Will Oil Demand Peak?

A Japanese View based on IEEJ Outlook

Special Seminar "Shifting Gears: Future of Transportation, Oil Demand and Geopolitics"

July 20th, 2018

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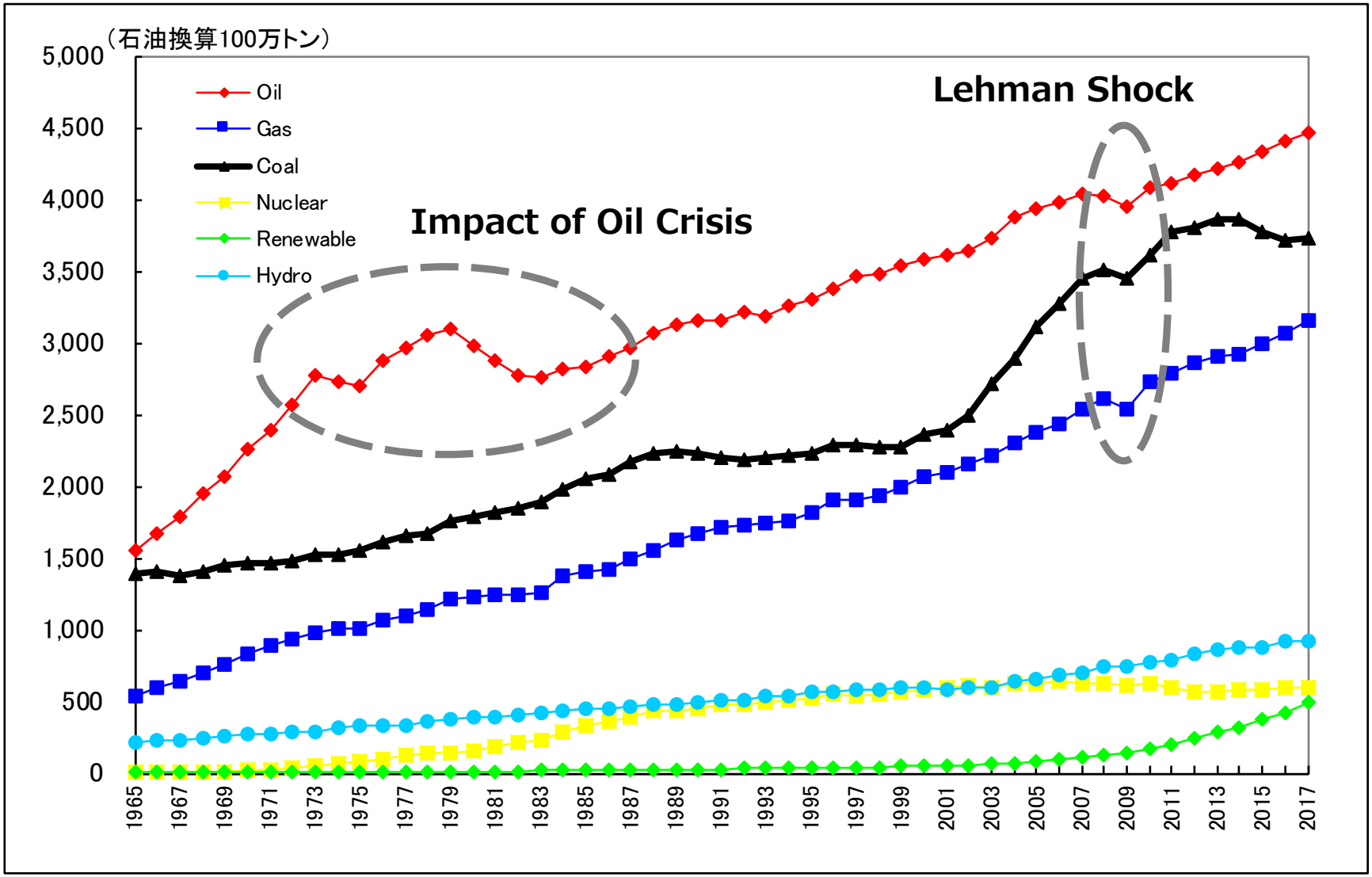
Global energy transition in the past

- **19th century: Coal became dominant under Industrialization**
- **20th century: "the century of oil"**
  - ✓ Background factors: economic competitiveness, supply potential, convenience, technology advancement, etc.
- **1970s: Oil crisis and oil substitution policy**
  - ✓ Enhancement of energy security policy in OECD resulted in energy diversification (away from oil)
- **21st century: What's next after "the century of oil"?**
  - ✓ Need to address environment and energy security problems
  - ✓ Technology development/deployment in renewable, ZEV, etc.
  - ✓ Possibility to develop new unconventional energy sources
- **World energy future heavily depends on the above conditions/uncertainties**

Global energy demand trajectories by source

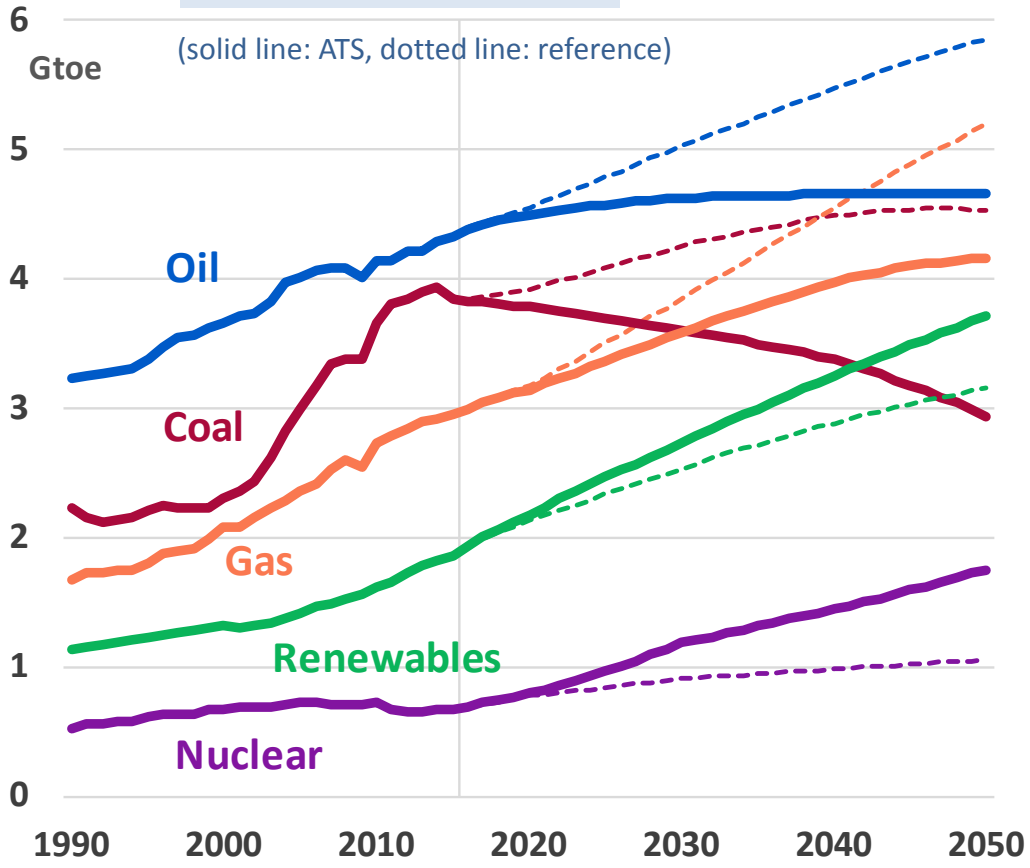
(Oil is the largest source, its trajectory kinked in the 1970s)



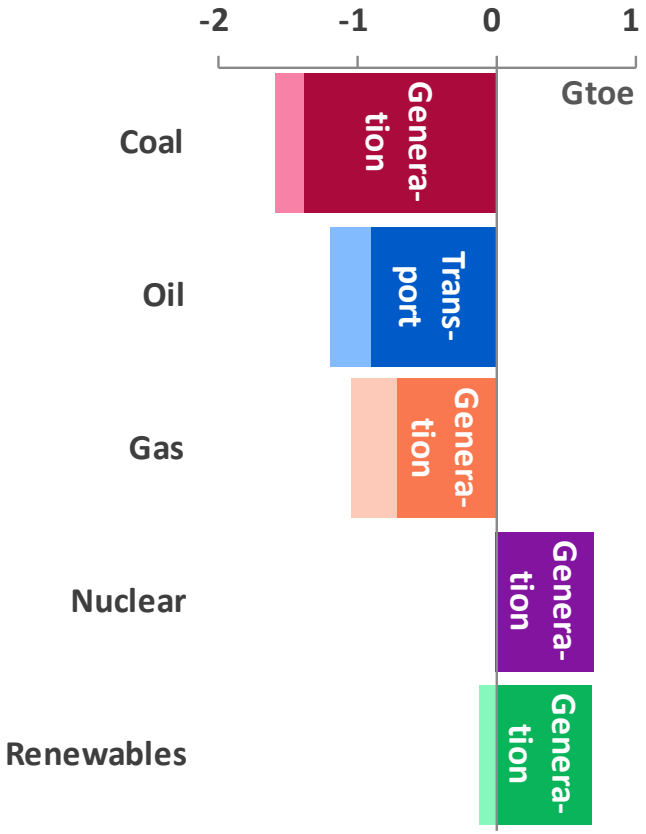
Source: Prepared by author based on BP Statistical Review of World Energy 2018

Oil demand will not peak out in IEEJ's ATS

❖ Primary Energy



❖ Effects by ATS in 2050



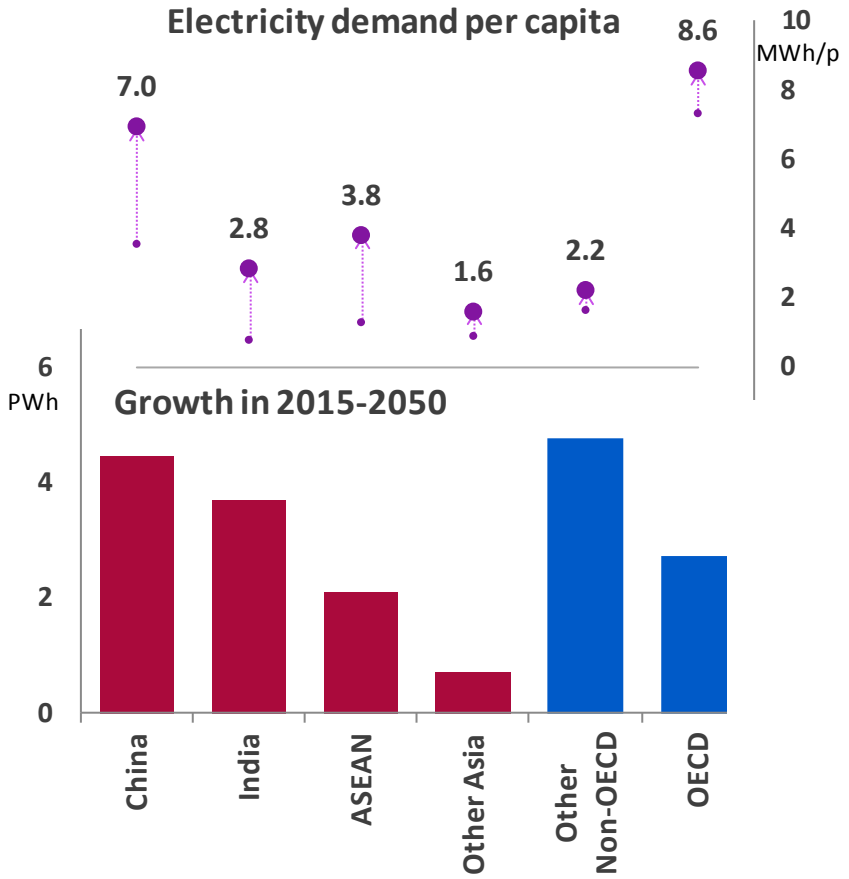
In ATS, coal starts to decline from now and is surpassed by renewable energy around 2040, due mainly to energy efficiency and the elimination of emissions in the power supply/demand sectors. Despite large decline in transportation fuels, oil does not reach a peak. Fossil fuels share of the total in 2050 is reduced to 68%, from 79% in the reference case. It is still a high level of dependence.

Source: "IEEJ Outlook 2018" (IEEJ, October 2017)

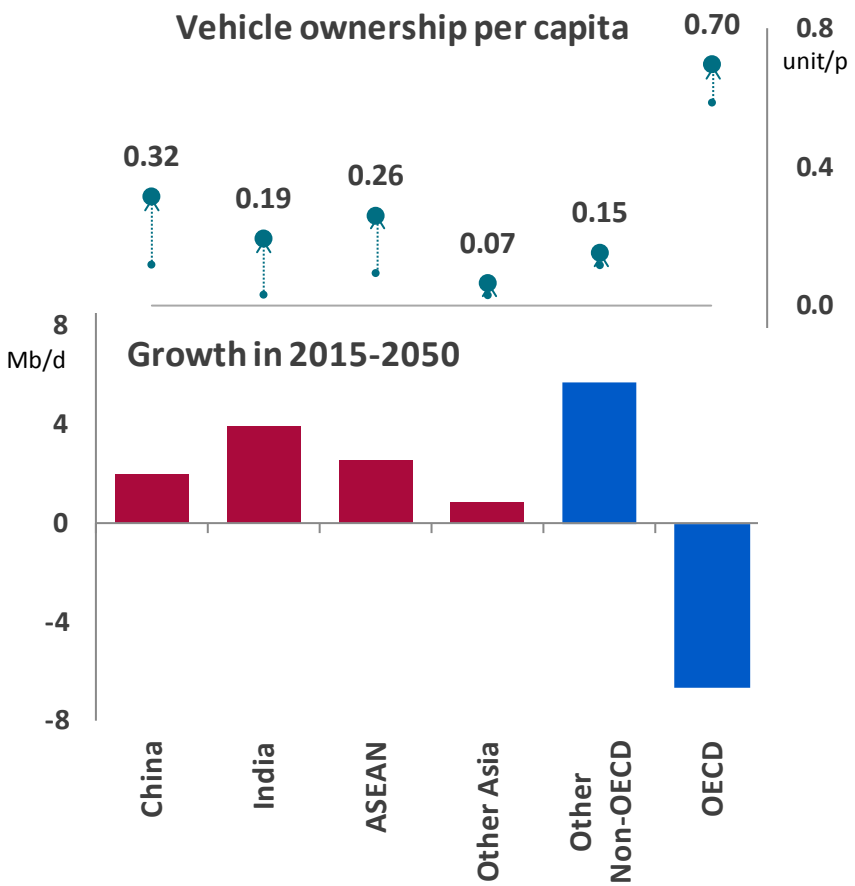
<Reference>

Generation & Transport lead Demand Growth

❖ Electricity



❖ Oil fuels for vehicles

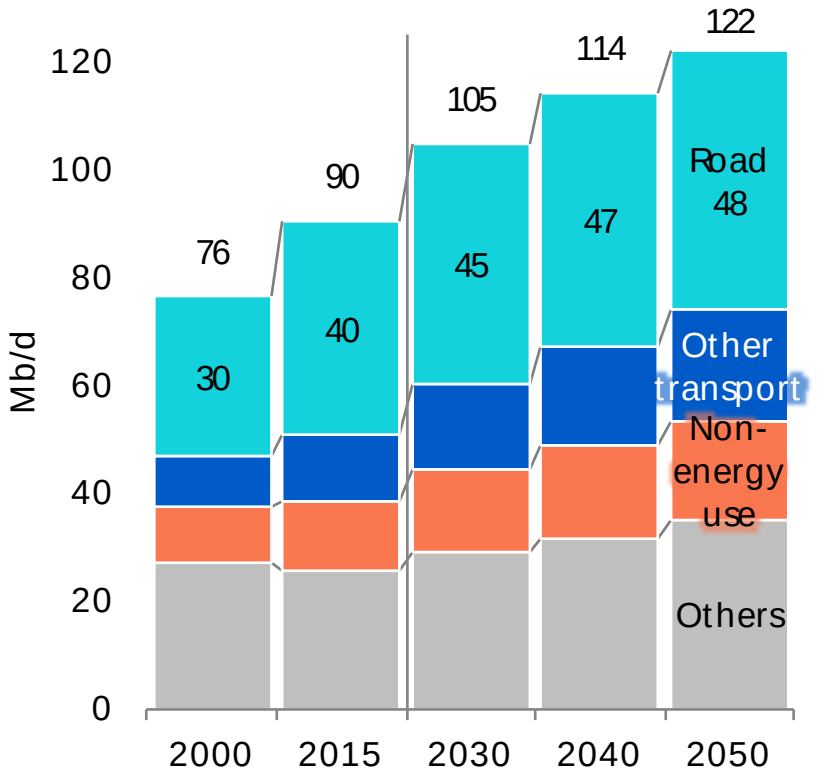


Three quarters of the growth until 2050 are for fuels for power generation and transportation. The economic development and improvements in living standards of the relatively poor and populous areas - non-OECD Asia - contribute to the global energy expansion.

Source: "IEEJ Outlook 2018" (IEEJ, October 2017)

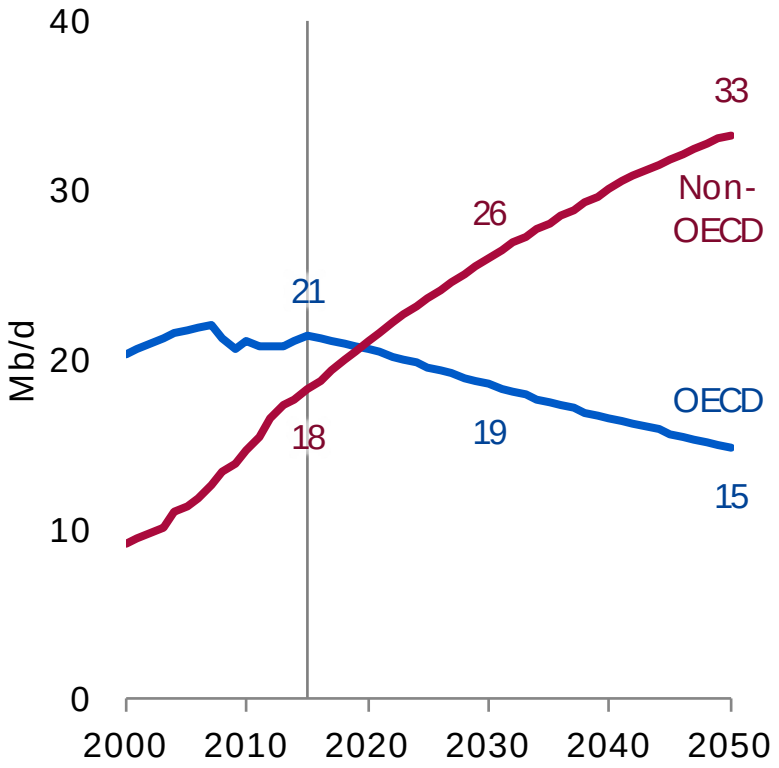
Transport, especially cars drive oil demand

Oil consumption [Reference Scenario]



About 70% of the increases in oil consumption until 2050 is by transport and petrochemical feedstock. In particular, road transport may decide where to go.

Oil for Road [Reference Scenario]



However, oil consumption by cars in OECD is decreasing, and it will be less than non-OECD around 2020. Non-OECD accounts for all future increases.

Source: "IEEJ Outlook 2018" (IEEJ, October 2017)

The time for car electrification has come?

Germany

A resolution to ban conventional car sales in the European Union by 2030 was passed by the Bundesrat of Germany (2016)

Norway

The ruling and opposition parties proposed the abolition of conventional vehicles by 2025 (2016)

France

The Government announced that it would ban conventional car sales by 2040 (2017)

United Kingdom

The Government announced that it would ban conventional car sales by 2040 (2017)

India

Minister said that all new car sales after 2030 would be electric vehicles (2017) ➡ But re-examined later

China

Deputy Minister mentioned that the ban on the sale of conventional vehicles was under investigation (2017)

Source: "IEEJ Outlook 2018" (IEEJ, October 2017)

Toyota

The target for FCV sales is more than 30,000/year in 2020 (2015). Reported of full-scale entry into EVs in 2020 (2016)

Volkswagen

Announced the strategy to increase EV share in its total sales to 25% with more than 30 models of EVs by 2025 (2017)

Renault-Nissan

Introducing 12 models of EVs by 2022. The target of 30% of its total sales as EVs (2017)

Hyundai

The plan to prepare EVs at all line up by 2020 (2015)

Ford

Announced that eco-cars combined with EVs and HEVs will be raised to 70% by 2025 (2017).

Honda

In 2030, two-thirds of automobile sales will be electrified. EVs will be released in China in 2018 (2017).

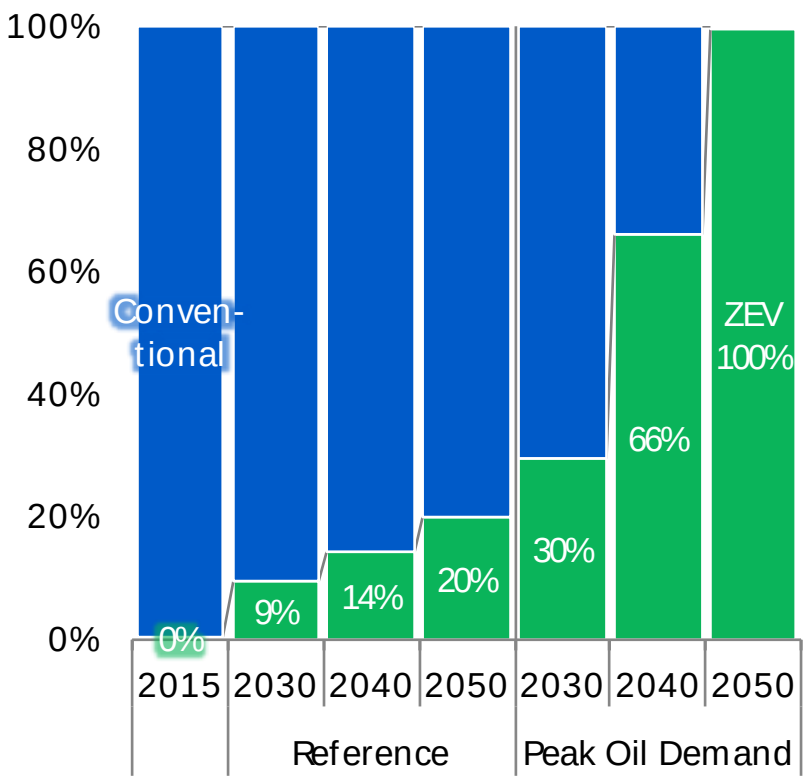
ZEVs 100% share in new car sales in 2050

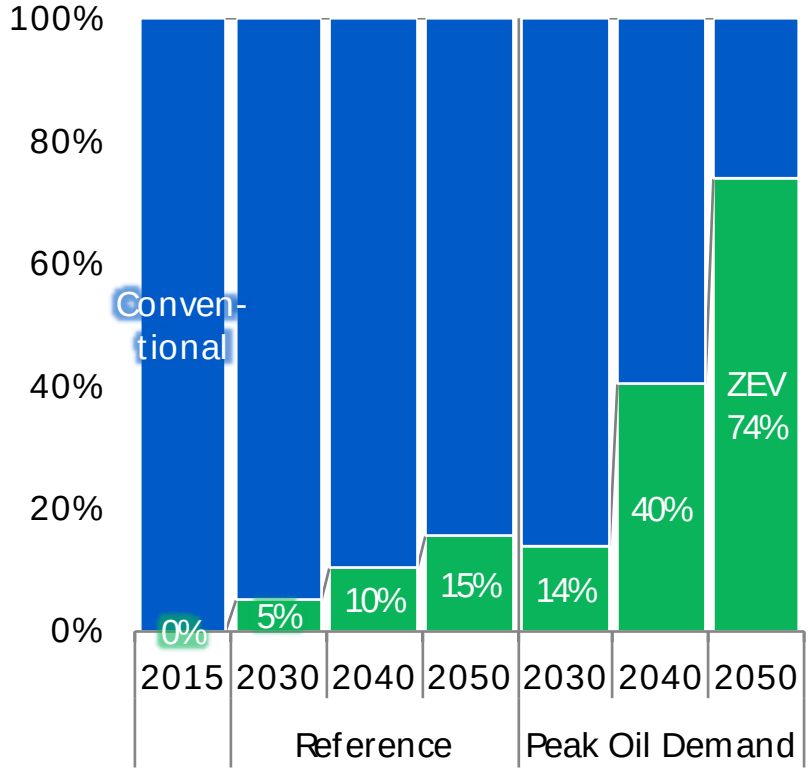
❖ Assumption of new car sales

❖ Car ownership

Expectation on penetration speed of ZEVs varies a lot. In the Peak Oil Demand Case, 30% and 100% of global new car (passenger and freight) sales are assumed to be ZEVs in 2030 and in 2050, respectively.

Sensitivity analysis of energy supply and demand was conducted assuming that the electricity demand increased by the ZEVs will be met by thermal power generation.



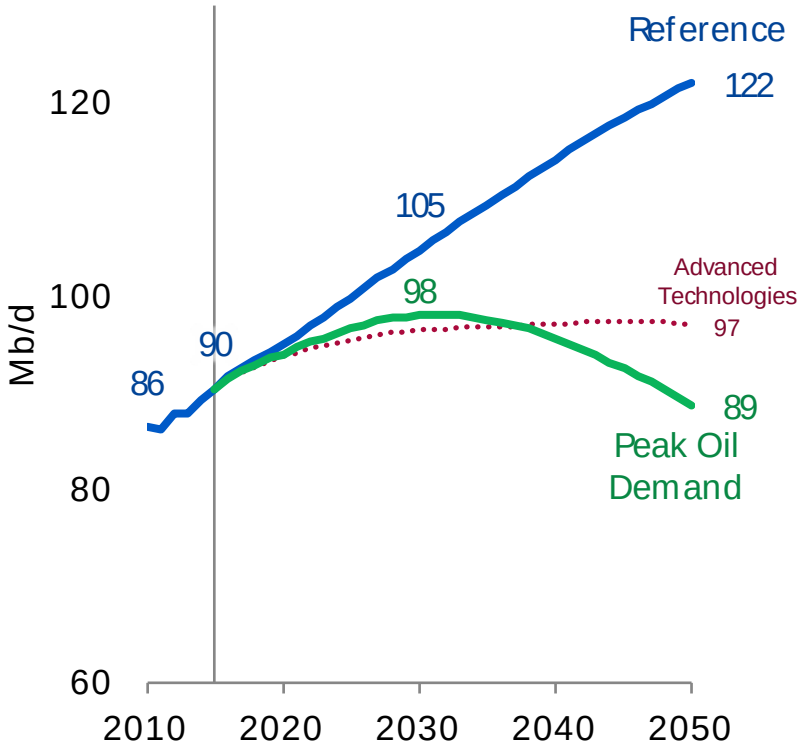


Note: ZEV consists of plug-in hybrid vehicles, electric vehicles and fuel cell vehicles

Source: "IEEJ Outlook 2018" (IEEJ, October 2017)

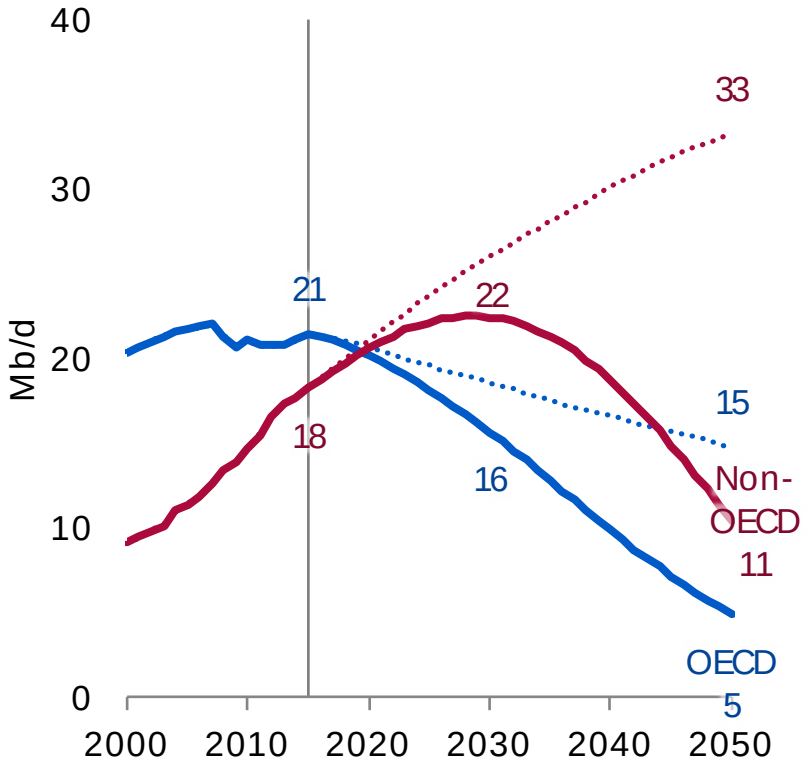
Oil demand peaks by rapid penetration of ZEVs

Oil consumption



In the Peak Oil Demand Case, oil consumption hits a peak of 98 Mb/d around 2030 then declines. The reduction from the Reference Scenario is 7 Mb/d and 33 Mb/d in 2030 and in 2050, respectively.

Oil for Road [Peak Oil Demand Case]



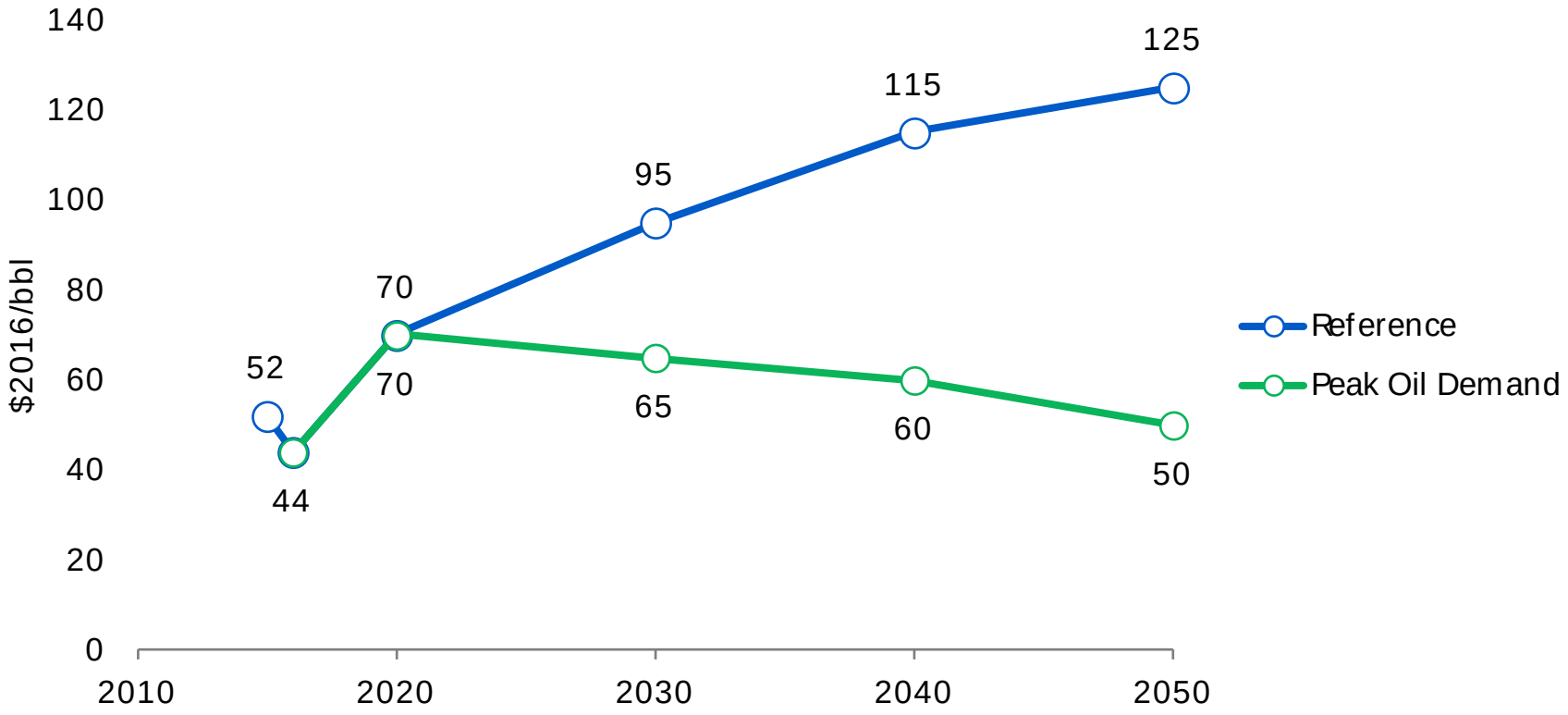
Note: Dotted lines are the reference scenario

Oil consumption by cars in Non-OECD, which continues to increase rapidly in the Reference Scenario, also declines from around 2030. It is as much as one third of the Reference Scenario in 2050.

Source: "IEEJ Outlook 2018" (IEEJ, October 2017)

Peak oil demand may result in lower oil price

❖ Assumption of real crude oil prices



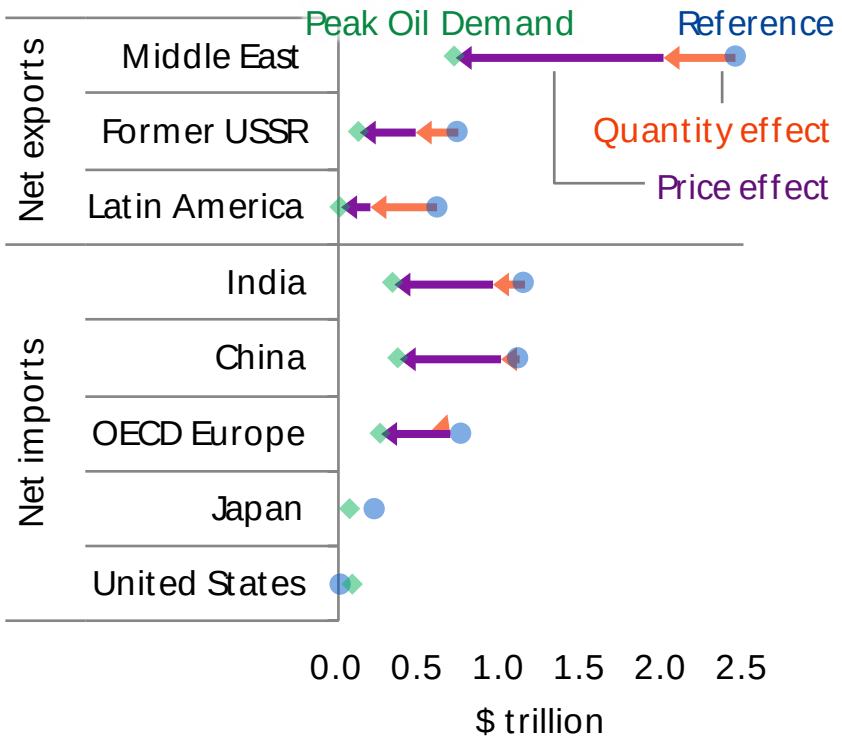
Assuming that the supply and demand relaxation will result in a decline in international oil prices.

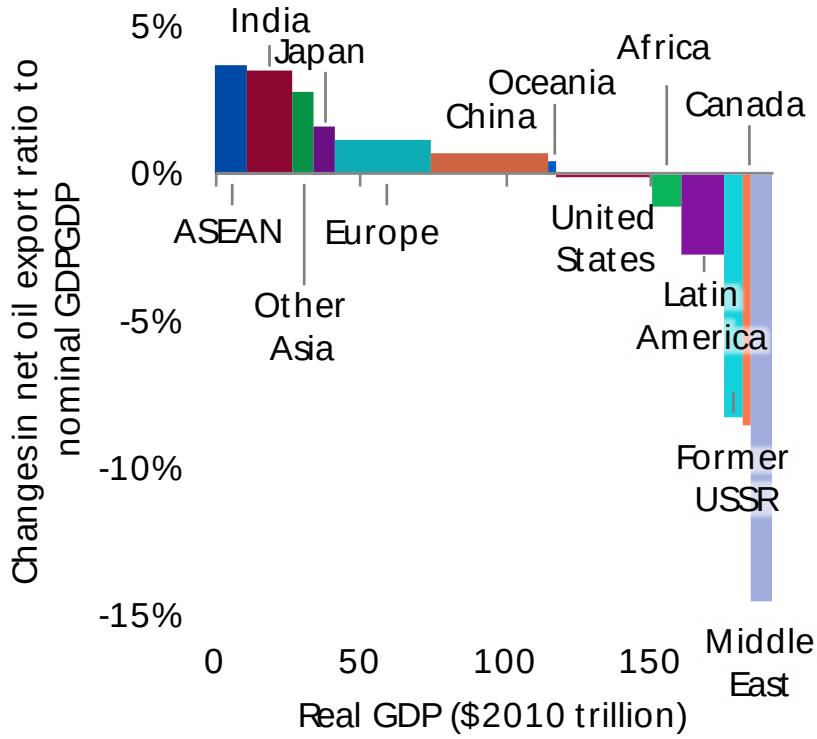
In the Peak Oil Demand Case, the prices begin to decline after the 2020s and fall to $50/bbl in 2050.

Source: "IEEJ Outlook 2018" (IEEJ, October 2017)

Economic impacts of peak oil demand

Changes in net oil exports/imports and ratios to nominal GDP [2050]





Note: Europe excludes the former Soviet Union

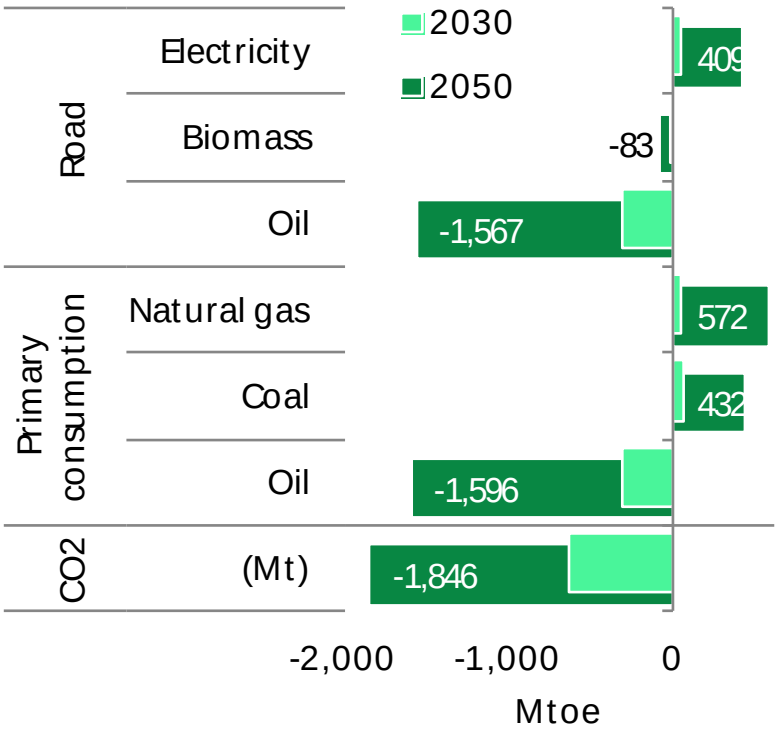
Although the Middle East obtains the relative gain, its net oil export decreases of $1.6 trillion or 13% of nominal GDP is significant.

On the other hand, the most benefiting country from net oil import decreases is India, the second largest oil consumer, followed by China, which has more car fleet than in any other countries. The United States has little impact despite of its consumption scale since it is almost oil self-sufficient.

Source: “IEEJ Outlook 2018” (IEEJ, October 2017)

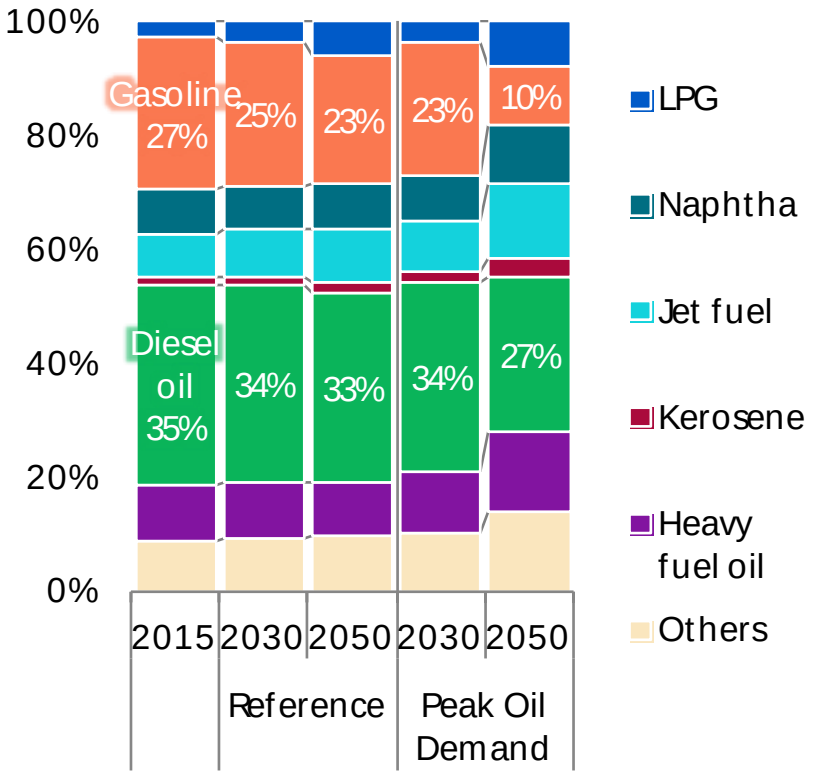
Impacts of oil demand peak on primary energy, etc.

Changes in consumption (from the Reference Scenario)



Whilst oil consumption declines, electricity demand by ZEVs increases fuel consumption for power generation. Both natural gas and coal exceed oil in the late 2030s. Since then, natural gas is the largest energy source.

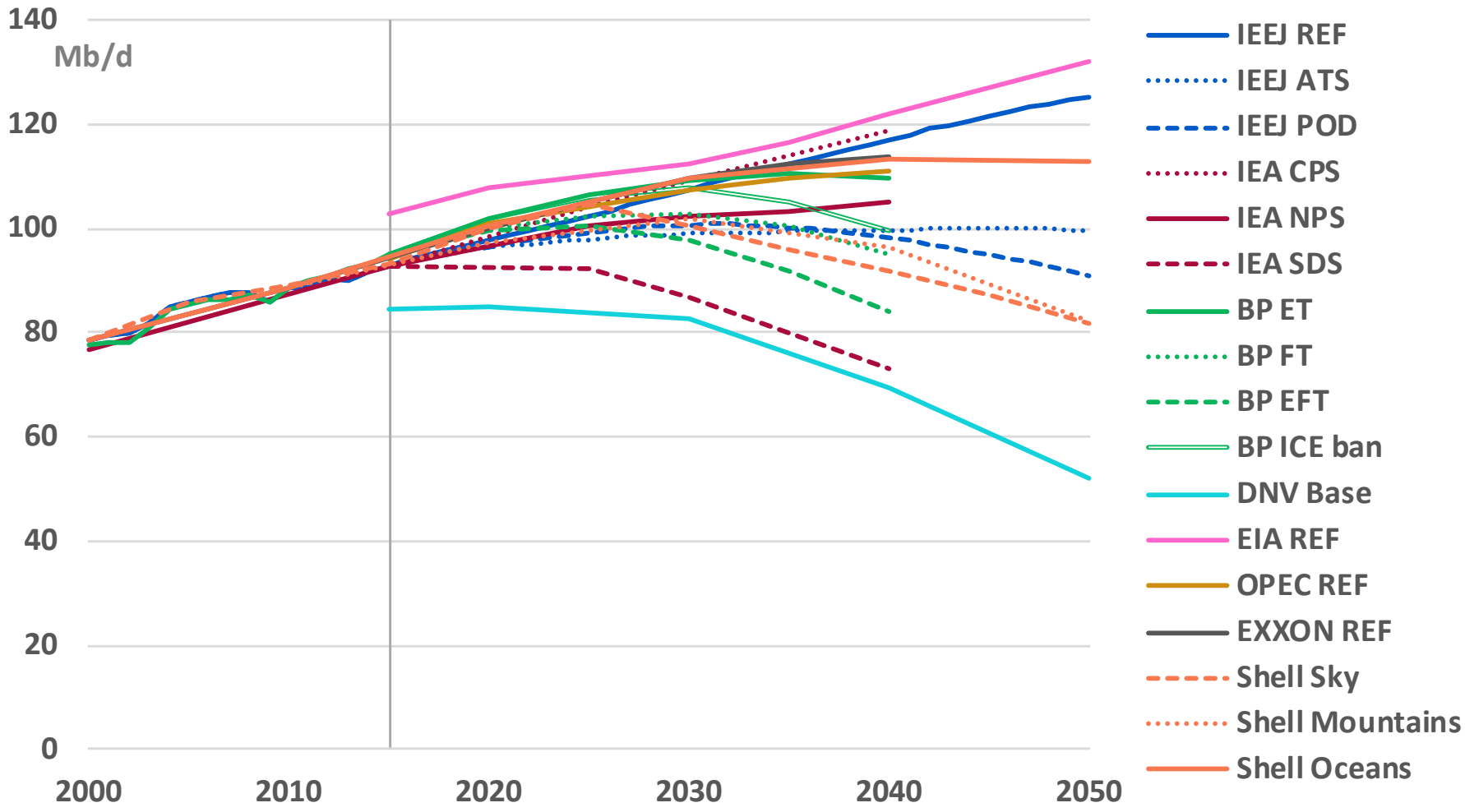
Composition of petroleum products consumption



Gasoline reduces its share to 10% in 2050. Share of diesel oil is not smaller than gasoline because diesel oil has other uses, but it is 8 points lower than today.

Source: "IEEJ Outlook 2018" (IEEJ, October 2017)

Oil demand projections differ greatly



*EIA figures include bio fuels, GTL, etc. DNV figures exclude NGLs.

Source: Prepared by Shigeru Suehiro, IEEJ (May 2018)

Implication of Peak Oil Demand

- The Peak Oil Demand Case shows that oil consumption can turn into a decline in the not too distant future in some circumstances.
- However, the feasibility of this Case can be said to be extremely challenging because the penetration of ZEVs is far greater than that in the "Advanced Technologies Scenario," in which a bottom-up approach to the maximum implementation of advanced technologies is adopted. Rather, it can be interpreted that oil consumption may not be easily reduced.

...and then

- It should not be overlooked that oil is required even in 2050 in the Peak Oil Demand Case on a scale that does not differ from today.
- If the supply investment becomes insufficient due to excessive pessimism in the future, it can trigger the switching from oil to other energy threatening energy security.

- The rising dependence on the Middle East crude oil will increase geopolitical risk for stable supply.
- Although it is reasonable the Governments in the Middle East cut public investment and subsidies to reduce the budget deficit coping with low oil price, it is difficult to deny the possibility of increasing social anxiety and worsening situation in the region.
- The role of consuming countries continues to be important as well as producing countries' own efforts. Support the efforts represented by Saudi Arabia "Saudi Vision 2030" is needed.

Source: "IEEJ Outlook 2018" (IEEJ, October 2017)