that 82% of the respondents agreed that RPPs contribute critically to harmonise regulations, standards, and technical guidelines to provide affordable, reliable, and sustainable energy to the country. Those who disagreed and strongly disagreed were at 9% respectively.

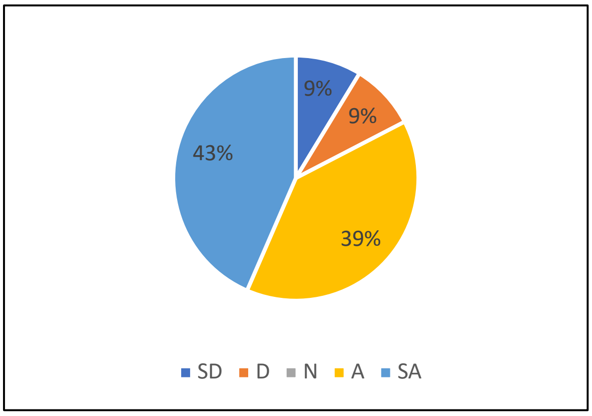


Figure 6.11: RPPs harmonise regulations, standards, and technical guidelines

Figure 6.12 presents data on the views of the study participants regarding whether regional power pools play a significant role in providing uninterrupted energy to customers. The data indicates that 30% of the respondents strongly agreed while 22% just agreed with the statement-making those who concurred to be 52% of the total respondents. The respondents with neutral views constituted 22%, while those who disagreed and strongly disagreed constituted 17% and 9% respectively.

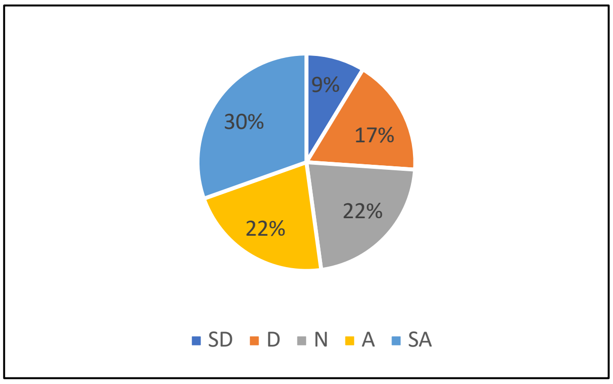


Figure 6.12: RPPs play a significant role in providing uninterrupted energy to customers

Figure 6.13 presents data on the views of the respondents on the fact that RPPs play a significant role in promoting renewable energy investment in Africa. The data revealed that 42% and 38% of the respondents strongly agreed and agreed respectively, making those who concurred overall to be 80% of the total respondents. On the other hand, 12% of the respondents strongly disagreed. Only 4% of the respondents were neutral, and another 4% of the respondents disagreed with the statement that RPPs play a significant role in promoting renewable energy investment in Africa.

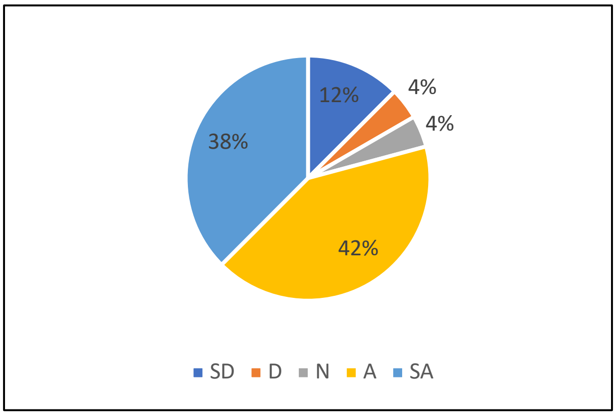


Figure 6. 13: RPPs play a significant role in promoting renewable energy investment in Africa

The data as displayed in this study illustrates that RPPs are institutions working to forge energy cooperation in Africa, a prerequisite for energy security in the continent. It is important to underscore the fact that many regional institutional attempts have been made in several parts of the world to intervene in the energy security dilemma. From the literature, African, Asian, and European countries proposed and embraced numerous regional institutions to promote energy cooperation and interdependence as a roadmap towards energy security. A case in point is the regional power pool arrangements in Africa. Thus, the liberal institutionalist theory of international relations, whose founding blocks are states, institutions, and interdependence, can sufficiently explicate the institutional approach that countries in the Eastern and Southern Africa regions embraced through the formation of regional power pools. The theory is also in line with the findings obtained in the study.

As indicated in table 6.3, the study required participants to establish the contribution made by the RPPs towards energy cooperation in Africa. These were meant to establish and conclude exhaustively on the hypothesis of this study that regional power pools lead to energy security in Africa. Overall, the results showed an average mean score of 3.79, which was approximately 4.0, implying that the respondents agreed with most of the items regarding the contribution of RPPs to energy cooperation in Africa.

Table 6.3: The interlink between RPPs and energy security

Statement/Question	**Mean**	**STD**
Regional power pools enhance/facilitate access to electricity in Africa	3.909091	1.305997

Regional power pools play a significant role in harmonising regulations, standards, technical guidelines to provide affordable, reliable, and sustainable energy to the nation	4.0000	1.279204
Regional power pools play a significant role in providing uninterrupted energy to customers	3.478261	1.343996
Regional power pools play a significant role in promoting renewable energy investment in Africa	3.875	1.329024
Average mean score	**3.815588**	**1.314555**

From the above table, the statements including regional power pools enhance/facilitate access to electricity in Africa; regional power pools play a significant role in harmonising regulations, standards, and technical guidelines to provide affordable, reliable, and sustainable energy to the nation; as well as the statement alluding that regional power pools play a significant role in promoting renewable energy investment in Africa were indicative of a strong belief that regional power pools are key to the achievement of energy security in Africa. This is because their respective means (M=3.9, STD=1.3; M=4.0, STD=1.3 and M=3.9, STD=1.3) respectively were higher than the average mean score of 3.8. On the other hand, the statement that regional power pools play a vital role in providing uninterrupted energy to customers with a mean of 3.5 and a standard deviation of 1.3 was found to indicate the unreliability of energy security in Africa. This is because the corresponding mean of 3.5 was less than the average mean score.

The study probed further to understand if energy cooperation/integration is necessary for socio-economic development in Africa. Various strategic/political and programmatic directions were proposed. Among the main strategic moves that were highlighted include strengthening of regional power pools, harmonised policy, and regulatory frameworks. Some respondents were of the view that there is a need for generating and transmitting projects, renewable technologies, and regional energy eco-systems. Specifically, one of the respondents observed that:

> *"What is needed is regional systems between generators, regulators, rural electrification agencies, and sustainable energy centres, preferably championed by power pools."*

Another respondent emphasized the need for:

> *"Strengthening regional institutions capable of forging energy cooperation such as power pools."*

Capitalising on the previous assertions that institutions such as power pools play a key role in forging energy cooperation as a means of achieving energy security, the researcher sought to understand whether Africa has pursued the right approach to energy cooperation and if RPPs can deliver during several interview sessions with key informants. Here is what one of the respondents stated:

> *"…power pooling is the way to go; there is no way to explore our energy resources without regional electricity market; so when you look at the examples of the successes of SAPP in that they have been able to set up a market which is operational . . . the arrangement encourages innovation in terms of financing models also technological innovations to bring down the cost of energy so that we become competitive; and the opportunity now, if you look at the revenues that SAPP coordination centre is getting from their market is making them increasingly self-sufficient, and they can finance their own operations . . ." (*KII, 02*)*

The participant affirmed the centrality of regional power pools; however, they acknowledged that the only problem likely to be faced is associated investment or financial model in the regional market. Considering this, another study participant remarked

> *"..imagine if that market grows, they will be able to raise enough revenue to be able to directly invest in the infrastructure necessary to integrate the region fully in power transmission; there is that great opportunity for it to happen; however, when you look at other power pools that are lagging behind and the financing models that we are using to set them up in the long term it will mean that it may take us a long time before we get to the level of SAPP" (*KII, 08*).*

Further, the researcher asked another key informant to elucidate the role of regional power pools in the attainment of energy cooperation in Africa. This was the response:

> *"The role of power pools is to create opportunities for members to engage; also, to provide an opportunity for power utilities to enter into various kinds of contracts; facilitate both bilateral and regional energy cooperation; at a regional level we also go beyond and engage with other power pools…" (*KII, 04*).*

Further, the study evaluated the role of regional institutions in addressing energy security to its member countries. One of the key informants interviewed viewed energy security as an implied outcome of several activities at a national and regional level. A specific response is stated below:

"…to be frank, that is why I was part of EAC; we developed a regional framework for energy security policy at EAC level because we try to cross-reference any prior work and completely there was nothing at country or regional level. Before regional power pools become the dominant regional energy security entities, energy security has not been a central focus of country or regional level cooperation; it was more focused on increasing generational capacity, interconnection in the access and such kind of issues, which of course, would have implications to energy security in a positive way, and it is the stated mandates and the activities under the power pools that brought the energy security agenda at the regional level" (KII, 05).

Energy security was not a regional agenda. It was mentioned as a form of justifying some actions but not really the driving factor as can be observed, for instance, in the case of EU where energy security in the electricity sector is crucial, measured and monitored. From the key informants, it could be gathered that countries have viewed energy security mainly as something to be achieved at the country level, which is a constraint for regional cooperation. That is why there is an over-investment in generating capacity in countries even when the per-unit cost of producing electricity is much higher than in the neighbouring country. There is so much evidence indicating that countries are still perceiving energy security as a national requirement as opposed to developing a regional approach [489] Energy cooperation must go with the level of perception in comfort with regional solutions, yet it is not at the level of joint energy security planning that touches upon both generation and transmission aspects of energy security. One of the respondents stated that,

"In this sense, I can say still there is a limitation at the country level; countries have done a lot of work particularly in generation expansion, access interconnection between different regions and the states but not with energy security as a central focus but has positive implications nevertheless; so energy security achievement at the country level – considering the subject of energy security, I would say, still requires at the level developing nations strengthening which in many cases is absent; if you look at national energy policies, energy

[489] Alfonso Medinilla, Bruce Byiers, and Karim Karaki, 'African Power Pools: Regional Energy, National Power' (ECDPM, February 2009).

security is mentioned in a paragraph in many cases as a pass by; regionally that framework for every security is absent; unfortunately, as I say, we try to develop in EAC, that was more or less the first attempt to conceptualise energy regionally; bringing regional power pools, I am not sure if RPPs broke that problem of creating confidence for countries to produce security regionally." (KII, 05).

The prioritisation of the individualistic approach on the generation aspect of energy security has hampered the development of regional cooperation on energy, and the benefits related to the latter could not be achieved. On regional power pools in Africa, there is the presence of the foundation already laid, and there is a great opportunity and potential for regional markets, especially if the unexploited resources are considered on the continent. The argument is that the African regional power pools have vast opportunities, and their advantage is associated with the "benefit of a latecomer" because they are developed especially after different models pioneered in North America, Europe, and China. From the interviews conducted, the respondents concur that as markets in Africa are being developed, there are learning opportunities from all those experiences useful for improvement so that better and efficient systems of electricity markets can be built. Accordingly, the findings from empirical research include the centrality of energy for economic growth and poverty reduction; power pools are vital drivers to energy integration and sustainable development, and there is an adequate political commitment to the establishment and development of RPPs. A study by UNECA (2014)[490] that examined the contribution of regional integration to economic growth and development in Africa acknowledged that lack of energy is a significant hurdle to socio-economic development in Africa. Considering the economics of regional integration, the report also recognised the crucial role RPPs could play in fostering cross-border electric trade.

6.4.1 How does the Eastern African Power Pool ensure energy security?

The EAPP is established to supply its region with affordable, reliable, and sustainable energy. The study, however, hypothesised that the EAPP's weakness is leading to energy insecurity in Eastern Africa.

Figure 6.13 presents data on the views of the respondents on whether the EAPP plays a role in contributing to increased access to electricity in their countries. The data revealed that 58% of the respondents agreed and strongly agreed in equal measure with the statement. These were followed by 28% of the respondents who never agreed, with 14% strongly disagreeing with the

[490] UNECA, 'Assessment of Power Pooling Arrangement in Africa'.

fact that the EAPP plays a role in contributing to increased access to electricity in their countries.

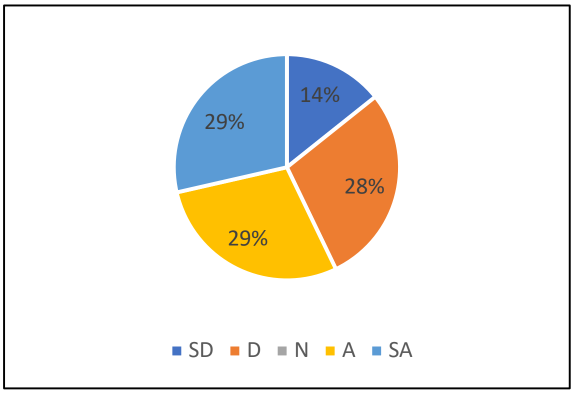


Figure 6.14: Role of EAPP in electricity access in your country

Figure 6.15 presents data on the views of the participants on the fact that the EAPP has the potential to play a key role in making energy affordable in their countries. The data revealed that 57% of the respondents agreed and strongly agreed with the statement. On the other hand, 29% of the respondents never agreed, with 14% being neutral.

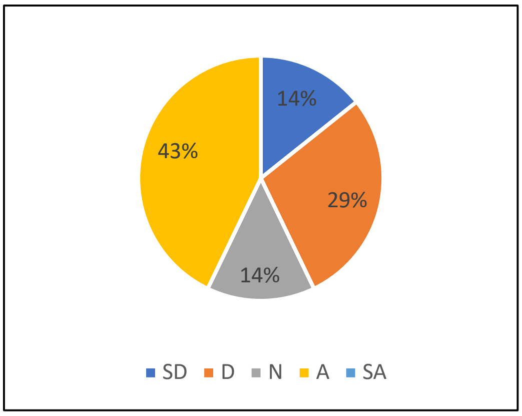


Figure 6.15: EAPP has the potential to play a key role in making energy affordable

Figure 6.16 indicates data on the views of the study participants on whether the EAPP has the potential to reduce blackouts and outages in their countries. The study findings revealed that those who strongly disagreed and those who strongly agreed were each 17%. Also, those who were neutral and those who just agreed on the statement were 33% each.

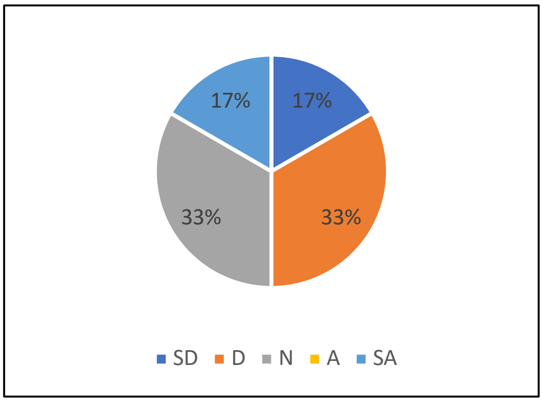


Figure 6.16: EAPP has the potential to reduce blackouts and outages

Figure 6.17 indicates data on the opinions of the respondents on whether the EAPP reduces energy rationing in their countries. The study findings revealed that those who strongly disagreed and those who strongly agreed were each 17%. Similarly, those who were neutral and those who just agreed on the statement were 33% each.

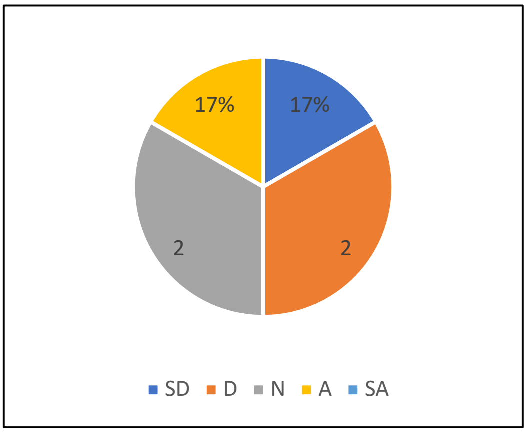


Figure 6.17: EAPP has the potential to reduce energy rationing

Figure 6.18 indicates data on the views of the study participants on whether the EAPP increases the utilisation of renewable energy sources in Eastern Africa. The study findings indicated that in almost equal proportion, some respondents strongly disagreed while others agreed, each at 14%. However, the majority, 43% of the respondents, and 29% of the respondents strongly agreed and were neutral, respectively.

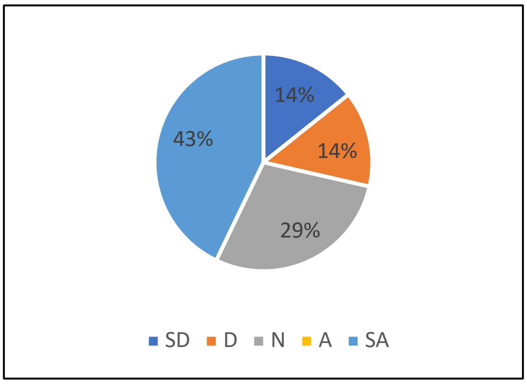


Figure 6.18: EAPP has the potential to increase utilisation of renewable energy

Further, the study calculated the means of the examined items from where the overall composite mean was computed. This aided in determining which aspects of the EAPP supported energy security in the region. Overall, the results showed an average mean score of 2.95, which was approximately 3.0, implying that the respondents were neutral on most of the items regarding the contribution of a regional power pool (EAPP) on energy insecurity in Eastern Africa.

Table 6.4: Eastern African Power Pool and ES

Statement/Question	**Mean**	**STD**
The Eastern African Power Pool (EAPP) plays a role in contributing to increases access to electricity in your country	3.285714	1.603567
EAPP has the potential to play a key role in making energy affordable in your country	2.857143	1.214986
EAPP has the potential to reduce blackouts and outages in your country	2.666667	1.36626
EAPP reduces energy rationing in your country	2.5	1.048809
EAPP increases the utilisation of renewable energy sources in Eastern Africa	3.428571	1.618347
Average mean score	**2.947619**	**1.370394**

Following the findings presented in the table above, the statements, including the East African Power Pool (EAPP) has the potential to contribute to increased access to electricity in member countries and the statement stating that the EAPP increases the utilisation of renewable energy sources in Eastern Africa was a positive implication on energy cooperation in Africa. This is because their respective means (M=3.2, STD=1.6; M=3.4, STD=1.6) were higher than the average mean score of 2.9. On the other hand, the statements which stated that the EAPP has the potential to play a key role in making energy affordable in their countries with a mean of 2.9 and a standard deviation of 1.2, the EAPP has the potential to reduce blackouts and outages in your country with a mean of 2.7 and a standard deviation of 1.4, and also the EAPP reduces energy rationing in their countries with a mean of 2.5, and a standard deviation of 1.05 were found to have a negative implication on the energy security in the EAPP region. This is because the corresponding means were less than the average mean score. Therefore, the study concludes that though the EAPP has the potential to contribute to the accessibility and sustainability aspects of energy security, it plays a marginal role in the affordability and reliability factors. As much as the EAPP, as a regional energy cooperation institution, can be regarded as weak, most of the energy insecurity challenges in the region have other sources such as lack of governance, infrastructure, and capital investment.

Literature has it that regional energy trade does not exist in Eastern Africa. In view of this, respondents were further requested to explain their understanding, and their views on the '*Bilateral energy trade is preferable to regional power trade in your region and the underlying reasons*.' One respondent said,

> *"The regional mechanism is not strong; there are several weaknesses; no regulatory body; no regional dispute settlement mechanism."*

Another respondent was so specific with reference to Libya that:

> *"Bilateral energy will increase investment but for Libya in a couple of years will introduce power covering shortage in the country and will have a chance in future to sharing other EAPP countries the power interchange."*

A respondent asserted that:

> *"In bilateral approach, the unknown is less; the bilateral approach is small, manageable, and predictable; second, we do not know what regional approach has; it has too many unknowns."*

Considering the above findings, the research concludes that bilateral electricity trade is the only mechanism in the EAPP region. The region has a number of bilateral electricity trade contracts between Egypt-Libya, Egypt-Sudan, Ethiopia-Sudan, Ethiopia-Djibouti, Ethiopia-Kenya, Kenya-Uganda, and Burundi-DRC-Rwanda and no regional competitive or cooperative trading arrangement mainly due to the inexistence of regional energy trade mechanisms that should be championed and governed by the EAPP. Therefore, the EAPP still lacks the overall capacity to institute a regional energy market so that it delivers on its mandate on providing access to affordable and clean energy.

6.4.2 Does the Southern African Power Pool ensure energy security?

Some regional power pools in Africa, including the SAPP, have evolved for decades. The SAPP started with relatively better interconnection than the EAPP. The SAPP has twelve member countries represented by their respective electric power utilities organised through SADC. Currently, there are nine countries that are already inter-connected apart from Angola, Tanzania, and Malawi. Thus, their priority is to integrate these three markets. Also of importance, the SAPP is now welcoming Independent Power Producers (IPP) to become full members.

The SAPP, a formation of SADC, is the oldest regional power pool in Africa. It is an established institution. Just like the EAPP, it was geared towards cooperating and coordinating the regional electricity planning and operation, facilitating energy trade in the region, promoting regional cooperation in power projects development, increasing energy access in rural areas, and attracting investment. It is hypothesised that the existence of a strong regional power pool results in energy security in Southern Africa.

Figure 6.19 presents data on the views of the study participants on whether the SAPP plays a role in contributing to increasing access to electricity in their country. The study findings indicated that 80% of the respondents strongly agreed with the statement, with 20% of the respondents only agreeing.

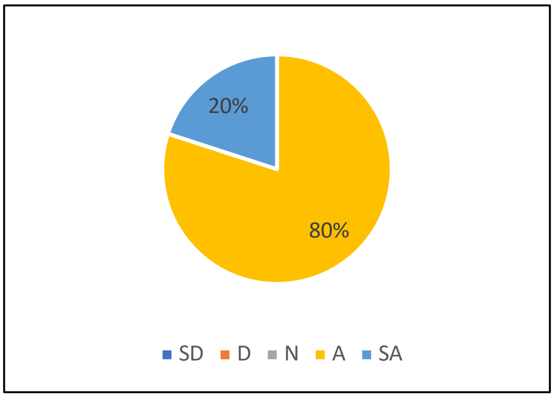


Figure 6.29: SAPP contributes to electricity access

Figure 6.20 presents data on the views of the study participants on whether the SAPP makes energy affordable in their country. The study findings indicated that all respondents (100%) strongly agreed with the statement that the SAPP plays a role in contributing to the affordability of energy in their country.

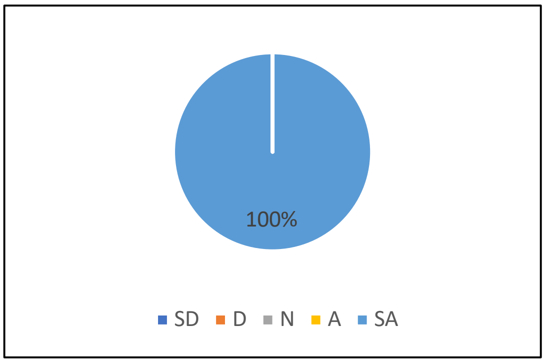


Figure 6.20: SAPP makes energy affordable in your country

Figure 6.21 presents data on the views of the study participants on whether the SAPP has the potential to reduce blackouts and outages in their countries. The study revealed that those who were neutral (40%) were equal to those respondents who just agreed (40%) with the statement. It was further shown that 20% of the respondents strongly agreed with the statement that the SAPP has the potential to reduce blackouts and outages in their countries.

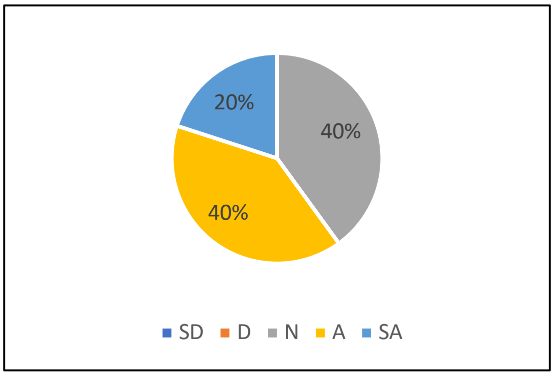


Figure 6.21: SAPP reduces blackouts and outages

Figure 6.22 presents data on the views of the study participants on whether the SAPP has the potential to reduce energy rationing in their countries. The study indicated that those who disagreed and those who were neutral were in equal proportions, that is 20%, respectively. The majority, 60% of the respondents, agreed with the statement.

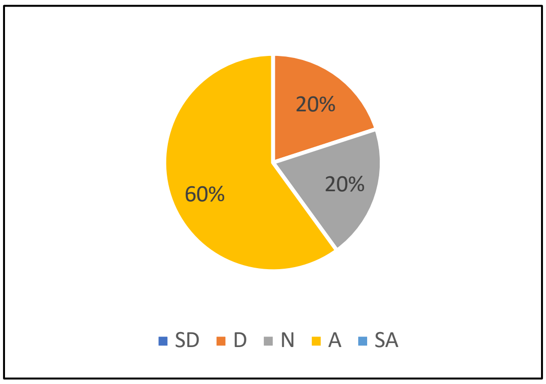


Figure 6.22: SAPP reduces energy rationing

Figure 6.23 presents data on the views of the study participants on the fact that the SAPP increases the utilisation of renewable energy sources in Southern Africa. The study showed that 80% of the respondents were neutral, whereas 20% disagreed with the statement that the SAPP promotes the usage of renewable energy sources in Southern Africa.

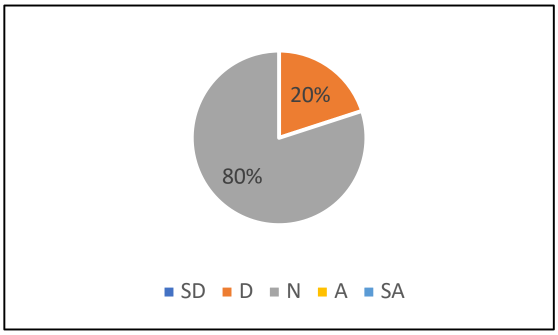


Figure 6.23: SAPP increases the utilisation of renewable energy sources in Southern Africa

In addition, the study computed the means and the standard deviations of the examined statements from where the overall composite means, and the corresponding standard deviation were computed. This aided in determining which aspects of the SAPP supported energy security in the region. Overall, the results showed an average mean score of 3.64, which was approximately 4.0, implying that the respondents concurred on most of the items regarding the contribution of the regional power pool (SAPP) on energy security in Southern Africa.

Table 6.5: Southern African Power Pool and ES

Statement/Question	**Mean**	**STD**
The Southern African Power Pool (SAPP) plays a role in contributing to increases access to electricity in your country.	4.2	.4472136
SAPP makes energy affordable in your country	4	0
SAPP reduces blackouts and outages in your country.	3.8	.83666
SAPP reduces energy rationing in your country	3.4	.8944272
SAPP increases the utilisation of renewable energy sources in Southern Africa.	2.8	.4472136
Average mean score	3.64	0.525103

Following the findings presented in the table above, the statements including the SAPP plays a role in contributing to increased access to electricity in your country, the SAPP makes energy affordable in your country, and the third one being the SAPP reduces blackouts and outages in your country had a positive implication on energy security in that region. This is because their respective means (M=4.2, STD=0.45; M=4, STD=0; and M=3.8, STD=0.84) respectively were higher than the average mean score of 3.64. On the other hand, the statement that the SAPP reduces energy rationing in your country had a mean of 3.4 and a standard deviation of 0.89, and secondly, the SAPP increases the utilisation of renewable energy sources in Southern Africa with a mean of 2.8, and a standard deviation of 0.45 were found to have a negative effect on the energy security in the SAPP region. This is because the corresponding means were less than the average mean score.

From the key informant interview, the study assessed the role of the SAPP in ensuring energy security to its member countries. On energy security planning in the SAPP, one of the study participants said that:

> *"What we have is an overall SAPP guide on how reliability is met; in the form of security criteria which is supposed to be met; what sort of generation capacity that is supposed to be met; generation mix; and the reserve margin" (KII, 04)*

On the status of operationalisation of the SAPP and perception or view on the progress, the same study participant affirmed that the SAPP has been in existence for a long period, that is more than 20 years. Though the SAPP started with existing bilateral contracts, it has developed various competitive electricity mechanisms that enable participants to trade electricity on a daily and monthly basis. The study further sought to understand, just like the case of the EAPP, why could bilateral energy trade be preferable or not preferable to regional power trade. Several responses were given. Some of them, for example, believed:

> *"Emphasis now is on the market-driven trade rather than bilateral, especially with the development of the Pool market."*

In addition, the researcher explored the role of energy integration for sustainable development and post-COVID19 economic recovery in Southern Africa. The FGD was requested to share the best practices and experiences of this power pool in the contribution of the regional integration of the energy sector to drive other catalytic sectors and sustainable economic growth in the Southern Africa Region. On post-COVID19 economic recovery, the FGD highlighted that:

> *"The Southern Africa energy sector has not been spared by the ongoing coronavirus pandemic, with both positive and negative impacts on efforts by the region to address power shortages. On the positive side, most countries in the Southern African Development Community (SADC) have experienced reductions in demand for electricity during peak hours due to lockdown measures. However, the negative impact of the pandemic is more worrisome, given the long-term implications of the lockdown measures on the ability of the SADC region to achieve energy self-sufficiency."* (FGD, 01)

The members of the SAPP created a common power grid between their countries and a common market for electricity in the SADC region. In terms of their mission, they aimed at providing the least cost, environmentally friendly, affordable energy, and increasing accessibility to rural communities. The FGD was asked to highlight the main strategies and roadmaps utilised by the SAPP to translate the vision of an integrated African Electricity market into action in that region. The same FGD noted that:

> *"As a strategy, electricity access should be holistic and not carried out in isolation. Another need is to move from a single-buyer model to a competitive electricity market. Also, to fast-track electricity access in rural areas."* (FGD, 01)

Considering the statistical findings, the research concludes that the SADC region is transitioning from cooperative to competitive modes of electricity trade. In this regard, the combined effort of the SADC and the SAPP have created the difference. Therefore, the SAPP is developing its overall capacity to institute a regional energy market so that it continues to deliver on its energy security mandate. The study agrees with the hypothesis that a strong regional power pool results in ES in Southern Africa.

Accordingly, EAPP has a potential to contribute to the electrification programmes; however, lack of available energy in the EAPP, a challenge that a regional power pool such as the EAPP is constituted to address, continues to hamper access to electricity, security of supply, and regional energy trade. On the other hand, the thorough implementation of power pooling in terms of regional energy trade and integration in Southern Africa region is attributed to the efficacy of SAPP. Therefore, it can be argued that strong power pools can contribute towards availing adequate energy to their member countries.

Also, ensuring reliable electricity supply continues to be a challenge where there is inadequate infrastructure development. Regional energy trade, facilitated by regional power pools, could enhance the reliability of the electricity supply by addressing the capital investment gap. Though there are several successful bilateral electricity trade arrangements in Eastern Africa, EAPP struggles to utilise these arrangements into developing a regional platform that horizontally integrates energy systems into proper pooling arrangements. A similar analysis of the Southern Africa region illustrates that SAPP managed to capitalise on the current bilateral energy trade arrangements to develop Africa's first competitive regional market, thereby ensuring a more reliable supply of electricity for the region.

When it comes to examining the roles of EAPP and SAPP in enhancing affordability of energy services, the analysis recognised the necessity of implementing cost-effective electricity tariffs and instituting an independent regulatory regime. Sustainability analysis of both EAPP and

SAPP confirmed that power pools could play a positive role by incentivising renewable energy sources. However, in the EAPP region, it is national initiatives rather than the EAPP that registered the encouraging development of renewable energy resources. On the other hand, SAPP's success in instituting a dedicated environmental sub-committee in its structure mandated with ensuring the sustainability of the energy systems in the region showed that power pools are best positioned to champion green energy resource development and contribute towards the environmental dimension of sustainable development.

In general, the analysis concludes that EAPP impacts its expanse in term of ensuring energy security whereas SAPP plays a crucial role in availing reliable and sustainable energy to its constituency. As contained in the second research hypothesis, the weakness of EAPP could not address energy insecurity in Eastern Africa, and the strength of SAPP contributes to enhanced energy security in Southern Africa.

6.5 Challenges and opportunities for implementation of power pooling in Eastern and Southern Africa

Africa's development, as envisioned in the African Union Agenda 2063, requires the provision of affordable, durable, and reliable energy. Africa has the established RPPs, one form of regional energy interdependence, to address the challenges of energy poverty. The study assessed the level of implementation of power pooling in relation to the attainment of the energy dimension of the African Union sustainable development Agenda 2063. In so doing, respondents were asked to answer questions related to the adequacy of an existing policy, institutional, and financial framework that enables the successful implementation of power pooling in Africa.

Figure 6.24 presents data of the respondents exploring whether Africa has an enabling policy framework for the development of the energy sector. The data revealed that 56% of the respondents strongly disagreed, whereas 16% disagreed, making the total percentage of those who disagreed with the statement 72%. About 24% and 4% were neutral and agreed, respectively, with the fact that Africa has an enabling policy framework for the development of the energy sector.

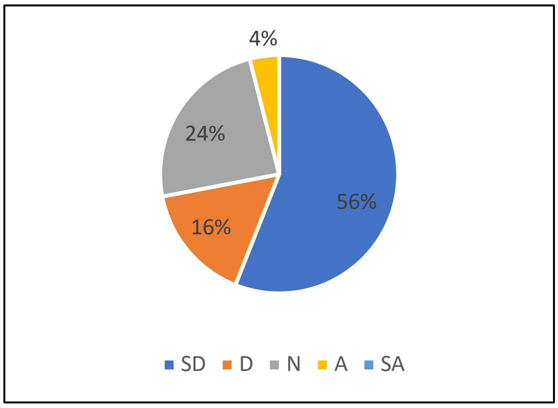


Figure 6.24: Africa has an enabling policy framework for the development of the energy sector

Figure 6.25 presents an analysis of respondents' views on whether Africa has an adequate institutional framework for the development of the energy sector. The data revealed that almost half (48%) of the respondents agreed, whereas only 8% strongly agreed to make the percentage of those who concurred 56%. In addition, the data showed that 4% were neutral, and 36% disagreed with the statement.

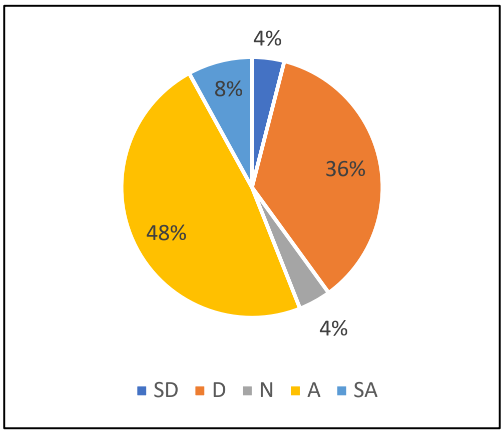


Figure 6.15: Africa has an institutional framework for the development of the energy sector

Further, Figure 6.26 presents data on the view of the respondents on whether Africa has an adequate financial scheme for promoting investment in the energy sector. The data revealed that almost half (48%) of the respondents just agreed, whereas only 8% strongly agreed to make those who concurred with the statement 56%. In addition, the data showed that 4% were neutral, and 36% strongly disagreed with the statement.

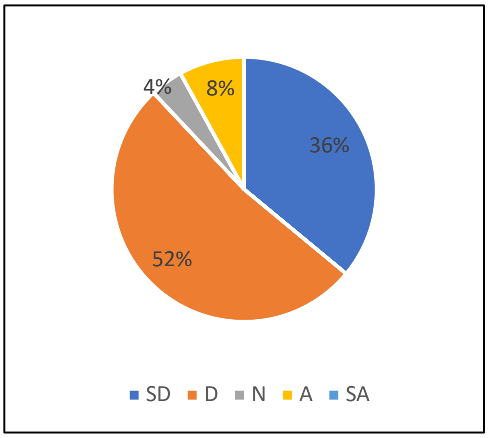


Figure 6.26: Africa has a financial scheme for promoting investment in the energy sector

Table 6.6: Operationalisation of regional power pools

Statement/Question	**Mean**	**STD**
Africa has an enabling policy framework for the development of the energy sector	2.76	.969536
Africa has an adequate institutional framework for the development of the energy sector	3.2	1.154701
Africa has an adequate financial scheme for promoting investment in the energy sector	1.84	.8504901
Average mean score	**2.6**	**0.991576**

The results in Table 6.6 above show three main areas for the implementation of power pooling. They include policy, institutional and financial frameworks. The following items: "Africa has an enabling policy framework for the development of the energy sector," and "Africa has an adequate institutional framework for the development of the energy sector" have a positive contribution towards operationalisation of RPPs because their means which are 2.76 and 3.2 respectively were more than the average mean score of 2.6. The statement which acknowledges Africa to have an adequate financial scheme for promoting investment in the energy sector was shown to have a negative influence as it had a mean which was less than the average mean score.

To begin with, there is electricity as a commodity for sale and thus a need for a marketplace guided by the principles of demand and supply. The researcher was interested in identifying the key elements and solutions to implement power pooling in the SAPP and the EAPP regions. In one of the FGD, it was stated that,

> *"Africa has adopted a regional integration approach to energy security. The policy frameworks are present at the continental level, and the institutional architecture is present though it needs to be reoriented to fit for purpose" (FGD, 02)*

One of the key informants went further to suggest the following:

> *"Africa has a plethora of institutions working to champion energy integration though the working relations among them is somehow inefficient, above all the market and financial structure needs to be reorganised to attract more private investment" (KII-09)*

In a nutshell, Africa has an adequate policy framework, working institutional setup, and inchoate financial frameworks affecting the implementation of power pooling. Can these challenges apply to the EAPP and the SAPP equally? Are the opportunities similar or different in the power pools? The following section presents the analysis.

6.5.1 Similarities and differences in implementing power pooling of the Eastern and Southern Africa Power Pools

The study assessed the level of implementation of power pooling in relation to the attainment of energy security. From the survey, opportunities for implementation were viewed in terms of the boosted level of grid interconnection; amount of investment in relation to the national grid as well as regional grid masterplan; presence of enabling legal framework for regional energy trade; availability of an adequate dispute settlement mechanism for short term energy market/regional energy trade; and lastly close working relationship of RPP with a nation's energy sector. Measures of central tendency in this case, mean and standard deviations, were employed. Table 6.7 shows the results.

Table 6.7: Operationalisation of (the EAPP and the SAPP) regional power pools

Statement/Question	**EAPP**		**SAPP**	
	Mean	**STD**	**Mean**	**STD**

EAPP/SAPP boosts the level of grid interconnection among members	4	.5773	4.6	.5477
The amount of investment in your country's national grid is in line with the regional grid masterplan as devised by EAPP/SAPP	3.7143	1.3801	3.6	.5477
There is an enabling legal framework for regional energy trade in your region.	3.5714	.7868	4.2	.4472
There is an adequate dispute settlement mechanism for short term energy market/regional energy trade in your region	3.4286	.7868	4	0
EAPP/SAPP is working closely with your country's energy sector	3.2857	1.254	4.4	.5477
Average mean score	**3.6**	**0.957**	**4.16**	**0.4181**

From Table 6.7 above, the EAPP is best operationalised to a greater extent by the boosts in the level of grid interconnection among members, and the amount of investment in the respective member states' national grid being in line with the regional grid masterplan devised by the EAPP. This is because the two dimensions had a mean of more than the average mean score. On the other hand, the SAPP was also found to be operationalised to a greater extent by boosting the level of grid interconnection among members, close working relationship with the member country's energy sector and the existence of an enabling legal framework for regional energy trade in that region. These three dimensions had higher mean scores compared to the average mean score.

It can be noted that both power pools share only one dimension that is the boosts in the level of grid interconnection among their members. Considering the average mean scores, both RPPs (the EAPP and the SAPP), the average mean scores of approximately 4.0 imply that collectively, all dimensions aided in implementing power pooling albeit at different levels. Nevertheless, considering the average mean score of 3.6 for the EAPP and 4.16 for the SAPP, it can well be argued that the SAPP is implementing power pooling better than the EAPP.

The study further sought to investigate from the key informants what they thought were the opportunities for generally operationalising the power pools. The following main aspects emerged, including developing regional markets, AFCFTA, winners of regional energy trade, and the active role of regional economic communities. Specifically, one study participant noted that:

> *"the possibility to develop regional markets, by putting all regulatory and other institutions in place; we see that countries are interconnecting within their regions; we have a very successful market in West Africa, and relatively successful market in Southern Africa; a problematic situation in Eastern and Central; nonetheless countries are increasingly prioritising interconnecting, and over time we hope we will address the challenges; the fact that countries are investing in interconnections is a huge opportunity that should be pushed" (KII, 05)*

Another respondent argued that there is an opportunity that emanates from the AFCFTA. The agreement provides clarity and a framework that helps participants to have a common understanding of how energy can be traded. AFCFTA has offered an amazing opportunity to regional energy trade. The African Union has capitalised on the same agreement to develop the largest electricity market in Africa by instituting the African Single Electricity Market (AfSEM). On matters related to AFCFTA and AfSEM, the study participant was of the view that:

> *"…what AFCFTA implies is that with more inter-African trade, industrial electricity demand will increase; more output means more energy input; it creates electricity demand, some of which can be supplied through regional power pools, which the creation of AfSEM will further strengthen." (KII, 010)*

Regarding the cost of energy, which affects trade competitiveness directly, the study participant gave an example that assesses the logic among individuals in different industries regarding their power plans. The reiteration revolved around the consequences of power cost that it can wipe one out of the market. To quote the respondent,

> *"The manufacturing sector will not grow when the power cost is 23 cents or so; any factory would be wiped out because the margin is so low due to competition; power cost can make the difference in some cases it could reach 20-40% if it is an energy-intensive industry. In Africa, we are looking at, to what extent power*

cost can alter trade among the different regions. For example, Djibouti and Sudan benefit from trading electricity with Ethiopia for it reduces the cost of electricity by a huge margin and it will certainly improve the trade competitiveness of these countries." (KII, 01)

On the installation of modes of production in Africa, countries are keen to drive down the overall cost of production. The cost of labour is relatively low; capital is relatively on the higher end because Africans are technology importers; land cost is fixed, so it doesn't affect competitiveness in the long run. The only volatile cost is associated with the importation of raw materials and the cost of energy. Therefore, within the context of the study, if Africa implements power pooling in its sub-regions through power pools and across the continent through the AfSEM initiative, the impact of regional energy integration would be significant in the attainment of sustainable development. The last theme identified during primary data collection is the opportunity associated with regional economic communities in championing power pooling in their respective regions. With respect to the relationship between SADC and the SAPP, a respondent noted the following:

"The role of SADC in regional energy integration is vivid from SAPP's creation to where it is now. . . SADC is like a guardian for SAPP . . . SADC and SAPP work closely as the latter reports to the former as captured in the organogram."

A similar assertion was recorded from one of the key informants:

"SAPP is a technical institution and sometimes faces policy-level challenges. In such a situation, SAPP elevates such an issue to its political umbrella, SADC, and the latter provides policy direction. So, the existence of an active regional economic community plays a vital role in the successful implementation of power pooling in Southern Africa." (KII-07)

When it comes to the role of regional economic communities in the EAPP region, a respondent noted the following:

"I do not think EAPP has the advantage of having a strong regional economic community that helps its endeavour to forge energy cooperation in its region. EAPP's members have overlapping membership with almost four RECs, and such a configuration makes collaboration difficult."

The researcher posed a question to gain insights on the role of COMESA, which was supposed to partner with the EAPP for the realisation of power pooling objectives in the region. A key informant made the following observation:

> *“. . . the pronouncement of EAPP as a specialised agency of COMESA only works on paper. EAPP works closely with COMESA, but the collaboration is not strong enough to impact the implementation of power pooling in the region.”* (KII-07)

Considering the above assertions, the study concludes that SADC has been an active REC that plays its role in implementing power pooling and the regional dimension of energy integration in Southern Africa. However, the same could not be said for all the RECs operating in the EAPP region. Therefore, an active REC in Southern Africa, namely SADC, is an opportunity, but the absence of a similar opportunity in the EAPP becomes a challenge.

6.5.2 Similarities and differences in challenges for operationalisation of the Eastern and Southern Africa Power Pools

The study assessed the challenges encountered by either the EAPP or the SAPP concerning their implementation of power pooling mandates and consequent attainment of energy cooperation and security. The study participants were requested to highlight the challenges of operationalising the respective power pools. From the findings, some clear-cut challenges that faced both power pools manifested themselves. For example, most respondents pointed the challenges such as governance, and institutional and financial constraints.

The EAPP is associated with the following sets of challenges – lack of appropriate and relevant energy integration governance, lack of trust and confidence among pool members, inadequate generation and transmission infrastructure, lack of finance, and lack of a regional independent regulatory mechanism. The response obtained from one of the study participants in the EAPP stated that:

> *“There is an infrastructural deficit, skilled manpower hence resulting to consultants as an alternative in some fields. This is in addition to funding challenges.”*

From the FGD, it was mentioned that:

> *“A key challenge in the EAPP region currently is excess power and idle power in some parts and shortage in other parts due to the lack of proper transmission and distribution infrastructure.” (FGD, 01)*

A key informant also noted that:

"One of the challenges in the EAPP region currently is excess power and idle power in some parts and shortage in other parts due to the lack of proper transmission and distribution infrastructure." (KI, 01)

Regarding peculiar challenges to regional energy integration in the SAPP region, the responses obtained mostly suggested a lack of regional regulation mechanism, inadequate generating capacity and reserve margin, institutional contradiction, and underdeveloped transmission networks. One respondent stated that:

"There was an absence of regional regulation and appropriate mechanism for dispute resolution."

From the key informant interview, the researcher probed on the challenges in implementing power pooling through regional institutions in Africa. The researcher queried other challenges that can largely be associated with the EAPP and the SAPP. It was gathered that in Africa, the power pooling arrangement is relatively new and with notable challenges. The key informant interviewed listed five sets of challenges. The first challenge is the tendency to support and embrace regionalism, but when it comes to specific projects to fall back to the bilateral approach. The following was the response from the key informant,

"…it is quite interesting that many countries want this regional framework on the other hand when it comes to actual investment on the ground, they tend to do it their way in a more bilateral manner. . . that trust in the regional framework is declared but on practical test we see countries falling back to their mechanisms and undermining regional cooperative mechanisms" (KII, 05).

The second challenge is on infrastructure. In this context, the respondent observed and said that:

"What practically is limiting is infrastructure; interconnection is a challenge. Africa is the least interconnected regionally so far, and there have been a few investments scattered here and there. . . so, the infrastructure gap is a practical constraint in terms of how you can cooperate. Infrastructure should be present for trade to follow." (KII, 05).

The third and fourth challenges revolve around harmonisation in policy and technical frameworks. Successful regional energy integration and market mechanisms require harmonisation of grid codes among participating countries. A key informant argued that:

"…for example, just between Kenya and Uganda, there have been a lot of efforts to harmonise their frequency and how they regulate their electric quality. Still, there are differences in terms of their quality standards. Then you try to go between Ethiopia, Kenya, and Tanzania; the region must deal with three different regulatory environments and approaches to grid development. For example, in the case of the EU, there is European wide quality and security standard for any participant in the market has to observe those rules - these terms have become clarified. In the case of Africa, we are attempting, but we have not yet finalised that process of harmonisation." (KII, 05)

Issues of harmonisation are practical challenges that have to be addressed as soon as possible. In this regard, another key informant noted that:

"Africa does not yet have a regional regulator; if you want to sell power from Ethiopia to Djibouti, though the countries are very close and cooperative, they have their regulatory autonomy; there is no common independent entity, so they rely on an agreement they signed in good faith, but you don't have a regional regulator to enforce the contract, enforce harmonisation" (KII, 10)

Africa has numerous regional mechanisms, but none of them has emerged into regional operators and regional regulators. It is difficult to achieve energy cooperation with national regulators who pursue national objectives based on national laws. A discussion should accompany the growing focus on hard infrastructures on establishing regional regulators and operators.

The fifth challenge is the difficulty to attract investors. It is due to a lack of sufficient regional interconnections and a failure to have harmonised rules. The key informant observed that:

"If you don't have regional regulators that protect investors, then it has become exceedingly difficult to attract investment on regional projects. Consequently, you hear countries borrowing to fund regional energy projects. Private sector participation is at 13% of all investment in the continent, and the remaining investment, 87%, burden the public sector." (KII, 10)

In addition, one key informant has summarised the challenges and proposed a solution related to the implementation of power pooling as follows:

"First, each utility was operating on its terms and SAPP started the pool with nine countries and three languages, which call for the greater pursuit of harmonisation. Second, SAPP faced

a major constraint along the major transmission lines mostly associated with finance, and we create an infrastructure financing facility to unlock the transmission constraints. Third, there was a resistance to move away from a bilateral arrangement to a competitive market because members didn't have much confidence in the competitive market initially because it was a new market. We started to develop regional markets with limited number of participants, and now participants of and energy traded in the competitive market have increased. Fourth, the region does not have a cost reflexive tariff system., This does not attract investment. We are working alongside SADC to institute regional regulators." (KII, 04).

From the preceding discussion, it can be seen that most challenges are similar across the two power pools. Perhaps, standing out uniquely between the two power pools is the level of support from the respective RECs.

6.5.3 Similarities and differences in innovative solutions for operationalisation of the Eastern and Southern Africa Power Pools

As indicated in the literature, energy cooperation and interdependence can best describe contemporary global energy relations as it offers a feasible solution to energy security challenges. The researcher asked respondents to highlight the innovative solutions for full implementation of the respective RPPs. Figure 6. 27 shows the opportunities /innovative solutions for operationalising the EAPP and the SAPP. As shown, for proper operationalisation, most respondents advocated for the strengthening of regional institutions. This suggestion was supported by 50% and 39% of respondents in the EAPP and the SAPP, respectively. It was followed by those who proposed increased initiatives meant to encourage private sector participation at 33% and 35% in the EAPP and the SAPP, respectively. The third approach was synchronisation between power pools and RECs at 17% and 26% for the EAPP and the SAPP.

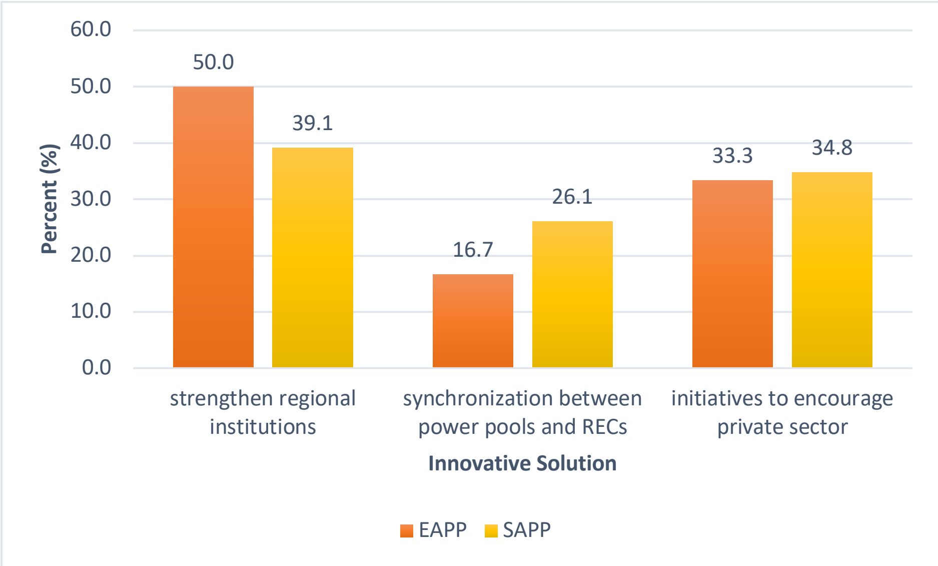


Figure 6.27: Innovative Solutions for full implementation of EAPP and SAPP

The study specifically examined whether RPPs are the right solution to the energy challenge in Africa. Given how energy resources are dispersed in the continent, some countries are endowed with low-cost energy while others are not. Therefore, regional energy integration is the most feasible approach for energy security in Africa. It offers or enhances the availability of power that everyone wants. One of the key informants reiterated that:

> *"…we need regional energy markets with a regional regulator. So far, the conversation has been minted on international regulation with all the power entrusted to it as an independent player. If you look at the country level, many countries agree that national electricity regulation should be independent at the country level. It should not be subject to political decision making. If it is independent at the country level, it is even more crucial for them to be independent at the regional level because you have trust issues between countries. If we solve these technical barriers towards moving to regional energy markets, then RPPs can play a phenomenal role in delivering the soft side of things, harmonisation, code clarification; standardisation; so that systems become similar and tradable."* (KII, 05).

From another perspective, RPPs are still needed in terms of pooling cooperation, but to put everything on the RPPs would include issues supposed to be handled by regional regulators which will be unfair. Therefore, RPPs are heavily criticised for lack of progress, which is not their mandate RPPs, like regulators, cannot enforce the decision. It is not how it is designed, according to one of the key informants:

> *"…unless given other powers; so, I think in Europe they have an EU wide rules and regulations. They have independent transmission system operators; numerous generators; independent regulators monitor regional progress, and it looks at regional agreements and codes and enforces them on regional projects."* (KII, 04)

Considering the institutional mechanism, the decision passed by the AU is characterised by a lack of implementation. There is no mechanism in place to ensure decisions are implemented. The same key informant believed:

> *"I was insisting on creating an enforcement institution or regulator with powers. It is crucial if not, you have layers of decision making with no enforcement. It is not for energy but also for other issues as well."* (KII, 05)

The researcher further asked members of FGDs to explain any innovative trade finance solutions that can attract financial development. Members listed some of the key considerations that were meant to necessitate transactions. They stated that:

> *"Once you interconnect the countries and have a harmonised market system, harmony in interconnection, payments, settlements, and harmony in regulation, then the transactions will automatically start to happen. It will then stimulate investors and investments. Therefore, instead of governments signing PPAs with private sectors, the power pools can act as the signatories for power purchasing agreements as done by the SAPP." (FGD, 02)*

In conclusion, the SAPP region has all forms of electricity trade, ranging from bilateral cooperative to competitive regional markets – thus, the SAPP is better operational than the EAPP. Considering the challenges and opportunities of power pools, not all challenges faced by the EAPP and the SAPP are identical. For instance, the EAPP and the SAPP benefited from Africa's regional approach that developed the Integrated Continental Transmission Network, and the African Single Electricity Market. Nevertheless, considering the relationship between the power pools and the respective regional economic communities for Southern Africa, it is an opportunity. In contrast, the same relation becomes a challenge in the EAPP region. Also, the EAPP and the SAPP share the energy governance challenges at the continental level and the lack of regulatory mechanisms at the regional level. Therefore, the study could not confirm that the challenges and opportunities are similar in the EAPP and the SAPP.

6.6 Bilateral energy trade and the development of Regional Power Pools

The EAPP and the SAPP have been leading the energy integration projects in their respective sub-regions in Africa. They have been building regional energy trade amid increased cases of bilateral electric trade agreements, which the study hypothesised to hinder the development of regional electric markets. On the other hand, literature has emphasised that bilateral cross-border power transactions can be building blocks to regional electric markets.

Data collected probed the respondents on interlinks between bilateral trade and regional/multilateral energy agreements. Respondents were requested to indicate the level to which they either agreed or disagreed that bilateral energy trade agreements discouraged countries from pursuing regional/multilateral energy agreements. Table 6.8 shows the results.

Statement/Question	**Frequency**	**Per cent**
Strongly disagree	2	8.70
Disagree	7	30.43
Neutral	8	34.78
Agree	5	21.74
Strongly agree	1	4.35
Total	23	100

Table 6.8 Regional institutions and multilateral energy agreements

From the findings, 35% of the respondents were undecided on the statement, followed closely by 30% who disagreed with the statement that bilateral energy trade agreements discourage countries from pursuing regional/multilateral energy agreements. Combined, those who agreed and those who strongly agreed were about 26%. Respondents who concurred on that question were required to suggest why bilateral approach discouraged countries from pursuing a multilateral approach to energy cooperation in Africa. Some of the highlighted issues include flexibility, transparency, policy harmonisation, and few complications in structuring projects. One of the respondents was of the view that:

> *"Bilateral approach gives too much control to the states, and it is simple to manage as such it hinders progress in the multilateral approach."*

Another respondent presented that:

> *"Bilateral energy trade often creates fixed features in the energy system that are not the result of regional planning. It has low flexibility that fits poorly with the electricity system of the future, that is regional and competitive."*

On the other hand, respondents who disagreed with the statement were asked to explain what they thought was the relationship between the bilateral approach and multilateral approach to energy cooperation in Africa. Several viewpoints were gathered and could be summarised to include complementarity of approaches, simultaneity in options, the facilitative role of AfCFTA provisions, and mutual inclusivity of approaches, among others. One respondent observed that:

> *"In most cases, the underdeveloped nature of regional markets convinces governments to pursue bilateral energy agreements. However, with adequate regional energy market mechanisms, governments are observed to have actively participated."*

In the same line of thought, another respondent argued that:

> *"As the power pools progress and regional markets are operationalised, also given the provisions under AfCFTA, there will be no conflict between bilateral and multilateral agreements for the former gives way to the latter."*

In addition, the FGD explored how Africa's Regional integration in the Energy sector can bring radical change in intra- regional economic communities and Intra-Africa trade. According to one FGD:

> *"The UNECA estimates that AfCFTA will boost intra-African trade by 52 per cent by 2022. The agreement will also liberalise trade in services, including electricity, and tackle "tariff and non-tariff barriers" which hamper trade between African countries and power pools can capitalise on this opportunity to build regional energy markets." (FGD, 01)*

Similarly, one respondent indicated that:

> *"Bilateral energy trade arrangements have the potential to champion regional energy cooperation in Africa."*

Thus, evolving theory based on the responses is that several major challenges affect the development of the regional energy market in both the EAPP and the SAPP, but bilateral trade is not one.

6.6.1 Bilateral energy trade and development of the Eastern Africa Power Pool

Further to the analysis above, the study assesses the role of the bilateral energy trade agreement (BETA) and that of regional energy trade modalities to energy security in the EAPP and the SAPP regions. The following analysis is for the EAPP region.

Figure 6. 28 presents data of the respondents regarding their views on the contribution of RETA and BETA to increase access to electricity in their countries.

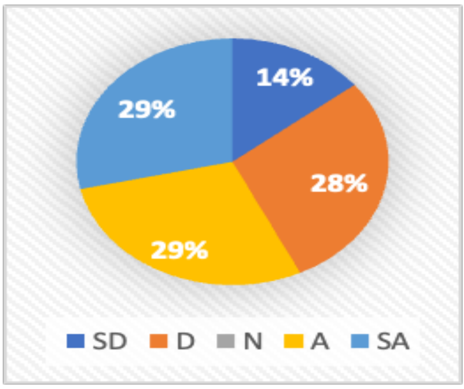


Figure 6.28: RETA, BETA and their contribution to access to electricity in the EAPP Region

The data revealed that over half (57%) of the respondents agreed, and 43% strongly agreed that BETA contributes to increased access to electricity in the EAPP region to make those who concurred be 100%. On the other hand, 28% and 14% disagreed and strongly disagreed, and those who agreed and disagreed are 29% each on the contribution of RETA to increased access to electricity. Thus, the comparison shows that BETA's contribution to access to electricity is much higher than RETA's in the EAPP region.

Figure 6.29 presents data of the respondents regarding their views on the contribution of RETA and BETA to electricity affordability in their respective countries.

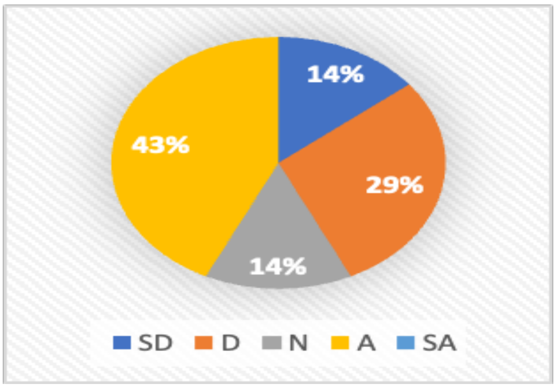


Figure 6.19: *RETA, BETA and their contribution to electricity affordability in EAPP Region*

The data indicated that over half (57%) of the respondents agreed, and 29% strongly agreed that BETA makes electricity affordable, leading to those who concurred to be 86%. In addition, only 14% of the respondents were of the neutral opinion regarding whether bilateral energy trade agreements make energy affordable in their countries. On the other hand, 29% and 14% disagreed and strongly disagreed respectively, 29% agreed, and 14% were neutral on the contribution of RETA to electricity affordability. Thus, the comparison shows that BETA's contribution to electricity affordability is much higher than RETA's in the EAPP region.

Figure 6.30 presents a summary of the respondents' views regarding the contribution of RETA and BETA in reducing blackouts in their respective countries.

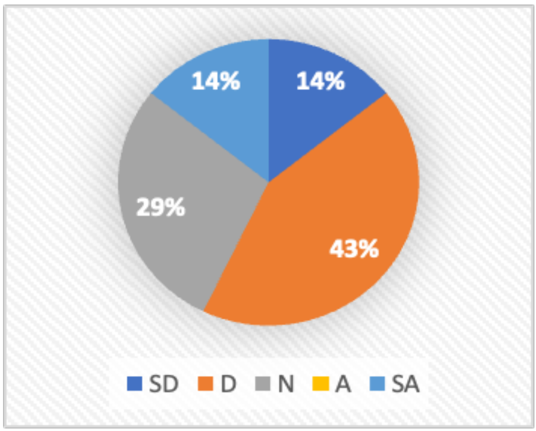


Figure 6.20: *RETA, BETA and their contribution to reducing blackouts and outages in the EAPP Region*

The results indicate that 43% of the respondents agreed, and 29% strongly agreed that BETA reduces blackouts and rationing. On the other hand, 28% of the respondents were neutral to the statement. In comparison, 43% and 14% disagreed and strongly disagreed respectively, while 14% strongly agreed, and 29% were neutral on the contribution of RETA in reducing blackouts and outages. Thus, the comparison shows that BETA's contribution to electricity reliability is much higher than RETA's in the EAPP region.

Figure 6.31 presents a summary of the respondents' views regarding the contribution of RETA and BETA in reducing electricity rationing in their respective countries.

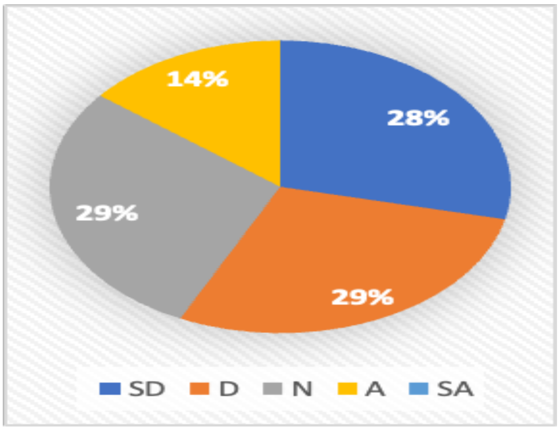


Figure 6.31: *RETA, BETA and their contribution to the reduction of electricity rationing in the EAPP Region*

The results indicate that 43% of the respondents agreed, whereas 29% strongly agreed that BETA reduced energy rationing. Those with a neutral view constituted 28% of the respondents. On the other hand, 29% and 28% disagreed and strongly disagreed respectively, while 14% agreed, and 29% were neutral on the contribution of RETA in reducing electricity rationing. Thus, the comparison shows that BETA's contribution to reducing electricity rationing is much higher than RETA's in the EAPP region.

Figure 6.32 presents a summary of the respondents' views on the contribution of RETA and BETA in increasing the utilisation of renewable energy sources in the EAPP region.

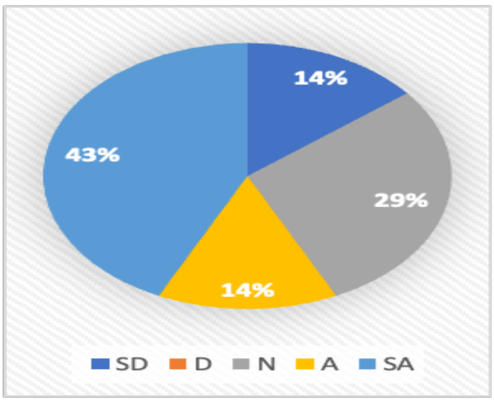


Figure 6.32: *RETA, BETA and their contribution to the utilisation of renewable energy in the EAPP Region*

The results indicate that 43% of the respondents agreed, and 57% strongly agreed with the statement, 100% of those concurring that BETA increases the utilisation of renewable energy sources in Eastern Africa. On the other hand, 14% strongly disagreed, 14% agreed, 43% strongly agreed, and 29% were neutral on the contribution of RETA in increasing the utilisation of renewable energy. Thus, the comparison shows that BETA's contribution to the utilisation of renewable energy resources is much higher than RETA's in the EAPP region.

Figure 6.33 presents a summary of the respondents' views regarding the contribution of RETA and BETA in boosting the level of grid interconnection among members.

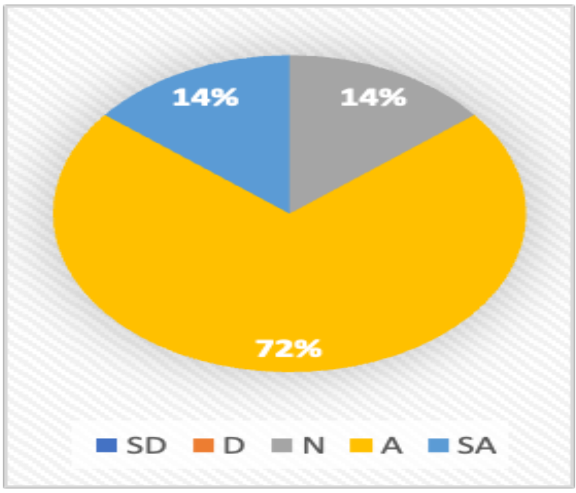


Figure 6.33: *RETA, BETA and their contribution to enhancing grid connectivity in EAPP Region*

The findings show that most participants (86%) agreed on the same, and the rest (that is 14%) strongly agreed. The finding implies that all participants generally concurred that BETA boosts the level of grid interconnection among members. On the other hand, 14% strongly agreed, 72% agreed, and 14% were neutral on the contribution of RETA in boosting the level of grid interconnection among members. Thus, the comparison shows that BETA and RETA contribute to enhanced grid connectivity in the EAPP region.

The study further required the respondents to answer if BETA is preferable to RETA in the EAPP region.

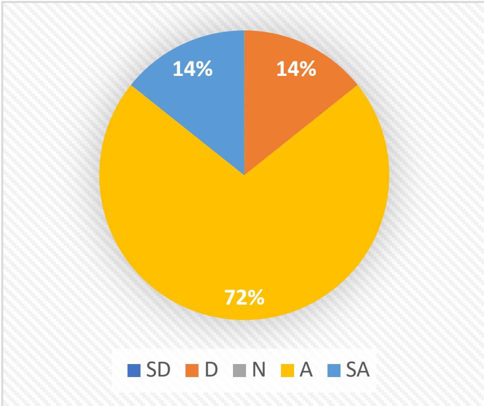


Figure 6.34: *Preference for BETA over RETA in the EAPP Region*

The findings show that 72% agreed, 14% strongly agreed, and 14% disagreed that BETA is preferable to RETA in the EAPP region. The finding implies that a strong majority of participants believed that BETA is preferable to RETA in the EAPP region.

6.6.2 Bilateral energy trade and development of Southern Africa Power Pool

As argued in the literature, the SAPP is relatively successful in championing regional energy trade than the EAPP, an assumption taken earlier in this study. The researcher sought to understand from the key informants interviewed how they assessed the relationship between bilateral energy trade agreements and regional energy markets in the SAPP. The researcher wanted to find out if it was complementary or competitive. The key informant said that:

> *"What we see now is; most of the bilateral contracts have dropped off; or going out slowly and competitive market is gaining traction; bilateral is more energy security but with the cost such as expensive; competitive are short and low price; I can say that at the beginning the bilateral contracts were complementary, but now we are moving into the competitive market."* (KII, 04)

Like in the previous subsection (6.6.1), the study examined the role of the bilateral energy trade agreement (BETA) and that of regional energy trade modalities to energy security in the SAPP region. Both quantitative and qualitative data were explored.

Figure 6.35 presents a summary of the respondents' views regarding the contribution of RETA and BETA in enhancing access to electricity in the SAPP region.

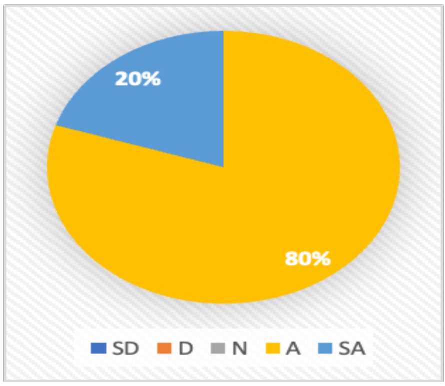


Figure 6.35: *RETA, BETA and their contribution to enhancing access to electricity in SAPP Region*

The data revealed that 80% of the respondents agreed, with 20% strongly agreeing on the role of BETA and RETA in enhancing access to electricity in the SAPP region, implying that all respondents concurred with the statement. Thus, the data shows that BETA and RETA contribute to enhanced access to electricity in the SAPP region.

Figure 6.36 presents a summary of the respondents' views regarding the contribution of RETA and BETA in making energy affordable in their countries.

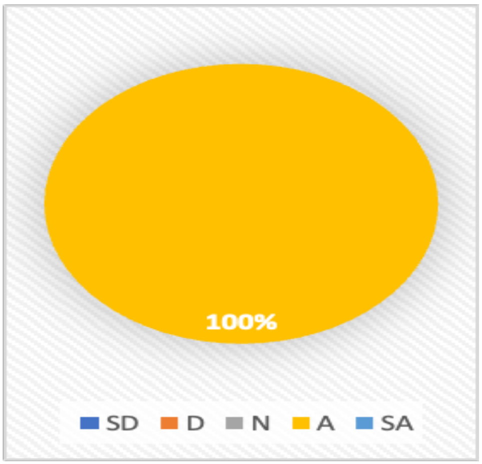


Figure 6.36: *RETA, BETA and their contribution to electricity affordability in the SAPP Region*

The data indicated that 60% of the respondents agreed, and 40% were neutral on BETA's contribution to make electricity affordable in the SAPP region. On the other hand, 100% of the respondents agreed on the contribution of RETA in making electricity affordable in the SAPP region. Thus, the comparison shows that RETA plays a more significant role in making electricity affordable than BETA in the SAPP region.

Figure 6.37 presents a summary of the respondents' views regarding the contribution of RETA and BETA in reducing blackouts and outages in their countries.

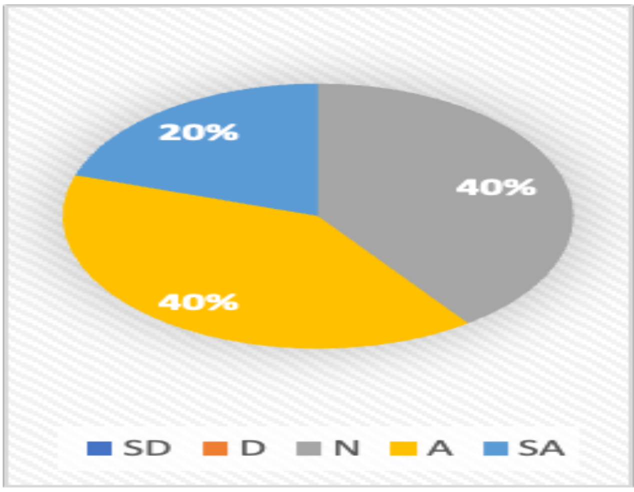


Figure 6.37: *RETA, BETA and their contribution to reducing blackouts and outages in the SAPP Region*

The results indicate that 60% of the respondents agreed with the statement while 40% were neutral. The distribution implies that the majority of the study participants believed BETA reduces blackouts and outages in their countries. On the other hand, 40% of the respondents agreed, 20% strongly agreed, and 40% were neutral on the contribution of RETA in reducing blackouts and outages in the SAPP region. Thus, the comparison shows that RETA plays a slightly better role in reducing blackouts and outages than BETA in the SAPP region.

Figure 6.38 presents a summary of the respondents' views regarding the contribution of RETA and BETA in reducing electricity rationing in their countries.

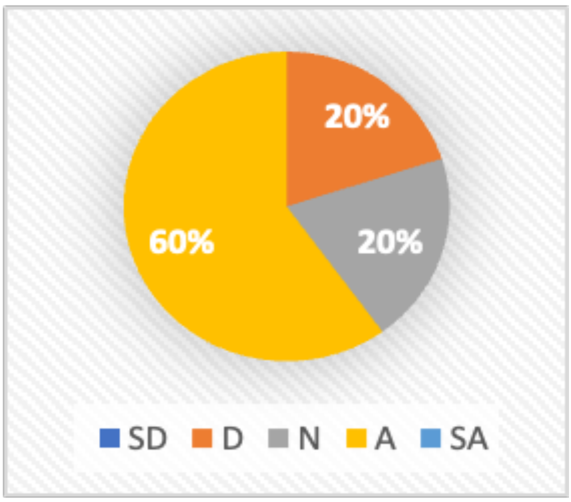


Figure 6.38: *RETA, BETA and their contribution to reducing electricity rationing in the SAPP Region*

The findings show that 60% of the respondents agreed, while 20% disagreed that BETA reduces energy rationing. The respondents who had a neutral view constituted 20%. On the other hand, 60% of the respondents agreed, while 20% disagreed that RETA reduces energy rationing. Similarly, 20% of the respondents were neutral to the statement. Thus, the comparison shows that RETA and BETA equally contribute to reducing electricity rationing in the SAPP region.

Figure 6.39 presents a summary of the respondents' views regarding the contribution of RETA and BETA to increase the utilisation of renewable energy sources in Southern Africa.

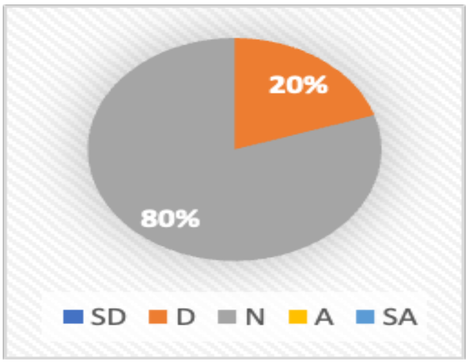


Figure 6.39: *RETA, BETA and their contribution to enhancing the utilisation of renewable energy resources in the SAPP Region*

The results indicate that 100% and 80% of the respondents on BETA and RETA, respectively, hold a neutral opinion that the trading modalities increased the utilisation of renewable energy sources in Southern Africa. This means that the respondents were not certain on this issue.

Figure 6.40 presents a summary of the respondents' views on the contribution of RETA and BETA in boosting the level of grid interconnection among members.

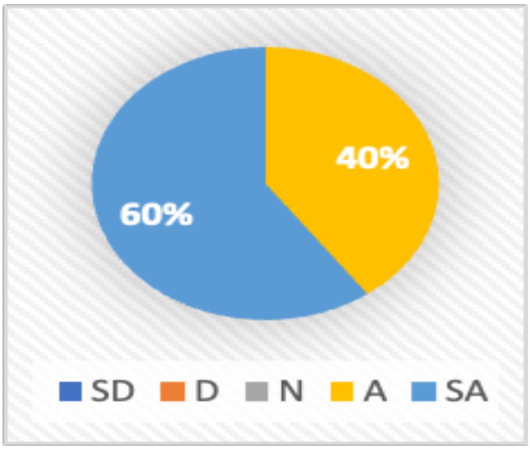
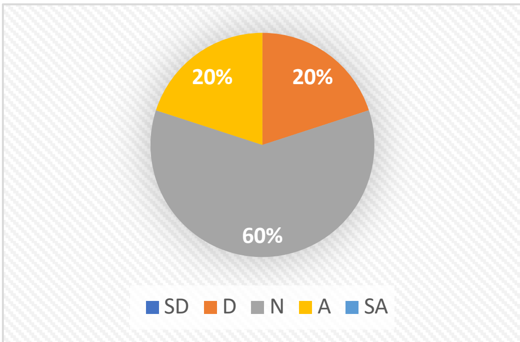


Figure 6.41: *RETA, BETA and their contribution to boosting grid connectivity in SAPP Region*

The findings show that most participants (80%) agreed on BETA's contribution in boosting grid connectivity, whereas the rest (20%) disagreed. On the other hand, 60% of the respondents strongly agreed, and 40% agreed that RETA boosts regional grid connectivity. Thus, the comparison shows that RETA plays a slightly enhanced role in boosting grid connectivity than BETA in the SAPP region.



The findings show that 20% agreed, 20% disagreed, and 60% disagreed that BETA is preferable to RETA in the SAPP region. The finding implies that the respondents were not certain on this issue.

6.7 Regional Institutions and Energy Cooperation

The study sought to determine the strongest factor for the dimensions of regional institutions and the contribution of bilateral trade on RPPs. This was achieved by comparing the means of the variables describing the bilateral trade dimension/ indicators. In so doing, the respondents were asked to rate their opinions on the statements on regional institutions according to their level of knowledge on a scale of 1 to 5. Where, 1=Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree. Data were analysed using descriptive statistics of mean and standard deviation. Variables with a mean close to 4.0 and above represented agreed and strongly agreed, while those with a mean close to 3.0 represented "neutral", and those with a mean of 2.0 and below represented disagreed and strongly disagreed. At the same time, the standard deviation was used to indicate the consensus of the respondents. The results are shown in the table below.

Regional Institutions	**Percentage (%)**					**M**	**SD**
	1	**2**	**3**	**4**	**5**		
Regional institutions such as the African Union and its organs, regional power pools, regional economic commissions, among others, play a crucial role in fostering energy cooperation in Africa.	8	4	4	42	42	4.04	1.20
Regional power pools play a significant role in promoting renewable energy investment in Africa.	13	9	9	39	30	3.65	1.37
The African Union plays a crucial role in developing clear, coherent and harmonised policy and regulatory framework to fostering energy cooperation in Africa	4	5	14	41	36	4	1.07
Regional economic communities play a significant role in customising the African Union's energy agenda and regulatory framework at the regional level concerning the AU Agenda 2063.	9	5	27	32	27	3.64	1.22
The Intergovernmental Authority on Development (IGAD) plays a significant role in fostering energy cooperation/integration at the regional level concerning the implementation of the AU Agenda 2063	35	9	39	17		2.39	1.16

The East African Community (EAC) plays a significant role in fostering energy cooperation/integration at the regional level concerning the implementation of the AU Agenda 2063		13	41	32	14	3.45	.91
The Southern Africa Development Cooperation (SADC) plays a significant role in fostering energy cooperation/integration at the regional level concerning the AU Agenda 2063.	5	9	23	27	36	3.82	1.18
The Common Market for Eastern and Southern Africa (COMESA) plays a significant role in fostering energy cooperation/integration at the regional level concerning the implementation of the AU Agenda 2063	9	9	27	50	5	3.32	1.04
Regional and sub-regional financial institutions such as the African Development Bank and Trade and Development Bank play a significant role in encouraging investments in the energy sector	4	5	5	36	50	4.23	1.07

Table 6.9: Regional institutions and energy cooperation

The above findings indicated that most of the respondents in this study agreed that regional and sub-regional institutions such as the African Development Bank and Trade and Development Bank play a significant role in encouraging investments in the energy sector. This variable for the regional institutions stood out across all the surveyed respondents, with the closest mean to 5 points out of a maximum of five points *(M=4.23, SD=1.07)*. Other items with higher means include a statement suggesting that regional institutions such as the African Union and its organs, regional power pools, regional economic commissions, among others, play a crucial role in fostering energy cooperation in Africa (M=4.04, SD=1.20). Also, the African Union plays a crucial role in developing a clear, coherent, and harmonised policy and regulatory framework to fostering energy cooperation in Africa (M=4.0, SD=1.07).

From the interviews conducted, respondents who did not subscribe to the idea that the African Union plays a crucial role in developing a clear, coherent, and harmonised policy and regulatory framework in fostering energy cooperation in Africa were requested to explain what they thought the African Union should do to promote energy cooperation in Africa. One of the respondents was brief:

> *"Harmonise the Africa Energy Markets"*

Another respondent explained the aspect of urgency or priority and stated that:

> *"Make energy cooperation a priority... and go beyond the current mechanisms, such as NEPAD or PIDA; the African Development Bank should also be asked to play a major role, and according to its mandate."*

On the other hand, study participants who concurred with the fact that the African Union plays a crucial role in developing a clear, coherent, and harmonised policy and regulatory framework to fostering energy cooperation in Africa were requested to further explain what they thought was the contribution of the African Union in promoting energy cooperation in Africa. The main issues revolved around coordination, leadership, regulatory, or policy framework with the integration of the AU Agenda 2063 and continental programs. From one of the respondents, it was concluded that:

> *"Harmonised African electricity market (AFSEM) plus strong inputs into PIDA PAP2. Also, work on sustainable cooking."*

The other respondent asserted that:

> *"Developing policies that will promote trade, industrial development Agenda 2063 is one such initiative; they have an office of the High Representative for Infrastructure whose role is to develop projects such as energy projects within the continent. One such project is the Grand Inga project in DRC."*

On regional institutions, regional economic communities have been proposed to be key pillars contributing significantly to customising the African Union's energy policy and regulatory framework at the regional level concerning the implementation of the AU Agenda 2063. The researcher further probed those who 'disagreed' or 'strongly disagreed' on what these institutions should do. From the respondents, most believed there was a need for improved cooperation and coordination among programs/organisations and acting as an effective bridge between the continental and national level, citing ECOWAS as an example.

Those who concurred on the fact that regional economic communities have been proposed to be key pillars contributing significantly to customising the African Union's energy policy and regulatory framework at the regional level concerning the implementation of the AU Agenda 2063 were requested to suggest possible success stories of these institutions. From the responses obtained, the successes presented by the majority were of the idea that the institutions provided a level playing field for all players, promoted investments in infrastructure, led the regional dimension of implementation of any programs under the African Union, the establishment of relevant regional energy regulatory bodies, among other success stories. In particular, one of the respondents stated that

> *"SADC has helped SAPP develop regional electricity market; EAC adopted regional energy security document."*

The above respondent was supported by another participant who believed:

> *"SADC through SAPP and ECOWAS through WAPP is developing real markets for international trade in Africa."*

Unlike the previous two respondents above, another respondent was, however, of a slightly different opinion though he/she agreed with the statement. The respondent said

> *"SADC is not totally successful but with a lot of achievements. The political nature is, of course, different from other African regions, but it still is possible to make some conclusions from the SADC."*

On other regional economic communities such as the Intergovernmental Authority on Development (IGAD), East African Community (EAC), SADC, and the Common Market for Eastern and Southern Africa (COMESA), the research requested those who disagreed or strongly disagreed on the same to propose actions that these RECs should be doing to promote energy cooperation in Eastern Africa.

From the responses, a participant noted that the energy issue is lost in IGAD and, therefore, must be properly located and contextualised. They agreed that IGAD is not visible at all. Rather, COMESA is the once seen to be active. One of the respondents noted that:

> *"IGAD has been absent, while invited to all workshops organised by the African Union Commission during the development of the relevant documents adopted or to be adopted by the AU Summit. As a start, it could start to participate in*

these activities or form agreements with EAC, which has been active to follow-up if there is a human resource issue."

Another respondent stated that,

> *"IGAD should learn from ECOWAS and SADC on how to work closely with EAPP."*

In general, respondents believed that IGAD ought to have placed energy as one of its priority pillars while balancing regional peace and security as an energy development endeavour. They noted that IGAD is missing in social and economic pillars of sustainable development.

On the EAC, one of the respondents said that:

> *"Acting as an effective bridge between the continental and national level".*

Those who concurred with the statement were requested to give EAC's success stories to promote energy cooperation in Eastern Africa. Some key themes that emerged include programme initiation, policy frameworks, setting up EACREE, and increased transmission and distribution. One respondent was of the view that:

> *"EAC participates in continental activities, setting up EACREEE, which is really active and trying to foster power trade among its members. Also, EAC pioneered energy security analysis at the regional level."*

Another respondent stated that:

> *"EAC championed and adopted the regional energy security policy as well as the signing of a tripartite agreement with SADC and COMESA."*

On SADC, one respondent stated that:

> *"Promoting regional investments, energy initiatives and programmes available via the SAPP, development of regional energy market, a day-ahead market, and promotion of regional energy investment."*

Another respondent reiterated that:

> *"SADC through SAPP / RERA / SACREEE has probably developed the most advanced electricity market in Africa, and it continues to set new goals and develop."*

On COMESA, many respondents believed that it was too invisible and lacked political will. Specifically, one of the respondents was of the view that:

> *"COMESA has an institutional set up well established for regional integration of energy on the region"*

Another respondent said that:

> *"COMESA is spanning from the Mediterranean down to South Africa. COMESA needs to forward activities for the operationalisation of EAPP."*

Regional and sub-regional financial institutions such as the African Development Bank and Trade and Development Bank play a significant role in encouraging investments in the energy sector. Those respondents who were not subscribing to this statement were required to suggest how regional and sub-regional financial institutions promote energy investment and cooperation in Eastern and Southern Africa. The common response provided was associated with putting more effort, being more risk appetite, and favouring regional energy projects. However, the respondents who either 'agreed' or 'strongly agreed' were put to task to illustrate the success stories of these financial institutions in promoting energy investment and cooperation in Eastern and Southern Africa. Like other regional institutions, most of the respondents supported the fact that these institutions are involved in funding projects, continental presence, knowledge of African reality, development agenda instead of only commercial, successful formulation and funding of various energy initiatives and projects within Africa, and financial institutions are providing grant funding to prepare a lot of energy projects. They should go a step further in mobilising development finance. AfDB's regulatory index is an outstanding success story, finances regional projects such as the Ethiopia-Kenya transmission line, among other projects.

One respondent stated that:

> *"AfDB is not only providing financing tools but also is actively supporting the electricity sector, for example, through the African Regulatory Index."*

Another respondent supported the observation by stating that:

> *"AfDB has a well set up institutional and financial framework established with priorities on energy and regional integration of energy on the continent."*

Despite respondents generally agreeing on the fact that the institution has financial schemes prioritising regional energy projects, as well as support to electricity sector through the African regulatory index, one respondent stated that:

> *"The potential for them (AFDB) to play a role is gigantic, but are they doing it? So far, I do not think they are doing systematically."*

In general, most of the respondents in this study agreed that regional and sub-regional institutions play a significant role in forging energy cooperation in Africa. Regional institutions such as the African Union and its organs, regional power pools, regional economic commissions, among others, play a crucial role in fostering energy cooperation in Africa, concurring with the institutionalist theory of international relations that institutions can help address transboundary issues of mutual concern such as energy effectively.

6.8 Hypothesis Testing

The study tested different hypotheses with the sole purpose of determining the contribution of RPPs in fostering energy cooperation by exploring challenges and opportunities towards the realisation of institutionalised energy cooperation in Eastern and Southern Africa. The study tested the hypothesis using both qualitative and quantitative approaches. The study tested the main hypotheses stated herein quantitatively by estimating the corresponding models in their bivariate nature. By testing the hypotheses stated quantitatively, the researcher intended to be more scientific, focused, and more objective so that the overall argument, in this case, sustainable development via energy cooperation theory in Africa will achieve higher validity.

The following hypotheses were proposed: first, *"energy cooperation leads to sustainable development in Africa;"* second, *"weak regional power pool leads to energy insecurity in Eastern Africa, and strong regional power pool results in energy security in Southern Africa;"* third, *"the challenges and opportunities of African power pools are identical irrespective of their phase of development;"* and last, *"bilateral energy trades hamper the development of a regional power pool."* Such hypotheses were in line with those objectives formulated from the literature and adopted in this study.

The composite indices were computed for each variable employed in testing the specific hypothesis. The hypotheses were tested using simple linear regression analyses. Choice of which analytical tools used was guided by the study objective, type of data, and measurement scales. The hypothesis at 95% level of confidence (α=0.05) is thus rejected or rather failed to be rejected based on p values and whenever $p<0.05$, it failed to be rejected at a null level and whenever p value>0.05 it formed a reason of being rejected.

The interpretation concerning the results was based and considered on some key statistics such as $R^{2,}$ which is a coefficient that is a determinant on the overall course of influence, as well as F as a value of statistics representing overall influences related to a model and value of t and (β) where t represents significant pertaining single factor and β is a value-added by single variable to the dependent factor. The findings are presented along with study objectives and corresponding hypotheses.

6.8.1 Energy cooperation leads to sustainable development in Africa

The sub-section presents the results of the tests for the first hypothesis of the study, which was formulated from the first research objective. The researcher intended to establish whether energy cooperation leads to sustainable development. The results are as shown in Table 6.10.

Table 6.80: Regression results for energy cooperation and sustainable development

Model Summary						
Model		R	R Square	Adjusted R Square	Std. Error of the Estimate	
1		.573[a]	.328	.321	.23189	
a. Predictors: (Constant), Energy Cooperation						
ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2.470	1	2.470	9.286	.000[b]
	Residual	5.055	19	.266		
	Total	7.525	20			
a. Dependent Variable: Sustainable Development						
b. Predictors: (Constant), Energy Cooperation						

Coefficients[a]						
Model		Unstandardised Coefficients		Standardised Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.770	.205		13.499	.000
	Energy Cooperation	.339	.050	.573	6.778	.000

a. Dependent Variable: Sustainable Development

The study found a relatively moderate relationship between energy cooperation and sustainable development (R= .573). R^2 =.328 indicates that energy cooperation explains 32.8% of the variation in sustainable development. Also, the model at the overall level is significant (F=9.286, p<.05). The unstandardised beta coefficient indicates that energy cooperation makes a significant contribution to sustainable development (Beta = .339, t = 6.778, p<.05), thus depicting energy cooperation as key in predicting sustainable development and therefore accepting the alternative hypothesis that energy cooperation significantly leads to sustainable development in Africa.

Based on the outcomes of the estimated model, the outcome model explaining the relationship becomes; *SD= 2.77 +.339EC;* Where SD is sustainable development and EC is energy cooperation.

6.8.2 Regional power pools and energy security in Eastern and Southern Africa

The study established and tested hypotheses on RPP and energy security. It was done by testing the hypotheses on weak RPP and strong RPP on energy insecurity and energy security in Eastern and Southern Africa. The composite indices for the respective variables were determined first to establish how energy security or insecurity changes with a unit change in the corresponding aspect of RPP. Two alternative sub-hypotheses were developed. The first sub hypothesis states that; **$H2_a$**: There is a significant relationship between weak RPPs and energy insecurity in Eastern Africa. The second sub hypothesis states that; **$H2_b$**: There is a significant relationship between strong RPP and energy security in Southern Africa. Results are later discussed within this chapter.

6.8.2.1 Weak RPPs lead to energy insecurity in Eastern Africa

The analysis determined the relationship between weak power pool and their associated influence on energy insecurity in Eastern Africa by subjecting it to a sub hypothesis that **$H2_a$**: there is a significant relationship between weak RPPs and energy insecurity in Eastern Africa. The study determined their significance levels through computing composite index of weak RPPs and energy insecurity constructs and applying simple linear regression analysis. The results are presented in Table 6.11.

Table 6.11: Regression results for weak RPP and energy insecurity in Eastern Africa

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.171[a]	.127	.109	.05224
a. Predictors: (Constant), Weak regional power pool				

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.009	1	2.009	15.574	.000[b]
	Residual	0.516	4	.129		
	Total	2.525	5			
a. Dependent Variable: Energy insecurity						
b. Predictors: (Constant), Weak regional power pool						

Coefficients[a]						
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.746	.242		11.369	.000
	Weak regional power pool	.345	.059	.517	5.851	.000
a. Dependent Variable: Energy insecurity						

There was a relatively fair relationship between a weak regional power pool and energy insecurity (R= .171). R^2 =.127 indicates that a weak regional power pool explains 12.7% of energy insecurity variance. Also, the overall model was significant ($F=15.574$, $p<.05$). The standardised beta coefficient indicates that a weak regional power pool makes a significant contribution to energy insecurity (Beta = .345, t = 5.851, $p<.05$), thus depicting that a weak regional power pool is key to predicting energy insecurity and thus the hypothesis that weak regional power pool significantly affects energy insecurity in Eastern Africa is accepted. Based on the regression model, the outcome model explaining the relationship becomes; $EINS= 2.746 +.345WRPP$, where EINS is energy insecurity, and WRPP is **a** weak regional power pool.

6.8.2.2 Strong regional power pool results in energy security in Southern Africa

To test the influence of strong RPP on energy security, it was anticipated that strong RPP would have a significant and positive influence on energy security in Southern Africa. It was achieved by testing the following hypothesis: **$H2_b$**: There is a significant relationship between strong RPP and energy security in Southern Africa. Table 6.12 presents a summary of the results for strong RPP and energy security in Southern Africa.

Table 6.12: Regression Results for Strong RPP and Energy security in Southern Africa

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.215[a]	.212	.176	.0773
a. Predictors: (Constant), Strong regional power pool				

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.850	1	5.850	6.558	.000[b]
	Residual	2.675	3	.892		
	Total	8.525	4			
a. Dependent Variable: Energy security						
b. Predictors: (Constant), Strong regional power pool						

Coefficients[a]						
Model		Unstandardised Coefficients		Standardised Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.847	.133		21.394	.000
	Strong regional power pool	.323	.033	.715	9.923	.000
a. Dependent Variable: Energy security						

The study found that a relationship, which is strong, between strong RPP and energy security (R= .215). R^2 =.212 indicates that strong RPP explains 21.2% of the variance in energy security. Overall, the model showed significance (F=6.558, p<.05), implying it fitted the data well. The unstandardised beta coefficient indicates that strong RPP makes a significant contribution to energy security (Beta = .323, t = 9.923, p< .05), thus depicting that strong RPP is a key predictor of energy security in Southern Africa. Thus, the alternative sub hypothesis was accepted. Based on the outcomes of the results, the estimated model explaining the relationship becomes; *ES= 2.847 +.323SRPP,* where ES is Energy security and SAPP is a strong regional power pool.

6.8.3 The challenges and opportunities of African power pools are identical

The successful realisation of the institutionalised energy cooperation in Africa cannot go without its fair share of challenges. The researcher extensively explored and compared the pull and push factors contributing to the realisation of institutionalised energy cooperation in Eastern and Southern Africa. The hypothesis stated that; **H3:** The challenges and opportunities of African power pools are identical irrespective of their development phase. The study tested this hypothesis qualitatively.

Following Chigbu (2019)[491] on visually hypothesising in a scientific paper, the author affirms that testing of hypothesis qualitatively would incorporate scientific narrative, analysis as well as numerical or textual data, or even both. It was constructed from conversations and

[491] Uchendu Eugene Chigbu, 'Visually Hypothesising in Scientific Paper Writing: Confirming and Refuting Qualitative Research Hypotheses Using Diagrams', *Publications* 7, no. 1 (2019): 1–18, https://ideas.repec.org/a/gam/jpubli/v7y2019i1p22-d215683.html.

discussions to disclose significant trends that explain a specific occurrence, event, or object. In this objective, therefore, this study disagrees with the notion that "*qualitative research studies are not hypothesis-driven*." Given that data was gathered via many channels, the study thus used the available evidence in the literature (see also Lindlof & Taylor[492]) to explore and present arguments supporting hypothesis-driven qualitative research.

According to Holloway and Galvin (2016)[493], hypothesis testing is critical in qualitative research. Variables can be qualitative or quantitative. However, qualitative variables lack numerical hypothesis testing that can be refuted, proven, confirmed, or verified with other numerical tools. It is argued that most times, qualitative researchers work with unstated hypotheses while few times they have it categorically stated as a hypothesis. It is further argued that to qualitatively test a hypothesis, variables must be stated clearly. In this study thus, the hypothesis, "*The challenges and opportunities of African power pools are identical irrespective of their phase of development*", has clear variables that are "*challenges*" and "*opportunities*" for implementation of power pooling in the two regions.

The study participants from both the EAPP and the SAPP member countries were requested to highlight the existing challenges and elucidate the opportunities for operationalising their respective power pools. As illustrated in Figure 6.42, study participants presented various challenges that the researcher analysed and presented in themes. The study followed Chigbu (2019)[494] in testing the stated qualitative hypothesis diagrammatically as a methodological tool given its strong visual effect as well as the backing by explanatory texts.

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[492] Thomas R. Lindlof and Taylor, *Qualitative Communication Research Methods*, 4th ed. (SAGE Publications, Inc, 2017).

[493] Immy Holloway and Kathleen Galvin, *Qualitative Research in Nursing and Healthcare, 4th Edition | Wiley*, 4th ed. (Wiley-Blackwell), accessed 6 July 2021, https://www.wiley.com/en-sg/Qualitative+Research+in+Nursing+and+Healthcare%2C+4th+Edition-p-9781118874493.

[494] Uchendu Chigbu, 'Visually Hypothesising in Scientific Paper Writing: Confirming and Refuting Qualitative Research Hypotheses Using Diagrams' 7 (20 May 2019), https://doi.org/10.3390/publications7010022.

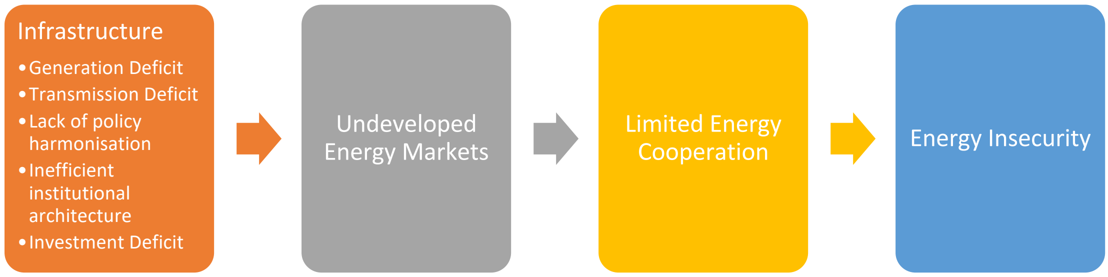

Figure 6.42: Challenges of operationalising RPPs (EAPP and SAPP)

The most dominant challenges include institutional and financial constraints, insufficient capacity, and poor legal framework. One of the respondents from the EAPP, for example, said that:

> *"Poor legal framework has necessitated absence of regional regulation and appropriate mechanism for dispute resolution."*

This sentiment was also echoed by a study participant from the SAPP who alluded that:

> *"There are no rules for access to the transmission grid, including setting wheeling charges as a result of the poor legal framework."*

Such sentiments indicate the replicative effect and thus problematic when it comes to the operationalisation of power pools in Africa. Some respondents argued that there had been a lack of trust and confidence among pool members, among other related factors.

On opportunities for operationalising the regional power pools, the study participants in the EAPP proposed several measures ranging from regional trade and development (energy security, access, and energy trade) to regional cooperation and integration (cost reduction and resource optimisation). On the other hand, the study participants in the SAPP region fronted opportunities for operationalisation of the power pool to include mutual assistance, security, regional cooperation, markets, optimisation, investment climate, generation, and transmission expansion, reduced capital, and operating costs. Figure 6.43 shows the interactional effect of main opportunities for operationalising RPPs in Africa.

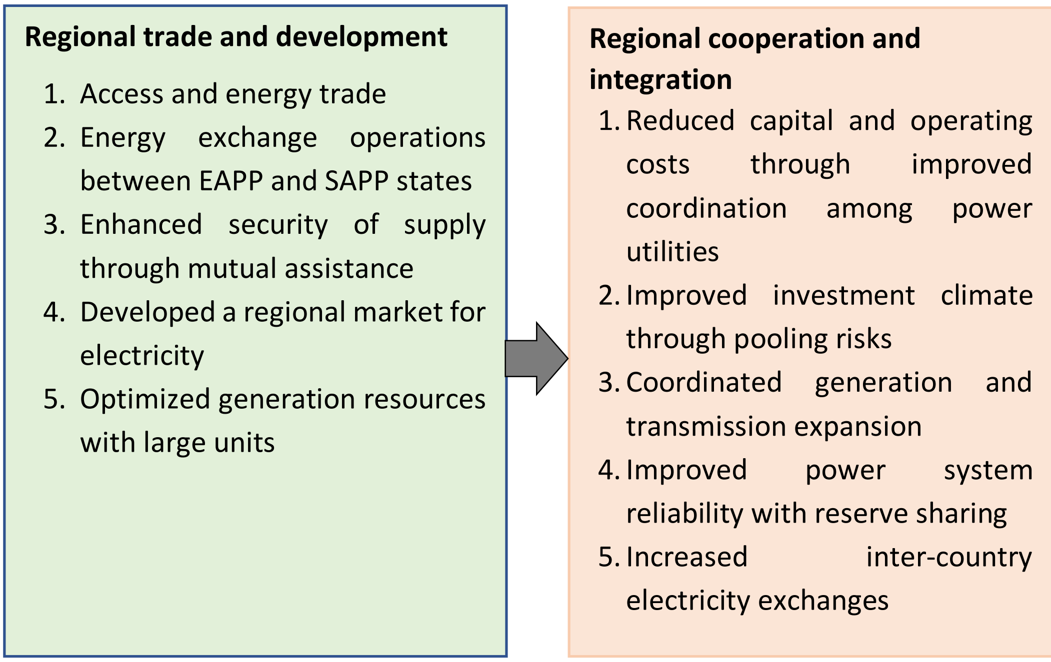

Figure 6.43: Opportunities for operationalising regional power pools in Africa

One of the study participants working in regional and sub-regional institutions stated that:

> *"The "soft" side of things (regulation, institutional framework, international cooperation) is progressing well; however, there are many problems faced in securing the needed budgets for the "hard" part of the infrastructure investments."*

Another respondent observed that:

> *"There are a lot of initiatives, ideas and programs in place, but project realisation is slow and insecure (projects are waiting for years to be realised, obstacles are usually related to an unstable political situation)."*

All this is well explained and detailed in the policy paper and roadmap for the African Single Electricity Market (AfSEM), which is adhered to. Based on this finding, the study concludes that the challenges and opportunities for operationalisation presented are entwined. Three similar main themes emerged under the pretext of innovative solutions for operationalisation. They include strengthening of regional institutions synchronisation between power pools and regional economic communities and initiatives to encourage the private sector. This study, therefore, failed to reject the third hypothesis that the challenges and opportunities of African power pools are identical irrespective of their phase of development.

6.8.4 Bilateral energy trades hamper the development of a regional power pool

This objective was meant to establish how bilateral energy trade leads to changes in the development of RPP in general and in a respective RPP. This study had anticipated that bilateral energy trade would have a significant and negative influence on the development of RPPs. Thus, the following hypothesis was tested; **H4:** There is a significant relationship between bilateral energy trade and the development of African RPPs. Table 6.13 presents a summary of bilateral energy trade and RPP development.

Table 6.13: Regression results for bilateral energy trades and development of RPP

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.442[a]	.251	.246	.08965
a. Predictors: (Constant), Bilateral energy trades				
b. Dependent Variable: RPP development				

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	4.144	1	4.144	12.260	.000[b]
	Residual	3.381	10	.338		
	Total	7.525	11			
a. Dependent Variable: RPP development						
b. Predictors: (Constant), Bilateral energy trades						
Coefficients[a]						

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.863	.214		8.702	.000
	Bilateral energy trades	.562	.052	.742	10.733	.000
a. Dependent Variable: RPP development						

The study found a relationship that is almost moderate between bilateral energy trades and the development of African RPP (R= .442). R^2 =.251 indicates that bilateral energy trades explain 25.1 % of the variance in the development of RPP. Also, it can be observed that the model on the overall level was significant (F=12.26, p<.05). The t-value also gave an indication concerning individual significance (β=.562, t=10.733, p<.05). This, therefore, depicts that bilateral energy trade is key in determining African RPP development (African), and thus the hypothesis that there is a significant relationship between bilateral energy trades and the development of RPP was accepted.

Based on the findings, the estimated model becomes; *RPPD=1.863 +.562BETs,* where RPPD was African regional power pool development and BETs is bilateral energy trades. The researcher further determined the contribution of BETs on the development of each regional power pool (EAPP and SAPP). Two sub hypotheses were thus formulated and tested: **$H4_a$:** There is a significant relationship between BETs and development of a power pool in Eastern Africa, and **$H4_b$:** There is a significant relationship between BETs and development of a power pool in Southern Africa.

6.8.4.1 Bilateral energy trades and RPP development in Eastern Africa

The study determined the influence of BETs on RPP development in Eastern Africa. This was determined by getting the composite index of BETA and regressed it against the composite value of RETA development in Eastern Africa using simple linear regression analysis to determine the significance. Thus, the following sub hypothesis was tested; **$H4_a$:** There is a significant relationship between BETs and RETA development in Eastern Africa**.** The results were as depicted in Table 6.14.

Table 6.14: Regression Results for BETA and RETA development in EAPP

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.224[a]	.177	.169	.07494
a. Predictors: (Constant), Bilateral energy trade				

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.107	1	2.107	2.769	.076[b]
	Residual	3.806	5	.761		
	Total	5.913	6			
a. Dependent Variable: EAPP development						
b. Predictors: (Constant), Bilateral energy trade						

Coefficients[a]						
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.447	.734		1.971	.049
	Bilateral energy trade	.573	.348	.614	1.647	.072
a. Dependent Variable: EAPP development						

The study found a strong relationship between bilateral energy trade and EAPP development (R= .224). The coefficient of determination (R^2 =.177) indicates that EAPP development explains 17.7% of the variation in BETs. The overall model was not, however, statistically significant (F=2.769, p>.05). The unstandardized beta coefficient indicate that BETs make non-significant contribution to EAPP development (Beta = .573, t = 1.647, p>.05). This, therefore, depicts that BET is not a key predictor of RETA development in the EAPP region and, thus, the sub-hypothesis that there is a significant relationship between BETs and RPP development in Eastern Africa was rejected. Based on the outcomes of the results, the non-significant regression model explaining the relationship becomes; *EAPPD= 1.447+.573BETs*, where EAPPD is RETA development and BETs in the bilateral energy trades.

6.8.4.2 Bilateral energy trades and RPP development in Southern Africa

The study determined the influence of bilateral energy trades on the development of SAPP. This was determined by getting the composite index of BETs and regress it against RETA development in SAPP using simple linear regression analysis to establish the significance. Thus, the following sub hypothesis was tested. **$H4_b$:** There is a significant relationship between bilateral energy trades and the development of SAPP**.** The results were as depicted in Table 6.15.

Table 6.15: Regression Results for bilateral energy trades and development of SAPP

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.620[a]	.385	.378	.03883
a. Predictors: (Constant), Bilateral energy trades				

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.9835	1	.9838	9.325	.000[b]
	Residual	.3164	3	.1055		
	Total	1.3	4			
a. Dependent Variable: SAPP development						

b. Predictors: (Constant), Bilateral energy trades						
Coefficients[a]						
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.212	.382		3.169	.002
	Bilateral energy trades	.717	.094	.620	7.666	.000
a. Dependent Variable: SAPP development						

The study found a relatively moderate relationship between bilateral energy trades and SAPP development (R= .620). R^2 =.385 indicates that bilateral energy trades explain 38.5% of the variation in SAPP development, and the overall model is significant (F=9.325, $p<.05$). The unstandardised beta coefficient indicates that bilateral energy trades make a significant contribution to SAPP development (Beta = .717, t = 7.666, $p<.05$). This, therefore, implies that BET is a key predictor of RETA development, and thus, the hypothesis that there is a significant relationship between BETs and RETA development in the SAPP region was accepted. Based on the outcomes of the results, the regression model explaining the relationship becomes; *SAPPD= 1.212 +.717BETs*, where SAPPD represents RETA development and BETs represents bilateral energy trades in SAPP.

6.9 Analysis

The critical discussion of the findings is presented and analysed to support or contradict and to arrive at the conclusions. In other words, the results discussed, and the reason for the findings explain the extent to which they are consistent or not consistent with previous empirical studies or theoretical arguments. The discussions follow the specific study objectives.

The first objective was meant to analyse the contribution of energy cooperation to sustainable development in Africa. The corresponding research question stated thus: "How does energy cooperation contribute to the attainment of sustainable development in Africa?" In attempting to realise the study objective and respond to the research question, the researcher developed a hypothesis with the aid of the literature that energy cooperation leads to sustainable development in Africa. Both qualitative and quantitative analyses were carried out in testing the hypothesis. From the findings, it was revealed that there was a positive and significant effect of energy cooperation on sustainable economic development in Africa. This was based on the quantitative-led hypothesis testing. This implies that increased energy cooperation leads to improved sustainable development in Africa. This finding, supported by reviewed literature, includes the centrality of energy for economic growth and poverty reduction, power pools being vital drivers to energy integration and sustainable development, and there being an adequate political commitment exhibited in the establishment and development of RPPs.

This finding is in line with Gaylor et al.[495] , who used the concepts of electricity security, electricity equity, and environmental sustainability to assess the viability of electric supply in Southern Africa. The study showed that the energy landscape in the SAPP region had been rapidly developing and integrating with an economy-wide transition to sustainability, with energy at its centre. In addition, UNECA's report examined the contribution of regional integration to economic growth and development in Africa.[496] The report confirmed our finding that lack of energy is a significant hurdle to socioeconomic development in Africa.

The second objective was analysed by comparing the role of PPs, particularly the EAPP and the SAPP, in fostering energy cooperation and addressing energy security in their respective sub-regions. The research question sought to determine how the Southern Africa and Eastern Africa power pools ensure energy security in their respective regions? The corresponding hypothesis was tested quantitatively and stated as: a weak regional power pool leads to energy insecurity in the Eastern Africa, and a strong regional power pool results in energy security in Southern Africa.

The two sub hypotheses stated as follows: weak RPPs and their associated influence on energy insecurity in Eastern Africa; on the other hand, strong RPPs and their associated influence on energy security in Southern Africa. Based on the hypothesis that was analysed, this sub-hypothesis was both accepted, implying that the level or strength of RPPs significantly determines energy security or insecurity in their respective power pools. They all recorded a positive effect implying if a RPP is weaker, there is energy insecurity, and if a RPP is stronger,

495 Gaylor Montmasson-Clair and Bhavna Deonarain, 'Regional Integration in Southern Africa: A Platform for Electricity Sustainability', n.d., 75.

496 'Economic Report on Africa 2011: Governing Development in Africa: The Role of the State in Economic Transformation', March 2011, https://repository.uneca.org/handle/10855/1154.

there is energy security. A study by Verrastro and Ladislaw (2007)[497] asserted that global energy infrastructures, including pipelines, tankers, ports, refineries, and institutions, such as RPPs are strengthening the interdependence in the energy sector and, ultimately, energy security.

From a theoretical perspective, liberal institutionalism proposed that states should establish institutions both at national and international levels to pursue areas of common interest. In this case, the establishment of international institutions, including OPEA and IEA, and regional institutions such as RPPs, therefore, are to address energy challenges by embracing cooperation and interdependence. From the literature reviewed, oil-importing and industrialised countries established IEA, an institution tasked to enhance members' energy security through energy cooperation globally. The establishment of the EAPP and the SAPP as regional institutions were thus significant achievements for those who subscribe to the liberal institutionalists philosophy as the world decides to tackle pressing energy security concerns by embracing interdependence and cooperation fixed on the contribution of institutions.

The third objective compared the operationalisation, challenges, and opportunities of Eastern and Southern Africa power pools. The research question stated as follows: What are the similarities and differences in operationalisation, challenges, and opportunities of the Eastern and Southern Africa Power Pools? The corresponding research hypothesis was formulated, stating: the challenges and opportunities of African power pools are identical irrespective of their phase of development. The study analysed this research hypothesis via a qualitative approach. The two variables were stated clearly from where the various responses were analysed.

The study established several challenges facing the power pools as well as the opportunities they had. It was found that the two power pools in the study shared identical challenges and opportunities for operationalisation. This was further affirmed by the suggested similar innovative solutions for the implementation of power pooling and regional energy cooperation in Africa, from where it was concluded that irrespective of their phase of development, indeed challenges and opportunities of African power pools are identical. The Infrastructure Consortium for Africa (2016) identified a lack of adequate infrastructure, inadequate legal framework, financial distress, and lack of political will as the primary challenges of

[497] Frank Verrastro and Sarah Ladislaw, 'Providing Energy Security in an Interdependent World', *The Washington Quarterly* 30, no. 4 (1 September 2007): 95–104, https://doi.org/10.1162/wash.2007.30.4.95.

operationalising power pools in Africa. On the other hand, the study concurred with the suggestions of Oliver (2018), who was highlighting the prevailing energy insecurity in the SAPP and explored new approaches to overcome the challenges of energy insecurity in Southern Africa. The study argued that regional power trade, through the SAPP, has the potential to solve the challenge if historical, political, and economic barriers can be sustainably addressed.

The fourth objective focused on examining the role of bilateral energy trade in the development of RPPs in general and in Eastern Africa and Southern Africa Power Pools in particular. The research question was, "What is the role of bilateral energy trade in the development of African RPPs?" Further, the study examined the research hypothesis that bilateral energy trades hamper the development of the African regional power pools. To determine whether to accept or reject the hypothesis, the study was subjected to hypothesis testing via a quantitative approach.

From the finding, BETs significantly increased the development of African RPPs, leading to rejection of the hypothesis. This was against the apriori expectation that BETs significantly reduced or hampered the development of African RPPs in general. This was a similar conclusion on the SAPP. However, this was not the case in the EAPP, as it was shown that BETs had a non-significant role in the development of regional energy markets in the EAPP region. A similar study by Foster and Briceno-Garmendia (2011)[498] did not denounce the role of bilateral electric trade agreements as a hindrance to regional electric markets. Their findings affirmed the results obtained in this study where BETs significantly and positively impacted the development of RPPs. Their study suggested that bilateral cross-border power transactions are building blocks to regional electric markets.

Further, a World Bank study entitled "Africa's *Power Infrastructure Investment, Integration, Efficiency*." [32] found out that the SAPP has evolved from long-term bilateral electric trade and further recommended that the practice can guide the development of other power pools in Africa. It can be argued that the EAPP never took lessons from the SAPP even though conceptualised later.

6.10 Chapter summary

This chapter has basically conducted data analysis and presentation of the corresponding study findings. It has presented descriptive statistics of the demographic characteristics of the study

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[498] Vivien Foster and Cecilia Briceno-Garmendia, 'Africa's Infrastructure: A Time for Transformation' (The World Bank, 2010).

participants. Examples of demographic factors considered include sex, age, education level, organisation as well as the distribution of respondents across the regional power pools. An in-depth analysis of each objective has been conducted thereafter. Data has been presented and explained.

The chapter also has done extensive testing of hypotheses. Both approaches such as qualitative and quantitative, have been used. The first, second, and fourth hypotheses employed a quantitative approach in testing the hypotheses, whereas the third hypothesis was tested via a qualitative approach and in line with the reviewed literature. The first hypothesis includes energy cooperation that leads to sustainable economic development. The finding led to accepting this hypothesis. The second hypothesis was conducted under the two sub-hypotheses: a weak RPP led to energy insecurity in the EAPP; on the other hand, a strong RPP led to energy security in the SAPP. Both hypotheses were accepted as stated. The third hypothesis stated that the challenges and opportunities for operationalisation of African power pools are identical irrespective of their phase of development. They were subjected to qualitative hypothesis testing of the two power pools from where the study failed to reject the hypothesis. The fourth hypothesis stated that bilateral energy trades hampered the development of regional energy trade. This hypothesis was tested at the regional or continental level (the EAPP and the SAPP combined) and sub-regional levels. In both cases, significance was reported, except in the EAPP case, which was not significant, and the positive sign implied that BETs promoted RPP development.

Based on hypothesis testing via estimation of various models, the study was concerned with establishing or determining the effect of one variable on another. The chapter concluded by undertaking a discussion of the findings obtained sequentially. The discussions are in line with the literature reviewed in the first chapter.

CHAPTER SEVEN

SUMMARY, CONCLUSIONS, AND POLICY RECOMMENDATIONS

7.0 Introduction

The study assessed the extent to which energy cooperation contributes to sustainable development in Africa. In the process, the study put light onto regional energy cooperation institutions, often referred to as power pools, and analysed their role in ensuring energy security by championing energy cooperation in their respective regions. Throughout the study, the researcher utilised the basic principles of the theory of liberal institutionalism that set the roles of institutions in international relations. The study capitalised on the works of Robert Keohane, especially his work entitled "*After Hegemony: Cooperation and Discord in the World Political Economy*,[499]" where he assesses the roles of international institutions, such as the IEA, in managing international energy relations. The capitalisation is that the study focused on regional institutions and regional energy, power pools, and electricity compared to international institutions and global energy, the IEA, and oil. However, the study took cognisance of the differences between IEA and OPEC, on the one hand, and power pools, on the other hand. While the former institutions involve consumers or producers separately, power pools involve both producers and consumers. Also, while oil is a global energy source managed by international markets, electricity is primarily a regional service commodity governed mainly through bilateral contracts and regional mechanisms.

The international community started to recognise the importance of institutions beginning from the conclusion of World War I; they have become the most recurring features of the international system after the end of World War II and the Cold War. Institutions provide a platform by which states pursue their selfish interests and other multifaceted transboundary challenges of environmental degradation[500] and energy crisis[501] through cooperation. Accordingly, institutions play a critical role in the evolution of a rule-based international system whereby "*rules, norms,* and *regimes"* set expectations.

[499] Robert O. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton, N.J: Princeton University Press, 1984).

[500]Steven Slaughter, "Liberalism and the Foundations of Global Environmental Governance," presented at *European Consortium for Political Research Annual Joint Session* (Grenoble, April 2001): 12

[501]Stockholm International Peace Research Institute, *Oil and Security* (New Jersey: Humanities Press, 1974), 64

Energy is "*a master resource"* that can determine the security and prosperity of a nation. Energy is unevenly and asymmetrically distributed around the globe, sanctioning the unattainability of energy independence. Robert Brice sums it all in his book "*The Gusher of Lies: The Dangerous Delusion of Energy Independence*[502]" that considering the geographic, economic, and technological factors, pursuing the path of independence is delusional. However fragmented, the international system created several institutions to manage international energy relations. In Africa, where there is a bounty of energy resources, energy poverty exists, squeezing development opportunities. Mindful of such a paradox, Africa pursued a regional approach to energy championed by its five power pools and several regional economic communities. In particular, power pools were designed with the ultimate objective of energy security through regional energy integration. Therefore, Africa has embraced energy interdependence and cooperation anchored on institutions, power pools.

Nevertheless, the noble objective of regional energy integration requires a smooth transition from fragmented systems dominated by national policies to an integrated regional system.[503] In this regard, the role of institutions becomes indispensable. As Keohane argued,[504] states should identify transnational challenges so that they are motivated to establish international institutions capable of addressing them. In the study context, the global challenge is energy security, and the institution is a power pool. Keohane and Cooper et al.[505] also argued that institutions could help "*build trust*" among states and on institutions and reduce *"uncertainties*" and "*negotiation costs*." It is evident that institutions reduce "*transactional costs*" of cooperation; in this regard, power pools reduce the "*cost of transaction*" by harmonising soft and hard infrastructure and market.

In harmonising complex infrastructures such as electricity generation and transmission projects, power pools provide a platform whereby members coordinate infrastructure

502 Robert Bryce, *Gusher of Lies: The Dangerous Delusions of Energy Independence* (Public Affairs, 2008), https://b-ok.africa/book/685240/189b6d.

503 Alberto Tita, 'Global Energy Institutions. Russia at the IEA Can Tip the Scale, Assuring Enhanced Governance', *The Journal of World Investment & Trade*, 2012, 972–96, https://doi.org/10.1163/22119000-01306004.

504 Robert Keohane and Helen Milner, *Internationalization and Domestic Politics | Robert O. Keohane, Helen V. Milner | Download* (Cambridge: Cambridge University Press, 1996), https://book4you.org/book/975057/8f26ab.

505 Scott Cooper et al., 'Yielding Sovereignty to International Institutions: Bringing System Structure Back In', *International Studies Review* 10, no. 3 (2008): 501–24, https://www.jstor.org/stable/25481990.

developments with the view to developing a unified plan capable of reflecting regional priorities. Also, power pools create a mechanism whereby members also harmonise their national laws, regulations, and grid codes to develop a regional market. Even after creating regional markets, power pools, on behalf of the members, continue to operate the overall trading and exchange system. In so doing, power pools provide adequate information and data to their members to reduce "*information cost"* in the context of regional trade or competitive markets. They also help the participants reach an agreement, minimising "*bargaining cost"* and follow up on the implementation of the contract, minimising "*policing costs*." Though with different levels of success, power pools in Africa have been doing this.

The study's general objective was to elucidate the contribution of power pools in fostering energy cooperation by exploring the challenges and opportunities contributing towards the realisation of institutionalised energy cooperation in Eastern and Southern Africa. The study also attempted to draw lessons on how regional institutions can address energy security in Africa. The chapter lays down the summary of the key findings and the conclusions of the study following the specific objectives. Implications of the findings are presented, followed by specific policy recommendations. In addition, the study outlines limitations, and areas for further research.

7.1 Key Findings

Energy is both a necessity and a prerequisite for the economic growth and prosperity of any nation. Despite this, the unattainability of energy independence, at least economically, makes a compelling case for energy cooperation. As conceptualised and indicated in the literature reviewed, the regional approach to energy cooperation through power pools is an arrangement where electric outputs from different utilities in a particular region are linked together and dispatched according to prior agreements. In this regard, the study put forward four hypotheses. Based on the data analysis, the study results support the objectives and thus support the hypotheses stated apart from the fourth hypothesis, which alluded that BETA hampered the development of regional power pools.

The data provides sufficient evidence that, firstly, energy cooperation leads to sustainable economic development in Africa. It was based on the hypothesis tested via simple linear regression analysis. The data showed that the majority of the study participants firmly acknowledged that energy was a prerequisite for sustainable economic development. Also, results revealed to a greater extent that energy cooperation/integration is necessary for socio-economic development in Africa. A good proportion, that is, over half of the study participants, were also of the view that energy cooperation/integration is flourishing in Africa despite challenges. From the qualitative analysis, study participants believed that poor access to energy could cause poor living standards, as livelihood depends on energy. Specific effects as presented by the respondents include poor standards of living (poverty, environmental degradation), low economic development, and high cost of energy. It is thus essential to enhance energy cooperation to trigger improved sustainable economic development as well as to attain other related continental as well as global goals.

Second, the study confirmed the hypotheses that a weak regional power pool leads to energy insecurity in Eastern Africa, and a strong regional power pool results in energy security in Southern Africa. These hypotheses were tested quantitatively and consequently accepted. The findings revealed a positive and significant relationship between weak power pools and energy insecurity in Eastern Africa. The study also concluded that a positive and meaningful relationship exists between strong power pools and energy security in Southern Africa.

In this objective, the study was focused on analysing and comparing the role of power pools, namely the EAPP and the SAPP, in fostering energy cooperation and addressing energy security. Most study participants believed that power pools enhance access to electricity in Africa and contribute critically to harmonising regulations, standards, and technical guidelines to provide affordable, reliable, and sustainable energy to the country.

Third, the study confirmed the hypotheses that the challenges and opportunities of African power pools are identical irrespective of their phase of development. The conclusion was arrived at following the testing of the hypothesis qualitatively. The innovative solution for implementing power pooling objectives was intertwined with the opportunities and challenges stated by the respondents. Generally, most of the study participants did not agree with Africa as having an enabling policy framework for developing its energy sector. Similarly, the majority of the study participants were opposed to the idea that Africa has an adequate financial scheme for promoting investment in the energy sector. However, most respondents concurred that Africa has an adequate institutional framework for developing the energy sector.

Opportunities for implementation of power pooling objectives were considered in terms of the level of grid interconnection, whether the amount of investment nationally is in line with the regional grid masterplan, presence of enabling legal framework for regional energy trade, availability of an adequate dispute settlement mechanism for short term energy market/regional energy trade, and lastly close working relationship between power pools and national utilities. The findings illustrate that the works of the EAPP and the SAPP enhanced the level of grid interconnection among their members.

Challenges of implementing power pooling objectives were provided, and key thematic areas include lack of political will, institutional and financial constraints. The second set is poor legal framework (inadequate policies), and the third set is insufficient transmission and generation capacity. The researcher concluded that most challenges were similar across the two power pools with almost zero uniqueness. The conclusion could be linked with the fact that the EAPP was developed with most lessons 'supposedly' learnt from the pre-existing SAPP.[506]

Fourth and last is the idea that bilateral energy trades hamper the development of regional energy trade in the EAPP and the SAPP regions. Two sub-hypotheses were thus formulated and tested: **$H4_a$:** There is a significant relationship between BETA and RETA development in Eastern Africa, and **$H4_b$:** There is a substantial relationship between BETA and RETA development in Southern Africa. In general, BETA was positively and significantly related to the development of RETA. Despite being significant, the finding means that BETA was not a hindrance to African regional energy markets; instead, it is a booster. The observation is similar in the SAPP. Despite having a positive effect, BETA was not significantly related to RETA development in the EAPP region.

It is, however, inconclusive on whether bilateral energy trade agreements discourage countries from pursuing regional/multilateral energy agreements because most respondents were uncertain on this question. Those who agreed presented challenges for the development of RETA as flexibility, transparency, and policy harmonisation. The other category of respondents who were of different opinions listed down opportunities including complementarity of approaches, simultaneity in options, the facilitative role of AfCFTA provisions, and mutual inclusivity of the approaches, among other reasons. On the other hand, the study revealed that BETA plays a critical role in the SAPP and will play the same in the EAPP in contributing to increasing access to electricity, making energy affordable, reducing blackouts and outages, reducing energy rationing, expanding the utilisation of renewable energy sources, and boosting the level of grid interconnection among members.

[506] SAPP was created in 1996 while EAPP was established in 2005.

7.2 Conclusions

Energy, both as an economic input and output, is central to Africa's economic development, the same way it is for the rest of the world. In addition, energy security plays an integral role in the security of the state. The essential elements of energy security include availability, reliability, affordability, and sustainability. Lack of at least one hinders social and economic development. The significant increase in energy demand, mainly from the emerging economies, is disrupting the energy market, threatening energy security, and impacting developing economies. In African power pools, the EAPP and the SAPP have been identified as potential power sector projects. Plans are underway for the EAPP and the SAPP to grow into a single regional power pool.

The main aim of this study was to assess the contribution of power pools in fostering energy cooperation with a focus on realising energy security in Africa. From the key findings, it can be concluded as follows:

1. Energy cooperation significantly leads to sustainable economic development in Africa,
2. A weak regional power pool significantly leads to energy insecurity in Eastern Africa, and a strong regional power pool significantly results in energy security in Southern Africa,
3. The challenges and opportunities of African power pools are significantly identical irrespective of their phase of development, and
4. Bilateral energy trade significantly promotes the development of regional power trade in Africa. It is the same case for the SAPP development. However, it can be concluded that bilateral energy trade has not significantly promoted the development of regional energy trade in the EAPP region.

The study arrived at these conclusions in line with the theoretical argument of liberal institutionalism and ultimately hypothesis testing. The findings or conclusions had a significant bearing and implications on the institutionalised energy cooperation via regional power pools. It eventually contributes to sustainable development in Africa, as hypothesised in this study. In light of this, the noble objective of regional energy integration, within the context of the broader regional integration, requires a gradual transition from fragmented systems of national policies to an integrated regional system.507 In this regard, the role of institutions become indispensable. As Keohane argued,508 states should identify cross-border issues of mutual concern to forge institutions capable of pulling resources to address critical challenges, or in our case pooling power to enhance energy security, thereby contributing to sustainable development. Institutions, regional or international, "build trust" and reduce "uncertainties" and "negotiation costs"509 in integrating systems of governance at various levels. The study finds out that institutions reduce "transactional costs" of cooperation; in this regard, power pools reduce the "cost of transaction" on harmonising soft and hard infrastructure and forging regional markets.

Also, contextualizing the findings of the study with the process of regional integration in Africa, regional power pools can be viewed as opportunities or instruments to forge larger electricity market for the development of the energy sector and eventually the development of the economy. There is consensus among policymakers, researchers, and political leaders that Africa could develop faster through regional integration. Regional integration furthers regional and inter-regional trade, attracts investment, and enhances infrastructure in Africa. Similarly, the attainment of regional energy integration through implementing power pooling in Africa enhances energy security by tackling Africa's daunting energy challenges - infrastructure, and investment. In so doing, the horizontal integration of energy systems in a certain region drives or contributes to the overall regional integration process thereby contributing immensely towards achieving sustainable development in Africa.

Also, energy production and consumption are primary causes of the environmental catastrophes. Science identifies that energy and its value chain have affected the well-being of the environment in the twentieth century. For instance, the International Panel on Climate Change reported that the energy sector, partly through fossil fuel use, is responsible for the two-third greenhouse gas emission and called for more investment in energy efficiency and

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[507] Alberto Tita, 'Global Energy Institutions. Russia at the IEA Can Tip the Scale, Assuring Enhanced Governance', *The Journal of World Investment & Trade*, 2012, 972–96, https://doi.org/10.1163/22119000-01306004.

[508] Robert Keohane and Helen Milner, *Internationalization and Domestic Politics | Robert O. Keohane, Helen V. Milner | Download* (Cambridge: Cambridge University Press, 1996), https://book4you.org/book/975057/8f26ab.

[509] Cooper et al., 'Yielding Sovereignty to International Institutions'.

renewable energy resources.[510] On the other hand, hydropower development, considered renewable energy, has significant ecological and social impacts as large reservoirs cause displacement and greenhouse gas emissions.[511] Also, the climate variations resulting from the advent of climate change affects the viability of hydropower stations, thereby calling for a major policy orientation on basin-wide natural resource management, including forestation.

7.3 Implications of the findings

Literature has clarified the reasons behind the emergence of several international energy institutions, as among others, to manage global energy relations and energy security concerns of producer and consumer states. Africa's energy security doctrine emanates from its challenges, potential, and its political history. There has been a vast and earmarked energy problem in Africa, and power pooling has been perceived to be the most feasible solution to address the problem. It fosters energy cooperation and consequent attainment of the AU Agenda 2063.

From the conclusions, the finding that energy cooperation leads to sustainable development in Africa means that if power pools are effective, we can anticipate regional cooperation to tap into those with huge potential, including Ethiopia, DRC, and Mozambique. In addition, there may be an opportunity to explore green energy solutions such as geothermal from Kenya, among other green energy solutions, by embracing an optimal energy mix. Further, there may be benefits associated with innovative financing alternatives such as green bonds. Africa is embracing energy cooperation for energy security to capitalise on such opportunities, and power pools have become the most desirable institutional setups to achieve these.

Power pools facilitate energy trade. Putting trade in the context of energy security, energy-producing states focus on securing a long-term and stable market, whereas the consumer states are anchored on ensuring a reliable supply of energy. The existence of inter-Africa electric trade for almost half a century and the uneven distribution of energy resources across a continent that embraced regional approaches have contributed to the development of energy cooperation through power pools.

The study findings revealed that a weak regional power pool led to energy insecurity in Eastern Africa, and a strong regional power pool resulted in energy security in Southern Africa. It

[510] IPCC, 'Global Warming of 1.5 ºC', Annual, 2019, https://www.ipcc.ch/sr15/.

[511] Holly Sims, 'Moved, Left No Address: Dam Construction, Displacement and Issue Salience', *Public Administration and Development* 21, no. 3 (2001): 187–200, https://doi.org/10.1002/pad.165.

implies that instituting strong regional power pools would ensure energy security in the continent. In addition, the result means that Africa can ultimately secure a long-term and stable energy market and provide a reliable supply of energy by implementing power pooling. In a nutshell, the power pools may lead to securing power supply for member states, facilitating the development of the electricity market, optimising the employment of energy resources, enhancing access to electricity, reducing electricity cost, and creating a conducive environment for investment.

It is argued that energy cooperation needs fertile ground to develop. The findings revealed that the challenges and opportunities of power pools are identical irrespective of their phase of development. In Africa, the journey to operationalise power pools is mainly dependent on addressing pre-existing challenges and capitalising on opportunities.

Governance issues are the primary challenges to regional energy integration. Governing markets and infrastructure investments constitute energy governance in Africa, one of the conceptualisations proposed in the study. Generally, there is a lack of coordination among the diverse institutions involved. In particular, the disjointed relations between the AUC, RECs, and power pools hamper energy market governance and energy security in Africa.

In contemporary international energy relations, states pursue interdependence as a viable approach to addressing energy security challenges. Consequently, it may require building an energy security regime on issues of mutual interest hence indispensable in making interdependence work. Energy security regimes (which amounts to opportunities for operationalisation) as manifestations of institutionalised energy cooperation mechanisms, set rules and regulations, correct market failures, and provide sufficient information for energy decision making.

The study further established that bilateral energy trade promotes the development of regional energy trade in Africa. Reviewed literature emphasises energy cooperation and interdependence, which are the best description of contemporary global energy relations and presents a viable solution to energy security. Bilateral energy trade contracts must pose significant success by defeating challenges posed by energy price volatility, protectionism, and securitisation. As revealed elsewhere in this study, political will and mutual trust are the fundamental dynamics impacting the attainment of energy cooperation through bilateral or regional market mechanisms. It is important to note that bilateral electricity trade, for example, between member states, is perceived to be a challenge to the development of regional energy markets. However, the finding has revealed that bilateral energy trades could also be a complementing factor towards promoting regional energy trade in Africa. The finding may lead to an increase in investment and mutual trust to steer the development of regional energy trade to foster energy cooperation for energy security.

Even though the international financial institutions are better placed in financing energy projects, the study recognises the critical role of the private sector and financing, purposely supporting to a particular extent, given that adequate investment for regional energy (electric) infrastructure is an uphill task for individual countries. However, with the combination of adequate national and regional policies, the private sector can fill the investment gap in the attainment of energy integration in Africa. In addition, the role of regional economic communities in implementing the African regional energy integration projects is indispensable, as clearly demonstrated in the success stories from the Southern Africa case.

7.4 Academic and Policy recommendations

Energy is a critical input in human development. The centrality of energy as an input to economic development has gained much attention at national and international levels. Africa, unfortunately, remains energy-deficient despite the abundance of energy resources. The urge for sustainable development through energy cooperation in Africa is inevitable. Statistics show that Africa is home to 600 million people living without access to electricity. Many international institutions, especially in Africa, recognize the significance of providing affordable and sustainable energy. Economic development and energy access point to the strong linkages between energy access and sustainable development in Africa. In addition, access to energy determines the state of the economy, development, and security of a nation.

Ensuring energy security in Africa requires devising a clear strategy to supply the growing demand from the different natural endowments. The evolution of energy security strategies ought to be systematic and a replica of international relations. Most states are in the process of pursuing interdependence as a viable approach to addressing energy security challenges. However, it is important to note that the energy cooperation and interdependence dream is not a natural affair in international relations. Instead, they must be cultivated. To do this, institutions, including power pools, play an indispensable role.

Based on the findings, the study recommends some strategies in designing and operationalizing or implementing regional power pools for sustainable development in Africa and beyond. However, these strategies are going to be considered within the perspective of energy governance, intermediated by both energy market and investment, and ultimately energy security as earlier conceptualised. The strategies must reflect on circumstances and should be noted that there is no general recommendation of an optimal strategy. The policy recommendations include:

7.4.1. Measures by Universities

These institutions have to undertake extensive research and produce requisite knowledge for policymaking and innovation (technologies) such as smart grid agendas. They should develop a body of knowledge that will be used to develop existing resources to meet energy needs sustainably. This could provide the technical background and support to the technical partners in all three levels (national, regional, and continental). Other measures that research institutions should undertake include:

i. Produce knowledge for policymaking,
ii. Researching at a regional level,
iii. Encourage research on Africa's energy potential, challenges, and opportunities,
iv. Support research in specific high potential areas for Africa (regarding renewable energy and energy efficiency), and
v. Encourage research on energy-related issues in Africa

7.4.2 Harmonisation of Law and Policy

The international system is composed of state actors that are rational and in continuous pursuit of their interests. However, when there is an opportunity to pursue the same interest by cooperating with like-minded equals, history teaches us those states capitalise on it. Pursuing national energy strategies without recognising the potential of regional alternatives that can contribute immensely to serving the needs of individual states is not what characterises the rational state. Also, the unattainability of energy independence calls for more cooperation with the sole purpose of integrating energy systems horizontally for greater energy security. In so achieving, states need to harmonise their policy and regulatory frameworks to facilitate smooth sharing of the diverse energy resources through power pools. The regional economic and cost differential promotes cooperation. It is expected that difficulties may arise in harmonising policies and energy governance mechanisms for regional energy markets and investment in addition to exacerbating any unresolved energy conflict causes, including transmission channels or other overlapping matters such as membership of conflicting regional economic communities. In doing so, member states to the respective power pools and other interested actors can easily understand if measures considered and decisions made are explicitly beneficial. Such direction may encourage greater participation in energy-boosting via regional planning and partnerships, including from the private sector.

In this regard, institutions such as power pools and regional economic communities are poised to cooperate to harmonise participating countries' policy and regulatory frameworks. The same countries continue to chase their energy objectives but through cooperation.

7.4.3 Operationalisation of Regional Energy Master plans (REMs)

Africa embraced the principles and practices of sustainable development in its fifty-year social, economic, and political master plan known as the African Union Agenda 2063. As popularly known, Agenda 2063 recognises the centrality of energy to achieve its objectives of sustainable development. It proposes that regional energy cooperation is a viable approach to achieve the energy dimension of the agenda. This measure is suggested to increase the role of regional power pools to foster energy cooperation. There is a clear need of integrating national energy masterplans into regional energy masterplans as clearly explained and detailed in the policy paper and roadmap for the African Single Electricity Market (AfSEM).

The PIDA energy projects and the Intercontinental Transmission Master plan developed by AUDA-NEPAD must be owned and implemented jointly by power pools and regional economic communities and led by AFREC. Without proper physical interconnections, power pools cannot develop an energy market. It is necessitated by the fact that the main barrier manifested as 'hard' challenges include the lack of proper infrastructure even if there are other few political issues among the countries in some of the power pools. The study suggests that, even as masterplans are being considered or are under implementation, the successful implementation may require institutional capability, adequate investment, and innovative financing.

7.4.4 System Operation Rules and Efficient Operationalisation

The five different power pools are in various stages of development and operation. The SAPP, for example, has already implemented a real functioning marker, and the Western Africa power pool (WAPP) is progressing in the same direction. The North Africa power Pool or the Comité Maghrébin de l'Electricité (COMELEC), on the other hand, is interconnected with Europe by the Mediterranean Transmission System Operation, and the cooperation offers opportunities for development and sharing of lessons. Therefore, considering the different stages of African power pools, the study recommends building capacities through training and experience, sharing on rules and operations of an interconnected power system.

7.4.4 Regional Institutions and Regional Energy Governance

The study concluded that challenges and opportunities for operationalisation are significantly identical. As states work to optimise existing opportunities, they ought to evaluate the inadequacy of their will and power to address global, regional, and national energy challenges conclusively. States need to maximise their energy resources and opportunities by embracing a more cooperative framework. There is a need to revamp international and regional energy institutions to manage international and regional energy relations and energy security concerns of producer and consumer states.

Energy market and investment are identified as two of the most pressing challenges of the energy sector in Africa. However, the policy paper and roadmap for the African Single Electricity Market (AfSEM) had already conceptualised the way forward for the twin challenge, though it needs more clarity. Respective institutions established need to invest in cross border transmission lines strengthening and implementing regional power pooling. The African Union, regional economic communities, power pools, and financial institutions should put more effort into contributing to the governance of regional energy integration, energy markets, and investment in Africa. The various institutions should craft strategies that will see a turn-around in the prevailing governance system that is rudimentary, fragmented, and ineffective. The governance structure should portray internal clarity given the overlapping mandates and unstructured relations among the institutions. There should be champions acting as a custodian for energy integration in Africa.

The energy actors should institute measures that should increase regional power pools' role to foster energy cooperation in Africa. The actors include national governments of participating member countries, Regional Economic Communities (RECs), regional organisations, financial institutions, research institutions and civil societies – the study provided tailormade recommendations for all as follows:

7.4.4.1 Measures by National Governments

The study suggests that the national governments of member states in each regional power pool should focus mainly on the policy and regulatory environment, energy planning, cooperation, and private sector inclusion. They are expected to do energy planning in a regional context and embrace regional interdependency. They should also embrace variable renewable energy as the lowest cost option and learn to manage the technical challenges rather than use them as an excuse to stay in the status quo. National governments should also accept that climate concerns will shape what is possible in future. Further, they should consider:

i. Enabling smooth operations of power pools by first joining the power pool, enable national utilities and other market participants to sell and purchase electricity in the regional market,
ii. Implementing activities as foreseen in the "action plan for the harmonised electricity market in Africa," which has been adopted by the heads of state of the African Union,
iii. Coordinating national utilities and providing more financing (public) as well as put an incentive in the legal framework,
iv. Harmonising their energy policies with regional bodies,
v. Unbundling electricity supply industry to allow for more players and independent power producers, including incentives to private sector investors,
vi. Seceding some level of sovereignty to institutions such as regional economic communities and power pools,
vii. Providing leadership by participatory engagements, collaboration, and prioritisation of the energy agenda, and
viii. Conscious effort to recognise the need for cooperation in this field,

7.4.4.2 Measures by Regional Economic Communities (EAC, IGAD and SADC)

These institutions coordinate the AU Agenda 2063 in their respective sub-regions. Their mandate needs re-evaluation to ensure that RECs are incorporated in guiding, facilitating, designing, and implementing energy-related projects, coordinating and harmonising policies and regulations affecting the energy sector, and engaging directly in projects that focus on supplying energy. The study recommends that RECs enhance resource mobilisation, technical assistance, and strengthening power pools. They are supposed to play an active role in regional energy planning that demonstrates the cost benefits of larger units that are well interconnected and are based on the lowest cost sources. In addition, this study suggests that RECs should plan to:

i. Aid in sourcing funds and coordination,
ii. Facilitate activities of the power pools,
iii. Technical assistance and coordination,
iv. Prioritise energy cooperation as a key driver to industrial development in Africa,

v. Create mechanisms that support and stimulate the political appetite and will to move forward with regional agendas,
vi. Play a key role in instituting the culture of cooperation in their respective regions,
vii. Give more power to regional regulators, and
viii. Proper investment planning for the energy sector

7.4.4.3 Measures by Regional Organisations (such as AU)

These institutions, for example, the AU, are involved in coordination activities to attain the political and economic integration of the continent. Generally, regional organisations should guide by providing policy direction, coordination of power pools, political will, enabling environment, administrative, and political support. Other measures include:

i. Providing capacity building, continental leadership, technical assistance, and political support
ii. Providing regional policy direction and enabling environment,
iii. Assisting in securing funding to support energy initiatives at the regional level,
iv. Providing a platform for proper policy formulation and implementation modalities,
v. Coordinating power pools and regional regulators,
vi. Linking its energy-related works with regional power pools, and
vii. Addressing political or policy challenges faced in the pursuit of regional energy integration.

7.4.4.4 Measures by Financial Institutions (such as AfDB, TDB)

Financing regional energy integration requires suitable innovative funding mechanisms and enabling the private sector to access debt financing. Regional financial institutions should:

i. Prioritise and fund regional energy infrastructure development,
ii. Cultivate innovative financial schemes to address financial challenges,
iii. Provide financing at affordable terms and conditions for the construction of generation plants and transmission lines, and distribution networks, and
iv. Assist governments in formulating bankable power purchase agreements.

7.4.5 Establishment of Regional Regulators

Institutions including RPPs exist because states sanction them, and the power relations among member states determine their nature or strength. This assertion is also held by the liberal institutionalist theory. Institutions provide information, reduce transactional costs, and make commitments by member states credible. The daunting challenge of the energy sector in Africa generally is the tariff structure. Without setting an electricity tariff that reflects the cost of generation and supply of energy, the industry will fail to recover the investment, consequently depressing new investments and pressuring the public sector.

Statistics show that the electricity tariff in most African countries is low due to the massive subsidy by respective governments, a move that this study praises, even though the sector becomes unattractive to investment, and the process of regional energy integration becomes prevaricated. The study calls for reasonable balancing and regulated entry of the private sector into the energy sector.

The RPPs in general and the EAPP and the SAPP should therefore affirm their duty of securing power supply for member states as well as enhancing access to electricity by reducing electricity costs and creating a conducive environment for investment. From the qualitative analysis, increased costs were found to lower the electricity demand. High costs further hamper bilateral energy trade and, ultimately, the development of regional power pools essential in steering energy cooperation.

The study explained the rationale behind establishing regional regulatory institutions. The study thus suggests the need for regional regulatory institutions as frameworks for harmonisation of different legal and regulatory systems of the participating states. These institutions could be involved in the removal of any tariff-related barriers. Also, these institutions would regulate the prevailing unreflective tariffs that negatively impact energy affordability, access, and equity at national and regional levels. In this regard, the EAPP and the SAPP should embrace common regional regulatory mechanisms even though it is an overwhelming challenge as they plan to form one bloc of power pool. The challenge has two faces: first, different states have different scopes for their regulatory agencies; and second, there are many regional regulatory institutions in the EAPP and the SAPP regions. A team of experts can evaluate these challenges and get a common harmonisation ground for establishing the same.

7.4.6 Increase Energy Generation Capacity and Efficiency in Energy Consumption

African countries should, therefore, prioritise the growth of energy generation and increased efficiency in energy consumption. This will be achieved through continued institutional reforms in the energy sector, including a strong regulatory framework, encouraging private generators of power, separating generation from distribution, securing new sources of energy through the exploitation of other renewable energy sources, and connecting excluded countries to the regional power pools to benefit from countries that have energy-surplus in the region.

7.5 Limitations

This study has purposely interrogated the concept of sustainable development through Energy Cooperation in Africa. The research was only devoted to energy relations dynamics in the Eastern and Southern African power pools. The study focused on RPPs assessing the state of energy cooperation in Eastern and Southern Africa in line with the objectives. Several challenges, however, emanated from the researcher and the research participants, including the crowded schedules of research participants and the Coronavirus (Covid-19) global pandemic. To ease such challenges of the overcrowded programs of research participants, the researcher made appointments in due time. The issue of COVID-19 led to the development of a digital research instrument that was distributable digitally. The researcher extensively employed digital platforms such as Skype, Google meets, and Zoom to reach all the study participants and increase the response rate. In addition, inspiring the participants to talk freely about the subject matter and trust the process was difficult, and it required the researcher to be diplomatic, creative, and friendly.

The last challenge is a bias emanating from both the researcher and the research participants. The best way to manage the bias originating from the behaviour of the researcher was to identify, acknowledge, and control the bias. In this study, one of the possible sources of bias is the researcher's familiarity with the research problem. The researcher continuously and carefully checked for such a bias throughout the progression of the study, particularly during the final phase.

7.6 Academic Recommendation

This study has purposely interrogated the concept of sustainable development through Energy Cooperation in Africa. Cross-sectional data were collected via questionnaires and interview guides and used to test the hypotheses. The researcher dwelt in understanding the contribution of regional power pools (the Eastern and Southern Africa power pools), particularly in fostering energy cooperation. The specific objectives included examining the role of energy cooperation for sustainable development in Africa; analysing the role of power pools, particularly the EAPP and the SAPP, in fostering energy cooperation and addressing ES in their respective sub-regions; analysing the challenges and opportunities of implementing power pooling in the Eastern and Southern Africa Power Pools; examining the role of bilateral energy trade in the development of power pools in general and in the Eastern and Southern Africa Power Pools in particular. The findings obtained were used in drawing lessons on how RPPs can address energy security in Africa.

Since the study focused only on energy relations dynamics in the Eastern and Southern Africa power pools, there is a need for another study to assess the contribution of the other power pools such as the North Africa Power Pool, West African Power Pool (WAPP), and Central Africa Power Pool (CAPP). In addition, another similar but longitudinal study is required examining the same aspects of regional power pools over a period of time. It will enable predicting and forecasting. There is a need to undertake a survey exploring the cost of operating power pulls and how to enhance the efficiency of power pools via other advanced approaches such as data envelop analysis (DEA) or frontier analysis. These techniques will help compare the performance of regional power pools and evaluate the relative efficiency of decision-making units (DMUs) established under the energy governance framework at regional or continental levels.

In estimating the hypotheses, both qualitative and quantitative methodologies were used. For the qualitative-led hypothesis, the inductive approach was used. There is a need for other similar studies to be done embracing the deductive method in hypothesis testing. In addition, simple linear regression modelling was used in quantitative-led hypothesis testing. The study suggests using other modelling techniques such as panel data (fixed effects, random effect, or mixed effects) modelling approaches or time-series approaches.

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Appendix I - Generic Research Questionnaire[512]

Dear Respondent,

I am Zerubabel Tefera, a PhD candidate at Institute of Diplomacy and International Studies, University of Nairobi. I kindly request you to provide information on my PhD study titled:

[512] This is a generic research questionnaire. It will be customized to fit research questions related to individual regional power pool.

Sustainable Development through Energy Cooperation: A Comparative Analysis of Eastern and Southern African power pools. The study intends to examine the role of regional power pools in fostering energy cooperation by exploring the social, political and diplomatic pull and push factors in Eastern and Southern Africa. The research aims at drawing lessons on how regional power pools can address energy poverty in Africa.

You have been identified to provide critical information to make this study a success. If you choose to participate in the study, all responses will be acknowledged, credited, and strictly used only for academic purpose. Information received will be treated in confidence. Your cooperation is highly appreciated.

If you have any inquiries, please contact me using the following address: +254732488071 (WhatsApp and Regular Calls), zerubabel.tefera@students.uonbi.ac.ke , or zerubabelmfa@gmail.com

Thank you!

Section A: Bio Data

Please tick as appropriate

i. **Sex**: [ ] Male [ ] Female
ii. **Age**: [ ] 16 – 25 [ ] 26 – 35 [ ] 36 – 45 [ ] 46 – 55
iii. **Level of Formal Education**: None [ ] Secondary Education [ ] College Education [ ] University Education
iv. **Organization**: [ ] Government [ ]International Governmental Organization [ ] International Non-governmental Organization [ ] Local NGO/Civil Society [ ] Academia [ ] Business
v. **Nationality** ________________________

Questionnaire

1. Energy is a prerequisite for sustainable economic development.

   ☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
   ☐ Neither agree nor disagree
   ☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

2. Lack of adequate energy impedes economic development

   ☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
   ☐ Neither agree nor disagree
   ☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

3. Africa's economy is supplied with adequate energy.

   ☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
   ☐ Neither agree nor disagree
   ☐ Somewhat agree ☐Agree ☐ Strongly Disagree

4. If your answer is ‘Strongly disagree’ to Question 3, what do you think the primary causes for inadequate energy access in Africa?

5. If your answer is ‘Strongly agree’ to Question 3, what do you think are the factors making energy very accessible in Africa?

6. A state can provide all the energy it needs from its domestic energy resources.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

7. States in Africa can provide all the energy it needs from their domestic energy resources.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

8. If your answer is “Disagree” or “Strongly Disagree” to Question 7, what other ways do you think states use to provide adequate energy supply for its economy?

9. Energy cooperation is necessary for economic development in Africa

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

10. If your answer is ‘Strongly disagree’ to Question 3, list the measures being taken or you think should be taken by respective governments and regional organizations to boost access to energy in Africa?

11. Energy poverty is one of the primary factors affecting economic development in Africa.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐Agree ☐ Strongly Disagree

12. If your answer is 'strongly agree' to Question 11, what measures governments and regional organizations are taking to address the challenge?

13. If your answer is 'strongly agree' to Question 11, what measures governments and regional organizations should be taking to address the challenge?

14. Energy cooperation is flourishing in Africa.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

15. If your answer to question 14 is "Strongly Agree", list the factors contributing to strong energy cooperation in Africa?

16. If your answer to question 14 is "strongly disagree", list the factors hampering energy cooperation in Africa?

17. Institutions play a crucial role in fostering energy cooperation at the global level.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

18. Which one of the following can best describe Africa's place in international energy relations?

☐ Consumer ☐ Producer ☐ Transit ☐ None

19. Regional power pools play a significant role in fostering energy cooperation in Africa.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

20. If your answer to question 19 is "strongly disagree", list the factors affecting the efficiency of regional power pools in Africa?

21. If your answer to question 19 is "strongly agree", list factors that enable regional power pools in fostering energy cooperation in Africa?

22. If your answer is ‘strongly disagree’ to Question 19, list the measures being taken or you think should be taken by respective governments and regional organizations to increase the role of regional power pools to foster energy cooperation in Africa?

23. Regional power pools enhance access to electricity in Africa.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

24. Regional power pools play a significant role in providing energy with reasonable price.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

25. Regional power pools play a significant role in providing uninterrupted energy to customers.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

26. Regional power pools play a significant role in promoting renewable energy investment in Africa.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

27. Bilateral energy trade deals discourage countries from pursuing regional/multilateral energy agreements.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

28. If your answer to question 27 is “strongly agree”, why do you think bilateral approach discourages multilateral approach to energy cooperation in Africa?

29. If your answer is ‘strongly disagree’ to Question 27, what do you think is the relationship between bilateral approach and multilateral approach to energy cooperation in Africa?

30. Which of the following energy resources are managed by the respective regional power pool? You may tick more than one box, if applicable

☐ Coal ☐ Hydropower ☐ Oil ☐ Thermal
☐ Solar ☐ Nuclear

31. The African Union plays a crucial role in fostering energy cooperation in Africa.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

32. If your answer is ‘strongly disagree’ to Question 31, what do you think should the African Union do to promote energy cooperation in Africa?

33. If your answer is ‘strongly agree’ to Question 31, what do you think is the contribution of African Union in promoting energy cooperation in Africa?

34. COMESA plays a crucial role in fostering energy cooperation in Eastern and Southern Africa.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

35. IGAD plays a crucial role in fostering energy cooperation in Eastern Africa.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

36. If your answer is 'strongly disagree' to Question 35, what do you think should IGAD do to promote energy cooperation in Eastern Africa?

37. If your answer is 'strongly agree' to Question 35, what is IGAD's contribution in promoting energy cooperation in Eastern Africa?

38. EAC plays a crucial role in fostering energy cooperation in Eastern Africa.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

39. If your answer is 'strongly disagree' to Question 38, what do you think should EAC do to promote energy cooperation in Eastern Africa?

40. If your answer is ‘strongly agree’ to Question 38, what is EAC’s contribution in promoting energy cooperation in Eastern Africa?

41. SADC a crucial role in fostering energy cooperation in Southern Africa.

☐ Strongly disagree ☐ Disagree ☐ Somewhat disagree
☐ Neither agree nor disagree
☐ Somewhat agree ☐ Agree ☐ Strongly Disagree

42. If your answer is ‘strongly disagree’ to Question 41, what do you think should SADC do to promote energy cooperation in Southern Africa?

43. If your answer is ‘strongly agree’ to Question 41, what is SADC’s contribution in promoting energy cooperation in Southern Africa?

Appendix II - Guide to Interview Process

Introduction

"I am Zerubabel Tefera, a PhD candidate at the Institute of Diplomacy and International Studies, University of Nairobi. I kindly request you to provide information on my PhD study titled: Sustainable Development through Energy Cooperation: A Comparative Analysis of Eastern and Southern African power pools. The study intends to examine the role of RPPs in fostering energy cooperation by exploring the social, political and diplomatic pull and push factors in Eastern and Southern Africa. The research aims at drawing lessons on how RPPs can address energy poverty in Africa."

"You have been identified to provide critical information to make this study a success. If you choose to participate in the study, all responses will be acknowledged, credited, and strictly used only for academic purpose. Information received will be treated in confidence. Your cooperation is highly appreciated. The interview is structured in three main sections: the first section will cover the nexus between energy cooperation and sustainable development; the second section will thoroughly discuss RPPs, and the last part will delve into the role of bilateral energy trade arrangements in the development of RPPs."

Thank you!

I. Energy Cooperation and Sustainable Development

1. How do you see the relationship between energy and economic development?

   Do you think a state can provide its economy with adequate energy from domestic sources? Please explain.

   If the answer is 'No' - what other ways do you think states use to provide adequate energy supply for its economy?

2. Do you think energy cooperation is necessary for sustainable economic development in Africa? Please explain.
3. How do you rate access to energy in Africa?
   a. Strong
   b. Moderate
   c. Weak

   What makes you say so?

4. Tell me the measures being taken or you think should be taken by respective governments and regional organisations to boost access to energy in Africa?
5. Do you think energy poverty is one of the primary factors affecting economic development in Africa?