

PROJECT FACT SHEET

40MW OTJIKOTO BIOMASS POWER STATION

Project Objectives

The primary objective of the first 40 MWe Otjikoto Biomass Power Station is to address energy security and affordability.

The Project and its economic drivers using encroacher bush as a fuel source to assist and alleviate bush encroachment, will promote a sustainable harvesting industry that will not only generate the required harvesting volumes to run a biomass power station but will potentially stimulate other spin-off markets and act as a catalyst for other de-bushing applications.

In summary, the Encroacher Bush Biomass Power Project objectives are to:

- Enhance security of supply by introducing a baseload or dispatchable electricity supply option,
- Stimulate the local economy and promote a local biomass fuel supply chain in Namibia,
- Increase environmental sustainability and biodiversity,
- Assist with combating bush encroachment with benefit to Namibian agricultural sector and
- Prove the concept for future project duplication across Namibia and its bush- encroached areas.

Project Site Details

The Project Site is situated 12 km North of Tsumeb in the Oshikoto Region of Namibia. The site is owned by NamPower and measures ± 44 hectares which is close to the existing NamPower Otjikoto Substation as seen in Figure 3.



Figure 3: Project Site location relative to Otjikoto Substation

The site selection was mainly driven by the larger socio-economic impacts, sufficiently available biomass fuel resources and proximity to existing transmission infrastructure requirements.

Power Station Technical Description

The Power Station design will consist of two 20MWe Boilers with a single steam turbine and generator.

Biomass wood chips made from encroacher bush will be used as fuel for the combustion process in the boiler to produce steam that will drive the steam turbine and the electrical generator.

The execution period of the project from the commencement date to completion date is expected to be approximately thirty (30) months with completion scheduled for the first quarter of 2027.

The EPC contractor will be responsible for constructing all related infrastructure and buildings which include but is not limited to access roads, administration buildings, fuel handling facilities.

Table 1: Key technical description details

Description	Unit	Value
Export Capacity:	MWe	40
Boiler Technology	-	Grate-fired boiler
Lifetime	Years	25
Availability	%	$\pm 85 \sim 92$
Cooling system	-	Dry Cooling
Fuel type	-	Namibian Encroacher Bush Wood Chips
Fuel Specification	-	P100 (as per ISO 17225 Solid biofuels)
Fuel energy content	MJ/kg	14.7
Fuel moisture content	%	5 ~ 15
Fuel density	t/m³	0.25
Annual energy production	MWh	$\pm 300,000$
Annual area of bush thinned	ha	$\pm 16,200$
Fuel requirement	t/a	$\pm 245,000$
Annual Capacity Factor	%	$\pm 70 \sim 85$
Operating hours per year	h/a	± 8000

The biproducts of the combustion process are two different ash streams namely Fly Ash and Bottom Ash. The fly ash is suitable for use in the manufacturing of bricks and interlocks whereas the bottom ash may be suitable for some agricultural applications as low-grade fertilizer.

Biomass Supply Strategy

Woodchips will be supplied by a combination of Long-Term Fuel Supply Contracts and Ad-hoc Fuel Supply Contracts. The Long-Term Fuel Suppliers will be responsible for sourcing, harvesting, processing, and delivering biomass woodchips to the power station by use of fully mechanized systems.



Figure 4 Typical Long Term Fuel Supply contract processing harvested Biomass

Ad-hoc Fuel Suppliers may be required to provide the final processed woodchips or semi-processed biomass to the power station where NamPower will process the biomass to the final required size. The Ad-hoc Fuel Supply Strategy is still under development and will require further stakeholder engagement to complete.



Figure 5 Typical semi processed wood delivered by Ad-hoc suppliers

Stakeholders and Authorisations

There are various stakeholders involved in the implementation of the project. The key stakeholders are listed below.

- The project has secured a loan through the *Agence française de Développement (AfD)* Loan of up to € 100 million for the construction of the Otjikoto Biomass Power Station,
- The Project has secured a grant with the *Mitigation Action Facility (MAF)* for € 25 million as a contribution to the capital cost of the project and for capacity building of the biomass Fuel Supply chain,
- The Government of the Republic of Namibia have made a capital contribution of N\$ 400 million based on the significant social, environmental, and economic benefits that will accrue from the project and to lower the electricity tariff to the end consumers,
- A grant of € 3 million has been secured from the *Le Fonds Français pour l'Environnement Mondial (FFEM)*. This grant is aimed at maximising the social benefits of the project and for environmental research,
- Consultants – NamPower has procured consultants to assist in providing technical advisory services on the development and execution of the Otjikoto Biomass Power Station and will also manage the project in collaboration with the NamPower Biomass Project team,
- EPC Contract – NamPower procured Dongfang Electric International Corporation as an Engineering, Procurement and Construction (EPC) Contractor the power station through a transparent and open international competitive bidding process as per the Public Procurement Act of 2015,
- Fuel Suppliers –. NamPower procured four (4) Long-Term Fuel Suppliers to harvest, process and deliver wood chips according to P100 Fuel Specification. A total of 180 000 tonnes will be procured through long-term fuel supply contracts which will run for a 7-year term.

Environmental Considerations

NamPower completed its EIA process for the construction and operation of the proposed Otjikoto Biomass Power Station and the associated harvesting activities as per the Environmental Management Act, Act No.7 of 2007, and obtain Environmental Clearance

Certificates (ECC's) in 2021.

Extensive research and testing were completed throughout Namibia to assess the availability, quantity, and quality of encroacher bush biomass wood chips as a fuel source. The project's Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) conforms to the International Finance Corporation's (IFC) performance standards and was audited against the Forest Stewardship Council (FSC)® Principles and Criteria. All harvesting activities for the project will be conducted in accordance with FSC® guidelines and regulations.

The project harvesting area which extends beyond a 100 km harvesting radius, which was assessed during the EIA is indicated within Figure 6.

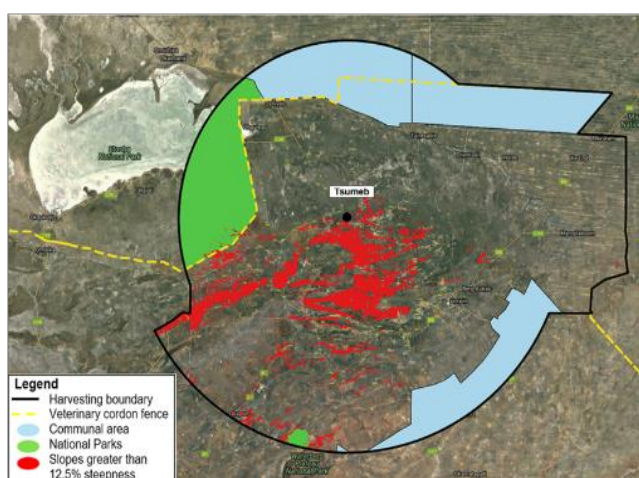


Figure 6: Harvesting Area for the Project

The area identified during the EIA was found to be approximately 3.1 million hectares in size, which excluded protected areas, slopes greater than 12.5% and ecologically sensitive areas.

It was estimated that 400 000 hectares would be harvested during the project's 25-year lifetime. This indicates that only 13% of the 3.1 million hectares of available biomass resource will be utilised which does not consider the rate of regrowth of the encroacher bush.

Impact on Climate Change

A Greenhouse Gas (GHG) Emission Assessment for the project was carried out by an independent consultant, UNIQUE Forestry and Land Use GmbH, in 2021. The assessment represented a footprint analysis and covered the direct emissions of the power plant and its related biomass fuel harvesting and transportation activities, as well as indirect emission sources and sinks from the considered land.

The results of the study indicated that at a 70%

operation capacity factor, the project has the potential to offset approximately 0.308 million t CO₂eq per year, which equates to a total mitigation of 7.71 million t CO₂eq over the project's 25-year lifetime.

A Vulnerability and Adaptation Assessment carried out for the project, by Namibia Nature Foundation (NNF) in 2021, outlines that the project contributes to key climate change adaptation benefits of enhanced water availability, improved land productivity, enhanced resilience and adaptive capacity of local communities through the rehabilitation of bush encroached land.

As a low-carbon energy project, the project notably contributes to achieving Namibia's international commitments under its Nationally Determined Contribution (NDCs), National Biodiversity Strategy and Action Plan (NBSAP II) and Third Programme under the United Nations Convention on Combatting Desertification (UNCCD).

Macro-economic Benefits

NamPower, the MEFT and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH– Bush Control and Biomass Utilisation (BCBU) Project, with the support of Namibia Biomass Industry Group (N-BiG), commissioned a macroeconomic study in 2021 to quantify and assess the microeconomic and macroeconomic impact of the project. The outcomes of the study indicated the following:

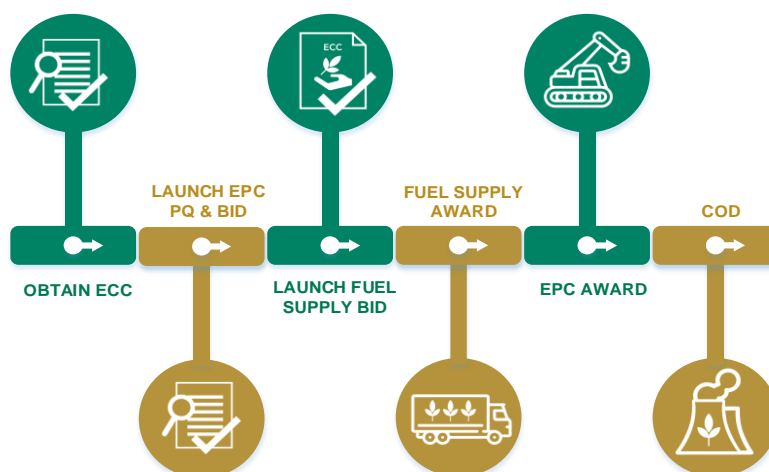
- The project will result in NamPower injecting N\$ 200 - 245 million into the Oshikoto region annually in the procurement of woodchips from local farmers and contractors. Thus, contributing to the income of local farmers to better utilize the restored rangelands and conduct other agricultural activities,
- The project will contribute greatly to youth unemployment by creating approximately **1000** direct jobs in harvesting activities and inducing a further **1500** jobs through the various economic spin-offs,
- The net present value (NPV) of the microeconomic benefits totals NAD 4.965 billion (discounted at 5.5% p.a.), or NAD0.81/kWh,
- The net present value of macroeconomic benefits (discounted at 5.5% p.a.) totals NAD 16.1 billion, or NAD2.67/kWh,
- The Power Station displaces 300 GWh of imported electricity.

The Encroacher bush Biomass Project is groundbreaking as it presents a Namibian Solution to a Unique Namibian challenge with bush encroachment and Energy Security.

Project Key Milestones

Table 2: Summary of the key milestones of the Project

Completed Tasks	Completion Date
NamPower Board approval of Project Business Case.	Aug 2018
NamPower Board and Ministerial approval on final project capacity.	Nov 2018
Market Sounding on the proposed technical description of the power station.	Jan 2019
Acceptance of the Transmission Connection Offer	Feb 2019
Appointment of a Technical Advisor to commence with the compilation of the technical specifications for the power station.	Feb 2019
Procurement of the project site	Jun 2019
Finalisation of the Geotechnical and Geohydrological Subsoil Investigations on the project site.	Jul 2019
Completion of the final confirmation review for the IFC Compliance Audit on the EIA.	Dec 2019
Launch of the Expression of Interest (EOI) for the shortlisting of the Owners Engineering Consultants.	Feb 2020
Appointment of a Legal Advisor to assist in the finalisation of the fuel supply contracting structure and development of the Fuel Supply Agreements (FSA).	Jun 2020
Appointment of a Forest Stewardship Advisor to assist NamPower in aligning its harvesting EIA and EMP's to the Namibian FSC Standard.	Jun 2020
Market Sounding on the proposed fuel supply related to potential fuel suppliers, land and farm owners.	Nov 2020
Completion of the FSC Gap Analysis and full alignment of the FSC Principles on the EIA and EMP's	Nov 2020
Launch of the formal RFP to the shortlisted consultants for the procurement of the Owners Engineer.	Dec 2020
Finalisation of the first draft Fuel Supply Agreement (FSA) with the assistance from the appointed Legal Advisor	Dec 2020
Launch of the formal Phase I: Prequalification Process to prequalify EPC Contractors and Boiler -and Grate System Suppliers.	Jan 2021
Appointment of the French Development Agency (AFD) as preferred project lender	Mar 2021
The ECC's for both the Biomass Power Station and the related harvesting activities were received	Apr 2021
Appointment of the Owners Engineering Consultant	May 2021
Conclusion of the Prequalification Phase by the CPBN with 15 EPC companies prequalified.	Oct 2021
Conclusion of the EPC and Fuel Supply procurement documents	August 2022
Launch of the final EPC and Fuel Supply procurement activities	August 2023
Award Bid for EPC Contractor and Fuel Suppliers	March 2024
Sign EPC Contract and Fuel Supply Agreements	May 2024
EPC Contract Effectiveness	July 2024
Power Plant Taking Over	Feb 2027



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