

ERI-PARI Joint Workshop

ASEAN Connectivity: Power Integration between Thailand and Myanmar

4 April, 2014

SEA Energy Outlook and Perspectives on Bilateral Cooperation

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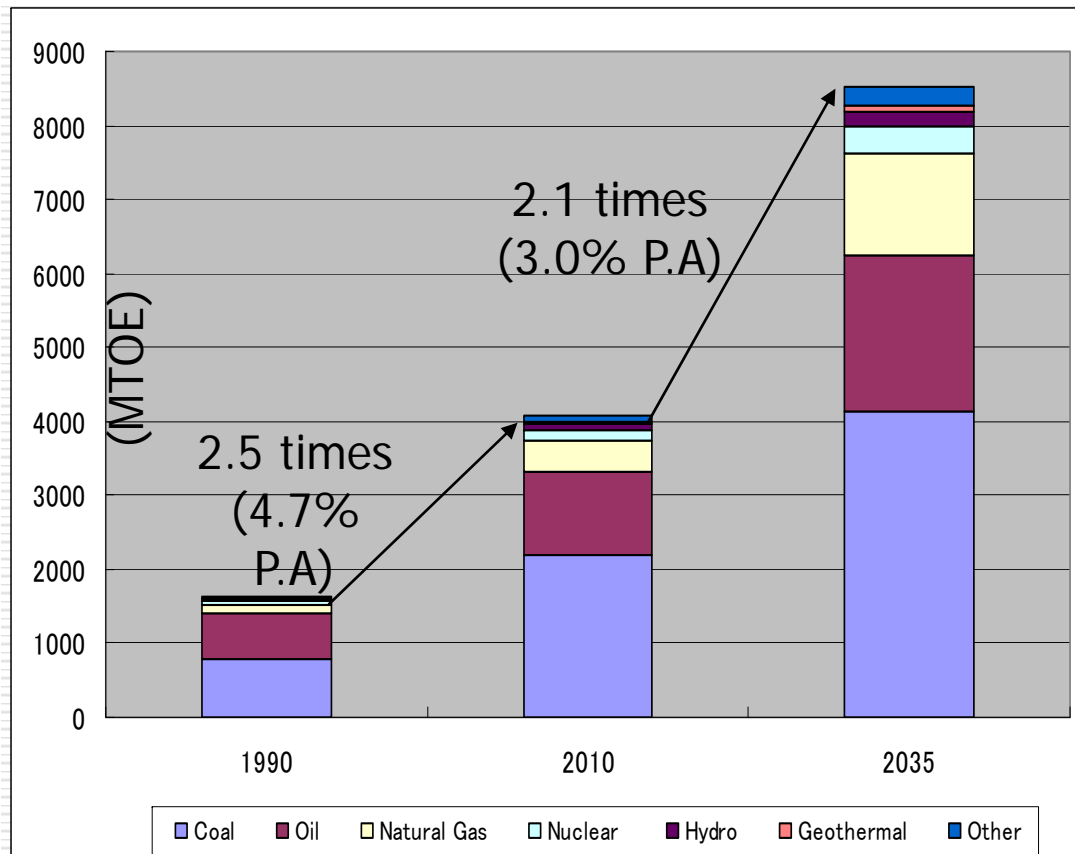
Outline

- Current situation of Energy use in SEA region (and outlook in 2035)
- Experiences of Bilateral Cooperation - Power Integration (Thai- Laos Energy Cooperation)
- Barriers and Opportunities for Power Integration (across and within borders)

SEA: The energy context

- Southeast Asia has emerged as a key player in the global energy system
 - *growing thirst for energy driven by sustained economic & social development*
- Diverse set of countries with vast differences in patterns of energy use
- Many of the individual countries increasingly reliant on energy imports
 - *although region as a whole is rich in energy resources*
- Fundamentals suggest energy needs will continue to grow
 - *economy to triple by 2035, despite some headwinds at present*
 - *population of 600 million to expand by almost one-quarter by 2035*
 - *per-capita energy use is still low & 134 million people lack access to electricity*

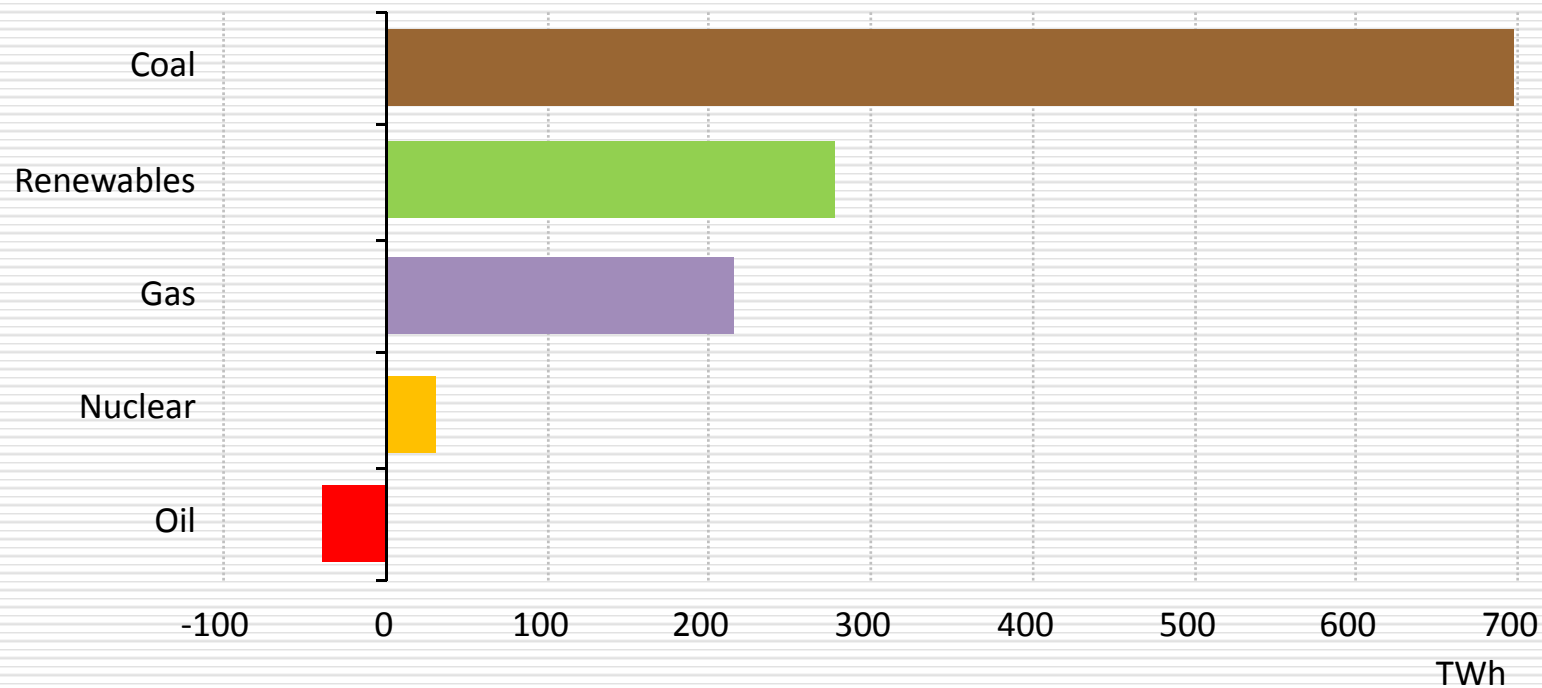
Energy Outlook for EAS



- GDP per capita will increase from US\$3,500 in 2010 to US\$8,200 in 2035
- TPES will increase 2.1 times from 2010 to 2035 and will be about 8,500 Mtoe in 2035.
- Energy intensity will decline largely at 22% from 2010 to 2035
- GDP elasticity will also improve to 0.74 in 2010-2035 compared to 1.33 in 1990-2010.

The power sector is fundamental to the energy outlook of Southeast Asia

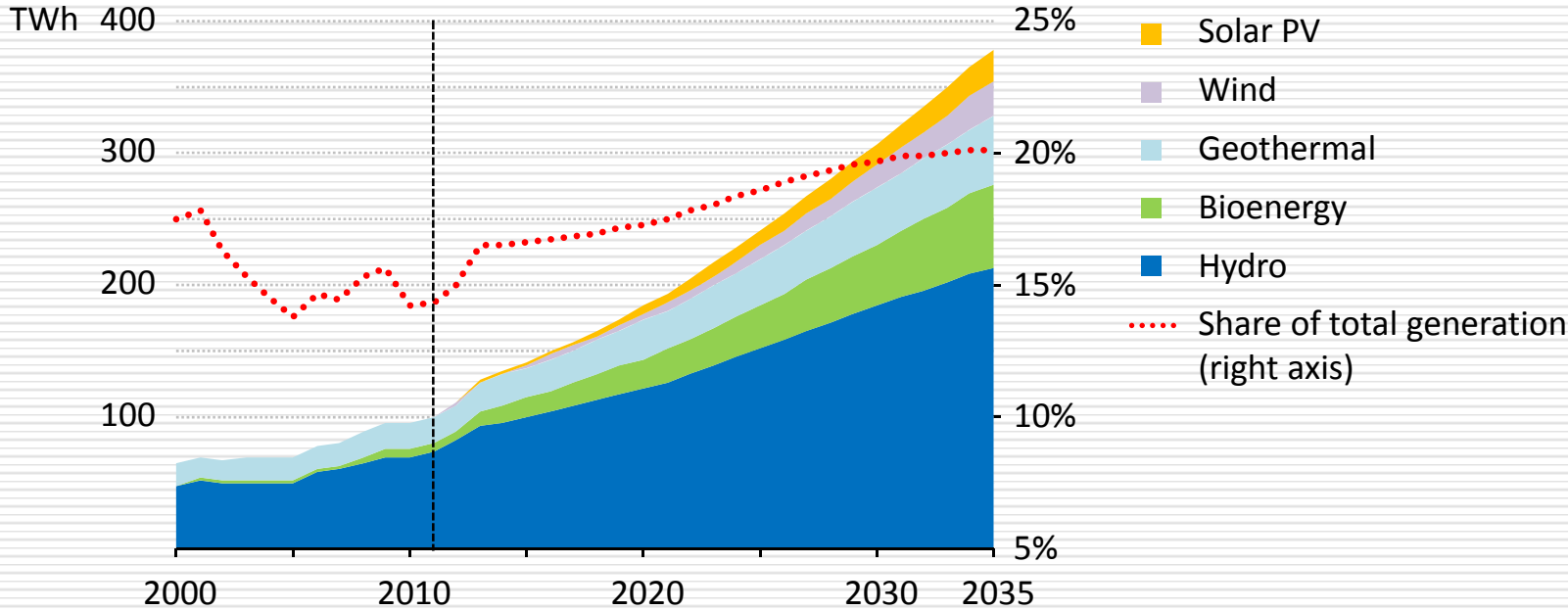
SEA incremental electricity generation by fuel, 2011-2035



Coal emerges as the fuel of choice, accounting for 58% of the growth; natural gas will continue to dominate the power market followed by renewables

Renewables can enter into the mainstream

ASEAN electricity generation from renewables



Renewables-based power increases by more than the current total power output of Indonesia & Thailand combined, although barriers to deployment need to be tackled



Renewable Energy shares in EAS Economies, 2010

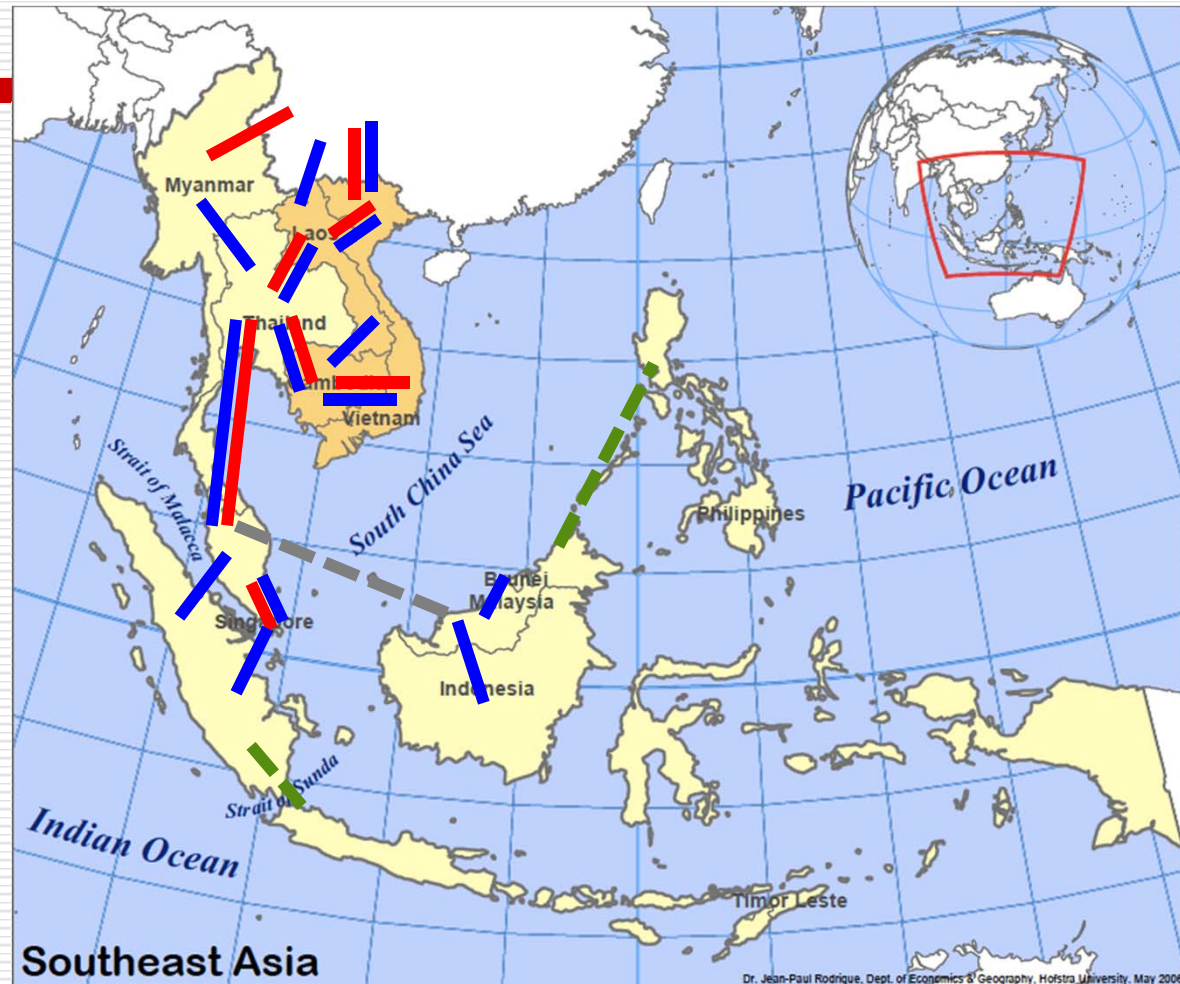
Members	TPES	Shares (%)			
	(MTOE)	Bio	Hydro	Other REs	Non-REs
China	2438	8.3	2.6	0.7	88.5
India	688	24.8	1.4	0.3	73.5
Japan	497	1.2	1.4	0.7	96.7
Korea	250	0.5	0.1	0.1	99.3
Indonesia	208	26.0	0.7	7.8	65.5
Australia	125	4.1	0.9	0.5	94.5
Thailand	117	19.3	4.0	1.0	80.3
Malaysia	73	4.7	0.8	0.0	94.5
Vietnam	59	24.8	4.0	0.0	71.2
Philippines	38	12.6	1.8	22.3	63.4
Singapore	33	0.6	0.0	0.0	99.4
New Zealand	18	6.5	11.7	20.8	61.0
Myanmar	14	75.3	3.1	0.0	21.6
Cambodia	5	72.0	0.1	0.0	27.9
Brunei	3	0.0	0.0	0.0	100.0
Lao PDR	2	67.0	13.0	0.0	20.0
EAS	4568	11.0	1.9	1.1	86.0
World	12782	9.8	2.3	0.9	87.0
EAS/World %	35.7%	40.1%	29.7%	45.0%	35.3%

Source: ERIA calculations using data from the IEA (2012) and IRENA (2013)



Planned Connectivity for Cross-border Power Trade

Connection	Capacity (MW)
MY - SG	600
MY - PH	500
ID - SG	1,200
LA - TH	7,947
MY - BN	300
LA - VN	4,399
LA - KH	300
TH - KH	2,200
TH - MY	400
KH - VN	465
MM - TH	11,709
CN - LA (TH)	1,500
CN - VN	460
MY - ID	1,030



ASEAN Power Grid + national plans of countries

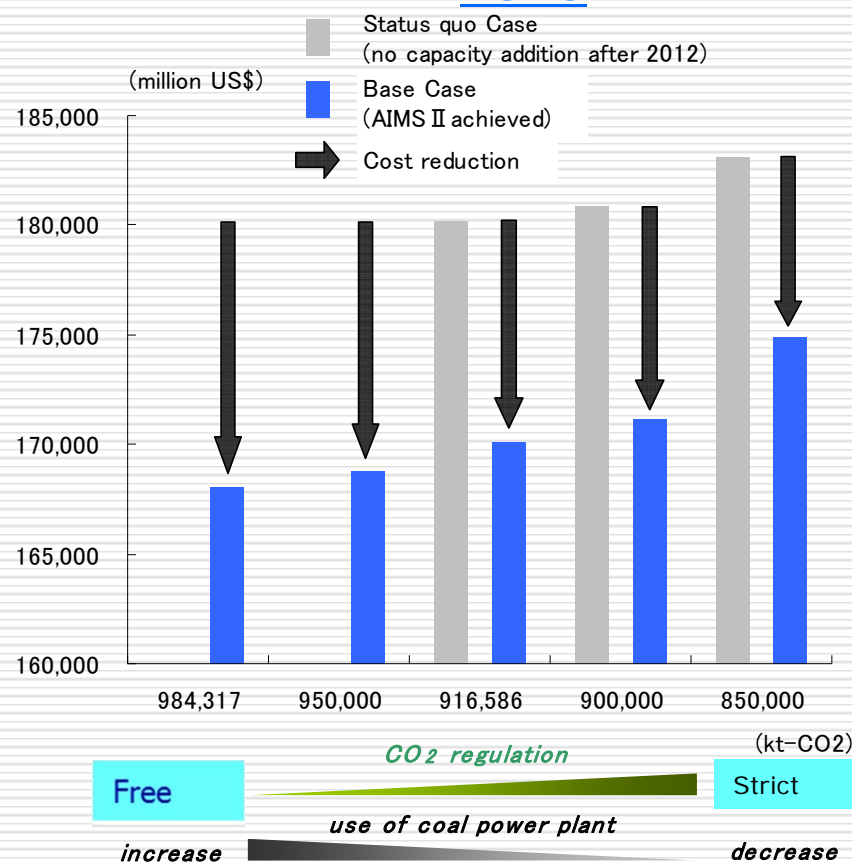
Effective Investment of Power Infrastructure in ASEAN through Power Grid Interconnection

Quantify benefits of the pan-regional power infrastructure

Draw policy implications toward investment decisions

- Total generating cost of US\$ 12.1 billion in 2020 can possibly be reduced at the maximum due to the cost reduction effect of utilizing the international power grid.
- ERIA suggests ASEAN countries to make a platform to ensure implementation of AIMS

Possible cost reduction in 2020



Thai – Lao Bilateral Cooperation: NT2 Project

Development, construction and operation of a 1,070 MW hydro power facility using water from Nam Theun River

- 39 m gravity dam
- 450 sq m km reservoir
- Power Plant
- 130 km transmission line to Thai power grid
- 70 km transmission line to Lao power grid
- Electricity export to Thailand (95%) and for domestic use (5%)
-



NT2 – Important to Lao PDR

NT2 helps Lao PDR further realize its hydro-power potential

- Lao PDR has few growth options. It is mountainous, highly forested, land locked, population only 5.4 million
- Its hydropower potential exceeds 23,000 MW
- Export of hydropower, through NT2, for instance is the most appropriate alternative for GOL to achieve its developmental goals

Lao DPR earns approximately USD 2 billion from NT2

- US\$ 30 million per year during the first ten year period while commercial debt service is paid
- Then rising sharply thereafter to an average of about US\$110 million from 2020 to 2030

NT2 – Important to Thailand

NT2 helps Thailand meet its growing power demand

- Thailand's historical GDP growth: approx 3% p.a for the one decade prior to NT@ project inception
- Electricity demand growth for same period: 6.4% p.a
- Going forward, Thailand would need at least 1,500 MW per year of added capacity.
- Only 9% of Thailand electricity from hydro sources
- NT2 represents a least cost economic environment friendly alternative for incremental power supply to Thailand

Based on this, EGAT (Thai power utility) agreed to assume demand risk, on take or pay model

NT2 Power Company

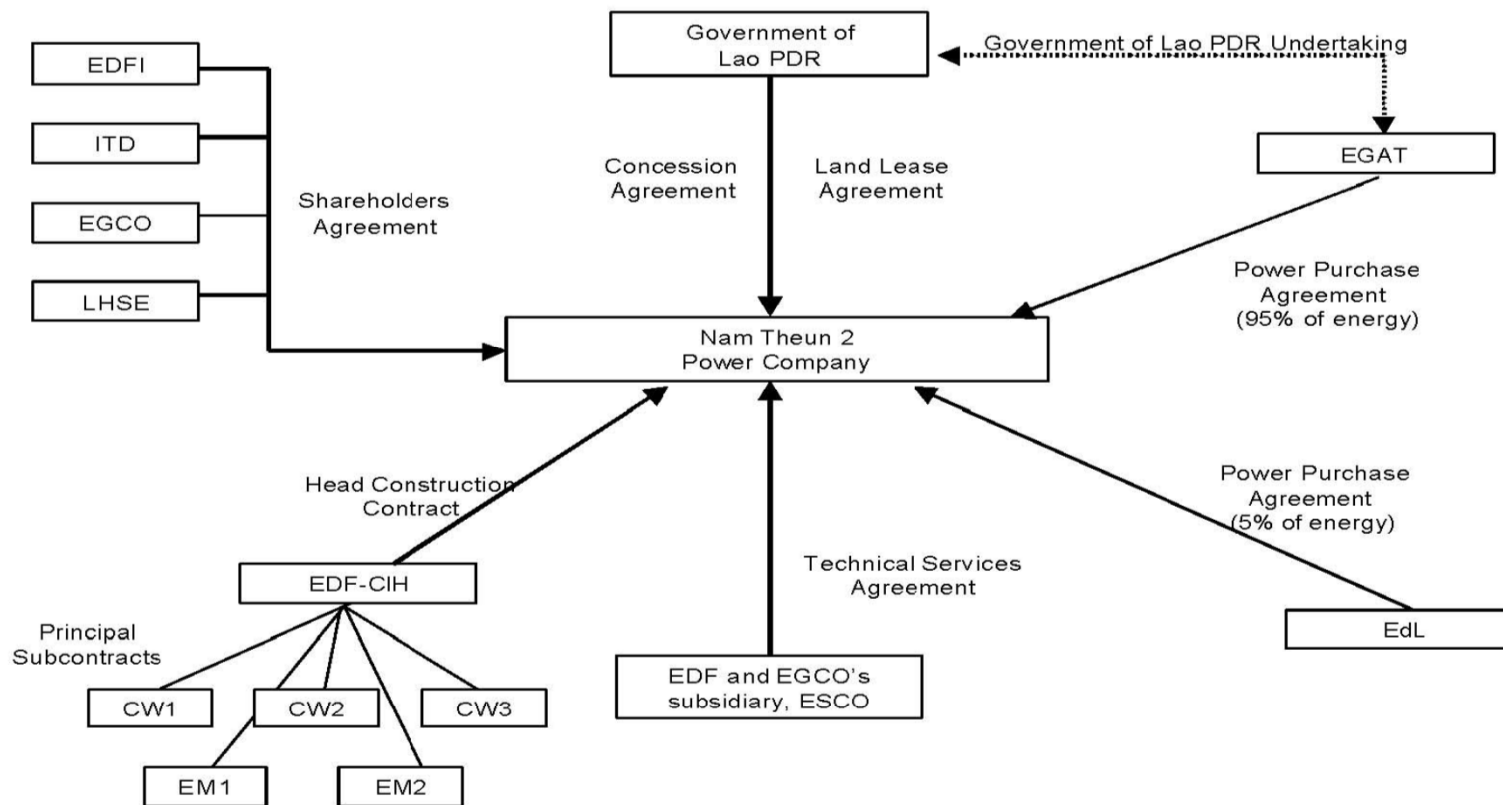
Nam Theun Power Company (NTPC), a single purpose company was established to jointly own by

1. Electric de France International (EDFI) – 35%
2. Government of Lao – 25%
3. Electricity generating Public Co (EGCO), Thailand – 25%
4. Italian- Thai Development Public Co (ITD), Thailand – 15%

NT2 – Bilateral Cooperation Arrangement

- EGAT Assumes demand risk
- Thailand assumes currency risk (total cost \$1.45 billion)
- Lao PDR provides full support in managing environmental and social risks
- Multi-laterals (WB, ADB) provided political risk guarantees.
- Sponsors shoulder all other (commercial risks)

Contractual Structure of Power Purchase Agreement



CW = Civil Works, EDF = Electricité de France, EDF-CIH = Electricité de France Hydro Engineering Centre, EDFI = Electricité de France International, EGAT = Electricity Generating Authority of Thailand, EGCO = Electricity Generating Public Company Limited, EM = Electromechanical, ESCO = Electricity Generating Public Company Limited Energy Services Company, LHSE = Lao Holding State Enterprise, ITD = Italian-Thai Development Public Company Limited, Lao PDR = Lao People's Democratic Republic.

Barriers to bilateral cooperation and energy market integration

1. Technical

- grid synchronization

2. Regulatory barriers

- distorted energy pricing & subsidies

3. Financial barriers

- Unequal starting points in trade negotiations

4. Political barriers

- Security concerns

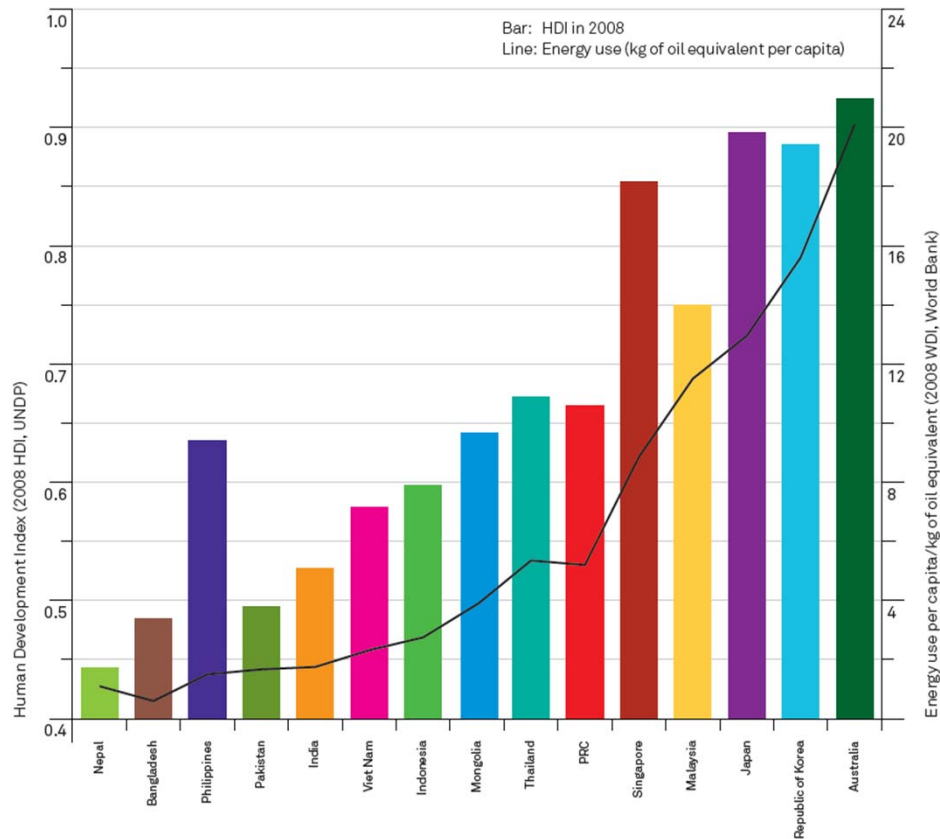
3 PRESSING POLICY RECOMMENDATIONS

Establish
functioning
regional/ sub-
regional body
to deal with
Power Market
and RETs
Deployment

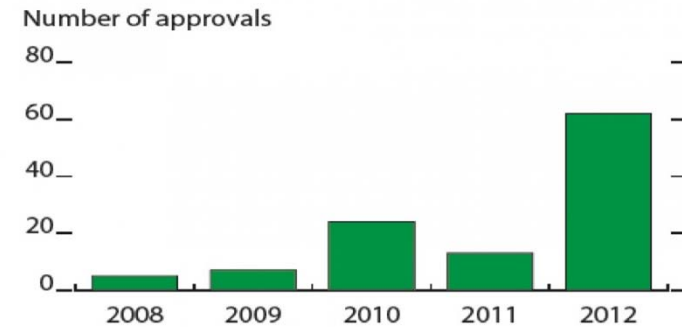
Long term
policies to
attract
investment in
Renewable
energy
Infrastructure
Development

Liberalized
power market
and removal of
trade barriers

Energy Vs Human and Economic Development

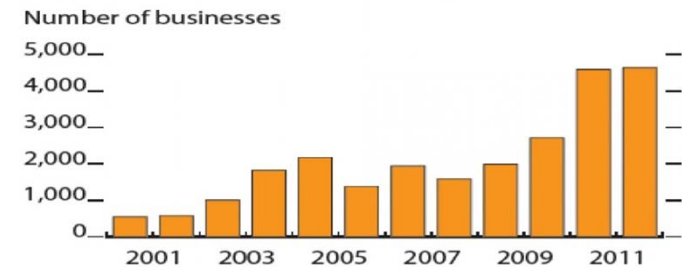


FDI in Myanmar



Note: Data in fiscal year (FY). 2012 data covers April–December 2012 only.

Domestic Business Registration



Note: Data in fiscal year (FY). 2012 data covers April 2012–January 2013 only.

Source: Directorate of Investment and Company Administration.

Source: World Development Indicators (2011); Human Development Report (2012)

Utilization of locally available and Off-grid access to modern energy

- Decentralized energy source: Renewables can greatly contribute to improving access to modern energy where there is no grid connection or only unreliable grid
- The term “best mix” in rural energy
 - Portion of renewable energy to the total energy demand in the community
 - Thermal: Solar, geothermal
 - Electricity: Wind, solar, mini-hydro, biomass, geothermal, wastes
 - Fuel: Biomass, wastes
- Select the right renewable energy in the right local area so that it could be utilized in a sustainable manner
 - High capital intensive technologies may not be appropriate/ acceptable in some situations/localities

How to craft a win-win strategy?

Implications for the study

- ❑ Energy demand projections that estimate the supply and demand at local, sub-national and national levels in the medium and short term.
- ❑ Investment planning at different levels (local, regional, sectoral) favoring least cost energy options (renewables, natural gas etc)
- ❑ Cost plus tariff structure and power purchase agreements that does not pass unnecessary costs to the consumers/communities.

Energy sector policies and institutional reforms



Ongoing ERIA Studies

- ✓ Best mix of renewables for sustainable development of communities
- ✓ ASEAN Bio-fuel Market Potentials
- ✓ Energy Trade and Market Integration

Thankyou



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