BIOMASS

Otjikoto Biomass Power Station

NamPower

Powering the Nation and beyond

PROJECT FACT SHEET

40MW OTJIKOTO BIOMASS POWER STATION

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Powering the Nation and beyond

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Financing Bank

AFD
AGENCE FRANÇAISE DE DÉVELOPPEMENT

Grant Donors

Mitigation Action Facility

FFEM
FONDS FRANÇAIS POUR L'ENVIRONNEMENT MONDIAL

Technical Assistance Consortium

N-BiG
Namibia Biomass Industry Group

OiED

Introduction and Background

At a Board Meeting on 8 November 2018, the NamPower Board ratified the implementation of the following projects as part of NamPower's 150MW allocation from the Ministry of Mines and Energy:

- 20MW Omburu PV Power Project
- 40MW Wind Power Project (Revised to 70MW Rosh Pinah PV Power Project)
- 40MW Otjikoto Biomass Power Project and
- 50MW Anixas II Firm Power Project

NamPower advanced the development of a 40MW Otjikoto Biomass Power Station to be located near Tsumeb. The proposed power station will be developed as an Engineering Procurement and Construction (EPC) project and will be owned and operated by NamPower.

The development of this project is a clear indication that NamPower is committed to supporting and achieving the Government objectives as set-out in the National Planning Policies, the National Integrated Resource Plan (NIRP), Harambee Prosperity Plan II and the 6th National Development Plan (NDP6).

Project Rationale

Namibia faces the challenge that its open savannah, characterised by a mixture of trees, bushes and extensive grass plains, is increasingly changing into a dense bushy landscape due to the intrusion and intensification of aggressive and undesirable wooden plant growth, more commonly known as bush encroachment.

Bush encroachment affects more than 26 million hectares of land in Namibia. This imbalance in the proportion of grassland to bush leads to a deteriorating biodiversity, a low carrying capacity of the farmland and a decrease in the underground water recharge of Namibia's aquifers.

Figure 1: *Extent of bush encroachment in Namibia (SAIEA, 2015)*

The abundance of encroacher bush and the national shortfall of electricity creates an economic opportunity for bush-to-electricity generation. Electricity generation and the harvesting of encroacher bush are both listed activities that fall in line with national development goals such as the NIRP, NDP6 and Namibia's Nationally Determined Contributions.

It is against this background that NamPower decided to develop and operate the Otjikoto Biomass Power Station, which will generate electricity by the combustion of woodchips from encroacher bush, which is harvested from the surrounding areas of the proposed project site.

Project Objectives

The primary objective of the first 40MWe 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 benefits to the 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.

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

Figure 2: *Images of a typical portion of bush encroached land versus a thinned landscape with livestock*

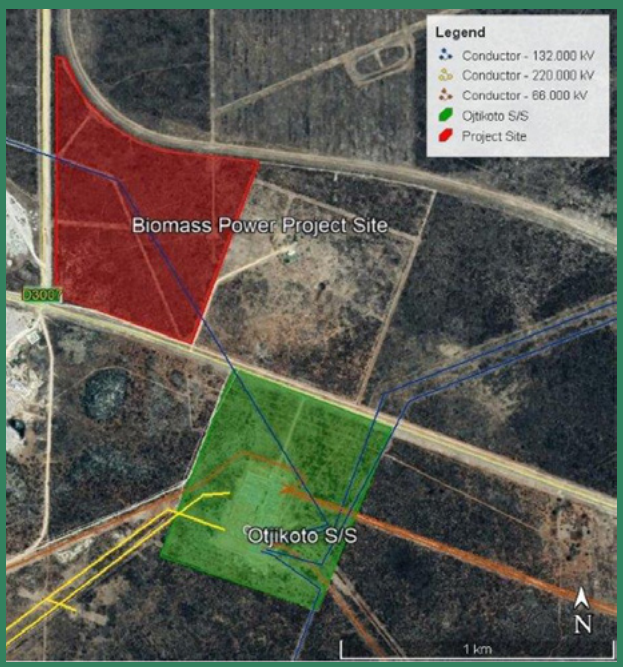


Figure 3: *Project Site location relative to Otjikoto Substation*

Power Station Technical Description

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

Biomass woodchips 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 2027.

The EPC contractor will be responsible for constructing all related infrastructure and buildings which include, but are not limited to, access roads, administration buildings and 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	**%**	±85~92
Cooling system	**-**	Dry Cooling
Fuel type	**-**	Namibian Encroacher Bush Woodchips
Fuel specification	**-**	Namibian Encroacher Bush Woodchips
Fuel energy content	**MJ/kg**	14.7
Fuel moisture content	**%**	5 ~ 15
Fuel density	**t/m³**	0.25
Annual energy production	**MWh**	±300,000
Annual area of bush thinned	**ha**	±16,200
Fuel requirement	**t/a**	±245,000
Annual capacity factor	**%**	±70~85
Operating hours per year	**h/a**	±8,000

The by products 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 such 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.

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 for the construction of the Otjikoto Biomass Power Station,

- The Project has secured a grant with the *Mitigation Action Facility (MAF)* 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 has made a capital contribution 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 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 who 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 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 woodchips 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.

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

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 obtained Environmental Clearance Certificates (ECCs) in 2021.

Extensive research and testing were completed throughout Namibia to assess the availability, quantity and quality of encroacher bush biomass woodchips 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, and which was assessed during the EIA, is indicated within Figure 6.

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.

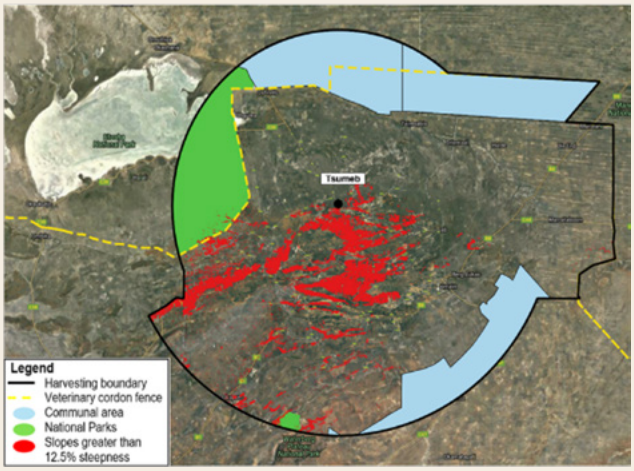


Figure 6: *Harvesting Area for the Project*

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 CO_2eq per year, which equates to a total mitigation of 7.71 million t CO_2eq 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, it notably contributes to achieving Namibia's international commitments under its Nationally Determined Contributions (NDCs), National Biodiversity Strategy and Action Plan (NBSAP II) and Third Programme under the United Nations Convention on Combatting Desertification (UNCCD).

The Benefits of Bush Control

Controlling encroacher bush through thinning and harvesting creates a range of benefits:

- Increased carrying capacity of rangeland which will make farms more productive
- Enhanced eco-tourism as the wildlife viewing experience is improved
- Increased farm value, potentially leading to more business opportunities
- Increase in groundwater recharge
- Improved scenic beauty, as a diverse landscape is more visually appealing
- Increased biodiversity
- Restored land can help preserve traditional farming practices and local heritage

Outline of the Fuel Supply Chain

The NamPower Biomass Fuel Supply Chain is a structured system designed to ensure a continuous, sustainable and efficient supply of biomass to the OBPS.

- Biomass will be sourced by contracted harvesters and fuel suppliers from farms, then processed, chipped and transported to the power plant under the Forest Stewardship Council (FSC) mandates. At the plant, the biomass will be stored, managed and utilised.

- OBPS will only accept woodchips from Forest Stewardship Council (FSC)-certified farms. Therefore, fuel suppliers must ensure that any farmland from which they intend to harvest is formally approved and certified under the NamPower FSC Group Scheme.

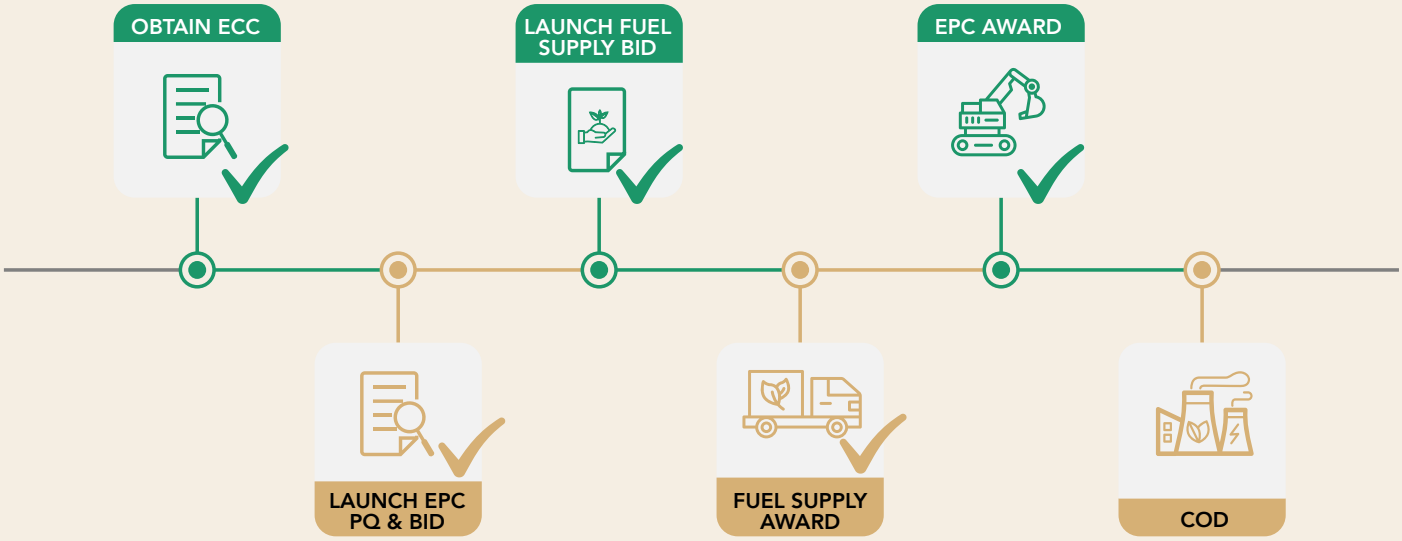
- NamPower will establish a dedicated Safety, Health, Environment and Wellness (SHEW) team, based at the plant to monitor field compliance and to produce environmental and social impact reports.

- Contracted harvesters must ensure that all harvesting activities and labour practices fully comply with relevant occupational health and safety regulations and Namibian laws.

- Landowners will be expected to sign agreements with long-term fuel suppliers. With support from N-BiG and the FSC Group Scheme Manager, Farm Management Plans will need to be developed. Farmers are expected to attend training on sustainable bush control, biomass production, restoring rangelands and environmental compliance as per EMP. Farmers can participate in the ad hoc programme directly.

Project Key Milestones

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 if 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 EMPs 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 EMPs.	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 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 ECCs 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.	Aug 2022
Launch of the final EPC and Fuel Supply procurement activities.	Aug 2023
Award Bid for EPC Contractor and Fuel Suppliers.	Mar 2024
Sign EPC Contract and Fuel Supply Agreements.	May 2024
EPC Contract Effectiveness.	Jul 2024
Power Plant Taking Over.	Feb 2027


OBTAIN ECC
LAUNCH FUEL SUPPLY BID
EPC AWARD
LAUNCH EPC PQ & BID
FUEL SUPPLY AWARD
COD

Notes

Contact Details
Benedictus Mingeli
Senior Manager – Generation Special Projects
+264 (61) 205 2465
Ben.Mingeli@nampower.com.na
biomass@nampower.com.na

Joe Mukena
Senior Manager: Strategic Finance and Treasury
Tel: +264 61 205 2752
Joe.Mukena@nampower.com.na

NamPower Centre, 15 Luther Street,
PO Box 2864, Windhoek, Namibia
www.nampower.com.na