Issue No. 101

ASIAN POWER

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PEAK FLOW

CHINA IS TAKING ITS UNIQUE HYDROELECTRIC DEVELOPMENT EXPERTISE TO NEW PROJECTS THROUGHOUT ASIA PACIFIC

+

GEOTHERMAL PROJECTS ENJOYING MODEST GROWTH

JAPAN CONTINUES ITS PUSH FOR OFFSHORE WIND

HONG KONG MAKING UP FOR LOST TIME ON RENEWABLES

TRACKING MALAYSIA'S DIFFICULT TRANSITION AWAY FROM COAL

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FROM THE EDITOR

ASIANPOWER

PUBLISHER & EDITOR-IN-CHIEF **Tim Charlton**
MANAGING EDITOR **Paul Howell**
PRODUCTION EDITOR **Janine Balleteros**
PRODUCTION TEAM **Djan Magbanua**

GRAPHIC ARTIST **Simon Engracial**

ADVERTISING CONTACT **Reiniela Hernandez**
reiniela@charltonmediamail.com

ADMINISTRATION **Accounts Department**
accounts@charltonmediamail.com
ADVERTISING advertising@charltonmediamail.com
EDITORIAL ap@charltonmedia.com

SINGAPORE
Charlton Media Group Pte Ltd.
101 Cecil St. #17-09 Tong Eng Building
Singapore 069533
+65 3158 1386

HONG KONG
Charlton Media Group
19/F, Yat Chau Building,
262 Des Voeux Road Central
Hong Kong. +852 3972 7166
www.charltonmedia.com

Can we help?

Editorial Enquiries: If you have a story idea or press release, please email our news editor at ap@charltonmedia.com. To send a personal message to the editor, include the word "Tim" in the subject line.

Media Partnerships: Please email ap@charltonmedia.com with "partnership" in the subject line.

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*If you're reading the small print you may be missing the big picture

The power industry continues to innovate and adapt to the changing market, with renewables leading the charge as countries cement their vows of carbon emmission reduction by increasing renewable energy into their power mixes. In this issue of Asian Power, we will see how Chinese firms have backed the development of hydroelectric power generation across Asia Pacific, despite a decline in that source globally. Read more, and find out why there has been a Chinese firm behind almost half of all hydroelectric plant developments in Asia Pacific from page 14.

Meanwhile, Japan is leaning towards offshore wind after it set several ambitious climate goals for itself - the country is now looking to be carbon neutral by 2050. Part of this involves plans to topple fossil fuel from its reign as king of the domestic energy mix and to push for an increase in renewables. We also took a peek at Hong Kong and where it is now on its climate goals. Read about it on page 22.

With several key market players determined to go green and renewable energy becoming an ever-cheaper option, we've also taken a long look at the possibility of the "death" of coal in the coming years - check that from page 18.

Happy reading!

Tim Charlton

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COUNTRY REPORT

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SECTOR REPORT

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MOST READ

IPP

Philippines' San Miguel Corportion to dump new coal projects

San Miguel Corporation will be removing new coal projects from its expansion as it transitions to low-carbon and ramps up its renewable power capacity against the heavy reliance on traditional power sources, according to its President and CEO Ramon Ang.

POWER UTILITY

South Korea green lights operation of Shin Hanul 1 nuclear power plant

The Nuclear Safety and Security Commission has given its approval for the 1.4-gigawatt Shin-Hanul 1 nuclear reactor to start operations. The reactor was actually completed in April but was forced to hold off its launch of operations because of a safety review.

IPP

ACWA Power targets $16b worth of new projects before year-end

Saudi-backed ACWA Power is planning to invest $16b in new projects around the world for 2021. In 2020, the company planned to invest $10b in new projects but the company only managed to finish $3.5b of its planned projects, after operations were severely impacted by the Covid-19 pandemic.

POWER UTILITY

Taiwan agrees to 15-year LNG supply deal with Qatar Petroleum

Taiwan state-owned CPC Corporation has entered into a 15-year Sale and Purchase Agreement with government-backed Qatar Petroleum to purchase 1.25 million tonnes of liquefied natural gas annually. The deal is slated to start in January, 2022.

POWER UTILITY

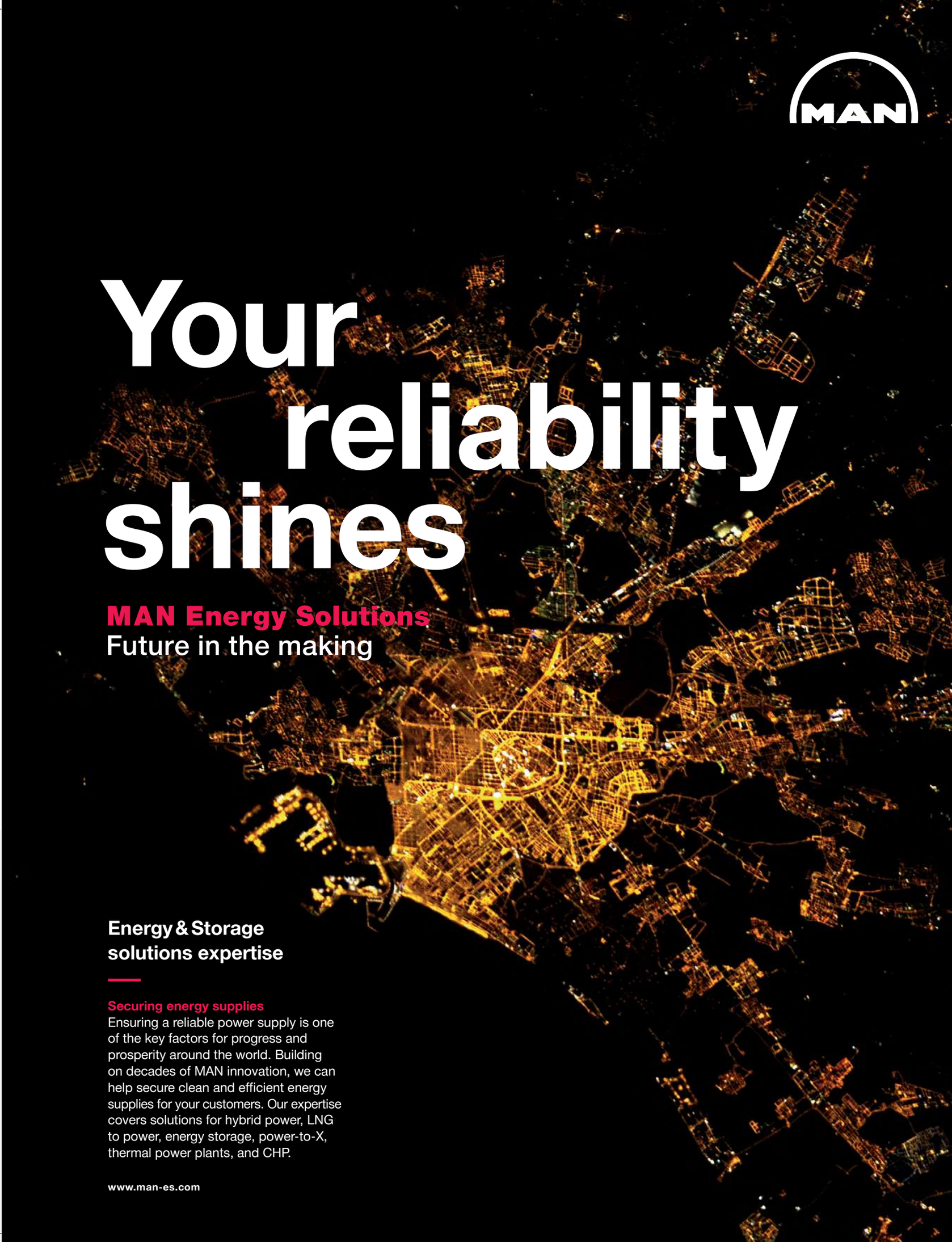
Thai oil giant PTT's subsidiary invests $635m in Asia green energy

The power generating subsidiary of Thailand's oil group PTT, Global Power Synergy, said it will invest 20m baht ($635m) in renewable energy in Asia. The power company said it will borrow the money from its parent company to invest mainly in solar and wind power.

PROJECT

Norweigan power producer Scatec ventures into Indian market

Norweigan power producer Scatec partnered with local power solar developer ACME Group for its first project in India, a 900-MW solar power plant. The project has an estimated total capital expenditure of $400m, with 75% debt financing.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AUSTRALIA FAST-TRACKS DUMPING OF DIRTY POWER

AUSTRALIA

It is predicted to be 75% powered by renewables by 2025

Australia will experience more days powered by 100% of renewable energy, as the country switches faster than expected to renewable energy sources.

The Energy Security Board has started a consultation process on its proposed reforms in Australia's energy market that will fast track transition from coal and other dirty fuels to renewable energies, such as solar and wind.

Chair of the Energy Security Board Kerry Schott said that currently the country's adoption of wind and solar were going beyond the most positive scenarios modelled by the Australian Energy Market Operator (AEMO) in its 2020 Integrated System Plan (ISP).

"Australia is heading towards a very high percentage of renewables within its mix, and that is great. The 2019 actuals have got us up around 35% or so sometimes; and the 2025 numbers are at times getting us to 75%," Schott said.

Schott said they are anticipating that with the step-change scenario in the ISP which they are tracking, a lot of renewables are coming in. They already recorded that in some jurisdictions, they are running 100% on renewables.

In AEMO's modelling of the day-to-day market share of renewable energy in the Australian grid, it suggested that it will become more commonplace for more parts of the country's energy system to experience periods of 100% renewable energy supply. It is estimated that by 2025, the possibility of this to become a regular occurrence will be high.

Currently, in South Australia and Tasmania, both having a renewable energy heavy power grid, it is already common for renewables to supply 100% of consumption for short periods.

In Australia's main grid, renewables have already exceeded 50% energy supply and even reached as high as 56% for a short period in April this year.

However, the high penetration of renewables in the country could eventually lead to greater challenges for grid operators. The Energy Security Board hopes to address these through its proposed reform.

Schott said with the current technology the grid can run smoothly with 75% renewables. Going above that will become difficult for the system, not only for capacity reasons, but for system security reasons, as well.

"We're now dealing with increasing proportions of asynchronous power and it is making the system behave in a completely different way," Schott said.

In 2020, energy from renewable energy sources grew by 16.3%.

The Integrated Renewable Power Hub-Toledo and BCCPP in Limay, Bataan

SMC launches $1b battery storage project

PHILIPPINES

Philippine's energy group, SMC Global Power Holdings Corporation (SMCGPH), has begun multiple projects to build a 1-gigawatt (GW) battery storage across 31 sites in the country.

The billion-dollar energy storage project will be happening all at the same time, according to the group.

In May, Finnish renewable tech group, Wärtsilä, announced finalising two energy projects commissioned by SMC with a capacity of 20 megawatts (MW)/20 megawatt-hours (MWh) and 40 MW/40 MWh, respectively.

The projects are delivered on an engineering, procurement, and construction basis. They will include Wärtsilä's proprietary software and hardware solutions. The systems comprise the company's GridSolv Max system, a standardised energy storage solution that provides flexible and modular storage for the core hardware assets of the systems, including the batteries, a safety and fire system, and inverters, alongside the advanced GEMS Digital Energy Platform.

This marks the first energy storage systems supplied by Wärtsilä to the Philippines. The company disclosed that it has a 100 MW/100 MWh total order booked from SMC.

Meanwhile, ABB also announced that it will be contributing to the billion-dollar energy storage project.

The SMC battery storage project is the first energy storage system supplied by Wärtsilä to the Philippines

The company, however, only referred to an 80 MW of battery storage and has not yet disclosed the total size of SMC's order.

ABB said that for those projects, it delivered pre-packaged battery energy storage system (BESS) solutions, with the equipment fully integrated and pre-tested before being sent to the site, which the company claimed sped up the installation process and reduced site works and costs. The systems run on ABB's proprietary controls software, called Ability Zenon, which allows system operators to make real-time decisions on operation.

Siemens-backed Fluence also announced the completion of the two 20 MW/20 MWh battery-based energy storage systems.

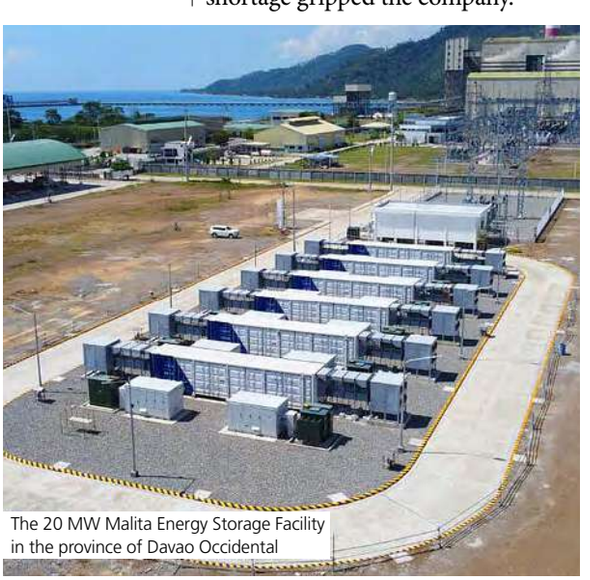
The initial projects represent the first wave of an energy storage portfolio totaliing 470 MW/470 MWh across 13 project sites that SMC has contracted Fluence to both supply and maintain.

According to Fluence, said that SMCGPH's battery-based energy storage portfolio is considered the largest such procurement to date in Southeast Asia.

SMCGPH and Fluence collaborated to develop a standard-sized 20-MW "building block" using Fluence's energy storage technology. Working with an established, bankable energy storage technology provider enabled SMC to quickly roll out state-of-the-art systems built on lessons learned from Fluence's many years of global deployment experience.

SMC already has at least 650 MW of the 1 GW project.

In April, Luzon saw rotating power interruptions as a power supply shortage gripped the company.



The 20 MW Malita Energy Storage Facility in the province of Davao Occidental

India is the world's fourth largest wind power market

India expects wind market boom by 2026, with 20 GW capacity jump

INDIA

The wind market in India is on the road to recovery, with an expected 50% growth surge in the next five years, according to a joint report by the Global Wind Energy Council (GWEC) and MEC Intelligence.

The report said that the country will see 20.2 gigawatts (GW) of new wind power capacity between 2021 to 2025, increasing India's 39.2 GW wind market by nearly 50%.

This marks a clear signal of the market bouncing back after a slow-down in recent years, the report added.

"India's wind market moved forward last year with new tenders, new capital, and new policies. Wind will be the central axis of renewable energy portfolios as we move from renewable energy making up less than 10% of the country's energy matrix today, to more than 30% by the end of this decade. We will see higher revenue for electricity generation that matches the buyer's needs, which means generation of electricity at the time and the quality they need. This is where wind will be critical," said Sidharth Jain, chief executive officer and founder of MEC Intelligence.

2020 was originally forecasted as a break-out year for wind power in India but the pandemic halted the market's advances. The forecasted installed capacity of 3.3 GW of wind power of 2020 was cut down to only 1.1 GW, with the remaining capacity pushed into 2021 or dropped by developers.

The pace of new installations is expected to double over the next two to three years

Despite that, the pace of new installations is expected to double over the next two to three years.

India currently has a pipeline of projects of 10.3 GW in both central and state tenders, which are expected to drive installations until 2023. The market post-2023 will likely be driven by nearly 10 GW of new capacity awarded to wind projects, mainly through hybrid projects which are becoming increasingly important for the country's "round-the-clock" power initiative.

According to GWEC's policy director Martand Shardul, Wind is a high-value resource and a critical link in India's clean energy transition, which can put the country on a path to a prosperous future while helping it realise its ambitious decarbonisation plans.

"It is encouraging to see the market beginning to bounce back, but to drive a post-pandemic green recovery and realise its climate goals, India will need to adopt a more aggressive climate emergency approach and set clear short-term milestones to enable an even more rapid uptake of wind projects," Shardul added.

Through the years, Shardul said that India's government has been very proactive in addressing bottlenecks with land and grid availability, however, further action will be required to unleash the country's vast wind potential.

Shardul stressed the importance of strengthening consensus and coordination to ramp up project installation between central and state governments as well as developing a clear roadmap to help the planning of supply chain, infrastructure, and finance.

THE CHARTIST: AUSTRALIA'S FOSSIL FUELS FALL AS SOLAR OUTSHINES WIND IN 2020 MIX

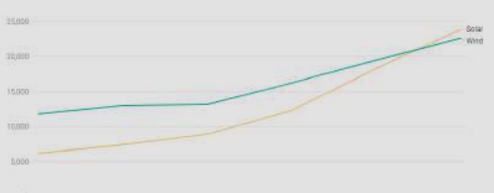
Solar energy took wind's crown as Australia's largest renewable energy source for 2020, this is according to a report by Renew Economy.

The market share of renewable energy sources also overtook the market share of fossil gas generation for the first time, which fell to 20% in 2020.

The amount of electricity produced from renewable energy sources grew by 16.3% in 2020, reaching 64,666 gigawatt-hours in total whilst the market share of fossil fuel generation fell to 75.6% in 2020 down from 84.8% previously recorded in 2017.

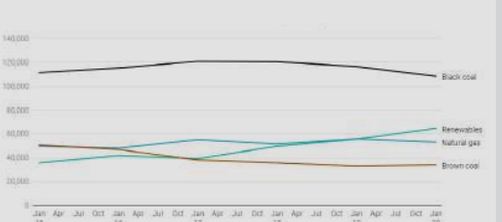
The report said renewable electricity generation grew by more than 20% in every state and territory, except for the high penetration states of Tasmania and South Australia, where renewable energy sources already supply more than half of the state's power.

Solar vs wind electricity power generation



Source: Renew Economy

Australia's electricity generation by fuel type (GWh)



Source: Renew Economy

South Australia aims for 100% green

AUSTRALIA

Shooting up from zero to 60% renewable energy generation in the last 14 years, South Australia has proven that the future of green energy dominated grid is possible, according to a paper by the Institute for Energy Economics and Financial Analysis (IEEFA).

In 2006, all electricity generated by South Australia came from fossil fuels. The state labor government, elected in 2002, introduced an initial target of 26% renewables generation by 2020, which according to IEEFA, was a bit ambitious at that time.

Fast forward to 2020, it has smashed through its previous goals to a whopping 60% of demand served by variable renewable energy in 2020

"Coal was phased out in 2016. Today, the grid is dominated by wind and solar backed up by battery storage and interstate grid connectivity, with peaking gas being used as a temporary generation technology until South Australia moves to net 100% renewables," said Johanna Bowyer, the co-author of the paper.

South Australia has the largest proportion of demand provided by rooftop solar of all states in Australia's National Electricity Market, with 13% of grid demand provided by rooftop solar

The region shoot up from zero to 60% renewable energy generation in just 14 years

in 2020. Around 40% of homes have rooftop solar, making South Australia a global leader.

Additionally, South Australia has proven that 100% solar generation is possible during the day.

South Australia's fast pick-up of renewables was driven mainly by many factors like strong wind and solar sources, historically high residential electricity prices, and historically high wholesale electricity prices, although wholesale prices have now dropped.

"The increasing proportion of low-cost renewables in South Australia's grid is driving down electricity prices. Wholesale electricity prices have dropped 65% in South Australia," the IEEFA report said.

Moreover, government policies have been significant in facilitating the transition to a renewable dominated grid, including the National Renewable Energy Target and the South Australian rooftop solar feed-in tariff.

South Australia is now expected to achieve its 100% renewable target by 2025, five years ahead of schedule.

South Australia has proven that a 100% solar generation is possible during the day

APAC BANKS WITHDRAW FROM COAL FINANCING

ASIA PACIFIC

Banks are being pressured to exit from dirty fuels

Several banks in the Asia Pacific have announced their intention to withdraw from coal financing, as pressure mounts for financial institutions to support renewable energy.

The Malayan Banking Bhd or Maybank disclosed that it will no longer finance new coal activities as part of a five-year strategy that will also see the bank committing $12b (RM50b) in sustainable financing.

This announcement came at the back of criticisms from a coalition of non-governmental organisations in Malaysia and Indonesia for funding coal plants despite making environmental, social, and governance commitments.

Meanwhile, the Manila-based Asian Development Bank (ADB) said it will end all financing for coal mining and power plants. It will also ban support for oil and gas production, under a new draft energy policy.

ADB said there has been "profound changes in the energy landscape" since it last updated its energy policy in 2009 and that the document "is no longer adequately aligned with the global consensus on climate change".

Australia's investment bank, Macquarie Group, said that it plans to halt coal financing by 2024. The company said that coal has never been a large focus for the group. However, the company said it would remain committed to the oil and gas sector until new technologies are developed.

Australia's top banks, namely Australia and New Zealand Banking Group or ANZ Bank, Commonwealth Bank of Australia, and Westpac, have all announced their intention to stop coal financing.

Japan's third-largest bank, Mizuho Group Financial will also be abandoning coal financing. The group initially said it would stop funding "mountaintop removal", a technique that involves using explosives to expose coal seams before updating its policy to halt any project for thermal coal mining, the first Japanese lender to do so.

Not just banks but other corporations are promising to go greener. The Sumitomo Corporation also vowed to exit the thermal coal mining business by 2030, either through the sale of its stakes or the ending of the life of its mines. In the company's three-year business plan, it said that it plans to cut its carbon dioxide emissions by more than 50% by 2035 from 2019 levels and would withdraw from the coal-fired power generation business by 2040.

Last April, Singapore's DBS Bank said it will phase out thermal coal exposure by 2039, making it the first Singapore bank to do so. In the bank's 2020 report, exposure to renewable energy projects increased to $4.2b from $2.85b in 2019.

PLANT WATCH

Australia's biggest solar & wind project

AUSTRALIA

The Port Augusta Renewable Energy Park is expected to start early operations before the end of 2021, Infigen Energy said.

It will combine solar and wind with a restricted combined output of 270 MW. PAREP will take advantage of Port Augusta's strong solar radiation and usual high daytime wind resources.

Australia's biggest wind and solar project initially was green lit in 2019 and began construction in 2020.

Infigen Energy took over the project from Spain-based Iberdrola, after the latter formally acquired Infigen last year.

China's first floating offshore wind turbine

CHINA

MingYang Smart Energy launched the first-ever Chinese-made floating wind turbine project in the South China Sea.

According to MingYang, the floating offshore wind turbine is a MySE5.5-MW typhoon-resistant floating wind turbine and will soon pave the way for more for both shallow water and deep wind farms.

The firm said that the wind turbine comes with MingYang's advanced floater movement control strategy, enabling the floating turbine to adapt to the complex environment of wind, wave, and current in the South China Sea.

South Korea's first floating wind project

SOUTH KOREA

South Korea's 200 MW Donghae-1 floating offshore wind project has passed its preliminary feasibility study by the Korea Development Institute, taking one step closer to the country's plans to raise its offshore wind capacity by 12 GW.

The Korea National Oil Corporation (KNOC) said that it welcomed the approval of the feasibility study and that it plans to "pursue in earnest" the plans to deploy the nation's first floating wind plant in 2026.

In July 2019, Equinor, KNOC and Korea East-West Power agreed to join forces to develop the project.

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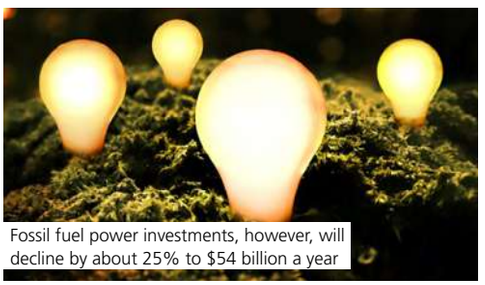
Wind and solar investments to hit $1.3t by 2030 in Asia Pacific: WoodMackenzie

ASIA PACIFIC



Fossil fuel power investments, however, will decline by about 25% to $54 billion a year

The Asia Pacific renewable generation investments, particularly that of wind and solar, are expected to hit $1.3t come 2030, according to the global energy research and consultancy group, Wood Mackenzie.

In contrast, fossil fuel power investments will decline by about 25% to $54b a year.

Wood Mackenzie's Research Director Alex Whitworth said that the region's power generation investments are leading the world and are expected to hit $2.4t in the current decade, with renewables accounting for over half or $1.3t of power investments.

"Under the current transition decade, subsidies across Asia are rolled back, while stronger policy targets and cost declines will continue. In most Asian markets, subsidy-free renewable power will not be able to compete with coal power until 2025 or later," Wood Mackenzie said.

Top contributors to wind and solar investments in the Asia Pacific include Mainland China, Japan, India, South Korea, and Taiwan.

According to Wood Mackenzie, China's 1,200 gigawatts (GW) of wind and solar capacity target by 2030 will require more than 534 GW of renewables to be added over the next decade. This will boost annual wind capacity to over 40 GW from 2021 to 2030.

Meanwhile, offshore wind power will play a key role in supporting Japan's 2050 net-zero target.

"Meeting this net-zero target would require building new offshore wind capacity equivalent to one new nuclear reactor every year until the middle of this century," Wood Mackenzie Principal Analyst Robert Liew said.

Wood Mackenzie also revealed its forecast that South Korea would quickly become one of the leaders of offshore wind in Asia with nearly 4.4 GW in the immediate development pipeline.

Between 2021 and 2030, annual additional wind and solar capacities will average at around 140 GW per year, accounting for two-thirds of average total power capacity additions in the region by 2030.

In the Southeast Asia region, the power market is hot with solar power, as solar continues to drive the growth of renewables. The region's installed capacity has more than doubled every year since 2018.

Southeast Asia will collectively require around $14b a year of wind and solar investments until 2040, forming just under half of the total power investments. Wood Mackenzie said it expects a momentary slow down with subsidies pulled back, but the region will add over 100 GW of solar in the next 10 years.

"The Asia Pacific is the epicentre of solar technology innovation and manufacturing. Home to the world's largest solar module manufacturers and PV inverter manufacturing, the region is the test field of many new technologies that have great potential to lower both solar Capex and operations and maintenance cost," Wood Mackenzie said.

On the other hand, the reaserch group see that wind and solar investments drop by 60% in the next five years but will bounce back to an average of around $7b a year by 2030.

Wood Mackenzie said that Australia is a leader in the energy transition in APAC as the country has the highest variable renewable energy share in generation and will soon accelerate the share from 20% in 2020 to 78% by 2050.

CHINA'S 8.1GW TIANWAN PROJECT GETS READY FOR LAUNCH

CHINA

The sixth unit of the Tianwan nuclear project has already begun operations.

China's Tianwan nuclear project is set to become the largest nuclear power plant in the world, with an estimated 8.1 gigawatts (GW) capacity, firmly beating the 7.4 GW capacity of Kori in Korea and the inactive Kashiwazaki-Kariwa in Japan with 7.9 GW.

The sixth unit of the project recently entered commercial operations in the country.

To date, CNNC now has 24 operational reactors for a total capacity of 24.5 GW.

The first safety-related concrete was poured for unit 5 on 27 December 2015, with that for unit 6 poured on 7 September 2016. Tianwan 5 entered commercial operation in September last year.

According to CNNC, the output from both units of Tianwan Phase III will offset the burning of 5.17 million tonnes of standard coal per year.

The power plant already includes the first phase of two 990 megawatts (MW) or 1.06 GW gross units, which were commissioned back in 2007.

Tianwan-3 entered commercial operation in February 2018 and Tianwan-4 in December of the same year. The construction of two additional 1 GW (1,080 MW gross) ACPR1000 reactors, Tianwan-5 and 6, started in late 2015 and early 2016, whilst unit 5 was commissioned in September 2020.

Tianwan 7 and 8 are scheduled to be commissioned between 2026 and 2027.

Once all eight nuclear plants are in operation, Tianwan therefore would become the world's largest nuclear power plant.

ASIA PACIFIC

Asia outshines the rest of the world in solar project pipeline

Asia remains the global leader in solar energy as the region projects 137.5 gigawatts (GW) of the total solar capacity under development, according to a report by Fitch Solutions.

Fitch said that the region holds the largest share of solar projects within its Key Projects Database (KPD). This accounts for almost 42% of KPD of the solar project pipeline.

The significant project capacity is mostly driven by a few markets like primarily India, Australia, and China although Fitch noted that at least 10 markets hold solar project pipelines with greater than 1GW in capacity under development.

"We note that China also remains underrepresented within our KPD due to limited project visibility. As such, the Asia region's solar capacity under development is even higher than the KPD would suggest, cementing its status as the global leader," Fitch said.

The Latin America and the North America and Western Europe regions have the second and third largest solar capacity project pipeline under development respectively.

Fitch said that the US is an outperformer with 40.9 GW under development. Fitch also expects the US solar project pipeline will get a sizable boost in the coming years as a result of increased policy support under the Biden administration, with significant upside risks from potential extensions to the solar investment tax credit.

Additionally, the recent surge in solar projects may be due to the fact that solar projects present low project risks, particularly in developed markets.

"An assessment of our Project Risk Metric (PRM), which quantifies the likelihood of a project progressing through the development phases in a timely manner, highlights solar power as one of the safest technologies for development with an average PRM score of 7 in comparison to a global power sector average PRM score of 6.3," Fitch said.

Recently, more countries are pledging to drop dirty fuel and concentrate their efforts in increasing renewable energy such as solar.

Global - Solar Capacity Under Development By Region, MW

Source: Fitch Solutions

National Infrastructure Holdings Co., Ltd.

PowerGen Kyaukse

MCM

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Five Asian countries responsible for 80% of world's new coal plants

This puts the Paris Agreement carbon target at risk

Five Asian countries plan to build more than 600 new coal plants with a combined capacity of over 300 gigawatts (GW) despite calls from the UN Secretary-General Antonio Guterres for all new coal plants to be cancelled.

These countries, according to a report by Carbon Tracker, make up about 80% of the world's planned new coal plants.

The report, however, warns that 92% of these planned units will be uneconomic, even under business as usual, and up to $150b could be wasted. Consumers and taxpayers will ultimately foot the bill because these countries either subsidise coal power or prop it up with favourable market design, power purchase agreements, or other forms of policy support.

"These last bastions of coal power are swimming against the tide, when renewables offer a cheaper solution that supports global climate targets," said Carbon Tracker's head of power and utilities, Catharina Hillenbrand Von Der Neyen. "Investors should steer clear of new coal projects, many of which are likely to generate negative returns from the outset."

A study by the International Renewable Energy Agency revealed that 162 GW or 62% of total renewable power generation added in the previous year had notably lower costs than the cheapest new fossil fuel option.

According to Carbon Tracker, by 2024, new renewables will be cheaper than coal in every major region; by 2026, almost 100% of global coal capacity will be more expensive to run than building and operating new renewables.

Growing competition from renewables, coupled with increased regulation, is likely to drive continued falls in coal plant usage, undermining their profitability. The report also said that coal plant economics are highly sensitive to utilisation and just a 5% annual reduction to the conservative base assumptions in its analysis would see global coal unprofitability almost double to 52% by 2030 and rise to 77% by 2040.

The same five Asian countries also operate nearly three-quarters of the current global coal fleet, with 55% in China and 12% in India. The Carbon Tracker report warns that around 27% of existing capacity is already unprofitable and another 30% is close to breakeven, generating a nominal profit of no more than $5 per megawatt-hour. Worldwide, $220b of operating coal plants are deemed at risk of becoming stranded if the world meets the Paris climate targets.

In April, China said that it plans to reach peak emissions by 2030 and become carbon neutral by 2060. Japan made similar vows that it will be a carbon neutral country by 2050.

Japan unlikely to meet 46% reduction in emission target: WoodMac

JAPAN

Japan's goal to slash greenhouse gas emissions by 46% in 2030 is 'extremely challenging'

Japan's pledge to reach a 46% reduction in greenhouse gas emissions by 2030 is an extreme challenge for the country, according to the energy consultancy group, Wood Mackenzie.

During April's Leaders Summit on Climate hosted by the US, Japan pledged a 46% reduction in emissions by 2030 compared to 2013, an increase from the previous target of 26%, and reach net zero by 2050.

According to WoodMac's Asia Pacific Head of Markets and Transitions Prakash Sharma, it is going to be 'extremely challenging' for Japan to meet its revised 2030 target.

"According to our analysis on the scenario where global warming is limited to 1.5 degrees Celsius (AET-1.5), we see Japan's emissions dropping to 34% in 2030 from 2013 levels and reaching net-zero by 2050," Sharma said.

He said that to reach its target, Japan needs to accelerate decarbonisation on all fronts backed by clear policies and incentives for businesses to ramp up investments. This would include expanding sales of electric and fuel cell cars and ending sales of gasoline-only vehicles by 2035 and increasing hydrogen refuelling stations to 1,000 in the same timeframe, an almost six-fold increase from today. Additionally hydrogen and carbon removal, including carbon capture and storage, and nature-based solutions, will also be required to tackle hard to abate sectors.

Meanwhile, WoodMac expects Japan's low-carbon hydrogen demand to reach 1.7 million tonnes (Mt) by 2030 and to meet its net-zero ambitions by 2050, the figure would need to grow ten-fold to 16.5 Mt.

"Japan is moving quickly to unlock hydrogen demand. Strategic policies are being put in place to develop new use cases in road transport, steelmaking, and power generation sectors. Pilot tests on co-firing ammonia in thermal power stations and recycling waste CO2 into synthetic fuels are also underway and commercialisation is expected after 2030," Sharma said.

But domestic hydrogen production will not be enough to meet this demand. Sharma said they expect imports to meet up to 80% of total demand in Japan by 2050 with the majority of imports coming from Australia due to proximity and lower cost.

"Together, both countries will take the lead in facilitating seaborne hydrogen trade, and ammonia will likely be the main carrier for green hydrogen," Sharma added.

Meanwhile, WoodMac expects Japan to source 30% of its power demand from renewables by 2030, boosted by falling cost of renewables and an expected $147b renewable capacity investment by 2030. Japan will be able to surpass its national target of 22% to 24%.

Japan also aims to decrease coal's share in power generation from over 30% in 2019 to 26% come 2030.

But WoodMac said that decreasing coal power generation is challenging due to the competitive economics of coal power.

"Without further policy support from the government, coal's share could increase due to a pipeline of 9 gigawatts of coal plants under construction and public opposition to expanding the operating nuclear fleet. The country is expected to make little progress towards its target to restart controversial nuclear plants and double the nuclear share of generation to 20% to 22% by 2030," WoodMac's Asia Pacific Head of Power and Renewables Alex Whitworth said.

Whitworth added that the challenge in shutting down coal and nuclear was further brought into focus by the power shortages and record-breaking power price spikes seen earlier this year. He stressed that though emissions are expected to drop by 16% from the power sector, this will not be enough to reach the government's target.

"Renewables are truly playing their part but there are significant challenges to decarbonising dispatchable power and non-power sectors," Whitworth said.

DEWA and Siemens Energy co-develop world's first Gas Turbine Intelligent Controller

Dubai Electricity and Water Authority (DEWA), in collaboration with Siemens Energy, has made a global achievement by developing the first-of-its-kind Gas Turbine Intelligent Controller (GTIC) and Gas Turbine Digital Twin. GTIC uses Artificial Intelligence (AI) and Machine Learning (ML) to recover gas turbine capacity and efficiency degradation due to ageing thus improving efficiency, increasing generation capacity and reducing fuel consumption, which in turn reduce emissions.

DEWA has added a new accolade to its record of global achievements by winning the Innovative Power Technology of the Year 2020 award at the 16th Asian Power Awards, considered one of the most prestigious electricity awards in Asia. This is in recognition of its Digital Twin Gas Turbine Intelligent Controller.

His Excellency Saeed Mohammed Al Tayer, MD&CEO of DEWA, expressed his pleasure with the new achievement.

"At DEWA, we work in line with the vision and directives of His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, to achieve the National Innovation Strategy, which aims to make the UAE one of the most innovative countries in the world, and the Dubai Plan 2021, which aims to make Dubai the home of creative and empowered individuals full of pride and happiness," His Excellency said.

His Excellency added, "Winning the Asian Power Award is a testament of the distinguished capabilities and expertise of the UAE nationals. It is another global recognition that strengthens the position of the United Arab Emirates in international forums and consolidates the country's competitiveness in all fields. DEWA works to establish a culture of innovation among its employees and all members of society, and relies on innovation as a fundamental pillar of its processes and organisational approach, and it is proceeding with confidence towards preparing for the next fifty years and building a sustainable future."

Deployment of GTIC across all six gas turbines in DEWA's M-Station, which is the largest power station in the United Arab Emirates, increases both the generation efficiency up to 2.2% and capacity of each unit by around 3.5 MW, resulting in the financial savings of AED 5 million (USD 1.36 million) in CAPEX and AED 2.83 million (USD 0.77 million) in OPEX per unit. This also reduces fuel consumption and eliminates around 10,000 tons of carbon emissions per unit per year and Nitrogen Oxides emissions by 10%.

GTIC development journey started in January 2016 and went through a number of phases starting with performance testing of 22 gas turbines, then installing Thermodynamic Diagnostic Systems on 10 gas turbines to collect technical data for one year from January 2017 to January 2018. A prototype of the automated response initiated by thermodynamic variables, piloted on M-Station GT number 11, was designed and applied in April 2018. Following the prototype success, an additional feature called SEM (Stability & Emissions Module) was added in January 2019 to increase stability of combustion systems and to reduce emissions, which has resulted in significant and continuous improvements.

GTIC was developed by DEWA's Emirati experts led by Mr. Nasser M. Lootah, Executive Vice President of Generation Division (Power & Water) with support from His Excellency Saeed Mohammed Al Tayer, and in collaboration with Siemens Energy. The system was launched by His Highness Sheikh Hamdan Bin Rashid Al Maktoum, Deputy Ruler of Dubai , Minister of Finance of the United Arab Emirates and President of DEWA, during the 21st Water, Energy, Technology and Environment Exhibition (WETEX) in October 2019 in Dubai.

Based on the excellent results achieved, GTIC is being extended to cover the complete combined cycle instead of gas turbines only. It will be further extended to cover the desalination plants as well (i.e. the complete cogeneration cycle). This will not only benefit the gas turbine; but will also improve the subsequent steam production process, which is used at DEWA both to generate electricity and produce drinking water from seawater. The goal is to optimise the overall operation automatically.

"For organisations like DEWA, which have to meet rapidly changing demands. Such an improvement is crucial for ensuring that the system becomes even more efficient and resilient whilst also significantly reducing the emissions. By applying this innovative solution to the complete cogeneration cycle, huge outcome and benefits are anticipated; such as fuel consumption reduction, DEWA assets optimisation, emission reduction and total plant efficiency increase," Lootah said.

Chinese firms helping to boost hydro development across the Asia Pacific region

In this part of the world, nearly 45% of all hydro-electric plant capacity involves Chinese firms or technology.

Amidst a global decline in hydropower as an energy source across the globe, Chinese companies have been ramping up hydro development, not just locally, but also across the Asia Pacific and beyond, analysts found.

In the Asia Pacific region excluding India, where China's involvement is very limited, nearly 45% of all hydropower plant capacity involves a Chinese company, according to a report from the International Energy Agency (IEA) revealed. In particular, Pakistan and Laos receive the largest contributions in the form of financing or construction.

"The Belt and Road Initiative, a Chinese government programme to develop infrastructure in developing and emerging economies, has enabled many of these projects, especially in the Asia Pacific region and Latin America," the IEA report stated.

China has been more involved in hydropower projects in developing regions, building them through construction contracts; finances them partially or majorly; or owns them through direct ownership of the project or the company building the project, IEA noted. These comprise over half of all new hydro project capacity larger than 30 megawatts (MW) that are expected to come online in sub-Saharan Africa, the Asia Pacific excluding India, and Latin America during 2021-2030.

In the Asia Pacific region, nearly 45% of all hydropower plant capacity involves a Chinese company

"Chinese hydropower firms have the technical expertise to help build, own and operate large projects owing to their experience developing large dams over the last two decades. The cost-competitiveness of these firms, coupled with aggressive project timelines to increase electricity access, are attractive for countries with budget sensitivity and tight schedules," IEA added.

According to the International Hydropower Association (IHA), China remains the world leader in respect of total hydropower installed capacity with over 370 gigawatts (GW). Further, data from GlobalData revealed that China has been making the largest annual capacity additions with over 12 GW added in 2019 alone. Its plants under construction have not been affected much by the pandemic, and the country is set to add over 140-GW hydro capacity during 2020–2030.

"Between 2019 and 2030, the share of hydropower in several major countries is estimated to continue falling. But globally, the decline is estimated to be less significant during this period, mostly due to the large-scale capacity additions by Chinese companies, not only in China, but also in other countries. Most of the largest upcoming hydropower plants are either in China or are being built by Chinese companies in other countries," GlobalData said in a report.

IEA noted that the country's role in hydropower development is most significant in sub-Saharan Africa, with nearly 70% of new capacity fully or partially owned, built and/or financed by China. This includes the largest hydropower project currently under construction in the continent, the Grand Ethiopian Renaissance Dam.

Locally, the country added 13.76 GW of new hydropower capacity in 2020, including 1.2 GW of pumped storage from the last four units of the Jixi project. At 1.8 GW, Jixi is China's largest pumped storage project by installed capacity.

The majority of the additions were in south-western provinces such as Sichuan (4.13 GW) and Yunnan (3.4 GW). The 10.2 GW Wudongde project is scheduled to be fully operational by July.

China remains the world leader in respect of total hydropower installed capacity with over 370 gigawatts

New hydropower installed capacity by region in 2020 (MW)

Source: International Hydropower Association

This will then be China's fourth-largest and also the world's seventh-largest hydro project by completion.

Pumped storage continues to be a significant focus in China's energy transition. In the 2021 Energy Work Plan issued by the National Energy Administration, nationwide medium- and long-term planning for pumped storage is emphasised. This is coupled with the consolidation of the pumped storage pricing mechanism released in April 2021 that suggested all pumped storage plants in China adopt a two-part tariff mechanism based on capacity and energy tariff after 2023.

APAC's fossil fuel phaseout

With rapid urbanisation and industrialisation, the East Asia and Pacific region has been on a trajectory of rapidly rising energy demand. At the same time, in many countries coal generation was the most affected by demand reductions in the pandemic-hit 2020, IHA found.

"The momentum of divesting from fossil fuel generation continued to grow in 2020 as more countries announced pledges to achieve carbon neutrality and deliver green recovery packages. Japan pledged to reach a net-zero emissions target by 2050 and cut emissions by 46 percent to 50 percent by 2030. South Korea committed to terminate public overseas coal finance and achieve net-zero emissions by 2050," the report stated.

Malaysia has stepped up its renewable energy ambitions and now recognises "large hydropower" as part of its renewable energy definition, in line with practices adopted by other countries internationally, IHA noted. Malaysia also rolled out large-scale solar tenders as part of a green stimulus package. The construction of the 1,285-MW Baleh project continued to progress and is scheduled to be completed in 2026.

Meanwhile, the Philippine government has declared a moratorium on new coal power plants.

The country also allowed full foreign ownership in geothermal and hydropower in its latest tender, which included 17 potential hydropower projects with a combined capacity of 80 MW.

Thailand also plans a transition away from coal, reducing it to only a 5% capacity share by 2030. The Electricity Generating Authority of Thailand has completed the construction of the 2.5-MW Klong Tron project. In addition, it is constructing the 14-MW Pha Chuk project which is expected to be operational by December 2021.

ASEAN has put forward an ambitious joint ministerial statement of achieving 23% renewable energy by 2025. The proposed ASEAN Power Grid aims to foster regional interconnection and economic growth, which has been taking shape under the Lao PDR-Thailand-Malaysia power integration project.

"The Lao People's Democratic Republic continued to advance its plan to export 20 GW by 2030, with a 728-MW Phou Ngoy project newly announced. Cross-border hydropower will therefore continue to play an important role in decarbonising the South East Asian power grid," the report stated.

In Viet Nam, the 26-MW Pa Hu project has begun commercial operations. PC1 began operation of the three hydropower plants—which have a total capacity of 54-MW 2020, including the 30-MW Mong An hydropower plant and the 18-MW Bao Lac B, and the 6-MW Song Nhiem 4 development projects.

Further, Ngan Truoi project's construction was delayed, whilst the 480-MW expansion of Hoa Binh Hydropower Plant has started, which is expected to have a 2,400-MW capacity. Another 180-MW expansion of the Yaly hydropower plant is scheduled to begin construction in the second quarter of 2021.

South Asia's hydro challenges

South Asian countries face problems where the reliability of electricity delivery is poor but the demand for electricity is expected to grow rapidly. Hydropower can help as a renewable alternative and a reliable source of energy storage, but it remains divisive in the region, where some expressed concerns about its social and environmental costs, according to a study published in the International Journal of Water Resources Development.

South Asian countries face problems where the reliability of electricity delivery is poor but the demand is expected to grow rapidly

In the study, penned by a team led by Ramesh Ananda Vaidya, hydro is still cheap compared with other energy sources, but in the long term it might change, and hydropower may lose its cost advantage. However, Vaidya and hi team claimed that it can remain competitive if it is developed sustainably because of its complementarity with solar energy.

On the environmental side, the sector's future may depend on how various risks are managed, the study noted. First, hydro-specific EIAs must identify potential impacts. Second, opportunities to derive benefits from environmental changes need to be carefully analysed. Finally, an integrated river basin approach, with the basin as the planning unit, should be used in planning projects to ensure maximum benefits and minimum environmental impacts.

On the social side, policies and institutions for benefit-sharing that reflect social justice are advised to be developed, and universal access to electricity should be promoted by way of maintaining a balance between on- and off-grid modes of delivery, the study said.

"If appropriate measures are taken by the government, civil society and the private sector to manage risks, where each stakeholder manages the type of risk – environmental, social, or financial – it can handle best, hydropower will continue to play a significant role in South Asia's energy future," the study said.

Ranking by total installed hydropower capacity.

Rank	Country/Territory	Installed capacity (MW)*
1	China	370,160
2	Japan	50,016
3	Viet Nam	17,111
4	Australia	8,790
5	Laos	7,376
6	South Korea	6,506
7	Malaysia	6,275
8	Indonesia	6,121
9	New Zealand	5,354
10	North Korea	5,010
11	Chinese Taipei (China)	4,694
12	Thailand	4,512
13	Philippines	4,385
14	Myanmar	3,331
15	Cambodia	1,329
16	Papua New Guinea	234
17	Fiji	125
18	New Caledonia	78
19	French Polynesia	47
20	Mongolia	23
21	Samoa	12

*including pumped storage

Source: International Hydropower Association (IHA) 2021 Hydropower Status Report

Modest geothermal growth to persist in Asia

There are very few growth drivers expected over the coming years, even in particularly tectonically-active areas.

Wayang Windu Geothermal Plant in Indonesia

Asia Pacific's geothermal sector has reached a standstill following the impacts of the COVID-19 pandemic. This is despite the rising demand for geothermal power amidst carbon neutrality pledges of several corporations and countries over the past years.

Whilst opportunities for the market are continuously appearing, recent actual growth was driven by only a few markets due to geographical restrictions and the indiscernible amount of pandemic-relatedconstraints on activity.

Fitch Solutions Infrastructure and Power & Renewables Analyst Daine Loh noted that the chances of geothermal faring in these pledges are dependent on the location of resource potential.

"We have only really seen this dynamic playing out in New Zealand, as its geothermal sector might benefit from its goal to achieve 100% renewable energy (including hydropower) by 2030; a target that has recently been brought forward by five years from 2035," Loh said.

A report from Fitch Solutions forecasts that by 10 years, New Zealand will be the fifth-largest market globally in terms of installed geothermal capacity. It expects the country's geothermal capacity to grow by 302 megawatts (MW) and account for just under a fifth of total electricity output.

"We highlight further upside risks for growth in the market as the New Zealand government has set a goal of reducing the role of coal- and gas-fired generation in the power mix by boosting geothermal, wind, solar, and biomass power generation," the Fitch Solutions report reads.

For most, the market has to be met with caution amidst issues on supply chain disruptions, financial headwinds, and the interruption of business activity from the pandemic. In Asia Pacific, geothermal's recovery will be driven predominantly by Indonesia and the Philippines, two of the region's geothermal giants based on power generation capacity, despite issues these markets currently face.

A key priority

Despite modest geothermal growth of Indonesia, government-led exploration drilling is being initiated in multiple working areas.

According to Institute for Energy Economics and Financial Analysis (IEEFA) energy finance analysts, Putra Adhiguna, Elrika Hamdi, and Sam Raynolds, the campaign is expected to help lower the risk for potential investors, and to narrow the gap between investor expectations and the power purchase price which could be afforded by the state utility company, PT Perusahaan Listrik Negara (PLN).

China remains the world leader in respect of total hydropower installed capacity with over 370 gigawatts

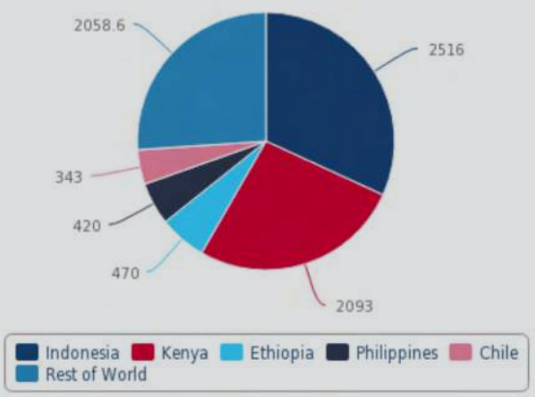
"This new development is also followed with a rising interest in utilizing slim-hole exploration wells to lower cost and further mitigate the exploration risks," the analysts said.

The three analysts also noted that tariffs remain a key challenge, and investors are waiting for the issuance of presidential regulation on renewable energy tariffs which will likely define the future outlook for Indonesian geothermal market.

In 2020, the Indonesian ESDM Ministry has postponed the auctioning of new working areas whilst awaiting the new regulation and expanding available geological information on the working areas. A number of expansion plans have been noted on the existing areas such as the 70 MW expansion by Star Energy Geothermal and 110 MW plan by Geo Dipa Energi.

There are also talks of a plan to construct a geothermal holding

Geothermal capacity under development by country, MW



Source: Fitch Solutions Key Projects Database

by combining various multiple state-owned enterprises, including Pertamina Geothermal Energy, PLN Gas & Geothermal, and Geo Dipa Energi. The consolidation is expected to be followed by an initial public offering of the new entity.

The merger is expected to make the entity more competitive and to support more geothermal growth in the market.

"Whilst optimism abounds, it remains to be seen whether the holding will be able to accelerate the development of geothermal in the country," Adhiguna, Hamdi, and Reynolds noted.

Meanwhile, Loh noted that expanding the geothermal industry is a key priority for the Indonesian government given the vast potential for geothermal power generation in the country, which is estimated at about 28 gigawatts (GW). The government is also targeting a geothermal power capacity of 7 GW by 2030 as part of Indonesian president Joko Widodo's power expansion plans.

"Although ahead of our current forecasts for the segment, there is significant upside potential in light of a number of supportive policies in place to help fulfil this target," Loh said.

"Most notably, the government has developed a geothermal drilling programme to mitigate the risks of the geothermal exploration, encouraging more investments and development into the sector," she added.

The IEEFA analysts also brought up the fact that geothermal power remains a key part of Indonesia's plan towards reducing greenhouse gas (GHG) emissions. But despite this fact, geothermal expected delivery has been toned down in the draft outlook of the country's 10-year electricity plan.

"Initially, a substantial capacity is expected to be delivered by 2025, this has now been replaced with a more gradual delivery within the next 10 years. Despite the lower target for 2030, PLN's long-term outlook maintains significant potential for geothermal development in the coming decades to 2060," they said.

Moreover, Adhiguna, Hamdi, and Reynolds pointed out that growth potential in Indonesia will hinge on the awaited presidential regulation and the outcome of the government-led exploration drilling. Also, there has not been a consensus on how to place a value on geothermal as baseload power amidst growing variable renewable energy capacity in Indonesia.

"Finding the right balance between the tariffs, risk profile, and geothermal value as a baseload power are some of the subjects which the industry and policymakers will need to explore further to successfully promote geothermal in the future," they said.

Loh added that Fitch Solutions forecast the region's geothermal capacity to grow from an estimated 5.6 GW in end-2020.

Ramping up projects

The Philippines' geothermal capacity also seems to have halted. As of April 2021, the country's total installed geothermal capacity stood at 1,928 MW and accounted for 11% of the country's total electricity generation.

However, there has only been one new geothermal project to come online since 2008. This is despite the country having the third largest geothermal capacity, just behind Indonesia and the United States.

The IEEFA analysts noted that although its government has committed to a GHG emissions reduction target of 75% by 2030, whether it will provide regulatory incentives for new geothermal developments remains to be seen.

"Industry groups in the Philippines have requested investment incentives in the form of insurance, a risk mitigation fund, or cost sharing for the high capital expenditures required in the drilling stages of early development. However, these proposals seem to have gained little traction to date," they said.


Daine Loh


Elrika Hamdi


Putra Adhiguna


Sam Reynolds

Earlier this year, the Philippine government launched a competitive bidding process for several geothermal sites, but these have been proven to be unsuccessful as many of the sites listed had small potential capacity, making them more expensive to develop and getting limited interest from private industry players.

The Philippines' Department of Energy (DOE) allowed foreign ownership of the large-scale geothermal plants that did not receive any bids to improve the outcomes of the tender. Since then, three companies have already submitted valid bids to develop some of the sites.

However, as of May 2021, DOE failed to sell the plants due to lack of bidders and disqualification brought by the bidders' failure to submit the necessary requirements. Since then, the department has opened 22 predetermined areas for bidders.

The IEEFA analysts ascertained that the country is poised for limited growth in the medium-term, with several projects anticipating an additional 170 MW of new geothermal capacity by 2030. "Whilst it may take a few years, added financial incentives from the government could provide a much-needed boost in eventually getting the projects online."

There are currently five geothermal projects with a total of 116 MW capacity in the committed stage of development, but only 3 MW are expected to reach commercial operations this year.

36 MW are expected to be online in 2022, and the rest of the total capacity is expected to be online by 2025. As of writing, there are also nearly 300 MW worth of projects in various pre-development stages.


Expanding the geothermal industry is a key priority for the Indonesian government

Asia's rapidly rising renewables could see the death of coal far earlier than predicted

The battle against climate change continues as more and more Asia Pacific countries pledge to cut down carbon emissions and boost renewable energy capacity in their respective markets.

Cutting down on emissions means also cutting down on the use of fossil fuels such as coal, oil, and natural gas. This would be hard for a region, such as Asia, as it is highly dependent on coal for its domestic power demand.

However, the winds of change began to blow across the power industry in the region that could see coal belch its last.

Policy changes

Recently, several financial institutions have started to review their policies on financing coal due to pressures from investor groups.

A group of 115 investors including the likes of Aviva Investors, Fidelity International, and M&G Investments who are overseeing a combined $4.2t assets, have written to 63 banks to demand that they exit coal financing by 2040, according to a statement released by ShareAction, a non-government organisation, focused on investor rights.

But before this, several banks in the Asia Pacific have already announced their intention to withdraw from financing coal projects entirely.

In Malaysia, the Malayan Banking Bhd (Maybank) has said it will no longer finance new coal activities as part of a five-year strategy that will also see the bank committing $12b (RM50b) in sustainable financing.

The Manila-based Asian Development Bank said it will end all financing for coal mining and power plants and ban support for oil and gas production, under a new draft energy policy.

Meanwhile, Australia's top banks, namley: Australia and New Zealand Banking Group (ANZ Bank), Commonwealth Bank of Australia and Westpac, declared thet they intend to stop coal financing.

Cheaper costs

Coal is also threatened by the continued fall of renewable energy prices. In a report by the International Renewable Energy Agency, more renewable energy are costing less than the cheapest fossil fuel on the market.

The report said that 62 gigawatts (GW) or 62% of total renewable power generation added last year had lower costs than the cheapest fossil fuel.

Aside from the lower cost, the report revealed that renewable energy plants are now cheaper to operate than coal power plants. Globally, over 800 GW of existing coal power costs more than new solar photovoltaics or onshore wind projects commissioned in 2021.

Aside from the lower start-up costs, renewable energy plants are now cheaper to operate than coal power plants

With cheaper costs and zero emissions commitment from countries, the coal industry is slowly flickering out.

In NSW, Australia, a government report said coal-related jobs could disappear entirely in the Australian state by 2041. This is only one of three scenarios the report predicted with only a decline to 10,000 from 22,000 jobs in the most optimistic case.

The possibility of the death of coal power in NSW is even further emphasized with renewable projects gaining traction in the region.

Recently, a consortium of energy firms has been aiming to build what is estimated to be the world's biggest renewable energy hub.

Set to produce 50 GW of hybrid wind and solar power, the Western Green Energy Hub (WGEH) will provide green energy sources both domestically and internationally.

The project has an estimated cost of $100b and will be built in phases to produce up to 3.5 million tons of zero-carbon green hydrogen or 20 million tons of green ammonia each year.

But will coal really flicker out?

Despite lowering costs and a surge in investments in solar and wind power, coal's grip in the region remains strong. According to a report by Carbon Tracker, five Asian countries — namely China, India, Indonesia, Japan, and Vietnam — have more than 600 coal projects are being developed.

This makes up about 80% of the world's planned new coal plants.

The report warns that 92% of these planned units will be uneconomic, even under business as usual, and up to $150b could be wasted. Consumers and taxpayers will ultimately foot the bill because these countries either subsidise coal power or prop it up with favourable market design, power purchase agreements, or other forms of policy support.

The same five Asian countries also operate nearly three-quarters of the current global coal fleet, with 55% in China and 12% in India. The report warns that around 27% of existing capacity is already unprofitable and another 30% is close to breakeven, generating a nominal profit of no more than $5 per megawatt-hour. Worldwide, $220b of operating coal plants are deemed at risk of becoming stranded if the world meets the Paris climate targets.

Coal has weakened and solar and wind power is gaining the upper hand in Asia; but governments still need to remain firm with their commitment and make clear policies to support the sustainable shift to renewables.

62% of total renewable power generation added last year had lower costs than the cheapest new fossil fuel option, according to a report by IEA

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Japan is currently boosting its share of renewables in line with its carbon neutrality goal, with offshore wind playing a crucial role

Japan bets on offshore wind in its bid to reach net-zero emissions in less than 30 years

Long overlooked by the Japanese market, offshore wind farms are finally in the energy industry limelight as the country pledges full carbon neutrality by 2050.

In the cold waters off the coast of northwestern Japan, a stone's throw from the ancient port city of Akita, a wind farm project of historic proportions is rapidly taking shape. Here, construction is in full swing for the country's first large-scale offshore wind farm, the 140-megawatt (MW) Akita Noshiro offshore wind project.

Japan had long ignored its offshore wind potential, with developers discouraged by perceived technology risk and administrative challenges. But the offshore wind sector was suddenly propelled into the limelight when the Japanese government unveiled its goal of net-zero emissions by 2050.

Winds of change

At present, Japan only has two commercially operating offshore wind farms, with a combined capacity of around 4.5 MW. This is a far cry compared to its East Asian neighbours—China, for instance, added 2.5 gigawatts (GW) of offshore wind capacity in 2019 alone. But Japan is boosting the share of renewables in line with its carbon neutrality goal; and offshore wind plays a crucial role. The government has set initial generation targets of 10 GW by 2030 and 30 GW to 45 GW by the year of 2040.

Previously, developers were discouraged by the perceived technology risks and administrative challenges of offshore wind

"The two wind farms of the ¥100b Akita project will generate with a capacity of 140 MW, enough electricity to power at least 150,000 of Japan's 52 million homes. By 2030, Japan plans to have installed a total of 10 GW, and the country's possibilities are even greater," noted Katsuhiro Sato, Partner, Tokyo, at McKinsey.

Figures from the Renewable Energy Institute (REI) show that there are currently projects totalling around 18 GW which are at the stage of environmental impact assessment. Most large-scale projects are concentrated in the waters of Akita and Aomori prefectures.

"For Japan, surrounded by the sea, utilizing offshore wind power is highly significant and an urgent necessity. Japan is second in the world in the deployment of solar photovoltaics (approximately 62 GW as of end-2019), so wind power, which generates electricity whether day or night, needs to be accelerated to create a balanced renewable energy mix," the REI said in a report. "Deployment of renewables on a large scale is what will enable Japan to achieve carbon neutrality by 2050; and offshore wind power, which tends to be large in scale and has relatively high capacity factor, will be one of Japan's primary energy power sources," it added.

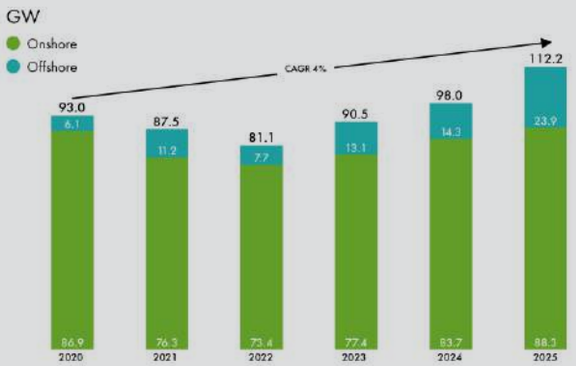
A turbulent path

However, experts caution that Japan's path to offshore wind dominance will be anything but smooth sailing. "Japan's journey will require multiple players, including regulators, utilities, and investors, to do their part in a country where the public remains sceptical about offshore wind's cost competitiveness with other power sources," Sato advised investors.

Geography is also an issue in scaling up offshore wind production. "Offshore wind looks promising and should certainly be explored, but Japan's wind geography is not as fortuitous as some regions, such as the North Sea which has a 20% higher annual utilisation ratio," noted Jun Arima, Senior Policy Fellow on Energy and Environment, Economic Research Institute for ASEAN and East Asia (ERIA).

REI further warned that Japan's coasts

Global wind power installations outlook 2020-2025



Source: Global Wind Energy Council

have many areas where the water gets deep almost immediately, which poses a challenge in bottom-fixing platforms. Seabeds may also be impacted by earthquakes, which means floating platforms moored to the seabed with lines are expected to be utilized.

"Japan has the additional challenge of needing floating platforms for a majority of the sites because of its deep coastal waters, as well as turbines that can withstand earthquakes and typhoons and make use of low wind speeds," Sato concurred.

Supply chain issues must also be addressed to help offshore wind truly take off domestically. REI highlights that Japan has no local turbine manufacturers, and most components have to be imported from other countries. This translates to higher costs, which may hobble the sector's growth in the long run.

"The supply chain is not only for turbines and their components. Turbine assembly, construction work for installation, and post-launch operations and maintenance are indispensable to offshore wind power projects. A supply chain strategy is needed that considers the enhancement of the supply chain in this broad sense. Building a supply chain that Japanese companies take part in can be expected to have major economic ripple effects, create many new jobs, and benefit the local region," REI said.

Despite these challenges, analysts are optimistic that increasing offshore wind production is crucial in securing Japan's future energy supply. Sato highlights that all these challenges are surmountable through rigorous stakeholder alignment, coherent market design, and supportive regulatory and financial conditions.

"The country is on the cusp of joining the global offshore wind scale-up club at the most opportune time in the industry's history. Japan has good reasons to pursue offshore wind energy and has picked an opportune moment to join the international scale-up club," he said. "Not only does developing offshore wind offer a way to stimulate the economy in one of the most severe global downturns in living memory, but also the industry itself has made great strides across the globe since its inception in Denmark in the 1990s," Sato noted.

"Many of the country's unique challenges are also its greatest opportunities. Offshore wind offers Japanese companies the chance to become international leaders in the design and construction of technologies that address some of the island's challenges. These technologies include floating foundations and turbines that can withstand typhoons, tsunamis, and earthquakes, as well as those that can operate efficiently at low wind speeds. These new technologies can be installed at home and exported to countries with similar conditions to Japan, such as China, South Korea, and the Philippines. Japan could become an industry leader in developing the technology and processes needed in deep water and challenging wind conditions," he added.

The long road to carbon neutrality

Offshore wind is not the only sector that will benefit from Japan's Green Growth Strategy. In the short term, the government is further looking to expand the share of solar power; in the long term, it targets the use of new technologies such as hydrogen and ammonia generation.

"The government counts on an ambitious expansion of renewables, a recovery of nuclear power and on the deployment of new technologies, including low-carbon hydrogen, safer advanced nuclear reactors and carbon recycling to decarbonise the electricity sector," the International Energy Agency (IEA) said in a report. "The strategy sees renewables accounting for between 50% to 60% of electricity demand in 2050 with the remainder supplied by nuclear and thermal plants with carbon capture utilisation and storage (30% to 40%) and 10% of hydrogen and ammonia generation."

In particular, hydrogen will play a prominent role in Japan's clean energy transition. The country aims to have

Jun Arima

Katsuhiro Sato

800,000 fuel cell vehicles and 5 million residential fuel cells by 2030. Researchers are also experimenting with large-scale power generation based on hydrogen.

While there are still calls to phase out nuclear power, the sector plays a crucial role in Japan's 2050 targets. Nuclear energy is expected to increase to at least 11% of the total primary energy supply (TPES) by 2030, up from 4% in 2019.

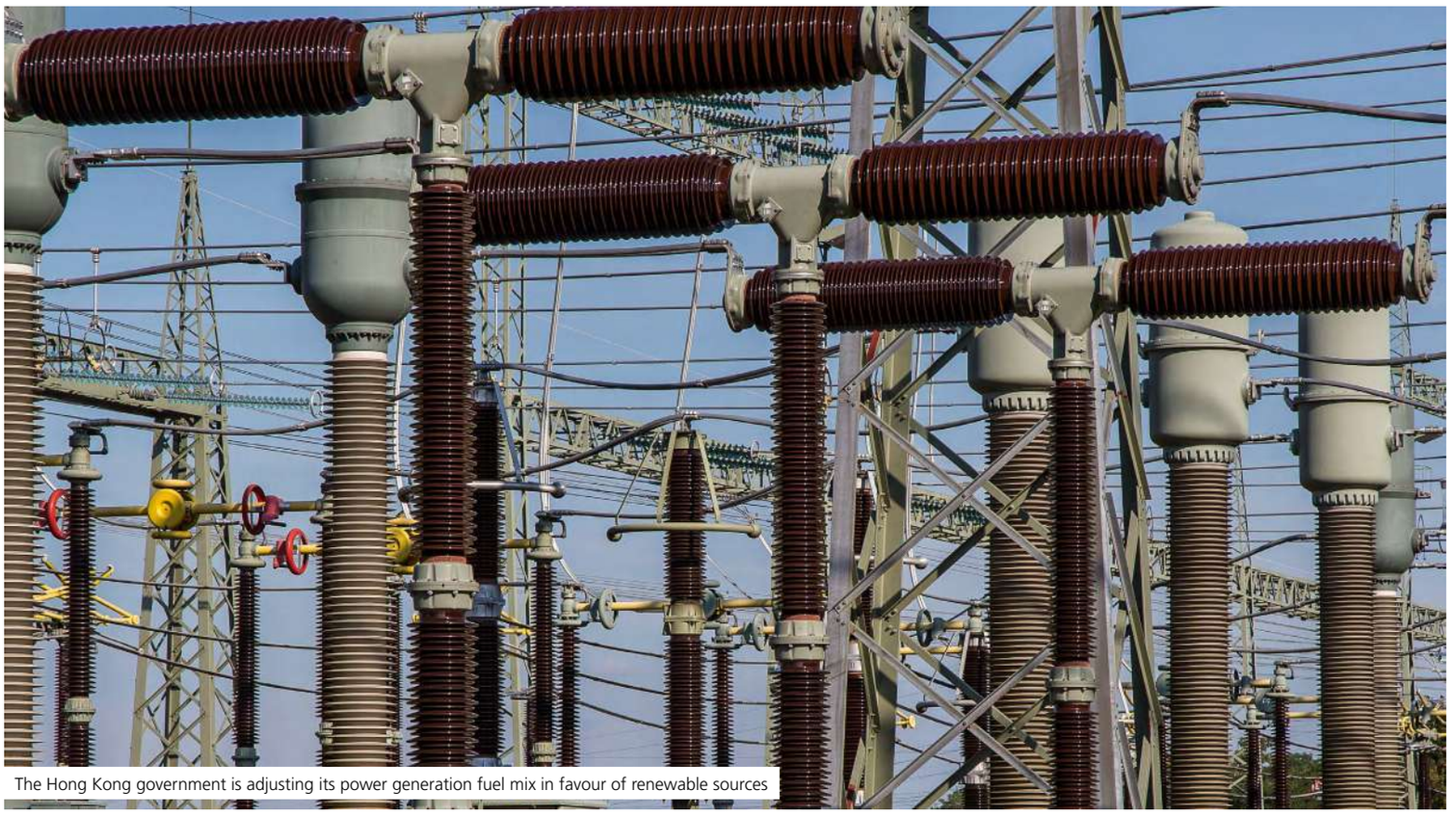
"Japanese energy policy debates after 3/11 have been distorted by a dichotomous argument between renewables or nuclear. Reality calls for a more pragmatic approach that incorporates both and makes use of their respective advantages. Together with renewables, Japan should accelerate the restart of nuclear power plants in the short- to mid-term. The c onstruction of new and more advanced nuclear plants should be an option for the 2050 carbon neutrality plan. It is also crucial to preserve and develop Japan's nuclear power technologies and respective human resources," said Arima of ERIA.

Moreover, despite its ambitious targets, Japan remains heavily reliant on imported fossil fuels. Data from the IEA show that in 2019, fossil fuels accounted for 88% of TPES, the sixth highest share among IEA countries. Fossil fuels will also account for more than half of power generation in 2030.

As Japan phases out old coal-fired power plants, experts warn that the country may face an electricity generation gap. "The significant reduction in Japan's thermal power generation capacity, which comprises about 70% of its energy mix, could threaten the country's power supply during high demand seasons without a significant boost in the utilization of the baseload generation source, which is currently nuclear power," S&P Platts said.

The IEA cautions that the government should develop scenarios on how to close an eventual gap in electricity generation if restarts of nuclear plants are delayed. "Achieving the aim of carbon-neutrality by 2050 will require Japan to substantially accelerate the deployment of low-carbon technologies, address regulatory and institutional barriers, and further enhance competition in its energy markets. It will also be important to develop different decarbonisation scenarios, to prepare for the possibility that certain low-carbon technologies, such as nuclear, do not expand as quickly as hoped," the IEA added.

"There is no perfect energy setup. Japan's reality does not allow it to count on one or another energy source while ruling out other options. Seeking the best diversified mix is the right answer, and it is time for Japan to return to this pragmatism in its (overall) energy debate," Arima concluded.



The Hong Kong government is adjusting its power generation fuel mix in favour of renewable sources

Where is Hong Kong now in its carbon neutrality target?

The city is now implementing several ambitious abatement measures as it aims to be fully carbon neutral by 2050.

Hong Kong has been introducing different measures to stabilise its carbon emissions, carefully tying its economic activities into its environmental goals of achieving carbon neutrality before 2050. Moreover, the Hong Kong government has implemented several new strategies on waste management, energy supply, and green building, amongst others, as part of this ambitious undertaking.

Since the year 2000, the region has seen an upward increase in greenhouse gas emissions, despite its concerted efforts to cut down and stabilize them since the late 1990s.

A report from the Hong Kong Legislative Council showed that carbon emissions in the region peaked in 2014, having increased to nearly 45 million tonnes annually. Amongst the sources of greenhouse gas emissions in the region, power generation has always accounted for the highest percentage. Power generation accounted for around 65% of Hong Kong's emissions in 2017.

Coal also remains the most dominant fuel in meeting power demands, still accounting for about 25% of the fuel mix despite its declining share.

Coal remains the most dominant fuel in power generation, still accounting for about 25% of the fuel mix, despite its declining share

Whilst Hong Kong's carbon intensity rate is still on a high, several efforts have been made by the government to stabilise it and —in time —lower it. In 2010, it made a pledge to cut carbon intensity by half to 60% over the next decade, compared to its 2005 level. Hong Kong pledged further to bring down carbon intensity by at least 65%, whilst making a new commitment of reducing per capita emissions by at least 37% before 2030.

However, those policy targets are seemingly still far-fetched for Hong Kong. It only managed to have a 35% decrease in carbon intensity, and an 8% decrease in per capita emissions on actual performance between 2005 and 2017. As such, the Hong Kong government has started making more urgent policy changes, including switching the fuel mix in its electricity generation.

Increased reliance on renewables and gas

One of Hong Kong's main measures to cut down carbon emissions is to increase the share of renewable energy in the mix. This includes the deployment of more offshore wind farms, solar power, waste-to-energy plants, and also increased electricity imports from mainland China.

Data from the Legislative Council revealed that renewable energy only accounted for about 0.8% of total energy usage between 2011 and 2017.

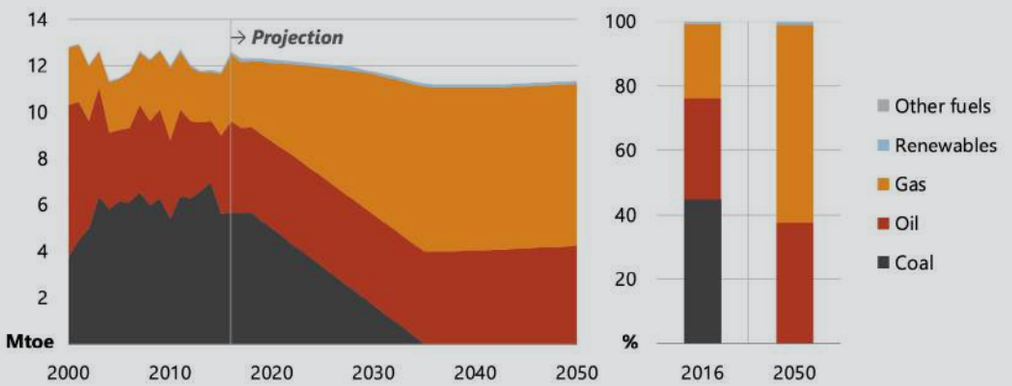
With this low share in mind, the government, together with local power firms, CLP Power and Hong Kong Electric, introduced the feed-in tariff scheme in 2017. This has been used as a way to encourage the private sector to invest in renewables. Under the scheme, both business and individual customers are incentivised to install solar photovoltaic or wind power systems at their premises for selling their renewable energy output from HK$3 to HK$5 per kilowatt-hour.

Furthermore, research from the Asia Pacific Economic Cooperation reveals that the generation mix in Hong Kong is also going to change significantly in the coming years, with the government planning to raise the share of natural gas in the electricity generation to 50%. Coal-fired generation is expected to be phased out by 2035, and gas-fired generation will expand from 35% of the fuel mix in 2016 to 78% in 2050.

Both CLP and HK Electric are actively contributing to this target.

CLP's Black Point Power Station currently comprises a newly-built 550-megawatt (MW) unit, five 337.5-MW units, and three 312.5-MW units, with an additional 550-MW unit currently under construction. The new 550-MW unit

Projected energy supply by fuel, 2000-2050



Source: APEC Energy Demand and Supply Outlook, 7th edition.

allowed CLP to achieve its target of about 50% gas-fired electricity generation, in line with the government target, last year.

Meanwhile, HK Electric's Lamma Power Station has recently commissioned its L10, a 380-MW gas-fired generating unit, which has increased its gas-fired electricity generation for its customers by about 50%, which is also in line with the government target. Two more 380-MW gas-fired generating units, L11 and L12, are currently under construction.

However, the two power firms will have to complete the construction of the three new gas-fired generating units by 2024. This directive is part of a memorandum on new caps on annual emission allowances, which was approved by the Legislative Council.

This will bring the proportion of local gas generation to around 57% of the total fuel mix for power generation by 2024.

The two power companies will also continue to acquire low-emission coal for electricity generation and maintain the performance of emission control devices to reduce emissions from coal-fired generating units.

The renewables push continues

The Hong Kong government is partly limited in its quest for greater renewable energy generation, by its lack of land and other development constraints. But it has managed to maintain progress over the last few years.

In his latest Budget speech, Finance Secretary Paul Chan said that the government would set aside an extra HK$1b for more than 80 projects to install additional small-scale renewable energy systems on government buildings and installations, and a HK$150m fund to conduct energy audits and install energy-saving appliances for non-governmental organisations.

"All these measures can help Hong Kong advance towards its carbon neutrality target, and will also create jobs available to the citizens," Chan said.

Hong Kong's leaders have also shown support for the development of offshore wind farms, with Hong Kong Electric planning to install offshore wind turbines near Lamma Island with a total generating capacity of 100 MW. These are expected to produce 175 gigawatt-hours of electricity per year once online.

"Analysis of the wind resource indicates that the site is feasible for development of an offshore wind farm," the company has told investors. "The wind monitoring campaign is still ongoing aiming at collecting additional data for optimizing the offshore wind farm design."

CLP is also considering the feasibility of constructing an offshore wind farm in the southeastern waters of Hong Kong.

"The project has been under consideration for some time, but recent advances in the technology of wind turbine generators and an increasingly mature supply chain in the region make it appear more feasible," it said.

In March this year, Environment Secretary Wong Kam-sing also spoke at a webinar to discuss numerous opportunities arising from Hong Kong's carbon neutrality pledge to the European business community.

Wong said, during the webinar, that the region has been exploring various solutions to combat climate change, which includes "seeking more zero-carbon energy, adopting energy-saving technologies, promoting the wider use of electric vehicles, and enhancing waste reduction and recycling, such as optimising the development of advanced waste-to-energy/resources facilities to further turn waste into valuable resources (for the economy)."

Fok Kin Ning

Richard Lancaster

Moving towards the target

With the Hong Kong government actively aiming to reach carbon neutrality by 2050, the two power companies are proactively welcoming this undertaking.

CLP aims to support the region in its target through promoting the development of renewable energy, helping customers improve their energy efficiency, and closely monitoring the latest technological developments in new zero-carbon energy.

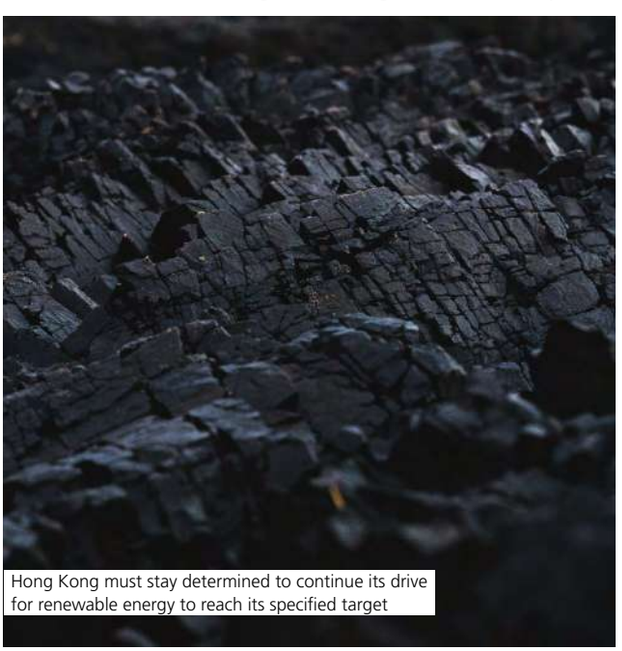
"We are seeing a clear shift from incremental improvements to an acceleration of the desire for change. This will create further opportunities given our strong existing position in the market," CLP CEO Richard Lancaster said in the company's 2020 report.

On the other hand, HK Electric aims to engage with the government on the best way forward, including exploring the wider use of zero-carbon energy and carbon reduction technologies.

"Sustainability is firmly integrated into our ethos and we have now reorganised our structure with a new Sustainability Committee to steer our efforts on this front," HK Electric Chairman Fok Kin Ning said in the company's 2020 report.

As Hong Kong moves forward, experts say it must continue to promote renewable energy and seek innovative solutions to its land constraints, both of which would be beneficial to reach their emissions target.

At the same time, the government must also work further with its stakeholders to overcome the issues it is facing on attaining carbon neutrality.



Hong Kong must stay determined to continue its drive for renewable energy to reach its specified target

Citi and CLP senior executives in front of solar panel installation

Citi Hong Kong installs 360 solar panels at Kowloon office

The project is part of a hybrid electrical and thermal energy system and is expected to produce 85,337 kilowatt-hours of renewable energy per year.

Banks around the globe have become creative in making their own operations more energy efficient and renewable. The Netherland's ING Bank's new headquarters Cedar, for example, used concrete and rubble from its old building as well as banned the use of single-use plastics in its restaurants and coffee shops, amongst other sustainability-related changes. But ING has the advantage of space. The question is what about financial institutions whose base of operations are located in jam-packed industrial centers with limited land areas, such as Singapore and Hong Kong?

Citi Hong Kong's solution is to build its new renewable energy source at its roof. In March, the bank unveiled its new hybrid electrical and thermal renewable energy system, built on the rooftop of Citi Tower at Kowloon East.

The new system's focal point is its 360 solar panels, which Citi said is able to produce 85,337 kilowatt-hours of renewable electricity. This is reportedly equivalent to the annual energy consumption of 20 households, according to the bank.

This rooftop installation also includes a wind turbine, which generates electricity on-site for local use. Even water heating is covered by the energy produced by this new installation, with the hybrid system making use of the sun's energy to heat up water for use in the tower.

Net zero means rethinking our business and helping our clients rethink theirs

Citi Hong Kong expects that the hybrid system will overall contribute to a cost saving of approximately 4% of the building's annual power consumption.

Through this installation, the bank was also eligible to take part in the Renewable Energy Feed-in Tariff FiT) scheme introduced by local electricity provider CLP. Under this, the bank will receive FiT payments for connecting the system to CLP's electricity grid.

The Feed-in Tariff Scheme is an important initiative to promote wider use of renewable energy in Hong Kong, Angel Ng, CEO for Citi Hong Kong and Macau, said during the unveiling of the bank's tailored hybrid energy system.

"We are proud to be contributing to this effort, which is in line with our group-wide strategy to reduce the environmental footprint of our facilities around the world," Ng added.

Even before the hybrid system was fully installed and revealed to the public, Citi said that it's Hong Kong operations had already reached its goal to source 100% renewable electricity to power its operations in 2020.

Net zero by 2050

The hybrid energy system is a step forward in Citigroup's commitment to achieve net zero greenhouse gas emissions by 2050, as announced by Citi CEO Jane Fraser in March. The commitment counts emissions that Citi directly produces and those contributed by the bank's specific financing and investment activities.

"Net zero means rethinking our business and helping our clients rethink theirs," Ng said. "We believe that global financial institutions like Citi have the opportunity—and responsibility—to play a leading role in accelerating the transition to a net zero economy and deliver on the promise of the Paris Agreement."

Ng added that the bank's track record in sustainable finance places it in a good position to support clients with new ways of creating financial value that have environmental and also social benefits.

From 2014 to 2019, Citigroup financed and facilitated US$164b in low-carbon solutions and in 2020 pledged an additional US$250b in environmental transactions by 2025.

Solar panel installation at Citi Tower in Kowloon East

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Malaysia ditching coal, in lieu of solar energy, may be harder than it seems

Will coal dependence hamper Malaysia's solar energy boom?

New solar energy investments are on the rise, but these may not be enough to meet Malaysia's ambitious renewable energy targets.

Solar panels are popping up on rooftops across Malaysia, from Malacca in the south to Penang in the north. An increasing number of commercial and industrial partners are joining the government's aggressive push for increased solar energy production, enticed by generous incentives and a competitive pricing scheme.

"Rooftop solar installations are becoming increasingly popular, as the offset mechanism under the Net Energy Metering programmes offers attractive cost savings and various financing initiatives are being offered to reduce the upfront cost involved," noted Fariz Abdul Aziz, Partner, and Rachel Chiah, Senior Associate at Skrine.

The Net Energy Metering (NEM) programme is the driving force behind Malaysia's rooftop solar growth. Under this system, consumers can generate electricity for their own use and export any surplus power to the grid. The scheme has proved so popular that the Ministry of Energy and Natural Resources has launched its third edition in 2021, known as NEM 3.0, with a total capacity of 400 megawatts (MW) available to domestic consumers, government entities, and commercial and industrial facilities.

"[These] policies have led to rounds of fresh investments in rooftop solar (commercial and residential) and utility-scale solar farms. These new investments are very visible to the casual observer and, by this metric, it can be said that the country's energy sources are getting visibly greener," noted Renato Lima-de-Oliveira and Mathias Varming of the Friedrich Naumann Foundation.

Rooftop solar installations are becoming increasingly popular as the offset mechanism offers attractive cost savings

The rise and rise of solar

Rooftop solar isn't the only beneficiary of Malaysia's efforts at drawing solar power investment. In October last year, the country opened its first large-scale floating solar farm, a 13 MW plant in Dengkil, Selangor. The plant, which features over 38,700 solar panels and is constructed on a former mining lake, will produce energy sufficient to power 5,800 households. Half a year later, in April 2021, another consortium revealed that it will construct two 30 MW floating solar farms in Kelantan. Upon completion, the 60 MW project will be the largest floating solar plant in Southeast Asia and the second largest in Asia after China.

In addition, Johor State has revealed the development of a 450-MW Sultan Ibrahim Solar Park in Pengerang, which will be the largest in the region upon completion. The project, which is a part of the 2030 Johor Sustainable Development Plan, marks its first investment into large-scale renewable energy.

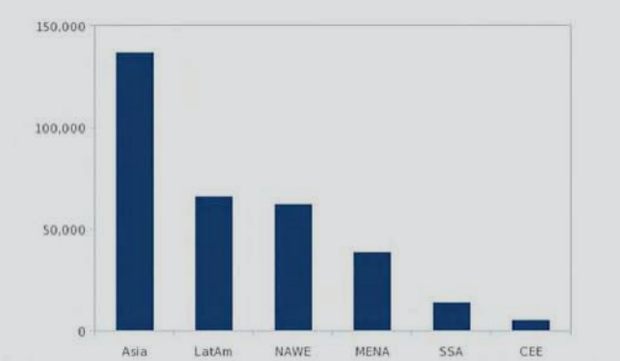
"There continues to be a great deal of focus on clean energy, in particular the development of solar- generated energy given Malaysia's geographic location. From a regulatory standpoint, following the announcement of the Laos-Thailand-Malaysia-Singapore Power Integration Project in October 2020, the Energy Commission has issued guidelines setting out the framework for cross-border electricity sales to Singapore and Thailand. These developments, as well as similar initiatives in neighbouring countries, have generated substantial interest in exploring projects aimed at the cross-border supply of clean energy," Aziz and Chiah said.

However, Malaysia's energy transition still faces a spate of challenges. "The cost of solar power has fallen dramatically but solar generation remains variable and intermittent until low -cost storage options become viable. Malaysia's options for dispatchable renewables are hampered by lack of infrastructure, which will take some time to address," noted Lima-de-Oliveira and Varming.

Lower profitability is also an issue. Data from Fitch Solutions show that winning bid prices at solar auctions continue to decline. During the third auction held in May 2020, winning bids ranged from as low as MYR0.1850 per kilowatt-hour (kWh) for 10-MW to 30-MW projects and MYR0.1768/kWh to MYR0.1970/kWh for 30-MW to 50-MW projects.

"Shrinking margins and availability of suitable land represent the main obstacles.

Global - Solar Capacity Under Development By Region, MW



Note: Excludes Completed and Cancelled Projects. Source: Fitch Solutions Key Projects Database.

Source: Fitch Solutions

Experts remain optimistic that Malaysia's solar boom will continue

Due to falling prices of panels in recent years and increasing competition, tariffs being offered by shortlisted bidders for solar projects have seen a dramatic reduction. It remains to be seen if an increase in the cost of panels will see tariff prices follow accordingly or instead lead to even thinner margins," Aziz and Chiah noted.

Still, experts are optimistic that Malaysia's solar boom will continue. "Stronger regulatory support and improved financing for the solar sector, as well as the continued success of solar tenders, further underlines our view of Malaysia being an attractive investment destination for renewables developers," Fitch Solutions said in a report. "While we expect some near-term headwinds to weigh on growth in 2020, stemming from the COVID-19 pandemic and ongoing political uncertainties, we expect the sector to recover from 2021 and to see stronger growth over the coming years," it added.

"We will probably see continued interest in solar projects," Aziz and Chiah concurred. "The Malaysian Government recently stated that they view solar as having the highest potential for increasing the share of renewable energy in the power capacity mix, and it is likely that there will be more opportunities to come for investments into and development of solar projects."

A mixed bag

Malaysia is also eyeing other renewable sources to diversify its energy mix. The government has released plans to build six waste-to-energy plants, and tenders have been issued for two of these projects. Hydrogen is also gaining steam, with Petronas reported to be increasing investments in hydrogen as part of its net-zero emissions goal.

"The announcement of the proposed development of a hydrogen-powered metro line in Kuching, Sarawak has been seen as a clear signal that the government is serious in exploring the viability of hydrogen as a source of the country's energy needs and has been viewed positively by market commentators given that hydrogen has been identified by a number of other countries as a viable future renewable energy source," Aziz and Chiah said.

Other regulations and financing incentives have also been put in place to encourage investment in renewables. For instance, the Green Investment Tax Allowance and Green Income Tax Exemption incentives will be extended to 2025, while the Green Technology Financing Scheme 3.0 will be guaranteed by state insurer Danajamin at MYR2b (USD485m).

"The government is also looking to enhance green energy trading with the private sector while planning to launch a Renewable Energy Transition Roadmap 2035. This forms part of the government's aim to boost the country's share of renewables in the power mix to 20% by 2025. This is in line with its Generation Development Plan 2020-2030, where they intend to build more renewables capacity to replace retiring thermal power plants. We believe that the roadmap will contain provisions and more specific actions to accelerate renewables growth, and may include strategies such as peer-to-peer electricity trading or transitioning towards a mandatory renewable energy certificate market," Fitch Solutions noted.

The COVID-19 pandemic is unlikely to dampen Malaysia's appetite for renewables, but intermittent lockdowns and local outbreaks are likely to cause project delays. "Companies are placing more emphasis on environmental, social, and governance goals now. That, coupled with infrastructure development being a popular form of economic stimulus particularly in developing countries like Malaysia, has led to an uptick in investments in renewable energy projects. The Malaysian energy market has actually been quite active due to that," Aziz and Chiah explained.

Fariz Aziz

Rachel Chiah

"However, given the intermittent imposition of restrictions to address local infection clusters, as well as disruptions in trade, projects which are in development have been impacted by the higher cost of importing panels and in meeting development milestones giving rise to higher than expected development costs and delays. As a result, it is anticipated that certain projects may not meet their original targeted operations dates," the two executive said.

The dark side

Through a mix of financial incentives and attractive pricing, Malaysia has made large gains in boosting the share of renewables in a short span of time. Beneath the surface, however, coal still reigns supreme in Malaysia's energy mix—and experts caution that more has to be done if the country is to meet its renewable energy targets.

"Malaysia has, paradoxically, recorded both the increase of coal and renewable energy in its matrix," explained Lima-de-Oliveira and Varming. "An analysis of government statistics reveals that, over the years, Malaysia has become increasingly more reliant on imported coal, the dirtiest of the fossil fuels. As a share of electrical energy generation, coal supplied 46% of the total 150,442 gigawatt-hour in 2016. This high use of coal despite domestically available natural gas and commitments to increase renewables presents a paradox at the heart of Malaysia's current energy mix."

Lima-de-Oliveira and Varming argue that in the short term, Malaysia should focus on replacing coal with natural gas. "Whilst coal is generally more affordable than natural gas, it is nearly twice as polluting. Moreover, natural gas is better suited to play the supporting role to intermittent renewables since it is generally cheaper to cycle combined-cycle gas power plants than coal-fired plants of similar scale, and gas can also be used to power smaller combustion engines, specifically designed for flexibility and peak demand," they said.

"However, the substitution of coal for natural gas alone will not be sufficient to ensure Malaysia mitigates the risks and capitalises on the opportunities of the global energy transition. The government will also need to put in place policies to ensure that Malaysia can adapt, including reducing dependencies on fiscal revenues and seizing new opportunities for new technologies. Replacing coal with gas is the low hanging fruit and beyond that the government should develop policies to adapt to and seize the opportunities of the energy transition," they said.

Industry leaders discuss the future of renewable energy across the Asia Pacific region

The trend is pointing towards achieving 100% renewables in the energy mix of many countries, but it will take time.

The topic of switching to renewable energy is becoming more than just a viable plan to cut costs and to contribute to alleviating the adverse effects of climate change. Leaders weighed in on 17 June, during the *Asian Power* Renewable Energy Digital Conference on how different industries are making the move toward renewables, in order to keep abreast of the changing times.

"The electricity industry's heavy reliance on fossil fuels has been the key reason why it is one of the leading contributors to greenhouse gases. With the zero targets being set by countries and corporations, the electricity industry is coming under greater scrutiny and the business models are getting redesigned to make renewable, clean green power as the central theme," said KPMG Asia Pacific Head of Infrastructure Sharad Somani.

Somani said that this highlights the consumers' requirement of having holistic energy as a solution that is green and sustainable. Regulators and governments take an increasingly strict view of the industry whilst the consumption load patterns are changing, as the cost of renewable energy is drops and a more modular approach to electricity generation and disruption become possible.

Clean and low carbon power, customer centricity, and cost-precious technologically connected and converging business models will drive the transformation of utilities.

"Most utilities have started to focus on the altered business models, understanding the convergence play and deciding how best to leverage the available and emerging technological solutions. Other industries have been disrupted beyond recognition. It is time for utilities to think about how to develop a sustainable business model both environmentally and economically," Somani added.

Constant Energy Founder and President Franck Constant said that this is a development not just in the Asia Pacific region, but a matter that is being widely adapted globally.

"More and more companies will be faced with constraints on reducing carbon emissions, either by regulation, by public opinion, or by consumer pressure all around the world. This is now a global issue. We are all affected by climate change and CO2 reduction is one of the key tools as the industry moves on to the market in Southeast Asia," he said.

Clean and low carbon power, customer centricity, and cost-precious technologically connected and converging business models will drive the transformation of utilities

Batteries to aid the move to solar

Necessary in the discussion in the move to using solar energy is the utilization of batteries, either as back-up or generally for use during the nighttime. Whilst installation of solar panels in different industries is now slowly gaining momentum, the topic of batteries will still take some time.

"We can not take the gas completely out of the equation by any stretch and anytime soon. But still, the best use case for batteries is for ancillary services and frequency control. Ideally you get the longer duration storage to cover the night time, but we're not really there yet," said The Lantau Group Managing Director Mike Thomas.

"Remember, batteries kind of charge and discharge, which means you've got to find a time to charge. You have to put a lot of solar to take that daytime price down. We've got some time before the future gets here. These are the risks that investors have to be concerned about," he added.

One of the drivers that are pushing companies to move to using renewable energy is to ensure a good relationship with their consumers. By reassuring their consumers that their products were manufactured sustainably, they are able to keep their existing consumers and attract prospective clients.

"It's a combination of reasons, one is that costs are lower. But we do have one of our clients that has specified that they must have 100% renewable energy. They're a jewelry manufacturer and they market their jewelry by saying it is sustainably produced," said OWL Energy Chief Engineer and Managing Director Tony Segadelli.

Segadelli said that rooftop solar units became more attractive because it is low-cost, especially comparing it to prices observed years ago.

"For rooftop solar units, anywhere from 75 to 90 cents per watt per hour. Five years ago, that would have probably been in the range of US$1.50, maybe slightly more. These are set to still come down quite significantly, but it is starting to taper off to an extent," he added.

While the development of this type of energy will take a couple more years, the potential is big. Remote areas and islands that have yet to have stable electricity are some of the places where solar may find room for continued growth.

"What we see mostly is the electrification of previously unserviced spaces. We are talking about Indonesia, talking about the Philippines —lots of islands have no reliable electricity. So they have a lot of players there that want to bring reliable and affordable electricity to those places, with the help of renewables with solar plus battery, and maybe with a backup diesel," said Fabian Baretzky, Senior Business Development and Sales Manager of DHYBRID Power Systems.

For businesses interested in shifting to solar, Baretzky said that the common estimate they have for ROI on solar is around two to five years.

"Clients will not tend to go for solar or even solar hybrid systems if the payback period is beyond five or six years. What we typically see when we execute projects, clients go for hybrids or for the solar systems with a payback period of below five years, so a safe estimate is around two to five years," he said.

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Will carbon capture and storage technologies lead Southeast Asia's transition to clean energy?

Carbon capture, utilisation, and storage (CCUS) strategies are becoming a vital element of emissions reduction, and are therefore present in energy systems throughout the Southeast Asia region.

According to the International Energy Agency's "Carbon Capture, Utilisation, and Storage: The Opportunity in Southeast Asia" report, CCUS is an energy- efficient technology that is deployed to tackle emissions in existing power and industrial facilities, whilst underpinning new economic opportunities associated with the production of low-carbon hydrogen and ammonia, and substantially reduces emissions from natural gas supply chains.

Rise of CCUS

Interest in CCUS has been on the rise globally, especially in Southeast Asia. This is strengthened mostly by climate commitments from various governments and industries.

In the recently concluded Earth Day Summit, the US pledged to cut down emissions by 50% to 52% by 2030. The country is second only to China as the world's largest carbon emitter.

Meanwhile, China's President Xi Jinping said his country would reach peak carbon emissions by 2030 and achieve net -zero by 2060.

Several countries in Asia like Japan, India, and Indonesia have made similar pledges to cut down carbon emissions.

Investment in CCUS also saw a surge since early 2020. The IEA said that governments and industries around the world have committed at least $12b in funding specifically for CCUS projects and programmes with projects eligible for a further $20b in clean energy funding programmes established since early 2020.

Interest in CCUS has been on the rise globally, especially in Southeast Asia, strengthened mostly by climate commitments from various governments and industry

With the improved investment environment, 30 new commercial CCUS projects were announced around the world in the first six months of 2021, bringing the total to 60 projects worldwide since 2018, with a potential capture capacity of 145 million tonnes of carbon dioxide a year. Currently, there are 24 commercial CCUS facilities in operation with a capture capacity of around 40 metric ton (Mt) CO_2 per year.

IEA said that Southeast Asia (SEA) alone has seven large-scale CCUS projects and are in early stages of planning, including several linked to natural gas processing with offshore storage.

Singapore and Indonesia are considered to have established leading CCUS-related research programmes, including the Institut Teknologi Bandung (ITB) Centre of Excellence for CCU and CCS in Indonesia. Implimented programs like these and continued funding poured in CCUS projects, especially in SEA, have fast-tracked CCUS-related opportunities in SEA.

Coal reliance

Despite countries in Asia making pledges to turn away from coal, it continues to be heavily reliant on fossil fuels. According to a report by Carbon Tracker, there are 600 new coal plants with a combined capacity of over 300 gigawatts in the pipeline from five Asian countries namely China, India, Indonesia, Japan, and Vietnam.

These make up about 80% of the world's planned new coal plants.

SEA remains the fastest growing region of the world. Growth in energy demand within the period 2015 to 2019 was second only to that of China. With per capita gross domestic product and energy consumption at around 45% below the global averages, energy demand growth is likely to remain strong.

IEA said that fossil fuels account for around 80% of the primary demand in SEA, up from two-thirds in 2000. As a result, CO_2 emissions increased from 0.7 gigatonnes (Gt) in 2000 to over 1.6 Gt in 2019 or an average annual growth rate of 3.8%. The emissions in SEA alone account for 5% of the global total.

The way to net-zero?

IEA said that reducing global CO_2 emissions to net-zero will require a fundamental transformation of how countries produce, transport, and consume energy.

The agency emphasized the critical role that CCUS technologies will play in putting the world on a path to net-zero CO_2 emissions.

"For CCUS deployment to remain in line with the temperature objectives set out in the 2015 Paris Agreement, CO_2 capture in Southeast Asia will have to reach at least 35 Mt CO_2 in 2030. This includes early and lower-cost retrofit opportunities in the industry, capture opportunities in fuel supply sectors, as well as retrofitting of coal power plants. By 2050, CO_2 capture will need to exceed 200 Mt, with CCUS deployed at scale across the fuel transformation, industry, and power generation sectors," IEA said.

IEA estimates that to reach optimal levels in SEA, CCUS would require a considerable investment, averaging to almost $1b per year for CO_2 capture facilities by 2030.

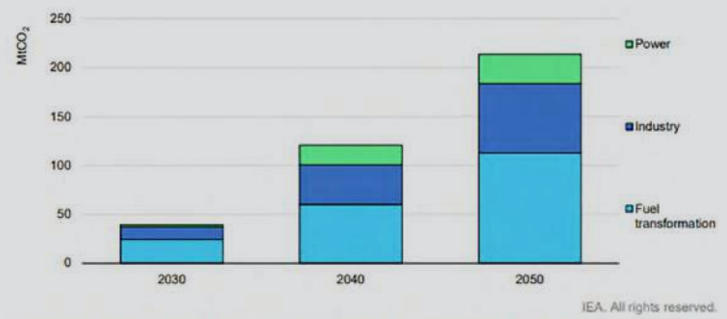
An increase in CCUS investment of this magnitude, IEA stressed, would require significant international support and private-sector investment as well as increased availability of debt finance.

In IEA's projections, Indonesia will lead SEA in CCUS investments, accounting for 80% in 2030. This number shrinks to 60% in 2040 as other countries in the region develop CCUS capacity.

"The share of investment in the power

Fossil fuels account for around 80% of the primary demand in Southeast Asia, up from 66% in 2000

CCUS deployment in Southeast Asia in the Sustainable Development Scenario



Note: Values shown are from the IEA Sustainable Development Scenario; corresponding CCUS deployment levels are generally higher in the Net Zero 2050 Roadmap.

Source: International Energy Agency

generation sector initially accounts for more than a third of total CO_2 capture investment, but declines over time, as more investment is directed to industrial applications. CCUS comprises less than 1% of SEA's total energy-related investment needs, which equates to an average of more than $140b annually between 2026-2030 under the Sustainable Development Scenario," IEA said.

IEA also identified three key countries in Asia for CCUS hubs, namely Indonesia, Vietnam, and the Philippines, through mapping emissions from power and industrial facilities in the region.

According to IEA, emission sources in Indonesia are concentrated on Java, which is a densely populated and industrialised island. More than half of Indonesia's thermal-power plant fleet is installed on Java. There are many old gas fields and deep saline aquifers in the vicinity of the island, and the CO_2 storage potential is high. In addition to Java, there are large emission sites on Kalimantan Island and Sumatra Island.

This could mean that Indonesia could play a leading role in CCUS deployment in SEA. Meanwhile, in the Philippines, the main emitters are concentrated near the capital, Manila.

The potential for early large-scale CCUS projects outside Manila may be limited due to a lack of concentrated emission sources. In Vietnam, many industrial emitters – including cement and steel manufacturing – are concentrated in the north but assessments of CO_2 storage capacity in that area have been limited thus far.

IEA case study of CCUS in Indonesia

IEA said India is the most advanced country in SEA for CCUS. The country gained early experience through the Gundih project as well as ongoing studies in Sukowati and Tangguh projects.

In 2017, the Ministry of Energy and Mineral Resources of Indonesia launched the ITB National Centre of Excellence for CCS and CCU that clearly demonstrated the country's interest and commitment to CCUS development.

These projects paved the way for planned commercial projects associated with low-carbon ammonia production (with Mitsubishi, JOGMEC, PAU, and ITB), and two projects targeting CO_2 capture from natural gas processing (Repsol SA in South Sumatra and a consortium of J-POWER, Japan NUS Co, with support of Indonesia's PT Pertamina at the Gundih gas development).

Indonesia is a major producer of oil, natural gas, and coal and is one of the world's largest energy exporters. However, rising domestic energy demand combined, in part, with diminishing resources, have increased the domestic claims on Indonesia's production, thereby lowering its energy export potential.

Energy security and affordability remain priorities in Indonesia; thus, CCUS is of growing importance in the effort to keep emissions in check, whilst meeting ballooning power demand from a rapidly expanding economy.

Coal is the dominant energy in Indonesia's power mix, supplying around 60% of its electricity in 2019. A quarter comes from natural gas and oil whilst renewables make up the remainder.

A significant increase in CCUS investment will require international support and availability of debt finance

"Opportunities for deploying CCUS at coal-fired power plants are being explored in Indonesia to reduce emissions from power generation. In addition, there is a growing interest in exploring opportunities for CCUS associated with geothermal energy, building on Indonesia's leading role in geothermal energy worldwide," IEA said.

Though CCUS has not yet been formally incorporated into Indonesia's National Energy Plan, the potential for CCUS to help mitigate the climate impacts of energy consumption and production, to mitigate CO_2 emissions, and to strengthen energy security is already recognized by the country.

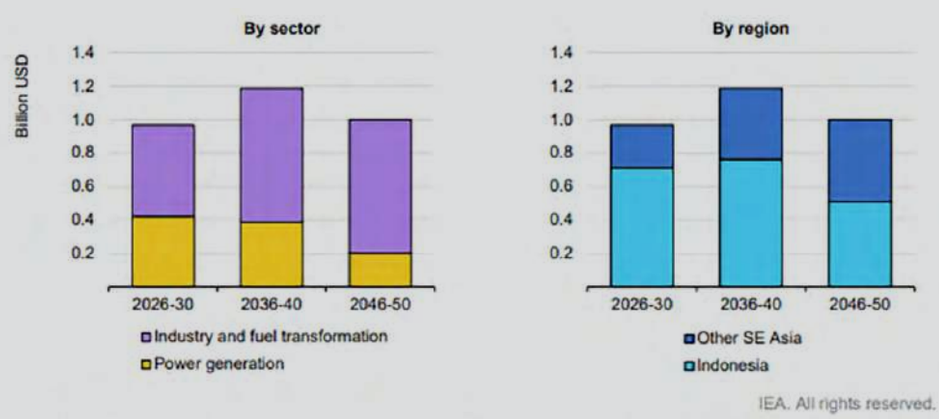
Carbon capture in Asia

Asia is dead set on achieving net zero. In June, Japan launched the Asia CCUS Network, an industry-academia-government platform aimed at promoting CCUS applications and boosting the business environment for CCUS development throughout Asia.

The 10 members of the Association of Southeast Asian Nations (Asean) in addition to the US and Australia, have expressed their intention to participate in Japan's initiative, along with more than 100 international organisations, companies, financial and research institutes, according to Japan's trade and industry minister Hiroshi Kajiyama.

With the continued push for countries to lower their carbon emissions, the potential that carbon capture technology brings to the table is highly necessary until renewable energy is able to hold up the full extent of power demand on its own.

Average annual CO2 capture investment by sector and region in the Sustainable Development Scenario



Notes: Values shown are from the Sustainable Development Scenario; investment needs in the Net Zero 2050 Roadmap are higher.

Source: International Energy Agency

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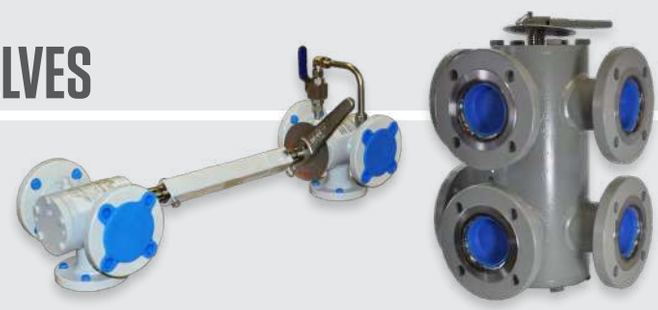

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