Asia-Pacific Economic Cooperation

APERC Asia Pacific Energy Research Centre

APERC Update

EGEEC 59 & EGNRET Joint Meeting

5 October 2022




Outline

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

Progress toward the APEC energy intensity goal

Final energy intensity declined significantly in 2020

Annual change in APEC final energy intensity, 2006-20

	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	2005-20
Δ in FEC*	2.7%	3.6%	0.6%	-1.3%	5.5%	4.4%	1.8%	1.5%	-0.2%	0.5%	0.5%	1.6%	3.4%	0.2%	-3.9%	22.6%
Δ in GDP (PPP, constant 2018 USD)	5.4%	5.5%	2.9%	-0.2%	5.7%	4.2%	4.2%	3.8%	3.8%	3.6%	3.4%	4.1%	4.1%	3.4%	-1.8%	66.5%
Δ in final energy intensity	-2.5%	-1.8%	-2.2%	-1.1%	-0.2%	0.2%	-2.3%	-2.2%	-3.9%	-3.0%	-2.8%	-2.4%	-0.7%	-3.0%	-2.1%	**-26.4%**

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

Sources: APEC statistics (EGEDA), APERC analysis

- ❑ *In 2020, COVID 19 caused a decline in GDP and final energy consumption.*
- ❑ *The result is similar what we saw in the 2009 during the financial crisis.*
- ❑ *Final energy intensity fell 26.4% between 2005 and 2020.*

Primary energy intensity improved y-o-y as well

Annual change in APEC primary energy intensity, 2006-20

	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	2005-20
Δ in PES*	2.6%	3.3%	0.7%	0.0%	4.9%	4.0%	1.1%	1.7%	0.1%	-0.4%	0.8%	1.7%	3.6%	1.7%	-2.3%	26.0%
Δ in GDP (PPP, constant 2018 USD)	5.4%	5.5%	2.9%	-0.2%	5.7%	4.2%	4.2%	3.8%	3.8%	3.6%	3.4%	4.1%	4.1%	3.4%	-1.8%	66.5%
Δ in primary energy intensity	-2.6%	-2.1%	-2.2%	0.2%	-0.7%	-0.2%	-3.0%	-2.0%	-3.6%	-3.9%	-2.5%	-2.3%	-0.4%	-1.7%	-0.5%	**-24.3%**

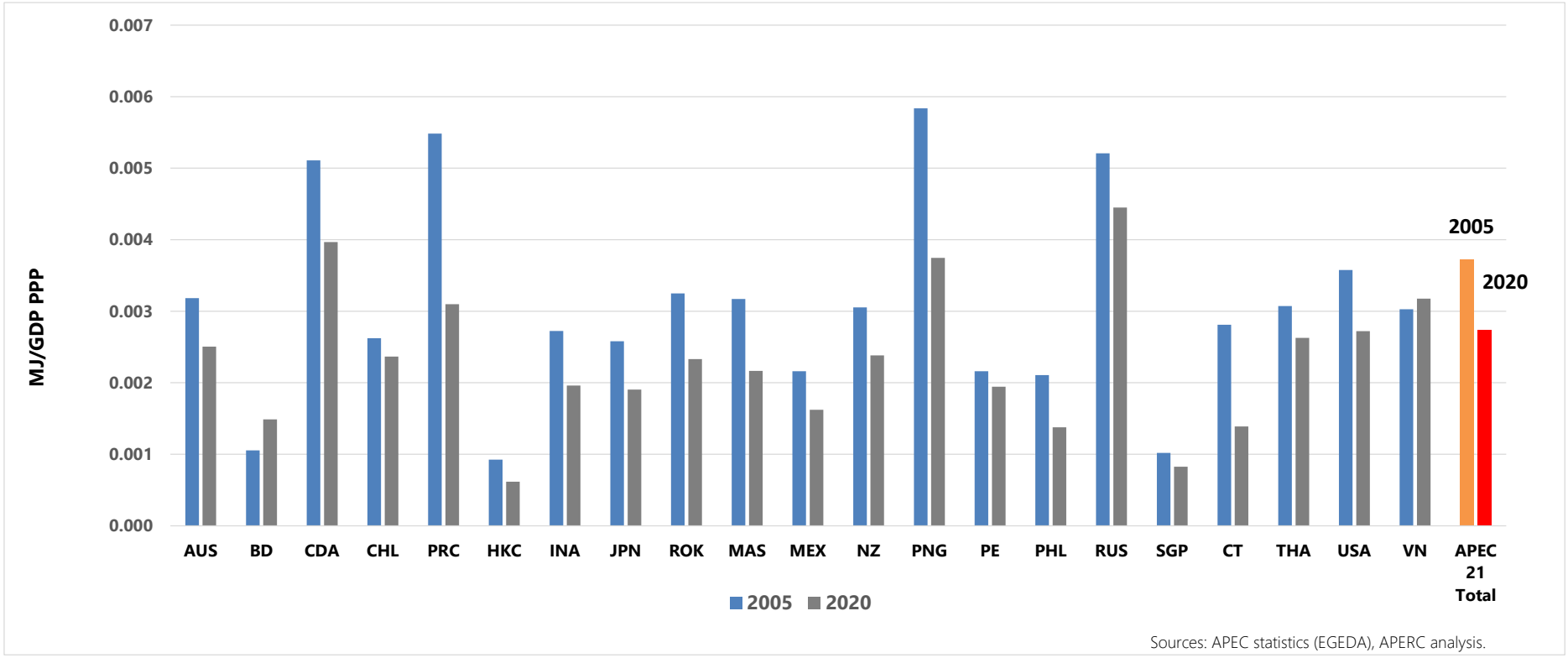
* **PES** – primary energy supply

Sources: APEC statistics (EGEDA), APERC analysis

- ❑ *At EWG62, APERC was asked to also show supply intensity.*
- ❑ *Year to year changes are generally similar to changes in final energy demand intensity*
- ❑ *Patterns appear to diverge in last three years.*

Energy intensity varies widely between economies

Energy intensity: Megajoules per 2018 USD (PPP GDP)



Note: energy intensity improvement is a collective goal.

Progress toward APEC renewables doubling goal

Renewable energy supply and consumption

Primary energy supply, PJ

	2010	2020	% change
Non-renewables	**287,866**	**315,490**	**9.6%**
Coal	117,084	118,423	1.1%
Oil	90,037	94,440	4.9%
Gas	61,451	82,034	33.5%
Other non-renewables	19,295	20,594	6.7%
Traditional biomass	**3,209**	**2,886**	**-10.1%**
Modern renewable energy	**14,641**	**25,129**	**71.6%**
Modern biomass	4,148	5,457	31.5%
Hydro	6,396	9,292	45.3%
Geothermal	1,473	1,793	21.7%
Solar	157	2,159	1277.7%
Wind	586	3,295	462.6%
Other renewables	1,882	3,133	66.5%
Total	**305,717**	**343,505**	**12.4%**
Modern RE share	**4.79%**	**7.32%**	**52.7%**

Final energy consumption, PJ

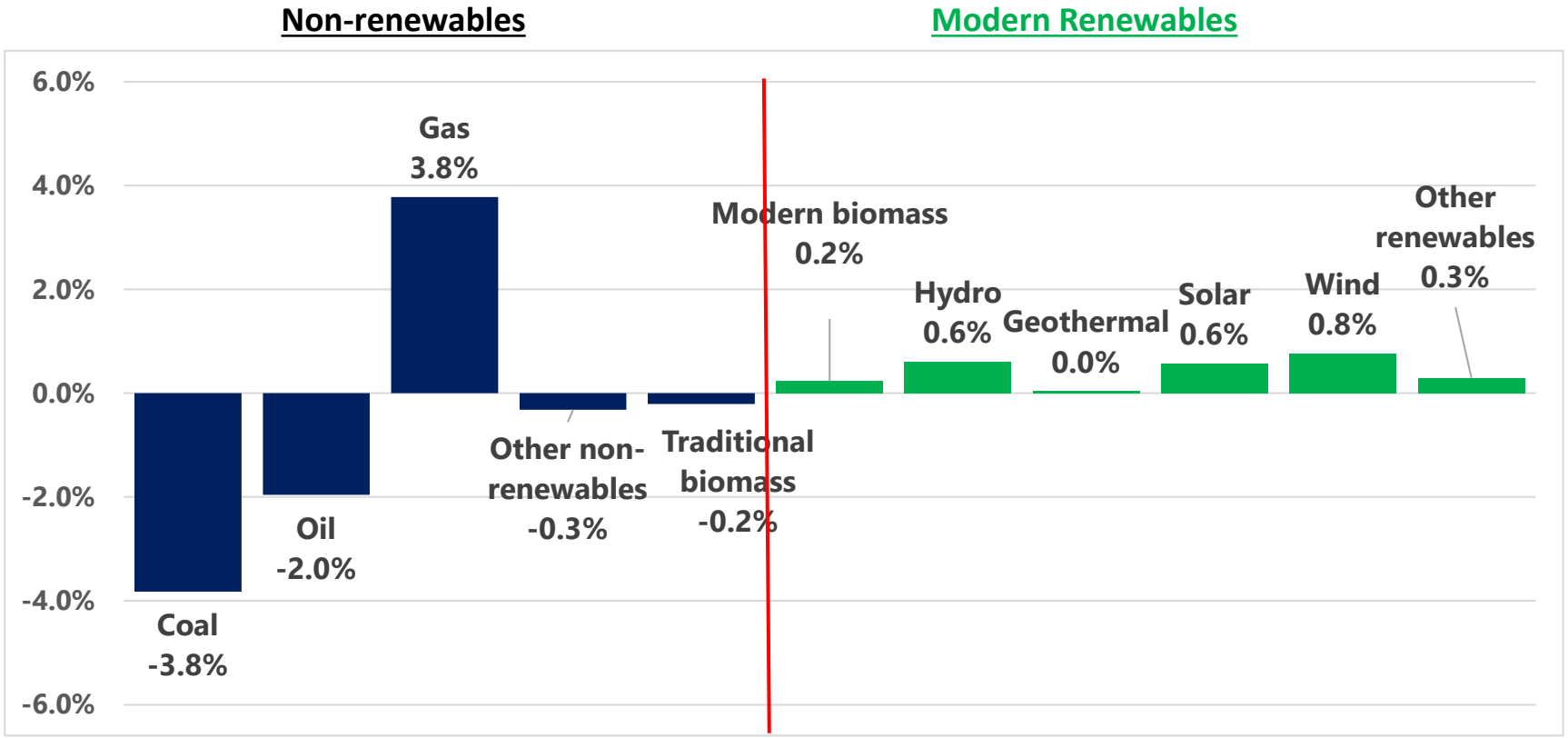
	2010	2020	% change
Non-renewables	**163,800**	**173,930**	**6.2%**
Coal	30,471	24,513	-19.6%
Oil	64,516	63,727	-1.2%
Gas	26,147	34,901	33.5%
Electricity	34,570	40,605	17.5%
Heat	7,882	9,837	24.8%
Other non-renewables	213	347	62.5%
Traditional biomass	**3,209**	**2,886**	**-10.1%**
Modern renewable energy	**10,693**	**18,580**	**73.8%**
Electricity	6,230	13,168	111.3%
Heat	64	58	-10.0%
Modern biomass	2,824	2,847	0.8%
Other renewables	1,575	2,508	59.3%
Total	**177,702**	**195,397**	**10.0%**
Modern RE share	**6.02%**	**9.51%**	**58.0%**

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

Source: APEC data.

Coal and other energy lost shares to gas and renewables

Percent change in fuels in primary energy supply market share, 2010-2020

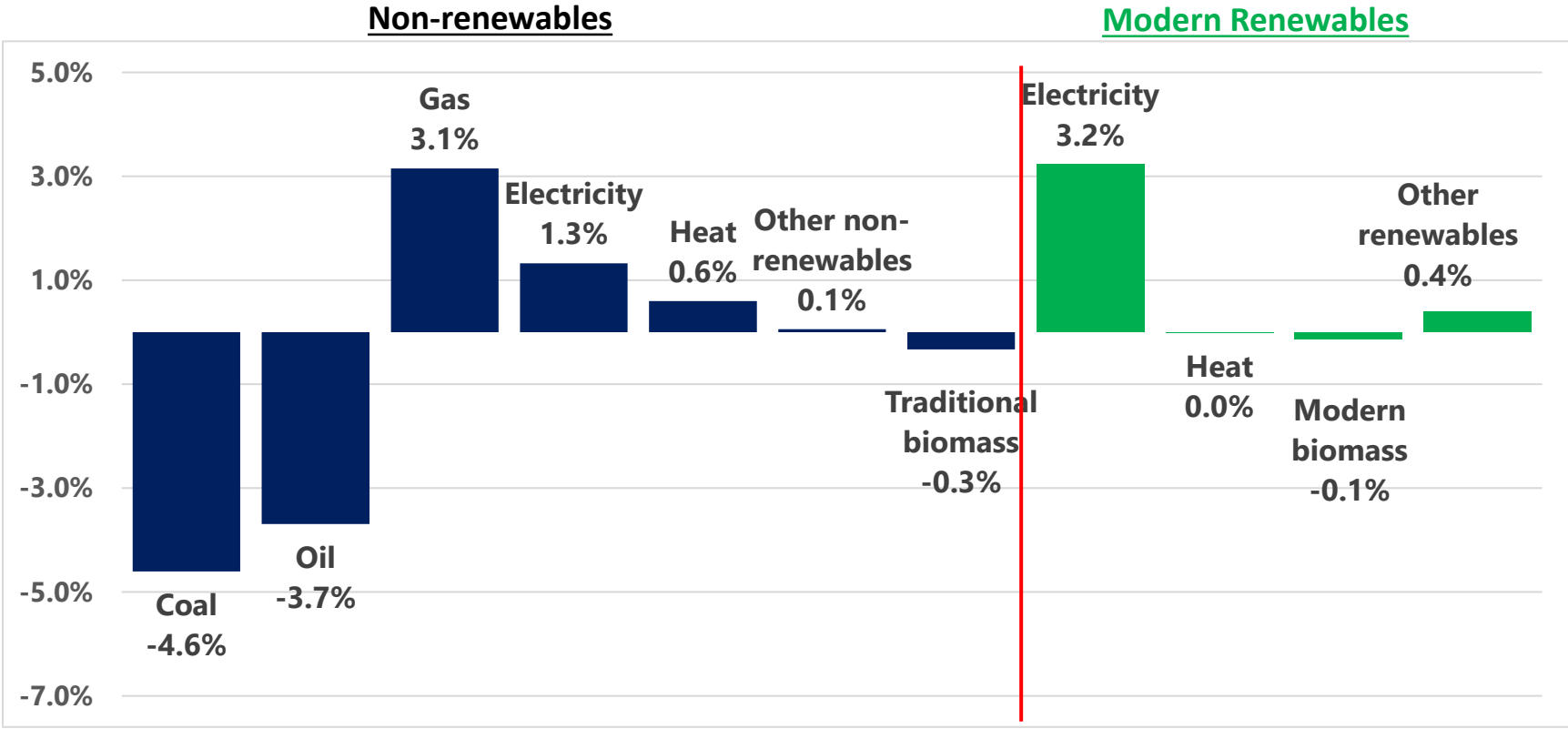


Note: Renewable energy includes electricity and heat generated from renewable energy sources
Source: APEC data

From 2010 to 2020, the renewable share increased 2.53 percentage points, 52.7% of the way to the goal.

Coal and oil lost shares to electricity from renewables

Percent change in fuels in final energy consumption market share, 2010-2020



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

Source: APEC data.

From 2010 to 2020, the renewable share increased 3.5 percentage points, 58% of the way to the goal.

Electricity Generation

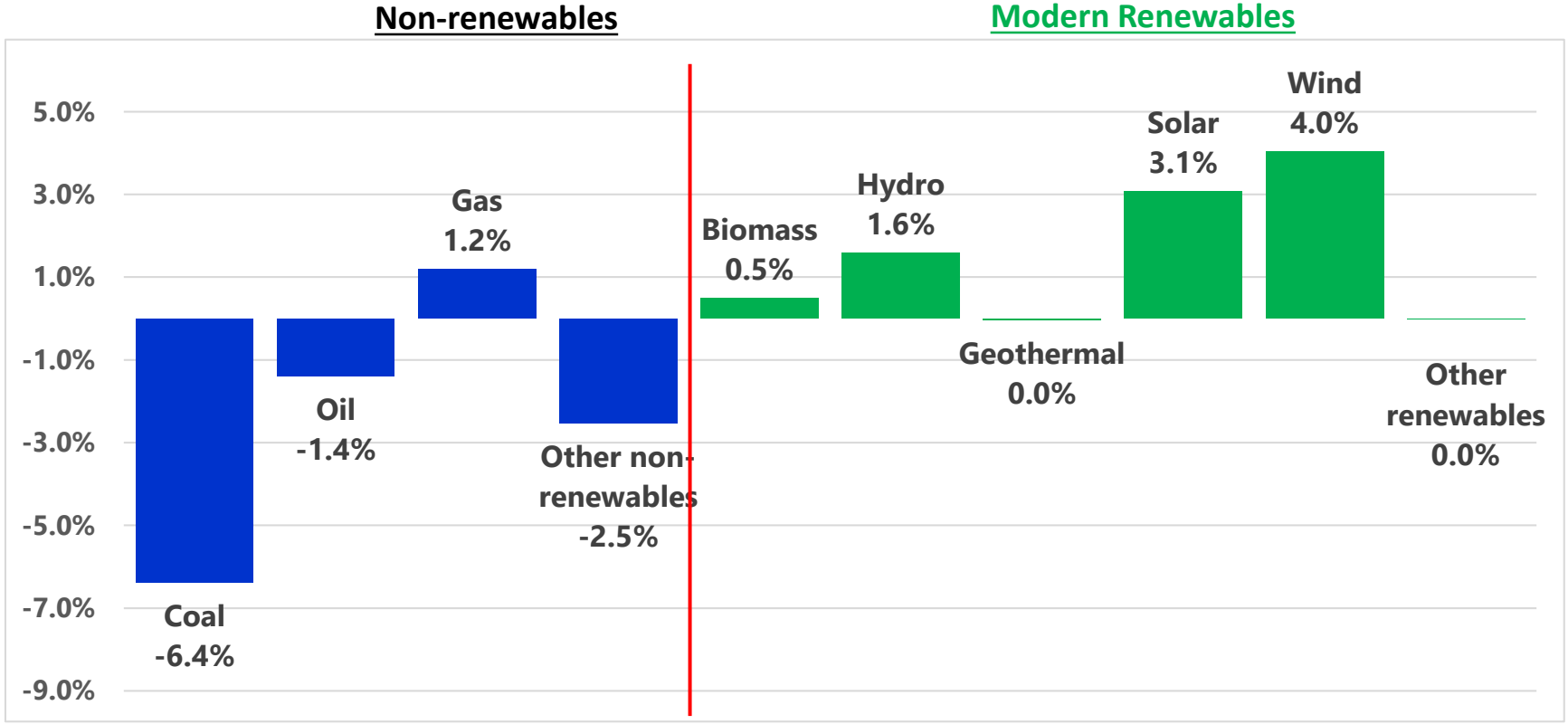
Electricity Generation, TWh

	2010	2020	% change
Non-renewables	**11,374**	**13,160**	**15.7%**
Coal	6,576	7,417	12.8%
Oil	324	176	-45.7%
Gas	2,713	3,726	37.3%
Nuclear	1,658	1,742	5.0%
Other non-renewables	102	100	-2.5%
Modern renewable energy	**2,099**	**4,316**	**105.6%**
Modern biomass	67	172	157.3%
Hydro	1,780	2,584	45.2%
Geothermal	53	63	18.6%
Solar	9	548	5990.5%
Wind	163	915	462.6%
Other renewables	27	33	19.1%
Total	**13,472**	**17,476**	**29.7%**
Modern RE share	**15.58%**	**24.69%**	**58.5%**

In electricity generation, for just 50% of the time to 2030, APEC has already increased renewable energy share by 58.5%

Coal and oil lost shares to gas and renewables

Percent change in electricity generation market share, 2010-2020



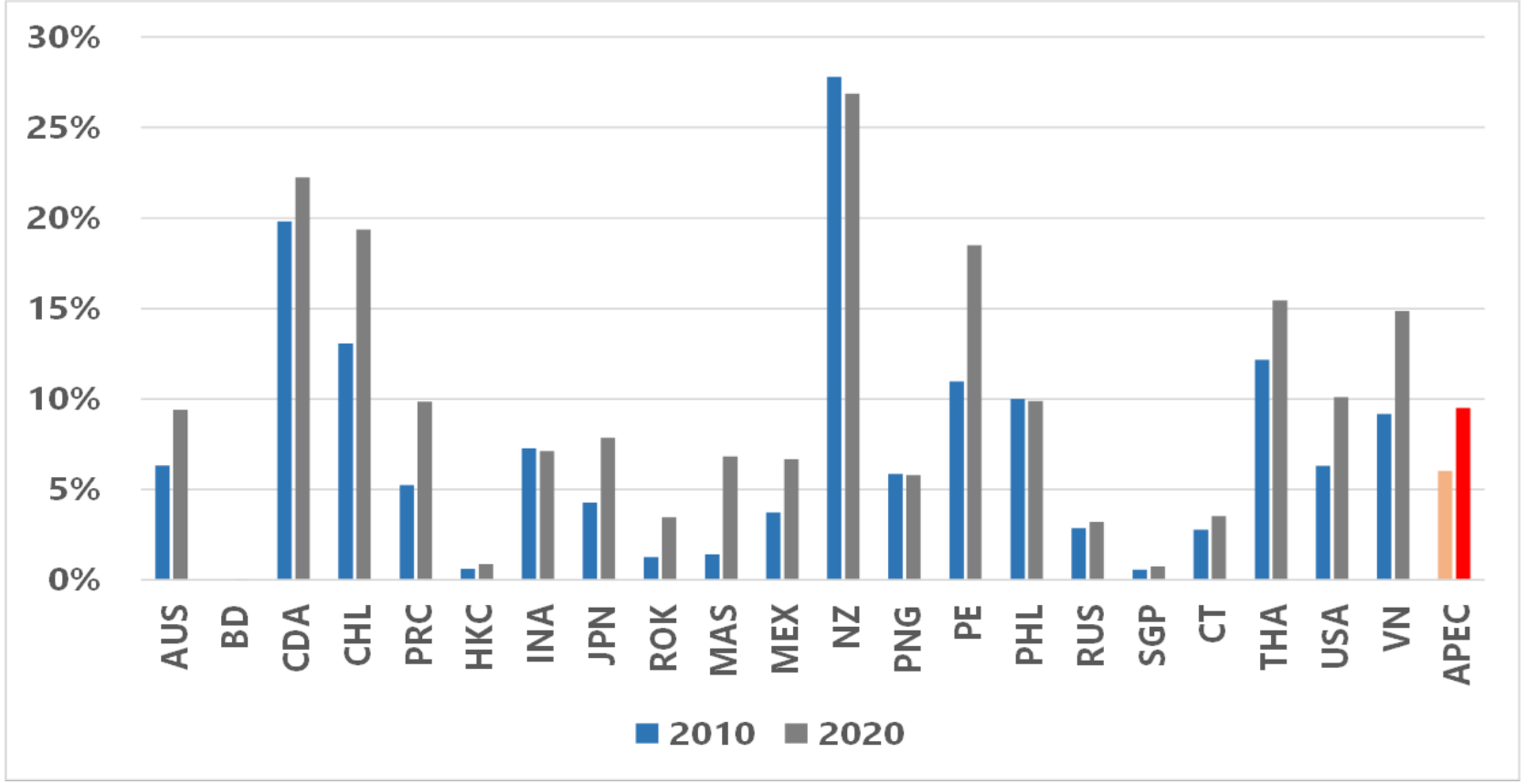
Note: Renewable energy includes electricity and heat generated from renewable energy sources

Source: APEC data.

From 2010 to 2020, the renewable share increased 9.1 percentage points, 58.5% of the way to the goal.

RE Share per economy, 2010 and 2020

RE share in final energy consumption varied widely



Note: the RE doubling goal is a collective goal.

Source: APEC data

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

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Scenarios

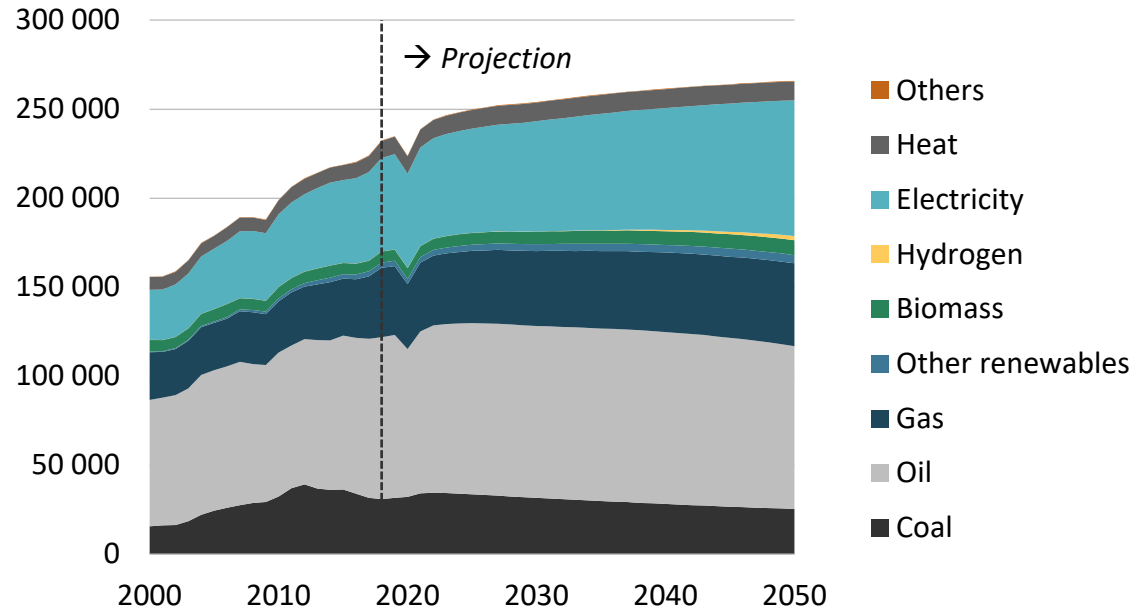
	Reference (REF)	Carbon Neutrality (CN)
Definition	Recent trends and current policies.	Hypothetical decarbonisation pathways for each APEC economy.
Purpose	Provides a baseline for comparison with the Carbon Neutrality scenario.	Additional energy sector transformations that support decarbonisation objectives.
Key assumptions	Current polices and trends continue.	Increased levels of energy efficiency, electrification, behavioral changes, fuel switching, and CCS deployment.
Limitations	Assumes that recent trends, including relevant decarbonisation measures continue.	Does not consider non-energy impacts on CO_2 or removal.

Note: does not represent APERC's recommendation or advocacy for a pathway or set of policies.

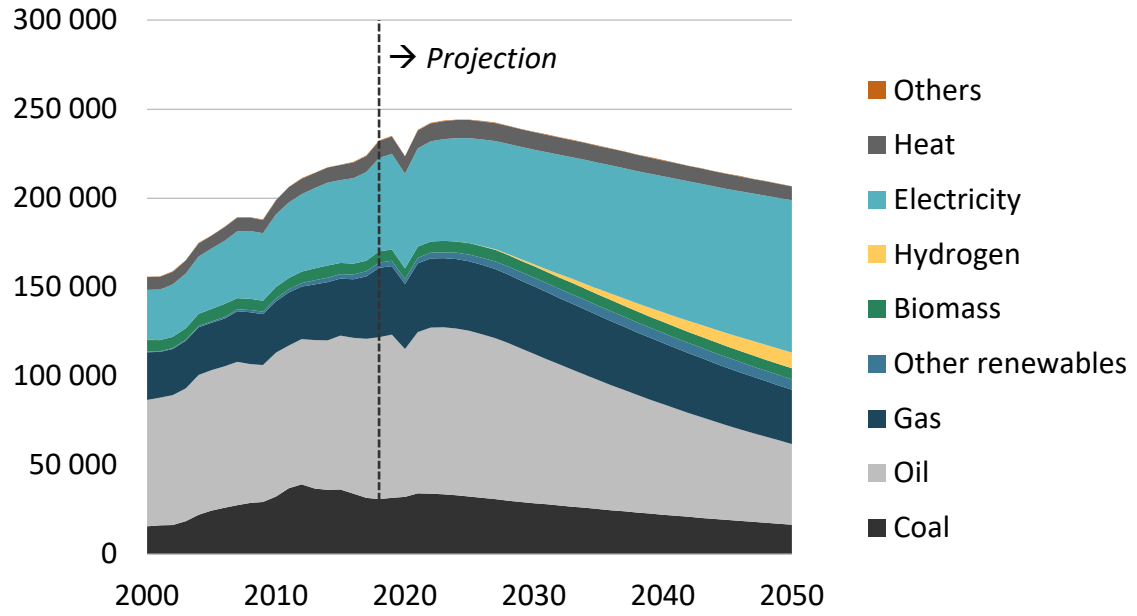
The analysis was performed prior to March 2022 and does not include current disruptions to international energy markets.

Energy demand decouples significantly from economic activity

Energy demand by fuel in REF (PJ)



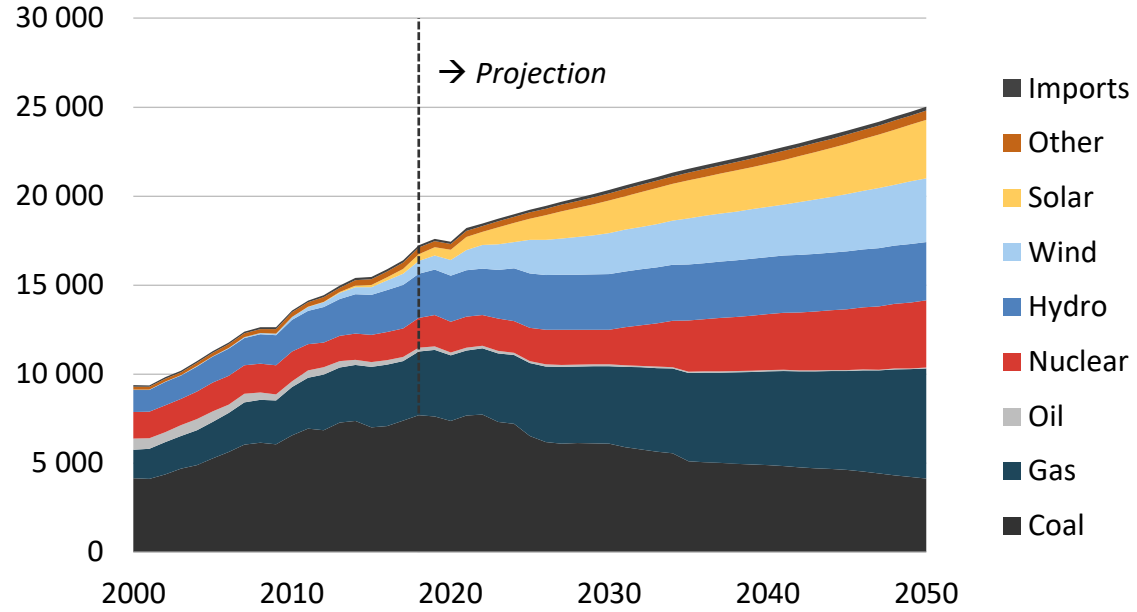
Energy demand by fuel in CN (PJ)



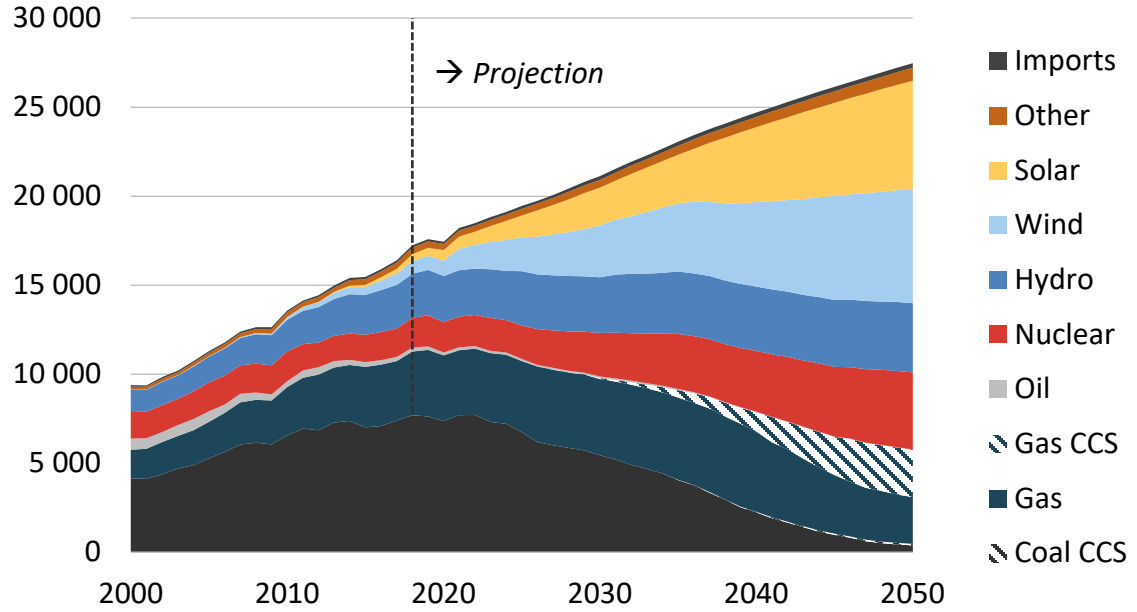
- In CN, energy efficiency and electrification enable energy demand to be 22% lower in 2050 relative to REF.
- In CN, energy use peaks in 2025.

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

Electricity generation in REF (TWh)



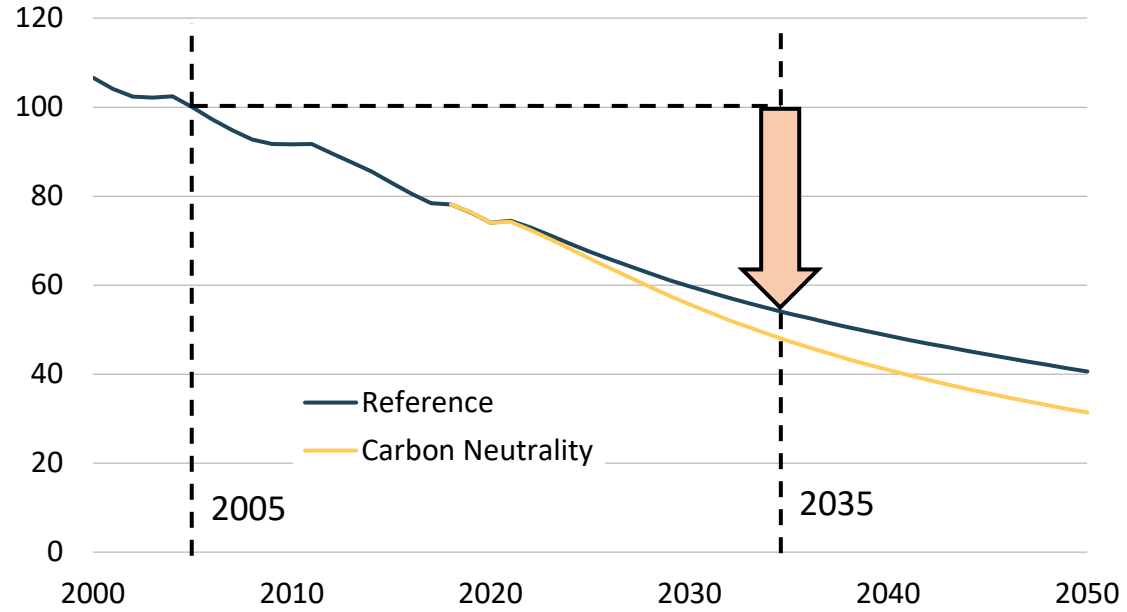
Electricity generation in CN (TWh)



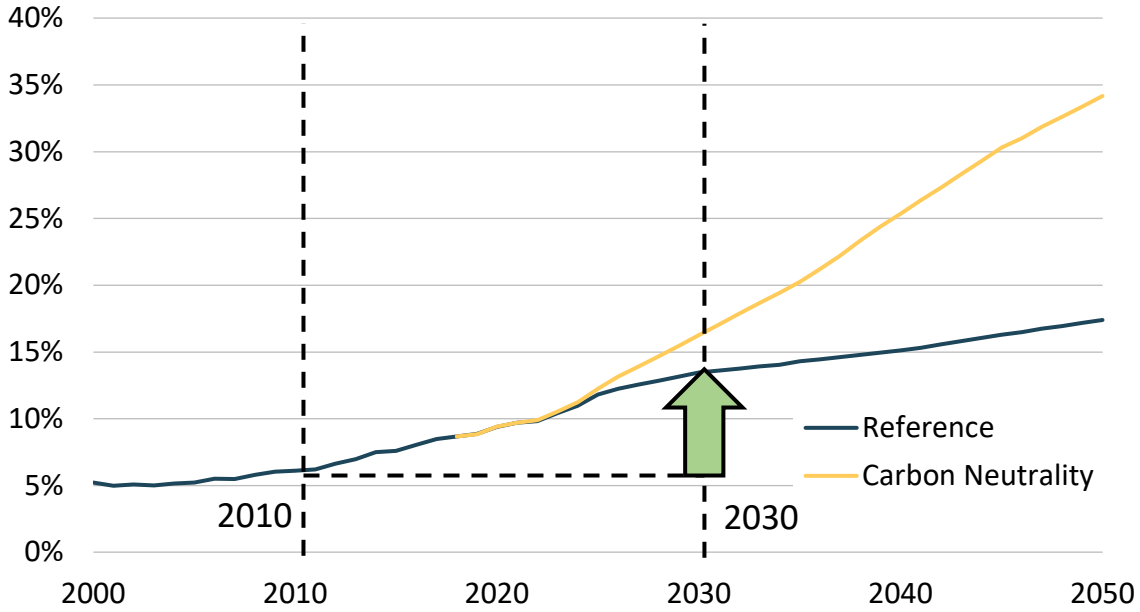
- Growth in electricity generation to meet increased demand, primarily in buildings and transport.
- Natural gas substitution for coal continues and provides balancing and ancillary services to the electric grid.

APEC projected to meet dual energy goals

Final energy intensity (2005 = 100)



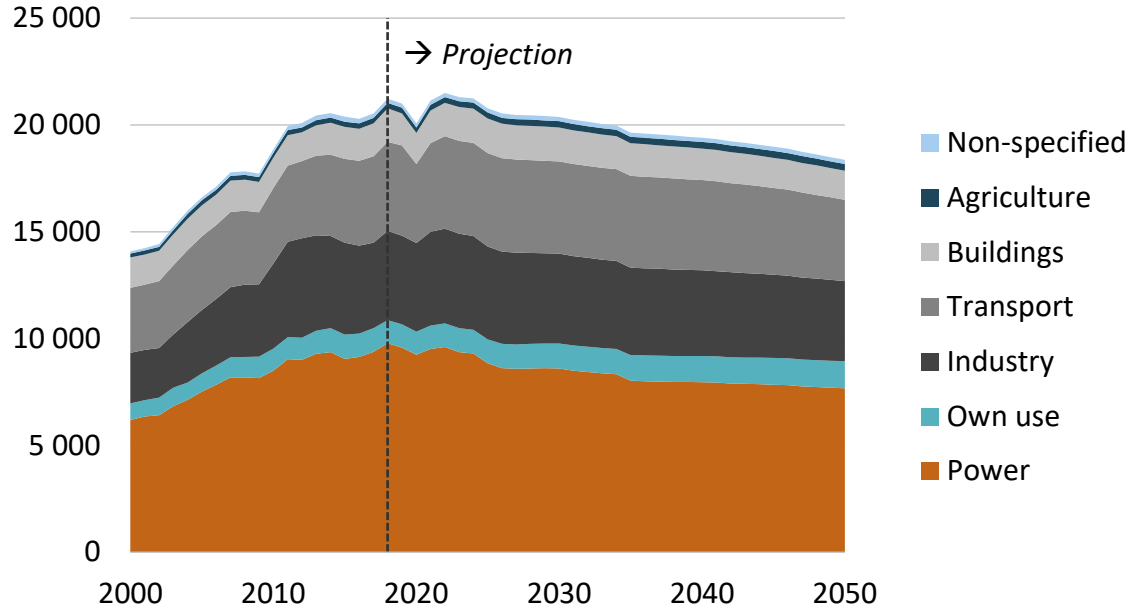
Share of modern renewable energy



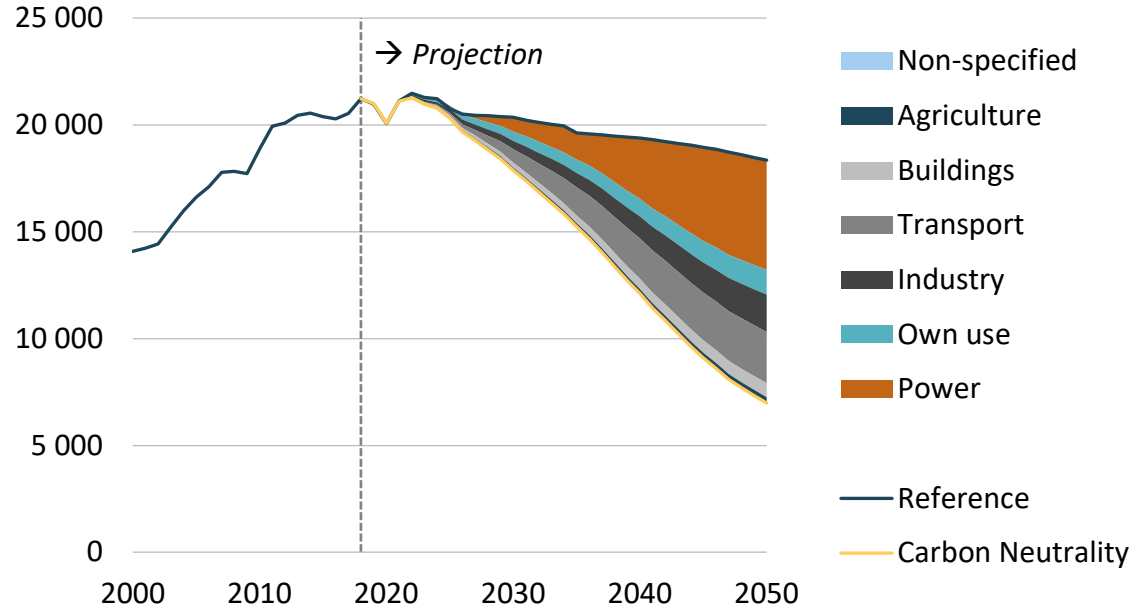
- Final energy intensity declines 45% by 2034 in REF and by 2031 in CN
- Modern renewable energy share doubles by 2026 in REF and by 2025 in CN

CN delivers ambitious CO_2 emissions reductions…

Energy-related CO_2 emissions in REF (million tonnes)

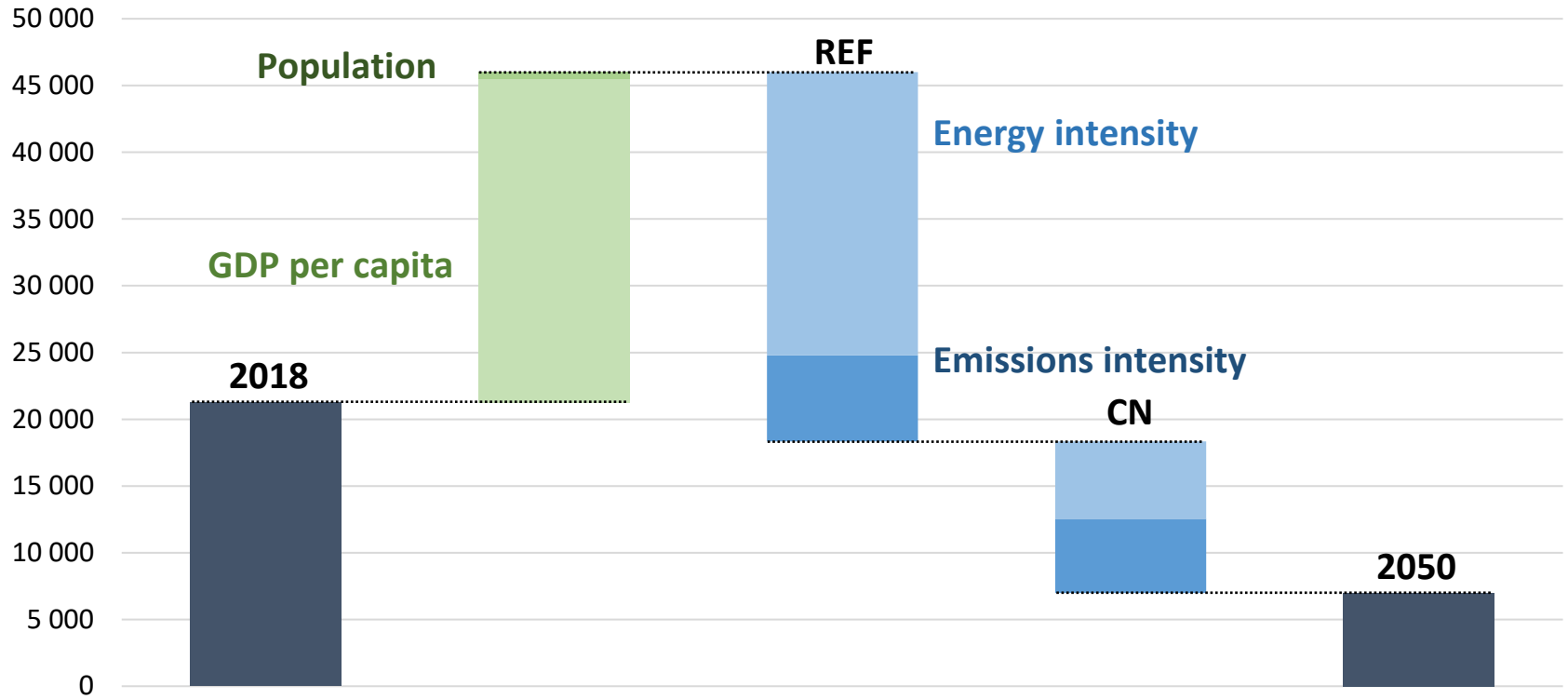


Decrease between REF and CN (million tonnes)



- APEC-wide CO_2 emissions decline by 14% in REF and by 67% in CN.
- The power and transport sectors are the most important contributors to incremental reductions in CN.

…through energy and emissions intensity improvements



- Lower energy intensity delivers approximately three-quarters of the emissions reductions in REF and CN.
- In CN, energy and emissions intensity reductions provide roughly equal incremental benefits.

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Thank you.

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