Asia-Pacific Economic Cooperation

APERC Asia Pacific Energy Research Centre

14.a. Progress toward the APEC Energy Intensity Reduction Goal and Renewable Energy Doubling Goal

The 66th Meeting of APEC Energy Working Group (EWG66)
29-30 November 2023 (UTC+7) – Bangkok, Thailand

Glen SWEETNAM, Senior Vice President (APERC)/EGEDA Chair

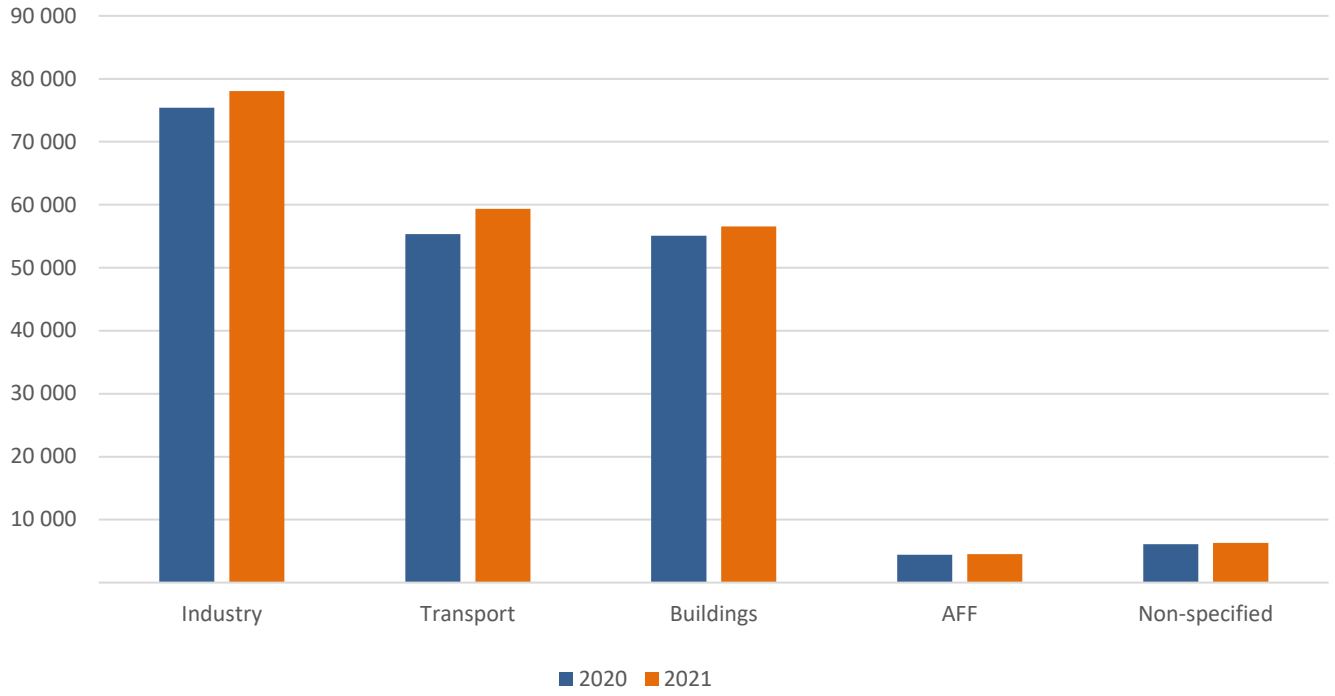
Outline

- Progress toward APEC's **energy intensity goal**
- Progress toward APEC's **renewable energy doubling goal**
- Energy intensity and renewable share **projections** from the *APEC Energy Demand and Supply Outlook 8th Edition*

Progress toward APEC's energy intensity goal

Energy rebounded in all sectors in 2021

Final energy consumption: 2020 versus 2021 (PJ)



Sources: APEC statistics (EGEDA), APERC analysis

- After dropping 3.9% in 2020, total final energy consumption in APEC grew 4.3% in 2021.
- The transport sector was especially volatile, dropping 11.4% in 2020 and climbing back 7.2% in 2021.

APEC final energy intensity continues to decline

Annual change in APEC final energy intensity, 2006-21

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2005-21
Δ in FEC	2.4%	3.5%	0.9%	-1.2%	5.6%	4.2%	2.0%	1.4%	-0.1%	0.3%	0.6%	1.3%	3.1%	0.4%	-3.9%	4.3%	27.7%
Δin GDP (PPP, constant 2017 USD)	5.2%	5.3%	2.9%	-0.2%	5.7%	4.1%	4.2%	3.8%	3.7%	3.7%	3.4%	4.0%	4.1%	3.3%	-1.5%	6.1%	76.2%
Δ in FEC intensity	-2.7%	-1.8%	-2.0%	-1.0%	0.0%	0.1%	-2.1%	-2.3%	-3.7%	-3.3%	-2.8%	-2.5%	-0.9%	-2.8%	-2.4%	-1.7%	**-27.5%**

** **FEC** – final energy consumption (excluding non-energy)*
Δ = change

Sources: APEC statistics (EGEDA), WB (GDP PPP), CT (WEO), APERC analysis

- Final energy intensity fell 27.5% between 2005 and 2021.
- In 2021, GDP rose more quickly than final energy consumption (+6.1% versus +4.3%); so final energy intensity declined 1.7%.
- Final energy intensity behaved differently after the pandemic relative to the Great Recession (2008-2010).

Primary energy intensity is now declining more slowly

Annual change in APEC primary energy intensity, 2006-21

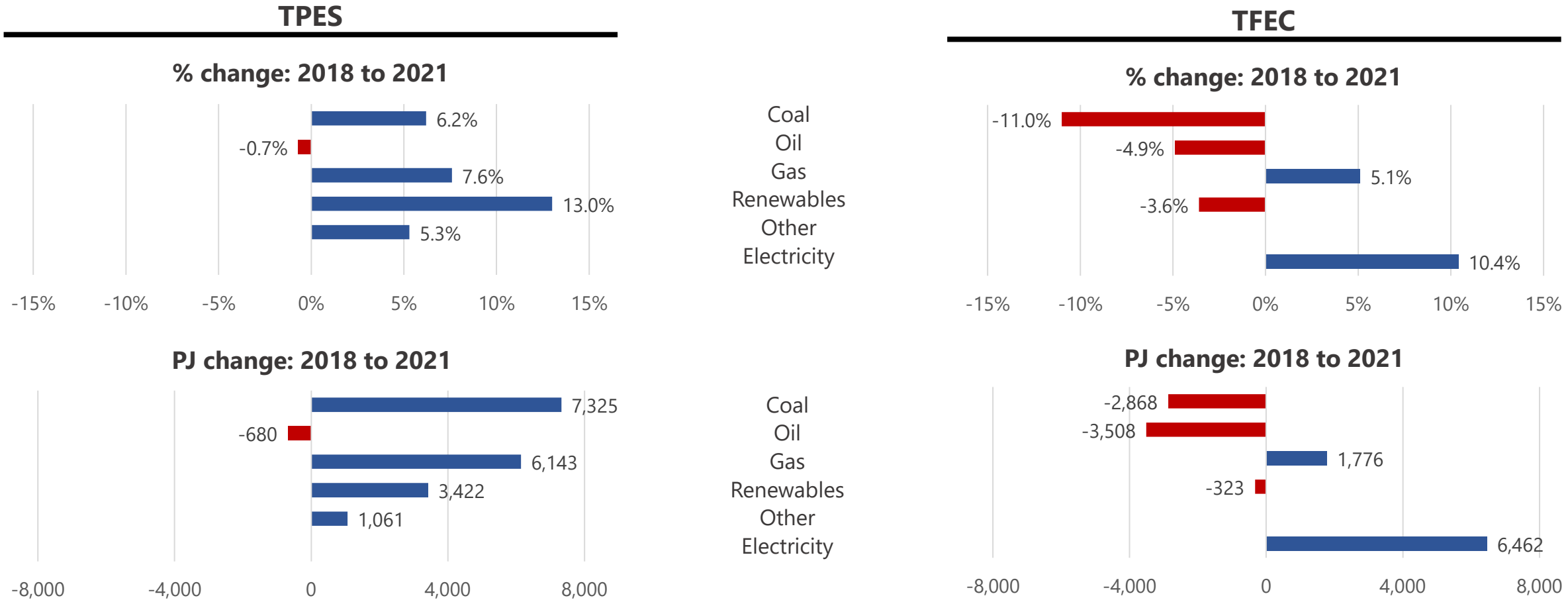
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2005-21
Δ in PES	2.5%	3.3%	0.7%	0.0%	5.2%	3.9%	1.0%	1.6%	0.2%	-0.6%	0.6%	1.7%	3.6%	1.8%	-2.4%	5.7%	32.7%
Δ in GDP (PPP, constant 2017 USD)	5.2%	5.3%	2.9%	-0.2%	5.7%	4.1%	4.2%	3.8%	3.7%	3.7%	3.4%	4.0%	4.1%	3.3%	-1.5%	6.1%	76.2%
Δ in PES intensity	-2.5%	-1.9%	-2.2%	0.2%	-0.5%	-0.2%	-3.1%	-2.1%	-3.4%	-4.1%	-2.8%	-2.1%	-0.5%	-1.5%	-0.9%	-0.4%	**-24.7%**

* ***PES*** *– primary energy supply*

Sources: APEC statistics (EGEDA), WB (GDP PPP), CT (WEO), APERC analysis

- Until 2018, the annual changes in primary energy supply intensity were generally similar to the changes in final energy consumption intensity.
- Since 2018, TPES intensity appears to be declining more slowly than FEC intensity.

From 2018 to 2021, renewables grew faster -- but from a smaller base

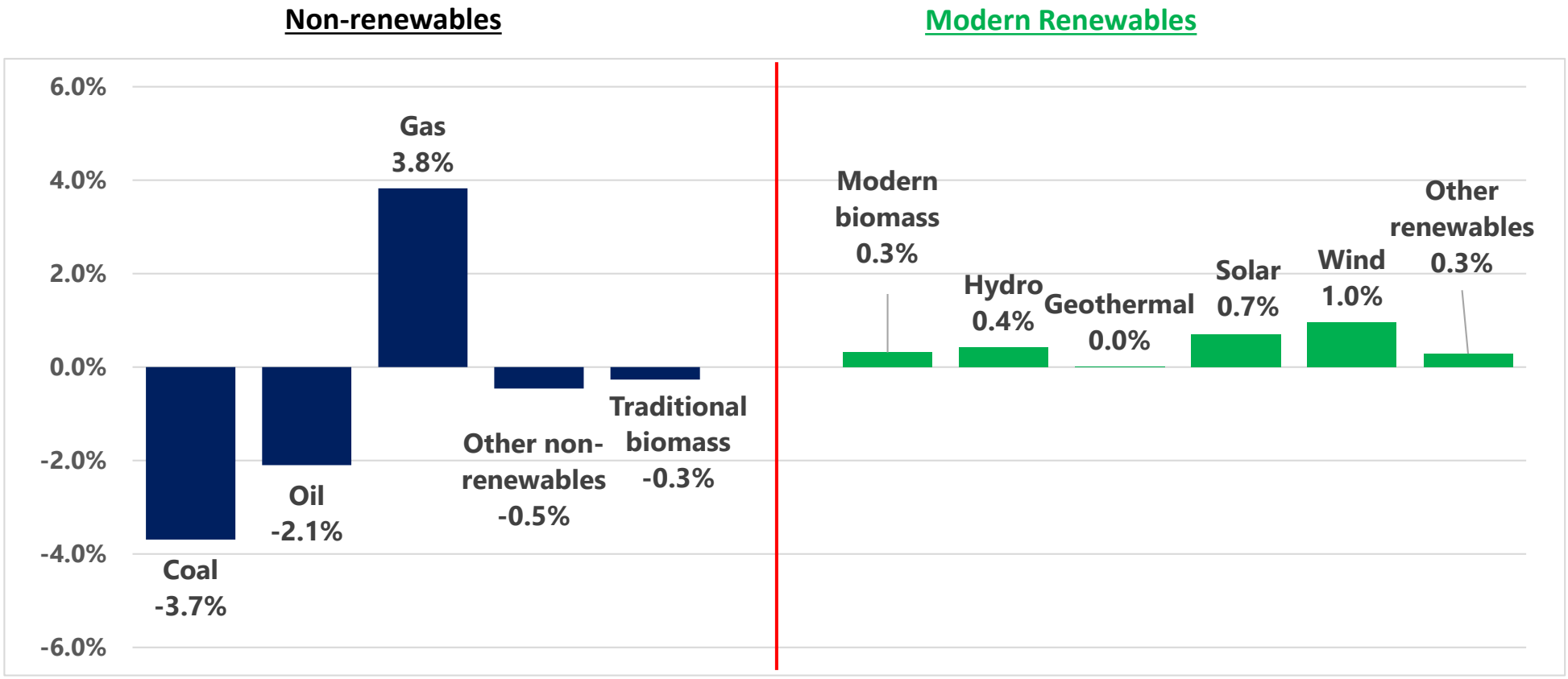


- For TFEC, electricity grew faster than all other fuels both in terms of percentage and absolute quantity.
- In terms of percentage change, TPES renewables grew twice as fast as coal or gas; but in terms of the quantity of energy, TPES coal and gas both grew twice as much as renewables.

Progress toward APEC renewables doubling goal

In energy supply, coal and oil lost shares to gas and renewables . . .

Percent change in fuel shares in **primary energy supply**, 2010-2021



Note: Renewable energy includes electricity and heat generated from renewable energy sources

Source: APEC data

- From 2010 to 2021, the renewable share increased by 2.7 percentage points, 56% of the way to the goal.

Renewable energy continues to gain share

Primary energy supply, PJ

	2010	2021	% change
Non-renewables	**288,015**	**332,038**	**15.3%**
Coal	117,088	125,186	6.9%
Oil	90,002	98,909	9.9%
Gas	61,630	86,765	40.8%
Other non-renewables	19,296	21,178	9.8%
Traditional biomass	**3,209**	**2,836**	**-11.6%**
Modern renewable energy	**14,578**	**26,970**	**85.0%**
Modern biomass	4,147	6,047	45.8%
Hydro	6,335	9,016	42.3%
Geothermal	1,471	1,793	21.9%
Solar	157	2,687	1615.0%
Wind	586	4,169	611.8%
Other renewables	1,883	3,259	73.1%
Total	**305,803**	**361,845**	**18.3%**
Modern RE share	**4.77%**	**7.45%**	**56.3%**

Final energy consumption, PJ

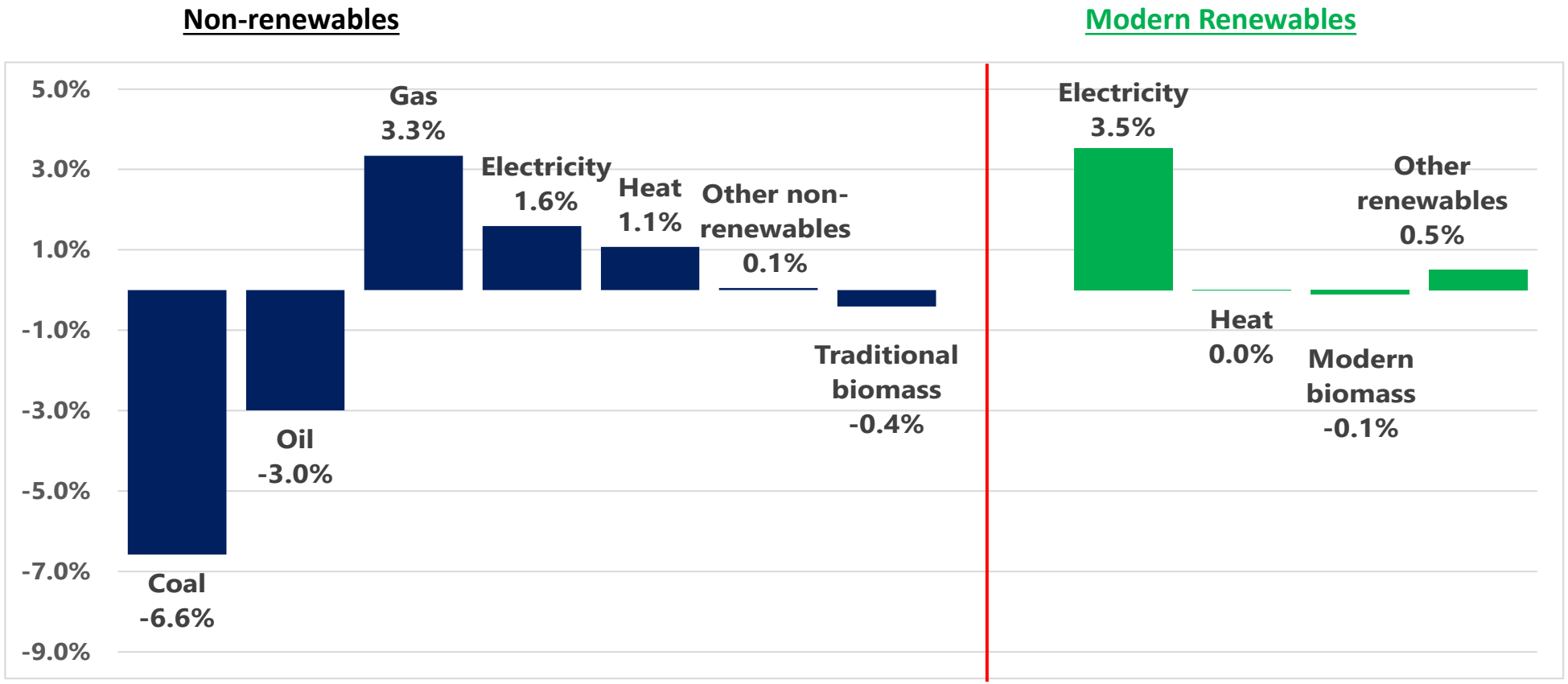
	2010	2021	% change
Non-renewables	**165,064**	**181,698**	**10.1%**
Coal	31,981	23,127	-27.7%
Oil	64,230	67,375	4.9%
Gas	26,187	36,806	40.6%
Electricity	34,571	42,827	23.9%
Heat	7,882	11,213	42.3%
Other non-renewables	213	350	63.9%
Traditional biomass	**3,209**	**2,836**	**-11.6%**
Modern renewable energy	**10,705**	**20,298**	**89.6%**
Electricity	6,233	14,358	130.3%
Heat	65	58	-10.5%
Modern biomass	2,824	3,016	6.8%
Other renewables	1,583	2,866	81.0%
Total	**178,978**	**204,832**	**14.4%**
Modern RE share	**5.98%**	**9.91%**	**65.7%**

Note: Consumption of electricity and heat from renewables is calculated from the share of total electricity and heat production.

Source: APEC data.

In final energy use, the pattern was similar

Percent change in fuel shares in **final energy consumption**, 2010-2021



Note: Renewable energy includes electricity and heat generated from renewable energy sources

Source: APEC data.

- From 2010 to 2020, the renewable share increased 3.9 percentage points, 66% of the way to the goal.

Renewable power generation doubled over the last decade

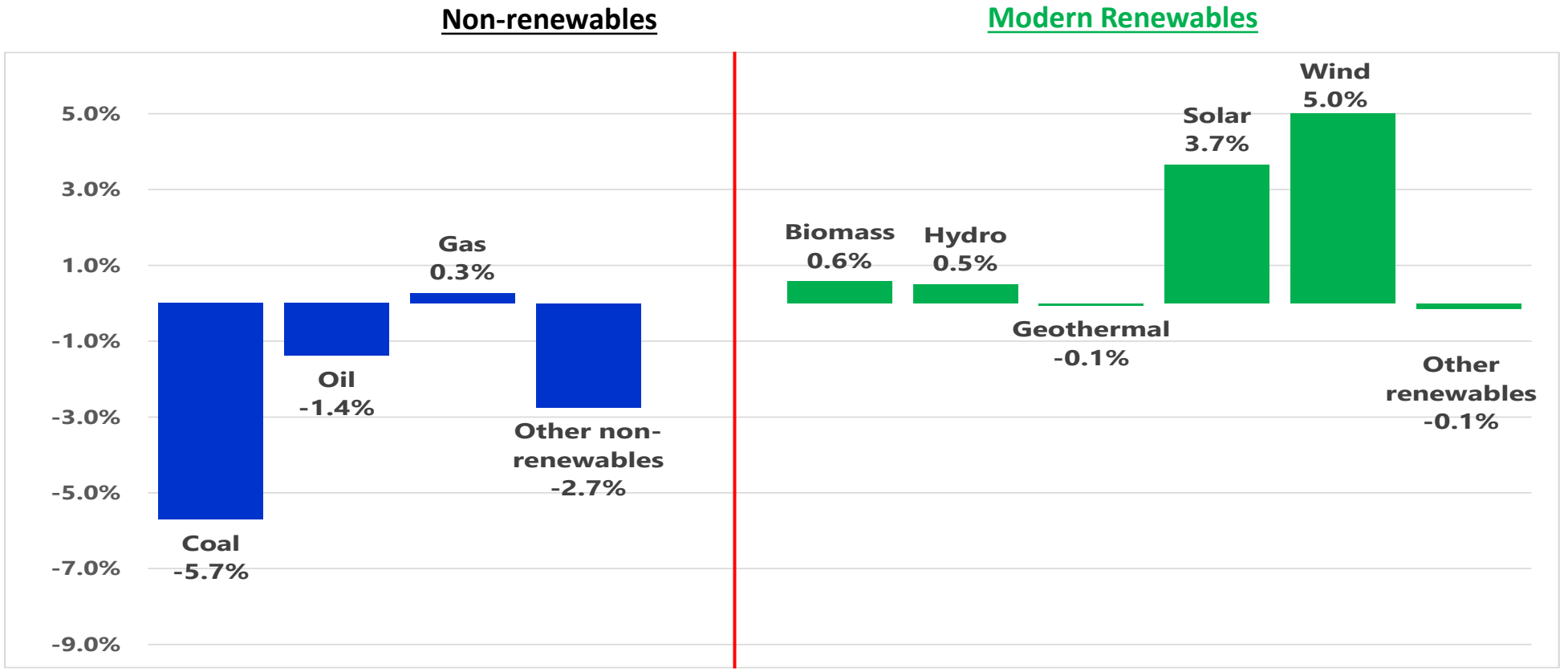
Electricity Generation, TWh

	2010	2021	% change
Non-renewables	**11,358**	**13,908**	**22.4%**
Coal	6,576	8,020	22.0%
Oil	324	190	-41.1%
Gas	2,713	3,797	39.9%
Nuclear	1,658	1,804	8.8%
Other non-renewables	87	96	9.5%
Modern renewable energy	**2,114**	**4,696**	**122.2%**
Modern biomass	67	201	199.1%
Hydro	1,780	2,551	43.3%
Geothermal	53	62	17.9%
Solar	9	693	7595.3%
Wind	163	1,158	611.7%
Other renewables	42	32	-24.6%
Total	**13,472**	**18,603**	**38.1%**
Modern RE share	**15.69%**	**25.24%**	**60.9%**

- In 2021, modern renewable energy provided a quarter of total power generation

Coal and oil lost shares to gas and renewables

Percent change in electricity generation market share, 2010-2021

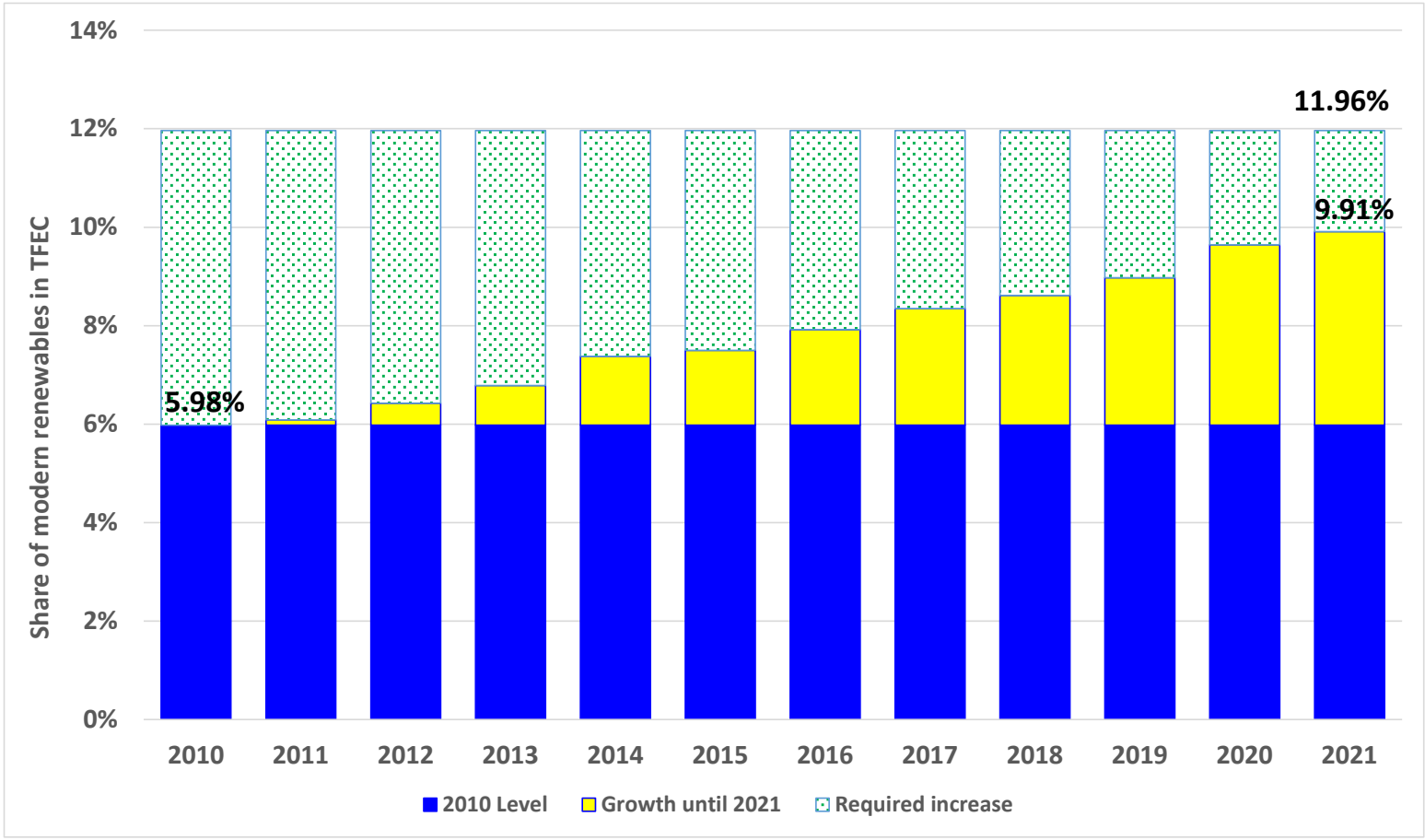


Note: Renewable energy includes electricity and heat generated from renewable energy sources

Source: APEC data.

- From 2010 to 2021, the renewable share increased by almost ten percentage points, 61% of the way to the goal.

Tracking the APEC renewable energy doubling goal

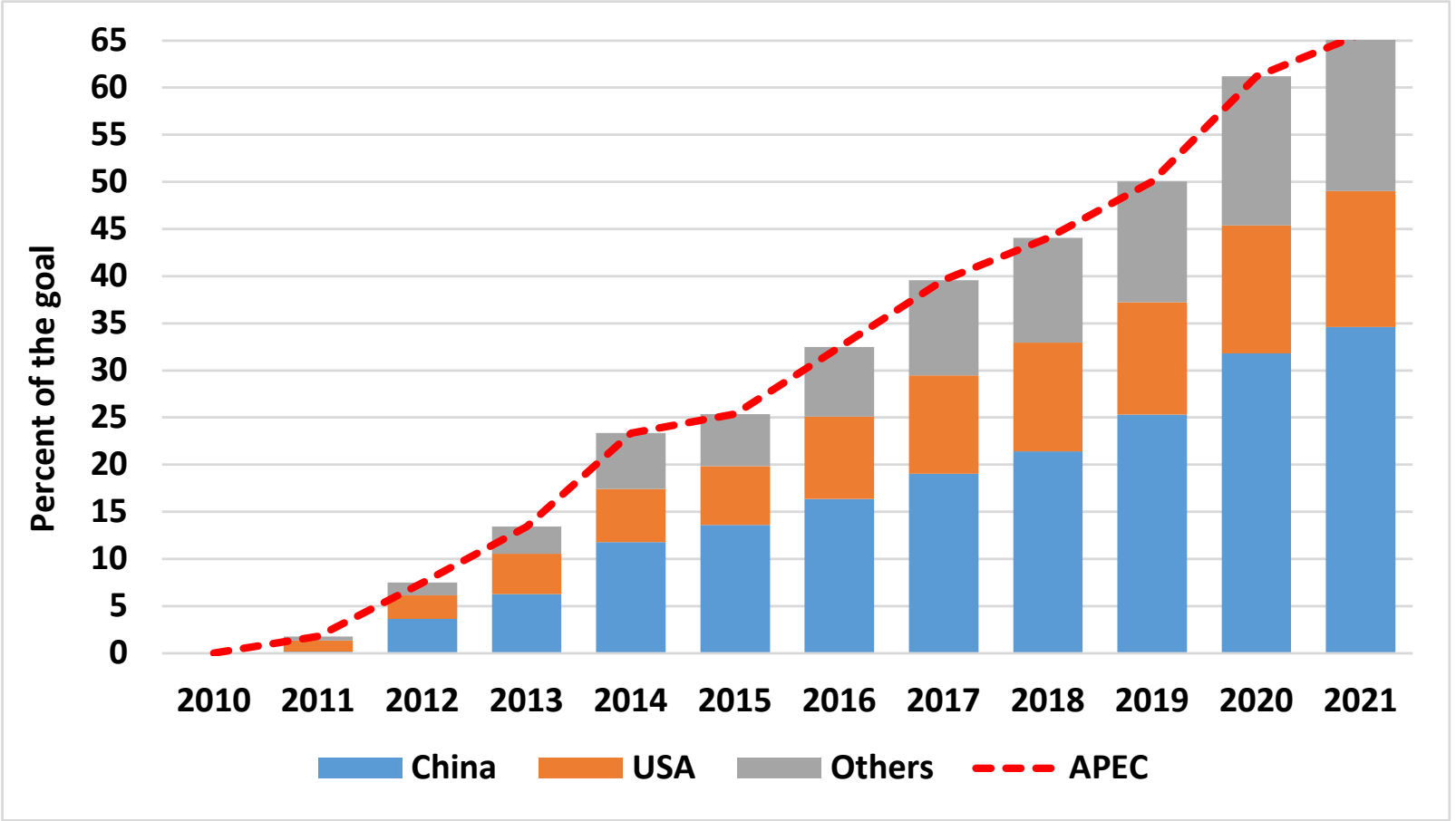


Just 2.05 percentage points more in the next 9 years

3.93 percentage points increase in the last 11 years

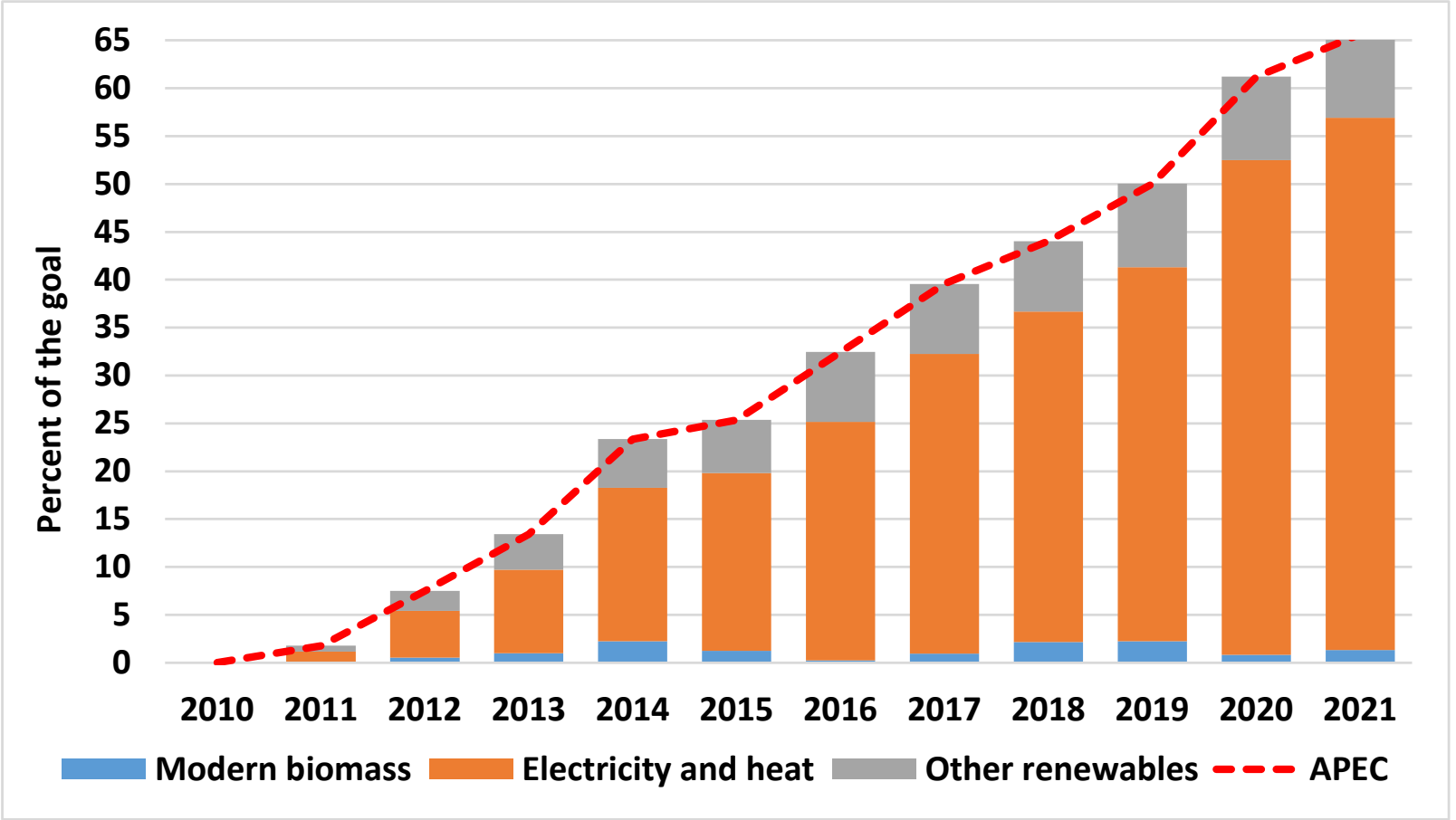
- *In 2021, which is still 9 years to 2030, APEC has increased RE share in final energy consumption by 3.93 percentage points, needing to increase by just 2.05 percentage points more in the next 9 years (2022 to 2030)*

China and the USA are the main sources of renewable energy growth



- *China's renewable energy share increased by 2.7 times from 2010 to 2021; that of the USA increased by 1.6 times during the same period. The rest of APEC also increased by 1.6 times.*

Electricity generation is the main source of renewable energy growth



- *Electricity generation accounted for 85% of the total increase in renewable energy share; other renewables for 13%, while modern biomass for 2%.*

Projections from the *APEC Energy Demand and Supply Outlook 8th Edition*

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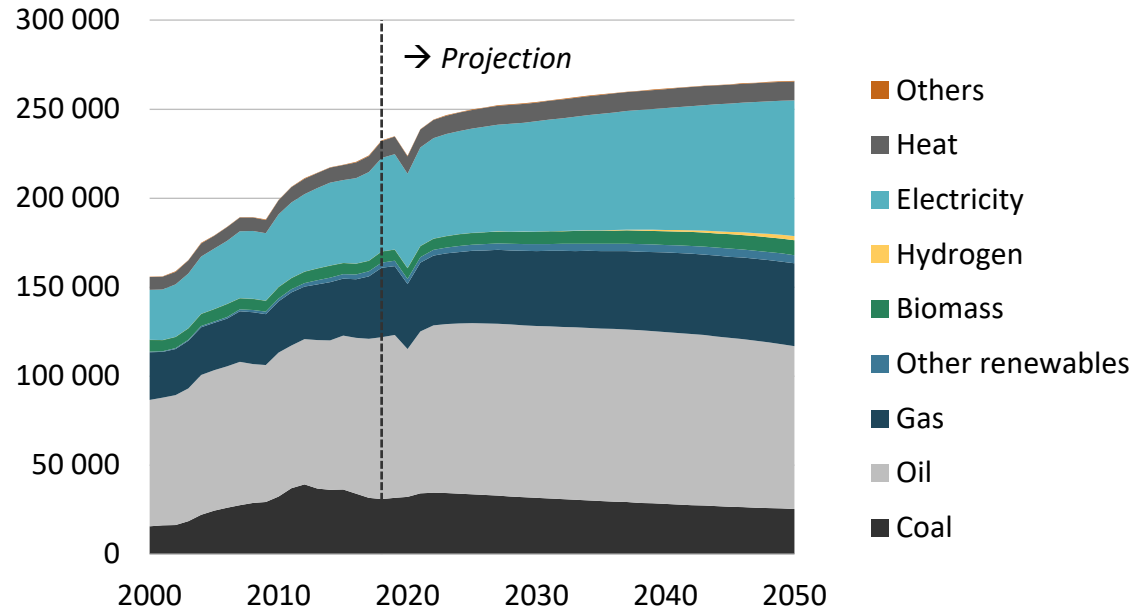
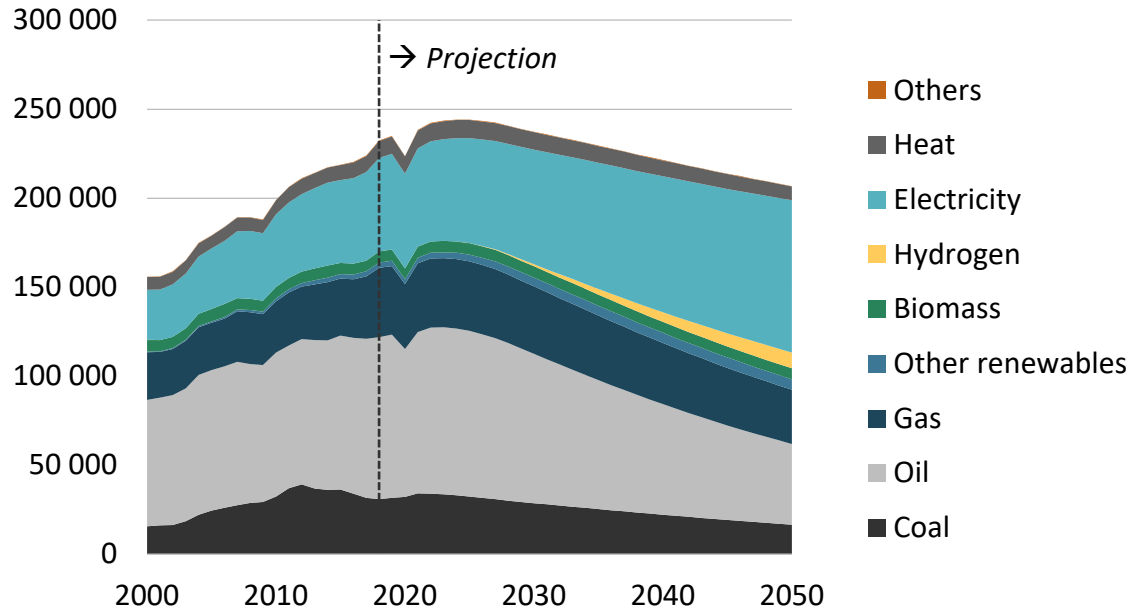
Energy demand decouples significantly from economic activity

Energy demand by fuel in REF (PJ)



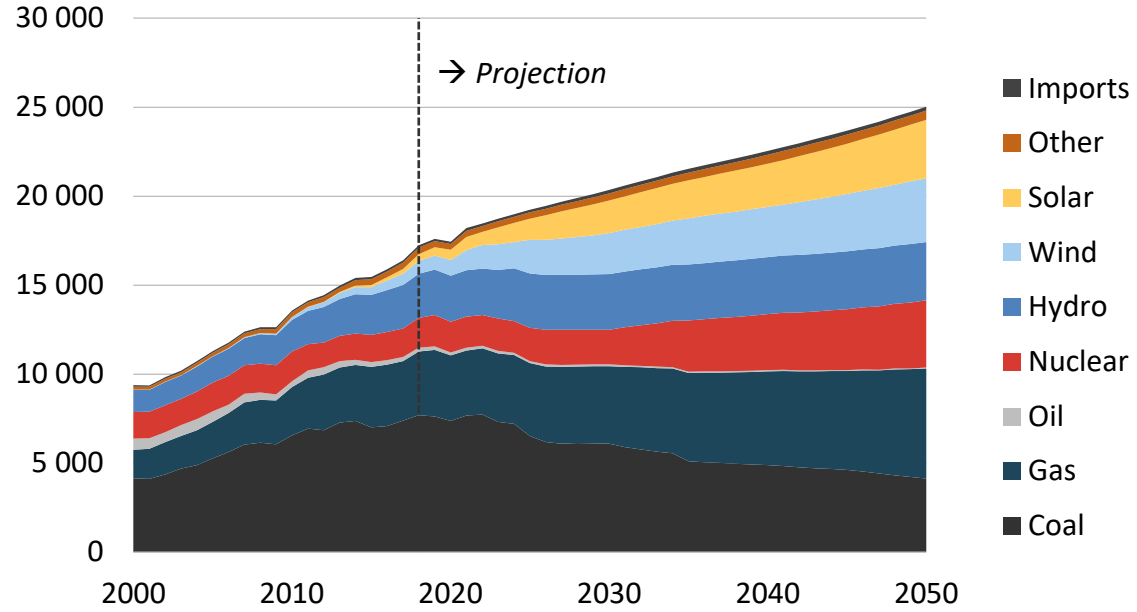
Energy demand by fuel in CN (PJ)



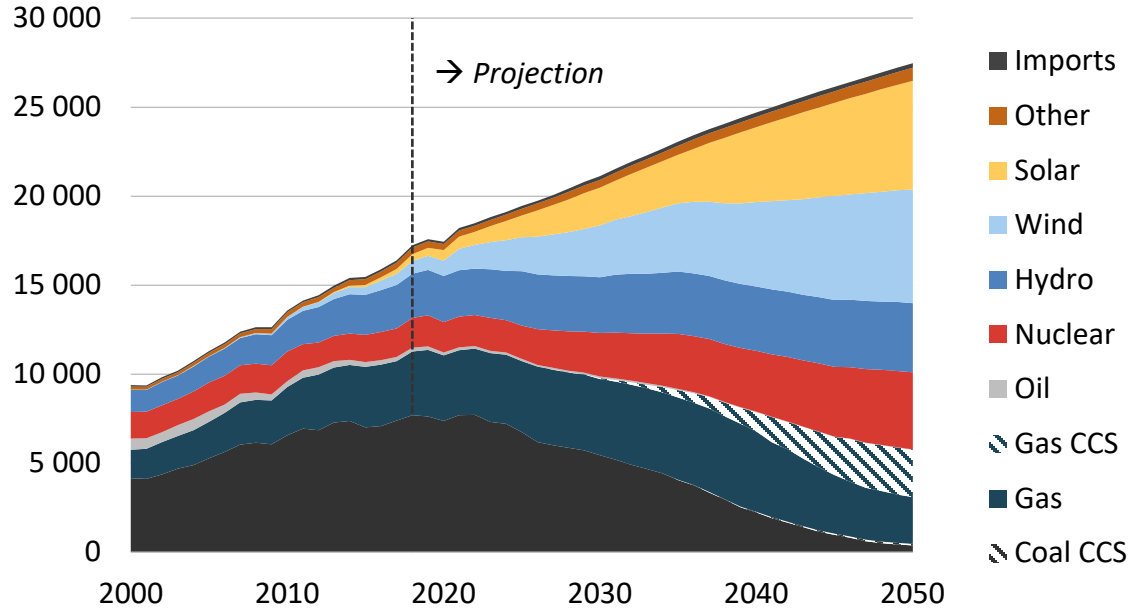
- In CN, energy efficiency and electrification enable energy demand to be 22% lower in 2050 relative to REF.
- In CN, energy use peaks in 2025.

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

Electricity generation in REF (TWh)



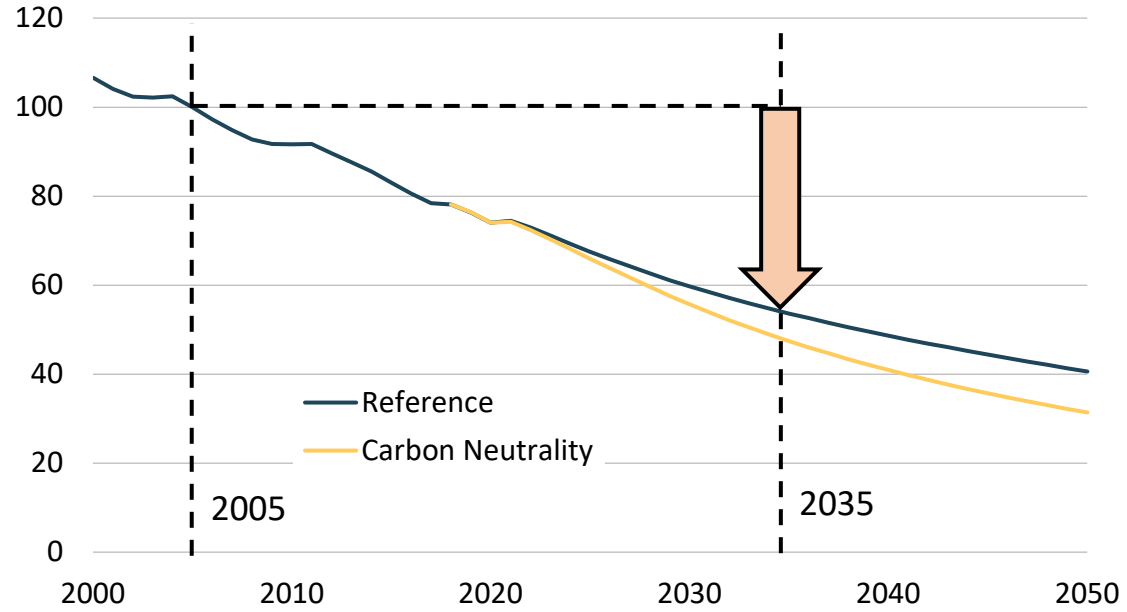
Electricity generation in CN (TWh)



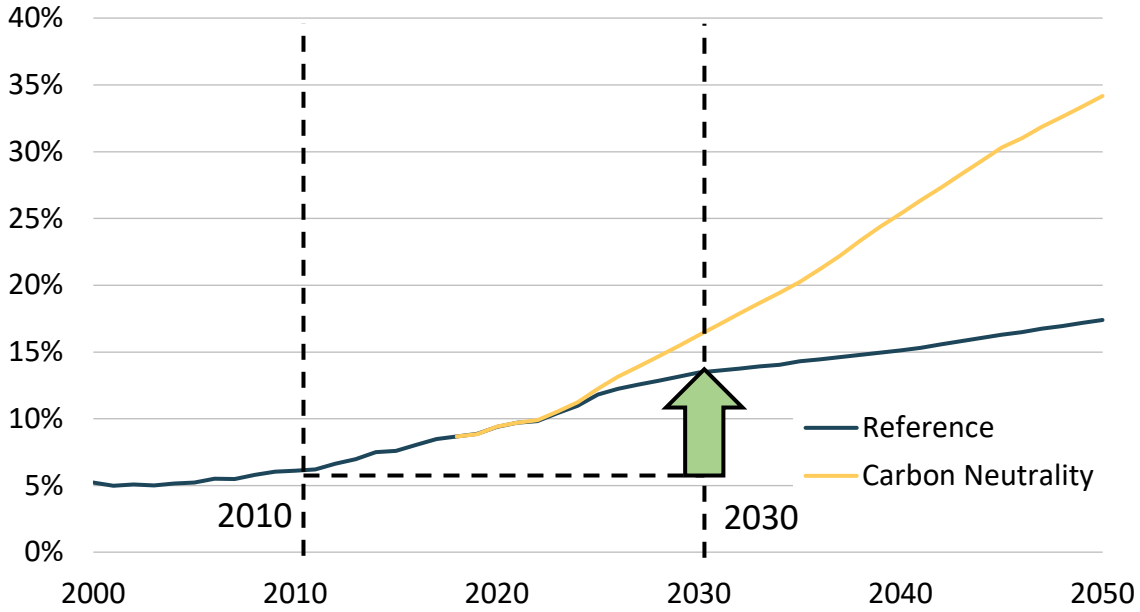
- Growth in electricity generation to meet increased demand, primarily in buildings and transport.
- Natural gas substitution for coal continues and provides balancing and ancillary services to the electric grid.

APEC projected to meet dual energy goals

Final energy intensity (2005 = 100)



Share of modern renewable energy



- Final energy intensity declines 45% by 2034 in REF and by 2031 in CN
- Modern renewable energy share doubles by 2026 in REF and by 2025 in CN

Summary

- Following the pandemic, APEC GDP and energy consumption both rebounded.
- In 2021, GDP grew more quickly than energy consumption and production, so relative to 2020, energy intensity continued to decline.
- Since 2018, total primary fossil fuel supply grew more than renewable energy supply causing the TPES and TFEC intensities to diverge slightly.
- APEC continues to make very substantial progress increasing renewable energy production.
- Based on history and APERC projections
  - APEC is likely to meet its final energy intensity goal by 2035.
  - APEC is almost certain to meet its renewable energy doubling goal.

APERC/EGEDA will continue to track both energy intensity and the renewable energy share

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Thank you.

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