

APEC Energy Demand and Supply Outlook 6th Edition 2-5 Investment, Energy Security and Climate Change

Cecilia Tam, Special Adviser
May 2016, EWG 51 Canberra

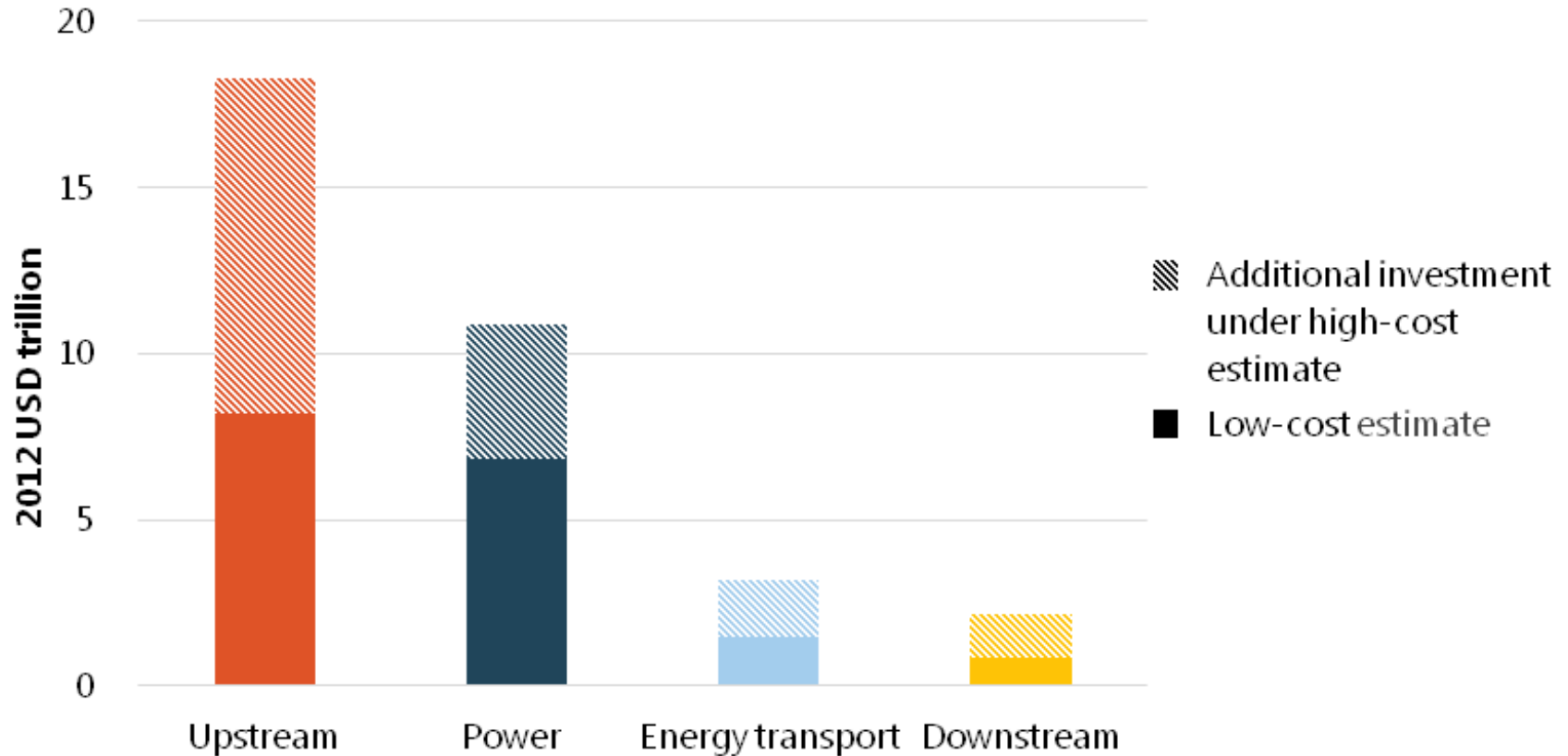




1. Investment

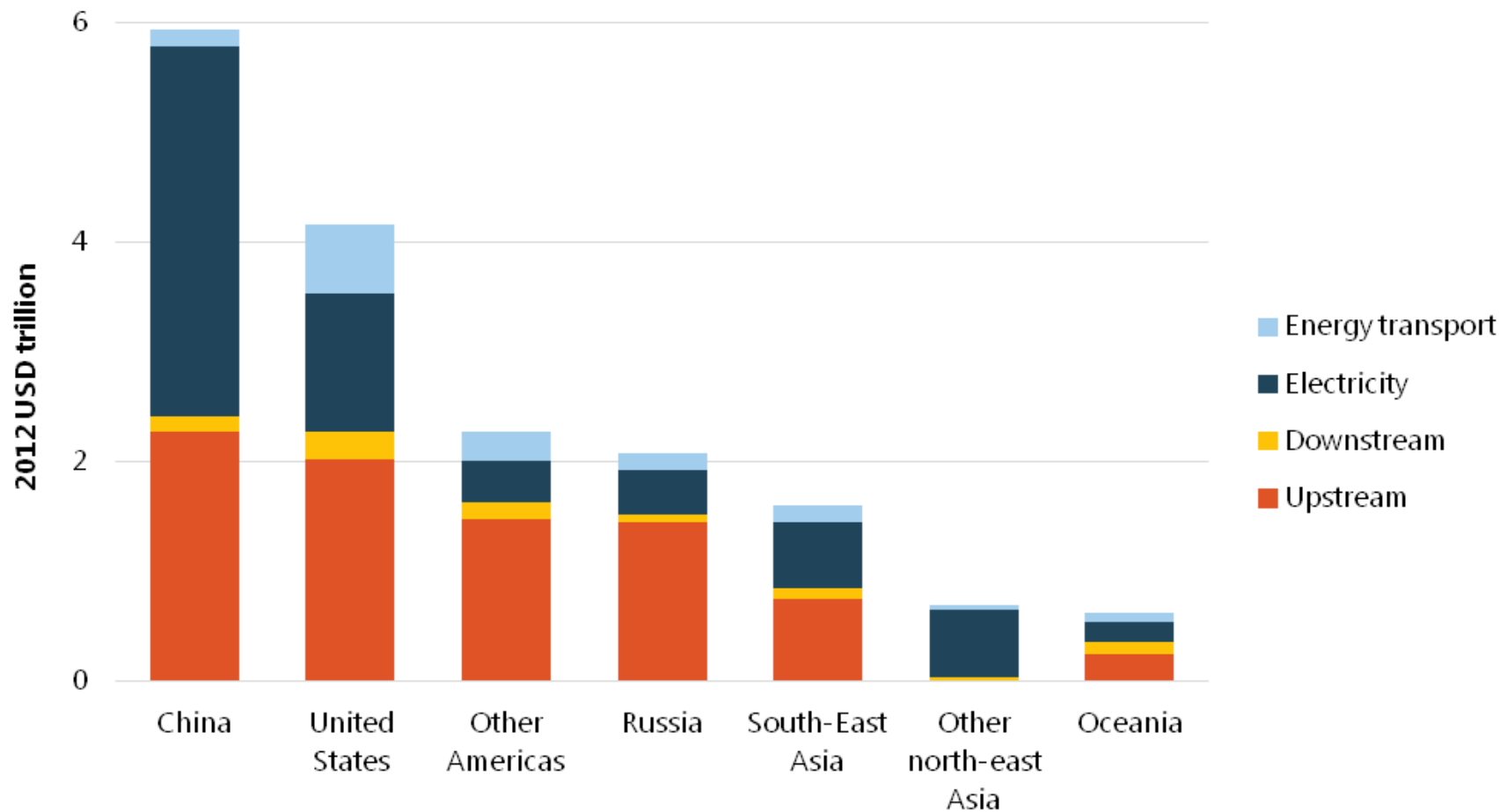


Investment by sub-sector



Upstream investments account for about half of the projected investment requirements in the energy sector

Investment by regional grouping and sub-sector

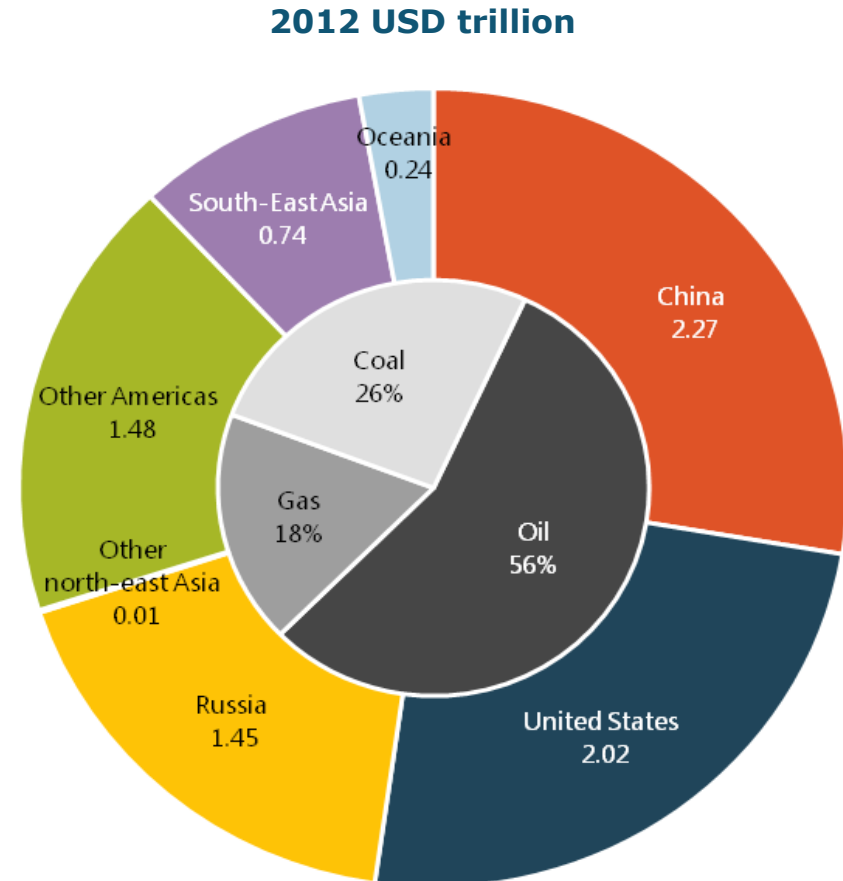


Note: **Oceania** (Australia, New Zealand and PNG), **Other Americas** (Canada, Chile, Mexico and Peru), **Other north-east Asia** (Hong Kong, Japan, Korea and Chinese Taipei), **South-East Asia** (Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore, Thailand and Viet Nam).

Upstream and/or electricity account for bulk of investments across all regions

Upstream investments by region and fuel

- China requires 64% of its upstream investments for coal;
- The United States and Russia spend 90% of upstream investments on oil and gas;
- Other Americas uses 99% of its upstream investment for oil and gas; and
- Other north-east Asia invests only marginally in upstream due to lack of fossil resources.

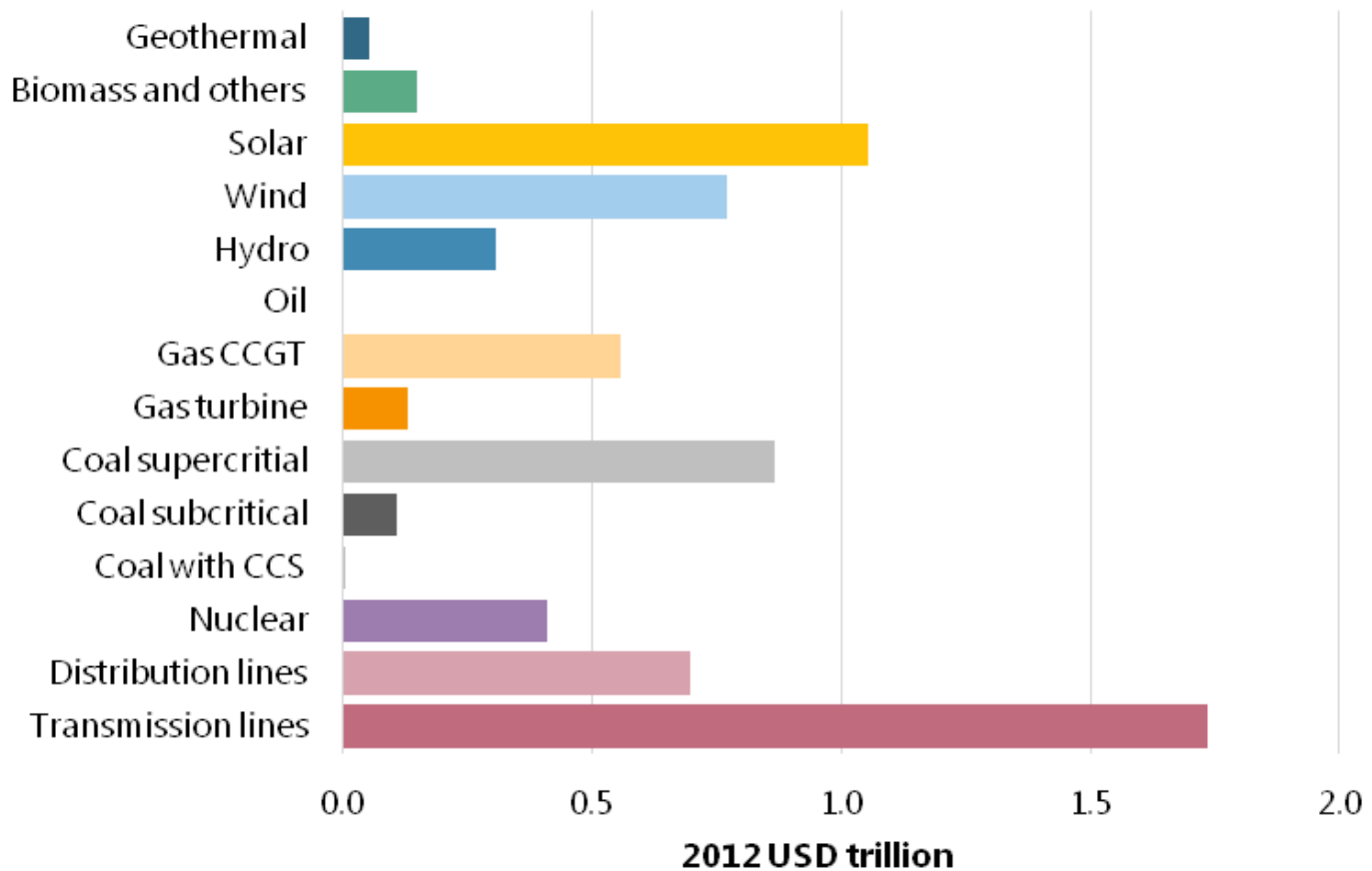


Note: **Oceania** (Australia, New Zealand and PNG), **Other Americas** (Canada, Chile, Mexico and Peru), **Other north-east Asia** (Hong Kong, Japan, Korea and Chinese Taipei), **South-East Asia** (Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore, Thailand and Viet Nam).

More than half of the upstream investment is required for oil production

Renewables lead investment in new generation capacity

Investment in the electricity sub-sector

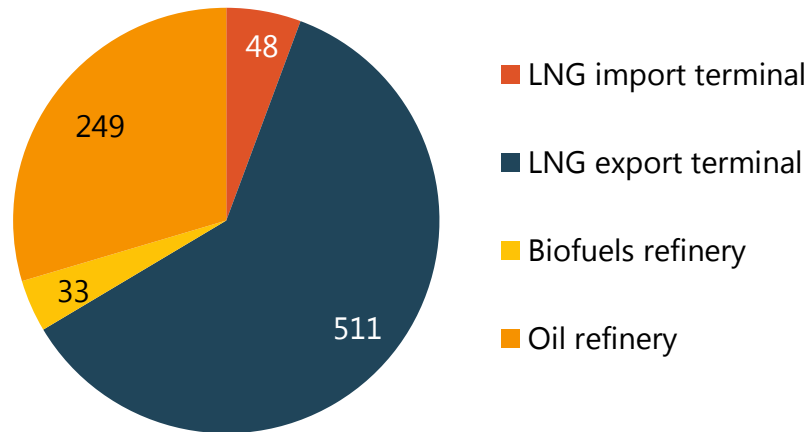


Solar and wind take 45% and 33% of the total RE generation capacity investment, respectively.

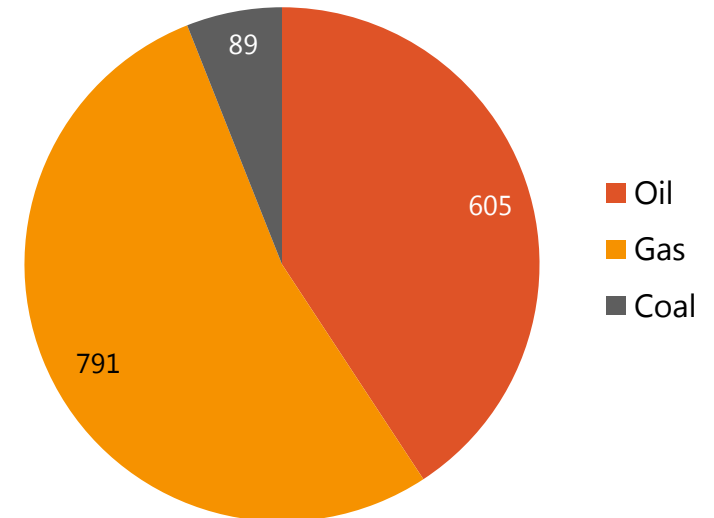
Downstream and energy transport investments

Downstream sub-sector

2012 USD billion



Energy transport sub-sector

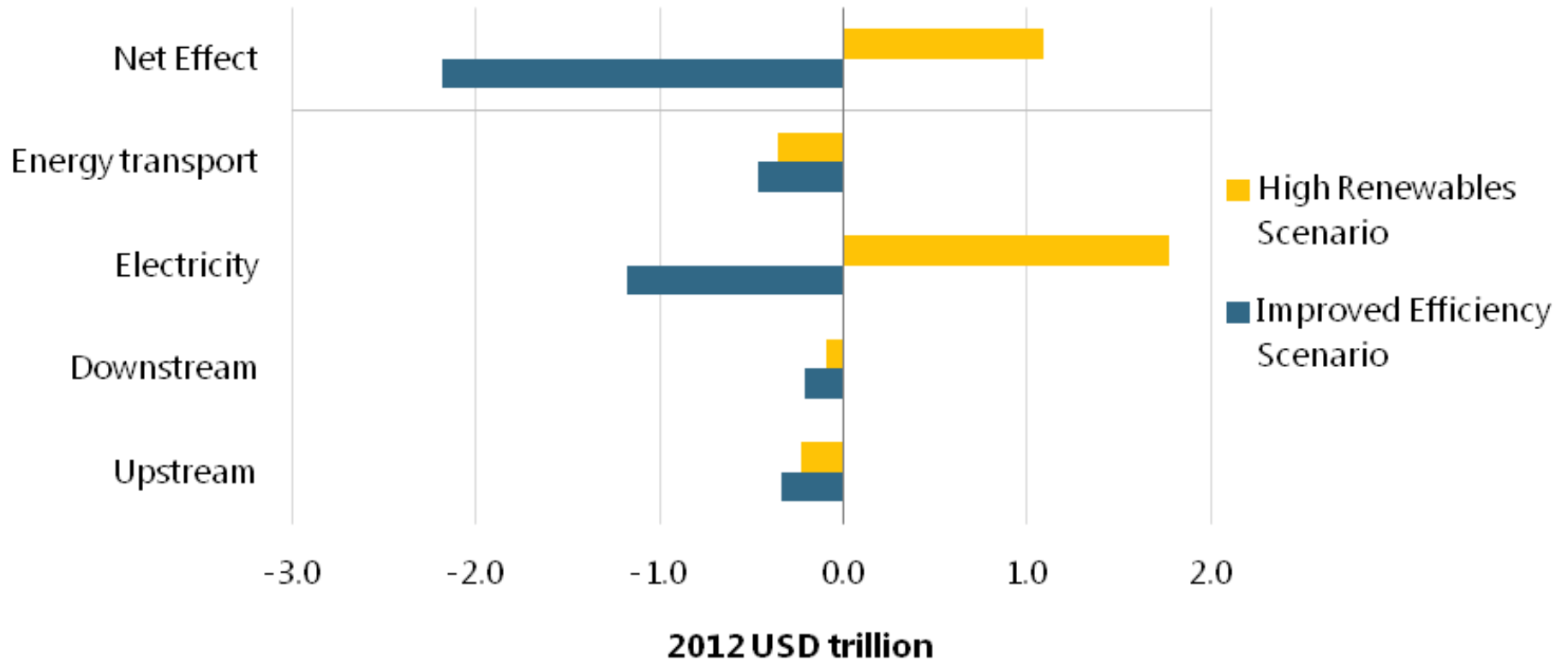


About 60% of total downstream investment is for LNG export terminals. Largest downstream investors are the United States, other Americas and China.

Gas accounts for over 60% of all investment requirements in energy transport

Improved Efficiency Scenario reduces investment significantly, and High Renewables Scenario shows small increase in investment

Investment in alternative scenarios

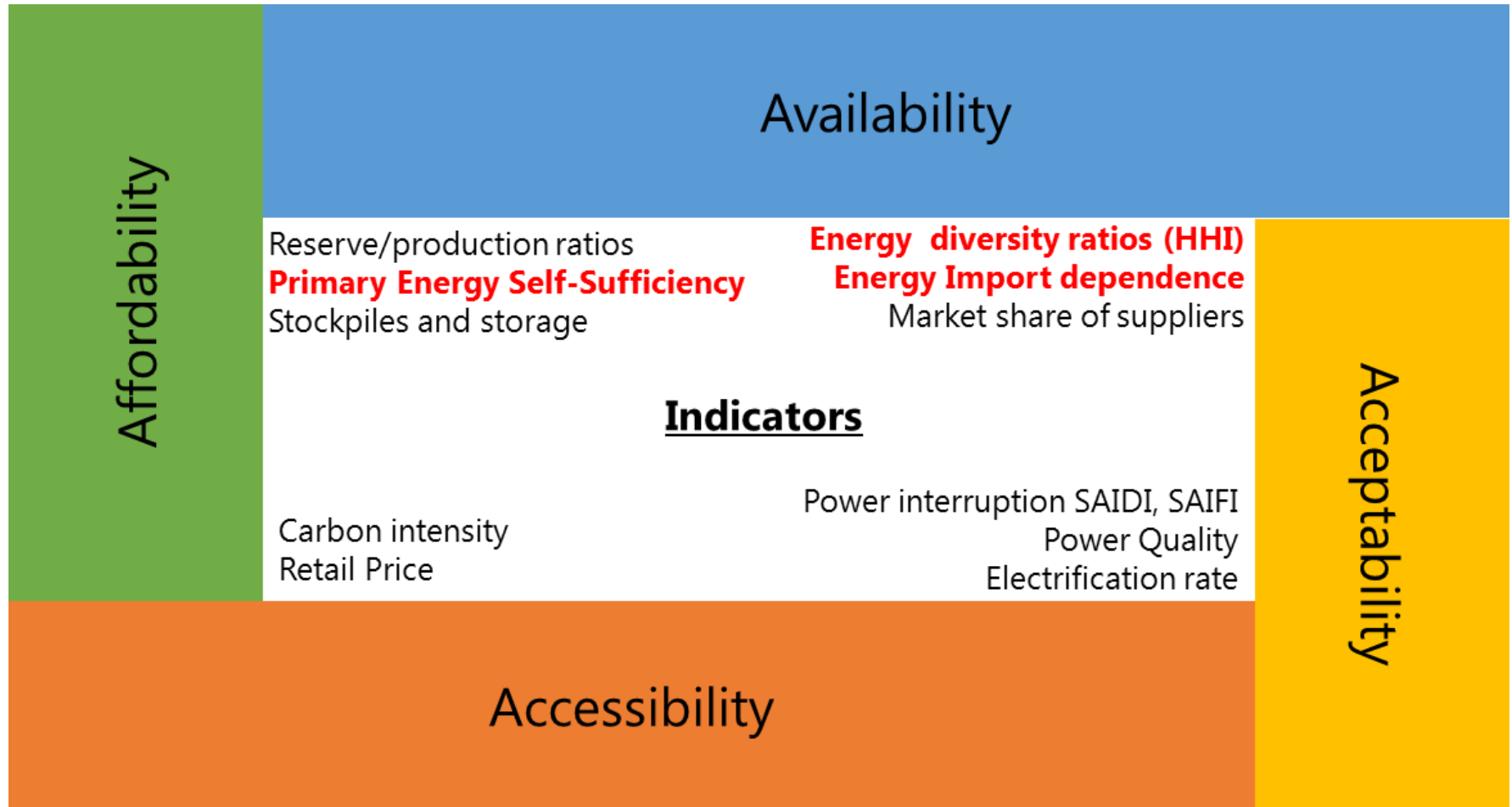


In the Improved Energy Efficiency Scenario, a 15% reduction in TPES leads to 13% reduction in investment compared with BAU, equivalent to USD 2.2 trillion savings.

The High Renewables Scenario results in 6% increase in investment, USD 1.1 trillion higher than BAU.



2. Energy Security

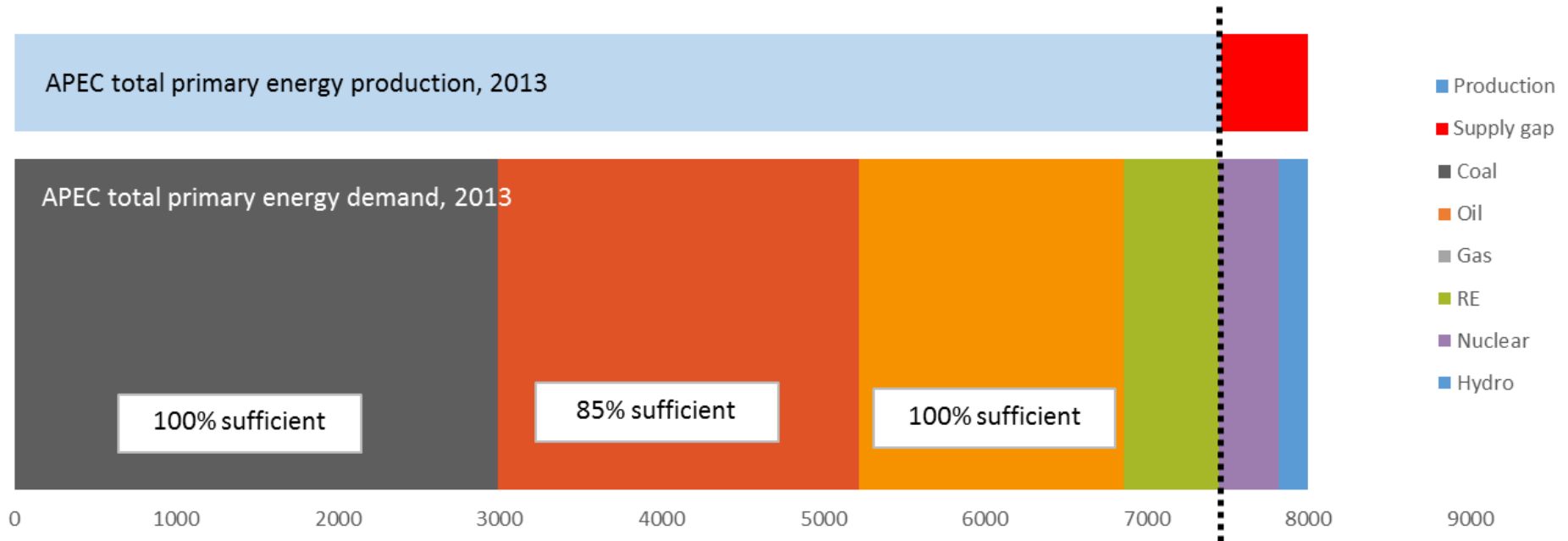


* Non-exhaustive indicators

Most organisations define energy security as encompassing four common dimensions: availability, affordability, accessibility and acceptability

APEC able to meet 93% of its primary energy demand in 2013

APEC primary energy self sufficiency and diversity 2013



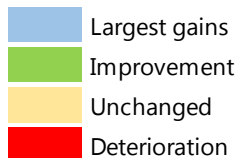
Source: IEA statistics 2015 and APERC analysis

With primary energy supply diversity of HHI 0.27, oil is the major fuel that is insufficient in APEC.

Note: Oil demand includes international transport.

BAU vs. Alternative Scenarios in 2040

	BAU	Improved Efficiency	High Renewables	Cleaner Coal	High Nuclear	High Gas 50%	High Gas 100%
Primary energy supply diversity (HHI)	0.24	0.23	0.23	0.24	0.23	0.24	0.24
Primary energy supply self-sufficiency (%)	92	95	94	92	94	88	85
Coal self-sufficiency (%)	100	100	100	100	100	100	100
Oil self-sufficiency (%)	75	80	76	75	76	75	75
Gas self-sufficiency (%)	92	100	92	92	93	83	75
Input fuel for electricity generation diversity (HHI)	0.31	0.28	0.27	0.31	0.28	0.29	0.29

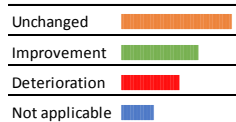


Source: IEA statistics 2015 and APERC analysis

Improved Efficiency Scenario and High Nuclear Case show largest improvements in diversity of fuel and self-sufficiency

Primary energy supply self sufficiency across all scenarios

	2013	2040						
	Actual	BAU	Improved Efficiency	High Renewables	Cleaner coal	High Nuclear	High Gas 50%	High Gas 100%
Brunei Darussalam	100	100	100	100	100	100	100	100
Canada	100	100	100	100	100	100	100	100
Russia	100	100	100	100	100	100	100	100
Viet Nam	100	33	35	39	31	38	33	35
Mexico	86	98	99	98	99	99	98	98
China	85	77	88	82	78	80	78	74
United States	84	93	96	93	93	93	93	93
Indonesia	84	64	68	70	64	65	59	53
Malaysia	84	57	63	60	56	60	57	56
Australia	80	69	70	67	68	69	69	68
New Zealand	77	78	80	80	78	78	78	78
Peru	73	67	72	68	67	67	67	67
Thailand	59	27	30	33	27	31	27	27
The Philippines	55	37	48	50	38	38	40	41
Papua New Guinea	52	53	53	58	53	53	53	53
Chile	39	29	35	40	29	29	30	30
Korea	16	23	26	26	23	29	23	23
Chinese Taipei	12	5	5	8	5	10	5	5
Japan	6	14	17	19	14	24	15	15
Singapore	3	2	2	3	2	2	2	2
Hong Kong	1	1	1	2	1	1	1	1



Source: IEA statistics 2015 and APERC analysis

In most economies, energy self sufficiency declines in the future. Energy efficiency and renewables can improve the situation in many economies

Note: The self-sufficiency level was determined based on shares of primary energy demand and production. Some economies may see deterioration in self-sufficiency due to increase in certain fuel will effect another fuel. Renewables and nuclear are considered as indigenous.

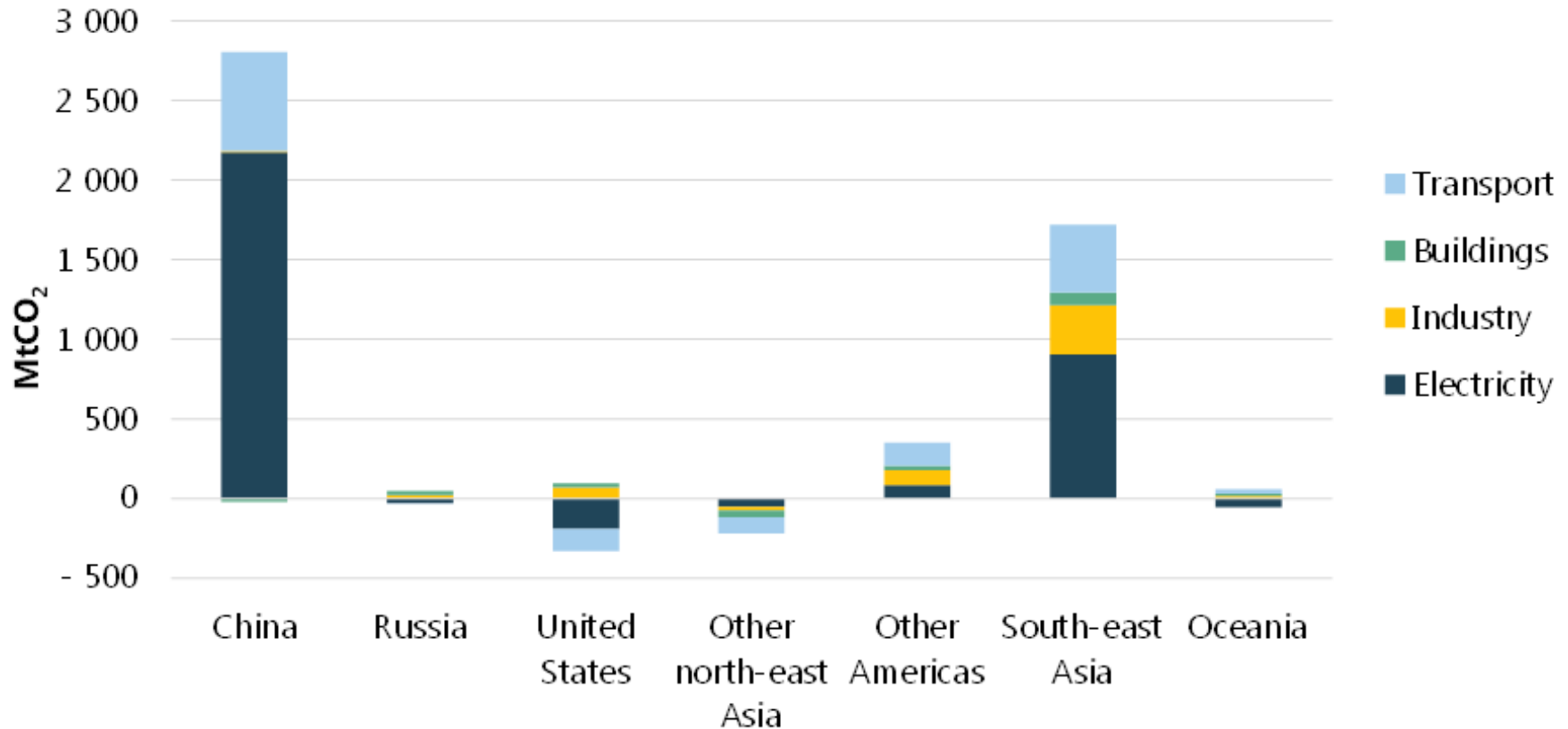


3. Climate Change



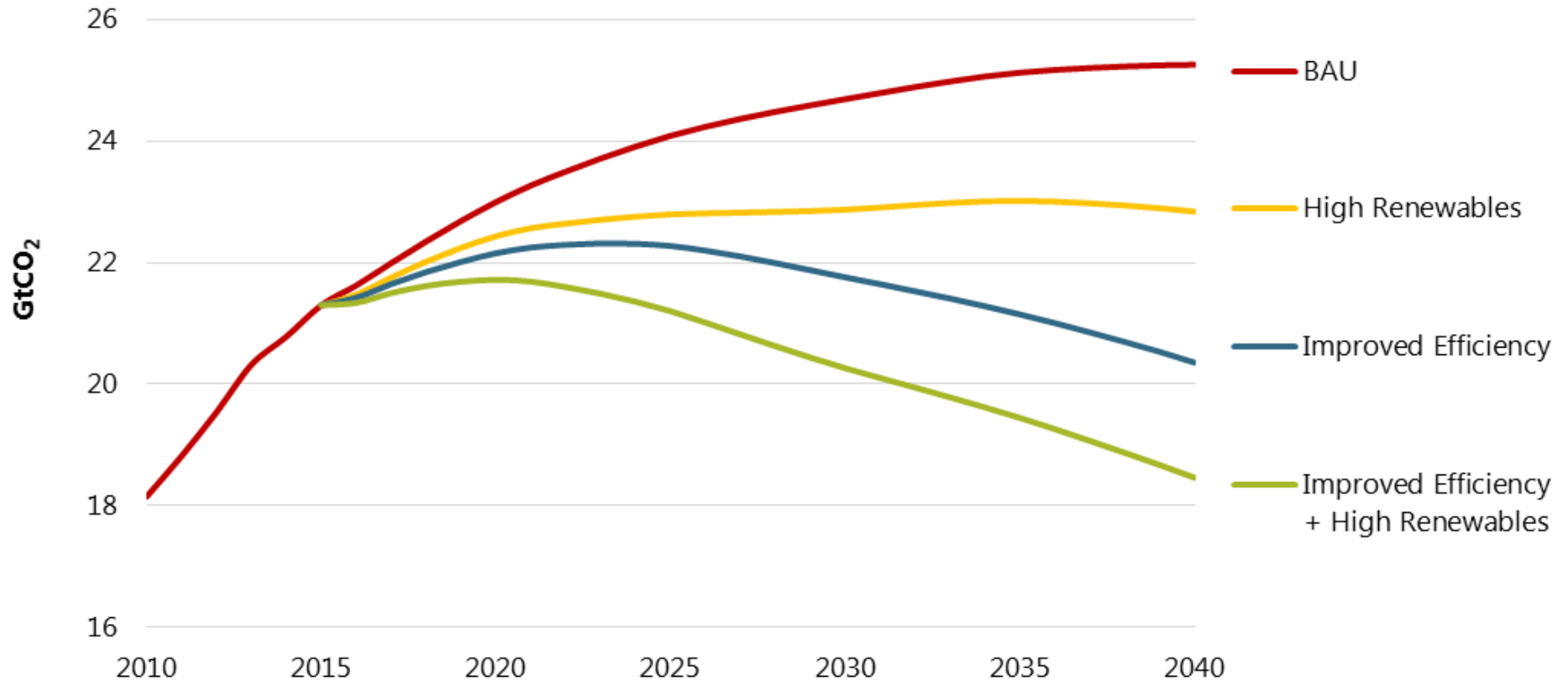
Rising electricity demand pushes up APEC emissions

Regional changes to CO₂ emissions, 2013 to 2040



Only the United States and Other north-east Asia see emissions declining

Total CO₂ Emissions in APERC Scenarios

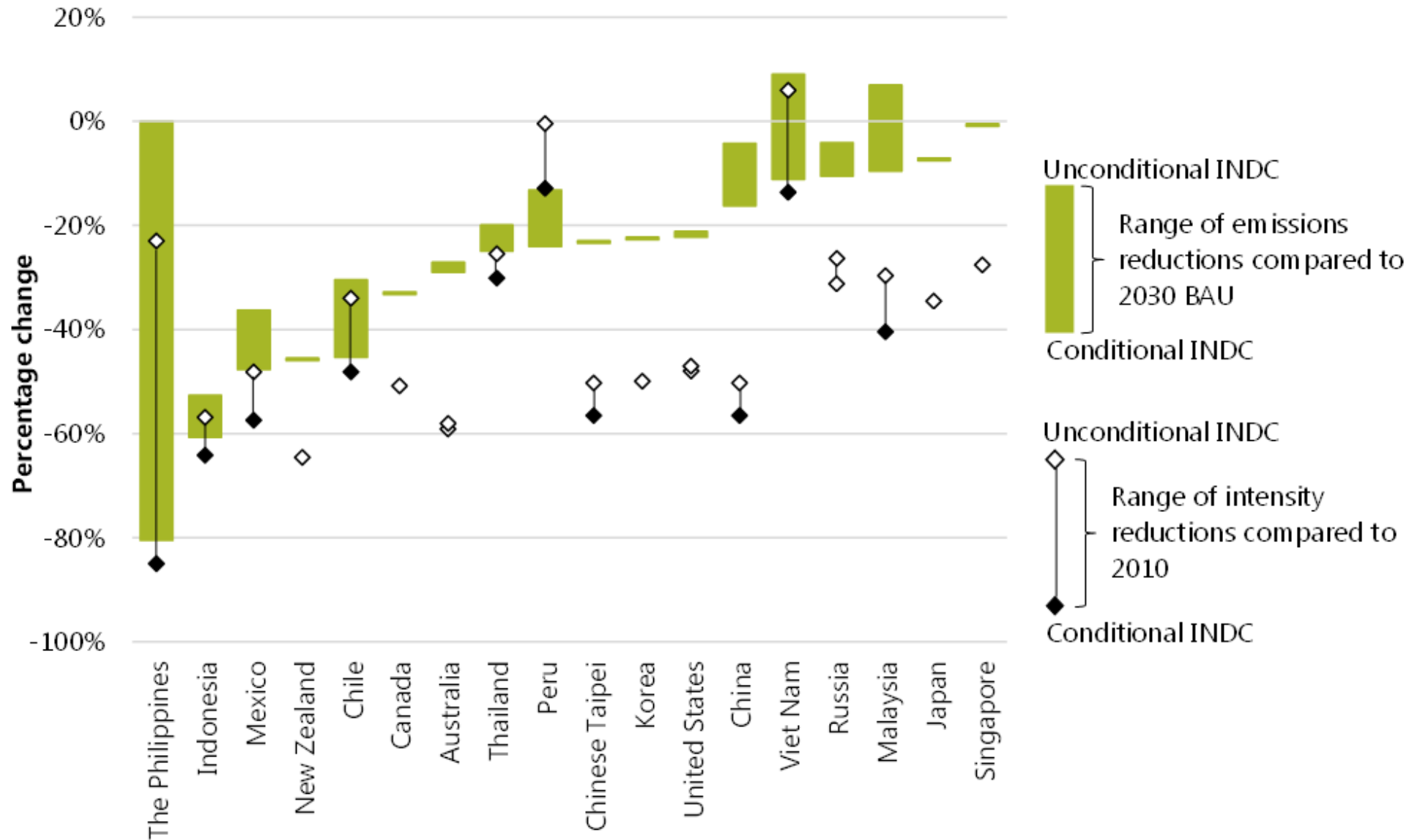


Level of ambition of APEC energy targets need to be raised if global climate goal is to be achieved

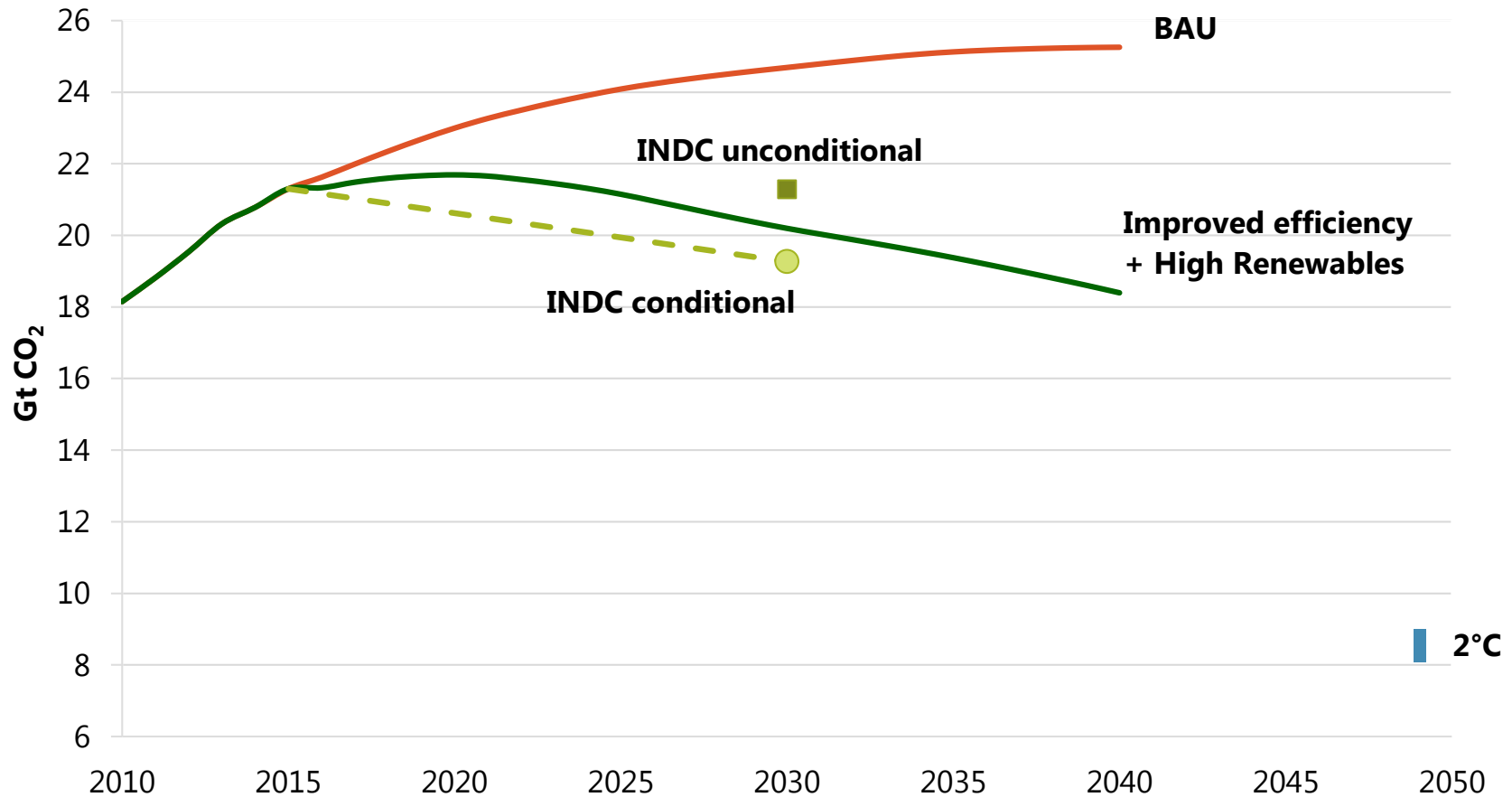
APEC INDCs

Economy	Reduction level (%)	Reference year	Emissions 2030 based on INDCs (MtCO ₂)	Change 2010 to 2030 (%)
Australia	26 to 28	2005	287 to 279	-22.6 to -24.7
Brunei Darussalam	63 (energy use in 2035)	Business as Usual	n/a	n/a
Canada	30	2005	371	-26
Chile	30 to 45 (intensity)	2007	91 to 71	35 to 5.9
China	60 to 65 (intensity)	2005	11 715 to 10250	64 to 43
Indonesia	29 to 41	Business as Usual	411 to 341	7.2 to -10.9
Japan	26	2013	927	-25
Korea	37	Business as Usual	449	-18.4
Malaysia	35 to 45 (intensity)	2005	327 to 277	55 to 31
Mexico	25 to 40	Business as Usual	411 to 337	1.4 to -16.8
New Zealand	30	1990	17	-39
Peru	20 to 30	Business as Usual	99 to 87	214 to 124
Papua New Guinea	100% renewable power by 2030 conditional to financial support			
Philippines	70*	Business as Usual	193 to 38	63 to -51
Russia	25 to 30	1990	1 495 to 1 395	6.7 to -0.4
Singapore	36 (intensity)	2005	65	27
Chinese Taipei	50	Business as Usual	214	20
Thailand	20 to 25	Business as Usual	330 to 309	
United States	26 to 28	2005	3 870 to 3 818	-27.9 to 28.9
Viet Nam	8 to 25	Business as Usual	396 to 323	221 to 162
APEC			21 653 to 19 555	19 to 8

Evaluating INDC ambition levels



Energy related CO₂ emissions



APEC economies need to raise INDC ambitions as well as APEC energy targets if the global climate goal is to be achieved

Key Messages

- Regional cooperation may help to create a suitable business environment that attracts long-term financing.
- Economies should carefully assess the investment implications of their policy agenda and initiatives.
- Diversity of primary energy supply in APEC is expected to improve as a result of higher share of renewables.
- Strengthening and expanding regional cooperation and trade within APEC can play important role in improving energy security.
- Accelerating technology development and deployment is central to establishing more secure and sustainable energy systems.
- APEC energy targets need to be enhanced to meet long term global climate objectives and economies should monitor and strengthen INDCs where possible.



Thank you for your support!

<http://aperc.ieej.or.jp/>

- Should the Outlook period be extended from 2040 to 2050?
- Should APERC develop a low carbon scenario consistent with limiting global temperature increases to 2°C? What recommendations do you have for how emissions reductions should be shared across APEC economies in this scenario?
- What other alternative scenarios or special topics would you recommend APERC consider developing?
- Do you expect low oil prices to persist? Should APERC develop a low oil price scenario?
- What game changers (either technological or consumer driven) should be considered? Revolution in transport (EVs, big data, Uber and self-driving vehicles) and quicker uptake of renewables.