13.a. Oil and Gas Security Studies (OGSS)

Final report of OGSS 20: What are the energy security implications of recent declines in both APEC and global spare petroleum refining capacity?

The 68th Meeting of APEC Energy Working Group (EWG68)
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Timeline of OGSS No. 20

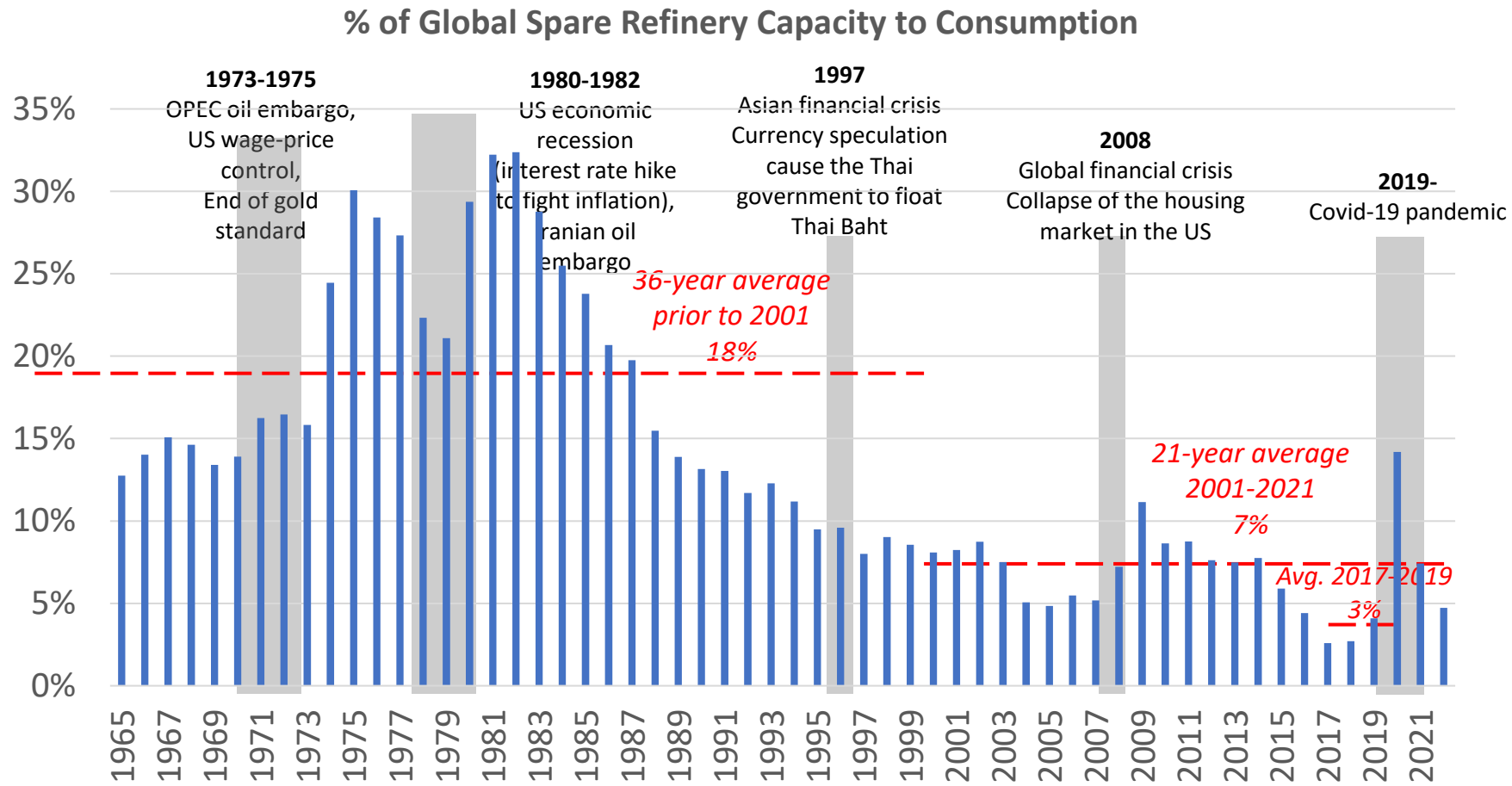
March 2024:	Presentation of first draft to the 7th OGSN Forum.
May 2024:	Presentation of draft final report to EGCFE 2024.
August 2024:	Presentation of final report to EWG 68.
By End 2024:	Publish on APEC Website.

Table of content of OGSS No.20

Historical trends:

Globally, the ratio of spare refinery capacity to product consumption shows a declining trends.

- Global refinery capacity has not kept pace with growing petroleum product consumption.
- Average ratio of spare refinery capacity[1] over consumption declined from 18% prior to year 2001 to 7% post-2001, and further to average 3% during 2017-2019 prior to the pandemic.

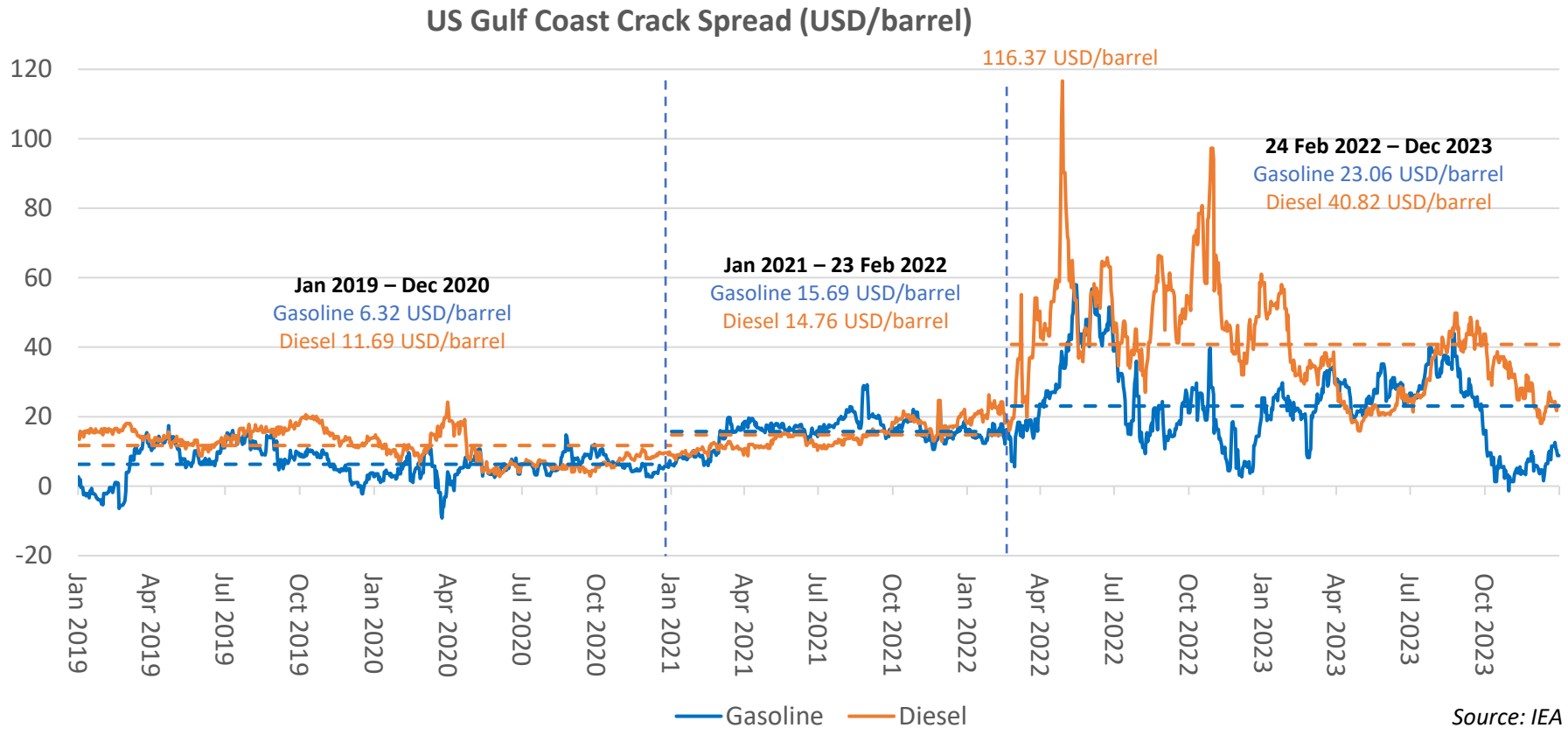


([1] Atmospheric distillation capacity less petroleum products consumption)

Source: BP Energy Statistics 2022 and APERC analysis

Low level of spare refinery capacity in APEC and the world likely contributed to increases in gasoline and diesel crack spreads.

- Average US Gulf Coast gasoline crack spread[2] increased from 6.32 USD/bbl in 2019-2020 to almost threefold to 15.69 USD/bbl in 2021 and 2022 prior to February, and almost fourfold to 23.06 USD/bbl after that date.
- Average diesel crack spread showed similar trends, with its peak at a historic 116.37 USD/bbl on 28 April 2022.
- Crack spreads in Singapore market experienced similar impacts, but at lesser degree.

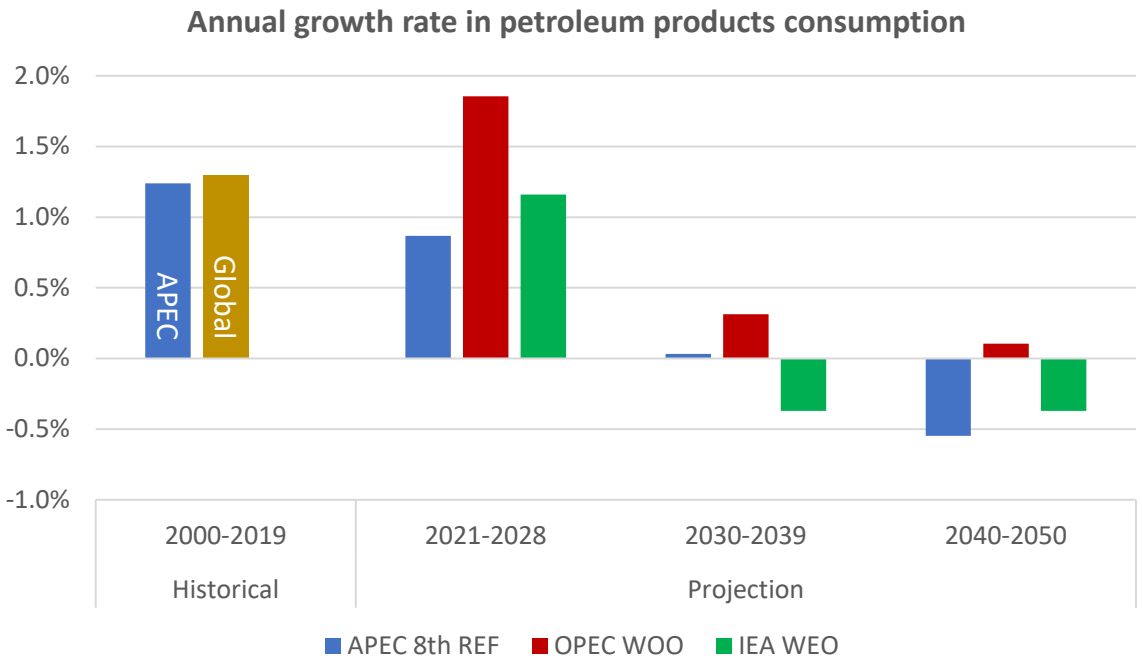


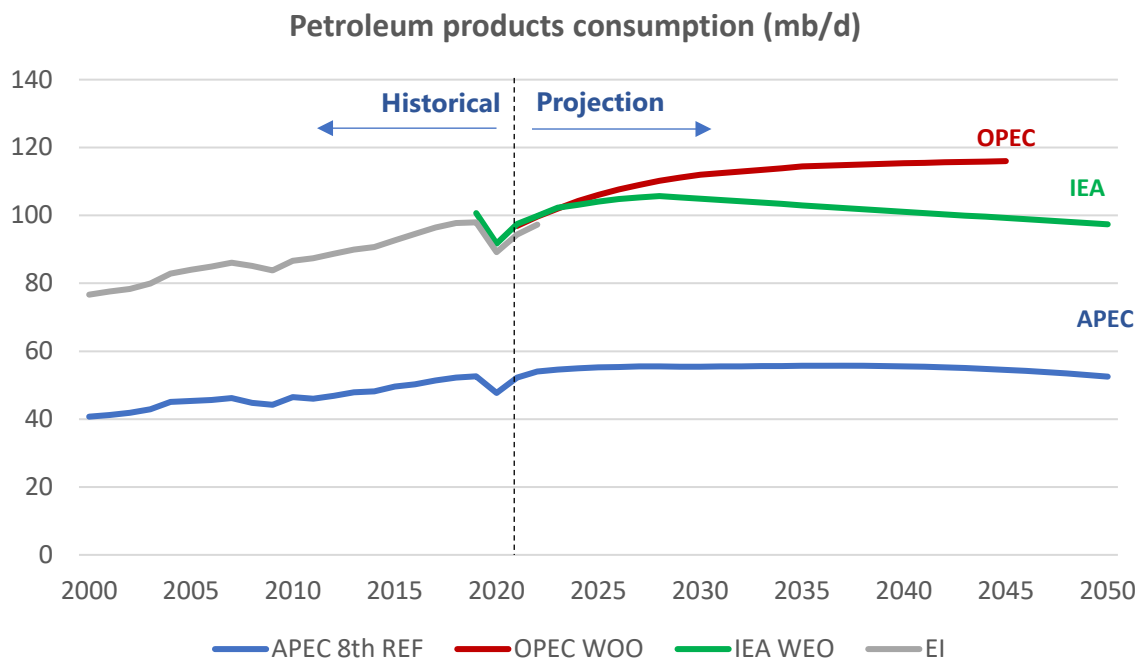
Source: IEA

(2 US Gulf coast crack spread is calculated by wholesale products spot price in the US Gulf Coast market less Brent spot crude oil price FOB)

Future challenges on petroleum product supply security:

APEC, OPEC, and IEA anticipate increasing petroleum product consumption in near term until 2028.

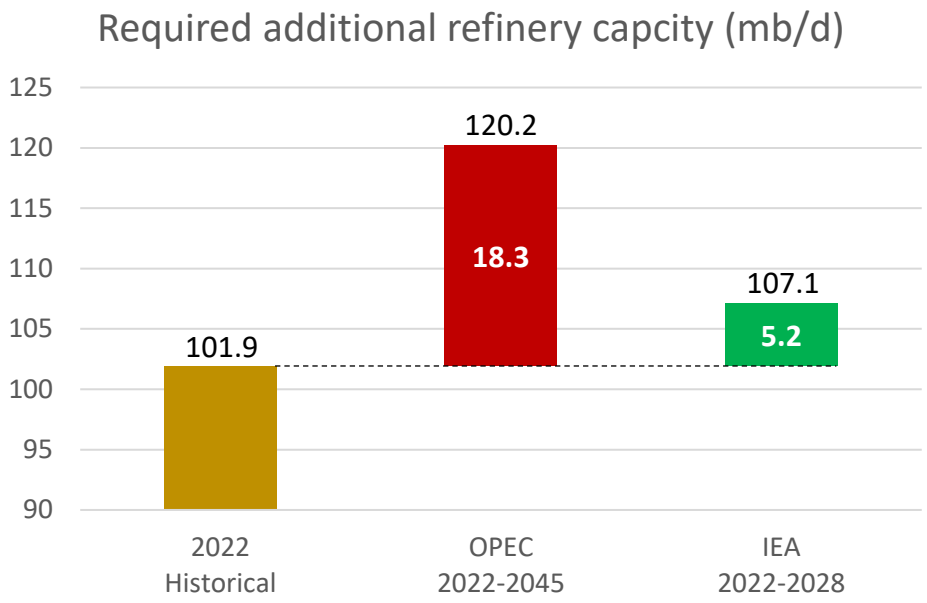




- APEC, OPEC, and IEA forecast petroleum product consumption to grow at 0.9%-1.9% per annum near-term to 2028.
- OPEC projected a growth trajectory to 116 mb/d in 2045. IEA projected peak at 105.7 mb/d in 2028.
- APEC 8th REF sees a flat consumption during 2030-2039 and long-term negative growth after 2040.

Significant investment in global refinery capacity additions is required to meet demand projections of OPEC and IEA.

- Assuming a constant capacity at the 2022 level (refer to EI) and no refinery closure after 2022, a capacity of 18.3 and 5.2 mb/d is required to meet the anticipated demand from OPEC and IEA, respectively (taking into consideration the highest projections from each source).
- These capacity additions translate to an investment ranging from 90 to 490 billion USD.
- Most investment is expected to be timely driven by high consumption growth in the near term before 2028 but with high uncertainty in longer term.



Estimated investment (cumulative)	Net refinery capacity additions (mb/d)	Low-cost estimate (billion USD)	High-cost estimate (billion USD)
2022-2045 OPEC	18.3	320	490
2022-2028 IEA	5.2	90	140

Assumptions:

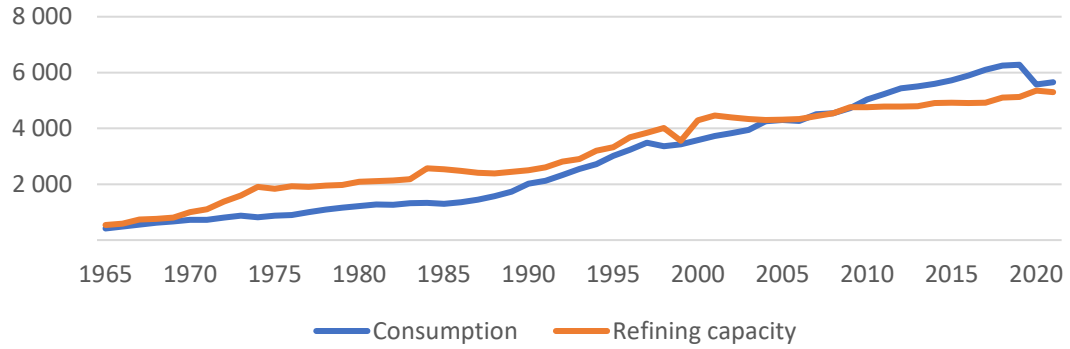
1) Low-cost estimate >> 7 billion USD per 400 kb/d capacity (Jizan, Saudi Arabia)
2) High-cost estimate >> 16.5 billion USD per 615 kb/d capacity (Al Zour, Kuwait)

Refinery - ief-sp-global-downstream-investment-outlook---vf.pdf - All Documents (sharepoint.com)

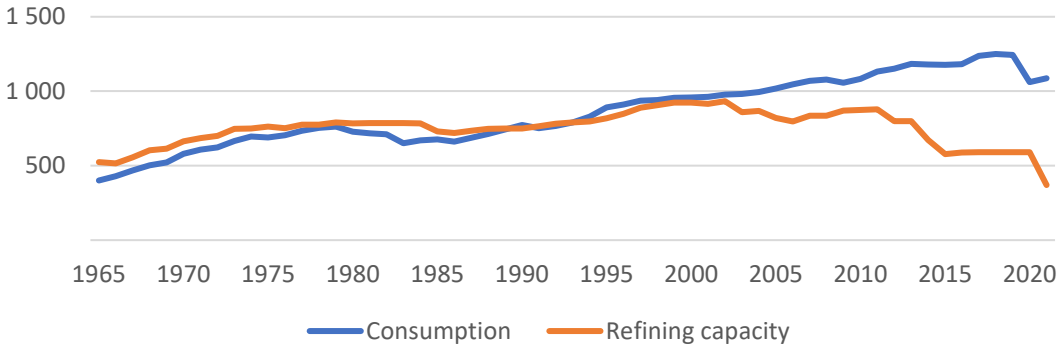
Assessment of petroleum products supply security in APEC sub-regions:

APEC Southeast Asia (SEA) and Oceania's dependence on imports is increasing.

APEC SEA petroleum products consumption and refinery capacity, 1965-2022 (mb/d)

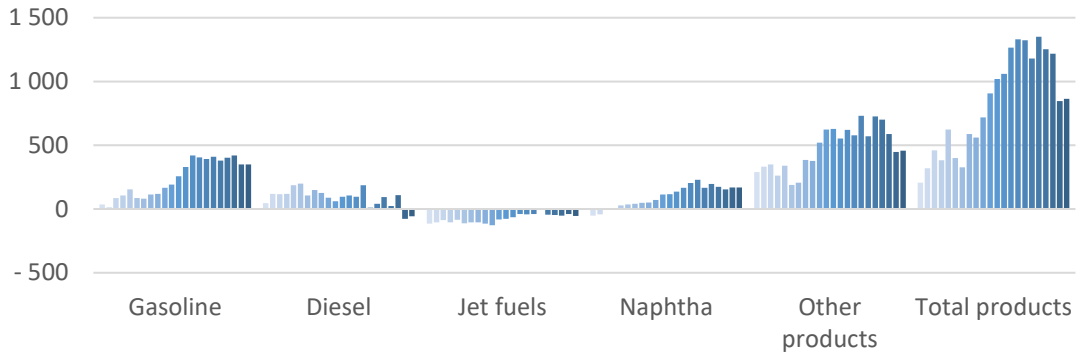


APEC Ocenia petroleum products consumption and refinery capacity, 1965-2022 (mb/d)

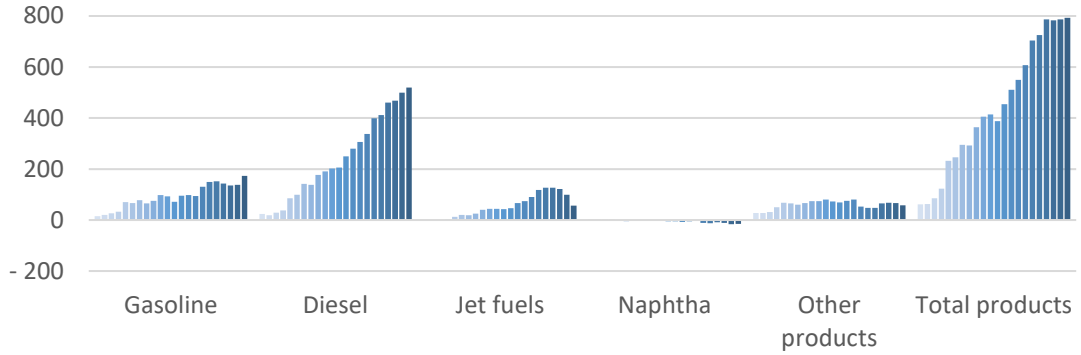


Source: EI

APEC SEA net imports of petroleum products, 2000-2021 (kb/d)



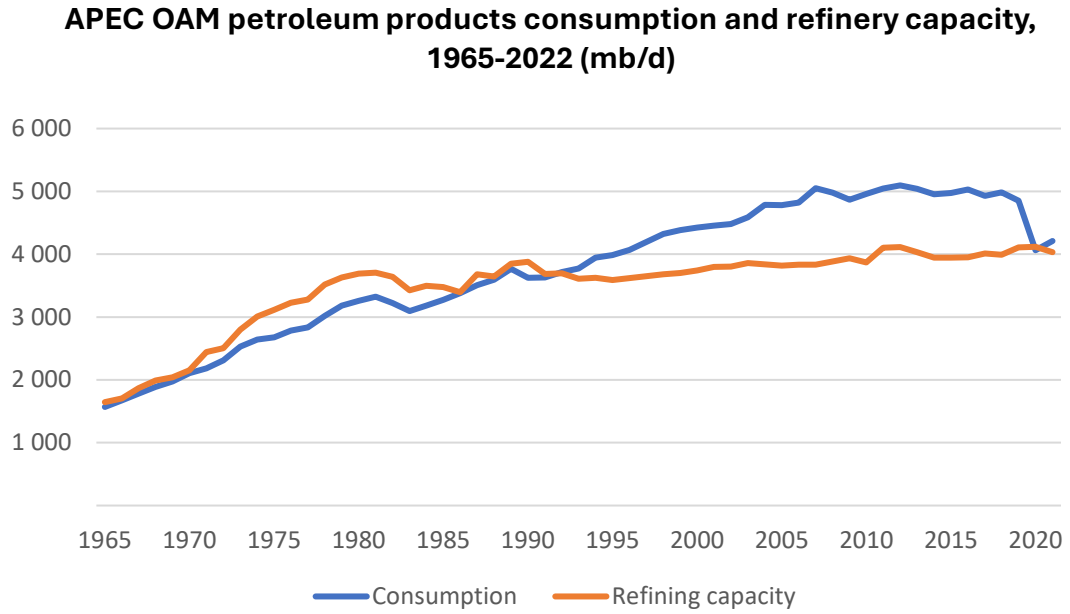
APEC Ocenia net imports of petroleum products, 2000-2021 (kb/d)

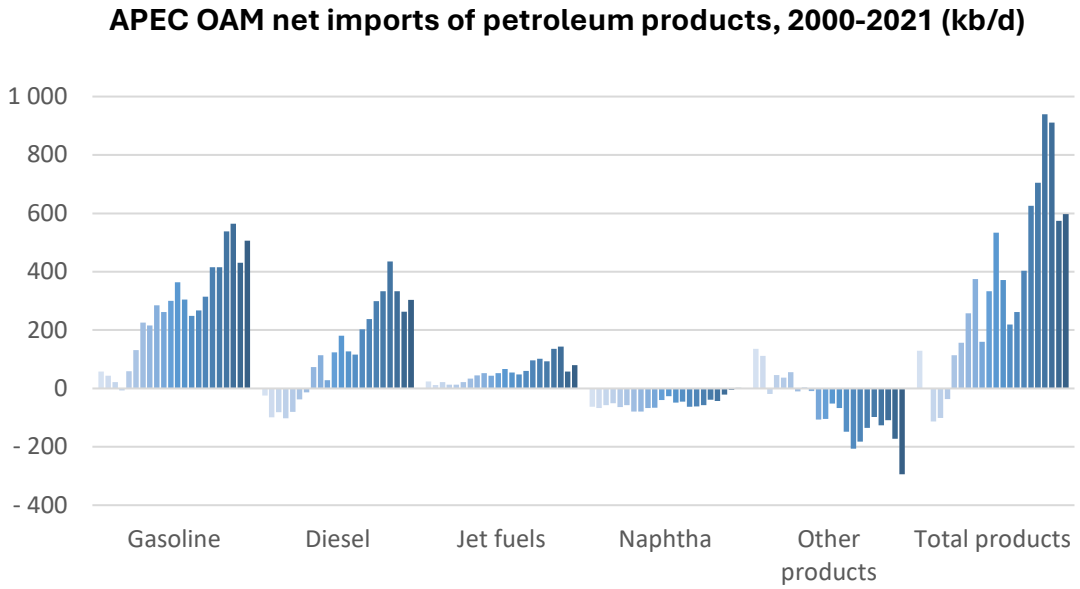


Source: EGEDA
Note: Other products includes fuel oil, petroleum coke, bitumen etc. (excluding LPG)

- In APEC SEA and Oceania, products consumption has outpaced refining capacity growth, whereas Oceania has seen several refinery closures, despite a 95% utilization rate before COVID-19.
- Fuel oil is the highest imported product in APEC SEA under Other products category, while diesel leads in imports of Oceania.

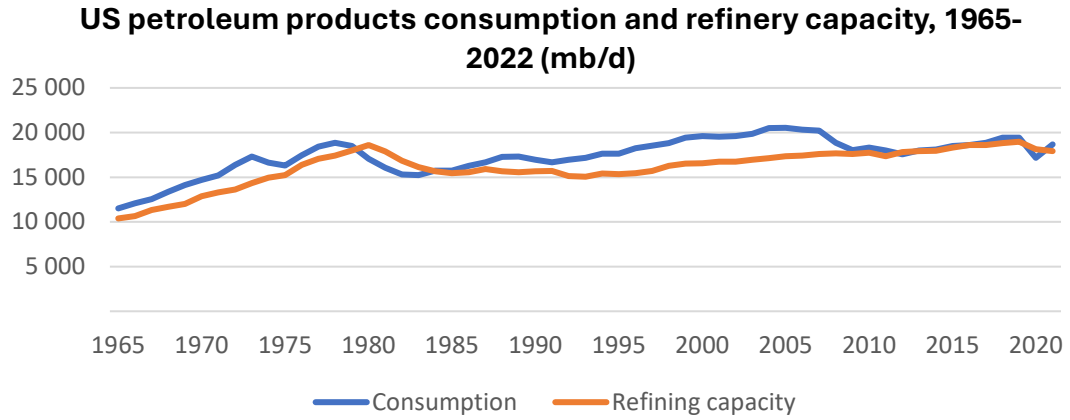
APEC Other Americas (OAM) also highly relies on imports.

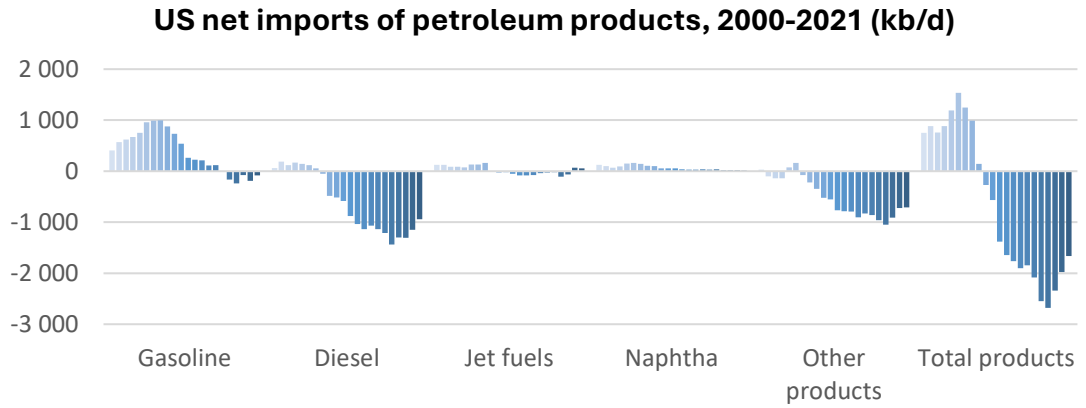


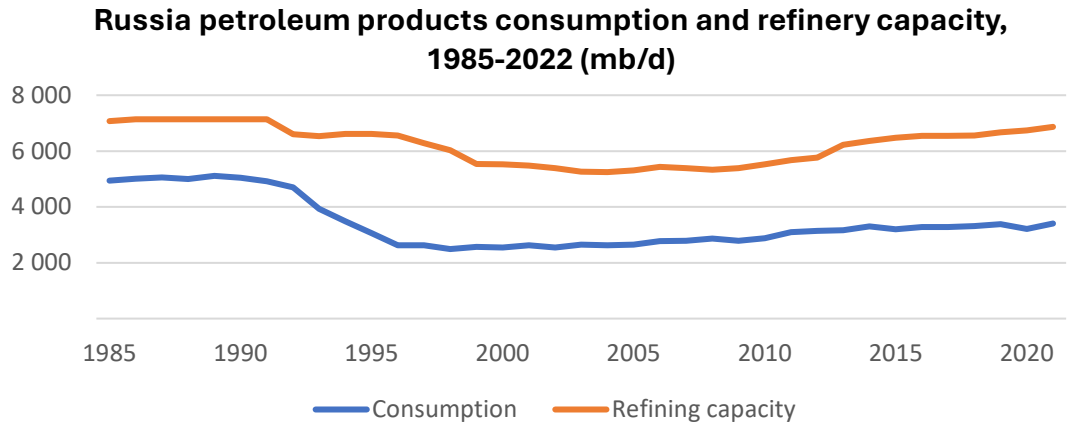


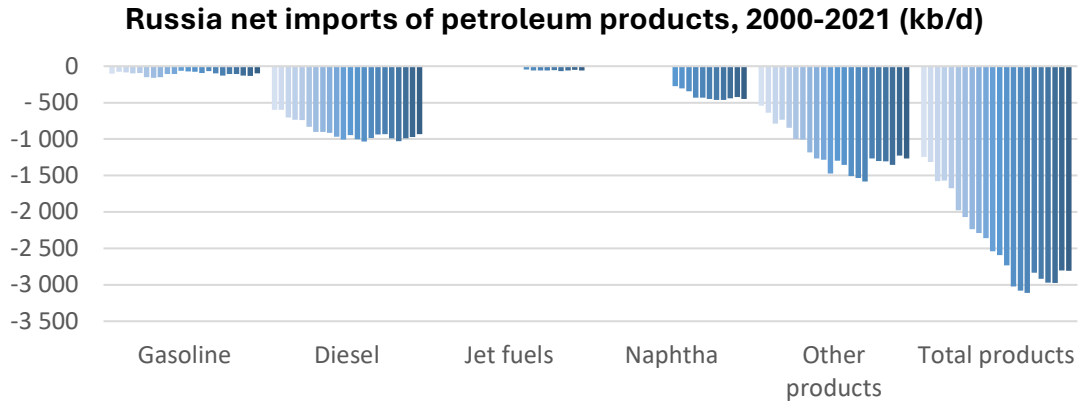
- Despite a moderate increase in refining capacity, the 5-year average utilization rate was relatively low at 70%. This situation is apparent due to more attractive import options from the US.
- Mexico previously contributed to naphtha exports in the OAM region, with export peaking in the early 2000s before entering a declining trend.

US and Russia subregions to continue their significant exports.





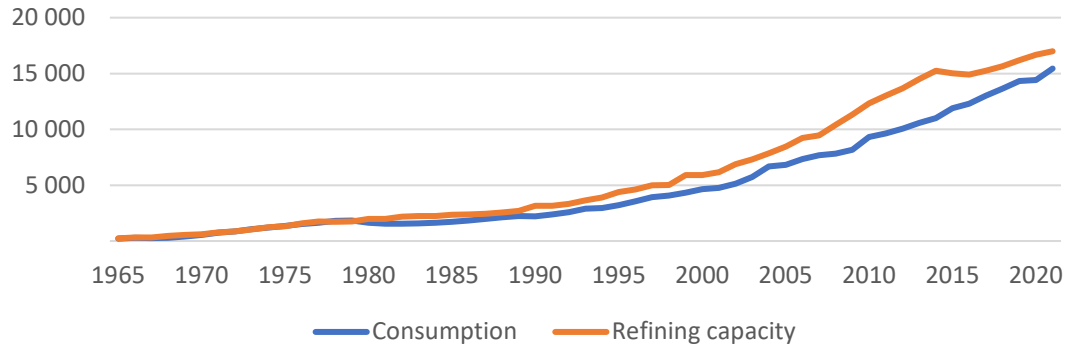




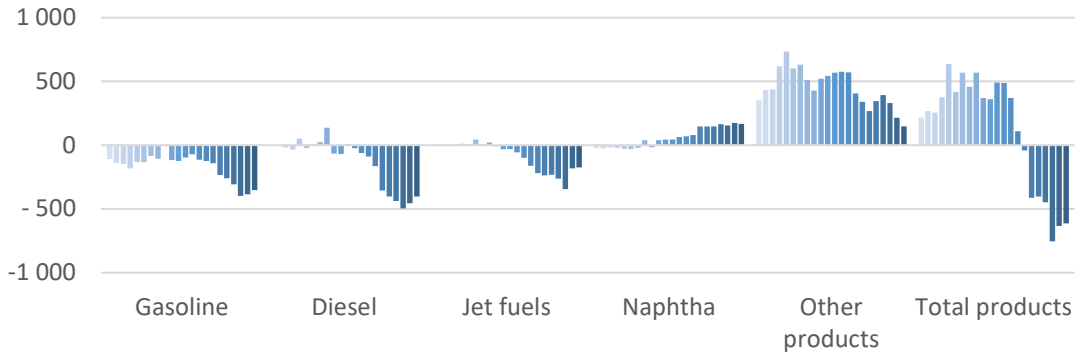
- The US emerged as a major net product exporter in 2009, in particular diesel, due to low energy prices and refining capacity additions.
- Russia has strengthened its standing as a leading global exporter of petroleum products. Over the past decade, Russia has consistently boasted the highest net total product exports within APEC.

China and APEC Northeast Asia (NEA) see an increase in LPG and naphtha imports, while remain net exporters of transport fuels.

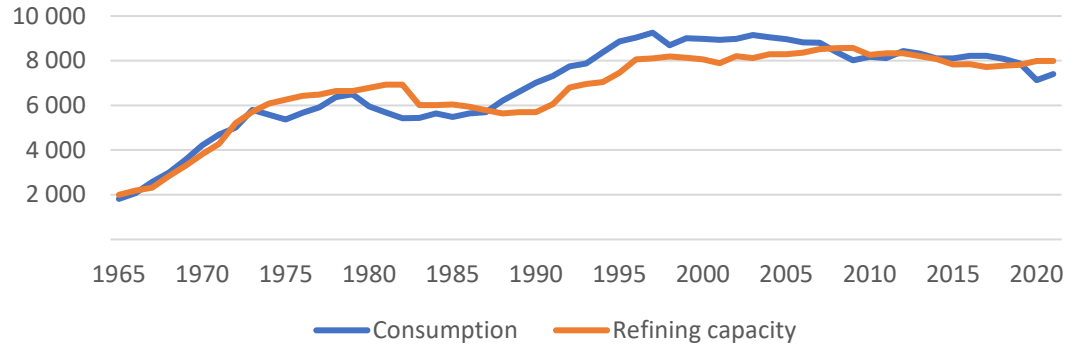
China petroleum products consumption and refinery capacity, 1965-2022 (mb/d)



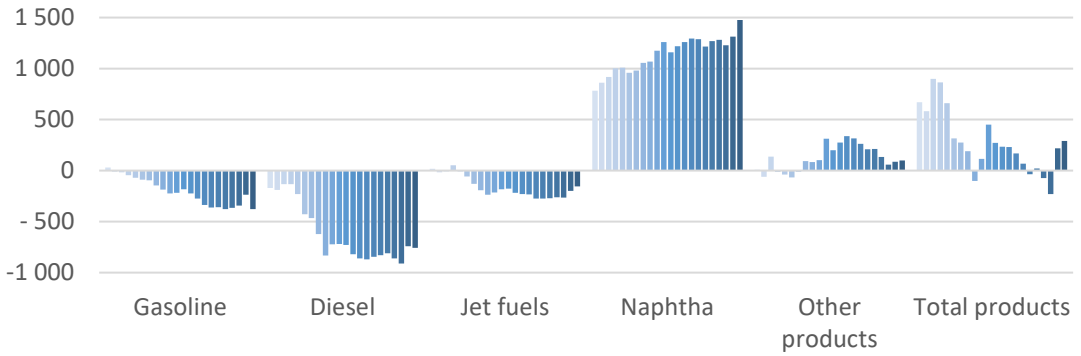
APEC China net imports of petroleum products, 2000-2021 (kb/d)



APEC NEA petroleum products consumption and refinery capacity, 1965-2022 (mb/d)

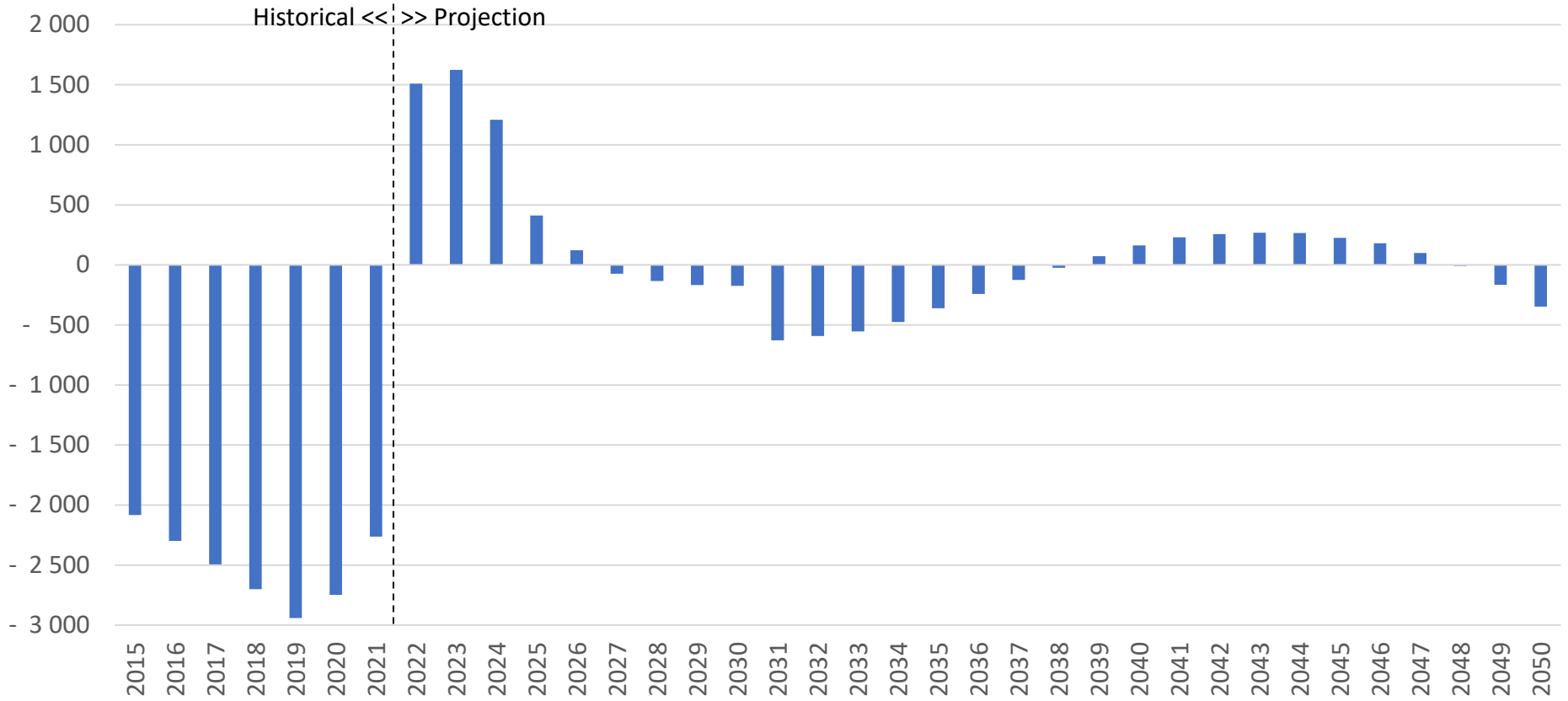


APEC NEA net imports of petroleum products, 2000-2021 (kb/d)



- China stands as one of APEC sub-regions with highest refining capacity and serves as a net exporter of transport fuels, but a net importer of naphtha and fuel oil in Other Products category.
- NEA's exports transport fuels as consumption declines due to successful energy efficiency measures. However, NEA has been reliant on naphtha imports with a growing trend.

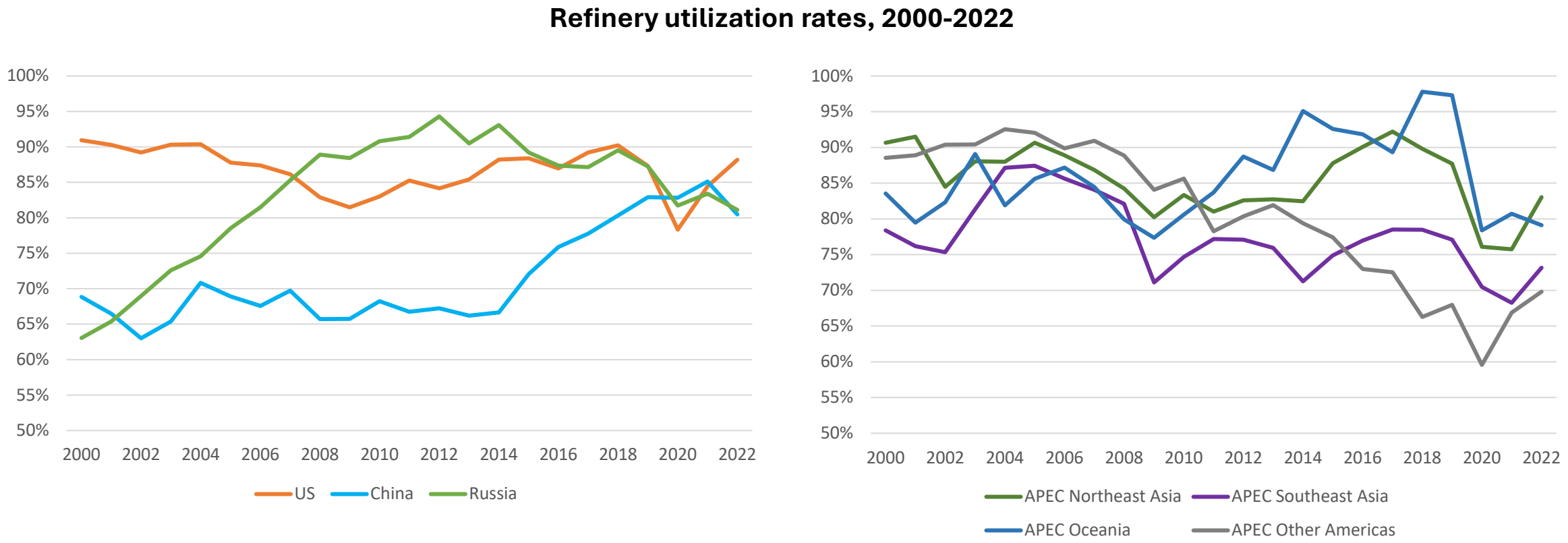
APEC net imports of petroleum products, 2000-2021 (kb/d)



- Looking ahead, APEC region's decade-long status as a net exporter of petroleum products will undergo a change.
- Decline in net petroleum products exports is driven by escalating demand in China and SEA sub-regions which outpaces total refinery output.

Assessment of petroleum refinery utilization in APEC sub-regions:

Refineries in all APEC sub-regions are running at high utilization rates, indicating current tight refinery situations.



Source: APERC analysis based on data from EI

Key summary:

- Spare refining capacity has been declining in APEC and the rest of the world for 40 years.
- Low spare refining capacity increases petroleum product price volatility and degrades energy security.
- Uncertainty about long term petroleum product demand increases the riskiness of additional refinery investments.
- Unless petroleum product demand declines, substantial capital investment in incremental refining capacity will be required.
- These issues are especially important for petroleum product importing economies.

What measures can APEC economies take to improve security of petroleum products supply?

- APEC economies should evaluate how low spare refining capacity affects their energy security.
- This evaluation is especially important for oil import dependent economies.
- Strategic petroleum product reserves can help with localized and/or short-term supply emergencies but are expensive to maintain.
- Spare refining capacity is better for longer term disruptions and/or market changes.
- If needed, APEC governments should consider ways to reduce the financial risks of new refinery investments or to encourage national oil companies to create spare refining capacity.

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Thank you.

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