LCS Scenario building exercise using Energy Snapshot Model (Residential & Transport Sector)

Shreekar Pradhan and Saksorn Chalermchaiarbha

Asian Institute of Technology
Klong Luang, Pathumthani
Thailand

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Brief Overview of Thailand

- **Location**:
  - Thailand is situated in the heart of the Southeast Asian mainland, covering an area of 513,115 km^2 and extends about 1,620 km from north to south and 775 kilometres from east to west.
  - Thailand borders the Lao People's Democratic Republic and the Union of Myanmar to the North, the Kingdom of Cambodia and the Gulf of Thailand to the East, the Union of Myanmar and the Indian Ocean to the West, and Malaysia to the south.
- **Population:** 64.76 million
- **Population Density:** 126 people/km^2
- **Capital**: Bangkok
- **GDP:** 7,103 billion Baht (US $ 176 billion : Exchange Rate: 40.22)
- **GDP per capita:** 109,682 baht (US $ 2727 in year 2005)
- **Economy:** 2nd highest in ASEAN region

Map of Thailand

Scenario Description/Background

- Thailand is a medium developed country having 2nd largest economy in ASEAN region.
- GDP growth has been positive since 1990s except in year 2004 and it has remained within the range of 4%-6% after 2004.
- In 2004, it had -ve GDP growth because of avian flu virus, tsunami and high oil prices. Impressively GDP growth from -10.8% in 1998 has been improved and is growing 4%-6% each year.
- In 2007/08, the GDP growth is predicted to be in the range of 5%-6%.
- Thailand economy is likely to grow higher in future. Two scenarios for year 2050 are described here for the purpose of exercise with underlining assumptions:
  - Reference Scenario (Base Case – Ref 2050)
  - Developed and Energy Efficient Society (DEES 2050)

Scenario Explicit Assumptions

Reference Scenario (Base Case Scenario)

- Current economic growth will continue in future.
- Current efficiency improvement measures like demand side management will continue in future.
- Efficiency Improvement of technologies will likely to continue in future.
- Medium developed society will be transformed into developed society having strong economy in the region.
- No counter measure, other than existing policies, will be taken for environmental checking.

Developed and Energy Efficient Society

- With increasing economic growth, the society will be transformed to an advanced developed society.
- Society will be very much aware about energy efficiency and environmental issues.
- Government will give much priority to environmental policy.
- It will take appropriate measures to check the environmental degradation.
- Technology efficiency improvement will be given higher priority on technology improvement.
- Thai society will be more conscious on environmental impact.

Developed and Energy Efficient Society

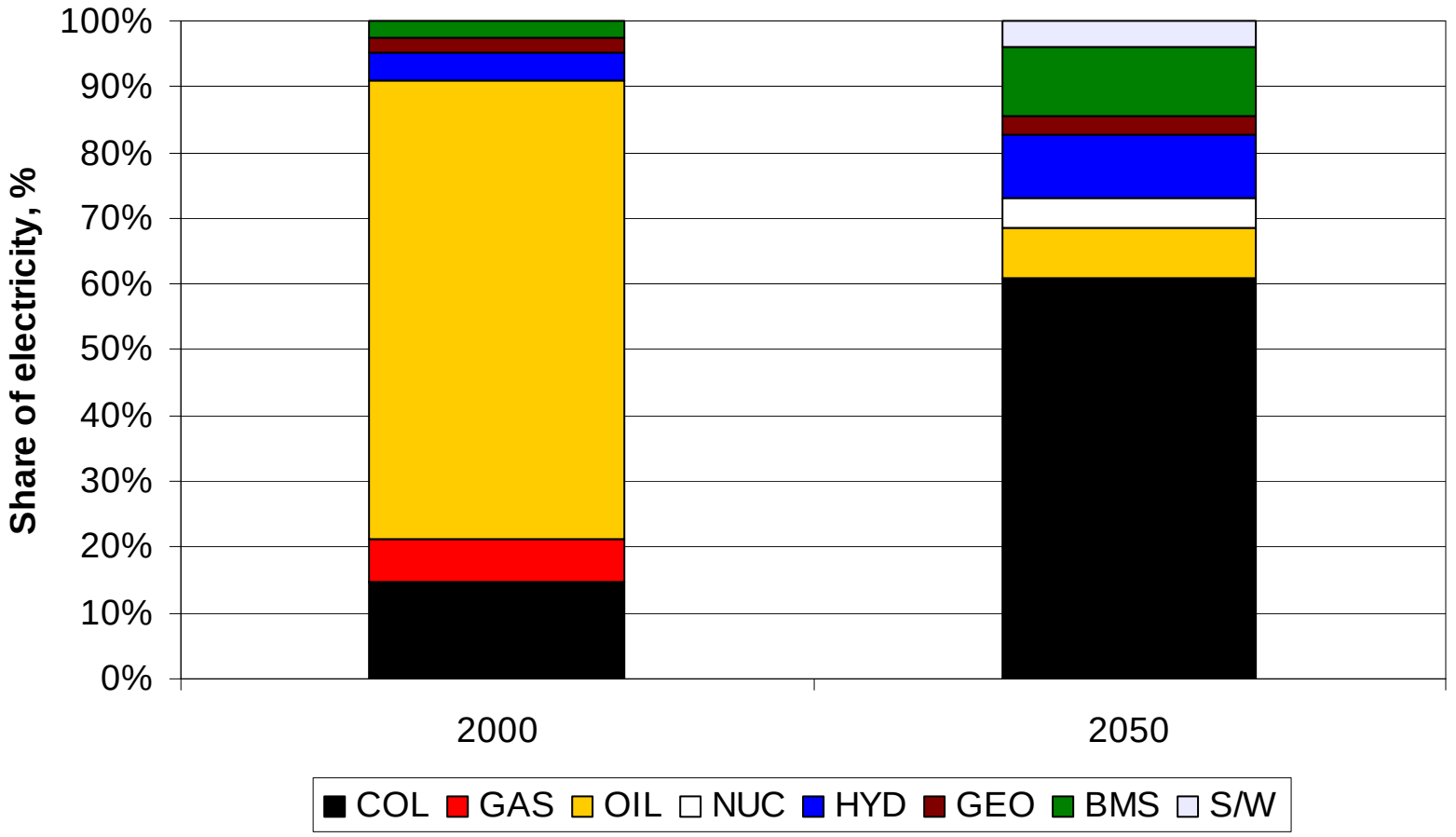
- Life Style of Thai Society by 2050
  - With increasing economic growth, Thai people are having less time to spend together and are spending more time in work. Family structure is moving towards nuclear structure as expanded family is decreasing. The households having single person is also growing (6% in 1990 to 9% in 2000). This will increase more in future with the increasing cost of living. It is more likely that the residential floor space will decrease. It is likely that more multi-storey buildings, with more offices, will come up in future. Society will have more awareness on environmental impact and required measures.

- Economy and Industry by 2050
  - From 1998 upto 2004, the main share of GDP was secondary sector. The primary industry's share will be decreased as the natural resources in mining will be less available in the future. As the land area is limited, agriculture industry will be saturated in the long run and thus its share will finally be falling in future. For secondary industry, more manufacturing industries are likely to grow high in future because the export has an increasing tendency. Meanwhile, more service industries will be coming up since it can produce more value added and have high potential in creating wealth to business. Thus, it will attract more entrepreneurs to run the tertiary business. So, future advanced scenarios can be seen as more extended manufacturing and service industries.

Scenario Description-Visualization

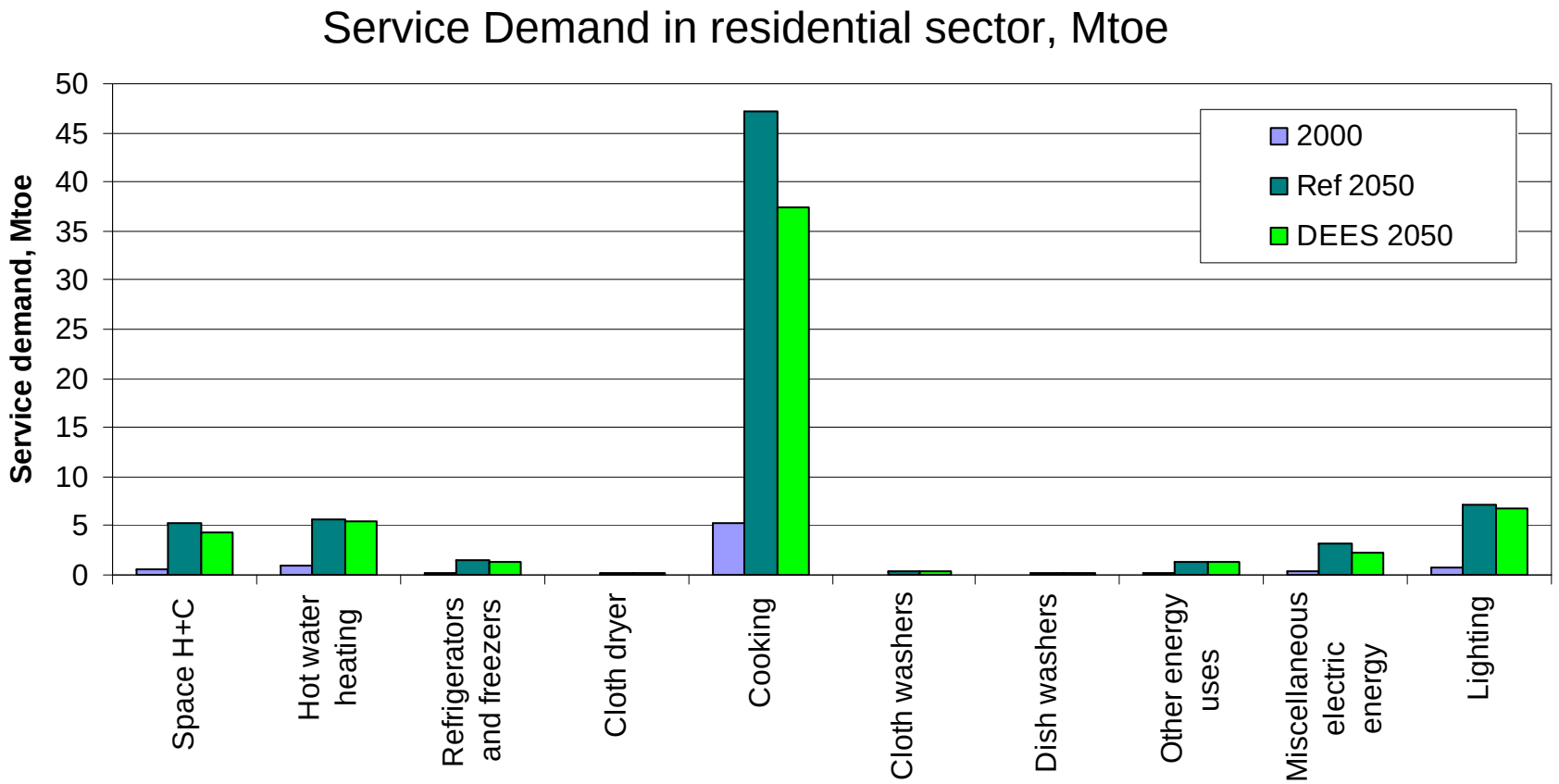
- Residential
- Transport
  - Passenger
  - Freight

Power Sector Electricity Supply share



Considering Carbon Capture and Storage technology will be applied to all coal powered plants by 2050. Nuclear is currently planned for 2020. Modest share of Nuclear is considered.

Residential Energy Snapshot Output

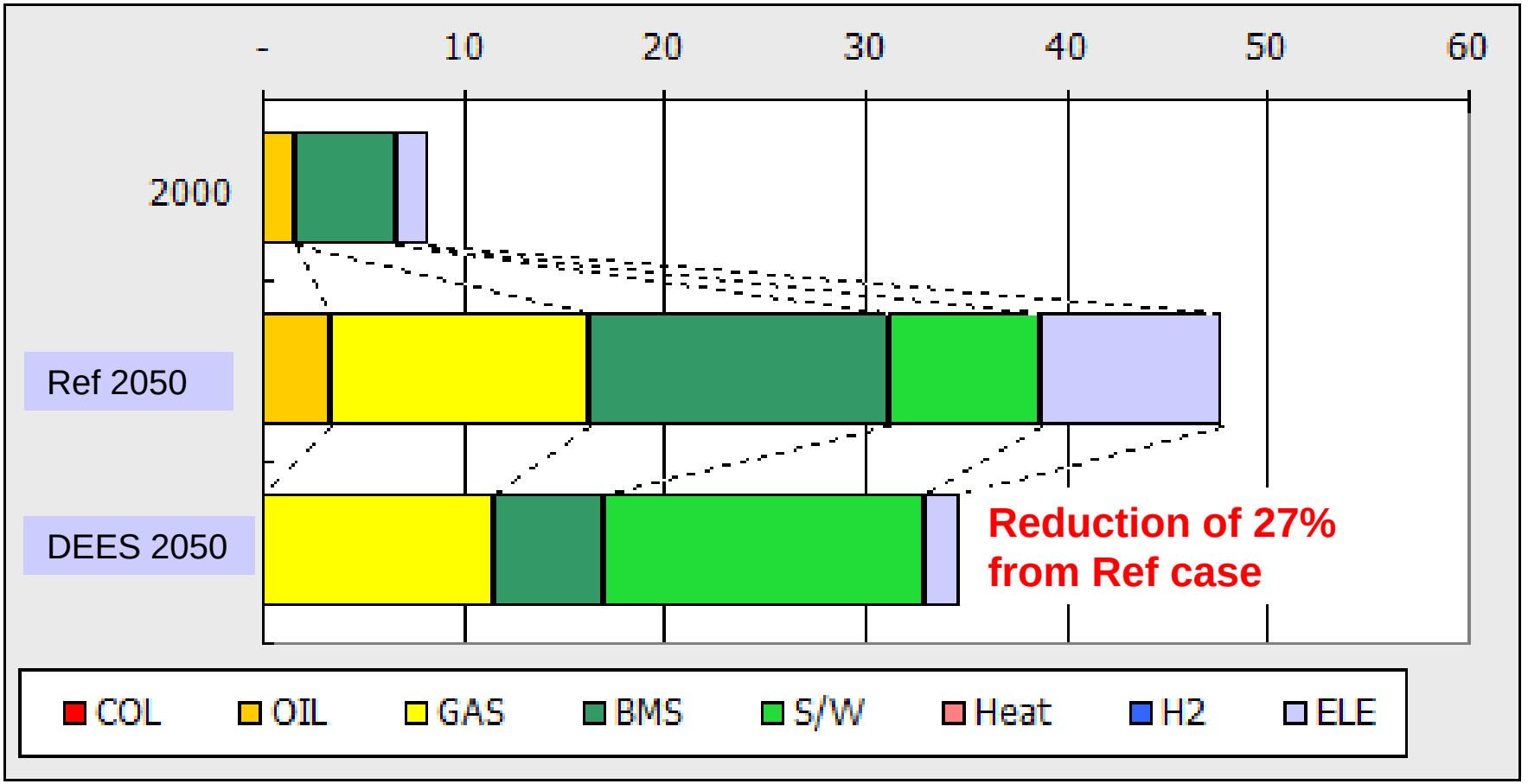


Assumptions of Service Demand Reduction Potential in Residential Sector by 2050

Space heating & cooling	82%
Hot water heating	95%
Refrigerators and freezers	86%
Cloth dryer	95%
Cooking	79%
Cloth washers	95%
Dish washers	95%
Other energy uses	95%
Miscellaneous electric energy	72%
Lighting	95%

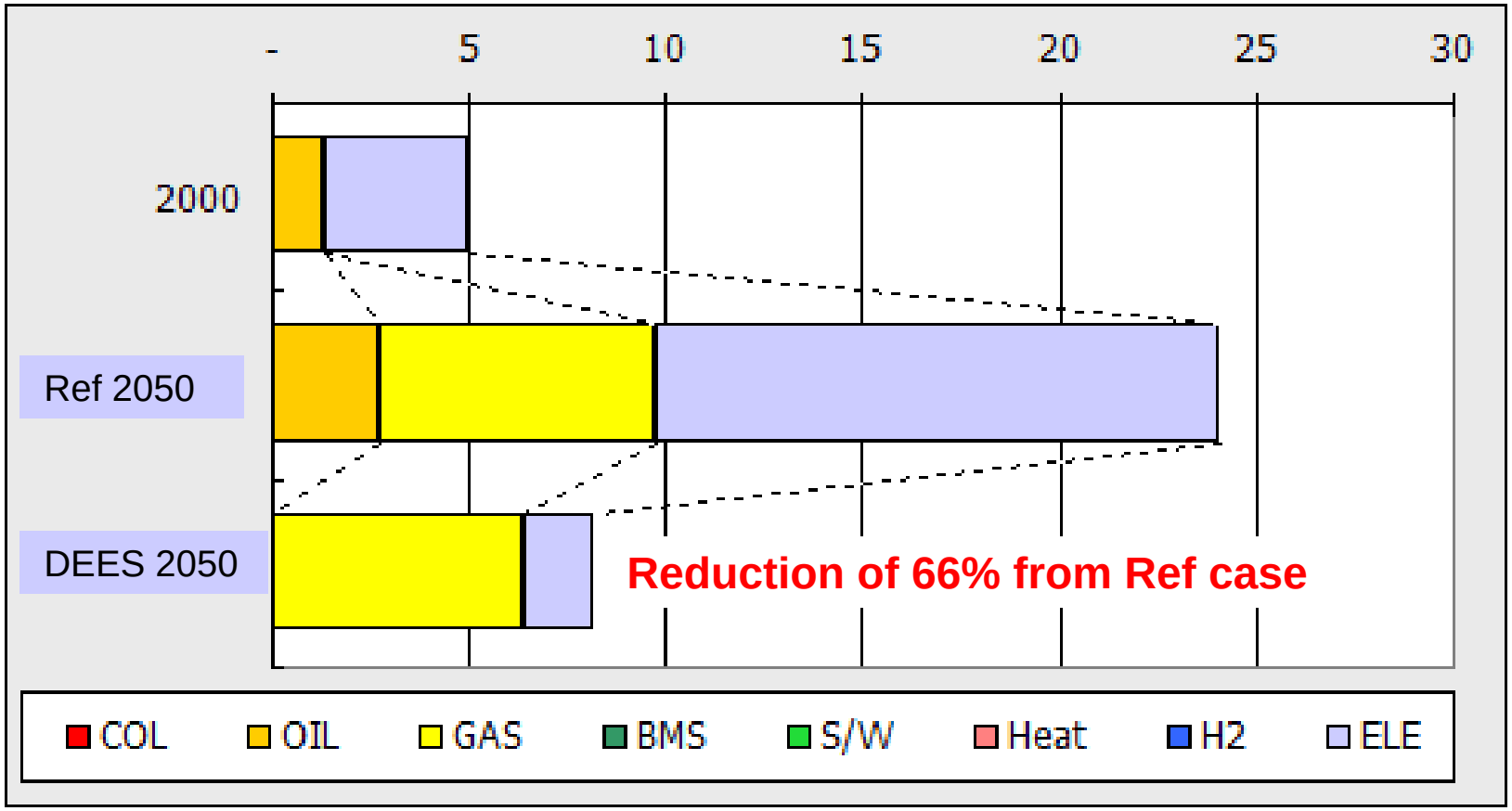
- Advanced autonomous control devices and environment-friendly life style will reduce operation hours and capacity of these devices with respect to Reference Case.
- Insulated households will reduce service loss.
- Change in lifestyle of the households will change the cooking habit in Reference case to eating precooked food, thus reducing operation hours of cooking devices.
- Compact lighting system will have more efficient lights thus reduces capacity of lighting system (It may increase the operation hours which is not considered here!).

Residential Energy Snapshot Output



Energy consumption in residential sector, Mtoe

Residential Energy Snapshot Output



CO2 emission in residential sector, MtC

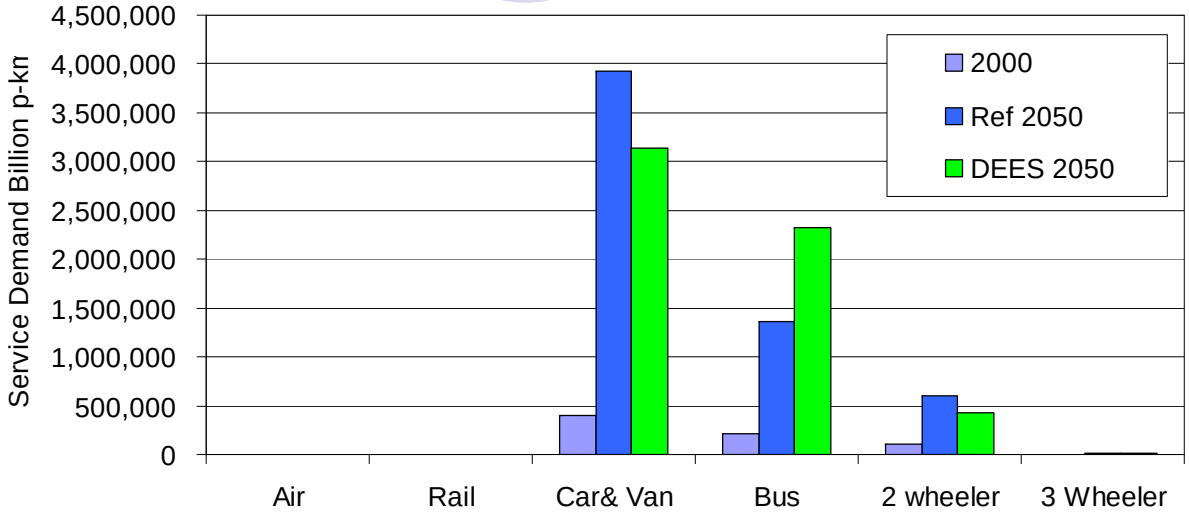
Assumptions of Service Demand Reduction Potential in Transport Sector by 2050

Passenger Transport, bp-km	Ref 2050	DEES 2050
Air	270	82%
Rail	197	95%
Cars and Van	3,925,098	86%
Bus	1,355,646	95%
2 Wheeler	605,474	79%
3 Wheelar	12,844	95%

Freight Transport, bt-km	Ref 2050	DEES 2050
Road	522	70%
Ship	20	100%
Train	25	739%

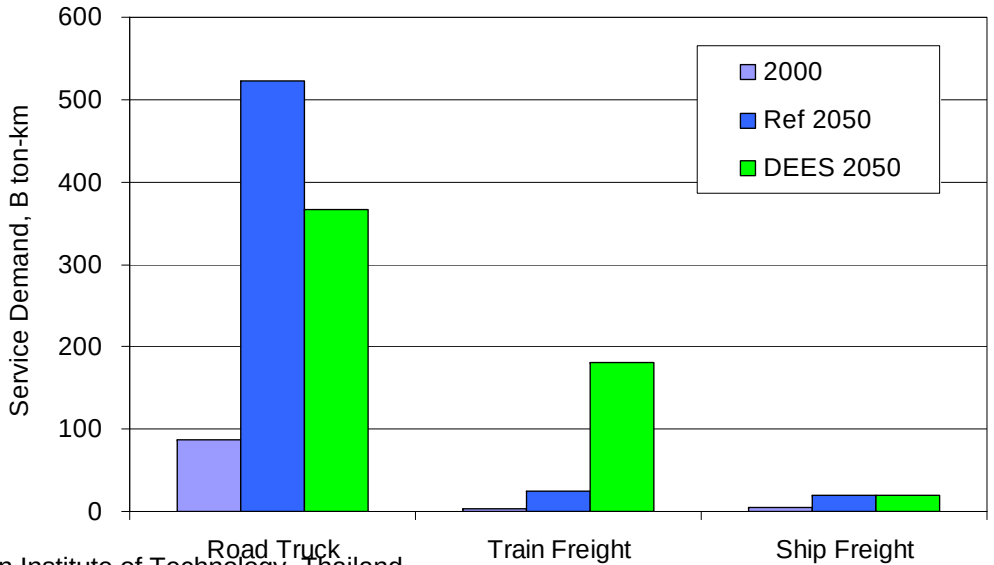
- In passenger transport, in DEES 2050, it is assumed that with increasing awareness on energy conservation and efficiency measures, private car demand will be decreased by 20% while 2 wheeler demand and 3 wheeler demand will be reduced by 30% and 20% respectively.
- 0.1% of the reduced private car demand will be shifted to rail where as 99.99% of the reduced car demand as well as reduced 2 wheeler and 3 wheeler will be shifted to Bus.
- In Freight transport, 30% of road demand will be shifted to train.

Transport Energy Snapshot Output

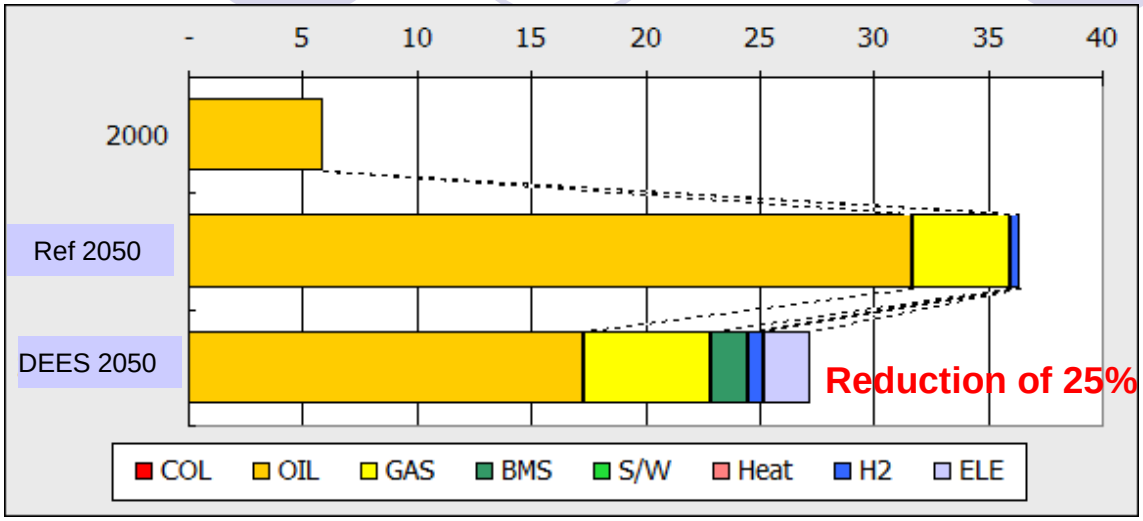


Service Demand in Passenger Transport sector, billion p-km

Service Demand in Freight Transport sector, billion ton-km



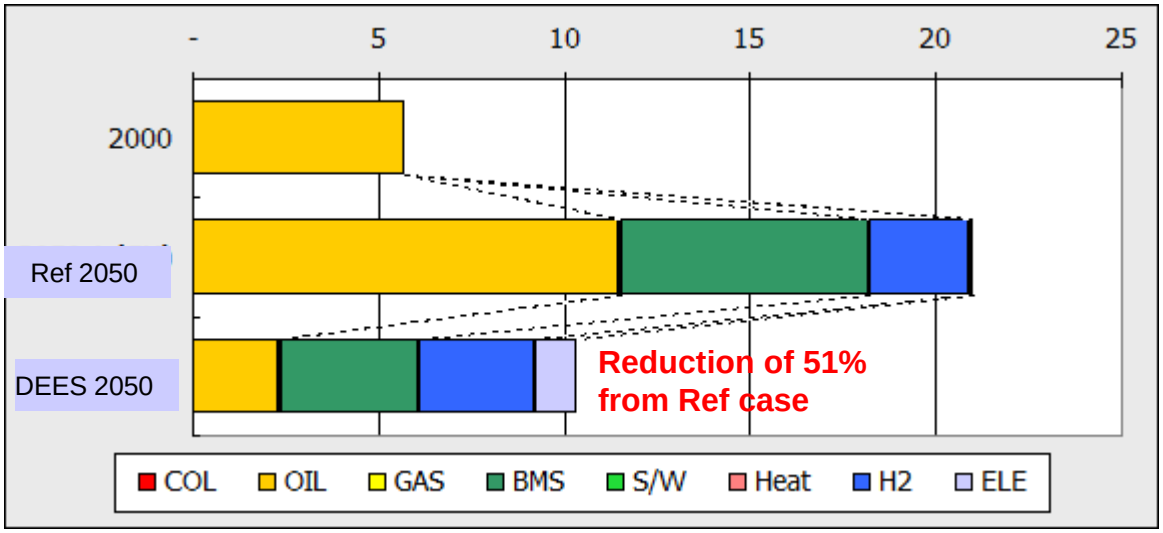
Transport Energy Snapshot Output



Energy consumption in Passenger Transport sector, Mtoe

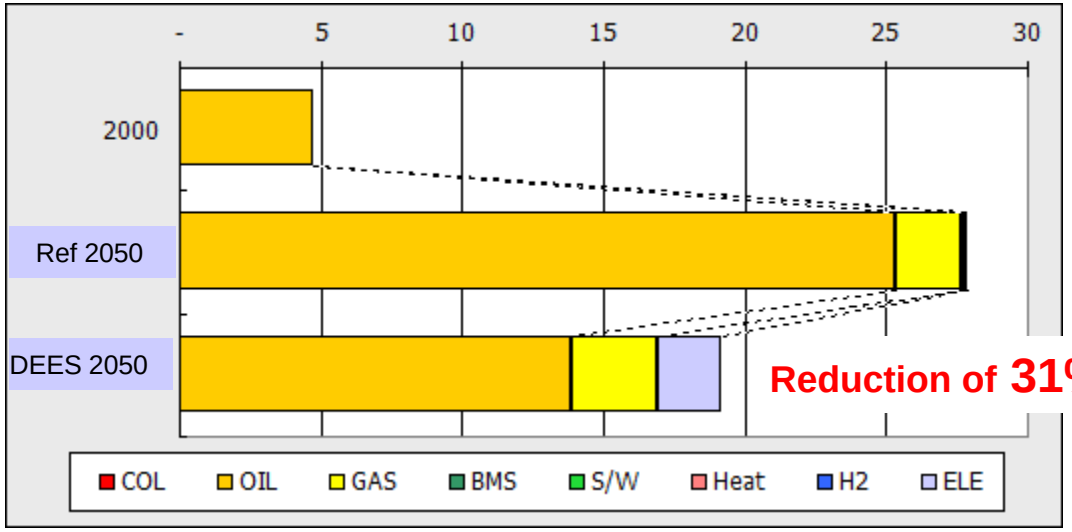
Reduction of 25% from Ref case

Energy consumption in Freight Transport sector, Mtoe



Reduction of 51% from Ref case

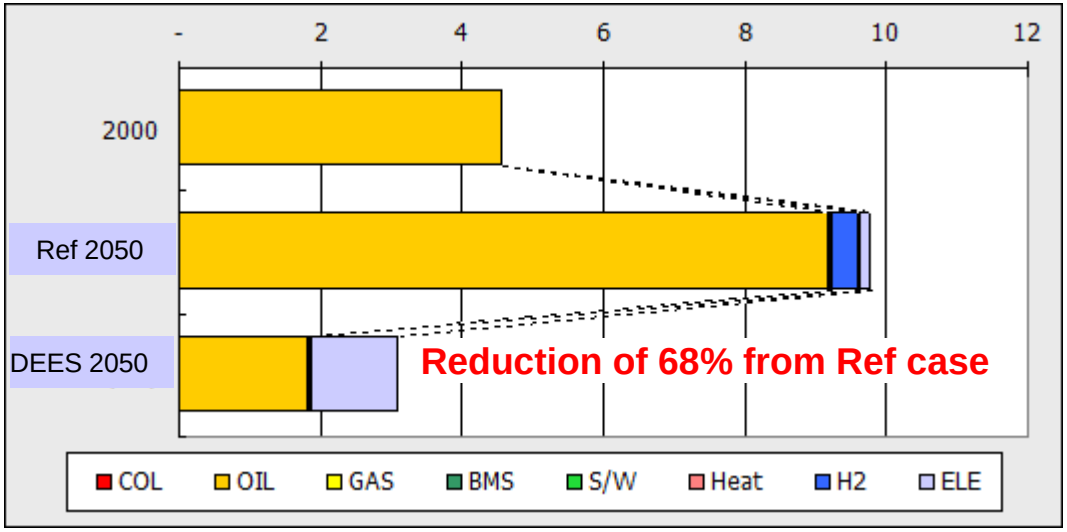
Transport Energy Snapshot Output



CO2 emission in Passenger Transport sector, MtC

Reduction of 31% from Ref case

CO2 emission in Freight Transport sector, MtC



Reduction of 68% from Ref case

Concluding Remarks

- Scenario building using ESS is useful for understanding the future scenario with low carbon economy. It is flexible enough to build up easy scenario.
- Extended worksheets are useful and will be very useful if the data required by these sheets are available.
- The results from ESS shows significant reductions in energy consumption and carbon reduction can be made in Developed and Energy Efficient Society (DEES 2050).
- In residential sector, the advanced technology will be introduced.
  - These technology will reduce service loss and it is likely to reduce operating hours too.
  - In residential sector energy consumption can be reduced by 27% from Ref case and CO2 emission can be decreased by 66%.
  - The main share of fuel in power plant will mainly be coal using more advanced technology namely Carbon capture storage in coal power plants.
  - Nuclear will have modest share.
- Mode of transportation will mostly be shifted from personal car to public transport system and road freight to train freight
  - Owing to speeder and more convenient in traveling including society's environmental awareness, the energy consumption in Passenger Transport sector will be reduced by 25% from Ref case and CO2 emission by 31%.
  - Energy consumption in freight Transport sector will be reduced by 51% from Ref case and CO2 emission by 68%.

Thank you