CONTENTS

• Introduction
• General Overview
• Fish Migration
• Navigation
• Existing Infrastructure
• Sediment Management
PROJECT OVERVIEW - LOCATION

- Located at Mekong km 2036 in Luang Prabang province, Lao PDR
- About 25 km upstream of the city of Luang Prabang
- Between Pak Beng HPP (upstream) and Xayaburi HEPP (downstream)
**Powerhouse**
- 7 Kaplan TG units (200 MW each)
- Design Discharge: 5,355 m³/s
- Total Capacity: 1,400 MW

**Auxiliary Powerhouse**
- 3 Kaplan turbines
- Total Capacity: 60 MW

**Spillway Structure**
- 3 Low Level Outlets
- 6 Surface Spillways
- Total Capacity: 41,400 m³/s

**Navigation Lock**
- 2-Step Navigation Lock
- 2 x 500 DWT
- Total Lifting Height: 35.50 m

**U/S Migration - Left Pier**
- Diversion wall during Construction
- Entrances along PH width
- 2 Fish Locks at Left Pier

**D/S Migration - Right Pier**
- Entrances above Power Intakes
- Terminal Structure: Chute
HYDROLOGY

In general good data basis
Main focus was in impact of Lancang Cascade

- Hydrological Rainfall-Runoff Model with 60 years of data, calibrated using first 4 years of full operation of Lancang Cascade

- Impact of Lancang Cascade
  - Significant higher than anticipated
  - Positive effects due to higher dry season floods
  - Sedimentation: Lancang cascade heavily impacts sediment regime in Lower Mekong
GEOLOGY

- Site investigation and laboratory testing carried out
- Geology:
  - Volcanic rocks and
  - Limestone
- Additional investigations ongoing
SEISMICITY

The Seismic conditions have been checked and the following conclusions have been made:

- Active faults about 10-20 km away from dam site
- Medium seismicity
- Probabilistic and Deterministic Seismic Hazard Assessment carried out
- No risk of reservoir triggered seismicity
The dam break analysis are based on the following scenarios:

- The failure modes for Concrete Gravity Dams are given in ICOLD Bulletin 99 and 111
- Dam break based on a 100-year flood
- The peak of the dam break flood will be in range the PMF flood.

Natural Flood Map of Luang Prabang
MAIN POWERHOUSE

Barrage Type Powerhouse

- 7 main units a 200 MW
- Total Installed Capacity: 1400 MW (main Units only)
- 2 Erection bays – advantages for installation
**SPILLWAY**

**Surface Spillway**
6 Overflow Spillway Bays  
All gates with flap gates  
Total Capacity: 41,400 m$^3$/s

**Low Level Outlets**
3 Bays  
Primary Spillway Devices Required for Sediment Routing

**Spillway**
- Designed for 10,000 year flood (one gate not operational)  
- PMF – Safety Check Flood  
- Total Capacity: 41,400 m$^3$/s  
- Freeboard (PMF): 2.80 m
NAVIGATION LOCK

- 2 stage Navigation Lock
- Designed for 2 x 500 DWT Vessels
- Same design and dimensions like the Navigation Lock in Xayaburi
- No Fish Attraction through Navigation Lock required as construction is done in one stage only
FISH MIGRATION - OVERVIEW

Auxiliary Powerhouse
• Use of water flow from d/s migration for u/s migration
• Additional water for upstream attraction flow

D/S Migration
• Entrances above power intakes
• Fish-friendly turbines

Right Bank Fish Migration
• Separated from Navigation Lock
• Fish Lock and open channel

U/S Migration
• Multiple Entrances along PH
• 2 fish locks
FISH MIGRATION SYSTEM - GENERAL

• Compliant with MRC Design Guidance
  o Upstream Migration with entrances over entire length of Powerhouse
  o Downstream Migration with entrances above Powerhouse
  o Upstream Migration at right bank – Spillway Operation, Navigation Lock
  o Fish Friendly Turbine Technology with survival rates between 92% to 97%

• Same Functionality like Xayaburi
  o Simplified and optimized design
  o One (1) Auxiliary Powerhouse (3x20MW) instead of two Pumping Stations (not required)
  o No Fish Ladder needed due to reduced tailwater level fluctuations

• Experience with Fish Migration System in Xayaburi
  o Already in operation since several months
  o System works as expected from the very first day
FISH MIGRATION SYSTEM - VISUALISATION
Design and layout of the Navigation Lock follows the recommendations of the MRC Design Guidance. Same design as in Xayaburi which operates since more than 4 years safely.

All requirements have been addressed adequately in the Design.

An additional second Navigation Lock is indicated in the design documents.

**Salient Features**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Lock</td>
<td>2-step Navigation Lock</td>
</tr>
<tr>
<td>Design Vessel</td>
<td>2 x 500 DWT</td>
</tr>
<tr>
<td>Max. Passage Time</td>
<td>50 Minutes</td>
</tr>
<tr>
<td>Max. Lifting Height</td>
<td>35.50 m</td>
</tr>
<tr>
<td>Length / Width (chamber)</td>
<td>120 m / 12 m</td>
</tr>
<tr>
<td>Min. water depth</td>
<td>5 m</td>
</tr>
<tr>
<td>Standards used:</td>
<td>MRC Design Guidance</td>
</tr>
<tr>
<td></td>
<td>PIANC report n.o. 106</td>
</tr>
</tbody>
</table>
NAVIGATION DURING CONSTRUCTION

• Navigation Requirements
  o Up to 8000 m$^3$/s safe navigation in the main channel is possible

• Numerical Model
  o 2D numerical model to check the navigability and proved

• Conclusions
  o Outcrop removal to improve navigability
  o Support during construction
    o Tugging boat support will be provided (for smaller vessels or higher discharges)
    o Small boat transfer with overland trailer
SEDIMENT DEVELOPMENT IN THE LOWER MEKONG BASIN

- Sediment Data, all available data collected
- Impact of u/s Lancang Cascade,
  Reduction from about 110 million ton per year to about 20 to 24 million ton per year

Source: Compagnie Nationale du Rhône
The Sediment management is envisaged to route as much sediment (fine and suspension fractions) through the Low Level Outlets and the turbines.

The Low Level Outlets are the first gates to open beyond Mekong flow of 5,355 m3/s

This will avoid large sediment concentration flows downstream and negative environmental impacts

Maintain similar sediment concentration as in natural conditions

The exact geometry of the approach channel will be evaluated in the hydraulic model test currently ongoing
EXISTING INFRASTRUCTURE

The existing infrastructure has been checked, e.g. railway bridge
THANK YOU