ASEAN's Energy Dilemna

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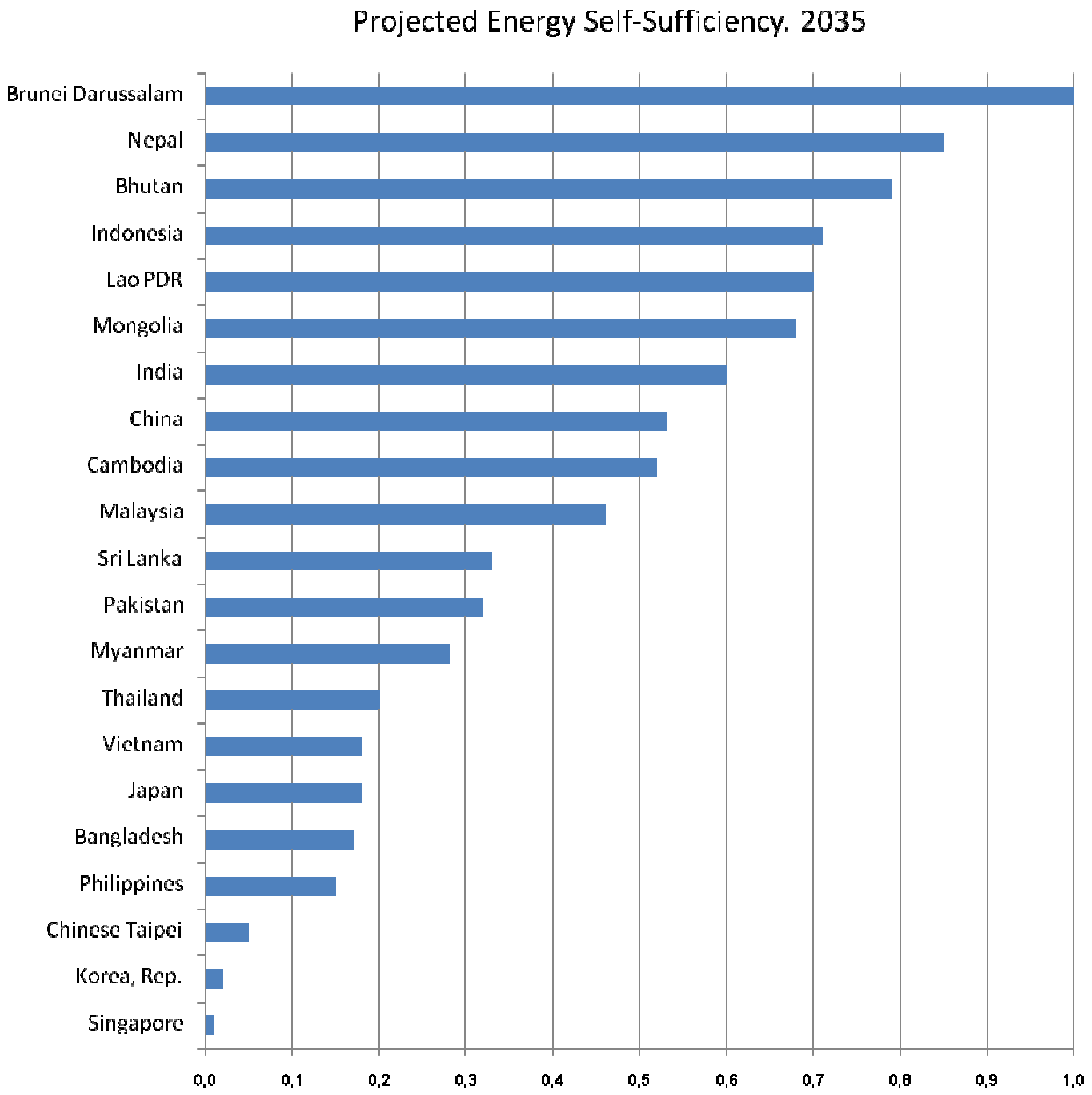
ASIA's Energy Challenge

- By 2035, oil consumption to double; Gas to triple; Coal 80% up; Hydro quadruple; Renewables (Hydro,, wind, solar, bio-fuels, geothermal) only 13% power generation by 2035.
- ASEAN depends on fossil fuel for 73% of its energy


Projected Energy Self-Sufficiency. 2035
Brunei Darussalam
Nepal
Bhutan
Indonesia
Lao PDR
Mongolia
India
China
Cambodia
Malaysia
Sri Lanka
Pakistan
Myanmar
Thailand
Vietnam
Japan
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Philippines
Chinese Taipei
Korea, Rep.
Singapore
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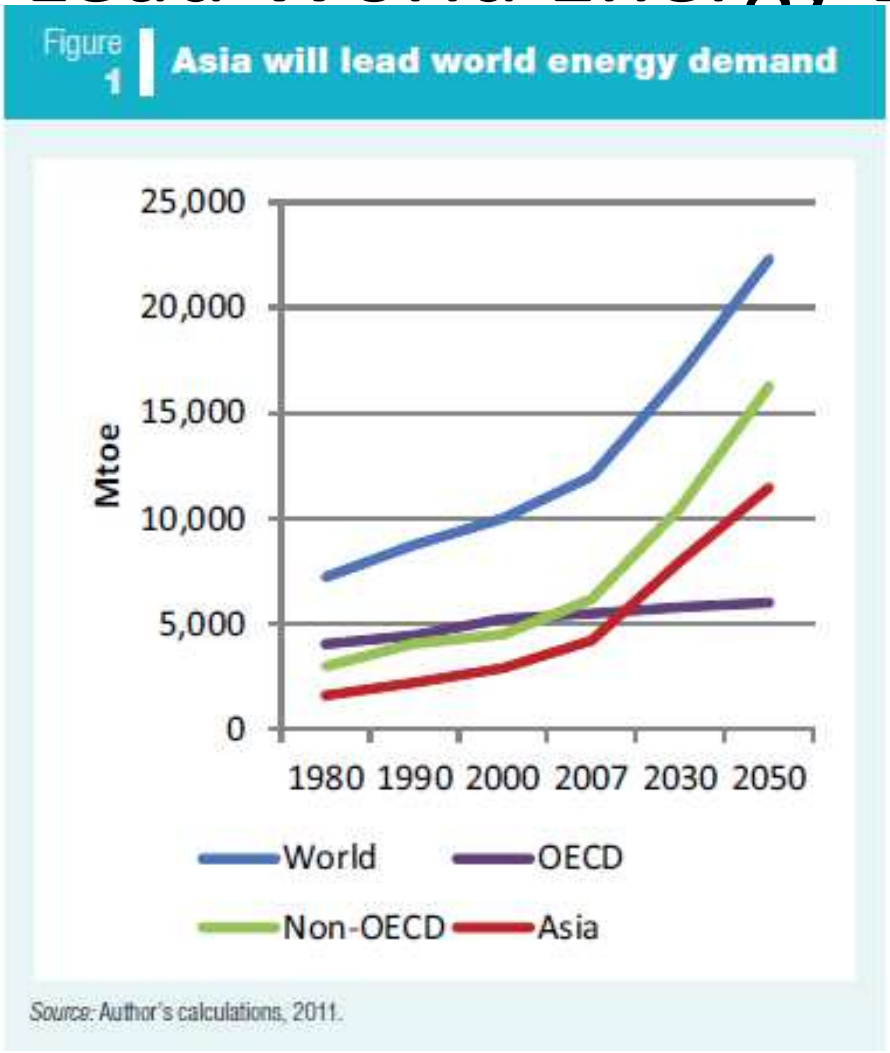
Asia Will Lead World Energy Demand



Source: Asia 2050 Study, ADB 2011

Projection of Energy Demand and Supply in Asia

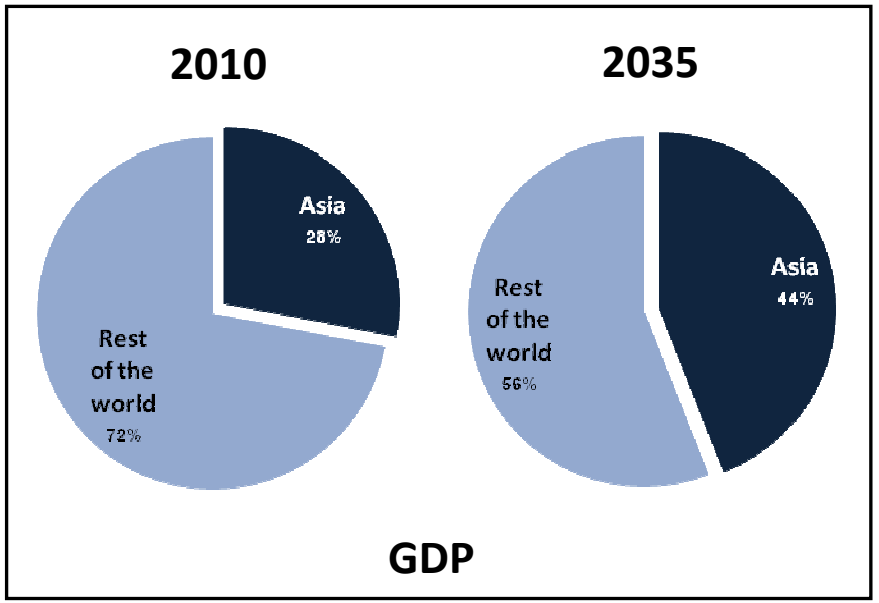
Table 1 **Projection of energy demand and supply in Asia**

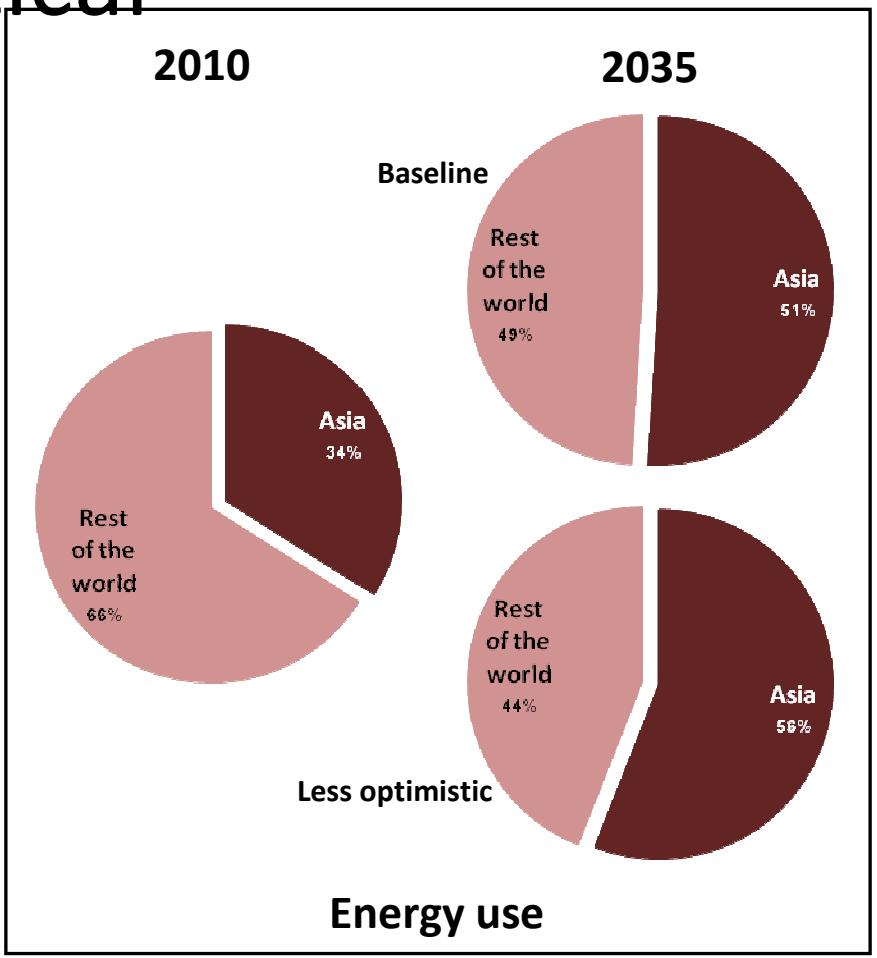
	1980	1990	2000	2007	2030	2050
Asia Energy Demand (Mtoe)	1,625	2,220	2,910	4,242	7,980	11,480
PRC	603	872	1,105	1,970	3,637	5,011
India	207	318	457	622	1,341	2,389
ASEAN	149	243	389	513	903	1,177
Central Asia	95	198	128	159	256	385
Iran		46	120	185	373	565
High Income Asia	557	629	746	896	995	1,112
Asia Energy Supply Mix (%)						
Coal		40	42	47	48	50
Oil		16	17	20	21	20
Gas		9	10	11	12	11
Hydro		3	2	2	2	1
Biomass		26	24	15	10	7
Other (including nuclear)		6	5	5	7	11
Asia electricity consumption (TWh)		2,249	3,057	6,113	17,267	26,181
PRC	259	586	1,081	2,717	7,513	10,630
India	90	197	369	544	1,966	3,440
ASEAN	55	167	321	497	1,383	1,956
Central Asia	63	162	124	152	443	715
Iran	38	58	86	145	332	544
High Income Asia	831	976	1,012	1,128	1,411	1,746
Reference Energy Consumption (Mtoe)						
World	7,228	8,761	10,018	12,013	16,790	22,288
OECD	4,050	4,476	5,249	5,496	5,811	6,011
US	1,802	1,913	2,280	2,337	2,396	2,412
Non-OECD	3,003	4,087	4,507	6,187	10,529	16,277

Source: EIA (2010), IEA (2008), IEA (2009), IEA (2010a), IEA (2010 b), World Bank (2010) and Author's estimates, 2011.

Source: Asia 2050 Study, ADB 2011

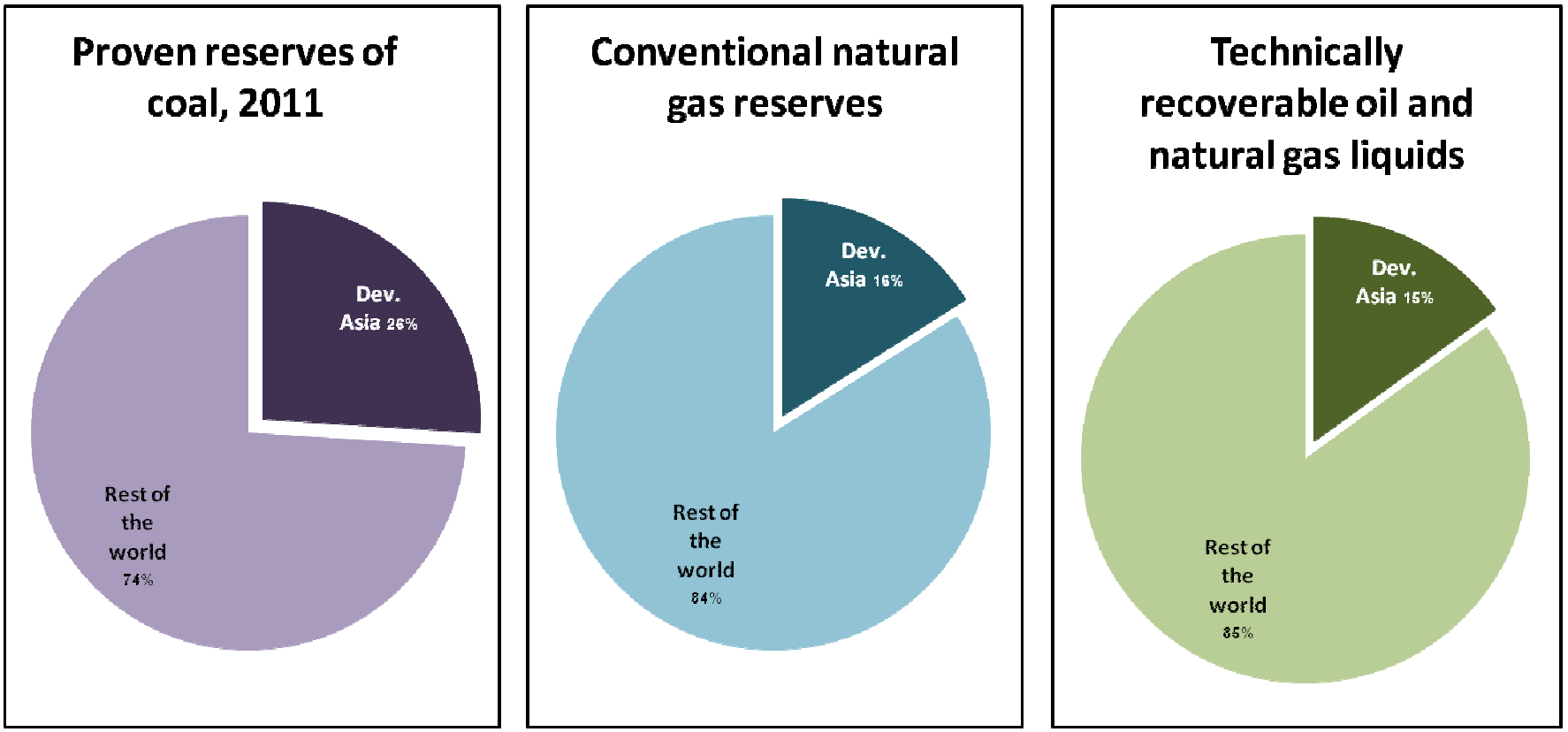
Energy needs for the Asian century are critical





⇨ ***Is this energy future realistic?***

Asia's endowment is not enough



Coal, Oil and Gas in ASEAN Countries (Reserves and Production)

Coal, oil and gas in ASEAN countries (reserves and production), at end of 2011

Countries	Coal Reserves (Million tonnes)	Coal Production (MTOE)	Oil Reserves (1,000 Million Barrels)	Oil Production 1,000 B/D	Gas Reserves (Trillion Cubic Metres)	Gas Production (MTOE)
Brunei	-	-	1.1	166.0	0.3	11.5
Indonesia	5,529.0	199.8	4.0	942.0	3.0	68.0
Malaysia	-	-	5.9	573.0	2.4	55.6
Myanmar	-	-	-	-	0.2	11.2
Thailand	1,239.0	6.0	0.4	345.0	0.3	33.3
Vietnam	150.0	24.9	4.4	328.0	0.6	7.7
China	114,500.0	1,956.0	14.7	4,090.0	3.1	92.3
World Total	860,938.0	3,955.5	1,652.6	83,576.0	208.4	2,954.8

Source: BP Statistical Review of World Energy 2012

Energy Use in ASEAN – Per Capita

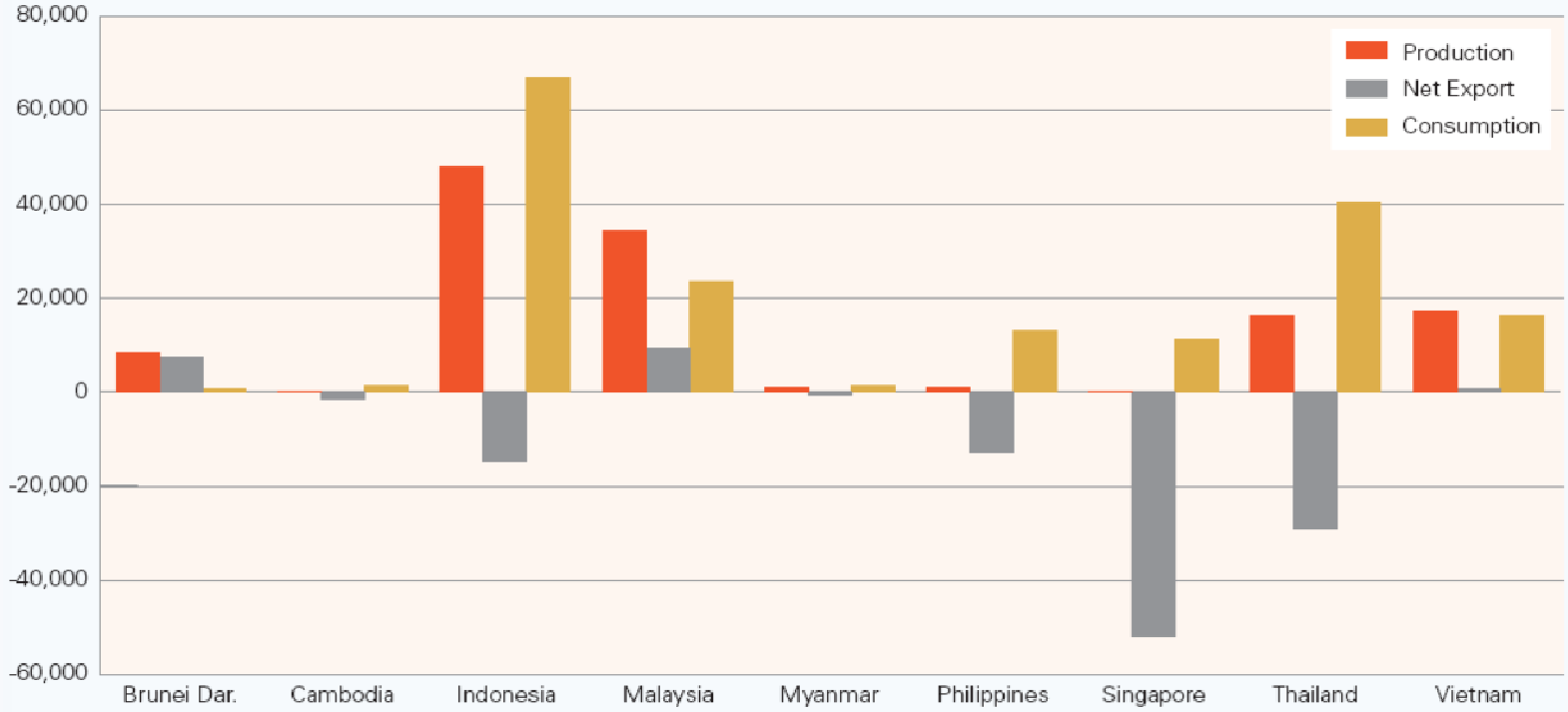
Energy use in ASEAN

Countries	Energy Consumption per Capita			
	Kilograms of Oil Equivalent			Average Annual Growth Rate (%)
	1995	2000	2009	00 -09
Brunei	7,984.1	7,502.7	7,971.3	1.3%
Cambodia	302.0	319.6	370.7	1.7%
Indonesia	676.9	729.6	850.8	1.7%
Lao PDR	-	-	-	-
Malaysia	1,791.1	2,018.8	2,391.0	2.1%
Myanmar	279.3	278.0	316.4	1.6%
Philippines	490.7	522.9	423.6	-2.3%
Singapore	5,289.1	4,778.2	3,704.4	-1.6%
Thailand	1,037.9	1,145.9	1,503.7	3.1%
Vietnam	416.4	475.6	744.5	5.2%
China	869.2	867.1	1,695.3	7.8%
Japan	3,956.1	4,090.4	3,700.2	-1.1%
Europe	3,544.9	3,730.3	3,534.5	-0.6%

Source: World Bank Database, 2012

Oil Production, Net Exports, Consumption

Figure 3.21. Oil Production, Net Exports, Consumption
Oil-Equivalent Thousand Tonnes in Selected ASEAN Countries, 2009



ASEAN=Association of Southeast Asian Nations; Brunei Dar.=Brunei Darussalam
Notes: (i) Oil-equivalent tonnes measure the amont of energy released by burning approximately one tonne of crude oil; (ii) Figures are calculated on a net calorific value basis.
Source: International Energy Agency. On-line Countries Data, available at: http://www.iea.org/countries/

Source: ASEAN 2030 Study, ADB 2011

Primary Energy Forms in Southeast Asia 2007,2030

Table 3.16. Primary Energy Forms in Southeast Asia 2007, 2030

Primary Energy	2007		2030		Annual average growth rate
	Oil-equivalent million tons	% share	Oil-equivalent million tons	% share	
Coal	76.0	14.9	300.1	26.0	6.2%
Oil	185.0	36.2	408.1	35.4	3.5%
Natural Gas	109.0	21.3	183.3	15.9	2.3%
Nuclear	0.0	0.0	30.4	2.6	–
Hydro	6.0	1.2	29.0	2.5	7.1%
Geothermal	15.0	2.9	47.4	4.1	5.1%
Others	120.0	23.5	154.2	13.4	1.1%
Total	**511.0**	**100.0**	**1,152.5**	**100.0**	**3.6%**

ASEAN=Association of Southeast Asian Nations.
Notes: (i) Oil-equivalent tonnes measure the amont of energy released by burning approximately one tonne of crude oil; (ii) Other sources of energy include the traditional use of biomass—the gleaning of fields and forests.
Source: Chira Achayuthakan and Weerakorn Ongsakul. 2012., Energy Needs toward ASEAN 2030, Background paper prepared for the ASEAN 2030 Study.

ASEAN Hydro Potential

- Besides fossil fuels, large hydro potential mainly in GMS, some installed
- GMS potential is 250,000 MW but only less than half feasible.
- Lower Mekong Basin potential 50,000-64,750 MW
- Yunnan and Myanmar: 70% total. Major potential in Myanmar
- Overall 6,000 MW built or under construction
- Viet Nam: 34,000 MW (+/- 20,000 feasible)
- Laos: 26,500 MW
- Myanmar: 108,000 MW (25,000 MW exploitable)
- Cambodia:10,000 MW in North East
- Malaysia: Sarawak
- Yunnan: 71,168 MW

ASEAN 2030 Projection on Renewables

Table 6 ASEAN 2030 Projection on Renewables

2030 Projection	Share in Primary Energy (APS)			Share in Electricity (APS)		
	Hydro	Geothermal	Renewables*	Hydro	Geothermal	Renewables*
ASEAN	**2.52%**	**4.11%**	**13.38%**	**16.32%**	**2.65%**	**6.12%**
Brunei	-	-	0.00%	-	-	0.00%
Cambodia	15.79%	-	30.70%	77.27%	-	0.00%
Indonesia	0.61%	5.96%	13.02%	5.09%	4.98%	1.44%
Lao	21.69%	-	10.84%	64.56%	-	-
Malaysia	2.18%	-	3.95%	11.99%	-	2.64%
Myanmar	40.37%	-	3.98%	97.64%	-	-
Philippines	1.37%	20.49%	11.47%	8.42%	12.22%	1.62%
Singapore	-	-	0.60%		-	4.93%
Thailand	0.15%	-	28.29%	1.06%	-	32.07%
Vietnam	2.74%	-	9.52%	15.40%	-	0.58%

* Mostly renewables are biomass or agricultural waste except solar in Singapore

Source: Achayuthakan C. and Ongsakul W., ADBI, 2012

ASEAN Energy Outlook

- ASEAN energy demand particularly for electricity will increase rapidly over the next 2 decades
- In spite of hydro potential, dependency on fossil fuel will remain large at over 70% in 2030. The share of coal might double.
- Projections by ACE up to 2020 show electricity generation by coal to double and that of hydro to stagnate
- For instance, in Viet Nam power plan 2006-2015, on 48,700 MW new generation capacity, 53% (25,890 MW) to be coal fired, 29% hydro, 13 % LNG.

Electricity Generation Mix in 2000 and 2020

Electricity Generation Mix in 2000 and 2020
(by country and type in fuel, in percentage, with values for 2020 in brackets)

Countries	Gas	Coal	Oil	Geo	Hydro	Others
Brunei	100 (89)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (11)
Cambodia	0.0 (19)	0.0 (0)	100 (12)	0.0 (0)	0.0 (30)	0.0 (39)
Indonesia	28.1 (25)	42.1 (60)	24.3 (4)	1.2 (3)	4.2 (4)	0.0 (3)
Laos	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	100 (100)	0.0 (0)
Malaysia	74.8 (44)	9.7 (46)	5.1 (0)	0.0 (0)	10.4 (9)	0.0 (1)
Myanmar	44.9 (4)	0.0 (2)	11.4 (0)	0.0 (0)	43.6 (93)	0.0 (0)
Philippines	0.0 (8)	44.8 (82)	19.3 (1)	11.1 (3)	7.5 (5)	17.2 (0)
Singapore	12.6 (78)	0.0 (18)	87.4 (2)	0.0 (0)	0.0 (0)	0.0 (1)
Thailand	74.1 (69)	16.0 (17)	8.1 (0)	0.0 (0)	1.8 (12)	0.0 (0)
Vietnam	20.9 (30)	28.8 (40)	20.2 (0)	0.0 (0)	30.1 (28)	0.0 (2)
Total	47.7 (39)	22.0 (45)	19.7 (1)	1.4 (1)	7.4 (3)	1.8 (1)

Source: BP Statistical Review of World Energy 2012; Nicolas F., ASEAN Energy Corporaation: An Increasing Daunting Challenge, IFRI, 2009.

ASEAN's Energy Security Challenges

1. The Financing Challenge
2. Energy trade and networking
3. Environmental Sustainability

Financing Challenge

- Huge financing needs particularly if hydro to quadruple capacity
- Private sector participates much in financing thru IPP: well tested and cost effective
- Pricing and subsidies still big problem (2% GDP in Viet Nam and Indonesia; $22 Bn in Indonesia).
- Problems of populist policies which also stand in way of regional cooperation and integration in energy: Each government wants to remain in control of energy policies and prices.
- No regional approach

Energy Trade and networking

- Energy resources not evenly distributed : demand not where supply is
- Integration at ASEAN level of energy production and delivery systems is essential to align demand and supply
- However cross border energy markets and infrastructure has been given low priority even in AEC. No deadlines or firm commitments
- Some local interconnections exist however in GMS and elsewhere
- No common standards and specifications agreed on.
- National monopolies reduce competition: EGAT, EVN, EDL, Petronas, PTT, etc
- Different national market structures, tariffs, and technical specifications.

Environment Sustainability

- No common environmental sustainability sta
- No common approach to climate change
- No common or coordinated tax policies

Political and Security Challenges

- Territorial sovereignty Challenges
- Hydropower development

Thank You