



NGONYE FALLS HYDROELECTRIC PROJECT

2024 PROJECT SUMMARY

4th Sept 2024



NGONYE FALLS HYDROELECTRIC PROJECT

The Ngonye Falls Hydroelectric Project is a \$700m, 180MW, run-of-river hydroelectric power station that will be built on the Zambezi River in the Western Province of Zambia.

Following its commissioning in 2028, the power station will produce approximately 800GWh per year of clean, reliable and climate change resilient, base-load electricity, enough to supply nearly 200,000 households in Zambia or to support 100,000tpa of new copper production.

A new 110km transmission line constructed as part of the project will provide a reliable offtake path for all the energy produced into the Zambian grid and wider Southern African Power Pool region. This \$50m transmission line will also serve to strengthen the Western Province power grid and facilitate a significant improvement in electricity access for the Western Province.

The project is being developed by Western Power Company (WPC), a partnership between African Power Projects (APP), InfraCo Africa (part of the PIDG Group) and the Barotse Royal Establishment representing the communities of the Western Province.

The project has strong support from the Government of Zambia (GRZ) which has signed an Implementation Agreement giving WPC the rights to develop, own and operate the project.

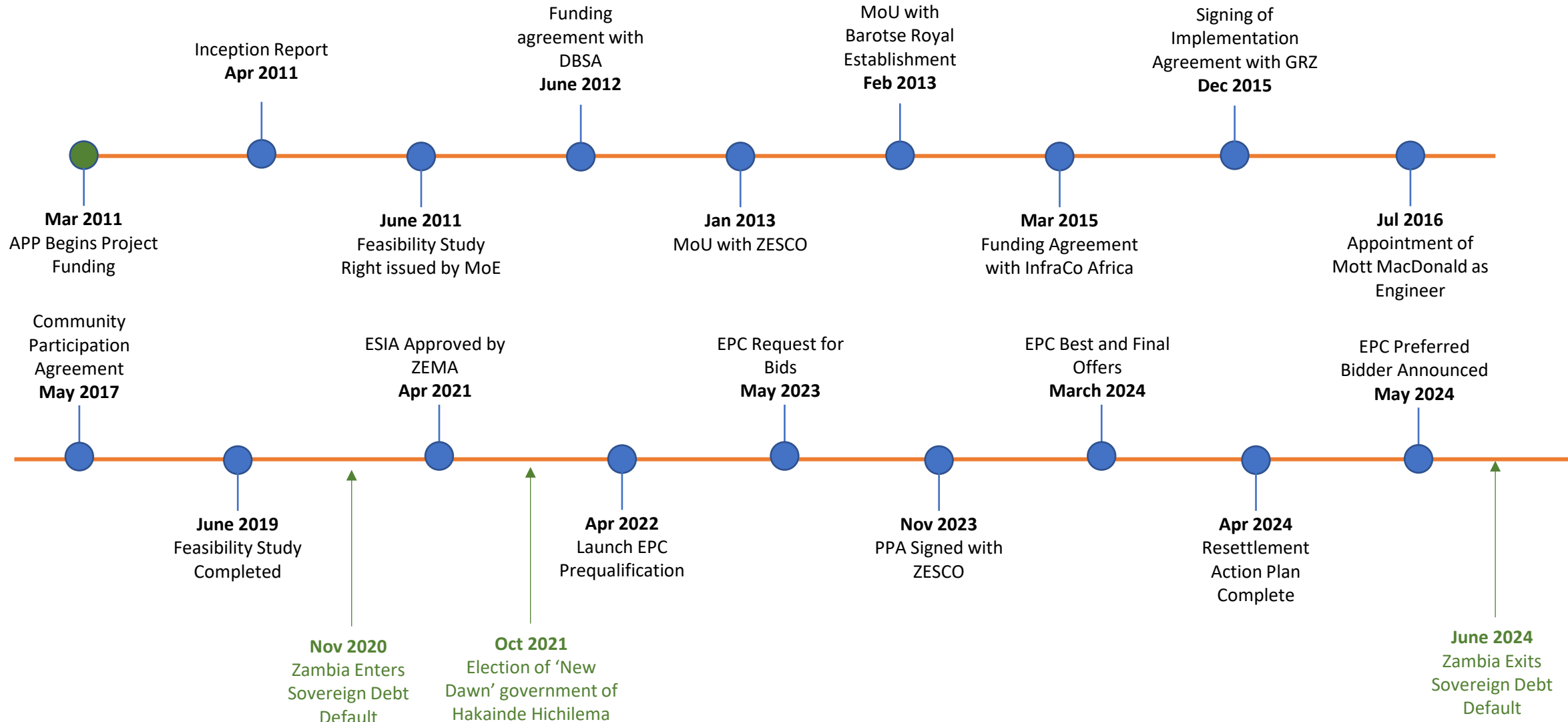
WPC has signed a Power Purchase Agreement (PPA) with ZESCO, the Zambian national power utility for the purchase of all the electricity produced by the project for 25 years.

Sinohydro Corporation has been awarded preferred bidder status to construct the project under a competitive international tender process.



[The Ngonye Falls hydroelectric scheme is located on the Zambezi River in the Western Province of Zambia, 110km upstream of Sesheke and 250km upstream of Victoria Falls.](#)

DEVELOPMENT HISTORY



PROJECT LAYOUT & DESIGN

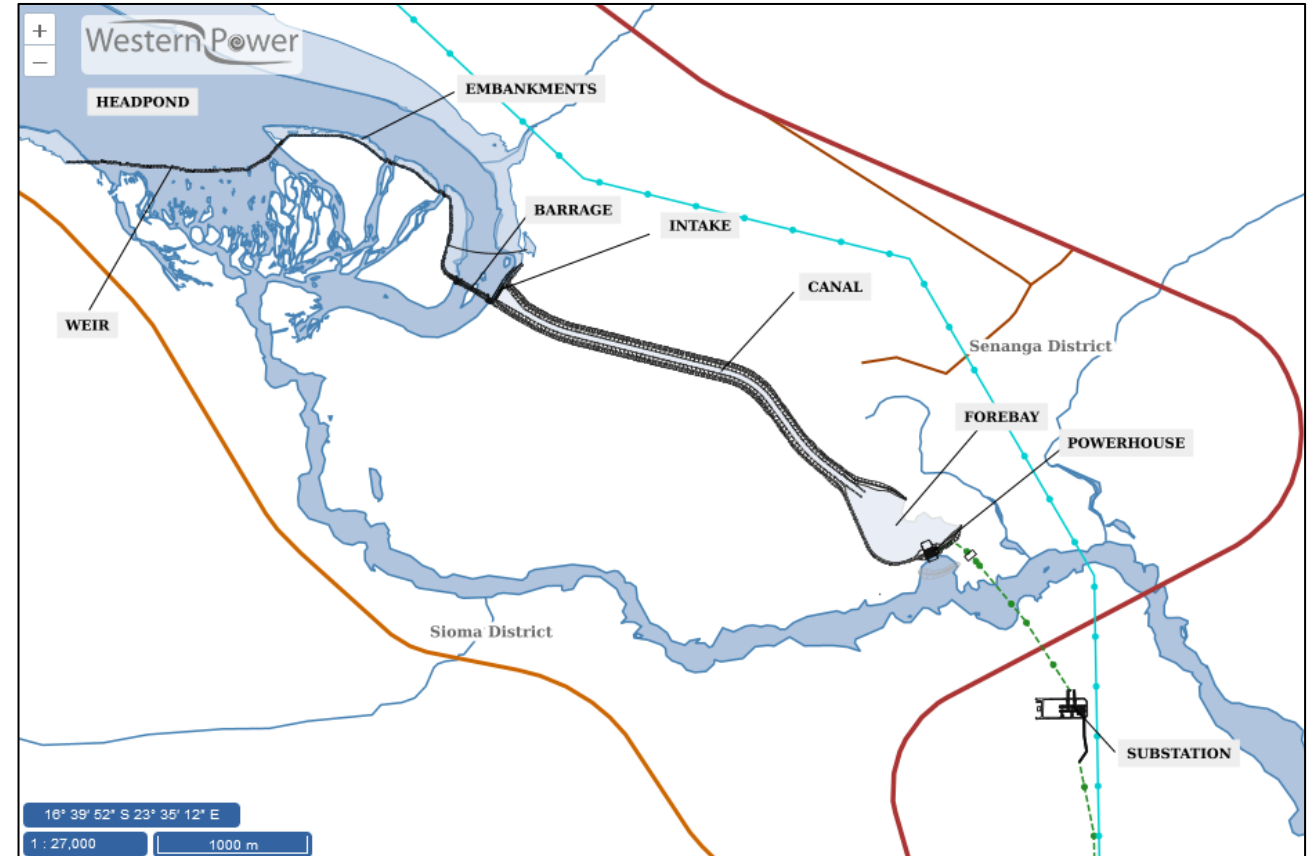
The Ngonye Falls Project will operate as a true run-of-river scheme without a high dam or reservoir by using weirs to divert a portion of the flows of the Zambezi River upstream of the Ngonye Falls into a 3km long power canal before passing this generation flow through 4 bulb turbines to generate electricity before flowing back into the river.

The low headworks structure comprising weirs, embankments and a gated barrage will be operated to maintain the level of the headpond, divert the optimum flows for generation into the canal, ensure sufficient environmental flows and allow for the movement of fish.

The run-of-river design, with no dam or reservoir, and the relatively flat, open terrain with excellent existing road access means the project has a very low environmental and social impact.

The simple, low risk design has no large, high dams and no tunnelling and the mostly linear infrastructure in simple, well understood geology will mean the short, 3-year, construction schedule can be maintained.

The project is a high-flow, low-head scheme which provides predictable, consistent, base-load output and leads to a construction program dominated by relatively simple and low-risk civil works rather than more complex and riskier hydromechanical works.



[Layout of the Ngonye Falls hydroelectric scheme.](#) A series of weirs and embankments will divert a portion of the river flow into a 3km canal which opens into a forebay above the powerhouse containing 4 bulb-type generating units. A substation is located away from the sensitive river frontage. Excellent existing access is provided by the M10 all-weather road (red) and new Sioma Bridge. An existing 66kV power line traverses the site.

POWER EVACUATION & TRANSMISSION LINE

The Western Province, which has a population of around 1 million people, is the least developed province in Zambia in terms of infrastructure including the electricity transmission and distribution network. The entire province is currently served by a single 66kV transmission line built in 1973 which runs for 300km from the Sesheke substation in the south where there is the interconnection to Namibia up to Mongu, the provincial capital, in the north.

Because of the length of the 66kV transmission line, the amount of power which can be supplied to Mongu and the other connected load centers (currently Senanga, Kaoma and Kalabo) is no more than 10MW or only enough to supply two large shopping malls. This is only 0.3% of Zambia's total electricity generation capacity of 3,500MW.

ZESCO has a plan to construct a single circuit 330kV line (initially energised at 220kV) from Sesheke north for 260km to Mongu. This line would pass within 3km of the Ngonye Falls project around 110km north of Sesheke. From Mongu a 132kV line would be constructed 160km north to Lukulu which would close the loop of the transmission system into the north-western region and the 'new copperbelt' around Solwezi.

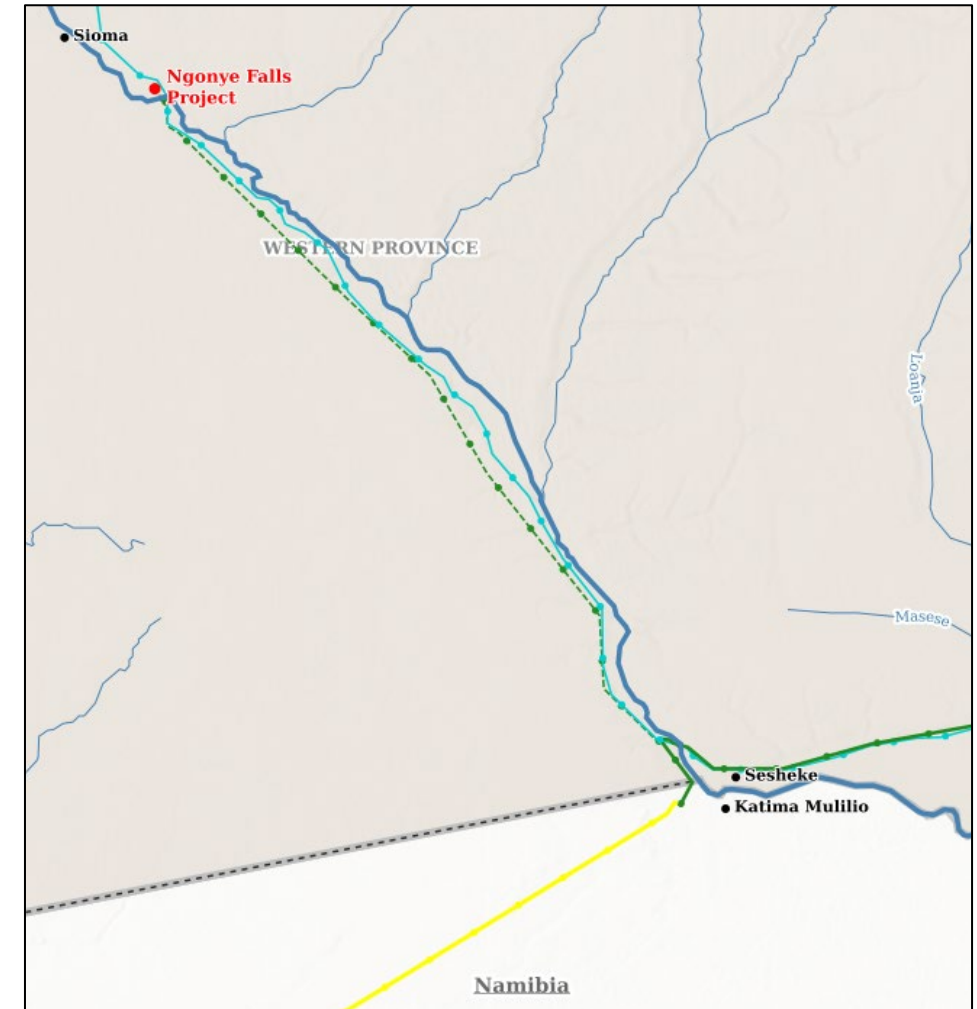
To ensure evacuation of power from the Ngonye Falls power station, WPC has agreed with ZESCO that it will finance, procure and construct the 110km of 330kV transmission line from the power station switchyard to the existing Sesheke substation.

The construction of this 110km of line is an integral part of WPC's EPC contract. WPC is also assisting ZESCO in the completion of an IFC PS compliant ESIA and RAP for the required transmission line.

WPC have drafted and are negotiating an agreement with ZESCO covering the construction and handover of and repayment for the 110km of transmission line that will connect the power station to the ZESCO grid at Sesheke.

For more information see:

<https://observablehq.com/@westernpower/powerevacuation>



[Route of the 110km 330kV \(initially at 220kV\) transmission line](#) that will be constructed as part of the Ngonye Falls project both to evacuate the power from the project and provide a new transmission line to supply the Western Province (green dashed). Existing 66kV line (blue), interconnect into Namibia and SAPP (yellow) and line into central Zambia (green).

PROJECT STATUS – KEY PROJECT AGREEMENTS

Development Rights: Implementation Agreement with the *Zambian Government*

An Implementation Agreement (IA) for the project was signed in 2015 giving full rights to develop, own and operate the power station selling power to any available offtaker.

Following signing of the Power Purchase Agreement (PPA), WPC has begun a negotiation with GRZ to conclude an Implementation Amendment Agreement to align the IA with the PPA and enhance the overall bankability of the project.

Offtake: Power Purchase Agreement with ZESCO

The Power Purchase Agreement for the project was signed with ZESCO in October 2023. The 25-year PPA, drafted by WPC's international legal advisors, is energy-only, take-or-pay and denominated in US Dollars.

The PPA will be made effective through a PPA Amendment Agreement which will capture any final bankability requirements.

Host Community: Community Participation Agreement with *Barotse Royal Establishment*

The Community Participation Agreement gives the project host community, represented by the traditional authority, the Barotse Royal Establishment, a 6% golden share in the project equity as well as ongoing community support payments of USD 500,000 per year in return for land and water rights at the project site.

Construction: EPC Contract with *Sinohydro Corporation*

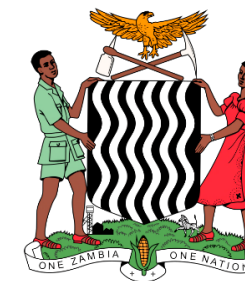
The EPC Contract was drafted by WPC's international legal advisors to ensure the allocation of risk between the EPC Contractor and WPC is bankable. The draft EPC contract was presented to prequalified EPC contractors during the bidding stage and WPC is now negotiating with the Preferred Bidder, Sinohydro Corporation, with the intention of agreeing the outstanding contract terms and finalizing the contract schedules.

Transmission Line BOT: T-Line Agreement with ZESCO as *TNSP*

WPC has drafted and is negotiating a separate agreement with ZESCO covering the construction and handover and repayment for the 110km 330kV (initially energized at 220kV) transmission line that will connect the power station to the ZESCO grid at Sesheke. The construction of the transmission line is included in the EPC Contract scope specified in the EPC tender.

Grid Connection: Connection Agreement with ZESCO as *TNSP*

A Connection Agreement has been drafted and is being negotiated with ZESCO to give the project the right to make and maintain a connection to the grid system.



PROJECT STATUS – LICENSES AND RIGHTS

Environmental and Social Impact Assessment (ESIA, ESMMP and RAP) approval by Zambia Environmental Management Agency (ZEMA)

The ESIA, ESMMP and Resettlement Policy Framework for the Ngonye Falls hydroelectric plant were approved by ZEMA in April 2021 with a 3-year validity. In April 2024 ZEMA approved a further 3-year extension to the validity of the permit.

The first draft RAP for the hydroelectric plant was submitted to ZEMA in Jan 2024 and the second draft in June 2024. Submission of separate ESIA, ESMMP and RAP for the 110km Transmission Line is expected in Q3 2024 with approval expected in Q1 2025.

Land Leases, Sub-leases, Easements and Wayleaves through Ministry of Lands

WPC is acquiring six pieces of land to cover all of the permanent infrastructure for the project under leasehold from the Zambian Government and sub-lease from the Barotse Royal Establishment.

The land for all of the primary, power generation infrastructure has now been acquired on title deeds issued by the Ministry of Lands.

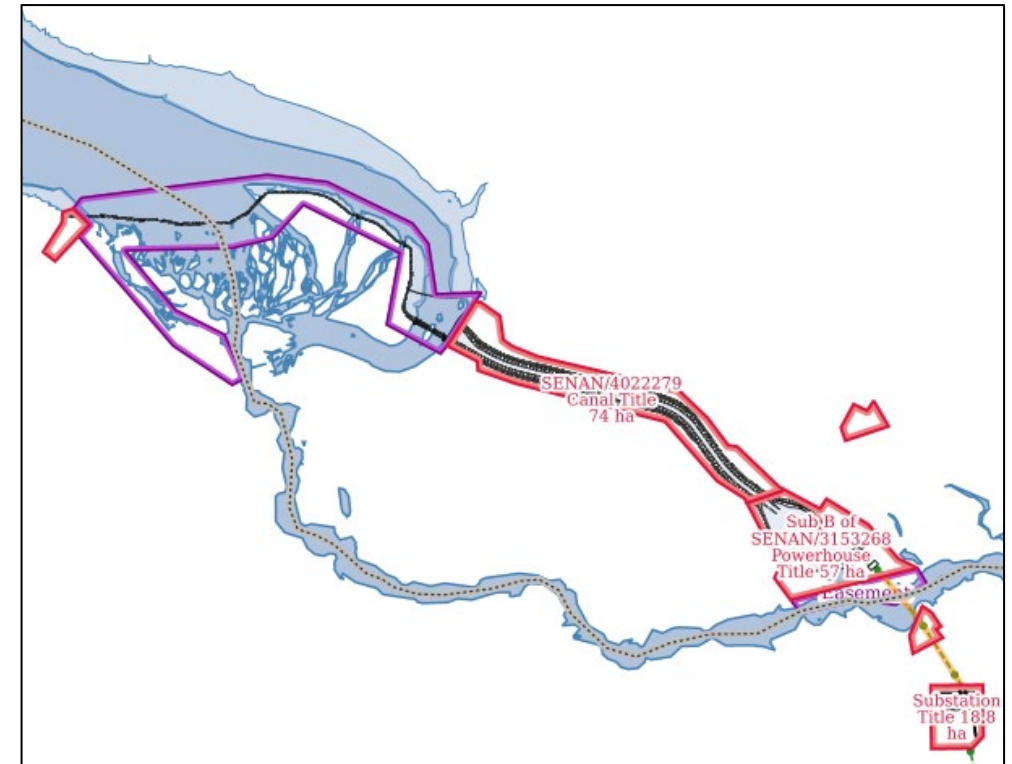
Easements are also being acquired to allow for the construction, operation and maintenance of the in-river works and wayleaves for the transmission lines.

Water Permit by Water Resources Management Agency (WARMA)

A Water Permit has been issued to the project for a period of 25 years by WARMA. WPC has applied to extend the validity of the permit to 30 years, the maximum extent allowable under the law to cover the entire period of the PPA.

Generation License from Energy Regulation Board (ERB)

The ERB have issued the project with an 'Investment Endorsement' which is a precursor to the Generation License which can only be issued after completion of construction.



[Land titles \(red\), easements \(purple\) and wayleaves \(yellow\) for the Ngonye Falls project.](#)



**ZAMBIA ENVIRONMENTAL
MANAGEMENT
AGENCY**

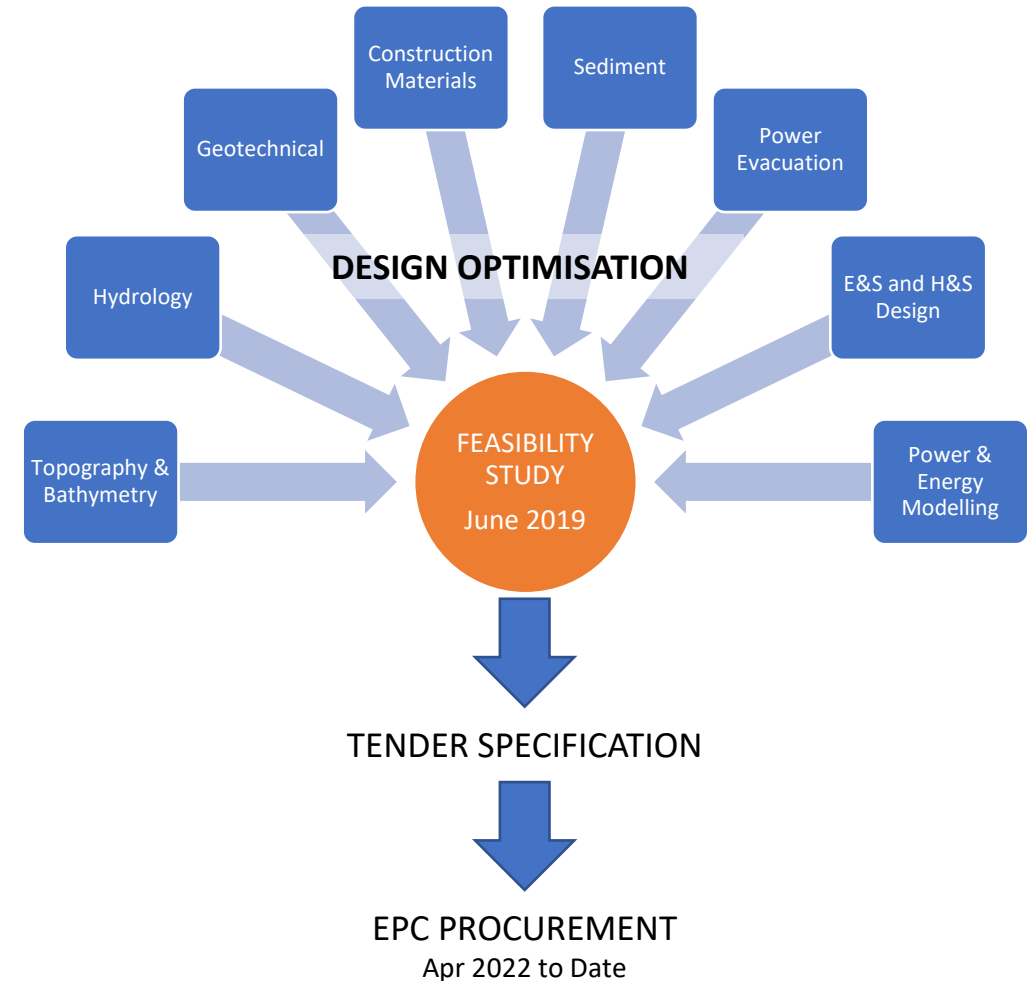


PROJECT STATUS – TECHNICAL DEFINITION

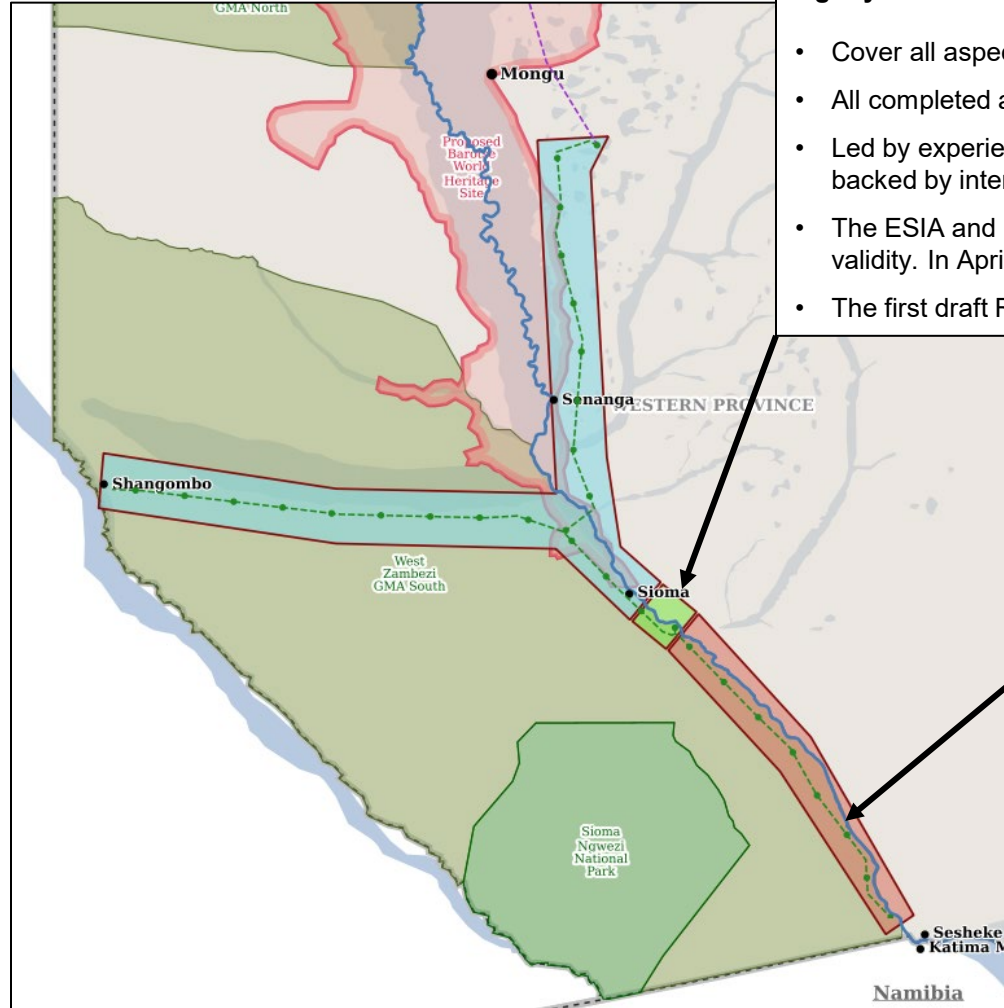
Completed Technical Studies and Surveys

- Intrusive geotechnical investigations (core drilling)
- LiDAR topographic and ADCP bathymetric survey
- Analysis and synthesis of 100 years of river gauging from Victoria Falls, 16 years from Ngonye Falls and 6 years of project site river gauging
- Iterative hydrodynamic modelling and infrastructure design
- Power & energy modelling, yield assessment and climate change impact risk
- Design options analysis and optimization
- Construction materials testing program
- Sediment study
- Power evacuation studies and grid integration Study
- E&S and H&S design measures including environmental flow requirements, aquatic habitat connectivity design (fish passage) and dam safety.

A technical specification for the project together with the associated 110km transmission line and switchyard was finalised in 2022 as part of the EPC procurement process.



PROJECT STATUS – ENVIRONMENTAL AND SOCIAL



Ngonye Falls HPP ESIA and RAP

- Cover all aspects of the power station design, construction and operation including the upstream impacts.
- All completed according to the IFC Performance Standards.
- Led by experienced Zambian consultants: DH Engineering (ESIA and ESMMP) and Armitage Environmental & Social (RAP) backed by international specialist consultants for studies (e.g. EFlows) and to ensure best practice (e.g. RAP).
- The ESIA and Resettlement Policy Framework were approved by the Zambian Regulator, ZEMA in April 2021 with a 3 year validity. In April 2024 ZEMA approved a 3- year extension to the validity.
- The first draft RAP was submitted to ZEMA in Jan 2024 and the second draft in June 2024.

110km T-Line ESIA and RAP

- Cover the transmission line, switchyard and connection to the grid.
- All completed according to the IFC Performance Standards. Led by ZESCO with technical assistance and financial support from WPC.
- Submission of completed ESIA and RAP expected Q3 2024 and approval in Q1 2025.

Ngonye Falls HPP ESIA Specialist Studies

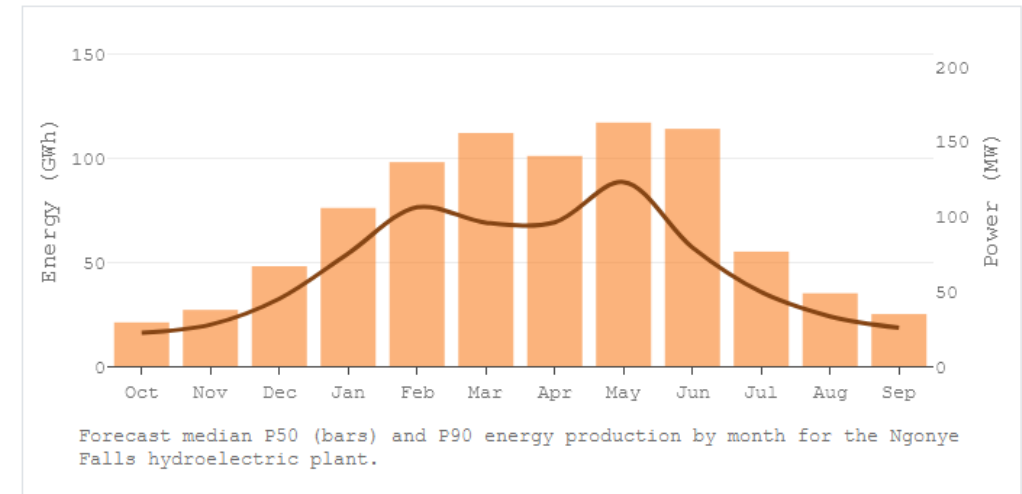
Baseline Biodiversity Assessment	Ecotone	October 2015 and January 2018
Social Impact Assessment	Nomad	September 2019
Heritage Impact Assessment	NHCC	April 2018
Health Impact Assessment	Dr Barbara Wiegand	October 2014
Landscape and Visual Impact Assessment	Mott MacDonald	April 2019
Ecological Flow Assessment	Ecotone	October 2015 and October 2017
Fish Migration and Fishway Design	Drs M and T Ross	November 2017
GHG Emissions Assessment	Mott MacDonald	December 2018
Climate Change Stress Test	Mott MacDonald	June 2024

POWER AND ENERGY YIELD

Due to the large catchment and hydrology of the Zambezi River as well as the unusual hydraulic characteristics of the site and project design, power output and energy generation from the Ngonye Falls hydroelectric power station is stable, consistent and predictable although it shows significant seasonal variation.

Variation in total annual energy yield is very small compared to the variation in annual river flow providing significant resilience against natural drought and flood cycles and the impacts of climate change.

As a run-of-river power station and due to its unusual hydraulic characteristics, the energy yield from the Ngonye Falls power station is completely decoupled from the large storage reservoir hydro-electric power stations downstream in the Zambezi catchment in particular the Kariba complex and Itezhi-tezi / Kafue Gorge stations.

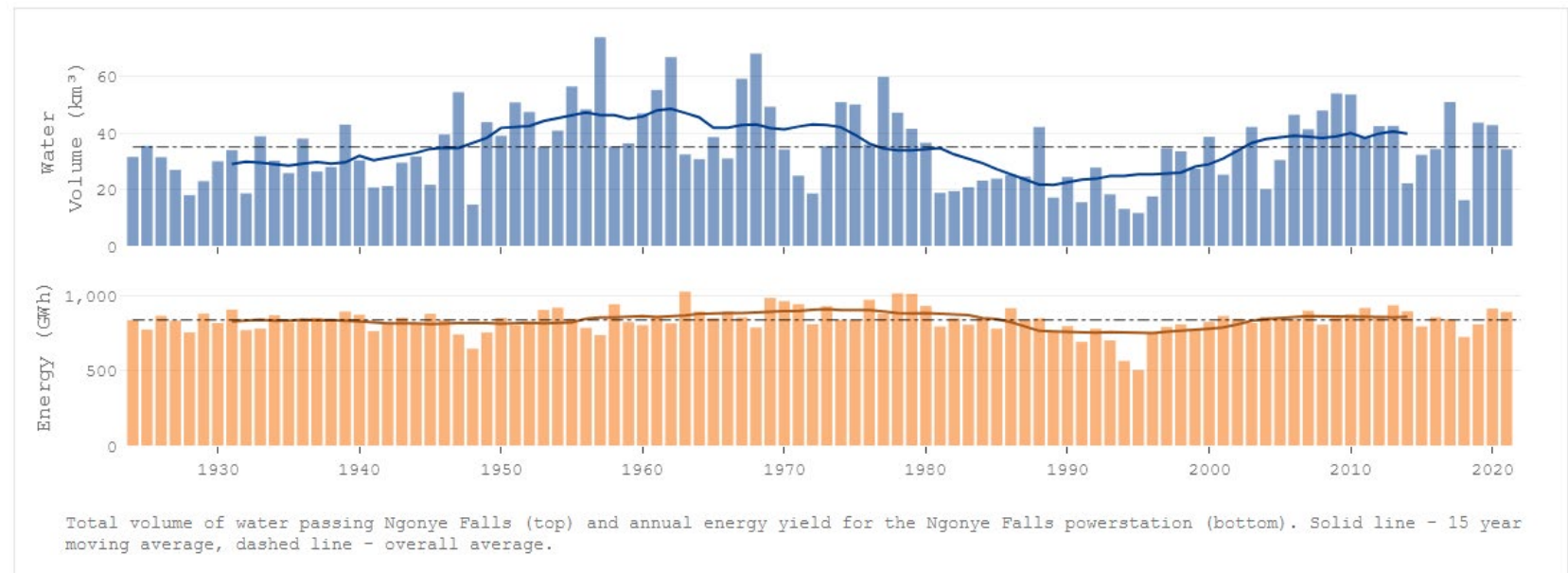


Power Summary

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

Annual Energy Summary

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



For more information see:

<https://observablehq.com/@westernpower/power-energy>

ENVIRONMENTAL – KEY IMPACTS AND RISKS

As a run-of-river scheme with no large high dam or reservoir, the project has almost no significant environmental and social impacts that cannot be managed. The comprehensive suite of surveys and studies has highlighted some issues which require careful management through the development (design), construction and operations phases.

Environmental Flows (Eflows): Following a comprehensive, multi-stakeholder assessment backed by detailed hydraulic modeling and biodiversity impact assessment, the project has adopted a robust Eflows regime that requires Eflows to be released across the width of the river dependent both on incoming river flow and the time of year.

Biodiversity and Critical Habitat: As with any large infrastructure project in a relatively undeveloped area, the impact on biodiversity and any Critical Habitat is of significant concern.

Upstream Impact: Construction of the headworks weirs and embankments across the Zambezi River will have an impact on the timing and frequency of the existing natural flood impacts on a stretch of approximately 4km upstream of the project.

Climate Change Resilience: The impact of climate change both on probable energy yield and the interaction of the project infrastructure on the environment and population in extreme events has undergone significant analysis and study.

To further strengthen bankability of the project and its E&S assessment and address the key impacts and risk, additional studies are ongoing, including:

- An updated **Critical Habitat Assessment** by Ecotone Freshwater Consultants, beginning with screening using the updated IFC GN for PS-6 (2019), to be followed by additional surveys and assessment as needed
- Surveys of 3 plant species flagged as potential **Critical Habitat Triggers** in the ESIA
- Strengthened **Analysis of Alternatives and Cumulative Impact Assessment**, incorporating the main project and the T-Line
- Updated documentation of the Eflows Assessment and **Eflows Management Plan**
- A new qualitative and quantitative **Climate Change Risk Assessment** with a new catchment level hydrology model



Aloe esculenta, a restricted-range species which is being surveyed and monitored in the project area as part of the biodiversity program.

For more information see also:

<https://observablehq.com/@westernpower/environmental-flows>
<https://observablehq.com/@westernpower/upstream-impact>

RESETTLEMENT– KEY IMPACTS

As a run-of-rive project without a reservoir, the resettlement impacts are relatively low. Three classes of impact on the local host community are covered under the resettlement planning:

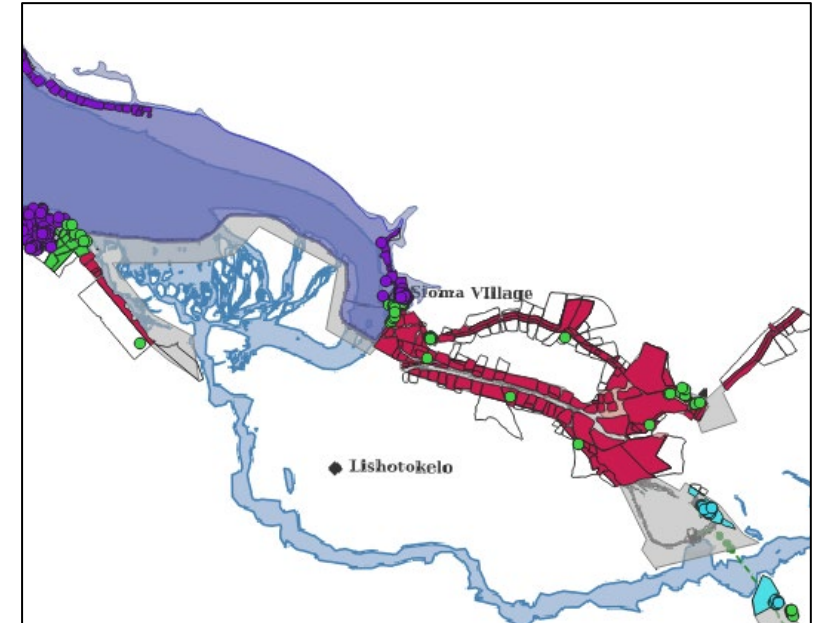
- Temporary impact during construction
- Permanent impact due to power generation infrastructure
- Permanent impact due to changes to natural flood frequency and duration upstream of the project

The range of impacts include:

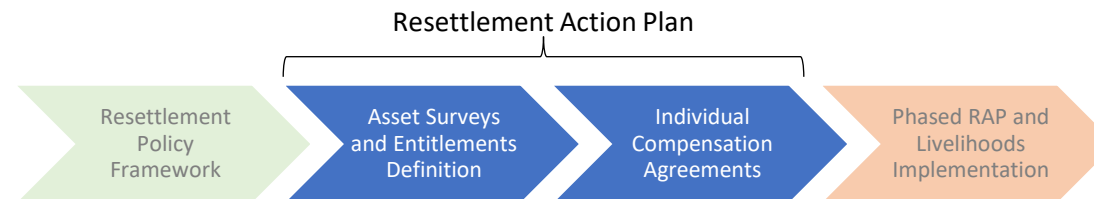
- Houses and other structures as well as some community structures such as places of worship
- Agricultural land and other agricultural assets such as trees
- Impact on other livelihoods and eco-services such as grazing land and thatching reeds
- Impact on fisheries

As part of the initial ESIA submission to the Zambian national environmental regulator, ZEMA, WPC provided a detailed Resettlement Policy Framework that set out the expected resettlement impacts, an entitlements matrix and an outline of possible livelihood restoration programs.


In 2022, the full Resettlement Action Plan (RAP) began with asset and livelihood surveys which covered 470 households across the project impact area. The completed RAP was submitted to ZEMA in 2024 and implementation of the first phases is now underway. Implementation of the full RAP will include the construction of 99 new residences primarily impacted by changes to the to natural flood frequency and duration upstream of the project.



Mapping of Resettlement Action Plan impacts.




HYDROPOWER SUSTAINABILITY STANDARD ASSESSMENT



Hydropower Sustainability Standard

Assessment Report

Project Name: Ngonye Falls HPP
Installed Capacity: 180 MW
Country: Zambia



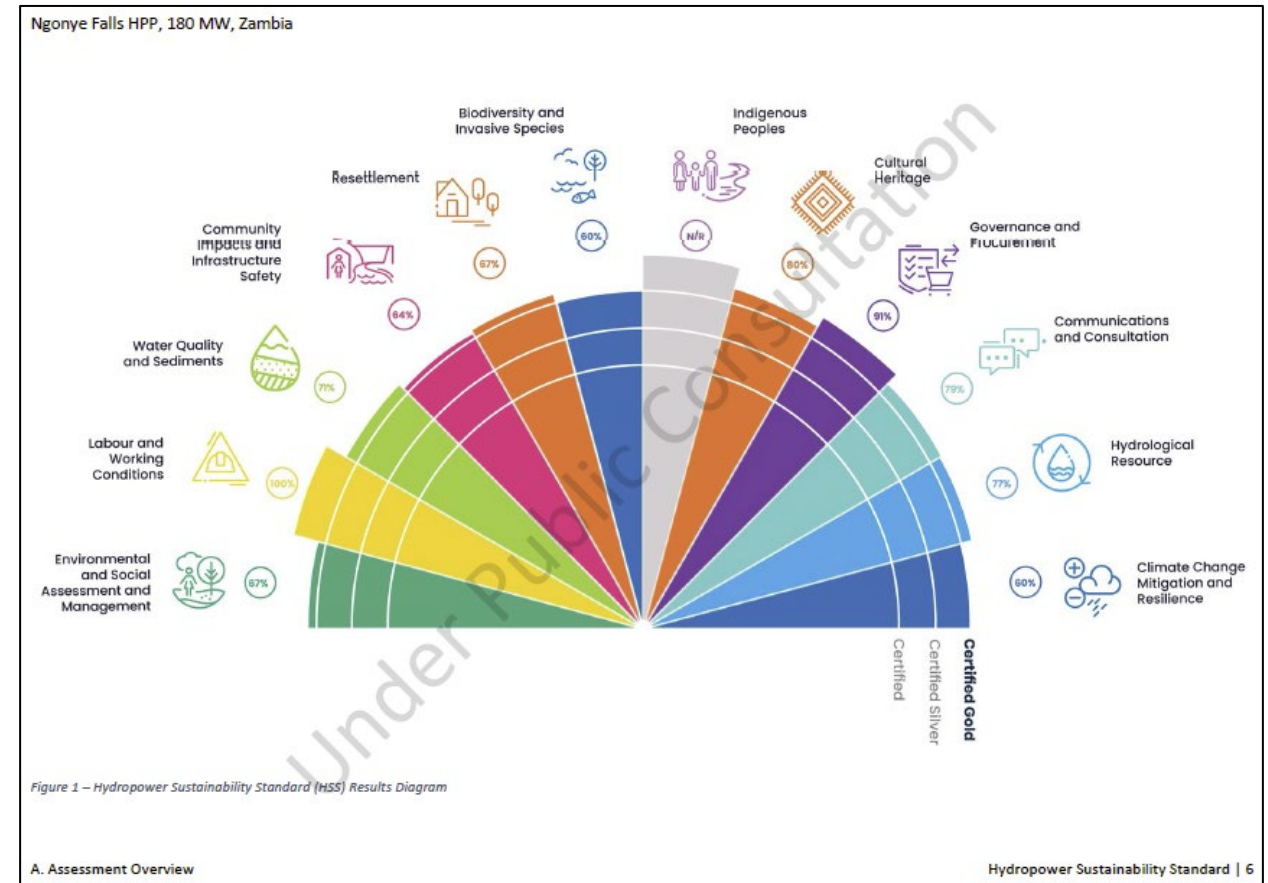
In 2024 the Ngonye Falls Project underwent an independent ESG assessment by the *Hydropower Sustainability Alliance* under the Hydropower Sustainability Standard.

The assessment included review under 11 topics ranging from Climate Change Resilience to Biodiversity and Resettlement by a three member assessment team.

The assessment report, which is currently within a public consultation phase, rated the project at over 60% compliance in all of the 11 applicable topics which will result in the project receiving the highest, **Gold Standard**, sustainability assessment.

Of more than 30 projects across the world currently certified or undergoing certification under the standard, Ngonye Falls will be the first in Africa to successfully complete certification.

<https://www.hs-alliance.org/published-assessments/ngonye-falls>

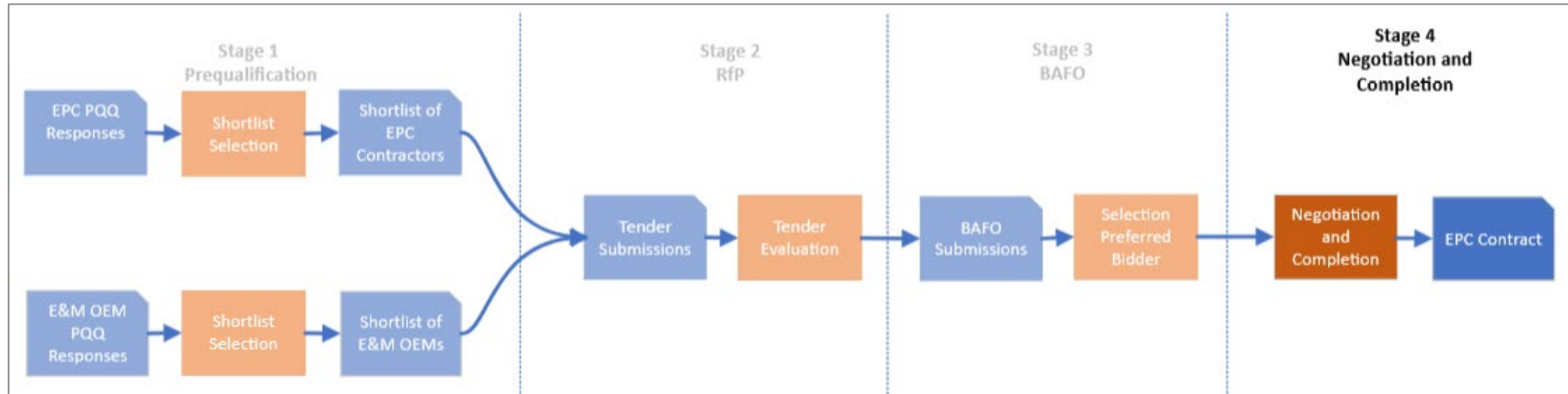


EPC PROCUREMENT

An open, competitive, international tender to select an EPC contractor with the necessary capacity and capability to construct the Ngonye Falls project was started in April 2022 with the publication of prequalification questionnaires for EPCs and E&M OEMs.

The procurement process is being conducted according to the EU Procurement Regulations (as set out by EIB for projects located outside the EU) with the primary motivation of selecting a contractor and agreeing an EPC contract that are 'bankable' under a project-finance structure. The detailed EPC contract has been drafted by the Project's lawyers, White & Case, and the document is agreed in principle with the preferred EPC contractor.

In Q1 2024, Sinohydro Corporation - using Andritz for hydromechanical equipment - was awarded Preferred Bidder Status based on their Bid and Best and Final Offer (BAFO) submission. Negotiations towards concluding the EPC Contract are now well advanced.



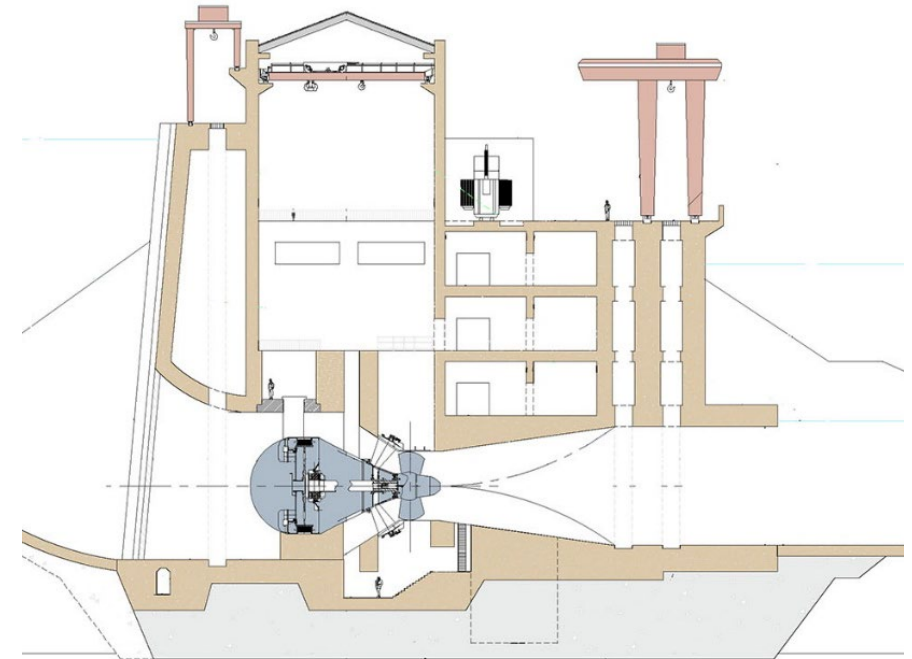
OPERATIONS AND MAINTENANCE (O&M)

To ensure that the project has suitably qualified and experienced O&M provision, without any possible interface risk or gap with the EPC contractor, the EPC Specification included a request for O&M provision (at WPC's option) for the first 5 years of operation.

In their bids, EPC candidates were asked to provide:

- An O&M Bid Price based on:
 - a) an initial mobilisation fee,
 - b) an early operation period from commissioning and syncing each unit to the grid until Substantial Completion, and
 - c) a yearly operation and maintenance fee for 5 years following Substantial Completion
- The costs associated with major component replacements or refurbishments and frequency thereof.
- Details of how they intend to carry out the O&M in a phased approach and details relating to staff, materials, equipment, spare parts, specialist equipment and services.
- Detailed specification and scope of works in respect of the O&M element as prepared by Mott MacDonald.
- Comments on the Heads of Terms for the O&M Contract works prepared by White & Case.

O&M services after the 5-year initial contract will either be provided by an extension of that contract or by a new contract with another O&M service provider.



CONSTRUCTION OWNER'S ENGINEER PROCUREMENT



A competitive tender has been launched to procure the services of a reputable engineering firm to carry out the Owner's Engineer role during the construction, commissioning and defects correction period.



Six engineering firms were selected using the previously pre-qualified firms from 2016.



Three proposals were received and the team is currently reviewing and assessing these proposals.

Invited OE Firms

Multiconsult UK Limited

SMEC International (Pty) Ltd

The unincorporated joint venture comprising Zutari Africa Limited (Zambia) Branch and Intertechne Consultores SA.

Mott MacDonald Limited

Norconsult Norge A.S.

Stantec Inc.

OE Firms which submitted proposals

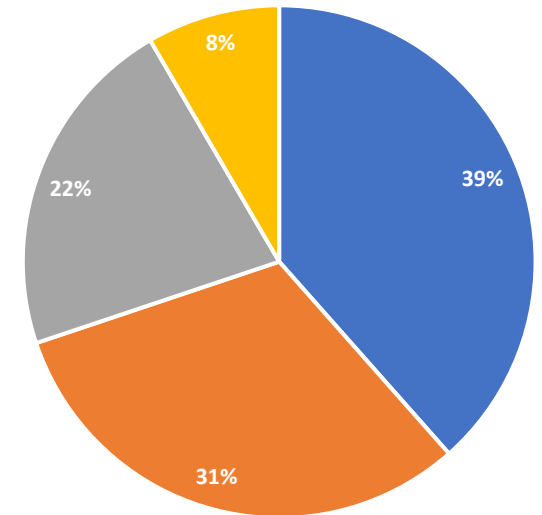
Multiconsult UK Limited

SMEC International (Pty) Ltd

The unincorporated joint venture comprising Zutari Africa Limited (Zambia) Branch and Intertechne Consultores SA.

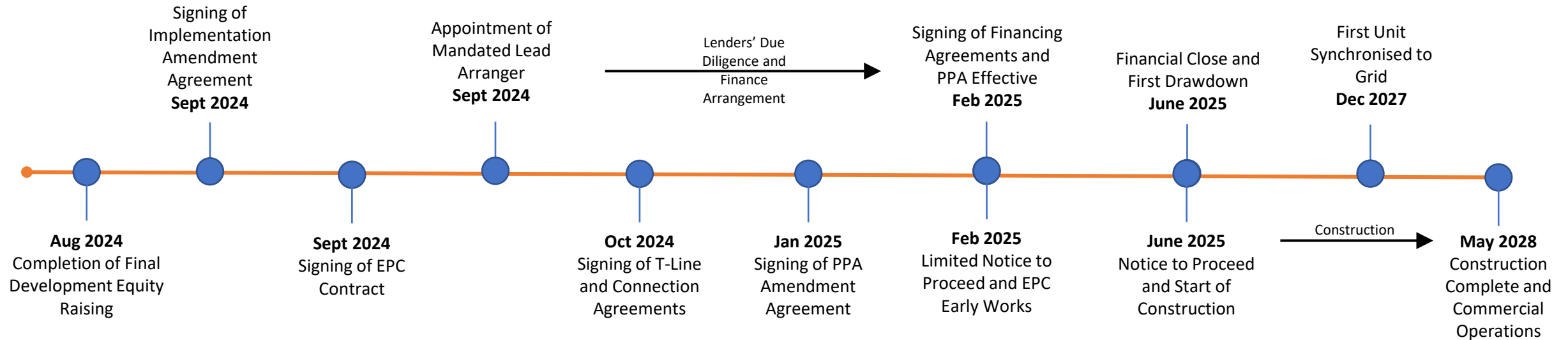
FINANCE

- The total finance raise for the project including the 110km transmission line is estimated at approximately \$700m with the supervised cost of the EPC construction contract around \$450m based on the firm bid provided by Sinohydro.
- The project will be financed with a combination of equity and non-recourse debt under a project finance arrangement secured by the proceeds of the 25-year Power Purchase Agreement signed with ZESCO.
- It is expected that the primary debt funders will be international Development Finance Institutions (DFIs), which are government supported institutions that fund infrastructure in the developing world. Letters of interest to provide the debt have been received from several top tier DFIs. The National Pension Scheme Authority (NAPSA) of Zambia is also considering lending. The lender group will be led by a Mandated Lead Arranger (MLA) and WPC expects to appoint the MLA within Q4 2024.
- Equity funding will primarily come from international energy sector investors and the existing shareholders. WPC is also in discussion with Zambian institutions that may have the capacity to invest in power station development.
- Project finance, non-recourse debt funding for infrastructure projects requires the highest standards of project development and documentation to ensure the 'bankability' of every aspect of the project design, construction and operation. WPC prioritises bankability considerations in all project development work.



- Civil Works
- Electromechanical and hydromechanical
- Engineering, Management, H&S, Mobilisation
- Switchyard and T-Line

PROJECT PROGRAM



PROJECT ADVISORS



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 be paid \$500,000 per year for community development projects. In total, including dividends, the project will fund community development projects with between \$500,000 and \$2,500,000 per year.

WPC and the BRE are actively exploring mechanisms and seeking funding partners to help increase the community equity share above the minimum 6% level.

The BRE has been instrumental in working with WPC, the Government of Zambia and our other partners to bring the project to a successful conclusion, having recognised the development benefits that the project will provide to the people of western Zambia.



DEVELOPMENT & FUNDING PARTNERS



APP

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 deployed 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

InfraCo Africa (IA) is an infrastructure development facility of the Private Infrastructure Development Group (PIDG). IA seeks to alleviate poverty by mobilising private sector expertise and finance to develop infrastructure projects in sub-Saharan Africa's poorer countries. It receives funding through PIDG's publicly funded trust, from the governments of the UK (FCDO), the Netherlands (DGIS) and Switzerland (SECO). IA is a major shareholder in WPC 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.



DBSA

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 WPC 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.

Western Power Company Ltd

Fig Tree House

17 Warthog Road

Box 320181, Kabulonga

Lusaka

Zambia

Tel: +260 211 262 773

Web: www.westernpower.org

Email: info@westernpower.org

