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**ASEAN EXPERIENCES ON
POLICY AND REGULATION FOR
RENEWABLE ENERGY
DEVELOPMENT**

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Energy field of study

Asian Institute of Technology

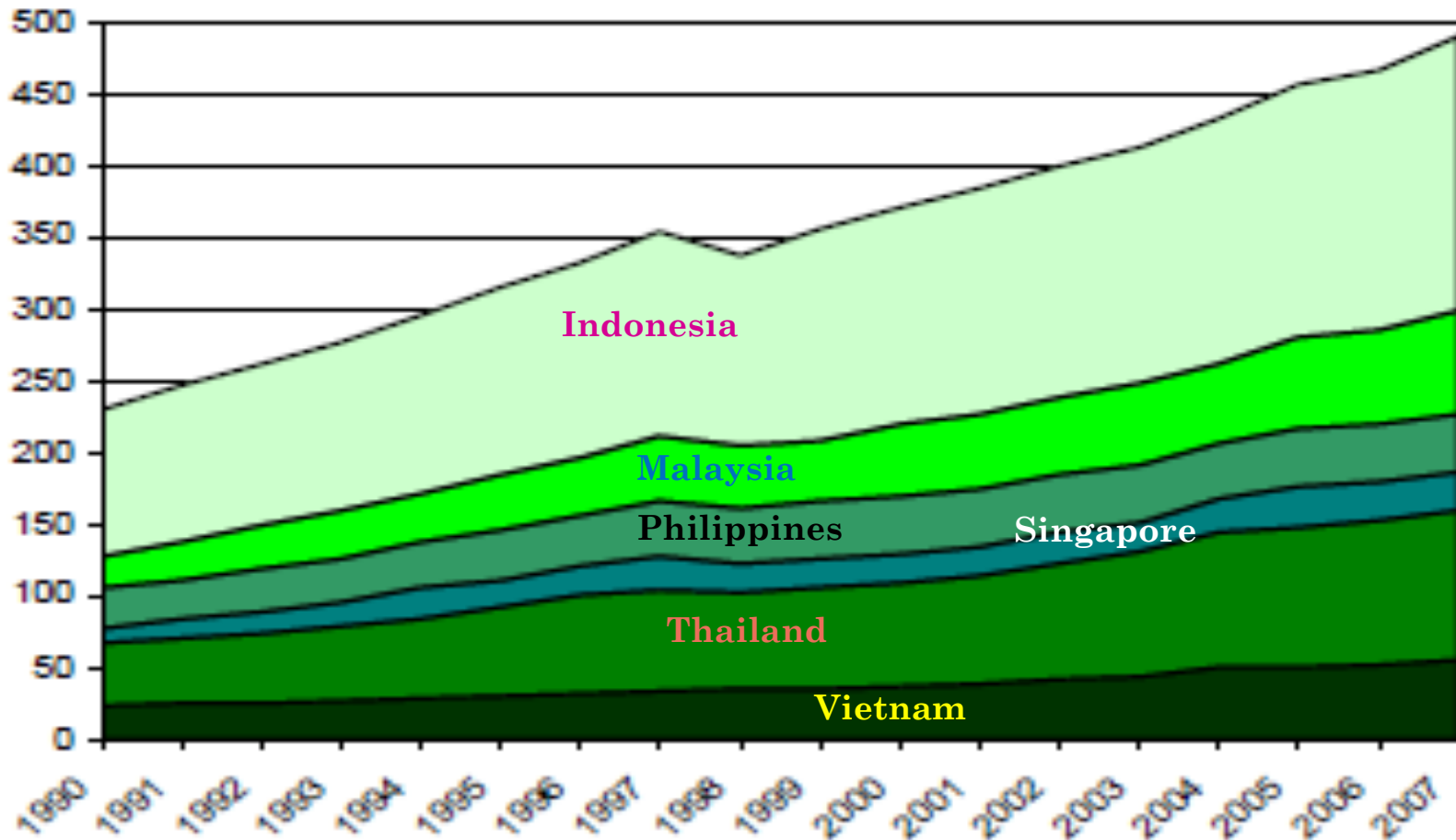
OUTLINE OF THE PRESENTATION

- Introduction
- Overview of RE potential & share (Country wise)
 - Potential, Share, Consumption
- Overview of RE policies & Regulatory Framework
 - RE targets, Financial incentives, Non-financial incentives, Other measures
- Barriers for RE development
- Conclusions

INTRODUCTION

- The energy sector of ASEAN countries has developed significantly in the past two decades (e.g. Energy demand more than doubled between 1990 and 2007, while power generation increased nearly fourfold over the same period)
- Analysis of the energy situation indicates that ASEAN countries rely largely on conventional sources of energy and renewables have less share
- However, Renewable Energy (RE) is abundant in ASEAN countries and significant realizable potential of diverse Renewable Energy Sources (RES) exist
- In recent years, most of the ASEAN countries have developed appropriate policy and necessary regulatory frameworks to foster development of RE in a more concerted manner.

INTRODUCTION



Trend of Primary Energy Demand in ASEAN-6 (Source: OECD/IEA 2010)

- Energy Demand in the ASEAN-6 countries more than doubled from 230 Mtoe in 1990 to 490 in 2007
- Indonesia had the significant growth in energy demand followed by Thailand and Vietnam

OVERVIEW OF RE POTENTIAL & SHARE - THAILAND

Potential

- Ample potential for harnessing RE resources, in particular biomass and solar energy
- Despite natural endowment of renewable resources, Thailand's RE sector is relatively untapped
- The share of renewable, including that of hydropower, in electricity production, was 8.2% in 2011

Table: RE Utilization in 2011

Source	Production (MWh)
Solid Biomass	1,468,039
Hydropower	30
Solar-PV	55,444
Wind energy	65

Table: Thailand's RE Resources Potential

Source	Potential
<i>(Electricity)</i>	<i>(MW)</i>
Solar	>5,000
Wind	1,600
Hydro Power	700
Biomass	4,400
Biogas	190
Municipal waste	400
<i>Total</i>	<i>>12,210</i>
<i>Liquid biofuel</i>	<i>Mil.litre/day</i>
Ethanol	6.0-10.0
Biodiesel	4.0-5.0
<i>Total</i>	<i>10-15.0</i>

OVERVIEW OF RE POTENTIAL & SHARE - THAILAND

Share of RE

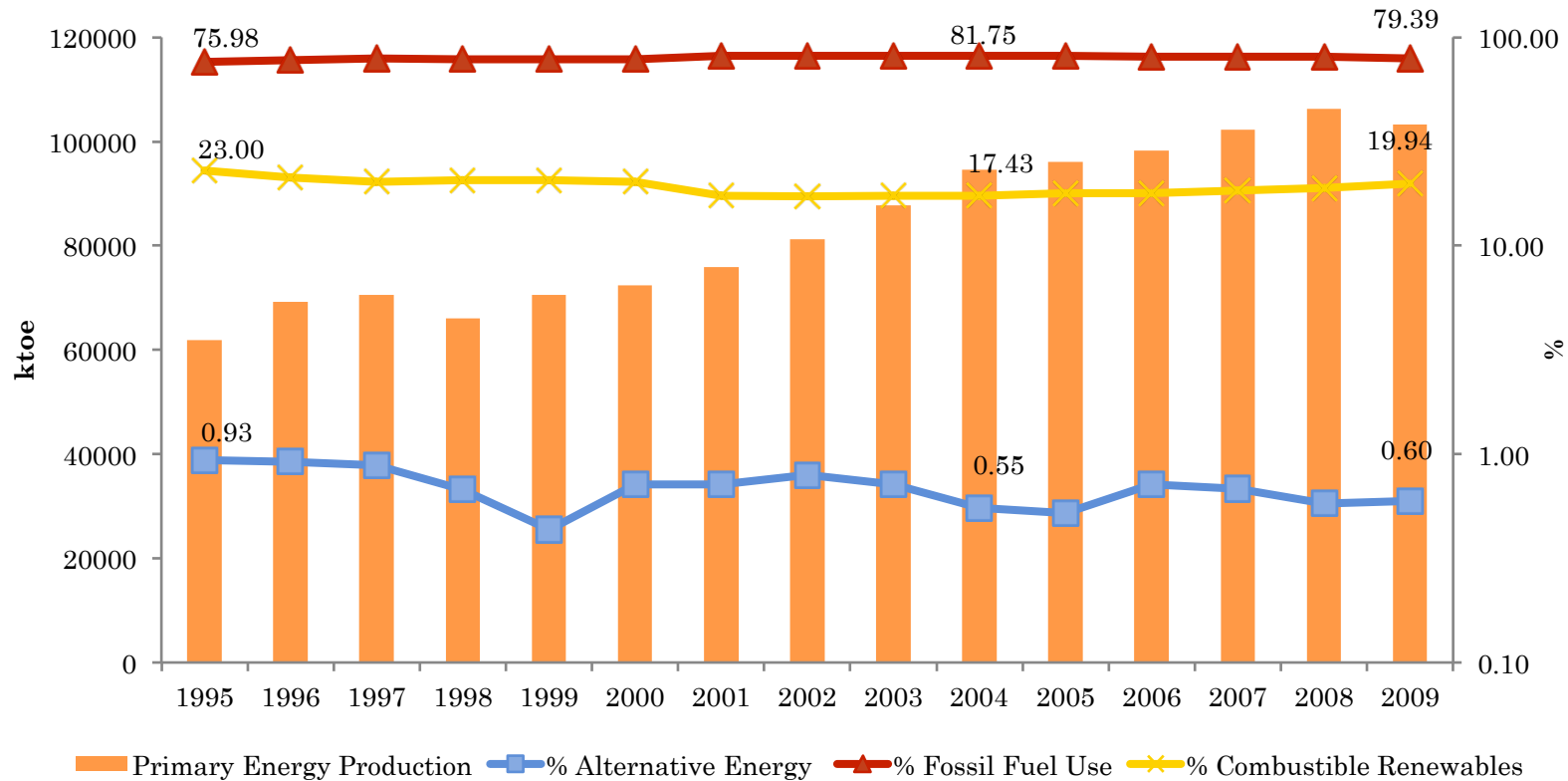
Production

- The total primary energy production, before transformation to other end uses fuel, in Thailand was 103,316 ktoe in 2009
- The share of alternative energy (including hydropower, geothermal, solar power) is relatively low
- The share of combustible renewable (including energy from solid biomass, liquid biomass, biogas and industrial and municipal waste) is relatively high and has been increasing over the years.

Consumption

- The total primary energy consumed in Thailand in 2011 was 106 million toe.
- Commercially traded fuels such as oil had the largest share, followed by natural gas and coal.
- The shares of renewable were minimal with a total share of 3.19%,⁶ mainly consisting of hydropower and biomass

OVERVIEW OF RE POTENTIAL & SHARE - THAILAND



Source: World Bank Indicators

- The share of alternative energy is very low compared to fossil fuel and combustible renewables
- Alternative energy → hydropower, geothermal, solar power
- Combustible renewables → energy from biomass & waste

OVERVIEW OF RE POTENTIAL & SHARE- MALAYSIA

Potential

- Good potential for harnessing RE resources, in particular biomass and solar energy
- Despite strong potential all the RE in Malaysia has not be harnessed in greater extent
- The share of renewable, including that of hydropower, in electricity production was 7.3% in 2011

Table: RE Resources Potential in Malaysia

Source	Potential (MW)
Hydropower	22,000
Mini-hydro	500
Biomass and biogas from palm oil mill waste	1,300
Municipal solid waste	400
Solar PV	6,500

Table: RE Utilization in 2011

Category	Mini hydro	Biomass & biogas	Solar PV	Wind	Total
Grid-connected (MW)	23.8	32	1	-	56.8
Off-grid (MW)	-	447	6.1	0.2	453.3
Total	23.8	479	0.2	7.1	510.1

OVERVIEW OF RE POTENTIAL & SHARE- MALAYSIA

Share of RE

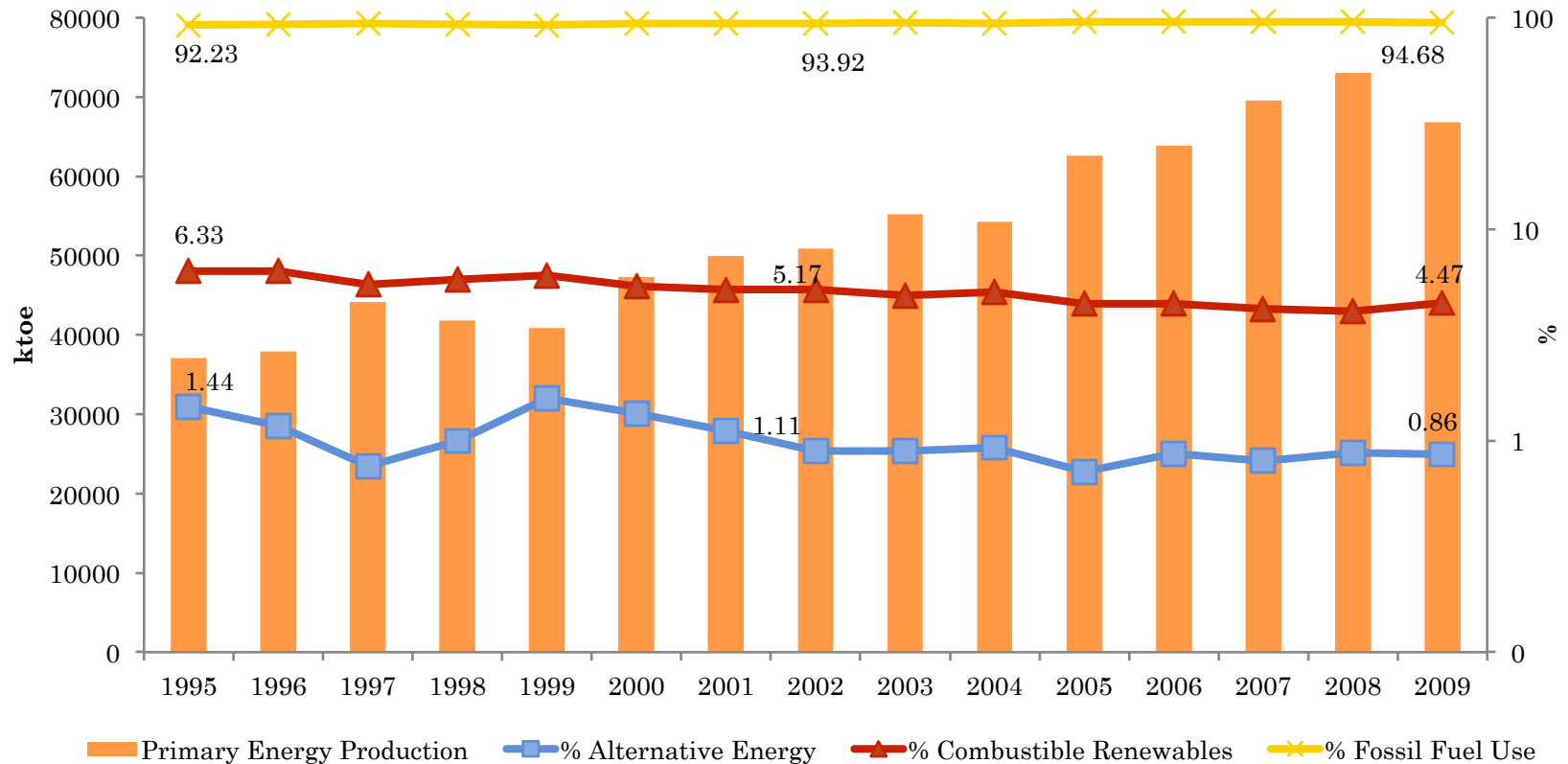
Production

- The total primary energy production, before transformation to other end uses fuel, in Malaysia was 66,826 ktoe in 2009
- Both the share of alternative energy and combustible renewable are relatively low in the primary energy mix.

Consumption

- The total primary energy consumed in Malaysia in 2011 was 69.2 million toe.
- Commercially traded fuels such as Oil had the largest share, followed by natural gas and coal.
- The shares of renewable were minimal with a total share of 2.45%, mainly consisting of hydropower

OVERVIEW OF RE POTENTIAL & SHARE- MALAYSIA



Source: World Bank Indicators

- The share of alternative energy and combustible renewables are both very low compared to fossil fuel
- Alternative energy → hydropower, geothermal, solar power
- Combustible renewables → energy from biomass & waste

OVERVIEW OF RE POTENTIAL & SHARE-INDONESIA

Potential

- High potential for RE sources such as hydropower, solar, biomass, geothermal,
- RE sources not been fully harnessed yet, however RE expected to contribute to a significant share of Indonesia's primary energy supply
- The share of renewable in electricity production was 12% in 2009

Table: RE Resources Potential in Indonesia

Source	Potential
Hydropower	75.67 GW
Geothermal	27 GW
Mini/Micro Hydro	500 GW
Biomass	49.81 GW
Solar Energy	4.8 KWh/m ² /day
Wind Energy	3-6 m/sec

Table: RE harnessed

Geothermal	1052 MW
Biomass	443 MW
Hydropower	4264 MW
Windpower	1.1 MW
Solar power	12.1 MW

OVERVIEW OF RE POTENTIAL & SHARE-INDONESIA

Share of RE

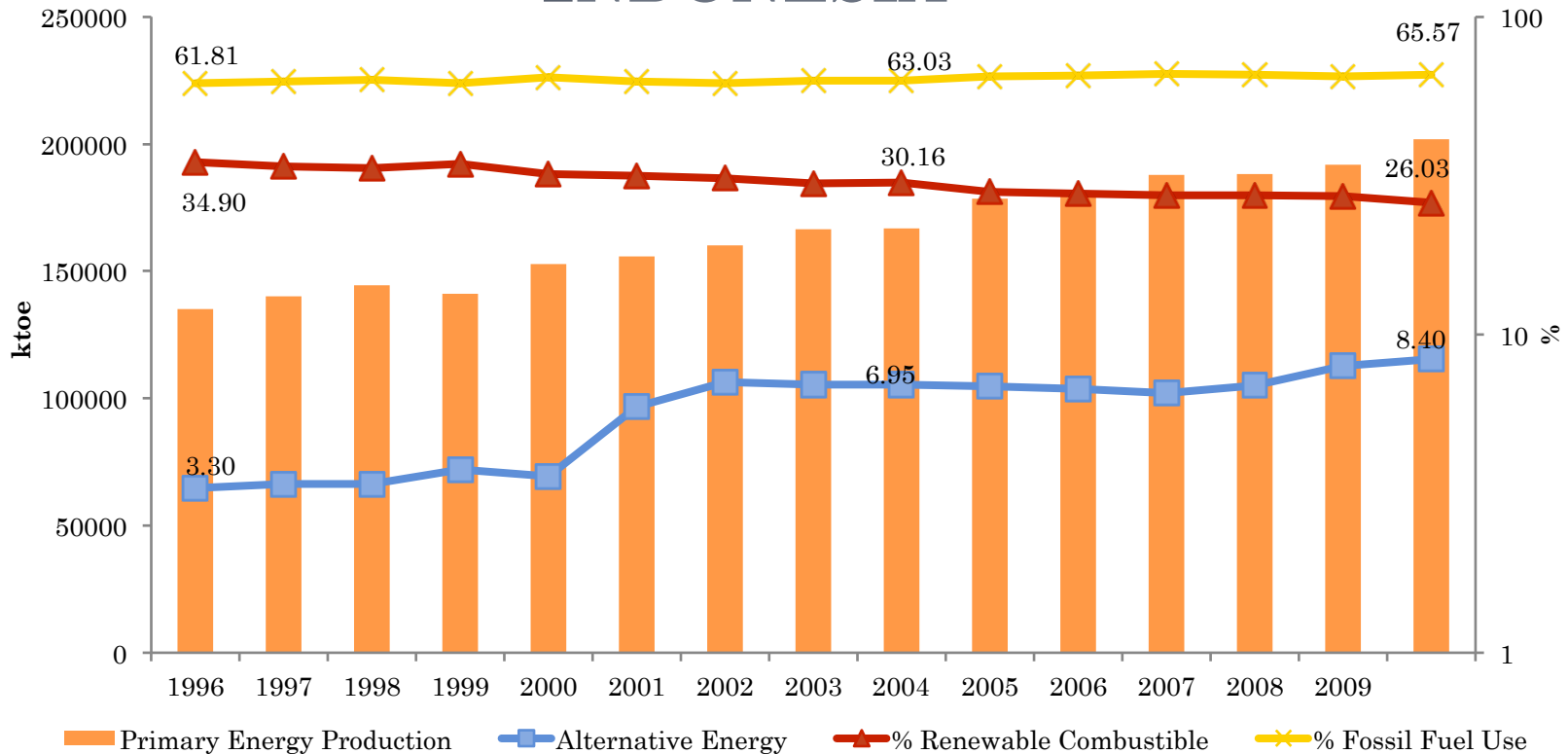
Production

- The total primary energy production, before transformation to other end uses fuel, in Indonesia was 201,999 ktoe in 2009
- Although, the total share of alternative energy is relatively lower than and the total share of combustible renewable, it has been increasing over the years

Consumption

- The total primary energy consumed in Indonesia in 2011 was 148.2 million toe.
- Commercially traded fuels such as Oil had the largest share, followed by coal and natural gas.
- The shares of renewable were minimal with a total share of 3.77%, mainly consisting of hydropower and geothermal

OVERVIEW OF RE POTENTIAL & SHARE- INDONESIA



Source: World Bank Indicators

- Although the share of alternative energy is low, it has been slowly increasing over the years
- Alternative energy → hydropower, geothermal, solar power
- Combustible renewables → energy from biomass & waste

OVERVIEW OF RE POTENTIAL & SHARE- PHILIPPINES

Potential

- High potential for most of the RE resources
- Second largest producer of geothermal in the world
- The share of hydropower alone in electricity production was 10% in 2011

Table: RE installed capacity (2010)

Energy	Capacity (MW)
Hydropower	3,400
Geothermal	1966.0
Biomass	39
Solar Energy	1
Wind Energy	33
Ocean Energy	0.0

Table: RE Resources Potential in the Philippines

Source	Potential (MW)
Hydropower	10,500
Geothermal	1200
Biomass	235.7
Solar Energy	5.0-5.1 kwh/ m2/day
Wind Energy	76,600
Ocean Energy	170,000

OVERVIEW OF RE POTENTIAL & SHARE- PHILIPPINES

Share of RE

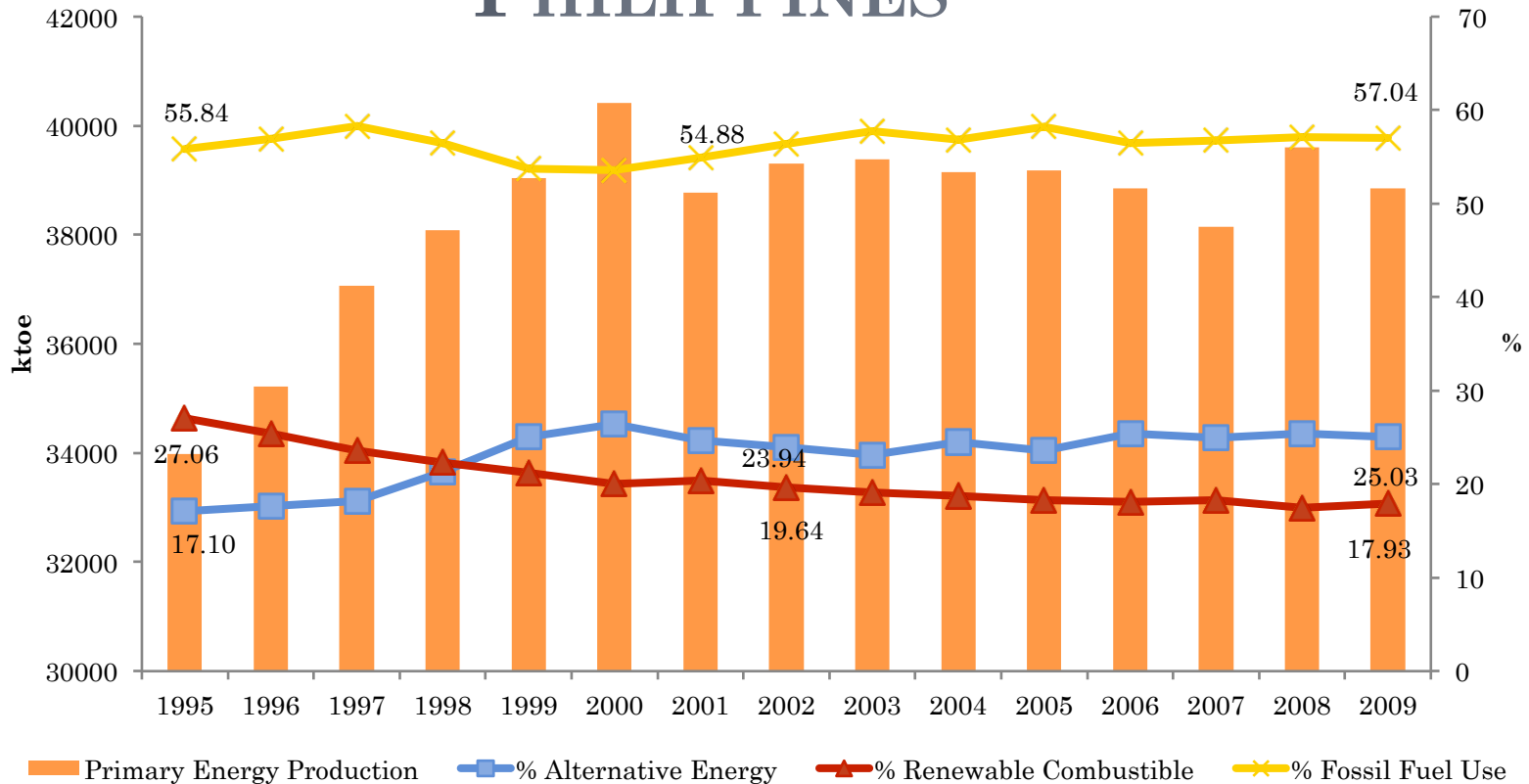
Production

- The total primary energy production, before transformation to other end uses fuel, in the Philippines was 38,843 ktoe in 2009
- The share of both alternative energy and the share of combustible renewable is relatively high in the total energy mix. And the share of alternative energy has been increasing over the years.

Consumption

- The total primary energy consumed in the Philippines in 2011 was 27.7 million million toe.
- Commercially traded fuels such as Oil had the largest share, followed by coal.
- The shares of renewable were more than that of natural gas with share of 15.88%, mainly consisting of geothermal and hydropower

OVERVIEW OF RE POTENTIAL & SHARE- PHILIPPINES

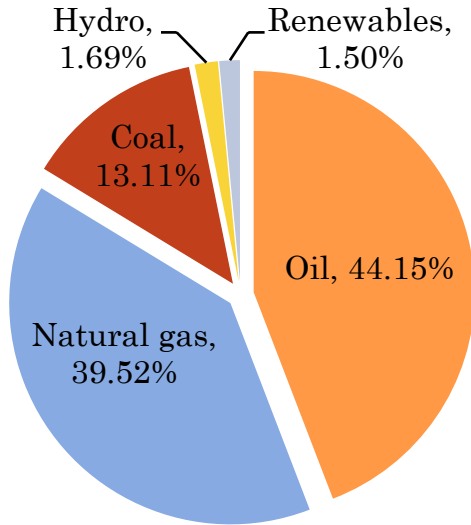


Source: World Bank Indicators

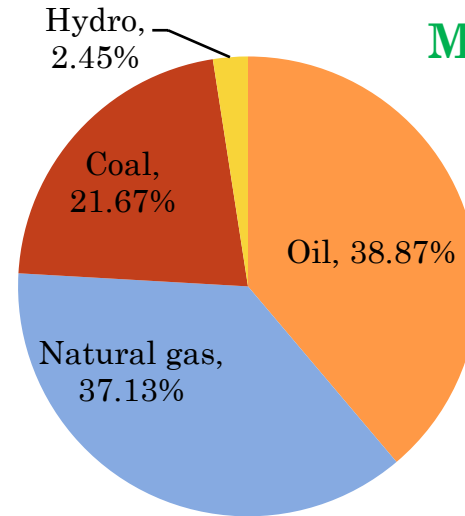
- In comparison to other ASEAN countries, the share of both alternative energy and renewable combustible are high and the share of alternative energy has been increasing over the years
- Alternative energy → hydropower, geothermal, solar power
- Combustible renewables → energy from biomass & waste

PRIMARY ENERGY CONSUMPTION BY TYPE OF FUEL IN THE ASEAN

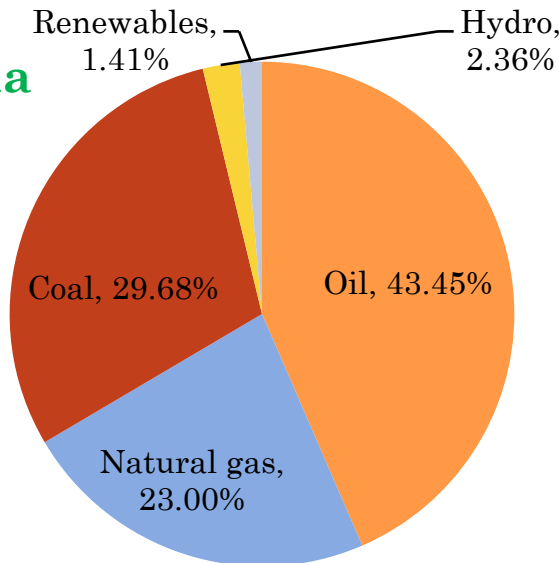
Thailand



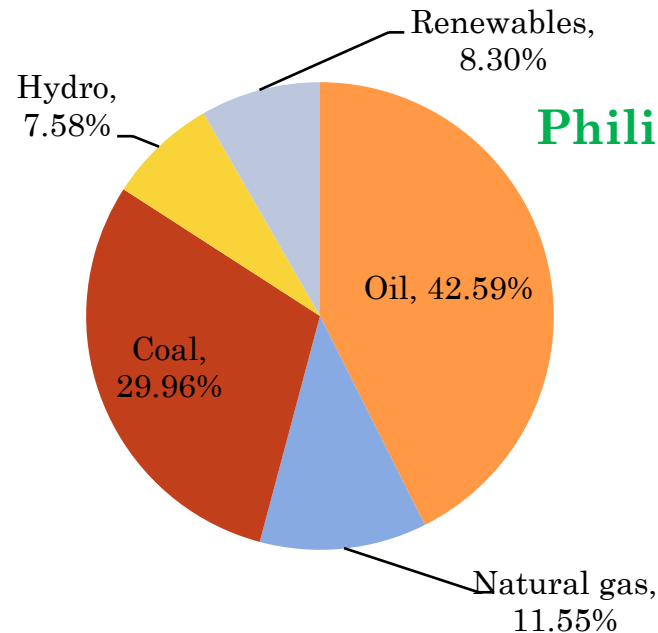
Malaysia



Indonesia



Philippines



PROSPECTS OF RENEWABLE BASED ELECTRICITY IN THE ASEAN

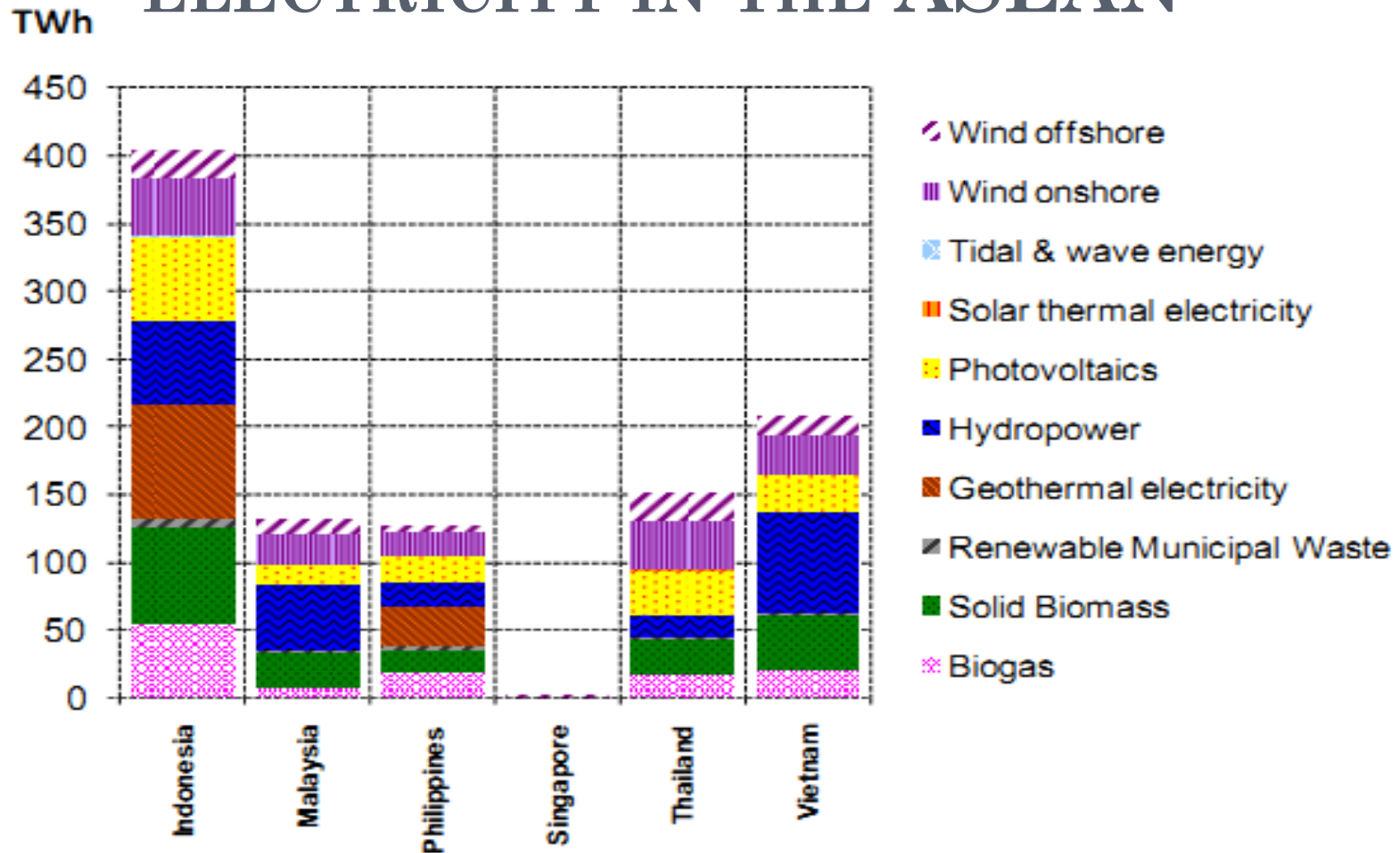


Figure: Total realizable potential of the ASEAN for RE electricity by Technology (Source: OECD/IEA, 2010)

- RETs that could make major contribution (in medium term to 2030) apart from hydro would be biomass, onshore wind, geothermal and solar PV

OVERVIEW OF RE POLICIES & REGULATORY FRAMEWORK

- Particularly in last decade, many ASEAN countries have fostered deployment of RETs through policy interventions
- The main driving forces for these policy formulations are increasing dependency on fossil fuel imports & the environmental impact of fossil fuel use incl. potential effects on climate change
- The policies are supported by appropriate regulatory frameworks.
- Regulatory frameworks include wide range of support instruments (e.g. market support, investment support, R&D support, awareness campaign) to support the RE policy implementation

RE POLICIES & REGULATORY FRAMEWORK TIME MAP IN THE ASEAN

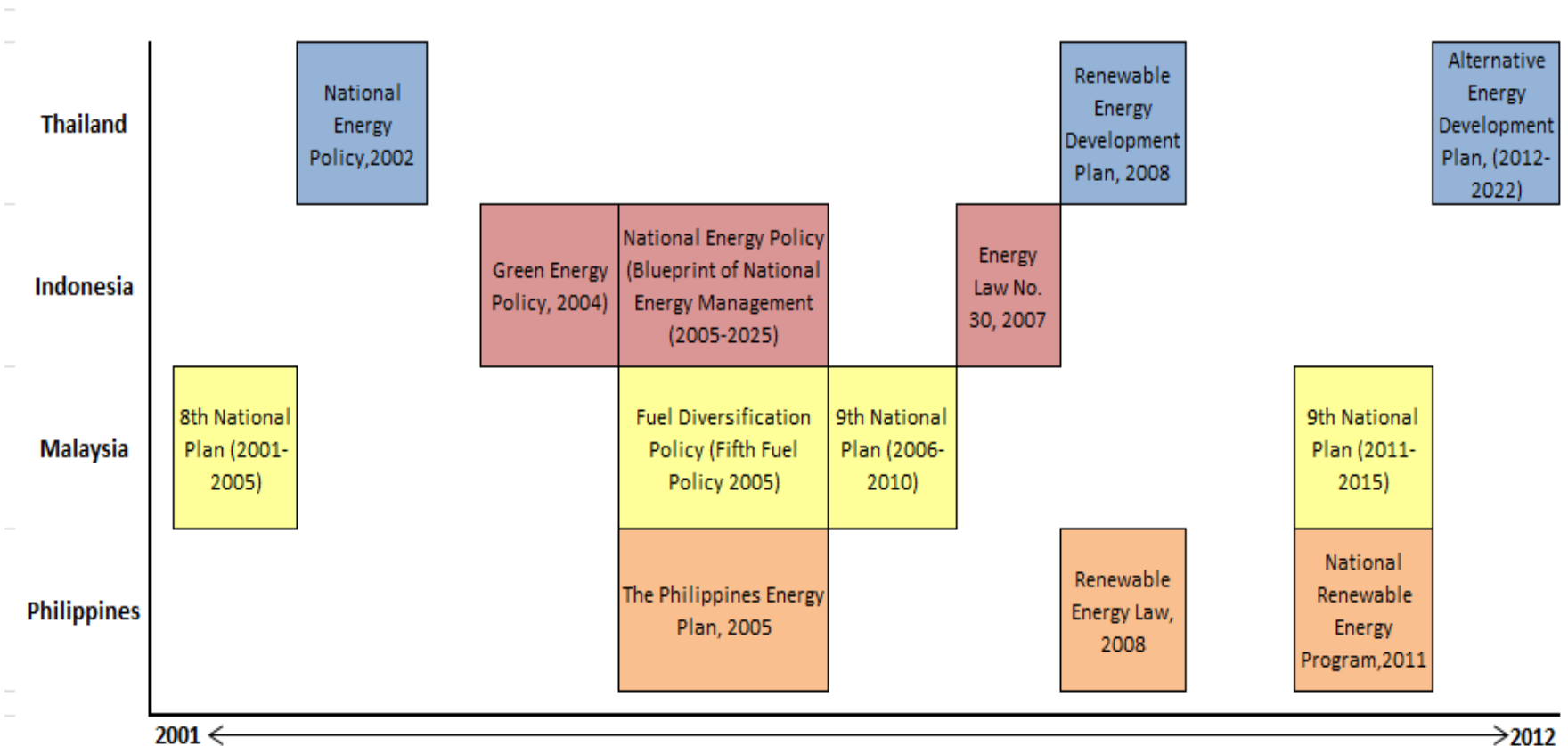


Figure: Key RE policies of the ASEAN since 2001

OVERVIEW OF RE POLICIES & REGULATORY FRAMEWORK

1. National RE Targets

- Most ASEAN countries have formulated medium term, long term targets for RE deployment
- Although the ambition level differs, the policy targets serve as an essential condition for developing a stable and integrated policy framework

Indonesia

- Wind, solar, hydro 1.4% share (combined) by 2025
- Wind 0.1 GW by 2025
- Solar PV 156.76 MW by 2025
- Hydro 2 GW, including 0.43 GW micro-hydro, by 2025
- Geothermal 6.3% share in primary energy and 12.6 GW electricity by 2025
- Biofuel 10.2% share in primary energy by 2025

OVERVIEW OF RE POLICIES & REGULATORY FRAMEWORK

1. National RE Targets

Malaysia

Grid connected RE power

- Electricity 2,065 MW (excluding large hydro), 11.2 TWh, or 10% of national supply;
- 6% capacity & 5% generation by 2015
- 11% capacity & 9% generation by 2020
- 14% capacity & 11% generation by 2030
- 36% capacity & 15% generation by 2050

Philippines

Philippines Renewables in general Triple 2010 renewable power capacity by 2030

- Wind 2,378 MW by 2030
- Solar 285 MW by 2030
- Hydro 8,724.1 MW by 2030
- Geothermal 3,461 MW by 2030
- Biomass 315.7 MW by 2030
- Ocean 70.5 MW by 2030

Thailand

15.6% RE in 2011, 19.1% RE in 2016 , 20.3% RE in 2022

Electricity

- Wind 1,200 MW by 2022
- Solar 2,000 MW by 2022
- Hydro 1,608 MW by 2022
- Biomass 3,630 MW by 2022
- Biogas 600 MW by 2022
- MSW 160 MW by 2022
- New energy 3 MW by 2022

Heating

- Solar 100 ktoe by 2022
- Biomass 8,200 ktoe by 2022
- Biogas 1,000 ktoe by 2022
- Waste 1,465 TJ (35 ktoe) by 2022

Transport

- Ethanol 9 million litres/day by 2022
- Biodiesel 5.97 million litres/day by 2022
- New fuel 25 million litres/day by 2022

OVERVIEW OF RE POLICIES & REGULATORY FRAMEWORK

2. Financial Incentives

- Several financial incentives such as Feed-in Tariffs, Tax incentives, Capital cost grants etc have been introduced by most of the ASEAN countries as part of its policy mechanism to accelerate the investment in RETs.
- Feed-in tariffs (FITs) offers long-term contracts to renewable energy producers and electricity generated from renewable energy sources (RES) is paid a premium price for delivery to the grid.
- Tax incentives such as tax credits, tax reductions or tax exemptions which are applied to VAT for energy or on custom duties on imported materials have been introduced to increase the competitiveness of RETs
- Capital cost grants that reduce investment costs are one of the means to overcome high initial capital cost of many RETs

OVERVIEW OF RE POLICIES & REGULATORY FRAMEWORK

2. Financial Incentives

Thailand

- In 2006, the Thai government enacted a FIT that ensures an additional energy purchasing price is guaranteed on top of the normal electricity market price.
- The amounts of adders in this feed-in premium scheme vary, depending on the technology used .

Type of RE <small>(Source: Tongsoipit and Greacen, 2012)</small>	Unit: US Dollars per kWh					Years Supported
	2007 Adder Rate	2009 Adder Rate	2010 Adder Rate	Special Adder for Diesel Replacement	Special Adder for Three Southernmost Provinces	
Biomass						
Installed Capacity ≤ 1 MW	0.010	0.017	0.017	0.033	0.033	7
Installed Capacity > 1 MW	0.010	0.010	0.010	0.033	0.033	7
Biogas						
Installed Capacity ≤ 1 MW	0.010	0.017	0.017	0.033	0.033	7
Installed Capacity > 1 MW	0.010	0.010	0.010	0.033	0.033	7
Waste						
Landfill and Digester	0.083	0.083	0.083	0.033	0.033	7
Thermal Process	0.083	0.117	0.117	0.033	0.033	7
Wind						
Installed Capacity ≤ 50 kW	0.117	0.150	0.150	0.050	0.050	10
Installed Capacity > 50 kW	0.117	0.117	0.117	0.050	0.050	10
Small/Micro Hydro						
50 kW < Installed Capacity < 200 kW	0.013	0.027	0.027	0.033	0.033	7
Installed Capacity ≤ 50 kW	0.027	0.050	0.050	0.033	0.033	7
Solar	0.267	0.267	0.217	0.050	0.050	10

OVERVIEW OF RE POLICIES & REGULATORY FRAMEWORK

2. Financial Incentives (Tax Incentives)

Malaysia

- Pioneer Status (PS) - Exemption from income tax (25% from 2009 onwards) on 100% of statutory income for 10 years
- Investment Tax Allowance (ITA) - 100% of qualifying capital expenditure incurred within a period of 5 years can be utilized against 100% of the statutory income for each year of assessment
- Exemption of import duty and/or sales tax to “Third Party Distributors (TPD)” - for Solar (PV or thermal) Systems products

Philippines

- Power plants using RES are exempt from income tax for first 7 years of operation
- After that, they pay reduced tax rate of 10% annually & property tax is capped at 1.5%
- No custom duties on import of materials on renewable energy power plant

OVERVIEW OF RE POLICIES & REGULATORY FRAMEWORK

2. Financial Incentives (Capital cost grants)

Thailand

- National Energy Conservation Programme (ENCON), which is funded by fossil fuel tax provides financial assistance and incentives for projects related to energy conservation, RE, R&D, as well as public awareness and training
- Investment grant of 30% for solar thermal systems in commercial applications, 30% for biogas installations and 10% for municipal solid waste

Indonesia

- 30 % net income tax reduction for six years, free repatriation of investments and profits, and dispute settlement for investor in RE
- Geothermal companies are afforded additional incentives. The 2003 Geothermal Law established long-term licenses for land use (more than 30 years) and a regulated price for geothermal energy

OVERVIEW OF RE POLICIES & REGULATORY FRAMEWORK

3. Non-Financial Incentives

- Non-financial incentives include different schemes and mechanisms that mainly aim at facilitating independent power producers (IPPs) to be able to enter the market easily
- *The Small Renewable Energy Programme (SREP) in Malaysia* → introduced to enable power generated from renewable sources to access the national grid.
- SREP developers can sell renewable power to utilities through the Renewable Energy Power Purchase Agreement, which gives plants a license for a period of 21 years to sell upto 10 MW to the national grid

OVERVIEW OF RE POLICIES & REGULATORY FRAMEWORK

3. Non-Financial Incentives

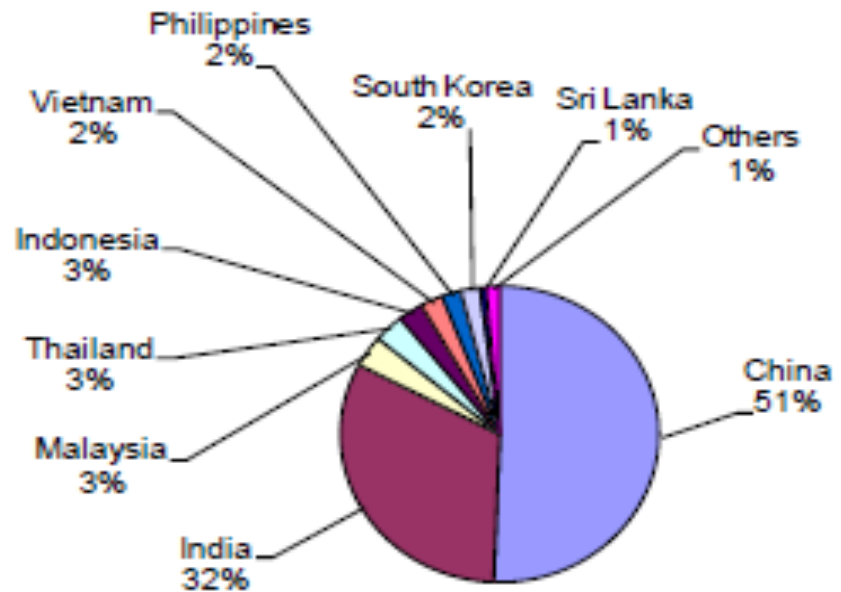
- *Ministerial Decree on Small Distributed Power Generation & Ministerial Regulation on Medium Scale Power Generation Using Renewable Energy in Indonesia* → allow private sector to sell renewable power to the local utility's power grid
- *Renewable Energy Program for Small Power Producers (SPP) & Very Small Power Producers (VSPP) in Thailand* → private producers producing electricity (less than 10 MW or upto 90MW) from combined heat and power and renewable energy sources can sell electricity to national electricity generating authority or directly to electricity utility company

OVERVIEW OF RE POLICIES & REGULATORY FRAMEWORK

4. Other measures

- Other measures like carbon finance has been useful for small-scale projects either by covering project development capital or a portion of the investment cost

- However unlike India & China, ASEAN countries have not been significant host to CDM projects compared to global lending



(Source: OECD/IEA, 2010)

- Other funding mechanisms such as Carbon Partnership Facility, ADB's Carbon Market Initiative, etc also place special focus on RE and EE projects

BARRIERS (OTHER) FOR RE DEVELOPMENT

- Several economic and non-economic barriers exist that deter the successful penetration of RETs. Some of the common categories of barriers include
 - I. **Institutional/ Political** (lack of regulatory framework, institutional coordination)
 - e.g. in Thailand, more than 3 GW of signed contracts, mostly for solar energy, are currently delayed due to bureaucratic obstacles (GIZ, 2012)
 - II. **Financial** (high cost of RETs, fossil fuel subsidies)
 - e.g. in 2010 Indonesia spent EUR 45.8 million for micro hydro & small scale solar PV installation; whereas in 2011 the country allocated EUR 10.8 billion for fossil fuel subsidies (GIZ, 2012))

BARRIERS (OTHER) FOR RE DEVELOPMENT

III. Market

e.g. in Thailand, although the govt. has announced funding for RE industries, much of the equipment for renewable energy plant has to be imported at relatively high prices (GIZ, 2012)

IV. Technical/Infrastructure

e.g. in Indonesia the national grid is quite fragmented
In the Philippines the grid is not yet in a state to absorb power from the targeted 0.83 GW RE (non-base load, such as solar or wind (GIZ,2012))

V. Socio-cultural (prevalence of vested interested)

e.g in Thailand, farmers have been protesting against biomass power projects in areas meant for conventional agricultural use

BARRIERS (OTHER) FOR RE DEVELOPMENT

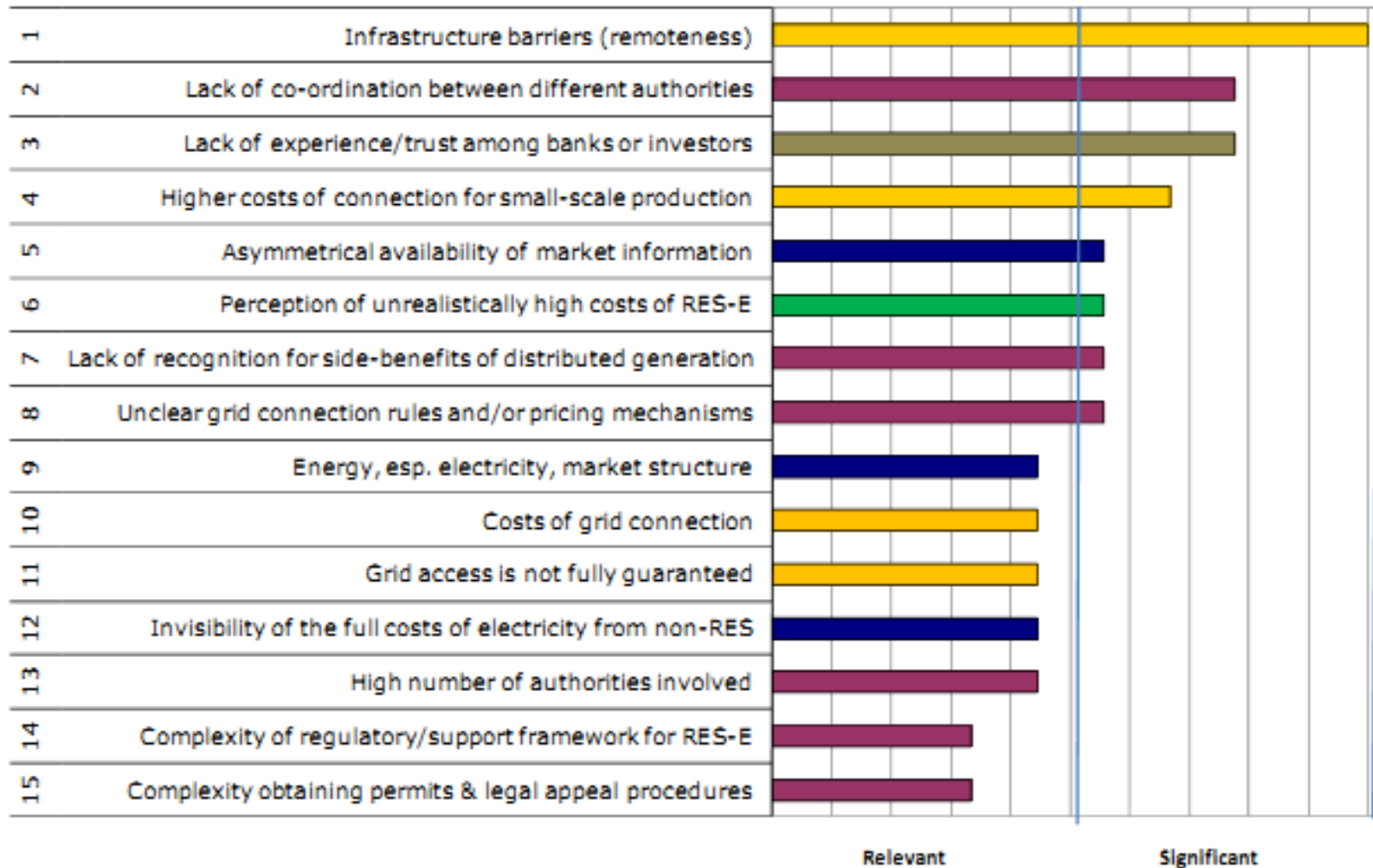


Figure: Ranking of some of the important non-economic Barriers in ASEAN countries (Source: OECD/IEA, 2010)

- Infrastructure (grid related) barriers are most significant in major ASEAN countries followed by administrative and market related hurdles

CONCLUSIONS

1. Most ASEAN countries have significant potential for diverse RES which were relatively untapped in the past
2. By setting national RE targets and providing financial incentives, the ASEAN countries have made steady progress towards building stable, long-term regulatory frameworks and attracting investment in RE.
e.g. Philippines will have 4,700 MW of renewable-based capacity installed by 2013, meaning Philippines will lead in the global production in geothermal electricity and also be the largest producer of wind power in Southeast Asia
3. To achieve the realizable potential of the diverse RES, the countries need to address the barriers and ensure the policies to support RE are effective
e.g. between 2007 and 2010, although contract for 4.3 GW of RE projects were signed under the provision of FITs in Thailand, only 0.85 GW (mainly from biomass) of capacity became operational

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