vRE Grid Integration in ASEAN

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Executive Director – ASEAN Centre for Energy

Asia Clean Energy Forum
Manila, 16 June 2015
OUTLINE

❖ ASEAN & ASEAN Centre for Energy (ACE) Background

❖ RE Development in ASEAN:
  Potential, Installed Power Capacity (MW), Electricity Generation (GWh), Export & Import

❖ Requirement on vRE Connection to Grid

❖ Status of Connection Codes in ASEAN
ASEAN: A COMMUNITY OF OPPORTUNITIES

A huge market: 615 million+ people

GDP: USD 2.4 trillion

Total Trade USD 2.5 trillion

The AEC Blueprint, signed in 2007 in Singapore… to establish ASEAN as a single market and production base with the goal of making ASEAN more dynamic and competitive.”
ACE IN ASEAN’S STRUCTURE

- Established on in1999 by the 10 Member Nations of ASEAN
- Hosted by the Government of the Republic of Indonesia
- Vision
  - A regional centre of excellence that serve to advance ASEAN energy goals
  - Function as an energy data and knowledge hub; and
  - Secretarial and Administrative functions.
POWER GENERATION IN ASEAN (GWH)

Renewable Energy

<table>
<thead>
<tr>
<th>Year</th>
<th>Biomass</th>
<th>Biogas</th>
<th>Biofuel</th>
<th>Geothermal</th>
<th>Solar</th>
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Non Renewable Energy

- Biomass
- Biogas
- Biofuel
- Geothermal
- Solar
- Wind
- Hydro
- others
- Non RE

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## Total Power Generation in ASEAN in 2013

### ASEAN Total Power Generation:

814,629 GWh

### ASEAN Power Generation for Renewable Energy:

163,533 GWh

<table>
<thead>
<tr>
<th>Unit</th>
<th>Non-Renewable</th>
<th>Biomass</th>
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<tr>
<td>GWh</td>
<td>651,096.25</td>
<td>15,386.97</td>
<td>19,019.85</td>
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<td>464.84</td>
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</table>

*Others : Biogas and waste

Sources: ACE Database, as of 2013
Hydropower Potential vs Installed Power Capacity

Potential Power Capacity vs Installed Power Capacity for different countries in ASEAN:

- Brunei Darussalam (Brunel D)
- Cambodia
- Indonesia
- Lao PDR
- Malaysia
- Myanmar
- Philippines
- Singapore
- Thailand
- Vietnam

ASEAN combined capacity is higher than individual countries.

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DRIVER FOR RENEWABLE ENERGY UTILIZATION

- Increase energy security
- Increase energy access
- Job creation
- Environmental benefits
- Affordability
vRE CONNECTION TO GRID

Site Specific | Variable | Limited Predictability | RE CHARACTER

Power Sector Investment
Policy and Regulation
Operational Strategies

Source: peswiki.com, 2015
VRE CONNECTION TO GRID

**Power sector investment**
Grid reinforcement, Centralized Dispatching Control Centre (CDCC), Demand Side Management (DMS), etc

**Operational Strategies**
vRE forecasting, CDCC, DMS, etc

**Policy and Regulation**
Technical standards and certification, vRE Grid Codes, Authorities coordination, etc
## STATUS OF CONNECTION CODES IN ASEAN

<table>
<thead>
<tr>
<th>Country</th>
<th>Grid Code</th>
<th>Distribution Code</th>
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For vRE: For variable renewable energy. PV Rooftop: Photovoltaic Rooftop.
THANK YOU

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ACE Building, 6th. Floor
Jl. H.R. Rasuna Said Block X-2, Kav. 07-08
Jakarta 12950, Indonesia
Website: www.aseanenergy.org
RE POWER GENERATION (2012)
RE POTENTIAL IN ASEAN (GWh)

- **Laos**: 1.2, 0.05, 26, 3-6 m/s, 3.6 – 5.3 kWh/m²/day
- **Myanmar**: 40.4, 4, 5 kWh/m²/day
- **Singapore**: 0.56, 0.34, 35, 7, 0.1-0.2, 4-5 kWh/m²/day
- **Thailand**: 11.5 kWh/m²/year, 10.5, 2.5, 15, 5.3-6.4 m/s, 18-20 MJ/m²/day
- **Brunei**: N/A
- **Malaysia**: 29, 1.2-4.1 m/s, 4.5 kWh/m²/day
- **Indonesia**: 32.6, 28.9, 75, 3-6 m/s, 49, 4.8 kWh/m²/day
# ELECTRICITY EXPORT AND IMPORT (2013)

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**Notes:**
- O : Import
- X : Export
ASEAN ECONOMIC COMMUNITY

- Single market and production base
- Competitive economic region
- Equitable economic development
- Fully integrated region in the global economy