Energy and Power Engineering, 2025, 17(9), 258-269
https://www.scirp.org/journal/epe
ISSN Online: 1947-3818
ISSN Print: 1949-243X

Governance of Energy Transition in South Africa: A Sociotechnical Analysis of the Electricity System

Abiodun Adeola Akinola

Shombay Electric Limited, Abuja, Nigeria
Email: akabad.abbey@gmail.com

How to cite this paper: Akinola, A.A. (2025) Governance of Energy Transition in South Africa: A Sociotechnical Analysis of the Electricity System. *Energy and Power Engineering*, **17**, 258-269.
https://doi.org/10.4236/epe.2025.179015

Received: June 30, 2025
Accepted: August 30, 2025
Published: September 2, 2025

Abstract

Energy access extends beyond social amenities; it is an essential part of life. The energy supply system is a crucial infrastructure because it underpins all sectors of society. South Africa, recognised for its infrastructure development, has experienced a slowdown in service delivery due to a decline in energy supply. Several factors contribute to reduced energy access; however, a close connection exists between South Africa's electricity and coal minerals, known as the minerals-energy complex (MEC). The MEC system influences South Africa's electricity supply, as it relies heavily on coal mining. Consequently, the decreasing demand for coal, driven by rising climate awareness, causes ripple effects on South Africa's electricity system. Therefore, there is an urgent need to transition from the current energy production system to sustainable forms of energy generation. This study examines the governance of the energy transition from a fossil fuel-based electricity system to renewable sources in South Africa, focusing on the roles of actors, institutions, national and global networks, and the dynamics at various levels that determine the success or failure of the transition. The research employs the sociotechnical system framework, based on the theories of the multi-level perspective (MLP) and strategic niche management (SNM). The findings indicate that the emerging electricity system cannot fully replace the existing regime; it can only complement it. Therefore, the government should promote the development of renewable energy equipment and component manufacturing companies within South Africa to create jobs, particularly for coal workers affected by the transition to renewable energy. Furthermore, the government should actively fund renewable energy projects and incentivise their adoption.

Keywords

Energy Access, Minerals-Energy Complex, Electricity System, Energy

Transition, Multi-Level Perspective, Strategic Niche Management

1. Introduction

Access to energy extends beyond the mere availability of social amenities; energy is a fundamental part of life. The energy supply system is a vital infrastructure because all sectors in society depend on it for their survival. The efficient functioning of transportation, housing, industrial, food production, and healthcare systems relies on a dependable and affordable energy supply [1]. South Africa, recognised for its infrastructural development, has experienced a slowdown in service delivery due to declining energy supply. Indeed, approximately 25 per cent of South Africa's population lacks access to electricity [2]. Several factors contribute to the decreasing energy access; however, a symbiotic relationship exists between South Africa's electricity and coal mineral supply, known as the minerals-energy complex (MEC). The MEC system influences South Africa's electricity supply, as it depends heavily on coal mining activities. Therefore, the decline in coal demand driven by rising climate awareness triggers a ripple effect on South Africa's electricity system.

Climate change mitigation is another concern due to the coal-intensive nature of South Africa's electricity generation. Baker *et al.* [3] state that South Africa's coal-dependent electricity sector was responsible for 45 per cent of the country's national emissions of 237 Mt CO_2-equivalent in 2010. According to Geert and Loorbach [1], severe air pollution in large cities is a direct result of coal burning, as seen in cities such as Kimberley in the Northern Cape, South Africa. In addition to air pollution, the reliance of South Africa's energy supply system on the extensive use of fossil fuels leads to the formation of CO_2, a product of carbon emissions, and a constituent of greenhouse gases (GHGs). Araujo [4] reveals that "In April 2016, 175 countries signed the Paris Agreement,[1] which aims to slow the growth of greenhouse gases (GHGs), including CO_2, in the atmosphere, to limit global warming", with South Africa being one of the signatories. Earlier, at the Copenhagen climate change summit in December 2009, President Jacob Zuma pledged to reduce the country's GHG emissions by 34 per cent by 2020 and 44 per cent by 2025 [5]. Less than five years before the 2025 target, GHG emissions are still very high in the country. Thus, the effort towards climate change mitigation becomes an obligation for the South African government. In addition to the crises of energy access and energy sustainability, South Africa has also continued to struggle with high unemployment rates [5]. According to Baker *et al.* [5], the production of alternative energy would enhance the employment prospects of 25 per cent of the population that remains unemployed. Thus, the need for a switch from the current system of energy production to a sustainable, economically viable, and environmentally friendly mode of energy production has become a necessity. Grubler [6]

[1]The Paris Agreement is an international treaty within the United Nations Framework Convention on Climate Change (UNFCCC), dealing with climate change mitigation, adaptation, and finance [7].

believes that the current energy systems have become unsustainable based on many social, economic, and environmental criteria. This study aims to examine the governance of the energy transition from a fossil fuel-based electricity system to a renewable electricity system in South Africa. It will revisit the role of actors, institutions, national and global networks, and the dynamics at different levels, which determine the success or otherwise of the energy transition. The study will employ the framework of the sociotechnical system, whereby technological advancements are intertwined with and work in tandem with the country's social structures, drawing on the theories of the multi-level perspective (MLP) and strategic niche management (SNM).

2. Profile of the South African Electricity System

The state-owned utility company, Eskom,[2] has an installed capacity of 42 GW, comprising 35.7 GW of coal-fired stations, 1.8 GW of nuclear power, 2.4 GW of gas-fired stations, 600 MW of hydroelectric power, and 1.40 GW of pumped storage stations [3]. Eskom, which supplies 90 per cent of the country's coal-fired electricity, is now debt-ridden and in crisis. The Renewable Energy Independent Power Producers' Procurement Programme (REIPPPP) is currently the most successful energy programme in the country. The program has approved 79 projects that allocate 5243 MW of renewable energy from wind, solar photovoltaic (PV), concentrated solar power (CSP), biogas, and small hydro sources, with a total private investment of USD 16 billion [8]. **Table 1** presents South Africa's key economic indicators.

Table 1. South Africa's key indicators (Source: [9]).

	2000	2018	2030
GDP ($2018 billion, PPP)	491	789	1010
Population (million)	46	57	66
• With electricity access	77%	95%	100%
• With access to clean cooking	56%	87%	90%
CO_2 emissions (Mt CO_2)	280	420	321

3. Methodology

This study utilises peer-reviewed journal articles, policy documents, textbooks, and government reports to analyse the energy transition in South Africa, with a focus on the governance of the electricity sector. The framework underpinning the study is the sociotechnical theory, used for global energy transition, which primarily concentrates on developed Western countries. While the MLP examines

[2]Eskom is a South African electricity public utility. It was established in 1923 as the Electricity Supply Commission (Escom), and is also known by its Afrikaans name, Elektrisiteitsvoorsieningskommissie (Eskom) [10].

niche emergence amid pressures from the coal-fuelled electricity regime and the broader landscape, including government policies on renewable energy adoption and network expansion, SNM highlights the actions, activities, and actors that influence niche emergence.

4. Electricity Governance in South Africa: Actors

According to Kooiman [11], "Governing can be considered as the totality of interactions in which public, as well as private actors, participate, aimed at solving societal problems or creating societal opportunity". Thus, electricity governance is the totality of activities among the actors—public and private—involved in the process of electricity supply and utilisation. These include the policies, regulations, markets, state-owned utilities, and independent power producers. According to Baker *et al.* [3], the following institutions are responsible for the governance of electricity in South Africa: The Department of Energy (DoE), which is responsible for energy policy and planning; the National Energy Regulation of South Africa (NERSA), the Independent System Market Operator (ISMO), and the Ministry of Energy (MoE). The Independent Power Producer (IPP) manages the renewable energy procurement program and is responsible for private power generation. Others are metropolitan and municipal governments, organisations such as the Association of Municipal Electricity Utilities (AMEU), and the South African Local Government Association (SALGA).

5. The Energy Transition: From a Fossil-Fuel Electricity System to a Renewable Electricity System

As presented by Bridge *et al.* [7], "energy transitions are major structural shifts within an energy system". The structural shift extends beyond a change in individual energy technology or fuel source; it encompasses the entire energy system [12]. According to Bridle and Geddes [13], the share of fossil fuels in South Africa's total primary energy is 92 %. The authors maintain that South Africa's energy sector is concentrated on one single energy source: coal. Due to the fossil-fuel energy system's contributions to global warming and the growing awareness of climate change, the energy transition in South Africa is primarily focused on the electricity system.

5.1. Governance of Energy Transition in South Africa

The governance of the energy transition is necessary due to the complex nature of energy transitions. Energy transition involves multiple actors at various levels, encompassing a complex system. It is a co-evolutionary process that requires numerous changes in sociotechnical configurations, multi-actor function, involving a large variety of social groups, and radical shifts from one structure to another [1]. Due to the complexity of events in the energy transition, without proper governance, it may lead to market, government, or structural failures. Changing the manner of energy production and consumption presents a considerable challenge.

Therefore, effective governance is crucial in establishing the foundation for a successful energy transition. Under the governance of the energy transition, three key elements are essential to understanding its dynamics: scope, characteristics, and timing. The scope of this essay is electricity, charting the move away from the existing fossil fuel electricity to a renewable electricity system. The characteristics of the energy transition in South Africa are shaped by its political structures, the MEC system, and the country's political economy. Baker *et al.* [5] posit that South Africa's energy sector is characterised by its unique socio-political and economic legacy of apartheid. Other characteristics are infrastructural decay, economic decline, and environmental concerns. Concerning timing, the process of transitioning to electricity is always slower due to the complex mix of technology, infrastructure, and capital investment. The timeline spans from 1860 to 2019 and beyond, as the transition is still ongoing. The following section summarises the timeline of South Africa's system change in electricity, from 1860 to 2019.

5.2. Timeline of South Africa's Energy Transition (1860-2019)

The shift from one electrical system to another in South Africa has evolved over the years. Essex and Groot [6] argue that the electricity system in South Africa underwent significant changes as early as 1860. Over this period, various policy initiatives have been implemented in response to political inclinations, including those of the apartheid and post-apartheid eras. The policies led to the development of different regimes of technology, including coal, nuclear, and renewable energy. There has also been the emergence of other actors and institutions, such as municipalities and private companies generating electrical power. Essex and Groot [6] identified four broad, but distinctive chronological phases of the electricity system change in South Africa as follows: the limited spatial extent of the supply infrastructure in the colonial period (1860-1948); the highly segregated supply of the apartheid period (1948-1994); the more equitable and pro-poor emphasis of the post-apartheid era (1994-2011); and the so-far unknown effects of a sustainable energy transition (2011-). **Table 2** presents the timeline and the relationship between the political, technological, and institutional dynamics of the electricity systems from 1860 to 2019.

Table 2. The inter-relationship between the political, technological, and institutional dynamics of electricity systems in South Africa, from 1860 to 2019 (Source: [6]).

Period	Political	Technological	Institutional
1860-1948	Emergence of a national industrial strategy based on MEC, dependent upon cheap electricity and labour.	Generation of electricity from cheap coal and hydro sources. Limited distribution capacity.	**Private companies** generated power for mining operations. **Municipalities** generated their power for public spaces in town and city centres, which later extended to businesses and residential areas. Creation of **Eskom** in 1926 to pool and distribute low-cost electricity.

Continued

1948-1994	Apartheid era: Overt forms of racial segregation and exclusion created highly segregated urban forms (Well-serviced white areas were geographically separated from poorly serviced black townships).	Plentiful supply of electricity from cheap coal (and later nuclear power).	**Eskom**: Effective in generating cheap and plentiful electricity as a central feature of the industrialisation of the country within the 'Minerals-Energy Complex'. **Local government**: Many urban municipalities generate and distribute their electricity only to white areas. Bantustans/homelands for black populations and elected councils for black townships (after 1982) had limited 'parastatal' electricity providers.
1994-2011	Post-apartheid: pro-poor policies to reduce inequalities in society.	Plentiful supply of electricity from cheap coal and nuclear power until 2007. Then, shortages in the generation capacity require load-shedding.	**Eskom**: Retained distribution of electricity to rural areas and some parts of cities and merged with the Homeland electricity parastatals. Failed government attempts to privatise the sector resulted in a lack of investment in generation capacity from 1998 to 2004, creating the load-shedding crisis from 2008 to 2015. **Local government**: Municipalities given a 'developmental' role in the new Constitution, including the distribution or reticulation of electricity in urban areas with cross-subsidisation of poor populations, especially in townships. Municipalities in urban areas were able to build on their existing functions and competencies from the apartheid era. In contrast, townships and rural and homeland areas had to start from a low or non-existent base.
2011-	Climate change agenda and renewable energy. The government pledges to reduce carbon emissions by 34 per cent by 2020 and 42 per cent by 2025 (Copenhagen Climate Change Conference, 2009).	Shortages in generation capacity encouraged investment in two new coal-burning power stations, as well as nuclear power and renewable energy, particularly wind and solar.	**Eskom**: Following the lifting of the 2004 ban on investing in new generation capacity, Eskom suffered from a lack of expertise and mismanagement in developing this new capacity from 2010 onwards. The rising cost of new investment necessitates an increase in electricity costs for consumers. In the 2010 Integrated Resource Plan, the Government encouraged independent power producers to generate renewable energy. **Local government**: Some municipalities formulate climate change strategies as an additional duty alongside their pro-poor obligations. The effect of small-scale embedded renewable energy as a form of decentralised generation is recognised as a potential threat to the financial viability of pro-poor subsidised energy provision.

6. Sociotechnical Analysis of Energy Transition in South Africa

This section analyses the energy transition from fossil fuel-based electricity systems to renewable electricity in South Africa using the sociotechnical system framework. Geels [14] defines the sociotechnical system as an analytic perspective that emphasises the inherent linkages between the technical and social aspects of energy provision. He highlights the following factors as the chief components of a sociotechnical system: technology, markets, user practice, public policies, regulations, and infrastructure (**Figure 1**). The change in the electricity system in South Africa will be analysed using theories of the MLP and SNM from the sociotechnical system framework.

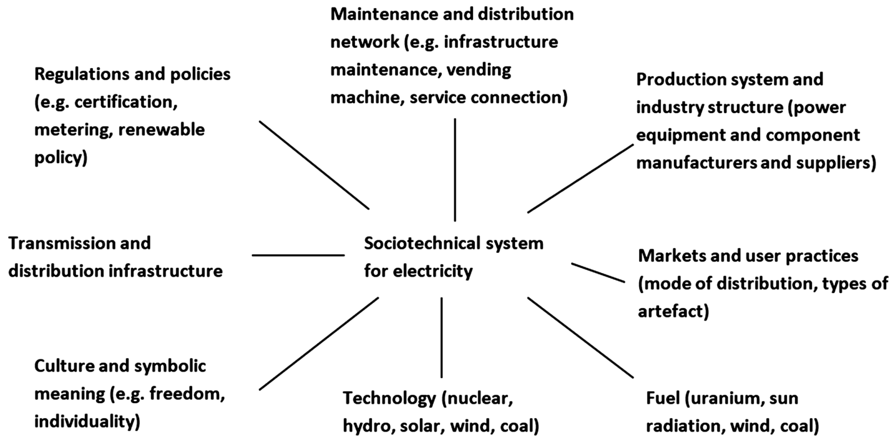

Figure 1. Sociotechnical system of electricity (Source: author; adapted from [14]).

6.1. The Multi-Level Perspective (MLP)

The multi-level perspective (MLP), according to Geels *et al.* [15], sees energy transitions as driven by interactions between three analytical levels: a) the sociotechnical regime, which is stabilised by lock-in mechanisms; b) niche innovations, which differ radically from the existing dominant regime; and c) exogenous landscape developments such as slow-changing trends or shocks that destabilise the regime and facilitate the breakthrough of niche innovations. Instead of single drivers, the MLP's key point is that transitions come about through the alignment of processes within and between these three levels (**Figure 2**). The landscape exerts direct pressure on the regime and indirect pressure on the niche (**Figure 3**). MLP analyses systems change from the level of 'landscapes', 'regimes', and 'niches', as shown in **Figure 2**, and is helpful because it attempts to capture how technological and political change is embedded within and affected by broader landscapes, as is the case with South Africa [5].

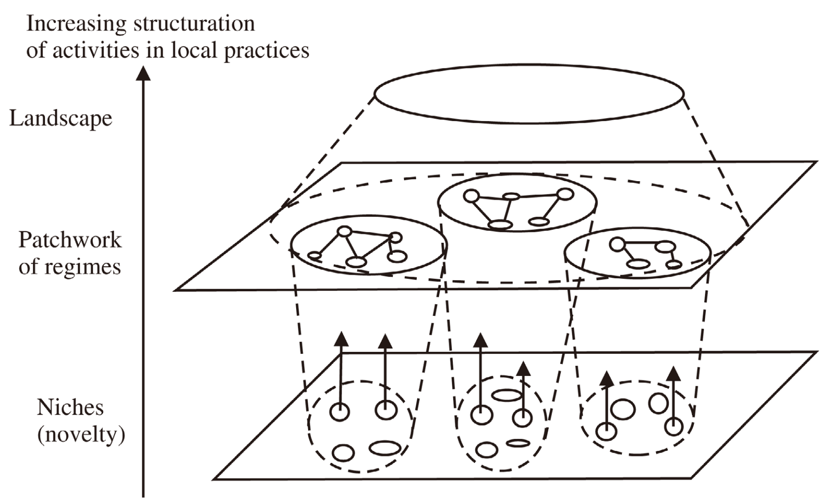

Figure 2. Multi-level as nested in a hierarchy (Source: Geels [14]).

In the context of South Africa, the niche is the emerging renewable energy of solar and wind power. The regime is the fossil-fuel electricity system. Climate awareness, inadequate electricity, and economic decline are the exogenous factors affecting landscape development. Other factors include the introduction of a regulatory framework for renewable energy, the emergence of independent power producers, and international dynamics such as rapidly evolving trends in the renewable energy sector [16].

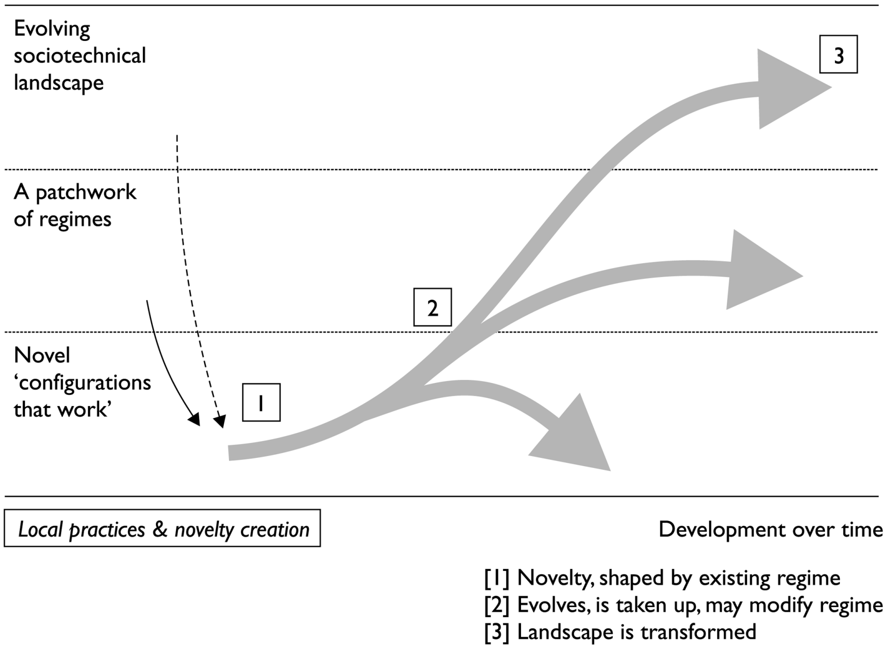

Figure 3. The emergence of a niche in a sociotechnical system (Source: [14]).

While MLP theory proposes a deliberate regime destabilisation, the case of South Africa is primarily the result of multiple crises in the electricity sector, notably those related to the energy company Eskom [3]. The exogenous landscape factors of climate awareness, inadequate electricity, and economic decline also put pressure on the sociotechnical regime of South Africa's electricity system. The combination of these pressures (**Figure 2** and **Figure 3**) led to a breakthrough in the niche of solar PV and wind power, entering the realm of fossil-fuel electricity. The crisis between state and non-state actors also played a role in the regime's destabilisation. According to Baker *et al.* [3], the disintegration of close-knit relationships between actors in Eskom, coal, and other mining companies, as well as the state, adversely affected the electricity regime, providing an opportunity for a niche breakthrough. At the niche level, the establishment of the RE IPPPP provides tools for empowering the emergence of a niche [16]. As a framework, the MLP is concerned with how incumbent regimes lose stability and thereby undergo transitions because of coordinated pressures from the niche and landscape levels [5]. With this considered, an MLP analysis of the electricity system change indicates that the sociotechnical regime of coal-based electricity has lost stability in South Africa.

6.2. Strategic Niche Management (SNM)

SNM is a theory that examines the roles of niches in the emergence of radical innovation [14]. A niche refers to a protected space where radical innovations and knowledge, such as new technologies, markets, ideas, practices, and policies, emerge, which deviate from the dominant regime [5]. A niche thus offers a protective space to shield, nurture, and develop a new technology. The following actors and agencies contributed to the development of a niche in South Africa: i) bilateral donors and private finance; ii) international institutions such as the World Bank, United Nations Framework Convention on Climate Change (UNFCCC), and initiatives such as the Clean Development Mechanism (CDM);[3] and iii) the IRP 2010 process, which demonstrates the contribution of emerging niche actors in private renewable energy generation [5]. Others are industry associations, energy firms, and environmental Non-Governmental Organisations (NGOs). These actors, supported by actors at the landscape level, create space for niche development and weaken the fossil-fuel electricity regime. To further analyse the development of renewable technologies in South Africa, using the concepts of SNM. Three kinds of processes are essential for the development of niches: i) the building of a social support network to nurture the new technology; ii) the learning process to stimulate the price and performance ratio of the technology; and iii) articulation and adjustment of expectations and visions [14]. The renewable energy actors in South Africa have established a social support network. The learning process has been successful, with a noticeable effect on the falling prices of renewable energy. Regarding the articulation and adjustment of the vision, the agendas influencing electricity in South Africa are numerous and conflicting [6]. Thus, different actors, institutions, and consumers have different visions and expectations. The development of renewable technologies in South Africa has moved to stage 2 (**Figure 3**), evidenced by the dramatic decrease in the tariffs bid by project developers under the RE IPPPP [2], which shows that many RE projects are now cost-competitive with Eskom's coal projects. While niches have gained some level of access to the regime, with support from landscape actors, South Africa's coal-generated electricity regime has thus far been able to resist pressures for more profound change [3].

6.3. Renewable Energy Policies in South Africa

Public policy is a significant component of the South African sociotechnical system, playing a crucial role in the country's push towards renewable electricity. Nevertheless, there are challenges to the policy process. The secretive nature of apartheid-era policymaking made national and public debate on energy nearly impossible [2]. Decision-making in electricity is highly politicised, with a marked lack of transparency and power struggles, such as battles over which technologies

[3]A CDM project is one form of carbon trading that aims to reduce greenhouse gases through international cooperation between an emitter in a developed country and a project owner in a developing country [17].

should be prioritised and which institutional arrangements should facilitate them [5]. The problem definition centred on a lack of adequate power, global warming, and unemployment. The agenda-setting brought various actors together. There were actors for and against the shift to renewable energy (**Table 3**). According to Rennkamp *et al.* [8], renewable energy became a priority in 2003, with a target of 10,000 GWh by 2013. Still, implementation failed as strong coalitions of the coal business opposed the program. The renewable energy policy was only implemented in 2011 when the government hosted the international climate change negotiations in Durban (COP17).

Table 3. Arguments in support and opposition of the RE policy (Source: [8]).

Arguments used in support	Arguments used in opposition	Most contested
Economic incentives, job creation, industrial development, emissions reductions, and international investment.	Policy uncertainty, policy strategy, and baseload power.	Policy uncertainty, policy strategy, and infrastructural benefit

7. Conclusions

Decarbonisation extends beyond purely technological or economic limits; it involves a range of complex political and social factors. The South African government's direct support of both production and consumption of fossil fuels in various forms, such as direct budgetary transfer, regulated prices and tariffs, continues to aid fossil fuel energy, suppressing the growth of renewable energy [13]. Despite resistance to system change and limited capital investment by the South African government, renewable electricity now makes up about 5 per cent of the total electricity supply [8]. While this progress is positive, structural path dependencies remain around coal-fired generation and ensuring security of supply [3]. The transition is mainly influenced by three key factors: energy inadequacy, climate consciousness, and economic decline. Nonetheless, even though system change is largely imposed, society stands to gain significantly from the new energy system in the future.

"Energy transitions, like other forms of change, can be proactive or reactive. While transformations can occur at times in response to challenging circumstances, windows of opportunity also exist to not only optimise an energy pathway, reduce environmental effects, and encourage industries, but to advance society itself" [4].

8. Recommendations

Based on the limited adoption of RE, the emerging electricity system cannot replace the incumbent electricity regime; it can only supplement it. Therefore, there is a need to enhance Eskom's capacity through unbundling and privatisation as a medium-term solution. At the same time, the short-term solution involves an infrastructure overhaul and Eskom's network expansion. The long-term solution would be a significant investment in constructing high-capacity hydro-power plants.

The government should encourage the growth of renewable energy equipment and component manufacturing firms in South Africa to create employment opportunities, especially for coal workers affected by the transition to a new electricity system. Furthermore, the government should directly finance renewable energy projects and incentivise the adoption of renewable energy to promote its use. The policy process should be more transparent and collective, and there should be better synergy between the various South African government institutions.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

[1] Geert, V. and Loorbach, D. (2012) Governing the Energy Transition: Reality, Illusion, or Necessity. Routledge.

[2] Arent, D., Arndt, C., Miller, M., Tarp, F. and Zinaman, O. (2017) The Political Economy of Clean Energy Transition. Oxford University Press.

[3] Baker, L., Burton, J., Godinho, C. and Trollip, H. (2015) The Political Economy of Decarbonisation: Exploring the Dynamics of South Africa's Electricity Sector. Energy Research Centre, University of Cape Town.

[4] Araujo, K.M. (2017) Low Carbon Energy Transitions. Oxford University Press.

[5] Baker, L., Newell, P. and Phillips, J. (2014) The Political Economy of Energy Transitions: The Case of South Africa. *New Political Economy*, **19**, 791-818. https://doi.org/10.1080/13563467.2013.849674

[6] Essex, S. and de Groot, J. (2019) Understanding Energy Transitions: The Changing Versions of the Modern Infrastructure Ideal and the 'Energy Underclass' in South Africa, 1860-2019. *Energy Policy*, **133**, Article ID: 110937. https://doi.org/10.1016/j.enpol.2019.110937

[7] Bridge, G., Barr, S., Bouzarovski, S., Bradshaw, M., Brown, E., Bulkeley, H. and Walker, G. (2018) Energy and Society: A Critical Perspective. Routledge.

[8] Rennkamp, B., Haunss, S., Wongsa, K., Ortega, A. and Casamadrid, E. (2017) Competing Coalitions: The Politics of Renewable Energy and Fossil Fuels in Mexico, South Africa and Thailand. *Energy Research & Social Science*, **34**, 214-223. https://doi.org/10.1016/j.erss.2017.07.012

[9] International Energy Agency (IEA) (2019) South Africa Energy Outlook. https://www.iea.org/articles/south-africa-energy-outlook

[10] Fin24 (2019) 1922-2019: The Rise and Fall of Eskom. https://www.news24.com/fin24/economy/1922-2019-the-rise-and-fall-of-eskom-20190213

[11] Kooiman, J. (2003) Governing as Governance. SAGE Publications Ltd. https://doi.org/10.4135/9781446215012

[12] Cherp, A., Vinichenko, V., Jewell, J., Brutschin, E. and Sovacool, B. (2018) Integrating Techno-Economic, Socio-Technical and Political Perspectives on National Energy Transitions: A Meta-Theoretical Framework. *Energy Research & Social Science*, **37**, 175-190. https://doi.org/10.1016/j.erss.2017.09.015

[13] Bridle, R. and Geddes, A. (2019) Beyond Fossil Fuels: Fiscal Transition in BRICS. Case Study: South Africa. International Institute for Sustainable Development.

[14] Geels, F.W. (2005) Technological Transitions and System Innovations: A Coevolutionary and Sociotechnical Analysis. Edward Elgar Publishing. https://doi.org/10.4337/9781845424596

[15] Geels, F.W., Sovacool, B.K., Schwanen, T. and Sorrell, S. (2017) Sociotechnical Transitions for Deep Decarbonization: Accelerating Innovation Is as Important as Climate Policy. *Science*, **357**, 1242-1244. https://doi.org/10.1126/science.aao3760

[16] Baker, L. and Sovacool, B.K. (2017) The Political Economy of Technological Capabilities and Global Production Networks in South Africa's Wind and Solar Photovoltaic (PV) Industries. *Political Geography*, **60**, 1-12. https://doi.org/10.1016/j.polgeo.2017.03.003

[17] Pillay, S. (2015) The Impact of Clean Development Mechanism Projects on Sustainable Development in South Africa. *International Business & Economics Research Journal* (*IBER*), **14**, 777-790. https://doi.org/10.19030/iber.v14i6.9485