PROJECT: FINANCE, DESIGN, BUILD, ADMINISTRATION, OPERATION AND MAINTENANCE OF THE

SANTIAGO HYDROELECTRIC POWERPLANT – PHASE I

General Description

The Santiago Hydroelectric Project – Phase I consists on financing, designing, building, manage, operate and maintain a 2,400 MW hydroelectric generation power plant with 14,613 GWh of average annual energy, which is part of the Zamora – Santiago hydroelectric system, a project with a hydropower potential of approximately 6,000 MW, with an average annual generation of approximately 26,000 GWh. An initial estimate indicates that the land required for the implementation of the project amounts to an area estimated at 3,943.68 hectare.

The general objective of this project, in compliance with the Master Plan of Electricity (PME), is to implement a hydroelectric infrastructure that allows the expansion and improvement of generation systems, in order to guarantee a stable and sufficient supply of electricity in the medium and long-term, with the constitutional principles of obligation, generality, uniformity, responsibility, universality, accessibility, regularity, continuity, quality, environmental sustainability; optimizing the technical, economic, financial, legal and socio-environmental aspects.

Currently, the investments required by the electricity sector to ensure the future supply of the country's electricity demand are more than USD 13,000 million. 50% of this value, about USD 6,600 million, is focused on new generation projects, essentially hydroelectric plants and other renewable sources.

Project Type

Greenfield.

Fundamental Criteria

The project contributes significantly to the national objectives set out in Ecuador's 2024-2025 Sustainability Development Plan. In addition, it is aligned with the PME, the Institutional Strategic Plan of the Ministry of Energy and Mines and the Generation Expansion Plan for the electricity sector.

Delegating Entity: Ministry of Energy and Mines.

Delegation and Compensation Model

Public-Private Partnership (PPP).

The generator (private manager) will not charge a fee directly to the end user but will invoice for the provision of energy to the distribution companies, through the respective regulated contracts. The distribution companies will in turn charge the users of the electricity service, whose rate is regulated in accordance with the provisions of Articles 54 and 56 of the Ley Orgánica del Servicio Público de Energía Eléctrica and which will include the costs associated with the generation of Santiago.

Beneficiaries

Located in the influx zone:

The presence of the hydroelectric project in the area is an opportunity for the population and the Decentralized Autonomous Governments (GAD's) of the province of Morona Santiago -which has 192,508 inhabitants- to implement joint actions aimed at sustainably improving the living conditions of its population, through a significant investment in education, health and production.

Environmental Beneficiaries

- Reduction of approximately 9 million tons of CO2 per year.
- Consideration of current emissions in the National Interconnected System.
- Calculation based on the CO2 emissions factor by fuel type.

Components

Alternative No. 4.-

Diversion Work:
- Diversion Tunnels: Two diversion tunnels are contemplated, located on the left bank of the river, with the aim of controlling the flow of water during construction and avoiding flooding. The tunnels will be lined to ensure their durability throughout the project.
- Material Cofferdams: Graduated material cofferdams will be installed to block the flow of water and allow work around the curtain and other structures, ensuring temporary isolation during the construction phases.

Curtain:
- Type of Curtain: The curtain will be made of kneeling/conventional concrete, combining two types of concrete:

- Kneeled Concrete (HCR): It is used to ensure greater hydraulic resistance, since it is compacted with rollers, offering greater stability and durability against water pressure.
- Conventional Concrete (HC): For certain areas of the curtain where a more traditional concrete construction is required, ensuring structural integrity.

Work of Surpluses:
- Controlled Spillway Attached to the Curtain: A spillway will be integrated into the curtain to control the excess water in the dam. This spillway will be controlled by means of gates to regulate the flow of water, preventing overflows and facilitating flow management.
- Discharge Tunnels: The spillway will be connected to two discharge tunnels to ensure that excess water is channeled efficiently and safely.

Intake and Conduction Work:
- Intake Work: It will be located on the right bank of the river and will be designed to efficiently extract water to the hydroelectric plant. The intake will be a fundamental part of the work, designed to guarantee a constant flow of water.

- Pressure Pipes: The pipeline system will consist of 6 independent pipelines, each designed to transport pressurized water from the intake site to the power generation plant.
- Oscillation Well: Each pipeline will have an oscillation well, which will serve to balance variations in water flow and prevent pressure fluctuations that may affect the performance of the turbines.

Powerhouse:
- Location: The powerhouse will be located on the right bank, at the foot of the curtain, and will be designed to house 6 Francis turbines, which will be responsible for power generation
- Configuration: The powerhouse will be equipped to manage a high flow of water and ensure the efficiency of the turbines throughout the life of the project.

Drains:
- Bottom Drainage Enabled in the Diversion Tunnel: A bottom drain will be enabled in one of the diversion tunnels, allowing water drainage during the construction and operation of the plant.

- Half-Bottom Drain Integrated into the Curtain: 4 half-bottom drain ducts will be incorporated into the curtain, allowing the controlled evacuation of water when necessary.

Current Project Status

Phase: Structuring.

Publication in the National Registry APP, integrated into SOURCE:

Infrastructure Type

Hydroelectric Powerplant

Socioeconomic Information

Positive Impacts of the Project
- Reduction of risk of rationing and economic losses.
- Reduction of electricity imports
- Reduction of costs for substitution of thermoelectric generation.
- Reduction of pollution and greenhouse gases by substitution of thermoelectric generation.
- Creation of direct and indirect jobs during the construction and operation of the hydroelectric plant, benefiting the local economy.
- Contribution to the country's energy security by providing a stable source and renewable electricity, reducing dependence on fossil fuels, and helping to mitigate climate change.
- Promotion of technological development in the energy sector, facilitating the adoption of cleaner and more efficient technologies in future projects.

Project Information

Project profile: 24/12/24

Potential Jobs Generated

182.633 aprox.

Potential Demand

The electricity demand projection for the 2023-2032 period, included in the Electricity Master Plan (PME), is based on trend demand growth and the incorporation of non-trend factors such as loads from industrial sectors (mining, cement, agribusiness, among others) and energy efficiency projects. This projection contemplates an average annual growth of 6.66%, higher than the historical 4.65%, due to the inclusion of key sectors such as mining, shrimp farms, and electric mobility, which drive a significant increase in energy demand.

Electricity Demand Projection

At S.N.I. generation terminals.

Year	Electricity Demand (GWh)			Growth Index (%)	
	Growth		Historic	Growth	
	Tendency	Base Case		Tendency	Base Case
2023	28.824	30.190		3,0%	7,9%
2024	29.872	32.157		3,6%	6,5%
2025	31.090	35.569		4,1%	10,6%
2026	32.378	38.392		4,1%	7,9%
2027	33.447	40.502	4.65%	3,3%	5,5%
2028	34.826	42.195		4,1%	4,2%
2029	36.383	43.989		4,5%	4,3%
2030	38.042	46.084		4,6%	4,8%
2031	39.651	48.290		4,2%	4,8%
2032	41.334	50.544		4,2%	4,7%
Growth 2023-2032	4,09%	5,89%			

On the other hand, the projection of annual power demand determined an average growth of 6.66%, as shown below:

At S.N.I. generation terminals.

Year	Electricity Demand (GWh)			Growth Index (%)	
	Growth		Historic	Growth	
	Tendency	Base Case		Tendency	Base Case
2023	4.72	4.89		7,7%	11,5%
2024	4.85	5.17		2,6%	5,8%
2025	5.02	5.86		3,5%	13,2%
2026	5.20	6.31		3,7%	7,8%
2027	5.35	6.63	3.81%	2,8%	5,0%
2028	5.55	6.86		3,7%	3,5%
2029	5.78	7.12		4,2%	3,9%
2030	6.03	7.46		4,3%	4,7%
2031	6.27	7.80		4,0%	4,6%
2032	6.52	8.12		4,0%	4,1%
Growth 2023-2032	3,64%	5,80%			

Comparative Analysis of Alternatives (Project Profile)

It is important to note that, since the PME has already defined a technical solution to the identified problem, the formulation of various conceptual alternatives is not contemplated. Consequently, the following table presents the implementation times, investment, and operating and maintenance costs as a reference for the Santiago hydroelectric project alternative –Phase I.

Rango	Base
Goal	Implement hydroelectric infrastructure that allows for the expansion and improvement of generation systems, in order to guarantee a stable and sufficient supply of electricity in the medium and long term, in accordance with the constitutional principles of obligation, generality, uniformity, universal responsibility, accessibility, regularity, continuity, quality, and environmental sustainability, optimizing technical, economic, financial, legal, and socio-environmental aspects.
Provisional Scope	Containment structure of rolled concrete/conventional concrete, Two diversion tunnels located on the left bank, Controlled spillway attached to the dam, Material cofferdams, Intake structure located on the right bank, 6 independent pressure pipes, Oscillation well for each of the pipes, External machine room with 6 Francis turbines located on the right bank, Bottom drain enabled in the diversion tunnel, Half-depth drain integrated into the dam (4 pipes).
Description of the service reference indicators to be met	Acceptable availability of installed capacity 2,400 MW.

Financial Information

Option 4	
CAPEX (Referential)	$ 3.630 millons.
OPEX (Referential)	$ 732 millons.
Total Project Value	$ 4.362 millons.

NOTE: It is important to indicate that the investment amounts reflected in this alternative are referential, as they originate from an initial profile of the project. This amount will be updated as the phases of the APP cycle progress; that is, pre-feasibility and feasibility respectively.

Implementation time in years

Technical Option	
Build	Operation a Mainteinance
6 years.	24 years.

Location

Province:
Morona Santiago

Cantons:
Tiwintza, Limón Indanza and Santiago de Méndez.

EL NUEVO ECUADOR

Secretaría de Inversiones Público - Privadas