AIM-LCS Workshop 2008

Scenario Analysis of Energy System in Thailand

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Presentation Outline

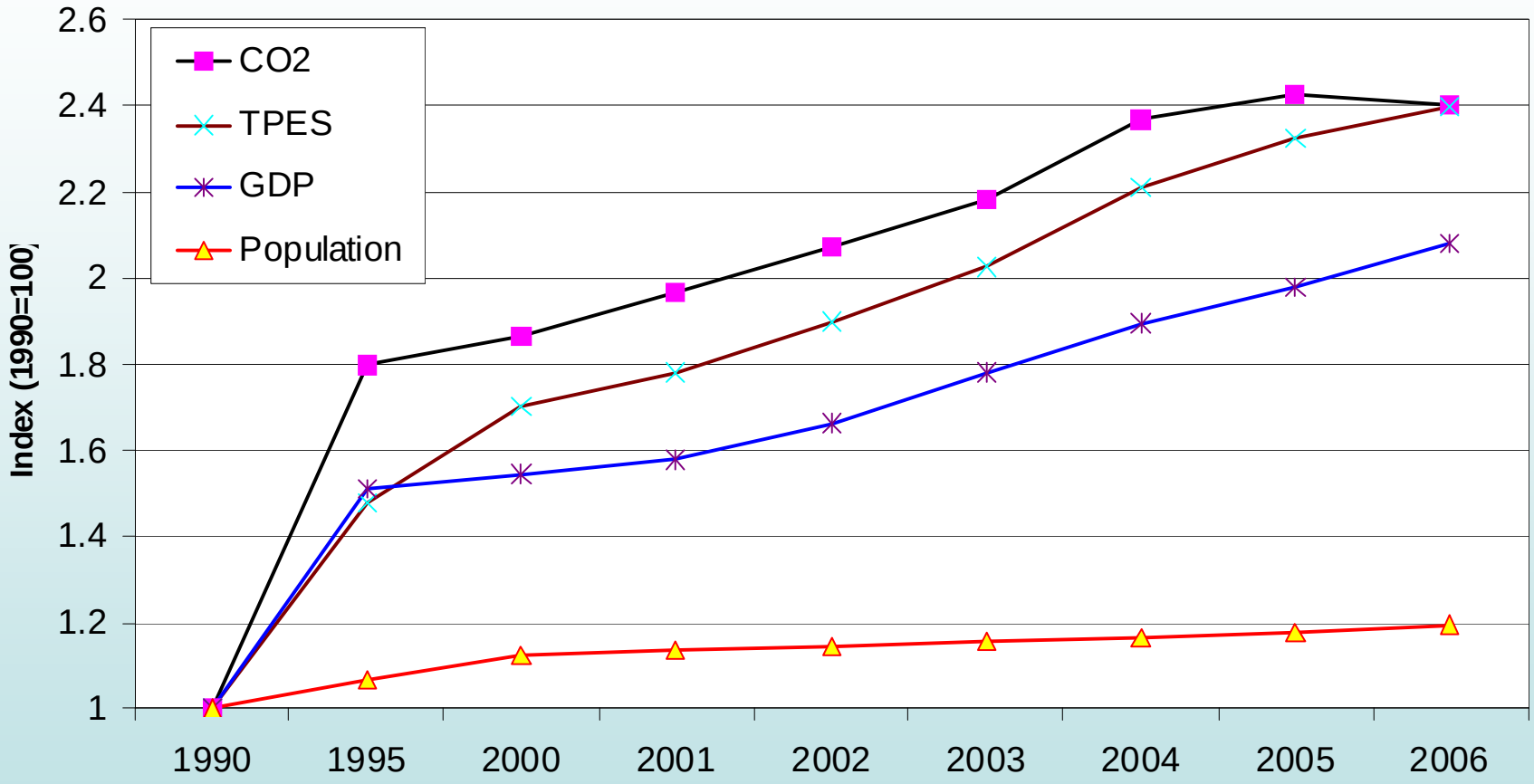
- Brief background
- Some indicators on energy and economy
- Reference scenario analysis
- Some environment friendly policies and strategies
- Snapshots of Scenario Analysis
  - Modal shift in Transport
  - Modal Shift with increase in Nuclear Power

Brief Background

- **Location**:
  - Area of 513,115 km^2 and extends about 1,620 km from north to south and 775 kilometres from east to west.

- **Population:** 64.76 million
- **Population Density:** 126 people/km^2
- **GDP:** US $ 176 billion
- **GDP per capita:** US $ 2727 (year 2005)
- **Economy:** 2nd highest in the ASEAN region

CO_2, TPES, GDP and Population Growth during 1990-2006



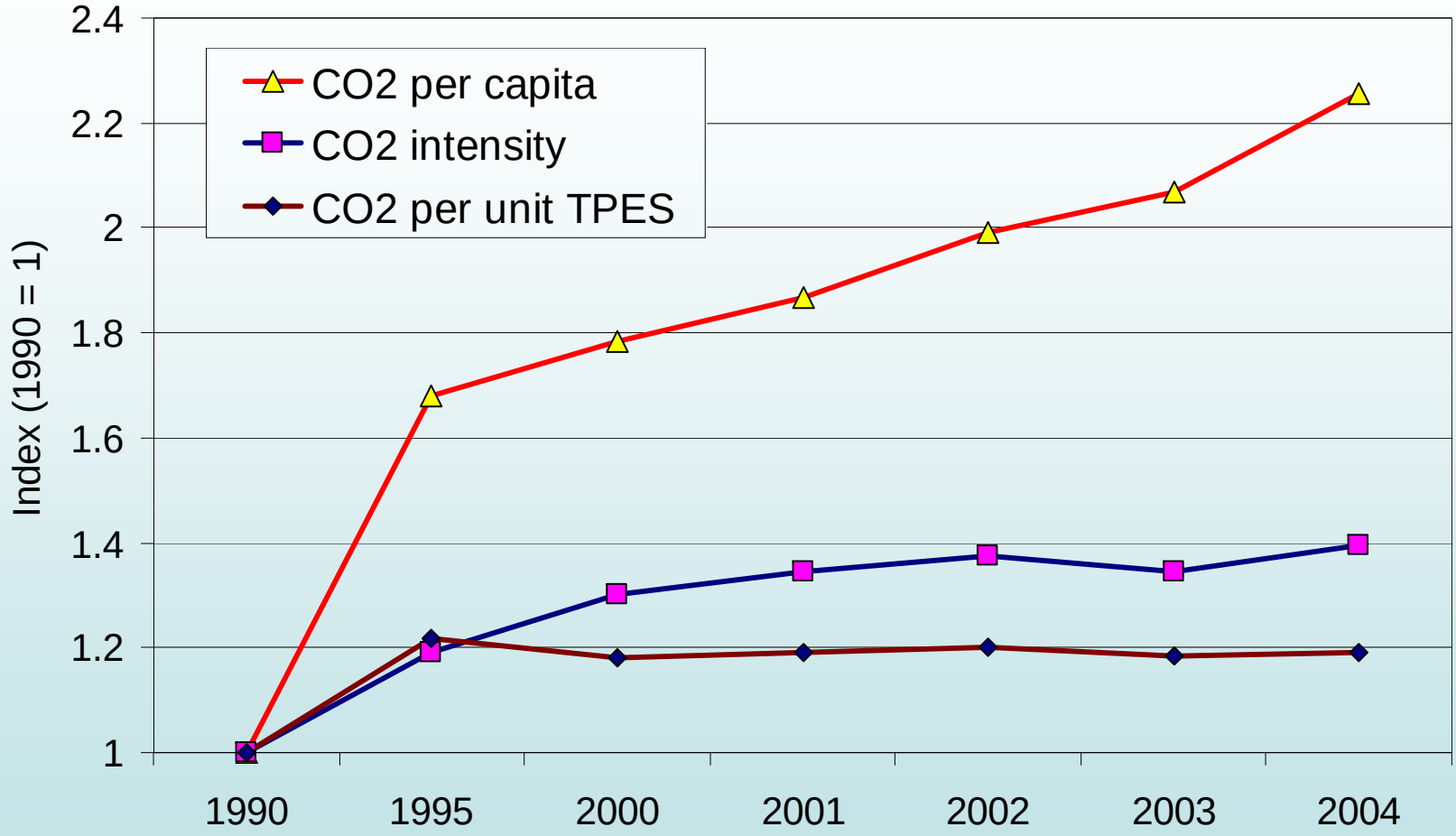
AAGR (2001-2006):

CO_2: 4.35% Population: 1.02%

TPES: 5.91% GDP: 5.07%

Source: DEDE, 2006, IMF, 2008, IEA, 2007 and 2008

CO_2 per capita, CO_2 Intensity and CO_2 per unit TPES



Source: IEA, 2007

AAGR (2001-2004):

CO_2 per capita:
Thailand: 6.06%
OECD: 0.07%

CO_2 intensity:
Thailand: 1.73%
OECD: -1.03%

CO_2 per unit TPES:
Thailand: 0.18%
OECD: -0.05%

GDP and Population Projection

GDP Projection

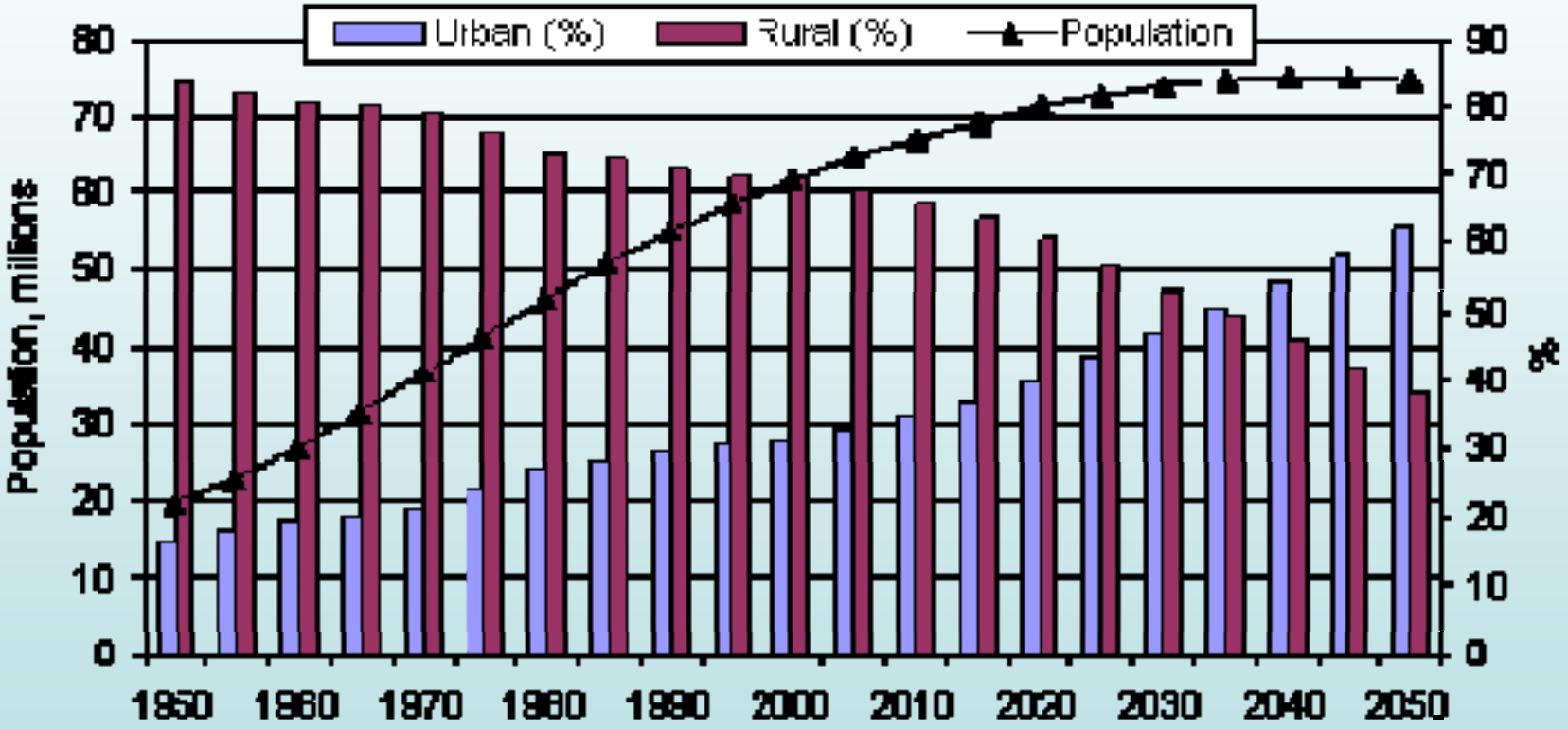
2000-2016	2016-2030	2030-2040	2040-2050
6.4%	6.4%	5.3%	4.5%

Population Projection

	2000	2010	2030	2050
Population (MEA) (UN, 2004), million	19.1	22.9	34.7	46.2
HH Size (NEPO, 1999)	3.6	3.0	2.6	2.4
Number of Households, million	5.3	7.6	13.3	19.2

	2000	2010	2030	2050
Population (PEA) (UN, 2004), million	42.3	43.9	39.1	28.4
HH Size (NEPO,1999)	3.9	3.6	3.2	3.0
Number of Households, million	10.9	12.4	12.2	9.5

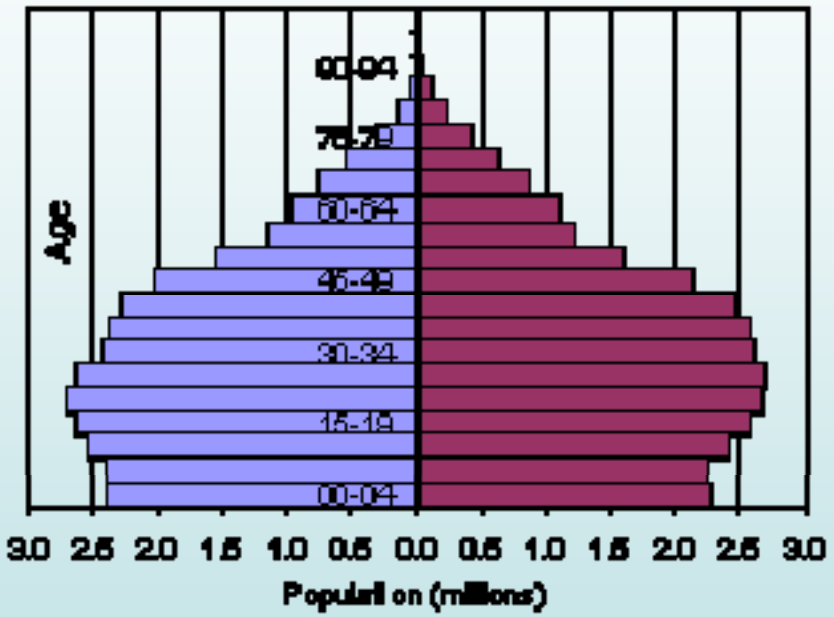
Urban and Rural Population during 2000-2050



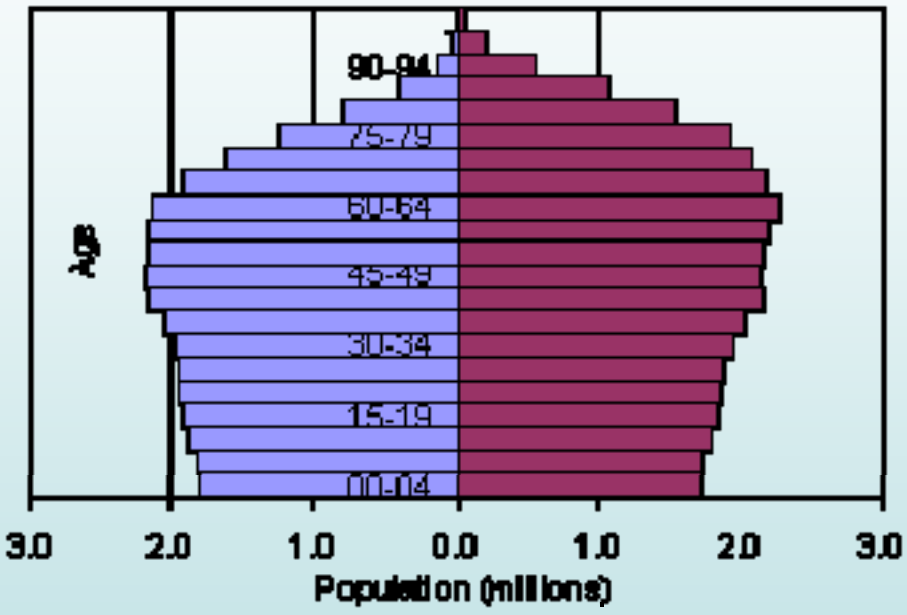
Source: UN, 2004

Labor Force in 2000 and 2050

Year 2000



Year 2050



Source: UN, 2004

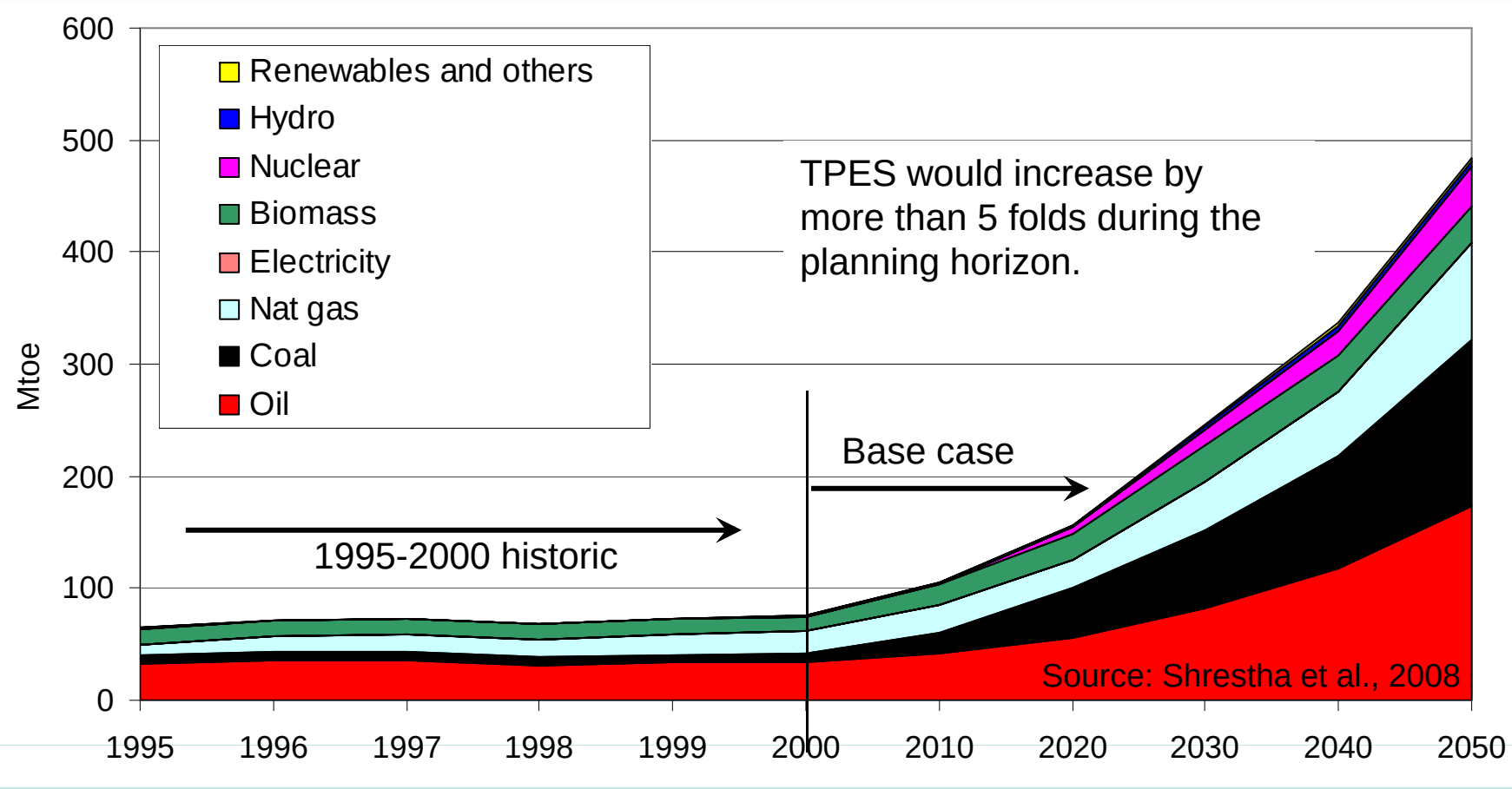
Reference Scenario during 2000-2050

Under the framework of
Asia Pacific Integrated Model (AIM)
Bottom up linear least cost optimization model

Dual Track Policy

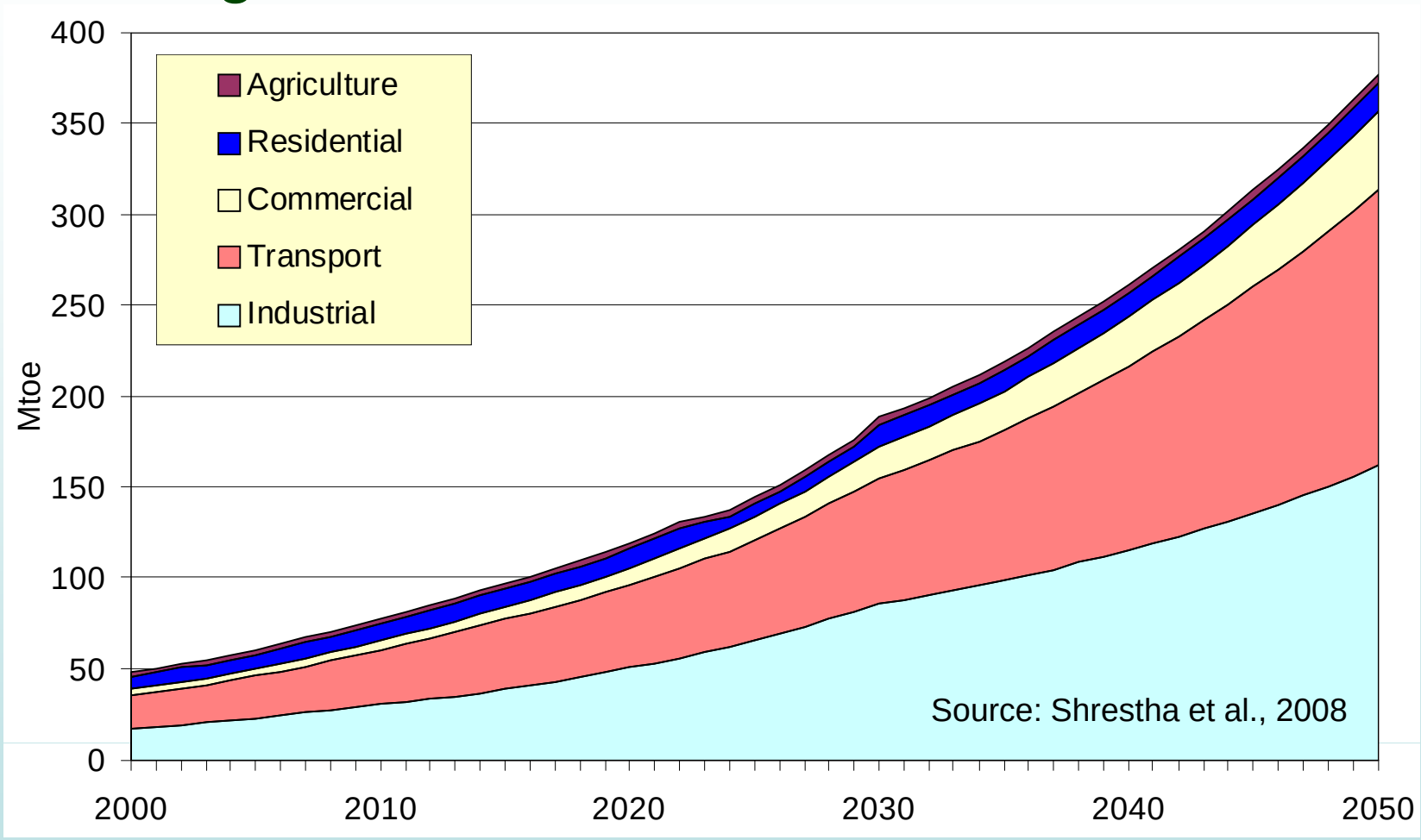
- Thailand follows closely the national development plans and policies. Thai government continues to pursue the explicit policy focus on the duality of the export and the domestic sectors (***dual track policy***) to bring economic growth with stability. (It is according to one of the four IPCC SRES storyline)
- There is a labor shortage partly due to the decreasing population growth. Aging population in the country rises.
- The government focuses on the alleviation of poverty and the upgrade of the quality of life for the Thai people.
- Thailand is successful in achieving its energy strategy that focuses on promotion and development of alternative and renewable energy sources, and energy management and conservation.
- However, energy import dependency (EID) increases with the increasing energy demand.
- The energy price increases.
- There is also some degree of technology progress because of financial ability for technology R&D.
- There is also some degree of national level environmental polices implemented.

TPES in the Reference Scenario



- Oil will continue to be the dominant fuel during 2000-2050, however, its share in TPES to decrease from 45% to 36% during the period.
- Share of coal to increase from 11% to 25%.
- Share of nuclear power to increase from 3% in 2020 to 7% in 2050.

How would the Final Energy Demand change during 2000-2050 in the Reference Scenario?



Final Energy Demand in future would increase by **more than 6 folds** during 2000-2050.

Residential: decrease from 17% to 4%

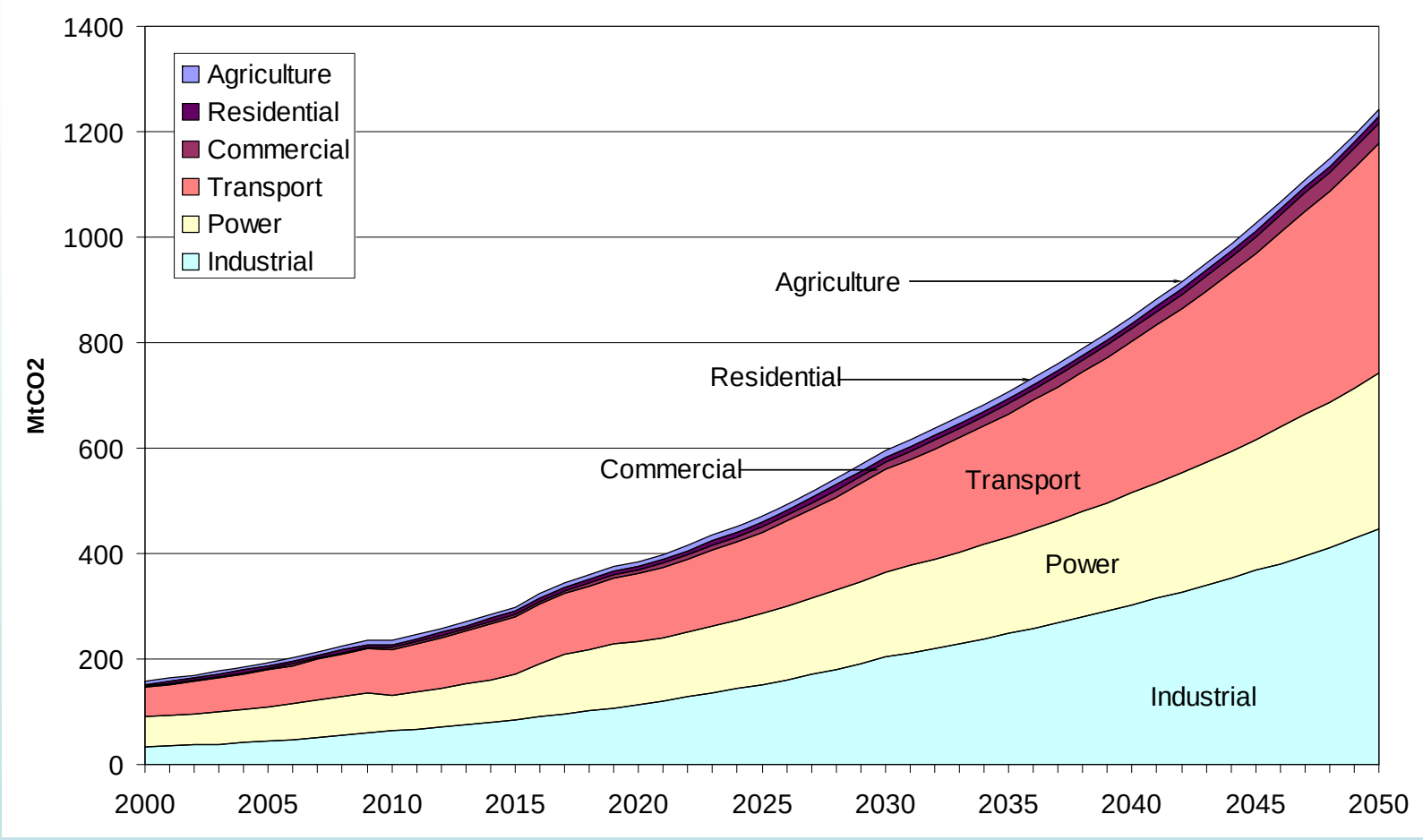
Agriculture: decrease from 4% to 1%

Industrial: increase from 33% to 41%

Commercial : Increase from 6% to 12%

Transport: Increase from 40% to 42%

How would the Sectoral CO_2 emission change during 2000-2050 in the Reference Scenario?



- Increase in CO_2 emission by more than 6 folds during 2000-2050.
- Industrial, Transport and Power sectors together account for 94% of the cumulative CO_2 emission during 2000-2050.

Some policies in the transport and power sectors in Thailand

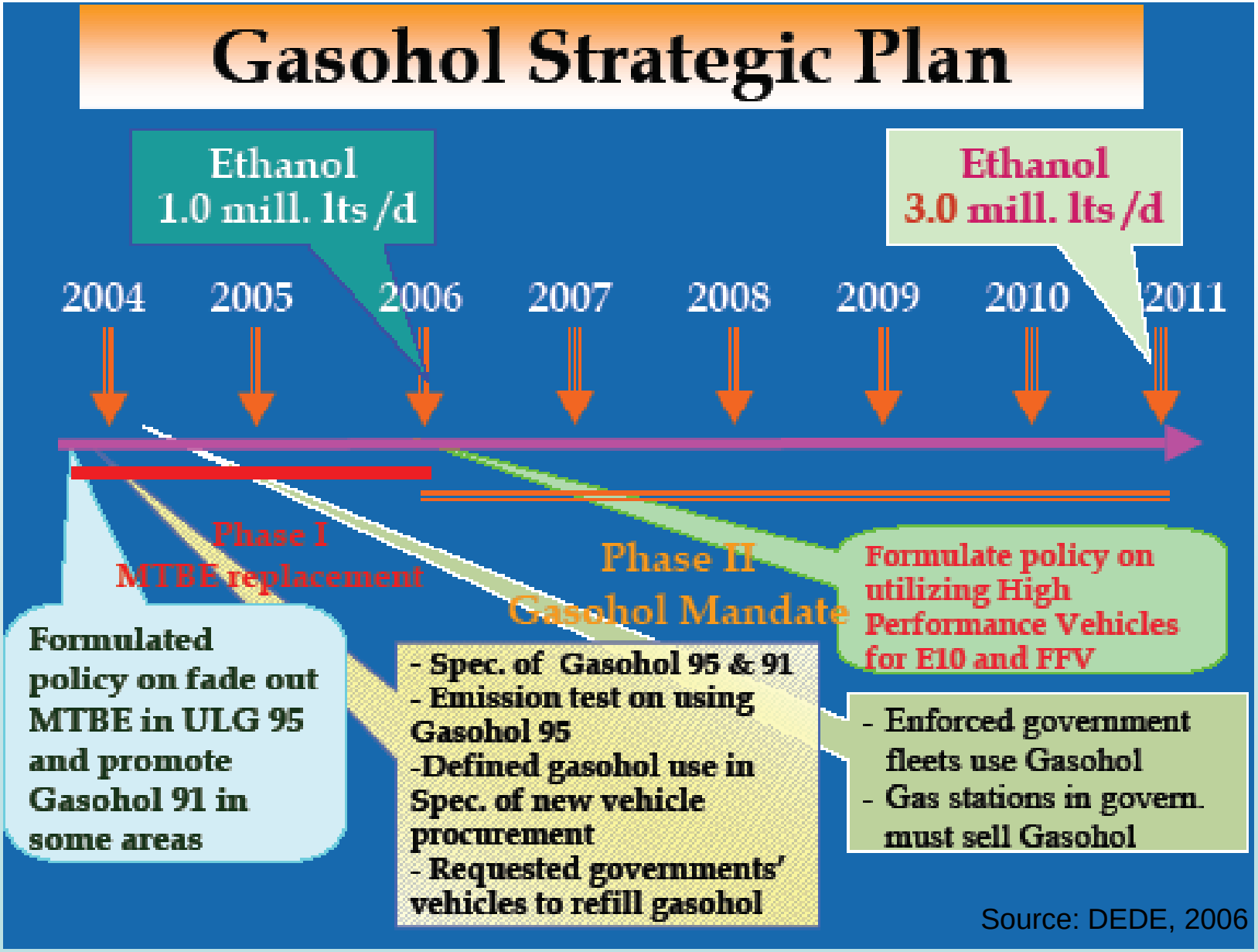
Power Sector Policies

- Renewable Portfolio Standard (RPS)
- Small Power Producer and Very Small Power Producer Policy
  - Feed in tariff for Renewable Power Generation
  - Soft loan
  - Tax Incentive
- Nuclear power proposed in Power Development Plan (Revised 2008)(EGAT, 2008)
  - 2000 MW in Year 2020
  - 2000 MW in Year 2021
- Use of natural gas for coal and fuel oil
- Promotion of clean coal technologies.

Transport Sector Policies

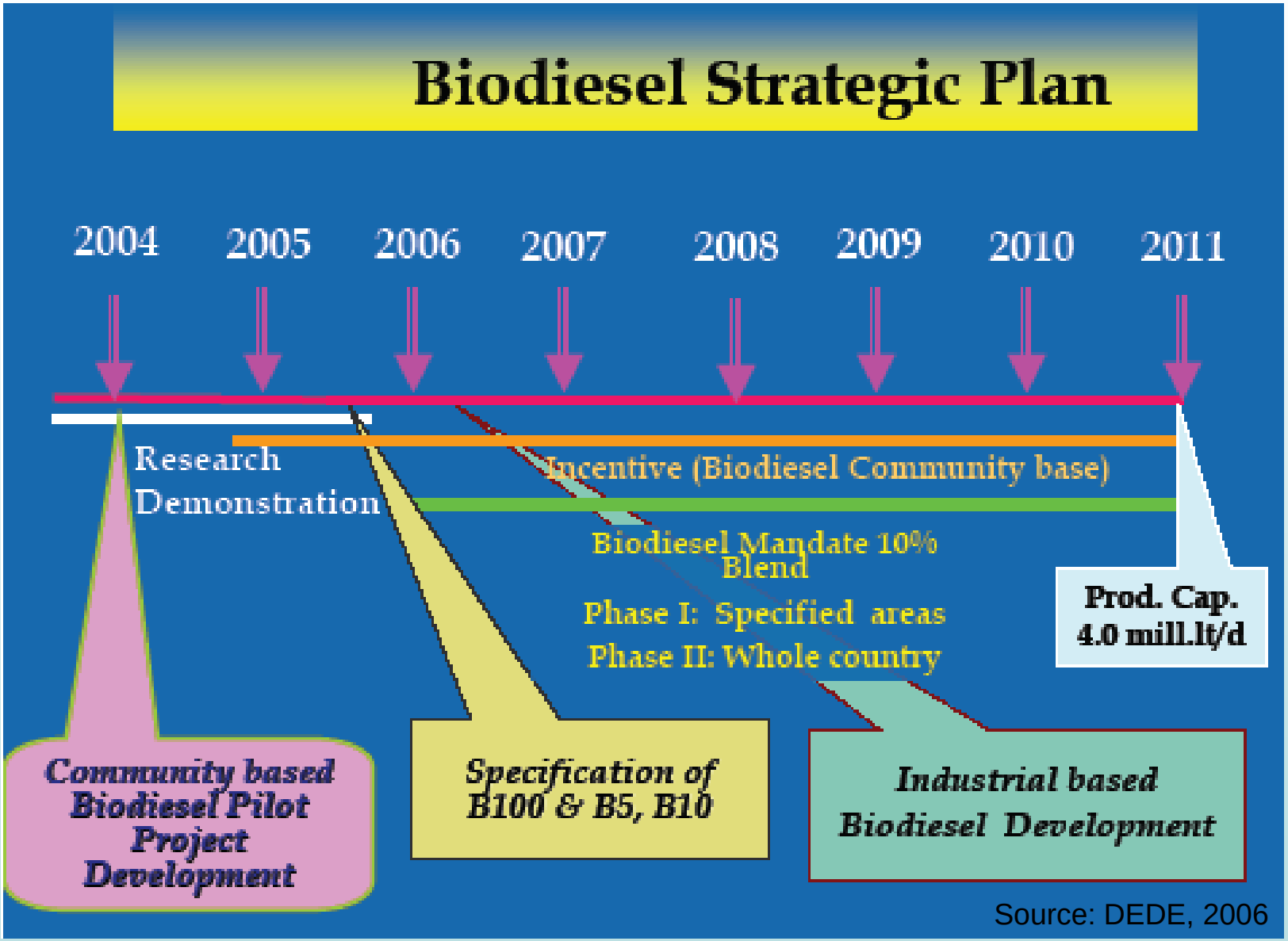
- Biofuel development and promotion
  - Gasohol
    - Targeted replacement of gasoline fuel use.
    - Strategy to promote fuel-flex vehicles
  - Biodiesel
    - Targeted replacement of diesel fuel use.
    - Community level biodiesel production.
- Strategy to promote natural gas vehicles
  - Subsidy in compressed natural gas
- Development and Strategy to promote Mass Rapid Transits
  - Extending of electrified subways and sky trains.
  - Development of double track railways.
  - Development opf intercity electric trains.
  - High speed electric engines to replace diesel engines in Railways.

Gasohol Promotion in Thailand



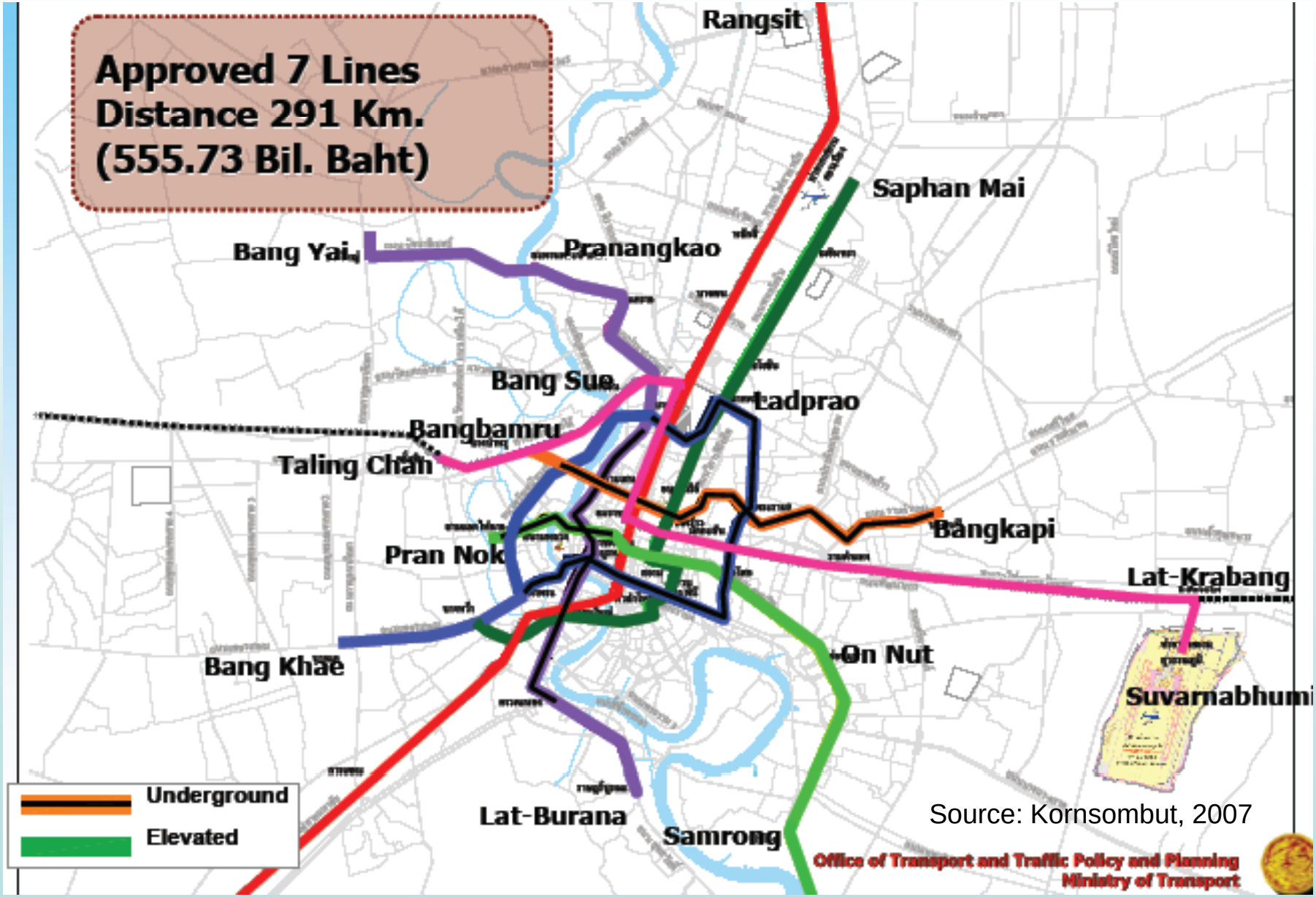
Source: DEDE, 2006

Biodiesel Promotion in Thailand



Source: DEDE, 2006

Mass Rapid Transit Development Plan in Thailand



Scenario Analysis of Modal Shift in Passenger Transport

Methodology

Aim End Use Model

- Base Year and Target Year Figures

Energy Snap Shot Model

- CO2 Factor Output

Scenario Analysis

- Factor Analysis

Scenarios in Energy Snapshot Model

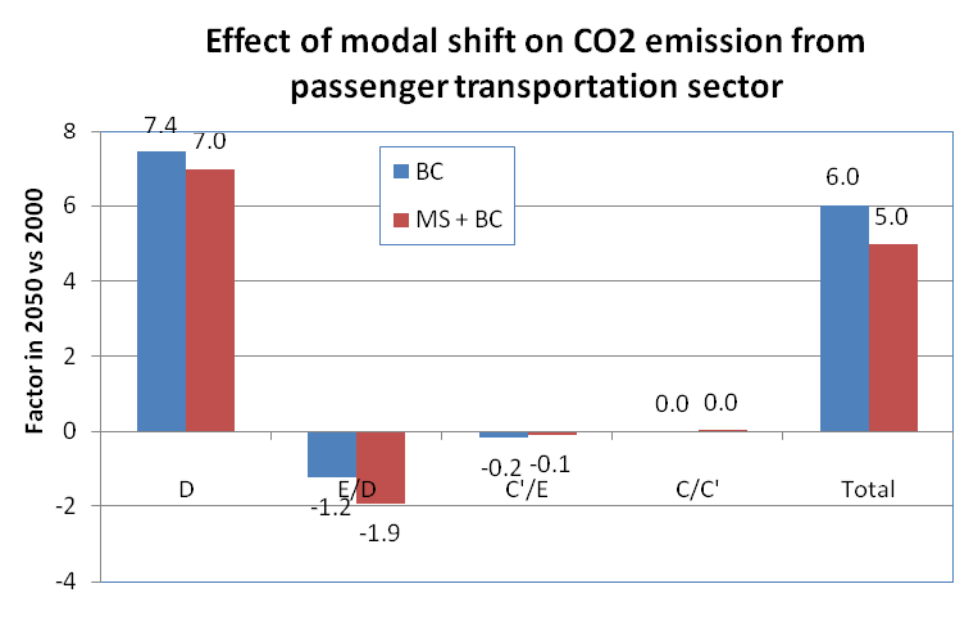
- Base Case (BC)
  - AIM End Use: Least cost linear optimization
  - Nuclear and CCS technology as options from 2020 onwards
  - Biofuels in transport sector

- Modal Shift (MS+BC)
  - Travel demand modal shift from taxi, cars and microbuses/vans to electrified MRTs in BC:
    10% in 2015; 20% in 2030; 30% in 2050

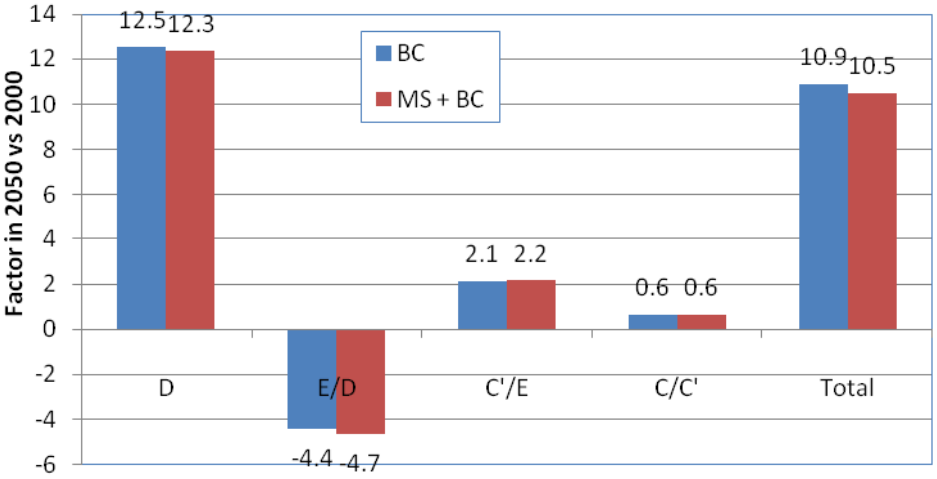
- Modal Shift (MS+BC:30%NC)
  - Nuclear option would increase to 30% by 2050 from 20% in BC+MS

- Modal Shift (MS+BC:40%NC)
  - Nuclear option would increase to 40% by 2050 from 20% in BC+MS

Effect of Modal Shift in Transport Sector (Passenger)

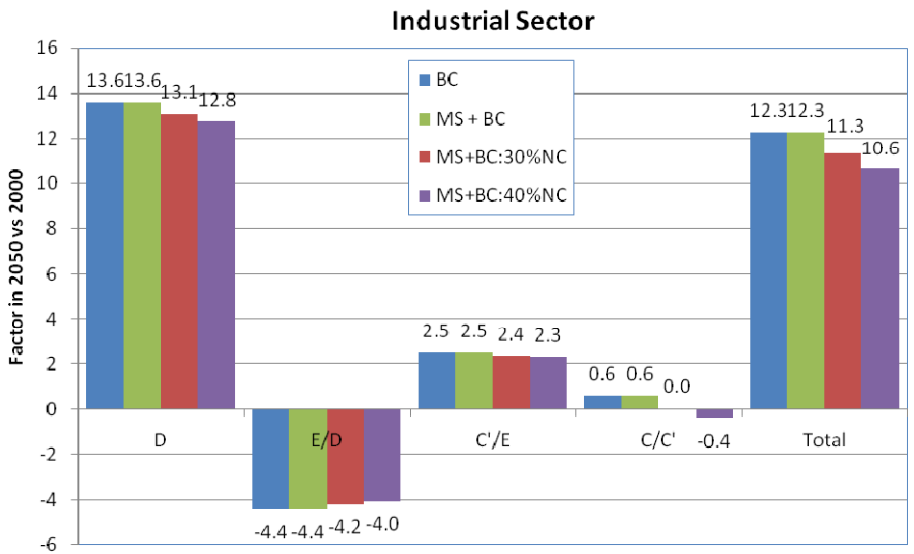


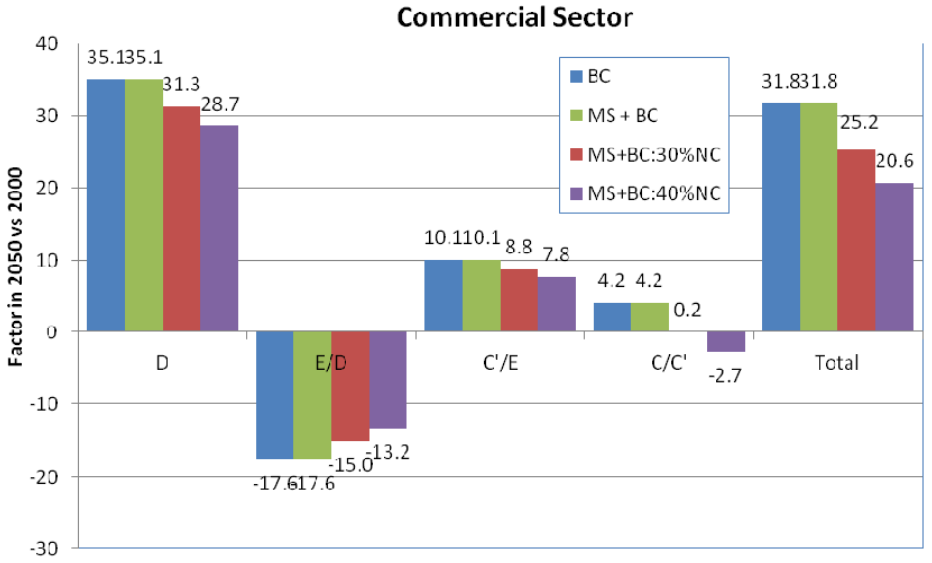
30% of travel demand modal shift from taxi, cars and microbuses/vans to electrified MRTs by 2050

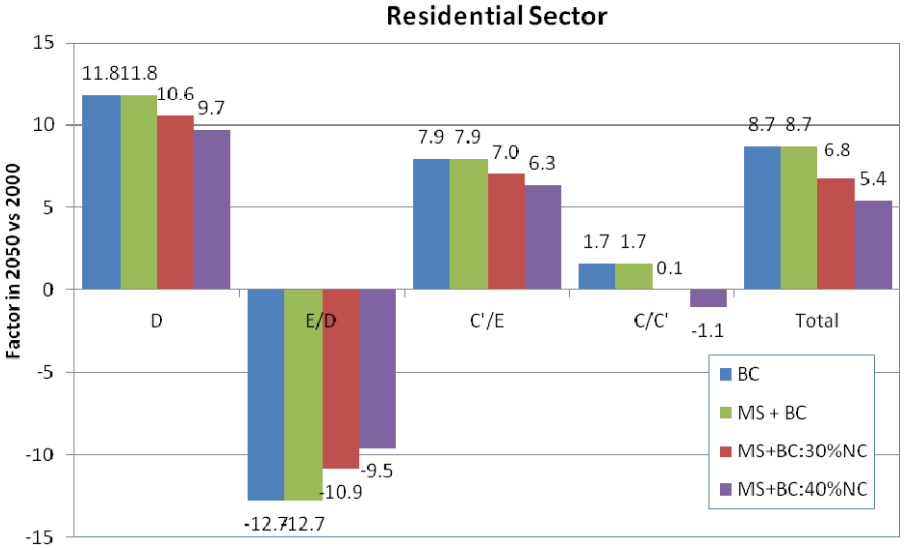


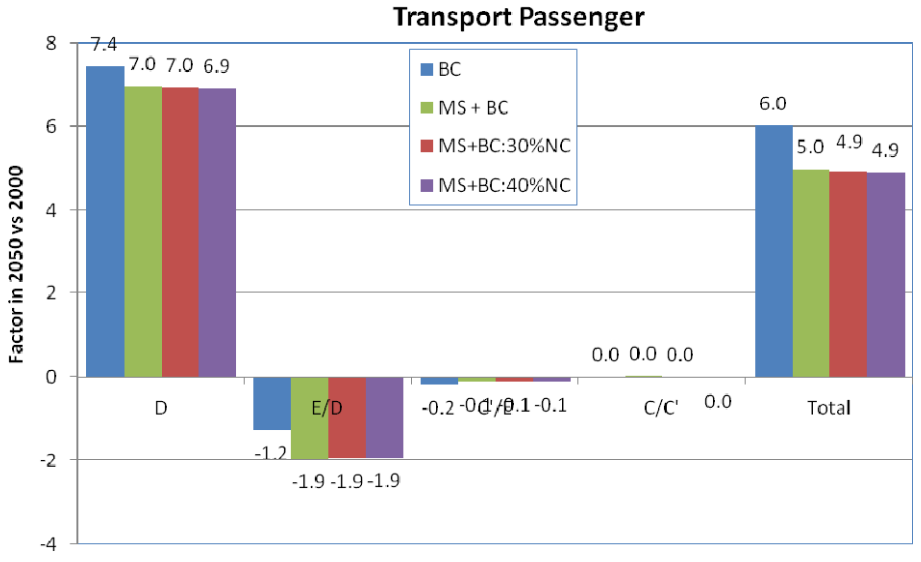
Modal Shift Along With Increase in Nuclear Power Generation

Effect on CO2 Emission









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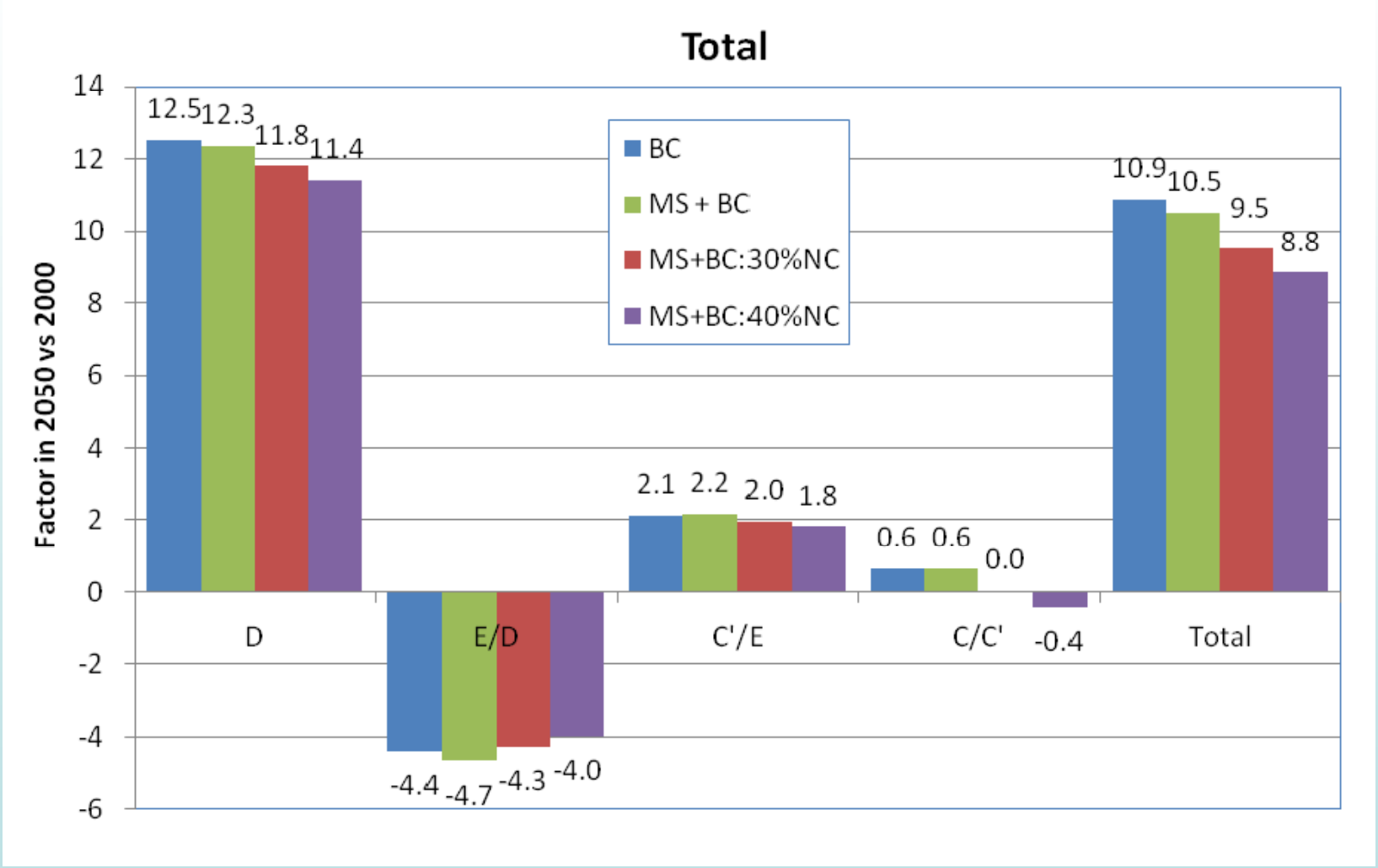

Concluding Remarks

- Increasing investment in public infrastructures promoting public passenger transport like electrified MRTs would decrease CO2 emission.
- In the reference scenario, higher share of coal fired power generation would not provide much effect in CO2 emission with the modal shift.
- Increasing the share of nuclear power generation would provide higher CO2 emission in the case of modal shift.
- Increasing the share of nuclear along with the renewable energy to the extent it is available would provide more CO2 emission reduction in the case of modal shift.

Thank You!