ASEAN POWER GRID: Powering the Region

Presented By:

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MOFA Korea & UN ESCAP - Seoul 15 December 2016
The Heads of ASEAN Power Utilities and Authorities

Objectives:

To promote the creation of regional power interconnection projects (the ‘ASEAN Power Grid’) through the exchange of experience and information:
1. on planning, construction and operation of interconnected systems,
2. the acquisition of appropriate technology and methodology in all aspects of the interconnected system, and
3. joint studies on transfer of electricity through interconnected systems.
Why we need ASEAN Connectivity

ASEAN has a huge of natural resources, high energy demand, high economic growth

“Connectivity creates Stronger, Safer, Better Economics”

“Stronger Economics, stronger ASEAN, stronger Member States”

Source: ASEAN Secretariat
The vision of ASEAN Leaders to build an ASEAN Community by 2015 calls for a well-connected ASEAN that will contribute towards a more competitive and resilient ASEAN.
ASEAN has emphasized regional cooperation in the “three pillars”, which are political-security, sociocultural integration, and economic integration.
ASEAN Vision 2020

Calls for ASEAN Partnership in Dynamic Development aimed at forging closer economic integration within the region. Specific to energy and utilities, ASEAN Vision 2020 seeks to:

- Establish interconnecting arrangements for electricity, natural gas and water within the region through the ASEAN Power Grid (APG), Trans-ASEAN Gas Pipeline (TAGP) and Water Pipeline; and,
- Promote cooperation in energy efficiency and conservation, as well as the development of new and renewable energy resources.
BACKGROUND

• Efficient, reliable and resilient electricity infrastructure in stimulating regional economic growth and development.
• Establishment of integrated systems.
• Promoting the efficient utilisation and sharing of resources.
• Enhance electricity trade across borders which would provide benefits to meet the rising electricity demand and improve access to energy services in the region”.
"Enhancing Energy Connectivity and Market Integration in ASEAN to Achieve Energy Security, Accessibility, Affordability and Sustainability for All"

- Development of the APAEC
- Global Energy Landscape
- ASEAN Energy Development
DRIVERS OF ASEAN POWER INTERCONNECTIONS
ASEAN – REGION OF DIVERSITIES

### Land Area (Sq km)

- Brunei
- Cambodia
- Indonesia
- Laos
- Malaysia
- Myanmar
- Philippines
- Singapore
- Thailand
- Vietnam

### Population 2013 (Million)

- Brunei
- Cambodia
- Indonesia
- Laos
- Malaysia
- Myanmar
- Philippines
- Singapore
- Thailand
- Vietnam

### Electricity Consumption 2013 (TWh)

- Brunei
- Cambodia
- Indonesia
- Laos
- Malaysia
- Myanmar
- Philippines
- Singapore
- Thailand
- Vietnam

### GDP per Capita 2013 (USD)

- Brunei
- Cambodia
- Indonesia
- Laos
- Malaysia
- Myanmar
- Philippines
- Singapore
- Thailand
- Vietnam

Source: ASEAN Statistics Leaflet
ASEAN economy grows in tandem with the electricity demand growth. Due to ASEAN’s high economic growth, electricity demand in ASEAN is projected to grow by 6.1% to 7.2% per annum, which would mean that it would have more than tripled by 2030.

* Historically, electricity demand expansion was two-and-a-half times since 1990

Source: CIMB ASEAN Research Institute (2013)
ASEAN abundant energy resources

The thirst for energy can be fulfilled by the region’s wealth of natural resources

- Blessed with abundance of natural resources.
- Potentials yet to be explored
- Transmission networks need to be expanded
- Grid density is still low

Need for efficient utilization of energy sources
Enablers for ASEAN Power Trade

Three key drivers that enable Power Trade among ASEAN countries

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**APG**

The APG is the key infrastructure to enable power trade between ASEAN countries.

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**Diversified Resources**

ASEAN’s availability of abundant of natural resources, e.g. Hydro (Myanmar, Laos), Gas & Oil (Malaysia, Brunei), Coal (Indonesia)

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**Price-demand disparity**

Cheaper system can sell to more expensive system
ASEAN – Energy Situation

ASEAN Generation Installed Capacity

Current

Forecasted

- Coal and lignite
- Oil
- Natural Gas
- Others
- Renewables

- Coal and lignite
- Oil
- Natural Gas
- Nuclear
- Renewables

[Graph showing generation capacity from 1990 to 2035 for different energy sources.]
ASEAN – Electricity Production (ACE, 2015)

Current

Forecasted

TWh


Coal and lignite
Oil
Natural Gas
Others
Renewables

100 200 300 400 500 600 700 800 900

1000 2000 3000 4000 5000 6000 7000 8000 9000

2013 2020 2025 2030 2035

Coal
Oil
Natural gas
Nuclear
Renewables
The ASEAN Power Grid (APG) is a flagship program mandated in 1997 by the ASEAN Heads of States/Governments under the ASEAN Vision 2020.

The 17th AMEM in Bangkok July 1999 has adopted The APAEC 1999-2004 tasked to implement the ASEAN Power Grid (APG) program.

LEGAL BASIS: The MOU of ASEAN Power Grid (APG)

*: The MOU of APG signed by ASEAN Energy Minister in July 2007
• Development for the APG is not only to have the infrastructure available, but also to have all the institutional, regulatory/legal, technical, economical aspects functional.

• Therefore, in addition to construct the infrastructure, the ASEAN cooperation on the APG involves also the institutional and regulatory framework, commercialization, harmonization, and etc., which needs to be addressed.

• Strategy to pursue the APG program is to encourage the development of the identified interconnection projects, first on cross-border bilateral terms, then gradually expanding to a sub-regional basis and, finally to a totally integrated Southeast Asian power grid system.
2007 Memorandum of Understanding of the ASEAN Power Grid (APG)

To strengthen and promote a broad framework for the ASEAN Member Countries to co-operate towards the development of a common ASEAN policy on power interconnection and trade, and ultimately towards the realisation of the ASEAN Power Grid to help ensure greater regional energy security and sustainability on the basis of mutual benefit.

(Signed in August 2007 and Ratified by all members in December 2008)
Objective:
To create economic benefits and opportunities for power exchange and trade amongst the Member Countries to support the ASEAN Economic Community

To ensure greater regional energy security and sustainability on the basis of mutual benefit toward the ASEAN Market Integration
Maximize the use of resources in the region to achieve best benefits for ASEAN
Encourage the development of a large-scale power generation in commercial scale
Promote the cooperation in the generation and use of power in ASEAN
Create Bilateral Trade as the first stage and Multilateral Trade as final stage
Greater economic generation and transmission of electricity

Greater reliability and security of electricity supply in member countries

Provision of a platform for future ASEAN electricity trade
Ways to Meet the Main Goals of APG

- Facilitate cross-border power purchases/exchanges within the region
  
  - Allows effective development and utilization of resources

- Optimize usage of diverse energy resources in the region
  
  - Enable power transfer from efficient generation in the region to load centers

- Reduce capital investment required for generation capacity expansion
  
  - Capitalizing difference of demand peaking time

ENHANCING REGIONAL ENERGY SUSTAINABILITY, SECURITY, RELIABILITY, TOWARD MORE EFFICIENT, ECONOMIC AND SECURE OPERATION OF POWER SYSTEM
UPDATED LIST OF ASEAN POWER GRID PROJECTS

1) P. Malaysia – Singapore *(Plentong – Woodlands)*
   - Existing
   - Post 2020

2) Thailand - P. Malaysia
   - Sadao - Bukit Keteri
   - Existing
   - Khlong Ngae - Gurun
   - Existing
   - Su Ngai Kolok - Rantau Panjang
   - Existing
   - Khlong Ngae – Gurun (2nd Phase, 300MW)
   - 2016
   - Sarawak - P. Malaysia
   - 2025

3) P. Malaysia - Sumatra
   - Post 2020

4) P. Malaysia - Sumatra
   - Post 2020

5) Batam - Singapore
   - Post 2020

6) Sarawak - West Kalimantan
   - Existing

7) Philippines - Sabah
   - Post 2020

8) Sarawak - Sabah – Brunei
   - Sarawak – Sabah
   - 2020
   - Sabah – Brunei
   - Not Selected
   - 2016

9) Thailand - Lao PDR
   - Existing
   - Roi Et 2 - Nam Theun 2
   - Existing
   - Sakon Nakhon 2 – Thakhek – Then Hinboun (Exp.)
   - Existing
   - Mae Moh 3 - Nan - Hong Sa
   - Udon Thani 3 - Nabong (converted to 500KV)
   - 2019
   - Ubon Ratchathani 3 – Pakse – Xe Pian Xe Namnoy
   - 2018
   - Khon Kaen 4 – Loei 2 – Xayaburi
   - 2019
   - Thailand – Lao PDR (New)
   - 2015-2023

10) Lao PDR - Vietnam
    - 2016-2020

11) Thailand - Myanmar
    - 2018-2026

12) Vietnam - Cambodia (New)
    - 2020

13) Lao PDR - Cambodia
    - 2016

14) Thailand - Cambodia (New)
    - Post 2020

15) East Sabah - East Kalimantan
    - Post 2020

16) Singapore – Sumatra
    - Post 2020
SUMMARY STATUS OF ASEAN POWER GRID PROJECTS
(as of November 2016)

EXISTING
- 9 cross borders
- Total power: 5,200 MW

ON-GOING (COD 2018/2021)
- 6 cross borders
- Total Power: 3,300 MW

FUTURE (BEYOND 2020)
- 16 cross border
- Total Power: 23,200 MW
Financing barriers
1. Return on investment.
2. Fiscal capacity (of ASEAN Member States).
3. Capital availability (from alternative sources).

Decision-making barriers
1. Prioritisation issues.
2. Agency issues.
3. Information failures.

Implementation barriers
1. Capacity.
2. Coordination.
3. Regulatory structures.

"THE BARRIERS TO IMPLEMENTATION"

"the implementation of other energy interconnection projects under the APG and the Trans-ASEAN Gas Pipelines encounter barriers due to resource constraints, bankability, technical and regulatory issues"
Overcoming the BARRIERS (The implementation Strategies)

- Prioritize, focus and agree on targets.
- Governance and strong stakeholders involvement
- Build human capacity, strong regulations, finance
- Performance feedbacks, monitoring, evaluation
ROAD TO MULTILATERAL ELECTRICITY TRADING
ROAD TO MULTILATERAL ELECTRICITY TRADING

ASEAN MEMBER STATES

X-BORDER LINK

BILATERAL ARRANGEMENT

APG

BILATERAL + THIRD PARTY

MULTI-LATERAL TRADING

Condition:
- Harmonization of National Energy Laws
- The Readiness of National Network & X-border Links
- Availability of Transmission Charges
- Bilateral Agreement involving Third Party.
The Nordic Pool Model

Objectives:

a) achieve long-term security, availability and reliability of energy supply;
b) enhances efficiency by optimizing the region’s energy resources; and
c) Allow access to affordable energy to populations across the region

The key benefits:

a) the system enhances efficiency, b) delivers electricity at the most cost-effective price, c) maximizing the benefits of both producers and consumers.

1. No interference with the national electricity supply industry,
2. No need to: - modify national pricing systems (including subsidies), - change the ownership structure of utilities (privatization),
3. No need to create regional bodies to supersede national regulatory authorities,
4. No need to unbundled and privatized the utilities and regulatory agency in each participant country can be retained.
5. Each country has its own market transmission system operator, working closely with the regional operator.

A step wise approach is necessary, rather than a big bang where everything is attempted at the same time.

ASEAN Multilateral Electricity Exchange

Objectives:

Can Nordic model works?

Approach

LESSON LEARNT FROM NORDIC MODEL
THANK YOU

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