



# ENERGIZED

Policy innovations to power the transformation of Africa's agriculture and food system



**S**outh Africa has made significant progress in improving access and use of energy to foster economic growth. From 1992 to 2013, the increase of the electricity expansion indicator<sup>i</sup> is estimated at 11.23 thereby being above the average of 8 for Africa as a whole, and the agricultural value added per worker growth rate averaged 5.08 percent annually. In addition, the score of 76 out of 100 on the RISE index<sup>ii</sup> in 2017 makes South Africa a strong performer and reflects the government's commitment to setting good national policy and regulatory frameworks for sustainable access to and use of energy.

## Institutional Innovations

South Africa has several institutions responsible for developing its energy sector. The Department of Energy (DoE) takes the lead in the formulation and implementation of energy policy. The DoE also controls the generation, transmission and distribution of energy by Eskom, a parastatal, and Independent Power Producers (IPPs), and ensures energy is consumed efficiently. Eskom was established in 1923 as the Electricity Supply Commission under the Electricity Act of 1922. Within the DoE, a dedicated office for the Independent Power

i - This indicator is expressed in logarithm of the difference of number of Nighttime Lights pixels between 1992 and 2013.

ii - The World Bank's Regulatory Indicator for Sustainable Energy (RISE) assesses countries' policy and regulatory support for each of the three pillars of sustainable energy—access to modern energy, energy efficiency, and renewable energy. RISE classifies countries in three groups based on their score levels as strong performers (those with a score  $\geq 67$ ), middle performers (those with a score  $\geq 34$  and  $< 67$ ), and weak performers (those with a score  $\leq 33$ ).



Producers Procurement Programme (IPPPP) manages public procurement for IPPs projects based on coal, gas and renewable energy. Several other state-owned agencies also contribute to the implementation of South Africa's energy policy.<sup>1</sup>

In 1977, the government created the Central Energy Fund, which has played a central role in ensuring South Africa's energy security. The Fund's role is to:

- Provide an affordable, reliable and diverse use of primary energy resources;
- Strategically partner with the DoE by providing insights in support of policy development and regulation.<sup>2</sup>

The National Energy Regulator of South Africa (NERSA) was created under the 2004 National Energy Regulatory Act to regulate the electricity, gas and petroleum pipeline industries. It is also in charge of licensing for electricity generation and for enforcing compliance. NERSA regulates all tariff increases recommended by Eskom, provides national grid codes, develops regulatory rules for relevant industries and determines the applicable standards.<sup>3</sup>

South Africa's energy mix includes nuclear energy since the introduction of a nuclear power program during the 1970s. Many institutions were created for the safe management of nuclear power. In 1999, the National Nuclear Regulator was established to monitor and enforce regulatory safety standards to prevent nuclear accidents and mitigate consequences of nuclear accidents.<sup>4</sup> During the same year, the Nuclear Energy Corporation of South Africa (NECSA), previously known as the Atomic Energy Corporation was established for the development and promotion of the use of nuclear technologies.<sup>5</sup> In 2009, recognizing the importance of the management of radioactive waste, the government created the National Radioactive Waste Disposal Institute (NRWDI) under the Ministry of Energy. The Institute informs the public on all aspects of radioactive waste management and provides technical assistance to power plants in the management of small quantities of nuclear waste. NRWDI has institutional control over closed repositories, including radiological monitoring and maintenance as appropriate.<sup>6</sup>

Furthermore in 2011, the South African National Energy Development Institute (SANEDI) was created under the National Energy Act No. 34 of 2008 as a public institute to support the DoE in the implementation of energy policies. SANEDI oversees R&D in the energy sector and leads on the development and deployment of new technologies as well as the promotion of green, low-carbon energy and energy efficiency. In addition, SANEDI oversees data and knowledge management on energy, energy efficiency, fuel technology, low-carbon energy, and transport, as well as energy end-use and infrastructure.<sup>7</sup>

## Policy Innovations

Significant changes were made to South Africa's energy policy during the 1990s, as access to energy was recognized as central to bridging social inequalities following the apartheid era. For example, electricity was seen as a key to generating new business opportunities and to improving health by reducing indoor air pollution. In 1998, a White Paper on Energy Policy was published by the government promoting access to affordable energy services for disadvantaged households, small businesses, small farms, and community services. The policy also sought to improve governance of the energy sector and diversify the energy mix. In addition, the policy called for more accountability and transparency with respect to the roles and functions of the various institutions involved in energy governance.<sup>8</sup>

For a long time, South Africa had been exploiting its coal resources and has developed an efficient, large-scale, power generation system providing comparatively low-cost electricity through a grid system that extends to rural areas. However, following the Johannesburg World Summit on Sustainable Development in 2002 and amid increasing concerns on climate change, a white paper on renewable energy was published in 2004 to complement the 1998 White Paper on Energy Policy. The 2004 policy paper envisioned an increased share of renewable energy in South Africa's energy mix and the creation of a renewable energy industry to produce a sustainable, non-subsidized alternative to fossil fuels. The government at the time aimed to increase the consumption of renewables to 10,000 GWh (0.8 Mtoe) by 2013, to be produced mainly from biomass, wind, solar, and small-scale hydropower.<sup>9</sup>

In January 2008, the National Response to South Africa's Electricity Shortage was released jointly by the DoE and Eskom. The policy focused on improving the electricity distribution infrastructure, and fast-tracking electricity projects by IPPs and power-generation partnerships between Eskom and private industries, such as chemical processors.<sup>10,11</sup>

In 2011, in its pursuit of tapping into renewable energy sources, the government adopted the Integrated Resource Plan (IRP) 2010-2030 (generally known as the IRP 2010) as the official long-term plan for building new electricity generation capacities. The IRP seeks to double South Africa's electricity generation capacity through a diversified energy mix including coal, gas, nuclear and renewables. The share of renewable energy was expected to reach 42 percent of all new capacity by 2030, equivalent of 17,800 MW. To achieve this goal, the government launched several bidding rounds to procure renewable energies under its Renewable Energy Independent Power Producer Procurement Programme (REIPPPP).<sup>12</sup> The IRP



is regularly updated to ensure stable electricity provision at low cost and to minimize any negative environmental impacts.<sup>13</sup> Yet, Eskom, which produces up to 95 percent of consumed electricity, has been struggling to meet the country's electricity demand. It is being restructured into three entities—for generation, transmission, and distribution—to improve its operational sustainability.<sup>14</sup>

The National Development Plan (NDP) of 2013 outlines the government's long-term plan to eradicate poverty and reduce inequality by 2030. The NDP calls for improving energy infrastructure in a sustainable way, increasing investments in energy efficiency, and reducing carbon emissions by procuring at least 20 GW of renewable energy by 2030. The NDP aims for 90 percent grid access by 2030 with the remaining 10 percent to be met through quality off-grid technologies. The NDP also recommends a greater diversity of IPPs in the energy industry and adjusting electricity pricing and access to the needs of the poor.<sup>15</sup>

Furthermore, in 2013 the Cabinet approved the New Household Electrification Strategy with a target of providing 300,000 rural households with off-grid electrification through installation of solar home systems and other cost-effective, non-grid renewable energy technologies including mini-grid or hybrid systems. Under the Strategy, all efforts are aligned with the goals

of the United Nation's Sustainable Energy for All (SE4All) initiative to achieve universal access.<sup>16</sup>

### **Programmatic Interventions**

#### *Bridging the Access Gap for Poor and Rural Communities*

In 1994, under the Reconstruction and Development Program, South Africa's government aimed to connect 450,000 households annually to electricity. Although this goal was exceeded with an average of over 500,000 households per year between 1994 and 1999, a strong rural-urban electrification divide has persisted. In 1999, the electricity access rate was just 46 percent in rural areas but reached almost 80 percent in urban areas.<sup>17</sup> To reduce this gap, in 2000, the Integrated National Electrification Programme run by the DoE was launched. Off-grid electrification was merged into the National Electrification program, with an early focus on off-grid solar PV systems for rural areas. Access to electricity in remote areas was facilitated through the use of alternative approaches to main grid extension, alternative energy sources for electricity generation, and decentralized provision that was more cost-effective than grid connections. As a result, remarkable progress has been made in increasing access to electricity across the country. Within just 10 years – between 1994 and 2014 – more than 6 million households were connected to the grid, and between 2002 to 2014,



more than 80,000 households were supplied with off-grid energy technologies (primarily solar).<sup>18,19</sup> In 2011, an evaluation showed that improved access to electricity in South Africa's rural areas increased employment rates, with a notable impact on women's labor market participation.<sup>20</sup>

Alongside the electrification program, a range of pro-poor energy-related policies were introduced by the government. In 2000, the Free Basic Electricity Tariff of 50 KWh came into effect, funded partly by the Local Government Equitable Share Grant of the National Treasury and, in cases of shortfalls, by surpluses generated by the municipalities' sale of electricity. A household is eligible if it uses less than 450 KWh per month from the grid. In 2007, this support was extended to subsidize alternative energy services to rural households – including farmers – not connected to the national grid through the Free Basic Alternative Energy in Rural Areas Policy. However, not all municipalities have been able to implement the policy. Electricity consumption by the poor is also subsidized through an *inclining block tariff system*, introduced in 2010, whereby charges increase with consumption. This system allows users with higher consumption rates to be charged at a higher rate, thus facilitating cross-subsidization of low-income groups that are charged at the lower rates.<sup>21</sup>

### *Crowding Private Sector to Boost and Diversify Supply*

In 2011, the government launched REIPPPP, inviting IPPs to tender for licenses to sell electricity to Eskom under a 20-year purchase agreement. The bids were evaluated based on price and economic development potential, including job creation, participation of disadvantaged populations, local environmental protection, rural development, community ownership, and skills development.<sup>22</sup> REIPPPP was overseen by the DoE IPP office. Specific requirements for the REIPPPP include:

- At least 40 percent of each project be owned by a South African entity
- Inclusion of shareholding by black South Africans across the value chain
- A required minimum ownership of 2.5 percent by local communities as procurement condition
- No more than 60 percent of project capital investment consisting of foreign currency
- Local content requirements above 40 percent.

By 2016, 6,590 MW were procured in four bidding rounds, awarding 95 onshore wind, solar, and small biomass and hydropower projects. As of October 2016, 54 power plants with the capacity of 2,800 MW were fully operational and 15 percent of the delivered energy was supplied into the grid during system peak periods, alleviating pressure on the power system. The source of electricity supply has broadened significantly with REIPPPP, with over US\$19 billion in private investment and a significant drop in the price of electricity sourced from renewable energy.<sup>23</sup>

There is also evidence that energy production from agricultural waste is increasing in South Africa. In 2015, the Bronkhorstspruit Biogas Project was launched by Bio2Wat, a South African IPP. Roughly 120,000 tons of feedstock, the bulk being manure along with food waste and additional supplements from slaughterhouses, are processed annually by the plant to generate a capacity of 4.6 MW. Over its expected lifespan of 20 years, the project is expected to contribute to the diversification of the South African energy mix by reducing the use of coal.<sup>24</sup> It has also resulted in the creation of long-term direct and indirect employment in peri-urban South Africa. With over 14 million cattle in South Africa, owned mainly by large farms, the potential for project replication is substantial.<sup>25</sup>

South Africa is among the leading countries in Africa in terms of electrification. However, rising demand and the near full-capacity operation by Eskom have been causing significant shortages of electricity and repeated outages, with significant impacts on the South African economy. For example, the cost of power shortages in early 2008 was estimated to be between US\$253 and US\$282 million.<sup>26</sup> Fresh produce and meat industries are worst affected by power cuts which are also detrimental to consumers and pose a huge threat on the nation's food security.<sup>27</sup> The programs for energy diversification therefore require urgent scaling up to transition to a cleaner energy system and reduce the country's reliance on its deteriorating fleet of coal fired power plants.



## Endnotes

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