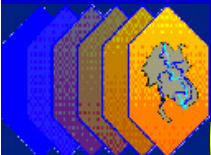


Regional Consultation on MRC Hydropower Program

# GMS Regional Electricity Market and Hydropower Development

Yongping Zhai  
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Southeast Asia Department, ADB

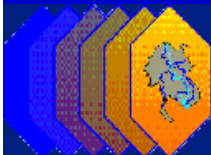
25 September 2008  
Vientiane, Lao PDR



ADB

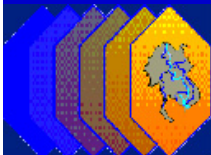
# GMS: Net Importer of Energy

- The region is a net importer of crude oil with imports amounting to nearly 20% of crude oil and 47% of petroleum products as the region does not have adequate refining capacity. In 2005, 23% of the total energy consumption of the region was imported.
- Thailand is the largest importer of energy and has to import nearly 40% of its energy in the form of electricity, natural gas and oil products. Cambodia, Lao PDR and Viet Nam import 100% of their transport and other petroleum-based fuels. The Guangxi and Yunnan provinces also have to import refined products from other areas of PRC.
- Myanmar and Viet Nam are net exporters of energy at present, but given the rapid demand growth, the region is likely to remain heavily dependent on imported fossil fuels in the medium term



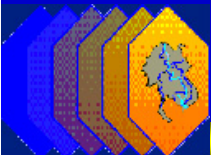
# Energy Demand Growth in GMS

- The GMS economies' rapid economic growth since the 1990s (averaging 7%) has stimulated a significant rise in energy demand. The overall growth in electricity consumption in the GMS region during 1990-2006, averaged at 9.8% per annum, slightly faster than the growth rate in electricity production.
- In the next decade, the demand for energy at national levels is expected to continue to rise between 7% and 16% per annum or at rates much faster than projected growth of economic activities.



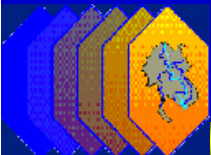
## Benefits of Regional Power Market

- provide energy security and regional stability,
- help efficiently utilize the subregion's energy potential by reducing investments in power reserves to meet peak demand, reduce operational costs, achieve more reliable supply, and reduce system losses,
- achieve environment benefits by substituting hydropower for coal and other fossil fuels, and
- allow countries with energy surplus can also benefit by servicing their deficit areas more efficiently with power imports from other grids.



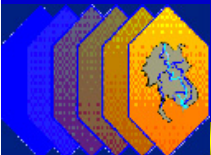
# Developing the GMS Power Trade A Two-Pronged Approach

1. **Providing the Policy and Institutional Framework** for increasing cooperation in power trade
2. **Developing the Grid Interconnection Infrastructure** through a building block approach allowing cross-border dispatch of power



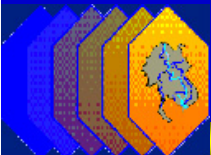
## Institutional Development for Regional Power Market

- Experts Group on Power Interconnection and Trade (EGP) Meetings. The EGP was created in June 1998 to develop detailed work programs and recommend its findings to the EPF to promote the development of the regional transmission network and facilitate the expansion of cross-border power trade.
- In 2002, at the first GMS summit, the Inter-Governmental Agreement on Regional Power Trade was signed by the leaders of six GMS countries. A Regional Power Trade Coordination Committee (RPTCC) tasked with coordinating and implementing activities was created in 2002 consisting of representatives from power utilities and energy ministries in each GMS country:
  - Focal Group (FG) of RPTCC tasked with coordinating priority RPTCC activities in each country
  - Planning Working Group (PWG), tasked to undertake planning and system operation studies that would help the GMS countries move towards common power trading guidelines.



# ADB Assistance to RPTCC

- TA5920-REG: Regional Indicative Master Plan on Power Interconnection in the Greater Mekong Subregion (2000)
- TA 6100-REG: Study for a Regional Power Trade Operating Agreement in GMS (2003)
- TA 6304-REG: GMS Power Trade Coordination and Development (2006)
- TA 6440-REG: Facilitating Regional Power Trading and Environmentally Sustainable Development of Electricity Infrastructure in the Greater Mekong Subregion (2008)

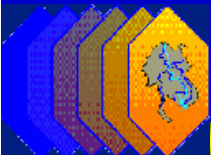


## Existing Power Trading in GMS

- Power trading in the GMS started in 1971 with Lao PDR's power export from its Nam Ngum hydropower plant to the northeastern portion of Thailand.

(The European power integration started in 1920 to take advantage of hydropower potential in Switzerland)

- Modest cross-border exchanges have been engaged in by the GMS countries which resulted in the electrification of remote areas of one country from the nearby system of another.
- Bilateral agreements, one way power flow





*Some bilateral  
power trade  
arrangements*



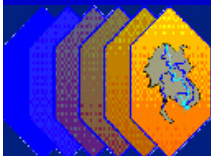
## Present Power Trade Medium and High Voltage

- Hydropower export/import Laos/ Thailand (150 MW Nam Ngum 1, 40 MW Xeset)
- Hydropower exports from Laos to Thailand (e.g. 210 MW Theun Hinboun, 150 MW Houay Ho) at 220 kV
- Various border power trade between countries:
- Malaysia-Thailand (200 MW dc),
- Thailand-Laos (22 kV, 150 kV)
- Laos-Viet Nam (22 kV)
- Laos-Cambodia (150 kV ongoing);
- Viet Nam - PRC (220 kV)

## ADB financed Regional Power Projects in GMS

Country	Project Name	Year of Approval	Approved Amount (\$ million)
LAO	Theun-Hinboun Hydropower Project	1994	270.0
LAO	Nam Leuk Hydropower Development	1996	112.6
CAM	Cambodia: GMS Transmission Project	2003	95.0
LAO	Nam Theun 2 Hydroelectric Project	2005	1,250.0

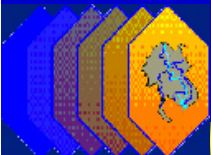
CAM = Cambodia, GMS = Greater Mekong Subregion, LAO = Lao People's Democratic Republic.  
Source: Asian Development Bank Database.



# Roadmap for Cross Border Power Trading

## Stage 1

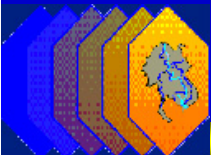
- Stage 1 corresponds to the initial period when only country-to-country power transactions are possible, before a regional transmission network is established to enable power trading between any pair of member countries. During this period, the existing cross border transmission lines are mostly associated with Power Purchase Agreements (PPAs) between a power utility and Independent Power Producer (IPP) located in one GMS country selling power to a power utility in another GMS country.



# Roadmap for Cross Border Power Trading

## Stage 2

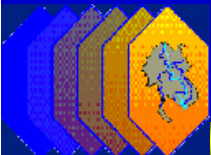
- Stage 2 corresponds to the moment when trading will be possible between any pair of GMS countries, eventually using transmission facilities of a third regional country. However in this stage the available cross border transmission capacity is limited and based on surplus capacity of lines linked to PPAs.



# Roadmap for Cross Border Power Trading

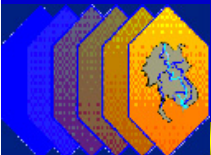
## Stage 3

- Stage 3 will be linked to the development of transmission links specifically dedicated to cross border trading. During this Stage some GMS countries may have completed a transition to competitive markets, where multiple buyers-sellers are allowed to enter in cross border transactions. The regulatory framework will allow the simultaneous existence of countries with multiple sellers-buyers with others with integrated utilities.



# Roadmap for Cross Border Power Trading Stage 4

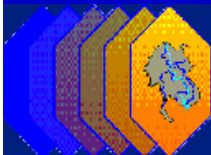
- Stage 4 corresponds to the situation when most of GMS countries have moved to a multiple sellers-buyers regulatory frameworks, so a regional wholly competitive market can be implemented.





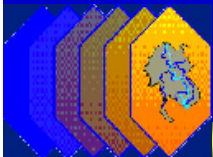
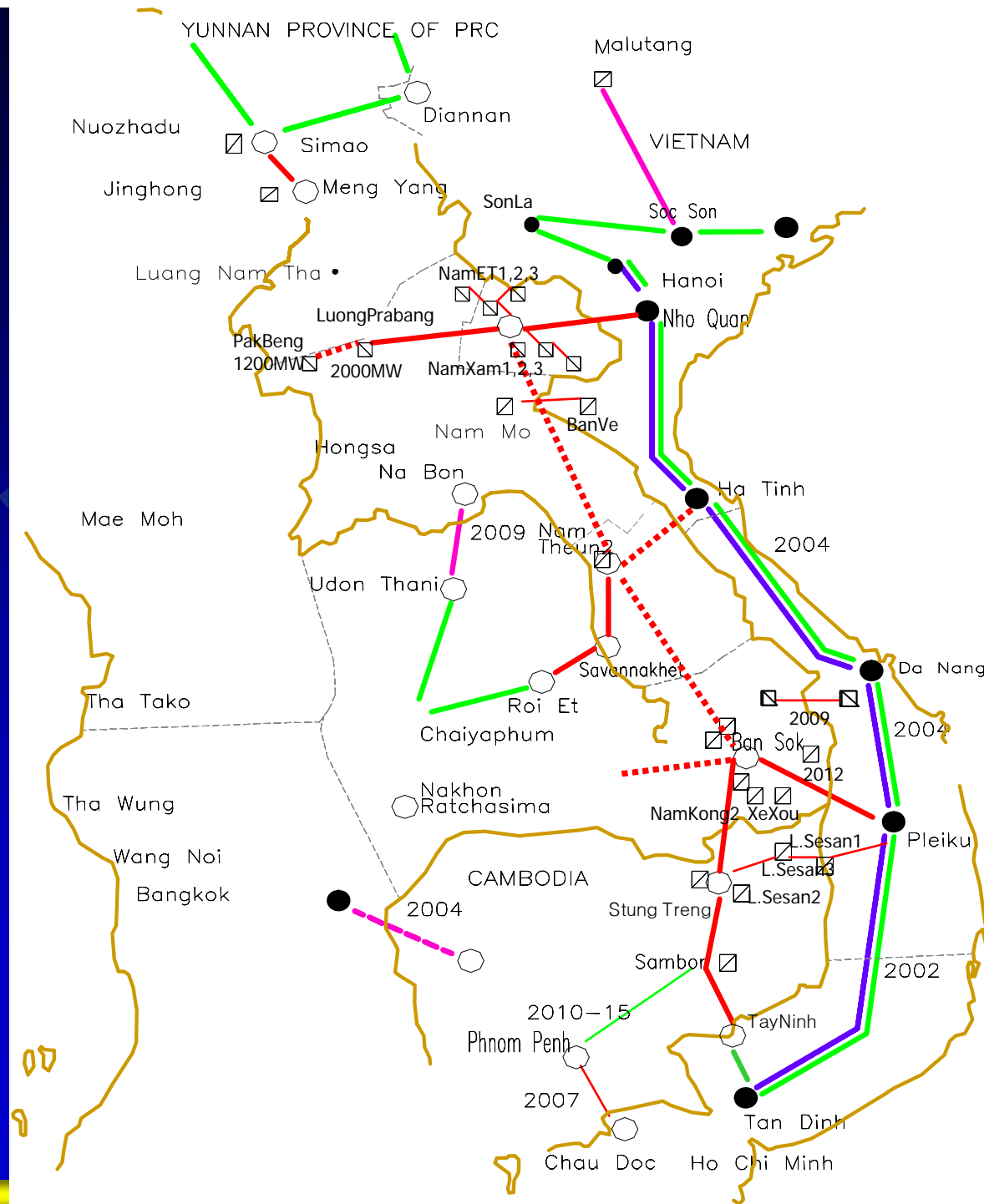
# On-going Activities under Stage 1

- Complete the study on a GMS Performance Standards for (i) new regional interconnections and for the synchronized operation of interconnected grids, and (ii) the transitional arrangements to achieve the GMS Performance Standards by 2010.
- Complete the study on Transmission Regulations to coordinate the operation and power flow control in grid-to-grid interconnections synchronization and operation by 2010.
- Complete the indicative power interconnection master plan by 2008 and select priority new interconnection projects for undertaking feasibility studies by 2009.
- Complete the study on standard regional metering arrangements and communications system in grid-to-grid interconnections for implementation during Stage 1 by 2010.
- Complete the study on power trade rules, including resolution mechanisms for disputes outside the existing PPAs by 2010 for implementation during Stage 1.









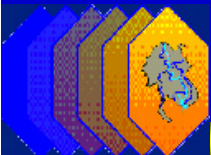
# Ban Sok - Pleiku Project

## Project description:

- South Lao PDR: Dak Emeule (138MW) Sekong 3A&3B(152+96MW); Sekong 5(253MW); Sekong 4(440MW); Xe Kaman 1 (468MW); Nam Kong 1(240MW)
- All hydropower schemes to be exported through common transmission facilities (one single transmission line 500kV) from Ban Sok 500/230kV substation in Lao to Pleiku substation in Vietnam.

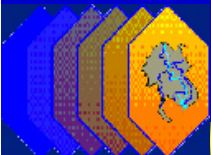
## Status:

- ADB PPTA under processing. Ensuing Loans expected in 2010.



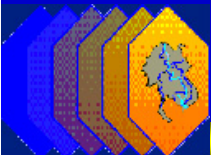
# The Na Bon – Udon Thani Project

- Four Hydropower projects in Lao PDR exporting to Thailand through a single common transmission facilities (Nam Ngum 2, Nam Ngum 3, Nam Ngiep 1 and Nam Theun 1).
- 500kV transmission line being constructed by the Nam Ngum 2 developer.
- ADB proposed assistance to finance the construction of Na bong substation and to refinance the transmission line.
- Status: PPTA ongoing. Ensuing loan financing in 2009



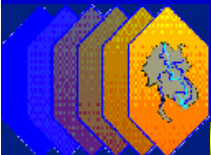
# Conclusions

- GMS countries are characterized by uneven load demand and quite different resource bases
  - biggest hydropower resources are in Myanmar, Laos and also in Viet Nam.
  - Thailand has limited mineral as well as hydropower resources.
  - Cambodia has diverse resources including hydropower and natural gas but yet to fully develop.



# Conclusions

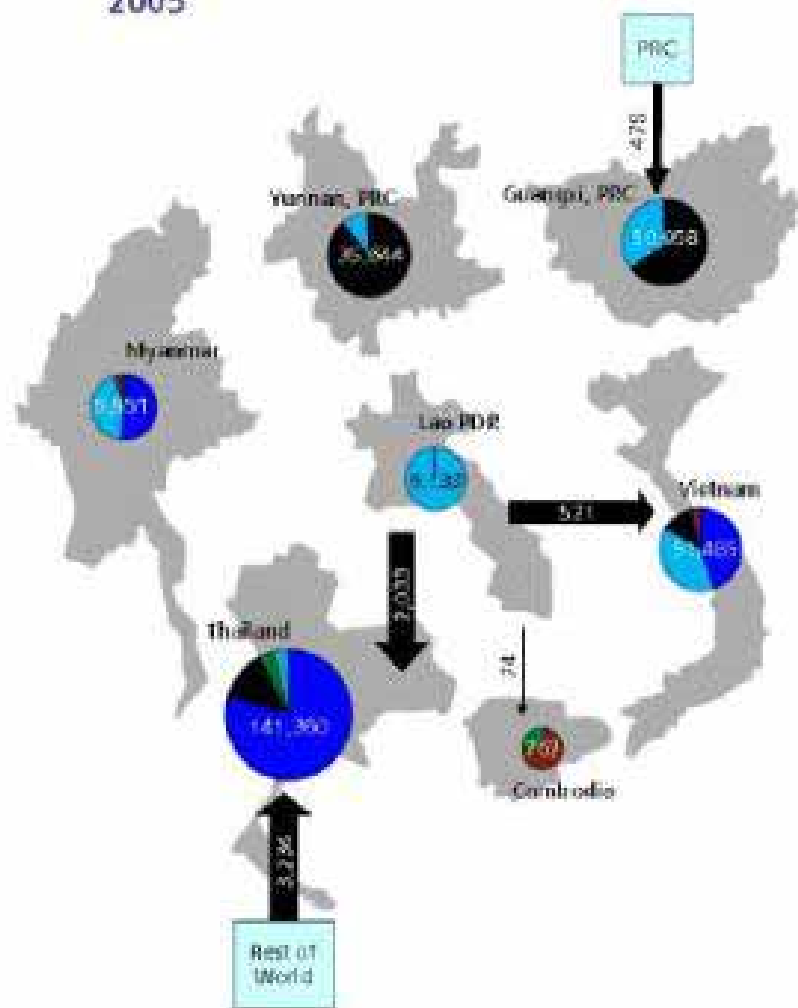
- Hydro power resources justify GMS power market ;
- Power market will promote hydropower development in GMS
- Optimize investments in power reserves to meet peak demand
- Reduce greenhouse gas emission and pollutants
- Increase consumer access to the cheapest power sources available



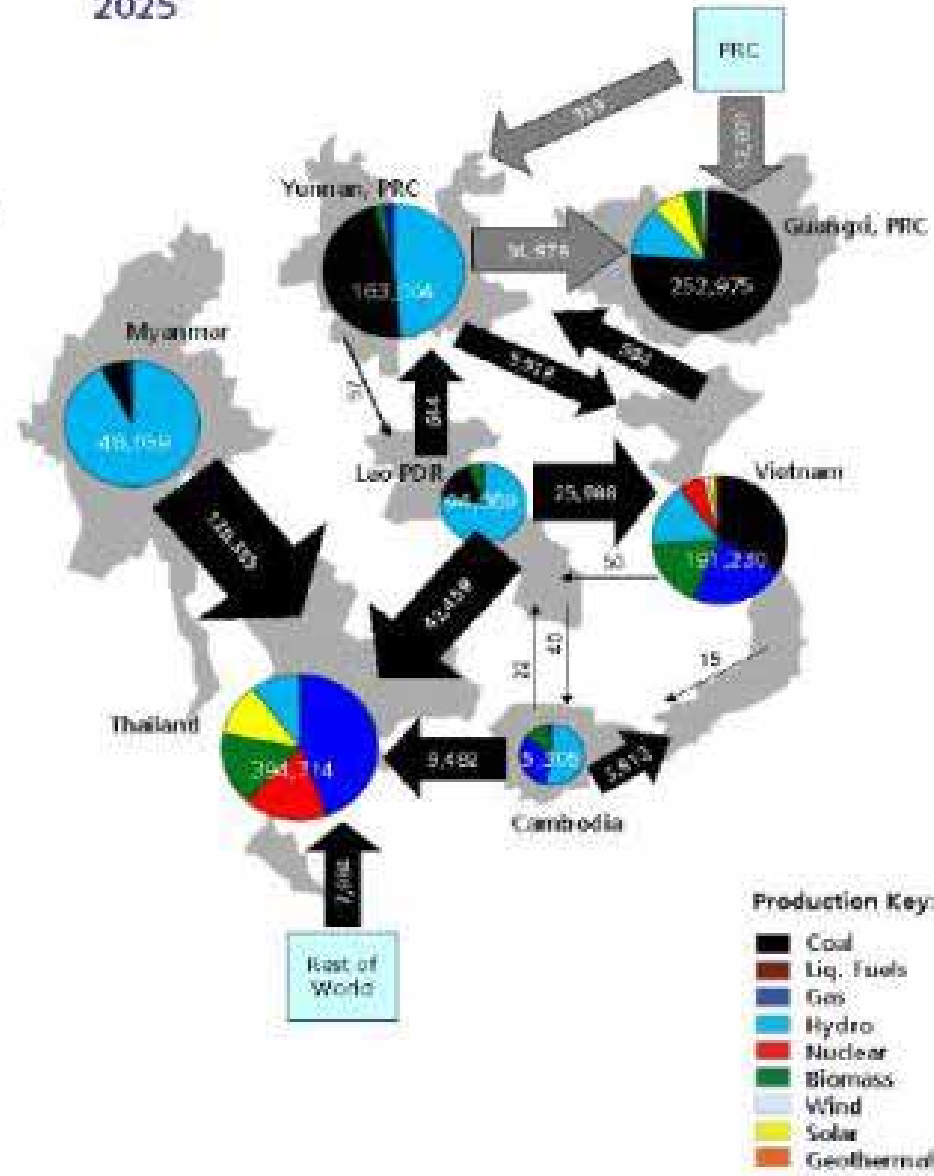




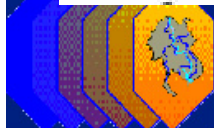
2005



2025



- Production Key:
- Coal
  - Liq. Fuels
  - Gas
  - Hydro
  - Nuclear
  - Biomass
  - Wind
  - Solar
  - Geothermal



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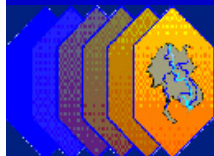
# Thank you

For ADB

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For the GMS

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