

MEKONG POWER SHIFT:

Emerging Trends in the GMS Power Sector

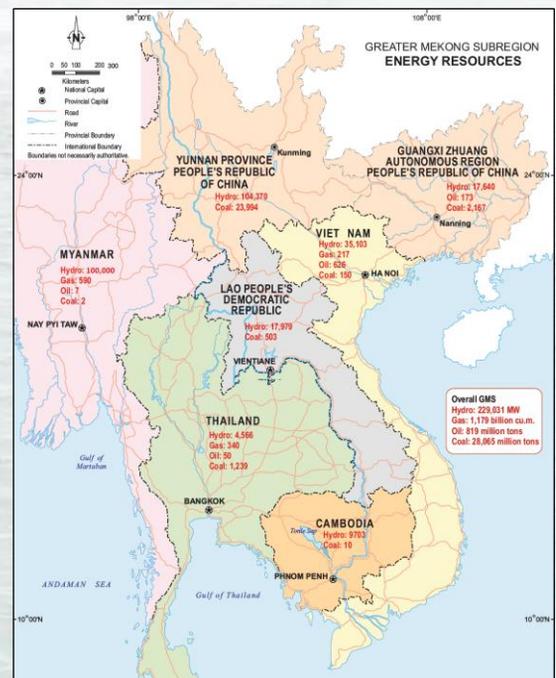


Courtney Weatherby and Brian Eyler
Press Club, Hanoi, Vietnam
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Emerging Trends

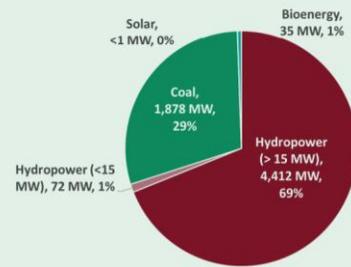
- GMS countries which once were net power importers or power neutral will likely shift to net-exporters as they significantly increase domestic capacity.
- Price of non-hydropower renewables is globally dropping more quickly than anticipated, making these sources of power generation competitive with traditional resources like large-scale hydropower and fossil fuels.
- Fossil fuel and hydropower externalities such as air pollution, climate change effects, and a range of social impacts produce political pressure, increasingly forcing changes in the type, location, and size of new power plants.
- Innovations in energy transmission and distributed grid structures are disrupting traditional infrastructure and utilities models, both globally and in the GMS



Energy Profile: Laos

- Aims to become the “Battery of Southeast Asia” through the export of electricity to neighboring markets
- Installed capacity 2016: 6,260 MW
- Potential resources: 18 GW of hydropower, 8.8 GW of solar, 2.8 of wind, as well as some coal and geothermal reserves
- 140 plus proposed dams in the Mekong Basin
- Most projects are Build-Own-Operate-Transfer (BOOT) from foreign investors

Lao PDR On-Grid Electricity Production by Type in 2015



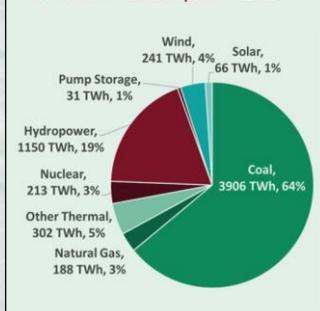
SUMMARY DATA FOR LAO DAMS >15 MW

STATUS	NUMBER OF PROJECTS	TOTAL CAPACITY (MW)	PERCENT OF TOTAL DAMS
Completed	29	3328.95	14.51%
Currently under construction	26	4145	18.07%
To begin construction prior 2020	9	1487	6.48%
To begin construction after 2020	24	3816.9	16.64%
Feasibility study approved	13	1973.9	8.60%
Under feasibility study	39	8192	35.70%
TOTAL	140	22943.75	100.00%

Energy Profile: China

- Total Installed Capacity 2016: 1,646 GW
- Energy consumption doubles by 2040
- Slowing economic growth and reduced energy intensity
- 13th Five Year Plan: Reduce coal to <60% by 2020
- Yunnan’s excess hydropower: 95 TWh

China Power Consumption in 2016



Myanmar's Installed Capacity in 2030 by Scenario



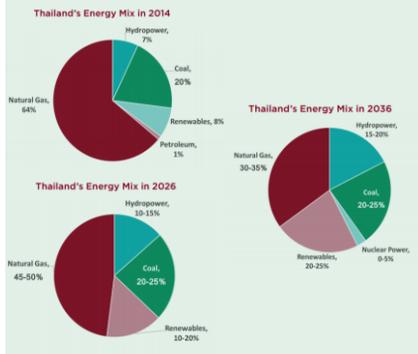
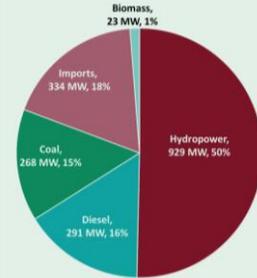
- Lowest electrification rate in region, with most relying on fuelwood for energy
- Low starting point (4,422 MW), but significant potential:
- Annual demand of 15% 2009 – 2014
- Potential to become net exporter down the road

Energy Profile: Myanmar

Energy Profile: Cambodia

- Lowest Installed Capacity in region: 1,511 MW in 2016
- High electricity prices: US \$0.24 in urban areas, up to \$.80 in rural areas
- Potential energy resources:
- Like Laos, dependent on BOOT model
- Long-term potential to export excess capacity during wet season

Cambodia Energy Mix in 2014



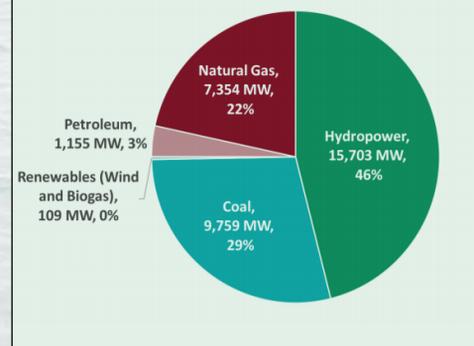
- Current installed capacity: 37,612 MW
- Likely to double through 2036
- Future energy plans characterized by diversification away from natural gas
- Unusually high reserve capacity
- Significant energy efficiency implementation opportunities

Energy Profile: Thailand

Energy Profile: Vietnam

- Current Installed Capacity: 33,964 MW
- Sustained high annual energy demand growth: 10-12% through 2015, with estimated demand between a high of 11% and a low of 7.5% through 2030
- As a result, installed capacity estimated to reach 129,500 MW in 2030
- Energy mix and ability to meet demand growth differ by location
 - North Vietnam: excess capacity, largely in coal
 - Central Vietnam: hydropower focus
 - South Vietnam: natural gas driven, faces significant gap through mid-2020s

Installed Capacity in Vietnam by Type (2014)



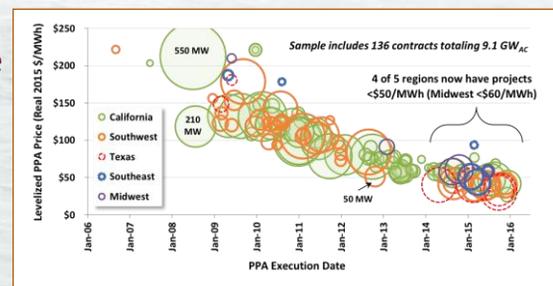
Challenges and Opportunities for Vietnam?

- Major trends in energy mix:
 - Diversification
 - Significant addition of thermal coal capacity
 - Significant growth in renewables
- Nuclear power projects are now suspended—what will replace them?
- MOU for power purchase from Laos is higher than planned imports in PDP VII
- Opportunity to be more ambitious on non-hydropower RE targets both domestically and import from Laos



Global Price Drop of Renewable Technologies

- Between 2009 and 2016, prices dropped more than 80% for solar and 60% for wind
 - 2015-16 drops in global price of commercial-scale solar (13%) and wind (10.75%)
- Factors:
 - Economies of scale
 - Overcapacity in solar panel and inverter production in China
 - Improvements in system installation and design
 - Supportive government policy
 - Development of alternative financing options
- Result: Renewable technologies are now competitive on an economic basis in many countries



Current Price of Electricity (c/kWh) by Energy Source in Vietnam

Solar	9.1 c/kWh	↓
Wind	7.8 c/kWh	↓
Coal	5-6 c/kWh	↑
Imports	6-7 c/kWh	↑
Hydropower	4 c/kWh	

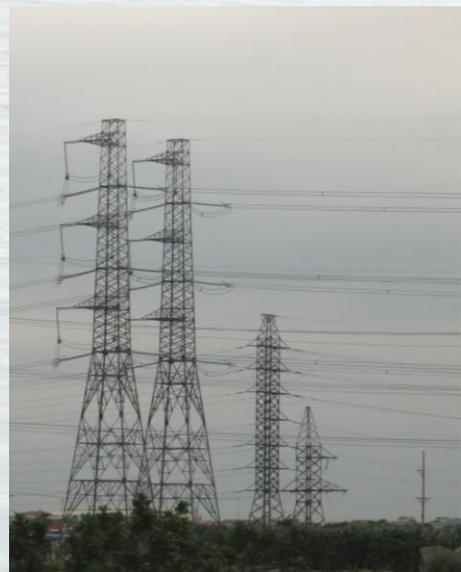


Environmental Movement

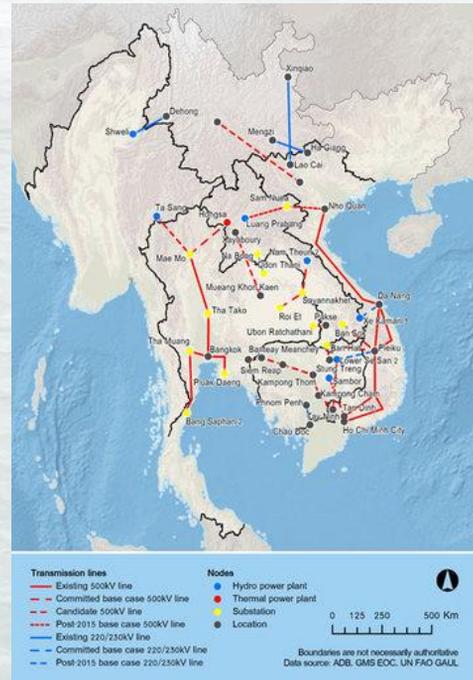
- Protests against unpopular coal and hydropower plants are common throughout the GMS
- Public pushback has directly influenced policy change at the top level:
 - Updated and strengthened Environmental Impact Assessment laws
 - Suspended projects in Myanmar, Cambodia, and Thailand
 - Environmental Code in Cambodia
- Pressure to address climate change, carbon emissions, and air pollution now coming from domestic interest groups as well as international community

Regional Power Trade: A new energy interdependence paradigm

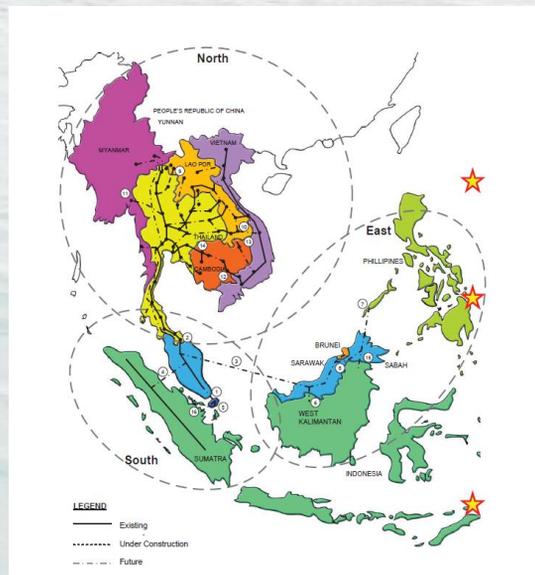
- 1) Reduce national power reserves
- 2) Create a level playing field for electricity prices throughout the region
- 3) Better linkages between power rich regions to load centers
- 4) Decrease GMS carbon footprint
- 5) Build flexibility for the future



- **Laos**
 - Substitute damaging hydropower with non-hydro renewables
 - Landlinked – earn income from wheeling power to and from neighbors
- **China**
 - Sell excess capacity in the short term to GMS
 - Alleviate hydropower buildout in downstream countries
- **Myanmar**
 - Short-term purchase power from China
 - Long-term transition into exporter to Southeast and South Asia
- **Vietnam**
 - Buy more power from Laos and Cambodia for sustainability gains
 - Push for regional power pool to access China's power
- **Cambodia**
 - Similar to Myanmar – transition to solar net exporter
- **Thailand**
 - Purchase non-hydropower renewables to drop reserve



Regional Power Trade Modalities



Recommendations

- Multilateral Development Banks (MDBs) such as the Asian Development Bank, Asian Infrastructure Investment Bank, and/or World Bank should finance a GMS Sustainable Infrastructure Preparatory Facility with funding to provide upstream, master-planning support that enables alternative power mix scenario analyses and system-scale planning.
- Thailand and Vietnam should both consider climate change emissions and sustainability of energy source when signing power purchase agreements to import electricity from neighbor countries.
- Stakeholders who impact regional energy discourse--particularly technical advisors, academic experts, and the private sector—should explore benefits of a regional energy grid in terms of energy security through energy interdependence.

