

# **Carbon Management in Asia: The Role of the U.S. and Japan**

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# Outline

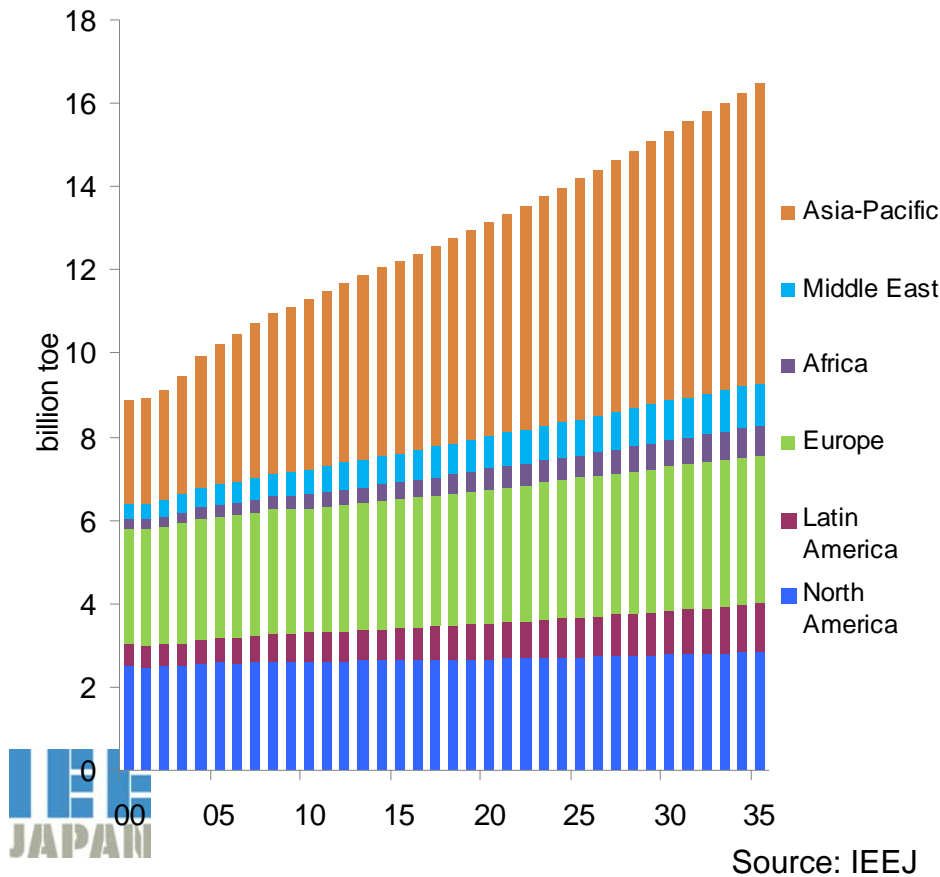
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- Energy demand and CO2 emissions outlook of Asia and the world
- Carbon management efforts in Asia
- The role of US and Japan

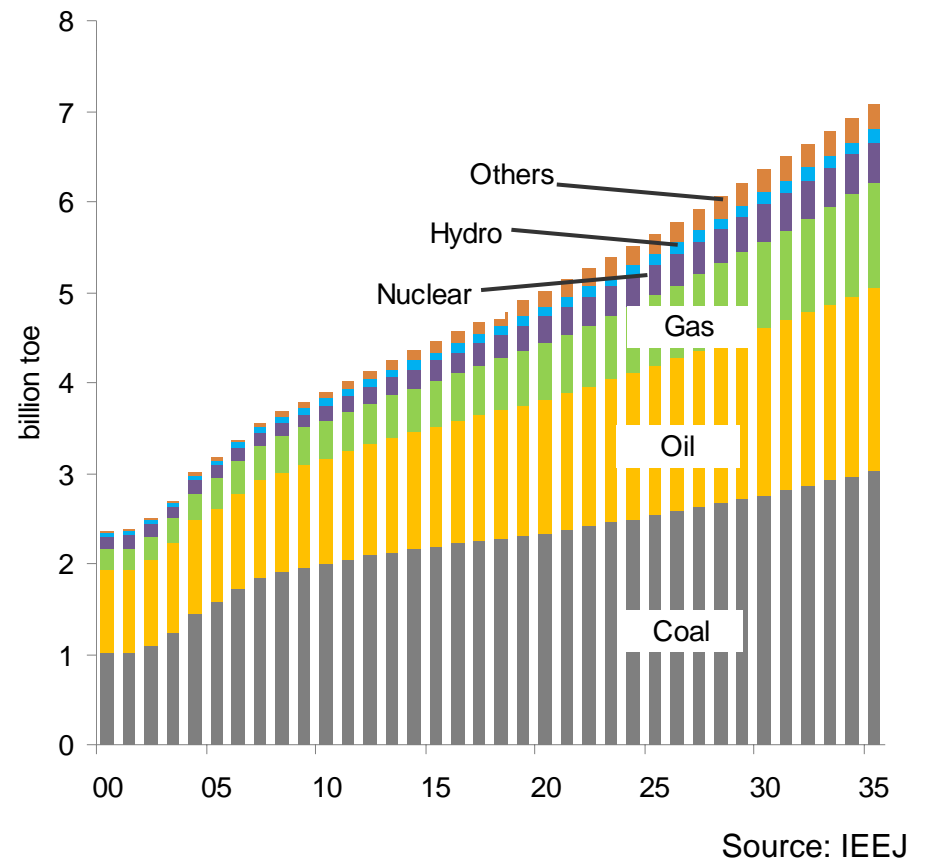
# Energy demand outlook

- Asia's demand growth is by far the largest of all regions of the world.
- Fossil fuels continue to be dominant in Asia.

**TPES outlook of world (by region)**



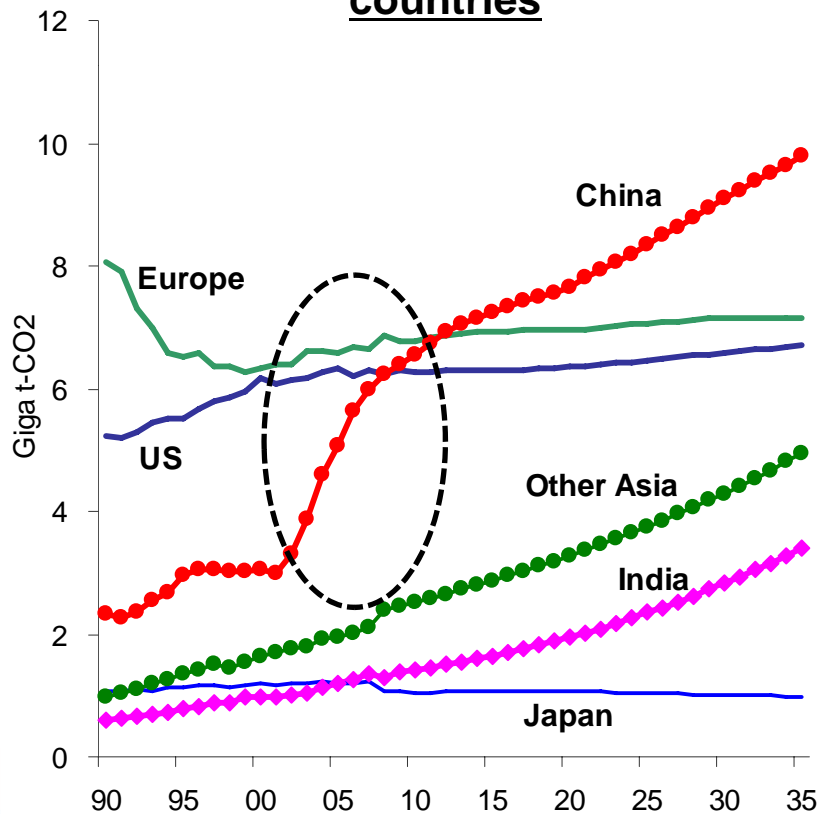
**TPES outlook of Asia (by fuel)**



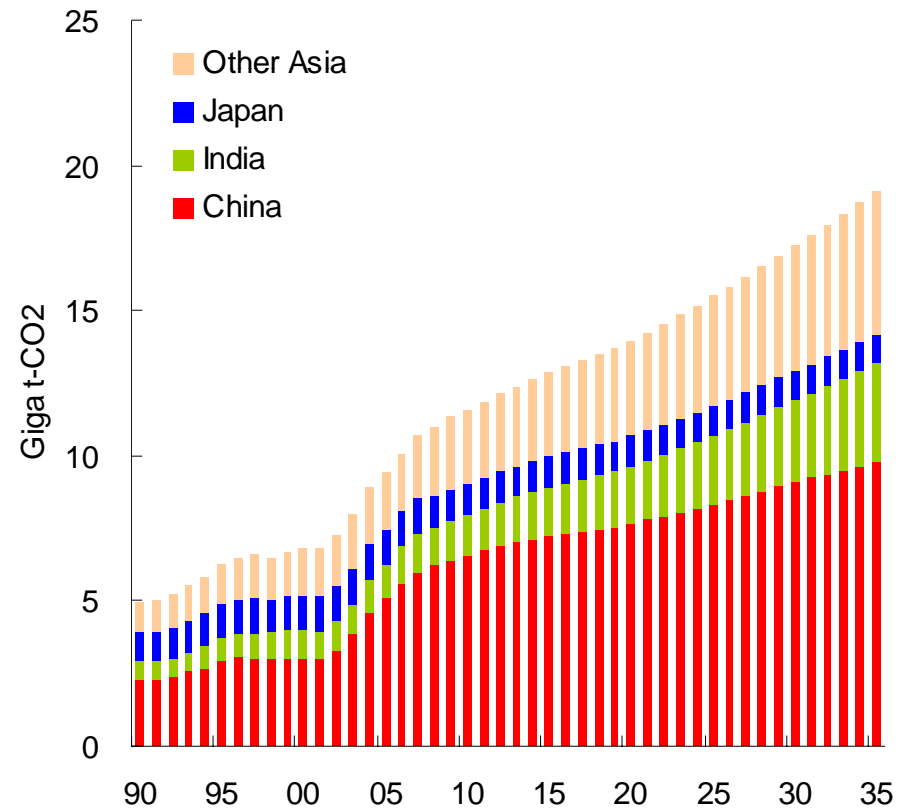
# CO2 emissions outlook

- CO2 emissions in Asian countries are also rapidly increasing.
- Asia, not limited to China and India, is the key region for global climate change efforts.

**CO2 emissions outlook of major countries**



**CO2 emissions outlook of Asia**



# IEEJ's Advanced technology case: Assumptions

Under the Advanced technology (Adv-Tech) case, the world will take climate change measures more proactively by adopting best available technologies.

## National Policy

National Target, Carbon tax/Subsidy, Emissions Trading, RPS, FIT, Efficiency Standard (appliances, vehicles and buildings), Low Carbon Fuel Standard, Labeling, etc.

## International Cooperation

Supports on creating laws and institutions, efficiency standards, and career development. Promotion of technology transfer, joint R&D, and business matching. Provision of funds.

## 【Demand Side Technology】

### ■ Industry

Best Practice on industrial process of energy-intensive industries such as steel, cement, paper, oil refinery, to be deployed widely.

### ■ Transport

Clean energy vehicles (vehicles of higher mileage, Hybrid, Plug-in hybrid, Electric driven, Fuel cell driven) to penetrate globally.

### ■ Building

High efficiency systems on electric appliances (Refrigerator, TV etc.), water-heating (heat-pump etc.), air conditioning, lighting, and insulation to be adopted worldwide.

## 【Supply Side Technology】

### ■ Renewables

More expansion of Wind, PV, CSP, Biomass power generation, Bio-fuel, etc.

### ■ Nuclear

Acceleration of nuclear power plant construction, and enhancement of operating ratio, etc.

### ■ High Efficiency Thermal Power Plant

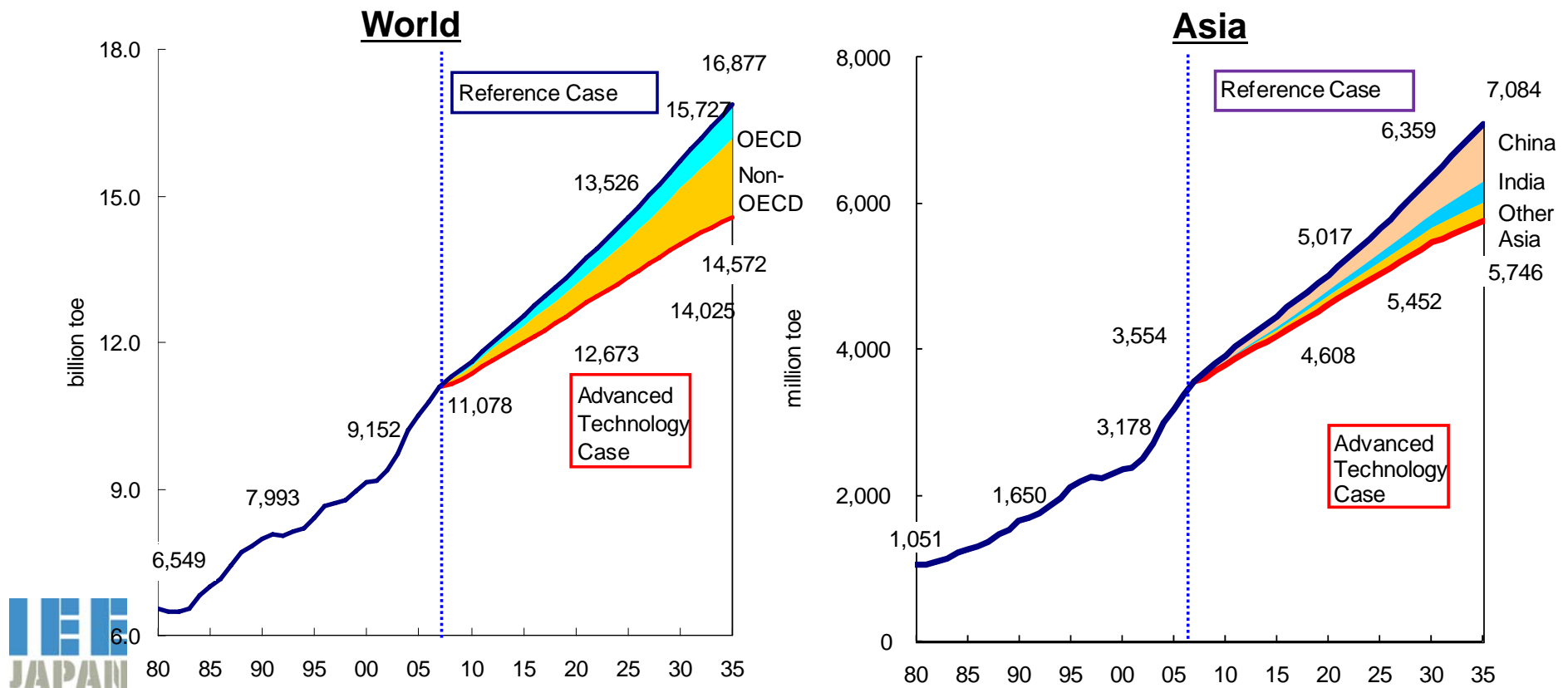
Deployment of modern coal thermal plant (USC, IGCC, IGFC), Natural gas MACC, etc.

### ■ CCS

Introduction into power generation (coal-fired, gas-fired) and industrial sectors.

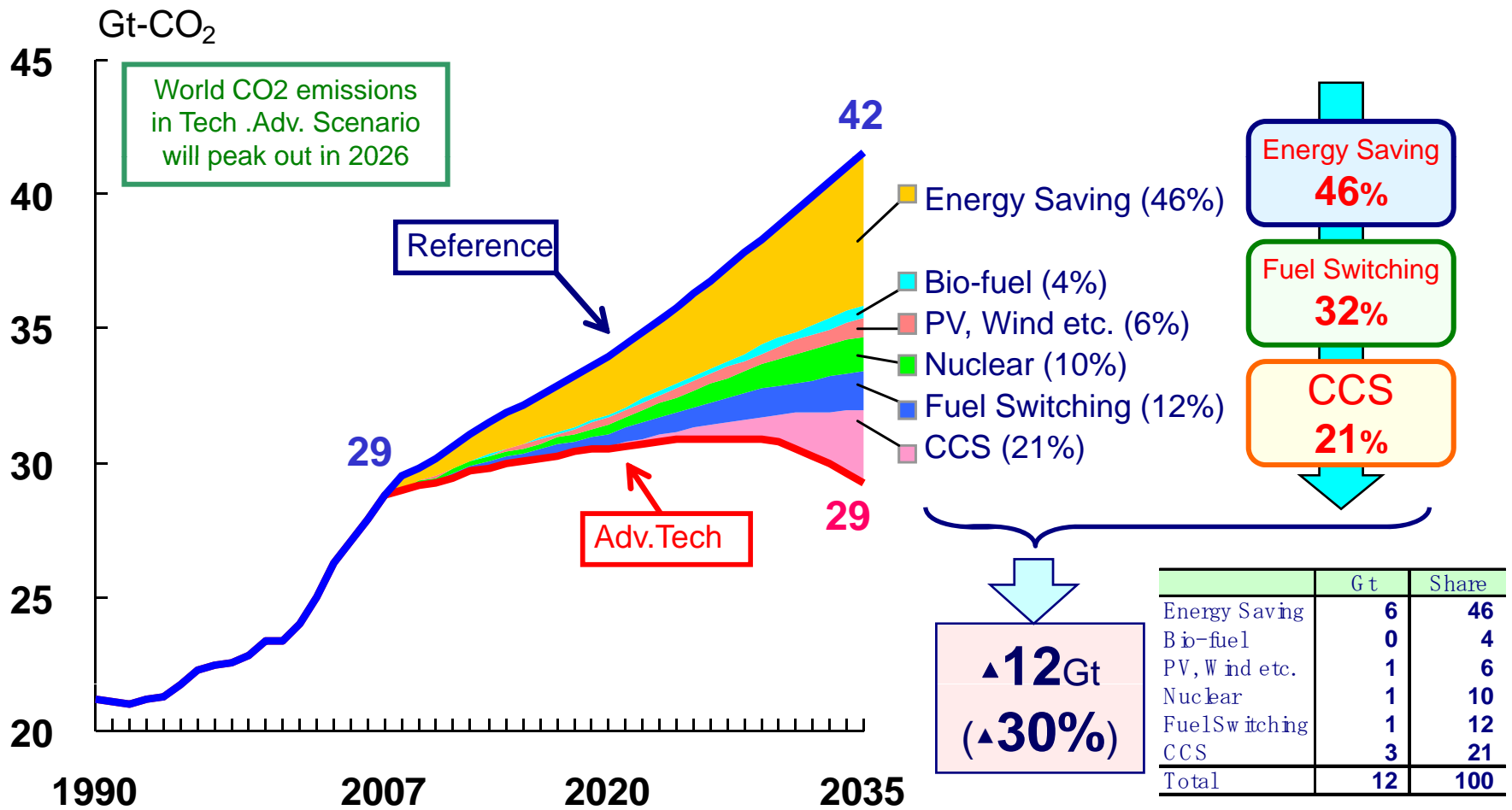
# Energy demand in Adv-Tech case

- World primary energy demand is reduced in the Advanced technology case by 14% as of 2035.
- In Asia, more than half of the reduction is observed in China.



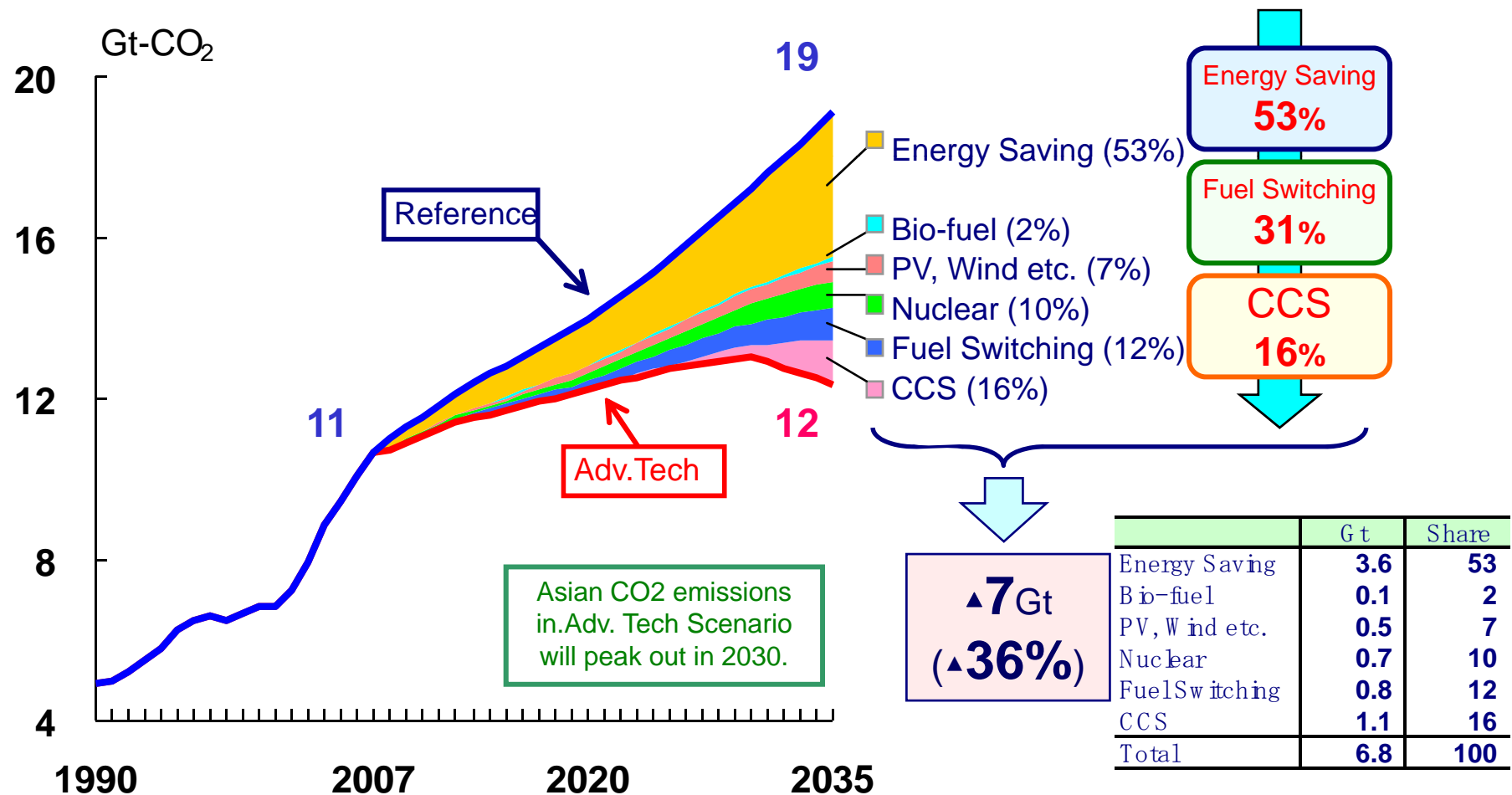
# World CO2 reduction in Adv-Tech case

- Multiple technological options, such as energy saving, enhancement of power generation efficiency, renewables, nuclear, fuel-switching, and CCS, contribute to a large scale CO2 emissions reduction.



# Asia's CO2 reduction in Adv-Tech case

- Aggressive development and deployment of advanced technologies in Asia enable to significantly reduce CO2 emissions and realize its peak-out until 2030.



# Japan: Basic Energy Plan

- The latest plan was approved by cabinet in June 2010.

## Major targets for 2030

1. **Double the ratio of self-sufficiency of total energy demand (18%) and the ratio of Japanese equity fossil fuels (26%).**
2. **Raise the zero-emission power source ratio from the current 34% to about 70%**
3. **Half CO2 emissions from the residential sector**
4. **Maintain energy efficiency in the industrial sector at the highest level in the world.**
5. **Obtain top-class shares of global markets for energy-related products and systems**

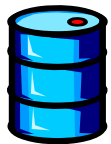
## Measures to achieve the targets

- Comprehensive efforts to secure resources and enhance supply stability
- Establishment of an independent and environmental-friendly energy supply structure
- Establishment of a low carbon energy demand structure
- Next-generation energy and social systems
- Development and diffusion of innovative energy technologies
- International cooperation on energy
- Structural reform of the energy industry
- Facilitation of mutual understanding with the public and development of human resources
- Division of roles among local governments, businesses and non-profit organizations and citizens' commitment

# Japan: Act of Energy Supply System Sophistication<sup>10</sup>

- Act of Energy Supply System Sophistication provides energy suppliers to use more non-fossil fuel energy as well as to utilize fossil fuel more efficiently.

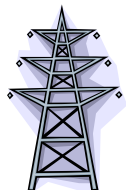
## Use of non-fossil fuels



Each oil company has to blend bio ethanol 500kkl/y (~8.6kbd) in total on a pro-rata basis by 2017.



Large gas suppliers have to recover and utilize 80% of bio gas generated from sewage treatment by 2015.



Power companies have to raise the share of non-fossil fuel power supply to 50% by 2020.

## Efficient utilization of fossil fuels



Each oil company has to raise the share of RFCC/coking capacity over total crude oil distillation capacity to 13% by 2013.



Large gas suppliers have to recover 100% of BOG at LNG terminals by 2020.

# Japan: Climate Change Bill

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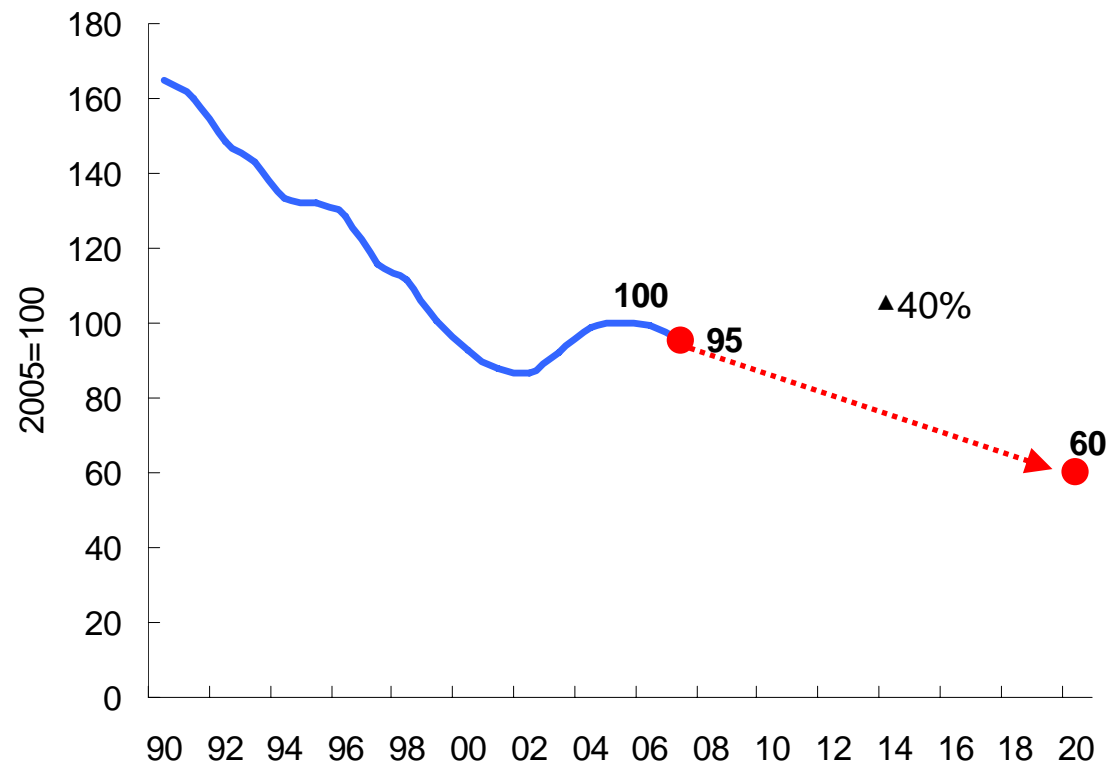
- Goals
  - ◆ 25% GHG emissions reduction by 2020 compared to 1990 subject to fair and effective international framework development and agreement for proactive emission reduction target by major emitters
  - ◆ 10% renewable energy share by 2020
  - ◆ 80% GHG emissions reduction by 2050 compared to 1990
  
- Reduction measures
  - ◆ Emissions trading
  - ◆ Taxation
  - ◆ Feed-in-tariff for all renewable energy
  
- Legislation process
  - ◆ Passed Lower House in May 2010, and sent to Upper House.
  - ◆ Discarded in Upper House due to expiration of session in June 2010.
  - ◆ To be submitted again in next diet session

# China: CO2 emissions reduction

- State Council of Chinese government set the target to reduce CO2 emissions per GDP by 40%-45% from 2005 level by 2020.
- CPC's national congress held in October 2010 may discuss a new 5 year target from 2010 to 2015.

China's CO2 emission per GDP (1990-2020)

Sources: IEA; IEEJ

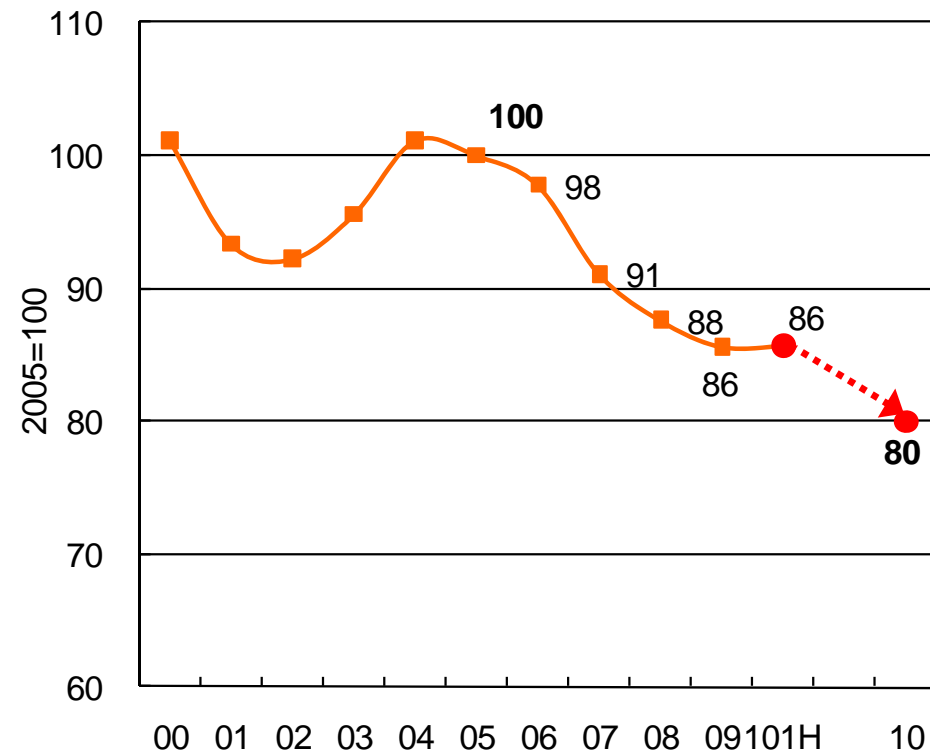


# China: Energy efficiency improvement

- Improvement of energy efficiency has been regarded as a major policy objectives by Chinese leadership.
  - ◆ 11<sup>th</sup> FYP (2006-2010) provides to mitigate energy intensity of GDP by 20%.
  - ◆ Some drastic measures may be taken by the government in 4Q 2010 because, in order to make its CO2 reduction target internationally credible, Chinese government has seriously committed to achieve this target.

## China's energy intensity of GDP (2000-2010H)

Source: IEEJ



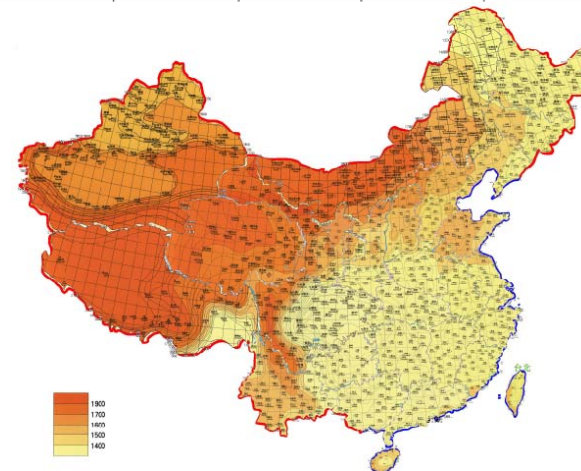
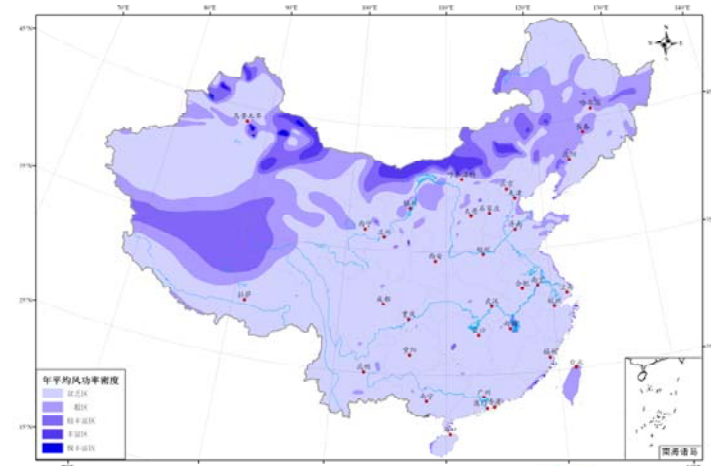
# China: Non-fossil fuel energy supply

- China aims to raise the share of non-fossil fuel energy to 15% by 2020.
  - ◆ It plans massive expansions of non-fossil fuel generation capacities as well as development of nation-wide grid system.

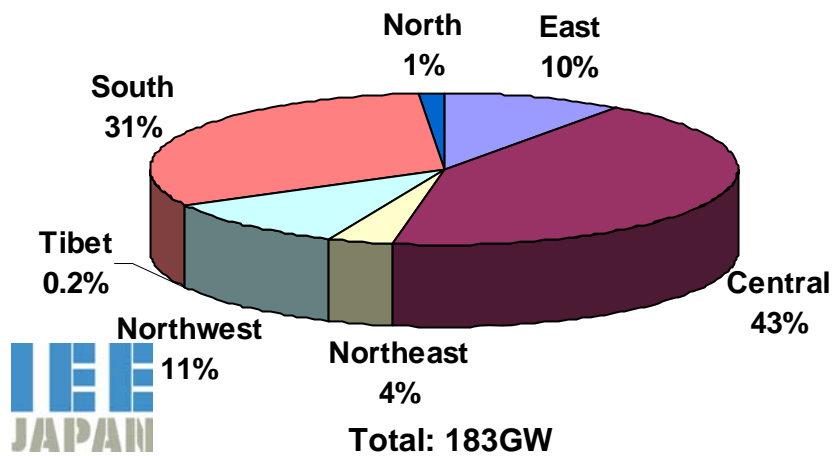
## Planned generation capacity

U=GW	2009	2020	2030
Hydro	183	320-350	360-430
Nuclear	9.08	72-80	150-160
Wind	16.1	100-150	200-300
Solar	<0.2	20	60-70

## Wind and solar resource distributions



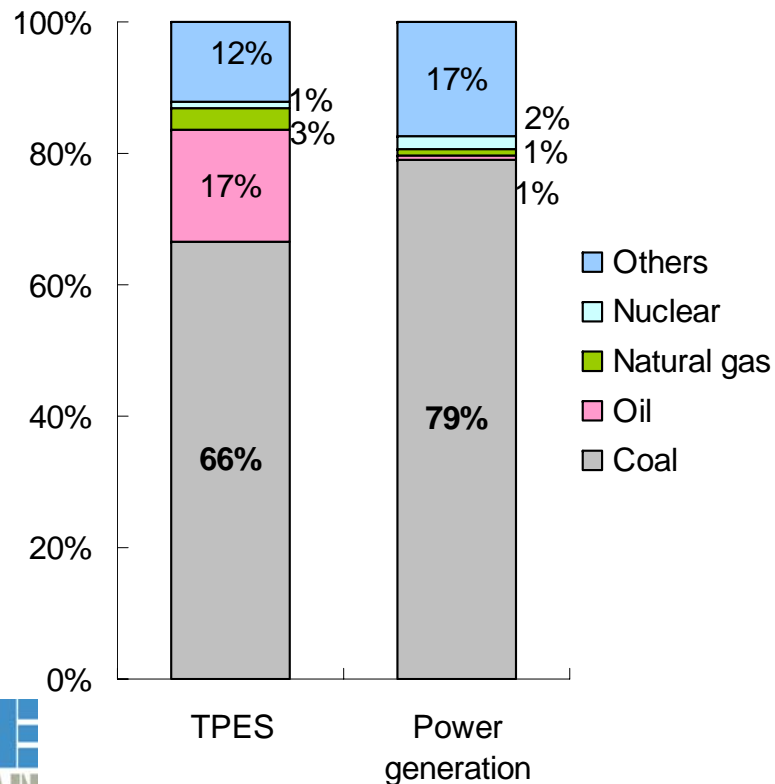
## Installed hydro power distribution



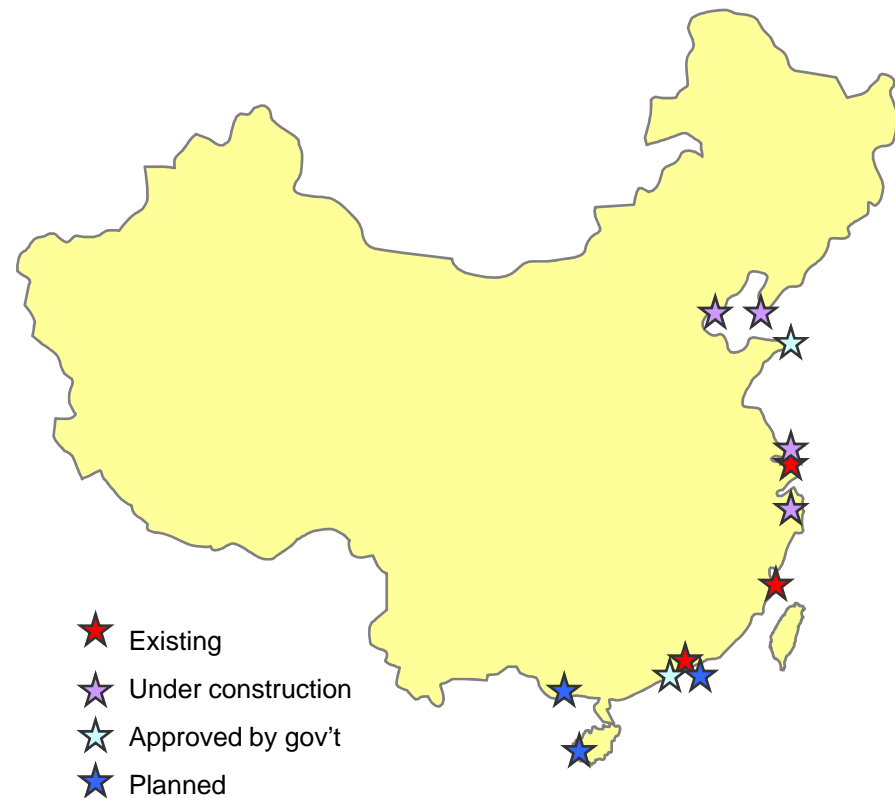
# China: Natural gas utilization

- While placing coal as the primary energy source, China is seeking to raise the share of natural gas.
  - ◆ NDRC official mentioned that the share of natural gas to be raised to 10% by 2020, which may result in 46 million LNG imports in 2020.

**China's energy mix (2008)**



**China's LNG terminals**



# China: Efficient vehicles

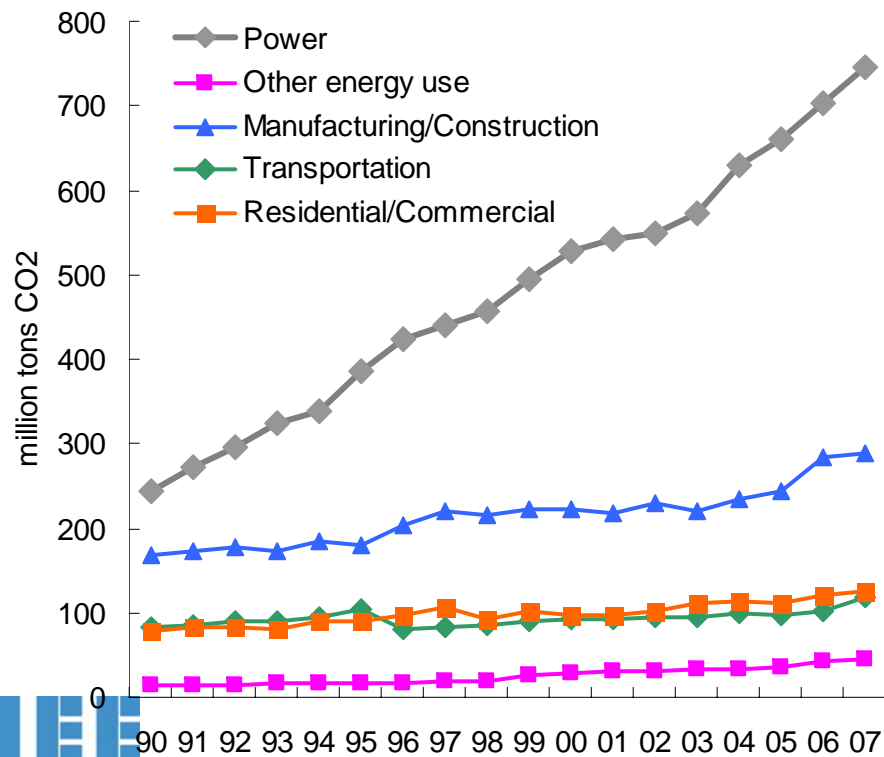
- Chinese government pursues aggressive policies to improve vehicle efficiency.
  - ◆ Lower tax rate for vehicles with <1,600cc
  - ◆ Subsidies for vehicles of <1,600cc and excess achievement of efficiency standard
  - ◆ Proactive adoption of EV/PHV by public sector and local governments
- NDRC sets the targets for HV and EV manufacturing and commercialization.
  - ◆ Share of HV and EV over total auto manufacturing to be raised to 20% and 10% as of 2015
  - ◆ Number of HV and EV ownerships to be raised to 3.0 million and 1.5 million as of 2015



# India's CO2 emissions reduction target

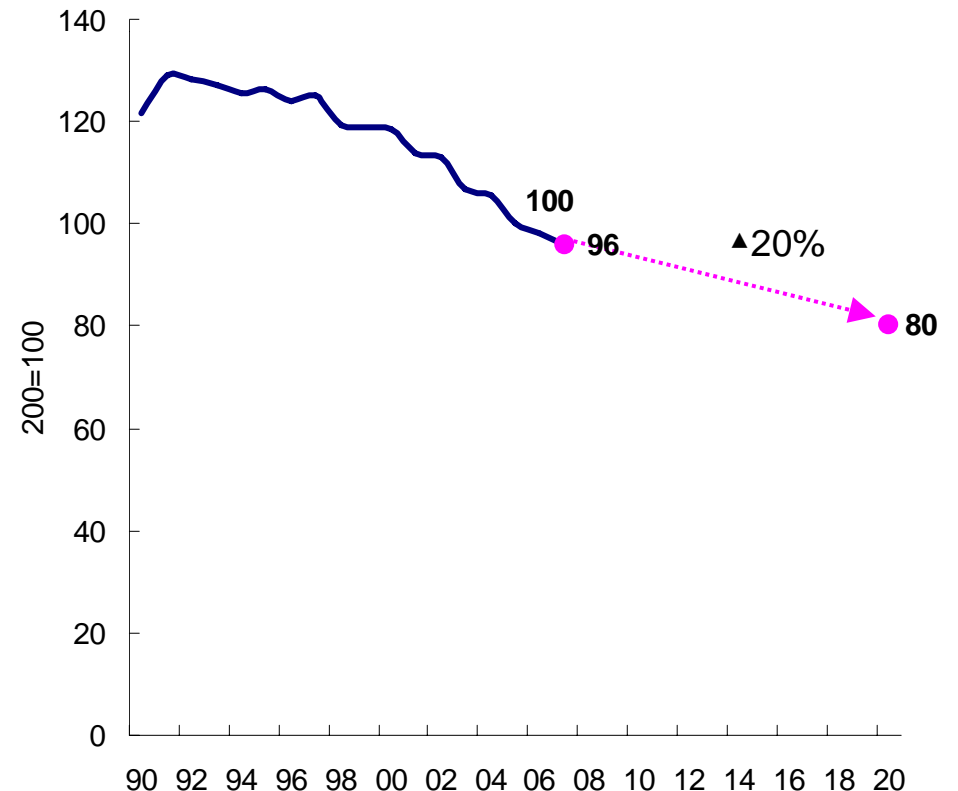
- India is the fourth largest CO2 emitter in the world
  - ◆ Emission from power sector in particular has been rapidly increasing.
- India aims to reduce CO2 emissions per GDP by 20-25% compared to 2005 by 2020.

### India's CO2 emissions by sector



Source: IEA

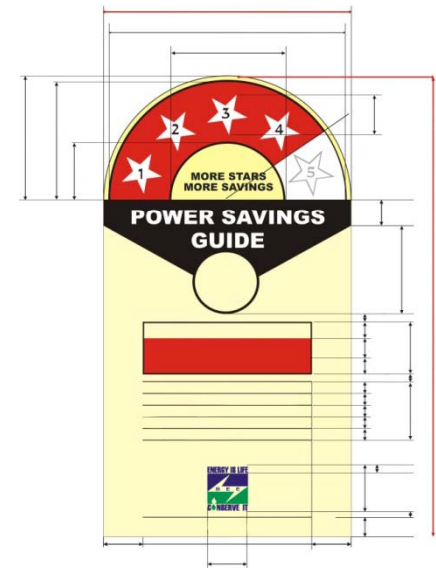
### India's CO2 emissions per GDP



Source: IEA

# India: Energy efficiency improvement

- India's energy efficiency performance in general is relatively poor.
  - ◆ India's average coal fired power generation efficiency is 26.6% compared to the world average 34.8%.
    - Heat efficiency in power generation, high internal energy consumption, and high transmission loss make Indian power sector inefficient.
  - ◆ India's energy intensity in steel sector, 6.9 Gcal/steel ton, is also low compared to world average, 4.5 Gcal/steel ton.
  
- India's efforts to improve energy efficiency
  - ◆ Energy Conservation Act was provided in 2001.
  - ◆ Energy balance / Statistical data development
  - ◆ Efficiency standards and labeling system
  - ◆ ESCO business
  
- Challenges in India's efficiency efforts
  - ◆ Insufficient data, lack of policy consistency and inter-ministerial coordination, subsidized energy prices, insufficient maintenance, consumers' behaviors, etc.



# India: Non-fossil energy

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- New/Renewable energy
  - ◆ Wind and small-sized hydro power generation has a large potential in India.
  - ◆ Government sets the target share of renewable energy at 10% of newly added power generation capacities.
  - ◆ Feed in tariff has been introduced in 13 states.
  
- Nuclear
  - ◆ India currently operates 17 nuclear reactors including domestically made 13 HWRs.
  - ◆ India plans to increase its nuclear power generation capacity from 4GW in 2009 to 20GW in 2020.
  - ◆ India made nuclear energy cooperation agreement with US in 2008, and resumed discussion with Japan in 2010.

# Japan-China energy cooperation

- Japan and China have held energy and environment forum annually since 2006 to enhance bilateral cooperation in energy efficiency as well as other kinds of energy related businesses.
  - ◆ 22 model projects and 42 cooperation items were agreed in the latest forum held in November 2009.
  - ◆ Forum agenda has expanded from only energy efficiency improvement to “top runner system,” recycling, desalination, auto manufacturing, and power generation.



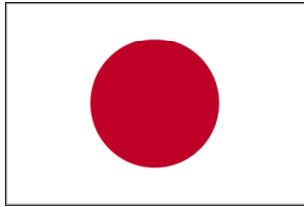
# US-China energy cooperation

- Agreement after the Second S&ED in April 2010 includes:
  - ◆ Specific cooperation in six priority areas: clean water, clean air, clean and efficient electricity, clean and efficient transportation, nature reserves and wetlands protection, and energy efficiency.
  - ◆ The first U.S.-China Energy Efficiency Forum
  - ◆ Meeting on Clean Energy Research Center
  - ◆ Electric Vehicles Forum
  - ◆ Oil and Gas Industry Forum in the second half of 2010; and promote shale gas development in both countries
  - ◆ U.S.-China Renewable Energy Forum, and Advanced Bio-fuels Forum, and start work on the U.S.-China Renewable Energy Partnership
  - ◆ Energy Security Cooperation
  - ◆ Support for the Copenhagen Accord



# Energy cooperation with India

- Both Japan and US have been actively involved in energy cooperation with India.



- Japan and India have continued annual bilateral energy dialogue since 2007.
- Cooperation items such as model projects for energy efficiency improvement, utilization of lower quality coal, smart grid development, joint study of Asian energy market, and training of renewable energy introduction were agreed in April 2010.
- Negotiation for nuclear cooperation agreement was resumed in June 2010.



- The U.S.-India Energy Dialogue was launched on May, 2005. It established working groups in coal, oil and gas, nuclear and renewable resources, electric power generation and energy efficiency.
- Coal working group in particular has been held frequently to exchange information on policies and to promote advanced technologies of production and use of coal.
- The U.S.- India civil nuclear energy cooperation agreement signed in July 2005.

# Common interests of US and Japan

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- CO2 emissions reduction in Asia is the key to address global climate change issues.
- US and Japan have a number of common interests in carbon management cooperation in Asia.
  - ◆ Lower-cost carbon emission reduction and credit opportunities
  - ◆ Effective and pragmatic carbon management framework development
  - ◆ Energy market stability through carbon and energy demand management
  - ◆ Several bilateral energy cooperation activities conducted by US and Japan overlap.

# Role of US and Japan

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- What US and Japan should pursue are:
  - ◆ Continue the existing supports and start discussions for long-term support for developing countries.
  - ◆ Share best practices and issues obtained from each country's bilateral cooperation experiences.
  - ◆ Develop jointly MRV (measurable, reportable, and verifiable) system for GHG emissions in Asia.
  - ◆ Cooperate to set common standards for advanced energy-related infrastructures and appliances.