

APERC updates

EGNRET 60 Meeting

24-25 April 2024 – Kaohsiung, Chinese Taipei

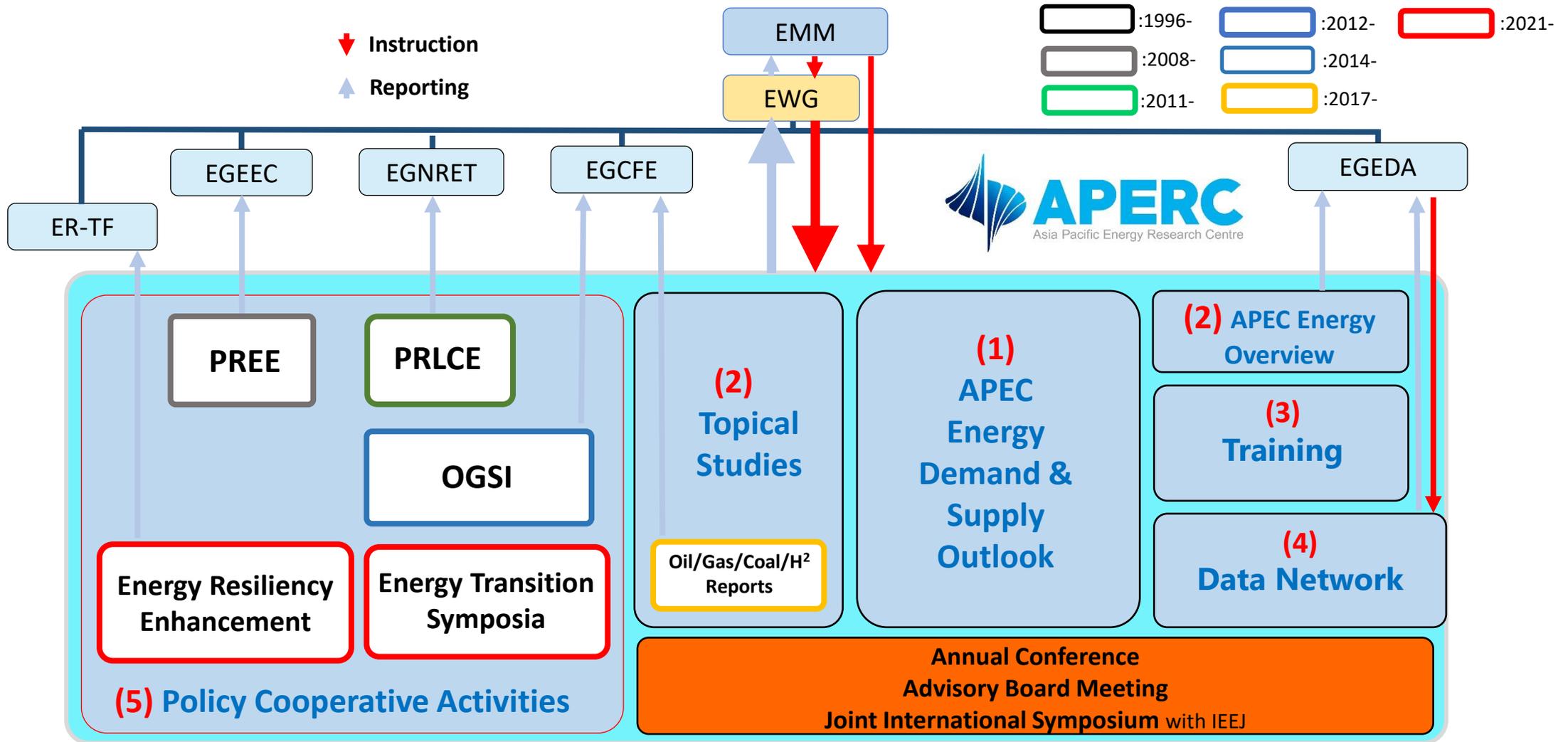
Mathew Horne, Senior Researcher, APERC



Outline

- APERC activities overview
- APEC Energy Demand and Supply Outlook
- APEC Energy Overview
- Recent APERC activities related to new and renewable energy technologies
 - Peer review on low-carbon energy, Peru (December 2023)
 - Symposia on Carbon Neutrality
 - Oil and Gas Security Network
- Forthcoming hydrogen report

APERC Activities



The APEC Energy Demand and Supply Outlook

A forward-looking exploration of potential energy futures in APEC

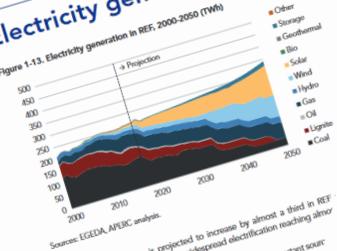
APEC Energy Demand and Supply Outlook

- Priority task for APERC under the APEC Energy Action Programme adopted by leaders in 1995
- Analyses and policy insights for energy demand and supply projections for APEC economies
- The 8th Edition Outlook published September 2022
- The modelling tools developed for the Outlook are used for training activities in APEC economies
- APERC researchers are modelling the 9th Edition Outlook to be published in 2025
 - Preliminary results are being shared with member economies, with projections now extending to 2060



Electricity generation

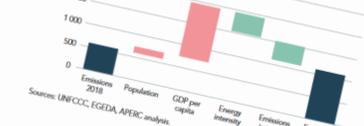
Figure 1-13. Electricity generation in REF, 2000-2050 (TWh)



- Electricity generation is projected to increase by almost a third in REF three-quarters in CN, owing to widespread electrification reaching almost all of CN, through their use take off faster, reaching zero generation small amount of coal generation remaining in the 2040s.
- Coal (including lignite) has historically been the most important source for Australia. Its relative prominence diminishes steadily through the 2000s.
- Both coal and lignite still provide important baseload generation in Australia, though their use takes off faster, reaching zero generation around 2040.
- Australian residential rooftop solar has posted world's highest growth in the 2000s and 2010s.
- Utility scale solar surpasses rooftop generation in 2020 and will continue to grow strongly in both scenarios.
- The Sun Cable project, which will export electricity from Australia to Europe, is likely to be completed in 2020.
- Domestic natural gas supply is likely to be met by 2020.

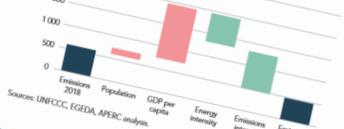
Components of CO₂ emissions

Figure 7-51. CO₂ emissions components in REF, 2018 and 2050 (million tonnes)



- Indonesia emitted just under 600 million tonnes of CO₂ in 2018, which amounted to less than 3% of APEC CO₂ emissions. Indonesia has low emitters per capita, placing it number 18 of the 21 APEC economies.
- In a world with no energy intensity or emissions intensity improvements, Indonesia's projected population and GDP growth would lead to CO₂ emissions more than tripling out to 2050, to 1 950 million tonnes. Population increases place upward pressure on emissions, but it is the projected growth in GDP per capita that contributes to the most significant upward pressure on Indonesia's CO₂ emissions.
- In REF, improvements in energy intensity and emissions intensity mean that CO₂ emissions are less than double to 1 100 million tonnes in 2050. CO₂ emissions reductions are attributable to energy intensity and emissions intensity in a roughly even split.

Figure 7-52. CO₂ emissions components in CN, 2018 and 2050 (million tonnes)



- In CN, emissions fall to 484 million tonnes in 2050. This is a fall of almost 20% from 2018 levels, and is 50% lower than emissions in REF.
- Emissions intensity improvements in CN are double that which occur in REF. These improvements are associated with fuel switching and CCS technologies which are present for Indonesia in CN. Energy intensity improvements are 50% larger in CN than in REF. These improvements are fostered by improved market incentives with low energy inputs policy support by the Indonesian government in CN.
- To compensate for the positive CO₂ emissions by the energy sector in CN, CO₂ emissions sinks from the non-energy sectors, such as land use and forestry sector, are needed to achieve carbon neutrality ambitions.

Note: The above charts are a representation of the Kaya identity which is CO₂ emissions = Population * GDP / Population * Energy supply / GDP * CO₂ emissions / Energy supply

APEC Energy Demand and Supply Outlook 8th Edition, Vol. 2 | 235

Updated scenarios for the 9th edition of the Outlook

The Reference scenario (REF)

- A set of economy-specific pathways where existing policies are retained, and new policy measures are included if and only if they are supported by implementation detail.
- In the absence of details, energy intensity, fuel switching, investment, technology deployment, and energy supply are assumed to loosely follow historical trends.

The Target scenario (TGT)*

- Illustrates a hypothetical pathway for each economy towards realizing energy-related policy targets, even if implementation details are not available.
- When details are not available, economy targets provide directional guidance and a general sense of policy priorities to inform assumptions.

* this scenario is different than the Target Scenario from the 7th Edition Outlook

Modelling challenges for the 9th Outlook

- The new Target scenario for the 9th Outlook meets economy level targets, no matter how unrealistic they may seem
- This is done to show that the targets may be 'achievable' but that the pathway may prove to be more challenging than many economies expect
- Uncertainty about costs remain
 - There is a least cost framework that underpins certain aspects of the modelling but qualitative assessments need to be made due to cost uncertainty
 - This is especially true when considering new and renewable energy technologies
 - We're undertaking parallel work on integration costs of high shares of VRE
 - Communicating cost uncertainty is a key objective of the 9th Outlook

The APEC Energy Overview

Analyzing the current energy situation in APEC

The APEC Energy Overview

- Annual publication highlighting the current energy situation in each of the 21 APEC economies
- Important for monitoring progress of APEC in meeting its aspirational energy goals:
 - Doubling the share of renewables from 2010 to 2030
 - Improving energy intensity by 45% from 2005 to 2035
- New for 2023 is a section devoted to energy transition challenges
 - Emissions and energy security and the role of new and renewable energy technologies



Recent APERC activities

Peer review on low-carbon energy, carbon neutrality symposia, and oil and gas security relationship with new and renewable energies

Peer review on low-carbon energy, Peru – December 2023

- PRLCE events typically involve energy supply side considerations
 - Complement peer review on energy efficiency (PREE) which focus more on energy demand
- Peru is the 7th APEC economy to host the peer review since it started in 2017
- Involves discussions of five experts with economy officials to deliver economy specific recommendations
 - Peru report scheduled for publication later in 2024
 - Hydrogen is a key focus alongside other renewable energy consideration



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APEC Symposia on Carbon Neutrality

- **Promoting Energy Efficiency and Energy Management Systems**, Tokyo, January 2024
 - Energy efficiency in buildings, transport, and industry
 - Energy Management Systems and Smart Cities
- **Pursuing Decarbonization of Fossil Fuels**, Kobe, October 2023
 - Hydrogen, fuel ammonia, CCS, direct air capture
- Next symposium will be on **Bioenergy**, to be held in Bangkok, December 2024
- Participants include government officials, policymakers, and representatives from industry
 - No single 'best' solution to achieving carbon neutrality

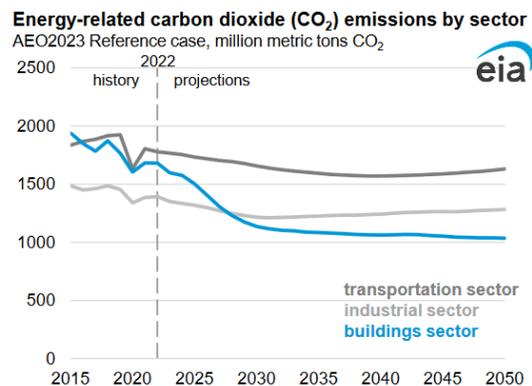
APEC Symposia on Carbon Neutrality

Symposium 2, Tokyo January 2024

Promoting Energy Efficiency and Energy Management Systems

Energy-related CO₂ emissions fall across all AEO2023 cases because of increased electrification and higher equipment efficiencies

- In the residential and commercial sectors, higher equipment efficiencies and compliance with building codes extend ongoing declines in energy intensity
- Changes in the buildings fuel mix reduce energy-related CO₂ emissions, which decline faster in buildings than any other end-use sector



Data source: U.S. Energy Information Administration, Annual Energy Outlook 2023 Reference case (AEO2023)
Note: Figure includes emissions associated with electric power generation. Electric power sector emissions are distributed to each end-use sector according to their share of electricity consumption.

Example of the role of efficiencies in different sectors in assisting with decarbonization challenges as analyzed by the EIA

Symposium 1, Kobe October 2023

Pursuing Decarbonisation of Fossil Fuels

Initiatives to Establish Hydrogen and Ammonia Supply Chain cont...



Cooperation in Upstream Area

- JERA has conducted an international competitive bidding process for the procurement of fuel ammonia. (2022.2-)
- In Jan 2023, JERA has executed MOUs with CFI and Yara, as a result of bid for development and sales of clean ammonia.

Number of bids sent	Approx. 30 companies
Duration	Long term from FY2027 into 2040s
Quantity	Up to 500,000 t/year
Delivery	FOB
Others	- CO ₂ is not generated during ammonia production, or captured and stored. - JERA has the opportunity to participate in ammonia production projects.

Cooperation in Shipping Area

- JERA has signed MOU with "NYK" and "MOL" to cooperate in transporting fuel ammonia. (2022.11)

MOU covers :

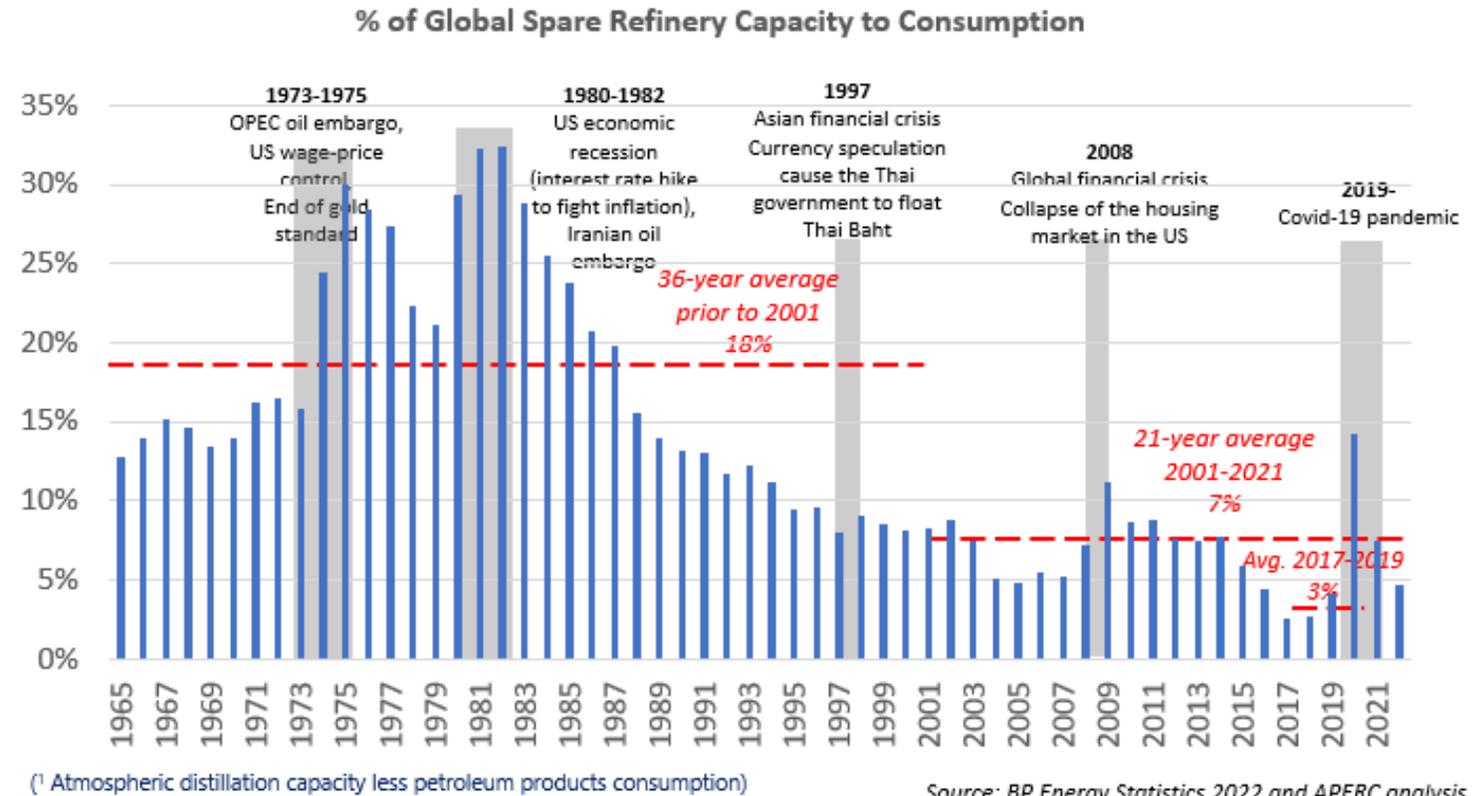
- ✓ Developing fuel-ammonia carriers suitable for domestic thermal power plants and receiving stations
- ✓ Building a fuel ammonia transportation and receiving system
- ✓ Installing and operating propulsion engines that use ammonia as ship fuel
- ✓ Working with related parties to foster the formation of rules related to the reception of fuel ammonia



New energy supply chain challenges are being explored by many companies due to opportunities that align with decarbonisation ambitions

Oil and Gas Security Network Forum 2024 – Osaka, March 2024

- Collaboration is facilitated by APERC to better understand these issues
- Recent analysis of declining spare capacity was discussed in Osaka
 - Declining spare capacity has hampered resilience to shocks.
- Biofuels can play a role in improving energy security.



New Hydrogen report available soon

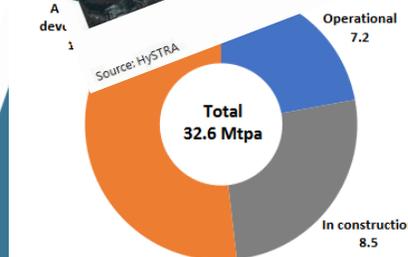
This report will complement the annual fossil fuel reports

New APERC report: Hydrogen report

- Annual publications that dissect coal, oil, and gas markets, will now expand to include hydrogen:

- Trade developments
- Technology breakthroughs
- Prices
- Supply and demand trends
- Short- to longer-term outlooks

- Economic contribution is analyzed alongside emissions and energy transition objectives of APEC member economies



No	Project name	Location
1	Boundary Dam Carbon Capture and Storage	Canada
2	Sinopec Qilu-Shengli	China
3	Yangchang Yulin CO2-EOR	China
4	China National Energy Taizhou	China
5	China National Energy Ningxia	China
6	Huaneng Longdong Energy Base	China
7	Yulin integrated coal-to-liquid	China
8	Sinopec Shengli Power Plant	China
9	Petra Nova Carbon Capture	US
10	Great Plains Synfuels Plant and Weyburn-Midale	US
11	Minkota Power Project Tundra	US
12	Gerald Gentleman Station	US
13	Prairie State Generating Station	US



Thank you.

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