Western Power

Ngonye Falls Hydroelectric Project

Western Power Company

Jan 2024

180 MW of renewable electricity generation for Zambia by 2026-7

- 180 MW capacity power station generating 830 GWhr per year
- Located on the Zambezi river at Sioma in the Western Province of Zambia
- Run-of-river hydroelectric scheme, no dam and no lake
- Very low environmental and social impact
- Including a 110 km transmission line extension to Zambia's national grid
- Reliable, predictable, base-load energy will stabilise the western transmission grid and enable building of more intermittent renewable generation such as solar and wind
- Climate change resilient due to unique hydrological characteristics
- 25 year PPA singed with the Zambian national utility, ZESCO
- Project cost: > $650m
- 3 to 4-year construction period starting in 2024 and employing 2,000 – 3,000 people

A collaboration between the private sector, the host community, ZESCO and Zambian Government

Location

At the Ngonye Falls on the Zambezi River in the Western Province of Zambia.

Adjacent to a new all-weather road giving access to the borders of Namibia, Botswana and Zimbabwe. Benefitting from a new bridge crossing the river below the falls .

Only 110 km from a major node on the SAPP electricity transmission network .

Zambia
A New Dawn
2021

Population	GDP (current USD billion)	GDP per head (current USD)	Size of Mining Industry	Mining Sector Export Value
17.8 million	23.3 bn	1,309	7.1 bn	77%

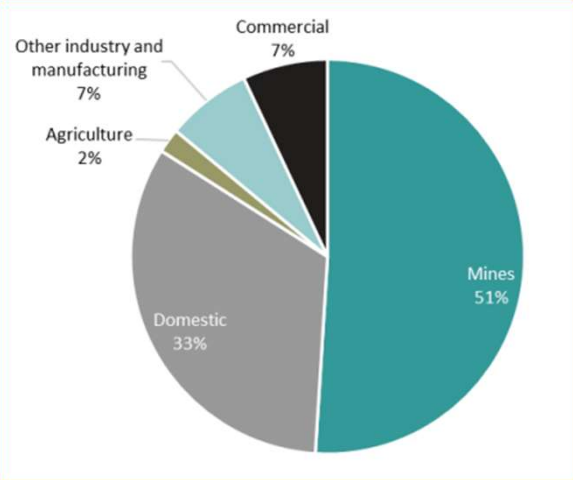
Source: World Bank 2019 and EITI

On his election in 2021, the **new president** of Zambia, Hakainde Hichilema, set out his plan for economic recovery "A New Dawn 2021" prioritising growth through the involvement of the private sector in both mining and energy to achieve the increased fiscal base necessary for a sustainable Zambian economy.

His Government's first priority has been to resolve Zambia's debt default through an IMF backed debt restructuring which appears now close to completion.

Key to this has been the development of a workable plan for the financial restructuring of ZESCO, driven by The President and the Minister of Energy. The introduction of cost-based electricity tariffs is allowing ZESCO, the national utility, to return to profit. Acceptance of the role of private power generation companies, reforms to the local power market and open access to the transmission grid are enabling the energy market in Zambia to operate efficiently and in due course to balance demand and supply.

Context - Zambian Electricity Market

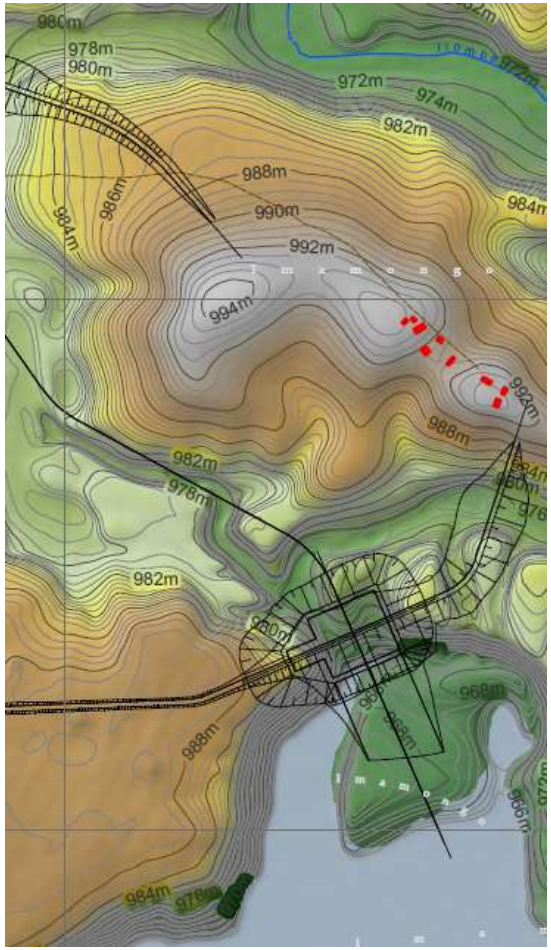


- Zambia's population was estimated at over 18 million people in 2020, forecast to double to 35 million by 2045.
- The Zambian government's plan to achieve fiscal sustainability is based on annual GDP growth of 6%. This growth is critically constrained by energy supply.
- Zambia has installed electricity generation capacity of 3.5GW (compare Kenya: 2.6GW, South Africa 53GW). Approximately 50% of the annual generation of 15TWh is consumed by the country's copper mines.
- Current access to electricity is less than 5% in rural areas and around 65% in urban areas. The Zambian government has targeted universal access to electricity by 2030.
- Throughout 2019, 2020 and 2021 the national utility, ZESCO, experienced a consistent deficit of up to 900 MW of generation compared to demand. This has led to a supply crisis where the majority of non-industrial customers nationwide had their supply disconnected for up to 8 hours per day. Inevitably, this has been a brake on the economy.
- The failure of ESKOM to deliver new capacity and the consequent generation deficit in South Africa means that Zambia can no longer rely on imports to fill its deficit.

A top priority for the Presidential Delivery Unit

Benefits

- The Ngonye Falls Project contributes to the Government's **Vision 2030** target of an additional 1,100MW of generation by 2026.
- Green, reliable and cost-effective baseload electricity for nearly 1 million people or 100,000 tpa of copper production.
- 110km of new National Grid transmission line in Western Province.
- 180MW of new generation capacity in western Zambia, because of its location, will provide significant support to the national transmission grid by providing voltage support and frequency control as well as reducing power losses.
- 2 - 3,000 direct jobs during construction plus significant indirect and multiplier jobs. Many highly skilled operations and maintenance jobs over decades of operations.
- Unlocks the economic and industrial potential of Western Province which is currently constrained by lack of electricity
- Ideally placed to export power to the Southern African region through existing international connections



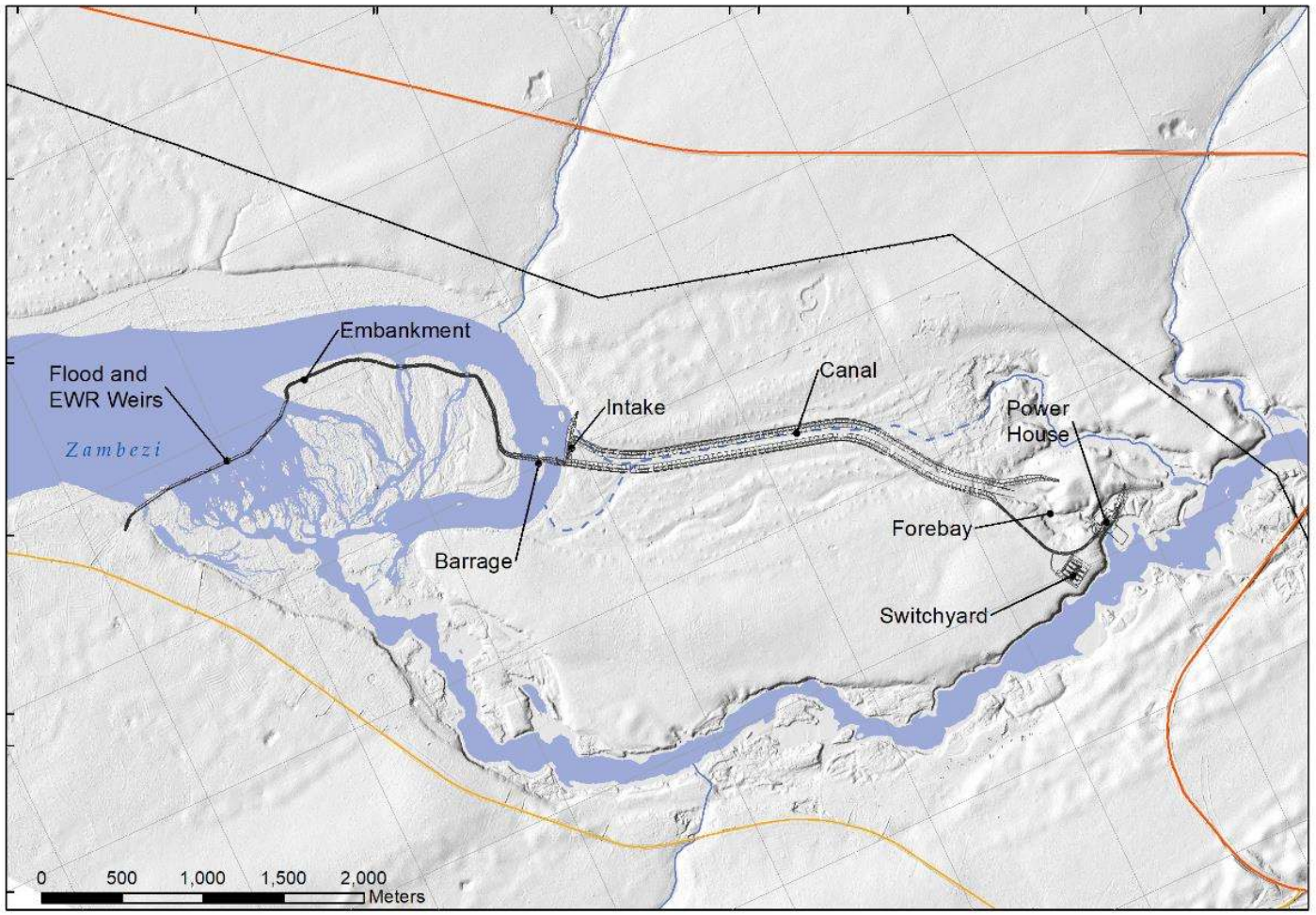
Design

A true run-of-river design using a series of low weirs and embankments to divert flow into a 3km-long power canal.

A forebay, using the natural topography, provides flow balancing.

Power is generated in 4 bulb turbines in the partially buried pit power house.

After passing through the turbines, the water flows back into the Zambezi where it is immediately available for all other uses.

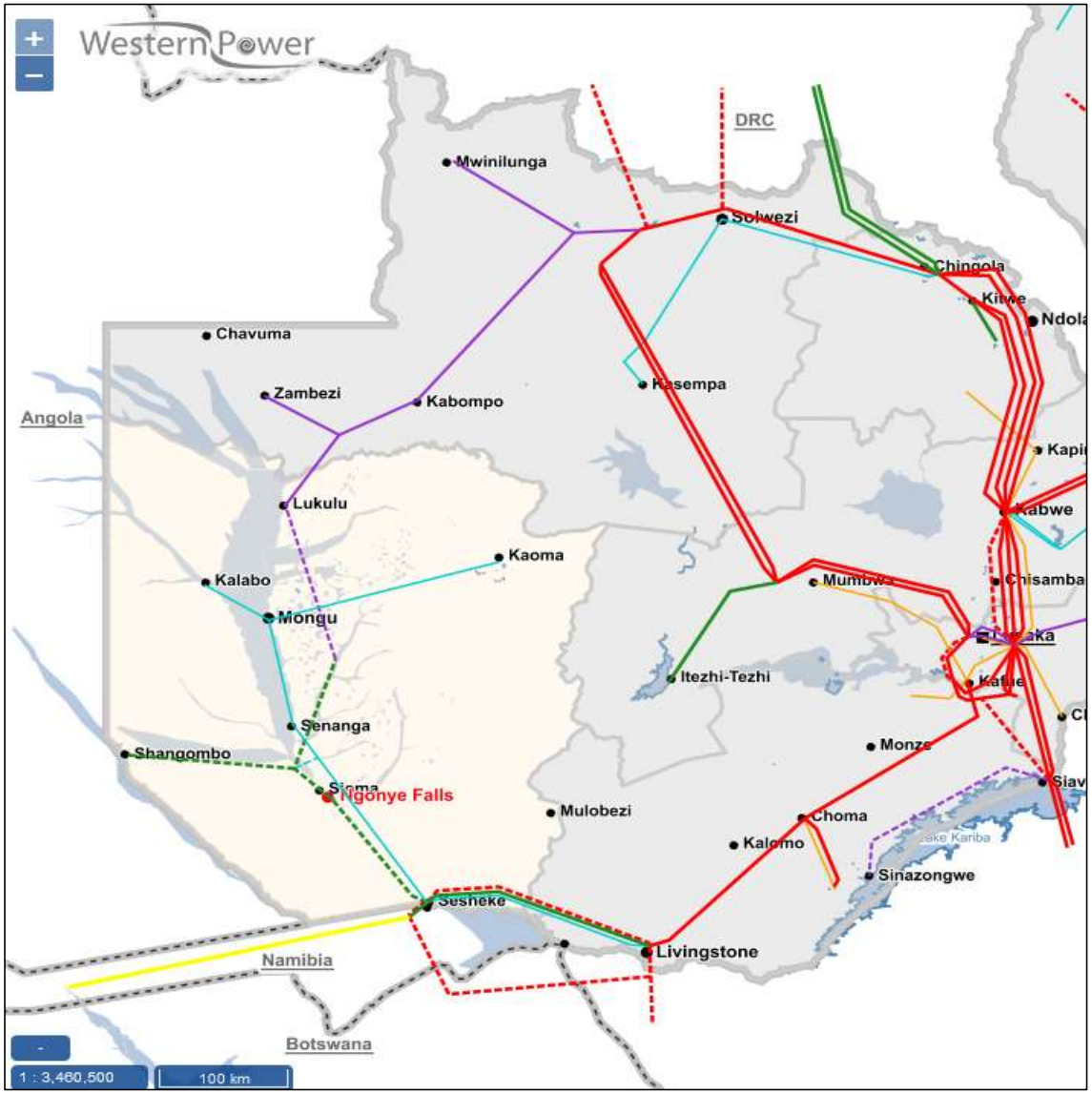


Power Evacuation

An existing 66kV powerline, which supplies all the electricity for the Western Province, passes within a few km of the project site but, with only 30MW capacity, cannot evacuate all the power produced.

A new 330kV powerline energized at 220kV will be constructed from the Falls to the existing substation at Sesheke . This 110km line will from part of the ZESCO's long planned grid extension north to Lukulu (dashed green and purple).

ZESCO have transferred responsibility for construction of this section to WPC and it is included in the scope of the main EPC contract.



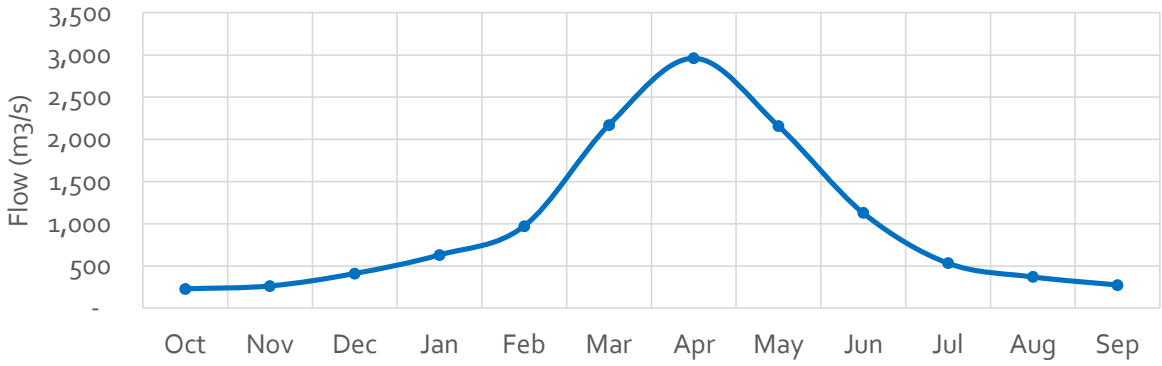
Hydrology Power & Energy

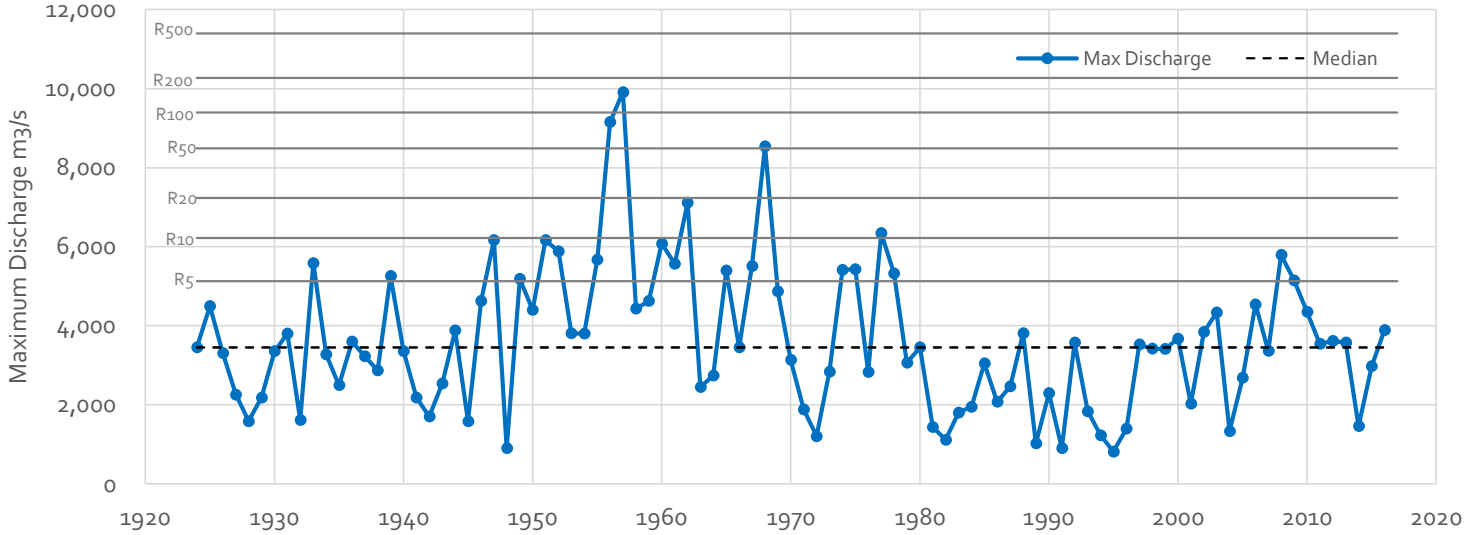
Hydrology

As a run-of-river power station without storage, the Ngonye Falls project relies entirely on the flow of water in the river at any one time to generate electricity.

The flow in the Zambezi at Ngonye Falls is stable and predictable but highly seasonal, with drought flows September and October rising to flood flows around March and April driven by the timing of the rainy season in the upper catchment.

There is also significant variation in flows from year to year depending on each season's total rainfall but the effect of this is mitigated by the some unique hydraulic features of the site.

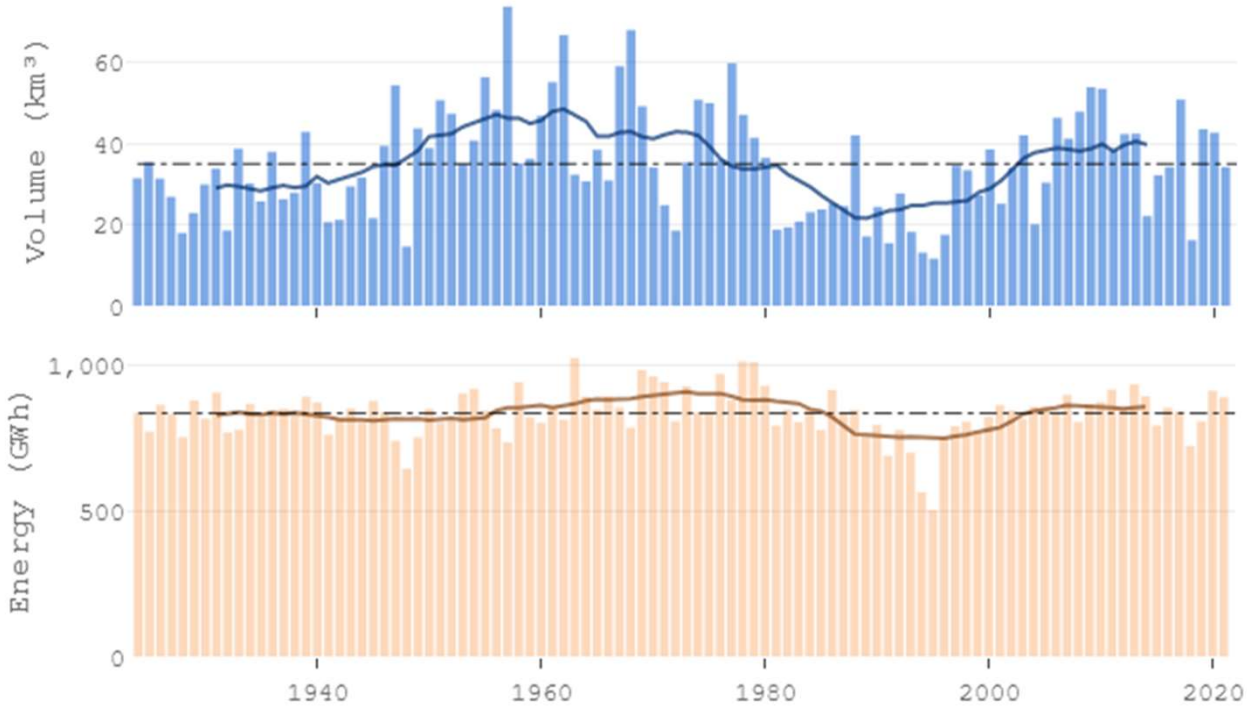




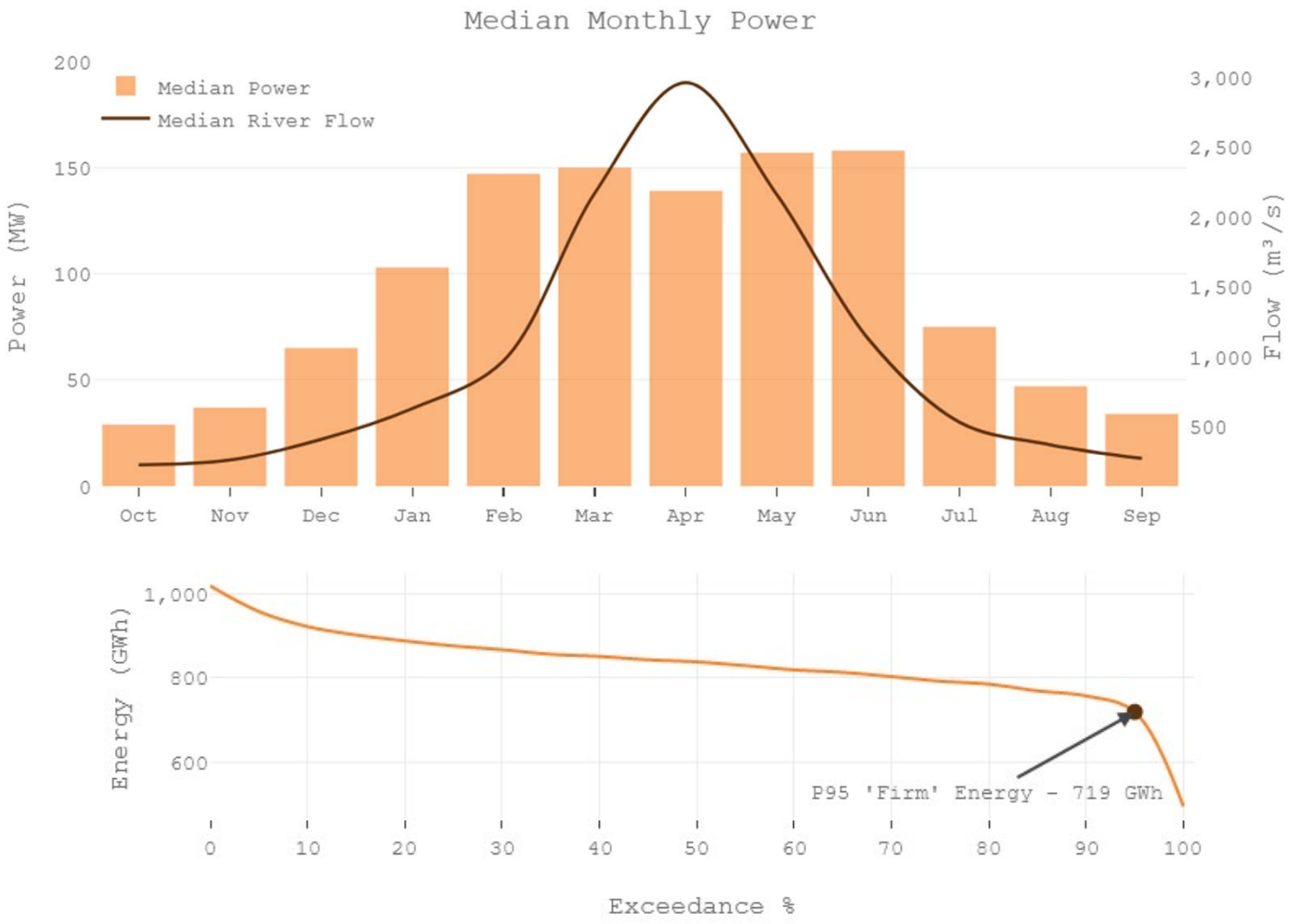
Power and Energy

Because of the unique hydraulic characteristics of the Ngonye Falls project and the size and hydrology of the Zambezi River, the variation in annual energy from the power station will be considerably less than the variation in river flow.

As a result, the project is highly resilient both to natural variations between flood and drought years as well as to any climate change impact on the river system.



Power & Energy



Power Summary

- Nominal - 180 MW
- Max power - 194 MW
- Min power (P95) - 26.0 MW
- Capacity factor (nominal) - 52.8%
- Capacity factor (max) - 49.0%

Energy Summary

- Mean - 832 GWh
- Median P50 - 838 GWh
- P75 - 792 GWh
- P90 - 757 GWh
- Max - 1,019 GWh
- Min - 494 GWh
- P95 'Firm' Energy - 719 GWh

The maximum power is determined by the turbine size
The minimum power is governed by the flow of the river

Community

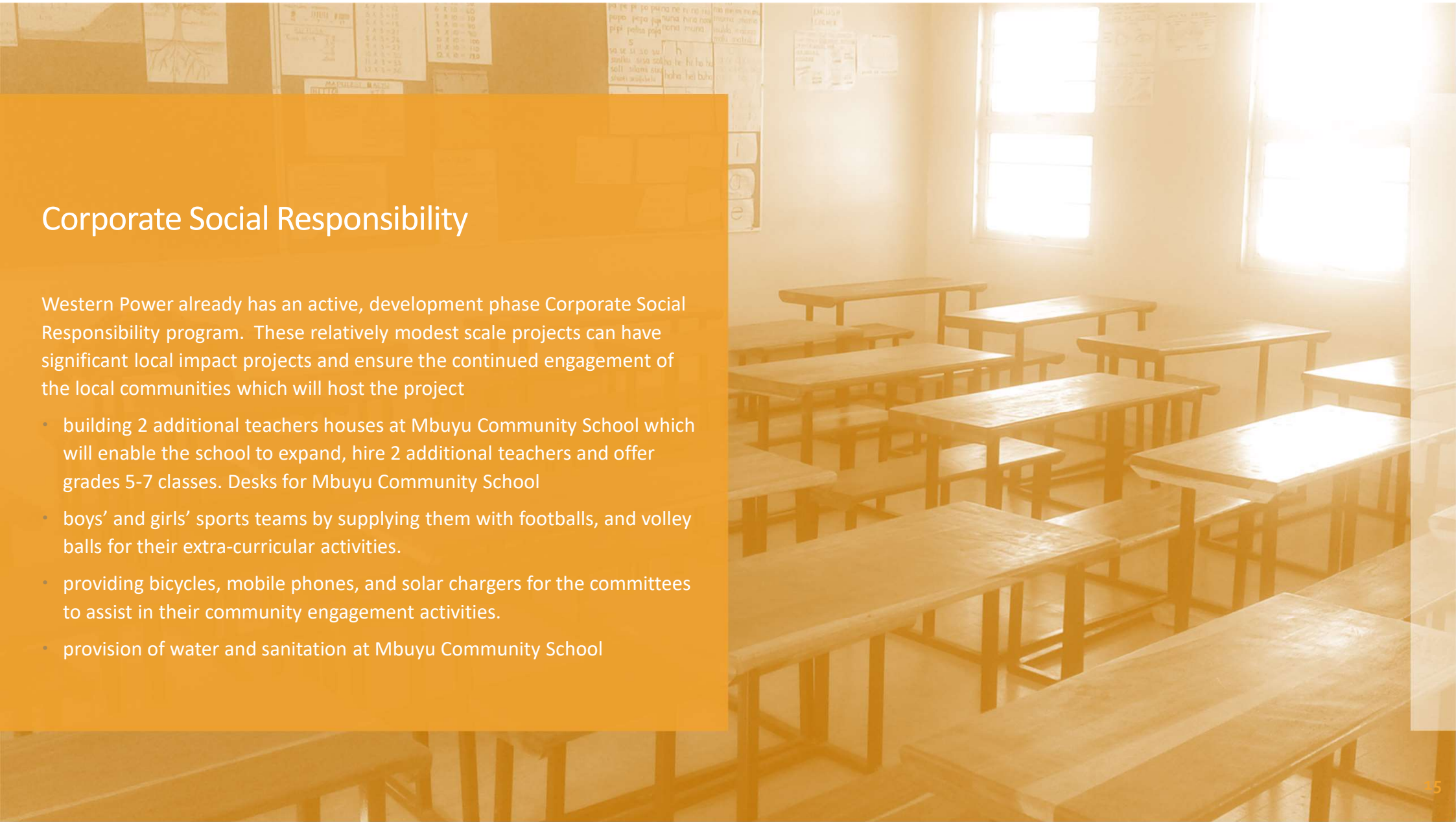
Host Community Partners

The *Barotse Royal Establishment (BRE)* is the administration of the Kingdom of Barotseland headed by His Majesty the Litunga who is the traditional leader of the communities of western Zambia.

The BRE represents all the communities that host the Ngonye Falls Project and owns 6% of the project in trust for the community in recognition of the natural resources being supplied to the development.

As well as earning 6% of all project profits through their equity share, the community will also receive $500,000 per year for community development projects. The total annual funding for community development projects of $500,000 - $1,000,000 pa will be managed by two trusts, one for projects across the Province and one for the area that hosts the project. The trusts are being established to have the highest standards of governance and transparency

The BRE has throughout been instrumental in working with Western Power, the Government of Zambia and our other partners to bring the project to a successful conclusion.



Corporate Social Responsibility

Western Power already has an active, development phase Corporate Social Responsibility program. These relatively modest scale projects can have significant local impact projects and ensure the continued engagement of the local communities which will host the project

- building 2 additional teachers houses at Mbuyu Community School which will enable the school to expand, hire 2 additional teachers and offer grades 5-7 classes. Desks for Mbuyu Community School
- boys' and girls' sports teams by supplying them with footballs, and volley balls for their extra-curricular activities.
- providing bicycles, mobile phones, and solar chargers for the committees to assist in their community engagement activities.
- provision of water and sanitation at Mbuyu Community School

Development Status and Progress

Project Status

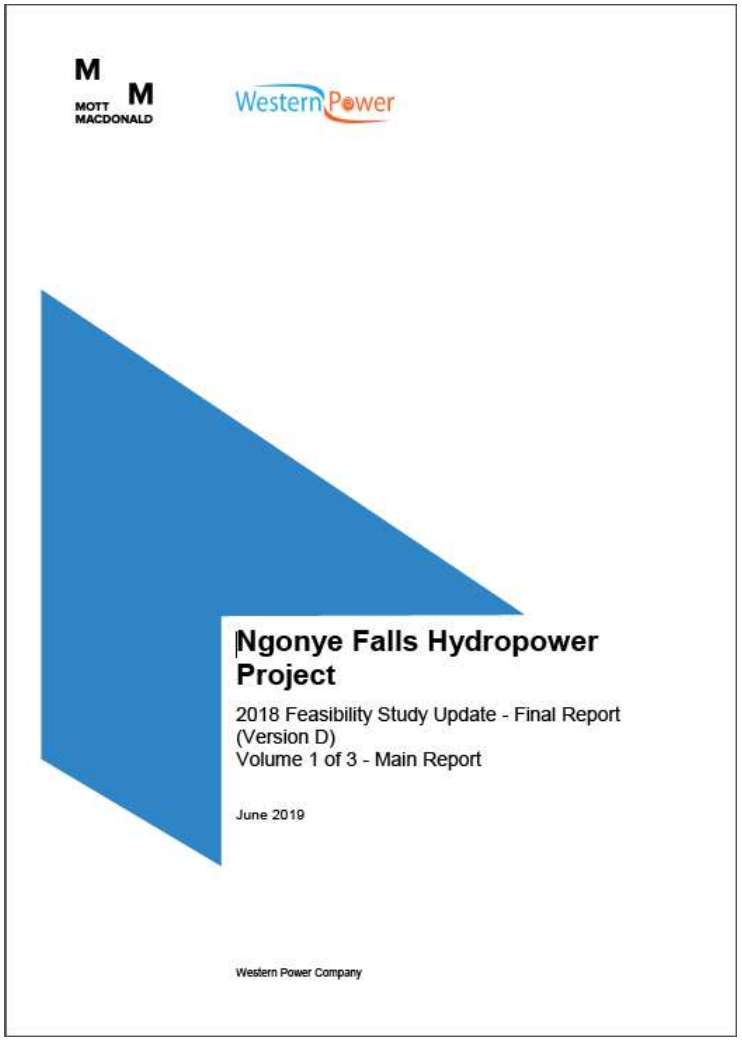
- All technical survey, studies and analysis completed April 2023
- Proven technical and economic feasibility completed 2018
- Community Participation Agreement with the host community completed May 2017
- Environmental and Social Impact Assessment to IFC standards approved by the regulator April 2021 and resettlement action plan (RAP) submitted to the regulator January 2024
- Power Purchase Agreement with the Zambian power utility, ZESCO signed October 2023
- EPC Contractor Procurement under EU Procurement Regulations – tenders received and being evaluated
- Land at the Falls for the hydro station and associated switchyards acquired
- Water rights permits granted Noveber 2022
- Implementation Agreement with Government (signed 2015) being updated and developed to align with the PPA and developments since 2015.

Technical and Economic Feasibility Study

The Project Feasibility Study was completed in 2018. It includes all the technical surveys and studies completed for the project, sets out a detailed reference design of the power station together with forecasts for the power output.

Components of the Feasibility Study include:

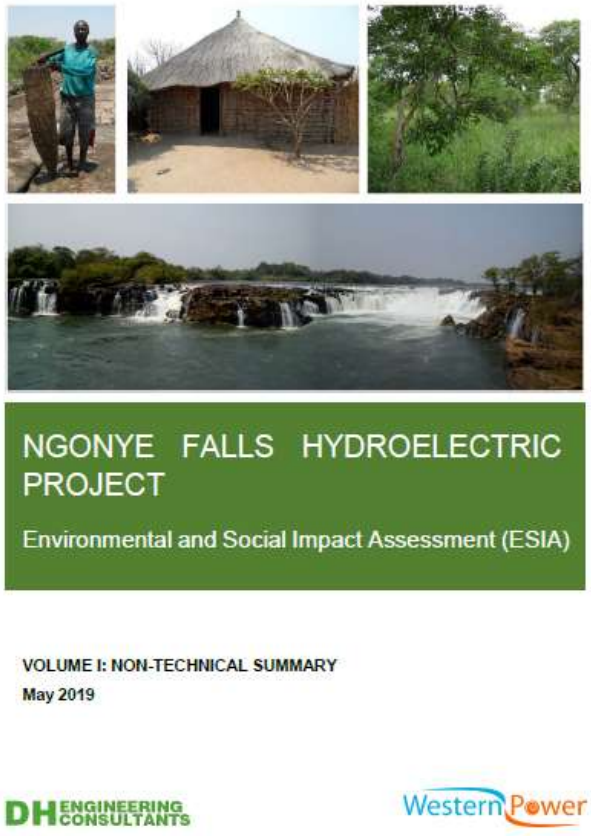
- Hydrology and topography
- Results of geotechnical studies
- Power station design
- Power and energy forecasts
- Seismic risk
- Construction cost estimates
- Transmission line



Environmental & Social Impact Assessment

A comprehensive Environmental and Social Impact Assessment to IFC standards was approved by ZEMA, the Zambian regulatory authority in April 2021. Components of the EISA include

- Environmental & Social Impact Statement
- Biodiversity including terrestrial and aquatic ecology
- Social Impact
- Heritage and Tourism Impact
- Health Impact
- Landscape & Visual Impact
- Environmental Flow Requirements (EFRs)
- Upstream Impact Assessment
- Climate Change Impact Assessment & GHGs
- Resettlement Policy Framework
- Environmental and Social Management and Monitoring Plan
- Stakeholder Engagement Plan



EPC Contractor & Turbine Supplier Tender

Construction of the power station will be undertaken by a specialist international EPC Contractor (engineering, procurement and construction) procured through an open, competitive tender .

The EPC contractor is being selected based on its experience and expertise in similar projects, the construction and management capacity it can provide and its financial strength. The contractors being considered are all large multinational construction companies.

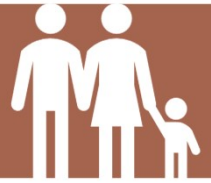
EPC Contractors
Sinohydro Corporation
Consortium of Cobra Instalaciones and Concor Construction
Dongfang Electric - Orascom Construction
VINCI Construction Grands Projects and Mota-Engil Engenharia
China Gezhouba Group Company Limited

Turbine Manufacturers
GE Hydro France - GE Hydro China
Elecnor, Litostroj, KONČAR
Dongfang Electric - Orascom
Andritz Hydro
Harbin Electric International

Finance

- Total project cost greater than $665m (excluding the transmission line)
- Development spend to date approximately $35m
- Development spend remaining to anticipated financial close at end 2024 c. $6m
- Construction funded using a typical *Project Finance* structure with up to 75% leveraged debt from Development Finance Institutions secured against a long-term offtake agreement (25-year PPA with ZESCO).
- Financial close targeted Q4-2024.

Remaining Project Development Milestones



Approval of the Resettlement Action Plan

Selection of the EPC Contractor (anticipated Q1 2024)

Completion of the financing for the project including selection of debt and equity financiers anticipated end 2024

Confirmation of the credit support arrangements to make the ZESCO PPA bankable, a workstream being led by IFC

Finalisation of the Implementation Amendment Agreement to accommodate the signed PPA

Western Power Company

Development and Funding Partners

African Power Projects (APP) is a Mauritian project development company established to develop renewable power projects across Southern Africa. APP was set up by a group of private international investors and Zambians. APP has raised significant development funding for the Ngonye Falls project and is an active part of the Ngonye Falls management team in cooperation with InfraCo Africa.

InfraCo Africa is an infrastructure development facility of the Private Infrastructure Development Group (PIDG). InfraCo Africa seeks to alleviate poverty by mobilising private sector expertise and finance to develop infrastructure projects in sub-Saharan Africa's poorer countries. InfraCo Africa receives funding through PIDG's publicly funded trust, from the governments of the UK (DFID), the Netherlands (DGIS) and Switzerland (SECO). InfraCo Africa is a major shareholder in Western Power and is supporting the company with significant development funding as well as expertise in the form of experienced infrastructure development professionals working for the project in Zambia and internationally.

The Development Bank of Southern Africa (DBSA) is a development finance institution that seeks to advance the development impact in Southern Africa by expanding access to development finance and effectively integrating and implementing sustainable development solutions. DBSA seeks to improve quality of life, support economic growth, support regional integration and promote sustainable use of scarce resource. DBSA has supported Western Power from the earliest stages of the project through their Project Preparation Fund which has provided funding for key project studies from inception through to bankable feasibility. Through their involvement DBSA has facilitated significant additional private and public investment in the project.

Project Advisors

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