ASIANPOWER

ISSUE 100 | DISPLAY TO 31 JULY 2021 | www.asian-power.com | A Charlton Media Group publication

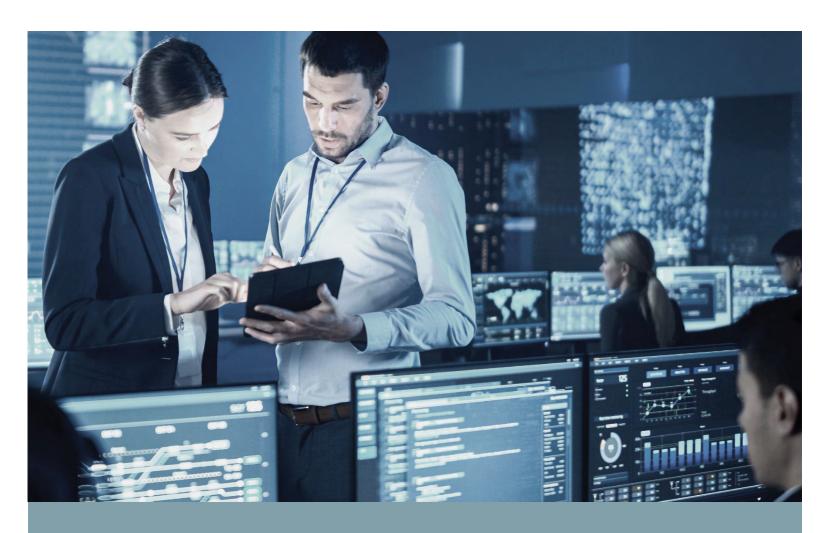
US\$360P.A

CLEANING UP ACROSS ASIA

ACWA POWER IS GOING ALL-IN ON A TRANSITION TO CLEAN ENERGY FACILITIES FROM VIETNAM TO SAUDI ARABIA







FLEXIBLE REMOTE SUPPORT CUSTOMIZED FOR YOUR POWER PLANT.

Together. Smarter. Powerful.

The $\mathsf{TOMONI}_\mathsf{TM}$ Suite of Intelligent Solutions is making remote support more powerful than ever. Through advanced analytics and digitalization, power plants can now virtually manage and monitor operations like never before. All customized to maximize flexibility and profitability. Securely supported by our team of subject-matter experts on demand 24/7, 365 days a year from our Remote Monitoring Centers in Takasago, Japan, and Orlando, USA. Additional support is provided by RMCs in Alabang, Philippines, and Nagasaki, Japan. We've been perfecting power plant remote support for more than 20 years. And today's solutions are a continuation of our decades-long innovation. Visit **ChangeInPower.com/TOMONI** to download our remote support white paper.



DATA FOUNDATION & ENABLERS

0&M OPTIMIZATION

PERFORMANCE IMPROVEMENT

FLEXIBLE OPERATION





FROM THE EDITOR

ASIANPOWER

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

GRAPHIC ARTIST Simon Engracial

ADVERTISING CONTACT Reiniela Hernandez

reiniela@charltonmediamail.com

ADMINISTRATION Accounts Department

accounts@charltonmediamail.com

 ${\bf ADVERTISING} \quad advertising @ charl ton media mail.com$

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.

Subscriptions: Please email subscriptions@charltonmedia.com.

Asian Power is published by Charlton Media Group. All editorial is copyright and may not be reproduced without consent. Contributions are invited but copies of all work should be kept as Asian Power can accept no responsibility for loss. We will, however, take the gains.

*If you're reading the small print you may be missing the big picture ଜ୍ୟାଷ୍ଟ୍ର କେ ଅପପ ଧାନ ଖଳ୍ଲାକ୍ୟ • ଅଅଧ୍ୟକ୍ଷ୍ୟର



It has been an eventful quarter for the power sector with the winds now beginning to change for renewables. In this issue, we take a close look at the wind power sector to see how it is coping with regulations across different Asia Pacific markets, and also a jittery funding market. However, reports also see a potential 49% reduction in costs by 2050, amidst lower raw material prices and technological advances. Find out more on page eight.

Nuclear power also takes a spotlight in this issue, with its role expanding as more countries pledge to go carbon neutral. Take a deeper look on what is pushing countries such as China and Korea to shy away from coal in favour of the nuclear option on page 12.

We also sat down for an in-depth conversation about clean energy and other projects with ACWA Power's chief portfolio management officer and chief investment officer Rajit Nanda. See the full interview on page 10.

Read on and enjoy!

7 Ce____ Tim Charlton

Asian Power is a proud media partner and/or host of the following events and expos:



CONTENTS







FIRSTS

- **06** Why China should retire its coal plants
- 07 "Coal inertia" will remain strong in Asia Pacific despite climate pressure
- **08** Wind energy gets 49% cheaper by 2050

CEO INTERVIEW

10 ACWA Power leads clean energy and water shift

SECTOR REPORT

- **12** More nuclear power needed amidst carbon neutrality pledges for Northeast Asia markets
- 14 ASEAN wind power struggles to take flight due to funding, regulatory woes

COUNTRY REPORT

16 South Korea pushes renewable energy ambitions for 2034



The all-round talent.

State-of-the-art components providing more power:

the compact design, a focus on a wide range of applications and high efficiency values make sure of that.

Controlled by the smart and secure TPEM (Total Plant & Energy Management), the new TCG 3020 series offers the optimal balance between profitability and reliability.

Energy. Efficiency. Environment.



Daily news from Asia

MOST READ



▶ REGULATION

S.Korea raises renewable energy quota to 25%

South Korea will require big power generation companies with over 500 megawatts to generate up to 25% of electricity from renewable energy sources starting October, after it has revised its renewable portfolio standards (RPS) system.



▶ REGULATION

Singapore's DBS targets zero thermal exposure by 2039

DBS has committed to zero thermal exposure by 2039, reportedly making it the first Singapore bank to commit to doing so. The bank plans to cease onboarding new customers who derive more than 25% of their revenue from thermal coal, effective immediately. It will also lower the threshold with time.



POWER UTILITY

India's annual power demand drops first in 15 years

The annual electricity demand of India has contracted for the first time in 15 years as power consumption was slashed amidst strict lockdowns. Data from the Central Electricity Authority of India (CEA) reveals that demand from state distribution utilities slipped by 1.1%.



> POWER UTILITY

Solar company Longi to enter the hydrogen market in China

China-based Longi Green Energy Technology Co. is entering the hydrogen market, according to a report by Solarzoom. The report said that Xi'an Longi Hydrogen Technology Co., was registered on 31 March in China. The company is considered as the world's biggest solar company.



▶ PROJECT

New 1.2 GW power plant in Malaysia underway

The construction of a new 1.2 GW gas-fired power plant Pulau Indah Power Plant (PIPP) in Selangor, Malaysia has already commenced, with full commercial operations expected to begin in 2024. The project amounts to a US\$837m investment, powering around 500,000 households.



▶ PROJECT

Siemens Energy to supply gas turbine power islands to Chinese power plant

Energy technology company Siemens Energy will supply Chinabased Shenzhen Energy Corporation with two 460 MW F-class gas turbine power islands for the phase two of its Fengda Power Plant Natural Gas Power Generation Expansion Project.

ASIANPOWER

Be in the know. Get the latest news on Asian power and energy.





Carbon Rduction for improved nature

Vayunandana Power Limited was lauded with the Biomass Power Project of the Year - Silver Award at the Asian Power Awards 2020

e are generating electricity from agriculture waste product i.e. Rice Husk, Soya Husk and Wood waste etc. Net generated electricity is being supplied to Maharashtra State Electricity Board (MSEB) as per power purchase agreement with Maharashtra State Electricity Distribution Company Limited (MSEDCL).

The project has installed 10 MW bleed cum condensing type turbine, manufactured by M/S Triveni Pvt Limited and 55 TPH travelling gate type boiler manufactured by thermodyne to generate electricity. Direct combustion of rice husk and agro waste in the boiler to generate the steam. High pressure super-heated steam to expand in condensing turbine to generate 10MW, electricity. It is based on Rankin cycle technology. The project is generating the electricity using renewable biomass to reduce G.H.G (Co2) emission. Zero Green House Gas emission has been recorded in V.P.L Project

Our plant is located in the Central India and it is about 1200 Km from the National Capital Delhi. The nearest airport is in Nagpur (Maharashtra) which is about 160 Kms from the plant. The plant has been certified by Quality and Environment Management under ISO-9001 AND 14001 by URS.

The project activity leads to generations of direct and indirect employment and improving the economic condition of the area. The project adds the extra income to the farmer of the waste product. Since biomass resources are to be collected and transported to the plant site from the field, opportunities are being generated for rural people to collect and transport the agricultural waste. The above benefits due to the project activity ensure that project would contribute to socio economic wellbeing in the area.

About 40 acres of land has been earmarked for plantations around the project. Mainly BALKOVA BAMBOO (Bambusa balcooa is a clumping bamboo native from the Indian



subcontinent to Indo-China.) has been planted in this area to improve the environment condition. It also helped to retain the rainwater. At present, the height of Balkova Bamboo is 4-5 meters. To reclaim the land used for dumping the fly ash, VPL is planting various saplings and the same area is now developed as a green zone which is a camping site for number of birds, monkeys etc. Even there are incidents of visit by leopard and Indian Tigers in the area.

The Government of India is imparting the responsibility of uplifting the rural poor through

various CSR schemes through private companies. We too go beyond business and

The project activity leads to generations of direct and indirect employment and improving the economic condition of the area.

extend to the implementation of socially relevant activities for the benefit of society at large.

During the last 3 years we had undertaken number of projects for the rural areas like:

- Drinking Water Supply through over head tank and pipe line system
- Pure drinking water through Gravity Water purifiers
- Construction of School Building
- Construction of Multipurpose Hall
- Construction of Toilet Blocks
- Installation of Lift Irrigation System for farmers
- Installation of Solar Water Pump system for farmers
- Water resistivity survey for the farmers Altogether we had spent US\$35000 in various projects.

The Gold Standard

The Gold Standard or Gold Standard for the Global Goals, is a standard and logo certification mark program for nongovernmental emission reductions projects in the Clean Development Mechanism (CDM). It is published and administered by the Gold Standard Foundation, a non-profit foundation headquartered in Geneva, Switzerland. We are successful in achieving our main motto of reduction of Greenhouse Gases emission and our project is registered with Gold Standard. (Regd. GS6607). Regular validation and verification is being done by approved authority Sustain CERT SA. The emission reduction achieved during September 01, 2017 to February 02, 2020 is 113490 Tone/CO2 (VER) which has been independently audited and verified by DOE.

Regular research and development programs are undertaken by us to improve the working quality as well as to extend more support for protecting the environment for generations to come.



J-POWER SHUTS DOWN PLANS FOR NEW COAL-FIRED POWER PLANT

ΙΔΡΔΝ



J-Power has decided to scrap its plans to build a 1.2 gigawatt (GW) coal-fired power plant in Yamaguchi, western Japan after a comprehensive assessment of the changing business environment.

The power company is considered the biggest coal-fired power company in Japan.

"We have decided to cancel our plan after considering demand outlook in western Japan, rising capacity of renewable energy and other circumstances surrounding our business environment," Hitoshi Kanno, executive managing officer at J-Power said.

The move comes after Chugoku Electric Power and JFE Steel cancelled a plan to build a thermal power station last month, amidst growing global trends in decarbonisation.

J-Power said that instead, it plans to build a gasification facility at the No.2 coal-fired power plant in its Matsushima station in Nagasaki, southern Japan, to improve efficiency and curb carbon emissions.

"We aim to further reduce CO2 emissions by cofiring biomass and ammonia in the future and use carbon capture utilisation and storage technology in the future. It would be the first step toward our goal of releasing CO2-free hydrogen power generation and CO2-free hydrogen production and supply," Kanno said.

The company also plans to use technology it developed in its Osaki CoolGen's project in Hiroshima, which generates electricity with both gas turbines and steam turbines through a coal gasification combined cycle, turning coal into a combustible gas with a high proportion of hydrogen.

With the gasification system added to the existing 500 megawatt power plant, the 40-year-old plant is estimated to improve its efficiency by 5 percentage points to 46% and reduce CO2 emissions by 11% from the current level.

This decision was further strengthened by Japan's recent vow to cut down greenhouse gas (GHG) emissions by 46% by 2030 from 2013 levels, a sharp uptick from the 26% cut it pledged last 2015.

Japan aims to achieve net-zero emissions by 2050 by promoting renewables and cutting its reliance on fossil fuels. Japan's Strategic Energy Plan said that the share of renewables in the power mix should increase from 17% in fiscal year 2018 to 22-24% by 2030.

Recent data showed that GHG emissions decreased by 2.9% in the FY 2019-2020 to 1,212 MtCO2eq, their lowest level since 1990-1991, according to final figures from the Japanese Ministry of the Environment.



China has around 247GW of coal power projects under development.

Why China should retire its coal plants

CHINA

ome 18% of China's coal-fired power plants "can be retired first and rapidly" to help the country achieve its goals of carbon neutrality by 2060, according to a newly-published study.

The study, titled A Pant-by-Plant Strategy for High-Ambition Coal Power Phaseout in China, found that around 186 out of the 1,037 active coal plants are performing poorly and are "particularly suitable" for fast-track retirement from a technical, economic, and environmental perspective.

Other existing plants could reach a minimum lifetime of 20 or 30 years with gradually reduced operational capacity once the shutdown happens. It will see China phase out coal entirely by 2045 under the 1.5-degree (Celsius) temperature goal, and 2055 under the 2C pathway.

The study, however, only explores these outcomes under the assumption that China stops building new coal plants altogether. At the moment, China has around 247GW of coal power projects under development.

"China's decarbonisation pathways suggest that any addition of new coal plants is not in line with the Paris climate goals," the authors explain.

The goal of carbon neutrality is currently far from sight amidst

China's decarbonisation pathways suggest that any addition of new coal plants is not in line with the Paris climate goals



increasing demand for electricity, traditional economic returns of investing in coal power, and lack of relevant policy.

The study was led by the University of Maryland Centre for Global Sustainability China programme co-director Ryna Yiyun Cui. It was recently published in open-access journal Nature Communications.

Meanwhile, Chinese banks are reportedly exiting the coal business.

A report by Project Finance International (PFI) said that the number of coal-fired power plants that still have project finance debt is greatly diminished today, whereas 15 years ago they were all financed with non-recourse debt.

PFI said borrowers will need to rely heavily on their relationship banks, as most banks have introduced policies to phase out coal power exposure with Chinese banks getting a lot harder to ask to lend

"It's not any easier getting Chinese banks to lend than other lenders. Maybe six to 12 months ago it was, but not now. The bigger Chinese state-owned entities are a lot more independent than they were even 12 months ago. They are genuinely trying to exit coal. Singaporean banks are exiting as well," PFI said in its report.

With China phasing out coal, they would soon be looking at new sources of power to fill the gap it will leave behind. Recently, the country said that it is aiming to increase solar and wind power generation to 16.5% by 2025.

In its draft plan, the National Energy Administration outlined its ambition to raise solar and wind power generation by 11% this year from 9.7% in 2020. It will then raise its power generation in the subsequent years until it reaches its goal by 2025.





"Coal inertia" will remain strong in Asia Pacific despite climate pressure

ASIA PACIFIC

ew coal-powered projects in the pre-construction phase may have decreased by 6% compared to the previous quarter, but it still remains strong in absolute terms according to a report by IHS Markit.

According to its report, the capacity of coal-fired power being developed remains large with 190GW under construction and 148GW in pre-construction planning. These projects, if all brought online, would increase the region's coal-fired power fleet by over 20% and make ambitious climate goals much harder to reach.

In the Philippines, India, and Vietnam, more than half of the power projects

currently under construction are coalfired. Even in developed economies like Japan and South Korea, coal accounts for 29% and 44% of all projects under construction, respectively. Singapore and Taiwan are the only two markets in the region that currently do not have coal projects being built or planned.

"This reflects a difficult reality in the energy transition process: fast-growing emerging markets require baseload generation capacity additions and coal is the immediate, easy option; meanwhile, some mature economies still have coal projects in the pipeline from past planning. Together these create immense

Fast-growing emerging markets requires baseload generation capacity additions and coal is the immediate, easy option



"coal inertia," akin to trying to turn a supertanker," IHS Markit said.

Despite coal still remaining strong in the market, renewables in Asia Pacific are accelerating.

After the recently held virtual climate summit hosted by the US President Joe Biden, countries such as South Korea, China and Japan have pledged to lower their greenhouse gas emissions and reach the 2050 decarbonisation goal.

By the end of March 2021, a total of 463GW of new power generation projects were under construction in the region's 16 key power markets. This was up 5% from the previous quarter, indicating more projects moving into construction phase than those that were completed.

The capacity mix of the underconstruction projects did not change significantly from the previous quarter, with coal's share down by 2% while hydro up by 2% in terms of share in the mix.

"With countries aiming to further reduce their carbon emissions, it is not surprising that the share of renewables in planned power projects increased in the last quarter," said Xizhou Zhou, vice president of the climate and sustainability team at IHS Markit.

A report by HSBC further reiterated that renewable energy is poised to double in ASEAN by 2025. It said that the key six countries in ASEAN – Vietnam, the Philippines, Thailand, Singapore, Malaysia and Indonesia – added around 24GW of renewable capacity over the last five years.

"In 2025, we estimate the equity IRR for solar and wind in the region to range from 11.9-15.8% and 9.4-14.6% respectively. Overall, the returns range from low to mid double digits and look very close between countries. Assuming a more favourable tariff policy, renewables in Indonesia also look viable in terms of returns," HSBC said.

THE CHARTIST: THAILAND TO MAINTAIN RENEWABLES GROWTH, OUTPERFORM IN SEA

Thailand will sustain growth in its renewables sector as well as keep its position as one of the outperformers in Southeast Asia in the next 10 years, according to a new report from Fitch Solutions Country Risk and Industry Research.

The forecast is backed by the country's supportive, regulatory environment for renewables, which will play a role in "diversifying the power mix away from a heavy reliance on natural gas-fired power" as Thailand would become a net importer of liquefied natural gas in the following years.

Supportive policies include feed-in-tariffs, tax incentives, net metering schemes, bidding programmes, and improved financing access, the report added. Moreover, the country's newest Power Development Plant (PDP) will pursue to source 35% of its energy mix from non-fossil fuel sources by 2037.

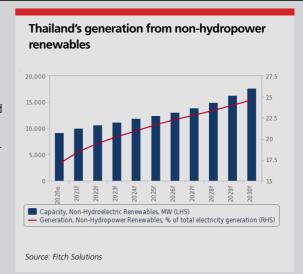
"Under the new PDP, licence granting from

the Energy Regulatory Commission is set to open up for a total over 10 GW of solar power capacity over the next two decades," the report said. "We forecast non-hydro renewables capacity to more than double over the coming decade to reach over 17.7 GW by 2030, accounting for 24.7% of the total power mix."

This will be propelled forward by the solar and biomass subsectors, with the latter presenting a more favourable outlook for the country.

"We have made a slight upward revision to our biomass capacity and generation forecasts this quarter, as the sector grew more strongly than our initial expectations across 2019 and 2020," Fitch commented.

Concurrently, the Energy Ministry has approved a \$216.8m budget from the Energy Conservation Fund for 2021, which would majorly be allocated to renewable projects for agriculture purposes.



FIRST

Wind energy gets 49% cheaper by 2050

CHINA

ind energy will get cheaper by as much as 49% by 2050 on the back of cost reductions seen in the last year, and technological advances in the future, according to a study published in Nature Energy.

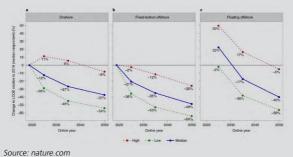
Industry experts predict that cost reductions may be by between 17% and 35% by 2035, and between 37% and 49% by 2050, driven by bigger and more efficient turbines, lower operating costs, smaller capital requirements, and technological advancements in the industry. The estimates cover three wind applications: onshore wind, fixed-bottom offshore wind, and floating offshore wind.

However, these predictions in reduction may still change drastically, depending on technological advancements, as wind energy costs had previously exceeded 2015 expectations with a significant drop in costs by as much as 50% lower than the consensus estimate at the time.

The study also said that the significant reduction of costs in the future will enable wind to play a larger role in the global energy supply whilst facilitating energy-sector decarbonisation.

"These trends and expectations

Levelized cost of energy over time relative to 2019 baseline values



might enable wind to play a larger role in global energy supply than previously thought while facilitating energy-sector decarbonization. As costs decline, additional focus may turn to the value of wind in energy markets and to deployment barriers such as humanuse conflicts, wildlife impacts and transmission needs," the study wrote

The study surveyed 140 wind experts globally concerning each of the three wind applications cited.

With cheaper wind energy, countries such as China, who has vowed to raised both solar and wind power generation by 16.5% by 2025, may be pushed further towards renewable energy and become less reliant on coal.

China's National Energy Administration has also urged solar and wind power projects to accelerate construction and asked local governments and power grid firms to guarantee electricity generated from the plants to be able to connect to the grid. As costs decline, additional focus may turn to the value of wind in energy markets



INDIA CONTINUES TO DELAY ANTI-POLLUTION RULES

INDIA



The anti-pollution guidelines for coal-fired power plants have been delayed since 2015

India's Ministry of Environment, Forest and Climate Change has further delayed anti-pollution guidelines for coal-fired power plants, extending the compliance deadline until the end of December 2022.

Under the new order, plants near populous regions and the capital of New Delhi will have until the end of next year to install the required Flue Gas Desulphurization (FGD) units that reduce emissions of sulphur dioxides. Meanwhile, those that are in less populated areas will have until the end of 2023. Plants that have been marked for retirement meanwhile will have until the end of 2025.

Failure to comply will incur a penalty of \$0.3 cents per kWh (INR20c/kWh).

The guidelines were first introduced in 2015, with the government giving power plants two years to comply. The deadline was later extended and revised, until it has now stretched to 2022.

Reports said that Indian coal-power plants have long resisted installing the FGD units, citing a high potential for financial stress. They later gained support from the power ministry which was said to have been in favour of the continued deadline extensions.

Plant owners have also expressed fears that the cost of the retrofits would make their electricity prices less competitive against renewable power.

In 2019, the International Institute for Sustainable Development said that India's coal power sector was 'dragging its feet' to address avoidable air pollution.

Delhi-based think tank Centre for Science and Environment said that continued delays would 'have grave repercussions for the fight against air pollution'.

"The power ministry's move seems to have been influenced by the industry's consistent efforts to dilute and delay the norms. The industry is obviously not bothered about the health risks posed by pollution from these coal-based power plants," Sunita Narain, director general of CSE said.

Coal produces about 65% of India's electricity, which several studies have linked to air pollution in India's major cities, as well as diseases and premature deaths for India's citizens.

India is the world's third-largest energy consuming country.

PLANT WATCH

Malaysia's biggest solar power plant

MALAYSIA



HM Sultan Ibrahim Ibni Almarhum Sultan Iskandar has revealed plans to transform Johor into a "major producer of environmentally friendly energy" by opening a solar power plant at Pengerang.

With a combined installed capacity of 450 MW, US\$0.35b project is expected to be Southeast Asia's biggest solar energy storage system.

Sultan Ibrahim said this will have Johor take a 'quantum leap' into the world of renewable and sustainable clean energy.

Vietnam commissions LNG power plant

VIETNAM



Korean private energy company GS Energy, together with partner investment firm Vietnam-based VinaCapital will invest \$3.08b to build two 1.5GW LNG power plants in Long An, Vietnam.

The two power plants, which will be completed by 2026 and 2027, will have the power generation capacity of three nuclear power plants. GS Energy will operate the plants for an estimated 25 years. Electricity produced by the plants will be sold to the Vietnam Electric Power Corp.

The start date for the construction has not yet been announced.

Ørsted builds wind farm in Taiwan

TAIWAN



Danish power company Ørsted has begun construction of the 900MW Greater Changhua 1&2 offshore wind farm in Taiwan.

The company has begun horizontal directional drilling to prepare for cable laying and scour protection works to make the seabed ready for foundation installation. Orsted has also completed the two onshore substation main buildings, and the upgrade work of the hinterland.

The project will be finalized by 2022 and is estimated to provide clean energy to one million households.

ASIANPOWER

Reach your prospects and leverage your brand

Webinars and virtual roundtables are taking the AP event experience to a whole new level and continually forging connections between Asia's power leaders.

Produced to address the most pertinent industry issues while letting you influence the discussion to leverage your products as a suitable solution for these pain points.

DISCUSS YOUR NEXT DIGITAL EVENT WITH US

For details, contact:
Reiniela Hernandez
+65 3158 1386 ext. 214
reiniela@charltonmediamail.com

Underpinning our assets is ACWA Power's commitment to develop and finance projects that would achieve high efficiencies and deliver the maximum value to its customers





Rajit Nanda Chief portfolio management officer ACWA Power

ACWA Power leads clean energy and water shift

The company currently has offices in 15 countries around Asia and the Middle East, and ongoing projects in 10.

s the COVID-19 pandemic continues to disrupt business operations, ongoing and planned projects in the Middle East and North Africa region have been affected.

The lockdowns have exacerbated a negative fiscal situation resulting from the low oil prices prevailing in recent years, leading regional governments to re-emphasise the transition towards renewable energy and water security to diversify their economies from a fossil fuel basis and sustain long-term economic growth.

This is how ACWA Power manages to stay on top of the market. ACWA Power is the largest independent power and water producer in the Middle East and North Africa region with 62 projects under operation, construction and advanced development with a capacity of over 41.7 GW and 1,276 MIGD of water desalination capacity.

Asian Power's spoke with ACWA Power's chief portfolio management officer (CPMO) and chief investment officer (CIO) **Rajit Nanda** on how the company paved the way to develop power and water desalination projects as support to the transition and to demonstrate client-focused approach to development in the midst of a global crisis.

What key achievements have you attained as ACWA Power's Chief Investment Officer and Chief Portfolio Management Officer?

As the CIO, I am responsible for identifying and securing new development and investment opportunities in our existing markets, as well as initiate business in new countries. Underpinning each of these assets is ACWA Power's commitment to develop and finance projects that would achieve high efficiencies and deliver sustainably high value to its customers. We develop projects in a number of emerging economies where access to energy and price of electricity are important drivers of economic growth.

As the CPMO of ACWA Power since 2020, I also have the responsibility of ensuring that the assets we develop are constructed and operated at the best standards of the sector, and produce power and water in accordance with customer requirements.

We are operating 38 assets across 9 countries, employing over 3,500 people. Additionally, during 2020, we have been engaged in advanced construction of ten power and water projects across four countries in the Gulf Cooperation Council region, representing over \$9.5b of project investment. This represents an aggregate power capacity of 3.85 GW and desalination capacity of 744 MIGD, which needs to be constructed during the midst of the pandemic.

What notable strategies have you implemented during your time leading these two vital functions?

During the early years as a Saudi-based developer of power and water projects, we participated in a number of tenders outside of the Kingdom of Saudi Arabia, but intense competition and limited development experience outside our home market proved to be significant challenges. Still, ACWA Power gradually overcame them.

In 2010 and 2011, ACWA Power entered the Oman and Jordan power markets through acquisitions of existing assets. This gave the company a foothold outside of Saudi Arabia, and access to strong operating platforms with sector experience within these countries. During the next several years, we have also expanded our expertise from the traditional oil and gas fired power and water generation to more emerging technologies including sea water desalination, solar PV and CS, as well as wind energy.

On the financing front early on, ACWA Power took up the challenging task of diversifying the financing sources away from bank financing which is still predominant in the I(W)PP space in the region. Given the changes in the global banking regulations, as well as the fiscal situation in the region, access to diversified

sources of financing is very critical for competitive project development and execution.

How did the company's operations change during the pandemic? What strategies did you adapt amid the crisis?

The first few months of the pandemic were uncertain and difficult for both projects under execution and operations, mainly because of fear and uncertainties about the nature of the virus. The initial impact on under-execution projects due to the huge number of external interfaces that were influenced by the pandemic in various geographies across the globe, mainly because of lockdowns imposed in various jurisdictions.

As an organization, ACWA Power has prioritized securing the health and safety of our people at the same time putting place measures to minimize the impact on construction schedules and as the lockdown situations eased, things gradually got back on track. Additionally, due to the large number of people on a construction project, initiatives like daily awareness sessions, health monitoring, and welfare management were taken to keep people safe and protected along with building multiple teams and redundancy shifts.

We noticed that most of your projects are located in Middle East Asia. Do you have any plans of construction facilities in other parts of Asia or even beyond?

We currently have projects in advanced development additionally in Ethiopia, Azerbaijan and Uzbekistan, and we are pursuing projects in a few other geographies. Over the past year, ACWA Power signed four power purchase agreements in Azerbaijan and Uzbekistan: 1500 MW high efficiency CCGT and 2x500 MW wind power in Uzbekistan; 240 MW wind power in Azerbaijan.

This represents \$2.8b of investments in these countries and is testament to ACWA Power's new market entry and business development acumen.

How does ACWA Power stand out amongst competitors?

ACWA Power's strong track record of successes in tenders in terms of project development in addition to its successful construction and operation of power projects across all of its operational geographies is a testimony of its strong stakeholder relationship management, a standout quality that distinguishes us from other players in the sector.

Our exceptional successes in upsizing the project scope vis-àvis the original award underscores our deep understanding of the clients' current and future requirements and ability to meet and exceed the expectations.

What have you learned during these rather trying times and how will you apply it to the company moving forward?

A key lesson is that focus on HSSE specially with EPC Contractors on construction projects is critical – in effect HSSE and importance towards it should be an area of competency for selection and evaluation of potential EPC contractors.

Additionally, the thinking at the project company level should be to work with all stakeholders including the O&M operators as a partner and not as a competitor – this is crucial to ensure that the O&M side is fully aligned with the objectives of the project companies and this leads to greater ownership of the businesses at grass root level.

Finally, a key aspect which has been reinforced is the importance of team work and collaborations across functional teams is the core of the development business. Involving people of right skills and knowledge with businesses to support is critical to successful project development along with empowerment of business leaders.

SECTOR REPORT: NUCLEAR

More nuclear power needed amidst carbon neutrality pledges for Northeast Asia markets

China, Japan, and South Korea each aim to be carbon neutral by 2060, with nuclear capability set to play a big role.

ecarbonisation efforts are rising faster than ever, as climate emergencies have fast-tracked the need for countries and corporations to reach net-zero carbon dioxide emissions.

To tackle climate change mitigation, several Asian countries have signed or acceded to the Paris Agreement, a legally binding agreement within the United Nations Framework Convention on Climate Change (UNFCCC).

The agreement establishes a framework for global climate action, including limiting global temperature rise through reduction of greenhouse gas emissions. Whilst it does not necessarily concretise the countries' goals of carbon neutrality, it sets a precedent as to how such programmes should be handled.

At the same time, countries like China, Japan, and South Korea have announced in 2020 their carbon neutrality pledges. China aims to be carbon neutral by 2060, whilst Japan and South Korea is set to do the same by 2050.

As the aforementioned countries target to have net-zero carbon dioxide emissions by the second half of the century, the need for nuclear power significantly rises. The problem comes, however, as they also face widespread anti-nuclear sentiments and changes in energy mix.

These countries will now have to assess the feasability of each of their individual pledges amidst environmental concerns and shifting public opinion.

South Korea reduces nuclear reliance

Nuclear generation is set to be lessened in South Korea as highlighted in the country's 9th Basic Plan for Electricity Supply

[China, Japan, and South Korea] will have to assess the feasibility of their pledges amidst environmental concerns and shifting public opinion



and Demand for 2020-2034.

Signed off on 28 December 2020, the long-term plan primarily strives to promote its energy transition policies and diversify its energy mix through increasing reliance on renewable energy. Through the plan, reliance on nuclear energy will also decrease through the years.

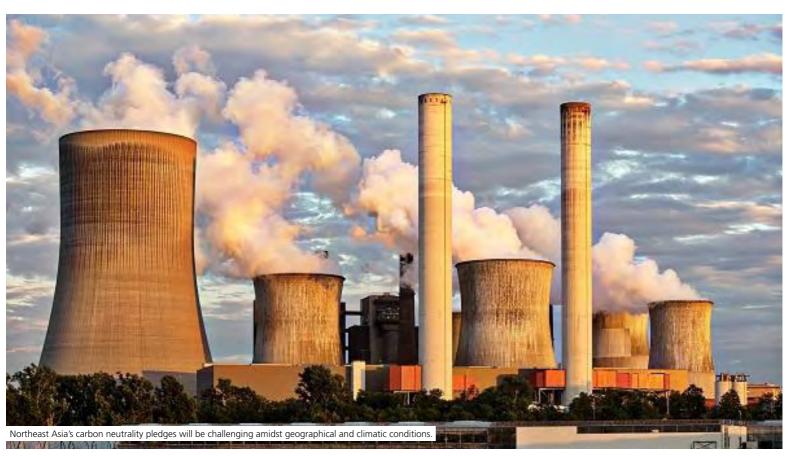
The South Korean government plans to bring down the number of nuclear power plants in the country to 17 by 2034—after its expected peak of 26 nuclear power plants in 2024—despite having a strong hold in the country in previous years.

The long-term plan also reveals the government's commitment to its nuclear phase-out policy, having prohibited the construction of new nuclear power plants and banned lifespan extension of the existing nuclear power plants.

As part of the policy, the Nuclear Energy Promotion Commission has also approved a government plan to spend \$456m (KRW 500b) over the next five years on nuclear decommissioning and waste management.

The portion of nuclear energy within the country's power generation capacity mix will decrease to 15.5% by 2034, down from 21% in 2020, whilst the generation capacity of nuclear power plants will be reduced to 19.4GW in 2034 from 23.3 GW in 2020, as a result of the long-term plan.

A previous Fitch Solutions report stated that it expects nuclear generation in South Korea to remain on a downward trajectory. Similarly, Wood Mackenzie previously noted that South Korea is not quite ready to say goodbye to nuclear power as it enters the last buildout phase for the technology. It noted that nuclear sources, together with coal sources, provide nearly two-thirds of



SECTOR REPORT: NUCLEAR

the country's power supply over the last decade.

In October 2020, South Korean President Moon Jae-In announced its carbon neutrality pledge by 2050, as his government has formed a policy position – later confirmed in a submission to the UNFCCC.

Wood Mackenzie Asia Pacific vice chair Gavin Thompson noted in a previous post that South Korea contributes 2% of the global carbon emission. He added that anti-nuclear sentiment in the country is "widespread, with relatively high levels of opposition to both existing and proposed plants."

The sentiments make the carbon neutral goal more challenging, compounding the already unfavourable geographical and climatic conditions.

10 years on from Fukushima

Fears on the use of atomic power heightened in Japan after the March 2011 Fukushima Daiichi nuclear disaster, the most severe since the Chernobyl disaster in 1986. This even heightened throughout the following decade, with several protests condemning the continuing use of nuclear, and calling for its total abandonment.

The effects of the disaster were so grave that the first reactor to restart after the incident was in 2015. Reliance on coal also increased heavily since the event.

Nuclear energy accounted for nearly 30% of the country's total electricity prior to 2011. However, it has been on a standstill pending regulatory changes. Japan's nuclear generating capacity was only at 7.5% of total energy capacity, and only nine reactors are currently operating.

The Ministry for Economy, Trade and Industry's (METI) 5th Basic Energy Plan, approved in 2018, presents nuclear power as "an important base-load power source contributing to the stability of the long-term energy supply-and-demand structure."

METI's latest energy plan also aims for around 20% to 22% of its energy mix by 2030 to come from nuclear power.

Despite hostile sentiments towards nuclear power, the Japanese government is starting to commit to the technology, highlighting its importance during the announcement of the country's 2050 net-zero pledge in October 2020.

According to Japanese Prime Minister Yoshihide Suga, the country will establish a stable supply of energy by advancing nuclear energy policy with the highest priority on safety.

A Fitch Solutions report, however, stated that "substantial public opposition, lack of support from many local and regional governors, and the high costs of safety upgrades will continue to challenge the government's push for nuclear restarts."

Thompson noted as well in his post that Japan contributes 3% of the total carbon emissions worldwide. He added that the country's carbon neutrality goal will be difficult to achieve in Japan due to unfavourable conditions of its climate and geography.

"We estimate that Japan will need to add an additional 25 GW of nuclear capacity by 2050, equal to over \$150b of investment to meet emissions goals," Thompson said.

As such, the Japan Atomic Industry Forum (JAIF) emphasised the significance of nuclear power in achieving its net-zero pledge by 2050.

"To achieve carbon neutrality and improve energy selfsufficiency, Japan will have to restart the remaining idle nuclear reactors as soon as possible, and endeavor to replace older plants and build additional new ones," JAIF said.

Currently, there are 18 reactors applying to resume operations. JAIF added that whilst Japan's nuclear industry will continue working to improve nuclear safety, it will take a continuing effort to accurately present the value of nuclear energy to society and obtain public understanding and confidence.

China to increase nuclear capacity in short-term

Despite being the largest contributor of carbon emissions, China

China total primary energy demand (Mtce) – a growing role for nuclear 6,000 5.000 4,000 3,000 2 000 1.000 2045 2005 2025 2050 Nuclea -Hydroger -TPED_carbon neutral scenario -TPED_base case Source: Wood Mackenzie

To achieve carbon neutrality and improve energy self-sufficiency, Japan will have to restart the remaining idle nuclear reactors as soon as possible



is considering hiking its total nuclear capacity by over 40% to 70 GW by 2025.

The country's nuclear power generation rose by more than 18% in 2019, raising the share of nuclear in the power mix from 4.1% to 4.9%, according to data from China's National Energy Administration.

China currently has 49 operable reactors amounting to 47.5 GW; 17 reactors are under construction.

Its plan to increase nuclear energy comes due to air pollution caused by its coal-fired plants, as well as climate change. China alone contributes nearly as much as one third (32%) of all carbon emissions globally.

The Energy Research Institute of the National Development and Reform Commission in China also mentioned back in October 2018 that the country needs its nuclear generating capacity to increase to 554 GW by 2050 if the country is to play its part in limiting the global temperature rise to below 1.5 °C.

President Xi Jinping, in a surprise announcement to the UN General Assembly in September 2020, made its pledge for netzero emissions by 2060 and said it would adopt "more vigorous policies and measures" to peak emissions before 2030.

"The Paris Agreement on climate change charts the course for the world to transition to green and low-carbon development. It outlines the minimum steps to be taken to protect the Earth, our shared homeland, and all countries must take decisive steps to honor this agreement," President Xi said in a video message early this year.

During a forum held by Tsinghua University online, Institute of Finance and Sustainability director Ma Jun noted that China's goal to reach carbon neutrality by 2060 will greatly influence the macro economy and could generate a total investment of between \$15.26t and \$45.78t ($\S100t$ to $\S300t$) over the next three decades to 2050.

Thompson also said that the role of nuclear in China's energy transition looks "more assured."

"Public sentiment in China is more ambivalent, with less opposition to nuclear and therefore a more supportive environment for [the] government and developers to get projects approved and constructed," he stated.

According to him, China's carbon neutrality is a "mammoth undertaking," as it would have to reduce emissions by a whopping 76% from the base case to meet its pledge. The level of growth in nuclear reactor builds required will also be exceptionally challenging for the country.

China would have to expand surveying of suitable plant sites and accelerate research and development in next generation nuclear reactors, establish a secure uranium supply chain to build up its spent-fuel storage and recycling capability, as well as attract more young professionals and train them to operate the planned network of power plants.

SECTOR REPORT: WIND

ASEAN wind power struggles to take flight due to funding, regulatory woes

Policymakers and investors must work together to increase wind power's share in the region's energy mix.

In a remote location in the southern tip of landlocked Laos, the construction of Southeast Asia's largest wind farm will soon be in full swing. The 600 MW project represents a truly cross-border deal: It is backed by two Thai renewable energy companies, and is set to sell electricity to state-owned utility Electricity Vietnam (EVN).

The project started in mid-2020 and is scheduled to start commercial operations in 2023. It forms part of the estimated 20.7 GW of new wind power capacity which is in the region's pipeline between 2020 and 2029. Of this figure, Vietnam alone accounts for 66% of new capacity expected to be added by the end of the decade, according to data from energy and consultancy firm Wood Mackenzie.

"Developing Asia is driving global electricity expansion, and within this context I anticipate that solar and wind will attract a growing percentage of investment in coming years," said Courtney Weatherby, research analyst at The Stimson Center. "At this point, the economics have changed such that wind and solar are increasingly competitive with traditional power generation sources, and most projections indicate continued price

Developing
Asia is driving
global electricity
expansion and
within this
context, solar
and wind are
anticipated
to attract
a growing
percentage of
investment in
coming years



drops through the mid-2020s."

Projects like the 600MW wind farm project in Laos are important because they give utilities sufficient time to pivot away from baseload coal toward renewables without taking on additional project development risk. "Most Asian countries remain reluctant to import power, and Vietnam is no exception to this trend. Nonetheless, the project could fill an important gap in Vietnam's power supply plans," said Melissa Brown, director of Energy Finance Studies, Asia at the Institute for Energy Economics and Financial Analysis (IEEFA). "This will provide EVN more time to optimize its approach to renewables integration and to benefit from well-priced merchant power imports without compromising their system development goals."

Investors wanted

Data from the World Resources Institute showed that in Southeast Asia, clean energy can reach levelized costs as low as \$64 per megawatt-hour (MWh) for solar photovoltaics and \$42/MWh for wind, which are cheaper than new coal and other fossil-based generation plants. This only means that solar and wind can now meet or undercut the price of power from

a fossil-heavy electricity grid, which reflects the decades-long reductions in renewable energy prices.

"The average cost of wind has dropped approximately 65% [since 2010]. The economic argument to expand the role of solar and wind will become even more compelling as battery storage solutions are brought to market at a more affordable rate and can help address concerns over the integration of variable renewable energy like solar and wind," according to Weatherby.

Despite record-low prices, the region may fail to realise its full potential unless there is sustained support from both policymakers and investors. "Currently there are about 20.7 GW of planned wind power capacity in the pipeline, but we think less than half or 8.9 GW will be realised by 2030," said Robert Liew, principal analyst for power and renewables research at Wood McKenzie, adding that Southeast Asia's wind power sector requires at least US\$14 billion of investments by 2030 to support these new projects.

"The coronavirus pandemic has slowed development in 2020, as border closures delay equipment transportation and prevented foreign technical staff support in these nascent Southeast



SECTOR REPORT: WIND



Asian markets," he noted.

Investors need to consider innovative financing options to bankroll the region's wind and solar projects. "Fee-driven project finance bankers have perpetuated an outdated model restricting funding to large projects that rely on sovereign guarantees to offset all forms of market risk. The most "bankable" PPAs do make it easier for bankers and lawyers to earn generous fees. They do not support the development of pools of patient capital to support power system operators that need to make diverse system investments to optimize renewables. This is a problem that can be solved with smarter application of sustainable finance tools," Brown said.

Whilst renewable energy investment in Southeast Asia had been previously dismissed as risky, expensive, or "unbankable", the recent experience of countries like Vietnam is changing how investors should approach the region. Energy research and consultancy firm Wood MacKenzie noted that the surge in projects in Vietnam is driven by the government's decision to upgrade the wind feed-in-tariff (FIT) in 2018 to 85 US\$ per MWh for onshore wind and 98 US\$/ MWh for intertidal offshore wind with a 2021 deadline for both FITs, though a potential extension to 2023 is still to be decided.

"Well-designed solar and wind power programs offer a completely different economic value proposition. The most significant trend to appreciate from 2020 is that wind and solar have now passed the market test in Southeast Asia's most attractive power market with flying colors," according to Brown.

"A diverse group of local and international wind and solar developers have delivered high performing system additions on-time under a well-designed program that will scale in a cost-effective way," adds Brown of IEEFA.

Stronger regulatory support needed

Policymakers must also use regulatory tools to sustain the region's pivot to wind and solar energy sources. Fuel-importing growth countries are rapidly moving away from traditional energy sources. For instance, Vietnam has recently announced that it will not allow new-build coal-fired power plants between 2020 and 2030, whilst the Philippines has similarly imposed a moratorium on new-build CFPPs.

"Fuel-importing growth countries are pivoting fast. In fuel-importing countries like the Philippines, specifically is the pushback that is emerging to uncontrolled fuel cost pass-through. Fuel price volatility has been a systemic characteristic of the over-reliance on fossil fuel power. Whilst market regulators have diverse strategies for managing fuel cost risk, the reality is that policymakers are now alarmed at the way it is an ongoing source of inflation and economic inequity because most consumers have no way to hedge this burden," IEEFA's Brown explained.

But preventing the construction of new coal power plants is simply not enough. "There are real technical challenges in terms of ensuring smooth integration of variable renewable energy into national electricity grids," Weatherby noted, highlighting that the variability of solar and wind sources poses a challenge for grid operators. However, this challenge can be addressed by improving grid infrastructure and changing operational procedures that improve weather forecasting, prioritisation of renewable energy in the dispatch of electricity, and rapid responses to



Melissa Brown



Courtney Weather

changes in production.

"For many countries in developing Asia, there will need to be initial investment into weather forecasting, policy pushes to adjust the terms of contracts to allow for prioritization of renewable energy in dispatching electricity, and institutional capacity building. These changes will undoubtedly pay off in terms of long-term grid sustainability, but they will take time and political will to implement," Weatherby said.

Brown agrees that political will is crucial in securing the future of renewables in the region. "The combination of depressed demand and shifts in peak demand requires a level of flexibility that is best addressed by demand response and storage resources that are supported by more resilient power systems. Ultimately, flexibility will translate into price benefits for end-users and the competitive potential of Southeast Asian economies," Brown noted.

She added that as Southeast Asian countries optimize renewables, supported by timely grid investments, the new economics of zero marginal cost power and sustainable finance will offer a more resilient power development pathway.

Will COVID curtail investment?

The pandemic has an undeniable effect on electricity markets in the region, and the wind energy sector is no exception. "Quarantine and lockdown practices in many countries have driven the demand curve down, and for export-focused countries the global economic slowdown has impacted commercial and industrial electricity demand. The drop in electricity demand has also presented short-term financial difficulties to utility companies in some countries and motivated potential policy changes in other countries which could impact timelines for future power purchase," Weatherby said.

Wood Mackenzie's principal analyst Liew noted that power demand will recover after the coronavirus disease pandemic, and Southeast Asian countries will be competing to attract large-scale investments to spur economic recovery. This will provide many opportunities for governments to push ahead with their new national power plans with expanded roles for more renewables.

"There is potential for more upside if Malaysia and Myanmar start utility-scale wind development and offshore wind development occurs in markets outside Vietnam," he said.

COUNTRY REPORT: SOUTH KOREA



South Korea pushes renewable energy ambitions for 2034

The densely-populated country aims to significantly reduce its current reliance on both coal and nuclear power as part of its carbon neutral commitments.

Tith the goal of promoting its energy transition policies and diversifying its energy mix, South Korea has proposed a significant increase in the share of the renewable energy sector by 2034, in line with the 9th Basic Plan of the Ministry of Trade, Industry, and Energy (MOTIE).

Under the long-term plan, the country will target a 40.3% share for renewable energy within its nameplate electricity generation capacity. That will see renewable sources account for 77.8 GW in 2034, almost quadrupling from its capacity in 2020.

MOTIE foresees the actual contribution of renewable energy to the nation's power generation by 2034 to rise by up to 8.6%.

In January, it announced that it would now allow domestic electricity consumers to purchase from renewable sources as part of the RE100 initiative, a global campaign which aims to transition whole grid networks to 100% renewable energy.

"At a time when the use of renewable energy is becoming a necessity, the K-RE100 system is expected to further strengthen domestic companies' global competitiveness and accelerate energy transition," MOTIE stated.

According to a report from information services group Fitch Solutions, the extent of the shift to renewable energy is expected to fall far below the government targets as the growth in the capacity of renewable energy will be largely

government's plans to rapidly build out necessary accommodate greater LNG generation capacity have been slow to pan out



The infrastructure to and renewables

\$456m (KRW 500b) over the next five years on nuclear decommissioning and waste management. As a result, the portion of nuclear energy within the country's power

number of nuclear power plants in the country to 17 by 2034. It has prohibited the construction of new nuclear power

The Nuclear Energy Promotion Commission has also approved to spend

generation capacity mix will decrease to 15.5% by 2034. The generation capacity of nuclear power plants will also be reduced to 19.4 GW.

Caution on long-term energy plan

The long-term plan estimates that South Korea's power demand will reach 102.5 GW in 2034, with its annualised growth rate coming in at 1%.

Fitch Solutions noted in the report that given the country's exposure to global energy price fluctuations, alongside the burden of rising import costs and energy security concerns, it remains cautious on the long-term viability of the energy plan.

"The government's plans to rapidly build out necessary infrastructure to accommodate greater LNG and renewables generation capacity have been slow to pan out due to cost concerns, insufficient investment, and opposition from the entrenched incumbent coal and nuclear sector players," it said.

Similarly, consultancy group Wood Mackenzie noted that South Korea was not quite ready to say goodbye to coal and nuclear power as it enters the last buildout phase for both technologies. The energy sources had provided nearly two-thirds of the country's power supply over the last decade.

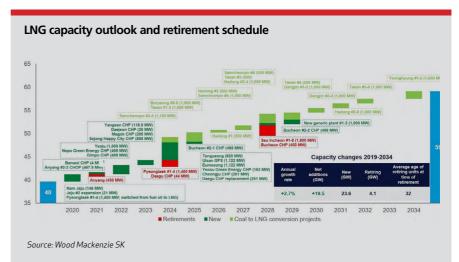
"Whilst the 9th Plan clearly favours gas and renewables at the expense of low-cost coal and nuclear, South Korea must balance its commitment to a green future and power prices for consumers," its senior power modelling analyst Kyeongho Lee said.

insufficient to offset the country's continuing thermal and nuclear reliance. In October 2020, the government also announced its pledge to go carbon neutral by 2050. The country's energy transition blueprint, moreover, is set to reduce its dependence on coal-fired power plants and nuclear reactors.

LNG-based power facilities are set to replace 30 ageing coal-fired power plants, half of those currently operating, by 2034.

As a result, the portion of coal within the country's power generation capacity mix will be lowered to 15% by 2034. The generation capacity of coal-fired power plants will decline to 29 GW.

Despite having a strong hold in the country in previous years, the government plans to bring down the





reliability Sines MAN Energy Your

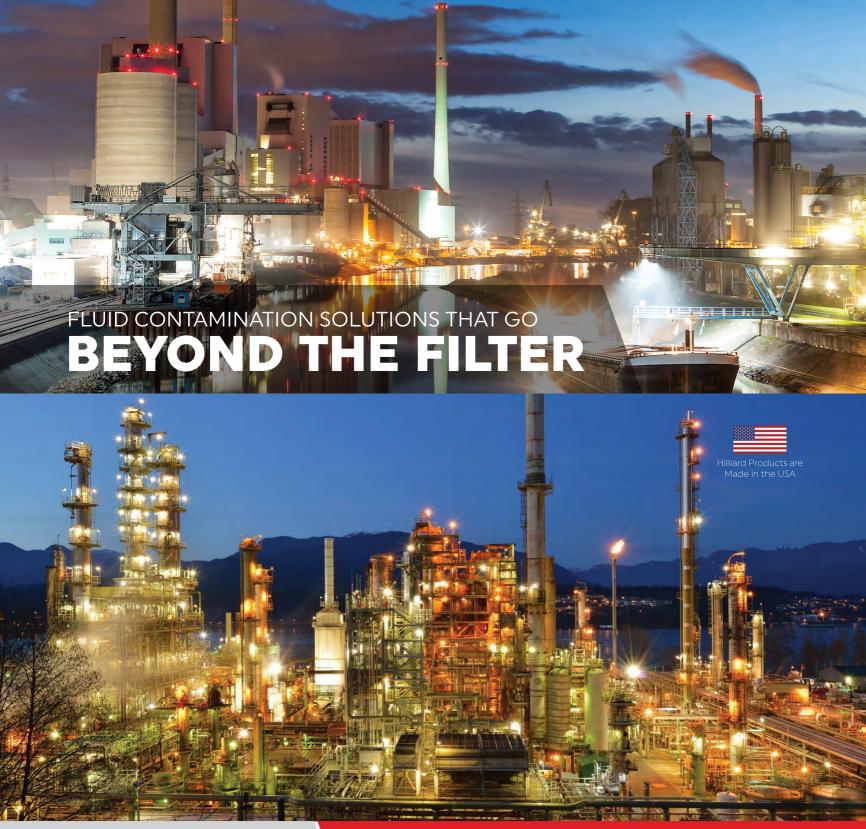
MAN Energy Solution Future in the making

Energy & Storage solutions expertise

securing energy supplies

Ensuring a reliable power supply is one of the key factors for progress and prosperity around the world. Building on decades of MAN innovation, we can help secure clean and efficient energy supplies for your customers. Our expertise covers solutions for hybrid power, LNG to power, energy storage, power-to-X, thermal power plants, and CHP.

www.man-es.com



HilliardCorp.com

Better for the Environment. Better for your Business.



- Custom Engineered Filtration Systems
- On-Site Fluid Analysis Lab
- Cost-Effective Solutions for Optimized Fuel Filtration
- All Products Made in America

