

*The 5th Regional Stakeholder Forum
Basin Planning and Environmental Management
20-21 September 2018
Landmark Hotel, Vientiane, Lao PDR*

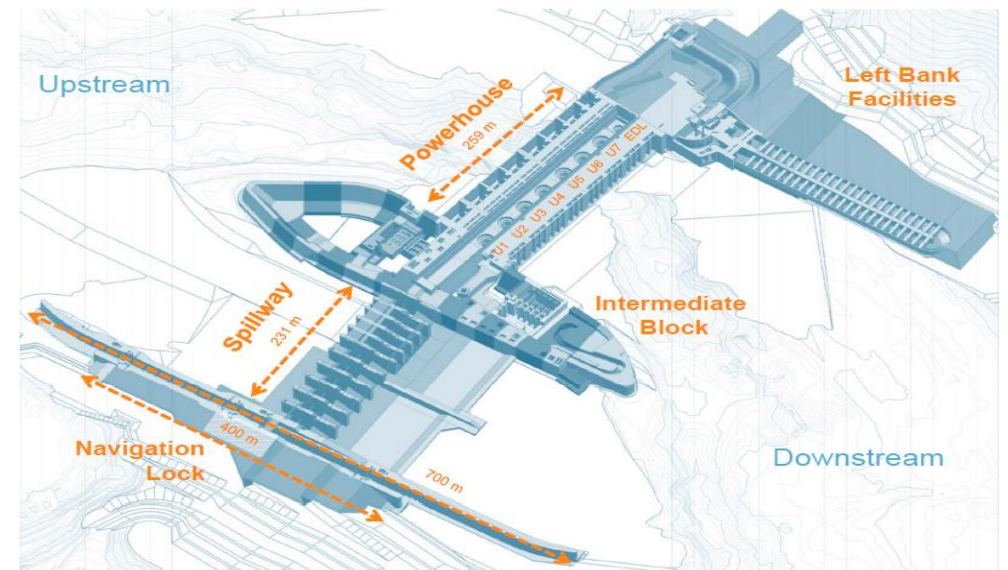


Review of the Design Changes made for the Xayaburi Hydropower Project



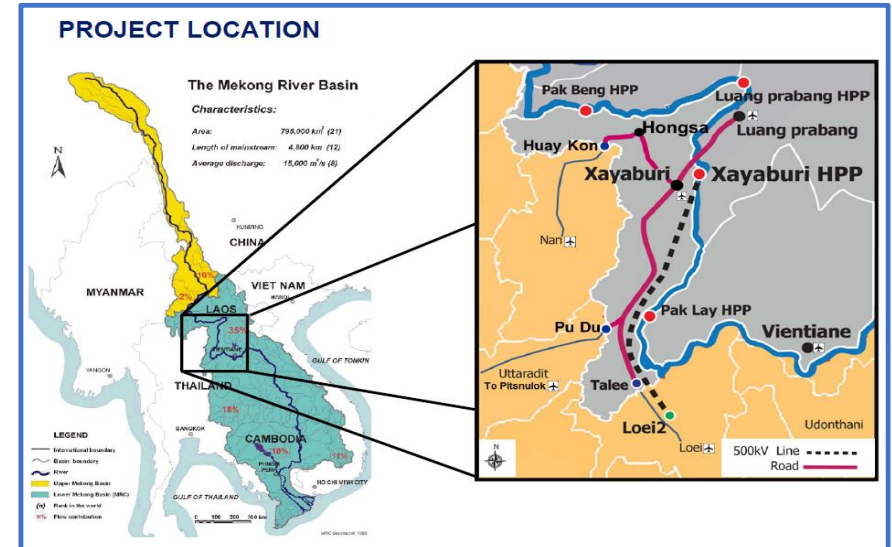
Outlines of Presentation

1. Background
2. Information received
3. Objectives of the review
4. Approach to the review
5. Review Results:
 1. *Navigation*
 2. *Fisheries, fish ecology, & passage*
 3. *Water quality and aquatic ecology*
 4. *Hydrology*
 5. *Sediment*
 6. *Dam safety*



1. Background

- Lao PDR submitted documents for PC on 20 Sep 2010
- **Start date of PC process: 22 Oct 2010**
- **End date: 19 Apr 2011**
- **No Agreement was reached** → referred issues to the Council
- **Response** by the Council: Study on Sustainable Management & Development of the Mekong River including impacts by mainstream hydropower projects (the Council Study)
- **Response** by GOL:
 - **Compliance Report** (by Pöyry) received in Oct 2011
 - **Additional studies and re-design** (by Compagnie Nationale du Rhône (CNR) and Pöyry): fish passage, navigation, sediment, & seismic risks



- **Xayaburi province, Northern Laos**
- 100 km downstream of Luang Prabang
- 3rd Cascade of hydropower projects
- Max. capacity: **1,285 MW**
- Turbines: **7*175 MW**
- Commercial operation: **OCT 2019**
- Export to THAILAND: **94%**
- For Lao PDR: **6% (1 million people)**

2. Information Received

1. Improvement of **Lock Design**;
2. **Physical Hydraulic** Model Study
3. **Plant Safety** Concept; and
4. **Seismic** Hazard Study

7. **Drawing in A3** scanned copies of sections of the construction

MRC Working Sessions:
Results of the Review
by MRCS

FEBRUARY 2014

JULY 2015

AUGUST 2016

NOVEMBER 2017

4 & 29
MAY
2018

OPEN FORUM

5. Power Policy & Plan;
6. Concession Agreement
7. Construction Status
8. Fish Passage, Navigation & Sediment

8. **Draft report** on design adaptation (navigation lock, fish passage, sediment, dam safety)
Missing: water quality and aquatic ecology

3. Objectives of the review

- **Assess the extent** to which the developer has made every effort to address concerns and recommendations raised in the XTRR;
- **Use the outcomes** of the *Council Study*, the *MRC hydropower Mitigation Guidelines* (ISH0306), and other studies to advise on whether there is sufficient evidence that the revised designs will allay their concerns regarding any Tb impacts of the XHPP; and
- **Make recommendations** to the JC for the development of a record of the proposed use as outlined in Article 5.4.3 of the PNPCA.



4. Approach to the review

- Undertaken by MRCS specialists supported by International Experts
- Not replicate the detailed assessment of the XTRR
- **Focus on the following questions:**
 - Does the documentation provide sufficient evidence that the revised design **addresses recommendations of the XTRR**, and allay the concerns raised during the PC process?
 - Is sufficient information provided to **establish the record of the proposed use** (PNPCA Article 5.4.3)?
- The review team is **aware that the engineering aspects of the project (e.g. dam safety) have been investigated in much more detail**, but as this information has not been provided, this information has not been included in this review

5. Review Results of the Xayaburi Design Change

- **This review covers six aspects including:**

1. **Navigation;**
2. **Fisheries, fish ecology, & passage;**
3. **Water quality and aquatic ecology;**
4. **Hydrology;**
5. **Sediment; and**
6. **Dam safety.**

- **Structure of the review**

- ✓ Summary of recommendations made in the 2011 XTRR
- ✓ Measures taken up by theXHPP (based on submitted documents)
- ✓ Comment on the revised design



5.1 Review Results on Navigation Locks

Recommendation in the XTRR	Measures Taken Up by XHPP	Conclusion & Recommendation (MRCS)
The provision for adding a second series of navigation locks	Provision for a possible second parallel navigation lock in the future	Most of the concerns raised in the XTRR have been dealt with.
Road and crane access during emergencies needs to be confirmed	Upstream & downstream approaches are wide enough to allow large barges crossing in either direction	The operations and hydraulic design have been described in details
The potential to use of navigation lock as <u>fish pass</u>	The navigation lock has been modified to support fish passage.	Limited information on design characteristics of using lock for fish passage. The system will be operational during rainy season, which may not be sufficient as peak fish migration period is at the onset of increased flows (i.e. in May).

5.2 Review Results on Fisheries, Fish Ecology & Passage

Recommendation in the XTRR	Measures Taken Up by XHPP	Conclusion & Recommendation (MRCS)
Address knowledge gaps on fish ecology to justify assumptions made in the fishways design	Extensive fish biomass and migration monitoring, baseline study, & swimming speed study	Little detailed information on fish studies: most information in PPT
UPSTREAM: Vertical-slot (VS) design: too small for species and biomass; too steep, shallow & turbulent	VS fishway revised: larger pools, lower turbulence, lower gradient, more depth	Discharge through fish locks is low and size may be small → Require quantitative assessment
UPSTREAM: Optimise spillway gate operation in physical modelling for fish attraction	Not applied	Can be considered as part of adaptive management once in operation
DOWNSTREAM: Turbine passage should provide 95% survival	Turbines designed with less shear, turbulence, less blades (5 instead of 6)	No specific data on turbine design → requires assessment
DOWNSTREAM: Use overshot gates for spillway passage	Not assessed	Can be part of operation plan

5.3 Review Results on Water Quality & Aquatic Ecology

Recommendation in the XTRR	Measures Taken Up by XHPP	Conclusion & Recommendation (MRCS)
<p><u>Monitoring programme</u> to assess impacts on water quality & aquatic ecosystems required during construction & operational phases</p>	<p>No information on water quality monitoring of river, waste water streams, site run-off or mitigation actions</p>	<p>Water quality and aquatic ecology monitoring and reporting needs upscaling and risks assessed</p>
<p>WQ during construction & operation <u>managed proactively by continuous monitoring</u>; & action taken if problems occurred</p>	<p>No inventory of pollution/water quality issues arising during construction provided</p>	<p>Suggestion for workshop to bring developer and MRC experts together not taken up</p>
<p>Hydro-peaking effects on aquatic ecology not considered</p>	<p>No information on aquatic biodiversity & conservation species provided</p>	

5.4 Review Results on Hydrology

Recommendation in the XTRR	Measures Taken Up by XHPP	Conclusion & Recommendation (MRCS)
While no changes in downstream flow regimes are expected, the changed flow characteristics in the impounded reach are likely to have negative impacts	<u>Additional low-level spillway gates & model test</u> . <i>Report</i> on physical hydraulic model study provided, but <i>not numerical model</i> study	Little information has been provided on <u>operation rules</u> , and <u>expected flow fluctuations</u> in the reservoir and downstream river.
<u>Operating rules</u> should be provided. Opening of spillway gates should be carried out carefully to avoid downstream flood	Documentation <i>not include sufficient details on operating rules</i>	Additional information on <u>monitoring parameters</u> is required to investigate hydrological changes & impacts during construction & operation
<u>Monitoring of flow conditions</u> during construction was not addressed	Extensive monitoring programme but <i>detailed information not provided</i>	<u>Environmental flows</u> are not detailed in the documents
<u>Reservoir level</u> should be lowered during floods to provide some flood protection for Luang Prabang	<i>River flow regime during construction</i> was not elaborated	

5.5 Review Results on Sediment

Recommendation in the XTRR	Measures Taken Up by XHPP	Conclusion & Recommendation (MRCS)
Dam design modified to enhance capacity for sediment routing & flushing (low level gates)	Three <u>spillway gates</u> was replaced with four low level outlets	Inclusion of four low level outlets increases sediment transport through impoundment. However, efficacy of measures to reduce impacts cannot be assessed as no operating procedures have been provided.
<u>Capability to manage sediment</u> adaptively to address uncertainty in modelling future sediment loads & operating conditions	Sand flushing outlet of power house removed from original design	
Reconsider <u>operating procedures</u> to optimize sediment routing and flushing	A provisional operating curve is provided showing draw down and sediment routing at flows of greater than 10,000 m ³ /s	Sediment transport through the dam will also be affected by changes to sediment inputs associated with the development and operation of upstream dams. → An adaptive management strategy.
<u>Adaptive sediment-management regime</u> to protect long-term generating capacity & minimise bank erosion.	Three sediment monitoring campaigns were completed.	

5.6 Review Results on Dam Safety

Recommendation in the XTRR	Measures Taken Up by XHPP	Conclusion & Recommendation (MRCS)
Formation of an Independent Dam Safety Review Panel (DSRP)	DSRP was not established.	<u>Values of DSRP</u> : Review geological information collected during construction to confirm impact on the design; and Review DSMS & EPP to confirm their completeness & adequacy
Dam Safety Management System (DSMS)	A Plant Safety Concept for the structural safety was implemented based on international standards	Unclear if recommendations on dam safety checking under higher peak ground accelerations implemented
Process for consultation & engagement of stakeholder, especially for the Emergency Preparedness Plan (EPP)	<p>Seismic ground motion parameters are determined</p> <p>A Probabilistic Seismic Hazard Assessment report by AIT: Safety Evaluation Earthquake (SEE) ground motion parameters - Return period of 10,000 years</p>	<p><u>Process for consultation & engagement of stakeholders:</u></p> <p>Needs to be implemented & emphasized during the construction and operation phases</p>

6. Conclusion

- **XPCL highlights PC process as instrumental in identifying additional measures to avoid, minimize and mitigate harmful effects**
 - **XPCL has made commendable efforts to reduce harmful effects**
 - Documentation provided **primarily OUTLINES** of the infrastructural changes,
 - **Less details of monitoring, data and analysis for rigorous scientific assessment**
 - Lao PDR's **Standard Environmental and Social Obligation** (SESO) have **domesticated the provision of the 1995 Mekong Agreement**, but it is not known how these been taken up in the Concession Agreement (CA) and Power Purchasing Agreement (PPA)
- ➔ **NEED** to provide description of **OPERATING Rules for Better Assessment**, and also to **establish the record of the use once commenced as outlined in Article 5.4.3** of the PNPCA, and as stipulated in the **Procedure for Water Use Monitoring**



Thank you

