Chapter 20: Namibia's Electricity Sector

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1 Introduction

This chapter provides a summary of the key features characterising Namibia's electricity sector.

2 Supply Entities

In mid-2020, Namibia's electricity requirements are sourced from 20 local electrical energy generation plant as well as supplies from various entities located in neighbouring countries; these exclude the various embedded, behind-the-meter and off-grid generation plant.[1] The local installed generating capacity amounts to 526 megawatt (MW), which excludes the capacity of all embedded, off-grid and behind-the-meter electricity generating assets.[2]

3 Independent Power Producers

In mid-2020, seventeen Independent Power Producers operate a total installed generating capacity of 126.5 MW, which excludes all embedded and behind-the-meter as well as off-grid plant. [3] Except for the Ombepo wind farm at Lüderitzbucht, all other Independent Power Producers operating in mid-2020 use solar photovoltaic (PV) electricity generating plant.[4]

4 Embedded Generators

In addition to the Independent Power Producers identified in Section 3 above, several distributors and commercial operations procure electricity directly from Independent Power Producers that operate embedded generating plant. These include HopSol's 5 MW PV plant near Otjiwarongo that sells to CENORED, OLC Arandis' 3 MW PV

1 von Oertzen (2019).
2 Ibid:42.
3 Ibid:43.
4 Ibid:42.

plant selling to Erongo RED, and SunEQ's 5 MW PV plant supplying Ohorongo Cement.[5]

5 Distributed Generating Capacity

An estimated 55 MW of grid-connected distributed generating plant is operational in mid-2020. Some are for own use only, including Windhoek's Grove Mall which operates a 2.8 MW_p PV plant, Maerua Mall's 2 MW PV plant, Wernhil Park's 2.1 MW PV plant, and Namibia Breweries 1 MW roof-mounted solar PV plant and others.[6] Many smaller capacity generating plants, including roof-top mounted solar PV systems operating as behind-the-meter generators, benefit from the Net Metering Rules,[7] and often have feed-in arrangements with a local electricity distributor.[8]

6 Emergency and Backup Generating Capacity

A large number and variety of backup generators are used throughout the country. Most mining operations have such generating plant on site. Examples include Ohorongo Cement's 7 MW diesel plant, Rössing's 6.3 MW diesel plant, Langer Heinrich Mine's 16.5 MW diesel-powered plant, the on-site generating plant at the Husab Mine, and many others.[9]

7 Off-grid Generating Capacity

Numerous off-grid generating plant, i.e. generating plant not connected to the national grid, are in operation. Prominent examples include B2Gold's 24 MW heavy fuel oil generating plant and its 7 MW solar PV plant, the off-grid installations at Tsumkwe, Gam and Gobabeb, as well as those on farms and small settlements that are not connected to the electricity grid.[10]

5 Ibid:43.
6 Ibid:43.
7 See Section 5 in the previous Chapter on energy in this publication.
8 Ibid:43.
9 Ibid:43.
10 Ibid:44.

8 Electricity Demand

In mid-2020, the nationally installed generating capacity neither meets the country's peak demand requirements, nor the demand for electrical energy. This is well-illustrated by the figures for the financial year 2018/19, during which Namibia sourced some 71% of total electrical energy units into the system from suppliers in neighbouring countries, which amounts to some 64% of the total local demand in that year.[11]

In the financial year 2018/2019, some 4.4 TWh of electrical energy was injected into Namibia's transmission system, including just over 1.0 TWh from NamPower's own generating assets. In the same period, a system maximum demand of 633 MW was recorded and excludes the Skorpion Zinc Mine, and some 684 MW when including Skorpion's demand.[12]

In 2018/19, NamPower sold some 3.5 TWh to local customers, excluding Skorpion and the Orange River projects. Of this, the main distributors procured some 2.8 TWh, while NamPower's transmission customers – other than the distributors – procured some 0.7 TWh. In that year, electricity distributors sold some 2.4 TWh to end-users. Of this, about 1.0 TWh was sold to domestic customers, and about the same amount to large power users, while some 0.4 TWh was sold to commercial customers. In 2018/19, electricity sales were highest in central Namibia, amounting to almost 1 TWh, followed by Erongo RED's sales of almost 0.5 TWh, NORED's sales of almost 0.4 TWh, and southern Namibia's sales of almost 0.2 TWh.[13]

9 Electricity Distributors

Some 83% of all grid-connected electricity customers are served by the three Regional Electricity Distribution companies and the City of Windhoek. NORED served some 30% of all electricity customers, followed by central Namibia which served some 27%, and about 14% (11%) by Erongo RED (CENORED). Some 37% of total electricity sales by distributors were made in central Namibia, followed by 19% by Erongo RED, and some 16% (8%) by NORED (CENORED).[14]

11 Ibid.
12 Ibid.
13 Ibid:44 and 45.
14 Ibid:45.

10 Revenues Generated

In 2018/19, NamPower generated revenues of almost N$ 6.6 billion, with average revenues generated per kWh of electrical energy sold amounting to some N$ 1.59/kWh. In the same year, the main distributors generated revenues of almost N$ 6.2 billion at an average of N$ 2.54/kWh sold. In the same year, sales to large power users other than distributors generated revenues of some N$ 2.7 billion, followed by revenues from sales to domestic customers amounting to some N$ 2.1 billion, some N$ 1.2 billion from commercial entities, and about N$ 0.3 billion from institutional customers.[15]

11 Electricity Price

The average price per unit of electrical energy is determined by dividing revenues by the total number of units sold. NamPower's average local price per unit of electricity sold increased to some N$ 1.75/kWh, from some N$ 1.67/kWh in 2017/18. In 2018/19, the distribution industry's average electricity price amounted to approx. N$ 2.46/kWh, thus increasing from some N$ 2.31/kWh in 2017/18.[16]

12 Key Electricity Sector Stakeholders

12.1 Electricity End-Users

The Namibian electricity sector served some 275,000 electricity customers. Of these, some 251,000 are domestic and 20,000 are commercial customers, with some 2,500 large power users and approximately 1,000 institutional users.[17] An estimated 71% of all urban households have access to electricity, while the associated access figure in rural areas is estimated at some 19%. This implies that the national electrification rate stands at approximately 45%.[18] Almost 99.7% of the total number of customers served by the country's electricity sector are private end-users, including domestic customers (91.5% of total customers served), commercial end-users (7.3%) and large power users (0.9%).[19]

15 Ibid.
16 Ibid:46.
17 Ibid:45.
18 Ibid:77.
19 Ibid:60.

12.2 Ministry of Mines and Energy

The Ministry of Mines and Energy is the principal custodian of Namibia's energy sector, and therefore by implication, the country's electricity sector.[20] The Ministry's mandate, as per the Ministry's strategic plan for 2017/18 to 2021/22, states that:[21]

> The Ministry of Mines and Energy was constitutionally established to take custody of the diverse geological, mineral and energy resources, and to ensure their contribution to the country's socio-economic development.

Among others, the Ministry's responsibilities vis-à-vis the country's electricity sector include policy development, ensuring energy security by, amongst others, identifying suitable procurement and off-take responsibilities for new electricity generation projects, approving electricity-related licences (the prerogative of the Minister of Mines and Energy) as well as planning, funding and implementing rural electrification programmes and projects and administering the solar revolving fund.[22]

12.3 Electricity Control Board

The Electricity Control Board is Namibia's regulatory authority responsible for the country's electricity sector.[23] Established under the Electricity Act No. 2 of 2000 as repealed by the updated Electricity Act No. 4 of 2007, the Electricity Control Board's principal responsibility is the regulation of the sector and related technical and economic matters. Specifically, this regulator administers the licensing regime throughout the sector, and makes recommendations to the Minister of Mines and Energy regarding the issuance of licences. It also acts as mediator and advisory body to all entities operating in the country's electricity supply industry and electricity distribution industry.

12.4 Namibia Power Corporation

The Namibia Power Corporation (NamPower) is the country's state-owned electricity utility.[24] Under the country's Companies Act, NamPower is a private limited liability company, with the Government of Namibia being its sole shareholder.

NamPower operates generation, transmission and distribution assets, and is responsible for trading, importing and exporting electricity. The utility owns and operates three of the country's major power stations, i.e. Ruacana, Van Eck and Anixas, as well

20 See http://www.mme.gov.na/, accessed 13 July 2020.
21 See https://bit.ly/3BtNWyn, accessed 15 February 2022.
22 Jones *et al.* (2009).
23 See https://www.ecb.org.na/, accessed 13 July 2020.
24 See https://www.nampower.com.na/, accessed 13 July 2020.

as all transmission infrastructure. The utility also remains involved in the distribution of electricity in areas that are not served by other distribution entities. As the single buyer of electricity, NamPower procures electricity from the power plant established as part of the Interim Renewable Energy Feed-in Tariff (REFIT) programme, as well as from all Independent Power Producers, except those that are embedded in the networks of distribution entities or large power users.[25]

In April 2019, Cabinet approved the modified single buyer market model, which replaces the erstwhile single buyer model. This implies that, once the new electricity market model is implemented, which is expected to take place from 2020, NamPower's role as single buyer changes, and the national utility assumes the responsibilities of Namibia's modified single buyer entity, as is further elaborated in section 13.2 below.

12.5 Electricity Distribution and Supply Entities

Electricity distributors are licensed to distribute and supply electricity to end-users. The prominent distribution and supply entities are the City of Windhoek,[26] the three Regional Electricity Distributors (REDs), i.e. NORED,[27] CENORED[28] and Erongo RED,[29] Oshakati Premier Electric[30] and NamPower Distribution.[31]

In addition, select local authorities and regional councils in the Omaheke, Hardap and //Karas Regions are responsible for the distribution and supply of electricity to end-users. Several private electricity distribution schemes exist, including farmers' co-operative schemes and entities distributing electricity to specific end-users.[32]

12.6 Private Sector Entities

Various private sector entities have commenced operations in Namibia's electricity supply and distribution sectors.[33] These include Independent Power Producers selling to NamPower, as well as a number of embedded Independent Power Producers that sell directly to select REDs. In addition, private electricity distributors have

25 See https://www.nampower.com.na/refit, accessed 14 July 2020.
26 See http://www.windhoekcc.org.na/depa_electricity.php, accessed 15 July 2020.
27 See http://www.nored.com.na/, accessed 13 July 2020.
28 See https://www.cenored.com.na/, accessed 13 July 2020.
29 See https://www.erongored.com/, accessed 13 July 2020.
30 See http://www.ope.com.na/, accessed 13 July 2020.
31 See https://www.nampower.com.na/Page.aspx?p=149, accessed 15 July 2020.
32 See https://www.ecb.org.na/index.php/documents2/regional-electricity-distributors, accessed 13 July 2020.
33 von Oertzen (2019).

commenced operations, including those operating estates and various farmer electricity supply schemes. In addition, the private sector is the principal technology and service provider to most electricity entities active in the country.

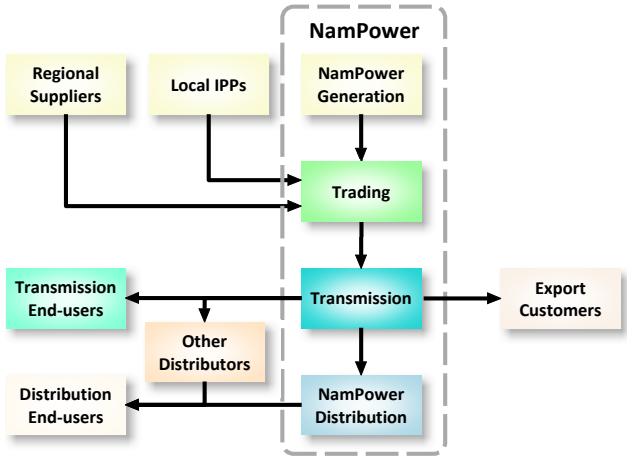
13 Namibia's Electricity Market Model

13.1 The Single Buyer Market Model (2000 to 2019)

In November 2000, Cabinet approved the single buyer electricity sector market model for the restructuring of the country's electricity supply industry.[34] This electricity market model required the establishment of a 'single buyer', which became NamPower's responsibility as the national electricity utility. At the time, the single buyer market model was seen to be sufficiently practicable to ensure the orderly management and administration of electricity trading arrangements, while also increasing investments in electricity generation in the country.

The implementation of the single buyer model implied that all entities wishing to supply electricity to or within the country were required to sell to NamPower, as illustrated in Figure 1. NamPower, in turn, supplied bulk power to distributors and select large power users, while also distributing electricity in areas where other distribution entities did not provide services.

Figure 1: Schematic Diagram of the Single Buyer Electricity Market Model



Source: von Oertzen (2019:61).

34 GRN (2000c).

While select investments in new electricity generation assets took place, these were limited to those undertaken by NamPower. For example, the 22.5 MW heavy fuel oil-fired Anixas power plant at Walvis Bay was commissioned in 2011, and a fourth turbine adding 90 MW of generating capacity was installed at the Ruacana hydro-electric plant in 2012.[35]

From 2010 onwards, REDs and other distribution entities started investigating the modalities of procuring power from entities other than from NamPower. Numerous potential Independent Power Producers introduced themselves but found it difficult to negotiate tangible supply conditions with third-party off-takers.[36]

It became evident that the development of the power market remained unnecessarily constrained, and many saw NamPower as an entity that was protecting its monopoly position.[37] Various industry players lobbied for the change of the existing market model, amongst others to eliminate NamPower's alleged conflict of interest in its dual roles as single buyer and principal supply entity. In addition, a new market dispensation would also seek to introduce competition in the electricity supply sector, enhance the electricity sector's economic impact on the country's economy through a focused uptake and use of renewable energy technologies,[38] while enabling an accelerated entry of Independent Power Producers as well as the provision of other essential electricity services.[39] It was realised that the single buyer market model, with its relatively simple trading arrangements, held advantages for Namibia's small economy. However, even the most ardent supporters of this market model recognised the lack of investments in the country's generation capacity. In addition, NamPower's slow pace of implementation, and near-absolute domination of the electricity industry, could also not readily be argued away.[40]

The status quo started changing in 2015, when InnoSun established the first commercial Independent Power Producer at Omburu, near the town of Omaruru. Thereafter, embedded plant began operations in CENORED's and Erongo RED's supply areas, while others started supplying select large power users. These developments signalled the end of the single buyer market model as had originally been envisaged. Electricity supply industry stakeholders wanted the market model to be revised, to formally enable the entry of Independent Power Producers, which then led to the conceptualisation of the modified single buyer market model.[41]

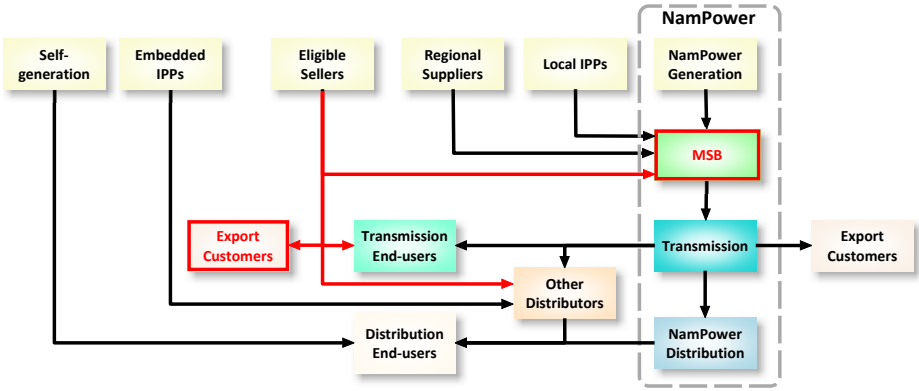
35 von Oertzen (2015).
36 von Oertzen (2010).
37 von Oertzen (2014b).
38 von Oertzen (2018b).
39 von Oertzen (2018c).
40 von Oertzen (2019:62).
41 Ibid.

13.2 The Modified Single Buyer Market Model (from 2020)

Based on numerous inputs from stakeholders, including from potential Independent Power Producers, and an assessment of international best practices, the new market model that was to replace the single buyer was developed. A so-called 'modified single buyer market model' was designed and workshopped with electricity supply industry stakeholders from 2018 onwards.[42]

As is suggested by its name, the 'modified single buyer market model' is a modification of the erstwhile single buyer market model as described in the previous Section, and aims at enabling Independent Power Producers to supply electricity to select customers without having to involve third-party entities such as the single buyer, as illustrated in Figure 2.[43]

Figure 2: Schematic Diagram of the Modified Single Buyer Market Model



Source: von Oertzen (2019:63).

The modified single buyer also allows private generators to build generation capacity which are to be used to export electricity into the southern African region. As such, the introduction of the modified single buyer market model thereby deliberately opens Namibia's electricity market, providing a step-by-step liberalisation of the previous single buyer rules of engagement throughout the sector. In this way, the modified single buyer market will also create opportunities for both established and new Independent Power Producers, as well as eligible off-takers.[44]

The modified single buyer market model also changes some of NamPower's erstwhile roles and responsibilities. While this national utility will continue to own and operate select electricity generation plant, the transmission system and parts of the

42 ECB (2019a).
43 ECB (2019b).
44 Ibid.

country's distribution system, NamPower will also have to manage the market and system operations needed for the modified single buyer. In addition, NamPower will become the supplier of last resort, which implies that it will be responsible to supply customers who are unable to procure electricity from other providers. On the other hand, NamPower's exclusivity as the electricity sector's sole trader disappears, with this functionality being replaced by multiple trading relationships between eligible suppliers and contestable customers.[45]

The modified single buyer market model creates a new basis on which transactions involving the supply of electricity will take place in Namibia in future. Specifically, this new market model implies the creation of a formal platform on which bilateral trade takes place and paves the way for additional investments in local generation capacity, while creating the framework conditions for large-scale investments in generation plant specifically earmarked for the export of electricity to neighbouring countries. Such arrangements are of particular interest to those wishing to monetise Namibia's world-class solar resource, and the good to excellent wind regime along the country's south-western coastal areas, amongst others.[46]

14 Private Sector Participation in the Electricity Industry

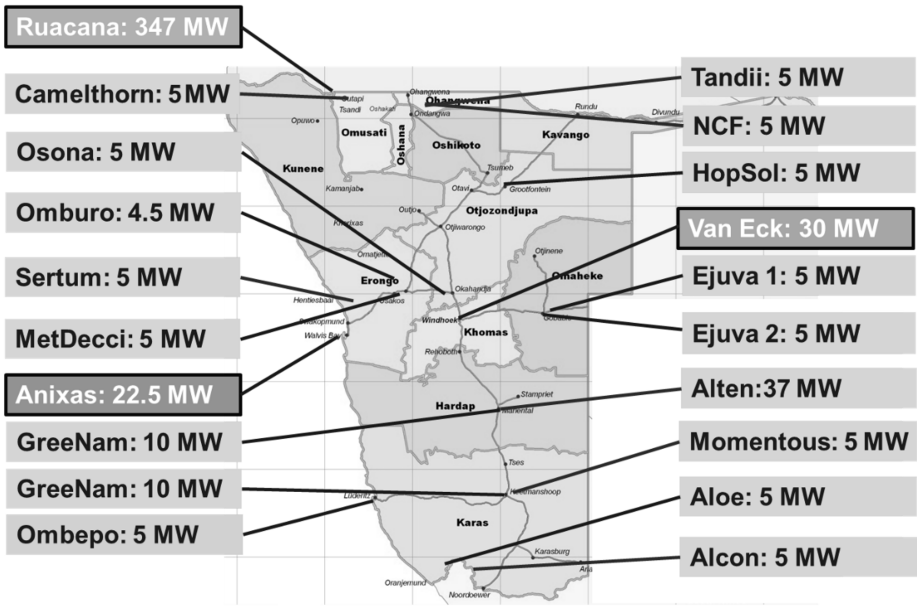
Private sector participation in Namibia's electricity industry commenced in 1996, when a private electricity distribution company, i.e. Northern Electricity, was established. The utility was to trial the concept of a privately-held entity tasked with the distribution and supply of electricity using assets belonging to the Government of Namibia. Although regarded as a model for further private sector participation in the country's electricity industry, this contract agreement came to an end in 2002, and the responsibility for the distribution and supply of electricity in northern Namibia was taken over by the newly formed Northern RED company.

In 2014, Omburu solar photovoltaic (PV) project reached financial close. It demonstrated that appropriately sized generation projects could be viable and be operationalised without a sovereign guarantee. In 2016, fourteen Renewable Energy Feed-in Tariff (REFIT) projects of 5 MW each, were commissioned. Two projects by Greenam, i.e. a 10 MW solar PV project near Mariental as well as one near Keetmanshoop, were commissioned in 2018, following a drawn-out directly negotiated procurement process. In contrast, the Alten 37 MW solar PV capacity[47] was the result of a competitive bidding process, and also commenced operations in 2019.[48]

45 Ibid.
46 Ibid:64.
47 Alten Renewable Energy, see http://alten-energy.com/developing/namibia/, accessed 25 August 2020.
48 Kruger *et al.* (2019).

In mid-2020, the country's electricity requirements were sourced from 20 local electrical energy generation plant, not including embedded, behind-the-meter and off-grid generation plant, as well as imports from neighbouring countries. The local generating capacity amounted to 526 MW, excluding embedded, off-grid and behind-the-meter generating capacities. Figure 3 shows NamPower's generation assets (in lined boxes) as well as 17 Independent Power Producers (IPPs), excluding the capacities associated with embedded, off-grid and behind-the-meter electricity generating plant.

Figure 3: Namibia's Electricity Generating Capacity in Mid-2020



Source: von Oertzen (2019:55).

The seventeen IPPs operate a total installed generating capacity of 126.5 MW, these exclude all embedded and behind-the-meter as well as off-grid plant. Except for Ombepo, which is a wind farm, all other IPPs operating in mid-2020 use of solar PV technology. Several distributors and commercial operations procure electricity directly from IPPs that operate embedded generating plant. These include HopSol's 5 MW PV plant near Otjiwarongo that sells to CENORED, OLC Arandis' 3 MW PV plant selling to Erongo RED, and SunEQ's 5 MW PV plant supplying Ohorongo Cement.[49]

An estimated 55 MW of grid-connected distributed generating plant is operational in mid-2020. Some are for own use only, including Windhoek's Grove Mall which operates a 2.8 MW_p PV plant, Maerua Mall's 2 MW PV plant, Wernhil Park's 2.1 MW

49 von Oertzen (2019:43).

PV plant, and Namibia Breweries 1 MW roof-mounted solar PV plant and others. Many smaller plant, including roof-top solar PV systems operating as behind-the-meter generators, benefit from Namibia's net metering rules, and often have feed-in arrangements with a local electricity distributor.[50] A large number and variety of backup generators are used throughout the country. Most mining operations have such generating plant on site. Examples include Langer Heinrich Mine's 16.5 MW diesel-powered plant, Ohorongo Cement's 7 MW diesel plant, Rössing Mine's 6.3 MW diesel plant, and many others.[51]

Numerous off-grid generating plant, i.e. plant not connected to the national grid, are in operation. Prominent examples include B2Gold's 24 MW heavy fuel oil generating plant and its 7 MW solar PV plant, the off-grid installations at Tsumkwe, Gam and Gobabeb, as well as those on farms and small settlements that are not connected to the electricity grid.[52]

15 Procurement of Additional Generating Capacity

Namibia's National Energy Policy, National Renewable Energy Policy and National Independent Power Producer's Policy spell out the Government's intent, direction and undertakings regarding the development and future of the Namibian energy sector. Critical to the implementation of the aforementioned policies is how additional capacity is to be procured.

Namibia's Public Procurement Act No. 15 of 2015, regulates the procurement of goods, works and services of public entities, such as NamPower.[53] The use of appropriate procurement mechanisms is key to ensure that capacity is available when required. Internationally, several procurement approaches and instruments have been successfully applied. These have resulted in important lessons that will hopefully inform the corresponding processes that are to be applied in Namibia, specifically for the procurement of new renewable energy generating capacity.

15.1 Direct Negotiations

Many countries in sub-Saharan Africa continue to use direct negotiations to procure additional capacity in electricity markets, which outnumbers the competitive bidding

50 Ibid.
51 Ibid.
52 Ibid:44.
53 GRN (2015b); see https://laws.parliament.na/cms_documents/public-procurement-3ff4b6e324.pdf, accessed 25 August 2020.

taking place in the Region.[54] Direct negotiations are usually started following the receipt of an unsolicited proposal that is submitted by an investor. An advantage of direct negotiations is that they allow utilities to rapidly identify and enact the appointment of suppliers.[55] However, while negotiated projects may offer a quick response to addressing capacity gaps, they are often poorly coordinated, inadequately embedded and part of a country's national development imperatives and lack the strategic focus that characterise initiatives undertaken as part of well-considered integrated resource plans.[56]

As is happening in the SADC Region, direct negotiations can readily pave the way for corrupt dealings, driven by well-connected individuals. They also lead to higher energy prices, and deter investments, as politically – or otherwise connected individuals steer the process to meet their own requirements.[57]

15.2 Competitive Bidding and Tendering

International reforms of electricity markets that started in the 1990's led to the development of tendering procedures that were specifically aimed at adding new renewable energy capacity to the energy mix. This procurement approach entailed the use of competitive bidding, specifically with the aim to ensure greater transparency, enhance efficiency and lower the cost of capacity additions brought about by the pressures inherent in competitive market approaches.[58]

In the SADC region, South Africa is leading the competitive bidding process. Between 2011 and 2015, the country conducted four renewable energy auctions, leading to private investments amounting to some N$ 19 billion, and resulting in 92 projects adding some 6.3 GW of new generating capacity.[59]

Broadly speaking, the South African competitive bidding process includes the following: Following the announcement of a bid, and submission of bids by interested parties, the bidding evaluation follows a two-step evaluation process. Bidders must satisfy specific minimum threshold requirements, including environmental, land, commercial and legal, economic development, financial and technical.[60] Bids that satisfy

54 Eberhard *et al.* 2014.
55 See http://www.fao.org/3/Y1398E/y1398e09.htm, accessed 21 August 2020.
56 Kruger *et al.* (2019).
57 World Bank Group, see https://openknowledge.worldbank.org/handle/10986/19784, accessed 19 August 2020.
58 Kruger *et al.* (2019).
59 Ibid.
60 The environmental review examined approvals, while the land review looked at tenure, lease registration, and proof of land use applications. Commercial considerations included the project structure and the bidders' acceptance of the Power Purchase Agreement. The financial review included standard templates used for data collection that were linked to a financial model used

the requirements proceed to the second evaluation step where the actual bid price weighs 70% of the total score and 30% is allocated to criteria including job creation, local content, ownership, management control, preferential procurement, enterprise development and socio-economic development. Bidders must provide two prices, i.e. a fully indexed for inflation and the other partially indexed, with the bidders initially allowed to determine the proportion that would be indexed while in subsequent rounds, floors and caps were instituted for the proportion that could be indexed. Bids were then evaluated using a standard financial model.[61]

Tendering entails the participation of project developers through a competitive bidding process. Generally, the capacity to be added and (in some cases) a specification of the technology that is to be used, are specified. Criteria for the evaluation of bids are set before each bidding round.[62] Bidding is often accompanied by an obligation on the part of electricity utilities to purchase a certain amount of electricity from renewable sources at a given price.[63] Once a producer has secured a long-term contract, a penalty is incurred if they cannot deliver or in case they withdraw from their initial offer.[64]

Tendering procedures require clear processes for application, approval of proposed projects and monitoring performance. From a regulatory perspective, it is important to develop transparent rules to minimise corruption, ensure the adequacy of information that is disseminated to bidders and to level the playing field.[65] This demands significant organisational efforts from the Government and good cooperation between the parties involved, including the entity tasked with monitoring and verification.[66]

15.2.1 Quota Systems and Green Certificates

A quota system implies that the Government specifies the percentage or an amount of energy, usually on an annual basis, that is to be procured from specific generators, for example from renewable energy power plant, while allowing the marketplace to set the price at which a given quantum is made available.[67]

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by the evaluators. The technical specifications were set for each of the technologies. For example, wind developers were required to provide 12 months of wind data for the designated site and an independently verified generation forecast. The economic development requirements, in particular, were complex and generated some confusion among bidders.

61 Eberhard *et al.*, 2014.
62 Bjork *et al*. (2011: 41).
63 Ibid:42.
64 Ndhlukula (2010:14).
65 Bjork *et al*. (2011:42).
66 Hellman *et al.* (2000)
67 Bjork *et al*. (2011:40).

The departure point of a quota system rests on the concept that the Government specifies the quantity of energy that is to be procured from specific plant and allowing the market to competitively decide how to most cost-competitively deliver such supplies. The economic underpinning rests on the assertion that competition will drive down the cost of supply which will then be of benefit to the end-user.[68] Quota systems involve the issuance of certificates to supply electrical energy. These certificates guide the market in terms of the overall quantity of electricity to supply, and for trading between suppliers to meet the quota requirements while maximising profits.[69] Such quota systems have the advantage that they are efficient, and that they are effective in ensuring energy security.[70] In addition, as quota systems usually involve little or no subsidisation, the aggregate cost of supply is minimised, provided that suppliers remain independent from one another.[71]

A common downside of a quota system is that they incentivise the development of supply options that are considered to be the least-cost supply option. This feature implies that longer-term strategic considerations, for example the overall resilience of the energy mix, are often not adequately catered for as supply options that offer cost advantages over the short-term are usually favoured in quota systems. In practice this implies that technologies that offer cheap and quick-to-market supplies are incentivised over others that may hold advantages over the medium or long term.[72]

Of note is that quota systems are usually an effective approach to procure supplies if the market is well developed and deep. This implies that quota systems are often less useful in small markets and those that are less developed, as is the case in many a developing nation, including in Namibia.[73]

16 Reflections on Namibia's Electricity Future

Namibia is blessed with world-class renewable energy resources, well-developed energy policies, solid regulatory provisions, a well-functioning national electricity utility and cost reflective electricity tariffs. In addition, considerable private sector investments in new electricity generating capacity have been secured since 2016.[74] Based on these strengths one could readily assume that Namibia's electricity future is bright. However, a variety of challenges continue to strain the country's electricity supply industry. Amongst the more important impediments are the country's continued

68 Ibid.
69 Bjork *et al*. (2011:40).
70 Ndhlukula (2010:15).
71 Bjork *et al*. (2011:41).
72 Ibid.
73 Bjork *et al*. (2011:40).
74 von Oertzen (2019).

dependence on imports. Also, despite considerable efforts since Independence, less than one-halve of the population has access to electricity. And, in the past decade, year-on-year electricity price escalations have been substantial, thereby negatively affecting the affordability of electricity, driving inflation and weakening the country's regional competitiveness.[75]

Central to most of the electricity-related challenges faced by Namibia in 2020 is the lack of appreciation of what a substantial energy-related position could imply for Namibia's development, and the deep disconnect between lofty policy ambitions and the ability to actually implement them. Actions to strengthen Namibia's energy security on the one hand, and the political rhetoric on the upliftment of living standards on the other hand appear to take place in entirely disjoint universes. Economically, voices advocating a rapid move towards improved access to affordable modern energy remain quaint at best. However, it must also be acknowledged that a general appreciation exists that secure, adequate, accessible and affordable electricity supplies are essential pre-requisites to a more competitive and inclusive economy.

Internationally, there is broad consensus that access to modern energy unfolds multiple positive socio-economic impacts.[76] Generally, it is recognised that access to electricity is important to improve the conditions that underpin national development.[77] Consequently, many nations refocus their national development objectives to include pronouncements on energy security and electrification as these are recognised as fundamental drivers of other development-related objectives, including becoming more resilient to the impacts of a changing climate.[78]

Given the nexus between energy, climate and development, the remainder of this section reflects on the steps towards a future-oriented electricity future in Namibia.[79] The departure point centres around the practical question on how a secure, resilient and competitive electricity future can be brought about. The focus will be on the key short-term imperatives, i.e. those to be undertaken between 2021 and 2025, and on medium- to long-term imperatives beyond 2025.

16.1 Short-term Imperatives – 2021 to 2025

Namibia's National Integrated Resource Plan (NIRP) elaborates how the national demand for electricity is to be met in future, noting that the NIRP has a 20-year horizon.[80]

75 Ibid.
76 See for example Sustainable Energy for All; see https://www.seforall.org/, accessed 29 August 2020.
77 von Oertzen (2016).
78 IRENA (2019).
79 von Oertzen (2009).
80 See https://bit.ly/2TIrHmx, accessed 26 August 2020.

In mid-2020, the NIRP of 2016 is being reviewed and updated. This is essential as the rapid pace of developments, particularly in the solar energy and electrical energy storage space, implies that cost and roll-out requirements are changing as well.

In order to strengthen the country's security of electricity supplies, and cognisant that the current national demand cannot be met from local supplies only, the Minister of Mines and Energy as the country's principle custodian of energy, must be informed by a balanced and up-to-date generation capacity plan to pronounce him/herself on how such capacity is to be developed. The NIRP update is expected to be finalised by 2021 at the latest and will identify those least-cost supply options that are to be procured in future.

Upon allocation of new generation capacity by the Minister of Mines and Energy, procurement of such capacity commences. This may entail an allocation to the state-owned electricity utility NamPower, as well as capacity allocations that are to be brought online by Independent Power Producers. Also, the concept of private-public partnerships (PPPs) exists in Namibia and has been applied in other spheres before, based on the provisions of Namibia's Private Public Partnership Act No. 4 of 2017. However, PPPs have not yet found their way into the country's electricity industry, although a variety of unsolicited proposals were received by the Ministry of Mines and Energy, NamPower and the PPP Unit in the Ministry of Finance.[81] A further option to procure future supplies is by way of regional partnerships, as well as bilateral supply agreements. The latter has been practiced for decades and entails securing supplies from neighbouring power utilities such as South Africa's Eskom,[82] Zambia's ZESCO Limited,[83] the Zimbabwe Power Company (ZPC) [84] and others.

In the short term, the electrification of schools, clinics and essential infrastructure that is used to provide services by the Government is of critical importance. The Covid-19 pandemic has highlighted that teaching and learning must continue as the development of children may not be interrupted. Here, the use of modern information and communication technologies and the internet are indispensable. However, without access to electricity, these critical needs can simply not be met. The same applies to the continuous operation of hospitals and clinics that rely on the maintenance of a permanent cold chain and operation of refrigeration facilities. It is therefore imperative that schools, clinics and remote Government offices are electrified as a matter of national urgency.

Another short-term activity must include the development of the new National Electrification Master Plan,[85] which is to be a key pillar on which the process to achieve universal access to electricity is to be built. The Master Plan is to treat on- and off-grid

81 See https://mof.gov.na/public-private-partnerships, accessed 28 August 2020.
82 See https://www.eskom.co.za/Pages/Landing.aspx, accessed 28 August 2020.
83 See https://www.zesco.co.zm/home, accessed 28 August 2020.
84 See http://www.zpc.co.zw/, accessed 28 August 2020.
85 See http://www.mme.gov.na/energy/electricity/, accessed 28 August 2020.

electricity supply options on an equal footing, irrespective of whether electrification is to take place in underserved peri-urban or rural localities. It is expected that the Master Plan is commissioned in 2021, and likely be finalised during 2022.

In mid-2020, a National Electrification Policy and associated National Electrification Funding Portfolio is being developed, as has been described in Section 15 above. These instruments are to pave the way towards achieving universal access to electricity services in Namibia. The Policy is expected to be completed in 2021 and will result in a harmonised and more focused approach to create access to electricity services for all, funded by way of a portfolio that includes contributions by the Government, electricity distribution entities as well as a broad mix of contributions from regional and international grant and loan facilities.

Several demand side management programmes have been undertaken in the past, including by NamPower, distributing one million light emitting diode (LED) lights to end-users,[86] as well as a public awareness campaign, i.e. 'Power of Knowing', to advocate the benefits of energy saving measures. However, many related initiatives remain to be implemented, including a campaign to replace electric water heaters by solar water heaters,[87] complementing the national generation capacity by utilising virtual power stations,[88] and the concerted drive to reduce the demand for electricity. It is also considered important that the benefits associated with energy efficiency technologies and associated behavioural measures, as well as demand side measures, are reinvigorated, as the electrical energy that is not demanded by end-users does not have to be generated in the first place.[89]

16.2 Medium- to Long-term Imperatives – beyond 2025

Namibia's electricity imperatives in the medium- to long-term would best be centred on supporting national development actions that strengthen the resilience of the economy, enhance local productivity and diversify and broaden the economy. Central to such initiatives is that the country's electricity security is further strengthened by investments in local generating plant, that accessibility is rapidly extended and that electricity prices remain as affordable as possible.

Generation capacities must be extended, as projected in the National Integrated Resource Plan. This may include the Baynes hydropower project in the Kunene River, with a capacity of 600 MW that is to be shared between Namibia and Angola.[90] The governments of both countries have agreed to develop the Baynes option following

86 See https://www.nampower.com.na/ledmicrosite/, accessed 27 August 2020.
87 See https://www.nampower.com.na/Page.aspx?p=206, accessed 27 August 2020.
88 See https://bit.ly/3rPjFqv, accessed 15 February 2022.
89 von Oertzen (2015).
90 See https://www.nampower.com.na/Page.aspx?p=222, accessed 27 August 2020.

studies showing that the site would be less disruptive to the life of the indigenous Himba communities, and would have fewer environmental impacts than the Epupa site that had been considered before.[91] Current estimates suggest that Baynes will cost some USD 1.2 billion, which is considered optimistic.[92] If commissioned at all, Baynes will not likely come on stream before the end of 2028 or early 2029.[93] It is noted that the Baynes project will raise regional security concerns as the site is located on the international border between Namibia and Angola, and the source of water lies beyond Namibia's control.[94]

The SADC's long-term power generation vision rests on the ZiZaBoNa project, which is envisaged to be a joint electricity transmission interconnector project linking the power networks of Zimbabwe, Zambia, Botswana and Namibia.[95] ZiZaBoNa also aims to establish a second transmission corridor besides the existing central transmission pathway from Zambia through Zimbabwe, Botswana into South Africa.[96]

Other large-scale projects are mooted as well. For example, in March 2017, the Southern Africa Energy Program was launched by the United States Agency for International Development (USAID) in collaboration with several southern African governments.[97] The initiative provided technical assistance to various public and private stakeholders, including the regulatory authority, NamPower and the Ministry of Mines and Energy. In mid-2020, the USAID's Power Africa initiative has commenced with an investigation of the feasibility of adding some 5,000 MW of new solar energy capacity in Namibia and Botswana. [98] Such capacity would clearly necessitate power exports into the SADC region, which would require substantial investments in additional transmission capacities to effectively wheel these supplies to regional off-takers. However, while the assessment has not been completed, the viability of such mega-projects in small countries such as Namibia and Botswana remain highly questionable, especially in view of the multitude of constraints that characterise the region's economies.

A strategy that promises tangible step-by-step additions to the existing generation capacity is based on steadily increasing the contributions of small- and medium-scale renewable generation projects in the Namibian electricity mix.[99] The benefit of adding

91 See for example https://www.lac.org.na/projects/grap/Pdf/epupa_debate.pdf, accessed 27 August 2020.
92 *The Namibian*, at https://www.namibian.com.na/200244/archive-read/Baynes-power-plant-construction-slated-for-2023, accessed 27 August 2020.
93 Ibid.
94 See https://www.lac.org.na/projects/grap/Pdf/epupa_debate.pdf, accessed 27 August 2020.
95 See for example https://www.sardc.net/en/southern-african-news-features/sadc-lures-investors-for-zizabona-energy-project/, accessed 28 August 2020.
96 See https://bit.ly/3Bkv1WC, accessed 15 February 2022.
97 See https://pdf.usaid.gov/pdf_docs/PA00TCZ5.pdf, accessed 26 August 2020.
98 See https://bit.ly/3rPtvsp, 15 February 2022.
99 von Oertzen (2016).

appropriately sized capacity is that these can be funded more readily, including from private sector investments, as has been successful in Namibia.[100] For larger-scale investments, as would for example be the case for concentrated solar power projects, partnerships between the national utility on the one hand and external investors on the other are likely to be useful.

Namibia's small electricity industry must guard against overextending itself in programmes and initiatives that mainly serve the interests of parties beyond the borders. This is not to mean that Namibia should not expand its generation capacities to serve regional markets. Indeed, the country's vast solar and wind resources should actively be unlocked to supply southern African markets, which is considered realistic and achievable in view of Namibia's renewable endowments and the cost competitiveness of these clean energy supplies.[101]

On the demand side, the medium- to long-term future is expected to see the increased uptake of mini-grids supplying remote areas.[102] The days where grid-connected electricity supplies were the only means to establish access to electricity are over, noting that the cost of building and operating conventional distribution grids to low-density areas is high.[103] As Namibia is moving closer to realising universal access to electricity, small-scale stand-alone supply options powered by renewables are likely to be deployed as well, both in sparsely populated rural areas as well as in select peri-urban areas.[104] This expansion necessitates the development and roll-out of innovative business models for the decentralised supply of electricity, which is expected to unlock private sector participation in the electricity sector.[105] These and related developments are expected to create new jobs, contribute to the upliftment of communities and power the nation's economy into the future.[106]

17 Concluding Remarks

Energy is an integral ingredient of any modern economy. Key development drivers, including human capital, water, food, health, education, and others, depend on the availability, accessibility, affordability and adequacy of energy supplies.

Electrical energy is one of the key contributors to Namibia's total energy mix. Electricity is a most versatile form of energy and is indispensable in the provision of most goods and services that a modern society relies on. There is strong evidence that

100 von Oertzen (2019).
101 GRN (2017b); GRN (2017d).
102 GRN (2020).
103 See https://bit.ly/3oPpMcA, accessed 15 February 2022.
104 Ibid.
105 GRN (2020).
106 von Oertzen (2018a).

access to reliable and affordable electricity supplies is of fundamental importance for socio-economic development, which is an insight that is of pivotal importance to Namibia.

Strengthening the security of national electricity supplies necessitates that the right choices are made, and projects are diligently implemented. In the recent past, the Namibian electricity sector has witnessed a considerable number of investments in small, medium- and large-scale electricity generation technologies, utilising local renewable energy resources. These developments benefit from Namibia's rich renewable energy endowments, which are abundant, readily accessible, available, safe, and clean, and will remain so in future.

The uptake of technologies that add value to the country's natural resource endowments is also benefitting from international trends and initiatives that promote cleaner, more sustainable, and climate-friendly energy choices. With a focus on creating local value, such initiatives are expected to promote local social, environmental, and economic benefits by leveraging Namibia's endowments to energise development in all its facets.