

APEC Energy Demand and Supply Outlook 8th Edition: Executive Summary

ABOUT THE OUTLOOK

The *APEC Energy Demand and Supply Outlook 8th Edition* (“the Outlook”) provides projections of energy demand and supply for each of the 21 Asia-Pacific Economic Cooperation (APEC) member economies. First published in 1998, *the Outlook* provides analytic support for member economies by identifying major challenges and opportunities facing the region’s energy sector and assesses the impact of current energy trends and policies on the region’s fuel mix, energy goals, and CO₂ emissions.

This edition explores two scenarios through 2050: the **Reference scenario (REF)** and the **Carbon Neutrality scenario (CN)**.

- REF reflects a continuation of existing trends in technology development and deployment, and current government programs and policies¹.
- CN illustrates a pathway with additional energy intensity and carbon intensity improvements. These improvements are supported by technological advancements and ambitious policy frameworks that are constructed based on the unique characteristics, objectives, and starting points of each economy².

The Outlook contains two volumes. **Volume 1** covers the following APEC-wide trends: end-use energy demand (Chapter 2); power and heat (Chapter 3); energy supply (Chapter 4); APEC energy goals (Chapter 5); CO₂ emissions and key technologies (Chapter 6); and energy security and grid reliability (Chapter 7). **Volume 2** provides detailed analysis for each APEC member economy.

KEY TAKEAWAYS

1. Energy demand decouples significantly from economic activity in both scenarios

After a decades long upward trajectory, energy demand collapsed in 2020 due to COVID-19 lockdown measures and reduced mobility. As global economic activity recovers, energy demand is expected to return to pre-pandemic levels. The speed and extent of global economic recovery, ongoing energy supply constraints, and associated supply-side and demand-side inflation are contributing to an uncertain energy future.

Energy demand grows most strongly in southeast Asia, more than doubling in REF and almost doubling in CN. This large increase in energy demand supports a more than tripling in economic activity, which highlights that the decoupling story is influential in all APEC economies. Decoupling is driven by continued improvements to energy efficiency. At the same time, there is a shift away from more carbon-intensive fossil fuels (coal and oil) supported by a growth in electrification.

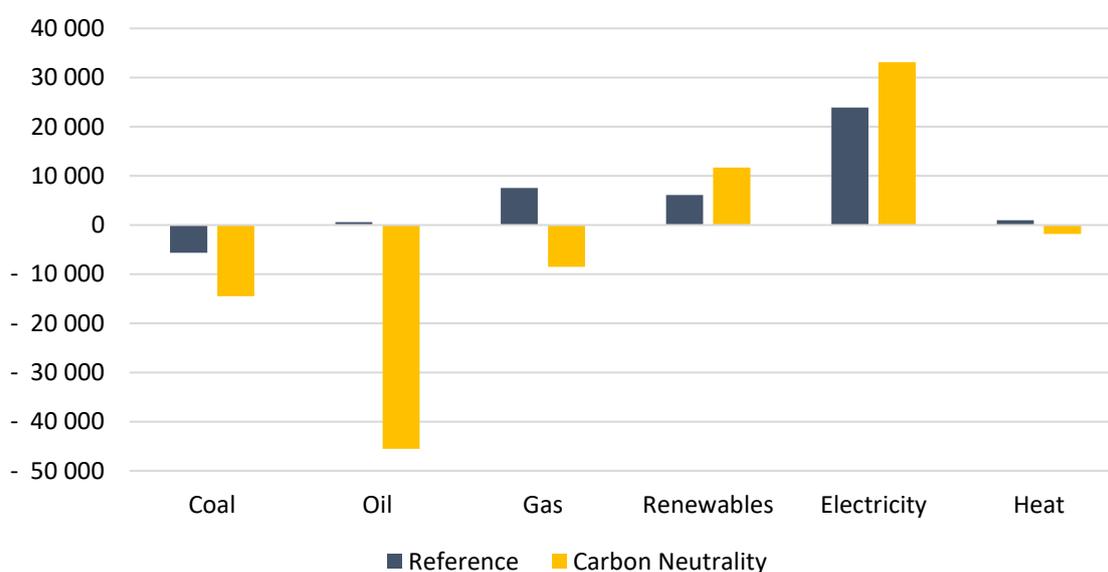
¹ Net zero pledges and commitments are not assumed to be part of current programs and policies.

² CN does not consider emissions associated with land-use or removal technologies like direct air capture

2. Energy efficiency gains and electrification lead to energy demand being almost one-quarter lower in CN than in REF by 2050

In REF, end-use energy demand increases 14% through 2050. In CN, end-use energy demand peaks in the mid-2020s, before declining to a level 11% lower in 2050 relative to 2018. Increased electrification of end use sectors leads to electricity accounting for 40% of energy demand in 2050 in CN, compared to 29% in REF (up from 23% in 2018). Electrification is most prominent in the transport sector due to the rise of electric vehicles. There are less available options for electrification in industry, and the buildings sector is already heavily reliant on electricity. Nevertheless, electricity consumption becomes more prominent in these two sectors.

Figure 1. Change in final energy demand by fuel and scenario, 2018-2050 (PJ)

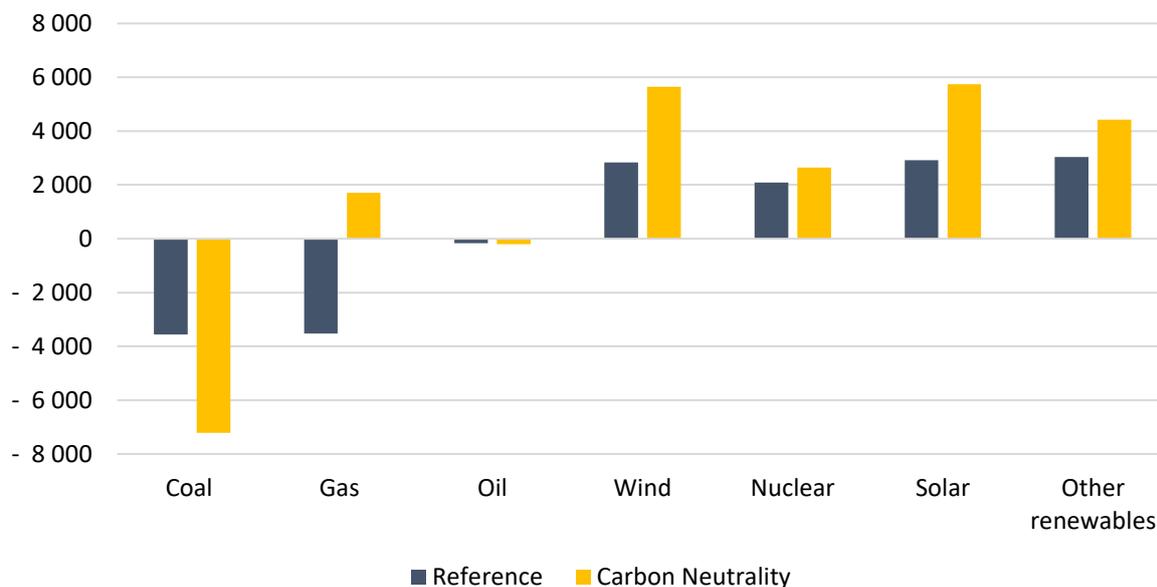


3. Electricity demand is increasingly met with generation from wind and solar

Electricity generation grows in both scenarios to meet increased demand in transport and buildings. Coal is gradually displaced with an increase in generation from natural gas, wind, and solar through a combination of cost competitiveness and CO₂ reduction policies. Although generation from renewables increases, fossil fuels, in particular natural gas, continue to maintain a substantial proportion of the share of the generation mix. Fossil fuels continue to provide firm generation, due in part to their higher energy density and ease of dispatch.

Wind and solar electricity generation increases in both scenarios, driven by a push to further decarbonize the fuel mix. Solar and wind generation expands to a 27% share in REF and 45% share in CN. The absolute increases in both solar and wind generation from 2018 to 2050 rank number one and two in both scenarios. However, challenges remain in balancing reliability, affordability, and sustainability given the variability of wind and solar generation, high electricity storage costs, and growing concerns about strategic material requirements.

Figure 2. Change in electricity generation by fuel and scenario, 2018-2050 (TWh) ³



4. Fossil fuels remain a large share of energy supply

In REF, fossil fuel supply is flat after 2030, with its share of energy supply declining to 74% by 2050. In CN, volumes decline, though fossil fuels still account for 55% of supply in 2050. Natural gas supply becomes more prominent in both scenarios, reaching 39% share of fossil fuel supply in REF and 54% in CN. Even though there is a larger share of natural gas in CN, absolute volumes of natural gas are one-fifth lower than REF in CN by 2050, due to gains in energy efficiency.

5. Natural gas and oil import growth is driven by China and southeast Asia

Southeast Asia is the only region to have a higher level of energy supply in CN in 2050, albeit at a lower level than in REF. Southeast Asia and China increase reliance on oil and gas imports due to continued economic growth and lack of domestic production. Coal-fired generation declines in both scenarios, with a near complete phase-out in CN. Gas-fired electricity generation expands in both scenarios, with carbon capture and storage (CCS) technology enabling a substantial amount of natural gas to remain in CN while meeting emissions abatement goals.

6. APEC relies more heavily on fossil fuel imports in REF than in CN

Crude oil continues to dominate net energy imports, but production growth, mainly from the United States and Canada, reduces net crude imports by 20% in REF. APEC becomes a net refined products exporter in CN as refineries strive to capture global market share in the face of declining global demand.

³ Other renewables includes hydro, bio, geothermal, and waste.

7. APEC is on track to meet aspirational goals of improving energy intensity and doubling the share of modern renewables

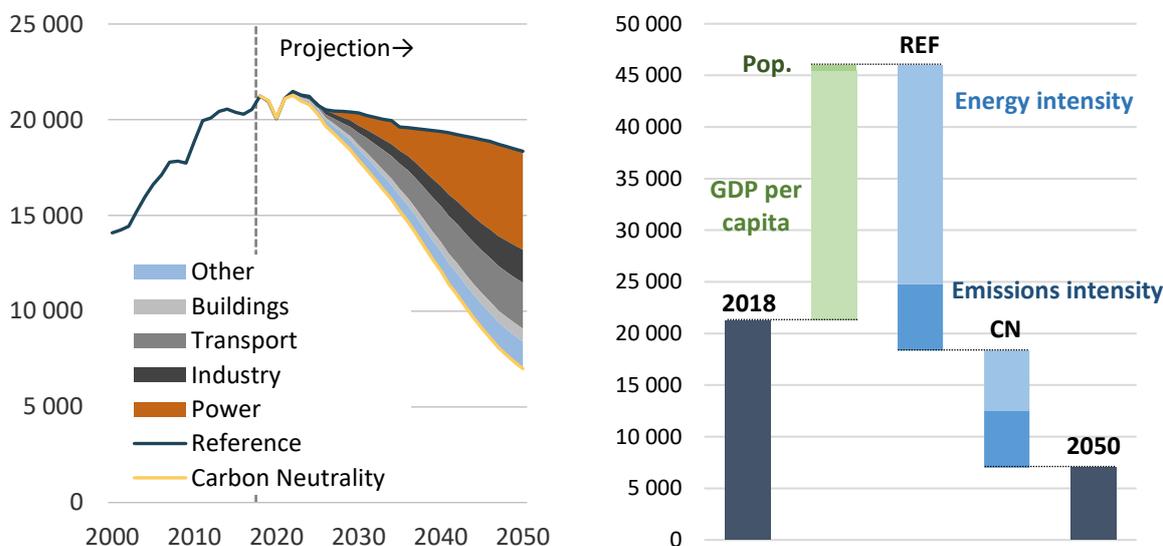
APEC has a shared goal to improve energy intensity by at least 45% by 2035 relative to 2005. The goal is expected to be reached one year ahead of schedule (2034) in REF and four years ahead of schedule (2031) in CN. This progress is achieved primarily through improved energy efficiency in the industry, transport, and buildings sectors.

The second shared APEC energy goal is to double the share of modern renewables consumption by 2030, relative to 2010. APEC is expected to meet the aspirational goal of doubling renewables by 2026 in REF, and by 2025 in CN. Progress is driven by a combination of direct consumption of renewables in end-use sectors and an increase in the share of electricity generated by wind and solar technologies.

8. The Carbon Neutrality scenario delivers ambitious emissions reductions through the combination of energy intensity and emissions intensity improvements

APEC CO₂ emissions decline by 14% in REF and by 67% in CN⁴. The power and transport sectors are the most influential in driving emissions lower in CN (Figure 3). The switch to electricity that is increasingly produced by renewable sources accounts for a large share of the emissions reductions.

Figure 3. APEC energy-related CO₂ emissions (million tonnes) and components



Lower energy intensity delivers around half of the emissions reductions in CN. Emissions intensity, such as from switching to less carbon-intensive energy carriers, and carbon capture and storage technologies deployed in the power, industry, hydrogen, and own-use sectors delivers the other half of emissions reductions.

Read the full report and other research at <https://aperc.or.jp/reports/outlook.php>.

⁴ Other greenhouse gases, fugitive emissions (such as from flaring and methane leakage), and non-energy sector emissions are not considered in this analysis.