



Sustaining GMS Cooperation in Cross Country Power Trade

RPTCC meeting – 27th August 2021



From the GMS Transmission Master Plan

Optimized interconnection capacity (GW) 2022 - 2032



- Total GMS = 12.4 GW

No.		TH-KH	LA-VN	LA-KH	LA-MM	KH-VN	MM-TH	CH-LA	CH-MM
1	Yangon area - Mae Moh						1.5		
2	Mawlamyine - Tha Tako						1.5		
3	Ban Soc/Ban Hatxan - Tay Ninh via Stung Treng			1.0		1.0			
4	Namo - Kenglatt - Tachileik - Kengtung				0.8				
5	Luang Prabang HPP - Sam Nua (Lao PDR-N) - Nho Quan		2.5						
6	Wangnoi - Banteay Mean Chey - Siem Reap - Kampong Cham	0.3							
7	Mae Khot TPP - Mae Chan						0.4		
8	Luang Prabang - Yunnan							0.65	
9	Mandalay - Yunnan								0.6
10	Kampong Cham - Tay Ninh					0.3			
11	Lower Se San 2 HPP - Pleiku					0.2			
12	Xekaman 4 HPP - Ban Soc/Ban Hatxan - Pleiku		1.0						
13	Savannakhet - Ha Tinh		0.6						
14	Nam Mo HPP - Ban Ve		0.1						
	Total	0.3	4.2	1.0	0.8	1.5	3.4	0.65	0.6

Potentially High Benefit Cross-border Interconnections



- Highest average benefit in all the medium demand growth scenarios

Index	From	To	Connection Points	Voltage	Type	Length	Capacity
				(kV)		(km)	(MW)
1	Myanmar	Thailand	Yangon area - Mae Moh	500	HVAC	350	1500
2	Myanmar	Thailand	Mawlamyine - Tha Tako	500	HVAC	300	1500
3	Lao	Viet Nam	Luang Prabang HPP - Sam Nua - Nho Quan	500	HVAC	400	2500
	PDR						
4	Cambodia	Viet Nam	Kampong Cham - Tay Ninh	500	HVAC	100	300
5	Myanmar	Thailand	Mae Khot TPP - Mae Chan	230	HVAC	115	370
6	Lao	Cambodia	Ban Soc/Ban Hatxan - Tay Ninh via Stung Treng	500	HVAC	320	1000
	PDR						
7	Lao	PRC	Luang Prabang - Yunnan	500	HVAC	350	650
	PDR						
8	Myanmar	PRC	Mandalay - Yunnan	500	HVAC	350	600
9	Lao PDR	Myanmar	Namo - Kenglatt – Tachileik – Kengtung	230	HVAC	230	800

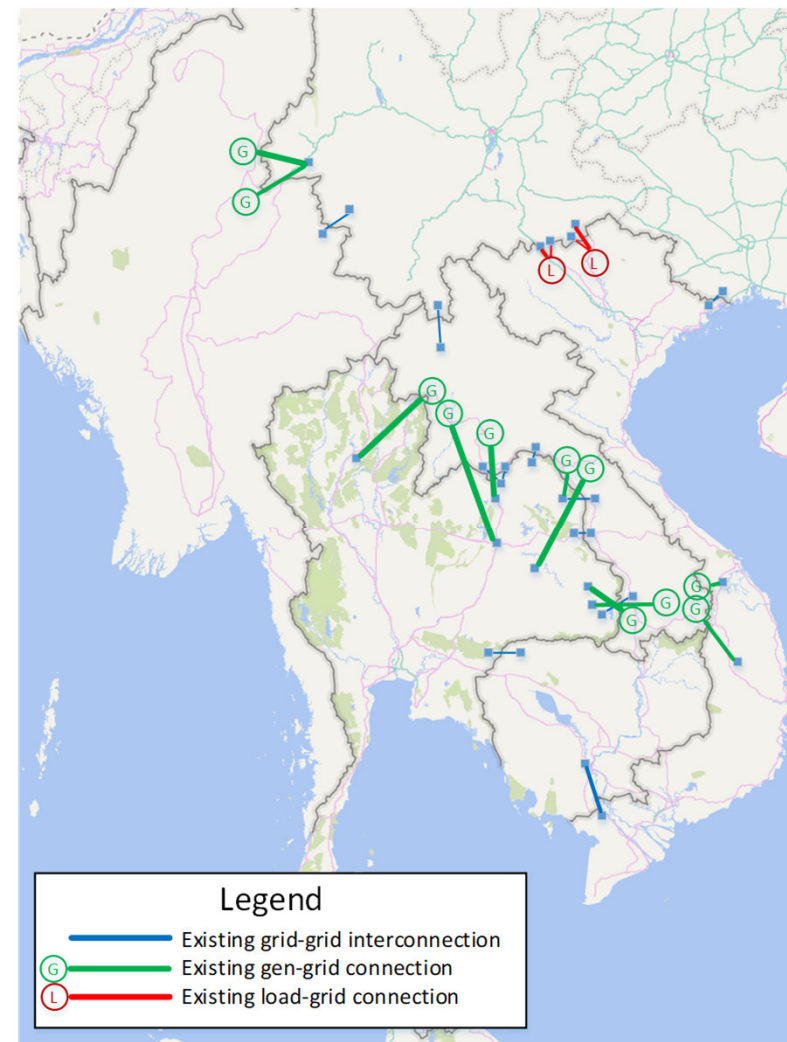
Synchronous grid-grid interconnection of GMS region

Current situation



- Number of grid to generation (G) or grid to load (L) connections
- Existing Cambodia-Vietnam synchronous interconnection (230 kV)
- Other medium voltage synchronous interconnections (shown in blue)
- Other low voltage (<35 kV) interconnections (not shown in the figure)

LV connections			
From	To	Voltage [kV]	Number
Lao PDR	Cambodia	22	2
Thailand	Cambodia	22	8
Lao PDR	Vietnam	22	6
Vietnam	Cambodia	22/35	18





GMS Cooperation – 3-country Power Trade Pilot Project

Proposition



WGPO proposed GMS regional grid codes; demonstrated regional economic benefits; and examined a number of interconnections

WGRI examined issues critical for multi-country power trade; proposed methodologies for addressing them

RPTCC to discuss and propose a pilot 3-county power trading

Identify practical problems and proposals for resolving them

Demonstrate GMS commitment to future GMS open power trade

Others

Discussion steps



The meeting discussed and adopt a 3-county pilot project (e.g., proposed Lao PDR – Thailand – Cambodia)

The meeting defines the indicative scope of the selected pilot project

The meeting defines the indicative timeline for the pilot project

The meeting empowers its WG to work on details of the pilot project

Discussion points



- Are there potentials for 3-country power trade:
 - Via 115 kV/110 kV ?
 - Via HV (230/220 or 500 kV) with HVDC ?
 - Via HV (230/220 or 500 kV) with HVAC ?
- Currently there are system to system interconnections at 110/115 level or below. Can we utilize them for higher volumes of power transmitting to the 3rd country?
- Currently 220 and 500 kV cross-border connections are from G to L. Can a topping up power in the intermediate country beneficial? technically possible?
- **What is a set of generic criteria for setting up a 3-country pilot?**
- **What should be the expectations for countries that engage in the pilot project?**
- **What are the expectations from the other GMS countries?**

Proposals



- Lao PDR – Thailand – Cambodia:
 - 115 kV
 - Laos exports power to Cambodia via Thailand system
- Lao PDR – Cambodia – Viet Nam
 - 220 kV
 - Lao PDR (and Cambodia) export power to Viet Nam
- PRC (Yunnan) – Lao PDR – Viet Nam
 - 500 kV
 - PRC (Yunnan) (and Lao PDR) export power to Viet Nam
- Any other?



Proposed 3-country Pilot Project:

Lao PDR – Thailand – Cambodia

Proposed pilot project: Lao PDR – Thailand – Cambodia



- Consider utilizing the **existing 115kV interconnections**
- Achieving an **additional power transfer** between Lao PDR and Cambodia via Thailand to meet demand in Northwest Cambodia
- **Lao PDR:** trading marginal power with Cambodia and understanding related technical, commercial implications to make this a real trade possible
- **Thailand:** impact of an additional power wheeling through its transmission network and related technical, commercial implications
- **Cambodia:** a practical demonstration of how increased power imports from Lao PDR could be achieved in the short-term over existing interconnectors, using “opportunistic” trading
- **All 3 countries:** practical solutions to the challenges of using/giving access to cross-border transmission assets; implications on application of codes, regulation of cross-border trade by regional and national regulatory authorities.

Defining the trade example Laos to Cambodia via Thailand

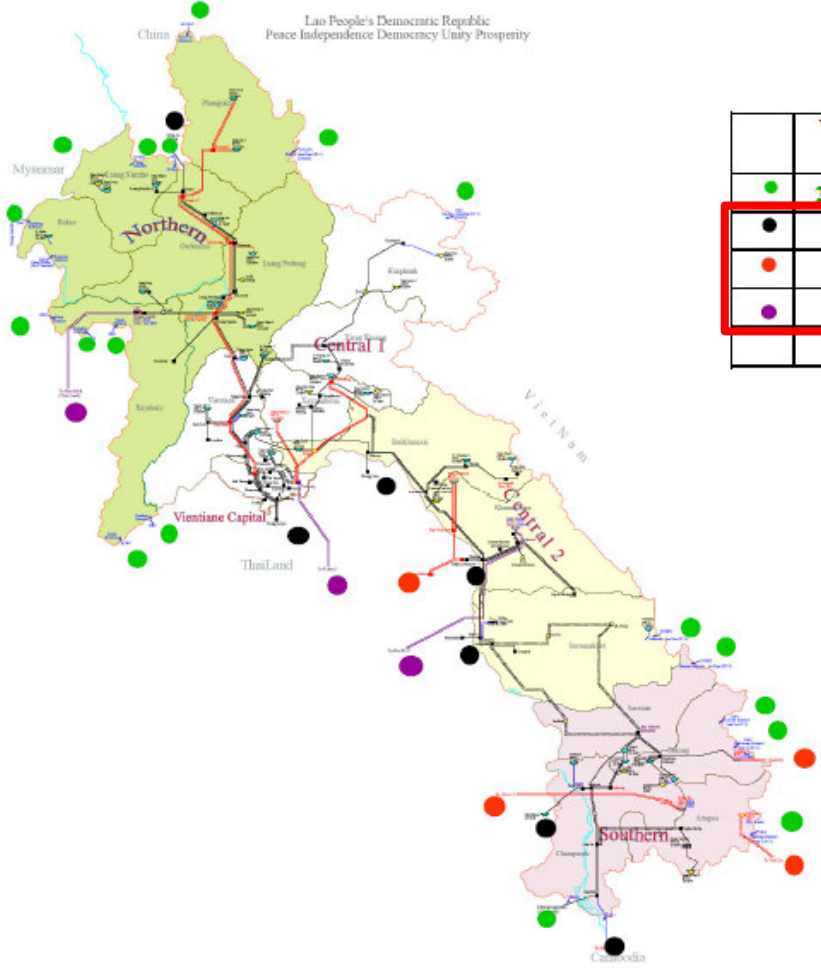


1. Review with Lao PDR (EDL) which power plants are connected to the interconnection points with EGAT
2. Is the new trade a long-term bilateral contract or a short-term, “opportunistic” trade?
 - Decide whether short-term trading arrangements would be needed as per TA8830 proposals, and if so, propose minimum requirements to make pilot trade possible
 - Define contractual basis for the new trade – long-term/short-term PPA
3. Identify potential trade capacity (MW) and timeframes of delivery (daily/seasonal patterns) that could influence power flows
4. Discuss the current PPA arrangements (noting any confidentiality constraints) to check which PPAs and which plants could sell additional capacity
5. Discuss plans for additional IPPs and likely connection points
6. Discuss physical trade with Cambodia (EDC) to agree capacity and exit point into EDC network
7. **Agree key characteristics of proposed power sale to model**
 - capacity/energy profile
 - grid entry point into EGAT system
 - **grid exit point into EDC system**

Lao PDR – Thailand interconnections – RPTCC 26 relevant for Lao-Thailand-Cambodia Interconnection

1. Present Status

- Existing Grid System and cross – border interconnection



	Voltage Level	EDC	EVN	CSG	Myanmar	Thailand		Total
						EGAT	PEA	
●	22/35 kV	1	7	3	1		6	18
●	115 kV	1		1		5		7
●	230 kV		2			2		4
●	500 kV					3		3
	Total	2	9	4	1	10	6	32

Remarks:

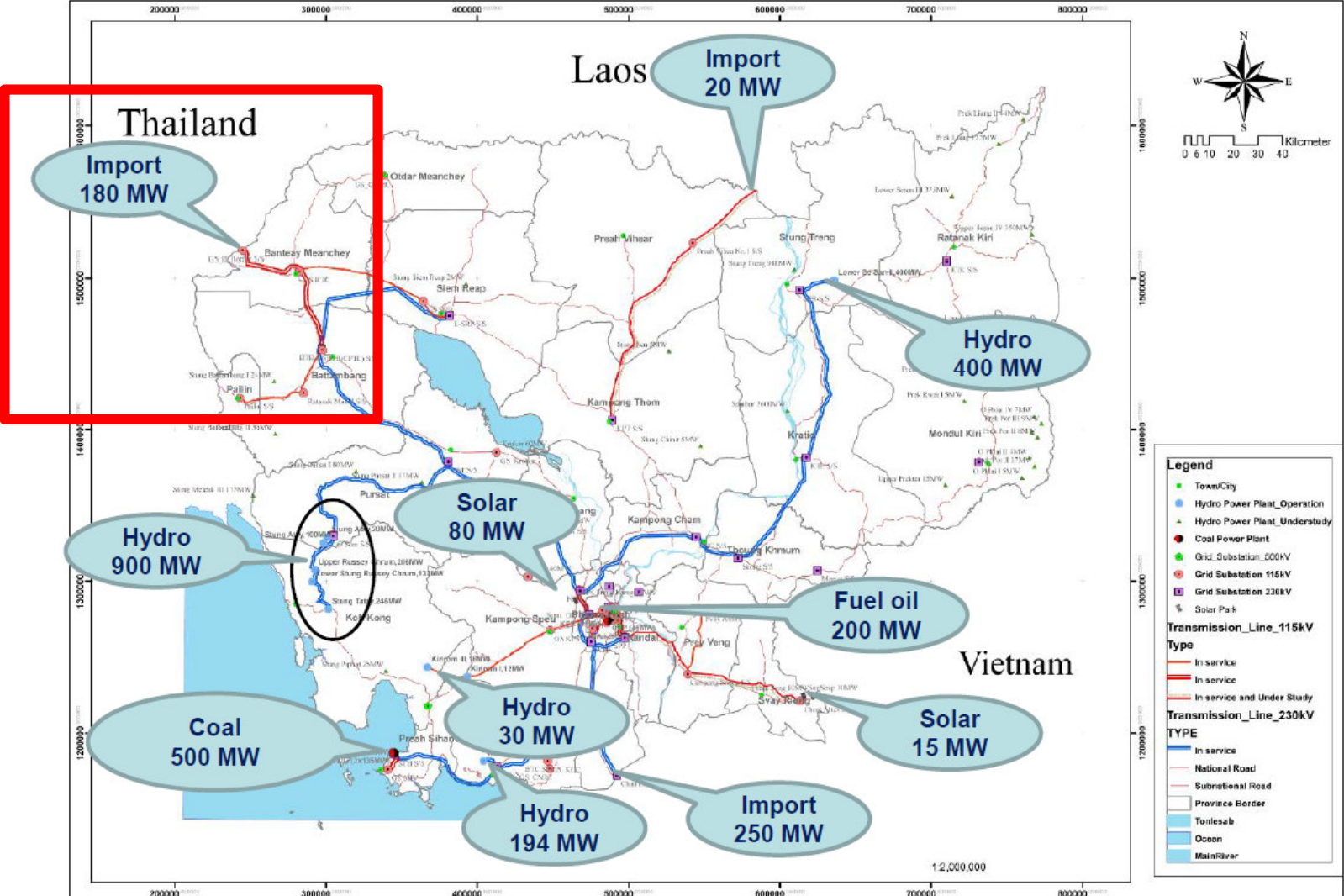
- 22/35kV – Import
- 115kV – Exchange
- 230kV – Purely Export
- 500kV – Purely Export

Legend :

115 kV	
230 kV	
500 kV	

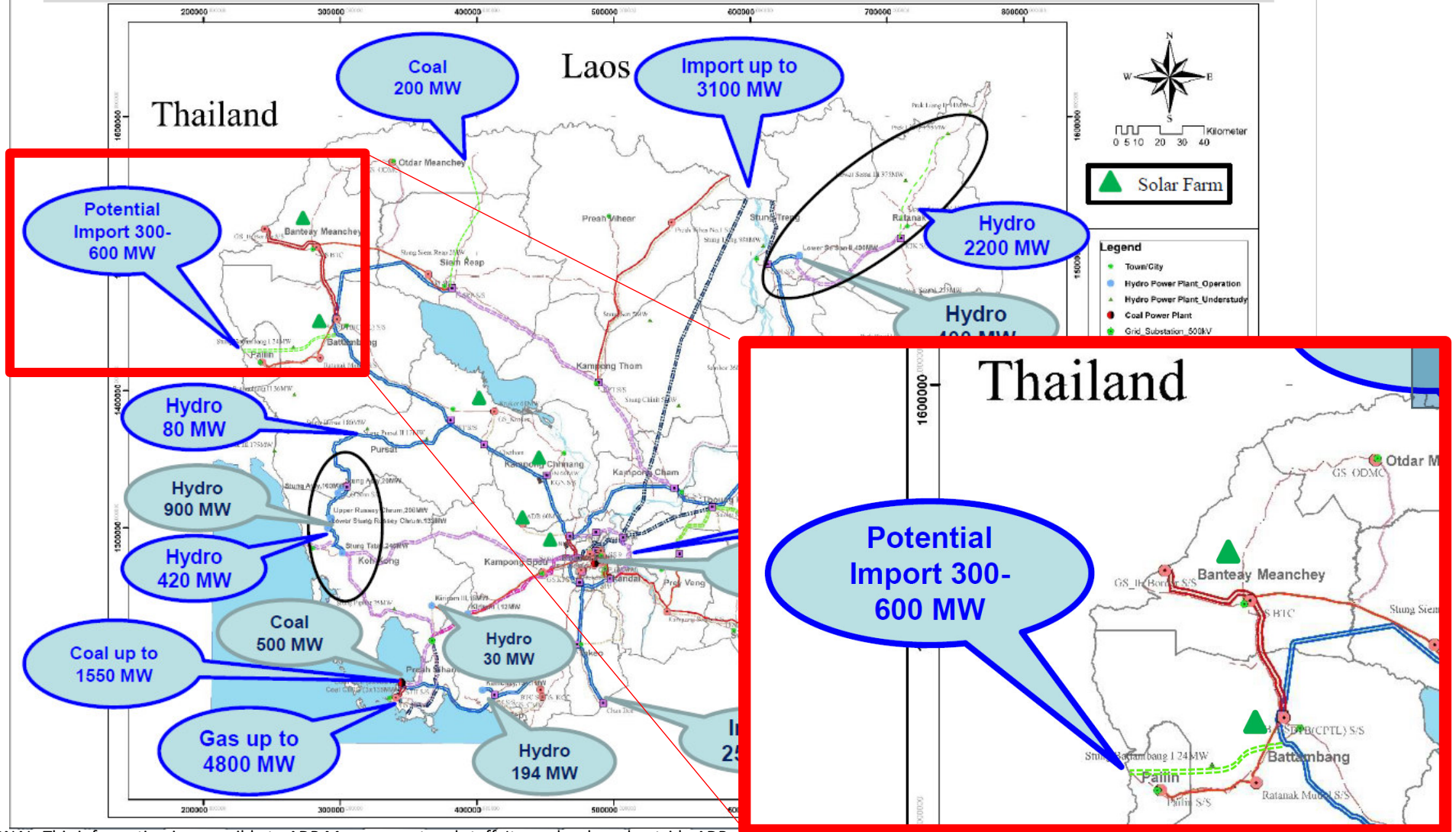


Actual Generation Power Transmission



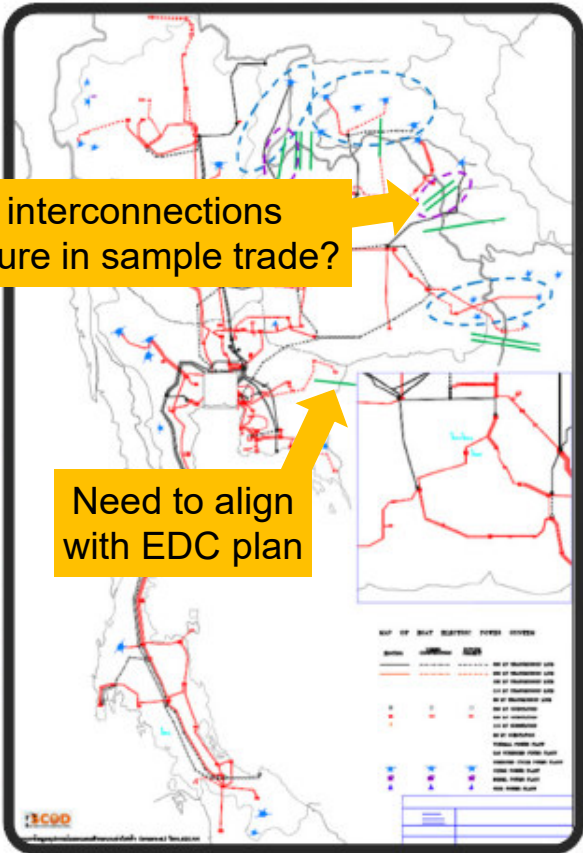


Generation and Power Transmission Plan up to 2030





Foreign Generation, Interconnection & Transmission Plan



	FIPP	Contract Capacity (MW)	Interconnection	Circuits	Complete
FIPP	Xe-Pain Xe-Namnoy	390	230 kV Ubon Ratchathani 3 - Xe-Pain Xe-Namnoy	2	6 DEC 2019
	Nam Theun1	523	500 kV Udon Thani 3 – Nabong (existing)	2	23 MAY 2022
	Nam Ngum3	440	500 kV Udon Thani 3 – Nabong (existing)	2	DEC 2026
Interconnection	EDL		115 kV Nakhon Phanom – Thakhek *	2	Waiting for Laos
	EDL		115 kV Sirindhorn 2 - Bangyo	2	JUN 2020
	EDL		115 kV Thali - Paklai	1	JAN 2021

	Future 500 kV Transmission Line	Circuits	Complete
North-Eastern Area	500 kV Chaiphaphum 2 - Roi Et 2	2	DEC 2019
	500 kV Roi Et 2 - Ubon Ratchathani 3	2	MAR 2020
	500 kV Nakhon Ratchasima 3 - Ubon Ratchathani 3	2	SEP 2023
	500 kV Nakhon Ratchasima 3 - Chaiphaphum 2	2	SEP 2023
Metropolitan Area	500 kV Nakhon Ratchasima 3 - Khlong Mai	2	OCT 2023
	500 kV Tha Tako - Sam Khok	2	OCT 2022
Southern Area	500 kV Chom Bung - Bang Saphan 2	2	SEP 2021
	500 kV Bang Saphan 2 - Surat Thani 2	2	SEP 2021
	500 kV Surat Thani 2 - Puket 3	2	SEP 2021
	500 kV Surat Thani 2 - Thung Song	2	DEC 2022
	500 kV Thung Song - Hat Yai 3	2	DEC 2022

Expected results of the analysis



- **A defined [100MW] trade** between Lao PDR and Cambodia
 - Seasonal/monthly/weekly/daily characteristics
 - Contractual basis for the trade
 - A methodology for establishing the trade as a long-term or short-term option
- **Wheeling revenue for EGAT** arising from the trade
 - Based on load flow analysis
 - Taking account of existing system load conditions
 - Defining the share of network costs attributable to the wheeling trade
- **A wheeling charge for the trade**
 - Defined as USD/MW of capacity
 - Converted to an indicative energy charge based on trade characteristics, for conversion to a tariff
 - Recommended balance between Generation and Demand charges
- **Licence and regulatory changes** needed to make the trade possible
 - Including revisions to PPAs where appropriate
- **Recommendations for the Regional Grid Code**
 - Specifically the parts of the code associated with electricity trading



THANK YOU VERY MUCH