

Aligning climate change and sustainable energy development in Thailand

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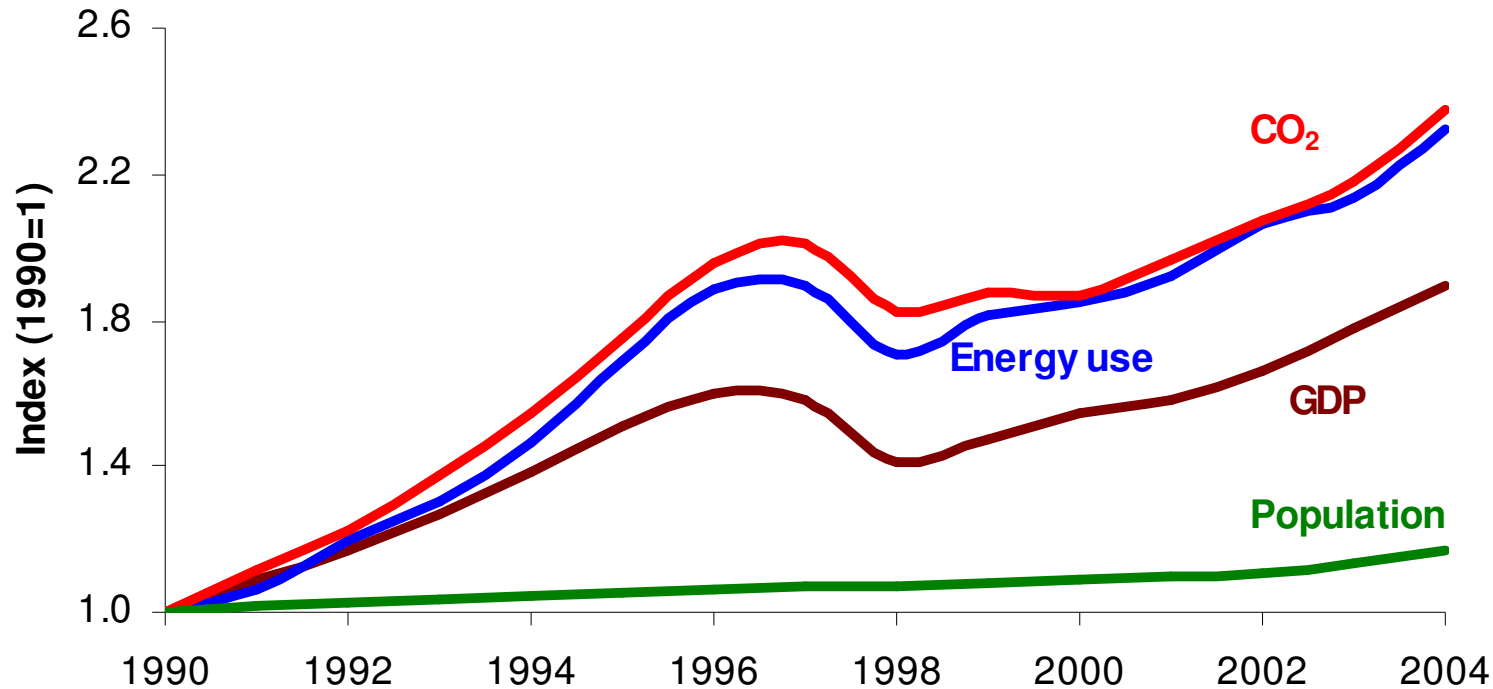
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Overview of Thailand's energy and environment situation

Fast increasing of GDP, energy consumption and CO₂ emissions



AAGR (1990-2004):

CO₂ emissions: 6.6 %

Energy use: 6.4 %

GDP: 4.8%

Population: 1.1%

- Growing energy demand

- Per capita CO₂ emission **doubled** in 2004 compared to 1990.

Energy use per unit of GDP (“energy intensity”)

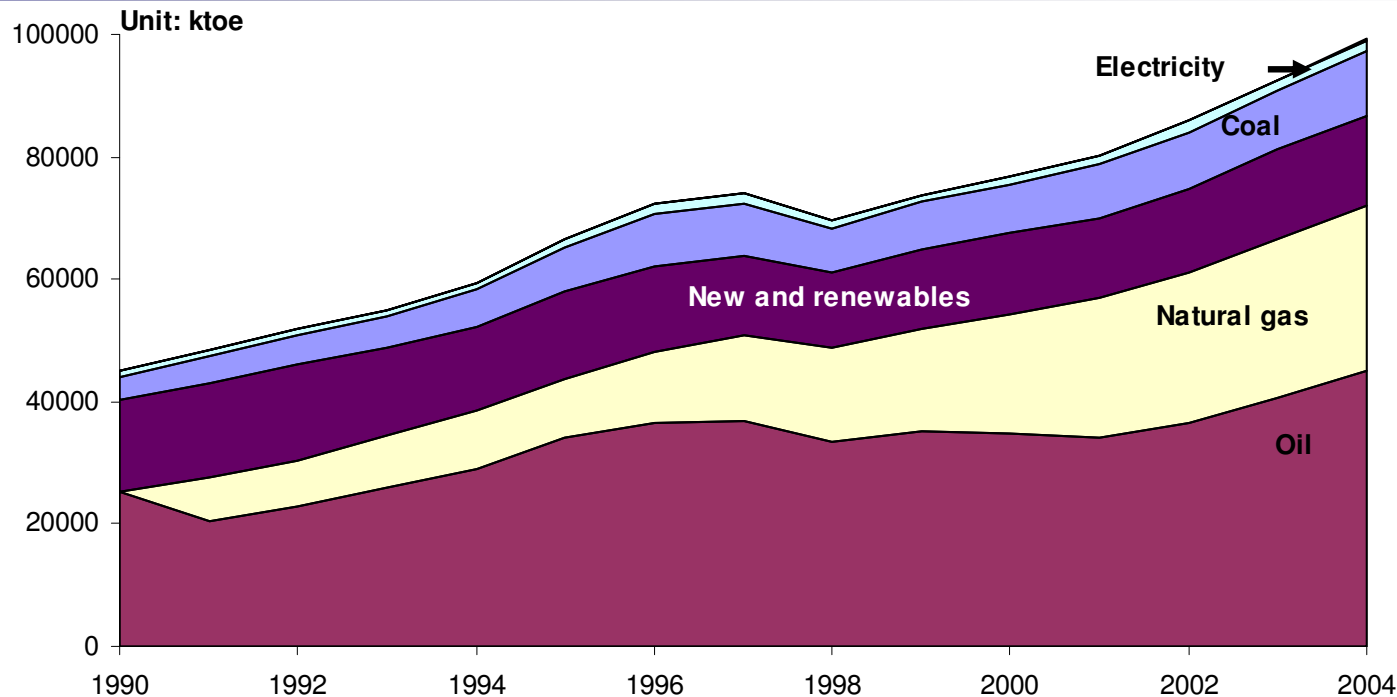
Country/region	AAGR (%) (1990-2002)	Energy intensity (kgoe/US\$ at 1995 prices)
Thailand	1.135	0.45
Philippines	0.906	0.43
South Korea	0.857	0.30
Indonesia	0.247	0.70
Japan	0.004	0.09
OECD total	-0.840	0.19
World	-0.974	0.29
Asia excluding China	-1.064	0.64
India	-1.979	1.04
Vietnam	-2.485	1.28
China	-6.246	1.02

Primary energy intensity has been increasing (AAGR: **2.3%**) in Thailand during 1994-2002.

Source: IEA (2004)

=> Potential for energy efficiency improvements and reduction in the use of fossil energy and CO₂ emissions.

Increasing share of fossil-fuels



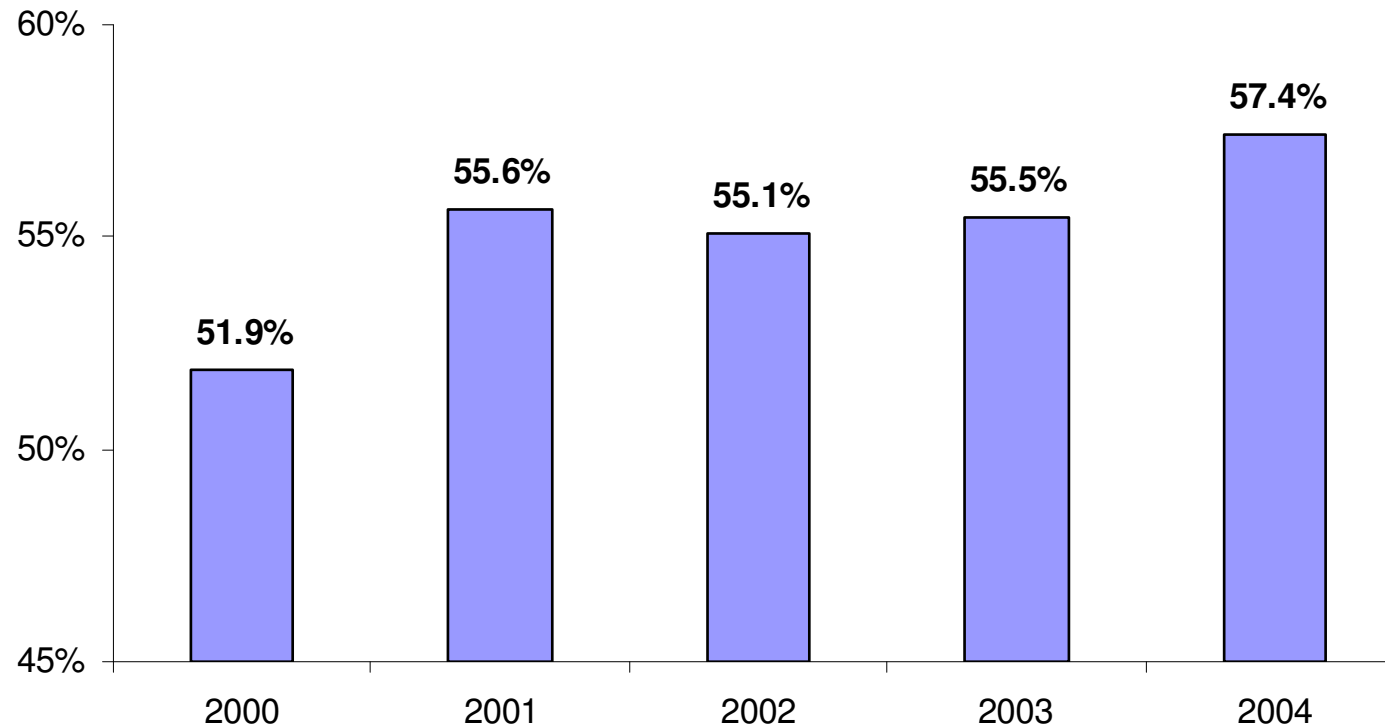
- Primary energy supply: 1990: **45 Mtoe** 2004: **99 Mtoe**
- Share of fossil fuels: 1990: **65%** 2004: **83%**

AAGR (1990-2004):

Coal: 8% ; Oil: 4.6% ; Natural gas: 11.1%

Electricity: 4.8% and New and renewable energy: 0.1%

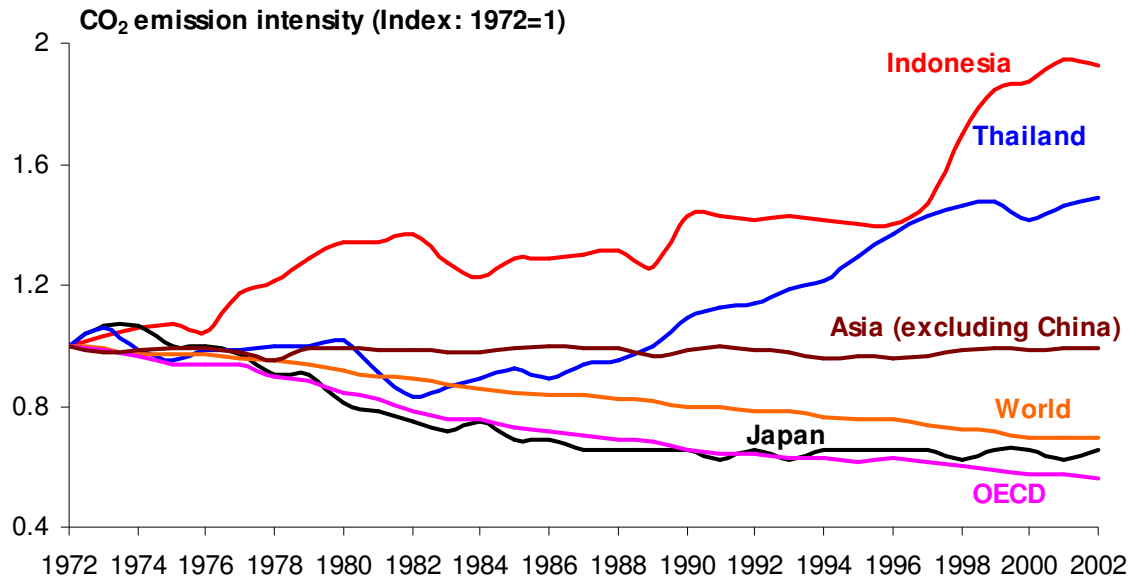
Increasing energy import dependency



Source: IEA (2004) and DEDE (2005)

- In 2004 alone, energy import accounted for **8.6%** of the total GDP (**US\$14 billion**).

Growth of CO₂ emission per unit of GDP ("carbon intensity")



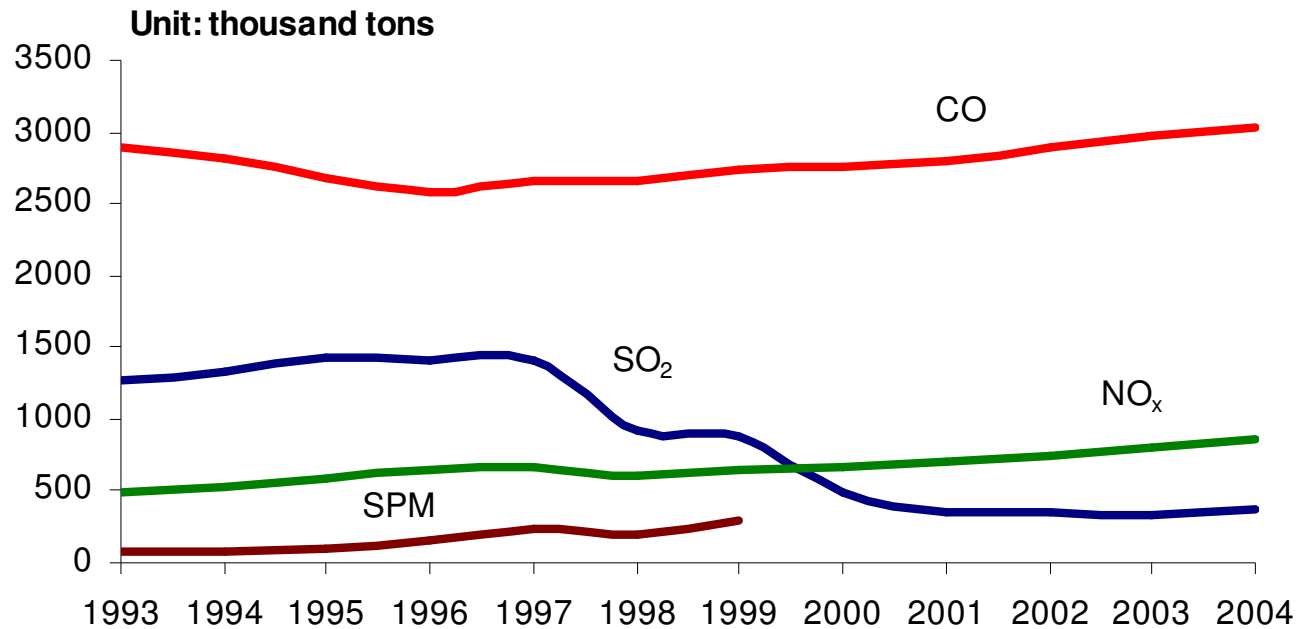
Source: IEA (2004)

Carbon intensity in 2002
(kg of CO₂/US\$ at 1995 prices)

Country/region	2002
Japan	0.21
South Korea	0.66
Thailand	0.97
Indonesia	1.37
OECD	0.44
World	0.68
Asia (ex. China)	1.22

Increasing CO₂ emission intensity (AAGR: 2.6%) in Thailand during 1990-2002.

Trends of local air pollutant emissions



Source: DEDE (2000-2004)

AAGR (1993-2004)

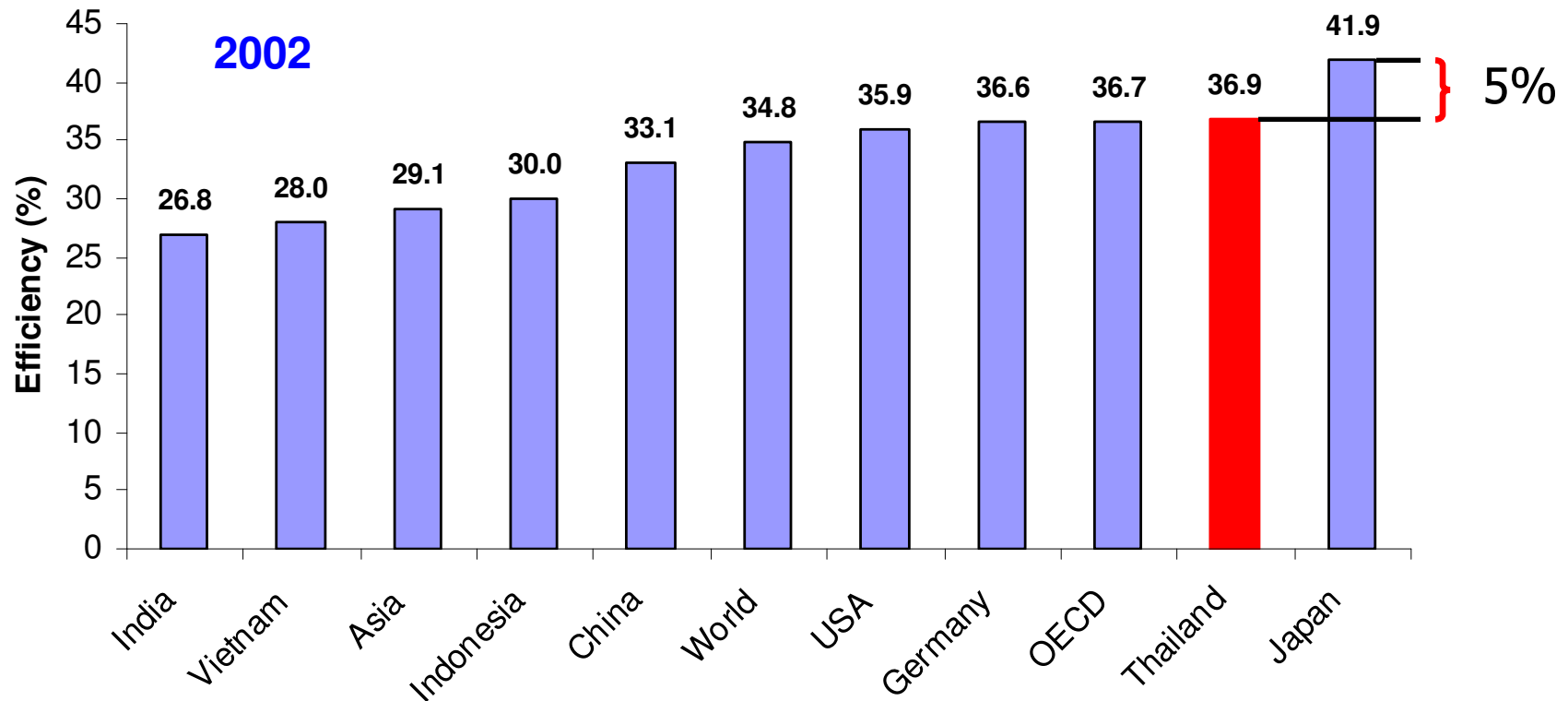
SO ₂	-8.4
NO _x	5.4
CO	0.5
SPM*	29.1

* AAGR (1993-1999)



Potential for energy efficiency improvements

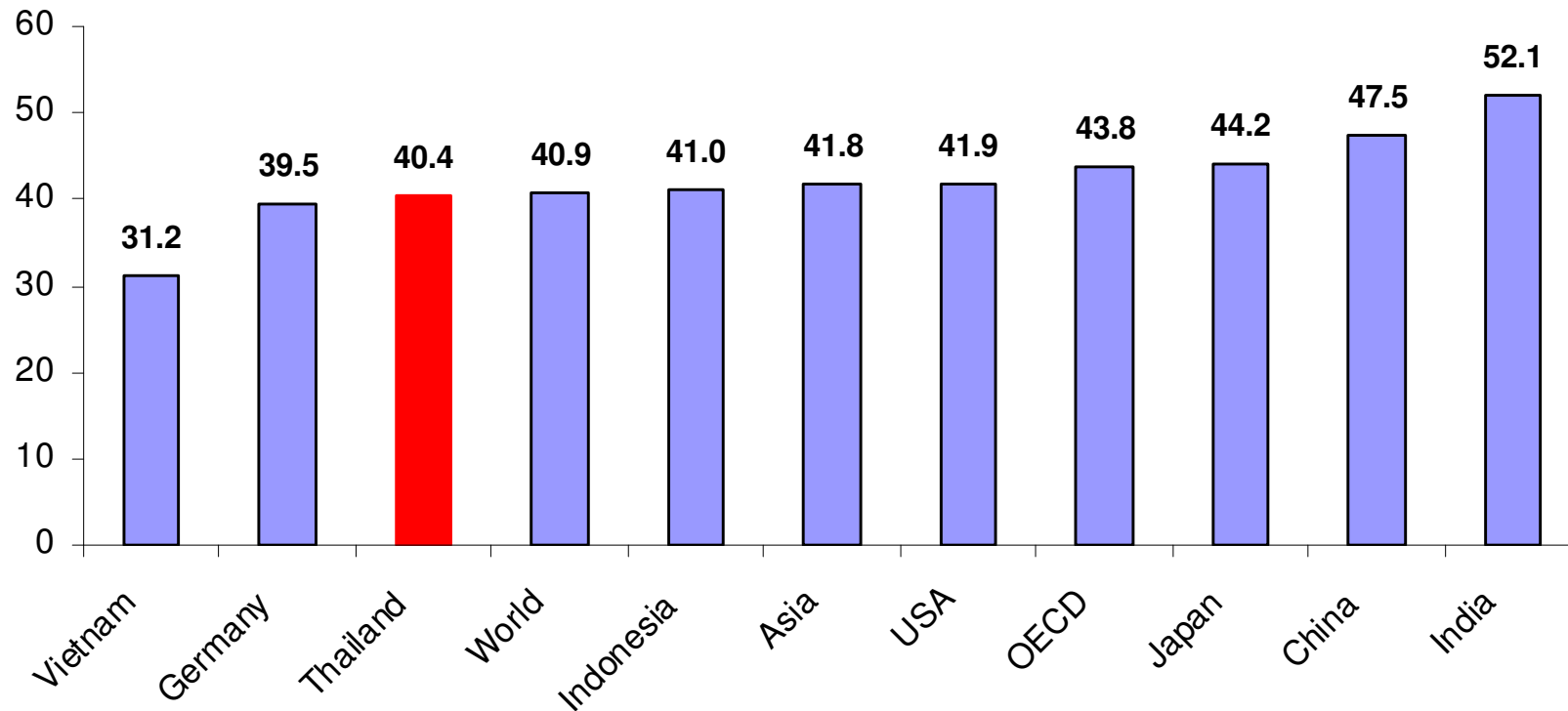
Potential to improve energy efficiency in coal-fired power plants.



Sources: IEA (2004) based on public electricity plants. For Japan, Germany and USA data are from ECOFYS (2005)

Potential efficiency improvement of 5% (compared to Japan) corresponds to about 12% reduction in coal requirements in power sector. This implies CO₂ emission reduction of over 12%.

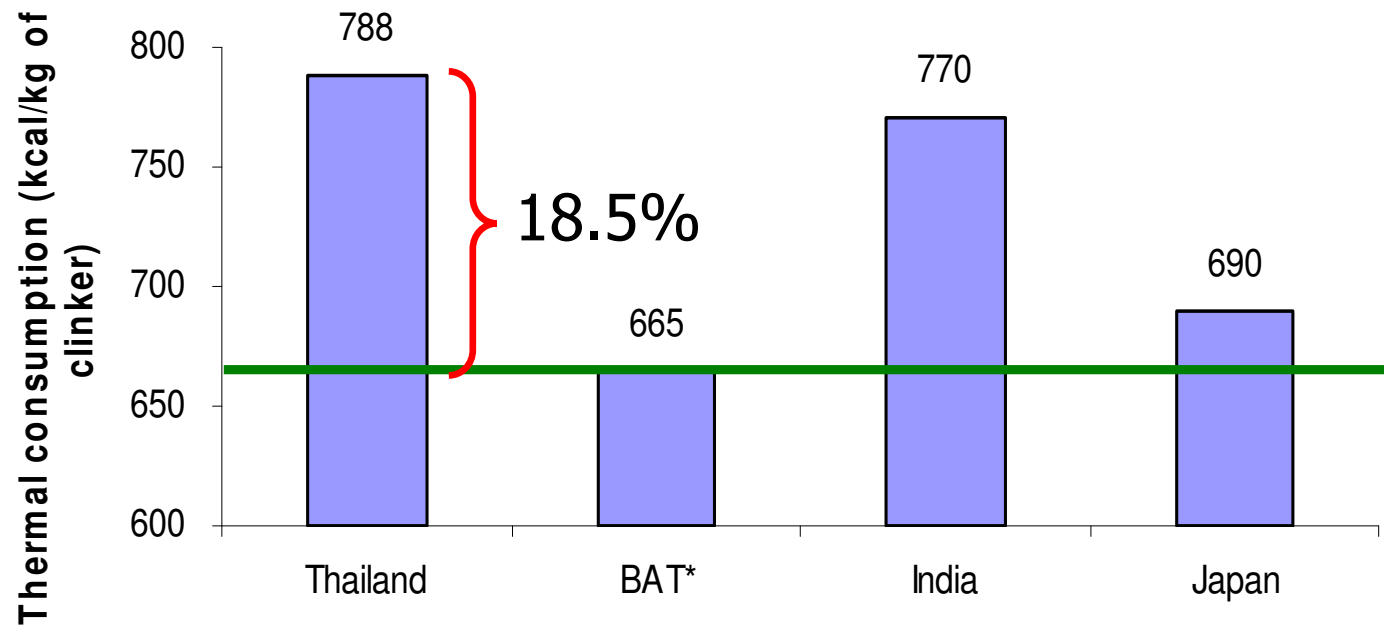
There is also a potential to improve energy efficiency in gas-fired power plants.



Sources: IEA (2004) based on public electricity plants. For Japan, Germany and USA data are from ECOFYS (2005)

Potential efficiency improvement of **3.8%** (compared to Japan) corresponds to about **8.6%** reduction in natural gas requirements in power sector.

Specific thermal energy consumption of cement production

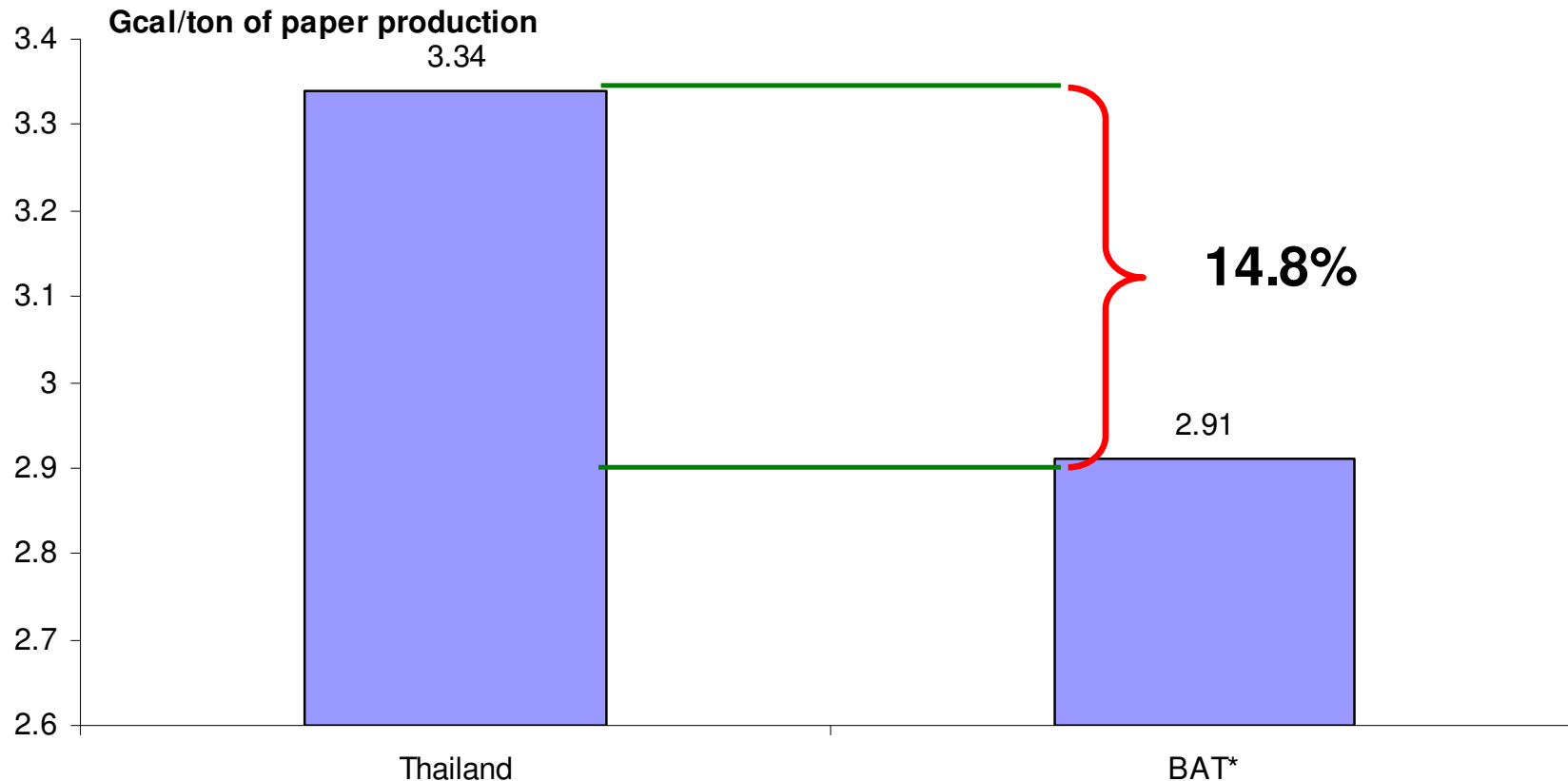


Source: Siam Cement Group Sustainability report (2005); NCCBM (2004); Worrell and Galitsky (2004)

Note: * Best available technology (BAT) is based on dry-6 stage pre-heater twin stream pre-calcinator pyro-step cooler technology.

The reduction in specific energy consumption by 18.5% could reduce total industry sector energy use by 2% (438 ktoe) in 2004.

Specific energy consumption of paper production

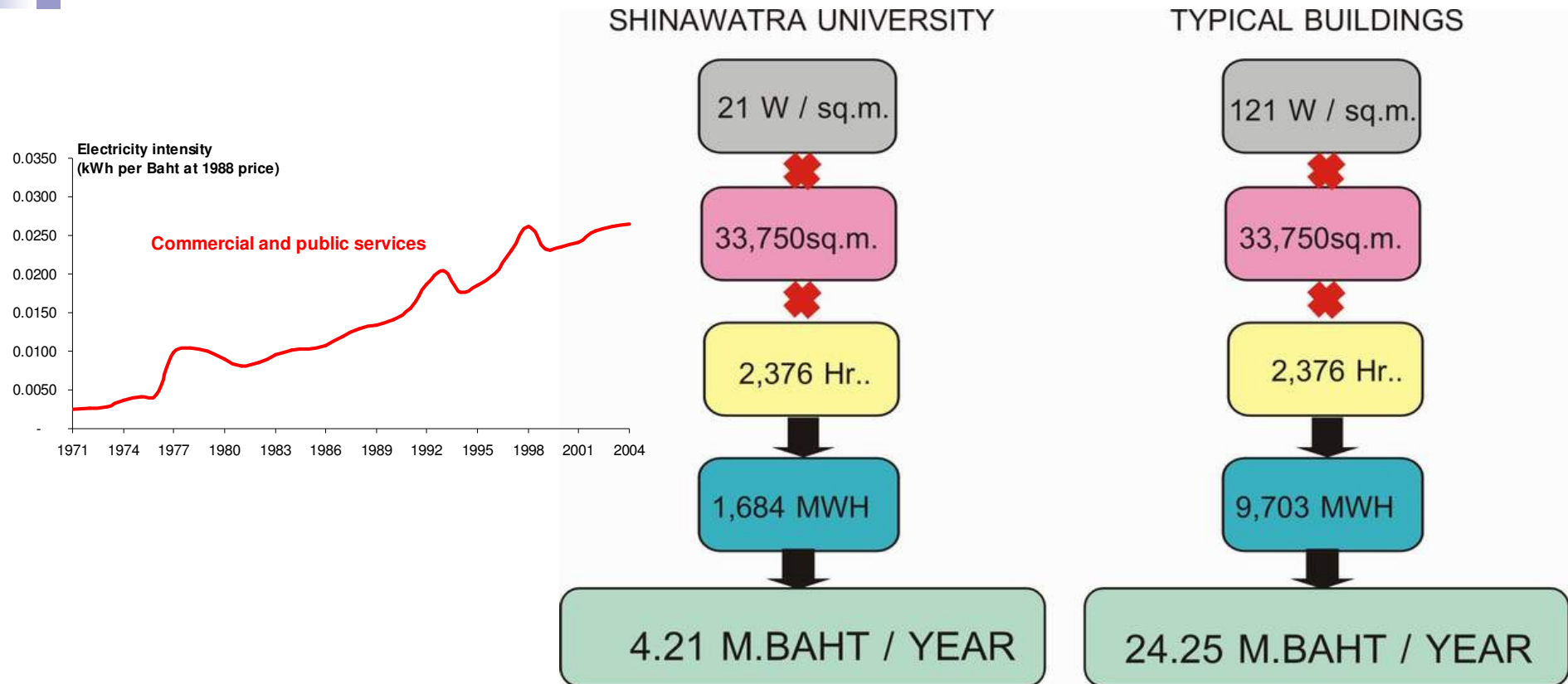


Note: * Best available technology (BAT) is based on Modern Kraft Market Pulp Mill.

Source: SCG (2005); NRC (2002)

This 14.8% translate to reduction of 0.2% (i.e., 40 ktoe) of total energy use in industry sector in 2004.

Energy cost reduction in commercial sector: An example



- About **20 million Baht** (0.5 million US\$) per year could be saved. (About 15 US\$ saving per sq. m. per year)
- About **82.6%** reduction in electricity requirement.
- Energy use for air conditioning is growing rapidly.



Climate-friendly energy strategies/policies:

More a response to economic and energy security concerns

Five energy strategies of Thai government

- Enhancing efficiency in the transport sector;
- Enhancing efficiency in the industry sector;
 - ENCON fund
- Enhancing national energy security;
- Enhancing overall capability in energy management and integration; and
- Becoming a regional energy hub.

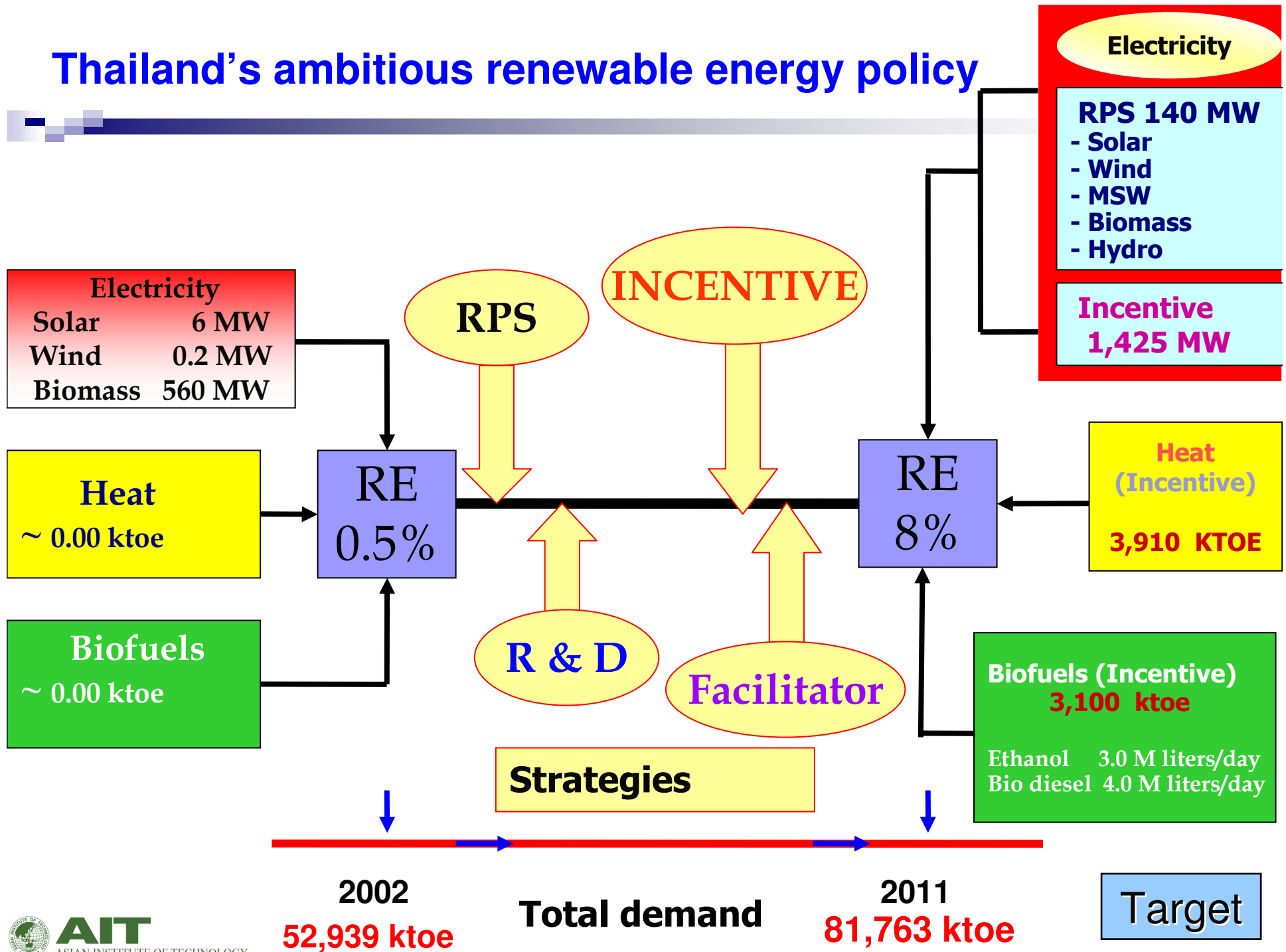
Energy strategies (contd.)

- Establishment of 1992 Energy Conservation Promotion Act
- Establishment of ENCON Fund
 - to support activities related to energy efficiency and energy conservation

Specific national energy targets/“strategies”:

- to reduce oil consumption by 20% by 2009;
- To increase the share of new and renewable energy use to 8% by 2011.
- Renewable Portfolio Standard (RPS): to increase the share of RE based power generation capacity to 6% of total capacity by 2011

Thailand's ambitious renewable energy policy

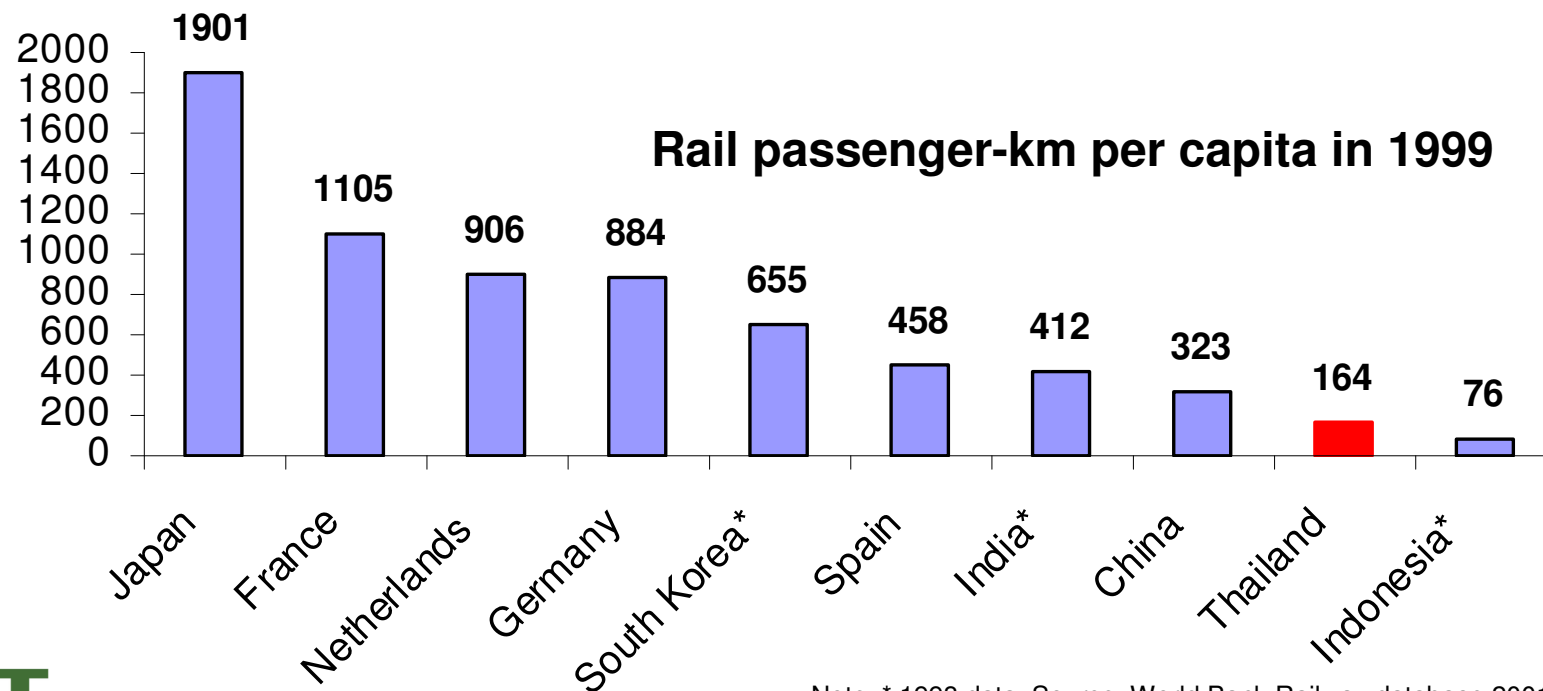




Biofuels program in Transport sector

Key characteristics of transport sector

- Transport accounts for 37% of total final energy demand in 2004.
- High share of road transport in transport energy demand (78% in 2004)
- Low share of public transport
- Low share of MRT/rail transport



Note: * 1998 data. Source: World Bank Railway database 2001

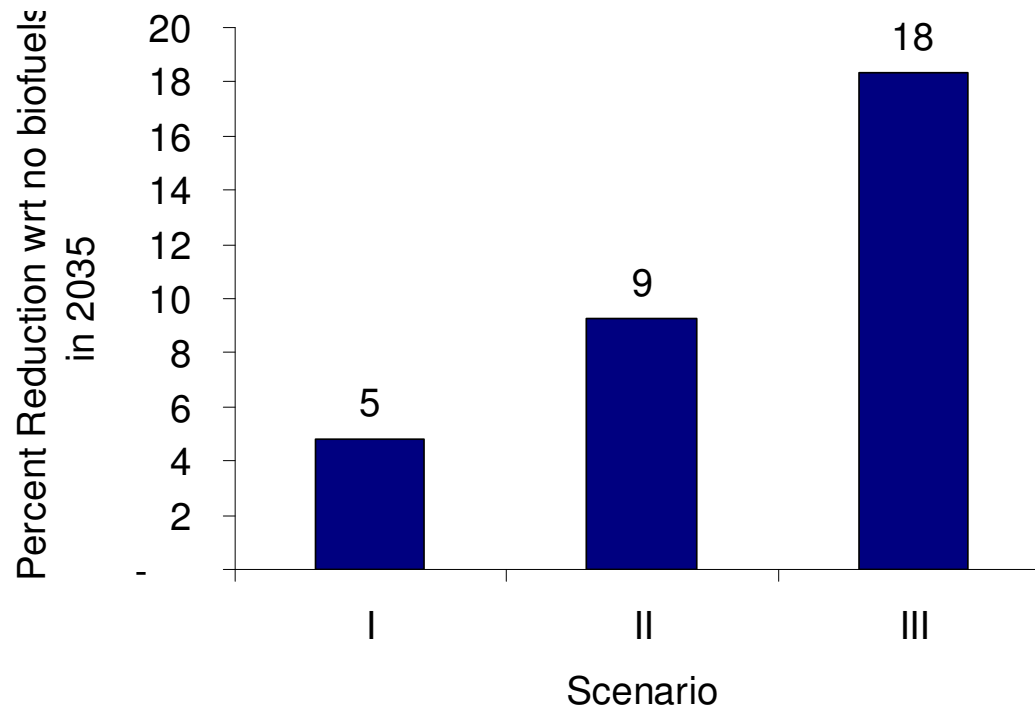
Biofuels utilization target and policy

- Utilization of 3.0 million liters of ethanol per day by 2011;
- Utilization 8.5 million liters of bio-diesel per day by 2011;
- Subsidy of 1.5 Baht per liter of gasohol.

Effects of biofuels on CO₂ emissions: An AIM/Enduse Model Analysis

Scenario	Description
I	Base case with limited production of biofuels (Government plan)
II	No limit on biofuels production and no subsidy
III	Doubling the blend of biofuels + Scenario II

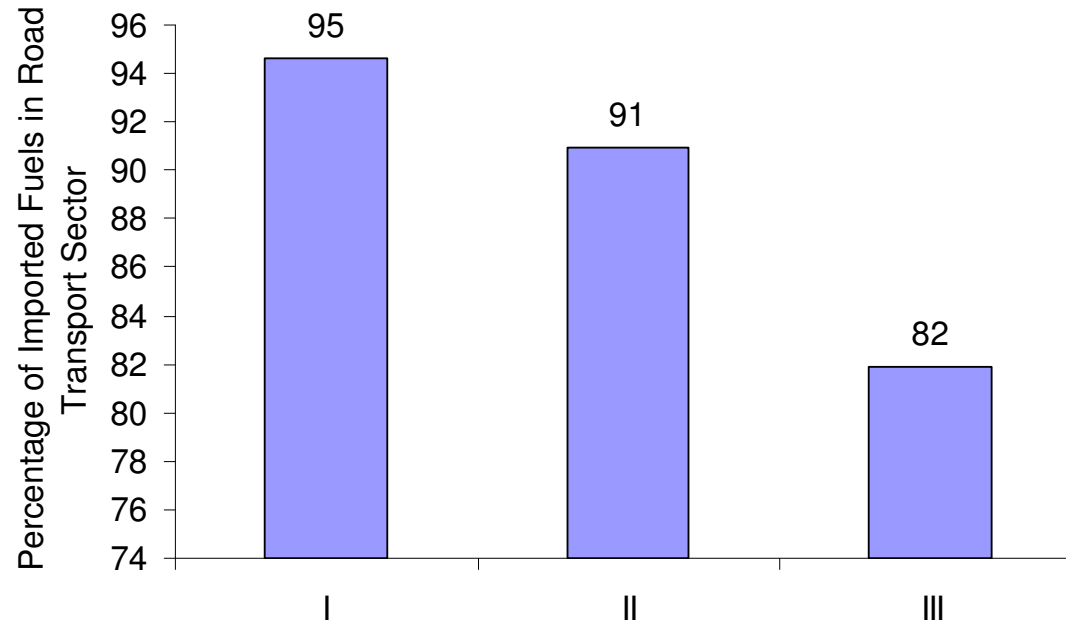
Reduction in CO₂ emissions with biofuel program in 2035



About **5%** of total CO₂ emissions from road transportation could be reduced with the government plan.


Without any limits on domestic production of biofuels, **9%** of total CO₂ emissions could be reduced.

Reduction in oil imports with biofuels promotion (2035)



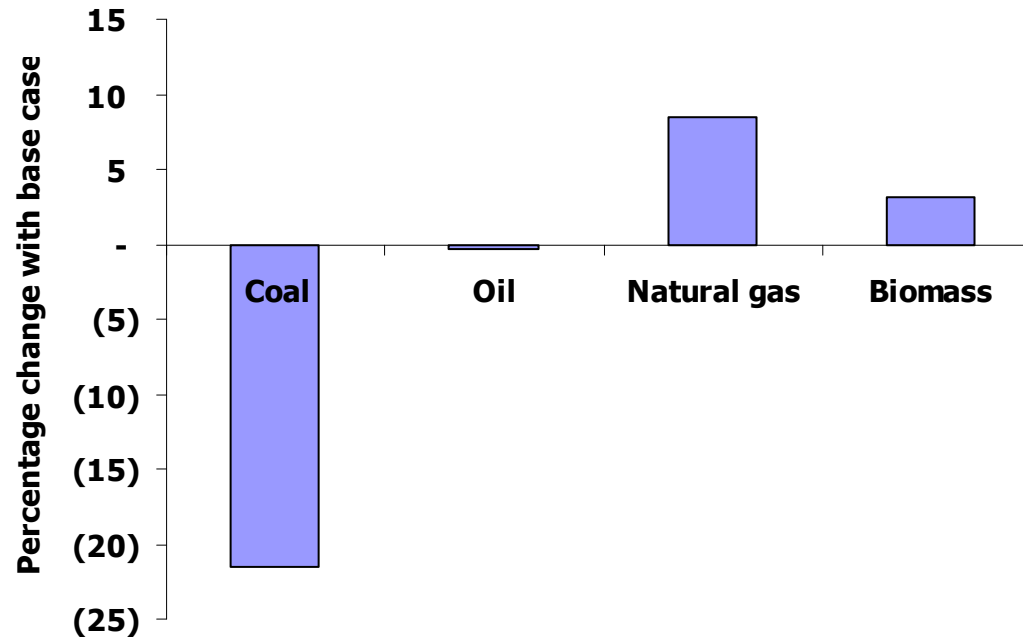
With the government plan, about **5%** of the fuel import in road transport could be reduced in 2035.

As high as **18%** of the fuel imports could be reduced if the blend of biofuels is doubled.



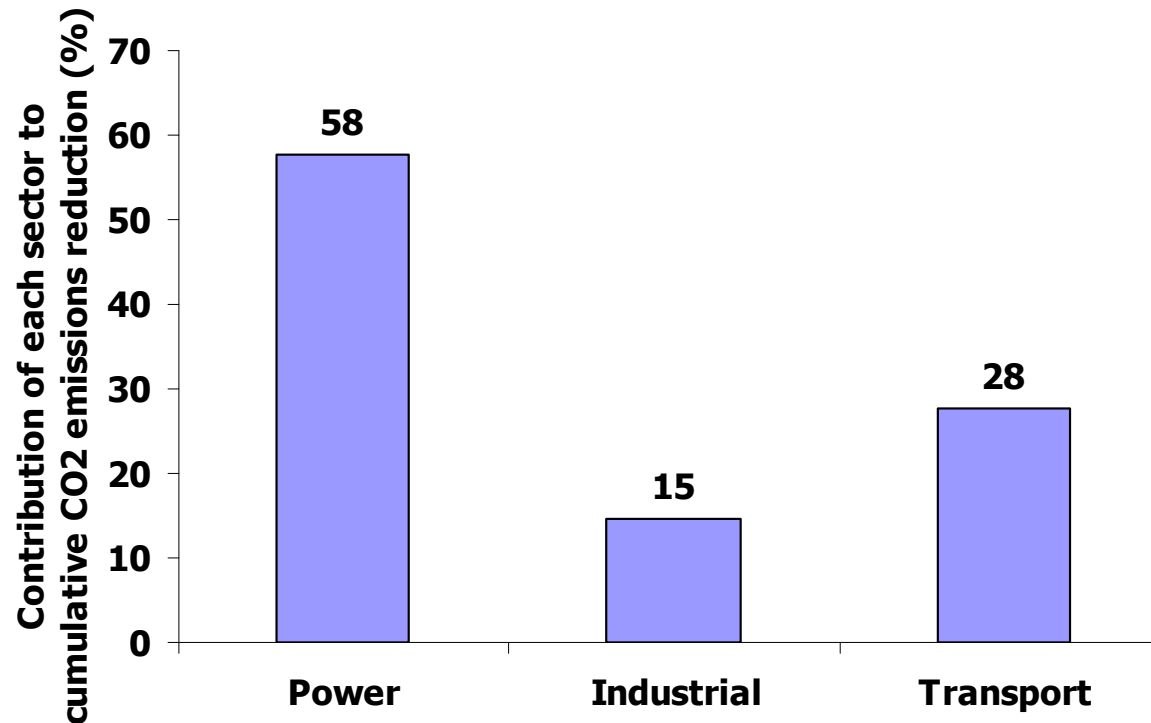
**Implications of a CO₂ emissions reduction
target:
An AIM/Enduse Model Analysis**

What changes in primary energy mix are needed to attain 10% CO₂ emission reduction during 2010-2030?



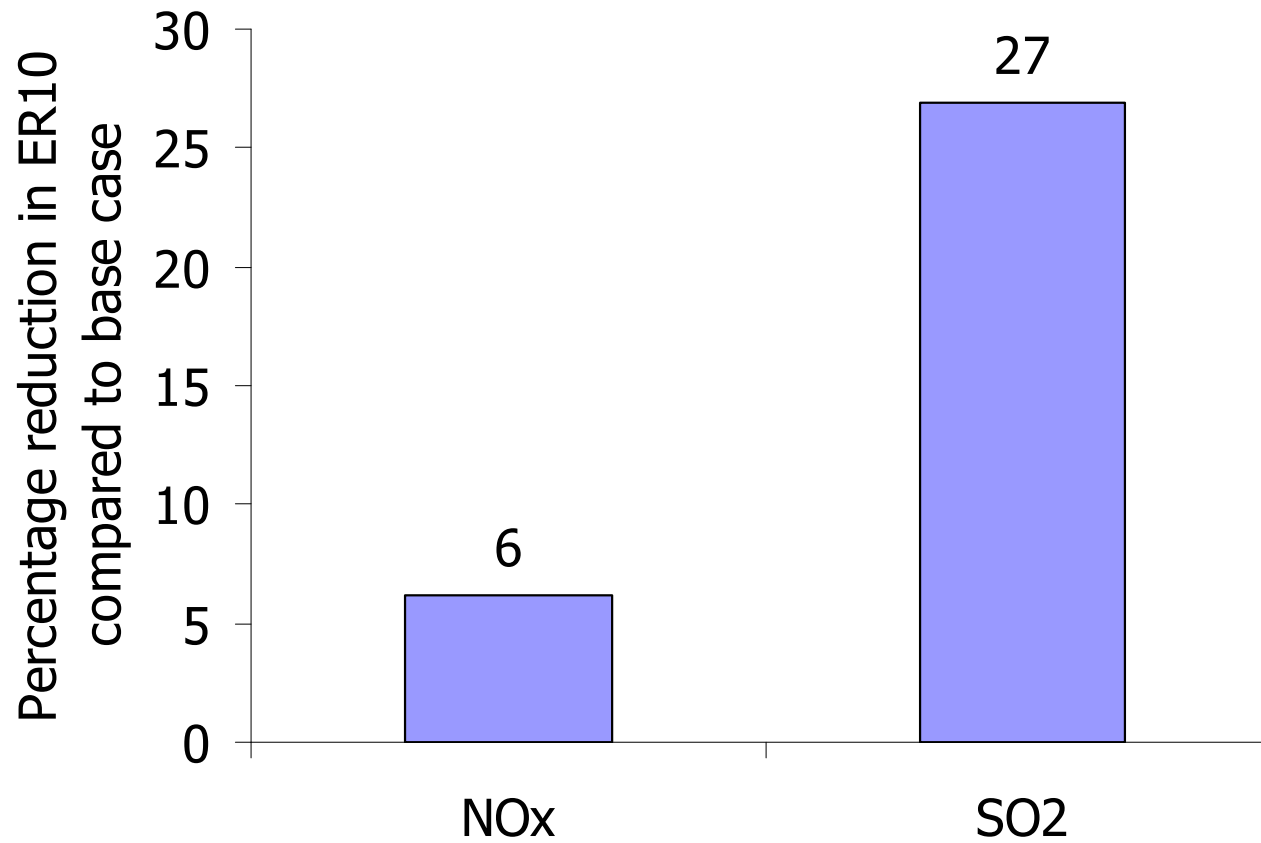
- With a 10% CO₂ emissions reduction target,
 - coal share to decrease by 22%
 - natural gas to share increase by 8%
 - Biomass share to increase by 3%

Sectoral shares in cumulative CO₂ emissions reduction during 2011-2030 (reduction target: 10%)

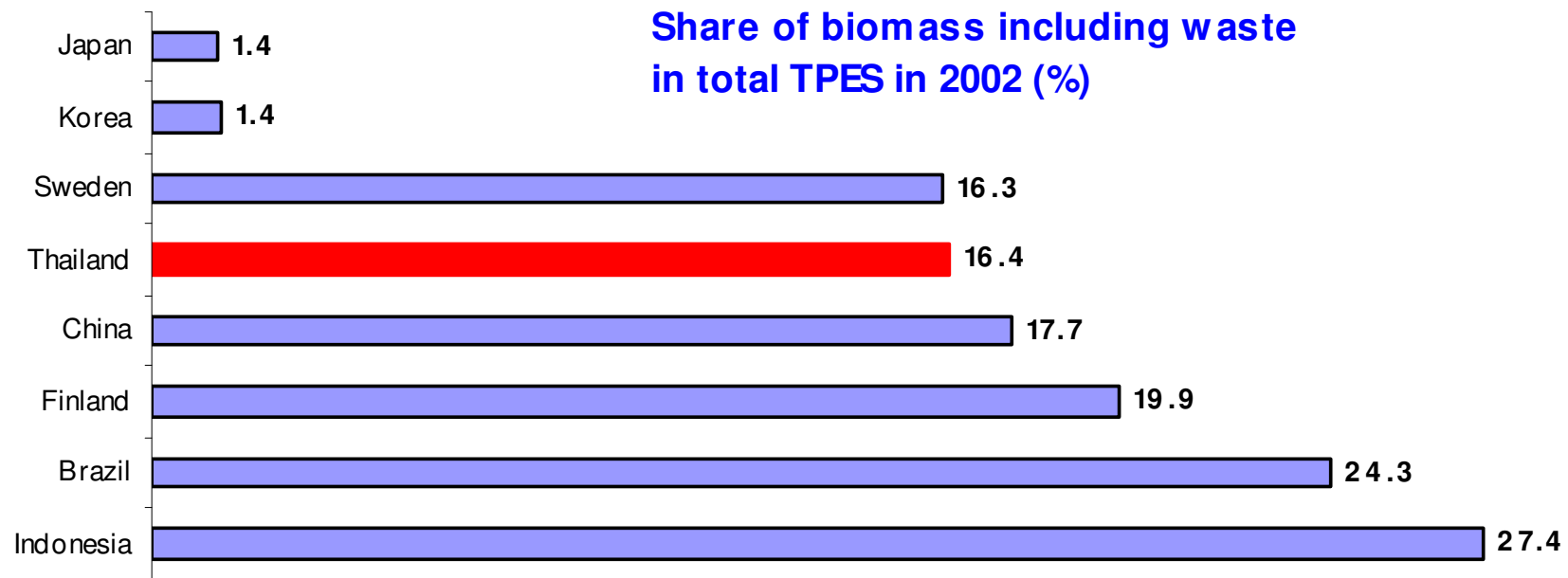


Power sector will have the highest share (58%), followed by transport (28%) and industry (15%) sectors.

Co-benefits: Reduction of SO₂ and NO_x emissions during 2011-2030



Role of energy from biomass including waste in future?



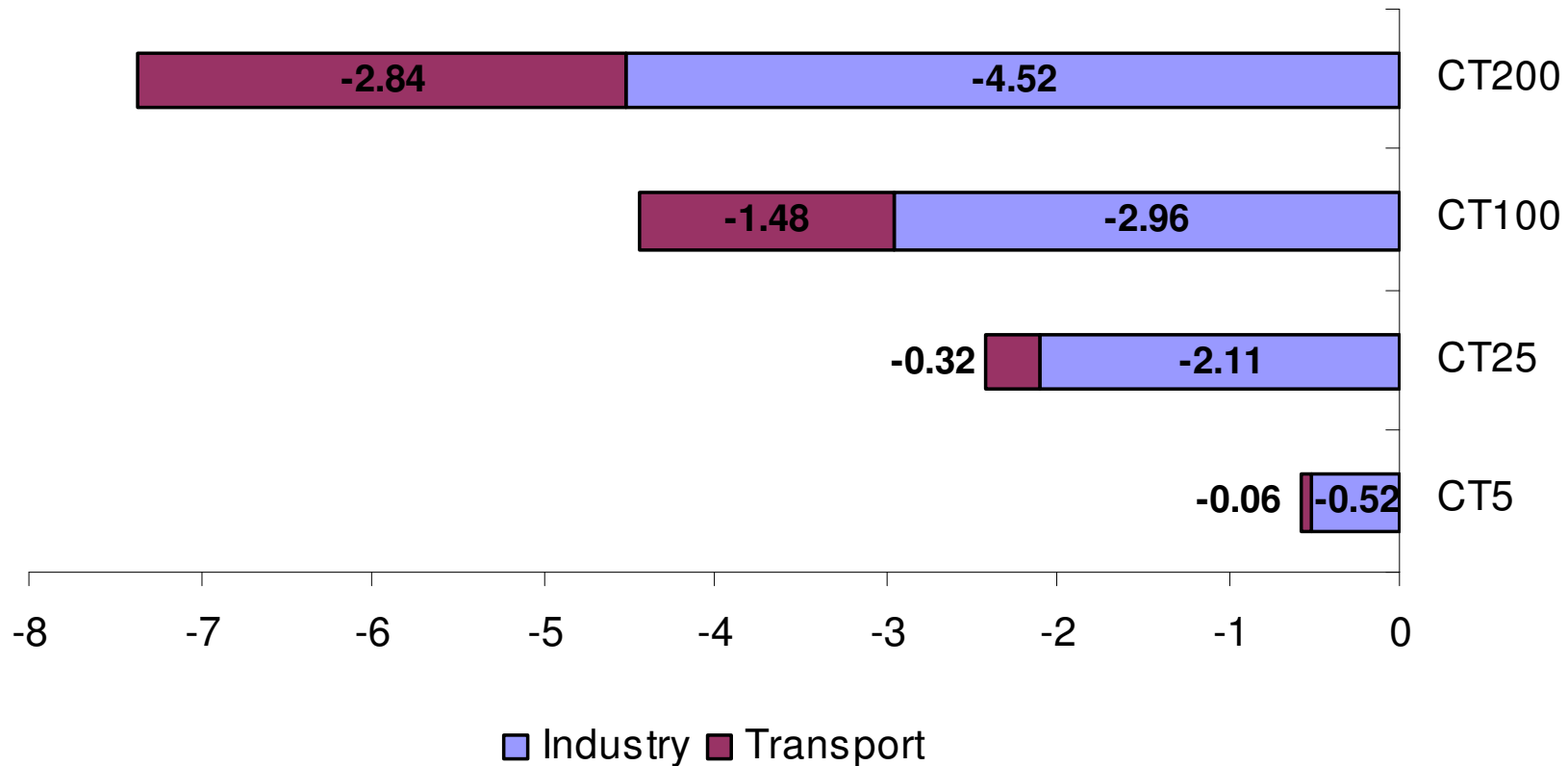
Regional energy development

- Hydropower in Thailand almost fully exploited
- Low fossil energy reserve, negligible wind power and geothermal potential
- Regional cooperation on cleaner energy (e.g., hydropower in Laos and Myanmar, natural gas in Myanmar, Malaysia, Indonesia) an option



Effects of Carbon tax: An AIM/CGE Analysis

Percentage change in CO₂ emissions from industry and transport sectors with carbon tax compared to base case



- In industry sector, the range of CO₂ emission reduction varies from about **0.5%** (3 million tons) with CT5 to **4.5%** (26 million tons) with CT200.
- Reduction in CO₂ emissions mainly comes from **fuel switching** and reduction in energy consumption in the industry sector through **structure change**.

Concluding remarks

- There exists large potential for energy efficiency improvements in Thailand which can promote climate friendly sustainable energy development.
- Renewable energy (biomass) is already playing a significant role in the energy system and may have limited role in the long term. Wind, hydro and geothermal have limited potential in the country.
- Shift towards biofuels in road transportation and increased share of public transportation (MRT): potential climate friendly sustainable options in the long run.
- Besides energy efficiency improvements, new and renewable technologies will have to be considered for GHG reduction.
- Regional clean energy development an option.



THANK YOU.

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