

14.b. Progress toward energy intensity and renewable energy doubling goals

The 60th Meeting of the APEC Energy Working Group (EWG)
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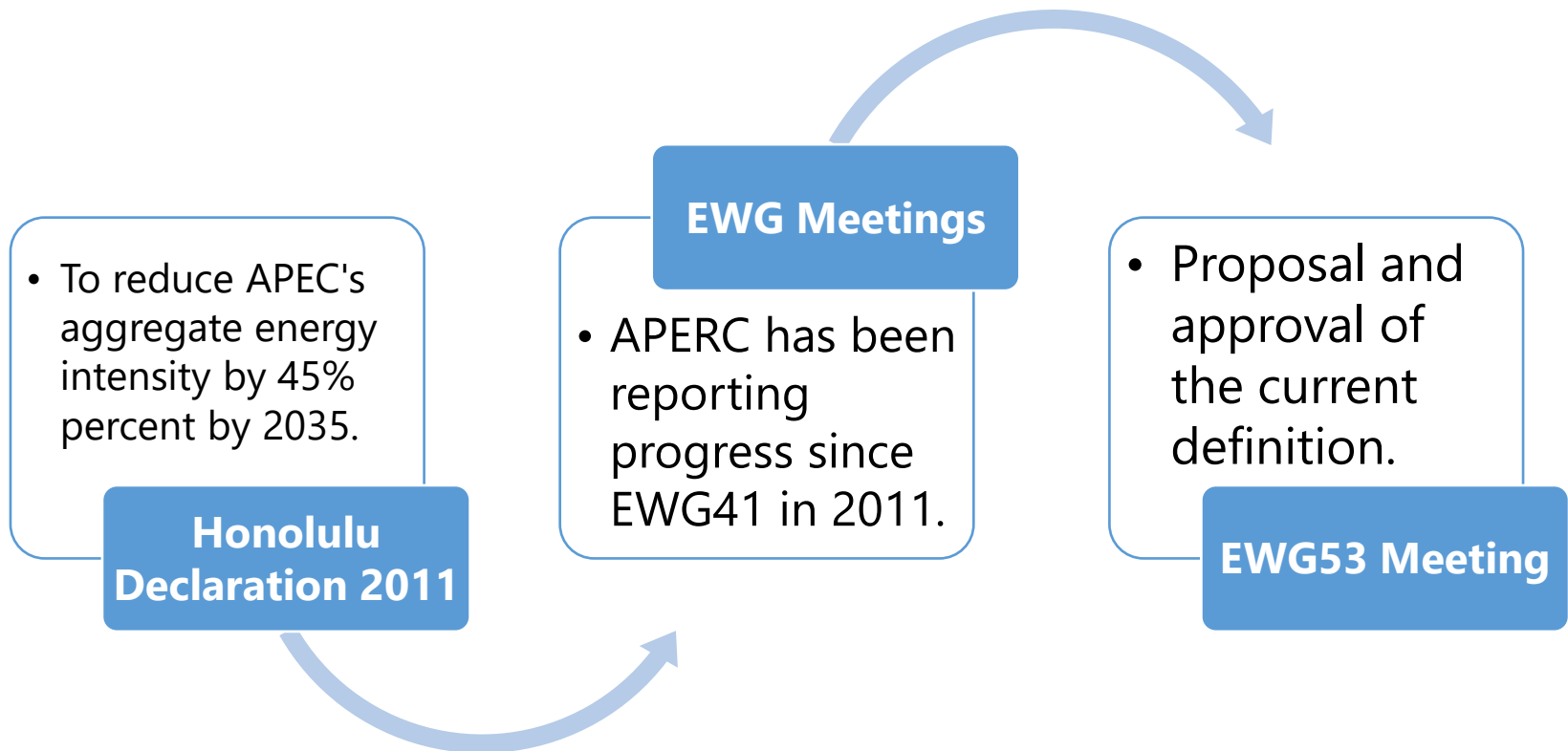


Outline

- Progress on APEC intensity goal
- Decomposition analysis
- Progress on APEC RE doubling goal
- Closing thoughts

1. Progress on APEC energy intensity goal

APEC energy intensity indicator milestones



- ❑ Agreement was reached at EWG53 to analyse final energy consumption intensity (excluding non-energy), using APEC data.

Energy intensity continued to decline in 2018...

Annual change in APEC final energy intensity, 2006-18

	2006	07	08	09	10	11	12	13	14	15	16	17	18	Trend to 2035
Change in final energy consumption	2.5%	2.9%	0.7%	-1.3%	5.5%	4.3%	1.9%	1.4%	1.4%	0.2%	1.2%	0.3%	1.8%	
Change in GDP (PPP, constant 2017 US dollars)	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%	
Change in final energy intensity	-2.7%	-2.5%	-2.2%	-1.1%	-0.1%	0.09%	-2.3%	-2.3%	-2.3%	-3.4%	-2.1%	-3.6%	-2.2%	-46.4%

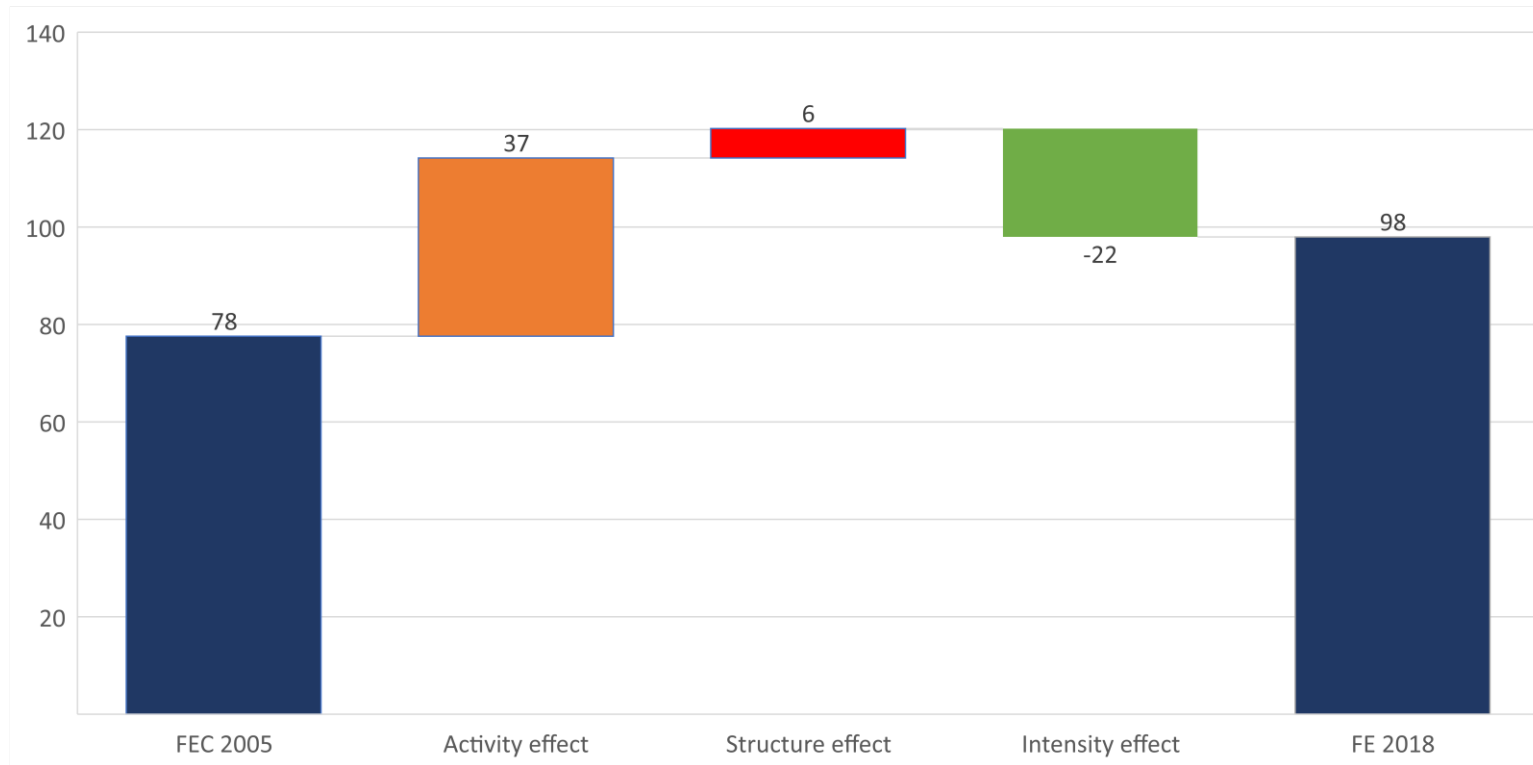
Sources: APEC statistics, WB, DGBAS (CT) and APERC analysis.

- ❑ *Final energy intensity has been improving reasonably consistently year-on-year, with 2.2% reduction in 2018*
- ❑ *Final energy intensity fell 23.7% between 2005 and 2018.*
- ❑ *If the current trend continues, the APEC final energy intensity goal of 45% will be met in 2035;*

2. Decomposition of the change in energy consumption

Analysis

Decomposition : Final energy consumption(Exajoules), 2005-18



- ❑ *Energy efficiency or intensity effect played a significant role in offsetting the increases in final energy consumption brought about by the rapid growth (activity) of the APEC region*

Note: China's energy data was estimated, based on preliminary information: monthly/quarterly

Better data = better analysis

- Decomposition method allows us to separate structural shifts or activity shifts, understanding better true trends in energy consumption as well as trends in economic activity that influence energy consumption in APEC.
- However, more useful analysis requires more detailed data. Decomposition of aggregate intensity is already a challenge
- Transport (passenger-km travel and number of vehicles)--initially tried with three OECD APEC economies--and residential (floor area and weather effect) will be challenging.

3. Progress on APEC RE doubling goal

Renewable share doubling goal milestones

- 1. EWG 47 (May 2014)** - US proposed the APEC aspirational goal of doubling the share of renewable energy by 2030 and noted that it interacted with APEC's aspirational energy intensity goal.
- 2. EMM 11 (Sep 2014)** - "Doubling the share of renewables in the APEC energy mix, including in power generation, from 2010 levels by 2030."
- 3. EWG 54 (Nov 2017)** - EWG decided that traditional biomass will not be counted; IRENA's definition of renewable energy is recommended; APEC data should be used for monitoring progress; and the goal should be monitored on both the supply and demand side.

Renewable energy supply and consumption

Primary energy supply, PJ

	2010	2018	% change
Non-renewables	287,524	311,028	8.2%
Coal	116,655	113,078	-3.1%
Oil	90,579	98,671	8.9%
Gas	61,372	79,630	29.7%
Other non-renewables	18,917	19,649	3.9%
Traditional biomass	3,551	3,090	-13.0%
Modern renewable energy	14,985	23,441	56.4%
Modern biomass	4,491	5,808	29.3%
Hydro	6,396	8,898	39.1%
Geothermal	1,486	1,757	18.2%
Solar	152	1,497	881.7%
Wind	586	2,611	345.9%
Other renewables	1,873	2,869	53.2%
Total	306,060	337,559	10.3%
Modern RE share	4.9%	6.9%	41.8%

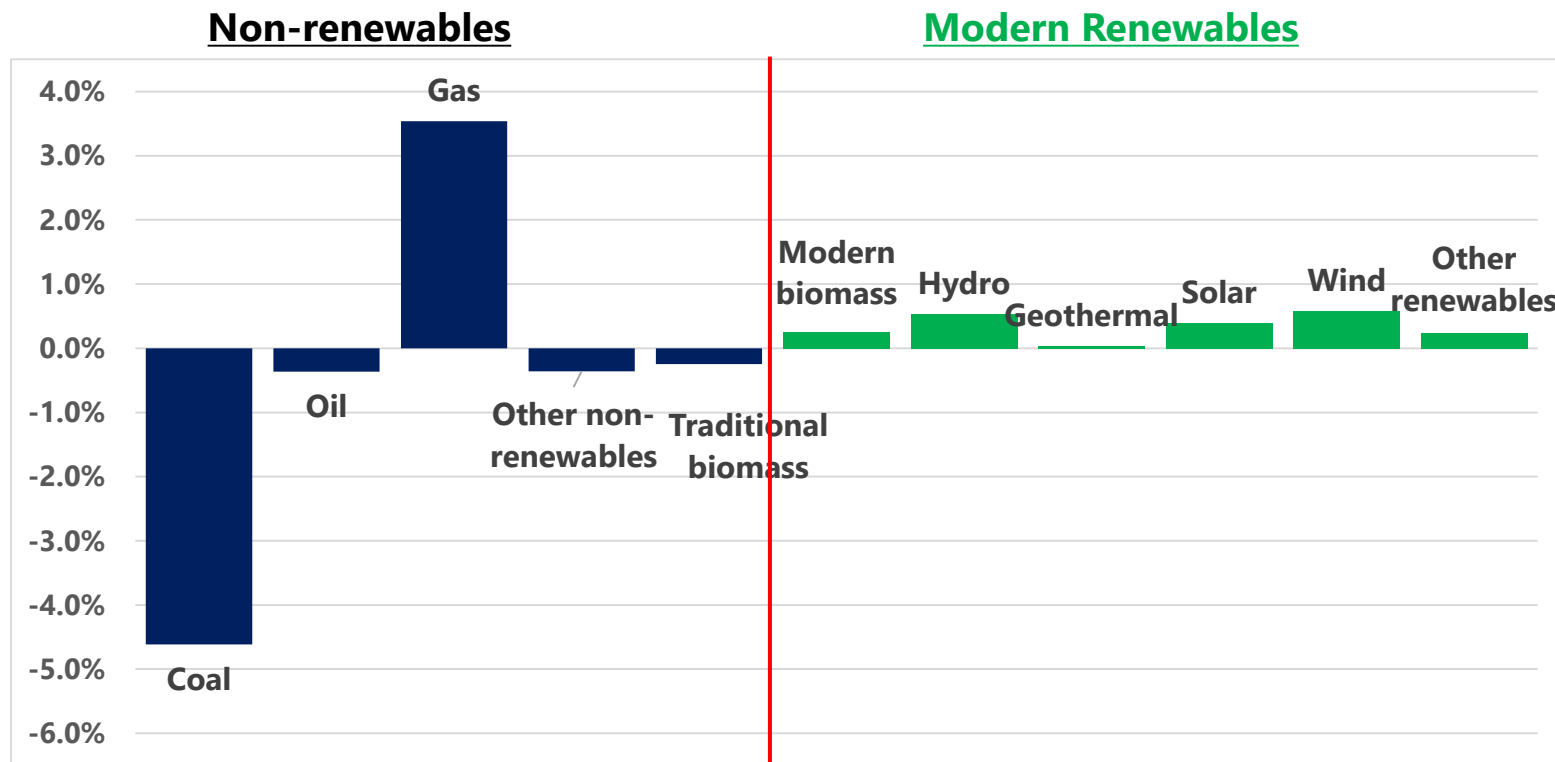
Final energy consumption, PJ

	2010	2018	% change
Non-renewables	164,548	181,546	10.3%
Coal	30,630	26,292	-14.2%
Oil	65,128	71,216	9.3%
Gas	26,184	34,326	31.1%
Electricity	34,553	40,037	15.9%
Heat	7,839	9,373	19.6%
Other non-renewables	215	303	40.8%
Traditional biomass	3,551	3,090	-13.0%
Modern renewable energy	10,735	17,543	63.4%
Electricity	6,243	11,584	85.6%
Heat	61	62	0.8%
Modern biomass	2,862	3,276	14.5%
Other renewables	1,570	2,621	67.0%
Total	178,835	202,179	13.1%
Modern RE share	6.0%	8.7%	44.5%

Note: Consumption of electricity and heat from renewables is calculated from the share of total electricity and heat production.
 Data of China for 2018 are estimated based on preliminary information.
 Source: APEC data.

Coal and other energy lost shares to gas and renewables

Percent change in fuels in primary energy supply market share, 2010-2018



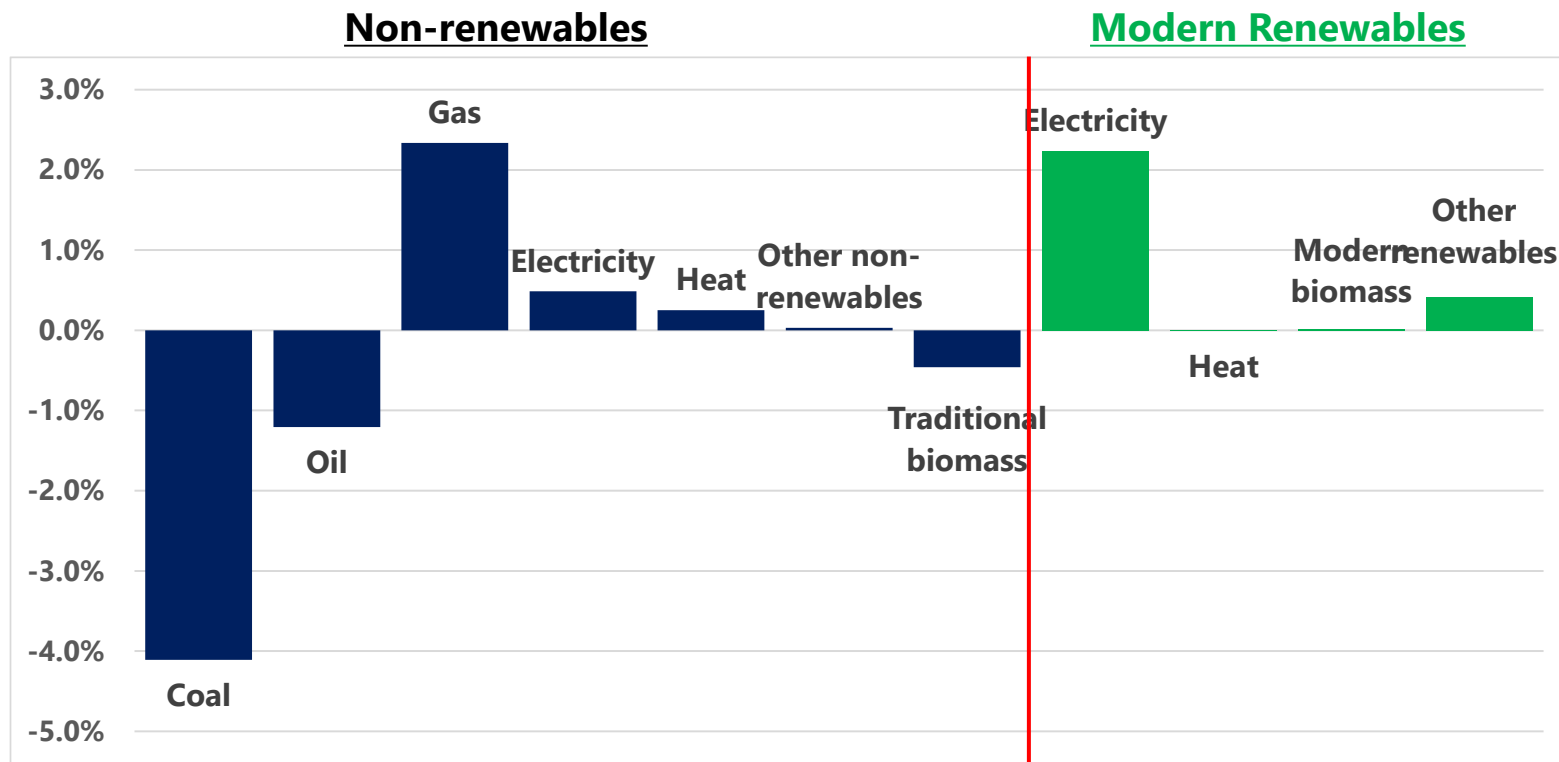
Note: Renewable energy includes electricity and heat generated from renewable energy sources

Source: APEC data

From 2010 to 2018, the renewable share increased 2.0 percentage points, 42% 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, 2010-2018



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

Source: APEC data.

From 2010 to 2018, the renewable share increased 2.7 percentage points, 45% of the way to the goal.

Renewable energy supply and consumption

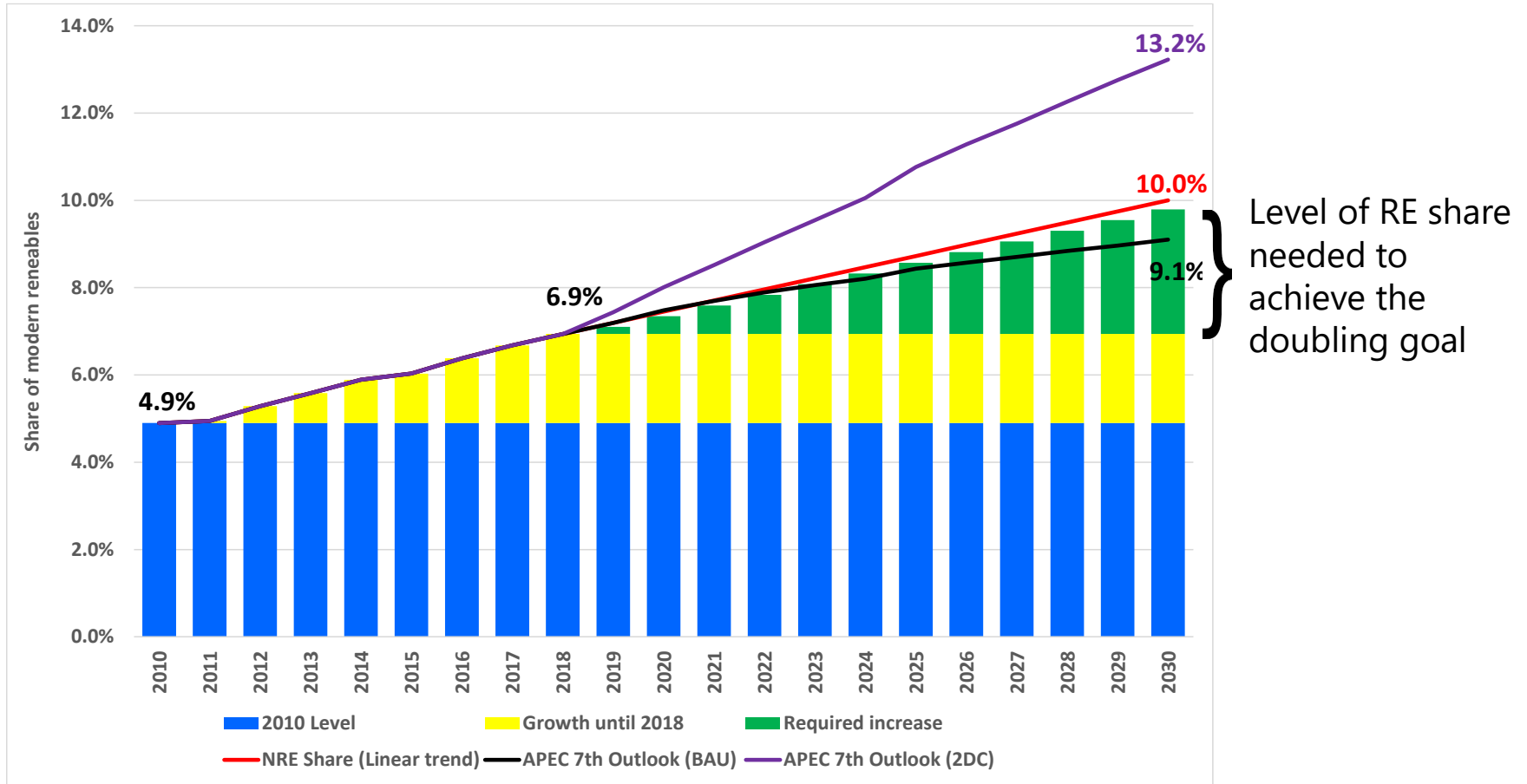
Electricity Generation, TWh

	2010	2018	% change
Non-renewables	11,377	13,059	14.8%
Coal	6,572	7,463	13.6%
Oil	330	210	-36.5%
Gas	2,711	3,624	33.7%
Nuclear	1,658	1,681	1.4%
Other non-renewables	106	81	-23.4%
Modern renewable energy	2,103	3,824	81.9%
Modern biomass	73	165	126.8%
Hydro	1,780	2,475	39.1%
Geothermal	53	60	13.7%
Solar	9	366	3966.3%
Wind	163	725	345.8%
Other renewables	26	34	29.6%
Total	13,480	16,884	25.3%
Modern RE share	15.6%	22.7%	45.2%

Even in electricity generation, for just 40% of the time to 2030, APEC has already increased renewable energy share by 45%

Supply outlook BAU extrapolation fails to meet the goal

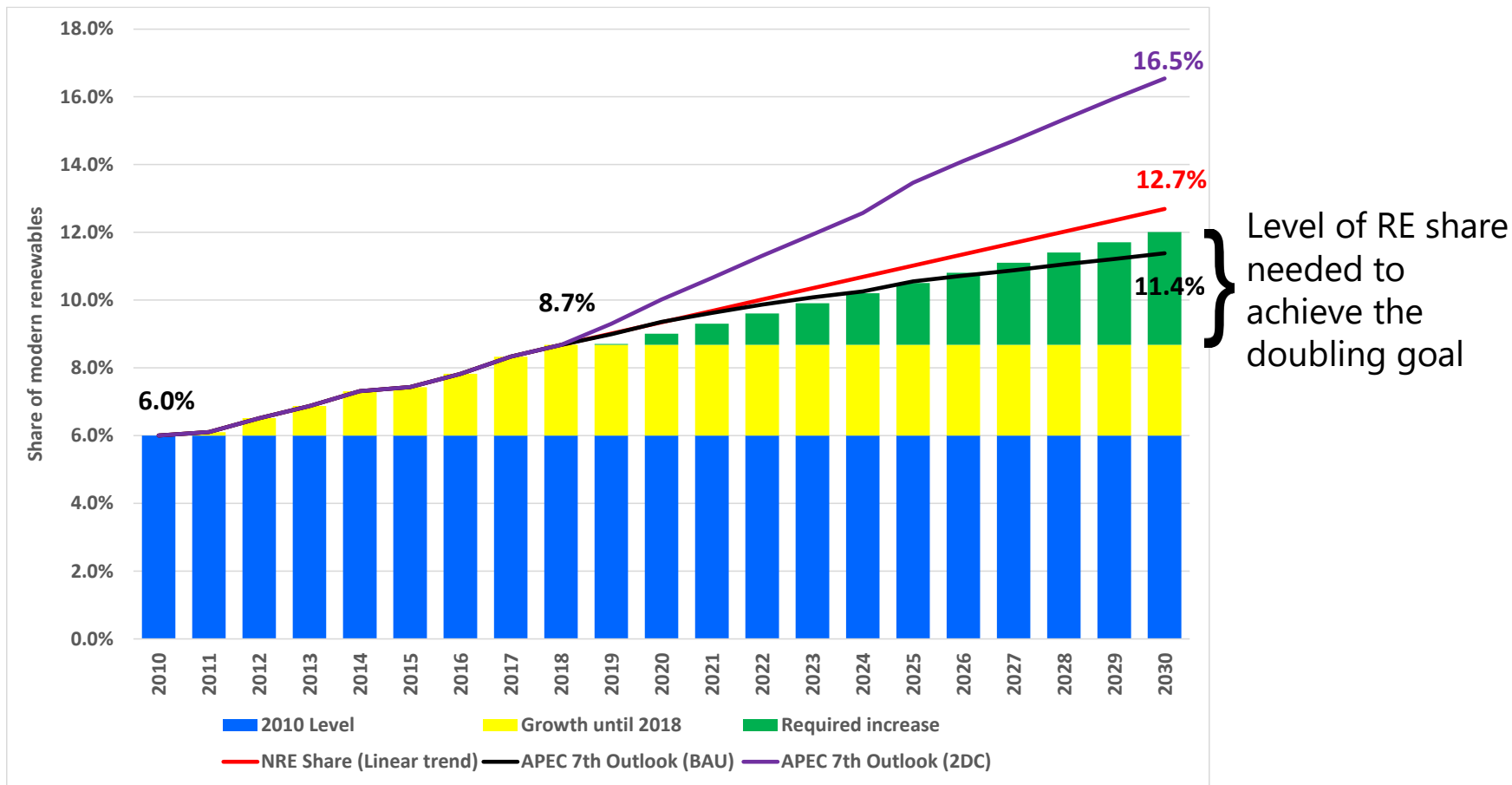
Renewable energy share in total primary energy supply, 2010-2030



Source: APEC data and APERC analysis.

Demand outlook BAU extrapolation also fails to meet the goal

Renewable energy share in total final energy demand, 2010-2030



Source: APEC data and APERC analysis.

Closing thoughts

- From 2010 to 2018, real progress has been made toward achieving the renewable doubling goal
 - Enabled by rapid decrease in costs and favorable government policies (FIT, RPS, etc.)
- Further increases in the share of VREs will require back-up generation and/or substantial increases in electricity storage to ensure grid stability
 - There are many options, although some are high cost with current technologies
 - An APERC study shows that one option for storage is battery electric vehicles (BEVs)
- We expect the grid stability challenge to be addressed on an economy-by-economy basis and APERC will continue to monitor progress and identify lessons learned over the coming years.



Thank you for your kind attention.

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