



# ENERGIZED

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



**E**lectrification has been the cornerstone of Zambia's development plans over the last few decades. Between 1992 and 2013, the increase of the electricity expansion indicator<sup>i</sup> was estimated at 8.43 – slightly higher than the average of 8 for Africa as a whole. During the same period, Zambia's agricultural value added per worker grew at an average of 1.51 percent annually. Zambia scored 43 out of 100 on the RISE index<sup>ii</sup> in 2017, making it a middle performer in terms of policies and regulations that support access to modern energy, energy efficiency and renewable energy.<sup>1</sup>

By 2017, 75 percent of Zambia's urban population and 14 percent of the rural population had access to electricity.<sup>2</sup> Biofuels and waste constituted the largest share of total primary energy supply in 2017 (75 percent). Hydropower provided nearly all of Zambia's *electricity* supply until 2014, when a small amount of oil-based generation was introduced to diversify sources and counter the impacts of recurrent droughts.<sup>3</sup>

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  $\leq 33$ ).



## Institutional Innovations

Zambia has a dedicated agency for rural electrification. Established in 2003 through Parliamentary Act 20, the Zambia Rural Electrification Authority (REA) is mandated to increase access to electricity to 51 percent by 2030 by providing infrastructure and appropriate technology to all rural areas. Although this is not in line with SDGs that call for universal access to electricity by 2030, Zambia requires an exponential effort to meet this target, with an access rate of less than 15 percent in 2017.<sup>4</sup> The REA advises on suitable policies, designs and implements the Rural Electrification Master Plan (REMP), and administers and mobilizes the Rural Electrification Fund (REF)—also founded through Parliamentary Act 20. The REF streamlines the previous bottom-up process of selecting and funding rural electrification projects. It is funded by a 3 percent levy charged by national utilities.<sup>5</sup>

The establishment of the REA followed extensive changes to the energy sector between 2011 and 2016. As part of the liberalization process of the sector in the 1990s, the Zambian government created the Ministry of Energy and Water Development, later rationalized as the Ministry of Energy (MoE) in 2016. The Department of Energy (DoE) within the MoE is responsible for the development and implementation of energy policies, programs and projects, including the promotion and facilitation of renewable energy, energy efficiency, and electrification solutions.<sup>6</sup>

An Energy Regulation Board (ERB) was another outcome of the liberalization process. The ERB was created in 1995, and operationalized in 1997, to monitor the reliability and quality of service provided by national and independent private providers. It is overseen by the MoE.<sup>7</sup> In addition, an Office for Promoting Private Power Investment (OPPI) was established in 1999 within the MoE to facilitate the growing involvement of the private sector in power project development in Zambia.<sup>8</sup>

Although the energy sector was largely liberalized, Zambia Electricity Supply Corporation Limited (ZESCO) remains the key national energy supply utility, responsible for generation, transmission, and distribution of electricity across the country. Rather than privatize ZESCO in the 1990s, the government chose to corporatize and commercialize it to enhance efficiency and improve its performance. Although there were some increases in tariffs too, electrification across the country expanded rapidly.<sup>9</sup>

Hydropower provides 99 percent of ZESCO's electricity, and the rest is from diesel-powered generators. Almost half of the hydropower comes from the Kariba Dam on the River Zambezi; eight additional dams provide the rest.

Maintenance of the Kariba Dam and development of new dam sites on the Zambezi are the responsibility of the Zambezi River Authority.<sup>10</sup> Copperbelt Energy Corporation Plc and the Lunsemfwa Hydro Power Company Ltd—the first independent power producers (IPP) in Zambia — provide approximately 53 MW of additional capacity.<sup>11</sup>

Beyond hydropower, Zambia's energy sector is supported by TAZAMA Pipelines Limited, which transports crude oil from the coast at Dar-es-Salaam in Tanzania to Indeni Petroleum Refinery Corporation in Zambia. Incorporated in 1968, the ownership of Tazama Pipelines Limited is shared between the Governments of Zambia (66.7 percent) and Tanzania (33.3 percent).<sup>12</sup> Petroleum is the only energy source that is wholly imported among Zambia's energy supply mix, constituting 12 percent of total primary energy supply in 2016.<sup>13</sup> In comparison, hydropower provides between 8 and 11 percent of total energy supply and biomass and waste provide 75 percent.<sup>14</sup> Zambia's Vision 2030 aims to reduce the share of fuelwood in the overall energy mix to 40 percent by 2030.<sup>15</sup>

## Policy Innovations

### *Fiscal incentives to boost and diversify energy supply*

Zambia's energy policies have also aimed to diversify the energy mix, increase access to electricity and modern energy services in rural areas, and expand private sector involvement. The first Energy Policy issued in 1994 focused on increasing the supply and demand for energy and forming the institutional structures to support this growth. It aimed to increase rural electrification from 2 to 15 percent and urban electrification from 45 to 78 percent and to reduce charcoal consumption by 400,000 tons. Further, it aimed to replace fuelwood with alternative energy sources (such as liquified petroleum gas), and to promote off-grid renewable energy sources.<sup>16</sup> This policy was reviewed and updated in 2008, when access to electricity in rural areas had increased eightfold to 5.3 percent and urban electrification had increased to 55 percent.<sup>17</sup>

The 2008 National Energy Policy (NEP), still in effect, provides policy and implementation guidelines to increase access to modern energy in rural areas, including from alternative and renewable energy sources. To support this, a renewable energy feed-in-tariff (REFIT) policy was drafted in 2015 to catalyze private sector investment in renewable-energy power generation.

Through specific fiscal and regulatory measures such as smart subsidies, low interest loans, loan guarantees, tax incentives, and waivers, the NEP seeks to make biomass use more sustainable, including through a transition to biogas technologies, to reduce pressure on indigenous forest resources, and to expand the role of biofuels in the



energy mix. In particular, the policy pledges to support farmers wishing to engage in biofuel crop production and support the provision of modern energy sources to small rural farmers to reduce the need for slash-and-burn agriculture. Thus, the 2008 NEP advocates for, and should result in, closer collaboration among other economic and social sectors such as agriculture, trade and industry, transport, information and communications technology, health, and education.<sup>18</sup>

The Zambia Development Agency is the first point of call for private sector companies wishing to engage in the energy sector, for fiscal and non-fiscal incentives as well as coordination with the ERB, OPPPI, and other regulatory bodies. For investments of more than US\$500,000 in an industrial park, rural enterprise, or a priority sector, companies benefit from favorable tax and import duty incentives. Furthermore, investors may be entitled to a zero percent tax rate on dividends for five years from the first declaration of dividends; zero percent tax on profits for five years from the first year of operation; and zero percent import duty on capital goods, machinery, and specialized motor vehicles for five years. Smaller investments of between US\$250,000 and US\$500,000 benefit from non-fiscal incentives.<sup>19</sup>

#### *Cluster based approach to agricultural electrification*

Zambia's Vision 2030 declares the ambition to become "a prosperous middle-income nation by 2030."<sup>20</sup> This goal is founded on transforming Zambia's agriculture sector into a competitive, sustainable, and export-led sector by increasing productivity and growth in processing of agricultural products, particularly for export. Although rural electrification is increasing, the amount of electricity used by the agriculture and forestry sectors remained relatively stagnant between 1994 at 2013, averaging about 160 GWH per year. Among Zambia's economic sectors, the agriculture and forestry sectors are the lowest consumers of electricity, although the agriculture sector contributes on average at least 10 percent to GDP and employs about 67 percent of the labor force.<sup>21</sup> Currently the sector accounts for less than 1 percent of total energy consumption.<sup>22</sup>

Within this context, a key policy objective has been to promote increased productivity for major crops in which Zambia has a comparative advantage, such as wheat, sugar, cotton, coffee, tobacco, cashew nuts, cassava, and horticultural/floricultural crops. These crops form the basis of a core venture within "farm blocks" – large agricultural areas – in addition to other medium - and small-sized commercial farms. To date, the government



has identified 11 farm blocks with a total area of 895,000 ha through land development programs. Each farm block benefits from basic infrastructure and facilities such as trunk roads, bridges, electricity, dams, schools, and health centers, provided either by the government or in partnership with private sector and development partners.<sup>23</sup> These complement the establishment of industrial cluster zones for processing agricultural produce and ensuring it is competitive in export markets. Several sites are currently undergoing environmental impact assessments, with pledges amounting to one billion Zambian kwacha (approximately US\$100 million) received from investors from China, South Africa, Botswana, Sudan, Jordan, and India.<sup>24</sup> Farmers will be connected to hydroelectricity for farming and processing at 10 sites.

The National Agricultural Investment Plan (NAIP) 2014–2018 also recognizes the importance of agricultural development in reducing poverty. Targets to introduce 1,900 renewable-energy-based irrigation pumps have been proposed within the “sustainable use of the natural resource base” pillar in the NAIP. Further, the NAIP proposes to reduce charcoal and fuelwood consumption by targeting 4,000 households to adopt energy efficient stoves.<sup>25</sup> These objectives align with Zambia’s 2019 Climate-Smart Agriculture Investment Plan, which recommends prioritizing a reduction in biomass burning and charcoal use.<sup>26</sup>

## Programmatic Interventions

### *Matching demand and energy mix to accelerate rural electrification*

The 2008 NEP emphasizes implementation of the Rural Electrification Master Plan (REMP). Effective from 2008 to 2030, the REMP provides a detailed strategy for expanding electrification using a combination of grid extension and off-grid solutions. Following a decentralized planning process, 1,217 “rural growth centers” – hubs of residential, social, and commercial activity such as schools, hospitals, and agricultural depots or markets – have been identified for electrification across the country. Each center is then reviewed based on potential peak demand, distance from the grid, cost of grid extension, and rates of return to select the most cost-effective solution for electrification. From the centers identified, 972 were selected for grid extension, 241 for solar home systems, and 4 for mini-hydro power development – at a total cost of US\$1.1 billion, or US\$50 million per year over 22 years. With this approach, REMP aims to double the number of electrified households by 2030, equating to 50 percent of total rural areas. By 2017, 152 grid extension projects had been implemented and 423 solar home systems delivered. One mini-hydro plant was completed in 2018. In addition, one solar mini-grid was constructed in 2013, and two more initiated in 2016.<sup>27</sup> As a result of these interventions, rural electrification nearly

tripled by 2017, increasing from 5.3 percent to 14 percent.<sup>28</sup> PowerAfrica, an initiative led by USAID, has further supported the Zambian government’s electrification program. In addition to strengthening regulatory frameworks, Power Africa invested US\$2 million to provide approximately 100 MW of new solar power in 2016.<sup>29</sup> Similarly, a collaboration between Sweden and the Netherlands provided grid extensions to 11 locations across Zambia, which led to a proliferation of enterprises and mills and to an improvement in health services and education, as children were able to study for longer hours.<sup>30</sup>

### *Smart Financing for Power Suppliers and Farm Equipment*

The Beyond the Grid Fund for Africa was founded to foster new private sector business models offering affordable and clean energy access across the continent. The Fund is financed by the Swedish International Development Agency, managed by the Nordic Environment Finance Corporation, and implemented by the Renewable Energy and Energy Efficiency Partnership. Initiated in 2016, Beyond the Grid for Zambia (BGFZ) “de-risks” costs of operating and expansion while companies establish themselves in the market. BGFZ operates as a fund with a tendering process, with results measured in terms of the provision of energy services for Zambians. The first round of tendering resulted in the selection of four companies to deliver clean energy services: Standard Microgrid, Fenix International, energizing cooking solutions, and Vitalite, which offer mini-grid installations, solar home systems, clean cooking products, and agricultural innovations such as solar irrigation pumps. In January 2019, at the end of the first 18 months, the companies had overshot their targets, serving 447,000 people, nearly double the target number.<sup>31</sup> It is expected that BGFZ will meet its goal of bringing modern energy services to one million Zambians much earlier than targeted date of 2021. Benefits include:

- Job creation: the number of sales agents (also consumers themselves) grew tenfold and the number of employees within the four companies tripled.
- Income generation: customers are undertaking new income-generating activities such as mobile-phone charging and lighting of shops.
- Savings: savings made on fuel and candles are being redirected to food, animal feed, and loan repayments.
- Communications: more information sharing via mobile phones, radio, and television. Specifically, Vitalite produces educational shows for smallholder farmers on improving productivity and farming practices.
- Education: children are studying for longer hours and attended school more.
- Cleaner indoor air.



BGFZ has also formed an Off-Grid Energy Task Force, composed of stakeholders from the government, development partners, finance, and the private sector to coordinate activities, share challenges and opportunities, and define pathways to strengthen the enabling environment for the market. The Task Force is embedded in, and led by, the Ministry of Energy. It has already assisted with the drafting of a new national mini-grid policy and the initiation of discussions to improve the affordability of off-grid energy solutions.<sup>32,33</sup>

The Rent to Own (RTO) initiative mitigates the lack of access to affordable, available, and appropriate equipment for farming and food production. Founded in 2010, RTO loans productive assets requiring either grid or off-grid electricity, such as submersible solar irrigation pumps, freezers, oil presses, maize shellers, stoves, and hammermills to farmers. Each asset is carefully selected for clients and combined with tailored financing, delivery, and training on equipment maintenance and repair. The equipment itself also acts as collateral if needed. By December 2018, with support from Shell Foundation, Small Foundation, and others, RTO had delivered over 7,000 productive use assets and achieved an exceptional 96 percent repayment rate. The solar irrigation pumps—which deliver over 10,000 liters of water per day at 25 meters of lift—have been particularly successful for

farmers and livestock producers facing climate change and increasingly frequent droughts.<sup>34</sup>

Although renewable energy technologies and off-grid solutions are increasingly available on the market—in response to a growing demand to counter Zambia’s blackouts—there is still a perception that grid extensions are prioritized and continue to receive a large proportion of resources.<sup>35</sup> Moreover, continued reliance on hydropower and bioenergy have further exposed the country’s energy system to climate change and contributed towards rapid deforestation. Importantly, strengthening climate-smart agriculture programs would ensure that farmers are both more efficient in their energy use and resilient to climate change impacts. More attention to off-grid, mini, and micro solutions would potentially enable Zambia to reach its electrification targets more quickly and at a lower cost. Ensuring that these solutions are based on renewable energy sources will avoid an increase in CO2 emissions. Finally, although the energy sector has been liberalized, there is an opportunity to clarify and maximize the role of private finances in funding the Rural Electrification Authority.<sup>36</sup>



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