

PROJECT: REHABILITATION OF THE MOCO MOCO HYDROPOWER PLANT TO 700 KW

NON-TECHNICAL SUMMARY



Introduction

Part of the mandate of the Guyana Energy Agency (GEA) is to advise and make recommendations to the Minister regarding any measures necessary to secure the efficient management of energy and the source of energy in the public interest; to encourage the development and utilization of sources of energy other than sources presently in use; and to carry out research into all sources of energy including those sources presently used in Guyana for the generation of energy. As such, the GEA and the Hinterland Electrification Company Inc. (HECI) is proposing to rehabilitate the defunct 500 kW Moco Moco Hydropower plant to an installed capacity of 700 kW. The site was developed in the year 1999 based on an agreement between the Government of Guyana and the People Republic of China. However, the plant went out of operation in the year 2003 due to a landslide along the penstock alignment due to heavy rainfall. It is located on the Moco Moco creek

on the Kanuku Mountains at approximately 20 km from the Town of Lethem in Regio 9 (Upper Takatu – Upper Essequibo) and 500 km from the Capital city of Guyana (Georgetown) at coordinates 3° 18'N, 59° 38'E.

Why is the Project needed?

Rehabilitation of Moco Moco Hydropower Plant will ensure a reliable supply of electricity in the Town of Lethem and surrounding villages from a renewable energy source, and it will do so without generating significant greenhouse gasses. Additionally, the Hydro-Power Plant (HPP) will increase the share of renewable energy sources within the country's electrical generation system in the context of sustainable energy development.

Description of the Project

The Moco Moco Hydropower project is a high head run-of-the-river diversion type system which is technically and economically feasible. It will comprise an upgraded installed capacity of 700 kW, which will generate approximately 4,565MWh/yr of energy on an annual basis. The structures that were installed included a diversion system, headrace, forebay, penstock, powerhouse, tail water canal, step up substation, administration buildings and transmission line. As such, the rehabilitation will seek to maintain the current location of the existing hydraulic structure (weir), headrace, forebay, powerhouse, step up substation and tailwater canal. However, the penstock alignment will be determined when the Geotechnical and Topographical surveys are completed. As such, water will be extracted from the left bank of the Moco Moco creek.



Figure 1: Layout of the Moco Moco Hydropower Plant

Economic Analysis

Current Issues and Production Costs in Lethem

Electricity supply in the Lethem Area is provided by the Lethem Power Company Inc. (LMPC) on a 24 hour basis, generated from the company's six diesel units with a total installed capacity of 3.825 MVA. Fuel, which accounts for between 60-65% of operational costs, is transported by bulk transportation carriers 450 km from Georgetown, to Lethem, on unpaved roads which becomes very challenging during the rainy seasons resulting in delays in delivery. Though generation cost is about US\$0.49 kWh, consumers currently pay an average rate of US\$0.33 -0.40 per kWh, thus requiring Government subsidies in the range of US\$500,000 per annum. With income at subsistence level, the high cost of electricity supply continues to remain a major burden on the households and businesses, which can only be expected to intensify considering the expansion of businesses and Government's housing program in the area. Thus, while the area's

peak demand is 800 kW, this is expected to increase in the short to medium term, particularly since Government of Guyana has recently completed infrastructural works for an industrial estate in the Town which will add to the demand for a more affordable electricity supply.

Cost Estimation

Estimated capital cost of 700 kW Moco Moco Hydro: USD 2.2 Million

Financial Analyses Models

Assumptions for the financial models:

- The range for Electricity Sales Prices (at power transformer) were chosen between 0.10 USD per kWh (calculated production cost) and 0.20 USD per kWh (maximum sales price)
- Equity Interest Rate for State Owned Model: 0%
- Equity Interest Rate for Private Investor: 6%
- Loan Interest Rate: 9%
- OPEX (% of capital cost): 3%
- Yearly Price Increase: 2%
- Yearly revenue includes savings for State Owned Model : 500,000 USD / year
- Project Construction Time: 2 years
- Project Lifetime 25 years
- LCOE 4.70 US cents per MWh

Description of possible effects on the environment

In addition to positive benefits, the project could have negative impacts on the environment and people, if not managed carefully. Therefore, the Hinterland Electricity Company Inc. (HECI) will seek to implement certain actions to prevent, reduce, or mitigate all possible negative impacts. A summary of key impacts and mitigation measures have been identified in Table 1 below.

Pre-construction and construction phase

No.	Issue	Potential Impact	Who/What will be affected	Priority	Mitigation measures
1.	Water availability and maintenance of a minimum ecological flow throughout the year	Impacts of the volume of water in the river.	Aquatic Fauna Plants Public	Medium Low Medium	- Carry out dedicated water assessment studies and integrate their results into the project engineering design. (Prior to the start of construction)
2.	Water quality	Impacts on water quality	Aquatic Fauna Public	High High	- Control erosion and sedimentation during construction. - Ensure that the facility does not contribute to deterioration of water quality and watershed either upstream or downstream of the facility. - Testing and monitoring of water quality against baseline.
3.	Protected species (fish and terrestrial fauna) and sensitive habitats	Impacts on fish species composition and numbers, impacts on terrestrial	Fishes, fauna and sensitive habitats	Medium	- Undertake pre-construction ecological surveys and associated assessments of the project footprints to establish a robust baseline.

		fauna and sensitive habitats			
4.	Tourism	Impacts on tourism and recreation	Individuals living near the site, as well as those in surrounding communities	Low	- Identify any recreational uses of the river around the site and plan construction and operation to minimize negative impacts;
5.	General construction activities	Impacts during construction of the main (dams, powerhouse, diversion tunnel) and associated (transmission line) project facilities, such as land excavation, dust, noise etc.	Individuals living near the site, as well as those in surrounding communities	Medium	<ul style="list-style-type: none"> - Prepare and implement construction management plan to reduce and mitigate general construction impacts, including noise, air emissions, waste generation, safety and disposal. - Continuously monitor impacts to comply with appropriate national environmental standards and requirements. - Apply requirements to all construction contractors.
6.	Emergencies: floods, landslides	Impacts of the project on the magnitude and	Plants Aquatic ecosystem	High Medium	- Develop appropriate emergency plans and maintain high level of staff preparedness for emergencies.

		mitigation of floods, landslides and other potential emergencies.	Residents	High	
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Operation phase

No.	Issue	Potential Impact	Who/What will be affected	Priority	Mitigation measures
1.	Water availability and maintenance of a minimum ecological flow throughout the year	Impacts of the volume of water in the river.	Aquatic Fauna Plants Public	Medium Low Medium	<ul style="list-style-type: none"> - Maintain the minimum ecological water flow in the river at all times. - Monitor the water levels in the river throughout the year to verify the minimum level is maintained. - Adjust minimum levels if needed to protect biodiversity.
2.	Water quality	Impacts on water quality	Aquatic Fauna Public	High High	<ul style="list-style-type: none"> - Ensure that the facility does not contribute to deterioration of water quality and watershed either upstream or downstream of the facility. - Testing and monitoring of water quality against baseline.
3.	Protected species (fish and terrestrial fauna) and sensitive habitats	Impacts on fish species composition and numbers, impacts	Fishes, fauna and sensitive habitats	Medium	<ul style="list-style-type: none"> - Monitor ecosystem during operation and implement actions if needed to prevent or reduce unacceptable impacts.

		on terrestrial fauna and sensitive habitats			
4.	Tourism	Impacts on tourism and recreation	Individuals living near the site, as well as those in surrounding communities	Low	- Leave access to the water unchanged by the facility to accommodate recreational uses of the river to the extent technically possible.
5.	General construction activities	Impacts during construction of the main (dams, powerhouse, diversion tunnel) and associated (transmission line) project facilities, such as land excavation, dust, noise etc.	Individuals living near the site, as well as those in surrounding communities	Medium	- Continuously monitor impacts to comply with appropriate national environmental standards and requirements as well as implement occupational safety and health guidelines.
6.	Emergencies: floods, landslides	Impacts of the project on the	Plants	High	- Plan and implement techniques to minimise the exacerbation of effects caused by landslides or

		magnitude and mitigation of floods, landslides and other potential emergencies.	Aquatic ecosystem Residents	Medium High	flooding, which could arise from land use changes due to project activities; - Develop appropriate emergency plans and maintain high level of staff preparedness for emergencies.
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Closure Phase

No.	Issue	Potential Impact	Who/What will be affected	Priority	Mitigation measures
1.	Water availability and maintenance of a minimum ecological flow throughout the year	Impacts of the volume of water in the river.	Aquatic Fauna Plants Public	Medium Low Medium	- Maintain the minimum ecological water flow in the river at all times.

2.	Water quality	Impacts on water quality	Aquatic Fauna Public	High High	- Monitor the state of aquatic ecosystems impacted by the project. - Closure
3.	Protected species (fish and terrestrial fauna) and sensitive habitats	Impacts on fish species composition and numbers, impacts on terrestrial fauna and sensitive habitats	Fishes, fauna and sensitive habitats	Medium	- Monitor ecosystem during project closure and implement actions if needed to prevent or reduce unacceptable impacts.
4.	Tourism	Impacts on tourism and recreation	Individuals living near the site, as well as those in surrounding communities	Low	- Leave access to the water unchanged by the facility to accommodate recreational uses of the river to the extent technically possible.
5.	General de-commissioning activities	Impacts after closure of the main (dams, powerhouse, diversion tunnel)	Individuals living near the site, as well as those in surrounding communities	Medium	- Prepare and implement de-commissioning management plan to reduce and mitigate general impacts such as noise, air emissions, waste generation and disposal.

		and associated (transmission line) project facilities.			
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