Asia-Pacific Economic Cooperation

APERC Asia Pacific Energy Research Centre

APEC Energy Demand and Supply Outlook

7th Edition

Atlantic Council: The Role of Oil & Gas Companies in the Energy Transition

Singapore International Energy Week

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APEC members and regions

North-east Asia
Hong Kong, China
Japan
Korea
Chinese Taipei

South-east Asia
Brunei Darussalam
Indonesia
Malaysia
Philippines
Singapore
Thailand
Viet Nam

Oceania
Australia
New Zealand
Papua New Guinea

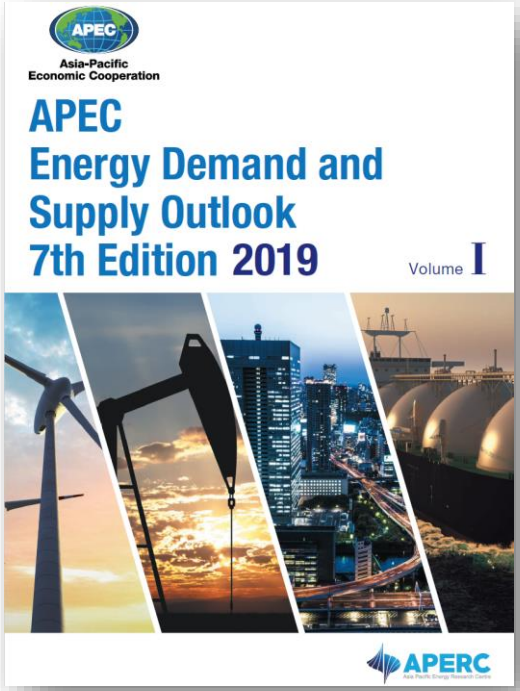
Other Americas
Canada
Chile
Mexico
Peru

Russia	United States	China

Asia Pacific Energy Research Centre

- APERC is a energy research center of the APEC
  - Researchers from 16 of APEC's 21 economies
  - Located in Tokyo, Japan

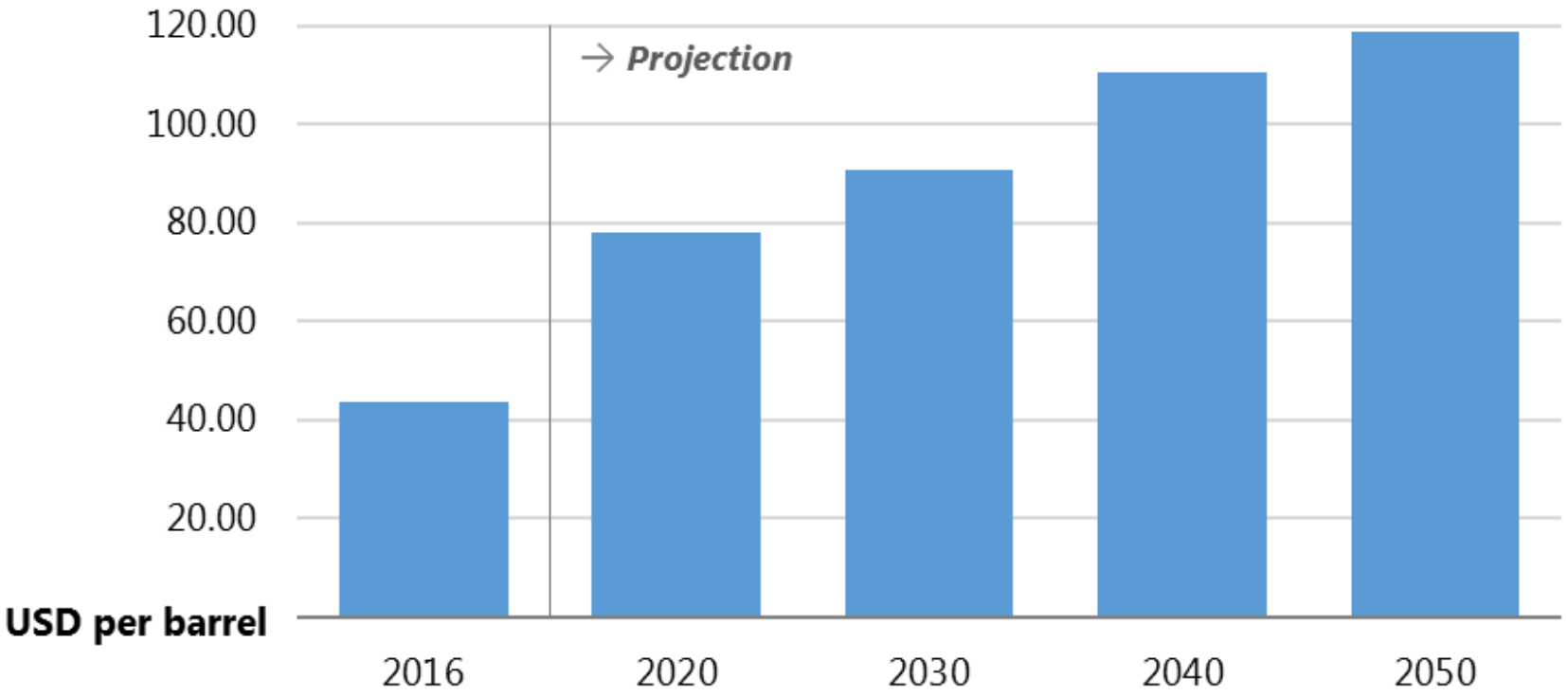
- Two flagship publications
  - Annual Energy Overview
  - Triennial Energy Demand and Supply Outlook



1. Assumptions & Macro

Assumptions: world oil prices

World oil prices in all scenarios, 2016 - 2050

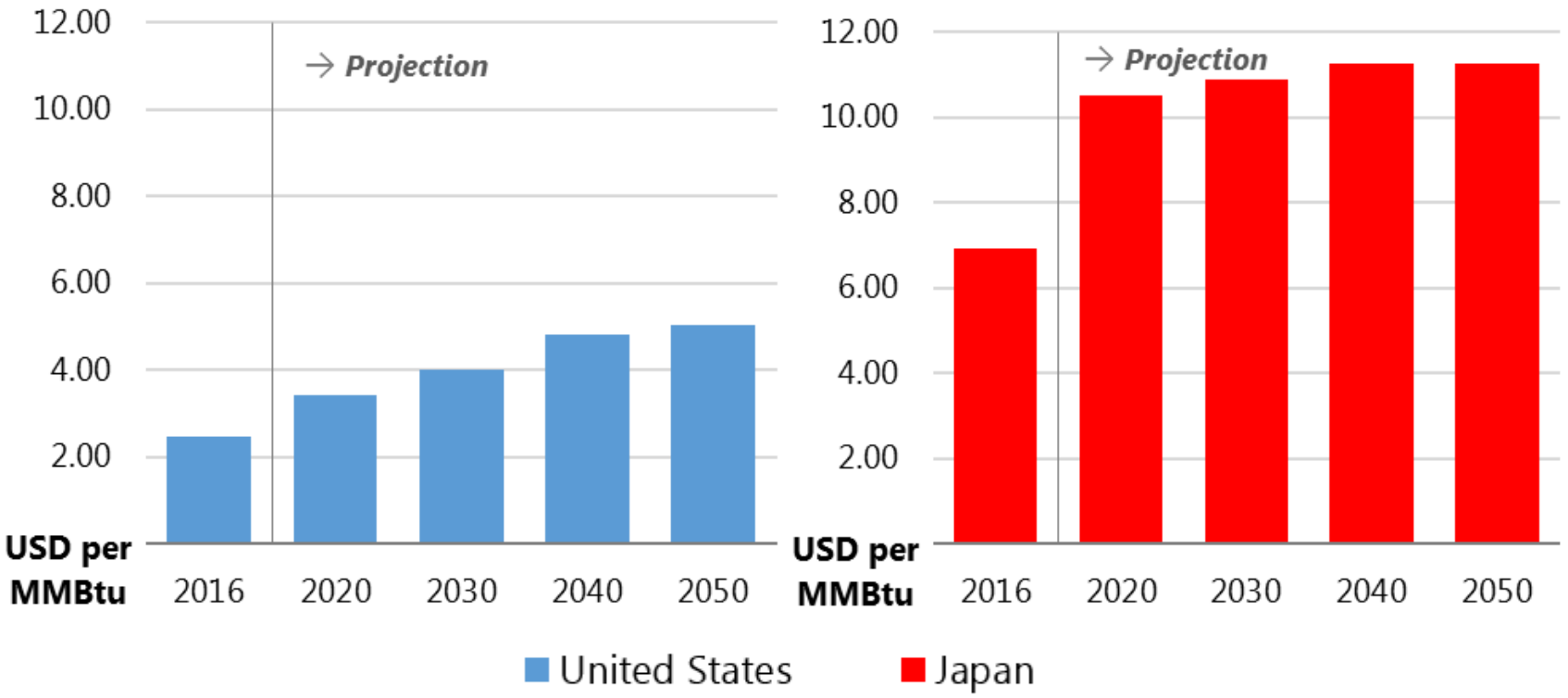


Source: IEEJ, APERC

Oil prices increase steadily.

Assumptions: world gas prices

World natural gas prices in all scenarios, 2016 - 2050

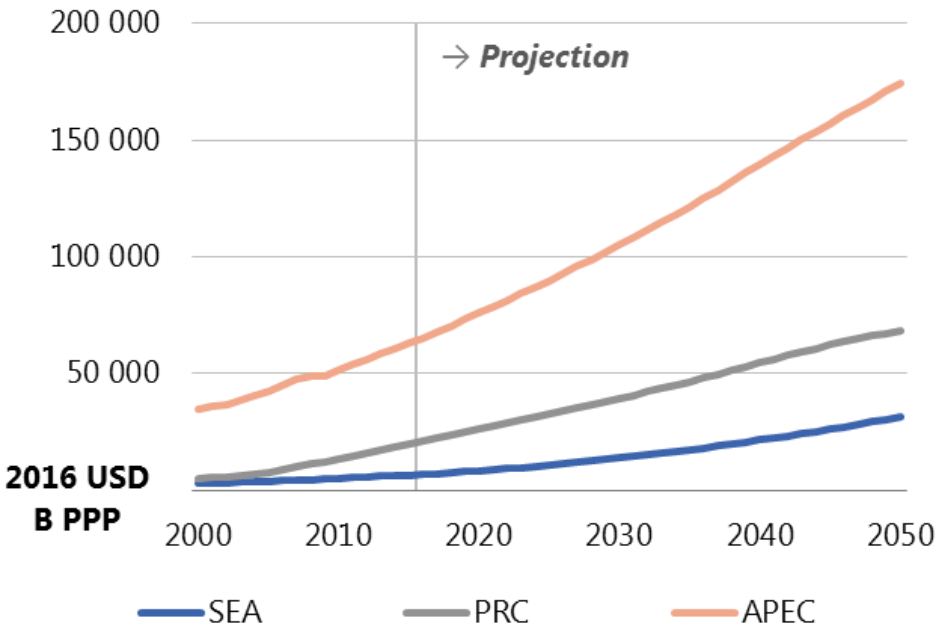


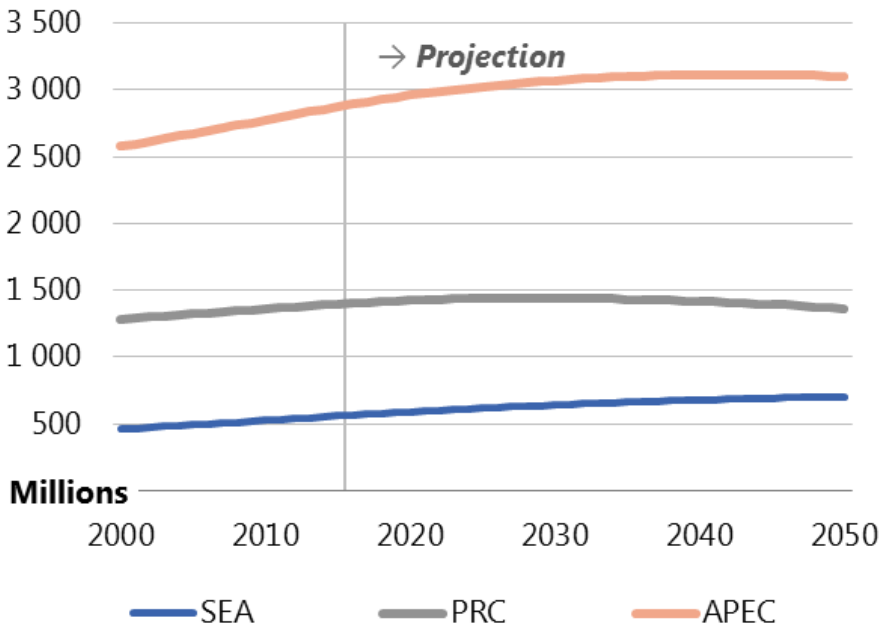
Source: IEEJ, APERC

Gas prices rise in response to rising demand growth.

GDP and population by region

GDP (left) and Population (right) for select regions in all scenarios, 2000 - 2050



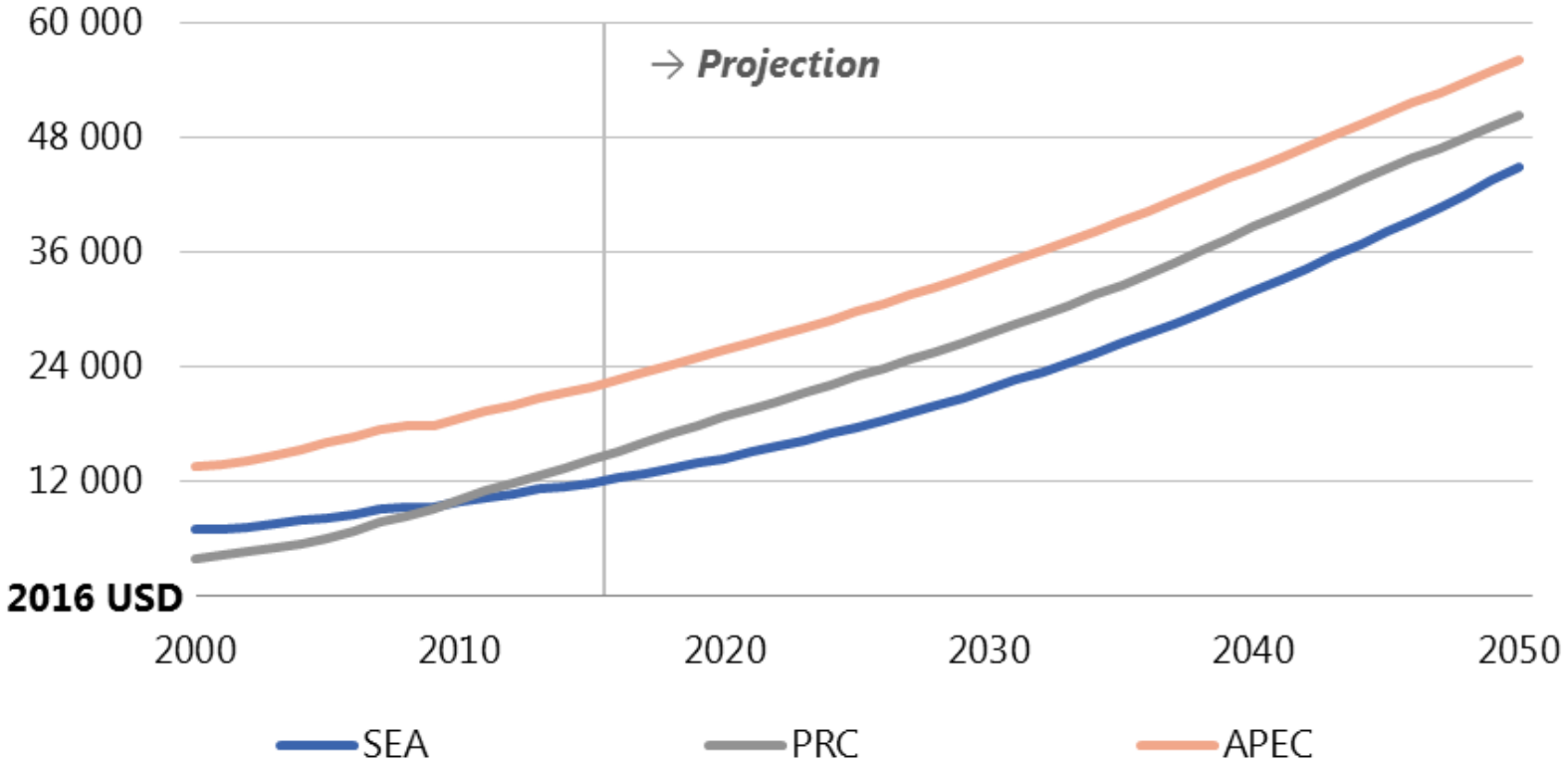


Source: APERC Analysis

APEC real GDP in 2050 rises to about 2.7 times that of 2016. Population exceeds 3 billion by 2023.

Income convergence in SEA and PRC

GDP per capita for select regions in all scenarios, 2000 - 2050

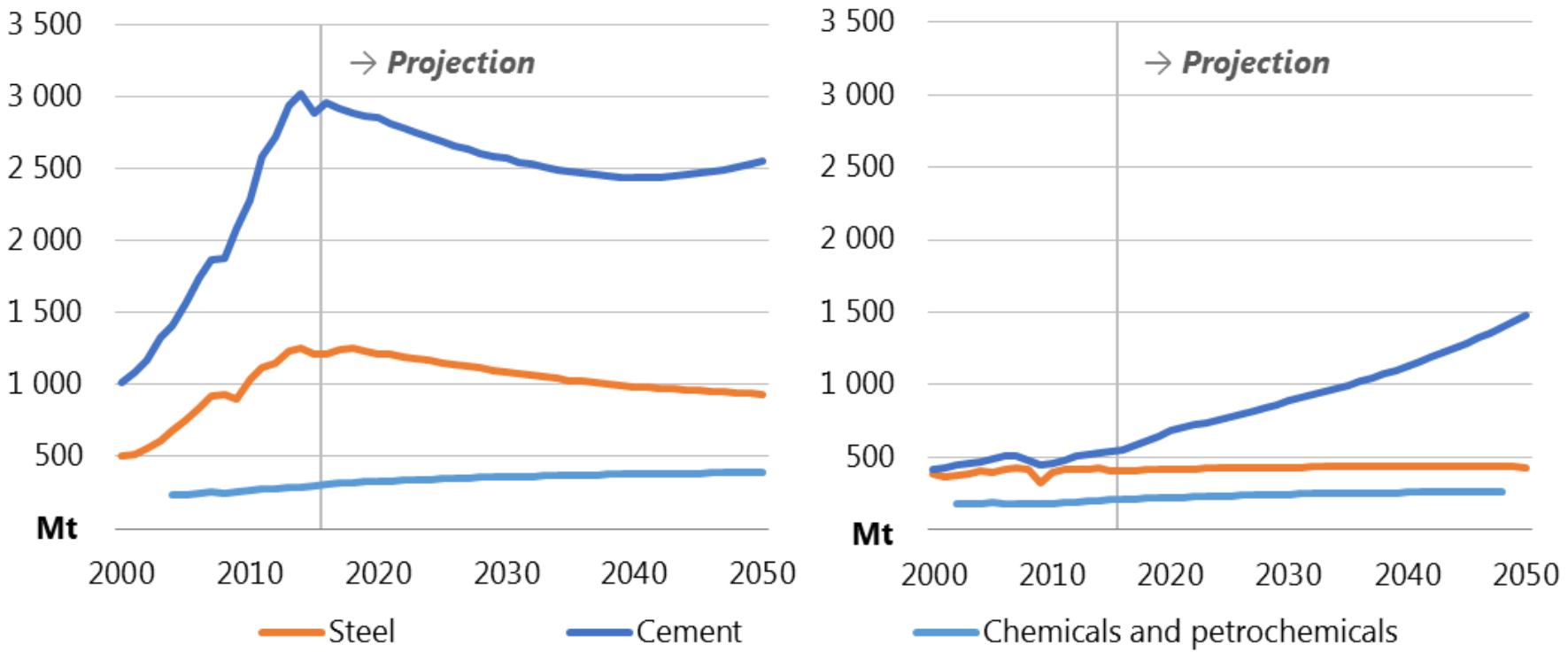


Source:

Convergence of incomes drive much of the consumer-driven demand in the outlook.

APEC industrial output declines in some sectors

Industrial production of fossil-heavy sectors; APEC (LHS), APEC less PRC (RHS)



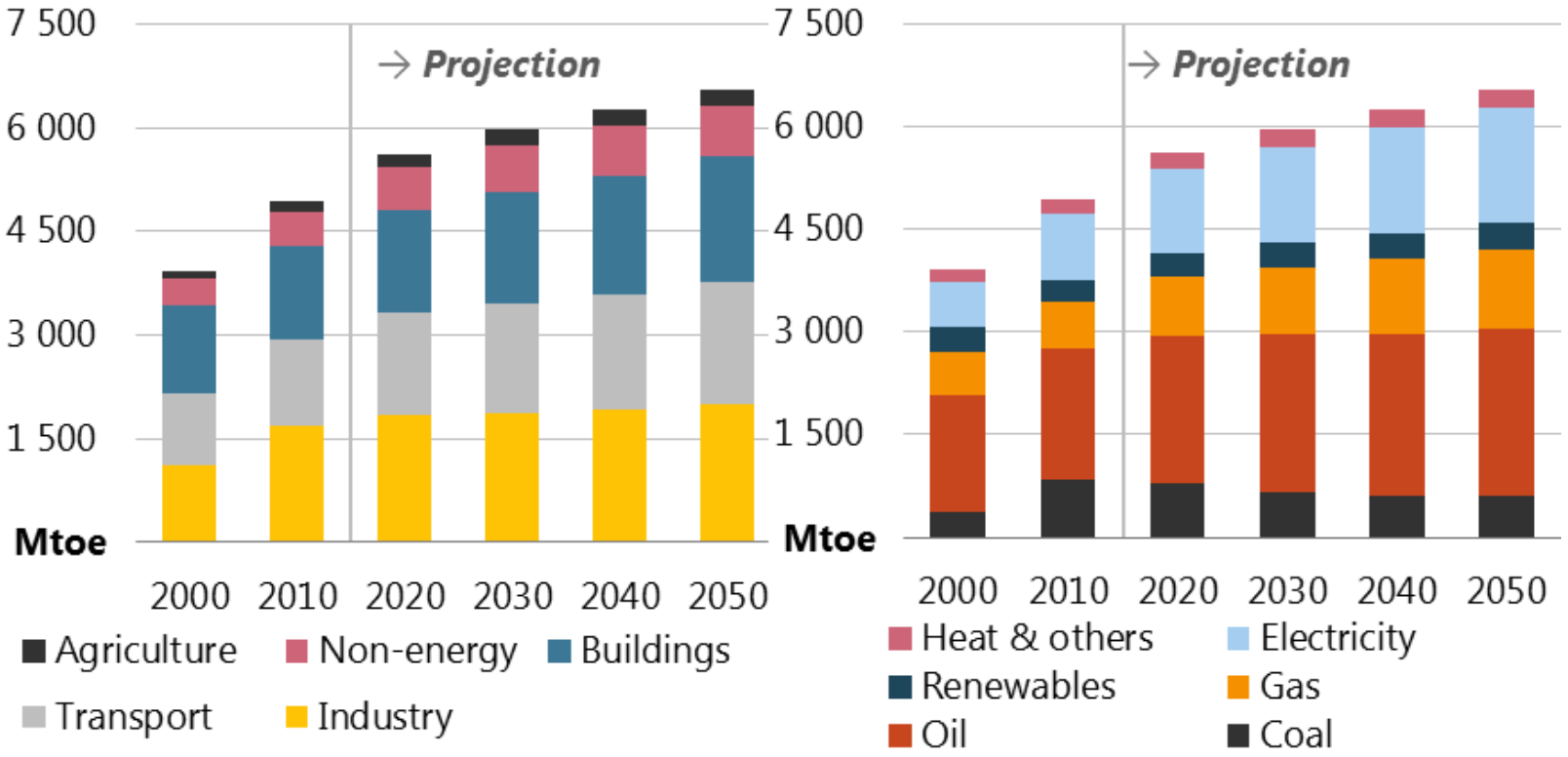
Source: IEA (2018), APERC analysis

Structural shift in Chinese economy reduces Steel and Cement tonnage, growth elsewhere driven by SEA.

2. BAU Scenario

Buildings and transport drive FED

Final energy demand, by sector in BAU, 2000-50

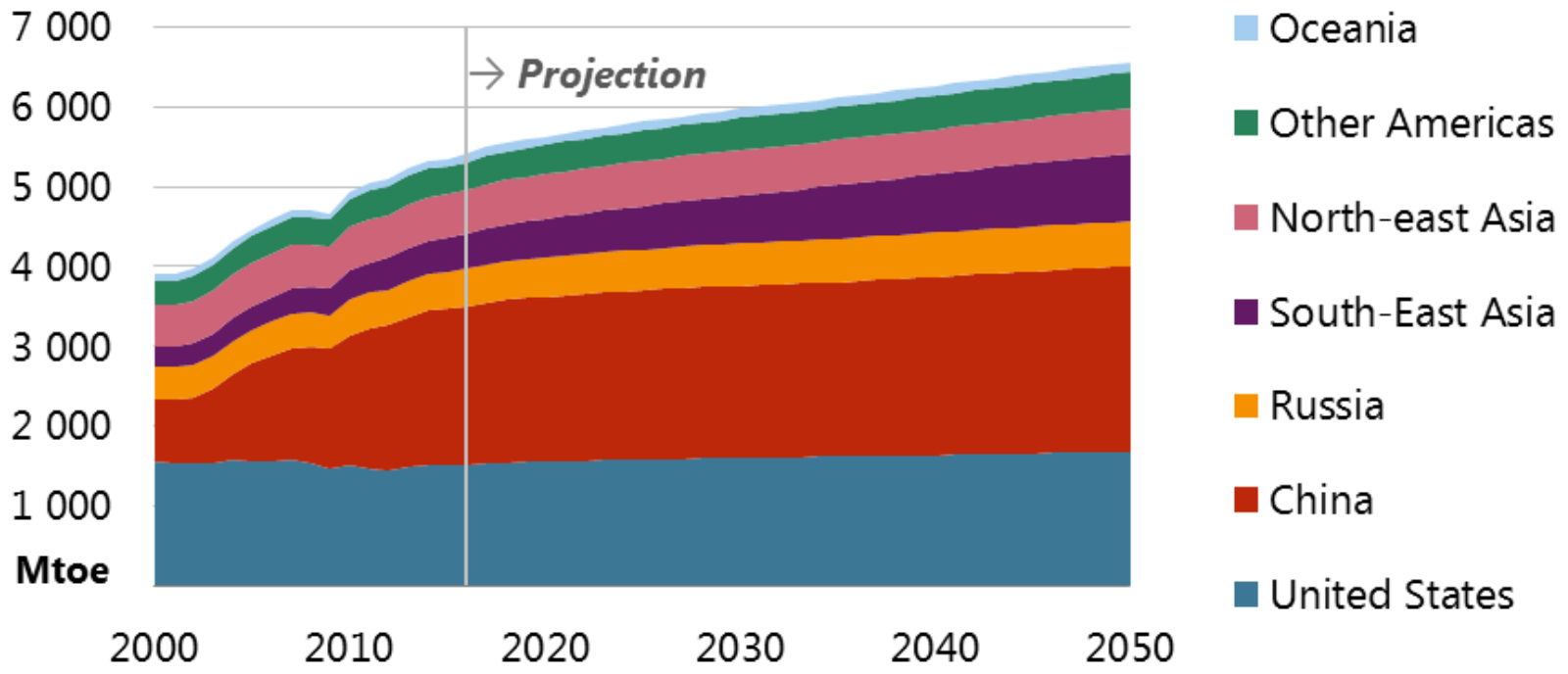


Sources: APERC analysis and IEA (2018).

FED rises to meet increasing energy needs of buildings and transport, and fossil fuels continue to dominate the fuel mix.

South-east Asia, China lead FED growth

Final energy demand by region, 2000-50

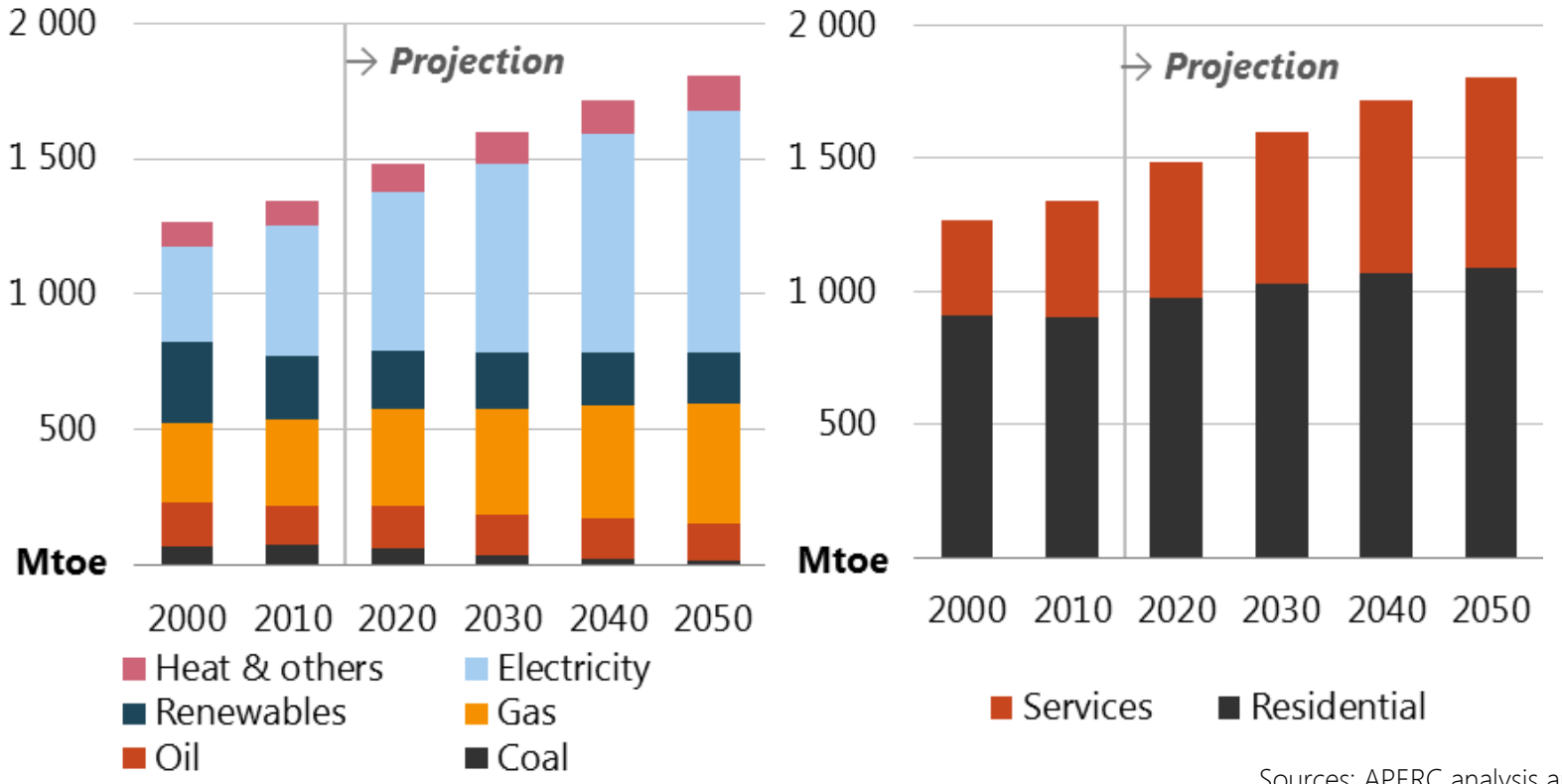


Sources: APERC analysis and IEA (2018).

Final energy demand in South-east Asia doubles from 2016 to 2050.

Buildings FED grows 30%

Buildings sector final energy demand, by fuel, 2000-2050

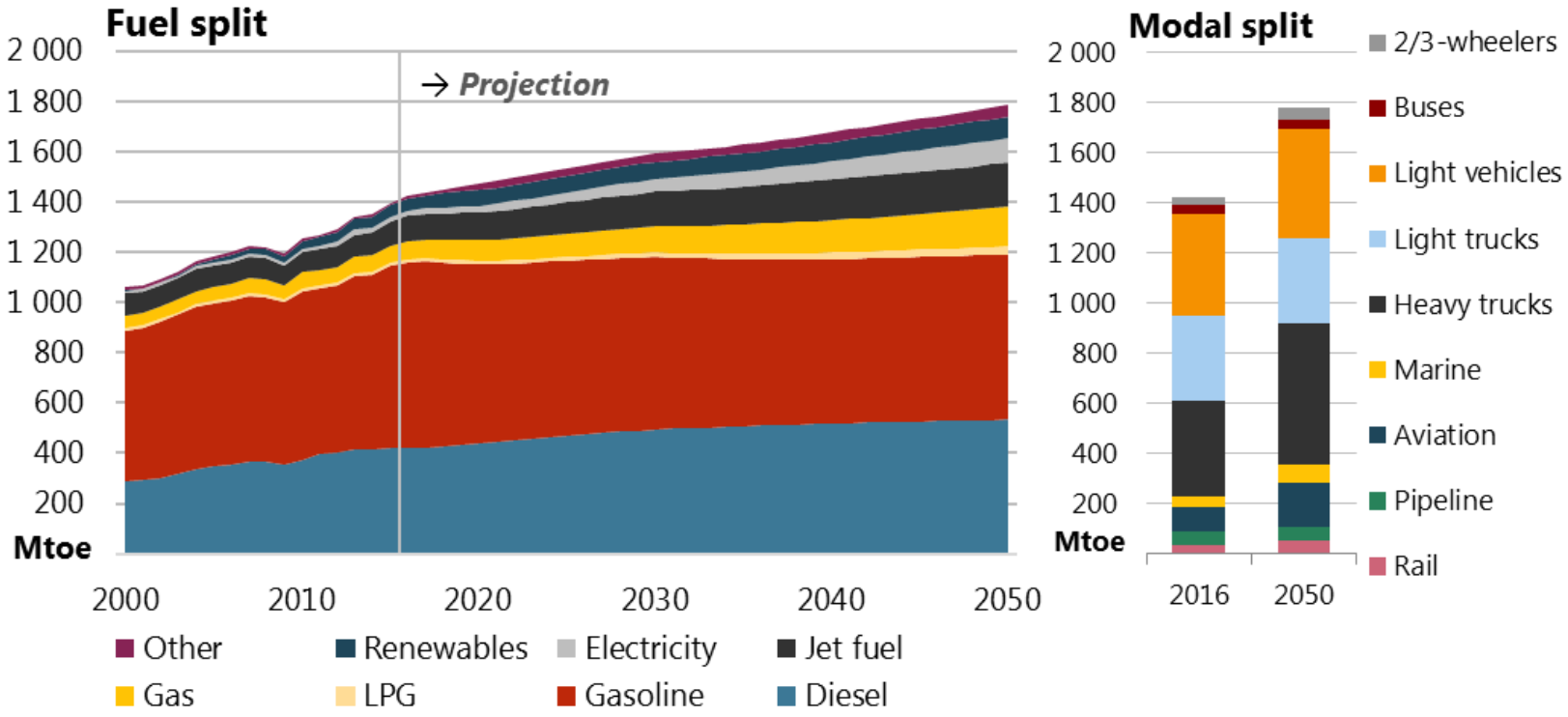


Sources: APERC analysis and IEA (2018).

Fuel switching, urbanisation and a rising service economy increase demand over the Outlook period.

Transport buoyed by world trade and rising incomes

Domestic transport sector final energy demand, by fuel and mode, 2000-2050

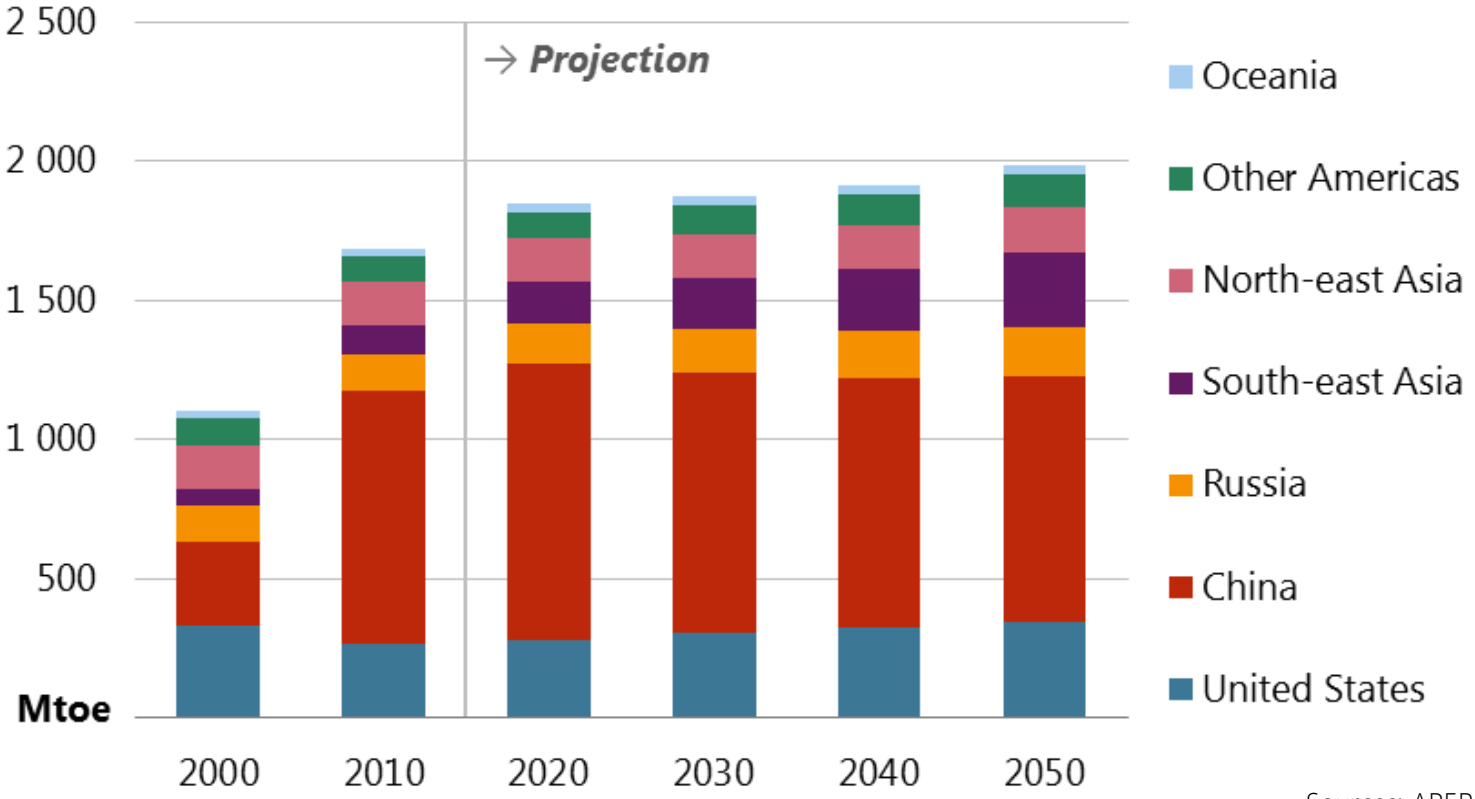


Sources: APERC analysis and IEA (2018).

Oil use continues to dominant transport fuel mix; energy efficiency limits growth, particularly in gasoline.

Most industrial growth occurs in SEA

Industry sector final energy demand, by region, 2000-2050

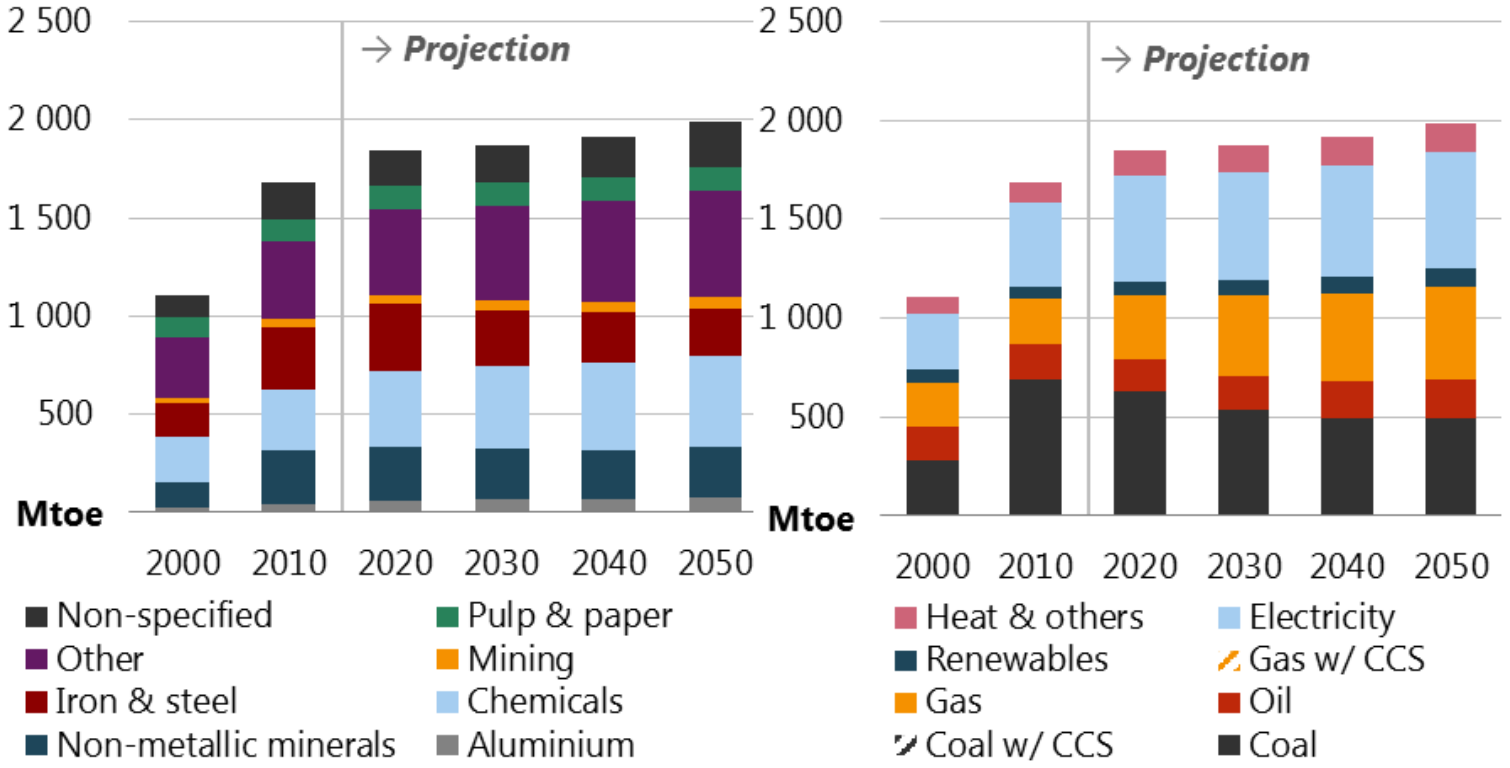


Sources: APERC analysis and IEA (2018).

Small growth overall, as declines in China offset by growth in SEA, US and Russia.

Petrochemicals drive industrial demand

Domestic transport sector final energy demand, by fuel and mode, 2000-2050

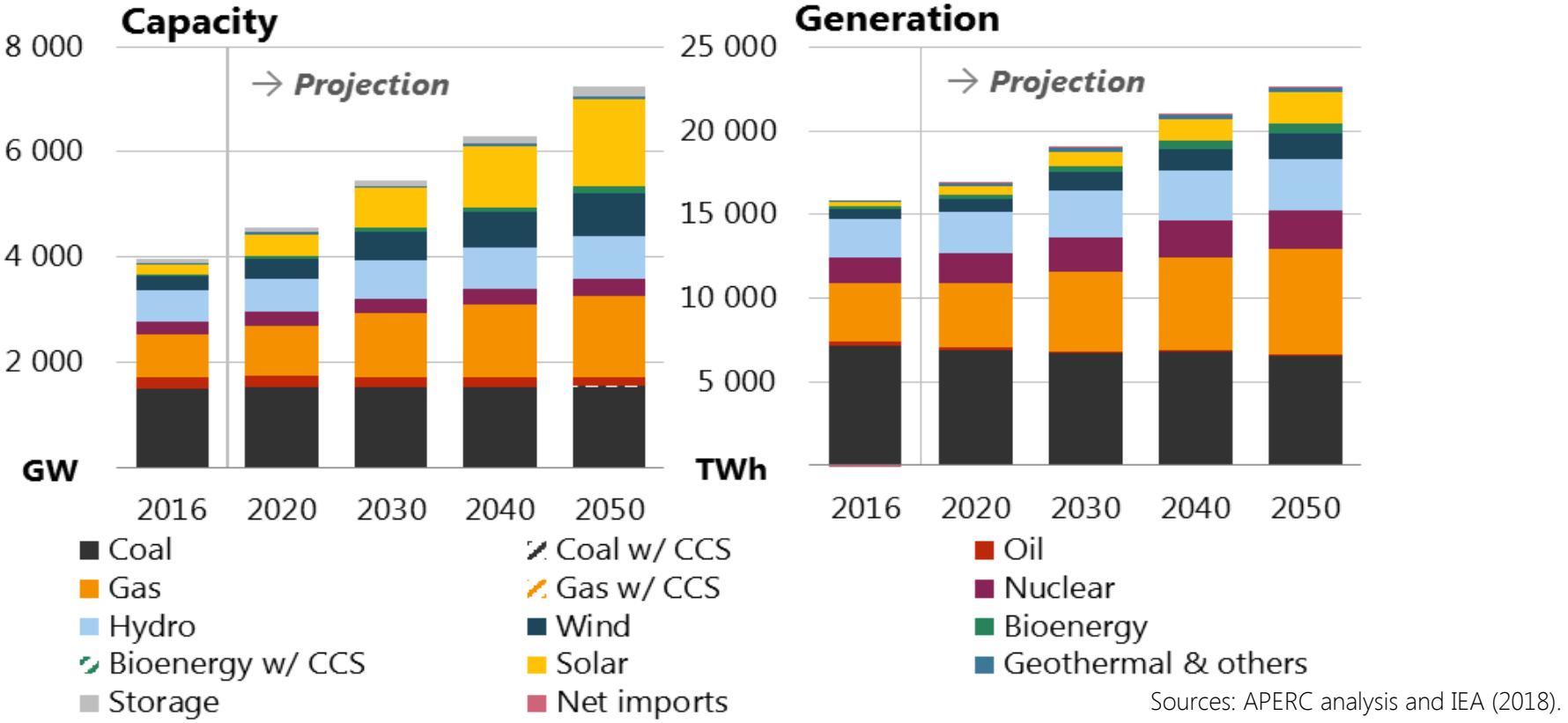


Sources: APERC analysis and IEA (2018).

China's structural shift reduces coal use, while gas and electricity use rise to fuel needs of other sectors.

Cooling, heating, cooking boost electricity demand

Power **capacity** and electricity generation, by fuel, 2016-50

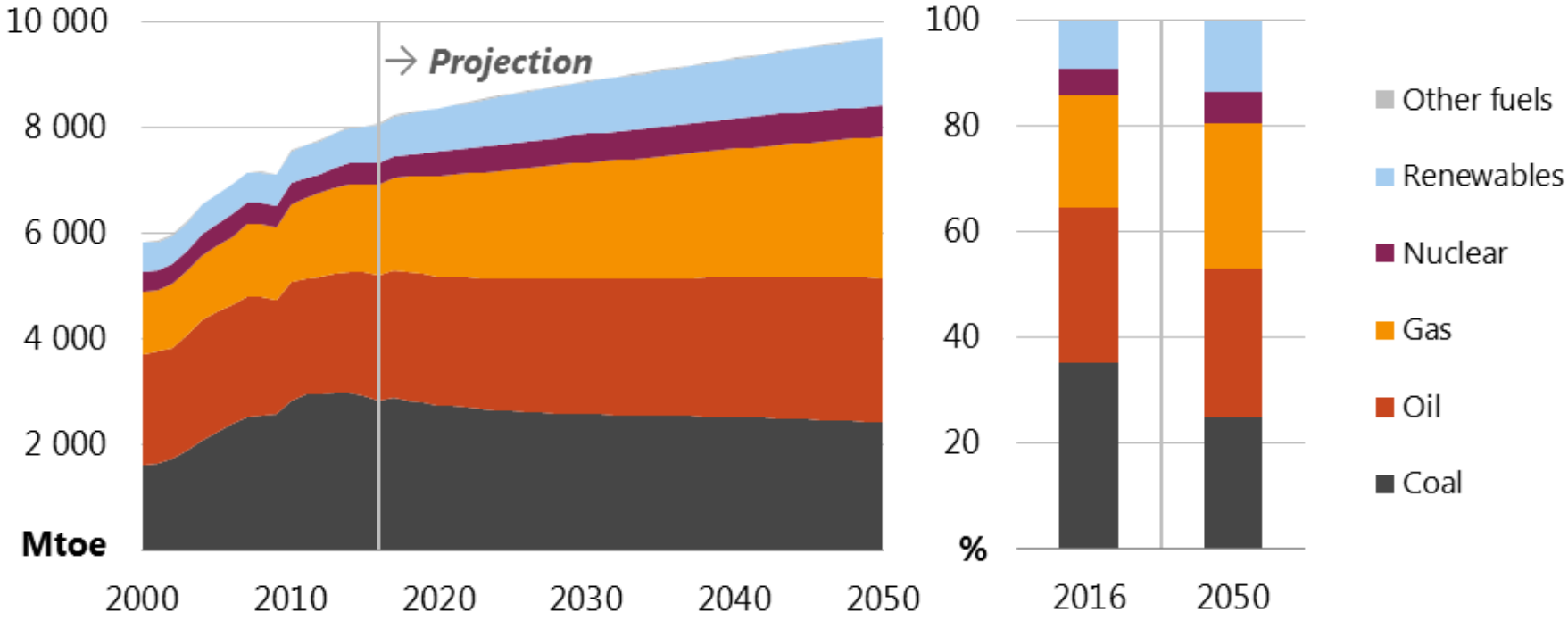


Sources: APERC analysis and IEA (2018).

More than 3,200 GW of new capacity needed, of which 44% would be renewables.

Fossil fuels continue to dominate supply

Total primary energy supply by fuel in BAU, 2000-50

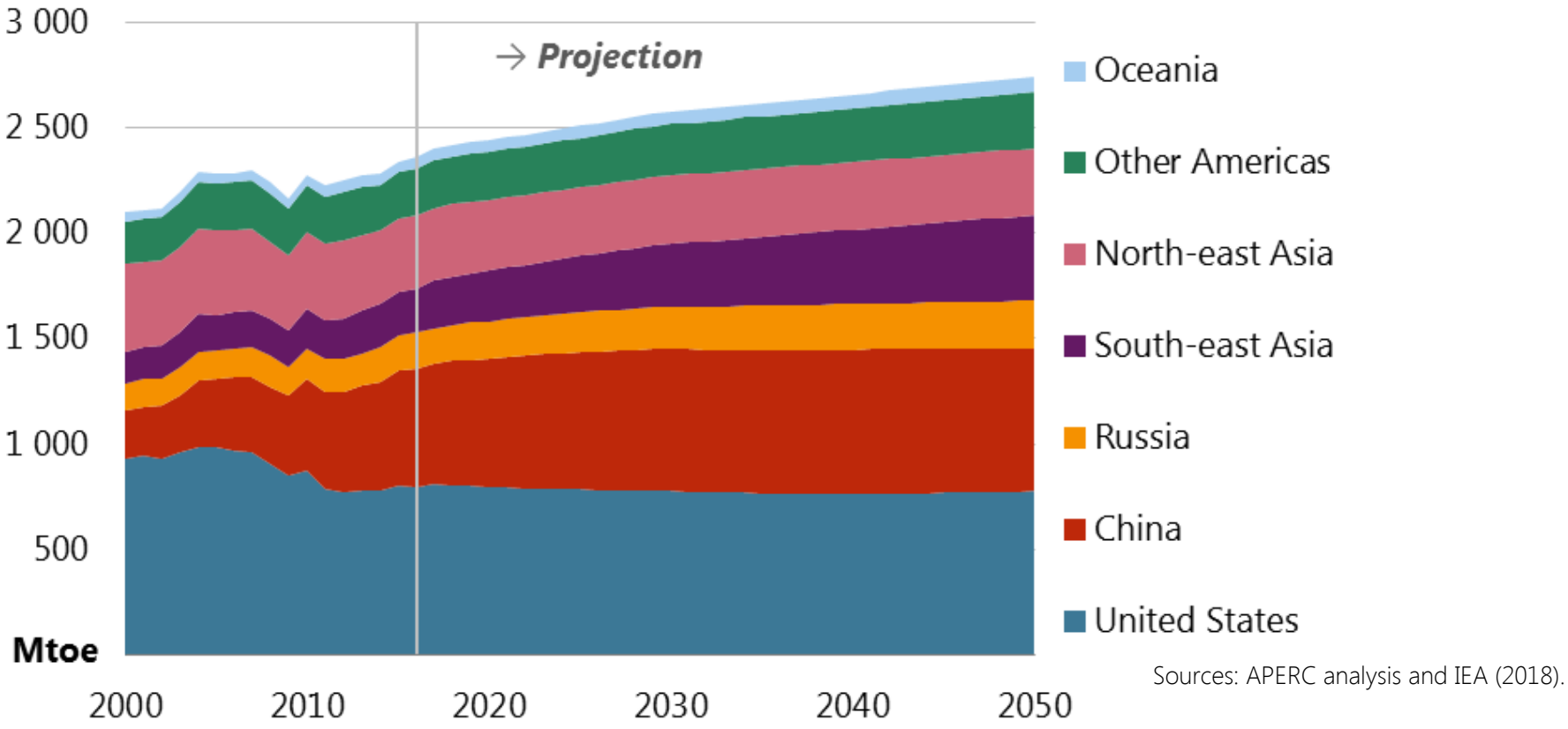


Sources: APERC analysis and IEA (2018).

Natural gas increasingly substitutes for coal, as increased production and trade enable lower prices.

Oil needs of APEC grow 16% in the BAU

Oil supply by region, 2000-50

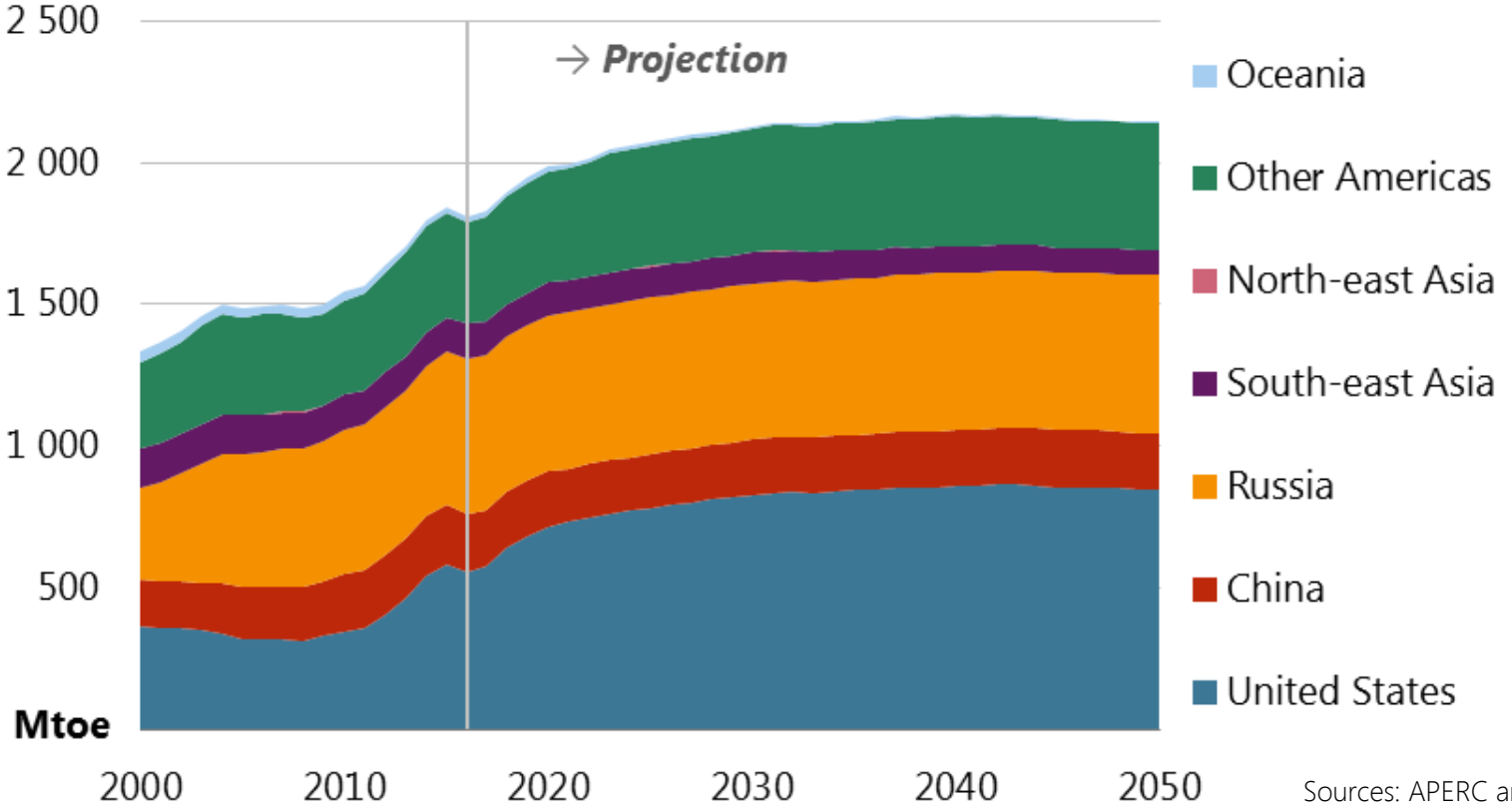


Sources: APERC analysis and IEA (2018).

Oil supply grows to meet rising refining needs in China and SEA.

US, OAM, Russia lead oil production growth

Oil production by region, 2000-50

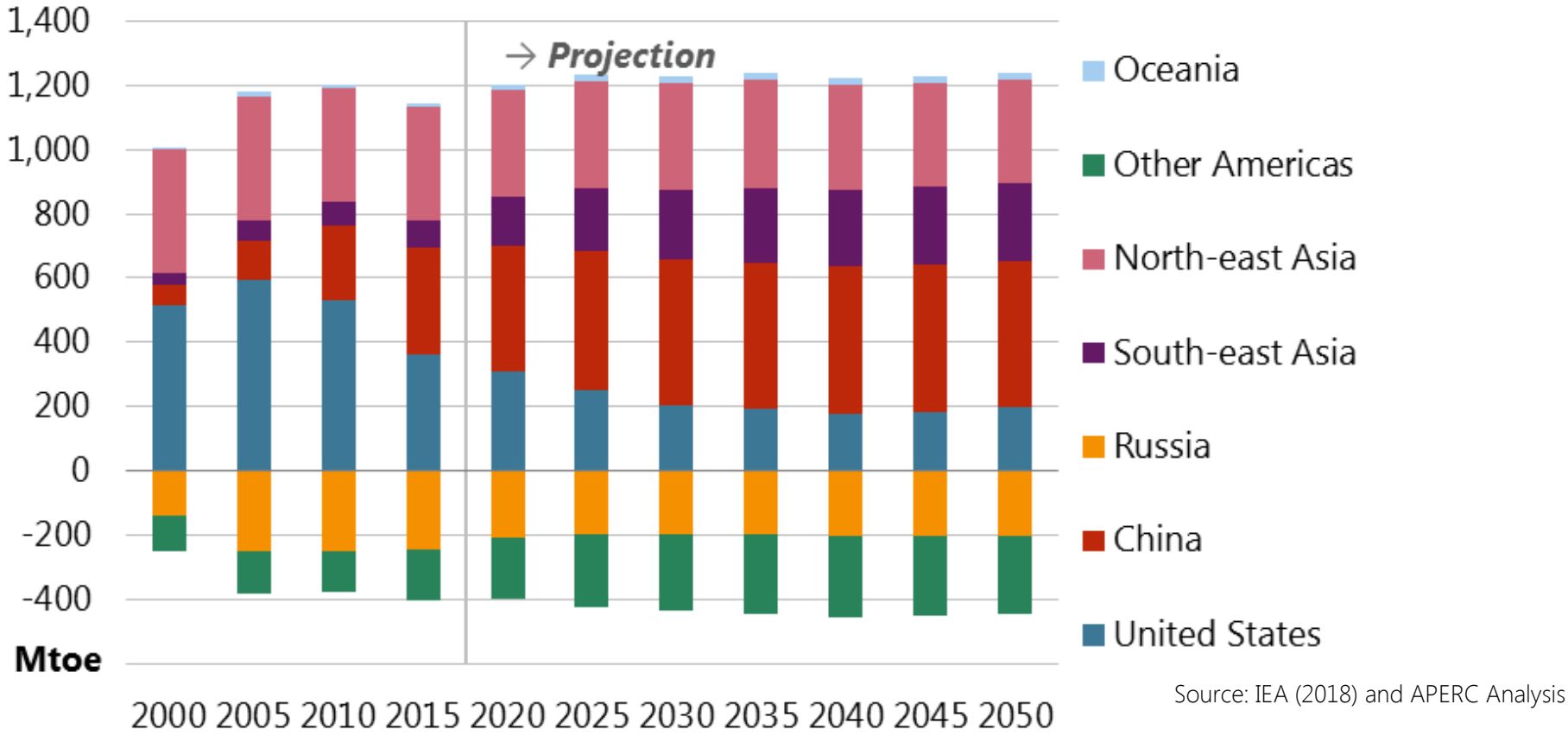


Sources: APERC analysis and IEA (2018).

Trade flows in the APEC region driven by the locus of supply growth being centered away from demand growth, which drives trade flows.

APEC remains a net importer of oil in BAU

Net imports of oil, by region, 2000-2050

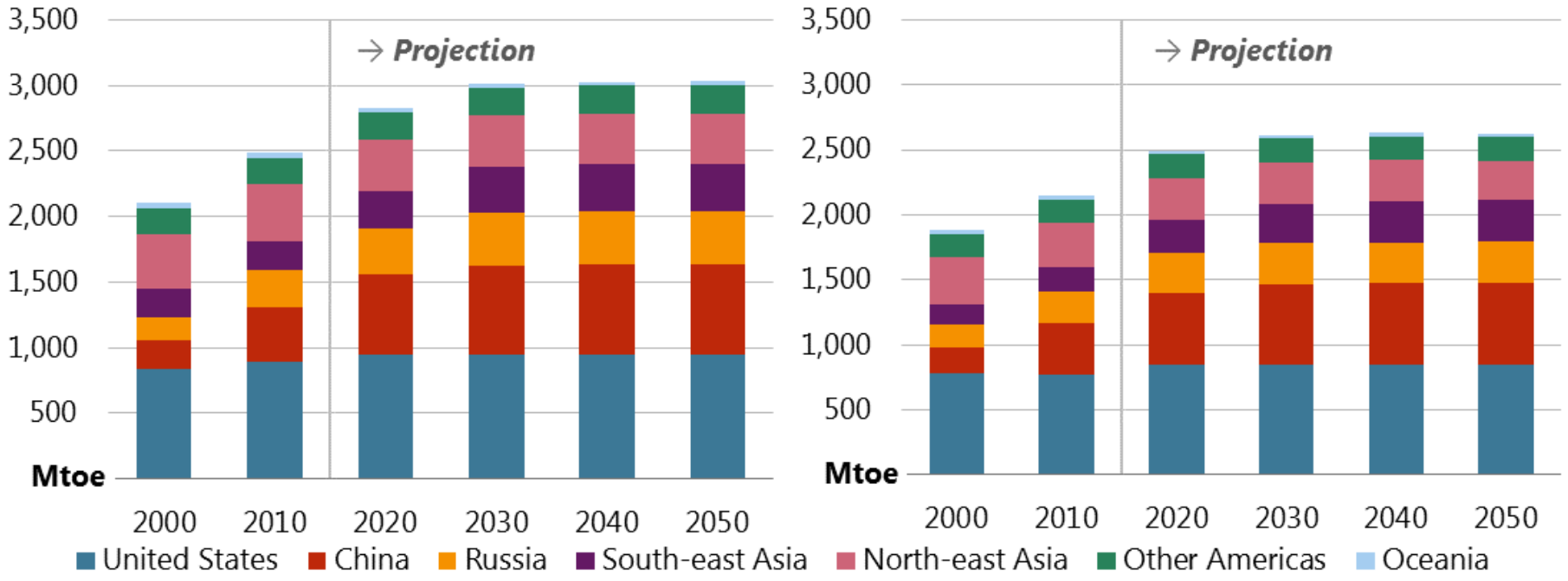


Source: IEA (2018) and APERC Analysis

Most economies continue to be net oil importers, while the Non-APEC region continues to play an integral role in supplying crude.

Refining capacity rises to meet need for oil products

Refining Capacity (LHS) and Production (RHD) by region, 2000 - 2050

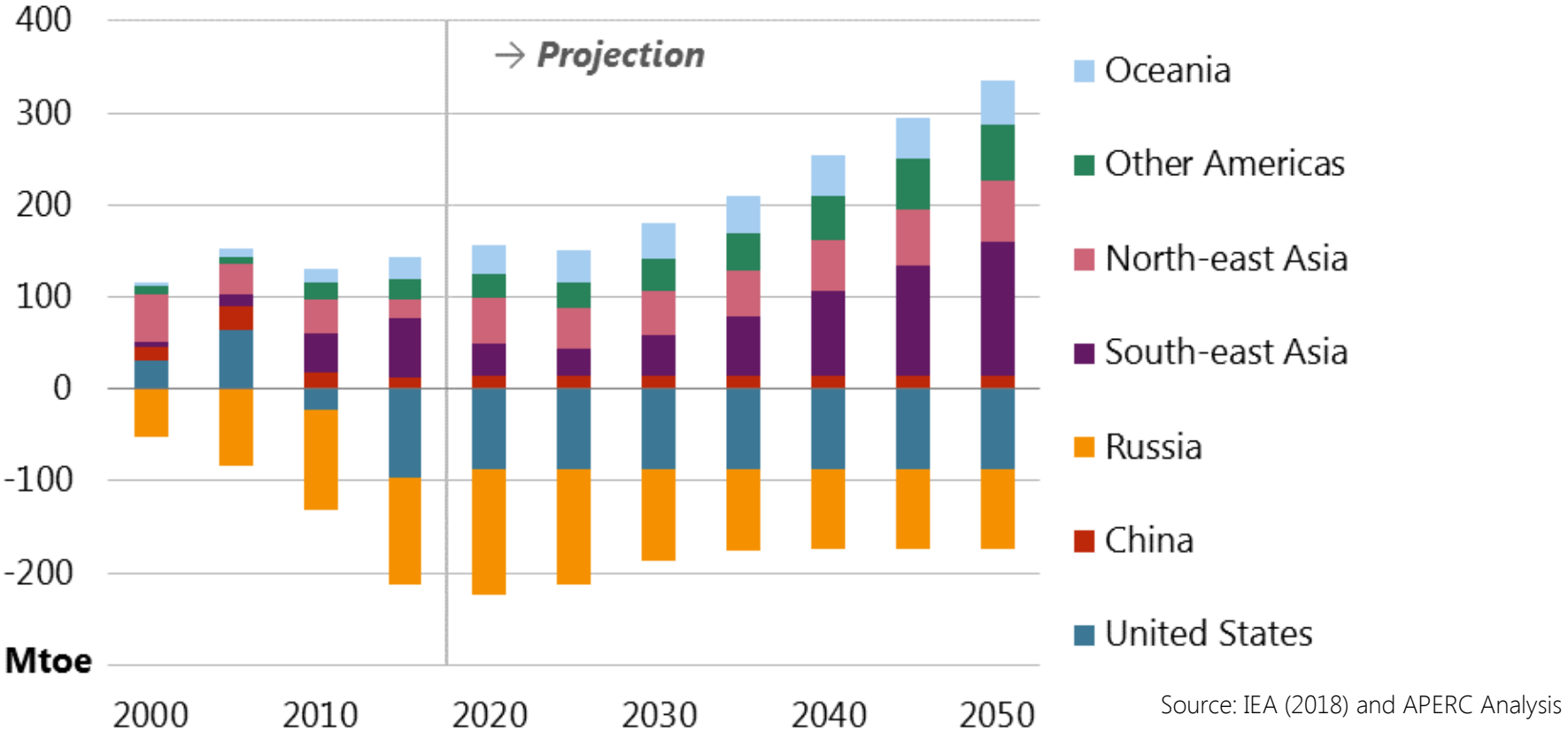


Source: APERC analysis, IEA (2018)

Refining capacity growth centered in China, SEA and Russia.

APEC becomes net importer of oil products

Net imports of oil products, by region, 2000-2050

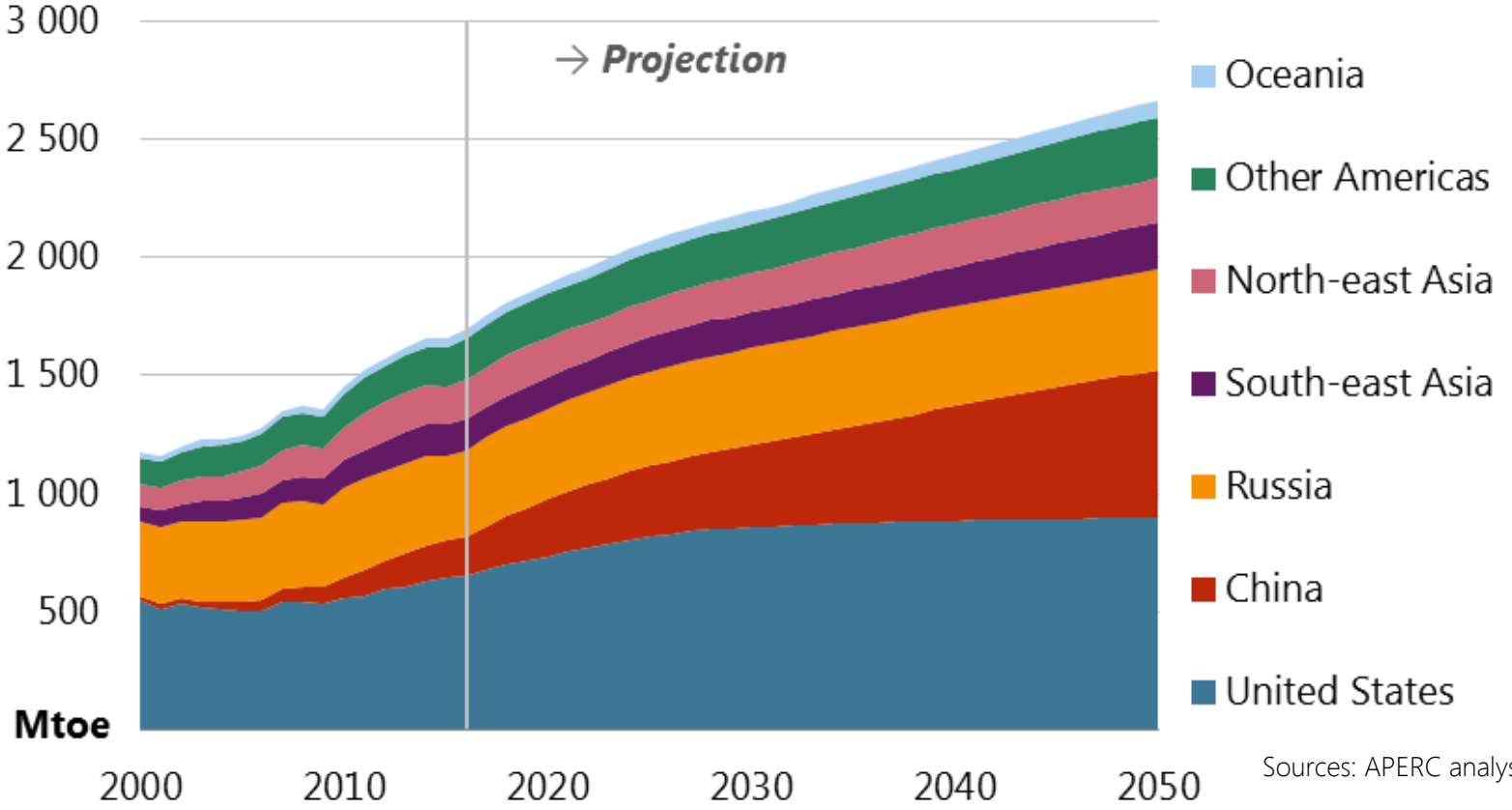


Source: IEA (2018) and APERC Analysis

Russia and US remain net exporters of oil products, with SEA the largest APEC growth market.

Gas needs increase significantly throughout APEC …

Gas supply by region, 2000-50

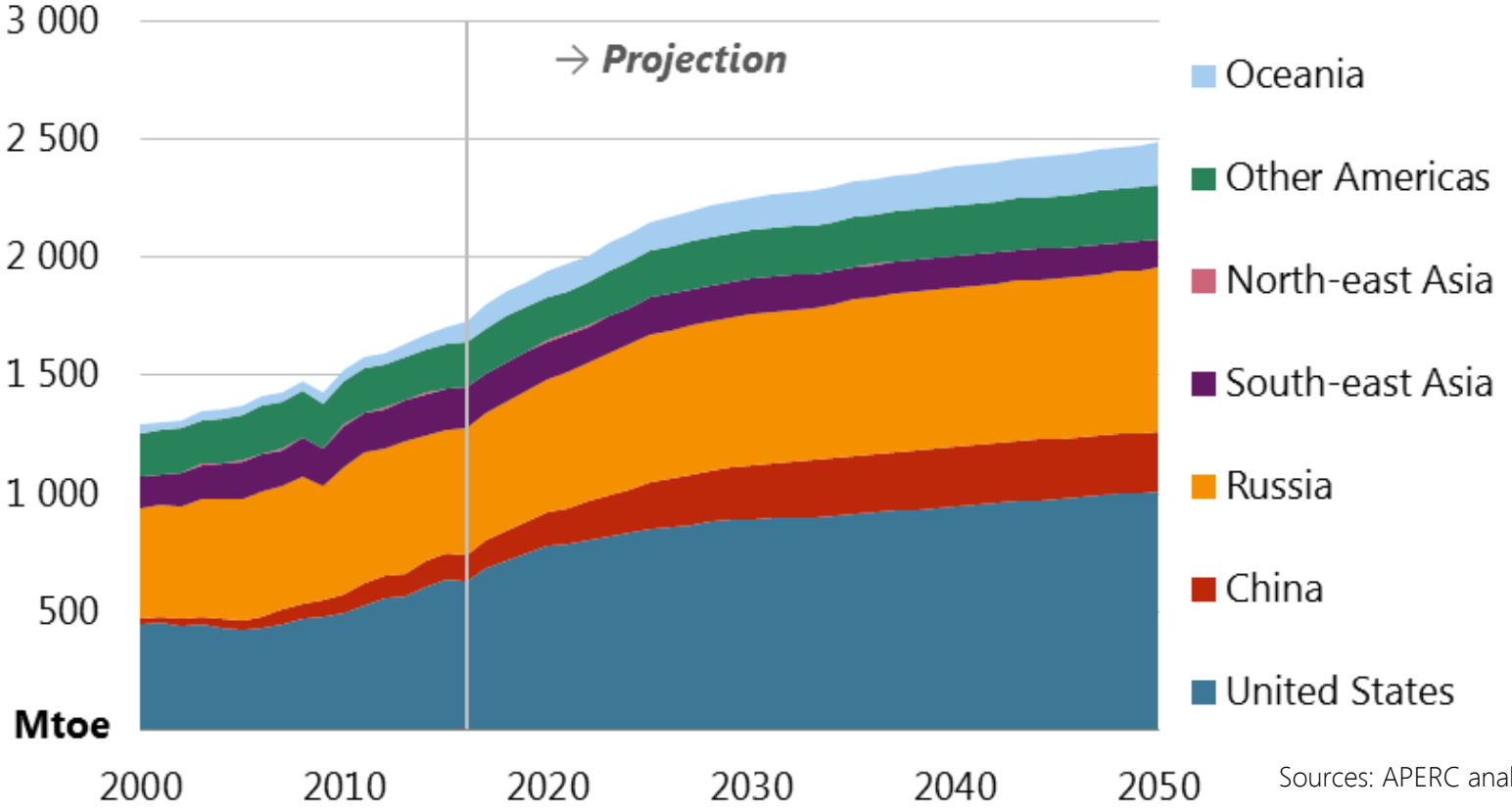


Sources: APERC analysis and IEA (2018).

Gas demand grow throughout APEC, but is concentrated in the US and China.

… but production growth limited to several economies…

Gas production by region, 2000-50

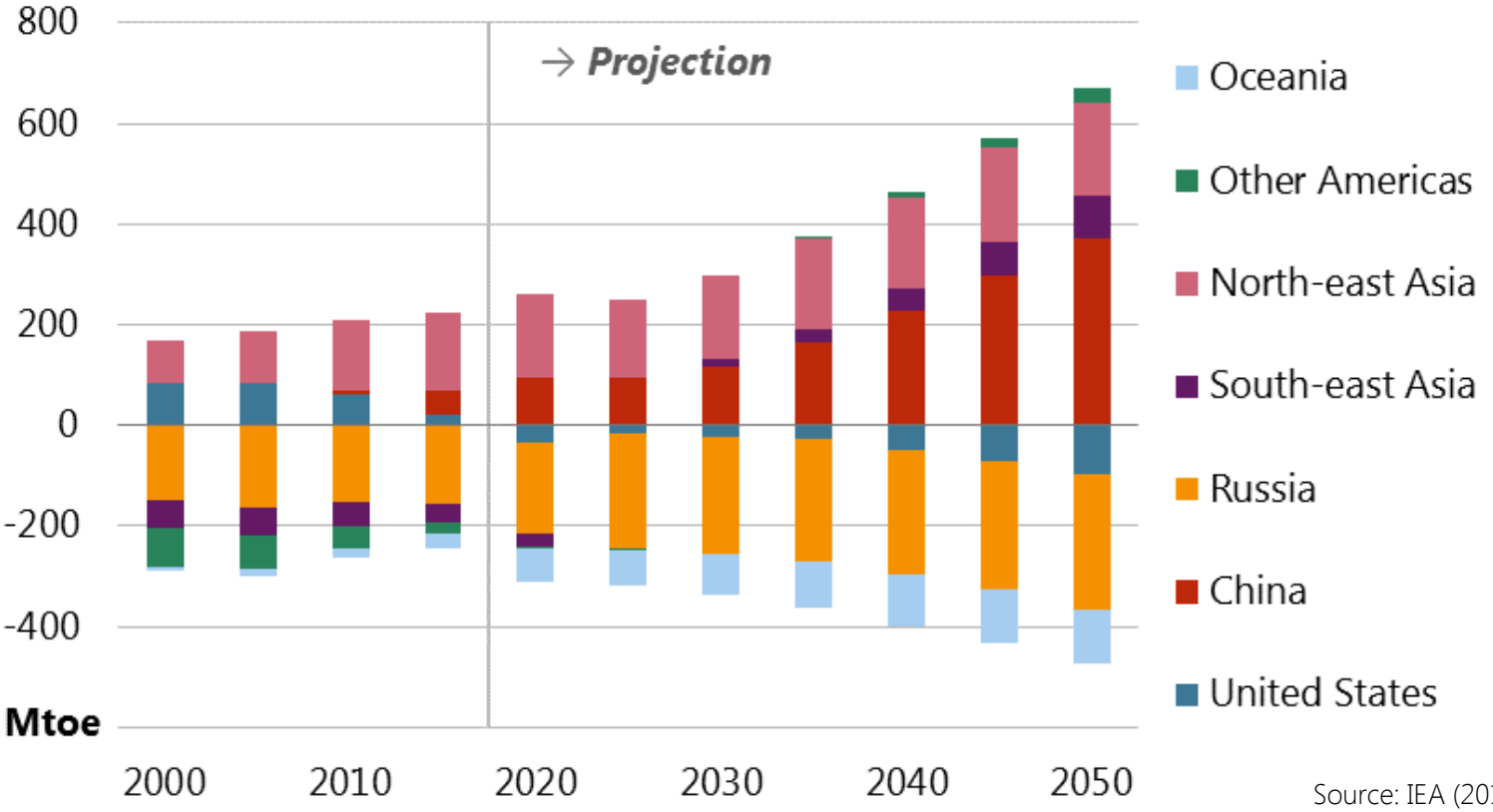


Sources: APERC analysis and IEA (2018).

Several global leaders see production volumes grow in excess of supply needs.

… which drives gas trade in the APEC region.

Net imports of gas, by region, 2000-2050

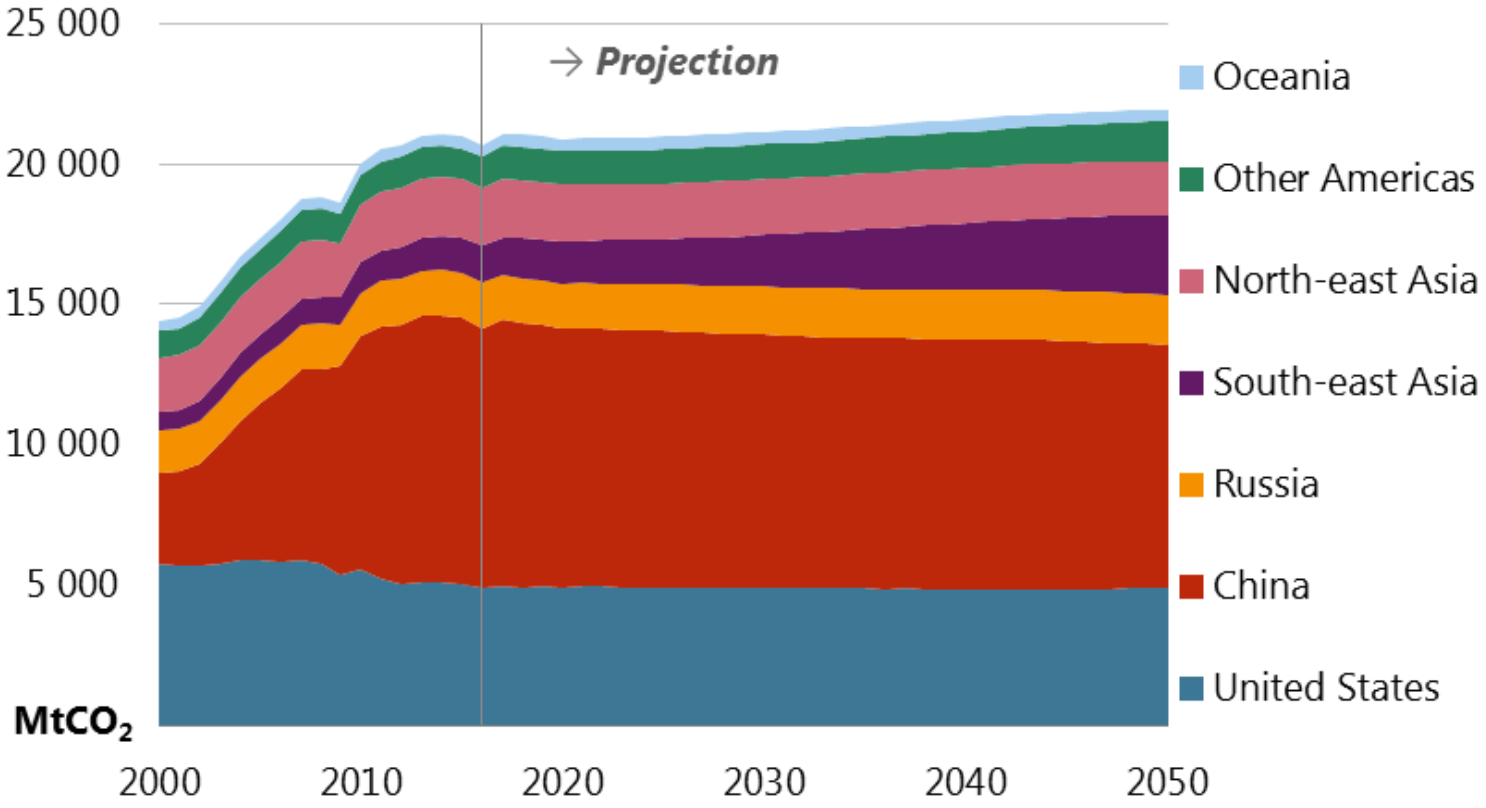


Source: IEA (2018) and APERC Analysis

APEC becomes a net gas importer; gas needs in China, SEA and NEA outweigh production growth.

Emissions reflect fossil fuel dynamics of APEC energy system

Total CO2 emissions, by region, 2000-2050



Fossil fuels continue to meet rising energy needs but reduced coal use limits emissions growth.

3. Alternative scenarios

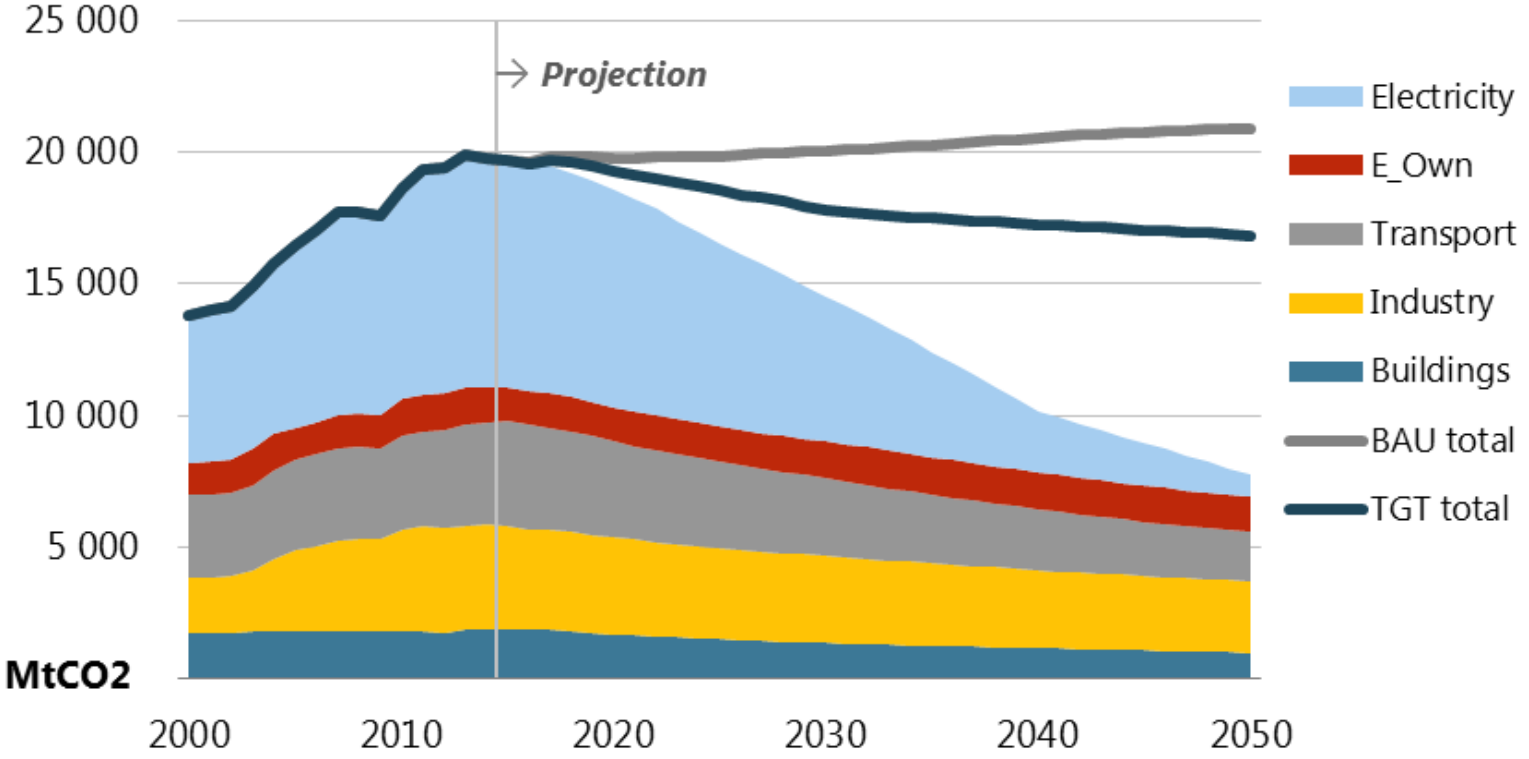
Scenarios

Business-as-Usual (BAU)	APEC Target (TGT)	2-Degrees Celsius (2DC)
Recent trends and current policies.	Pathway that achieves APEC-wide goals to • reduce energy intensity 45% by 2035 • double the share of renewables by 2030.	Pathway that provides a 50% chance of limiting the average global temperature rise to 2°C.
Provides a baseline for comparison.	Explores implications of alternative scenarios and identifies gaps to overcome.	

4. 2DC scenario

In 2DC, CO_2 emissions fall below 2016 levels

Total CO_2 emissions by sector in the 2DC, and other scenarios, 2016-50

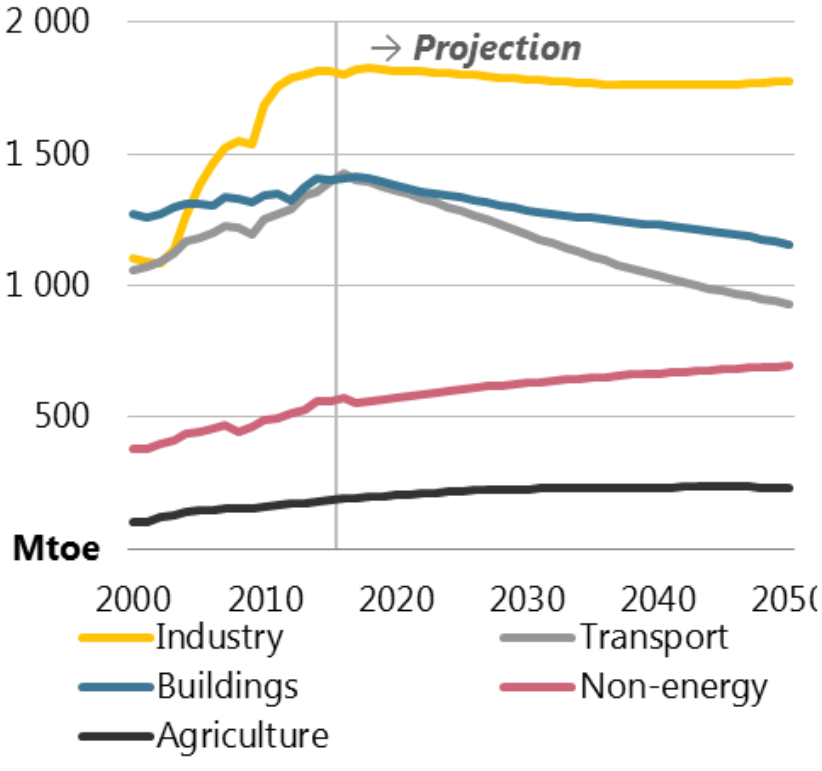


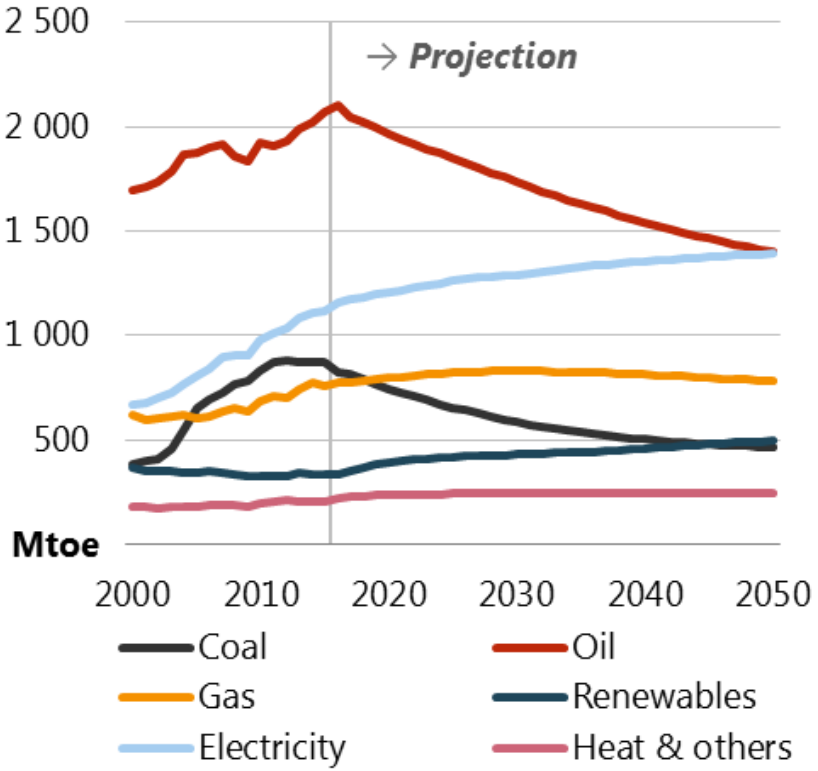
Sources: APERC analysis, IEA (2016 and 2018), IPCC (2018) and UNFCCC (2018).

Electricity sector decarbonisation drives a 2.6% per annum decrease in CO_2 emissions. Industry decarbonisation is challenging.

FED declines led by transport and buildings

Final energy demand, by sector and fuel, 2DC, 2000-2050



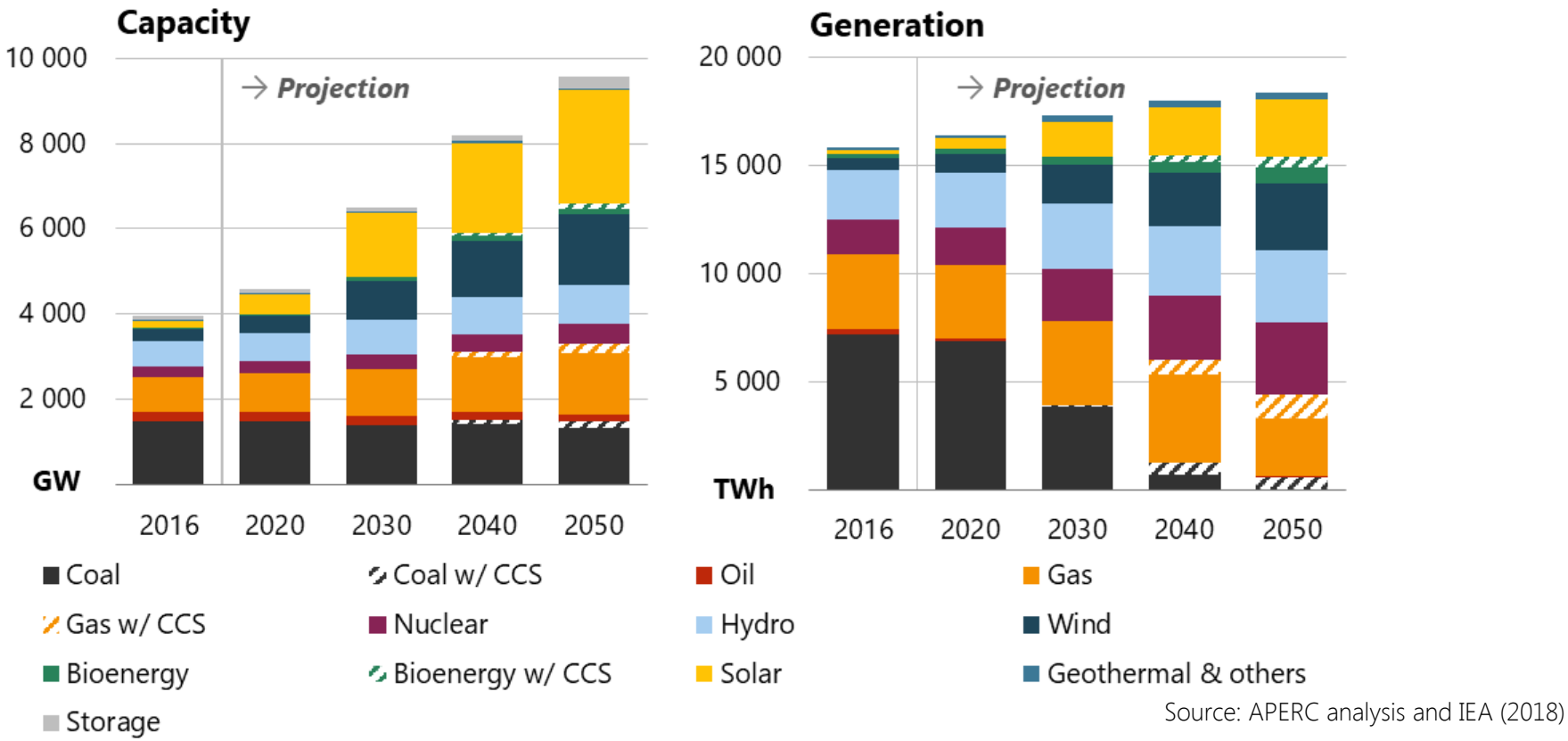


Source: APERC analysis and IEA (2018)

Energy efficiency gains reduce energy use. Fossil fuel use curbed but still predominant.

A range of technologies and fuels are required in the 2DC

APEC power capacity and electricity generation in the 2DC by fuel, 2016-50

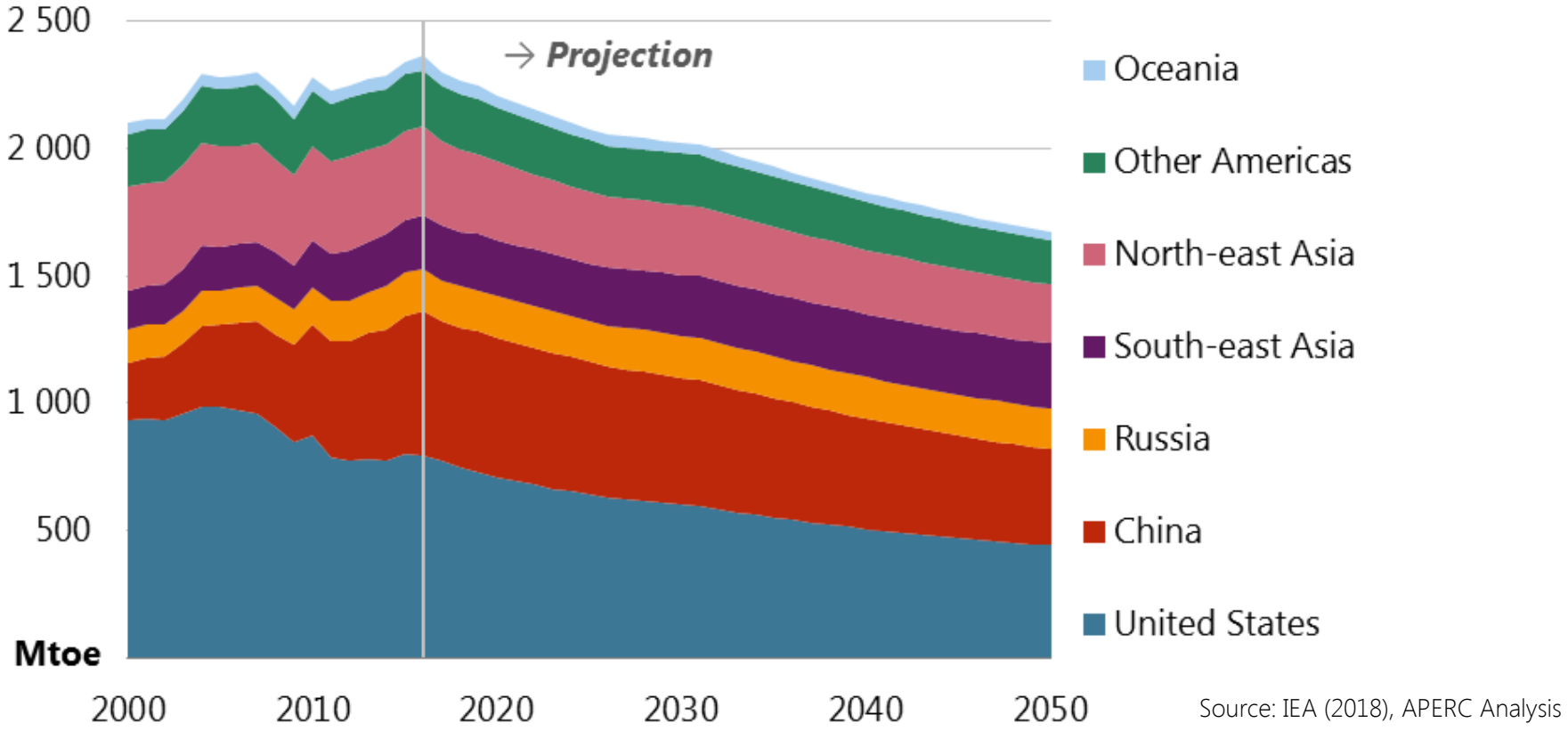


Source: APERC analysis and IEA (2018)

Nuclear and CCS are key technologies to meet these modelled CO_2 emissions reductions, while gas generation peaks in 2040.

Oil Supply in 2DC

TPES of oil, by region, 2000-2050

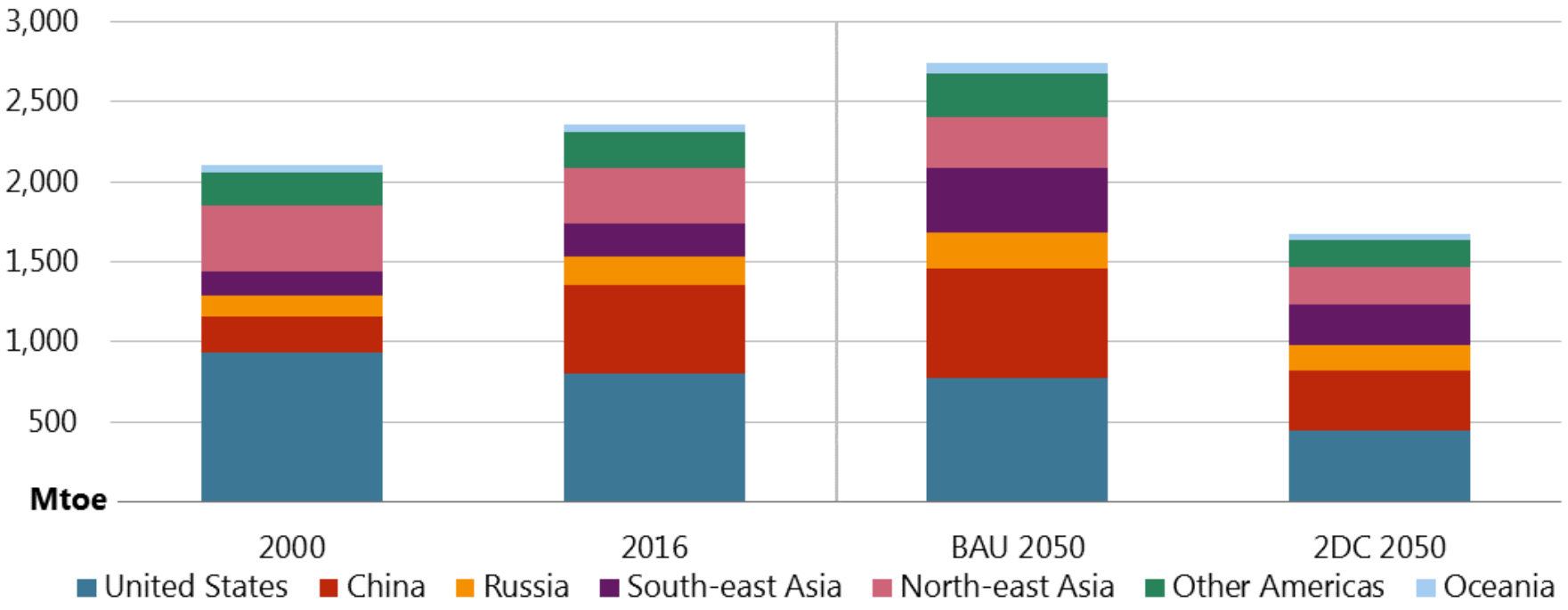


Source: IEA (2018), APERC Analysis

Oil needs in APEC decline immediately in almost every sector.

Oil Supply Changes in 2DC

TPES of oil, by region, 2000-2050

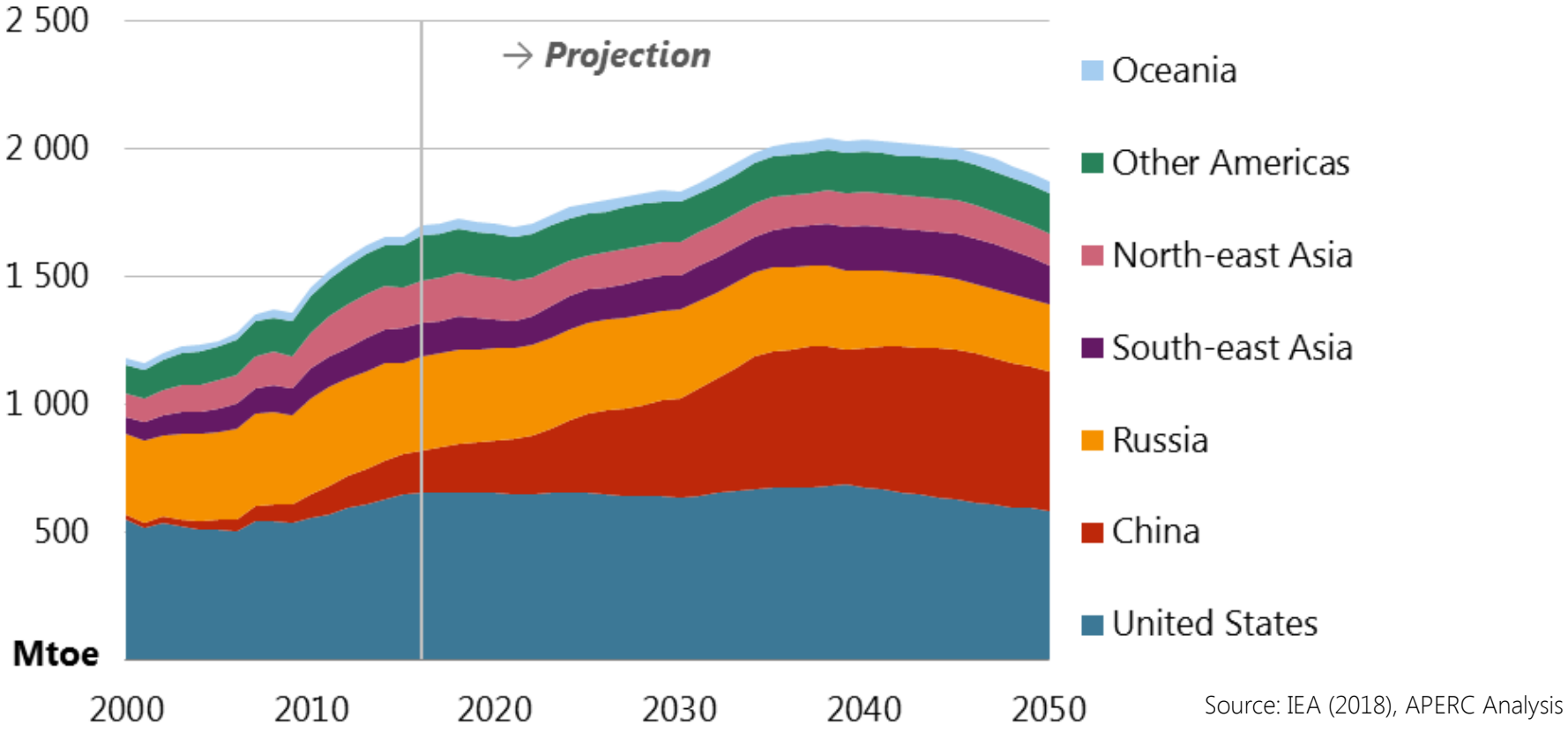


Source: IEA (2018), APERC Analysis

SEA presents a growth opportunity for oil growth despite the reduction APEC supply needs in the 2DC.

Gas Supply in 2DC

TPES of gas, by region, 2000-2050

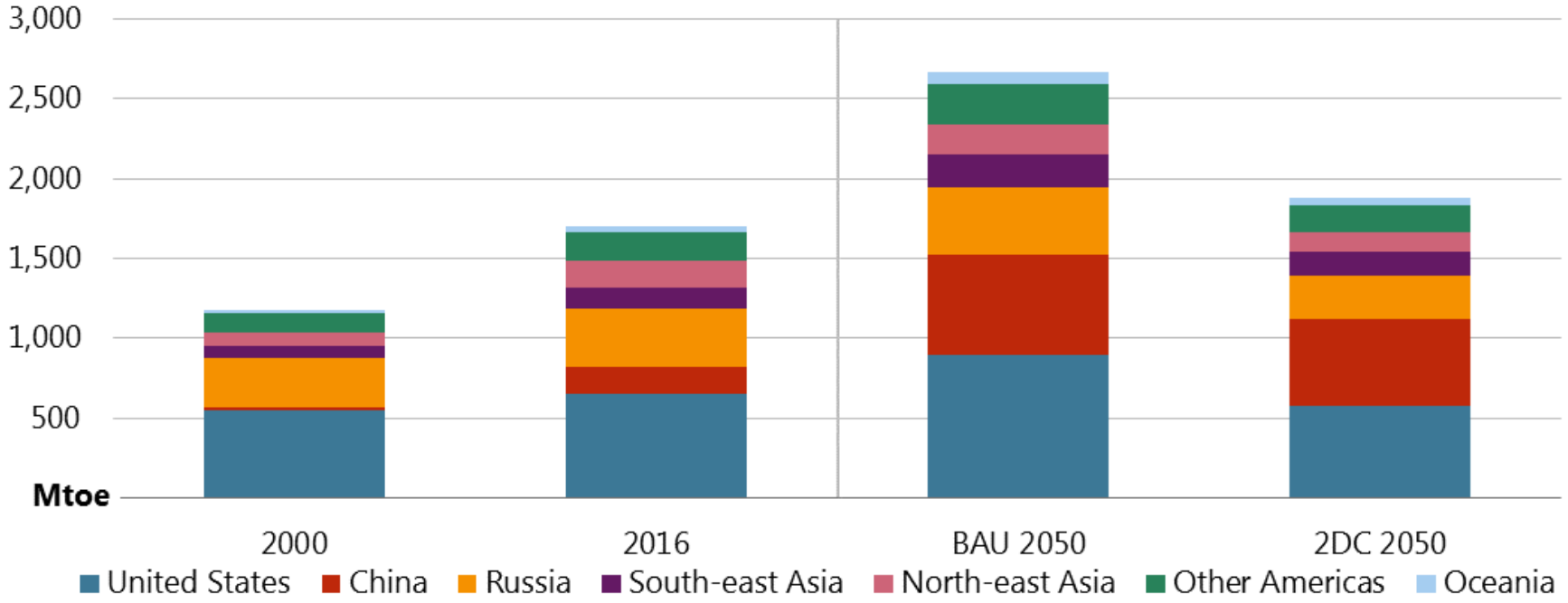


Source: IEA (2018), APERC Analysis

Gas remains a growth opportunity well into the 2030s.

Gas Supply Changes in 2DC

TPES of gas, by region, 2000-2050

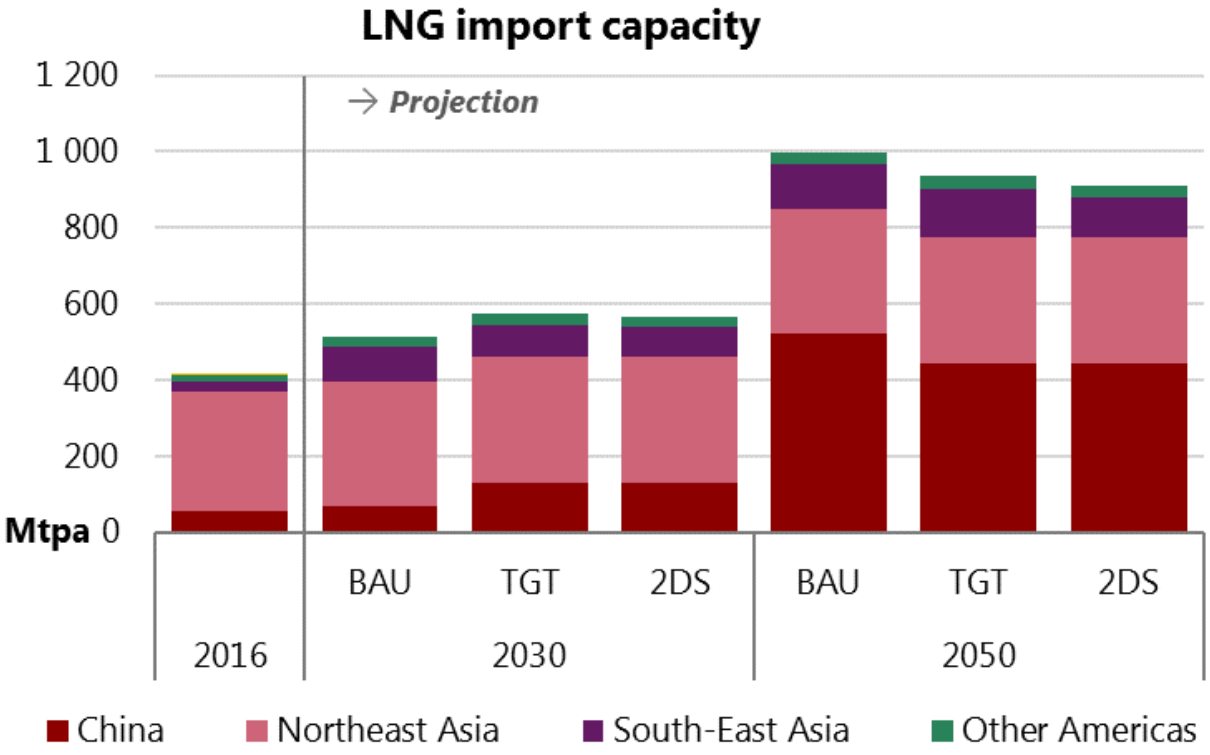


Source: IEA (2018), APERC Analysis

China still a growth area in 2DC, as it continues to phase-out coal-fired generation.

Regasification needs decline in the 2DC

Select regasification trends in all scenarios

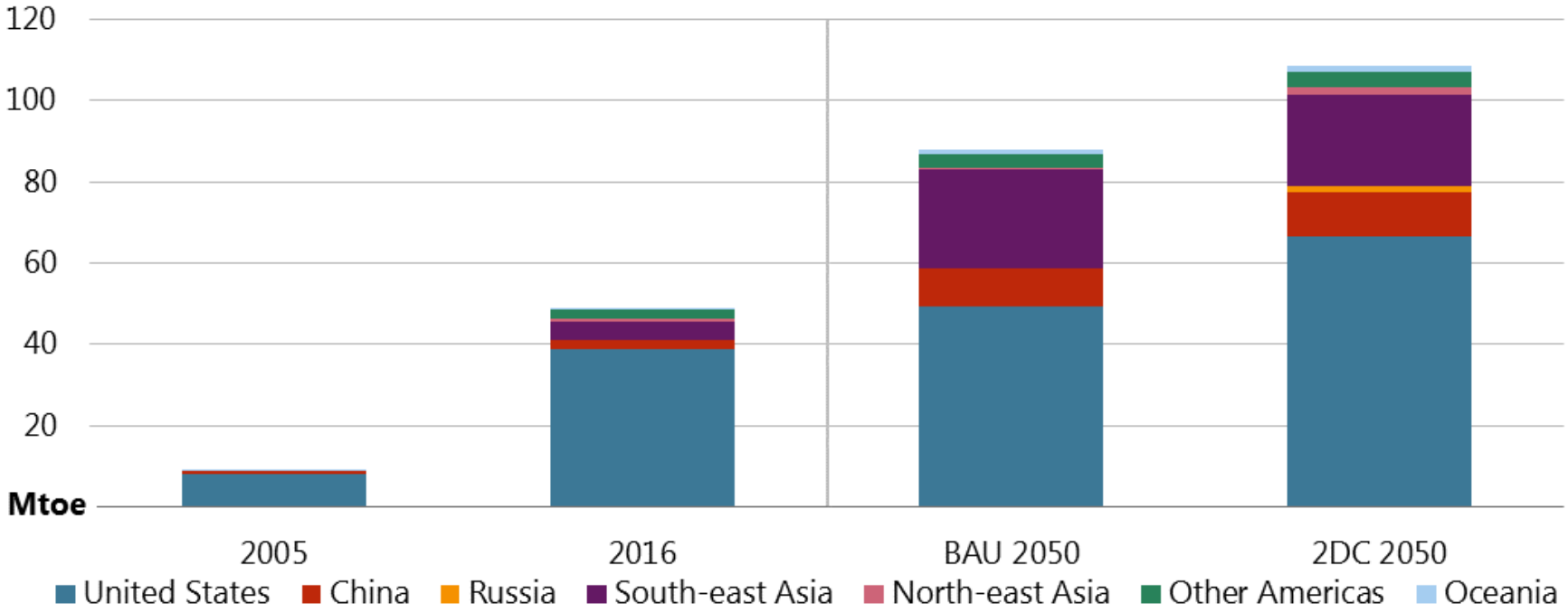


Source: APERC Analysis

Substantial investment in liquefaction capacity is needed to meet gas demand in several APEC regions in the 2DC.

Liquid renewable demand changes in 2DC

Liquid renewables, by region, 2000-2050

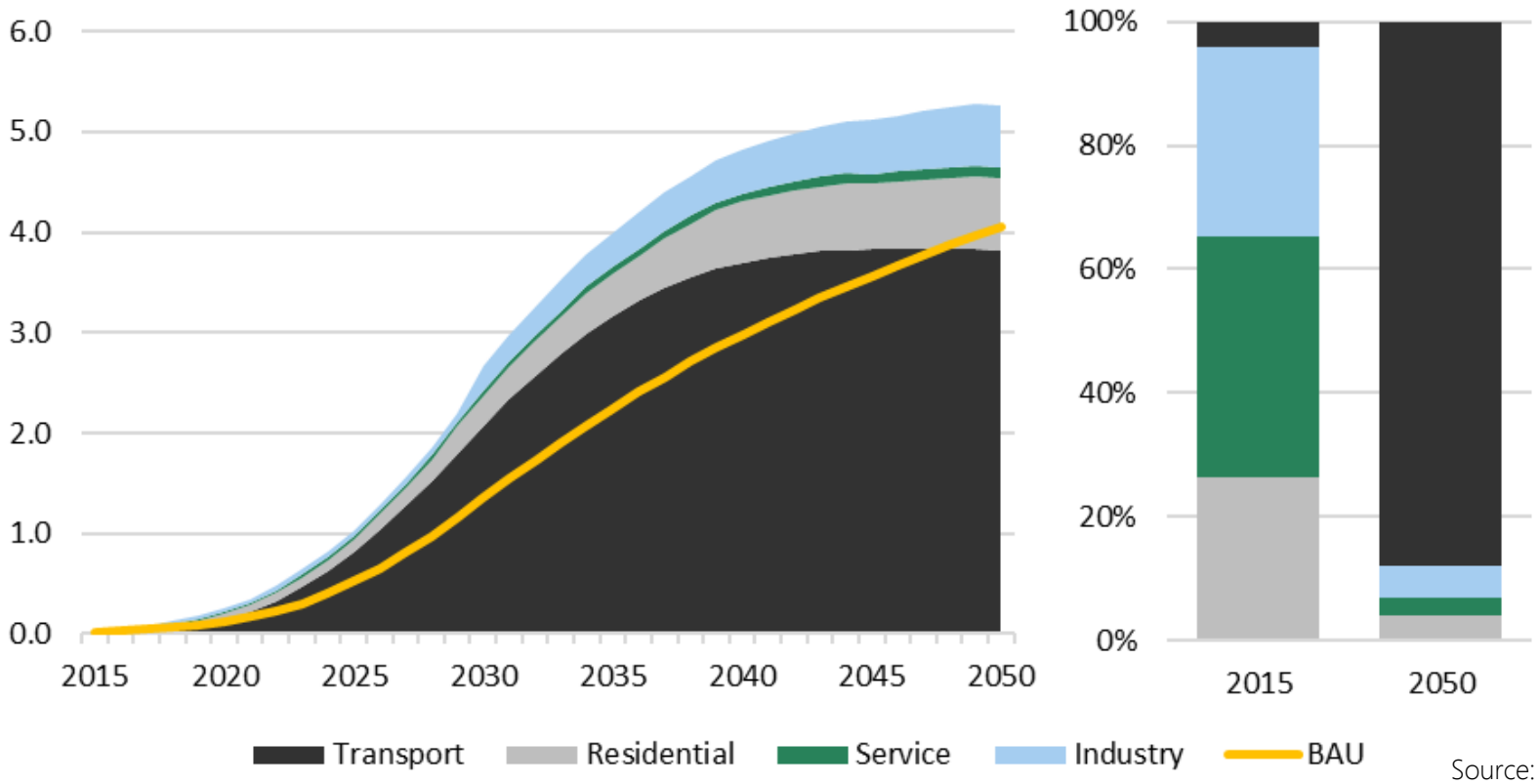


Source: IEA (2018), APERC Analysis

USA, China and SEA are significant growth markets for biofuels in both scenarios.

Hydrogen demand opportunities increase in the 2DC

Hydrogen demand in the 2DC and BAU



Source: APERC Analysis

Growth centered in China, US, Korea and Japan, with notable growth in Canada and Australia.

Key APEC-wide trends through 2050

- Fossil fuels continue to dominate the supply mix in the BAU and 2DC
- Electricity demand rises in all scenarios.
- Gas growth opportunities are reduced in the 2DC but still persist due to its role as a bridge fuel
- Oil growth opportunities limited to SEA in 2DC
- Potential for stranded assets in 2DC
- Efficiency, renewables, nuclear and CCS are all required to achieve COP 21 goals
- Hydrogen and biofuel opportunities in BAU the 2DC

Thank you!

https://aperc.ieej.or.jp/

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