Asia-Pacific Economic Cooperation

APERC Asia Pacific Energy Research Centre

APECエネルギー需給見通し第7版：
2050年までの日本のエネルギー動向

APEC Energy Demand and Supply Outlook <7th Edition>
Key trends for Japan through 2050

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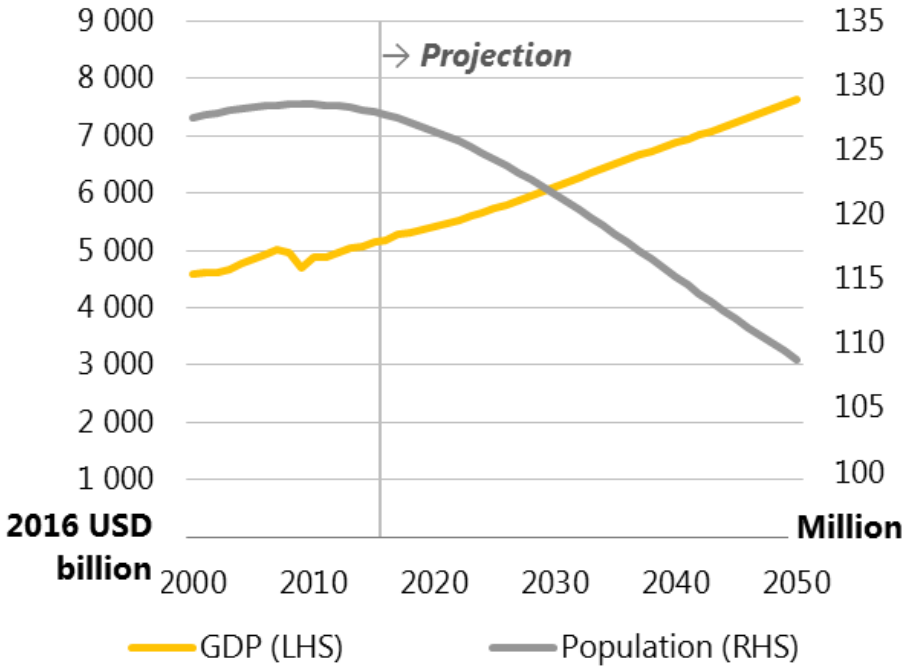
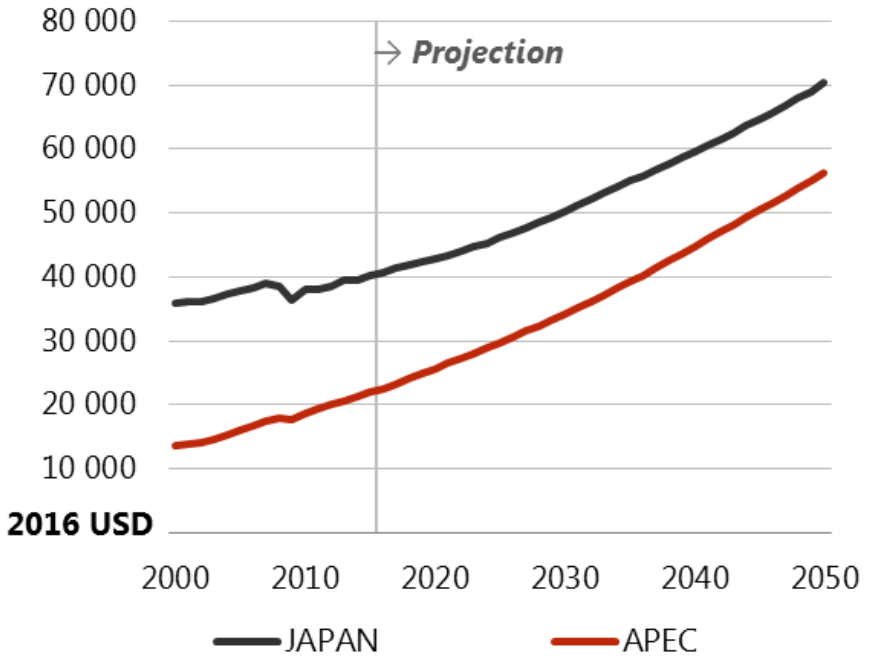
GDP and population

Japan • GDP, population and GDP per capita, 2000-50





Sources: APERC Analysis and IEA (2018).

Japan's GDP per capita almost doubles over the Outlook period as GDP grows while population decreases.

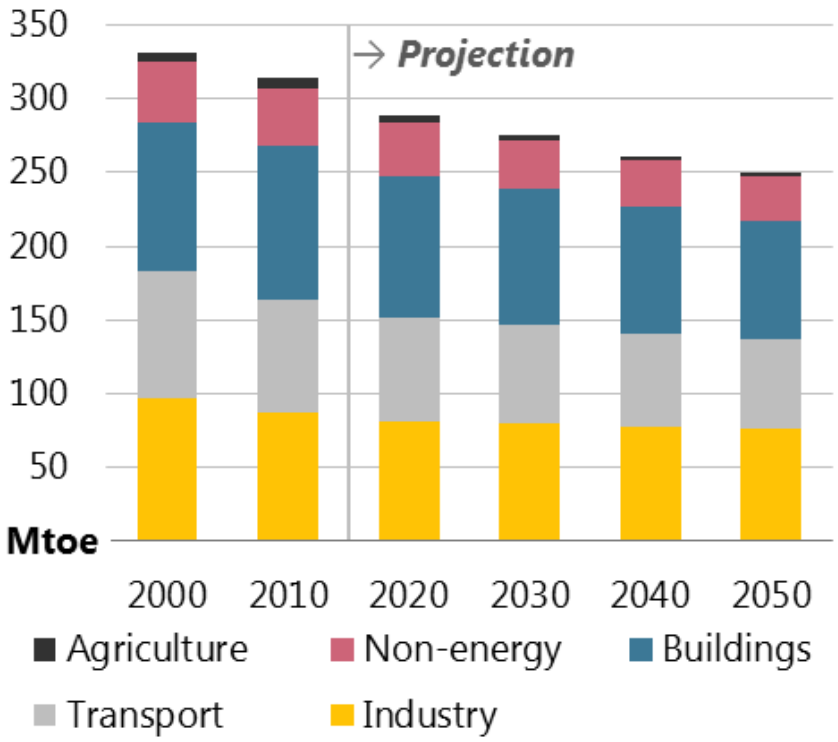
1. BAU Scenario results

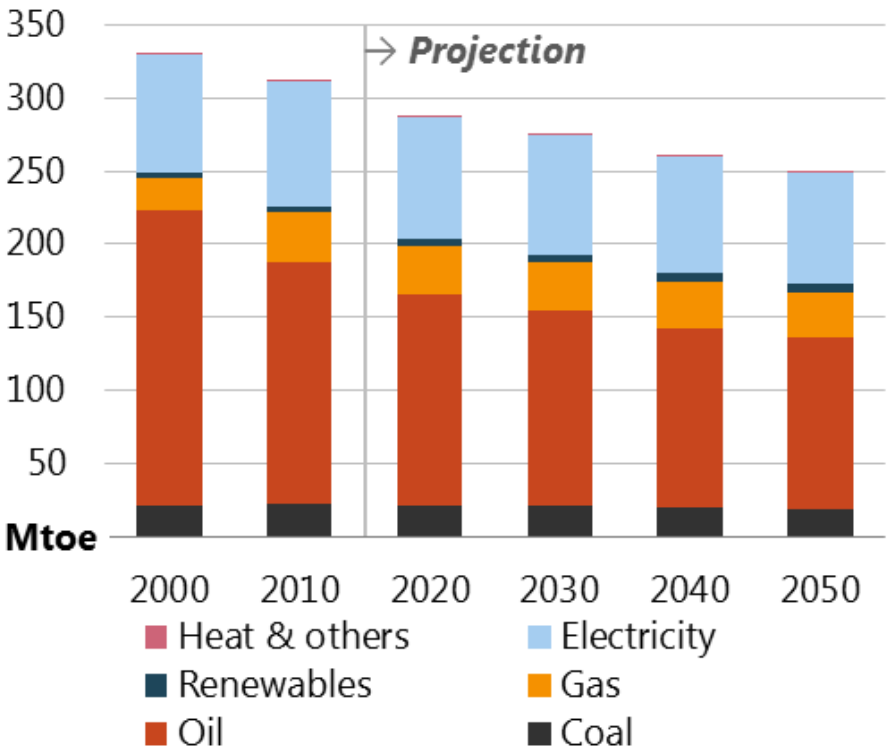
Key Assumptions in the BAU

Buildings（民生部門）	• Top Runner制度等による省エネ実施 • 電化の推進
Industry（産業部門）	• エネルギー集約型産業は縮小 • 短期的には復興需要や五輪による需要増 • 長期的には人口減により減少
Transport（運輸部門）	• Top Runner制度による燃費向上 • 軽車両でハイブリッド車の普及が進む
Supply（供給）	• 輸入化石燃料への依存が続く • メタンハイドレートは考慮しない
Power mix（電力）	• 事業者のH30供給計画を考慮 • 2018年内にNRAにより延長が認められた炉以外、寿命を40年に設定
Renewables（再エネ）	• FiTは地熱、風力、バイオマスを推進 • 石油精製業にバイオ燃料の供給義務化
Climate change（気候変動）	• 「2030年までに0.37 $kgCO_2/kWh$」考慮せず • 「2050年までにGHG排出80%削減」考慮せず • 小型炉、核融合炉、宇宙太陽光といった技術は研究開発に取組むが、実用化せず

FED drops 15% to 250 Mtoe in 2050

Final energy demand by sector and fuel in the BAU, 2000-50



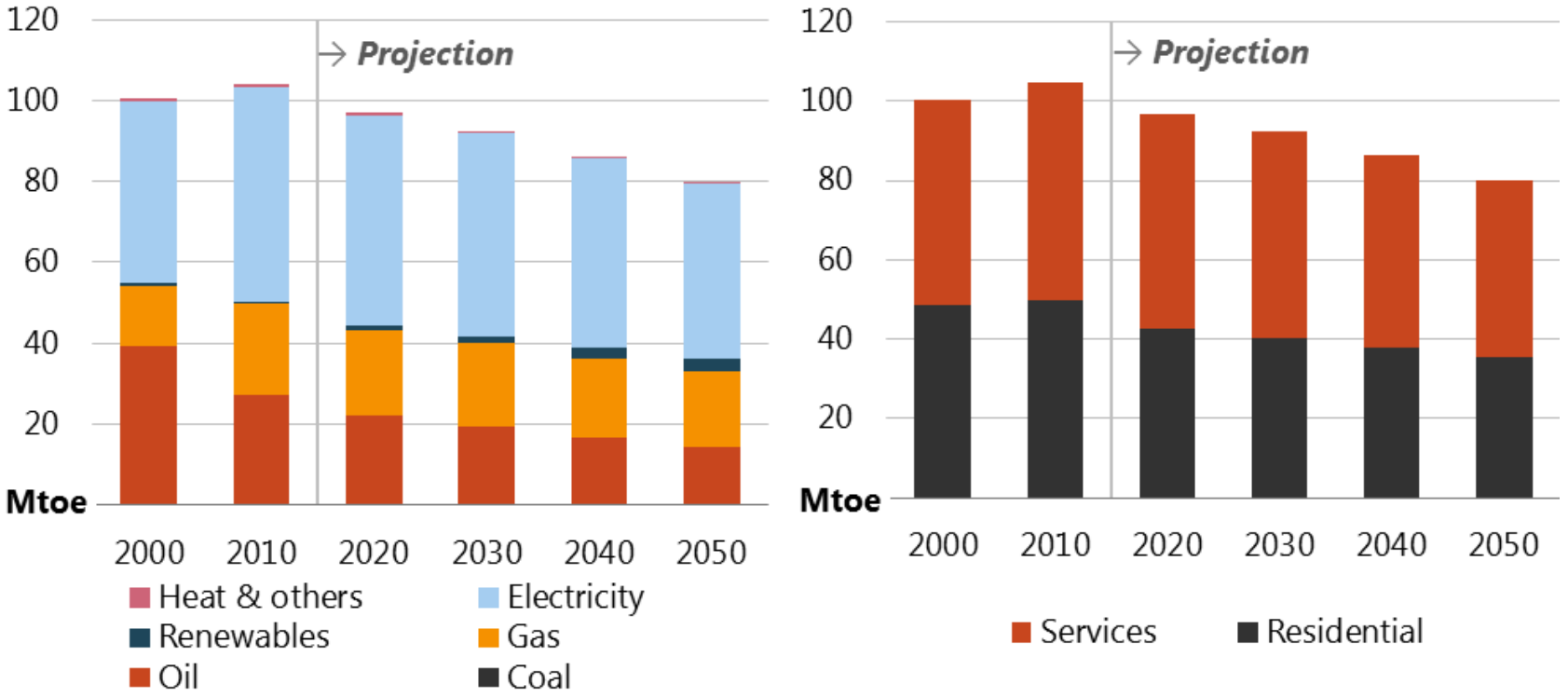


Source: APERC analysis and IEA (2018)

This is due to ongoing energy efficiency efforts and a declining population. Buildings and transport contribute most to this reduction.

FED in buildings drops 18% to 80 Mtoe in BAU

Final energy demand by sector and fuel in the BAU, 2000-50



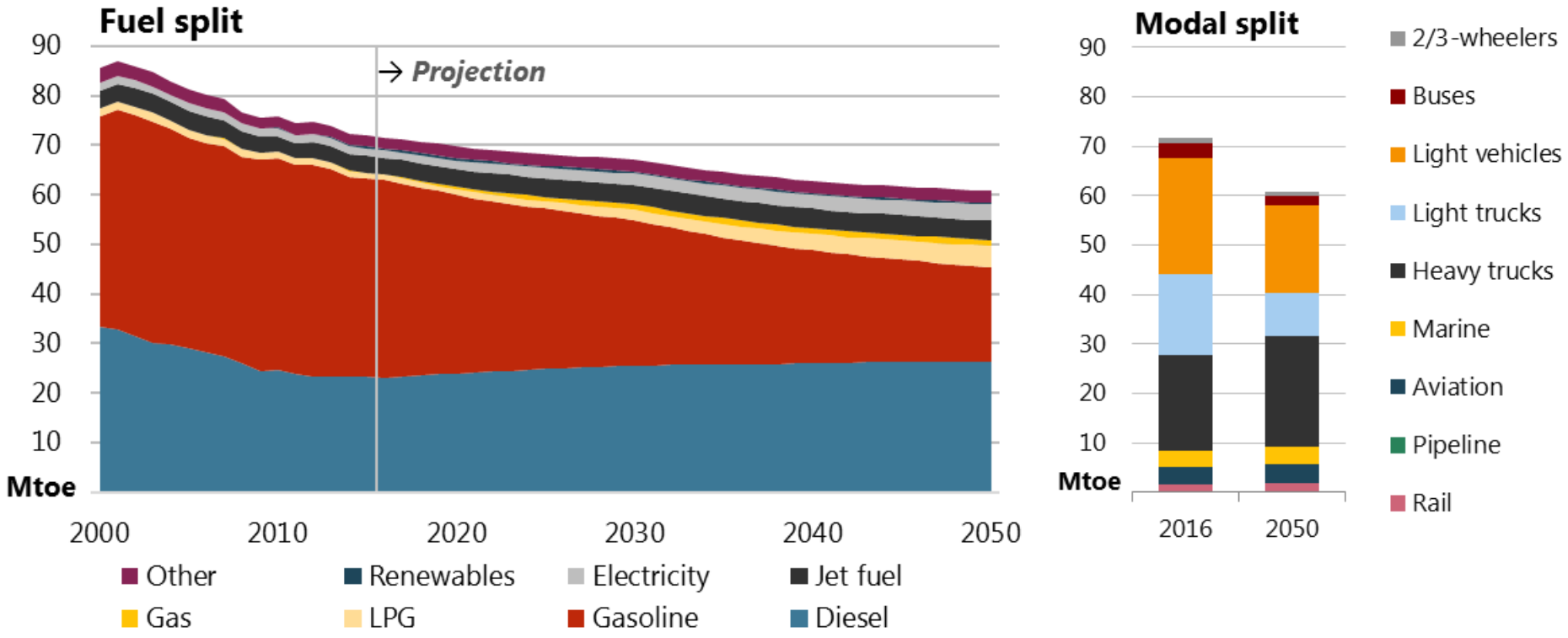
Source: APERC analysis and IEA (2018)

This is due to existing policies/efforts and a declining population.

Oil consumption decreases while electricity gains shares.

Transport FED drops 15%

Domestic transport sector FED by fuel and mode in BAU, 2000-50

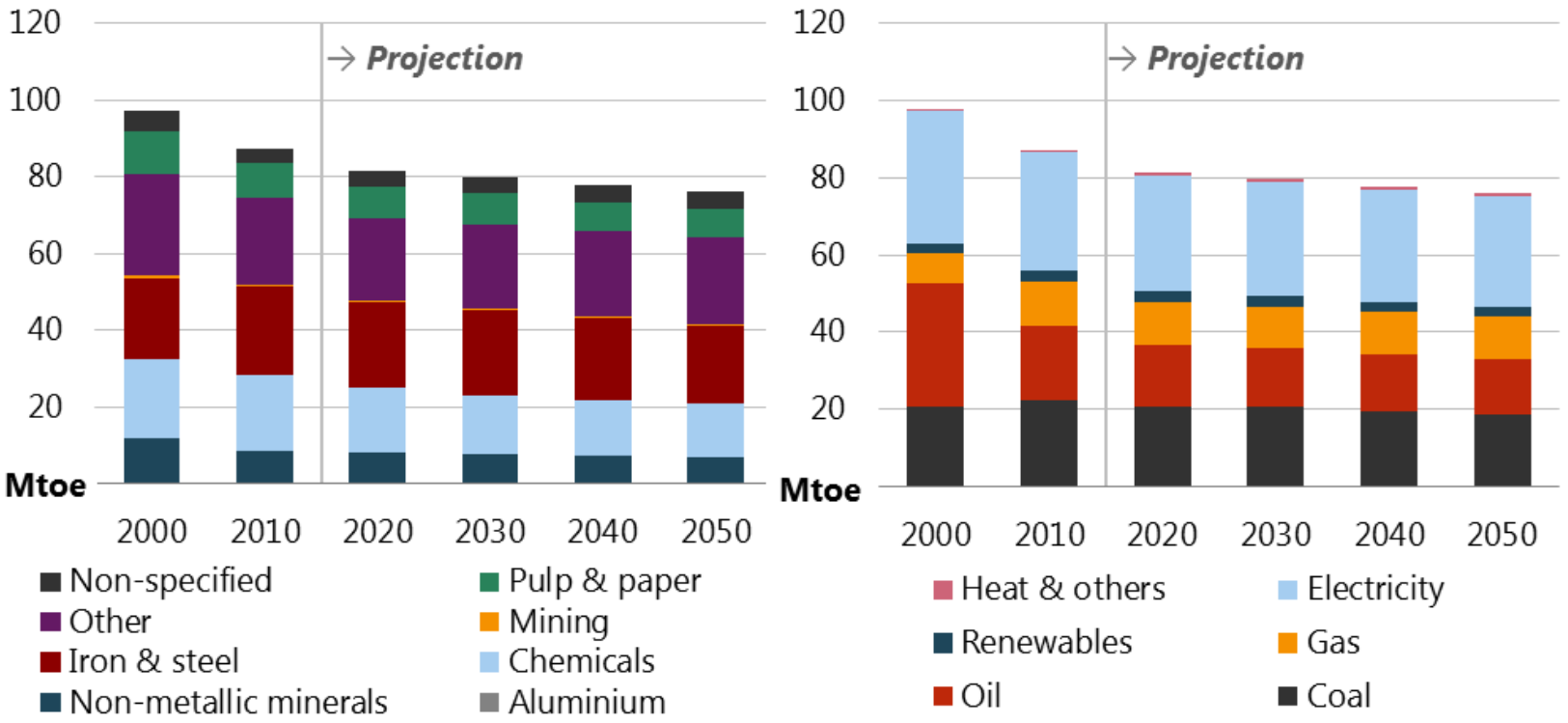


Source: APERC analysis and IEA (2018)

Gasoline hybrids reach 36% of total light vehicle stock in 2050. This decreases fuel consumption, together with declining passenger demand.

Industry FED decreases slightly

Industry sector final energy demand in BAU, by end use and fuel, 2000-50

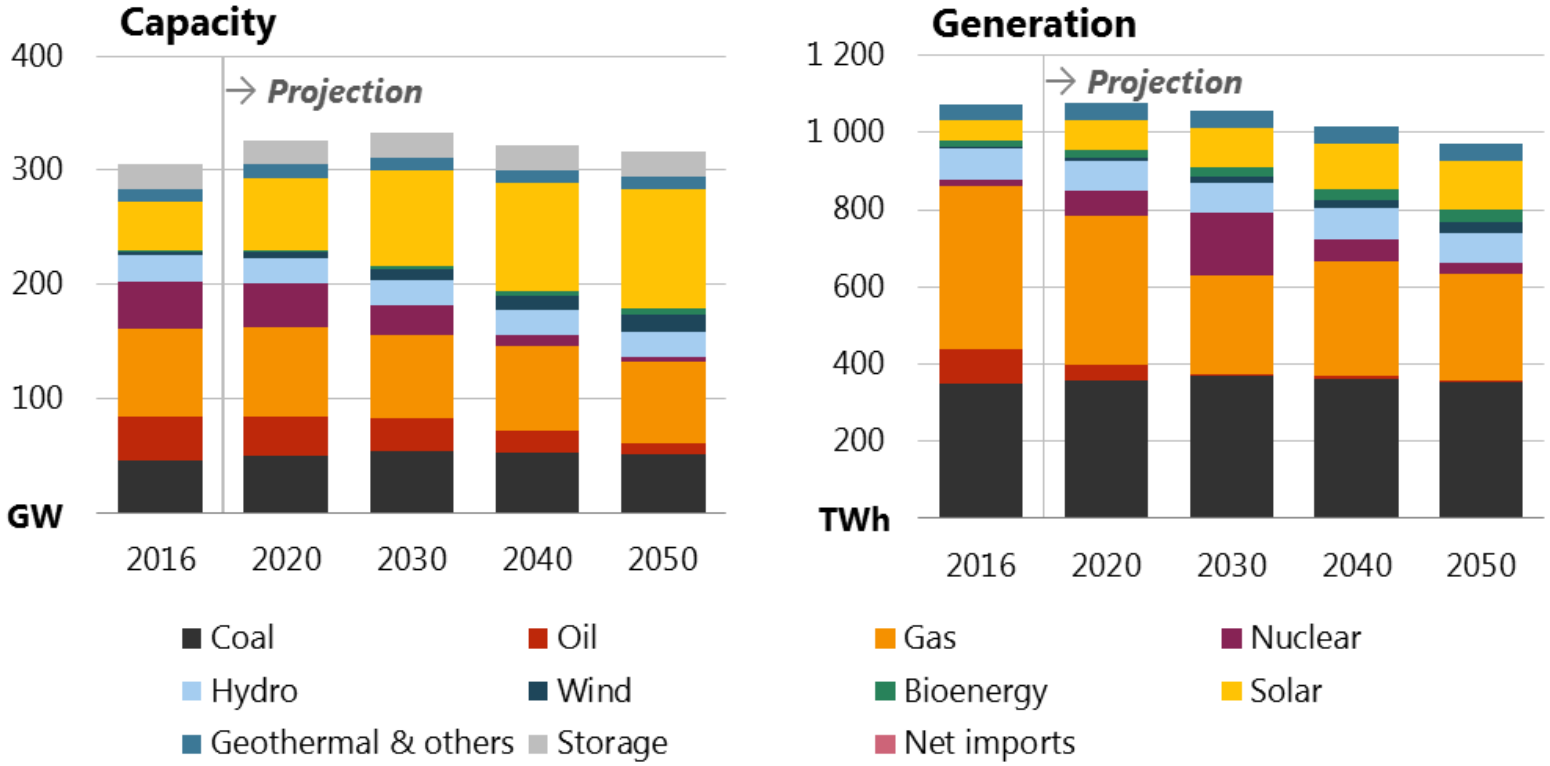


Source: APERC analysis and IEA (2018)

The fuel mix is largely the same throughout the Outlook. Energy efficiency rates are already high in major energy intensive subsectors. Chemicals declines due to competitive overseas producers.

Electricity demand declines 102 TWh in 2050

Power capacity and electricity generation by fuel in BAU, 2016-50



Source: APERC analysis and IEA (2018)

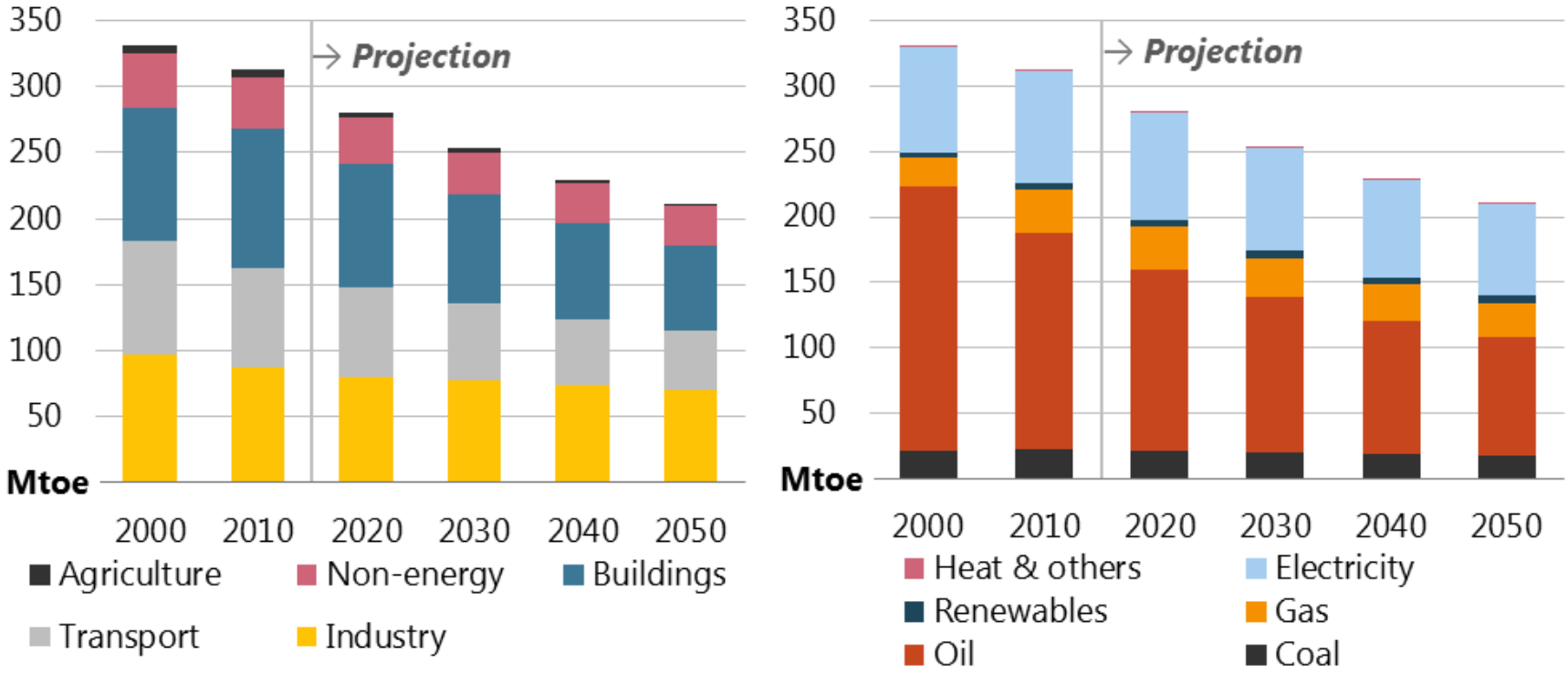
Generation peaks in the 2020s mainly due to a matured economy and demand-side efficiency. In 2050, solar has the largest share of capacity.

2. Alternative Scenario: 2DC

(TGT results are primarily intended to be APEC-wide and have been omitted from this presentation)

FED is curtailed by 15% in the TGT (vs BAU)

Final energy demand by sector and fuel in the TGT, 2000-50

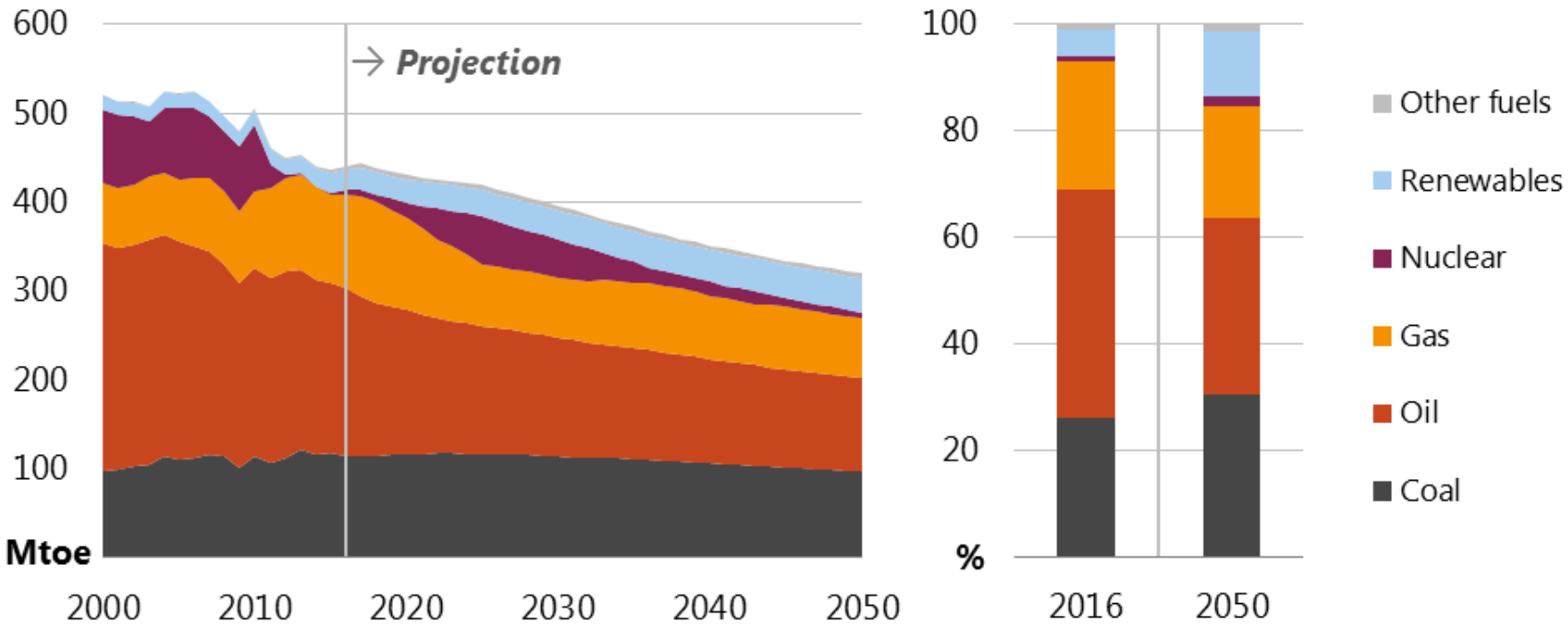


Source: APERC analysis and IEA (2018)

Accelerated penetration of high-efficiency space heating/cooling in buildings and advanced vehicles in transport is the main driver of lower demand in the TGT.

TPES: renewable share is 2% larger in TGT

Total primary energy supply in TGT, 2000-50



Source: APERC analysis and IEA (2018)

From 436 Mtoe in 2016, TPES declines to 318 Mtoe in TGT, compared to 375 Mtoe in BAU. The share of renewables is 12% in TGT, 2% more than BAU.

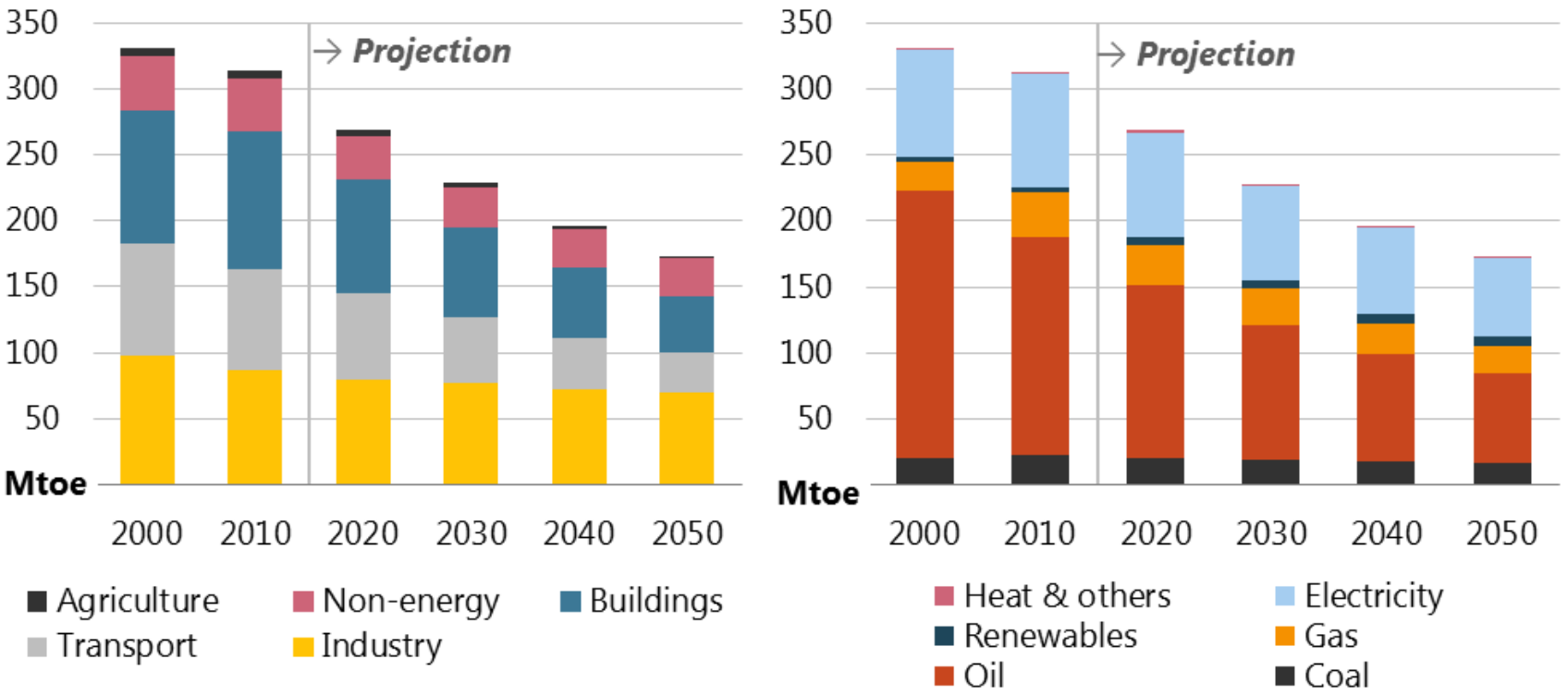
About the 2DC Scenario

- Modelled to achieve 50% chance of limiting global average temperature rise to 2˚C by 2050
  - Emissions are set to be 10% of 2016 levels in the power sector in Japan
- Other assumptions include:
  - behavioural changes
  - heavier improvements on efficiency
  - investment in low-carbon energy sources (such as CCS)
- Allocation of efforts among sectors is based on cost-optimised modelling developed for the Energy Technology Perspectives of the IEA[1]

IEA, 2017. *Energy Technology Perspectives 2017.* https://www.iea.org/etp2017/

FED declines by 41% in the 2DC (vs BAU)

Final energy demand by sector and fuel in the 2DC, 2000-50

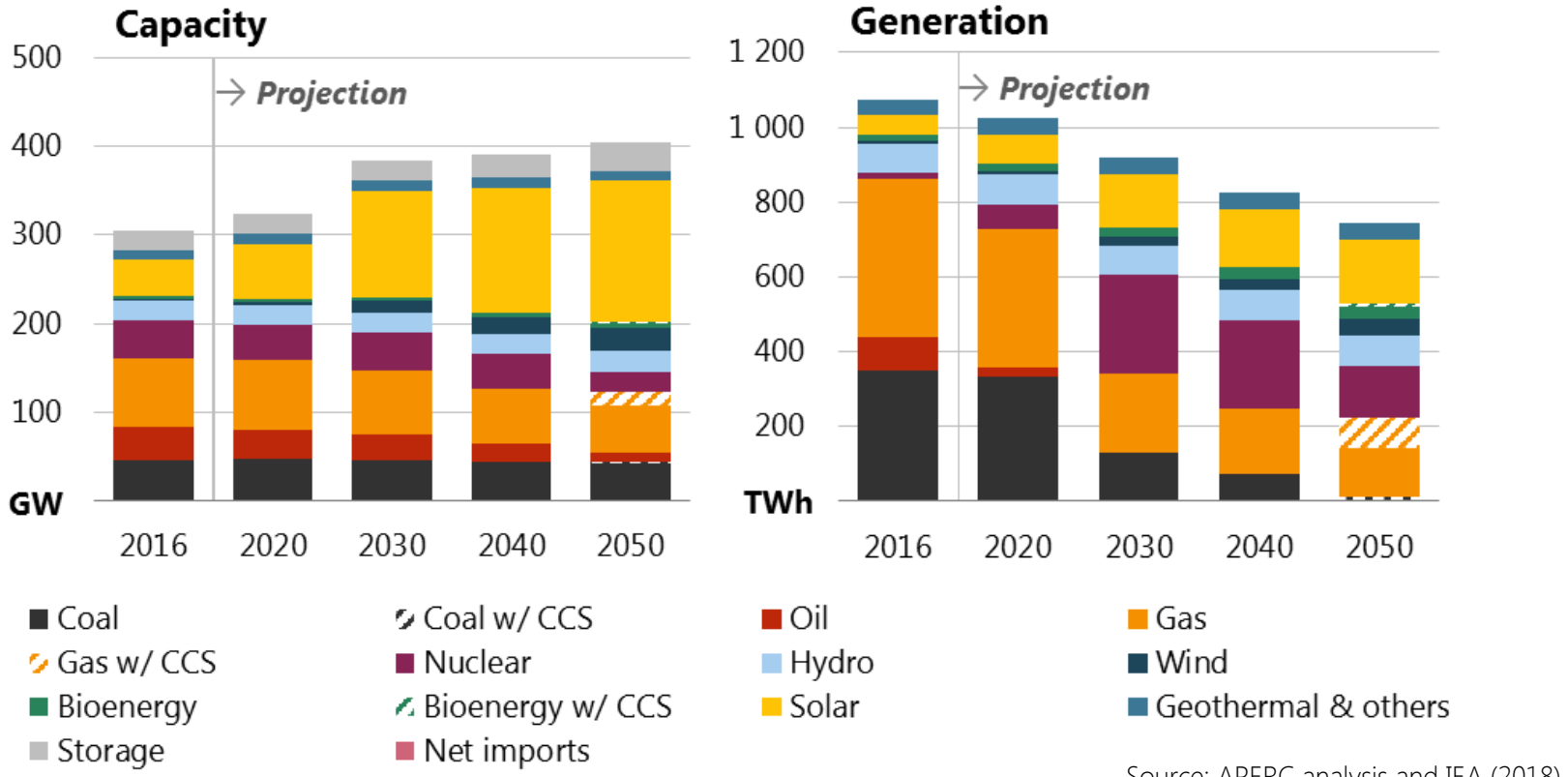


Source: APERC analysis and IEA (2018)

This is due to sharper decline in space heating in residences, fuel economy improvements, less vehicles, improved city planning and lifestyle changes.

Power sector in 2DC

Power capacity and electricity generation in 2DC by fuel, 2016-50

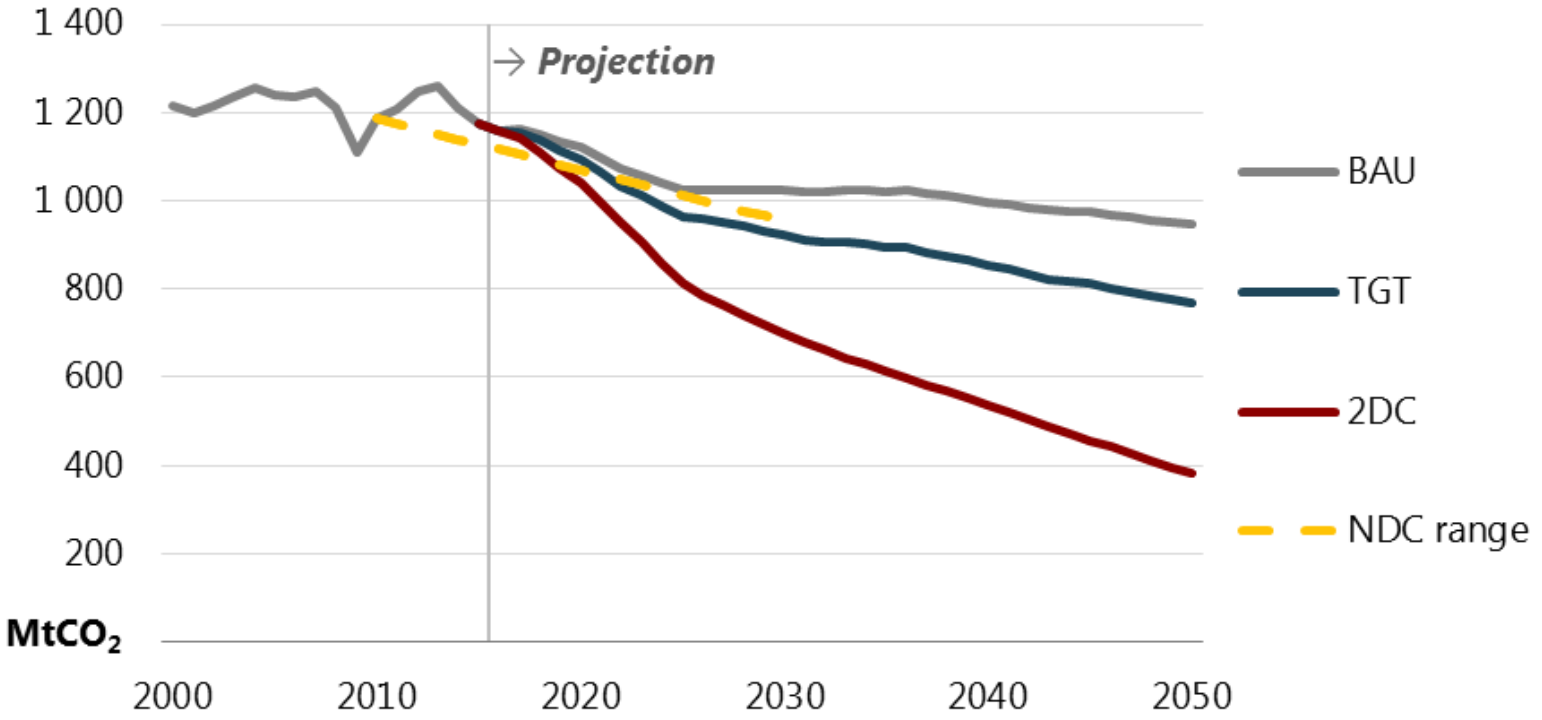


Source: APERC analysis and IEA (2018)

Emissions must decrease 90% from 2016 levels by 2050. To do so, renewables take up 46% of generation, storage capacity grows to 31GW and CCS is deployed after 2040.

Energy-related CO_2 emission comparison

Total CO2 emissions under BAU, TGT and 2DC, 2000-50 (TPES-based)

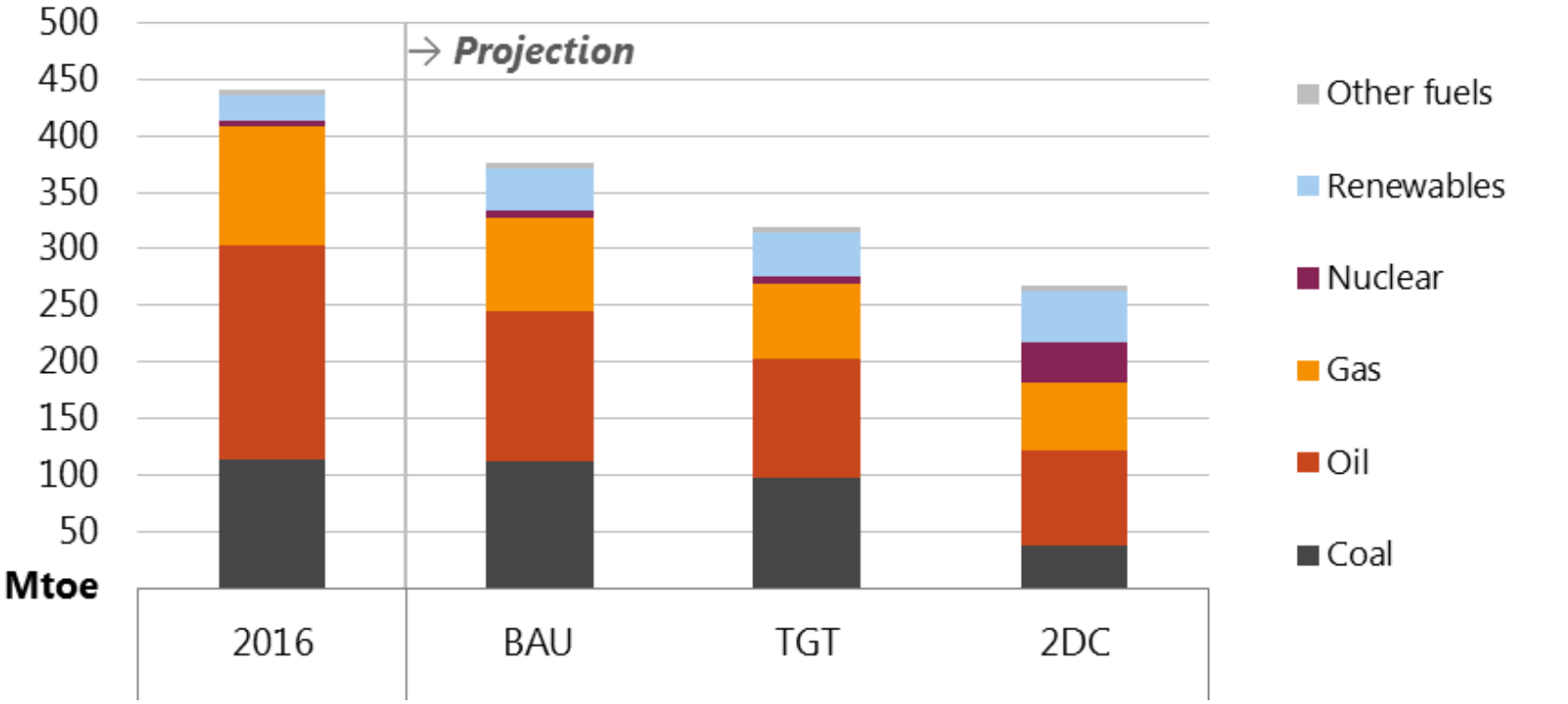


Source: APERC analysis and IEA (2018)

Emissions fall 19% in the BAU, compared to 27% in TGT and 40% in 2DC (2013 vs. 2030). The power sector accounts for two thirds of cumulative reductions in 2DC.

TPES in 2DC

Total primary energy supply in 2DC, 2000-50

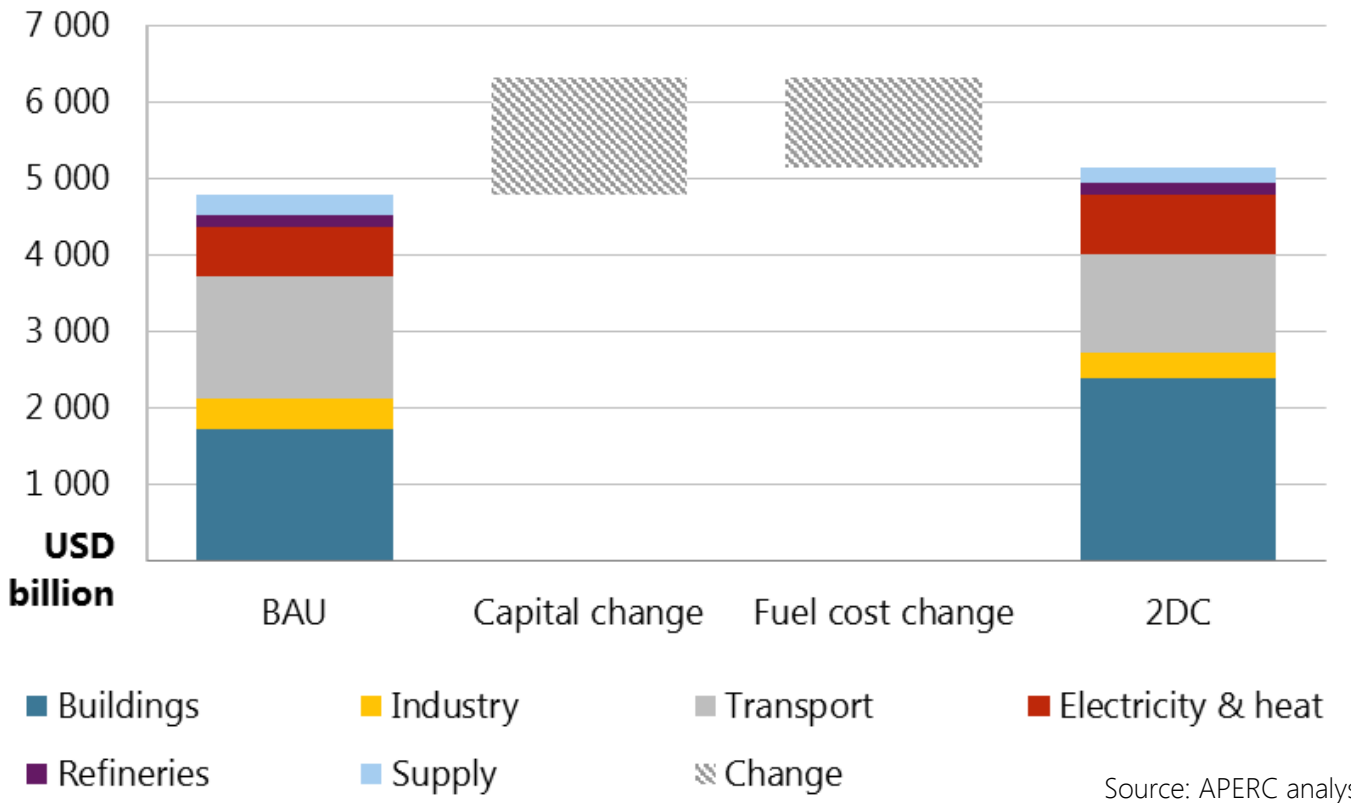


Source: APERC analysis and IEA (2018)

From 436 Mtoe in 2016, TPES declines to 268 Mtoe in 2DC, compared to 375 Mtoe in BAU. The share of renewables is 17% in TGT, 7% more than BAU.

Investment is 7.6% higher than BAU in 2DC

Capital investment and fuel costs, by scenario, 2017-50



Source: APERC analysis and IEA (2018)

The total in BAU is USD 4 777 billion. Buildings, transport and electricity sectors account for most of the cost in all scenarios.

Summary

- Ongoing efficiency efforts coupled with modest economic growth and a declining population lead to FED decline of 15% in the BAU
- Increases in solar PV double the share of renewables in power generation in the BAU
- Long-term self-sufficiency rates are a key concern
  - It rises with energy efficiency efforts and renewable growth, but drops after late 2020s due to nuclear retirements according to the '40 year lifetime' rule
- NDC target not met in BAU
- Both emissions and self-sufficiency improve in the 2DC, but come at the cost of heavy capital investment.

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