

Low Carbon

Energy Supply Policies for APEC

- Case of Renewable Portfolio Standards [RPS] -

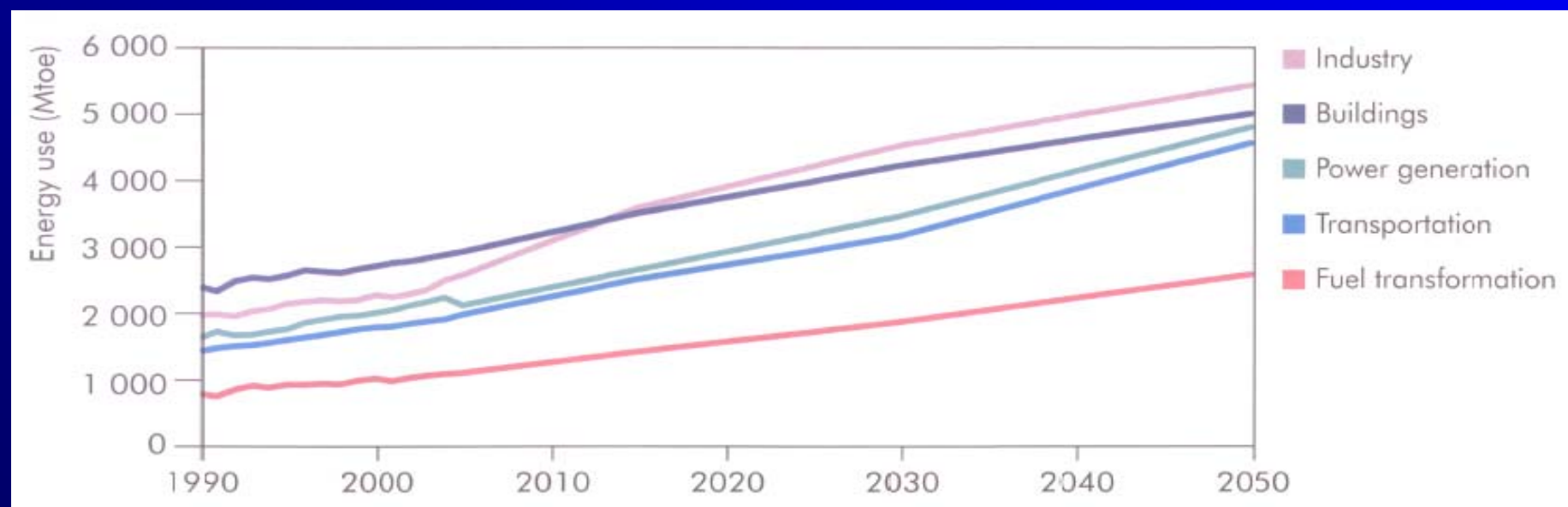
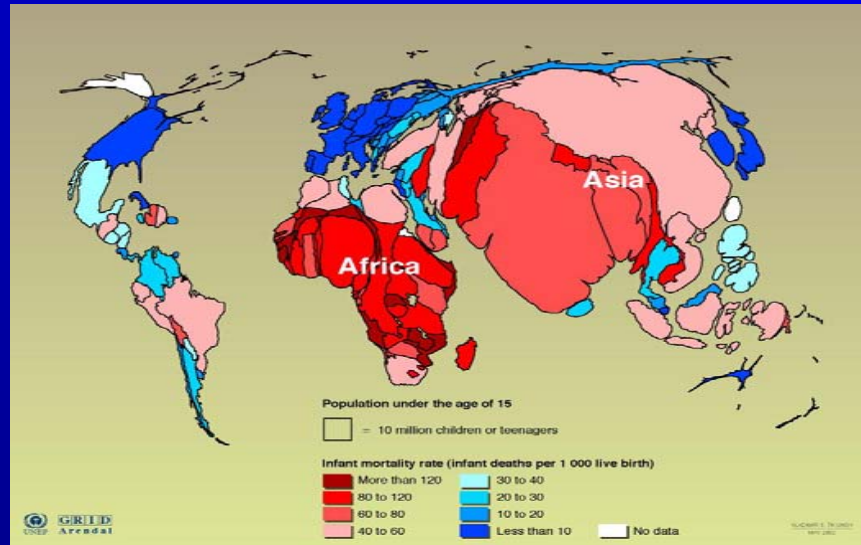
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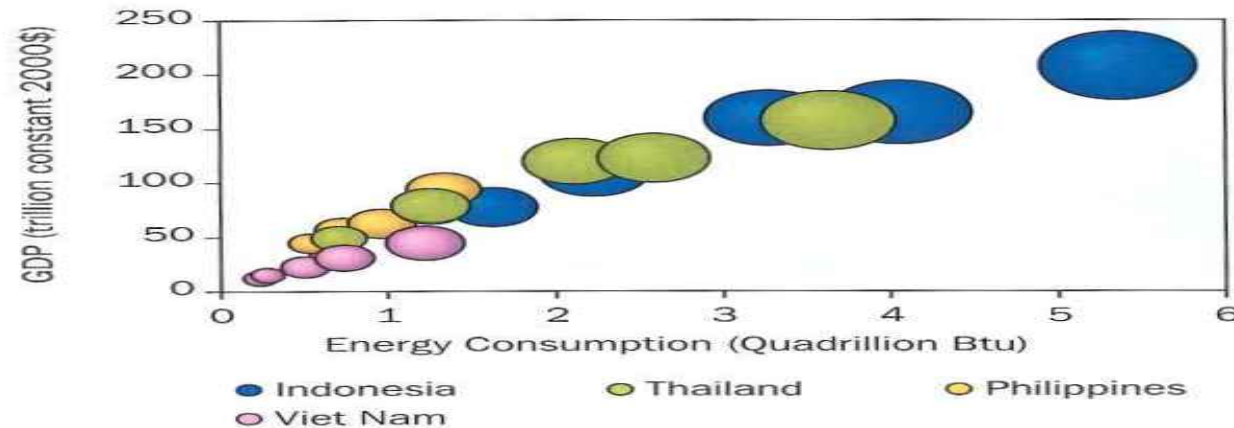
Asia Pacific - The Growth Engine of the World



Source, IEA, 2009

Energy Intensive Production Pattern in Asia

Figure 8.1. Nexus Between Energy Consumption, GDP, and CO₂ Emissions



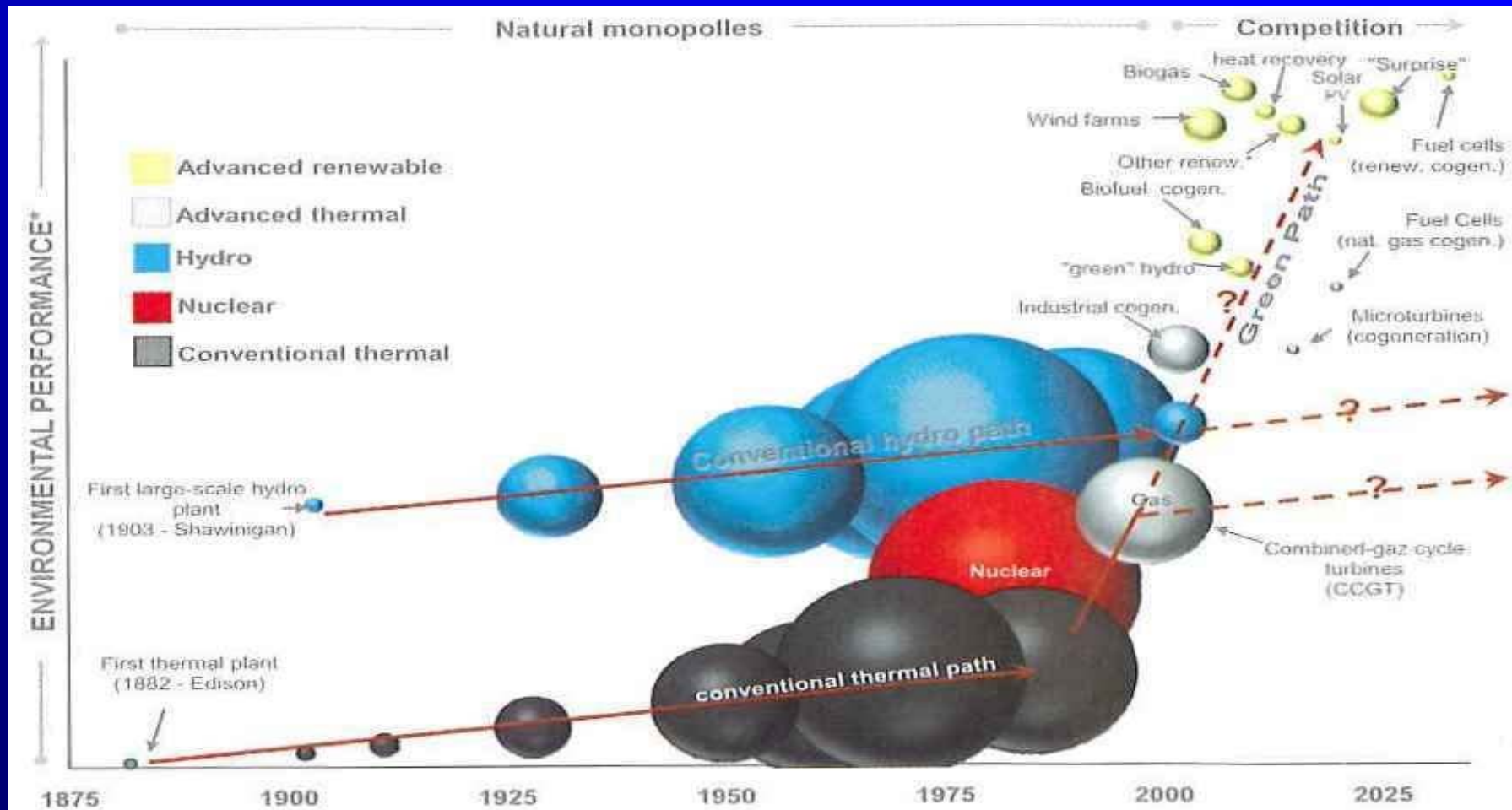
Note: Size of bubble indicates CO₂ emissions. Data shown for 1985, 1990, 1995, 2000, and 2005.
Source: EIA (2008) and World Bank (2007).

- 1.3 billion people live on less than US \$ 1 a day.
- Overall consumption of the richest fifth of Asia's population is 16 times that of the poorest fifth.
- Nearly 1 billion people lack access to energy.

Energy intensity (Btu /\$GDP)

China	35,766
Indonesia	25,799
India	24,799
USA	9,113
Europe	8,727
Japan	4,519

Conventional and Green Paths of Energy Supply



(source: Dunsky , 2008)

- Two parallel paths of conventional – thermal and hydro - continues
- The green lane of energy is not only as a result of the technological and economic changes
But also of growing consciousness on carbon emissions

Low Carbon Economy

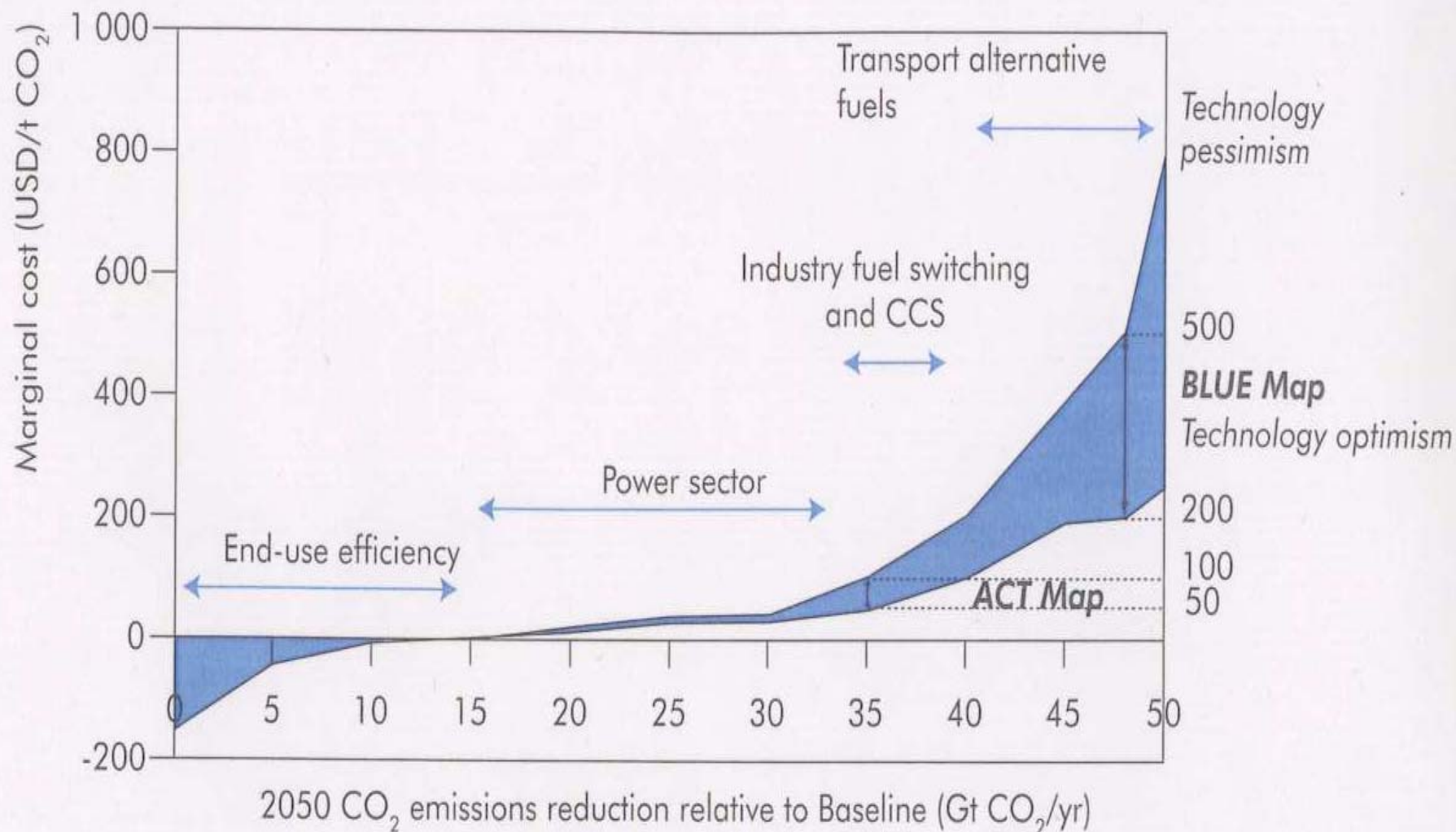
Changing Energy Mix

- Renewable accounts for less than 5%
- Coal remain the major source of energy
- Adjustment needed is massive. May take long time.

Energy Efficiency

- Producing more with less energy is a low-hanging fruit, when compared to other options.
- Accelerating energy efficiency measures can be a no-regret strategy as it brings business profitability with short pay back time
- EE offers greater emission reduction than any other options with short term payback period (e.g. 20-40 % saving in energy use with a payback of less than an year.

Technology Optimism and Pessimism Co-Exist



Source: OECD, 2008

Asia-Pacific's primary energy mix can be improved

Fuel Mix	2006	2030	EU (Present)
Coal	49%	51%	30%
Oil	23%	24%	7%
Gas	7%	9%	21%
Nuclear	1%	2%	17%
Hydro	2%	2%	15%
Biomass	17%	10%	1%
Geo, solar	1%	1%	9%

Cost is the Main Barrier for the uptake of RET

Technology	Representative cost (LCOE, ¢/KWh)	Challenges and constraints
Wind	9-12	Variability, Transmission access
Concentrating solar	24-29	High price, Variability, Transmission access
Utility Scale Solar PV (20MW+)	28-42	High price, Variability, Transmission access
Distributed Solar PV (<10MW)	46-59	High price, Variability,
Natural gas	5-10	Fuel price, Volatility, Carbon emission
Coal (PF, FB, IGCC)	3.7 – 5.3	Carbon emission

This considers the first costs of the technology itself, ongoing fuel as well as operations and maintenance (O&M) costs of keeping the technology operating. Incentives, credits, carbon credits are not included.

Renewable energy promotion – policy support options

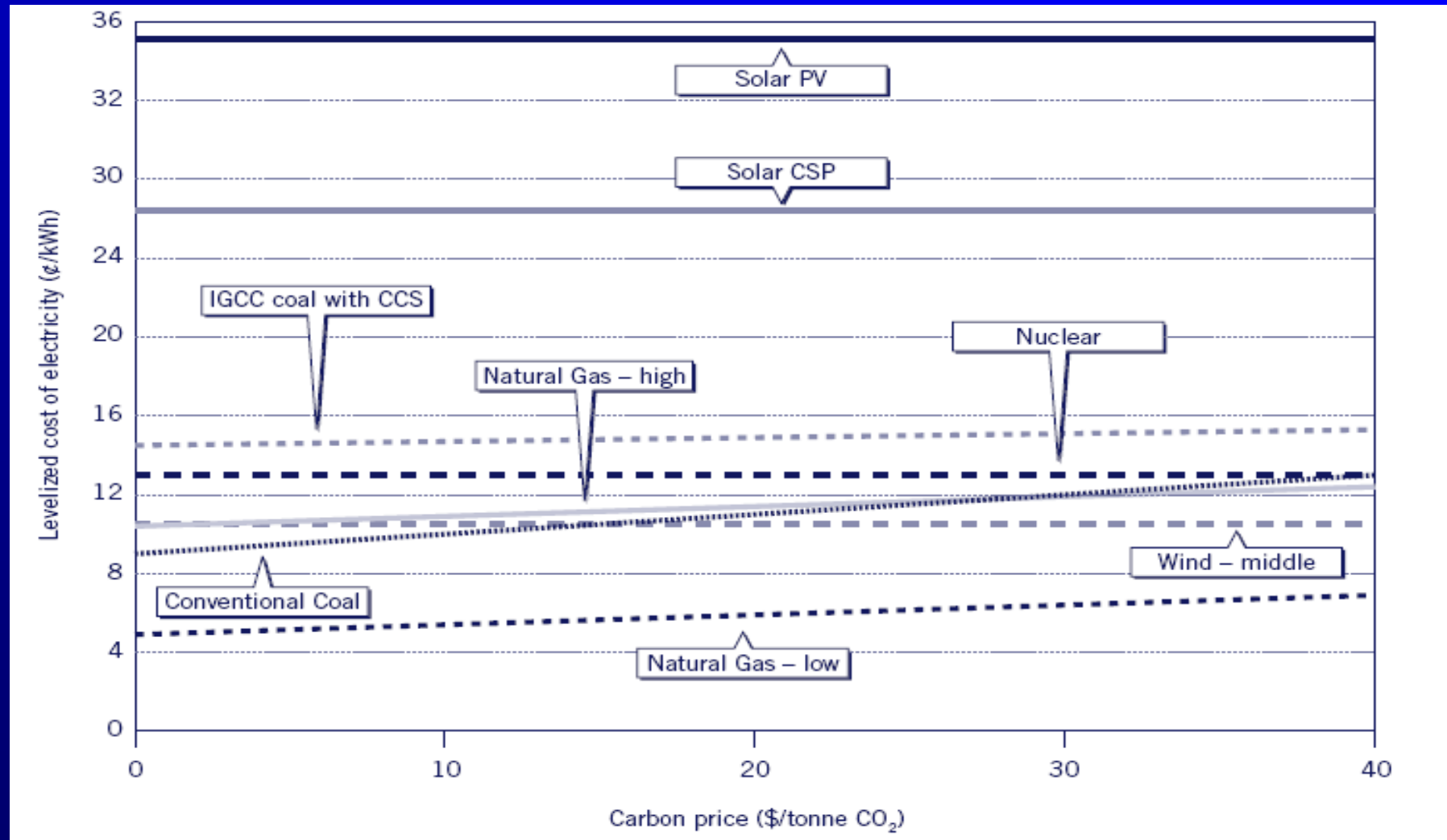
- **It is clear that promotion of renewables require support to thrive. These are provided by policies such as:**
- **Renewable portfolio standards**
- **Feed-in Tariff**
- **Capital Subsidies, grants or rebates**
- **Sales Tax, energy tax or VAT reduction**
- **Tradable Renewable Energy Certificates**
- **Energy Production Payments or Tax Credits**
- **Net Metering**

At the national level, removing pervasive fuel subsidies can accelerate the uptake of renewable energy and bring Carbon benefits

Country	Average rate of subsidy (% of market price)	Annual economic gain (% of GDP)	Reduction in energy consumption (%)	Reduction in CO ₂ emissions
China	10.9	0.4	9.4	13.4
India	14.2	0.3	7.2	14.1
Indonesia	27.5	0.2	7.1	11.0
Iran	80.4	2.2	47.5	49.4
Kazakhstan	18.2	1.0	19.2	22.8
Russia	32.5	1.5	18.0	17.1

Source: UNEP, 2006

Carbon price is an Option



- Wind is competitive Solar is not

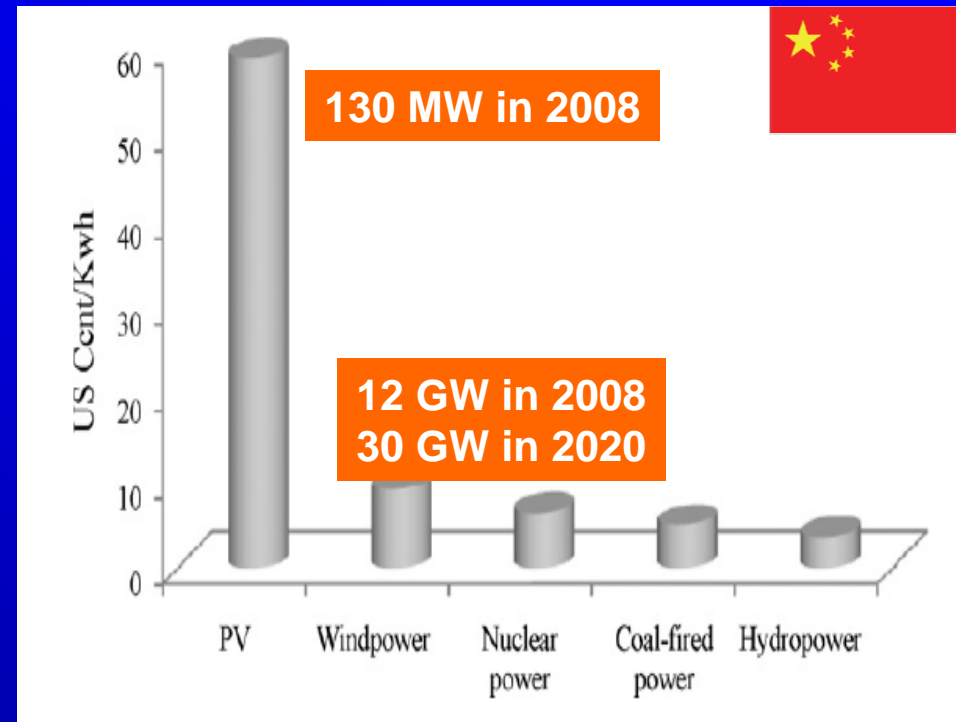
RPS: What does it mean?

- One policy option to promote renewables is Renewable Portfolio Standards (RPS)
- A market based policy tool which ensures the increased production of electricity from renewable energy resources in energy sector.

Renewable electricity typically include any electricity produced from a renewable fuel source such as sunlight, wind, geothermal heat, wave or tidal energy, running water and organic matter

Why RPS ?

- Renewables are normally more expensive than conventional electricity sources like Coal, Oil and Natural Gas.
- Their market penetration has been growing, but still not substantial.



Source: Wang Q. Effective policies for renewable energy—the example of China's wind power—lessons for China's photovoltaic power. *Renew Sustain Energy Rev* (2009)

The broader goal of the RPS is to achieve various benefits associated with renewable energy - related to the environment, resource diversity, technology advancement, and economic development.

RPS: How does help uptake of RE?

- RPS advances renewable energy resources in the most efficient way possible by maximizing reliance on the market.
- Second, the RPS maintains and increases the quantity of renewables in the system over a long period of time.
- Third, noncompliance penalties ensure that retail sellers will act to meet the country's renewable energy goal.

These characteristics distinguish the RPS from other types of renewable energy policies, such as government subsidy programs and tax credits.

Implementing RPS

(1) Setting RPS target

- A basic pre-condition of the system is to set the minimum quantity and to define the increase of the obligation over time as well as the final target. The obligation may be in terms of capacity or energy.
- The currently available renewables capacity and the potential could be taken into account for defining the obligation percentage. It is often proposed to fix the RPS at first at the given level of renewables electricity generation and to increase it gradually later.
- The final aim of RE support being preservation of fossil resources and reduction of carbon emissions.

Implementing RPS

(2) Certification of Renewables

- Certification of renewables are delegated to the operator of the grid, subject to periodic review by the government agency responsible for administering the RPS.
- This would also take note of what renewable resources are considered.
- The certificates are usually denominated in energy terms. Another possibility is to choose the avoided CO₂ emissions. The latter option depends largely on defining the CO₂ equivalents of each RE technology.

Implementing RPS

(3) Compliance monitoring

Three options by which electricity suppliers may comply with RPS requirements are :

- own an eligible renewable energy generator and its output electricity
- buy electricity generated by an eligible renewable energy generator or
- buy tradable Renewable Energy Certificates (RECs).

Suppliers may meet the target standard using any combination of the three options.

Implementing RPS

(4) Setting and collecting penalties for non-compliance

Another common feature of RPS legislation is the establishment of a penalty for non-compliance with the RPS.

- Penalties may primarily be intended to punish willful disregard of an RPS statute
- They have also been used as fair compliance alternatives to account for the possibility that poor development of the renewable market makes normal compliance difficult for or even unavailable to a supplier.

RPS: Some experiences around the world ..

Country	Target	Target year
Japan	3%	2010
EU	20%	2020
Australia	20%	2020
USA	20%	2020
Thailand	8%	2012
India	4-5%	2012

RPS: Barriers

- **Transmission and distribution**

- Transmission has quickly become recognized as among the most prominent barriers to the achievement of stated RPS targets.
- New transmission lines are needed in order to extend the transmission system to remote locations that have wind and/or solar resources
- Building new transmission lines typically costs about \$3 million per km.

RPS: Barriers

- **Managing the variability**

- The variability of wind and solar electricity reduces their value to electricity system operators. This also raises concerns about impacts on electricity system reliability.

- Several electricity systems are operating with significant amounts (over 10 %) of variable electricity (mostly wind). Higher levels of variable electricity, such as 20 %, will require changes in electricity system operation.

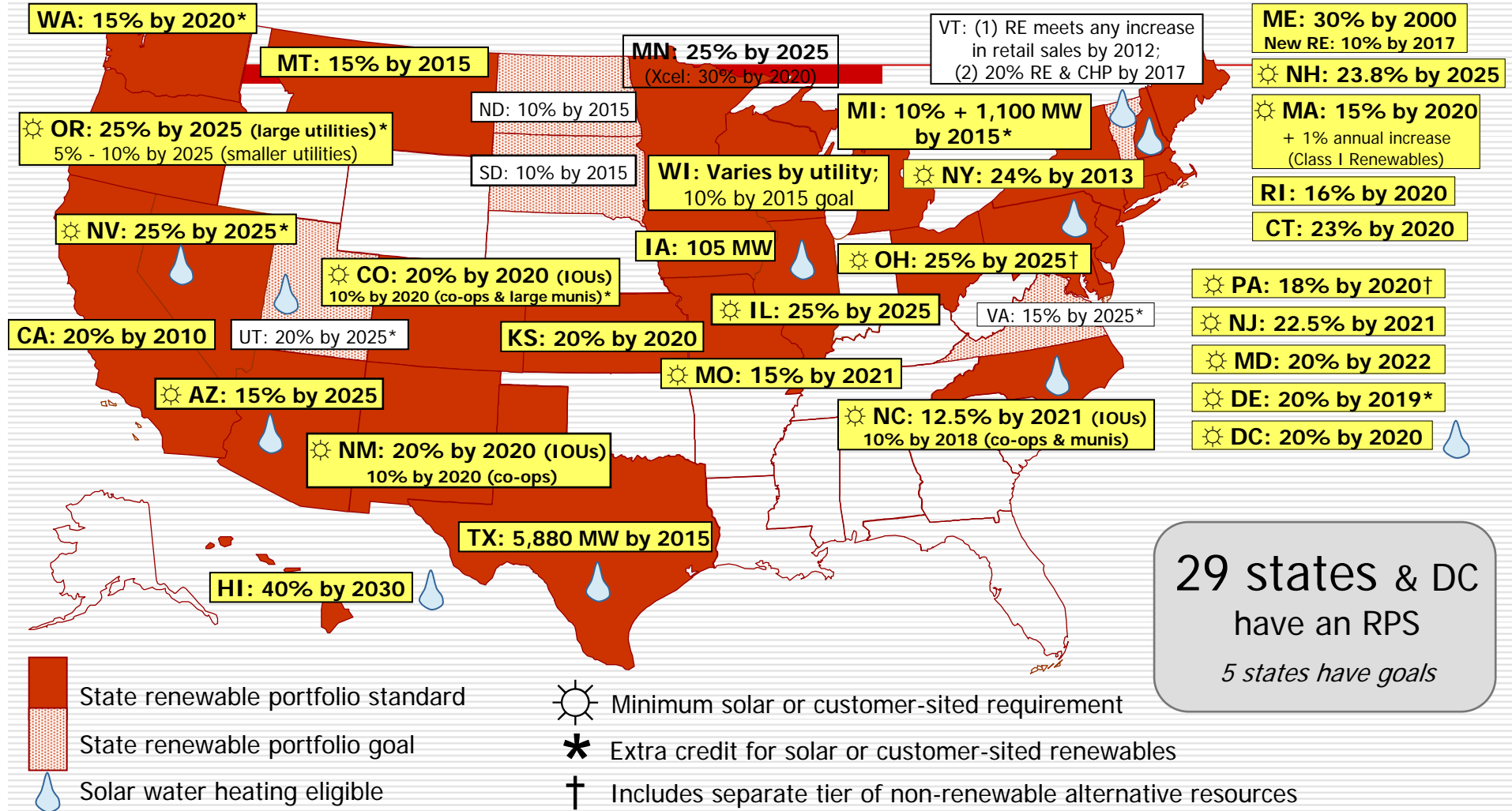
- There are three approaches to this problem: supply flexibility (providing more or less electricity as needed to accommodate the variable generation), demand flexibility (changing the demand for electricity as needed), and storage.

RPS: Exploited Opportunities

•in the US:

- Over 50% of non-hydro renewable capacity additions in the U.S. from 1998 through 2007 occurred in states with active, mandatory RPS policies, totaling roughly 8,900 MW.
- In 2007 alone, approximately 76% of all non-hydro renewable capacity additions came from states with active RPS programs.
- However, other significant factors include Federal tax incentives, state renewable energy funds, voluntary green power markets, etc also have a role for this increase.

US Renewable Portfolio Standards - Goals



29 states & DC have an RPS
5 states have goals

A Taxonomy of Policy Instruments available to support RPS Implementation

Policy Instruments

Market-based
Incentives

Command &
control
measures

Gov't production
or expenditure

Direct Instruments

Emission Charges,
tradable permit,
deposit refund

Emission regulation
(source – specifics,
non transferable
Quotas)

Regulatory agency
expenditure for
enforcement

Indirect Instruments

Input/output,
taxes
& subsidies, for
substitutes &
abatement inputs

Regulation of
equipment,
processes, inputs
& output

Development of
green technology

MIXED APPROACHES + partnerships

Bridging the Gap for RPS in Developing Economies

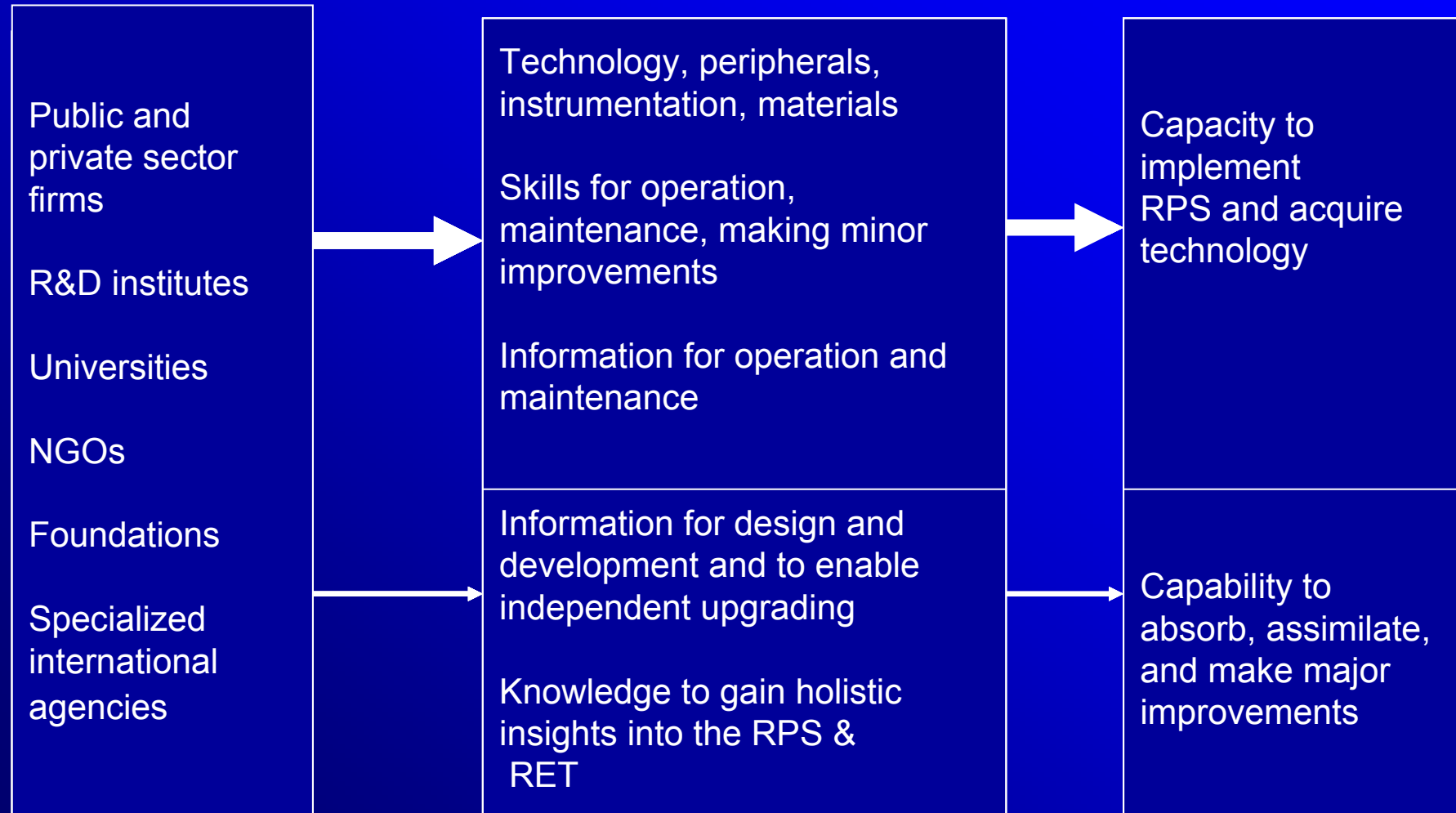
- Establishing and maintaining high carbon standards for high carbon sectors – energy, transport, construction etc.
- Financing for the development, deployment and transfer of renewable energy technologies.
- Policy and regulatory frameworks to integrate RPS into economic growth architecture.
- Building strategic international partnerships for capacity building.

International Cooperation & Capacity Building for RPS

Advanced Economies

RPS Components

Developing Economies



Thank You



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