

# DRAFT TECHNICAL REVIEW REPORT FOR THE LUANG PRABANG HYDROPOWER PROJECT – DAM SAFETY

THE 9<sup>TH</sup> MRC REGIONAL STAKEHOLDER FORUM

DAY 1: THE 2<sup>ND</sup> REGIONAL INFORMATION SHARING ON PRIOR CONSULTATION FOR LUANG PRABANG  
HYDROPOWER PROJECT

05 FEBRUARY 2020, LUANG PRABANG, LAO PDR

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# OUTLINES



**Background**



**Main Review findings**



**Public comments from 8<sup>th</sup> RSF  
and MRC's response in Draft TRR**



**Recommendations**

# 1. Background

The Luang Prabang HPP is located approx. 25 km upstream of Luang Prabang City.  
**Safety is important!**

The TRR provides an assessment of the Luang Prabang HPP FS Report with respect to **Dam Safety requirements.**

- Ensure that a dam does **not contradict Article 7 of the Mekong Agreement** by causing harmful damage to the environment (upstream or downstream)
- **Protect life, property and the environment** from the consequences of dam operation or failure
- Ensure a **consistent approach to design criteria for mainstream dams**, specifically for the safe passage of extreme floods and seismic stability.
- Ensure that design, construction, operation and maintenance regimes, as well as institutional arrangements, are **consistent with national requirements and international good practice** for the safety of dams and related emergency response planning.

## 2. Main Review Findings (1) – Geological Analysis

### Geology

- Geological investigation provides a good basis for assessing the foundation conditions
- The information is well presented
- **NEED: additional investigation to provide further details of the anomalies found**, a more intensive laboratory testing and field mapping of outcrops. Now, Developer is conducting.

### Seismicity

- Luang Prabang is within a moderate to high seismicity region → The nearest active fault is 8.6 km distance to the project site.
- Design earthquakes have been determined for the following load cases (MCE, SEE, etc.)
- Clauses related to seismicity are considered to meet requirements of PDG 2018.
- Two seismic events occurred on 20 November 2019 near Dam site → The reported Peak Ground Acceleration (PGA) at the epicentre was significantly below the design limit proposed in the FS → Developer confirmed that the LPHPP design standards are adequate.

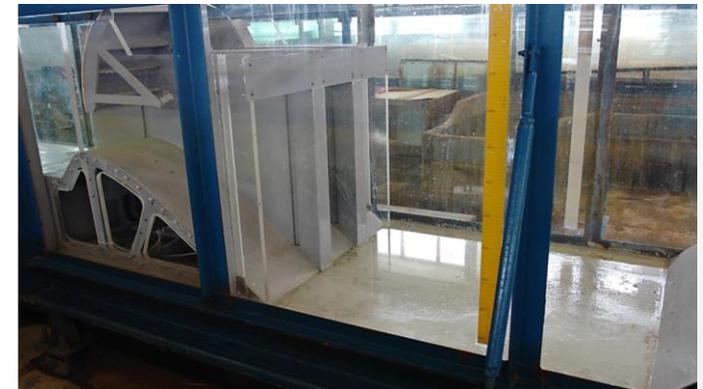
## 2. Main Review Findings (2) – Design and operational parameters

### Flood Parameters

- Lao Electric Power Technical Standards (LEPTS 2018) requires the spillway to pass the PMF as the Inflow Design Flood → More onerous than envisaged by the FS.
- **NEED:** The ultimate spillway capacities of existing and planned upstream projects should be assessed.

### Discharge Capacity

- The work undertaken in the FS is useful as a first approximation, but **more work is required** → Physical model test of the entire dam and spillway, including U/S and D/S of the river, has been underway.
- **No clear reference in the FS report to the proposed freeboard between reservoir level and crest level under various combinations of events (LEPTS 2018 requirement).**



## 2. Main Review Findings (2) – Design and operational parameters

### Reliability

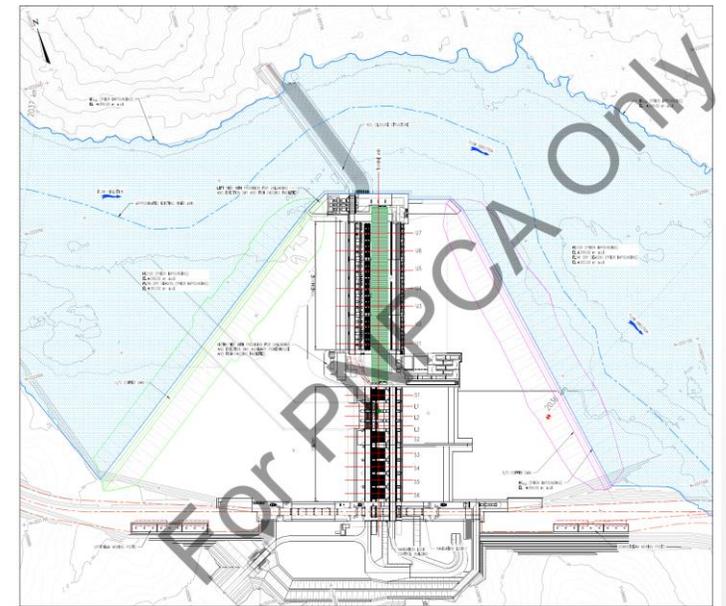
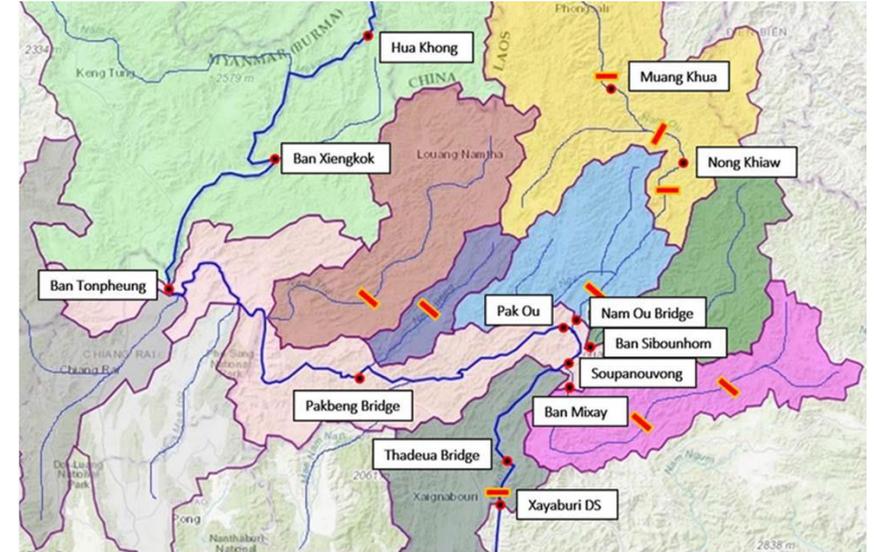
- The requirements for opening times, redundancy and security of spillway gate operation are **currently not considered in the FS report.**

### Energy Dissipation

- The **physical model test report does not provide any information on the effectiveness of energy dissipation or the potential for erosion in the riverbed downstream.**
- The geological model currently indicates that part of the powerhouse is to be founded on meta-sedimentary rocks → **Potential for bed erosion D/S of the turbine outlets.**
- **NEED:** The ongoing physical model study covering the full dam and spillway will provide an opportunity to measure velocity fields and determine potential zones of erosion and deposition

## 2. Main Review Findings (3) – Flood Management

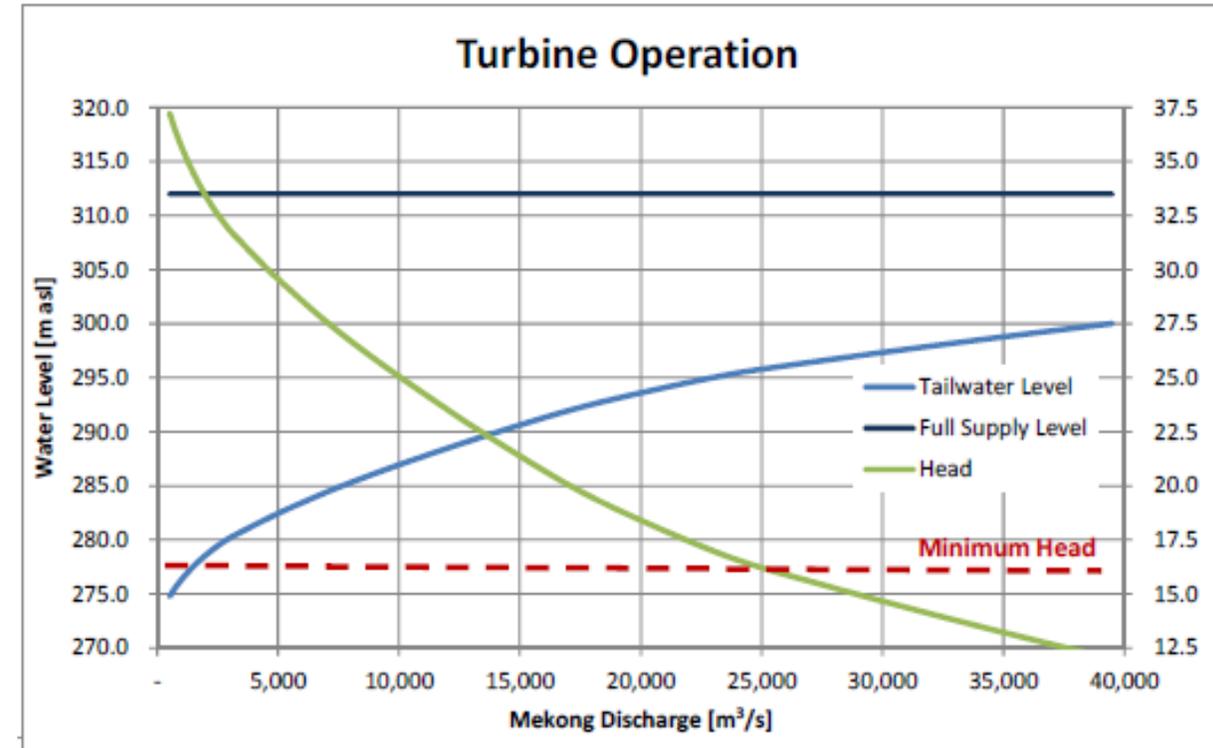
- **NEED:** Effective flood management → Requirement for an upstream hydrometric network and effective communication with upstream projects. → The developer verbally advised that the hydrometric network for the Xayaburi project will also be used.
- **No reference to a cascade flood management strategy in the FS report.** → A co-ordinated approach by the Government of Laos is required.
- River diversion is achieved by constructing the right bank structures first in a single coffer dam and confining the river to the left channel. **NEED:** Some form of upstream flood forecasting system





## 2. Main Review Findings (5) – Reservoir Operations

- The reservoir operating rules are not outlined in detail elsewhere in this FS report.
  - Require to limit the rate of change of water level D/S of HPP to a safe rate for riverbank users including river crafts
  - **NEED:** Ideally be considered and explored as part of the cascade operations.
- The operating level range of 312 to 312.5 m is higher than the value of 310 m proposed by GoL.
  - No apparent dam safety consequences for the adoption of this higher operating level. However, the impact is on the profitability of Pak Beng HPP.
  - **Must be resolved by GoL**

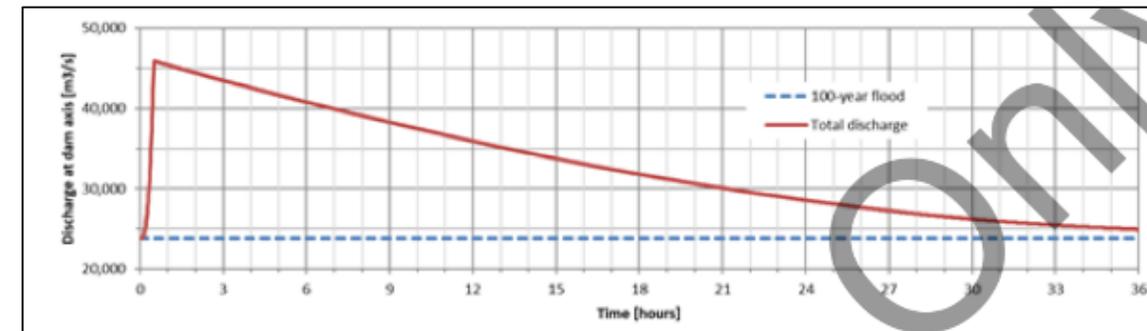
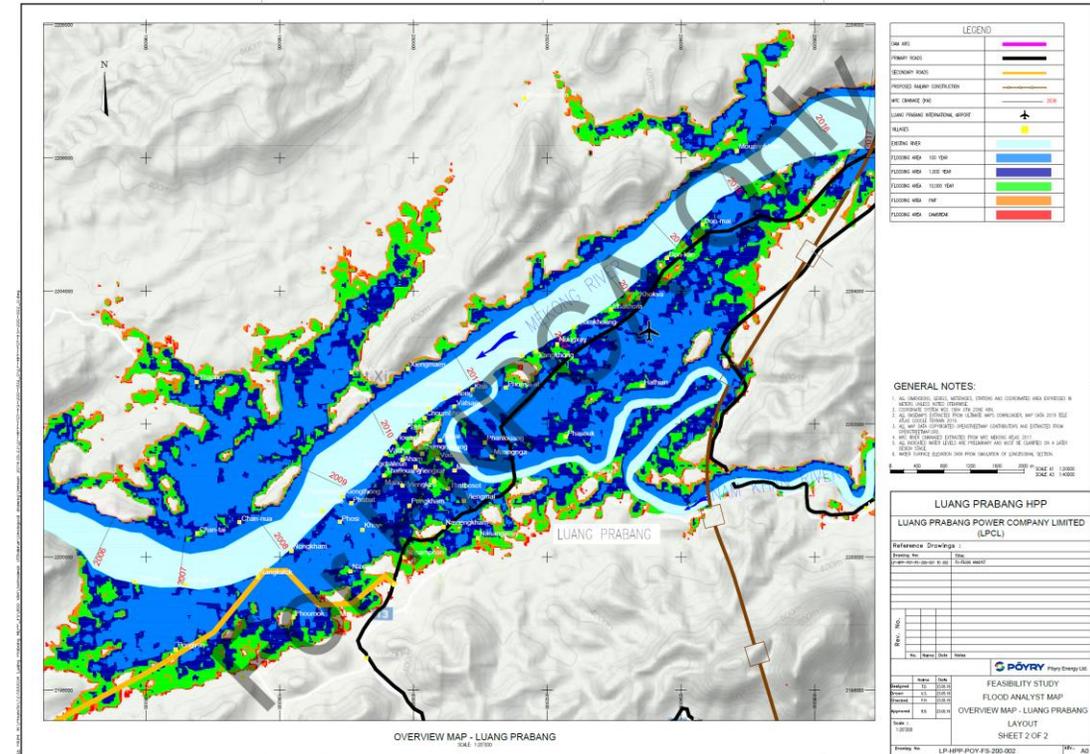


## 2. Main review findings (6) – Dam Safety Management

- **Panel of Experts** - The FS report does not refer to the appointment of a Dam Safety Review Panel (ICOLD and World Bank Operating Policies' requirement)
- **Emergency Preparedness Planning** – The FS report provides a general discussion, which is appropriate at this stage.
- **Instrumentation** – The FS provides an initial indication of the instrumentation. The final requirements can be determined later.
  - **NEED:** The instrumentation system must also cover the left channel closure dam since sections of this dam are over 50 m high → **The requirement for pendulums in the closure dam.** → The developer verbally indicated to consider.
- **Dam Safety Management System (DSMS)** - The FS report provide sufficient information in this stage.

# Main review findings (7) – Failure Modes Assessment

- The FS report presents an overview of failure modes assessment.
  - This is reasonable at this stage, but a detailed failure modes assessment should be undertaken at the commencement of the detailed design stage.
- The DS impacts of failure have been examined by the inundation studies in the FS.
  - At this stage sufficient work has been done, in the next stage, the potential for dam breach to impact Thailand should be checked considering together with other D/S projects e.g. Xayaburi.



# Public comments from 8<sup>th</sup> RSF and MRC's address in Draft of TRR

Public comments from 8 <sup>th</sup> RSF	MRC's address in Draft of TRR
<p>The dam safety design is based on World Bank (WB) policies. Are other dams in Laos based on WB guidelines too?</p>	<p>The TRR refers to the importance of the Lao Electric Power Design Standards with regard to design. These would apply to all the dams in Lao PDR.</p>



# Recommendation (1)

1. The Feasibility Study presents a sound basis for the formulation of the project but lacks some of the detail that would be expected at this stage for a major hydroelectric development;
2. An initial site investigation programme has been undertaken. This programme has provided a good understanding of the structural geology of the site but has identified issues that require further investigation. A further investigation is in progress, but the details should be shared when they come available;
3. There is no interpretation of geology to derive preliminary foundation parameters for design and no description of stability loading cases and results. → The developer has indicated that this is in progress;
4. A Seismic Hazard Assessment has been undertaken that provides a suitable basis for project design.

## Recommendation (2)

5. The **hydraulic model study has not yet been undertaken** and therefore the spillway capacity and erosion protection requirements for the project have not been adequately demonstrated. → The developer has indicated that these studies are underway;
6. The **proposed design standards for stability and flood management do not meet the dam stability and design flood requirements of the revised 2018 LEPTS.** → The developer has indicated that the project will comply to the latest version of the LEPTS.
7. There is **no reference to the appointment of a Dam Safety Review Panel**, which should be in place during prior consultation. This Panel should be appointed as soon as possible. → The developer has indicated that the establishment of an independent panel of experts will be coordinated with the GoL.



**THANK YOU**

*One Mekong. One Spirit.*