



SECTOR BRIEF NAMIBIA: Renewable Energies



State of the electricity market in Namibia

The Namibian energy and electricity market is in a state of flux and undergoing progressive liberalisation. The government has set itself the task of creating an enabling environment in which private sector players increasingly participate in the electricity market. This is hoped to usher in new forms of electricity generation and distribution models.

Liberalisation and structure of the energy market

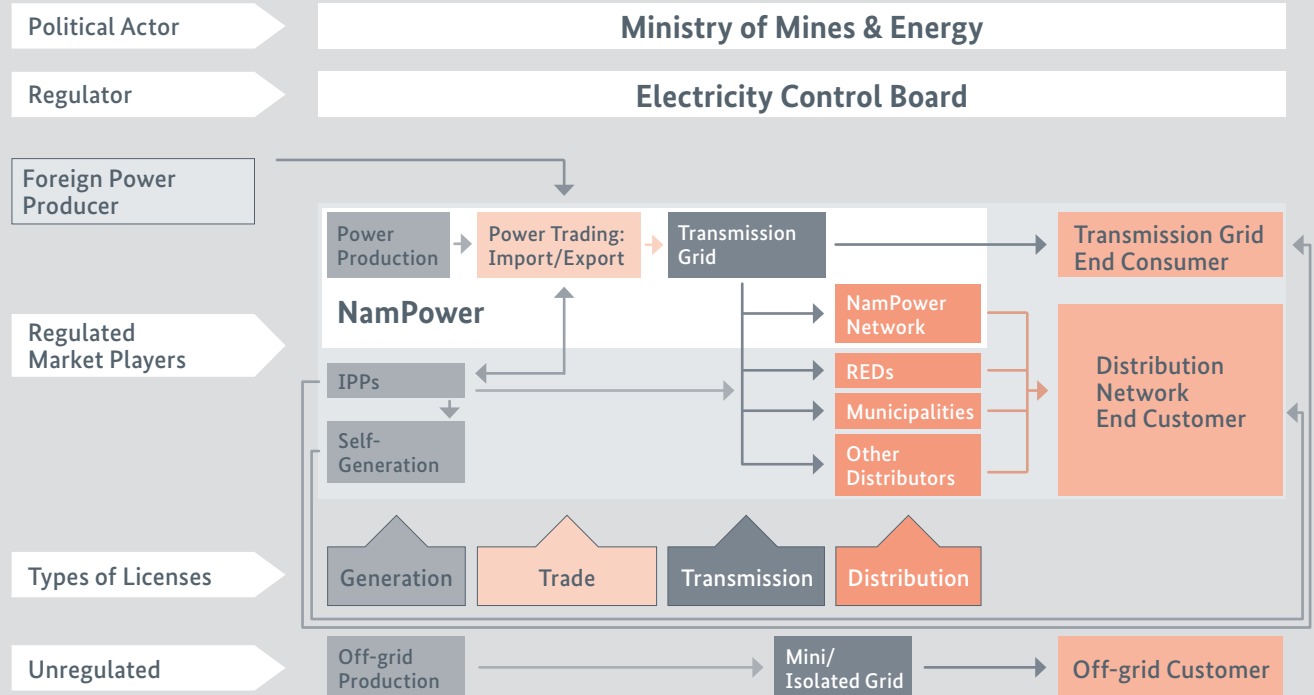
Traditionally, the Namibian electricity market has been dominated by the state-owned utility Namibia Power Corporation (Pty) Ltd., or NamPower for short. In the Namibian electricity market, NamPower was responsible for generation, transmission, distribution and the trading of electricity as well as supplying the end customer. For some years now, the Namibian government has been attempting to liberalise the market with a view to creating a more flexible and cost-reflective electricity market open to private sector players and investments.

The Modified Single Buyer Model (MSB) was introduced as a new market platform in 2019, which will gradually replace the current Single Buyer Model (power purchase only by NamPower). The MSB strengthens the role of Independent Power Producers (IPPs) by allowing certain customers (Contestable Buyers) to purchase a portion of their electricity needs directly from IPPs (Eligible Sellers).

After completion of the gradual implementation of the MSB, electricity trading by private players is also to be possible from 2026. However, electricity deliveries to private households will continue to be handled by the regional electricity distributors (REDs) and the municipal utilities.

The necessary licenses for electricity generation and distribution will be granted by the Electricity Control Board (ECB). The licensing process takes around 60 days. The list with the necessary documents and requirements for license applications is available on request from the ECB. Up-to-date information on the status of renewable energy regulations and the granting of licenses can be found on the ECB website.

Structure and players of the Namibian electricity market



Development and licensing of the Namibian electricity market according to the MSB model
Source: International Finance Corporation, 2020

Electricity generation and prices, expansion of producer capacity

Namibia is heavily dependent on imports for its energy supply. All fossil fuels (coal, fuels) must be imported. Despite the small population and the low electrification rate of 56%, only about 40% of the country's electricity needs can be met from its own generation capacities. With a peak load demand of about 630 MW, only 610 MW of grid-connected generation capacity is installed in the country – of which 459.50 MW is owned by the state utility NamPower and 150 MW is operated by IPPs, mostly photovoltaic. As a result, Namibia remains dependent on electricity imports from neighbouring countries, which met about 60% of total demand in 2020. The majority of electricity imports are sourced from South Africa.

Due to the high import dependency and the fact that cost recovery is an important criterion in tariff setting, Namibia has the highest electricity prices in southern Africa. The 2021/22 base electricity price for large consumers (regional electricity suppliers, municipal utilities) and direct NamPower customers is 1.70 Namibia Dollar (NAD)/kWh (approx. 0.10 Euro/kWh). This means that the electricity price has more than doubled since 2011 (0.68 NAD/kWh – approx. 0.04 Euro/kWh). It should be noted that the actual electricity costs for end customers are significantly higher than the base electricity price, as the costs and margins of regional electricity suppliers and municipal utilities are added on. In addition, there are seasonal and



time-of-use (TOU) electricity price fluctuations to cushion the high import costs at peak times. The various electricity suppliers also have different tariff structures, which can vary greatly according to customer groups, consumption levels, and type of connection (prepaid or billing). As a general guideline, an average electricity consumption cost of 2.40 NAD/kWh (approx. 0.14 Euro/kWh) can be conservatively assumed for commercial electricity consumers.

Due to the growing demand for electricity, and in order to reduce electricity imports, according to the National Integrated Resource Plan (NIRP) of 2016, power plant capacities are to be expanded to 1,677 MW by 2035. At 708.5 MW, renewables account for the larger share of planned power plant capacity, providing 4,947 GWh or about 60% of electricity generation in 2035. By renewable energy technology, the following additions are planned:

	Photo-voltaics (PV)	Wind power	Biomass	Concentrated Solar Power (CSP)
Total planned capacity	229.5 MW	149 MW	80 MW	250 MW
Built so far	150 MW	49 MW		
Comment	Remaining capacity to be put out to tender in several lots by 2032.	Grid connection planned by 2028.	Realization in three lots between 20 and 40 MW by 2025.	Whether construction occurs depends on battery storage cost trends. Reallocation to PV or wind power possible.

The investment costs for the construction of the planned renewable energy capacities are estimated in the NIRP at 41.36 billion NAD (approx. 2.48 billion Euro). The projects are to be implemented mainly through competitive bidding by IPPs.

Renewable Energies

Given the government's plan to expand power generation capacities – 60% of which should be from renewable energies – and growing interest from commercial electricity consumers to invest in self-generation facilities, the Namibian renewable energy market is dynamic and replete with viable business cases. Given the high costs of grid electricity, renewable energy plants are competitive and can be economically implemented without subsidies.

By 2030, a total of 510 MW of grid-connected renewable energy capacity is expected to be installed. The expansion is set to take place through competitive tenders with IPPs subject to power purchase agreements with NamPower or REDs. Renewable energies will also play an increasingly significant role in rural electrification. The construction of mini-grids with photovoltaics or biomass is to be accelerated, again through the use of IPPs.

In addition to the government's expansion plans, growing interest by commercial and industrial electricity consumers in renewable energy self-consumption systems is driving the growth of the renewable energy market. To date, it is estimated that just over 50 MW of renewable energy self-consumption plants have been implemented in Namibia. The ability to plan for future electricity costs is a key aspect of investment interest. Photovoltaic systems on the consumer's premises (embedded generation) are by far the favourite form of self-consumption.





Natural potential for renewable energies

The clear focus on photovoltaics is based on the high solar irradiation values, which clearly stand out even by African standards and rank among the highest in the world. With approx. 300 sunny days and over 3,000 sun hours per year, the annual solar irradiation reaches values of 2,200 to 2,400 kWh/m². Due to the constantly high irradiation, PV systems in Namibia generate twice as much electricity as comparable systems in Germany on an annual average. A daily yield of up to >5.6 kWh can be expected per kWp of installed PV capacity.

In comparison, natural conditions for wind power are limited in the region. High, constant wind speeds, which offer ideal conditions for the construction of wind power plants, are found above all on the south coast in the region around Lüderitz, as well as in the coastal region on the border to Angola. According to an analysis by the Ministry of Mines & Energy, an annual electricity yield of around 2,800 MWh per installed MW of wind power can be expected in Lüderitz.

In the bioenergy sector, the use of invasive bush wood (encroacher bush) offers potential for biomass plants to produce and use wood chips, pellets or for wood gasification. The state-owned energy operator NamPower is also planning a 40 MW biomass power plant. The bush encroachment affects up to about 45 million hectares, offers large quantities (approx. 14 million t/a) that can be sustainably harvested annually with positive ecological effects (groundwater, biodiversity, etc.) on the environment. However, the challenge lies in the harvesting of the bush wood and the logistics. As a result, only about 10% of the biomass potential is currently commercially exploited, primarily for charcoal production and increasingly for material use pathways (animal feed, biochar). Namibia is the world's fifth largest charcoal exporter with about 210,000 tons. Bioenergy from specially cultivated energy crops is out of the question in Namibia due to land competition with food production and water scarcity.

The natural potential for hydropower is estimated at 2,250 MW. Of these, 347 MW are already being used from Ruacana hydroelectric power station. However, hydropower potential in Namibia

is mostly theoretical, as limited water resources and regular drought make the continuous operation of hydropower plants difficult or near impossible. Complicating the matter is the fact that the large Ruacana hydroelectric power station can only be operated at maximum capacity during the rainy season.

Green Hydrogen

It can also be assumed that the topic of green hydrogen will provide additional momentum in the field of renewable energies (PV, wind power). Biomass could also play a supporting role as a biogenic CO₂ source in the development of a national H₂ economy. Namibia would like to position itself internationally as a production location for green hydrogen due to its very good renewable energy potential. Model calculations assume that green hydrogen can be produced for 25 to 33 NAD (ca. 1.50 to 2 Euro) per kilogram in Namibia. The country also cooperates closely with Germany on the topic of the green hydrogen economy and receives funding from the German Federal Ministry of Education and Research.

Initial industrial project approaches in the hydrogen sector are taking concrete shape. In November 2021, the Namibian government announced the preferred bidder for a vertically integrated hydrogen project near Lüderitz: The Hyphen Hydrogen Energy consortium, with the participation of the German company Enertrag, is to realize and operate the plant. Starting in 2026, the first build-up stage (2 GW renewables) is expected to start producing hydrogen. By the end of the decade, the entire plant is to be realized: 5 GW of renewables and 3 GW of electrolysis are to produce up to 300,000 tons of green hydrogen and/or ammonia. The investment volume is estimated at USD 9.4 billion.

Financing opportunities for renewable energies

Larger firms and industrial enterprises generally have the financial resources or access to capital, to finance investments in renewable energy for self-consumption. Due to the trend towards operator models, however, project developers must increasingly have their own capital to finance projects.

Local financing is available for this purpose. The banking sector in Namibia is well-developed and access to credit financing is possible. Similarly, financiers are showing an increased interest in renewable energy projects.

In addition to commercial banks, development finance institutions such as the Development Bank of Namibia are also involved in renewable energy financing. The Development Bank of Southern Africa and the Industrial Development Corporation are equally open to financing transactions, with given conditions subject to individually negotiated terms.



Market segments and potential for renewable energies

The basic policy framework and regulations for private-sector participation in the electricity market have been established. Due to current regulations and the modified single-buyer model, the following opportunities have emerged for private sector involvement in the Namibian electricity market.

Embedded generation and sale to commercial customers

Rising costs for grid power mean that decentralised renewable energy systems for self-consumption can be implemented economically and with relatively short payback periods. This is why the market segment for self-consumption in industry, commerce and agriculture is developing dynamically. A conservative estimate based on industrial large-scale consumers in Namibia assumes at least 5,000 potential customers or plants in this market segment.

On-premise PV systems (embedded generation) are by far the most typical application, with system sizes varying. For agricultural and tourism consumers, plant capacities range from 20 to 250 kWp. Commercial consumers – industry and the service sector – tend to request systems between 500 to 1,000 kWp. For large-scale consumers, project sizes can also reach low double-digit MW values.

With the expansion of MSB, including the ability to pass electricity through the public grid, further growth in the market segments can be expected.

A trend in the area of self-supply plants is the orientation towards operator models in which the electricity consumer concludes a purchase agreement with the project developer. This requires that the project developer has access to financing in order to realise the plant.

Grid-bound projects – Private to public

The Namibian government's expansion plans essentially represent the theoretical market size of the segment. After almost 20 power purchase agreements have already been concluded with IPPs, around 510 MW remain according to the NIRP: 80 MW photo-voltaics, 100 MW wind power, 250 MW CSP and 80 MW biomass, which are to be awarded by means of competitive tenders.

PROCEED

At the behest of the Federal Republic of Germany, the Federal Ministry of Education and Research is supporting the development of viable models for renewable energy-based mini-grids in Namibia. The project is called Pathway to Renewable Off-Grid Community Energy for Development (PROCEED) and, among other activities, analyses existing mini-grids in order to develop concepts and solutions that meet local needs, are technically up-to-date, economically viable, maintenance-friendly and thus sustainable.

Whether the planned 250 MW of CSP will be realized is questionable due to cost trends. A shift of CSP capacities to photovoltaics and wind power is conceivable.

However, the introduction of the MSB means that regional electricity suppliers (REDS) and municipal utilities can now also conclude supply contracts with private electricity producers on a larger scale.

Mini-grids

Only 35% of the population in rural areas has access to electricity. Due to the long distances and sparse population, connecting rural communities to the national power grid in large parts of the country is neither technically nor economically viable. Therefore, mini-grids are coming into focus to improve access to electricity.

Around 300,000 households currently have no access to electricity. Even though the estimates can only be considered as a guideline, they indicate a market potential for the construction and operation of renewable energy mini-grids. However, there is hardly any dynamism in the market segment.

This is partly due to the lack of regulations for stand-alone grids, which clarify issues such as the award of exclusive land supply contracts or concessions, and partly to the challenge of economic viability. The high electricity generation costs in mini-grids cannot be covered by retail tariffs. Thus far, no mechanism for subsidising mini-grids has been established and any potential subsidy or support mechanism must be sought out on a case by case basis.

Green People's Energy for Africa

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is implementing the project "Green People's Energy for Africa" in Namibia together with the Ministry of Mines & Energy. The project supports the dissemination of decentralized renewable energy for rural regions in selected African countries with the participation of local communities and enterprises.

Opportunities for European companies

In order to serve the growing renewable energy market, Namibia depends 100% on imports of renewable energy technologies. Import duties are not levied on renewable energy technologies, except solar thermal energy for households. Profits of foreign subsidiaries in Namibia can be transferred without limitation to the parent company. This offers interesting business opportunities for German and European renewable energy companies despite the relatively small size of the market. Particularly in the embedded generation segment and for companies that:

- offer operator models, including financing: e.g. Build Own Operate Transfer (BOOT), leasing concepts, power purchase agreements;
- manufacture renewable energy components of various technologies, including electricity storage; and
- provide solutions that optimise own consumption and perform load management.



Best Practice

Sustainability in the tourism sector

Since September 2018, the Chobe Water Villas Lodge, on the border to Botswana and Zambia, is being supplied by a 150 kWp photovoltaic system, including a 332 kWh lithium-ion battery storage solution. The PV plant was realised by O&L Nexentury GmbH, a joint venture between Cronimet Power Solutions GmbH from Starnberg and the Namibian company O&L Energy, who jointly financed and constructed it. Qinous GmbH from Berlin developed the energy storage system. Replacing the existing diesel generators with a PV system reduced energy costs and continues to ensure a more sustainable operation of the lodge.

The number of local, established renewable energy companies in Namibia is low. Most companies focus on project development, engineering-procurement-construction (EPC) activities and installation of photovoltaic and solar thermal solutions. The established, local companies, some of which have been active in the field of renewable energies for more than 10 years, generally have sound know-how and technical understanding. Only since 2019 there is formal training in the field of renewable energies offered in Namibia. Apart from these trainings at technical and vocational education and training centers, employees are individually trained by their companies or by other private service providers. Thus, the quality and the level of education of local companies and specialists can vary considerably.

However, cooperation with local companies is recommended in order to participate successfully in public contracts and tenders. In order to strengthen and develop the local economy, the Namibian government deliberately uses its procurement expenditures. Preference is given to local companies and consortia with local participation.



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Sources and useful links:

- Electricity Control Board (ECB): <https://www.ecb.org.na/>
- Germany Trade & Invest on Renewable Energy in Namibia (in German): <https://www.gtai.de/de/trade/namibia/branchen/dynamische-entwicklung-im-solarektor--688442>
- Green People's Energy for Africa: <https://gruene-buergerenergie.org/en/>
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- Ministry of Mines & Energy: <http://mme.gov.na>
- NamPower: <https://www.nampower.com.na/>
- Namibia Investment Promotion and Development Board (NIPDB): <https://nipdb.com/>
- Pathway to Renewable Off-Grid Community Energy for Development (PROCEED): <https://www.bmbf-client.de/en/projects/proceed>
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- Southern African-German Chamber of Commerce and Industry: <https://suedafrika.ahk.de/en/competence-centres/sustainable-energies>
- Sector Brief on Biomass in Namibia (in German): <https://www.giz.de/de/downloads/giz2022-de-namibia-buschemasse.pdf>

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In order to support the sustainable engagement of German companies in emerging and developing countries, Germany Trade & Invest (GTAI), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and the German Chambers of Commerce Abroad (AHKs) as well as other partners combined their expertise in the German publication series “New Markets – New Opportunities”.

The booklet shows companies the economic potential of future markets as well as the funding and consulting opportunities offered by the German development cooperation. “New Markets – New Opportunities: A Guide for German Companies” is supported by the Federal Ministry for Economic Cooperation and Development (BMZ). All issues are published on the websites of GTAI and GIZ. You can find selected issues, for example on Namibia also at

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