



Asia-Pacific  
Economic Cooperation

Asia Pacific Energy  
Research Centre



# APEC Energy Demand and Supply Outlook and New and Renewable Energy

26<sup>th</sup> Meeting of APEC New and Renewable Energy  
Technologies Expert Group Meeting

3-4 April 2006

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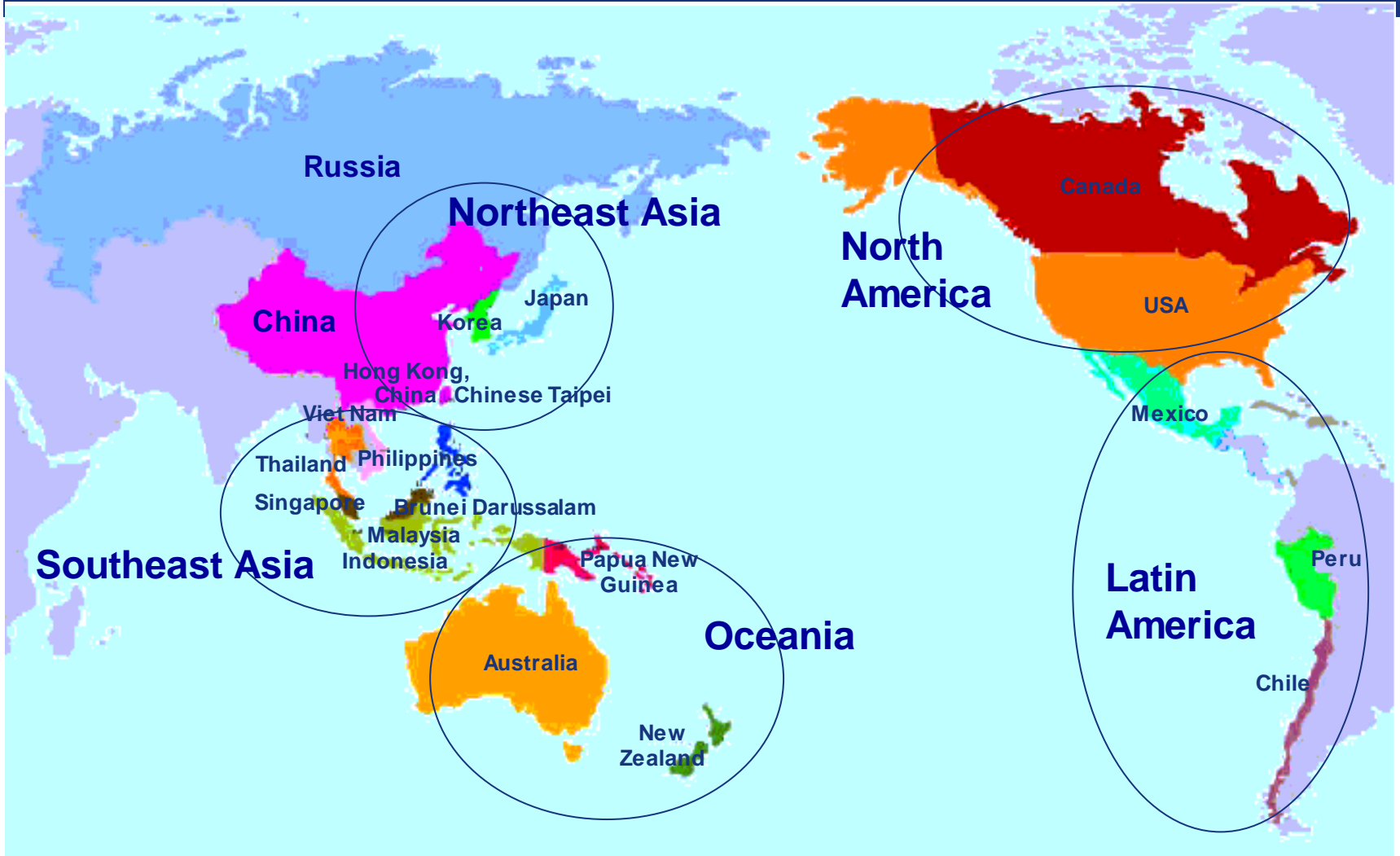


# Outline

- Regional Grouping
- Key Factors in the APERC Outlook
- Drivers
- Final Energy Demand
- Primary Energy Demand
- Oil Import Dependency
- Electricity Generation
- Investment Requirements for the Energy Sector
- Environment
- Implications



# Regional Grouping





# Key Factors in the APERC Outlook

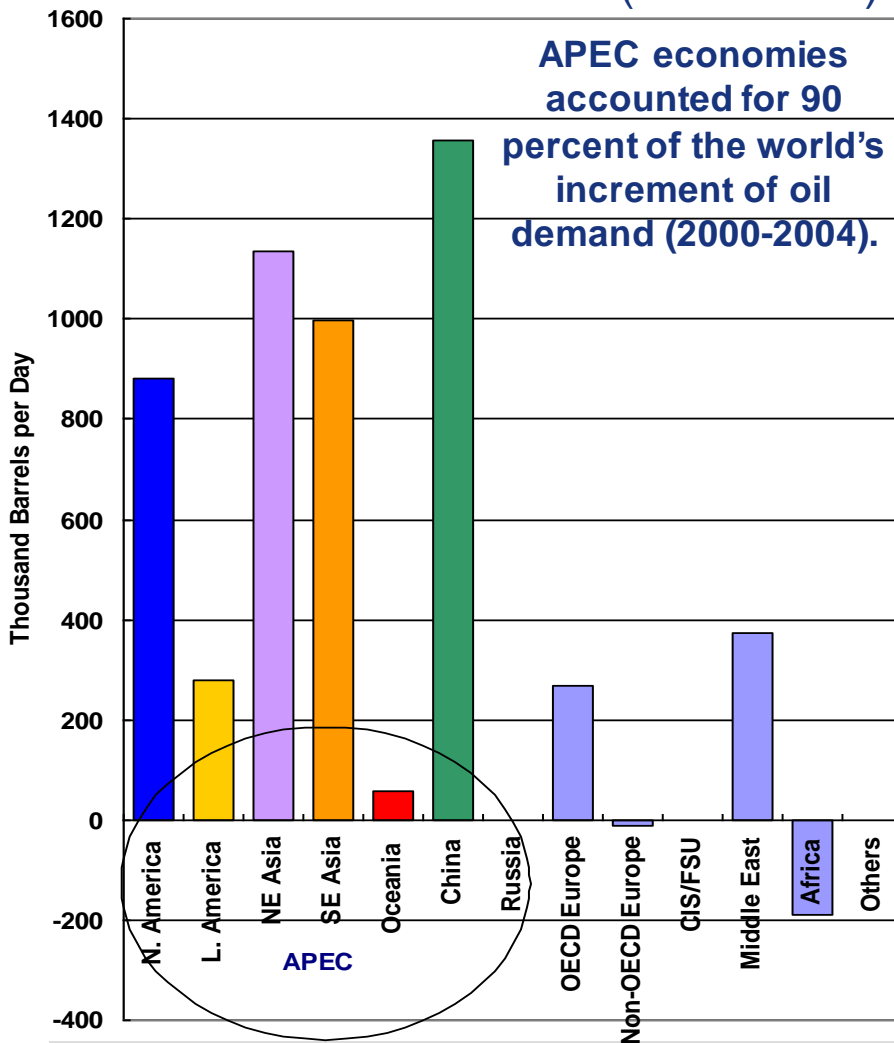
- **Income growth and change in life style**
  - **Urbanisation**
  - **Pursuit for comfort and convenience**
    - Growing number of electric appliances (Residential), escalating number of passenger vehicle (Transport), and surge in PC use (Commercial)
- **Industrialisation of the developing economies**
  - **China's robust growth for iron and steel, petrochemical, cement industries and its repercussion to the global economy.**
  - **Asian economies to develop automobile industries.**
    - **China, Indonesia, Japan, Korea, Malaysia, and Thailand**
- **Rising energy security concern**
- **Water availability and power demands**
- **Integration of regional energy markets into global market**
- **Technology development**





# Drivers for the APEC Energy Demand

## Growth of Oil Demand (2000-2004)



(Source) Blackwell (2005)

## ■ Income Growth

- GDP per capita will grow at an annual rate of 3.5 percent.

## ■ Urbanisation

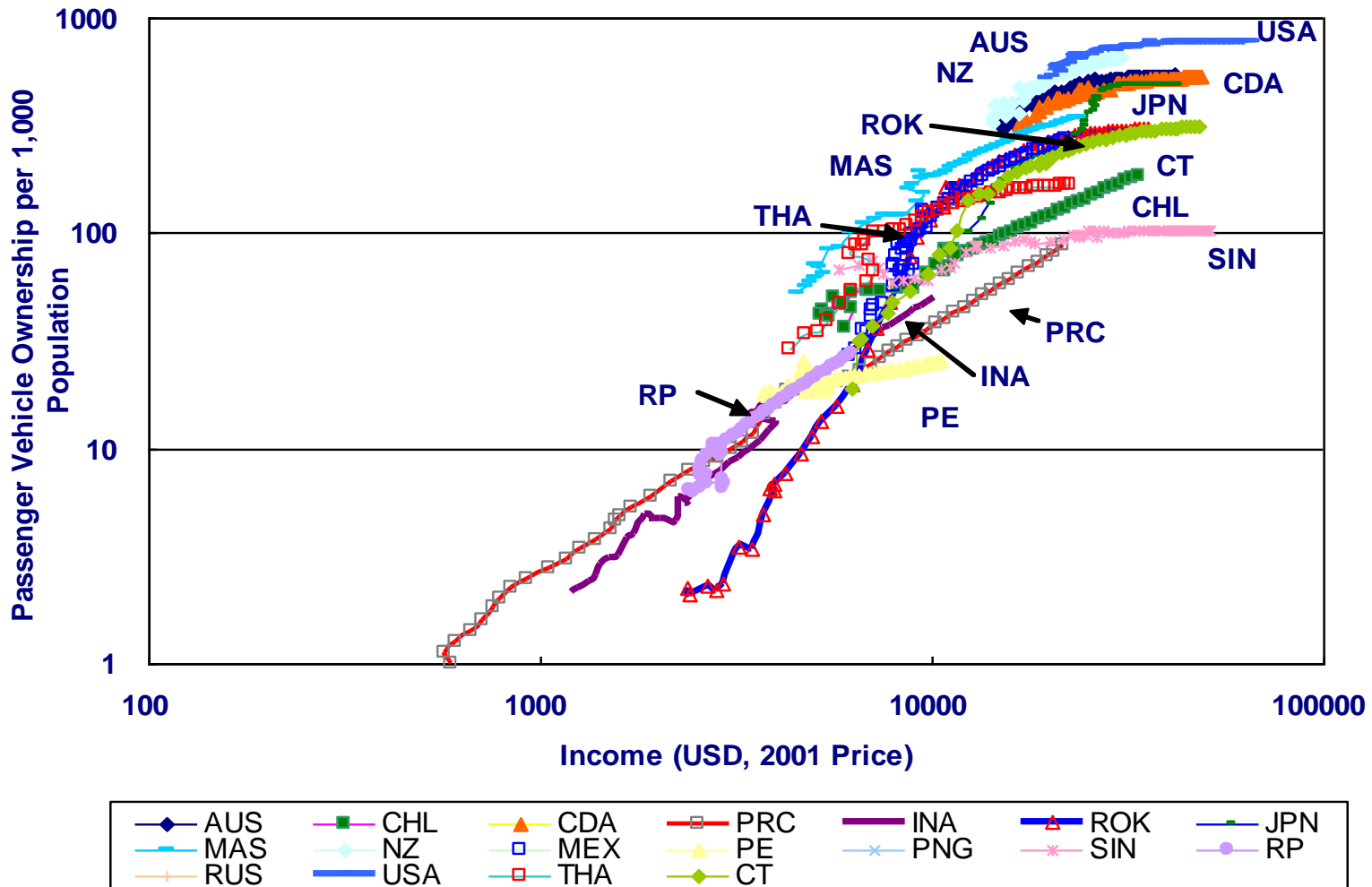
- By 2030, share of urban population will reach 68 percent of the total from 52 percent in 2003.
  - 26 million people per year will move from rural to urban cities.

## ■ Industrialisation

- Industry value added will grow by 4.8 percent per year, while GDP will grow by 4.1 percent per year.



# Income Growth and Fast Pace of Motorisation (1980-2030)



(Source) Asia Pacific Energy Research Centre (2006), "APEC Energy Demand and Supply Outlook", Forthcoming

(Note) The outlook shown here includes tentative result subject to change.

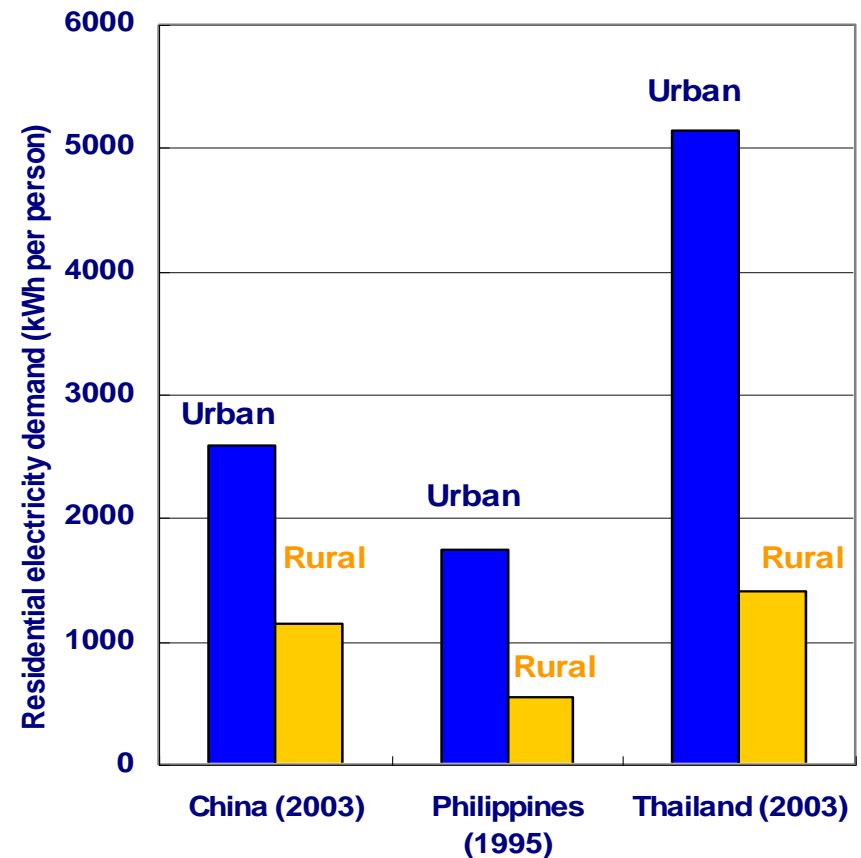


# Urbanisation and Residential Energy Demand in the Selected APEC Economies

## Urbanisation

	Urban Population (Millions)		Share of Urban Population	
	2003	2030	2003	2030
N. America	261	354	80%	87%
L. America	112	160	76%	84%
NEA Asia	146	159	71%	78%
SEA Asia	210	389	44%	63%
Oceania	22	29	76%	77%
China	504	878	39%	61%
Russia	105	94	73%	78%
<b>APEC</b>	<b>1,360</b>	<b>2,063</b>	<b>52%</b>	<b>68%</b>

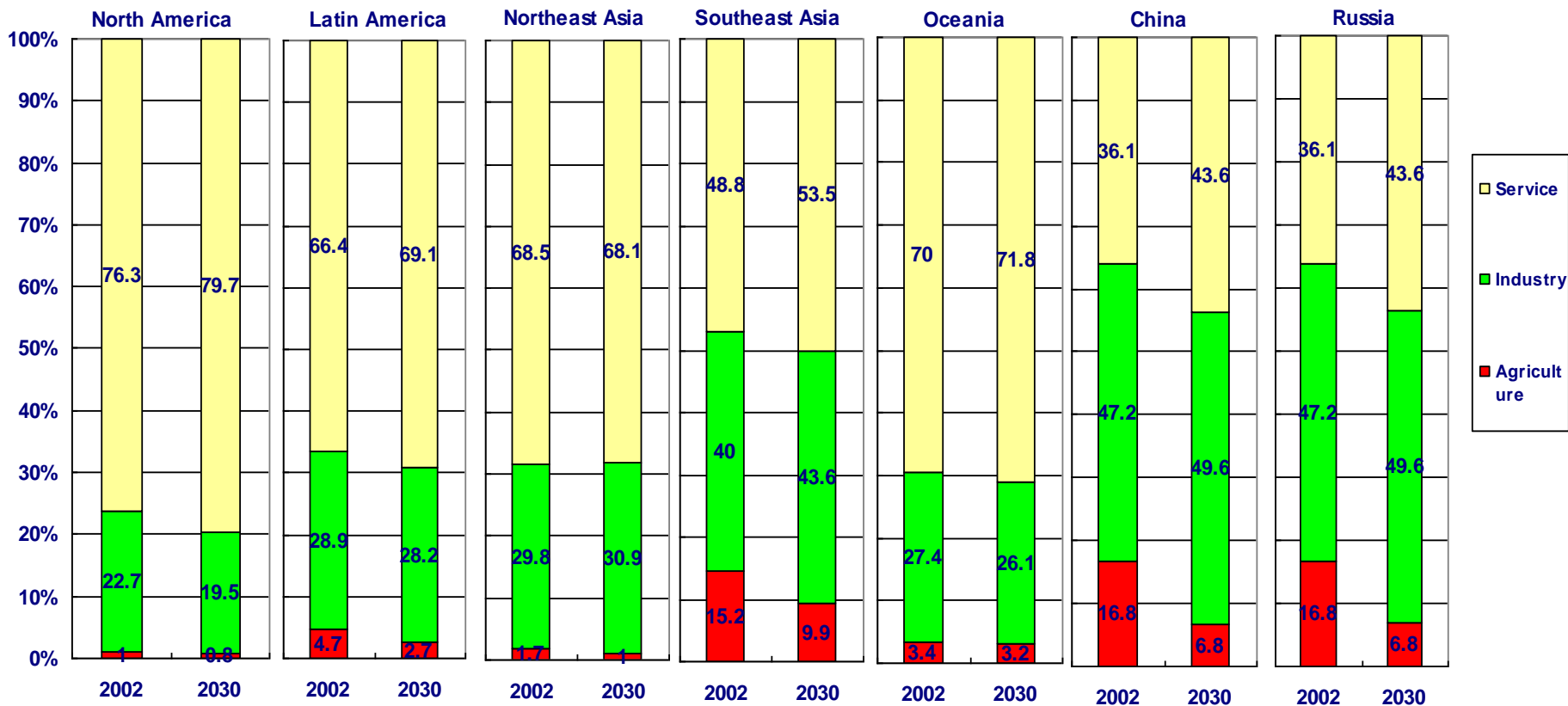
## Urban and Rural Residential Electricity Demand Per Person





# Share of Sectoral Value Added by Region (2002 and 2030)

## Increasing Share of Services Sector across the Region



(Source) Asia Pacific Energy Research Centre (2006), "APEC Energy Demand and Supply Outlook", Forthcoming

(Note) The outlook shown here includes tentative result subject to change.





# APEC Sectoral Energy Demand Outlook (2002-2030)

*Commercial sector to grow at the fastest pace followed closely by industry and transportation sectors.*

	Absolute Level (Unit:Mtoe)				Annual Growth Rate			
	2002	2010	2020	2030	2002-2010	2010-2020	2020-2030	2002-2030
<b>Industry</b>	1407.1	1841.8	2288.6	2768.6	3.4%	2.2%	1.9%	2.4%
<b>Transport</b>	1090.0	1334.6	1675.3	2074.2	2.6%	2.3%	2.2%	2.3%
<b>Commercial</b>	383.4	471.9	609.0	777.5	2.6%	2.6%	2.5%	2.6%
<b>Residential</b>	871.8	960.8	1071.9	1199.7	1.2%	1.1%	1.1%	1.1%

(Source) Asia Pacific Energy Research Centre (2006), "APEC Energy Demand and Supply Outlook", Forthcoming

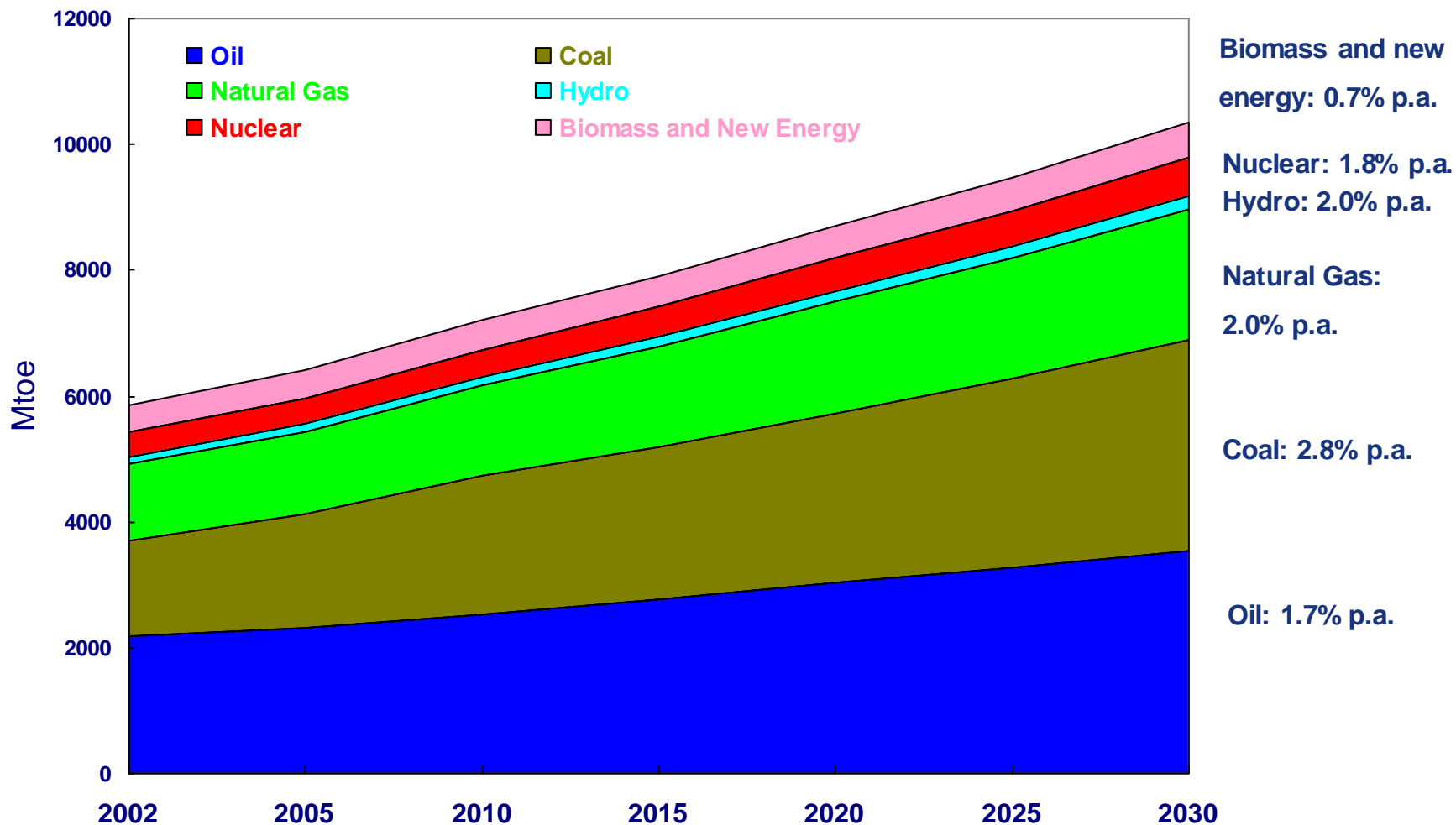
(Note 1) The outlook shown here includes tentative result subject to change.

(Note 2) Residential demand includes demand for electricity, gas, oil products, heat and biomass.



# APEC Primary Energy Demand Outlook (2002-2030)

*Coal to grow at the fastest pace, followed by natural gas.*



(Source) Asia Pacific Energy Research Centre (2006), "APEC Energy Demand and Supply Outlook", Forthcoming

(Note) The outlook shown here includes tentative result subject to change.



# Oil Import Dependency (2002-2030)

*Rising oil import dependency in North America, Southeast Asia, Oceania, and China*

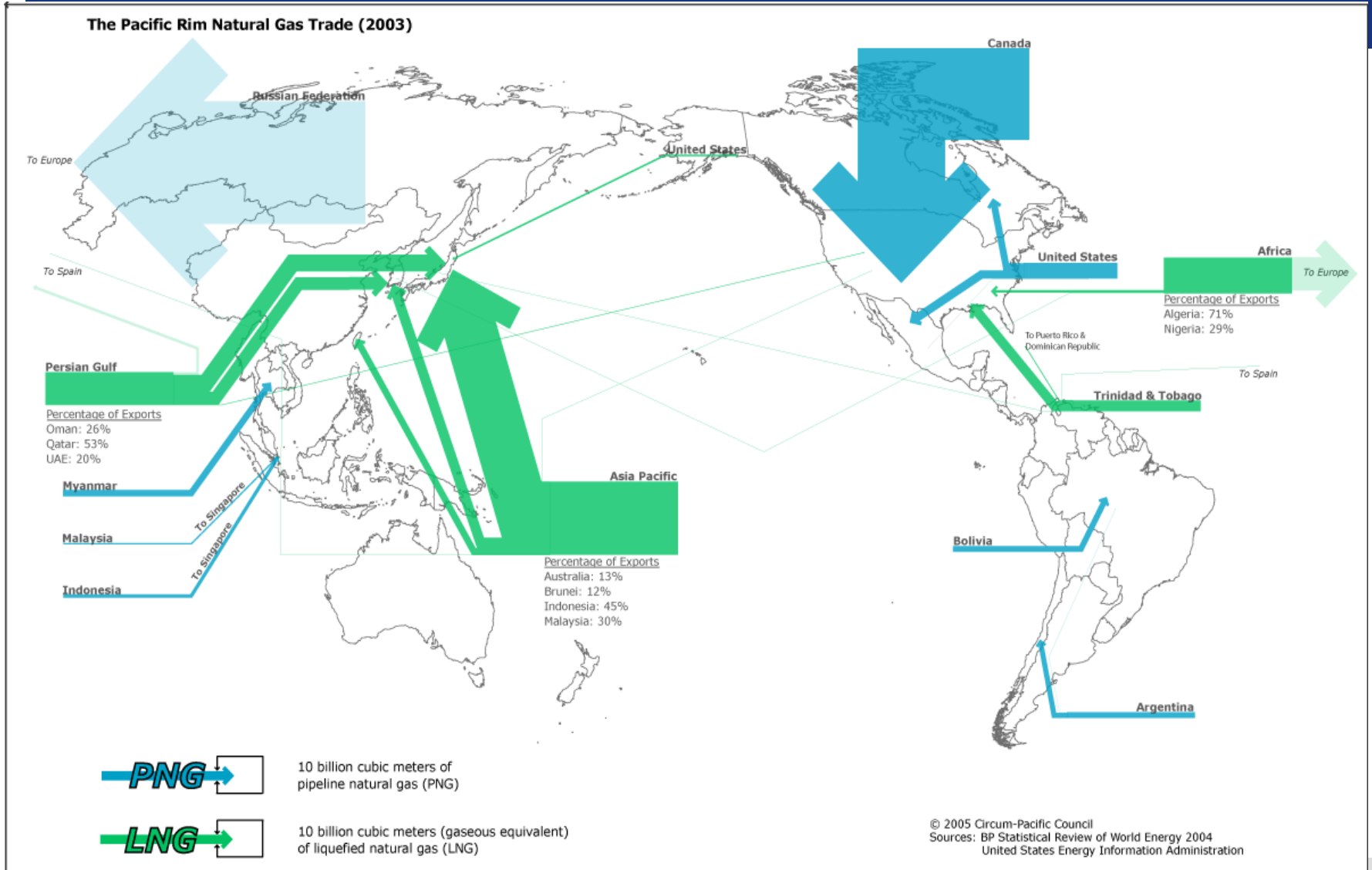
	<b>2002</b>	<b>2010</b>	<b>2020</b>	<b>2030</b>
<b>North America</b>	<b>55%</b>	<b>50%</b>	<b>54%</b>	<b>60%</b>
<b>Latin America</b>	<b>-73%</b>	<b>-35%</b>	<b>-27%</b>	<b>-16%</b>
<b>Northeast Asia</b>	<b>101%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
<b>Southeast Asia</b>	<b>21%</b>	<b>37%</b>	<b>56%</b>	<b>68%</b>
<b>Oceania</b>	<b>25%</b>	<b>42%</b>	<b>55%</b>	<b>62%</b>
<b>China</b>	<b>22%</b>	<b>39%</b>	<b>53%</b>	<b>68%</b>
<b>Russia</b>	<b>-167%</b>	<b>-156%</b>	<b>-139%</b>	<b>-141%</b>
<b>APEC</b>	<b>36%</b>	<b>38%</b>	<b>44%</b>	<b>52%</b>

(Source) Asia Pacific Energy Research Centre (2006), "APEC Energy Demand and Supply Outlook", Forthcoming

(Note) The outlook shown here includes tentative result subject to change.



# Natural Gas Trade: LNG and PNG

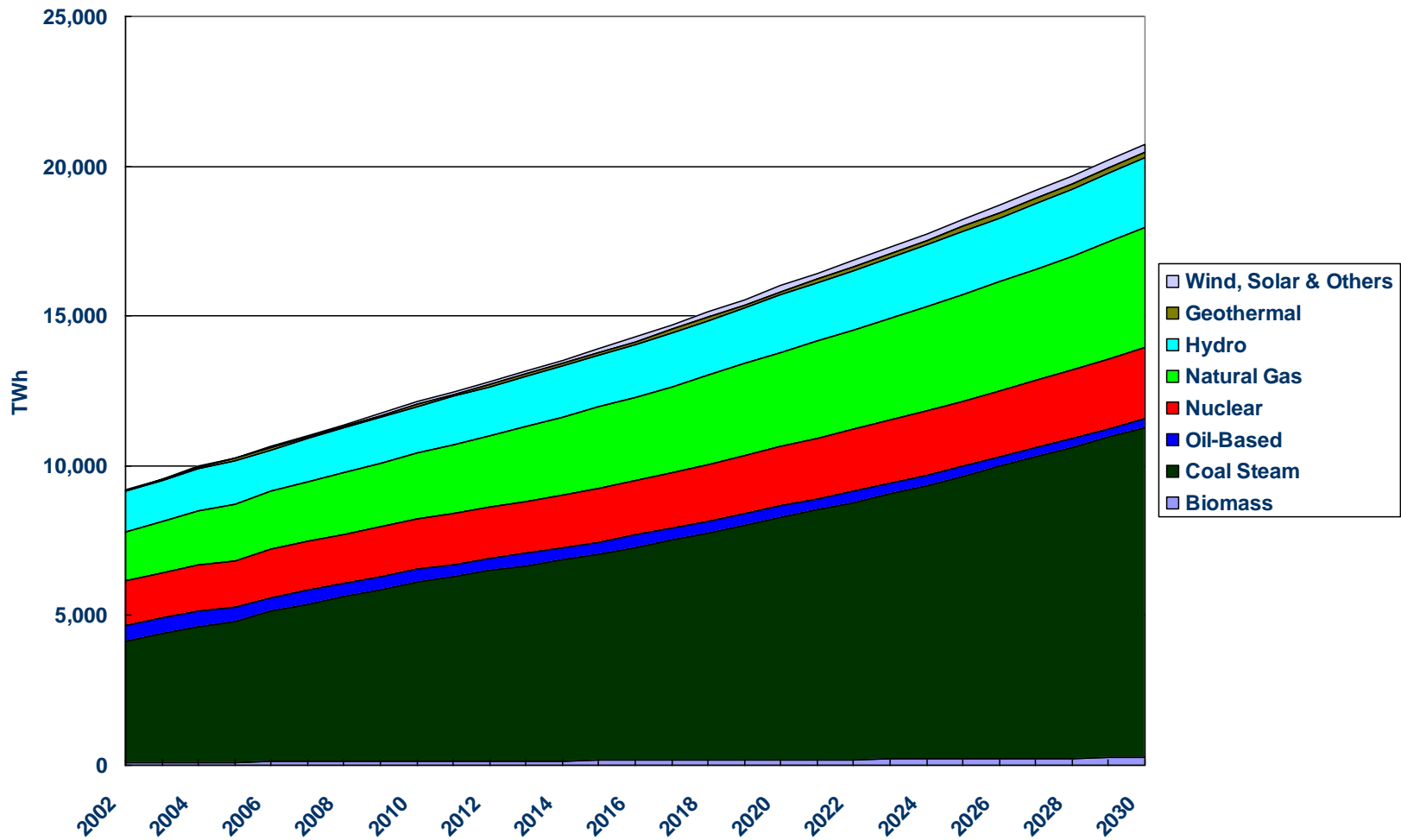


(Source) Circum-Pacific Council (2005)



# Electricity Generation in APEC (2002-2030, GWh)

*Coal to remain the dominant share in generation*



(Source) Asia Pacific Energy Research Centre (2006), "APEC Energy Demand and Supply Outlook", Forthcoming

(Note) The outlook shown here includes tentative result subject to change.





# Electricity Generation by Types

*NRE will grow at the fastest pace, while its share remains small.*

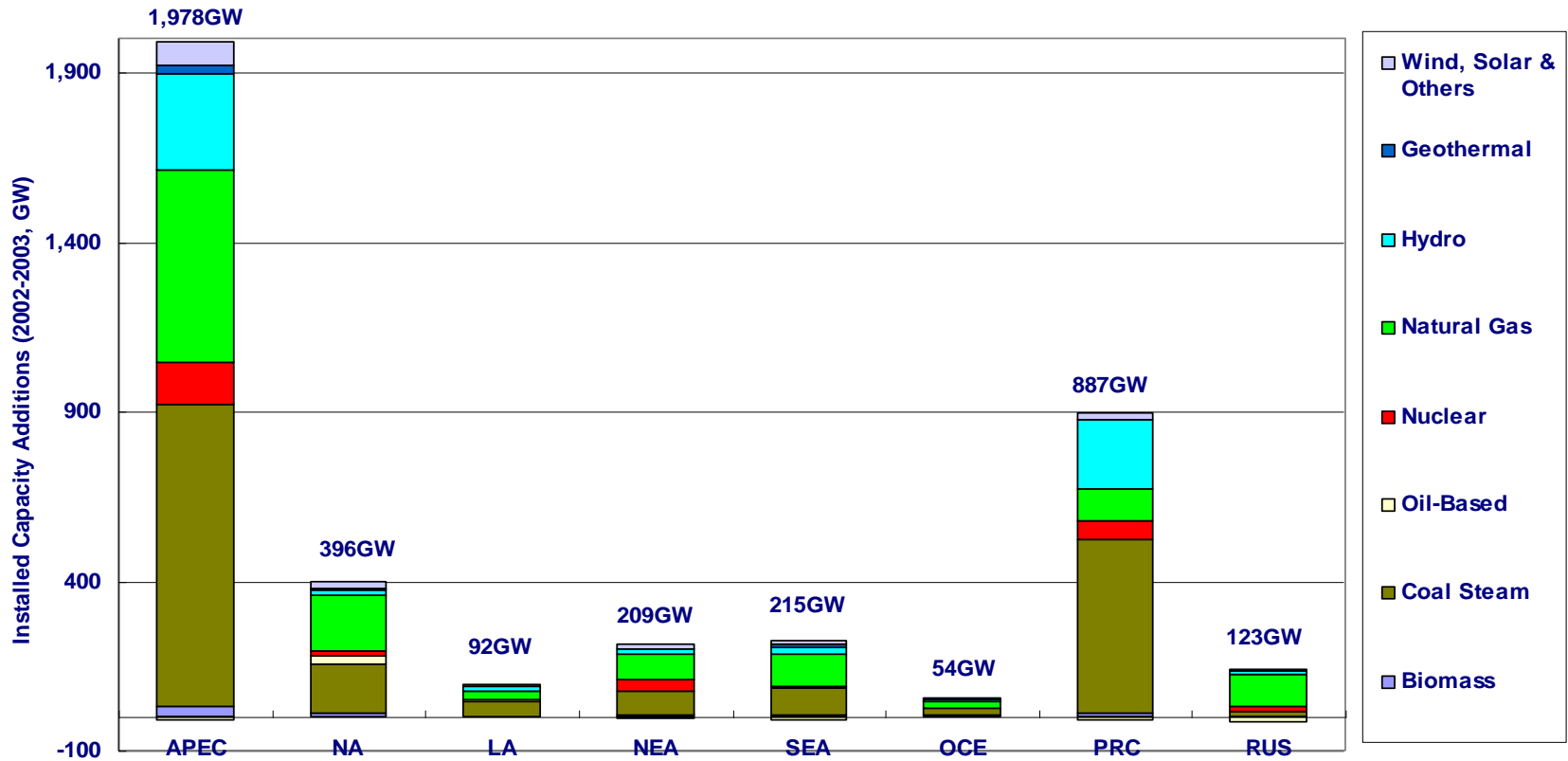
	TWh		Share		AGR
	2002	2030	2002	2030	2002-2030
<b>Biomass</b>	<b>92</b>	<b>181</b>	<b>1.0%</b>	<b>1.2%</b>	<b>2.4%</b>
<b>Coal Steam</b>	<b>4,029</b>	<b>8,078</b>	<b>43.8%</b>	<b>53.1%</b>	<b>2.5%</b>
<b>Oil-Based</b>	<b>556</b>	<b>398</b>	<b>6.0%</b>	<b>1.4%</b>	<b>-1.2%</b>
<b>Nuclear</b>	<b>1,466</b>	<b>1,988</b>	<b>16.0%</b>	<b>11.6%</b>	<b>1.1%</b>
<b>Natural Gas</b>	<b>1,665</b>	<b>3,149</b>	<b>18.1%</b>	<b>19.2%</b>	<b>2.3%</b>
<b>Hydro</b>	<b>1,326</b>	<b>1,903</b>	<b>14.4%</b>	<b>11.3%</b>	<b>1.3%</b>
<b>Geothermal</b>	<b>43</b>	<b>118</b>	<b>0.5%</b>	<b>0.9%</b>	<b>3.7%</b>
<b>Wind, Solar &amp; Others</b>	<b>14</b>	<b>186</b>	<b>0.1%</b>	<b>1.3%</b>	<b>9.8%</b>
<b>Total</b>	<b>9,191</b>	<b>16,000</b>	<b>100.0%</b>	<b>100.0%</b>	<b>2.0%</b>

(Source) Asia Pacific Energy Research Centre (2006), "APEC Energy Demand and Supply Outlook", Forthcoming

(Note) The outlook shown here includes tentative result subject to change.



# Power Sector: Incremental Growth of Installed Capacity by Region and by Energy Type (2002-2030, GW)



	APEC	NA	LA	NEA	SEA	OCE	PRC	RUS
Annual Additions (2002-2030, GW)	70.7	14.1	3.3	7.5	7.7	1.9	31.7	4.4
Regional contribution to the total additions of installed capacity in APEC	100%	20%	5%	11%	11%	3%	45%	6%

(Source) Asia Pacific Energy Research Centre (2006), "APEC Energy Demand and Supply Outlook", Forthcoming

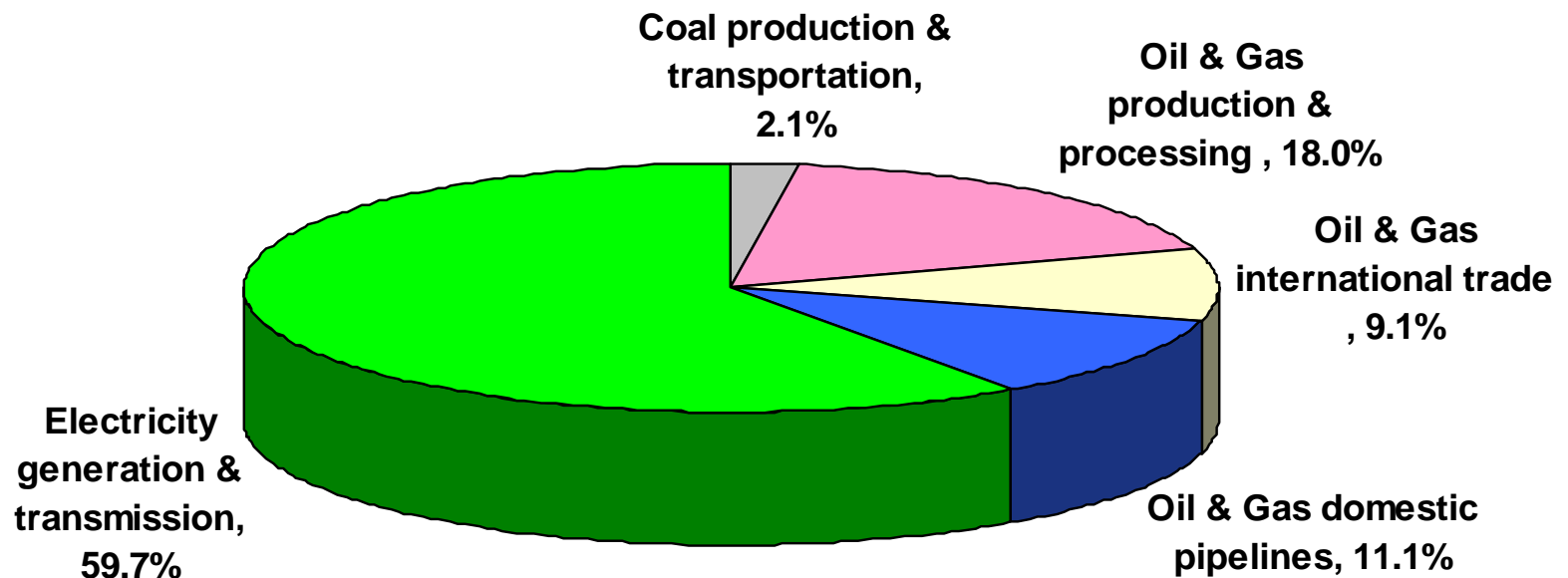
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# Total Energy Investment Requirements 2003 – 2030, by Sector

**Between 5.3 trillion USD to 6.7 trillion USD**

Investment by sector, cumulative 2003-2030  
High case



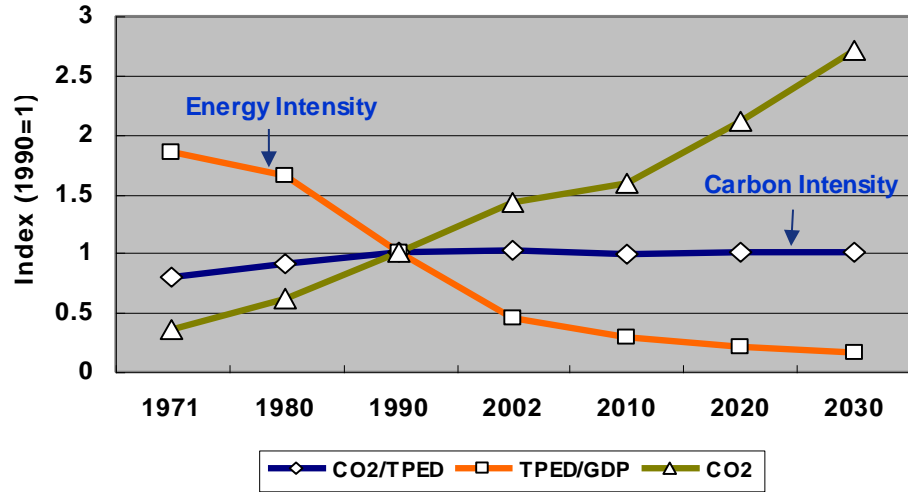
(Source) Asia Pacific Energy Research Centre (2006), "APEC Energy Demand and Supply Outlook", Forthcoming

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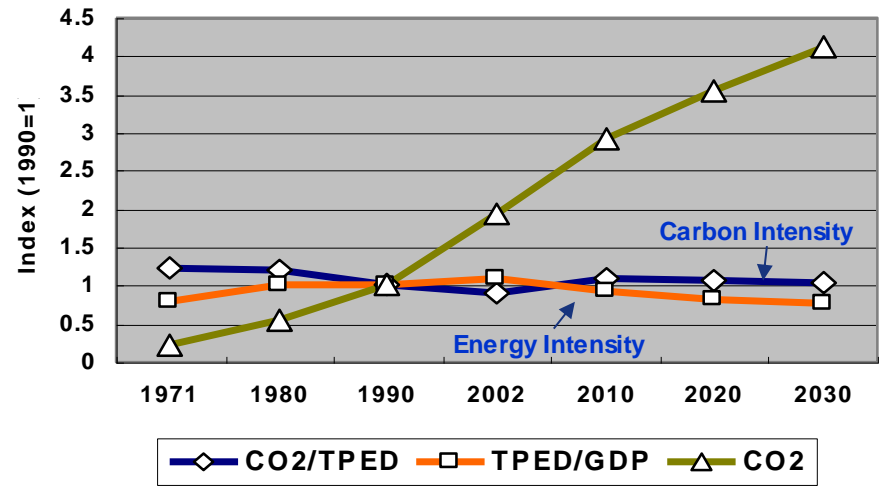


# Prospects: CO2 Emissions, Carbon Intensity and Energy Intensity

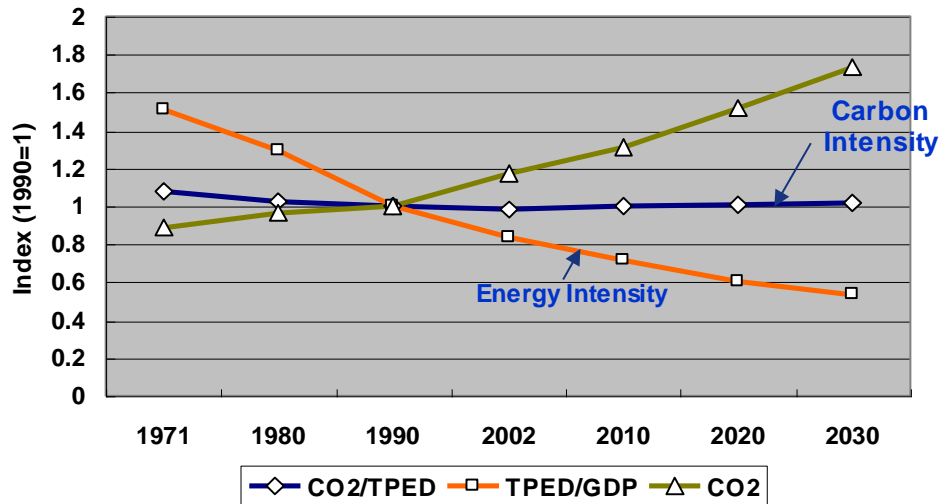
China



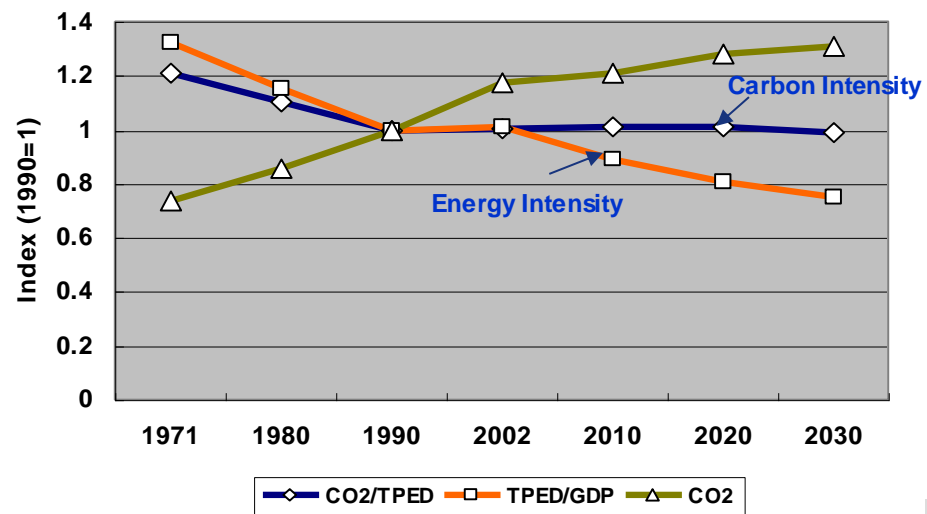
Korea



USA



Japan





# Options for Reducing CO2 Emissions

- $C = (C/E) * (E/GDP) * GDP$

Carbon  
Intensity

Energy  
Intensity

- Government's Interest

- "constraining carbon intensity while minimizing adverse affects on GDP growth"

- Energy Intensity

- Big gap among economies

- Industry structure
- Energy efficiency improvement
  - Technology
- Weather
- Life Style

- Carbon Intensity

- Relatively small gap among economies

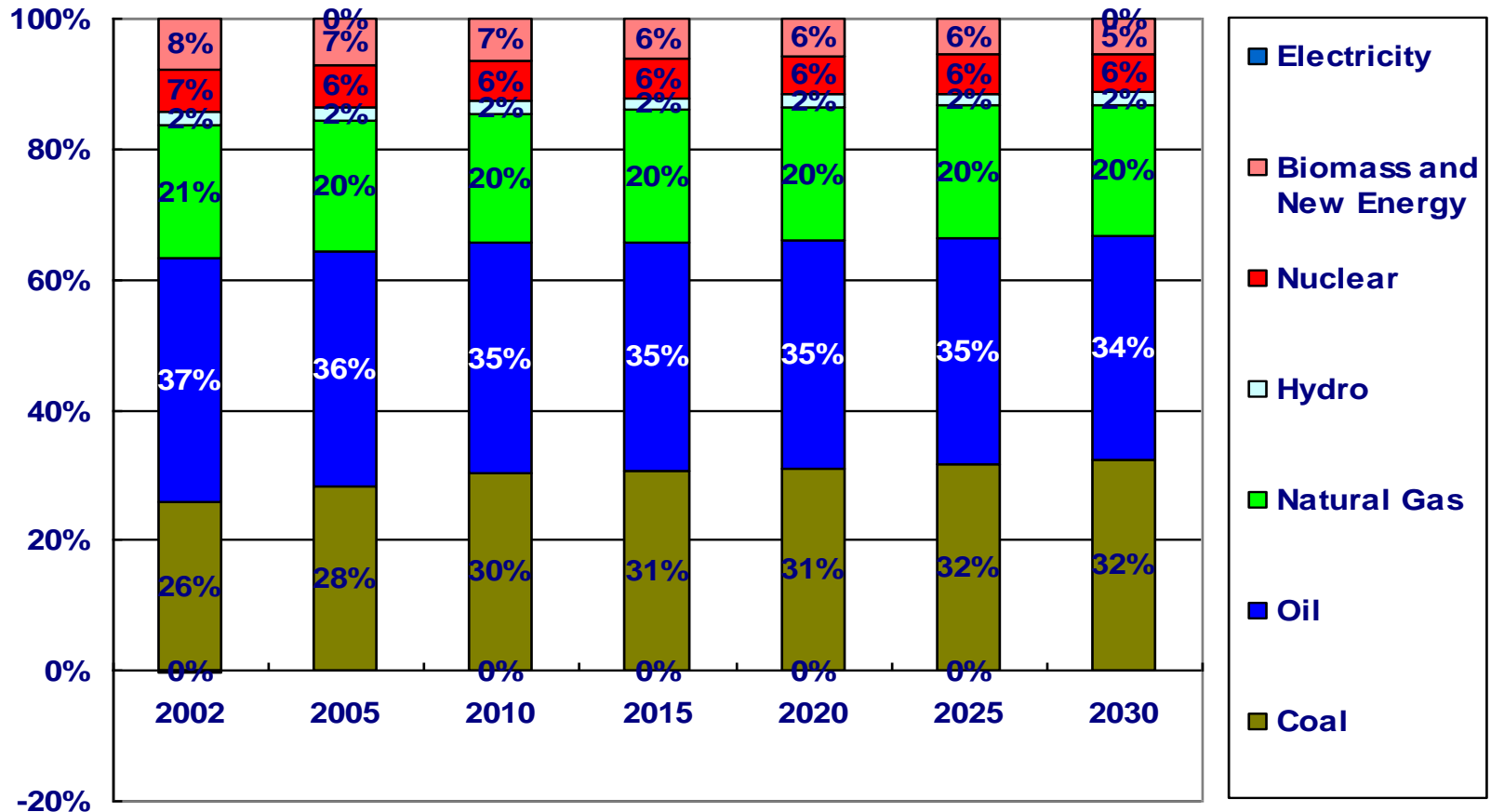
- Continued reliance on fossil fuels
  - Oil for transportation
  - Coal for power generation





# Prospects for Fuel Switching in APEC (2002-2030)

*Limited potential for fuel switching.*



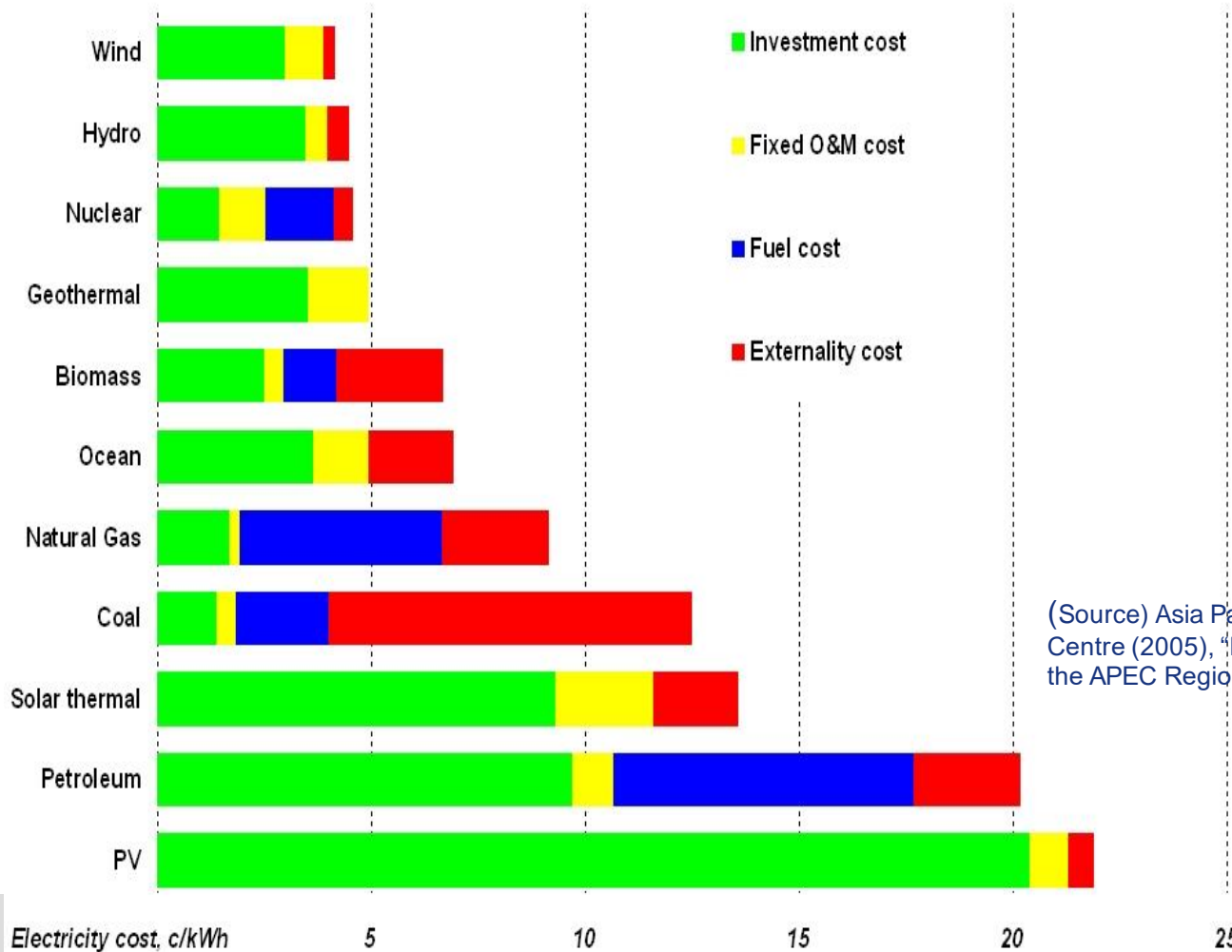
(Source) Asia Pacific Energy Research Centre (2006), "APEC Energy Demand and Supply Outlook", Forthcoming

(Note) The outlook shown here includes tentative result subject to change.



# Leveraged Costs of Electricity Generation (Japan)

- without externalities, coal is the cheapest option and NRE (except solar) are competitive to natural gas.*

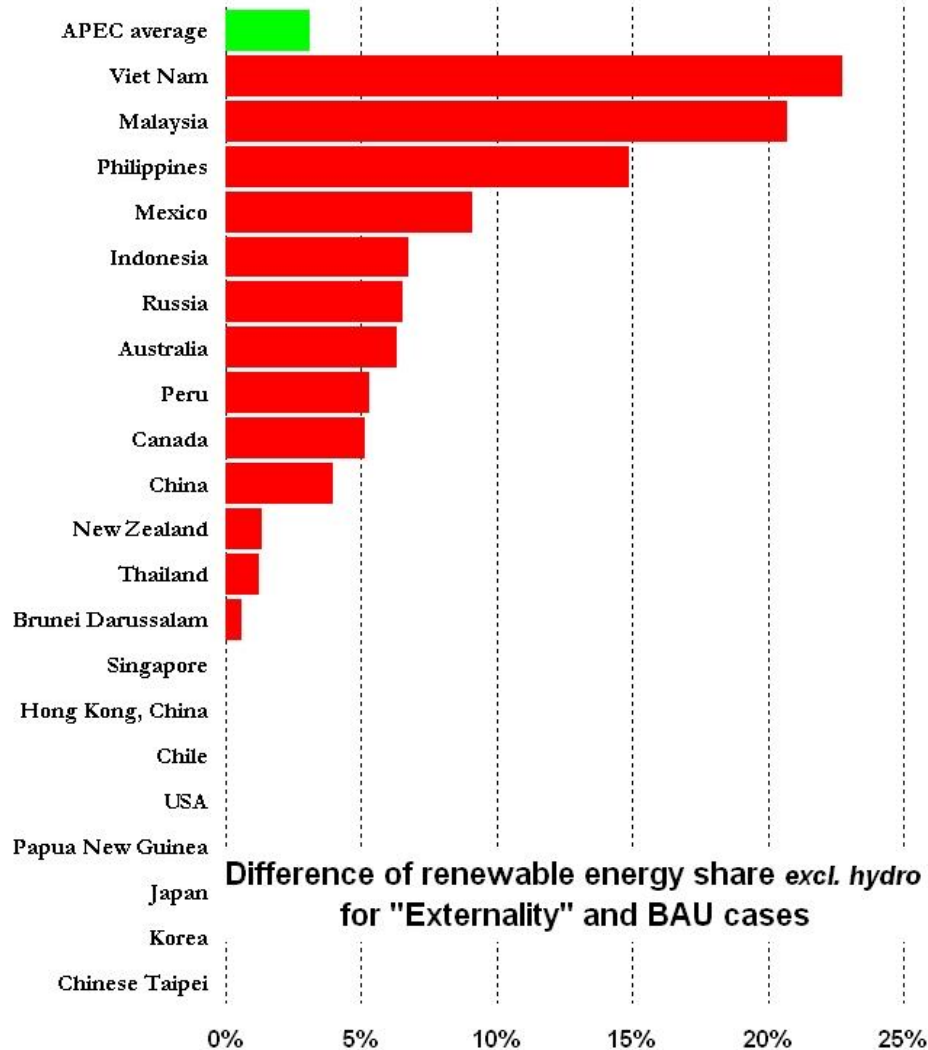


(Source) Asia Pacific Energy Research Centre (2005), "Renewable Electricity in the APEC Region"



# NRE Share: Externality Case and BAU Case

## Individual sensitivities of APEC member economies to the application of externality



With the application of externality to the cost of generation, almost half of the APEC member economies would have significant changes in generation structure.



# Implications

- **Limited potential for fuel switching**
  - Increasing use of coal and damaging impact on local and global environment
- **Need for NRE to offset likely environmental impact from BAU**
  - Potential to increase NRE in electricity generation
  - Time to reflect environmental cost on price
- **Call for realistic commitments for the expansion of NRE from the International initiatives**
  - APEC bio fuel task force
  - UNFCCC
  - Asia-Pacific Partnership on Clean Development and Climate



# New Project for 2006/2007 (provisional)

- **Transportation energy: demand trend and new supply options**
  - Urbanization
  - Biofuel, NGV, Hybrid vehicles, and etc
- **APEC Energy Security in the 21<sup>st</sup> century: constraints and options**
  - Resource constraints: conventional and NRE
  - Input constraints: water, land(siting), public acceptance
  - Human resources
- **International Energy Initiatives: fact and myth**
  - G8, APEC, UNFCCC, ASEAN, UNDP, OECD, AP6 and etc
  - Origin, operation, impact and future