

Global Transmission Report

Information and analysis on the global electricity transmission industry

Integrating Japan's Grid

Paving the way for renewable energy transformation

Japan's electricity sector is undergoing a significant transformation, primarily driven by the imperative to enhance interregional connections.

The goal is to meet Japan's carbon neutrality targets by 2050 under its Green Growth Strategy through the Achieving Carbon Neutrality initiative, which necessitates decarbonising the power generation base and increasing the share of renewable energy sources (RES) in the nation's generation mix. These changes are particularly crucial due to Japan's unique challenges, including a heavy reliance on liquefied natural gas (LNG) imports, geographical constraints limiting RES expansion, and a lack of cross-border transmission interconnections.

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Dutch Transmission Plans

TenneT to double grid capacity for energy transition

The Netherlands aims to be climate-neutral by 2050 and has put in place policy measures to achieve 60 per cent emissions reductions by 2030. For this, the country is building a new energy system that in a few decades will rely almost entirely on renewable energy sources (RES) such as wind and solar.

Particularly, the Dutch government in 2022 announced its goal of achieving 50 GW of offshore wind (OSW) capacity by 2040 and 70 GW by 2050 in the maximum scenario. It is working on its post-2030 vision with a focus on energy islands that can connect OSW located further from the shore and transport both electricity and hydrogen to the mainland. It is already working on plans to deliver up to 21 GW by 2031.

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Morocco's Green Ambitions

To leap forward in regional integration

Morocco's electricity sector is at a crossroads. It is among the first middle-income countries to actively pursue a strategy to diversify its energy sources by harnessing its huge renewable energy sources (RES) potential to limit the country's heavy dependence on imported energy resources (at over 90 per cent).

The country aims to increase RES share to 52 per cent of the installed capacity by 2030 from the current 38 per cent (including hydropower). This will help contribute to its revised nationally determined contributions (NDC) of a 45.5 per cent reduction of greenhouse gas emissions (GHG) by 2030 and a long-term commitment to achieving an 80 per cent RES share by 2050. It will also help it become an exporter of energy by the end of the decade. Thanks to its geographical location and abundant clean energy resource potential, Morocco is expected to become a green energy hub and play a key role in connecting the African subcontinent to Europe and the UK.

To its credit, a recent industry report recognises Morocco's 2030 RES target as the most credible one in the Middle East and North Africa (MENA) region.

This is supported by the lucrative investment opportunities the country presents for both local and international investors.

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Integrating Japan's Grid (contd...)

Japan's oil imports are at risk due to their growing dependence on the Middle East for nearly 95 per cent of their oil supply. This vulnerability is exacerbated by global oil market uncertainties caused by the Russia-Ukraine and Israel-Hamas tensions. All these reasons have made it more imperative for Japan to diversify energy sources and reduce reliance on volatile fuels.

Under its carbon neutrality strategy, Japan emphasises the extensive adoption of RES besides encouraging innovation in the pursuit of new decarbonisation technologies for power generation, such as hydrogen and ammonia, as well as thermal plants with carbon capture, utilisation and storage (CCUS) technology. Japan has set a target of generating approximately 10 per cent of its total electricity output from offshore wind (OSW) farms, particularly in Hokkaido, Honshu and Kyushu. To facilitate the transportation of electricity from these regions to urban centres such as Tokyo and Osaka, it is essential to establish a well-connected national grid.

Presently, Japan grapples with inadequate grid connections across regions, leading to challenges like solar farms in Kyushu having to curtail generation due to grid limitations. To address this issue, the Ministry of Economy, Trade, and Industry (METI) has collaborated with utility companies to enhance grid connections. Recently, in 2023, it also published a draft Wide-Area Grid Long-Term Policy (master plan for wide-area interconnection system) to

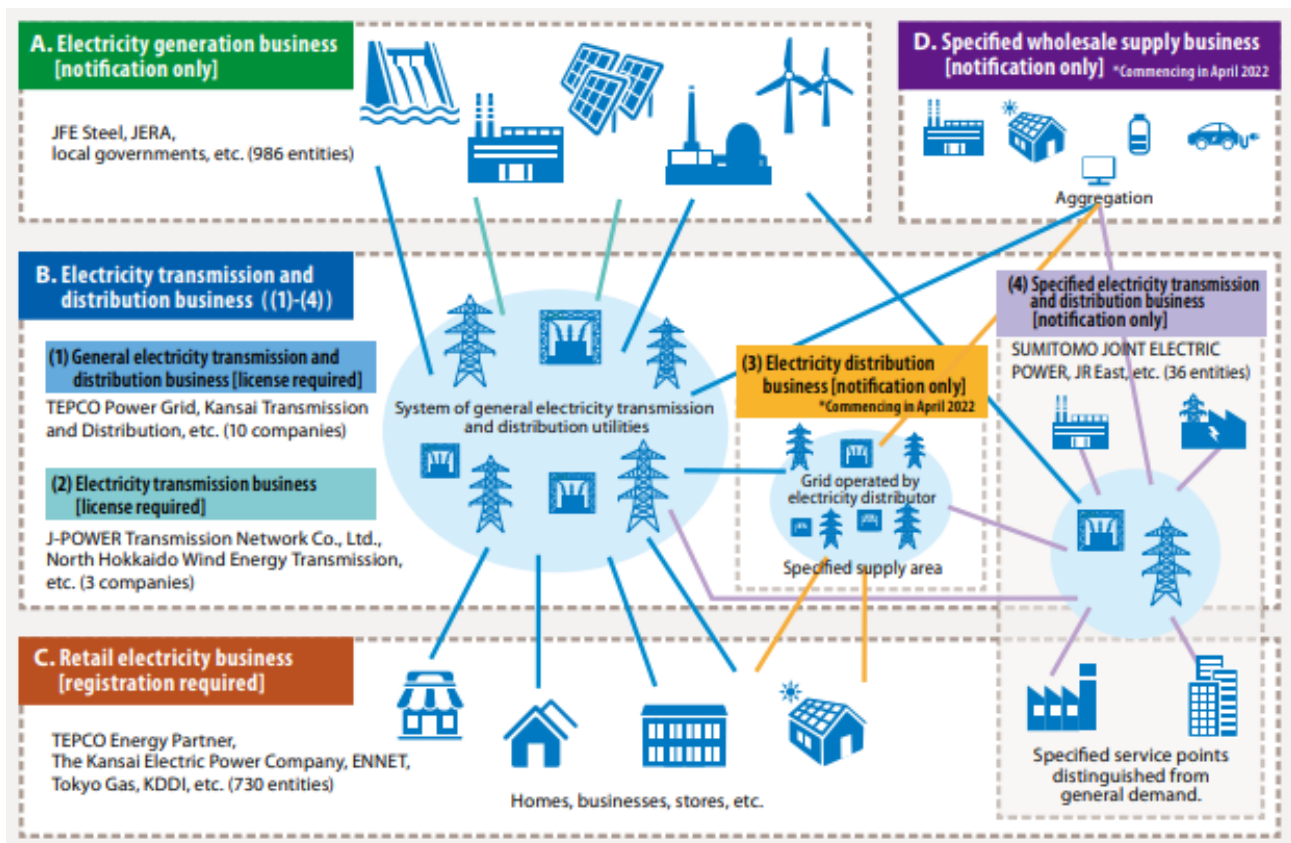
outline the direction for the development and renewal of wide-area interconnection systems at the national level for more than 10 years. Under this, Japan's Organization for Cross-regional Coordination of Transmission Operators (OCCTO), which regulates the supply and demand of electricity nationwide, calls for an investment of JPY6 trillion to JPY7.9 trillion for the development of Japan's transmission and distribution (T&D) networks by 2050.

Hence, Japan is on the path to transforming its electricity sector through initiatives such as doubling regional electrical grid capacity, connecting various regions via new transmission lines and undersea cables, and facilitating OSW energy projects. The aim is grid integration of upcoming RES capacity, facilitating power interchange between regions, and increasing interregional flexibility. The report forecasts that more electricity will be transmitted from Hokkaido and Kyushu, which generate substantial RES, to areas such as the Tokyo metropolitan area, which consumes a lot of electricity.

Power sector overview

In recent years, Japan's electricity sector has experienced a significant transformation. A reformation of the industry occurred with the full liberalisation of the retail market in April 2016, which led to the introduction of a new licensing system for electricity business operators, resulting in three primary categories: electricity generation, T&D and retailing. These categories are stringently regulated by the METI through its Agency for Natural Resources and Energy. The 10 general electricity utilities that have historically

Figure 1: Japan's electricity supply system



Source: OCCTO

been engaged in power supply since 1951 are now called “former general electricity utilities”.

Though the generation segment as of April 2022 had 1,038 entities, approximately 80 per cent of capacity was controlled by J-Power and the Japan Atomic Power Company Limited. In the T&D sector, 10 utilities (nine utilities spun out from the former general electricity utility) have been conducting business as general electricity T&D businesses; three companies, including J-POWER Transmission Network Company Limited, are conducting business as electricity transmission utilities; and 36 corporations including Sumitomo Joint Electric Power Company Limited are operating as specified electricity T&D utilities. To manage all these utilities, OCCTO was established in April 2015 as a government-authorised organisation that all electricity utilities are required to join. It aims to promote cross-regional transmission network development, enhance supply and demand adjustments, and ensure national energy supply resilience, both in normal and emergencies.

Existing infrastructure

As of 2022, Japan had an installed capacity of 297,089 MW of which 63 per cent or 1,88,247 MW was thermal, 17 per cent or 49,924 MW was hydro-based, 11 per cent or 33,083 MW was nuclear-based and finally, 9 per cent or 25,835 MW was renewable-based.

The 2011 Great East Japan Earthquake and the subsequent Fukushima nuclear incident had a profound impact on Japan’s electricity system following which all nuclear power generation was temporarily halted. As a result, nuclear power now plays a minor role in Japan’s power generation mix. On the thermal front, natural gas has emerged as the primary fuel source for electricity generation, closely followed by coal, while the share of oil in the energy mix has been decreasing.

Being an island nation with no cross-border power connections, Japan has to maintain a balance between its electricity generation

and consumption. The country is divided into 10 distinct regions, each overseen by its own transmission system operator (TSO). Furthermore, Japan is divided into two separate regions, operating on different frequencies—50 Hz and 60 Hz—due to historical reasons. This technological division necessitates careful management of interconnection capacity and coordination between the two regions. The OCCTO plays a crucial role in coordinating power exchange among the 10 TSOs during disruptions or emergencies. It also serves as a vital information-sharing hub with the national administration.

As of 2022, Japan’s grid comprised 38,573 km of line length between the 110 kV and 500 kV voltage levels, of which 95 per cent or 36,611 km was overhead lines (OHL) and the remaining 5 per cent or 1,962 km was underground cables (UGC). Voltage-wise, the majority or 43 per cent of the lines were at 110-154 kV, followed by 500 kV and 275 kV lines, both at about 21 per cent. Additionally, Japan had a transformer capacity of 6,33,942 MVA with 1,124 transformers.

The 10 general electricity T&D facilities in Japan taking care of their respective regions are Hokkaido Electric Power Network, Inc.; Tohoku Electric Power Network Company; TEPCO Power Grid, Inc.; Chubu Electric Power Grid Company; Hokuriku Electric Power T&D Company; Kansai T&D, Inc.; Chugoku Electric Power T&D Company; Shikoku Electric Power T&D Company; Kyushu Electric Power T&D Company; and Okinawa Electric Power Company.

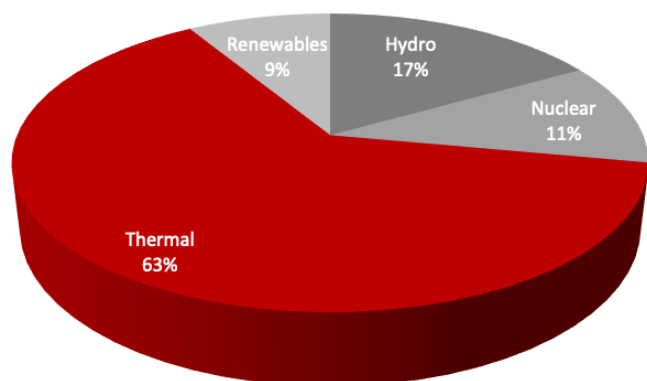
Future Plans

In line with the country’s carbon neutrality goal, Japan’s Sixth Strategic Energy Plan, which was approved by the Cabinet in October 2021, aims to control electricity demand at 864 TWh in fiscal year 2030 through rigorous energy conservation efforts, despite expected economic growth. In line with these targets, OCCTO has also anticipated a slight reduction of 0.1 per cent in peak demand and 0.2 per cent in annual electric energy requirement during 2023-32. This anticipated reduction in demand is mainly attributed to initiatives aimed at reducing electricity consumption, the widespread adoption of energy-efficient electric appliances, a shrinking population, and load-leveling measures.

The Strategic Energy Plan seeks to increase the share of renewables to 36-38 per cent by 2030, nuclear power is expected to contribute 20-22 per cent to the energy mix, while thermal power’s share will be minimised, with coal and LNG contributing 19 per cent and 20 per cent, respectively.

The government is resolutely committed to RES as the primary source of electricity. To achieve this, Japan has introduced various mechanisms, such as feed-in tariffs (FIT) and feed-in premiums (FIP) to incentivise RES production, including solar, wind and other sources. OSW power holds significant potential, and Japan is actively promoting it as a means to transition to RES. The government has also established rules for exclusive sea area use and designated offshore zones for wind power projects. The auctioning process for projects has evolved to facilitate market entry for a wider range of enterprises and expedite project launches. Ongoing discussions explore amendments to bidding rules to further support the development of OSW projects.

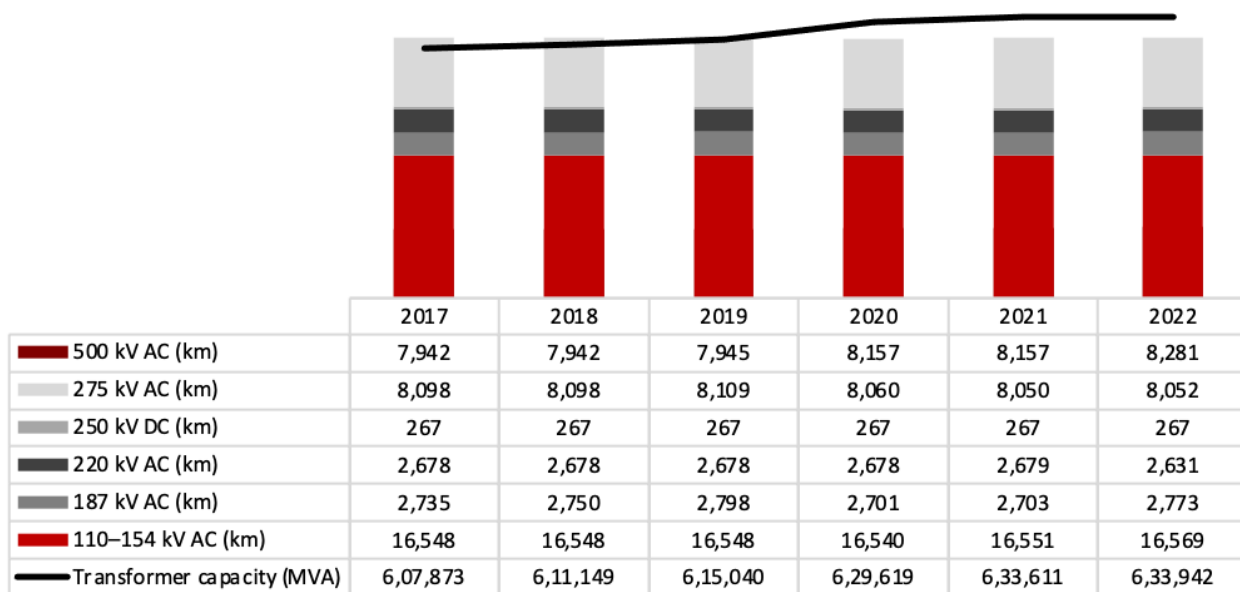
Figure 2: Japan’s installed generation capacity by source, as of 2022 (%)



Total installed capacity: 297,089 MW

Note: Figures represent the total amount generated by power plants with a generating capacity of 1 MW or above; renewables include biomass and waste-to-energy plants.

Source: Japan Electric Power Information Center, Inc. (JEPIC); Global Transmission Report

Figure 3: Transmission infrastructure by voltage, as of 2022

Note: Data is as of March 31 for the mentioned year. It does not include 2,143 km of J-Power's transmission lines as the voltage-wise break-up for these lines is not available.

Source: The Federation of Electric Power Companies of Japan; J-Power; Global Transmission Report

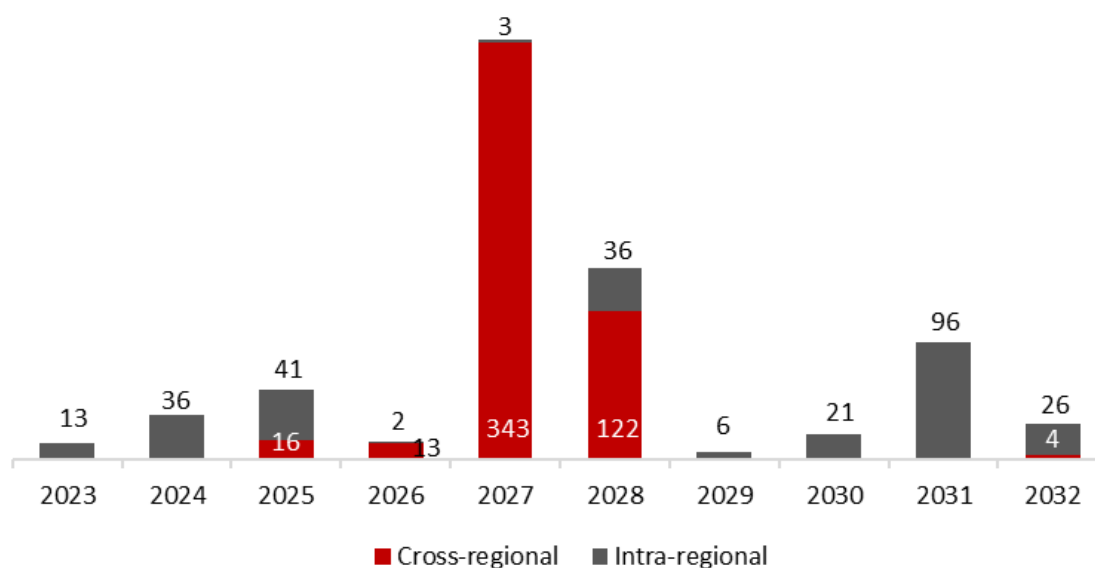
Figure 4: Map of Japan's transmission infrastructure system

Source: IEA

Table 1: Power generation capacity expansion plans up to 2031 by stages

	New Installation (MW)	Upgrading/Derating (MW)	Retirement (MW)	Net additions (MW)
Hydro	446	60	(193)	313
–Conventional	446	60	(193)	313
–Pumped Storage	-	-	-	-
Nuclear	10,180	152	-	10,332
Thermal	11,995	7	(11,729)	273
–Coal	4,820	-	(288)	4,532
–LNG	7,149	7	(2,168)	4,988
–Oil	26	-	(9,273)	(9,247)
Renewables	10,458	-	(813)	9,645
–Wind	3,636	-	(650)	2,986
–Solar	5,102	-	(2)	5,100
–Geothermal	75	6	(50)	31
–Biomass	1,583	-	(48)	1,535
–Waste	62	(6)	(63)	(7)
Total	33,079	219	(12,735)	20,563

Source: JEPIC; Global Transmission Report

Figure 5: Japan's planned line length addition, by year (km)

Note: In addition, 104.3 km of line length will be decommissioned during the period. In 2023, there will be a net decrease in line length due to the planned decommissioning of the Shin Tokuyama bulk line; and in 2026, the decommissioning of the Sakuma Nishi bulk line has been scheduled.

Source: OCCTO; Global Transmission Report

Transmission plans

To support the change in the energy mix, efforts are underway to strengthen the electricity transmission system, ensuring efficient power distribution among regions. This includes enhancements to the grid network and the potential construction of a direct current (DC) submarine power transmission system. Japan is also embarking on an ambitious plan to bolster its inter-regional

power grid capacity by 23 GW, mainly for wind projects. Between 2023 and 2032, Japan plans to add 777 km of line length capacity, of which 64 per cent or 498 km will be inter-regional connections (cross-regional links) and the remaining 36 per cent or 279 km will be intra-regional lines.

The country has also planned to decommission 104.3 km of line length during the period.

Table 2: Key upcoming transmission projects in Japan

Project	Voltage level (kV)	Components	Scheduled commissioning date
Cross-region interconnectors			
Interconnection facility enhancement plan between Hokkaido and Honshu	275	AC/DC converter stations of 1,200 MW capacity: Hokuto converter station: 300 MW–600 MW; Imabetsu converter station: 300 MW–600 MW Lines: Hokuto Imabetsu DC interconnection line: 122 km; Imabetsu bulk DC line extension: 50 km	2028
Interconnection facility enhancement plan between Tohoku and Tokyo	500	Lines: Miyagi-Marumori bulk line: 79 km; Marumori-Iwaki bulk line: 64 km; Soma-Futaba bulk line/ connecting point change: 16 km; Shinchu access line/ Miyagi-Marumori switching station lead-in: 1 km; Joban bulk line/Miyagi-Marumori switching station lead-in: 1 km; Fukushima bulk line/mountain line connecting point change: 1 km Switching stations: Miyagi-Marumori switching station with 10 circuits	2027
Interconnection facility enhancement plan between Tokyo and Chubu	275 kV and 500 kV	Frequency converter stations of 1,200 MW capacity: Shin Sakuma FC station: 300 MW; Higashi Shimizu substation: 300 MW–900 MW Lines: Sakuma Higashi bulk line: 123 km; Higashi Shimizu line: 19 km; Sakuma Higashi bulk line/FC branch line: 3 km; Sakuma-Toei line/FC branch line: 1 km; Shin Toyone-Toei line: 1 km; Sakuma-Toei line: 11 km Transformers: At 500 kV: Shin Fuji substation: 750 MVA×1; Shizuoka substation: 1,000 MVA×1; Toei substation: 800MVA×1 –1,500 MVA×2; at 275 kV: Shin Fuji substation: 200MVA×1–0 MVA	2027
Interconnection facility enhancement plan between Chubu and Kansai	500	Lines: Sekigahara-Kita Oomi line: 2 km; Sangi bulk line/Sekigahara switching station lead-in: 1 km; Kita Oomi line/Kita Oomi switching station lead-in: 0.5 km Switching stations: Sekigahara switching station: 6 circuits; Kita Oomi switching station: 6 circuits	-
Intra-region lines			
Dewa bulk line	500	96 km	2031
Ooma bulk line	500	61 km	2027
Shin Kakogawa line	275	25.3 km	2025
Johoku line	275	20.9 km	2030
Abukumananbu line	154	24 km	2024

Note: Development plans for transmission lines and substations must be submitted for voltages higher than 250 kV, or within two classes of the highest voltage available in the regional service areas; development plans corresponding to changes in line category or circuit numbers that were not included in measuring the increased length of transmission lines were treated as no change in the length of transmission lines.

Source: OCCTO; Global Transmission Report

Additionally, about 31,262 MVA of substation capacity would be added along with decommissioning of 5,800 MVA, translating to a net increase in substation capacity of about 25,462 MVA. The decommissioning activities reflect Japan's evolving energy landscape and a shift in transmission priorities.

One of the most notable cross-regional projects is the plan to link Hokkaido and Tokyo via an undersea cable of 8 GW to 12 GW.

Similarly, Hokkaido and Honshu will be connected through an undersea cable, while the northern area of Tohoku and greater Tokyo will be linked via landlines. Additionally, the interconnection facility enhancement plan between Tokyo and Chubu as well as that between Chubu and Kansai has also been planned.

The way forward

Japan is currently in the process of developing its blueprint for next-generation power networks.

While this roadmap is still evolving, the reforms and initiatives that have been undertaken and are in the planning stages are anticipated to contribute to the establishment of a robust power grid capable of facilitating the nation's decarbonisation objectives.

The country is also in talks with other countries to reduce its dependency on imported fuels.

Net net, Japan is taking proactive measures to achieve its carbon neutrality goals. ♦

Dutch Transmission Plans (contd...)

On the demand side also, dramatic changes are expected with the rapid rise of electrification particularly in the transportation and heating sectors. This has put the spotlight on overhauling the electricity grid and creating new transmission infrastructure that is capable of RES integration as well as ensuring reliability and security for end consumers.

TenneT BV, the country's transmission system operator (TSO) responsible for the high-voltage grid both on land and at sea, has a critical role to play in building such a grid and ramping up investments for the same. To realise this, on November 1, 2023, it published the draft investment plan (IP) for the grid on land and at sea for 2024-33 known as Ontwerpinvesteringsplan Net op land and Ontwerpinvesteringsplan Net op zee, outlining its plans for the onshore and offshore grids. Over the next decade, under draft IP2024, TenneT expects to carry out around 700 major infrastructure projects including grid extensions, replacements, new customer connections, OSW and reconstruction projects. Among other things, TenneT will develop five larger new power highways at 380 kV and modernise 140 high-voltage substations. These actions will help double the capacity of the grid compared to the previous investment plan (IP2022) and involve an investment of a whopping EUR68 billion.

The fast-growing demand for additional grid capacity is the main reason for the increase in the portfolio. The demand for grid connections has tripled in three years and there are currently over 105 GW of applications for reinforcements or new connections to purchase electricity. Further, recent studies by TenneT for Utrecht, Gelderland, the Flevopolder, the port area of Rotterdam and Goeree-Overflakkee show that there is no room on the grid for companies in these regions, thus resulting in longer waiting times. In addition, the maximum capacity of the electricity grid has been

reached in Noord-Holland for companies seeking a connection or an increase in capacity.

Stakeholders can respond to the draft IP2024 until November 29, 2023. The final plan will be sent to the Netherlands Authority for Consumers and Markets (ACM) for approval in early 2024.

Existing infrastructure

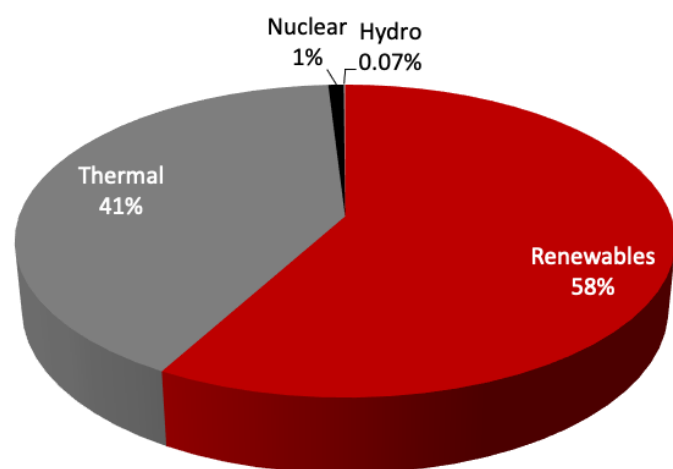
As of 2022, Netherlands' installed generation capacity was 54,959 MW. Of this, RES projects accounted for a 58 per cent share, followed by thermal (31 per cent) and nuclear (1 per cent). Notably, RES installed capacity increased almost 10 times to 32 GW in 2022 from 3.5 GW in 2011.

As of 2022, between 110 kV and 450 kV, the Netherlands had 11,130 circuit km (ckt km) of transmission line length capacity along with an estimated 49,377 MVA of transformer capacity across 345 substations. The majority of the network (about 42 per cent) comprises 150 kV AC lines, followed by an almost equal share of 380 kV and 110 kV lines. The Dutch network is interconnected with that of Germany's at three locations and with that of Belgium's at two locations, all at 380 kV. The Netherlands also has one HVDC connection each with Norway (NorNed), the UK (BritNed) and Denmark (COBRACable). Between 2011 and 2022, TenneT invested over EUR9.4 billion in the Dutch onshore and offshore electricity infrastructure.

Future plans

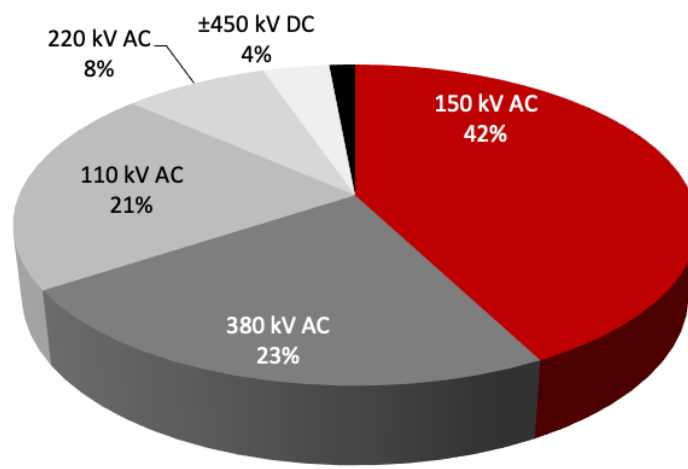
According to TenneT's draft IP2024, Netherlands will add over 67 GW of new generation capacity and retire about 6.5 GW of thermal capacity by 2030 under the Climate Ambition (KA) scenario. More energy will be produced by OSW, onshore wind and solar photovoltaic (PV), while gas and coal consumption in power stations will fall in favour of hydrogen and biomass. Majority of the capacity addition will come from solar at over 44 GW. However, as solar PV only produces full peak power for a limited

Figure 1: Netherlands' installed generation capacity by technology, 2022 (%)



Total installed capacity= 54,959 MW

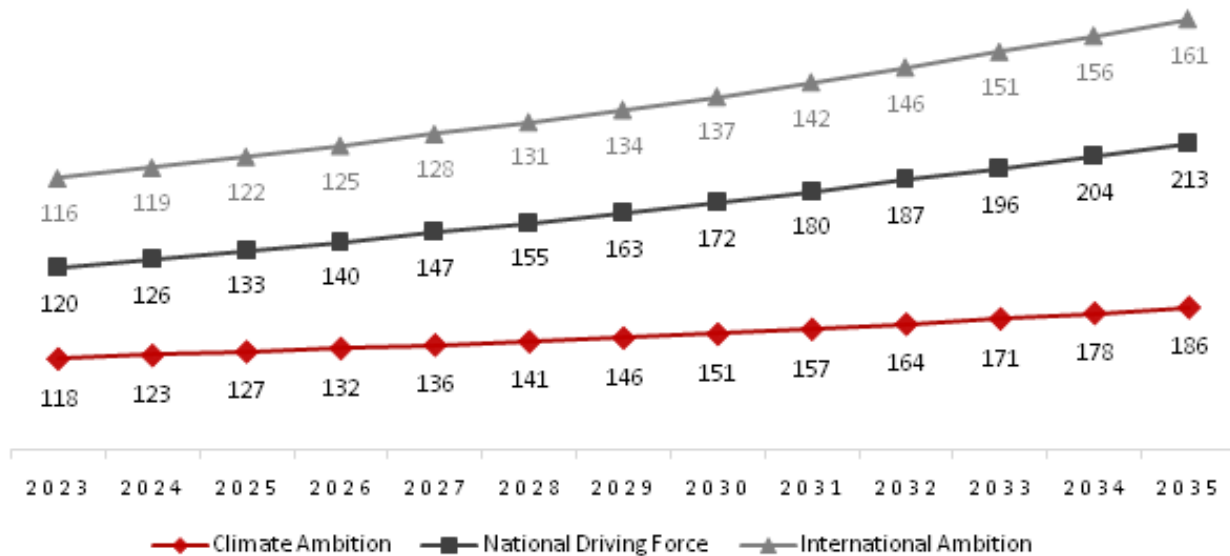
Figure 2: Netherlands' transmission line length by voltage, 2022 (%)



Total line length= 11,130 ckt km

Source: TenneT, Global Transmission Report

Source: TenneT; Global Transmission Report

Figure 3: Forecasted growth in electricity demand (TWh)

Source: TenneT; Global Transmission Report

time period, the connection of large-scale solar PV is dimensioned smaller and production above the connected load is capped in the calculations. The real challenge is the connection of wind power (23 GW), particularly OSW of over 19 GW by 2030.

To accommodate the shift in the generation mix, TenneT plans to expand the onshore grid particularly by strengthening the 380 kV network across the country. For this, as per the draft IP2024, TenneT is currently working on four National Coordination Regulation (RCR) projects, for which permitting and decision-making will be fast tracked – 380 kV North-West (NW380); 380 kV South-West (ZW380); Better Use of Existing 380 kV (BBB380) and 110 kV Net Reinforcement Friesland (NF110).

OSW integration and energy hubs

For OSW integration, TenneT will develop 21 GW of offshore grid connections till 2031. The draft sea IP2024 includes the following new offshore wind projects: Nederwiek 1, Nederwiek 2, Nederwiek 3, Doordewind 1, Doordewind 2 (all five connections are 2 GW) and Hollandse Kust (west) Gamma (700 MW). Project Ijmuiden Ver Gamma (2 GW) was already included in IP2022.

Notably, either Nederwiek 3 or one of the Doordewind projects will be realised after 2031. The final investment decision is yet to be made for the three projects mentioned above and the Hollandse Kust (west) Gamma.

Until 2026, TenneT will use the standard 700 MW platforms with 220 kV high voltage alternating current (HVAC) export cables. Beyond that, it plans to implement the 2 GW, 525 kV high voltage direct current (HVDC) platforms, which are the world's first such OWF connections developed by the company. Notably, the 2 GW offshore converter platforms are 'hubready', which means that they can be connected to a future meshed HVDC grid.

It is also working on possibilities for energy hubs at sea. In fact, TenneT was among the pioneers of the concept of artificial islands

for OSW development based on a hub and spoke principle through its participation in the North Sea Wind Power Hub (NSWPH) consortium.

The latter plans to connect large-scale OSW power to a central hub (an artificial island) and create new energy highways and trade corridors among the North Sea countries including the Netherlands. These hubs will eventually make large-scale conversion of OSW to green hydrogen possible.

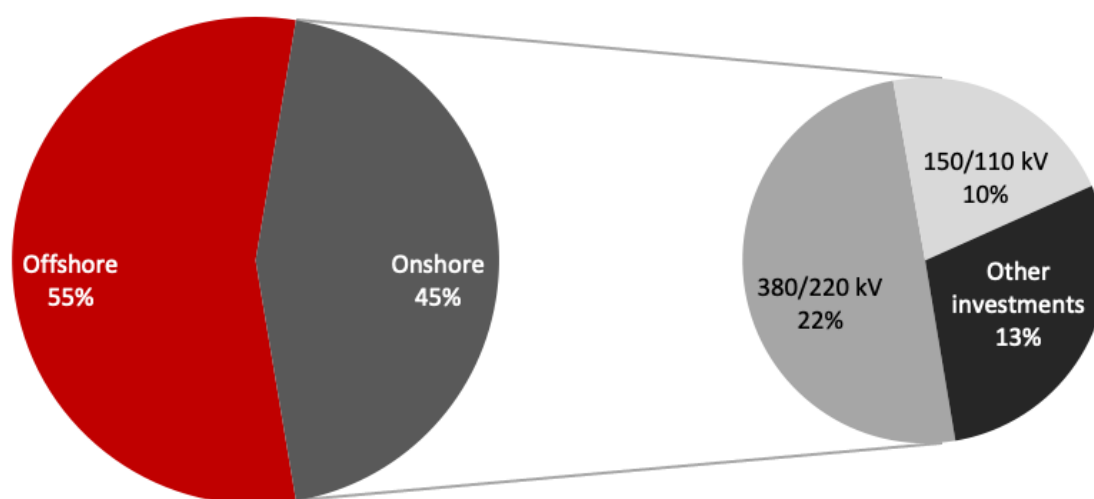
TenneT has collaborated with the UK's National Grid Ventures (NGV) for a hybrid project, which involves the construction of transmission infrastructure that connects the OSW projects to national grids and acts as cross-border interconnections. Known as LionLink [formerly EuroLink multipurpose interconnector (MPI)], the hybrid project is expected to be able to transport around 1.8 GW of electricity between the countries via a Dutch 2 GW platform by 2030.

Target Grid 2045

A key feature of IP2024 is the 'Target Grid' developed by TenneT in coordination with the Ministry of Economic Affairs and Climate. It presents TenneT's vision of an integrated, onshore and offshore, cross-border electricity grid, which is crucial to the climate-neutral energy system in 2045. It is based on the scenario with the highest degree of electrification under the Integrated Infrastructure outlook 2030-2050 (II3050) and goes a step further because it applies innovations and anticipates possible future regulatory changes.

With a robust view of the Target Grid Map, TenneT can engage in long-term planning, future-proof investments and start preparing infrastructure needed for energy transition in a timely manner.

TenneT presented the first version of Target Grid in April 2023 and is in the process of further developing the Target Grid strategy. By the end of 2023, TenneT will update Target Grid based on stakeholders' discussions.

Figure 4: TenneT's planned investments between 2023-33

Total investment=EUR68 billion

Note: Figures have been estimated based on graphs given in TenneT's investment plans

Source: TenneT; Global Transmission Report

Future grid investments

During the 2023-33 period, TenneT has planned an investment of around EUR68 billion on transmission networks. The majority of this at about 55 per cent will be invested in the offshore grid while the rest will be spent on the onshore network. The investment in the offshore portfolio at around EUR38 billion has increased multifold compared to IP2022 (roadmap 2030) due to the price increase of the 2GW portfolio, which has in turn been caused by market conditions (global demand for offshore HVDC equipment has increased substantially), inflation (including higher prices of raw materials such as steel and copper, personnel costs at suppliers) and macroeconomic effects (increased climate ambitions, geopolitical tensions, market disruptions after COVID-19).

Of the onshore grid investments of about EUR30 billion, 50 per cent will be spent on strengthening the 380 kV and 220 kV network and another 21 per cent on the 110/150 kV network.

Supplier collaboration agreements

To respond to the acceleration of OSW targets by 2031 and to be prepared for the subsequent period and considering the market capacity shortage, TenneT has secured market capacity through collaboration with specialised contractors early on. TenneT has reserved market capacity for the first eight 2GW grid connection systems anticipated beyond 2031 through tenders at an early stage.

During 2023, TenneT has signed several framework agreements and service level contracts. For HVDC converter stations, TenneT has tied up with Hitachi Energy/Petrofac for five projects (IJmuiden Ver Alpha, Nederwiek 1 and 3, Doordewind 1 and 2) and GE Grid (GE)/Sembcorp Marine Offshore Platform Pte. Limited (SMOP) consortium for three projects (IJmuiden Ver Beta, IJmuiden Ver Gamma and Nederwiek 2) (April 2023). For offshore cables, TenneT has signed up NKT (March and May 2023) for six connections (IJmuiden Ver Gamma, IJmuiden Ver Beta, Nederwiek 2 and 3, Doordewind 1 and 2) and Prysmian for two projects (IJmuiden Ver

Alpha and Nederwiek 1). TenneT also entered into a framework agreement with Dutch construction companies – Dura Vermeer, BAM Infra Nederland and Visser & Smit Bouw – to carry out civil engineering works for at least eight onshore stations associated with its 2GW offshore links (January 2023).

Separately, TenneT signed a service level agreement with Prysmian (July 2023) to provide comprehensive nearshore and offshore cable inspection, maintenance and repair services for its HVDC and HVAC submarine power cables in the North Sea.

For the onshore grid, TenneT has signed multi-year framework agreements with eight partners for 900 km of HVAC lines in the Netherlands (August 2023) and with Siemens Energy, Hitachi Energy, GE Grid and Dutch Royal SMIT Transformers BV for transformers and substations (September 2023).

As per TenneT, forming these long-term collaborations will encourage smart ways of working and fast deliveries. It will also help the contractors focus on innovation and adjust their production processes and machinery accordingly, which will in turn reflect in improved materials and design optimisation.

Key challenges and the way forward

Given the sudden increase in the volume of projects in recent years, TenneT has been experiencing delays in the development of the high voltage grid. Of the 252 grid expansion projects already planned, 60 have been delayed due to both internal and external factors.

Internally, TenneT faces the challenge of disconnecting grid sections to work safely on necessary upgrades; besides the issue of shortage of skilled personnel and complex dependencies between projects leading to changes in their scope and schedule. The external issues include personnel problems among contractors, shortages of materials and components and spatial problems relating to difficulty in finding suitable locations and very long permit processes.

Table 1: TenneT's key projects in the Netherlands

Project Name	Route	Voltage	Type of line	Line length (km)	Scheduled completion
Interconnectors					
LionLink (Netherlands and UK)	Yet to be finalised	525 kV HVDC	USC and UGC	NA	2030
Netherlands–Germany interconnection	Eemshaven (Netherlands)–Emden (Germany)	380 kV AC	OHL, USC and UGC	31	2035
North Sea Wind Power Hub (NSWPH) (Netherlands, Denmark and Germany)^	Maasvlakte (Netherlands)–Power Link Island (Netherlands 1); Eemshaven–Power Link Island (Netherlands 2)	HVDC	USC	650	Beyond 2035
Domestic projects					
Noord–West transmission project (NW380)	Eemshaven–Vierverlaten	380 kV AC	OHL	42	2023
South–West transmission project (ZWW380)	Borssele–Rilland	380 kV AC/150 kV AC	OHL	100	2025
Friesland grid reinforcement 110 kV	–	110 kV/220 kV	OHL	NA	2025
Beter BenuttenBestaande/ Better Use Existing 380 kV programme	Krimpen–Geertruidenberg; Ens–Zwolle; Eindhoven–Maasbracht	380 kV AC	OHL	Not applicable	2026
South West 380 kV East (ZWO380)	Rilland–Tilburg	380 kV AC	OHL	78	2032
Northern East–West connection	Not yet decided	NA	NA	NA	2040
Offshore wind projects					
Hollandse Kust West Alpha and West Beta Project	Hollandse Kust West Wind Farm Zone–Wijk aan Zee substation	220 kV AC	USC and UGC	2x65 km + 9 km	2026
Hollandse Kust (West) Beta	Dutch Coast (west)–Beverwijk	220 kV AC	USC and UGC	NA	2026
IJmuiden Ver Alpha offshore project	IJmuiden Ver Alpha–Borssele	525 kV HVDC	USC and UGC	176	2029
IJmuiden Gamma offshore project	IJmuiden Ver Gamma–Amaliahaven (Maasvlakte)	525 kV HVDC	USC and UGC	NA	2029
IJmuiden Ver Beta offshore project	IJmuiden Ver Beta–Amaliahaven (Maasvlakte)	525 kV HVDC	USC and UGC	NA	2030
Nederwiek 1offshore project	Nederwiek–Borssele	525 kV HVDC	USC and UGC	217	2030
Nederwiek 2offshore project	Nederwiek 2–Amaliahaven (Maasvlakte)	525 kV HVDC	USC and UGC	95	2030
Nederwiek 3offshore project	Nederwiek 3–Geertruidenberg of Moerdijk	525 kV HVDC	USC and UGC	NA	2031
North of the Wadden Islands*	North of the Wadden Island–Eemshaven	220 kV	USC and UGC	NA	2031
Doordewind 1offshore project*	Doordewind 1–Eemshaven Oude Schip	525 HVDC	USC and UGC	NA	2031
Doordewind 2offshore project*	Doordewind 2–Eemshaven	525 kV HVDC	USC and UGC	NA	2031
Hollandse Kust (West) Gamma**	Yet to be finalised	220 kV	USC and UGC	NA	2031

Note: HVDC– high voltage direct current; OHL– overhead line; USC– undersea cable; UGC–underground cable; NA– not available; MPI – multi-purpose interconnector
The length of cross-border interconnections pertains only to the Dutch territory.

^Includes seven sub-projects including two mentioned above. The overall length of the project is 2,258 km.

* The connection of North of the Wadden Islands, Doordewind 1 and 2 (in total 4.7 GW) is under investigation jointly in the Connection Program Wind at Sea – Eemshaven (PAWOZ-Eemshaven) **Pending clarity about Tata Steel's plans in development for the sustainability of the energy supply and the production process, further decisions will be made on this.

Source: TenneT; Global Transmission Report

Figure 5: Map of TenneT's Target Grid for the Netherlands in 2045

Source: TenneT's draft Investment Plan for land 2024-2033

In addition to expanding the grid, maintenance is also a major task for TenneT, which estimates that 30 per cent of the high-voltage grid has to be replaced in the coming years. This is crucial to continue to achieve high supply security (above 99.99 per cent), especially as society becomes increasingly dependent on electricity. The latter also requires closer cooperation with the distribution system operators (DSOs).

TenneT has already entered into a partnership with the Dutch DSOs to launch a new smart solution to reduce congestion in the electricity grid by using flexible power from the market.

Notwithstanding the challenges facing TenneT, it is leading the Dutch energy transition through various innovations in grid planning and design, and technology and supplier collaborations. ♦

Morocco's Green Ambitions (contd...)

The Moroccan government has put in place several laws and incentives, including long-term power purchase agreements (PPA), favourable tax policies, streamlined permitting processes, and financial support options. To attract more private investment in RES, the government is committed to continuing the electricity sector reforms, first initiated in 2010 through the passage of Law 13-09 opening up RES to the private sector. Until a decade ago, Morocco's electricity sector was predominantly under the control of the vertically integrated state-owned Office National de l'Électricité et de l'Eau Potable (ONEE). Besides opening up generation to the private sector, distribution was opened to municipalities and private concessionaires while Law 48-15 gives the Moroccan energy authority, Autorité Nationale de Régulation de l'Energie (ANRE), the power to regulate the electricity sector.

Notably, in February 2023, the country passed two laws – Law 40-19 (amending Law 13-09 and Law 48-15) with a focus on grid capacity, facilitation of solar energy projects, system feed, electricity purchase mechanisms, RES operators' obligations and guidelines for exporting RES, as well as Law 82-21 introducing regulations on self-generation of electricity covering grid access, energy storage, surplus energy sales, and green electricity certificates for self-generators. While the laws are in place, the Ministry of Energy Transition and Sustainable Development (METSD) is expected to adopt ministerial decrees needed for implementing them. These developments show the government's seriousness about decarbonising its economy by creating an investment-friendly environment.

Further, to create a level playing field for RES players, the unbundling of ONEE, which currently owns and operates the country's electricity transmission network, several generation assets, and more than 50 per cent of domestic electricity distribution, is also on the cards. To begin with, the plan is to separate the

financial accounts of ONEE's electricity transmission business from those of its other businesses, a proposal that ONEE plans to send to ANRE for its approval by 2025.

With the shift towards RES, the country's electricity sector has been able to attract investments from several international institutions including the World Bank, European Investment Bank (EIB), African Development Bank (AfDB), European Bank for Reconstruction and Development (EBRD), Agence Française de Développement (AFD), KfW Development Bank, the Dutch government and the European Union (EU). Particularly, following the signing of the EU-Morocco Green Partnership in October 2022 to promote Morocco's RES potential combined with the EU's clean energy transition efforts, the EU is currently finalising a three-year Energie Verte programme. The EUR50 million programme aims to increase the share of RES in Morocco's installed capacity and generation to 45 per cent and 30 per cent respectively by 2026 (from 38 per cent and 18 per cent in 2022); facilitate the publication of at least two regulatory texts for implementation of the laws 40-19 and 82-21; aid the implementation of a green electricity certificate mechanism by 2026; and secure ANRE's approval of ONEE's proposal for separate accounting of transmission activities by 2026.

To support RES integration, ONEE has planned the expansion and reinforcement of the domestic grid as well as the development of interconnections. It has planned investments worth MAD28.4 billion in electricity generation and grid infrastructure between 2024 and 2027, which translates into an average annual investment of close to MAD9.5 billion. This is much higher than ONEE's investment during 2022 and 2021 of MAD3,461 million and MAD4,014 million respectively as well as its planned investment of MAD5,035 million for 2023, signifying the considerable activities lined up in the coming years.

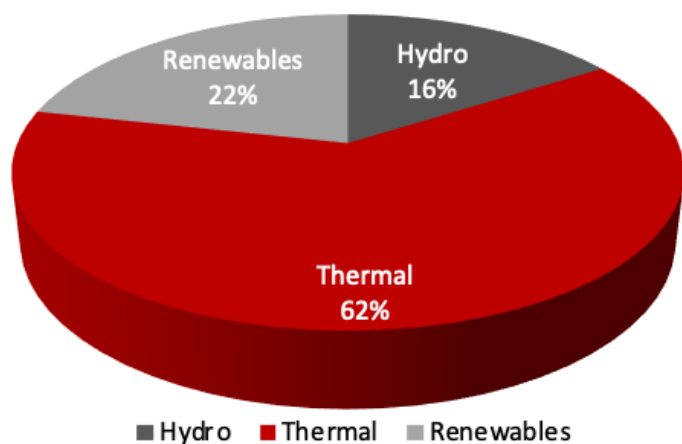
Existing infrastructure

As of 2022, generation capacity in Morocco stood at 11,055 MW, recording a compound annual growth rate (CAGR) of 4.6 per cent over the previous five years from 2017 (8,820 MW). By the end of 2022, the majority of the installed capacity was accounted for by thermal power (6,901 MW) followed by RES (2,384 MW) and hydropower (1,770 MW). RES capacity included 1,553 MW of wind and 831 MW of solar capacity. The latter includes the 580 MW Noor Ouarzazate complex, which is the world's largest concentrated solar power plant (CSP).

In terms of generation, RES accounted for 19 per cent of total generation of 41,420 GWh by 2022. Meanwhile, ONEE's generation plants (10,156 GWh) accounted for a quarter of the total generation.

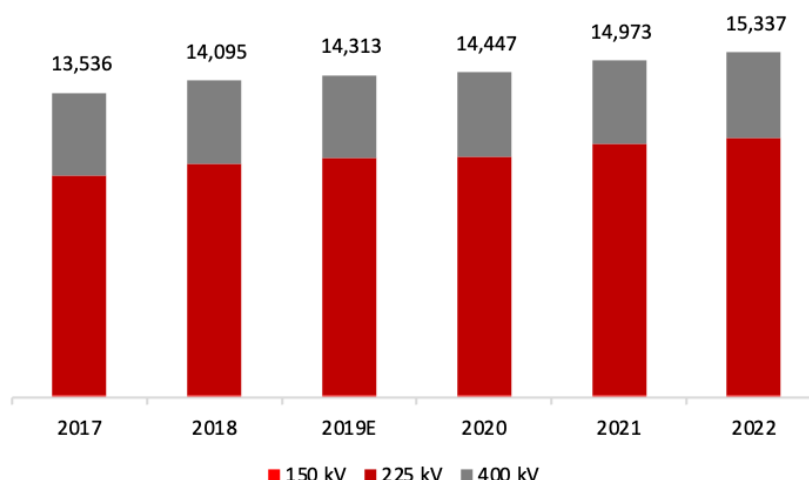
As of 2022, Morocco's transmission network comprised 15,337 km of transmission lines, of which 74 per cent or 11,407 km was at 225 kV, followed by 25 per cent or 3,783 km at 400 kV and the remaining 1 per cent or 147 km at 150 kV. Additionally, Morocco's electrical grid is connected with the grids of Algeria and Spain. The latter interconnection includes two 400 kV submarine cables between Tarifa in Spain and Fardioua in Morocco to connect the energy infrastructure of Europe and Africa. It facilitates a net transfer capacity (NTC) of 900 MW from Spain to Morocco and 600 MW in the reverse direction. Morocco and Algeria currently have two 400 kV transmission lines and two 220 kV transmission lines,

Figure 1: Morocco's installed generation capacity by source, as of 2022 (%)



Total installed capacity: 11,055 MW

Source: ONEE; Global Transmission Report

Figure 2: Existing transmission network of Morocco as of 2022 (km)

Note: Data in all years includes 147 km of line length at 150 kV. 2019 data has been estimated based on projects commissioned during the year.

Source: ONEE; Global Transmission Report

theoretically allowing a NTC of 1 GW. However, practical power exchange has been restricted to 300 MW from Morocco to Algeria and 600 MW from Algeria to Morocco. The two 220 kV lines were disconnected to prevent looping effects.

Future plans

Electricity demand in Morocco is expected to increase from 34,106 GWh in 2023 to 40,760 GWh in 2032, according to International Energy Agency's (IEA) projections. To meet this rising demand as well as diversify its energy mix, Morocco intends to reach 12 GW of RES by 2030. Further, it plans to add 2.4 GW of gas-based capacity by 2030 and completely phase out coal-fired plants by 2050. This transition will reduce water usage, lower carbon emissions, enhance energy security, and offer economic benefits. Currently, several RES projects with a combined capacity of about 4.6 GW are under construction, with an additional 203 MW expected to come into service by 2023. Among the key under-development projects is the 800 MW Midelt solar project that combines CSP and photovoltaic (PV) technologies, making it one of the world's largest hybrid solar projects.

Besides the ongoing projects and official targets, RES projects with a capacity of over 40 GW have been announced, which are either committed to hydrogen production or direct electricity export to Europe and the UK. For instance, UK-based Xlinks' Morocco-UK power project is a comprehensive initiative that encompasses a 10.5 GW solar-plus-wind generation facility and a substantial 20 GWh/5 GW battery storage facility in Morocco's RES-rich region of Guelmim Oued Noun as well as a high voltage direct current (HVDC) subsea interconnection to export 3.6 GW of this capacity to the UK. RES capacity will also support the country's green hydrogen ambitions, which include investments in green ammonia. Three prominent proposed projects include the METSD's Hevo ammonia project; France-based Total Eren's 10 GW Total Honor hybrid power plant; and Morocco-based OCP Group's AMUN ammonia production facility near Tarfaya to be powered by 3.8 GW RES.

Transmission plans

ONEE is investing in the domestic transmission grid driven by the requirement to maintain security and quality of service while meeting final demand; ensure supply and security of large cities; connect new production plants; and massive RES integration besides the development of interconnections.

The domestic projects during the 2023-27 period focus on evacuation projects for new power plants and the connection of new RES projects to the grid; strengthening the network in the Rabat, Casablanca, Tensift and Agadir regions as well as the southern region for power evacuation from new RES projects; an autotransformer strengthening project; and installation of 225/60 kV substations to strengthen the high voltage network.

Additional projects involve a range of activities such as redevelopment, renewal or reinforcement of high-tension and high-voltage (HTB) power lines and structures to ensure the robustness and sustainability of the transmission infrastructure.

In the southern region where several RES projects are coming up, ONEE is strengthening the 400 kV network through the construction of the second 400 kV Agadir-Ladyoune line, through Tiznit, Guelmim, Tan-Tan and Hagounia. ONEE has initiated a call for tenders to develop the MAD2 billion project, which includes the implementation of necessary grid enhancements, voltage adjustments, compensation and stabilisation measures.

Another project that is making progress is the Midelt solar project evacuation system. In May 2023, ONEE commissioned the new 225 kV Midelt substation at an investment of MAD65 million. The solar project will be connected to the national grid through the 27-km, 225 kV Khénifra-Mibladen line. The project also includes 400 kV lines (spanning 180 km) to connect the Midelt substation to the El Ouali station in the Fez region at an investment of MAD476 million.

In the Casablanca region, ONEE is developing the 400 kV Chemaia-Sidi Bennour-Laawamer-Médiouna line. Within this,

Table 1: Key upcoming domestic transmission projects in Morocco

Project	Key objective
Key transmission line projects	
400 kV Agadir–Tiznit–Guelmim–Tan-Tan–Hagounia–Ladyoune II line; extension of 400 kV Agadir and Tan-Tan substations and 400/225 kV Laayoune II substation	Strengthening the 400 kV network in the south
400 kV El Ouali–Boulmane–CS Midelt line; 225 kV Khenifra–Mibladen line; 225 kV Midelt substation*	Power evacuation from the Midelt solar power plant
400 kV Chemaia–Sidi Bennour–Laawamer–Médiouna line	Strengthening the Casablanca network
Key substation projects and connection lines	
225/22 kV Benslimane substation	Ensuring power supply to the vaccine manufacturing plant in Benslimane
225/60 kV Oulad Rahou substation, extension of Galcha and Oulad Teima substations	Strengthening power supply to the Souss-Massa region
225/60/22 kV Afzi substation	Strengthening power supply to the Afzi industrial zone
225/60 kV Essaouira substation	Strengthening power supply to the Essaouira region and enabling power evacuation from the Jbel Lahdid wind farm
225/60/22 kV Chrifia substation	Strengthening power supply to the Marrakech region
225/60 kV Guelmim substation	Strengthening the electricity network in the Guelmim region
225/60/22 kV Mghila substation	Strengthening power supply to the Beni Mellal region
225/22 kV Imouzzer substation	Strengthening power supply to the Imouzzer region
225/60 kV Agdz II substation	Strengthening power supply to the Ouarzazate region

Note: *Substation was commissioned recently in June 2023

Source: ONEE, Global Transmission Report

India-based contractor Larsen & Toubro is developing the 80-km Laawamer–Médiouna section, which involves an investment of MAD141 million. It will enhance connectivity and power distribution in the region, supporting the Casablanca-Settat area’s energy infrastructure and contributing to the broader electrical network.

Cross-border interconnections

Morocco is working on three key interconnections with the UK and the Iberian nations of Spain and Portugal. The interconnections with Iberia form part of the Mediterranean Project, supported by the European Commission (EC), with the overarching objective of fostering the progressive integration of power systems along the Mediterranean shores.

Morocco–UK Interconnection: It involves the construction of an interconnection from the Xlinks RES facility in Morocco to the UK power grid at Alverdiscott in North Devon, southwest England, via four 3,800-km subsea HVDC cables. After some initial hiccups, the project has started making some progress.

In April 2023, the United Arab Emirates (UAE)-based Abu Dhabi National Energy Company (TAQA) and British renewable energy supplier Octopus Energy announced an investment of EUR25 million and GBP5 million respectively in the Xlinks development phase of the project. In October 2023, a delegation from the UK Department of Energy Security and Net Zero (DESNZ) met with ONEE as part of the examination of the Xlinks project to supply the UK with clean power. While ONEE assured the availability of its teams to support

the development of the project, the British delegation presented its progress since the submission of the project documents to the Moroccan authorities within the framework of Law 13-09. Upon completion by 2030, the project will supply 8 per cent of the UK’s electricity needs.

Spain–Morocco Interconnection: The countries are already interconnected through two submarine links. This third link involves the construction of a 100-km, 400 kV high voltage alternating current (HVAC) link (including 30 km of subsea cable) by ONEE and Spain’s TSO Red Eléctrica. This 600 MW interconnector will link Puerto de la Cruz, Spain, with the Beni Harchane substation in Morocco at an estimated cost of EUR382 million including a significant portion allocated to infrastructure enhancements in both countries. It is included in the Spanish National Development Plan and will be commissioned by 2030. This will increase Morocco’s net transfer capacity with Spain to 1,200 MW (export) and 1,550 MW (import).

Morocco–Portugal Interconnection: The new 265-km HVDC link between Beni Harchane, Morocco, and Tavira, Portugal, is being promoted by the governments of the two countries, which have jointly launched the feasibility study for the interconnector. It is based on a configuration of two circuits (bipolar converter) of 500 MW each.

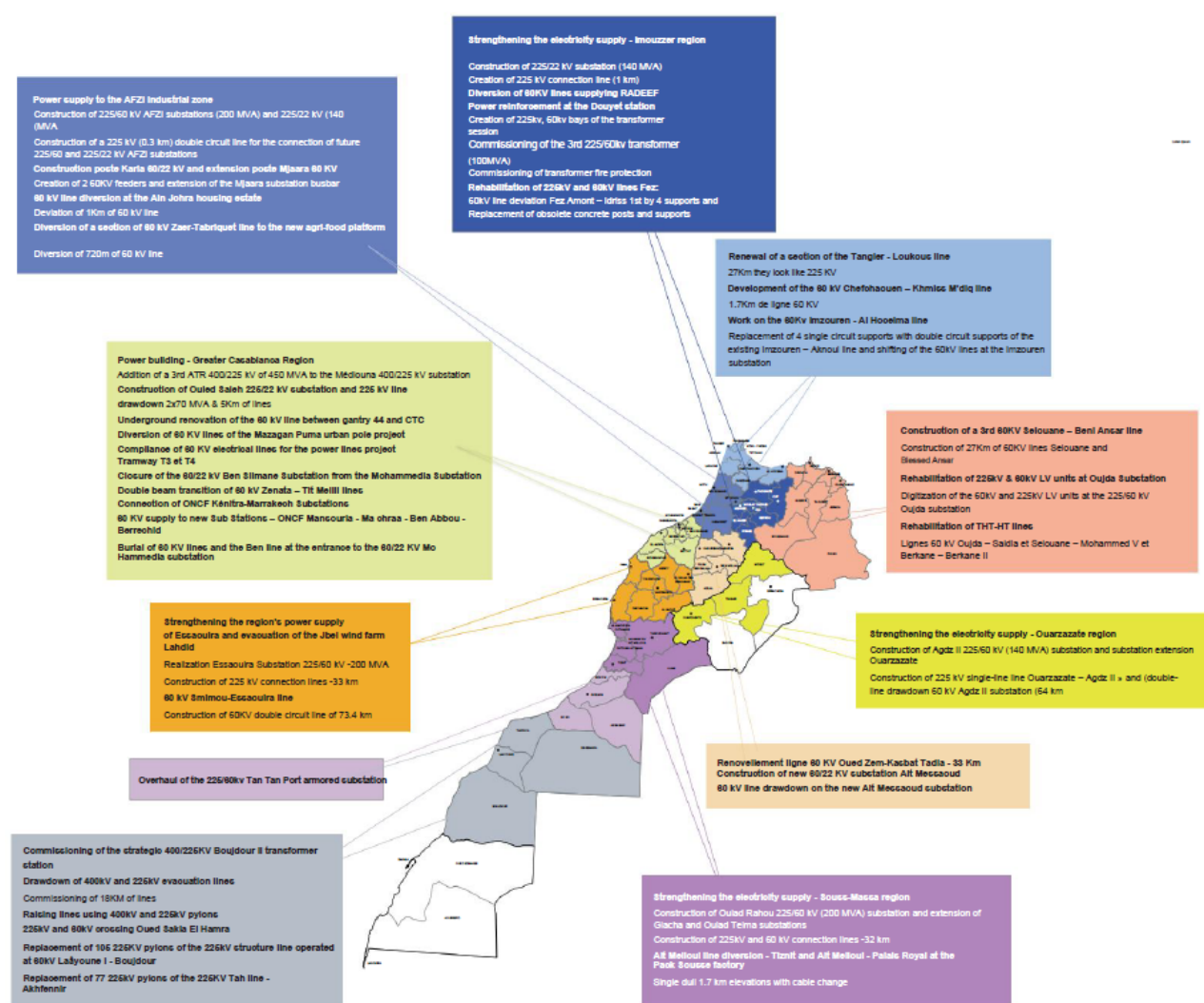
This project aims to enhance the energy connectivity between Portugal and Morocco, promoting a more integrated and reliable power transmission network.

Table 2: Morocco's planned interconnection projects

Project Name	Components	Voltage	Length (km)	Cost
Morocco–UK	Twin 1.8 GW HVDC subsea cable systems that will run from the Moroccan site to Alverdiscott, North Devon in the UK	HVDC	3,800	GPB16 billion
Spain–Morocco interconnection	A new 600 MW HVAC interconnection between Beni Harchane, Morocco, and Puerto de la Cruz, Spain.	400 kV HVAC	100	EUR188 million
Morocco–Portugal interconnection	A new 1 GW HVDC link between Beni Harchane, Morocco, and Tavira, Portugal	HVDC	265	EUR645-745 million

Note: HVDC – high voltage direct current; HVAC – high voltage alternating current

Source: ONEE; Med-TSO; Global Transmission Report

Figure 3: Map of key domestic network projects in Morocco

Source: ONEE

Conclusion

With Morocco's evolving energy strategy, robust institutional framework, and international interest in its energy initiatives, the nation is poised for continued growth and leadership in the RES

sector. As it advances towards its green energy goals, Morocco's journey towards sustainability, energy security and regional integration with Europe is a prominent example in the MENA region and the global energy landscape. ♦



Agenda/Structure

- ❖ Potential and Outlook
- ❖ Developments in Key Markets
- ❖ Advancements in Floating Platform Technology
- ❖ Hybrid Projects with Floating Solar
- ❖ Cost Considerations
- ❖ Project Design and Execution
- ❖ Case Studies and Learnings
- ❖ Grid Considerations
- ❖ Investors' Perspective
- ❖ Solar Plus Storage
- ❖ O&M Considerations
- ❖ Developers' Plans and Experience

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US DOE releases National Transmission Needs Study

The US Department of Energy (DOE) has released the National Transmission Needs Study, which serves as a comprehensive assessment of current and projected transmission needs in the US, spanning through the year 2040. The study, also referred to as the Needs Study, represents a meticulous examination of existing data and forecasts for transmission requirements and was conducted in accordance with Section 216(a)(1) of the Federal Power Act (FPA). The findings of the study will guide DOE as it coordinates its funding related to electric transmission, including the implementation of grid resilience and technology investment provisions outlined in the Bipartisan Infrastructure Law (BIL) [enacted as Infrastructure Investment and Jobs Act (IIJA)] and Inflation Reduction Act (IRA).

The study underscores that today's power grid is ill-suited to meet the demands of the 21st century, which include integrating new clean energy sources, accommodating the growth of electric transmission, and building electrification while maintaining resilience in the face of increasingly extreme weather events exacerbated by climate change. Given its pivotal role as the backbone of the nation's electricity system, the power grid must adapt to ensure reliability and resiliency.

The study has highlighted that virtually all regions across the US would benefit from enhanced reliability and resilience through additional transmission investments, especially those areas that consistently experience high electricity prices or have historically grappled with congestion and unscheduled flows posing reliability risks. Within-region transmission deployment is expected to be crucial by 2030, particularly in the Plains, Midwest, and Texas. By 2040, substantial deployments will also be necessary in the Mountain, Mid-Atlantic, and Southeast regions. Interregional transmission deployment follows a similar trajectory, with large relative deployments required by 2030 and a significant need for new interregional transmission anticipated by 2040 across nearly all regions.

The study considers a broad spectrum of factors, including electricity demand, public policy, and market conditions. Notably, the study draws upon publicly available information and over 120 recently published reports to identify critical national needs that can inform investment and planning decisions. However, the Needs Study does not aim to supersede existing transmission planning processes, nor does it attempt to prescribe specific transmission solutions. Historically known as the National Electric Transmission Congestion Study (Congestion Study), this report has evolved to serve as DOE's triennial state of the grid report. This transformation aligns with a US government requirement, mandating assessments of national electric transmission capacity constraints and congestion at intervals of no less than once every three years. Unlike its predecessor, the Needs Study has broadened its scope, thanks to IIJA, which now necessitates an examination of both historical and anticipated future capacity constraints and transmission congestion that could adversely affect consumers.

US DOE releases draft Transmission System Interconnection Roadmap

The US DOE has unveiled a draft Transmission System Interconnection Roadmap aimed at addressing interconnection challenges on the nation's transmission grid. DOE's Solar Energy Technologies Office (SETO) and Wind Energy Technologies Office (WETO) have jointly issued a request for information (RFI) to gather input on the draft roadmap, which was prepared in collaboration with various clean energy stakeholders through the Interconnection Innovation e-Xchange (i2X) and is designed to serve as a practical guide for implementing both short-term and long-term solutions for interconnecting clean energy sources and addressing the backlog of solar, wind and battery projects awaiting connection to the grid.

The i2X draft roadmap establishes four key goals for deploying clean energy resources: enhancing data access and transparency; improving process efficiency and timing; promoting economic efficiency; and maintaining grid reliability.

The i2X initiative, initiated in June 2022 with funding from the BIL, strives to simplify, expedite, and make the

interconnection of clean energy resources fairer, while enhancing the electric grid's reliability, resilience and security. Since its inception, DOE has engaged over 2,000 stakeholders through a series of 22 virtual public meetings that addressed critical topics such as cost allocation, queue management, data transparency, equity, energy justice, workforce, grid engineering practices, and electric vehicle charging.

The US is on a trajectory to significantly increase the deployment of solar and wind energy resources to align with its target of achieving a decarbonised electricity sector by 2035. While incentives and demand for renewable energy have surged, the process of connecting clean energy projects to the grid has become complex, resulting in extended wait times and added costs. By streamlining interconnection processes to be more efficient, transparent and equitable, DOE aims to reduce costs and expedite the development of clean energy projects across the country.

The objective of the latest RFI is to solicit feedback on the challenges and solutions outlined in the draft roadmap, especially the feasibility of the proposed timelines and any significant areas that are not identified. It is open for responses till November 22, 2023. After that, DOE aims to finalise the transmission roadmap and release a draft second volume that focuses on the distribution grid.

DOE grants USD3.5 billion funding for 58 grid enhancement projects

DOE has granted USD3.46 billion funding for 58 projects across 44 states to strengthen electric grid resilience and reliability under the Grid Resilience and Innovation Partnerships (GRIP) Program. Funded by the BIL, these projects will leverage more than USD8 billion in federal and private investments to deliver affordable, clean electricity and ensure that communities across the nation have a reliable grid that is prepared for extreme weather worsened by the climate crisis. These transformative projects, which will support the country's Justice40 Initiative to benefit disadvantaged communities, will help bring more than 35 GW of new renewable energy online, invest in 400 microgrids, and boost employment.

The recent USD3.46 billion funding represents the first round of projects

selected under the broader USD10.5 billion GRIP Program. Under this, key projects that received GRIP's Grid Resilience Utility and Industry Grants, are Sectionalization and Circuit Improvements to Mitigate Outage Impacts for Disadvantaged Communities of Consumers Energy (USD100 million); Wildfire Mitigation and Extreme Weather Resilience for Xcel Energy (USD100 million); PacifiCorp's Equity-aware Enhancement of Grid Resiliency (USD99.6 million); Transmission Line Rebuild/Replacement for Wildlife Mitigation and Renewable Resource Access of Midwest Energy (USD97 million); and Line Hardening and Battery Microgrid in New Orleans of Entergy New Orleans, LLC (ENO) (USD55 million).

Key projects that received GRIP's Smart Grid Grants are Minnesota Power's high-voltage direct current (HVDC) Terminal Expansion Capability of Allele Inc. (USD50 million); Enabling the Clean Energy Transition by Enhancing Grid Stability Using SmartValve Technology of Algonquin Power Fund America Inc. (USD43 million); Deploying Adaptive Networked Microgrids to Improve Grid Flexibility and Reliability Project of DTE Electric Company (USD23 million); and Smart Grid Manhole and Vault Monitoring Project of Florida Power & Light (FPL) (USD30 million).

Key projects that received grants under GRIP's Grid Innovation Program are Regional Grid Improvements to Address Reliability in Georgia with a Focus on Remote or Hard-to-Reach Communities of Georgia Environmental Finance Authority (USD249 million); Joint Targeted Interconnection Queue Transmission Study Process and Portfolio of Minnesota Department of Commerce (USD464 million); State of Louisiana: Louisiana Hubs for Energy Resilient Operations (HERO) Project of Louisiana Department of Natural Resources (USD249 million); and Railbelt Innovative Resiliency Project of Alaska Energy Authority (USD206.5 million).

US DOE commits USD1.3 billion for three grid projects under TFP

The US DOE, as part of its Investing in America agenda, has unveiled a commitment of up to USD1.3 billion towards the development of three interregional transmission lines, traversing

six states. This investment is made possible through the Transmission Facilitation Program (TFP) under the BIL [enacted as the IIJA in November 2021] and aims to enhance the grid's capacity, create jobs, and expand access to clean energy. The primary objective of this commitment is to add 3.5 GW of additional grid capacity across the US. Under this, DOE has announced capacity contract negotiations with three interregional transmission line projects, as below:

Cross-Tie 500 kV Transmission Line Project (Nevada, Utah): The proposed Cross-Tie project encompasses a 214-mile (344.4-km) transmission line with 1,500 MW capacity, connecting existing transmission systems in Utah and Nevada. Cross-Tie's bi-directional design will bolster transfer capabilities in the Western United States, facilitating greater access to cost-effective renewable energy resources. The project's primary objectives are to enhance transmission capacity, bolster grid reliability and resilience, and alleviate congestion on critical transmission lines. Construction is scheduled to commence in the first quarter of 2025. According to the National Transmission Needs Study, it is anticipated that the Mountain states (which include Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah and Wyoming) will require approximately 2,300 GW-miles of new transmission capacity by 2030 to fully realise the emission reduction potential of the IRA. Cross-Tie is poised to address 14 per cent of this regional demand.

Southline Transmission Project (Arizona, New Mexico): This project is a proposed 175-mile (281.6-km) transmission line with a capacity of 748 MW. It will span from Hidalgo County, New Mexico to Pima County, Arizona, and its primary aim is to facilitate the development of renewable energy sources in southern New Mexico while supplying clean energy to growing markets in Arizona, which currently rely on fossil fuel-based generation. Construction is slated to commence in the first quarter of the calendar year 2025. According to the National Transmission Needs Study, it is projected that the Southwest will require 935 GW-miles of new transmission infrastructure by 2030 to unlock the emissions reduction potential outlined in the IRA. The Southline project is expected to contribute 14 per cent toward fulfilling this regional requirement.

Twin States Clean Energy Link (New Hampshire, Vermont): This link, which spans New Hampshire and Vermont, is a proposed 1,200 MW HVDC, bi-directional transmission line. Its primary purpose is to augment the capacity of the New England electric grid while enhancing its resiliency, reliability and efficiency. This will be achieved by granting access to clean, reliable energy resources in Quebec, Canada. The bi-directional configuration of the Twin States line will also enable the New England grid to export surplus power to Canada. Construction is scheduled to commence in the third or fourth quarter of 2026. According to the National Transmission Needs Study, the Northeast region is projected to need an additional 1.5 GW of transmission capacity for interregional cooperation, with the Twin States project contributing a substantial 79 per cent towards fulfilling this interregional requirement. The selection of the above projects was in response to the first request for proposals (RfP) by DOE for capacity contracts under the USD2.5 billion TFP. The latter aims to establish an innovative revolving fund to help overcome the financial hurdles facing large-scale new transmission lines, upgrades of existing transmission lines and the establishment of microgrids and includes three financing tools— loans; DOE participation in public-private partnerships (PPPs); and capacity contracts with eligible projects in which DOE would serve as an 'anchor customer'. Under the latter, DOE will commit to purchasing up to 50 per cent of the maximum capacity of the transmission line for up to 40 years. The TFP capacity contract essentially represents the contractual right to schedule and use the transmission service for the term of the agreement. The latest RfP was open for capacity contracts to 'shovel ready' transmission projects that are likely to begin construction by end-2027. DOE anticipates releasing a second round of funding through TFP in the first half of 2024, with a potential investment of up to USD1 billion involving PPP, loans and capacity contracts.

FERC asks NERC to address IBR concerns through reliability standards

The Federal Energy Regulatory Commission (FERC) has issued a directive to the North

American Electric Reliability Corporation (NERC) to develop new or modified reliability standards that address reliability gaps related to inverter-based resources (IBRs) by November 4, 2026. It also directed NERC to submit an informational filing within 90 days of the issuance of this directive, with a detailed, comprehensive standards development plan. This move comes as a response to the growing presence of IBRs, which use inverters to convert the electricity they generate from direct current (DC) to alternating current (AC) for grid compatibility. Unlike synchronous generators (like natural gas power plants) that can naturally ride-through grid disturbances, IBRs are required to be programmed to do so. Since 2016, there have been at least 12 significant grid events involving IBRs acting unexpectedly and adversely in response to normally cleared transmission line faults on the bulk power system (BPS), resulting in an average loss of about 1,000 MW of electricity. These events highlight the need for comprehensive planning and operational standards for IBRs to ensure grid reliability. IBRs can offer operational flexibility and support during abnormal grid conditions when appropriately programmed. However, there are also risks associated with IBRs, including their response to disturbances.

FERC's directive outlines four specific areas where new or modified reliability standards are needed:

Data sharing: Reliability standards must require generator/transmission owners, and distribution providers to share validated modelling, planning, operations, and disturbance monitoring data for all IBRs. This data sharing is crucial for predicting IBRs' behaviour and their impact on grid reliability.

Model validation: The standards should mandate that all IBR models are comprehensive, validated, and regularly updated. This ensures that grid planners and operators can accurately predict how IBRs, individually and collectively, will behave in various scenarios.

Planning and operational studies: The standards should require that planning and operational studies incorporate validated IBR models to assess their impact on grid reliability, under normal operations and contingency event conditions.

Performance requirements: The standards must ensure that registered IBRs provide frequency and voltage support during disturbances in a manner that contributes to the overall system's essential reliability services. Clear and reliable technical limits and capabilities for registered IBRs should be established.

FERC has also directed NERC to submit the new or modified reliability standards in a phased approach as follows. For Phase 1, to be submitted by November 4, 2024, NERC must submit standards addressing IBR performance requirements, including those related to frequency and voltage ride-through, post-disturbance ramp rates, phase lock loop synchronisation, and other causes of IBR tripping. For Phase 2, to be submitted by November 4, 2025, NERC must submit standards covering data sharing for registered IBRs, unregistered IBRs, and IBR-distributed energy resources (DERs) in the aggregate. Additionally, these standards should address data and model validation for the same categories of resources. For Phase 3, to be completed by November 4, 2026, NERC must submit standards that focus on planning and operational studies for registered IBRs, unregistered IBRs, and IBR-DERs in the aggregate.

While FERC has not set an explicit implementation deadline, it has emphasised that the new standards should be in effect before 2030.

PNNL unveils innovative OWT strategy to boost grid benefits

The Pacific Northwest National Laboratory (PNNL) has unveiled an OSW transmission strategy aimed at maximising electrical system benefits in the Southern Oregon and Northern California regions. This approach aims to facilitate the integration of offshore wind (OSW) energy into the power grid.

The project, which began in late 2021 and concluded in the third quarter of 2023, falls within the domain of electrical power systems, addressing one of the most critical challenges in the energy transition. At the heart of the project is a transmission valuation methodology, designed to assess the worth of various transmission options for delivering OSW energy to load centres efficiently. This approach considers the specific conditions and development

scenarios in the region.

The PNNL team applied their valuation methodology to three distinct transmission scenarios: the 2030 high voltage alternating current (HVAC) radial topology scenario, which assumes 3.4 GW of OSW capacity connected through an HVAC radial topology; the 2030+ HVDC radial topology scenario, which assumes 16.3 GW of OSW capacity connected through HVDC radial topology (reflecting a more advanced stage of development); and the 2030+ multi-terminal HVDC (MTDC) backbone topology scenario, which assumes 16.3 GW of OSW capacity but utilises MTDC backbone topology, emphasising a high-capacity interconnection network.

The key findings of the project were that expected annual net benefits ranged from USD127 million to USD6 billion, contingent on factors such as carbon costs, heat wave probabilities, and HVDC costs; the 2030 HVAC radial topology consistently emerged as the most financially viable option, surpassing costs in all scenarios; capacity value contributed up to 60 per cent of the total value in certain scenarios; and MTDC backbone topology exhibited the highest potential for annual net benefits.

This research underscores the pivotal role of transmission infrastructure in enhancing OSW capacity and mitigating diminishing marginal value as capacity increases. It emphasises the importance of considering transmission design when planning for long-term energy sustainability.

WPP releases concept paper to establish

To address critical challenges in the Western US electricity transmission network, the Western Power Pool (WPP) has introduced a concept paper proposing the establishment of the Western Transmission Expansion Coalition (WTEC). The primary objective of WTEC is to develop an actionable transmission plan encompassing both regional and inter-regional needs over a 20-year timeframe, marking a pivotal shift from the status quo of stagnant transmission planning.

The paper highlights that the current transmission planning processes in the Western US, established under FERC Orders 890 and 1000 have fallen short in identifying new transmission solutions and executing

new projects. These limitations hinder the broader western region from developing inter-regional transmission solutions effectively. Presently, Western transmission planning responsibilities are distributed among NorthernGrid, WestConnect, and the California Independent System Operator (CAISO). Although these planning regions were created in response to FERC orders, the paper points out that the latter have resulted in thorough but less fruitful transmission planning processes. The paper further suggests that the cost allocation implications for FERC-jurisdictional transmission providers, especially in regions without a regional transmission organisation (RTO) or independent system operator (ISO), have created challenges and uncertainties, making it difficult to predict and control cost allocations.

WTEC envisions the creation of an actionable transmission plan that addresses grid capability, reliability, and resiliency challenges over a 20-year timeframe. The concept paper outlines a comprehensive set of goals and objectives, which include the development of an actionable transmission plan, ensuring compliance with NERC standards, achieving operational flexibility, enhancing commercial and economic efficiency by meeting future energy requirements, reducing congestion, and optimising reserve margins, with emphasis on unlocking investment savings, promoting supply and demand diversity, and improving infrastructure utilisation. The concept paper further underscores the importance of improved visibility and coordination, aiming to provide transparency on the region's capabilities and requirements, facilitating well-informed transmission planning decisions. It supports cost allocation for potential projects arising from the plan and prioritises a fair and unbiased approach, ensuring equity across various resource types, business models, and stakeholders, in line with existing and evolving regulations.

The WTEC concept promotes consistent communication with a wide range of stakeholders, including tribes, state regulators, policymakers, and other interested parties. Its proposed structure includes key committees and stakeholder participation opportunities, such as the Steering Committee, Regional Engagement Committee, Technical Task Force, and engagement with states, tribes and other

stakeholders. This structure allows for diverse input and feedback, ensuring a holistic approach to addressing transmission challenges in the western region. Feedback on these proposals have been invited, with the comment period ending on October 31, 2023, following which the committees are expected to be established in November 2023 and December 2023.

ISO/RTO Council reiterates disparities in capacity accreditation for grid resources

The ISO/RTO Council has submitted its comments on the American Clean Power Association's (ACP) request to the FERC to hold a technical conference to discuss "the accreditation of resources' capacity value in ISO/RTO regions with and without capacity markets, as well as in non-ISO/RTO regions".

The conference aims to focus on improving the evaluation of the contributions made by power plants, energy storage systems, and other resources, to transmission reliability.

In their comments, ISO/RTO Council have raised their concerns against the conference request while stating that regional disparities in how capacity accreditation is approached create an unsuitable environment for a national conference aimed at achieving consensus.

The ACP's petition for the technical conference received support from various renewable energy trade groups such as Advanced Energy United, as well as entities like Southern California Edison; the Chair of the Colorado Public Utilities Commission, Eric Blank; and the Institute for Policy Integrity at the New York University School of Law.

However, the ISO/RTO Council maintains that hosting a national conference could hinder the ongoing discussions regarding capacity accreditation within various regional entities, including New England ISO, New York ISO, PJM, Midcontinent Independent System Operator (MISO), Southwest Power Pool (SPP), and CAISO.

They argue that each region needs the flexibility to develop capacity accreditation approaches tailored to address their specific reliability requirements.

Independent power producer (IPP) Calpine voiced support for improving capacity accreditation, but emphasised the need to avoid any delays in ongoing efforts to enhance these measures. Southern California Edison (SoCal Ed) supports discussing capacity accreditation issues, suggesting that a forum for sharing experiences and best practices among regions could be highly useful. However, they also caution against creating uniform capacity accreditation policies due to significant regional differences across the US. The Colorado Public Utilities Commission (PUC) has highlighted the patchwork of capacity accreditation rules and resource adequacy approaches in the West, making it challenging to determine the capacity value of resources. It suggests that sharing common goals and general approaches, with meaningful regional or federal guidance, could improve capacity accreditation methodologies.

On the whole, the grid operators are emphasising the importance of preserving regional flexibility in developing tailored capacity accreditation approaches to address their specific reliability needs.

US solicitor general concludes Texas ROFR as unconstitutional

The US solicitor general has concluded to the US Supreme Court that Texas' right of first refusal (ROFR) law that prohibits non-incumbent companies, including NextEra Energy, LS Power, and Grid United, from constructing transmission lines in the state, is unconstitutional and violates the US Constitution's Commerce Clause. It was argued that the states lack the authority to grant monopolies in the interstate electric transmission markets. The US solicitor general has requested the Supreme Court to dismiss the request from the PUC of Texas and others to review a ruling of the US Court of Appeals for the Fifth Circuit that found the Texas law likely violates the dormant Commerce Clause. Various stakeholders, including Entergy, ITC Holdings, and Xcel Energy's Southwestern Public Service, had supported the PUC of Texas in its petition to the Supreme Court.

The case stems from an August 2022 ruling by the US Court of Appeals that the Texas law likely discriminates against interstate commerce by preventing out-of-state companies without an existing in-

state presence from competing to build and operate electric transmission facilities that are part of the interstate transmission grid. This legal dispute has taken place as FERC considers reinstatement of a federal ROFR that would enable incumbent electricity transmission owners to block competitors from bidding to design, construct, and own certain new interstate transmission facilities.

The court had requested the solicitor general's input on whether the Texas law discriminates against out-of-state economic interests, and the solicitor general has concluded that Texas ROFR law is unconstitutional and the appeals court's decision does not warrant Supreme Court review.

Illinois coalition urges General Assembly to pass ROFR legislative

A coalition comprised of Illinois labour groups, contractors, and economic development advocates, has urged the Illinois General Assembly to pass legislation that would grant regulated utilities and union workers the ROFR for the construction and maintenance of essential electric transmission infrastructure within the state. This push for ROFR is based on concerns that without it, out-of-state developers could secure contracts, potentially taking jobs away from local Illinois workers and businesses.

The ROFR concept essentially allows Illinois companies to select the winners of construction projects through a competitive bidding process, giving preference to individuals and entities based in Illinois. By doing so, it prevents non-Illinois companies from gaining an unfair advantage and working on the state's transmission lines. The coalition has emphasised the importance of supporting the ROFR in Illinois so that it would help maintain control and oversight within the state, ensuring accountability and adherence to Illinois values.

The coalition is particularly concerned about the potential involvement of out-of-state energy developers who may embrace FERC models that bypass local control, potentially increasing their own profits. They argue that these FERC policies have not lived up to promises of innovation, cost savings, or timely development of

transmission capabilities, as suggested by a recent study. In support of the ROFR initiative, the coalition comprises various organisations such as the International Brotherhood of Electrical Workers Illinois State Conference, Ameren Illinois, Economic Development Corporation of Decatur & Macon County, Greater Peoria Economic Development Council, Illinois Black Chamber of Commerce, J.F. Electric, Leadership Council Southwestern Illinois, LUZCO Technologies, NAACP Illinois State Conference, Plocher Construction, Poettker Industrial Services, Springfield Sangamon Growth Alliance, and Trice Construction.

New England to invest up to USD26 billion in transmission by 2050

According to the ISO New England (ISO-NE) 2050 Transmission Study, New England is set to make substantial investments in upgrading its power transmission infrastructure, with a potential expenditure of up to USD26 billion by the year 2050. However, the study also suggests that implementing measures to reduce peak demand through the use of stored fuels and energy efficiency programmes can help curtail the cost to approximately USD17 billion. The study anticipates a surge in power demand due to the increasing electrification of heating and transportation. This growth in demand will be accompanied by a larger portion of power generation coming from offshore wind and other renewable sources situated farther from end-users. The region's aging transmission system could become a significant bottleneck to progress if it fails to keep up with the evolving power system.

The study further outlines the cost estimates for necessary transmission upgrades – amounting to around USD750 million for each additional GW of capacity, up to 51 GW. Beyond this, the cost would double to USD1.5 billion per GW, up to 57 GW. To mitigate peak load, the study proposes the limitation of power demand to 51 GW. This can be achieved through measures such as – using stored fuels like natural gas, for heating during extremely cold days, encouraging consumers to reduce electricity usage during high-demand periods; and the more aggressive implementation of energy efficiency programmes.

New York Governor vetoes passage of OSW transmission Bill

The Governor of New York has vetoed a Bill titled Planned Offshore Wind Transmission Act. The latter, which was passed by the state assembly in June 2023, requires the New York State Energy and Research Development Authority (NYSERDA) to establish a plan for improved transmission planning and coordinating systems for an offshore grid.

The governor's veto decision was driven by concerns from residents regarding electromagnetic fields and the impact of the construction of transmission lines associated with OSW projects on the local community in Long Island. Opponents of the transmission line expressed their support for transitioning away from fossil fuels to combat climate change. However, they argued that the placement of electromagnetic cables under densely populated communities raised health concerns. Environmental leaders considered the veto a temporary setback for OSW projects in New York. Particularly, the passage of the Bill would have paved the way for Equinor-BP's 1,260 MW Empire Wind 2 off Long Island near Jones Beach. It would have authorised the City of Long Beach to discontinue the use of and alienate certain lands to EW Offshore Wind Transport Corporation, which along with Empire Offshore Wind LLC is developing the Empire Wind 2 OSW project, to build an underground conduit and cable system for the OSW project.

This development follows a recent decision by the New York State Public Service Commission (NYSPSC), on October 12, 2023, to reject requests for contract price adjustments by the developers of four OSW projects – 924 MW Sunrise Wind, 816 MW Empire Wind 1, Empire Wind 2 and 1,230 MW Beacon Wind as well as 86 land-based renewables projects aggregating 4.2 GW. Empire Wind and Beacon Wind, with a combined capacity of 3,306 MW, are developed by Equinor ASA and BP Plc, while the 924-MW Sunrise Wind project is a joint venture of Ørsted A/S and Eversource Energy.

The Alliance for Clean Energy New York Inc (ACENY), a trade association, filed the petition on behalf of the land-based projects, seeking adjustments to their agreements

with NYSERDA due to inflationary pressures. The requested weighted average price increase for the OSW projects was 48 per cent. The NYSPSC's decision to deny financial relief was made to uphold the competitive bidding process. The requested contract amendments would have introduced adjustments outside of the competitive procurement process, which contradicts longstanding NYSPSC policy.

Following the decision, NYSERDA expressed its commitment to advancing large-scale renewable energy projects to meet New York's climate goals. The agency would swiftly initiate an accelerated procurement process, emphasising competition, simplified bid requirements, and inflation indexing. This approach aligns with the 10-Point Action Plan launched by New York to support the state's large-scale renewable energy industry (one of the plan's key components is launching an accelerated renewable energy procurement process for both offshore and onshore projects to fill any gaps left by terminated contracts). Additionally, NYSERDA, having concluded its current OSW and land-based renewables procurements, plans to make award announcements in the near future.

PJM seeks FERC approval for capacity market reforms

PJM Interconnection (PJM) has proposed a significant revamp of its capacity market rules to enhance grid reliability, especially as renewable and energy storage resources gradually replace traditional fossil-fuel power plants. The proposed changes aim to provide a more granular and hourly framework for assessing risk drivers and the probabilities of resource and energy inadequacy throughout the year. This contrasts with PJM's current practice, which primarily considers peak load periods.

The proposed changes consist of two separate filings with FERC. The first filing aims to improve PJM's resource adequacy risk modelling and capacity accreditation processes, as well as strengthening testing requirements for capacity resources. The second filing focuses on PJM's offer cap and capacity performance rules. The offer cap rule aims to make sure the grid operator has adequate power, and its value for an associated unit is equal to the incremental operating cost of that unit, plus the applicable percentage adder or dollar per

MWh adder. The capacity performance rule requires generators to deliver electricity when PJM determines they are needed to meet power system emergencies.

These changes will include adopting a forward-looking approach for determining energy and ancillary services' revenue when calculating the offer cap and minimum offer price. Through these PJM aims to have more sophisticated tools to handle factors affecting resource adequacy risks, including extreme weather and correlated generator outages.

PJM has requested that FERC approve both of these proposals simultaneously by December 12, 2023, allowing the grid operator sufficient time to prepare for its upcoming annual capacity auction scheduled to commence on June 1, 2024. PJM has also mentioned potential additional changes to its capacity market, including the possibility of transitioning to a seasonal market.

These proposed reforms come after two years of stakeholder meetings and discussions, with heightened urgency following Winter Storm Elliott in late December 2022 which narrowly avoided rolling blackouts. PJM believes that these changes will enhance grid reliability while also maintaining the fundamental principles of competition to control costs and incentivise investments in new resources.

Ohio ratepayers urge FERC to review unchecked transmission projects

The Office of the Ohio Consumers' Counsel (OCC) has filed a formal complaint with FERC, urging comprehensive review of the local transmission projects undertaken by major Ohio utilities, including American Electric Power (AEP), FirstEnergy, AES Corporation, and Duke Energy.

According to the complaint, these utilities have collectively invested nearly USD6.5 billion in PJM-approved supplemental projects (transmission expansions or enhancements aimed at addressing local reliability needs, such as customer service improvements, load growth management, equipment maintenance, operational performance, risk mitigation, and infrastructure resilience) since 2017, without adequate scrutiny regarding their necessity, prudence, and cost-effectiveness.

PJM had presumed that the PUC of Ohio would oversee these projects, but OCC asserts that this oversight has been lacking, specifically in evaluating local projects.

OCC has put forth several recommendations, including requesting FERC to – review the local transmission projects undertaken by Ohio utilities; appoint an independent transmission monitor (ITM) to assist in overseeing these projects; and prohibit Ohio utilities from using formula transmission rates for these projects. The complaint also highlights ongoing concerns within RTOs like PJM, where transmission investments are often directed towards supplemental projects, receive less scrutiny and are eligible for formula rates, which are approved by FERC without a more rigorous rate case review.

OCC argues that these projects fall into a regulatory gap, as Ohio does not oversee the need for transmission facilities under 100 kV, neglects to review the cost-effectiveness of any transmission facilities, and does not scrutinise the rebuilds of existing transmission lines. The complaint points out that over three-quarters of the USD8.2 billion in Ohio transmission projects from 2017 to 2022 are classified as supplemental projects leaving consumers in Ohio without adequate assurance that the transmission rates are just, reasonable, and not discriminatory or preferential. This calls for a pre-construction review process for supplemental projects.

Under OCC's proposed solution, FERC would require Ohio utilities to seek approval for supplemental projects before construction begins. Additionally, utilities would be mandated to engage in a transparent stakeholder consultation process, including at least three meetings, the publication of local transmission needs, a list of potential solutions, and solicitation of stakeholder input.

However, PJM has stated that FERC had previously clarified that certain asset management activities, such as end-of-life decisions that do not expand the transmission system, fall under the purview of individual transmission owners. FERC is actively considering strengthening requirements around local transmission projects in its pending rulemaking for transmission planning, to demonstrate an awareness of the issue of local projects within the regulatory framework.

PJM approves changes to RTEP and proposed USD4.9 billion worth projects

The Board of Managers of PJM has authorised changes to the Regional Transmission Expansion Plan (RTEP) to help ensure the most efficient, economical and reliable supply of power across 13 states and the District of Columbia. The PJM Board on October 3, 2023 approved three reliability projects. These are:

Arizona Public Service's (APS) project of USD0.08 million, to adjust relay settings at the Riverton substation on the Riverton-Bethel Tap 138 kV line, to mitigate issues related to the 2025 deactivation notice of Brandon Shores 1 and 2 coal units in the APS zone by 2025.

Pennsylvania Electric Company's (PENELEC) USD2.25 million project, which involves removal of the 345 kV and 230 kV generator lead lines at the recently deactivated, coal-fired Homer City Generating Station, and install new station and separate AC station, separate protection and control schemes, and review and adjust relay protection settings by 2025.

APS's USD7.36 million project entailing installation of a series reactor on the 138 kV Cheswick-Springdale line by 2024. It was originally designated to Duquesne Light (DL) at the Cheswick substation; however, this has been relocated to the APS Springdale substation due to insufficient space at Cheswick. Consequently, the cost of the project has decreased from USD9 million to USD7.36 million.

In another development, PJM has made recommendations for over USD4.9 billion worth transmission projects to address concerns related to reliability, specifically focusing on accommodating the increasing demand from new data centres and the retirement of power plants within PJM's footprint. This announcement was part of PJM's Reliability Analysis Update by its Transmission Expansion Advisory Committee.

PJM had initiated planning Window 3 earlier this year with the objective of soliciting transmission proposals that would address reliability requirements. The latter are primarily driven by a notable increase in demand, amounting to 7,500 MW, due to the establishment of new data centres

in Virginia and Maryland. Additionally, the retirement of approximately 11,000 MW of power generation capacity across PJM's footprint in 13 Mid-Atlantic and Midwest states, including Washington, DC, has further accentuated the need for transmission projects to ensure grid reliability. The proposed plan not only addresses immediate needs but also offers long-term advantages, such as to streamline the process of connecting new power generation resources to the grid.

Dominion Energy is a significant contributor to these projects, responsible for building transmission infrastructure with a total investment of around USD2.5 billion. Other selected entities, including Exelon's Potomac Electric Power, Public Service Electric & Gas, FirstEnergy, LS Power, NextEra, and Transource, are also involved in various aspects of the proposed plan.

The selection of these projects was based on four primary criteria. They should – effectively fulfil the system's requirements through 2028; have the potential to expand beyond 2028 to accommodate future needs; whenever possible, utilise existing rights-of-way (ROW) to minimise environmental impact and community disruption; and receive approval from PJM of their estimated costs.

During the solicitation phase, PJM had received a total of 72 proposals from 10 different entities, including six incumbent transmission owners. The proposal is scheduled for another review by the committee on December 5, 2023, before it proceeds to PJM's Board for final approval.

NASEM releases report outlining plans for smooth energy transition in US

A recent report from the National Academies of Sciences, Engineering, and Medicine (NASEM) outlines a plan to ensure a smooth transition to net-zero carbon emissions in the US by 2050, with a strong focus on enhancing the country's electricity transmission infrastructure. This report represents the second instalment of a two-part series examining the nation's journey toward a decarbonised energy system. The report underscores that one of the most significant technological challenges to achieving a successful energy

transition is the risk of not adequately siting, modernising, and expanding the electrical grid. Without increased transmission capacity, the deployment of renewable energy sources may face delays, potentially leading to a temporary rise in fossil fuel emissions and hindering the nation's emissions reduction objectives. To address this challenge, the report advocates for the expansion of the high-voltage interstate electricity grid, emphasising the importance of streamlining permitting processes. Additionally, it calls for the modernisation of local electricity distribution systems and electricity markets, and the more aggressive adoption of energy-efficient practices.

The report also recommends that the US DOE and FERC take proactive steps to strengthen the nation's energy grid. This includes allocating funds from the IRA to support technical assistance and community engagement efforts.

NYPSC approves Reliable Energy New York plan of NYSEG and RG&E

New York State Electric and Gas (NYSEG) and Rochester Gas and Electric (RG&E), both subsidiaries of Avangrid, have received approval from the New York Public Service Commission (NYPSC) for their Reliable Energy New York plan. This is designed to facilitate essential investments in the areas of reliability, resiliency and customer service, and aligns with New York's ambitious Climate Leadership and Community Protection (CLCPA) goals, which include achieving 70 per cent renewable energy generation by 2030 and transitioning to a zero-emissions electricity sector by 2040.

The PSC ruling comes after more than a year of intensive engagement and negotiations involving the New York State Department of Public Service and various external stakeholders. It garnered support from eight intervenors, including the staff of the New York State Department of Public Service, International Brotherhood of Electrical Workers (IBEW) Local Union 10, and the New York Power Authority (NYPA).

With the rising impact of climate change, the grid investment requirements are also increasing to mitigate risks for the customers, with the rising share of solar and wind energy in power generation. The

Reliable Energy New York plan addresses these needs with investments in critical electric and gas projects.

The implementation of these improvements will result in an increase of approximately USD10 in the monthly bills of the average residential customer from November 1, 2023 onwards. The decision by the PSC has received positive reactions from several New York economic development organisations and unions.

SRP's for enhanced transmission and energy storage

The Salt River Project (SRP) (a not-for-profit organisation providing water and power to central Arizona) District Board of Directors have approved a series of strategies to guide the utility's actions between 2025 and 2035. These strategies, detailed in SRP's pioneering Integrated System Plan (ISP), represent a shift from traditional Integrated Resource Planning (IRP) to a more holistic approach that considers the evolving landscape of customer energy needs and the imperative of achieving SRP's 2035 carbon reduction goals.

The comprehensive ISP includes the addition of 7,000 MW of new renewable resources by 2035, with 6,000 MW from large-scale solar resources. Additionally, the report highlights the construction of large electrical transmission systems. Moreover, SRP is gearing up to incorporate 1,500 MW of new battery resources and 1,000 MW of long-duration energy storage (LDES) capacity from pumped hydro by 2035. This additional storage will significantly enhance grid stability and energy reliability.

SRP is already investing in over 1,100 MW of battery projects, scheduled to be online by the end of 2024. These resource additions are expected to contribute to 56 per cent reduction in SRP's water usage for power generation compared to 2005 levels.

Power reliability remains a paramount concern for SRP, particularly in light of recent peak energy demand scenarios. To ensure grid stability as SRP integrates more renewable resources and phases out coal-fired generation, the ISP recommends the addition of 2,000 MW of natural gas by 2035. The above plan also includes the construction of local electrical distribution networks and customer programmes such

as demand response and energy efficiency to effectively manage energy consumption in view of surging adoption of electric transportation, and electric heating and cooling. Developing the ISP was a meticulous two-year process that engaged a diverse array of stakeholders with insights from customer focus groups and surveys that involved over 1,400 respondents.

Entergy New Orleans announces USD1 billion OGI plan

Entergy New Orleans, a subsidiary of Entergy Corporation, has announced the launch of "Operation Gridiron (OGI)", an ambitious power infrastructure programme designed to make the city's grid stronger and better prepare for more frequent, stronger storms. The OGI plan has been developed in response to a request by the New Orleans City Council following Hurricane Ida in 2021. The proposal is now with the City Council for its consideration and approval.

If approved, OGI will provide New Orleans with one of the most storm-ready power infrastructure in the US. Under this plan, Entergy will:

- Invest USD1 billion over 10 years in two phases of 5 years each
- Upgrade thousands of poles to withstand 150 mph winds
- Strengthen 650 miles (1,046 km) of power lines
- Entergy is now planning to discuss the plan with the local residents.

Grid North Partners to build 19 transmission projects in Minnesota

Grid North Partners, a collaborative effort involving 10 utilities in the Upper Midwest, has unveiled plans for 19 electric transmission upgrades set to be implemented over the next three years. These projects will span across Minnesota and extend into eastern South Dakota, with the primary goal of alleviating congestion on the transmission system. By doing so, they aim to create a more efficient pathway for delivering low-cost renewable energy from western Minnesota to customers throughout the region.

Transmission congestion has emerged as a growing concern, particularly in

western Minnesota, in part due to the rapid construction of new energy generation resources outpacing the development of new transmission lines. Congestion essentially acts as a limitation on the electric transmission system, preventing the most economical energy generation, which is often low-cost renewable energy, from reaching customers throughout the region. As a result, there are higher electricity costs for consumers.

Among these projects is the installation of 51 miles (82.08 km) of 230 kV transmission line connecting Mud Lake in Crow Wing County and Benton County; 60 miles (96.56 km) of 345 kV CapX2020 Brookings 2nd circuit; 39 miles (62.76 km) of 345 kV CapX2020 Helena 2nd circuit; and 24 miles (38.62 km) of 115 kV Morris–Grant County transmission line, among others.

In total, the 19 projects organised by Grid North Partners represent an investment of USD130 million and are expected to be completed within three years

Grid North Partners comprises 10 utilities, including investor-owned and not-for-profit cooperative and municipal utilities. The members include Central Municipal Power Agency/Services (CMPAS), Dairyland Power Cooperative (DPC), Great River Energy (GRE), Minnesota Power (MP), Missouri River Energy Services (MRES), Otter Tail Power Company (OTP), Rochester Public Utilities (RPU), Southern Minnesota Municipal Power Agency (SMMPA), WPPI Energy, and Xcel Energy. The collective mission of this consortium is to address the challenges of congestion, enhance grid reliability, and support clean energy goals in the region.

Grain Belt Express receives approval from Missouri PSC to amend CCPN

Grain Belt Express Clean Line LLC (owned by Invenergy LLC) has received approval from the Missouri Public Service Commission (PSC) to amend its existing certificate of convenience and public necessity (CCPN) application, marking the last required state siting approval for significant enhancements to the project. This approval provides certainty about power delivery, which is crucial for ongoing and upcoming commercial contracting efforts. The USD7 billion Grain Belt Express electric

transmission infrastructure project entails the construction of an 800-mile (1,287.48-km) line to deliver 5,000 MW (3,500 MW previously) of wind energy from western Kansas to utilities and customers in Missouri, Illinois, Indiana and states farther east. Phase I of the project consists of an approximately 530-mile (853-km), $\pm$ 600 HVDC line between Ford County, Kansas and Monroe County, Missouri; two HVDC converter stations (in the two counties); a 1,000-foot AC transmission line from the HVDC converter station at the terminus of the Ford County HVDC transmission line to an existing substation; and an approximately 40-mile (64.3-km), 345 kV AC line from the HVDC converter station at the terminus of the Monroe County HVDC transmission line to an existing substation and a proposed substation, both in Callaway County, Missouri. The AC line is known as the Grain Belt Express Tiger Connector. This has received approval from Kansas Corporation Commission (KCC) and Missouri PSC. Grain Belt Express has acquired 95 per cent of easements for the Phase 1 main line between southwest Kansas and northeast Missouri.

Phase II of the project will extend the line from Missouri into Indiana, south of Terre Haute. In Kansas, the project includes the construction of approximately 384 miles (618 km) of HVDC transmission line and 2.5 GW Ford County interconnection facilities. In Missouri, it includes the construction of approximately 146 miles (235 km) of HVDC transmission line and 2.5 GW Missouri interconnection facilities.

To meet regional energy supply and reliability needs, the line's capacity has been increased to 5,000 MW, with 2,500 MW flowing to the line's mid-point delivery location in Missouri. FERC has acknowledged a request by Grain Belt Express to initiate a new open solicitation process to contract power delivery on Phase 1 of the line.

However, the Missouri Landowners Alliance is urging FERC to compel Invenergy to submit a new application for permission to offer capacity on the USD7 billion Grain Belt Express transmission project at negotiated rates. The group requested FERC to reject Invenergy's request to amend its existing negotiated rate authority for the project, as significant changes have occurred since its approval

in 2014. This action, if enforced, could potentially disrupt the project's financing and construction plans. Invenergy is attempting to streamline the approval process by amending its existing negotiated rate authority in a new docket and by requesting a shorter comment period. The company hopes to expedite the project's development, with the first phase slated to begin construction in 2025, contingent on FERC approval.

Grain Belt Express has made significant progress in the past year, including beginning the federal environmental review for Phase 1, selecting Siemens Energy Inc. to supply HVDC transmission technology, receiving a CCPN from Illinois Commerce Commission (ICC), and establishing a long-term supply agreement for overhead conductor cable with Prysmian Group North America. In June 2023, KCC also granted an amended approval of the Grain Belt Express transmission project to allow for phasing.

Full construction is expected to begin around the start of 2025, pending federal permitting approvals.

Developers seek Minnesota PUC approval for 345 kV project

Project developers of the 345 kV Big Stone South–Alexandria–Big Oaks transmission project have filed for a Certificate of Need and route permit for the eastern segment of the project between the Alexandria and Big Oaks substations, with the Minnesota PUC on September 29, 2023.

Great River Energy, Minnesota Power, Otter Tail Power Company, Missouri River Energy Services and Xcel Energy, are developing the project together, which includes two segments – Eastern (Alexandria–Big Oaks line), and Western (Big Stone South–Alexandria line).

Western Segment: The 100-mile (161-km) segment extends from the Big Stone South substation in South Dakota, to the existing Alexandria substation in Minnesota. It proposes the establishment of a new transmission line between Otter Tail Power's Big Stone South substation and the Alexandria substation owned by Missouri River Energy Services.

Eastern Segment: The 105-mile to 108-mile (169-km to 174-km) eastern segment is

designed to introduce a new transmission circuit on existing structures established as part of the CapX2020 Fargo–St. Cloud and St. Cloud–Monticello projects, connecting Alexandria and a new substation on Xcel Energy property near the Sherco power plant in Becker.

Xcel Energy is leading this Certificate of Need application for the Minnesota portion of the project and route permit application for the eastern segment on behalf of the developers. Otter Tail will lead the route permit application for the western segment and plans to file the application in the fourth quarter of 2024. Otter Tail and Western Minnesota are also expecting to file a facility permit application in South Dakota, along with any other applicable permits required within South Dakota, for the portion of the western segment that will be located in South Dakota.

The 345 kV Big Stone South–Alexandria–Big Oaks transmission project is expected to cost about USD606.5 million to USD699.4 million.

The project was studied, reviewed and approved as part of the Long-Range Transmission Planning (L RTP) Tranche 1 portfolio by MISO's Board of Directors in July 2022 as part of its 2021 Transmission Expansion Plan (MTEP21) report. This project, situated in Minnesota and north-eastern South Dakota, aims to enhance the delivery of reliable energy to consumers and create new avenues for the incorporation of additional renewable energy resources within the Upper Midwest. By adding extra capacity, the project seeks to address current capacity limitations, maintain electric system reliability, alleviate grid congestion, and enable cost-effective wind energy from western Minnesota and the Dakotas to reach consumers across the region.

In addition, Otter Tail Power Company and Missouri River Energy Services have scheduled public meetings during October 16, 2023 to October 24, 2023 to discuss the western segment of the project with key stakeholders.

Xcel Energy proposes route for Minnesota Energy Connection line

Xcel Energy has submitted two proposed route options to state regulators for the Minnesota Energy Connection transmission

line. The purpose of this line is to connect new, low-cost wind and solar energy from southwest Minnesota to the grid, ensuring that customers continue to have access to reliable and affordable electricity.

The proposed transmission line is a double-circuit (D/C), 345 kV, 175-mile (281.6-km) line designed to carry up to 4,000 MW of new renewable energy. This renewable energy will replace electricity previously generated by the retiring Sherco coal plant.

To comply with the route permit application process, Xcel Energy submitted two potential route options, which follow existing corridors where feasible, such as roads and existing transmission lines. The company has strived to minimise the impact on land use, agricultural operations, natural resources, cultural and historical sites, and recreational areas. Southwest Minnesota boasts some of the most abundant wind resources in the US and the proposed route options are a significant step towards utilising these resources effectively.

Xcel Energy has been actively engaging with local governments, landowners, and other stakeholders in the regions affected by the proposed route options. Over the course of a year, it introduced the project to the community and solicited feedback on the potential impact of different routes on land use. The Minnesota PUC and Minnesota Department of Commerce will review both the route permit and certificate of need application filed by Xcel Energy for the project. This review process typically takes 12 to 15 months and allows key stakeholders to provide input.

If both the certificate of need and route permit are approved, construction of the transmission line is expected to commence in late 2025, with completion in late 2027. The project represents an investment of over USD1 billion for the region. Xcel Energy has also invited proposals from renewable energy developers for new energy generation such as wind turbines, to connect to the transmission line once it is operational.

MISO selects ATXI to develop 345 kV transmission line in Missouri

MISO has selected Ameren Transmission Company of Illinois (ATXI), a subsidiary of Ameren Corporation, along with Missouri

Electric Commission for a USD84 million transmission project in northwest Missouri. This is the second competitively bid project from the LRTP Tranche 1 portfolio approved by MISO's board of directors last year.

The Fairport to Denny to Iowa/Missouri State Border 345 kV Competitive Transmission Project includes two 345 kV lines and a new Denny substation near the existing Fairport substation. The first line spans 42-mile (67.6-km), from Denny to the Missouri/Iowa State Border and the second 345 kV line will connect the Denny substation to the Fairport substation.

Ameren will now move forward on executing the Selected Developer Agreement following a rigorous competitive selection process that included nine proposals from four developers to construct, own, operate and maintain the project. MISO issued an RfP for the project on December 5, 2022, and developers had until May 19, 2023, to complete submissions. This is the second of five competitive projects identified out of LRTP Tranche 1 to complete the competitive selection process. The competitive selection process for the remaining three will continue through the first half of 2024. The project is expected to be in service by 2030.

ITC schedules public meetings for Helix–Hiple transmission project

ITC Holdings (ITC) has planned to engage with the public in various townships to discuss the construction of the Helix–Hiple transmission line project.

The project entails the construction of the new Helix substation, along with an approximately 50-mile (80.5-km), 345 kV transmission line from the Michigan/Indiana border in Branch County to a new ITC Helix substation in Calhoun County. The broader LRTP project aims to interconnect Indiana and Michigan, which also includes construction of an approximately 40-mile (64.4-km) line from the Oneida substation in Oneida Township to the Nelson Road substation in New Haven Township.

The public meetings will provide an informal opportunity for the project team to address questions and showcase detailed plans for the proposed transmission line. Representatives of ITC will meet with the

public in several townships (Butler, Girard, Gilead, Bethel, Batavia, and Union) and counties such as Branch, between October 12, 2023 and October 26, 2023.

In August 2023, ITC had finalised its primary and secondary route selections, following an extensive two-year review process. However, the final route for the transmission line will be subject to approval by the Michigan PSC. The project was identified as being in the public interest and necessary to import more power to the state based on a 2020 study conducted by MISO. An application for the proposed transmission line is yet to be filed with the MPSC. Once filed, it will be treated as a contested case with a one-year deadline for MPSC to either grant or deny the request for the new transmission line.

Construction on the Helix substation is scheduled to begin by the fourth quarter of 2025 and complete by 2026, while transmission line construction works are scheduled for 2029 and 2030.

NY Transco deploys OHL monitoring system at NYES project

New York Transco (NY Transco), owned by affiliates of Con Edison, National Grid, Avangrid, Inc. and CH Energy Group, has deployed an overhead line (OHL) monitoring system on its newly energised New York Energy Solution (NYES) electric transmission project. The advanced, non-contact OHL monitoring system has been delivered by LineVision, a global provider of such systems.

The NYES project included the modernisation of 1930s' era 54-mile (87-km) transmission corridor with new modern, storm-resilient monopoles, and several new and improved electric substations to relieve congestion and facilitate the flow of clean energy to homes and businesses in furtherance of New York State's goals. Following the project's energisation, LineVision's innovative technology was incorporated into strategic sections of the new NYES assets, leading to the efficiency, resilience, and health of this critical grid infrastructure.

This technology will provide NY Transco with real-time situational awareness and rapid alerting if anomalies are occurring with the conductor's performance. It also uniquely allows the operators monitoring

NYES to track all phases of power with a single monitoring system that accomplishes dynamic line ratings and greater visibility of the asset's behaviour.

Great River Energy to hold open house for Appleton–Benson project

Great River Energy has planned to hold open houses for its Appleton–Benson transmission line project. The company, in collaboration with Otter Tail Power Company, Missouri River Energy Services, Benson Municipal Utilities, and Agralite Electric Cooperative, has proposed the construction of a 28-mile (45.06-km), 115 kV transmission line between Appleton and Benson in west central Minnesota.

The line project aims to enhance the reliability of the transmission system in the region. Approximately 20 miles (32.19 km) of the proposed route will involve replacing an existing 41.6 kV transmission line with the new 115 kV line, which will be constructed primarily with wood poles, 60 to 90 feet above ground, generally 300 to 400 feet apart. Line angles and changes in direction might require the support of guy wires and anchors or steel poles on concrete foundations. A final design will determine the span distances and need for speciality poles.

Open houses are scheduled for November 1, 2023, at the Appleton Civic Center in Appleton, Minnesota and November 2, 2023, at McKinney's in Benson, Minnesota to provide information about the project to interested property owners and community members. These events will provide an opportunity for community members to gather information about the project.

New York Transco energises RTS transmission project

Transmission developer, New York Transco, has announced the early energisation of the Rock Tavern to Sugar Loaf (RTS) electric transmission project in Orange County, New York, on September 27, 2023. This milestone was achieved six months ahead of schedule. The project involved the overhaul of an aging 115 kV transmission line situated within an existing electric transmission corridor spanning New Windsor, Hamptonburgh, Blooming Grove, and Chester. The construction,

supported by New York union labour, replaced century-old 115 kV transmission lattice structures with modern monopoles. Additionally, it upgraded the existing Rock Tavern substation in New Windsor and rebuilt the Sugarloaf substation in Chester.

The RTS project is in line with New York State's clean energy goals as outlined in the CLCPA, which include achieving 70 per cent renewable energy generation by 2030 and transitioning to a zero-emissions electricity sector by 2040. The RTS project enhances New York Transco's recently energised NYES and also augments the network's capacity to transmit increasing quantities of clean energy. Furthermore, the upgraded infrastructure bolsters the reliability and resilience of the transmission system, ensuring consistent electricity supply on both normal and adverse weather days.

The RTS project was selected as part of the Public Policy Transmission Need (PPTN) for AC Transmission Upgrades through a competitive process led by the New York Independent System Operator in April 2019.

Ameren Illinois to develop new transmission lines

Ameren Illinois, a subsidiary of Ameren Corporation, is advancing plans for new transmission lines in south and west McLean County, and has scheduled public meetings from October 9, 2023 to October 23, 2023 to discuss the projects with stakeholders. The Central Illinois Grid Transformation Program aims to construct or rebuild 380 miles (611.55 km) of lines across 13 counties in Illinois, which will be carried out in collaboration with Ameren Illinois.

The new transmission lines are rated up to 345 kV to bolster the energy grid's capacity and reliability. The grid will be more resilient to storm damage, as many H-frame or single-pole structures will be replaced with new steel monopoles. The lines will also promote access to a diverse set of energy sources, better enabling energy import from the lowest-cost supplier.

However, there are concerns about the line projects' impact on avian wildlife, as certain route options pass near the Schroeder Nature Preserve, which is home to many bird species. Some route

alternatives have been proposed that would minimise the impact on the preserve, but the final routes are yet to be determined and filed with ICC.

The project is currently seeking community feedback and will continue through 2024, with installation and service expected by 2030.

In another development, Ameren Illinois has received approval from ICC to proceed with the construction of a new transmission line in LaSalle County, with the aim of enhancing energy reliability for local residents and businesses. The project entails construction of a new, 11-mile (17.70 km), 138 kV transmission line to connect the Corbin substation in Oglesby to the North Utica substation near North Utica in Illinois. This will establish additional energy pathways to the region, thereby reducing the frequency and duration of power outages. The project will be carried out through a competitive bidding process and will involve Illinois-based union electric workers.

Ameren Illinois had facilitated a series of meetings to engage with the public and key stakeholders in order to identify the most suitable route for the new transmission line. It had submitted the application for the project to ICC in September 2022, and the final route and CCPN were approved on August 31, 2023. The project is scheduled to commence construction in the spring of 2024, and it is anticipated to be operational by the summer of 2025.

Con Edison plans for substation expansion in Long Island

Consolidated Edison Inc. (Con Edison) has revealed plans to enhance its electrical infrastructure on Long Island by adding five transmission and distribution (T&D) substations by 2028. These projects are a vital component of Con Edison's USD14.6 billion three-year spending outlook, which is a part of the company's commitment to achieving 100 per cent green electricity generation by 2040.

One of the prominent initiatives is the Brooklyn Clean Energy Hub project in Vinegar Hill, New York with an estimated cost of USD810 million, which received approval from NYSPSC in April 2023. It is a transmission substation project with a capacity of up to 1,500 MW, aimed at

enhancing New York's power facilities by serving as a connection point for future OSW power. Construction of the Brooklyn Clean Energy Hub is scheduled to commence in mid-2024, with full development expected by 2028.

Furthermore, Con Edison's plans encompass transmission stations in the Vinegar Hill neighbourhood of Brooklyn (scheduled to be finalised by 2025); and a T&D substation as a part of Eastern Queens project, which is closely tied to the modernisation efforts at John F. Kennedy International Airport and is expected to bifurcate the existing network (slated for completion in 2028).

In conjunction with similar projects in Brooklyn and Staten Island, Con Edison is on track to add 900 MW of transmission capacity by 2025.

US DOE selects KCEC to receive funding for building BESS

The US DOE has announced its selection of Kit Carson Electric Cooperative (KCEC) to receive USD23 million in funding, with USD15.4 million from federal sources and a USD7.7 million recipient cost share.

This funding has been allocated to support the building of a modern, intelligent, distributed battery energy storage system (BESS), which aims to enhance the power grid's resilience and reliability in northern New Mexico and ensure the delivery of affordable, clean energy to local communities.

The funding is part of the GRIP Program, which aims to enhance grid flexibility and bolster resilience against extreme weather and climate change. Supported by the BIL and administered by the DOE's Grid Deployment Office (GDO), the GRIP programme leverages federal and private investments to – ensure that communities nationwide have a reliable grid capable of withstanding extreme weather events, and promote the delivery of clean and affordable energy.

With the grant, KCEC plans to implement BESS and microgrid capabilities in three locations: Picuris Pueblo, Taos Ski Valley, and El Rito West, which will enable it to conduct public safety power shutoffs while maintaining critical power loads and essential services locally.

FERC approves ISO-NE's proposal for SATOAs

FERC has recently given its approval to a proposal presented by ISO-NE, which allows energy storage technology to play a vital role in ensuring the reliability of the transmission system. The initiative, known as Storage as Transmission-Only Assets (SATOAs), involves various storage resources (including battery technology and pumped hydro), which are specially designed for the sole purpose of enhancing the reliability of the transmission system.

SATOAs will not participate in the competitive electricity markets and consequently, their presence will have minimal impact on wholesale electricity prices. SATOA rules do not apply to the many other energy storage resources that are already operating in the markets. This includes nearly 2,000 MW of pumped storage and over 600 MW of existing and new battery storage resources that have secured commitments in a Forward Capacity Auction for the 2024-25 commitment period. These rules also do not constrain approximately 18,000 MW of battery resources proposed in ISO-NE's Interconnection Request Queue or any future projects seeking market participation. SATOAs will be owned and maintained by transmission companies, but their use will be overseen by ISO-NE system operators. They will be deployed under specific system conditions to prevent localised overloads following at least two unplanned equipment outages on the transmission system. The construction of SATOAs will depend on their selection in the open regional system planning process, similar to how reliability-based system upgrades are currently managed.

NERC report reveals issues in California BESS

NERC released its comprehensive report on disturbances observed in 2022 among California BESS facilities, on October 2, 2023. The report underscores concerns related to poor commissioning practices that have contributed to unreliable performance of IBRs.

The report examines the two widespread losses of BESS in California, caused by normally cleared faults in the Western Interconnection that occurred on March 9,

2022, and April 6, 2022. These were the first major events involving BESS facilities, and represent a significant data point in NERC's ongoing investigation into IBRs tripping offline or reducing output in response to grid disturbances. The report points out that BESS facilities might exhibit similar systemic performance problems as solar photovoltaic (PV) resources. Notably, all BESS facilities involved in the disturbances experienced partial plant tripping caused by inverter protection, leading to the inability to ride through typically cleared single-line-to-ground grid faults. NERC thus recommends that industry swiftly eliminate these problems to prevent the proliferation of systemic risks. Additionally, the report advises transmission owners (TOs) and generation owners (GOs) to identify unreliable ride-through performance issues before commercial operation, and enforce the requirements throughout the interconnection process. Poor commissioning practices are identified as a significant contributor to the unreliable performance of IBRs, and NERC is actively working on commissioning best practices to ensure that installed facilities align with the studied models. NERC also plans to conduct a model quality assessment of this event and issue an alert as needed, emphasising the importance of accurate modelling. Finally, since adequate monitoring is crucial for performance and event analysis, the report highlights the need for data to allow for the thorough analysis of abnormal performance and identifies ongoing projects to ensure data availability.

The GOs are also urged to check with their inverter manufacturers to ensure they are not prone to tripping under various grid fault conditions, including unbalanced AC and DC issues. Inverter and plant-level recording functions should be configured according to interconnection agreements, including enabling fast-logging and ensuring meter data remains accurate during grid fault events.

ERCOT passes NPRR 1186 to stipulate energy storage batteries maintain SOC

The Electric Reliability Council of Texas (ERCOT) has passed a new rule known as Nodal Protocol Revision Request (NPRR) 1186, which specifies that energy storage

batteries must maintain a particular state of charge (SOC) based on the ancillary services they provide. This rule, which received unanimous approval from ERCOT's board of directors, is intended to assess the capability of energy storage resources during critical hours when dispatchable generation is required. While grid officials believe that the rule will enhance the effectiveness of batteries in maintaining grid reliability, some advocates for energy storage are expressing concerns that the rule could discourage further development by imposing punitive penalties and reducing flexibility, especially during grid emergencies. Furthermore, they contend that NPRR 1186 imposes different and more severe performance penalties on energy storage resources compared to other market participants in ERCOT, thus being inherently discriminatory.

The implementation of this rule may have substantial implications for the growing energy storage market within ERCOT. As of June 2023, approximately 3,300 MW of battery capacity existed in the ERCOT system, while the SOC proposal indicates an estimated increase to 9,500 MW by October 2024. The rule's final approval lies with the PUC of Texas, which is expected to make a decision, possibly in November 2023. Parties with concerns have the opportunity to appeal ERCOT's decision to the PUC prior to the vote.

APS and TEP reveal resource plans for Arizona

APS and Tucson Electric Power (TEP) have revealed their resource plans, outlining significant additions of renewable energy, energy storage, and other resources over the next 15 years, as detailed in documents submitted to the Arizona Corporation Commission.

APS plans to add about 2 GW of battery storage by 2027 and will issue frequent all-source solicitations to meet its energy needs. For instance, its 2023 request for proposals seeks at least 1,000 MW, including 700 MW of renewables and transmission options. Emphasis is placed on the need for high-voltage transmission to access out-of-state wind resources, especially in New Mexico and other Rocky Mountain states, which offer significant value to customers due to their low cost and output diversity.

APS also intends to invest in over 6 GW of solar and wind power, along with energy efficiency, demand response, and microgrids, as part of its comprehensive strategy.

TEP plans to add about 1.33 GW of battery storage by 2038. Its plan may evolve over time to adapt to changing circumstances, but for now also includes the addition of 2.24 GW of wind and solar power, and 400 MW of gas-fired generation.

Both APS and TEP are responding to the surging demand for energy in Arizona, driven by population growth and industrial development. These plans underscore their commitment to transition towards cleaner, more reliable, cost-effective and sustainable energy sources and storage solutions, while ensuring that they can meet the evolving energy needs of their customers, as they shift away from coal-fired generation.

SRP initiates RFI to solicit insights on non-inverter-based LDES technologies

SRP has released a RFI to solicit insights from vendors specialising in non-inverter-based LDES technologies. SRP's objective is to enhance its understanding of the performance and cost dynamics associated with these specific LDES technologies.

The insights garnered from this RFI will play a pivotal role in shaping SRP's approach for an upcoming RfP, which is anticipated to be issued in mid to late 2024. The RFP will target pilot LDES projects with a commercial operation date set for 2027-28.

SRP is inviting information for demonstration projects with a minimum capacity of 5 MW, extending up to 50 MW. While proposals for larger projects are not ruled out, projects exceeding 50 MW are unlikely to be included in the subsequent RFP, although SRP may contemplate them under future procurement endeavours. The storage technologies eligible for consideration must be non-inverter-based or possess mechanical inertia. SRP is open to exploring technologies that can be integrated with existing gas or steam turbines, but for the purposes of the demonstration project, respondents are expected to provide a completely new system, encompassing the turbine.

SRP is aiming for a target duration of 10 hours at the rated discharge capacity. Nevertheless, LDES technologies offering durations ranging from 8 to 12 hours will be considered. While SRP's primary interest lies in power purchase agreement (PPA) options for the future RFP, the RFI mandates respondents to furnish a capital cost estimate. Additionally, operational and maintenance cost details are sought to support the RFI process.

This initiative aligns with SRP's commitment to delivering reliable and sustainable energy to its customers while working towards its 2035 and 2050 sustainability goals.

The responses to the issued RFI are due by December 22, 2023.

Canada's Hydro-Québec announces CAD90 billion investment

Canadian Hydro-Québec has unveiled a plan to invest a minimum of CAD90 billion for the development of new power generation facilities and transmission lines. The primary goal of this growth strategy is to steer the province away from fossil fuels and towards clean energy. Hydro-Québec is set to construct approximately 5,000 km of fresh power transmission lines, triple its wind power generation, expand existing hydropower facilities and establish new ones, and enhance energy efficiency through collaboration with its existing customer base. The projected cost for executing this extensive plan up to 2035 is estimated to fall within the range of CAD155 billion to CAD185 billion. To secure the essential financing, Hydro-Québec will explore alternative funding sources, including the issuance of bonds and other external financing options.

(CAD1=USD0.73)

Hydro One to prioritise three transmission projects in Ontario

Canadian Hydro One Inc., which is Ontario's largest electricity T&D company, has planned to reinforce critical infrastructure in northeastern and eastern Ontario, responding to a directive from the state government aimed at addressing the escalating demand for electricity in these regions.

The three designated priority transmission projects are designed to address capacity constraints and accommodate the surging electricity demands in various sectors, including transportation, mining, steel, and manufacturing. These projects are as follows:

Mississagi–Third Line: This entails an approximately 75-km, 230 kV transmission line connecting the Mississagi Transformer Station (TS) (located west of Sudbury) with the Third Line TS in Sault Ste. Marie.

Hanmer–Mississagi Line: This project involves the construction of an approximately 205-km, 500 kV transmission line that links the Hanmer TS (in Greater Sudbury) with the Mississagi TS west of Sudbury.

Greater Toronto Area East Line: This includes the establishment of an approximately 50-km, 230 kV transmission line that connects either the Cherrywood TS in Pickering or the Clarington TS in Oshawa with the Dobbin TS in Peterborough.

Under the guidance of the Minister of Energy, the Ontario Energy Board (OEB) has been directed to amend the transmission license of Hydro One, which will serve as the gateway for the development and construction of the three designated priority transmission lines. The latter will play a pivotal role in meeting the electricity requirements of expanding industries in north-eastern and eastern Ontario.

These projects underscore a collaborative partnership between Hydro One and First Nations, wherein the latter will invest in a 50 per cent equity stake in the transmission line component of these projects upon their completion, as per Hydro One's Equity Partnership model.

In response to the escalating demand for electricity, the Independent Electricity System Operator (IESO) has recommended that these three new transmission lines should be operational no later than 2029.

NL Hydro to upgrade Labrador Island Link in Canada

Reportedly, Newfoundland and Labrador Hydro (NL Hydro) has planned to invest CAD28 million over four years to add and replace components of the Labrador Island Link, which is a 1,100 km, 900-MW HVDC transmission line that carries electricity

from a generating facility at Muskrat Falls to the island of Newfoundland. The line runs from central Labrador, crossing the Strait of Belle Isle, and extending to Soldiers Pond on the Avalon Peninsula. The project was developed by Nalcor Energy, which was later merged into NL Hydro.

The decision of upgrading the line follows the findings of four investigations into failures on the link during the winter of 2022-23, with the most significant issue being the occurrence of galloping (a phenomenon that results from various factors, including wind and ice, causing power lines to move up and down), which caused turnbuckles on the transmission poles to snap.

The turnbuckles that hold the wires were not designed to withstand galloping, so NL Hydro plans to address this by swapping out some equipment, including the turnbuckles, and adding specialised devices to prevent galloping in high winds. The project will be carried out by an external contractor in remote areas of the province.

The first year of the four-year plan is nearly complete, with work concentrating on the most remote sections. The link was initially designed for 900 MW, but it is currently approved for 700 MW. NL Hydro had planned to perform tests at the maximum capacity in the fall, but these have been postponed to April 2024. The decision is based on the need to address a few items related to the software supporting the operation.

The CAD28 million investment is expected to enhance the stability and reliability of the transmission line, especially during harsh winter conditions. (CAD1=USD0.73)

Wataynikaneyap Power connects First Nations to grid in Canada

Canada's Wataynikaneyap Power has announced the electrification of Wunnumin Lake First Nation and connected Kasabonika Lake First Nation to the provincial power grid, both as part of its CAD1.9 billion Wataynikaneyap Power Transmission Line.

Wataynikaneyap Power is a licensed transmission company, majority-owned by a partnership of 24 First Nations along with Fortis Inc. and other private investors, and regulated by OEB.

Wunnumin Lake First Nation was energised on May 25, 2023, and linked to the provincial power grid on September 21, 2023. The new transmission system has linked Wunnumin Lake's community distribution system to the Ontario grid through a total of 604 km of line originating from the Dinorwic substation, and five substations. Hydro One Remotes Communities Inc. (HORCI) will serve Wunnumin Lake for local electricity distribution.

Kasabonika Lake First Nation is located about 600 km north of Thunder Bay, Ontario. There are no all-season roads into the community; it is only accessible by airport and ice roads. The Wataynikaneyap Power transmission system connects this community's distribution system to the Ontario grid through a total of 673 km of line and six substations, originating from the Dinorwic substation. Kasabonika Lake will also continue to be served by HORCI for the local distribution of electricity.

The transmission project entails the construction of approximately 1,800 km of transmission and distribution infrastructure ranging in voltage from 25 kV to 230 kV, along with 22 substations in Northwestern Ontario, to connect 17 remote First Nations communities to the Ontario power grid, alleviating their dependence on diesel-generated electricity. Pikangikum First Nation was the first community to be connected in December 2018. Once completed, it will be the largest electric infrastructure project ever implemented to connect remote communities in Ontario, including First Nations, with electricity generation and distribution systems that are not currently connected to the provincial transmission grid.

The entire Wataynikaneyap Power Transmission Line project is scheduled to be completed by 2024.

(CAD1=USD0.73)

Nova Scotia to set up 345 kV link with New Brunswick in Canada

The government of Nova Scotia (NS) in Canada has unveiled its 2030 Clean Power Plan to help achieve the province's clean energy target. Under this, it has proposed the NS–New Brunswick (NB) Regional Transmission project to improve connectivity with the North American

Grid. With this, both the provinces have agreed to invest in clean energy sources and have dropped their plan for the Atlantic Loop project, which aimed to link the power grids of Newfoundland and Labrador, Nova Scotia, New Brunswick, Prince Edward Island and Quebec, with an investment of CAD9 billion.

This new 345 kV NS–NB line is needed to manage renewables, and boost reliability and resiliency. It will run from Onslow to Salisbury, enabling power exchange of over 500 MW by 2028. Further, extending this line to Point Lepreau would enable greater access to NB, New England, and Quebec. This new line and extension can be completed by 2029 at a total cost of CAD1.4 billion, far less than the Atlantic Loop project. It also supports regional population growth, enhances power reliability, and enables more energy trading. The project will be implemented in two stages: Stage 1 – Salisbury (NB) to Onslow (NS) line; and Stage 2 – Salisbury (NB) to Point Lepreau (NS) line.

As part of this project, Nova Scotia Power, a vertically integrated electric utility in Nova Scotia, Canada, has planned to upgrade the transmission line connecting Nova Scotia with New Brunswick. The proposal includes the construction of a new 345 kV transmission line from Onslow, Nova Scotia, to the New Brunswick border, along with an upgrade to the power substation in Onslow. The new transmission line will feature its own steel towers and run in parallel to an existing 96-km line with the same capacity. Nova Scotia Power has formally submitted an application to the Nova Scotia Department of Environment and Climate Change for approval of this work, emphasising that this transmission line will serve as a vital regional link. It will enable Nova Scotia Power to meet provincial renewable energy targets, balance wind generation, and enhance grid connectivity.

New Brunswick Power, a vertically integrated power company operating in the Canadian province of New Brunswick, will be constructing 65 km of the new transmission line on its side of the border, along with the extension to Point Lepreau. However, its plans are yet to be officially registered for environmental approval, but this is expected in the coming months. The estimated cost for the entire system,

including the transmission lines from Onslow, Nova Scotia, to Salisbury, New Brunswick, and the extension to Point Lepreau, is approximately CAD1.4 billion. The provinces are seeking to share this cost with Ottawa, and discussions about funding details are ongoing. Nova Scotia Power has already received significant funding from Ottawa for preliminary studies on the new transmission line, and it is exploring additional funding options, including programmes and tax credits from Ottawa and the Canadian Infrastructure Bank.

If approved, the construction could commence in the fall of 2024, with the new transmission line expected to be operational by the end of 2027.

In addition, the Clean Power Plan also focuses on hydrogen-capable, flex-fuel generators (fast-acting generation); wind and solar projects; 300-400 MW batteries and renewables integration projects; over 450 MW emergency/back-up oil generators; and peak management, demand response and efficiency investment. The plan centres on affordability, and ensures that the path to 2030 protects NS ratepayers (who already face high power bills) from being burdened with additional excessive risks or uncontrolled costs. Implementation of this plan will ensure that NS avoids decades of financial and technological lock-in, creates flexibility both on the path to coal closure by 2030, and also opens doors for future investments in growth sectors like offshore wind, hydrogen, batteries, etc. The plan further states that the focus of all the major electricity legislation or investments should be on the former's core actions, and to close the coal plants on time.

With this, the province has also received approval from the federal government to drop its plans for the Atlantic Loop project, which involved extending transmission line to import hydroelectric power from Quebec, as a solution to replace coal. However, the project's costs have tripled since 2020 to CAD9 billion, and may not be ready before 2030 due to supply chain issues. Earlier during the month, the province also introduced amendments in the Electricity Act to add more renewable energy to the grid and clear a path for energy storage solutions. The amendments will allow the government to quickly approve innovative energy storage projects that NS Power (a

vertically integrated electric utility in NS and owned by Emera Incorporated) aims to build, and take advantage of committed federal funding to reduce the cost for ratepayers. This will help advance the use of batteries for storing excess renewable energy for use during peak demand hours, which makes the grid more stable.

This is in line with NS's climate change goals of reducing dependency on coal and producing 80 per cent of electricity from renewables by 2030, though the province expects to reach 88 per cent renewable energy before that deadline.

(CAD1=USD0.73)

Latin America

Brazil seeks energy transition partnerships with BNDES

The Ministro de Minas e Energia (MME) or Minister of Mines and Energy of Brazil has had discussions with the Banco Nacional de Desenvolvimento Econômico e Social (BNDES) or National Bank for Economic and Social Development, to seek partnerships in key areas such as energy efficiency, energy transmission, decarbonisation, green hydrogen, and energy transition.

BNDES is expected to serve as a crucial partner in expediting the implementation of projects integral to the energy transition. This partnership could involve strengthening technical cooperation, exploring potential financing avenues, and engaging the private sector to advance these initiatives. The overarching goal is to leverage Brazil's leadership in the energy transition.

The Secretário Nacional de Transição Energética e Planejamento or National Secretary for Energy Transition and Planning of the MME participated in a workshop on financing the transmission sector, which was organised by the BNDES with support from the MME. The workshop brought together investors and industry entities to delve into the role of BNDES in energy transmission projects and to address the specific challenges and requirements of the sector. The dialogue at the workshop revolved around aligning BNDES' planning with the needs of the transmission sector, with investments of

about BRL56 billion anticipated in the coming years in this sector.

The planning data presented during the workshop highlighted the growing electricity demand and the need for transmission infrastructure expansion to meet this demand. By 2024, an estimated 25,000 km of transmission lines are slated to receive investments.

In another development, Brazilian energy regulator, Agência Nacional de Energia Elétrica (ANEEL), conducted a workshop to clarify Auction No. 2/2023, which would take place on December 15, 2023. ANEEL's workshop engaged approximately 121 participants, including consultants, investors, and other stakeholders. Three lots are slated for auction this time, covering construction projects across states such as Goiás, Maranhão, Minas Gerais, Piauí, São Paulo, and Tocantins. The diverse array of projects has varying construction timelines, ranging from 60 to 72 months.

The workshop aimed to provide stakeholders with comprehensive information about the auction, explaining its specific features and addressing their queries.

(BRL1=USD0.21)

Brazil's ANEEL hosts clarification workshop for Auction No. 2/2023

Brazilian ANEEL hosted a oficina de esclarecimento (clarification workshop) for its upcoming Auction No. 2/2023, on October 23, 2023. Key representatives from the MME, Empresa de Pesquisa Energética (EPE) or Energy Research Company, Operador Nacional do Sistema Elétrico (ONS) or National Electric System Operator, and ANEEL, made presentations at the workshop.

Under Auction No. 2/2023, ANEEL will offer concessions for 4,471 km of new transmission lines and 9,840 MVA of substation capacity.

This auction is scheduled for December 15, 2023 and will be held at the B3 headquarters in São Paulo. It will encompass three distinct lots, each focusing on projects in the states of Goiás, Maranhão, Minas Gerais, Piauí, São Paulo, and Tocantins. Project timelines range from 60 to 72 months, with an estimated creation of 36,900 job opportunities.

Brazil's Eletrobras completes major transmission projects

Brazilian state-owned Centrais Elétricas Brasileiras SA (Eletrobras) has successfully completed the rehabilitation of a section of the 230 kV Blumenau–Joinville Norte transmission line between the future Joinville Sul substation (of Neoenergia) and the Joinville Norte substation in the northern region of Santa Catarina, ahead of schedule.

The project, which was authorised by ANEEL under Resolution No. 9,655/2021, became operational four months ahead of the authorised deadline. Eletrobras, through its subsidiary Eletrobras CGT Eletrosul, had previously completed the reconditioning of a parallel section of the 230 kV Blumenau–Joinville line in July 2023. The combined investments made in these two transmission lines total approximately BRL28.7 million. These projects are expected to contribute to an annual revenue increase of BRL3.9 million for the company.

In addition to these transmission line improvements, CGT Eletrosul also undertook significant upgrade works at the Blumenau substation in August 2023. It involved an investment of BRL20.7 million for the replacement of two transformers, providing enhanced reliability, safety and availability for power transmission to the Vale do Itajaí, North, South and Coast regions. Specifically, the project involved the replacement of the 150 MVA three-phase transformer TR3 (230/138 kV) on August 20, 2023; and the energisation of the new 150 MVA three-phase transformer TR4 (230/138 kV) on August 6, 2023. These services were also completed ahead of the deadline established by ANEEL, based on Authorising Resolution 10,921/2021 (a resolution that establishes that the authorisation grants for generation projects requested until March 02, 2022 will be granted without the requirement of access information to the feasibility of the project's connection). The replacement of this equipment is categorised as a major improvement, with a receita anual permitida (RAP) or allowed annual revenue estimated at BRL5.37 million.

With a transformation capacity of 1,962 MVA, the Blumenau substation connects to a total of 14 transmission lines, including

the 525 kV lines from Biguaçu, Curitiba, Campos Novos, and Curitiba Leste; 230 kV lines from Joinville Norte, Joinville, Gaspar 2-1, Gaspar 2-2, and Itajaí 1 and 2; and 138 kV lines from Blumenau 1 and 2, Ilhota, and Gaspar.

(BRL1=USD0.21)

Brazil to resume clean energy imports from Venezuela

Brazil's MME has held a meeting with the Ministro de Energía Popular para Energía Eléctrica (MPPEE) or Minister of People's Power for Electric Energy of Venezuela, on October 23, 2023, to discuss the resumption of importing renewable energy from the Guri hydroelectric plant in Venezuela to the northern Brazilian state of Roraima.

A joint working group comprising representatives from MME, the ONS, and the company overseeing Venezuela's electricity sector was established to expedite negotiations between the two nations. The group will verify the required procedures and technical prerequisites, along with operational agreements. It is anticipated that load and energy transmission tests to Brazil will commence in November 2023.

The resumption of energy imports from Venezuela was made feasible through a presidential decree signed in August 2023, when ongoing efforts to link Roraima to the Sistema Interligado Nacional or National Interconnected System were authorised. Roraima, which is currently the only Brazilian state not connected to the SIN, relies on diesel oil thermoelectric plants for its energy supply. Related infrastructure works have already commenced, and the state is expected to be integrated into the SIN by July 2025.

Cobra IS secures contracts for 1,950 km of lines in Brazil

Cobra IS, a subsidiary of VINCI, has secured three significant contracts for the construction of nearly 1,950 km of high-voltage transmission lines in Brazil. These contracts are a result of an auction organised by ANEEL, for approximately 6,000 km of new electrical transmission lines divided into nine lots. Cobra IS, through its Brazilian subsidiaries, emerged as the successful bidder for three of these lots.

The first is Lot 3, which is a PPP contract and involves the design, construction, and operation of a 349-km, high-voltage transmission line and the extension of two existing substations in Minas Gerais state. The associated investment for this project is estimated to be around EUR150 million.

The other two are design-build lots, with a combined value of approximately EUR570 million, for Companhia de Transmissão de Energia Elétrica Paulista (CTEEP). These contracts include Lot 1 – construction of 1,092 km of transmission lines and three new substations located in the states of Minas Gerais and Bahia, and Lot 7 – construction of 507 km of transmission lines and a new substation, in the states of Minas Gerais and Rio de Janeiro. These projects have a twofold purpose of enhancing the transmission of clean, carbon-free energy from upcoming production facilities such as PV farms and onshore wind farms in eastern Brazil, and also increasing the capacity of the national electricity grid.

(EUR1=USD1.07)

Brazil's ANEEL initiates public consultation for integrating storage systems into SEB

Brazilian ANEEL, has approved the initiation of a public consultation process to explore regulatory solutions for integrating storage systems into the Setor Elétrico Brasileiro (SEB) or Brazilian Electric Sector. This initiative is part of ANEEL's Regulatory Agenda for the 2022-23 cycle and aims to facilitate the regulatory adaptation necessary for the incorporation of storage systems (including pumped storage plants) to support the transition to sustainable energy practices.

The proposal outlines a three-cycle approach, each lasting 18 months, to address various aspects of electrical energy storage and regulatory adaptation:

First Cycle (2022-23): During this initial phase, discussions will focus on the characterisation of storage resources, defining the services they can offer. Topics related to market access and the removal of regulatory barriers for different services provided to the system will also be addressed.

Second Cycle (2023-24): In the second cycle, the focus will shift to open-cycle

reversible hydroelectric power plants (those not significantly impacting watercourses). The feasibility of developing regulatory sandboxes, revenue stacking for economic viability, and capturing more system benefits will be explored.

Third Cycle (2024-25): The third cycle will delve into more complex topics, including aggregators for various services, simulations in computational models and their impacts, and exploring new business models such as storage applications to mitigate curtailment and generation plant constraints. It will also involve deeper structural definitions related to revenue stacking. ANEEL's general objective is to facilitate the integration of new storage solutions into the Brazilian electricity sector, for which they have also identified five specific objectives and proposed a combination of eight normative (regulatory) and five non-normative (non-regulatory) solutions. The public consultation will provide a platform for stakeholders and experts to contribute to the development of regulatory frameworks for storage systems in Brazil, ensuring they play a significant role in the country's energy landscape.

Argentina's CAMMESA gets over 60 bids in priority transmission dispatch tender

Argentine state-owned wholesale electricity company, Compania Administradora del Mercado Mayorista Electrico SA (CAMMESA), has received more than 60 projects in its latest priority transmission dispatch tender for the third quarter of 2023. These projects include new initiatives, as well as those already under construction or in operation. The total associated installed capacity of these projects is 6.69 GW, with the largest among them being RPG Yuncon's 540 MW Yuncon wind farm, planned for the province of Neuquén.

Priority dispatch is granted to projects with private PPAs between generators and buyers, such as industrial facilities. CAMMESA offers two types of priority dispatch: the standard Mercado a Término de Energías Renovables (MATER) or Renewable Energy Term Market projects and a new modality called MATER Reference A projects. The latter, introduced through a rule amendment in May 2023, allows CAMMESA to grant priority

dispatch to renewable projects along congested transmission corridors, with the understanding that some of the associated production may be restricted. While MATER has been advocating for an increase in Argentina's installed wind and solar capacity, the lack of sufficient transmission capacity has been causing challenges. Demand for private PPAs from companies remains strong due to factors such as pricing, supply security, decarbonisation, and meeting local renewable energy targets.

Several projects are also taking advantage of a recent change that allows development companies to carry out work on the network to increase transmission capacity. So, companies such as Energy Point, Genneia, Windenergy Argentina, Luz de Tres Picos, and YPF Luz have proposed network expansion works.

The Cámara Argentina de Energías Renovables (CADER) or Argentine Chamber of Renewable Energies is working on a legislative proposal to resolve the same. One of the main obstacles identified is access to financing.

CAMMESA is expected to make capacity allocation decisions by the end of October 2023.

Argentina's ENRE approves transmission projects across various provinces

Argentina's energy regulator, Ente Nacional Regulador de la Electricidad (ENRE) or the National Electricity Regulatory Entity, has approved two transmission expansion projects across the country.

Through its Resolution No. 756/2023, ENRE has granted authorisation for access and expansion of the electrical energy transmission system in Neuquén, as requested by the Neuquén Provincial Energy Entity, on behalf of Vista Energy Argentina. This endeavour encompasses various critical works to accommodate new electrical demand from the Bajada del Palo Oeste Field and involves modifications at the Loma Campana TS. The works include replacement of the 132/33/13.2 kV, 15/15/10 MVA transformer with one of 45/45/30 MVA; provision of a second 45/45/30 MVA transformer as a spare, and necessary adjustments for connection to the TS; and expansion of the 33 kV bus bars for the

installation of new connection fields for the second transformer and the exit of the medium voltage line towards the Bajada del Palo TS.

Article 2 of the same Resolution mandates that the involved companies must strictly adhere to the provisions laid out in Articles 5, 6, and 7 of ENRE Resolution No. 699/2023, dated September 20, 2023.

As per its Resolution No. 755/2023, ENRE has disclosed a request for the CCPN submitted by Empresa Distribuidora y Comercializadora Norte SA (EDENOR). This request pertains to the expansion of the power transmission system in the Province of Buenos Aires. The proposed work consists of two key components: construction and assembly of a delivery and measurement station, outdoors and at 132 kV, to supply electrical energy to its client Transclor SA in the Pilar Industrial Park; and the construction of a 132 kV underground cable power supply pipeline – Ternas 689/690. Articles 5 and 6 of the same resolution establish the technical requirements that EDENOR must fulfil in order to undertake the requested work.

Through its Resolution No. 728/2023, pertaining to a request made by Transmisión Comahue SA (TRANSCOMAHUE), which was submitted at the request of the provinces of Río Negro and Neuquén, ENRE plans to expand the electricity transmission system in Patagonia. The key components of this project include: a new 132/33 kV TS at Dina Huapi substation; a 132 kV high voltage line of 108 km, connecting Alicurá to Dina Huapi substations; a 132 kV high voltage line extension of about 20 km will run from Dina Huapi to Bariloche TS; and two 132 kV fields at the Bariloche TS (under TRANSCOMAHUE's jurisdiction) and the Alicurá substation [under Transporte de Energía Eléctrica en Alta Tensión SA's (TRANSENER) jurisdiction].

ENRE's Resolution No. 725/2023 concerns a request from state-owned distribution company, Empresa de Transporte de Energía Eléctrica por Distribución Troncal de la Provincia de Buenos Aires Sociedad Anónima (TRANSBA), made at the behest of the Empresa Distribuidora de Energía Atlántica (EDEA) or Atlantic Energy Distribution Company, to expand the electricity transmission system in the Province of Buenos Aires. The project includes: a new

132/33/13.2 kV TS at the town of Ayacucho in Buenos Aires; and a 132 kV high voltage line extension involving the sectioning of the existing 132 kV Tandil–Las Armas line (this includes the construction of a double-triple high voltage line spanning approximately 4 km near Ayacucho).

Through its Resolution No. 724/2023, ENRE, at the request of Argentina's Transporte de Energía Eléctrica por Distribución Troncal del Noroeste Argentino (TRANSNOA), which was submitted at the request of the Empresa de Energía Catamarca Sociedad Anónima del Estado Provincial (EC SAPEM) or Catamarca Energy Company, aims to expand the electricity transmission system in Catamarca. The project includes the construction of a complete 132 kV transformation field to connect transformer no. 2 of the Catamarca II TS.

A five-day period has been allotted for public access to the latter resolution on the websites of ENRE and CAMMESA. Once the indicated terms expire without filing of opposition or registration of alternative projects, ENRE will proceed to authorise the required access and grant the CCPN for the same. In cases where well-founded objections are collectively raised by various users, ENRE will convene a public hearing to examine them and provide the requesting companies with an opportunity to respond and present their arguments.

Chile's CNE issues resolution for transmission qualification process

Chile's Comisión Nacional de Energía (CNE) or National Energy Commission has recently issued Exempt Resolution No. 514, for the qualification process of transmission system installations for the period 2024-27. This qualification process is a fundamental regulatory procedure governed by the Ley General de Servicios Eléctricos or General Law of Electrical Services, and is designed to assess and ensure the reliability, efficiency, and compliance of facilities in the transmission systems of the country.

The General Law of Electrical Services mandates the periodic qualification of transmission system installations. This process is also guided by Decree No. 10 of the Ministerio de Energía or Ministry of Energy, published in the Official Gazette on June 13, 2020, which outlines the regulations

for the qualification, valuation, pricing, and remuneration of transmission facilities. The coordination of this process involves collaboration with the Coordinador Eléctrico Nacional (CEN), and it is essential to validate technical information from transmission companies to meet the legal requirements and ensure the accuracy of information. The qualification process covers a broad spectrum of transmission system installations, including those within the national transmission system, zonal transmission systems, and dedicated transmission systems.

The report defines and categorises facilities into substation sections and transport sections. Each of these categories has specific criteria and characteristics outlined in the qualification regulations. Furthermore, international interconnection facilities are not within the scope of this report, as their qualification is governed by separate decrees from the Ministry of Energy. The report also provides a detailed summary of qualified installations, including their categorisation and the facilities involved, to understand the scope and extent of the qualification process. Finally, the report highlights the background used in the qualification process, which includes data related to fuels' price projections.

To ensure transparency and engage the public in the process, a citizen participation registry was established. Citizens and institutions registered in this registry have the opportunity to observe and provide feedback on the Informe Técnico Preliminar de Calificación de Instalaciones de Sistemas de Transmisión or Preliminary Technical Report on the Qualification of Transmission Systems Installations.

In another development, CNE, through Exempt Resolution No. 478, has published the Informe Técnico Definitivo del Plan Anual de Expansión de Transmisión del Sistema Eléctrico Nacional (SEN) or Definitive Technical Report of the Annual Transmission Expansion Plan for the National Electrical System for the year 2022. This report outlines a total of 42 expansion works involving an estimated investment of about USD1,053 million. These works include, 15 national projects valued at approximately USD662 million and 27 regional works totalling around USD391 million.

The main expansion works in the report include:

- Laying the second circuit of the 2×500 kV Ancoa–Charrúa line, with a reference investment of USD60 million. This expansion is expected to increase transmission capacity in the southern zone of the National Electric System to at least 1,700 MVA.
- Expansion of the Kimal 220 kV substation, with an investment of USD8.1 million, to facilitate the connection of the second 2×220 kV link associated with the New Kimal–Lo Aguirre HVDC line project.
- A new 2×500 kV Digüenes–Nueva Pichirropulli line, with a reference investment of USD345 million.
- A new 2×500 kV Entre Ríos–Digüenes line, with a reference investment of USD102 million.
- For the Sistema Nacional de Transmisión or National Transmission System, there are 15 expansion works, of which 10 involve expansions of existing facilities, with a budget of approximately USD90 million, while five are new projects, totalling about USD572 million. In the case of zonal transmission, there are 27 expansion works, of which 12 are expansions of existing facilities, with a budget of roughly USD58 million, and 15 are new works amounting to approximately USD333 million.

Construction of these works is estimated to commence in the first half of 2025.

Chile's CEN initiates re-tendering of transmission expansion works

Chile's CEN has announced a re-tendering process for the construction, execution and operation of five transmission system expansion works, with a reference investment value of USD10 million. This initiative aligns with the application of Article No. 157 of the Regulación de Sistemas de Transmisión y Planificación de Transmisión or Regulation of Transmission Systems and Transmission Planning. According to the latter, in the event that the successful bidder of an expansion work fails to comply with the obligations established in the bidding rules or those contained in the award decree, the work can be re-awarded to a new successful bidder.

The project are the addition of second circuit of 2×110 kV Agua Santa–Placilla (USD1,343 million); capacity increase of the 66 kV Monterrico–Cocharcas line (USD893 million); capacity increase of the 66 kV Charrúa–Chillán line (USD6,394 million); and extension of 66 kV Las Pinatas–San Jeronimo line (USD399 million), along with the addition of a new transformer at the La Calera substation (USD1,974 million). These expansion works are part of Decrees No. 293-2018 and No. 198-2019 issued by the Ministerio de Energía or Ministry of Energy. CEN submitted the required progress reports to the CNE, confirming the reference investment values and deadlines specified in the expansion decrees.

Bids are due on March 27, 2024.

Chile's Conexión Energía submits EIS for Kimal–Lo Aguirre HVDC project

Chile's Conexión Energía has submitted the environmental impact study (EIS) for the Kimal–Lo Aguirre HVDC transmission line project, to the Servicio de Evaluación (SEA) or Evaluation Service. This milestone comes after winning the international tender conducted by the CEN in 2021, and the subsequent publication of the decree granting the rights to execute and operate the project.

The project involves the development of an HVDC transmission line with a capacity of up to 3000 MW. It will operate as a bipole circuit with a voltage rating of ±600 kV and span approximately 1,342 km, featuring 2,686 towers. The project also includes the construction of two 1,500 MW high HVAC/HVDC converter substations in Kimal (María Elena, Antofagasta Region) and Lo Aguirre (Pudahuel, Metropolitan Region). These substations will be interconnected with existing substations, forming part of the SEN. The Kimal–Lo Aguirre HVDC transmission line is a crucial component of the Plan de Expansión de Transmisión or Transmission Expansion Plan initiated by CNE in 2018.

The project's construction phase is expected to last 51 months, with the assembly of the converter substations being the most time-consuming aspect. The use of HVDC technology is relatively new to Chile, and is a distinctive feature of this project.

Chile's Ministry of Energy inspects Santa Elvira substation expansion project

Representatives from the Ministerio de Energía or Ministry of Energy of Chile, specifically, the team of Secretario regional de energía Ñuble or Ñuble regional energy secretary, recently visited the Santa Elvira substation in the northern sector of Chillán in the Ñuble region of Chile to inspect the ongoing expansion works of the energy infrastructure at the substation.

Currently, the Santa Elvira substation is equipped with two transformers, each with a capacity of 25 MVA. The ongoing expansion project involves the installation of a new transformer with a capacity of 50 MVA, effectively doubling the power available in the regional capital of Ñuble. The expansion project is being executed by the Compañía General de Electricidad (CGE) or General Electricity Company through Tecnored a Chilean engineering and construction services company, with a total investment of USD5 million and scheduled completion in July 2024.

The ministry is currently focusing on addressing energy transmission challenges in the Ñuble region. To tackle this issue, significant public policies such as the Plan Especial Ñuble or Ñuble Special Plan and the Ley de Transición Energética or Energy Transition Law have been introduced, aimed at fostering the necessary development in the region.

Canadian funds consider selling stakes in Chile's Transelec

Canadian pension funds, including the Canada Pension Plan Investment Board (CPIB), the British Columbia Investment Management Corp. (BCI) and the Public Sector Pension Investment Board (PSP), are exploring the possibility of selling their combined 72 per cent stake in Chilean power transmission company, Transelec SA.

This potential sale is estimated to be worth approximately USD3 billion. Among the potential buyers, China Southern Power Grid Company—already the largest shareholder with nearly 28 per cent of Transelec—is a prominent candidate. Other companies within the energy sector and various investment funds may also express

interest. However, these considerations are in the preliminary stage.

Transelec operates an extensive network of power lines spanning over 10,000 km throughout Chile.

Chile inaugurates Emerald BESS project in Atacama region

The Ministro de Energía or Minister of Energy of Chile has inaugurated the Emerald BESS project in the Atacama region. This project, located in the 122-hectare Salvador PV solar plant near Diego de Almagro, represents an investment of USD75 million.

The BESS project comprises 116 battery containers and four auxiliary equipment containers, providing a storage capacity of 50 MWp for five hours, equivalent to 250 MWh. This capacity supplements the 68 MW of the Salvador solar park. The BESS project covers an area of 1.74 hectares, including an extension of the interconnection building and 600 metres of pipelines within the solar park.

Due to the exceptional conditions in the Atacama region for generating clean energy, nearly 70 per cent of the energy produced in the region in 2023 comes from renewable sources. This aligns with the goals of the Just Energy Transition, aiming to expand the use of renewable energy. The primary objective of the Emerald project is to enhance the stability and reliability of the electrical system, by balancing electrical production and storing energy generated during peak solar availability hours.

Chile has promoted the development of storage systems with a storage law enacted in November 2022, which encourages the use of energy storage to support the integration of renewable energy sources, helping to manage variability in the country's energy supply.

Peru's ProInversión to award USD900 million contracts for transmission projects

Peru's investment promotion agency, ProInversión, has plans for the concession of four new electrical transmission project groups in 2024, with an estimated investment of approximately USD900 million. These projects are part of the Transmission Plan 2023-32.

The four transmission project groups are:

- Group 1: This group consists of three new electrical projects designed to enhance transmission security at 500 kV and improve the reliability of electricity supply in the regions of Ica and Arequipa. The estimated investment for Group 1 is USD307 million.
- Group 2: Focused on benefiting the regions of Lima, Ica and Ayacucho, Group 2 has a projected investment of USD290 million. One of the standout projects in this group is the 500 kV Chilca CTM–Carabayllo Link, which aims to increase electricity supply for Lima, a significant centre of electricity consumption. Another notable project is the New Bicentenario substation, which will strengthen transmission in the Independencia district, providing greater reliability and capacity.
- Group 3: Group 3 will benefit the regions of Apurímac, Arequipa, Lima and Puno, with an approximate investment of USD175 million. The focus is on strengthening the Sistema Eléctrico Interconectado Nacional (SEIN) or National Interconnected Electrical System, and facilitating the cost-effective and uninterrupted transmission of energy from production centres to consumption centres.
- Group 4: This group will directly benefit the industry and residents of the regions of Áncash, Huánuco, Junín, La Libertad and Ucayali, with an estimated investment of USD98 million. The concession will enhance the reliability and capacity of the electrical system nationwide, while minimising losses and making low-cost electrical energy accessible in areas with limited availability of affordable energy.

ProInversión has also unveiled an extensive project portfolio for 2024, consisting of 40 PPP initiatives requiring an estimated investment of USD8 billion, with a significant focus on transmission projects.

Additionally, Ministerio de Energía y Minas (MINEM) or Ministry of Energy and Mines has signed the concession contract with Transmisora de Energía SAC, under the concessionaire Puerto Maldonado Transmisora de Energía SAC [a company established in Peru by Celeo Redes Sociedad

Limitada Unipersonal (SLU)] for the 500 kV Piura Nueva-Frontera transmission line project. ProInversión had awarded this project to Celeo Redes SLU in July 2023. The project, requiring an investment of USD233 million, is expected to ensure efficient and quality electrical interconnection between Peru and Ecuador for the next 30 years. Additionally, it will increase the 500 kV energy transmission capacity of the national network to cover more areas on the Peruvian coast. It will facilitate the exchange of hydroelectric energy at a lower cost due to the complementarity between the hydrological basins of the two countries. Presently, the schedule for the Ecuadorian section has shown progress, having concluded the EIS. In the remainder of 2023, the financing of the works will be completed and in 2024 they will be put out to tender; expecting to complete the work in mid-2027. Moreover, a group of five projects awarded in August 2023 at an estimated investment of USD118 million, includes the 220 kV Belaunde Terry–Tarapoto Norte Link, 500 kV San José–Yarabamba link, 220 kV Piura Nueva-Colán Instalaciones de Transmisión de Conexión (ITC) or Transmission Connection Facilities link awarded to Interconexión Eléctrica SA ESP (ISA) as well as ITC SE Lambayeque Norte 220 kV line with sectioning, and the Piura Este substation awarded to Alupar Inversiones Perú. These projects will address the energy demand in the south, north and northeast regions of the country.

The execution of these projects under the PPP model has been made possible through extensive collaboration between ProInversión, MEM (grantor), Comité de Operación Económica del Sistema Interconectado Nacional (COES) or Economic Operation Committee of the National Interconnected System, Ministerio de Economía y Finanzas or Ministry of Economy and Finance, and the Organismo Supervisor de la Inversión en Energía y Minería (Osinergrmin) or Supervisory Body for Investment in Energy and Mining.

Grupo ISA unveils Coya project in Peru

Grupo ISA has officially unveiled the 500 kV Mantaro–Nueva Yanango–Carapongo transmission line and associated substations project or the Coya project, in Peru. The project, undertaken by ISA Consorcio

Transmanto (ISA CTM)—a subsidiary of ISA, has been completed over a span of five years.

It is expected to benefit the regions of Lima, Junín and Huancavelica. Beyond improving access to electricity, it plays a pivotal role in supporting the nation's transition towards cleaner and more sustainable energy sources. Moreover, it reinforces Peru's national power grid, and sets the stage for future domestic and international energy connections with neighbouring countries.

The Coya project, involving an investment of over USD290 million, is an integral part of ISA CTM's long-term vision for the 500 kV network within the country's Sistema Interconectado Nacional (SIN) or National Interconnected System. It will be able to transport energy from upcoming renewable energy sources, by facilitating the connection of new energy generation projects across multiple regions. The project's implementation was met with substantial technical and logistical challenges due to its complexity and the unique geographical conditions, with numerous transmission towers being erected at high altitudes.

ISA secures two 500 kV transmission projects Peru

Peru's investment promotion agency, ProInversión, has awarded two major electrical projects worth a combined USD800 million to Colombian ISA. These projects are set to extend the existing 500 kV high voltage lines in seven regions, expanding the total length of transmission lines by more than 1,000 km across the country, leading to more reliable and high-quality electricity supply. The beneficiaries of these projects are expected to be more than three million Peruvians residing in Cajamarca, Huánuco, La Libertad, San Martín, Amazonas, Lambayeque, and Piura.

The two projects entail the incorporation of approximately 1,044 km of 500 kV high-voltage lines. They include:

- 500 kV Huánuco–Tocache–Celendín–Trujillo link expansion: This project, with an estimated investment of USD561 million, will create an alternate axis for the transmission of electrical energy between the central and northern areas

of the country. It will connect the 500 kV Huánuco substation to the new 500 kV Tocache and Celendín substations, ultimately linking to the 500 kV Trujillo substation. This link will provide energy supply in case of contingencies to connected 500 kV substations, including La Niña, Piura and Chimbote. The project will span the departments of Huánuco, San Martín, Cajamarca, and La Libertad.

- 500 kV Celendín–Piura link expansion: This project, with an investment of approximately USD272 million, will establish an alternate axis for electrical energy transmission between the central and extreme northern areas of Peru. It will begin from the 500 kV Celendín substation and connect to the 500 kV Piura Nueva substation. This link will improve reliability and increase transfers in the 500 kV Peru–Ecuador interconnection. The project's development will cover the departments of Cajamarca, Amazonas, Lambayeque and Piura.

The total annual cost of operation and maintenance for the two projects is estimated at USD83.5 million, which will be realised once the transmission lines become operational. Both projects will be executed through the PPP model, with a commercial operation period of 30 years, in addition to the time required for the infrastructure development phase for each project, totalling 66 months.

With the award of these projects, the bidding process of 10 concessions under the 2021–30 Transmission Plan has been completed by ProInversión.

XM shares update on Colombia's transmission network

As per the latest update shared by Colombia's grid operator, XM Compañía de Expertos en Mercados SA ESP (XM) for April to September 2023, a total of 10 transmission projects and 18 generation projects have been launched in Colombia to reinforce energy transmission networks.

During this period, solar generation capacity witnessed a 32 per cent increase, primarily driven by the commercial operation of 15 new solar projects. In addition, hydroelectric generation capacity saw a 0.33 per cent increase with the

commissioning of three small hydroelectric plants.

The 10 transmission projects that have been brought online in the second and third quarters of 2023 are distributed among the Sistema de Transmisión Nacional (STN) or National Transmission System, the Sistema de Transmisión Regional (STR) or Regional Transmission System, and transformation projects within the Sistema de Distribución Local (SDL) or Local Distribution System.

Notable achievements in this sector include the installation of distributed flexible AC transmission system (D-FACTS) type devices by Empresa de Transmisión del Caribe Colombiano (TRANSELCA) or Transmission Company of the Colombian Caribbean on key transmission lines, enhancing control and regulation of power flow. Additionally, Empresas Públicas de Medellín's (EPM) or Public Companies of Medellín's declaration of the 500 kV Bolívar Sabanalarga line and transformer project in operation contributes to improving voltage strength and power import capacity. Meanwhile, strategic projects like the 115 kV Mesa del Sol substation by Empresas Públicas de Santander SA (ESSA) strengthen operational flexibility, ensuring uninterrupted energy supply in the country.

Collaboration has been a cornerstone of these energy developments, with key institutions and market agents working together to strengthen the energy system. XM, as a key player in operational planning for the SIN, has been actively involved in ensuring that technical requirements are met.

GEB commences construction of 500 kV project in Colombia

Colombia's Grupo Energía Bogotá (GEB) has officially initiated construction activities for the 500 kV Colectora–Cuestecitas–La Loma transmission project. The project is considered of vital importance as it will connect a slew of new solar and wind developments in the country's north in the Department of La Guajira to the national transmission grid.

The project aims to connect 1.05 GW of future wind capacity generated in the northern Guajira department into Colombia's SIN, through a 475-km-long, 500 kV power line. It will be developed

in two parts – the 114-km Colectora–Cuestecitas line, and the 247-km, double-circuit Cuestecitas–La Loma line. The project also involves the expansion of existing substations at Cuestecitas and La Loma. While the substation in La Loma is owned by GEB and has made significant headway, challenges have arisen with the Cuestecitas substation, which is not under GEB's ownership. The Colectora–Cuestecitas–La Loma transmission line is valued at over USD2 billion.

However, due to the extended delays in the Colectora project, GEB has incurred costs of nearly USD90,000 million, compromising a notable portion of the project's initial profitability. GEB now aims to complete the transmission line by mid-2024.

Looking ahead, GEB has outlined a comprehensive investment plan exceeding USD1.4 billion over the next five years. Its primary focus will be on Brazil, Peru and Guatemala, with significant investments earmarked for these regions.

Colombia's UPME selects auditor for 230 kV La Paz substation project

Colombian mining and energy planning unit, Unidad de Planeación Minero Energética (UPME), has selected an auditor to oversee the development of the 230 kV La Paz substation and its associated transmission line project.

The decision was made through Resolution No. 000697 of 2023, which outlines the process and outcomes of the selection. To assess the offers and ensure a fair selection process, UPME had appointed members of the evaluation committee, which determined that the offer submitted by Andina De Energía Sas met the necessary requirements and was selected as the consultant to monitor and ensure the project's compliance with relevant regulations and standards.

The resolution specified the monthly value of the audit service at COP30.95 million before value-added tax (VAT). The resolution for selection of the auditor has been published on UPME's website. The resolution clarified that there is no avenue for appeal against this decision.

UPME had officially published the documentos de selección de inversores

(DSI) or investor selection documents and the controller for the La Paz 230 kV substation project through a public call on August 23, 2023. This publication marked the beginning of the selection process.

(COP1=USD0.00025)

Failure in Paraguay's transmission line causes outage

A transmission line failure originating from the Itaipú hydroelectric plant led to power outages in several regions of north, east and central Paraguay, as reported by the Paraguayan Administración Nacional de Electricidad (ANDE). The outage resulted from issues with a current transformer, causing the transmission line to be out of service for approximately 29 minutes.

ANDE stated in the report that electricity supply in the affected areas had been restored to 90 per cent normalcy, with the expectation that full normalisation would be achieved shortly. The report did not provide specific details regarding the percentage of users impacted by the blackout. The above hydroelectric plant supplies around 85 per cent of Paraguay's energy needs and approximately 12 per cent of Brazil's, and ranks as the second-largest hydroelectric plant globally.

Construction progresses on of Bolivian ENDE's Carrasco line

Bolivia's state-owned power utility company, Empresa Nacional de Electricidad Corporation (ENDE), is progressing in the construction of the 500 kV Carrasco transmission line—the second 500 kV electrical transmission line in the country—and associated substations. This extra-high voltage line is set to enhance electrical supply in the Cochabamba and Santa Cruz departments and facilitate the export of electricity.

The project encompasses the construction of the 186.3-km transmission line, running from the Carrasco substation in Entre Ríos, Cochabamba province to the Brechas substation in the Cordillera province of Santa Cruz. This initiative will establish a high-capacity energy transmission corridor, connecting the eastern and central regions of the SIN. This, in turn, will bolster the electrical supply in eastern Bolivia and enable the export of surplus energy.

The project is progressing steadily, with significant headway in the construction of line structure foundations. A total of 427 reticulated metal structures will compose this transmission infrastructure. ENDE is playing a vital role in engineering the line and associated substations.

Bolivia invests BOB410 million to interconnect San Ignacio de Velasco to SIN

Reportedly, Bolivia's ENDE, is investing BOB410 million to build a 230 kV transmission line that will interconnect San Ignacio de Velasco in Santa Cruz to the SIN. Expanding the transmission lines will enhance the national electrical system's capacity, enabling it to meet the growing demand in the region. The project is expected to be completed by 2025 and is part of a broader set of initiatives aligned with energy policy.

Additionally, the 500 kV Carrasco–Brechas line and associated substations project is in the construction phase. This project involves an investment of over BOB913 million and aims to ensure the continuity and reliability of, and universal access to electricity supply.

(BOB1=USD0.14)

Bolivia's ENDE initiates construction of San Roque substation

ENDE has initiated construction of the 115/12 kV San Roque substation in the San Patricio del Chañar, District 7 of El Alto, with the objective of meeting the current and future electricity demand of the growing city of El Alto and the surrounding municipalities.

Key components of this project include the installation of a 25 MVA power transformer, which will step down the voltage from 115 kV to 12 kV for distribution in the northwest area of El Alto. The substation will feature both modern hybrid equipment and conventional equipment isolated in the air. It will also encompass three 115 kV bays and two transformation bays. Additionally, there will be an independent control room housing the medium voltage cells, and protection and control cabinets.

This project is being overseen by Distribuidora De Electricidad La Paz SA

(DELAPAZ), a subsidiary company of ENDE, and aims to address the increasing demand for electricity services in the northwest sector, particularly towards the exit of the lake area highway. Furthermore, it contributes to a larger project aimed at upgrading the voltage of the medium voltage distribution system from 6.9 kV to 12 kV. The investment for the construction of the San Roque substation amounts to BOB25.35 million and these funds will be sourced from DELAPAZ's own resources. This infrastructure will serve as a backup for the Cosmos and Río Seco substations in case of contingencies or maintenance requirements.

Additionally, ENDE has also inaugurated the El Sena medium and low voltage network expansion project in the municipality of El Sena, located in the department of Pando, as part of the commemorative agenda for the 121st anniversary of the Battle of Bahía. The El Sena electrical expansion project was undertaken by ENDE and required an investment of BOB0.67 million, which was financed using the company's own resources. The project encompasses the construction of 0.10 km of medium voltage lines, 5.20 km of low voltage networks, and the installation of one electrical transformation station.

(BOB1=USD0.14)

Panama's ETESA expands capacity of 230 kV transmission line

Panama's state-owned electricity transmission company, Empresa de Transmisión Eléctrica SA (ETESA), has initiated a project to strengthen the capacity of the 230 kV Veladero–San Bartolo–Llano Sánchez–El Coco–Panamá II transmission line II (LTII). The LTII consists of 111 high voltage towers and 33 steel poles, with a current transmission capacity of 275 MVA per circuit. Through this project, its capacity will be increased to 450 MVA per circuit under normal conditions and 500 MVA per circuit during contingencies. The project encompasses major maintenance, changes in accessories, and earthworks aimed at maintaining the safety distance from the existing LTII.

Spanning 401.33 km from the Veladero substation to the Panamá II substation, the project will enhance the capacity of this

line. It will be managed by the Gestión de Administración de Proyectos (GAP) or Management of Administration of Projects wing of ETESA. The total investment for this project is approximately PAB35.89 million. ETESA has assigned technical and specialised personnel to supervise the project, ensuring strict compliance with quality standards throughout.

The project was approved on January 13, 2023, and is currently in the engineering and development phase of the environmental impact study.

(PAB1=USD1)

CELEC EP to enhance energy transmission across Ecuador

Ecuador's state-owned power company, La Empresa Pública Estratégica Corporación Eléctrica del Ecuador's (CELEC EP) transmission unit Transelectric, has taken an initiative to construct the new La Avanzada transmission system at 230/138 kV, 150 MVA, and expand the Machala substation, featuring the installation of a new 225 MVA transformer.

On October 25, 2023, a commencement meeting marked the beginning of construction for the new La Avanzada transmission system situated in Santa Rosa. This project is pivotal in ensuring the reliable delivery of transmission services to the distribution company, La Empresa Eléctrica Pública Estratégica Corporación Nacional de Electricidad (CNEL EP) El Oro. The project is expected to cater to the increasing demand in the El Oro province by establishing a new connection point from the national transmission system to CNEL EP. The La Avanzada system is set to fortify the supply of electricity to key industrial loads in the area, contributing to the development of various economic activities, particularly in the industrial and mining sectors located in the southwestern region of El Oro province. The project has secured the environmental license from the Ministerio de Medio Ambiente, Agua y Transición Ecológica or Ministry of Environment, Water, and Ecological Transition.

In parallel, Transelectric is also expanding the Machala substation, featuring the installation of a new 225 MVA transformer. This endeavour is currently in the civil works stage, with a reported

overall progress of 40 per cent. This expansion project is expected to ensure a steady supply of energy in the short term within El Oro province.

Transelectric has also commenced the construction of the new 30/69 kV Cajas transmission system project of 150 MVA capacity situated in Tabacundo, within the La Pedro Moncayo canton. The Cajas transmission system will enhance the delivery of electricity services to Empresa Eléctrica Regional Norte SA (EMELNORTE), distributor and marketer of regional power in Ecuador. The project aims to benefit the central-north area of Ecuador, including the provinces of Imbabura and Carchi, along with the northern region of Pichincha. The Cajas transmission system will establish a new connection point for EMELNORTE to cater to the growing energy demand in the region. This new system is expected to provide uninterrupted and efficient electrical service, improve voltage levels, and encourage the development of new industries and local businesses in this vital region of the country. The project had received the environmental license from the Ministerio de Medio Ambiente, Agua y Transición Ecológica or Ministry of Environment, Water, and Ecological Transition, in 2021. The construction phase was initiated after a meeting held on October 6, 2023, along with an inspection of the proposed Cajas substation site.

Additionally, Transelectric has commenced the construction on the new Tancuchí transmission system, to bolster the reliability of the electrical service in the province of Cotopaxi. The project includes the installation of a new 230/138 kV transmission system with a capacity of 150 MVA, to be completed by July 2024. This enhancement will effectively double the available power supply in the regional capital of Cotopaxi.

In another development, Transelectric has recently signed four contracts, valued at USD59.4 million, for civil works and electromechanical assembly. These projects include the construction of new transmission systems and the expansion of a substation. The funding for these is provided through a credit arrangement with the Inter-American Development Bank (IaDB).

The new transmission systems and expansions include: La Avanzada

transmission system, including the 230/138 kV Santa Rosa–El Oro transmission line; Las Orquideas transmission system, including the 230/69 kV Guayaquil–Guayas transmission line; Tanicuchí transmission system, including the 230/138 kV Latacunga–Cotopaxi transmission line; and 230/69 kV transmission system boxes at the Imbabura and Posorja substations expansion project with the 138/69 kV Posorja–Guayas transmission line.

The signing of these contracts marks the commencement of physical construction activities in October 2023. These projects aim to fortify the national electrical energy transmission infrastructure, enhancing the reliability of electrical services. They will also create additional energy delivery points from the Sistema Nacional de Transmisión (SNT) or National Transmission System to electrical distribution companies, enabling them to meet the growing demands of residential, commercial and industrial sectors. These four projects are slated for completion between 2025 and 2026 and are expected to directly benefit 6.2 million Ecuadorians.

Mexico's CFE unveils transmission projects in Yucatan Peninsula

Mexican state-owned power company, Comisión Federal de Electricidad (CFE), has unveiled several transmission projects in the Yucatan Peninsula, aiming to increase transmission capacity and improve the reliability of the SEN. These projects were presented during a roadshow, with the intention to invite major contractors, manufacturers and suppliers to participate in the tendering process.

The projects in the Yucatan Peninsula are focused on the Cancun and Riviera Maya II areas, with financing through Proyectos de Inversión Diferida En El Registro del Gasto (Pidiregas) or the Deferred Investment Projects in the Expenditure Registry scheme. They include increasing transmission capacity in Cancun and Riviera Maya (Kantenáh), laying an underwater AC line from Playacar to Chankanaab II, and installing transmission network in various regions. Additionally, CFE has presented the Nachicom transmission project connecting the communities of Chichi Suárez, as well as the I19 Contests 1, 2 and 3 to increase transmission capacity.

The roadshow included 90 companies, including contractors, manufacturers and suppliers, and aimed to outline the contracting requirements for these projects, including company experience, and technical and economic capacities. CFE also plans to provide mechanisms for competitive financing to make the projects bankable for the contracting companies.

Furthermore, CFE extended invitations to industry players for another significant transmission project, called Incremento de la Transmisión de Energía Eléctrica en la Costa Oeste del País or Increase the Transmission of Electrical Energy on the West Coast of the Country (I20), which involves an investment of approximately USD750 million to build 766 km of transmission lines at the 400 kV level, across the states of Sonora, Sinaloa and Nayarit. This initiative is part of the efforts to enhance the transmission capacity in the northwest, north and west regions of Mexico.

Hurricane Otis causes damage to infrastructure in Mexico

Mexican CFE has reported that the passage of Hurricane Otis through Guerrero, Mexico, had a significant impact on the region's electrical infrastructure. A 300 MW power generating plant was damaged and 37 high-voltage lines affected. Restoration efforts are underway and eight of these lines have already been fully restored. The hurricane also caused damage to 26 substations, of which eight have been re-established. Additionally, 31 medium-voltage circuits were affected, with five of them fully restored. 73 transformers were damaged due to the hurricane, along with 1,700 poles and 58 electrical structures.

The total number of customers affected by electricity supply disruptions amounted to 1,374 million throughout Guerrero, including those areas most affected being Playa Diamante, Papagayo and Pie de la Cuesta in Acapulco, as well as Chilpancingo, Altamirano, and Arcelia, located outside the Port of Acapulco. Acapulco itself had reported 504,000 outages.

CFE is actively working to assess and restore the electrical infrastructure in the affected areas. The Federal Government and the Government of Guerrero have also announced plans to reconstruct Acapulco,

with the support of 10,000 members of the armed forces working in the area. The full extent of the damage and the timeline for complete restoration will be determined once all affected areas are accessible and assessed.

Deteriorating grid network hampers Venezuelan Corpoelec's hydropower delivery

Venezuela's National Electric Corporation (Corpoelec) is facing a significant challenge due to the deteriorating state of the Red Central de Transmisión or Transmission Core Network, resulting in a reduction of energy transmission from the Simón Bolívar hydroelectric power plant, commonly known as Guri.

The Transmission Core Network comprises a total of eight high voltage lines, encompassing three lines of 765 kV, three lines of 400 kV, and two lines of 230 kV. These critical infrastructure elements are responsible for transmitting the electrical energy generated at Guri, from where a staggering 80 per cent of Venezuela's electricity demand is met.

Corpoelec has curtailed the supply of electricity by discontinuing the transmission of between 700 and 900 MW from the Guri facility, to preserve the stability of the national electrical grid. However, the repercussions of this reduction in power supply are being felt most acutely in states located furthest from the Guri facility, primarily within the state of Bolívar. The other states affected by these power outages include Zulia, Trujillo, Mérida, Táchira, Barinas and Apure, where residents have reported enduring power interruptions of up to eight hours daily. The city of Maracaibo has been particularly hard-hit, with the electrical service being suspended on multiple occasions throughout the day.

The root cause of this crisis has been attributed to the deteriorating condition of the Transmission Core Network, exacerbated by a lack of maintenance. The network's incapacity to transmit the requisite volume of hydroelectricity generated in Guayana is not due to climatic conditions, as might be assumed. Instead, the network's essential components, including switches, capacitors and reactors, have fallen into disrepair, impeding the smooth flow of electricity. The network's

ailing condition became evident on September 13, 2023, when it experienced six failures in less than five hours. These frequent breakdowns triggered a cascade of electrical service disruptions, necessitating the imposition of rationing measures across at least 17 of Venezuela's 24 states.

Asia Pacific

China and Uzbekistan sign agreement for cooperation in energy sector

The State Energy Administration of China and the Ministry of Energy of Uzbekistan have signed an intergovernmental agreement for cooperation in the field of renewable energy sources (RES). This took place as part of the third Belt and Road Forum for International Cooperation (BRF) held on October 17-18, 2023, in Beijing.

This agreement, taking into account the joint statement of the two sides on September 15, 2022, will further strengthen cooperation in RES to ensure energy security in Uzbekistan, stimulate the transition to green and low-carbon energy, and achieve carbon neutrality.

As part of the latest agreement, the two sides have agreed to accelerate the transition to green development, build and modernise components of power transmission networks of RES, develop the scientific and technical base in RES; and conduct joint research, including in the development of solar and wind energy, and the introduction of energy-saving technologies and systems.

CSG subsidiary operationalises 500 kV line of Guangdong Target Grid in China

Guangdong Power Grid Corporation, a subsidiary of the second largest Chinese power transmission company China Southern Power Grid Corporation (CSG), has put into operation the 500 kV Dielong Line B, which is the western section of the 500 kV Outer Ring project in the Guangdong-Hong Kong-Macao Greater Bay Area. This marks the completion of a total of 11 main projects of the Guangdong Target Grid. With this, the main grid structure of Guangdong Power Grid has

been formed as a whole with reasonable zoning, flexible interconnection, security and controllability, and now enables the flow of green electricity into the Bay Area.

Guangdong Power Grid Corporation is making efforts to build a new power system in Guangdong with the Guangdong-Hong Kong-Macao Greater Bay Area as the core, comprehensively constructing a flexible DC interconnection main grid based on the outer ring of the Bay Area, improving Guangdong's power grid resource optimisation allocation capabilities and safe operation levels, ensuring Guangdong province's electricity load demand reaches 170 GW in 2025 and 210 GW in 2035, thus improving the Guangdong-Hong Kong-Macao Greater Bay Area's 14th Five-Year Plan (2021-25) and medium- and long-term power supply capabilities.

Relying on flexible DC technology, the Outer Ring project spans eight cities and approximately 2,000 km, and is the country's longest 500 kV outer ring channel that can further strengthen Guangdong, Hong Kong and Macao. Once fully completed, the power supply capacity of the Guangdong province will more than double to 300 GW.

For the west section, for the first time, the main project of Guangdong Target Grid used 100 per cent domestic insulated gate bipolar transistor (IGBT) devices in the converter unit and developed a new flexible DC converter valve section. It is the country's largest provincial level control system.

The development of the entire industrial chain has played a strong role in promoting independent innovation and development of this flexible DC technology.

China launches first electric power IoT operating system

China's second largest power transmission company, CSG, and the OpenAtom Foundation—a non-profit independent open-source software company, have jointly released the country's first power internet of things (IoT) operating system – Hongmeng IoT Operating System (OS) (Power Harmony OS) in Beijing. This has for the first time realised a system that enables plug-and-play of different types and brands of power equipment and massive data interconnection. It has realised intelligent

interconnection and interoperability of equipment from different manufacturers through a unified protocol. It provides a power IoT OS for the access, operation and maintenance of large-scale IoT equipment in new power systems. All key technologies of the system's full stack are independently developed by the two companies and are fully open source. Currently, more than 100 partners have joined the Hongmeng IoT industry chain ecosystem, covering domestic mainstream chip, module and terminal manufacturers.

Previously, domestic IoT OSs were fragmented with many types, inconsistent protocols, specifications, and security. They were all aimed at a single business and scenario in the power grid and did not support multiple services, data sharing, or plug-and-play. Power Harmony OS is a new generation of smart terminals for IoT. The OS has customised a function enhancement package for the power industry, providing a unified architecture for the intelligence, interconnection and collaboration of different power equipment.

With the integration of new renewable energy into the grid comes massive data analysis and processing. After power equipment terminals monitor and collect data, the massive data interacts on the network through a unified communication protocol, which can effectively improve data processing capabilities and keep power consumption consistent with the dynamic balance of power generation. The digital grid is the key carrier of new renewable energy systems. Power Harmony OS has assumed an important role as a unified IoT base in digital grid applications, and can also effectively support the collaborative interaction of source, grid, load and storage. It integrates new technologies such as big data, edge computing, artificial intelligence, and blockchain to build the foundation of a new power system, solving the two key issues of security and collaboration, and becoming a booster for the development of IoT.

The promotion of the new IoT OS will comprehensively promote the upgrading of the industrial chain in the field of IoT terminals in the power industry. By 2024, the industrial chain is expected to expand to more than 900 sub-categories of equipment, achieving full coverage of 1.35 million IoT terminals in the transmission,

transformation and distribution field. By the end of 2025, the scale of covered terminals will exceed 100 million.

China's Guangxi Power Grid puts two 220 kV substations into operation

Guangxi Power Grid Company, a subsidiary of the second largest Chinese power transmission company CSG, has put into operation two 220 kV substations – Tian'e and Fengshan in the mountains of Hechi, Guangxi. This marks Guangxi's realisation of full county coverage by 220 kV substations, which is of great significance for the comprehensive promotion of rural revitalisation, new urbanisation and development of Guangxi.

Guangxi Power Grid has been implementing the county-wide coverage project of 110 kV and 220 kV substations for completely eliminating the blackout risk in four counties, including Napo County, and solving the problems of heavy overload and low voltage in nearly 30,000 stations. Since the start of the 14th Five-Year Plan (2021-25), the average power outage time for customers in Guangxi's new power region has dropped by 27.8 per cent annually. Before 2019, there were only around 10,000 km of 110 kV and above transmission lines in Guangxi. 12 counties lacked 220 kV main power supply support and 81 substations were at risk of multi-station supply, while some counties were at risk of complete blackout. In August 2019, the Party Committee of the Guangxi Zhuang Autonomous Region, the People's Government of the Autonomous Region, and CSG collaborated for the integrated development of Guangxi's local power grids and central-owned large power grids through the establishment of Guangxi New Power Group. In the past four years, Guangxi Power Grid Company has promoted the investment and construction of Guangxi New Power Group's regional power grid on a fast track with a cumulative investment of more than CNY31.8 billion.

Currently, Guangxi has 25×500 kV substations, 270×220 kV substations, 95×500 kV lines, 738×220 kV lines, and more than 50,000 km of 110 kV and above transmission lines. Guangxi's 500 kV power grid has a four horizontal and two vertical grid structures. The 14 districts

and cities in the region are fully covered by 500 kV substations. The 220 kV power grid forms a double-ring and double-chain grid structure. The 110 kV power grid structure is dominated by bilateral power supply T-connections or chain wiring, which greatly improves the power supply capacity and reliability of the entire area. From January to October 2023, Guangxi Power Grid Company put into operation more than 60 main grid projects of 110 kV and above voltages. The company plans to build and expand 17×500 kV substations and 114×220 kV substations by 2025.

(CNY1=USD0.14)

China's CSG carries out grid inspections by drones in Guizhou province

The Guizhou branch of CSG is promoting the use of drones for grid inspections and maintenance across southwest China's Guizhou province which is known for its mountainous and heavily forested landscape and volatile weather. The branch carries out this task from an intelligent operations centre in Guiyang, the capital of the province.

Previously, maintenance workers had to routinely trek through mountains and climb towering grids. This is now done more efficiently and safely by drones. Two types of drones are utilised during an inspection session. One is a large fixed-wing drone, usually tasked with exploring the environmental conditions of areas where power grids are to be inspected. After examining the images sent back by the fixed-wing drone, workers give approval for the flight of a smaller and multirotor drone, which has greater flexibility that enables it to fly closer to the power grid. This drone is able to follow pre-determined mission routes that evade obstructions, and collects images of flaws automatically, greatly reducing manual efforts.

Currently, drones are being utilised for inspections of 90 per cent of lines across Guizhou, improving inspection efficiency by 150 per cent compared with traditional manual approaches. As the company plans to use unmanned drones for more applications, it will also maximise the use of artificial intelligence (AI) and improve data analytics capabilities to ward off defects and risks.

China's SGCC launches first live-line operation on 500 kV compact lines

The State Grid Hunan Electric Power Company, a part of State Grid Corporation of China (SGCC), has successfully carried out an insulator replacement operation on a 500 kV compact transmission line in Yiyang, central China's Hunan province. The work was carried out by the company's Live-Line Work Centre and marks the first such operation in China's electrical industry.

On October 17, 2023, at Tower 069 of a 500 kV compact transmission line, a team of seven aerial specialists fully equipped for high-altitude work, along with eight ground-based personnel, completed the insulator replacement on the compact tower. The completion of this live-line operation was enabled by newly developed, specialised tools designed for such work on compact towers. Unlike traditional transmission lines, compact lines have unique strengths, including a smaller land footprint and lower impact on surrounding buildings and vegetation. Currently, China is home to over 300 compact transmission lines, while several other countries are also working on the research and development of this technology.

Nepal's NEA exports surplus power worth over NPR11.83 billion to India

The state-owned Nepal Electricity Authority (NEA) has generated a net income of NPR11,828 million by trading surplus power with India since June 11, 2023. NEA exported electricity worth NPR9,645 million to India in the three months between mid-July and mid-October of the 2023-24 financial year. In mid-September to mid-October alone, surplus power worth NPR4,235 million was traded. During the review period, the average selling rate per unit of exported electricity to India was NPR9.18.

NEA has been exporting approximately 110 MW of electricity to the Indian power trading company NTPC Vidyut Vyapar Nigam Limited (NVDN), through both the day-ahead market of Indian Energy Exchange Limited (IEX) and a medium-term power agreement.

The Central Electricity Authority (CEA), under the Indian Ministry of Power (MoP)

India, has granted approval for NEA to export 632 MW of electricity to the competitive market, with 522 MW going to various buyers and 110 MW to NVVN. This export is facilitated through the 400 kV Dhalkebar (Nepal)–Muzaffarpur (India) cross-border transmission line (562 MW) and the 132 kV Mahendranagar (Nepal)–Tanakpur (India) line (70 MW). This has helped to bolster Nepal's foreign exchange reserves and reduce its trade deficit with India.

Considering the current trend, NEA expects to potentially export total electricity worth around NPR16 billion in 2023-24. It has also submitted a proposal to CEA seeking approval to export around 100 MW of additional electricity and is awaiting the latter's response.

(NPR1=USD0.0075)

CCEA approves GEC Phase-II ISTS for 13 GW renewable project in Ladakh, India

The Indian Cabinet Committee on Economic Affairs (CCEA), chaired by the prime minister, has approved the Green Energy Corridor (GEC) Phase-II interstate transmission system (ISTS) for a 13 GW renewable energy project in Ladakh. The project is targeted to be set up at an estimated cost of INR207.74 billion, with central financial assistance (CFA) at 40 per cent of the project cost, which is INR83.09 billion.

India's largest grid network developer, Power Grid Corporation of India Limited (POWERGRID), will be the implementing agency for this project. It will be deploying state-of-the-art voltage source converter (VSC)-based HVDC and extra-HVAC (EHVAC) systems under the project. The transmission line for evacuating this power will pass through Himachal Pradesh and Punjab up to Kaithal in Haryana, where it will be integrated with the national grid. An interconnection is also planned from this project in Leh to the existing Ladakh grid to ensure reliable power supply to Ladakh. It will also be connected to the Leh–Alusteng–Srinagar line to provide power to Jammu and Kashmir.

The project entails the construction of 713 km of transmission lines (including 480 km of HVDC line) and 5 GW capacity of

HVDC terminals each at Pang (Ladakh) and Kaithal (Haryana), which are expected to be completed by 2029-30. This will contribute to achieving the country's target of 500 GW of installed electricity capacity from non-fossil fuels by 2030.

This project is in addition to Intra-State Transmission System Green Energy Corridor Phase-II (InSTS GEC-II), which is already under implementation in the Indian states of Gujarat, Himachal Pradesh, Karnataka, Kerala, Rajasthan, Tamil Nadu and Uttar Pradesh for grid integration and power evacuation of about 20 GW of renewable power, and is expected to be completed by 2026. The InSTS GEC-II scheme targets the addition of 10,753 circuit-km (ckt km) of transmission lines and 27,546 MVA of substation capacity at an estimated cost of INR120.31 billion and CFA at 33 per cent (INR39.70 billion).

(INR1=USD0.012)

India CERC amends regulations on sharing of ISTS charges

The Indian energy regulator, Central Electricity Regulatory Commission (CERC), has notified the CERC (Sharing of Inter-State Transmission Charges and Losses) (Second Amendment) Regulations, 2023.

As per the amendment, the ISTS licensee will be paid 50 per cent of the yearly transmission charges (YTC) of its ISTS, for a period of six months from the date of deemed commercial operation date (COD) or till the commencement of actual power flow, whichever is earlier. Additionally, the licensee will be paid 100 per cent of YTC of its ISTS from the seventh month till the commencement of actual power flow, in case the latter does not commence within a period of six months from the date of deemed COD.

These regulations will come into effect from November 1, 2023.

Indian POWERGRID obtains approval for INR1.2 billion ERES-XXXVII project

POWERGRID has received approval from the company's Committee of Directors on Investment in Projects for an investment of INR1,199.5 million for the transmission project – Eastern Region Expansion Scheme – XXXVII (ERES-XXXVII).

The scope of the project entails the installation of 220 kV gas-insulated switchgear (GIS) at the 400/132 kV Lakhisarai substation, along with two 220 kV line bays for termination of the 220 kV Lakhisarai–Haveli Kharagpur D/C line to be implemented by Bihar State Power Transmission Company Limited (BSPTCL) under the intrastate transmission system. POWERGRID will also install 400/220 kV, 2×500 MVA interconnecting transformers (ICTs) along with the associated bays at the Lakhisarai substation as part of the project.

The project is scheduled to be commissioned within 24 months from the date of allocation by the National Committee on Transmission (NCT), which is May 19, 2025.

(INR1=USD0.012)

Indian RECPDCL incorporates SPVs to implement transmission system in Gujarat

REC Power Distribution Company Limited (RECPDCL) has incorporated two special purpose vehicles (SPVs) – Khavda IV C Power Transmission Limited and Khavda IV-E2 Power Transmission Limited, for implementing the 'Transmission system for evacuation of power from potential renewable energy zone (REZ) in Khavda area of Gujarat under Phase-IV (7 GW): Part C and Part E2'.

Part C involves the construction of the 4×1,500 MVA, 765/400 kV and 2×500 MVA, 400/220 kV Boisar-II GIS substation with 2×330 MVA, 765 kV bus reactors and 2×125 MVA, 420 kV bus reactors; 225-km, 765 kV South Olpad (GIS)–Boisar-II (GIS) D/C line; two 765 kV line bays at the South Olpad GIS substation for termination of the above line; 240 MVA switchable line reactors on each circuit at South Olpad GIS and Boisar-II GIS substations; 25-km line-in-line-out (LILO) of the 765 kV Navsari (New)–Padghe (POWERGRID) D/C line at Boisar-II; 10-km, 400 kV Boisar-II (Sec-II)–Velgaon (Maharashtra) D/C line; two 400 kV line bays at the Velgaon substation for termination of the above 400 kV line; 65-km LILO of the 400 kV Babhaleswar–Padghe (Maharashtra) D/C line at the Boisar-II (Sec-I) substation using twin high-temperature low sag (HTLS) conductors with a minimum capacity of 1,700 MVA per circuit at nominal voltage; two 80 MVA,

420 kV switchable line reactors at the Boisar-II end of the 400 kV Boisar-II-Babhaleswar D/C line; ± 200 MVar static synchronous compensators (STATCOM) at 400 kV bus sections I and II of the Boisar-II substation; and ± 300 MVar STATCOM at 400 kV level at the Navsari (New)(POWERGRID) substation with one 400 kV GIS bay.

Part E2 involves the augmentation of transformation capacity at KPS2 (GIS) by a $2 \times 1,500$ MVA, 765/400 kV ICT on bus section I (5th and 6th), as well as another $2 \times 1,500$ MVA, 765/400 kV ICT on bus section II (7th and 8th) and two numbers of 400 kV bays at bus section I and three numbers of 400 kV bays at bus section II for renewable energy interconnections.

RECPDCL has been appointed as the bid process coordinator (BPC) for selecting transmission service providers (TSP) for the projects through a tariff-based competitive bidding (TBCB) process. These projects will be implemented on a build, own, operate and transfer (BOOT) basis in the state of Gujarat.

Indian state task force approves two transmission projects

The Energy Task Force (ETF) of the Uttar Pradesh (UP) state government in India has approved three new power transmission and generation projects worth over INR4.6 billion.

This includes the proposal for the award of two transmission projects to be developed in PPP mode, to private developers selected through a competitive bidding process. The first is the 400 kV Meerut–Shamli transmission line, and the second is a 220 kV substation at Tirva in Kannauj, involving an investment of INR1.96 billion and INR1.36 billion respectively. The completion of the projects is expected to improve the quality of power supply in the areas connected to them.

The approved proposals will be sent to the state Cabinet for final approval.

(INR1=USD0.012)

Adani Energy Solutions commissions project in India

Indian private transmission developer, Adani Energy Solutions Limited (AESL) – formerly Adani Transmission Limited

(ATL), has successfully commissioned the Warora–Kurnool transmission line, spanning 1,756 ckt km across the Indian states of Maharashtra, Telangana and Andhra Pradesh. The line project will fortify the national power grid, and enable smooth transmission of 4,500 MW of electricity between the western and southern regions while improving the resilience of the southern region grid and facilitating the extensive integration of renewable energy.

The project was implemented by the SPV, Warora Kurnool Transmission Limited (WKTL), which was established in April 2015 to create an extra interregional AC link for power transfer into the southern region through the Warora–Warangal and Chilakaluripeta–Hyderabad–Kurnool D/C lines and the establishment of a 765/400 kV substation in Warangal. The project was remarkably large-scale, using 103,000 metric tonnes of steel for its towers and 30,154 km of specialised alloy conductor material for transmission lines. Notably, two 102-metre-high mid-stream towers were erected on the Krishna River, a feat accomplished within a tight three-month window of low water levels.

This is the most extensive 765 kV D/C (hexa conductor) project awarded through TBCB under a single scheme on a build, own, operate and maintain (BOOM) basis. Initially, the project was assigned to Essel Infraprojects Limited in early 2016. In March 2021, AESL acquired it for INR33.7 billion subsequent to the stressed debt restructuring undertaken by creditors.

Also, AESL commissioned the Karur Transmission Limited (KTL) project. It involved the construction of the 400/230 kV, 1,000 MVA Karur Pooling Station and an associated 8.51 ckt km transmission line in the state of Tamil Nadu.

The project will facilitate the evacuation of power from RES in the Karur/Tiruppur Wind Energy Zone, and also strengthen the southern regional grid and support RES integration on a large scale. AESL secured this project through the TBCB route in December 2021 for a 35-year-period on a BOOM basis. The company utilised innovative approaches, such as using high-boom, ready-mix concrete (RMC) machines for concreting work and implementing advanced cybersecurity solutions through the latest supervisory control and data acquisition (SCADA) system, all of which

were employed during execution. The project involved completing critical tasks, including the shutdown of the 400 kV D/C Pugalur–Pugalur (HVDC) line and the erection of tower structures under the constraints of the existing transmission line.

Earlier in October 2023, AESL also announced the commissioning of the Kharghar–Vikhroli Transmission Limited (KVTL) project, which will allow additional power to be brought to Mumbai. The KVTL project starts in the Kharghar area of Navi Mumbai, traverses through its urban locations, and terminates at Vikhroli in Mumbai city. The project is considered critical as the existing transmission corridor's capacity is insufficient for the city's growing power needs. It comprises approximately 74 ckt km of 400 kV and 220 kV transmission lines, and starts in the Kharghar area of Navi Mumbai, passes through its urban locations, and terminates at Vikhroli in Mumbai city. Notably, it includes Mumbai's first 1,500 MVA, 400 kV GIS substation in Vikhroli, designed for compactness and efficient space utilisation, occupying around 9,500 square metres.

AESL overcame a number of challenges posed by the difficult terrain by use of technology and innovation. It constructed six towers in creeks using heavy rigs on floating barges. Further, in urban areas, it adopted special horizontal configuration towers to overcome height restrictions in some locations.

IndiGrid wins first 20 MW/40 MWh BESS project in India

India Grid Trust (IndiGrid), India's first power sector infrastructure investment trust (InvIT), has received the Letter of Intent (LOI) and Letter of Award (LOA) from Delhi's distribution licensee, BSES Rajdhani Power Limited (BRPL), for the construction of a 20 MW/40 MWh BESS in Delhi. Indian private transmission developer, Sterlite Power Transmission Limited (SPTL), is the sponsor of IndiGrid.

The scope of work for the BESS project includes the design, supply, testing, installation, commissioning, operation and maintenance of the BESS on a BOOT basis for a period of 12 years. It won the project through TBCB. The primary applications envisaged for the project are energy time-shift (arbitrage) and ancillary services

such as frequency support and resource adequacy.

Over the last few years, IndiGrid, on a pilot basis, built capabilities to undertake BESS projects at its Dhule and Kallam substations. It commissioned its first BESS project integrated with its solar panels at the Dhule substation in Maharashtra in April 2023.

IndiGrid's Delhi BESS project will receive 70 per cent debt financing from the Global Energy Alliance for People and Planet (GEAPP), which has IKEA Foundation, Rockefeller Foundation, Bezos Earth Fund, and others as its anchor partners.

NEA completes Kaligandaki Transmission Corridor in Nepal

NEA has completed the construction of the Kaligandaki Transmission Corridor project. The 220 kV D/C project will help improve the reliability of the national electricity grid system in general and address the voltage issues in Nawalparasi and Rupandehi areas in particular. This was achieved with the completion of the 88-km Kushma–New Butwal line, which passes through Parbat, Baglung, Syangja, Palpa, Rupandehi and Nawalparasi. Indian company L&T was signed up as the contractor for the project in 2017.

The larger corridor project entailed the construction of the 40-km, 220 kV Dana–Kushma line, which connects Myagdi (Dana) to Parbat (Kushma); the 100 MVA, 220/132 kV Kushma, Dana and New Butwal substations; and the 220 kV, 88-km Kushma–New Butwal and 20-km New Butwal–Bardaghat power lines. Construction of the Dana–Kushma power line was delayed due to the COVID-19 pandemic and was finally completed along with the two substations in January 2021. The NPR11 billion Kaligandaki Transmission Corridor project was supported by the South Asia Subregional Economic Cooperation (SASEC) component under the Asian Development Bank.

(NPR1=USD0.0075)

Vietnam's MOIT cites insufficient legal framework to develop OSW

The Vietnamese prime minister has asked the state-owned Electricity of Vietnam (EVN) and Vietnamese enterprises to

develop OSW power on a trial basis. However, the Ministry of Industry and Trade (MOIT), in its latest statement to the government about the implementation of the eighth national Power Development Plan VIII (PDP VIII), has stated that it is difficult to identify both the projects and domestic enterprises to implement OSW projects, because of the lack of a clear legal framework for the same. Under PDP VIII, total OSW capacity is expected to reach 6,000 MW by 2030.

According to MOIT, there is no foundation to define the sea management sphere as the national marine spatial planning has not been approved. Further, the current laws on investment do not clearly stipulate which agencies have the right to approve OSW projects. MOIT, in the document proposing the amendment of the Law on Electricity, suggested that it is necessary to amend the Investment Law in order to identify the agencies to be authorised to approve policies on OSW development.

In the immediate term, MOIT has proposed that the government assign EVN and domestic enterprises to carry out fieldwork for OSW development to get ready to deploy the projects once the legal framework is completed. The lack of a sufficient legal framework was the reason mentioned by MOIT in response to a proposal to implement the USD11.9 billion Thang Long Wind project with a capacity of 3,400 MW by British power group, Enterprise Energy.

Meanwhile, MOIT has also requested the prime minister to propose the issuance of a plan to implement PDP VIII, which outlines an ambitious renewable energy installed capacity target of 41 GW or 28 per cent of total installed capacity by 2030 and about 366 GW or 70 per cent of installed capacity by 2050, as well as the addition of 28,585 km of new transmission lines and 1,27,875 MVA of new transformer capacity up to 2030, in addition to the renovation of 7,808 km of lines and 73,165 MVA of transformer capacity between the 220 kV and 500 kV voltage levels. In the long term (between 2031–50), the plan is to construct HVDC lines totalling 5,200 to 8,300 km and capacity of 40 to 60 GW; in addition to 20,795 to 22,855 km and 215,775 to 239,525 MVA in new construction and 1,305 to 1,455 km and 223,275 to 226,900 MVA through

renovation.

EVN and Vietnamese provinces collaborate to electrify Con Dao Island

In a collaborative effort, Vietnam's state utility EVN has joined forces with southern Soc Trang and Ba Ria-Vung Tau provinces to finalise a strategy to construct a 110 kV transmission line to bring power from Soc Trang province to Con Dao district, located off Ba Ria-Vung Tau province. This 104-km project includes over 73 km of undersea cables and aims to connect the Con Dao district to the national grid to ensure stable power supply.

The project will involve an investment of over VND4.95 trillion and is slated for implementation between 2023 and 2026.

(VND1=USD0.000041)

Vietnam's EVNNPT to upgrade transmission lines in Thai Binh

Vietnam Electricity National Power Transmission Corporation (EVNNPT), a subsidiary of state-owned EVN, is upgrading transmission infrastructure in the northern province of Thai Binh. In order to resolve the issues relating to the ongoing projects, EVN and EVNNPT have collaborated with Thai Binh People's Committee.

At a meeting between the three parties on October 19, 2023, EVN reported that the upcoming projects will guarantee electricity supply in Thai Binh. Currently, the total capacity of the 220 kV substations does not meet all the electrical demand in the province (744 MW). So it is supported by 110 kV lines linked to the power grids of Nam Dinh, Haiphong, and Ho Chi Minh City. To deal with this overload situation, its subsidiaries – EVNNPT and Northern Power Corporation (EVNNPC) – are investing in 500 kV, 220 kV and 110 kV transmission line projects, and have sought cooperation of the province in executing key projects.

For the 123-km, 500 kV Nam Dinh 1–Pho Noi, which is expected to start construction in December 2023, EVN has requested Thai Binh People's Committee to give its opinions on adjusting the project's route through the Vu Thu, Hung Ha, and Quynh

Phu districts. Further, EVN requires the province to accelerate the approval of the project's environmental impact assessment (EIA) report.

For the 500 kV Haiphong–Thai Binh project, which is set to start construction in the second quarter of 2026 and be completed in 2027, EVN has requested the People's Committee, Department of Planning and Investment, and relevant departments to provide their support and comments on the investment planning documents issued by the Ministry of Planning and Investment (MPI).

Further, EVN has requested the same parties to approve the investment planning of the 500 kV Thai Binh transformer station when EVNNPT submits its dossier to the MPI, towards implementing the next steps. The transformer station is expected to start construction in February 2024 and complete by end-2024.

Vietnam approves investment in 500 kV transmission line

Vietnam's Deputy Prime Minister (PM) has approved the investment and implementation plan of the 500 kV Nam Dinh I thermal power plant–Thanh Hoa transmission line project at a total investment of VND3.09 trillion, besides approving EVNNPT, a subsidiary of state utility EVN, as the investor of the project. The approval was given on October 24, 2023. EVNNPT will contribute VND925.83 billion for project development, while over VND2.16 trillion will be funded by commercial bank loans.

The 74.4-km line, which will pass through the provinces of Nam Dinh, Ninh Binh and Thanh Hoa, will help reduce load and avoid overload on existing 500 kV lines as well as improve the north-central transmission capacity. Combined with the larger 513-km, 500 kV Quang Trach–Quynh Luu–Thanh Hoa–Nam Dinh I–Pho Noi thermal power plant sections, the line will boost interregional connections and help ensure power supply for the northern region from power sources in the north-central region.

The People's Committees of three provinces will carry out procedures for land allocation, land lease, and permission to change land-use purposes to implement the project, to ensure compliance with

planning and plans. Construction on the project will begin in October 2023 and complete in June 2024.

Subsequently, on October 26, 2023, the Deputy PM directed EVNNPT to start the construction of the remaining three sections of the 500 kV Quang Trach–Pho Noi transmission line project [Quang Trach–Quynh Luu (226 km), Quynh Luu–Thanh Hoa (91 km) and Nam Dinh 1–Pho Noi (123 km)] in the following months. The line is considered vital to meet the expected consumption in northern Vietnam during the peak period of 2024 and the following years to ensure energy security.

Recently, the government and the PM issued several instructions and requested the Ministry of Industry and Trade (MOIT), the Commission for Management of State Capital at Enterprises, and relevant agencies to focus on fast-tracking the above line project's implementation. However, progress has been slow, so the Deputy PM has requested relevant ministries and local agencies to coordinate more closely and proactively. MOIT, with the responsibility of being the lead agency for project implementation, needs to urgently develop an overall work plan, assign responsibilities to agencies, and set timelines. This includes creating greater public awareness about the importance of the project for national energy security, compensation to landowners, site clearance, and resettlement.

For the 500 kV Nam Dinh I–Thanh Hoa section, the Ministry of Natural Resources and Environment was directed to urgently organise an appraisal of and complete approval of the EIA report before October 27, 2023. The EVN Group must approve project investment before October 30, 2023, approve the technical design and hand over boundary markers to localities before November 3, 2023, and organise project ground-breaking before end-October 2023.

For the Nam Dinh I–Pho Noi section, the Ministry of Construction must urgently complete the additional appraisal of the request by the EVN Group for an increase in investment capital of the project, and send it to the Ministry of Planning and Investment, which will report to the Deputy PM before October 30, 2023, ensuring that the project is eligible for consideration and approval to adjust the project investment policy. The Ministry of Natural Resources and Environment must approve the EIA

report for the project before November 3, 2023. EVN must then approve the investment on November 5, 2023, further approve the technical design and hand over landmarks to localities before December 15, 2023, and complete the procedures to start construction before December 31, 2023.

For the Quynh Luu–Thanh Hoa and Quang Trach–Quynh Luu sections, the People's Committees of the provinces of Nghe An, Ha Tinh, and Quang Binh need to be involved and participate in the appraisal by relevant ministries and agencies to convert forest-use purposes, which will be sent to the Ministry of Agriculture and Rural Development before October 30, 2023. Based on the above progress milestones, MOIT will prepare a plan to implement the project's steps and needs to send this to the PM by December 30, 2023.

(VND1= USD0.000041)

Vietnam's EVNNPT collaborates with Long An to tackle issues in grid projects

The state-owned EVN subsidiary, EVNNPT and its branch Southern Power Works Project Management Board (SPMB), held a meeting with the Long An Provincial People's Committee to resolve the challenges in site clearance for power transmission projects in the province of Long An.

In the province, EVNNPT has assigned SPMB to implement the 500 kV Duc Hoa transformer station project and connection lines as well as the 500 kV Song Hau–Duc Hoa line project. Both these projects are facing land problems currently. Specifically, the connection line associated with the transformer station project is stuck in a 12.4-km section passing through four communes and Duc Hoa town in Duc Hoa district, due to land clearance compensation problems. So far, 66 of the 69 pillars have been transported to the construction site, while three pillars are still pending. In case of the pillar T1-22, the households have not agreed to receive compensation and requested resettlement support with land, and support for fragmented land outside the safety corridor. In the case of pier foundations T1-33 and T2-33 (belonging to Nam Thuan Industrial Park Project), the Provincial People's Committee has issued an order dated September 12, 2023,

agreeing to move to a new location but there are still problems. In the line corridor, there are still 49 households that have not received compensation or support and have not handed over the land. For the 500 kV line project passing through the districts of Duc Hoa and Duc Hue, all 44 pole positions have been constructed. In the Duc Hue district, SPMB is urgently implementing wire-pulling work to energise the project in December 2023. However, at around T267-T268, the households have not received compensation nor handed over the construction site.

This is an important project, which will connect and release the capacity of power centres in the southwest region while increasing the electricity supply of Long An province, Ho Chi Minh City and surrounding areas. In addition, the project will help improve reliability, while reducing losses and load on transmission lines and transformers in the area. These projects must be completed in 2023 to ensure the country's energy security. For the transformer station project, EVNNPT and SPMB have proposed that the People's Committee of Long An Province soon issue instructions on complaints from households as well as consider the policy of unifying land allocation for resettlement housing for households, and agree on dismantling and relocation costs. For the 500 kV line project, EVNNPT proposed that the People's Committee of Long An Province direct the People's Committee of Duc Hue District to help mobilise households to receive their compensation to hand over the site. In case households do not hand over their premises, the committees will support the deployment of security forces to pull the rope before October 25, 2023. The People's Committee of Long An Province has therefore assigned the Department of Natural Resources and Environment to promptly review the issues and prioritise existing resettlement areas of the Duc Hoa district.

Vietnam's EVNNPT urges Dien Bien province to advance transmission projects

EVNNPT, a subsidiary of state utility EVN, has proposed that authorities in northern Dien Bien province should address the issues facing the 220 kV Dien Bien substation and 220 kV Son La-Dien

Bien power transmission line projects. The projects are facing obstacles in site clearance and right-of-way compensation. EVNNPT also suggested that provincial authorities add the two projects to the list of key projects of the province to accelerate them for completion by June 2024.

Singapore's EMA approves proposal to import clean electricity from Vietnam

Singapore's Energy Market Authority (EMA) has granted conditional approval to Sembcorp Utilities – a subsidiary of Sembcorp Industries, along with its partner Petrovietnam Technical Services Corporation (PTSC), to import 1.2 GW of low-carbon electricity from Vietnam including OSW energy. The conditional approval implies that the project has been preliminarily assessed to be technically and commercially viable. Sembcorp and PTSC will next work on the project proposal development, and towards obtaining the conditional licence and import permit from EMA, as well as the export permit from Vietnam. Sembcorp estimates that the operations could commence in 2033 at the earliest, subject to approvals. The clean electricity is planned to be transmitted from Vietnam to Singapore via new subsea cables that will span around 1,000 km.

This is part of Singapore's plans to import up to 4 GW of low-carbon electricity by 2035, unveiled in 2021. It marks the country's fourth cross-border electricity contract with its neighbours in the region. Like the Vietnam contract, Singapore has entered into similar tie-ups with Indonesia and Cambodia for 2 GW and 1 GW of electricity respectively. Further, in June 2022 it started importing the first batch of clean energy through 100 MW of hydropower from Laos through the Lao Public Democratic Republic (Laos PDR)–Thailand–Malaysia–Singapore Power Integration Project. The latter is the first multilateral, cross-border electricity trade involving four Association of Southeast Asian Nations (ASEAN) countries.

Singapore's Seatrrium and EMA build first floating ESS in Southeast Asia

Seatrrium Limited, an energy and marine solutions company, has installed a floating

energy storage system (ESS) in Singapore, which is expected to commence operations by the first quarter of 2024. It will be the first floating and stacked ESS in Southeast Asia. Deployed at Seatrrium's Floating Living Lab (FLL), the ESS is part of the SGD10 million partnership between EMA and Seatrrium to develop innovative energy solutions in the marine sector, as announced in April 2020.

The project was awarded to a consortium led by Univers (formerly Envision Digital International Pte Limited). The ESS will operate as an energy reservoir by capturing the surplus energy during low demand and releasing it during peak power consumption periods. The facility has a maximum storage capacity of 7.5 MWh. The ESS is integrated with a suite of intelligent energy management functionalities including a Smart Energy Management System supported by AI and machine learning (ML) algorithms to enhance operational efficiency and energy dispatch. It is also capable of supporting locations with intermittent power supplies or be activated for rapid deployment in remote islands affected by power disruptions.

(SGD1=USD0.74)

Indonesian PLN to invest IDR2,000 trillion to develop green power

State-owned electricity company, PT PLN (Persero), requires an investment of IDR2,000 trillion up to 2040, according to its Rencana Usaha Penyediaan Tenaga Listrik (RUPTL) or Electricity Business Supply Plan 2023-40. The investment will be used to build new power plants, increase transmission and distribution capacity, and develop smart grids. This includes IDR1,200 trillion for new generation capacity, IDR500 trillion in transmission and distribution, and IDR300 trillion for the development of smart grid solar panels.

PLN plans to accelerate the country's energy transition with 75 per cent of additional capacity targeted to come from renewable energy and 25 per cent from natural gas by 2040. It has envisaged several projects, including the development of energi baru terbarukan (EBT) or new renewable energy-based power plants with a total capacity of 35 GW, including 10 GW each of solar and hydropower, and 15 GW of wind power. It plans to increase transmission capacity by 200 GVA, increase

distribution capacity by 100 GVA, and develop smart grids across five regions in Indonesia. PLN will rely on various funding sources to finance this investment, including the state budget, loans from international financial institutions, and the private sector.

(IDR1=USD0.000064)

Malaysian TNB signs two key agreements to advance ASEAN Power Grid

Malaysia's leading utility company, Tenaga Nasional Berhad (TNB), has inked two strategic partnerships with its counterparts from Indonesia and Singapore. These collaborations aim to accelerate efforts to create an interconnected ASEAN Power Grid, enhancing energy resilience, and security, and promoting the integration of RES across the region. The signing of the two memoranda of understanding (MoU) took place during the 41st ASEAN Ministers on Energy Meeting (AMEM) held in Bali, Indonesia on August 25, 2023.

Under the first MoU, TNB has joined hands with Indonesia's state-owned PT Perusahaan Listrik Negara (PLN) and the ASEAN Centre for Energy (ACE) to undertake a joint feasibility study to explore the potential for a cross-border electricity interconnection linking Sumatra, Indonesia, and Peninsular Malaysia.

The interconnection will be instrumental in facilitating the seamless RES integration and stimulating economic development across ASEAN countries.

The scope of the joint feasibility study encompasses technical assessments, policy and regulatory reviews, economic analyses, commercial frameworks, preliminary environmental and social impact assessments, as well as an implementation plan.

Parallelly, TNB has entered into a partnership with Singapore's electricity transmission and distribution company, SP Power Assets (SPPA), to explore the technical feasibility of a second power interconnection to interlink Peninsular Malaysia and Singapore.

This project, upon completion, will further bolster energy trading between the two regions, enhancing energy supply reliability.

Philippines' NGCP secures key permits for major transmission projects

The Philippines' private grid developer, National Grid Corporation of the Philippines (NGCP), has managed to fast-track the permitting process of its PHP52 billion Mindanao-Visayas Interconnection Project (MVIP) and PHP10.2 billion, 500 kV Hermosa-San Jose line with the assistance of the Department of the Interior and Local Government (DILG). This has helped release the necessary permits for the projects, and in the operationalisation of the two projects that were energised in April and May 2023 respectively.

The 83 km Hermosa-San Jose line project helps boost the Luzon transmission network's dependability. It spans the provinces of Bulacan, Pampanga and Bataan, and strengthens transmission services and accommodates new bulk power generation from the Bataan area. It is a major component of the country's 500 kV transmission backbone. The project also included the 500 kV Hermosa substation to enable better voltage regulation and power transfer from existing 230 kV facilities in the area. The Philippines' Department of Energy (DOE) has announced that grid developer NGCP has committed to fully operationalise the 500 kV Hermosa-San Jose transmission line and 230 kV Cebu-Negros-Panay Stage 3 (CNP-3) project by October 2023. DOE is working with NGCP to fast-track the operationalisation of these two major transmission projects. The CNP project involves the construction of 238 km of transmission lines and includes the expansion of the Barotac Viejo substation, Enrique B. Magalona (EB Magalona) cable terminal station (CTS), and the Bacolod substation. The CNP-3 backbone is designed to deliver excess power equivalent to the output of two 400 MW plants from Panay and Negros to Cebu through a submarine cable. Earlier in July 2023, NGCP energised Stage 1 of the project (CNP-1) interconnecting Cebu, Negros and Panay for faster and more efficient power sharing. Specifically, CNP-1 entailed the construction of a 42-km-long, 230 kV line from the Bacolod substation to the EB Magalona CTS (initially energised at 138 kV) in Negros; a 22.75-km-long, 230 kV cross-linked polyethylene (XLPE) submarine cable from EB Magalona CTS

(Negros) to the Barotac Viejo substation (Panay) (initially energised at 138 kV); and expansion of the Bacolod, EB Magalona CTS and Barotac Viejo substations.

The MVIP project entailed construction of a 92-km-long, 450 MW, ± 350 kV HVDC submarine cable between the Santander (in Cebu, Visayas) and Dapitan (in Zamboanga del Norte, Mindanao) CTS; a 50-km-long, ± 350 kV HVDC OHL from Santander CTS to the Sibonga converter station in Cebu; a 135-km-long, HVDC OHL from Dapitan CTS to the New Aurora converter station in Mindanao; new converter stations, including associated electrode stations and electrode lines in Sibonga and Aurora; a new substation in Umapad, Cebu, including associated transmission line extensions from the Cebu-Lapu transmission line cable; CTSs in Santander and Dapitan; and expansion of the Magdugo (in Cebu) and New Aurora substations. The 350 kV submarine cable, Lala-Aurora 138 kV transmission line, and the CTSs in Santander and Dapitan were completed last year. NGCP announced that the project is expected to operate at its full capacity of 450 MW by the end of 2023.

The energisation testing for the project started in April 2023 with an initial load of 22.5 MW and was expected to gradually increase to 225 MW (half) in June 2023 and then 450 MW by July. It is reported that the project has crossed the 50 per cent transfer capacity mark.

In another development, NGCP has called for the government's support to ensure the speedy completion of the PHP14.03 billion Batangas-Mindoro Interconnection Project (BMIP). Earlier last month, DOE directed NGCP to complete the project two years ahead of schedule that is by end-2025 instead of 2027. Following this, NGCP is seeking support from the concerned national and local government agencies for the implementation of BMIP.

In February 2023, NGCP received approval from the Energy Regulatory Commission (ERC) for BMIP at an estimated cost of PHP14.03 billion. NGCP had, however, undertaken pre-construction work prior to approval. The project involves the laying down of 230 kV submarine cables and the installation of 69 kV OHL and substations. The company conducted the topographic survey of the submarine cable and CTS sites, marine and hydrographic

survey, and route survey for the 230 kV and 69 kV OHL portions. Further, it also started community engagement with other local government units (LGUs). However, NGCP estimates that it will take 50-55 months for the construction of the project.

NGCP originally applied to the ERC to undertake the project in 2011 with the master plan of connecting the off-grid islands to the main transmission grid. It re-filed its application in 2021 to connect the Mindoro provinces to the main Luzon grid to enable more reliable and stable power transmission on the island, which has been facing power interruptions. NGCP has communicated its concerns to DOE on the support it needs regarding ROW acquisition and processing of permits from LGUs and other government agencies. Even if there are no delays in any of these activities, NGCP has expressed that the timeline imposed by the DOE is still very tight, but it will make all efforts to finish the project at the earliest time possible. The procurement of right-of-way and the issuance of permits from local governments and other government agencies has been the most challenging for NGCP during project implementation. With DILG's assistance, NGCP has secured 26 building permits from affected LGUs, which are traversed by the MVIP. Meanwhile, DILG's assistance was also crucial in securing 42 building permits, 45 locational clearances, and eight barangay (small district) clearances for the completion of the Hermosa-San Jose line.

(PHP1=USD0.018)

Philippines' NGCP plans 174-km transmission line between Luzon provinces

NGCP plans to install a 174-km-long transmission line between the provinces of Zambales and Pangasinan in Luzon. The 550 kV transmission line will support the increasing energy demand in the area and the existing lines in western Pangasinan and Zambales. It will also support the upcoming power plants in the provinces. The line will begin in Candelaria, passing through the towns of Santa Cruz (in Zambales), Infanta, Dasol, Mabini, Burgos, Sual, and Alaminos City (these six being in Pangasinan).

The transmission line is expected to become operational by June 2025.

ERC grants approval for NGCP's ancillary services contracts in Philippines

The ERC of the Philippines has granted NGCP the provisional authority to implement four ancillary service procurement agreements (ASPAs) with Universal Power Solutions, Inc. (UPSI), Therma Visayas, Inc. (TVI), SN Aboitiz Power-Magat, Inc. (SNAP-MI), and Masinloc Power Partners Company Limited (MPPCL).

The new ancillary suppliers include SNAP-MI's 388 MW Magat hydroelectric power plant located on the border of Isabela and Ifugao provinces; UPSI's 20 MW battery BESS in Toledo City, Cebu; MPPCL's 10 MW BESS in Masinloc, Zambales; and TVI's 353.94 MW circulating fluidised bed coal-fired power plant in Toledo City.

ERC has directed NGCP to optimise the economic and technical dispatch of the available ancillary service capacity, wherein it will schedule a mix of hourly capacity, at the least cost, for a reserve needed to maintain power quality, and security and reliability of the grid.

The associated costs will be shouldered by NGCP's customers per the approved ancillary services-cost recovery mechanism.

Korean Jeonnam 1 OWF achieves financial closure

South Korea's Jeonnam Offshore Wind Power, which is a 51:49 joint venture between SK E&S Company Limited—one of the largest conglomerates in South Korea, and Copenhagen Infrastructure Partners (CIP)—through its fund Copenhagen Infrastructure III (CI III), has achieved financial closure for its Jeonnam I offshore wind farm (OWF). The 99 MW OWF located off the coast of Shinan County, Jeonnam Province in southwest Korea, is expected to become the first Korean commercial-scale OWF to become operational in 2024.

SK E&S and CIP are also jointly developing the Jeonnam 2 and Jeonnam 3 OWFs with a total capacity of 800 MW, which are currently in the development phase. The entire 899 MW Jeonnam OWF (all phases) will support Korea's ambitious target of reaching 14.3 GW of offshore wind capacity by 2030.

Jeonnam Offshore Wind Power obtained an electricity business licence (EBL) in 2017 and entered a grid connection agreement with the state-owned utility, Korea Electric Power Corporation (KEPCO), allowing the project to connect to the grid in 2024. In 2022, Jeonnam I was awarded a 20-year fixed-price offtake agreement with Korea Hydro & Nuclear Power through Korea's first wind offtake auction. During 2022, the developers signed manufacturing and construction contracts with Korean suppliers, including Hyundai Engineering and Steel Industries, Hyundai Electric and Gaon, KT Submarine, and LS Cable and System. The project will utilise Mokpo New Port as a marshalling port throughout construction.

New Zealand's Transpower calls for flexible resources to ease energy transition

New Zealand's national grid operator Transpower's latest Whakamana i Te Mauri Hiko (WiTMH) (or Empowering our Energy Future) six-monthly monitoring report highlights how growing investment in BESS and demand response can support the increasing proportion of intermittent renewable generation in New Zealand's power system as the country decarbonises. It also shows that a significant pipeline of new customer load connections is likely to boost electricity demand following flat demand growth in recent years.

According to Transpower, flexible resources can help address the winter peak capacity challenge – previously identified as a key power system concern. Transpower currently has 410 MW of dedicated BESS in its connection queue, while an additional 500 MW is under investigation and expected to be completed within the next one year. Additionally, 3,035 MW of solar has associated battery storage, 330 MW of which is consented, with a further 230 MW in delivery. The report also shows there is a strong pipeline of new renewable generation with 30.4 GW of projects at various stages of development. Though not all of this may be built, the country is witnessing connection enquiries from potential developers of new generation continuing to convert to committed projects.

However, Transpower's analysis supports a recent report from Te Waihangā,

the Infrastructure Commission that concluded that consent processing times from 2028 will need to be 50 per cent quicker than they are projected to be under the Resource Management Act, for the country to meet its climate aspirations.

Moving a significant proportion of new generation enquiries through consenting and commissioning will be essential for the electricity industry to meet forecast demand by 2050. The report is part of Transpower's WiTMH work programme, which estimates a 68 per cent increase in electricity demand by 2050 driven by underlying demand growth and electrification of transport and industrial processes.

Queensland introduces Bill for public ownership of T&D assets

The Energy (Renewable Transformation and Jobs) Bill 2023 has been introduced in the Queensland Parliament to enshrine the commitments in the Queensland Energy and Jobs Plan into law. The Bill includes binding targets for RES in Queensland of 50 per cent by 2030, 70 per cent by 2032 and 80 per cent by 2035; calls for public ownership targets of 100 per cent of T&D assets, 100 per cent of deep storage assets (that is pumped hydro with over 1.5 GW capacity) and 54 per cent of generation assets by 2035; and facilitation of investment and access to REZ to unlock the transmission infrastructure required to meet the RES targets. It translates to bringing 22 GW of new wind and solar projects by 2035, supported by grid-scale BESS and pumped hydro storage.

The major overhaul of Queensland's electricity sector up to 2035 will require an estimated investment of AUD62 billion.

The Queensland government has committed AUD19 billion in capital investment over the next four years to support new wind, solar, storage and transmission. Further, the AUD4.5 billion Queensland Renewable Energy and Hydrogen Jobs Fund empowers publicly-owned energy corporations to partner with industry to accelerate the clean energy transition.

Twelve potential REZs have been identified to be power and job generators in the future. As of August 2023, over 16,600 BESS were connected in Queensland, totalling over 260 MWh of storage capacity.

The Bill provides for the development of the Queensland SuperGrid Infrastructure Blueprint to identify and plan significant electricity and infrastructure projects such as priority and REZ transmission networks and large-scale energy storage. For public ownership of T&D assets, the Bill calls for the preparation of a strategy by the end of 2025, which will set out how these targets will be achieved and maintained by 2035. Efforts are already ongoing in this direction. For instance, earlier in 2023, as part of the Queensland Energy and Jobs Plan, the government purchased the privately-owned Copperstring 2032 project, which entails the construction of a 1,100 km grid designed to connect the North West Minerals Province to the national grid via Hughenden and Townsville. The Bill has been referred to the Transport and Resources Committee for examination, which is expected to submit its response by March 1, 2024.

(AUD1=USD0.64)

Australian regulator releases Social Licence for Electricity Transmission directions paper

The Australian Energy Regulator (AER) has released its Social Licence for Electricity Transmission directions paper, outlining its approach to social licence issues in the regulatory remit for transmission businesses, including in the context of transmission planning and cost recovery. AER is seeking stakeholder input on expectations for community engagement, desired outcomes, and how social licence issues can be factored into regulatory tests and cost recovery for new transmission development.

Establishing a reliable and efficient transmission system is critical for the country's energy sector, with the Australian Energy Market Operator's (AEMO) ISP requiring that 10,000 km of transmission lines be built to achieve net-zero. To streamline the development of these projects, transmission companies will need to build and maintain social licences with stakeholders that are expected to be affected by transmission development. Interested stakeholders can submit their feedback by December 1, 2023; post which AER will refine its approach and develop more detailed guidance for the industry during 2024.

Australian EnergyCo extends EIS consultation for REZ transmission in NSW

Australian EnergyCo, which is leading the development of REZ transmission network infrastructure in New South Wales (NSW), has announced the extension of the public exhibition of the EIS for a transmission project that will connect the Central West Orana (CWO) REZ to the grid, to November 8, 2023 from the earlier timeline of October 26, 2023 by the NSW Department of Planning and Environment. EnergyCo submitted the EIS earlier in October.

EnergyCo is responsible for developing and overseeing the planning and approval processes for the REZ transmission network infrastructure. It is also running a competitive tender to appoint a network operator to design, build, finance, operate and maintain the network. The CWO REZ transmission project involves the development of new twin double-circuit 500 kV transmission lines between Wollar and the proposed substations at Merotherie and Elong Elong, and connections from these lines to renewable energy generation and storage projects in the REZ. The latter, which was formally declared in November 2021, is expected to initially unlock at least 3 GW of capacity by the mid-2020s and bring up to AUD10 billion in private investment by 2030. The REZ will cover about 20,000 square km and will be serviced by new transmission infrastructure, including transmission lines and energy hubs, which will transfer power generated by solar and wind farms to electricity consumers.

The power to be transmitted through the REZ is expected to be enough for around 1.4 million homes, and will contribute to NSW's goal of having 12 GW of renewable energy and 2 GW of long-duration energy storage by 2030.

The two-week extension was given as some Upper Hunter residents complained about the insufficient opportunity to properly consider the implications of the EIS. Meanwhile, the NSW energy minister has announced AUD128 million over the next four years to deliver community projects and employment opportunities in the CWO REZ. EnergyCo will administer the community and employment benefit fund. Upfront funding will come from the Transmission Acceleration Fund, and

beyond 2028, funding will come through access fees paid by renewable energy generators connecting to new transmission lines in the CWO REZ. Over time, this programme will be expanded to the other four REZs in NSW; New England, South West, Hunter-Central Coast and Illawarra.

In another development, EnergyCo held a meeting with Sandy Creek residents regarding plans to build high-voltage transmission infrastructure from Guyra, which is part of the New England REZ, to Bayswater Power Station. Based on the feedback, EnergyCo is planning to release a refined corridor in early 2024 and seek requirements for the preparation of an EIS. It has also indicated it will formally commence negotiations with landowners within the proposed alignment as per the provisions of the Land Acquisition (Just Terms Compensation) Act 1991. Construction of the project is expected to commence after 2025 with energisation of the transmission line scheduled for 2029.

(AUD1=USD0.64)

Australian ACCC rejects AEMO's bid to keep grid stability powers

The Australian Consumer and Competition Commission (ACCC) has rejected a request from the nation's energy market regulator, the AEMO, to keep the power to coordinate and share information about generator and transmission outages and new connections that it has used to prevent blackouts, ruling that antitrust concerns outweighed the benefits of ensuring grid stability.

The preliminary ruling, which the ACCC could overturn, threatens to heighten AEMO's task of preventing blackouts and price rises during what is expected to be a hot summer. Since 2020, AEMO has had the power to coordinate and share information with other market participants regarding the scheduling of repairs, maintenance, upgrades and new connections. While ACCC acknowledged the benefits of information, it stated that sharing it with others in the market increased the threat of anti-competitive behaviours. It did not provide any details of suspected anti-competitive behaviour by generators or transmission providers, but it comes at a time of widespread public unrest about electricity bills, which have increased by over 20 per cent over the last two years.

AEMO has iterated that the purpose of the information sharing was to ensure grid stability, highlighting the prospect of a difficult summer as temperatures soar. Earlier in August 2023, AEMO warned of a significant risk of blackouts in Victoria and South Australia in the summer, as it called for urgent investment to avoid the prospect of a decade when electricity supplies could not be guaranteed.

AEMO will keep the powers until the ACCC makes a final decision following consultation with the market. It is likely that it will be able to keep the authorisation until at least the autumn.

Queensland to invest AUD1.3 billion in Australian CopperString 2032

The Queensland government has announced an investment of AUD1.3 billion to advance the construction of the AUD5 billion CopperString 2032 project. This funding will ensure that the project meets its construction start-date. Particularly, it will enable the Australian Queensland's transmission system operator (TSO), Powerlink, alongside construction partners UGL and CPB (which are Australian construction contractor CIMIC Group companies), to undertake detailed design and engineering, environmental assessments, and secure easements for the project.

CopperString 2032 will be connected to the Queensland SuperGrid, the nation's largest energy grid. The connection works will involve the construction of new generation storage and transmission to deliver the state's target of 50 per cent renewable energy by 2030, 70 per cent by 2032, and 80 per cent by 2035. CopperString 2032 involves the construction of 840 km of new power lines from Townsville to Mount Isa, which will connect Queensland's North West Minerals Province (NWMP) to the National Electricity Market (NEM). The project will help in transmitting about 6 GW of renewable energy generation, along with providing green electricity for the extraction of new critical minerals such as copper, zinc, vanadium and cobalt in NWMP. The project, which was initially proposed by a Townsville-based private company CuString, is being implemented by state-owned Powerlink, given its importance. The overall expanded project includes a 500 kV transmission line from

Townsville to Hughenden; a 330 kV line from Hughenden to Cloncurry; a 220 kV line from Cloncurry to Mount Isa; and up to six new substations.

The latest funding will get the project ready for construction to commence mid-2024. It will enable establishment of 100 permanent project jobs, procurement of transmission equipment, delivery of all site investigations and advancement of site development works, including camps and access works. The project will be calling for response to tenders from local companies.

Earlier in September 2023, Powerlink, UGL and CPB released over 40 works packages for expressions of interest (EOIs). The packages cover a range of activities and services such as engineering, construction, environmental management, logistics, camp construction, haulage and communications.

(AUD1=USD0.64)

Transgrid expands preferred corridor for Australian VNI West

NSW TSO Transgrid announced an expansion of the preferred corridor for the Victoria-NSW Interconnector West (VNI West) project, which aims to connect the high voltage electricity grids of both states in Australia. It has stated that the expansion has been supported by the community and landowner feedback collected during the consultation period for the draft corridor report released in July 2023.

VNI West is being jointly developed with Transmission Company Victoria (TCV) and will connect major projects – EnergyConnect in NSW and Western Renewables Link (WRL) in Victoria. It is recognised by the AEMO as a priority project in its 2022 ISP for linking the Victorian grid with that of NSW to unlock up to 5 GW of new renewable generation capacity. VNI West proposes to connect WRL from a new terminal station north of Ballarat, Victoria with the EnergyConnect project at a new Dinawan substation between Jerilderie and Coleambally, NSW. The project also involves the enhancement of the EnergyConnect transmission lines between Dinawan and Wagga Wagga to operate at 500 kV rather than 330 kV.

Previously, the draft corridor report assessed several possible corridor options

and proposed an initial preferred corridor. Based on the landowner feedback, Transgrid has amended the VNI West corridor in a number of locations. The route will run from near Jerilderie to Swan Hill, via Conargo, Wanganella and Moulamein. The latest preferred corridor report outlines the recent amendments to the project, which include an expansion of the corridor width from 15 km to 24 km in some areas to enable greater flexibility in responding to community and landowner feedback. It also includes changes near the Murray River to accommodate a disused rail corridor and align with the draft corridor announced by TCV. By expanding the corridor to the north, there are more opportunities to exclude any sensitive river systems and irrigation land and respond to suggestions raised during the recent consultation. It would allow the route to be more broadly aligned with road corridors, including Wanganella Road and Mabins Well Road, and minimise conflict with current renewable development to the west of the Dinawan substation.

A new Community Consultative Group (CCG) is expected to be soon announced to facilitate discussion between Transgrid, communities, landowners and councils about the next phase in project planning.

Using the amended preferred corridor, Transgrid will identify potential route options, including a recommended preferred route option within the corridor, based on detailed consideration of technical, environmental and social constraints. Public consultation of the recommended preferred route option will take place in the first half of 2024.

Following this, Transgrid will confirm the preferred route option and commence the detailed environmental assessment and approvals phase.

In a related development, AER rejected a legal challenge made by affected landowners and community members against the VNI West project. The dismissal comes after representatives of the AEMO and its subsidiary TCV abandoned a community meeting in St Arnaud on October 12, 2023, after landowners showed their vocal opposition to the project.

The Regional Victoria Power Alliance, formerly Moorabool and Central Highlands Power Alliance, had challenged the project on 10 different grounds, calling for the

design process to be redone. While AER dismissed the alliance's challenge, it stated that the group had a right to dispute the project as they had the potential to suffer any adverse impacts.

According to TCV representatives, the meeting at St Arnaud was abandoned on advice from Victoria Police due to protesters' intimidating behaviour. Prior to publishing the draft corridor, TCV conducted six weeks of public consultation within the 2-km area impacted by the project. Although the meeting at St Arnaud did not take place, TCV held public meetings in Charlton, Boort, Stawell and Kerang over two weeks, which were attended by over 400 people. Further, an online webinar for all impacted communities was held on October 19, 2023.

According to AEMO, VNI West is scheduled to be energised by July 2031.

Australian Project EnergyConnect makes steady progress

Australian TSO for NSW, Transgrid, is making steady progress on the construction of the 700-km NSW section of the AUD1.8 billion Project EnergyConnect (PEC). Transgrid has reported the arrival of key components of two synchronous condensers as part of the project.

Being jointly developed by Transgrid and South Australian (SA) TSO, ElectraNet, PEC comprises a proposed 330 kV interconnection with a short 220 kV branch line from Buronga in NSW to Red Cliffs in northwest Victoria.

The 800 MW interconnector will allow energy to be shared between NSW, SA, and Victoria, enable the connection of more new RES, bolster the grid, and provide customers with savings.

Transgrid's construction partner Elecnor Australia is building the NSW section of the project from Wagga Wagga to the SA border, and a connection to Red Cliffs in Victoria. The 120 MVar synchronous condensers will sit at the heart of the project to help maintain voltage on the transmission network and provide system resilience services such as inertia. Each unit is designed to rotate at a speed of 750 revolutions per minute (rpm) and generate an inertia of 7 MW/MVA. The synchronous condensers were supplied by Andritz with components built in Austria, Spain and Brazil. They were shipped to

Melbourne before a three-day road journey to Transgrid's Buronga substation near Mildura. The machines will now undergo five months of commissioning and testing.

The synchronous condensers will be housed in a 60-metre-long, 1,200 metre square machine hall manufactured in Geelong by Thornton Engineering. Delivery teams have installed cladding on the machine hall so the condensers would be protected from the elements and dust. The foundations for the condensers required 1,700 cubic metres of concrete, which was completed earlier this year. The machine hall includes a 130-tonne bridge crane that played a critical role in the assembly of the synchronous condensers on site. The lift and installation of the equipment were achieved safely and on time due to collaboration between Crane Systems Australia, George Rydel, and B&M Dorrington. The 16 ha Buronga substation will be one of the most complex sites for technology and engineering with equipment including five 200 MVA phase-shifting transformers (PSTs), four 330 kV/60 MVar shunt reactors, two 120 MVar synchronous condensers, two 120 MVA, 330/12 kV step-down transformers, three 200 MVA, 330/220 kV power transformers and two 330 kV, 52 MVar capacitor banks.

Meanwhile, ElectraNet is continuing to work with its construction partner and contractor, Downer, landholders, and councils to deliver the SA side of PEC, which includes 384 towers, 83 stringing pads, 10 laydown yards and various stringing, access tracks, road hurdles and passing bays. Downer and Meridian Helicopters Australia have successfully completed aerial stringing activities between the towers spanning 205 km from Robertstown to Bunday, and onto the NSW border. Aerial stringing has helped to ensure impacts to the surrounding environment along the route are minimised.

As the project is nearing the construction completion milestone on the SA side, ElectraNet has begun the environmental rehabilitation process around tower sites. This includes respreading the topsoil that was scraped off the site, which contains a seed bank that will promote native vegetation growth and further create habitat for native fauna.

(AUD1=USD0.64)

Australian NSW's largest BESS project operational

Australian private equity firm—Federation Asset Management, and renewable and storage developer—Edify Energy, have announced that NSW's largest BESS – the 150 MW/300 MWh Riverina and Darlington Point energy storage systems (Riverina BESS) – is fully operational. Federation Asset Management owns a 90 per cent stake in the BESS, while Edify holds the remaining 10 per cent and is responsible for the long-term operational asset management of the facility.

Designed and developed by Edify, Riverina BESS comprises three independent, co-located units of Tesla Megapack lithium-ion batteries located in Murrumbidgee Shire near Darlington Point, NSW. It is located in Wiradjuri Country, the largest Aboriginal Nation in NSW. The projects will connect to the NSW TSO Transgrid's network at the Darlington Point substation. The BESS will add more flexible, dispatchable capacity to the NSW market and complement the significant presence of renewable generation in the region. The battery's output, which has been contracted to Shell Energy and EnergyAustralia for 10 years, is sufficient to supply 240,000 homes with two hours of electricity at peak times.

The project has received funding of AUD6.6 million from the Australian Renewable Energy Agency as part of its efforts to support projects with a focus on batteries that offer grid-forming capability. The NSW government also provided AUD6.5 million.

(AUD1=USD0.64)

KEGOC receives EIA approval for West Kazakhstan Electricity Interconnection

Kazakhstan's grid developer, JSC Kazakhstan Electricity Grid Management Company (KEGOC), has received approval for the EIA prepared as part of the feasibility study of West Kazakhstan Electricity Interconnection Project. The project aims to interconnect Zone West (which includes Atyrau, West Kazakhstan and Mangistau oblasts) with the main part of the country's united power system (UPS) over Kazakhstan inland territory. Currently, part of the Zone West's power

demand is met by Russian imports via the 110 kV transmission line connecting Atyrau to Astrakhan in Russia, and three 220 kV transmission lines between the West-Kazakhstan oblast with Russia's Mid-Volga region. The unification of Zone West with the UPS aims to ensure the region's energy security and energy independence.

According to the conclusion of the Environmental Regulation and Control Committee of the Ministry of Ecology and Natural Resources of the Republic of Kazakhstan, the EIA report was recognised as compliant with environmental legislation. KEGOC will also comply with a number of requirements regarding environmental impact during the construction and operation of the project in the future. The project is scheduled to be completed in 2028.

ACWA Power to build wind and transmission project in Uzbekistan

Uzbekistan's President has approved Saudi Arabia's ACWA Power to construct the 1.5 GW Kungrad wind farm and an overhead power transmission network in the Kungirod district of the Republic of Karakalpakstan, Uzbekistan. The Kungrad wind farm will comprise three 500 MW projects (Kungrad Wind 1, Kungrad Wind 2 and Kungrad Wind 3) owned by three limited liability subsidiaries. Each of the three projects will also incorporate a 100 MW capacity BESS. The Kungrad wind farm will involve an investment of USD2.4 billion. In December 2022, Uzbekistan entered into a power purchase agreement with ACWA for the electricity generated by these plants. ACWA is responsible for building a substation and an overhead line to connect the wind power plants to the national grid. After completion, these assets will be transferred to the National Electric Grid of Uzbekistan JSC. The costs incurred for the transmission assets will be recovered over a period of 10 years. The project will be fully commissioned in 2027, when it is expected to power 1.65 million households.

Afghanistan to implement six projects for imports from Turkmenistan

Afghanistan plans to implement six important national energy projects,

involving an investment of USD75 million, to increase electricity imports from Turkmenistan and meet its energy needs. For this, the Ministry of Energy and Water Resources has signed relevant agreements with the local Awfi Bahram Mines Extraction and Processing Trading Company.

The projects will be implemented in the Kabul area. These include the completion of the remaining work on the construction of a 500 kV transmission line from Khwaja Alwan Desert to Arghandi (Kabul area); finishing the Arghandi substation; construction of a new substation in the Tarakhel area; a 220 kV power transmission line from Chamtala to Tarakhel substations; the Arghandi-Kabul substation; and a new substation in Bot-Hack. The implementation of these projects will allow the import of 1,000 MW of electricity from Turkmenistan, which will resolve the issue of electricity shortages in Kabul, as well as in the central, eastern and southern provinces, and the industrial sector.

The six projects' implementation period is two years.

Europe

EC presents European Wind Power Action Plan

The European Commission (EC) has presented its European Wind Power Action Plan to support the European Union's (EU) wind sector and improve its competitiveness.

The EU target of at least 42.5 per cent of renewables by 2030 will require the installed capacity to grow from 204 GW in 2022 to more than 500 GW in 2030. However, the European wind industry has recently faced a unique set of challenges including insufficient and uncertain demand, slow and complex permitting processes, lack of access to raw materials, high inflation and commodity prices, unsupportive design of national tenders, increased pressure from international competitors, and risks from non-availability of a skilled workforce. Further, the energy crisis following Russia's invasion of Ukraine, has underscored the risks stemming from over-reliance on a dominant foreign fossil fuel supplier and demonstrated the importance of wind and

other renewable energy sources for the stability and security of the energy system.

The Action Plan will help to maintain a healthy and competitive wind energy supply chain, with a clear and secure pipeline of projects attracting the necessary financing and competing on a level playing field globally. It is accompanied by a communication on delivering on the EU's offshore energy ambition, including OSW power, following up on the EU Offshore Renewable Energy Strategy adopted three years ago.

The Action Plan sets out immediate actions to be taken together by the EC, member countries, and the industry; building on existing policies and legislation and focusing on six main areas, viz. acceleration of deployment through increased predictability and faster permitting; improved auction design; access to finance; a fair and competitive international environment; skills development; and industry engagement and member countries' commitments. The EC plans to support the necessary build-out of electricity grids with a Grids Action Plan later in 2023. The EC has called on member countries and the industry to endorse and implement this action plan according to their respective roles. It has now invited the Parliament, European Council, and other EU institutions to support the objectives of this action plan.

UK's Ofgem publishes decision on FSNR framework

The UK's energy regulator, Office of Gas and Electricity Markets (Ofgem), has published its decision on the Future System and Network Regulation (FSNR) framework. The decision relates to the overarching framework approach for the next gas transmission (GT), gas distribution (GD) and electricity transmission (ET) network price controls, which will be implemented from April 1, 2026. It sets out the next steps for the development of methodologies and processes for the next GT, GD, and ET price controls.

On March 10, 2023, Ofgem launched the FSNR consultation, setting out proposals on the framework for the next round of price controls. Ofgem will publish the consultations on these sector-specific methodologies in December 2023, where it

will provide further detail on its framework approach. The current RII0-2 (Revenue = Incentives + Innovation + Outputs) price controls for GT/GD/ET networks run until March 2026, with the price control for electricity distribution (ED) running for five years until March 2028. Ofgem has now set out the framework design for the network price controls that will replace these.

UK's Ofgem publishes FNC on Harker Energy Enablement project

The UK's energy regulator, Ofgem, has published its final needs case (FNC) on the GBP252.68 million Harker Energy Enablement project. The latter, which will be developed by the UK's National Grid Electricity Transmission (NGET), includes the following:

- Construction of new 132 kV and 400 kV substations, incorporating any extension and up-ratings required for new circuits and additional supergrid transformers.
- Tendering for sulphur hexafluoride (SF6)-free solutions across the site – while NGET is exploring the opportunity for SF6-free technology across the site, the viability of an SF6-free solution is expected to be determined during the project assessment (PA) stage.
- Addition of six 400/132 kV, 240 MVA transformers to replace existing transformers, providing capacity required for present and future load drivers.
- The removal of the 275 kV Harker substation as it is no longer needed, but maintaining existing connections to Stella West and Fourstones substations in North-East England to the 400 kV substation.
- Replacement of existing interbus transformers on the 275 kV substation.

Harker is currently the highest emitting site for SF6 on the NGET network with holdings of SF6 within the existing 132 kV and 275 kV substations and a sizeable concentration at one 400 kV substation.

The project is slated for delivery by 2026 under the Large Onshore Transmission Investment (LOTI) mechanism as part of the RII0-2 (Revenue = Incentives + Innovation + Outputs) price control system.

(GBP1=USD1.23)

UK's Ofgem approves grants for SSEN Transmission's innovation projects

The UK's energy regulator, Ofgem, has granted GBP1.2 million to SSE Networks Transmission (SSEN Transmission), which is the transmission business of Scottish and Southern Energy (SSE), for three electricity projects under Ofgem's Strategic Innovation Fund (SIF).

SIF is a five-year scheme launched in 2021, and designed to fund innovative projects by gas and electricity networks that contribute to net zero while delivering net benefits to their customers.

The fund is structured into three distinct phases: Discovery, Alpha, and Beta. While the initial two phases are to help mitigate the technical uncertainties and establish proof-of-concept projects, the third and final phase aims to aid the development of demonstrator projects to advance the solutions further up the technology readiness level (TRL) and pave the way for their implementation.

The three projects, viz. INSIGHT (Innovative Network Status Intelligence Gathered by Holistic use of Telemetry and Simulation), REACT (Rapid Evaluation Area Connection Tool) and NIMBUS (Network Innovation and Meteorology to Build for Sustainability), have already completed the initial three-month Discovery phase to overcome the technical uncertainties of the projects, and will progress into the six-month Alpha phase in October 2023 to establish proof-of-concept and to develop innovative data-driven tools to transform transmission infrastructure.

INSIGHT aims to deliver a virtual, real-time, alert and control system that can monitor and mitigate different types of oscillation events experienced on Great Britain (GB) networks.

The outputs of INSIGHT will improve the network's strength, stability, and reliability, consequently enabling more renewable electricity on the networks. SSEN Transmission is working alongside the University of Strathclyde, National Grid Electricity System Operator and the National HVDC Centre on this project.

REACT involves creating an impact planning tool that provides a dynamic overview of all future connection requests

to SSEN Transmission's Network. The tool will provide network transparency to future demand customers by allowing them to visualise the optimal locations to place new demand and efficiently roll out new infrastructure quicker, and in more strategic locations.

This will help utilise the existing network and avoid large reinforcement, in turn providing a more cost-effective solution to decarbonisation.

This project is being undertaken by SSEN Transmission with Olsights, Mapstand, Scotia Gas Networks Limited (SGN), National Grid ESO and Icebreaker One.

The NIMBUS project is being implemented by SSEN Transmission, SSEN Distribution, Icebreaker One, IBM, and Plantir to change the way detailed meteorological data and models are used in the design and decision-making of electricity assets, through innovative uses of the data and predictive modelling techniques. In turn, this will lead to improved intervention planning and asset protection, which could extend asset lives by 10 to 20 years.

In another development, Ofgem has approved the FNC for SSEN Transmission's Argyll grid reinforcement project. The network upgradation from 132 kV to 275 kV would support the connection of at least 560 MW of new renewable energy, and also the transmission of this power to high-demand areas in Scotland and beyond. The GBP400 million project forms part of SSE Group's Net Zero Acceleration Programme, as per which it plans to invest GBP12.5 billion over the next five years on critical low-carbon infrastructure needed for the net zero transition in the UK and Ireland.

The Argyll network reinforcement would include the construction of three new substations – one each at Creag Dhubh, Craig Murrail, and in the vicinity of the existing Crossaig substation; construction of 10 km of new overhead transmission circuits connecting the Creag Dhubh substation to the existing Inveraray-Crossaig circuits; and replacement of existing substations at An Suidhe and Crarae along the route of the Inveraray-Crossaig line.

(GBP1=USD1.23)

UK's National Grid launches consultation for Sea Link between Kent and Suffolk

The UK's TSO, National Grid, has launched an eight-week statutory consultation process between October 24 and December 18, 2023, for proposals for a new subsea electricity infrastructure project between Kent and Suffolk.

The Sea Link project would comprise part of a 145-km cable connection from Pegwell Bay in Kent to a point on the Suffolk Coast between Aldeburgh and Thorpeness. The plan also includes the onshore infrastructure needed at either end, such as converter stations and substations, to connect the power to the existing network.

The link will increase the electrical network's capacity in Kent and Suffolk, allowing low-carbon and green energy to power nearby residences and businesses.

This reinforcement between Suffolk and Kent is essential in the UK's journey to net zero by 2050 and is part of a wider programme to upgrade the entire network.

UK's National Grid to extend Bodelwyddan substation in North Wales

The UK's TSO, National Grid, has launched plans to extend its Bodelwyddan substation in Cefn Meiriadog, Denbighshire in North Wales.

The substation extension is being proposed to connect new low-carbon energy projects, such as OWF and a MaresConnect subsea interconnector cable between Wales, the UK and Ireland.

As part of its proposal, National Grid is consulting local people and organisations between October 10, 2023 and November 27, 2023. The proposals are at an early stage and this consultation is being held ahead of the final development of plans and the submission of a planning application to Denbighshire County Council at the end of 2023.

As a separate but related part of its work, National Grid also needs to change how the existing overhead line that currently runs between Pentir in Gwynedd and Connah's Quay in Flintshire enters and leaves the expanded substation.

UK's Dogger Bank A OWF transmits first power to grid

The Dogger Bank A OWF located in UK waters of the North Sea, produced power for the first time on October 7, 2023. The OWF, which is located more than 130 km off the north-east coast of England, is being constructed in three 1.2 GW phases known as A, B and C, by a joint venture between the UK's SSE Renewables, and Norway's Equinor and Vårgrønn (a joint venture of Eni Plenitude and HitecVision).

SSE Renewables is the lead operator for the development and construction of the Dogger Bank wind farm. On completion, Equinor will take over as lead operator of the wind farm for its expected operational life of around 35 years. Vårgrønn brings specialist offshore wind expertise to the project.

Dogger Bank OWF is set to be the world's largest OWF consisting of 277 wind turbines with a capacity of 3.6 GW, which is enough to power more than 6 million homes. Power from the project's first offshore wind turbine at Dogger Bank A is now being transmitted to the UK's national grid via Dogger Bank's HVDC transmission system, making it the first time HVDC technology is being used on a UK wind farm.

Onshore construction of Phases A and B commenced in 2020, while offshore construction on Dogger Bank A began in the second quarter of 2022. Phase B is expected to produce power in 2024 and commercial operations are expected to begin six months later. The Phase C project is due to come online in 2026.

UK's SSEN begins consultation for West of Beaulieu Asset Replacement Project

The UK's SSEN Transmission, the transmission business of SSE, has invited the public to share their views on its plans to replace four of its 132 kV existing substations, viz. Deanie, Culligran, Aigas and Kilmorack, to the west of Beaulieu. These four substations, which were built in the 1960s, help transmit hydropower generated in the area to connect to the national grid. As these assets are now reaching the end of their operating life, SSEN plans to replace the same. The new substations are required

to be located with the existing substation compounds due to the new transformers requiring more space to meet modern health and safety standards, and the challenge of keeping the hydropower stations connected to the network during the construction phase for the new transformers.

SEEN Transmission is aiming to ensure the new substations are located within a radius of one km of the existing site, to ensure minimal electrical losses.

The public consultation events scheduled between October 23 and October 25, 2023 will detail final proposals for the Culligran and Deanie sites as part of the statutory Pre-Application Consultation (PAC) required for major planning applications.

SEEN will also introduce, consult and seek feedback again on the new selected sites for the Aigas and Kilmorack substations following public feedback provided in 2022, which included looking at alternative locations that were put forward by the local community.

SSE Renewables and TotalEnergies commission Scotland's Seagreen OWF

SSE Renewables – a subsidiary of SSE, and TotalEnergies have commissioned Scotland's largest wind farm, the Seagreen OWF. The USD4 billion-worth OWF is now fully operational and running at its design capacity of 1,075 MW. Construction for the project had commenced in June 2020.

The electricity generated from Seagreen's 114 turbines is being exported from the North Sea site via three subsea cables to landfall at Carnoustie, and then through 19 km of underground cabling to a new onshore substation at Tealing near Dundee, before being distributed to homes and businesses via the Great Britain power grid.

Seagreen is a joint venture between TotalEnergies (51 per cent) and SSE Renewables (49 per cent). It is located in the North Sea, some 27 km off the coast of Angus in Scotland. It is TotalEnergies' biggest operational offshore wind farm worldwide and the world's deepest, fixed-bottom wind farm, with its foundation reaching nearly 60 metres below sea level.

The project will generate around 5 TWh, to power almost 1.6 million homes

annually, equivalent to two-thirds of all Scottish homes.

The OWF will also prevent the emission of over 2 million tonnes of carbon dioxide from fossil fuel electricity generation every year.

German BayWa r.e. receives consent for 57 MW BESS in Northeast England

Germany-headquartered global renewable energy developer and service provider, BayWa r.e., has secured approval of its planning application for a 57 MW/117 MWh BESS in partnership with Grüne Energien Solar GmbH. The BESS facility at Meadow Farm will be built in Stockton-on-Tees in Northeast England and will help stabilise the local electricity system, by providing flexibility and supporting the wider deployment of renewable generation onto the grid.

TenneT ships offshore platform for German DolWin5 grid connection project

Dutch-German TSO, TenneT, has shipped out the 900 MW offshore platform DolWin epsilon from Singapore for the DolWin5 grid connection project in Germany. The platform is expected to arrive at the Aibel shipyard in Haugesund, Norway in December 2023 after which, Aibel – as a partner of the Aibel-Seatrium consortium (formed by Sembcorp Marine and Keppel Offshore & Marine), will supply and install the final technical equipment.

Further, Hitachi Energy – as Aibel's subcontractor and supplier for the HVDC technology, will install the converter and transformers. In 2024, the platform will be transported (self-floating) and installed at its final destination in the German North Sea.

The DolWin5 grid connection is of enormous importance to TenneT, as for the first time, the 66 kV direct connection is being used. In comparison to previous projects, a wind farm transformer station is no longer required. Instead, the wind power produced off the coast of Lower Saxony is transmitted directly as three-phase AC current to TenneT's DolWin epsilon converter platform, converted into DC and transported via a 130-km-long cable

route to the Emden/East converter station. Here, at the land station, the electricity will be converted back into three-phase current and fed into the extra-high voltage grid via the transformer station.

This also meant corresponding planning in the technical design of the platform and detailed agreements with the wind farm, whose technical systems are now located on the platform. The elimination of the wind farm's transformer station not only minimises costs, but also construction time and interference with the marine ecosystem.

Germany's BNetzA provisionally approves A-Nord HVDC connection

Germany's energy regulator, Bundesnetzagentur (BNetzA) or Federal Network Agency, has given provisional approval to the German TSO, Amprion GmbH, to commence construction on the ±525 kV HVDC A-Nord connection. However, the decision is reversible in case any change is made in the current planning approval procedure. Amprion must have a planning approval decision before it can proceed with any further construction on the 300-km-long underground project. The final approval is expected in 2024.

Construction work is approved to begin in Haren (Ems), Meppen, and Wietmarschen north of the municipal boundary to Nordhorn, up to the Kortenberken street. The approval also covers the BorWin4 and DolWin4 offshore grid connections, since the projects run directly parallel to one another and A-Nord project for over 100 km on land.

DolWin4 is a connection that is around 215 km long, with about 60 km at sea. BorWin4 has a total route length of around 280 km, with around 125 km at sea.

The approval to start construction early applies to the building of a cable protection tube system and all the necessary measures to build it.

This includes work to clear the way for the cables, digging the cable trenches, drilling as needed, laying the cables inside the cable protection tube system, installing the connecting points, and the necessary preparatory measures.

The A-Nord connection will transport the rapidly growing wind power from the

North Sea to large consumer centres in North Rhine-Westphalia. In the future, the EUR3 billion DC connection will absorb around 2 GW of wind power from the North Sea region in Emden and bring it to Meerbusch-Osterath near Düsseldorf. The A-Nord DC connection is expected to be commissioned by mid-2027.

(EUR1=USD1.07)

Bay of Biscay France–Spain interconnection declared as public utility

The Bay of Biscay interconnection between France and Spain has been declared as a public utility by French Ministry of Ecological Transition. The project entails the construction of a HVDC VSC 400-km link (mainly subsea) in the Biscay Gulf, between Gatica (Basque Country, Spain) and Cubnezais (Nouvelle Aquitaine, France).

The 400-km route will be divided underwater (300 km) and underground (100 km) to reach the Cubnezais substation from the Medoc coast, and includes the Capbreton canyon crossing. It is being developed by INELFE (Interconexión Eléctrica Francia-España or Electricity Interconnection France-Spain), which is jointly owned by France's TSO Réseau de Transport d'Électricité (RTE) and Spain's power grid operator Red Eléctrica de España (REE).

Recently, in June 2023, INELFE awarded an order for the supply of four HVDC converter stations for the interconnection to Hitachi Energy in partnership with VINCI, an industry leader in energy and construction. Hitachi Energy will supply HVDC Light®, which is a VSC technology developed by it.

The declaration of public utility (DUP) concludes a consultation phase of about five years and two public inquiries carried out respectively under the aegis of the National Commission for Public Debate (CNDP) and the investigating commissioners, thus making it possible to begin the works phase.

The latter will begin in October 2023 and carry on till 2027, in several phases and on several sites: in Gironde, the Landes, and in the Pyrénées-Atlantiques. Work at sea, over nearly 300 km, will begin at the end of 2025.

The commissioning of the Bay of Biscay interconnection is planned for 2028 after a few months of testing.

Measures underway to manage increasing pressure on Netherlands' grid

The Netherlands' grid operators and the government are taking additional measures to manage the ever-increasing pressure on the country's power grid, as a result of the increasing electricity demand. These include the mandatory use of intelligent charging stations, controllable heat pumps, and mandatory off-loading from the grid at peak times. Grid operators expect that these measures will relieve the pressure on the electricity grid and make better use of it, allowing them to connect more customers.

There are currently over 105 GW of applications for reinforcements or new connections to purchase electricity. This includes applications for large batteries (75 GW) and for industry, businesses, data centres, hydrogen factories and new housing developments. All these developments are adding up much faster than the grid can be expanded.

Rising energy prices and increasing climate ambitions are further accelerating this. Studies published by TenneT for Utrecht, Gelderland, the Flevopolder, the port area of Rotterdam and Goeree-Overflakkee show that there is no room on the grid for companies in these regions, thus resulting into longer waiting times.

In addition, the maximum capacity of the electricity grid has also been reached in Noord-Holland for companies seeking a connection or an increase in capacity. Nationally, the trend is that more and more regions are approaching capacity limits.

Although grid expansion is in full swif, with total investment is expected to exceed EUR5 billion in 2023, the demand is increasing at a much higher pace. By 2025, the grid operators' investment will increase to EUR8 billion per year.

To enable the work on the networks, governments need to make faster decisions about when and where to build which energy infrastructure. They also need to speed up the availability of land for grid expansion, and accelerate approvals and procedures.

In another development, TenneT has published the draft 'Investment Plan on Land' and 'Investment Plan at Sea' 2024 for the Netherlands' grid.

The plan describes the projects needed over the next ten years to make the electricity grid ready for the future.

TenneT expects to carry out around 700 major infrastructure projects. These include grid extensions, replacement investments, new customer connections, OSW farms, and reconstruction projects. This is double the estimate in the previous 2022 investment plan.

The fast-growing demand for additional grid capacity is the main reason for the increase in the portfolio, partly due to making industry more sustainable and the growth of heat pumps, charging stations, OSW turbines and solar farms.

Among other things, TenneT will develop five larger 380 kV new power highways over the next ten years and modernise 140 high-voltage substations. To ensure grid reliability, a significant part is to be invested in maintenance and replacement of the existing grid.

In addition, high-priority projects, such as the so-called Multi-Annual Programme for Infrastructure, Energy and Climate (MIEK) projects, have been identified in close cooperation with the various authorities.

The investment plan also reveals the progress of ongoing projects. Of the 252 grid expansion projects already planned, 60 projects have been moved up in the schedule compared to the investment plan of two years ago.

Stakeholders can respond to the plans until November 29, 2023, post which the final plan will be sent to the Netherlands Authority for Consumers and Markets (ACM) in early 2024.

(EUR1=USD1.07)

Belgian Elia secures environmental permit for energy island

Belgium's TSO, Elia, has secured an environmental permit for the country's first energy island, Princess Elizabeth Island, located 45 km of the coast in the North Sea. Elia had applied for the permit in January 2023.

This will be the first artificial energy island in the world to combine both HVDC and HVAC. The island will house exclusive transmission infrastructure to connect new wind farms (up to 3.5 GW) as well as future interconnectors. Around 300 km of HVAC cables and 60 km of HVDC cables will be installed around the island to connect all future offshore facilities to the Belgian high-voltage grid.

The high-voltage infrastructure on the island will bundle together the export cables from the wind farms in the new Princess Elisabeth Zone, while also serving as a hub for future interconnectors with the United Kingdom (Nautilus Link) and Denmark (Triton Link). These hybrid interconnectors will have two functions, leading to enhanced efficiency. They will handle power exchanges between countries, and will also be connected to new offshore wind farms in the North Sea that will eventually supply Belgium with large quantities of renewable energy.

Construction of the energy island will start in early 2024 and is expected to be completed in 2026. A consortium comprising Belgian marine construction companies DEME and Jan De Nul, has already started preparing the site where it will build the caissons (concrete foundations) in Vlissingen (North Sea Port).

Portugal opens consultation for offshore renewable energy allocation plan

The Portugal government has released the 'Allocation Plan for the Exploration of Renewable Energies' (PAER) for public consultation.

The document lists the areas suitable for the location of OWFs as a preliminary step to the awarding of projects that it intends to launch at the end of 2023. The OWFs will have a cumulative capacity of 10 GW, spreading over seven large sites along the coast.

The electricity produced from these OWFs can contribute approximately 32 per cent of the electricity production of Portugal. The government may also consider a scenario where it exports energy directly from the sea.

In Viana do Castelo, 50 km south of the border with Galicia, Spain, 25 MW Wind

Float Atlantic, Europe's first floating OWF has been operating since end of 2019. Two priority areas are being considered for future auctions – Viana do Castelo Norte, with 301 square kilometres, and Viana do Castelo Sur, with 294 square kilometres – where up to 2 GW of floating OWF capacity can be installed.

In the case of the Viana do Castelo OWFs, the Portuguese authorities have identified as a possible connection point the future Fonte de Lima substation, which is one of the infrastructure planned as part of the new electricity highway with Galicia, and the Vila Nova de Famalicão substation.

The reinforcement of the power lines on both sides of the Minho will facilitate the deployment of offshore wind power to the point that Portugal is considering the possibility of interconnection with the electricity grid that runs towards the neighbouring community. This will allow it to become a net exporter of electricity to Galicia, from where it currently imports more power.

In 2022, almost 4,200 GWh was exported to Portugal from Galicia (a third of everything exported by Spain), compared to 200 GWh imported from there.

To comply with cross-border processing regulations, Portugal has sent the Supervisory Review and Evaluation Process (SREP) to Spain, where it will be submitted for the opinion of almost a hundred public bodies and entities, some of them from Galicia due to the proximity of the Viana do Castelo OWFs.

Italy's Terna launches public consultation for GR.ITA 2

Italy's TSO, Terna, has launched a public consultation for the future HVDC interconnection between Greece and Italy, known as GR.ITA 2.

The first meeting with local communities and institutions was held online on October 13, 2023 and another four in-person meetings will be held over the following two weeks to guarantee the widest possible participation and interaction with the seven municipalities in the province of Lecce, affected by the work.

The EUR750 million interconnection will guarantee more reliable exchange between the two countries and reinforce Italy's

role as a Mediterranean energy hub. The planning of this second interconnection responds to the objective of ensuring greater integration of the new renewable energy generation expected in the near future in Italy and Greece.

The interconnection will increase the transport capacity towards Greece and neighbouring EU countries, with consequent benefits in terms of market efficiency, reduction of national electricity supply costs, and sharing of flexibility services for the balanced and safe management of the national transmission grid (NTG).

The project involves an HVDC undersea cable (USC) to double the current exchange capacity between the two countries. Two 250-km submarine cables with up to 1,000 MW of power and two 50-km underground DC cables will connect the landing site in Melendugno to Galatina through the municipalities of Soleto, Sternatia, Martignano, Calimera and Carpignano Salentino.

The new conversion station that will be connected to the national grid via an underground AC cable will be built in Galatina.

This second interconnection project is expected to be commissioned in 2031.

Nordic TSOs release NGDP 2023

The four Nordic TSOs—Energinet (Denmark), Fingrid (Finland), Statnett (Norway) and Svenska kraftnät (Sweden), have published the report on 'Nordic Grid Development Perspective 2023 (NGDP)', which is released biennially.

The report lays out a unified vision of the overall trajectory of the future power system up to 2050 and presents various strategies to address the emerging challenges. It also provides a status update on the ongoing and planned investments of significant Nordic impact.

Furthermore, NGDP 2023 includes a summary of an ongoing joint Nordic project, the Converter Dominated Nordic Project (ConDoNproject).

This project identifies and proposes solutions for a number of challenges associated with a power system that integrates a large amount of converter-connected generation. This is one of the most

critical challenges the Nordic countries face in the near future in their energy transition towards net zero emission.

DEA launches consultation for Danish Bornholm Energy Island

The Danish Energy Agency (DEA) has launched an eight-week consultation on the draft plan 'Program Energiø Bornholm' with the accompanying environmental report for Denmark's energy island project at Bornholm Island in the Baltic Sea.

The consultation will run from October 2, 2023 to November 24, 2023, after which DEA will review the responses and, if necessary, update the plan, post which it will prepare a summary report, which will be published together with the final adopted plan. In connection with the specific projects on land and sea, an EIA of the projects will be carried out, the results of which will be clarified and the public involved before an establishment permit can be granted.

Bornholm Energy Island is one of two energy islands being developed off the coast of Denmark, making them the world's first projects of this kind. Approval for the energy islands was granted by the Danish Parliament in 2020, marking a significant step towards achieving sustainable and reliable energy systems.

In June 2023, Germany and Denmark had signed a legally binding cooperation agreement focusing on connecting Bornholm Energy Island to the mainland, enabling the transmission of at least 3 GW of OSW generation by the early 2030s. Of this capacity, 2 GW will be transmitted to Germany, while mainland Denmark will receive 1.2 GW. To support the project, the German and Danish TSOs, 50Hertz Transmission GmbH and Energinet respectively, have agreed to each share half of the infrastructure costs. The agreement is the first legally binding cooperation agreement on a joint offshore energy project under the EU's Renewable Energy Directive.

Earlier, the TSOs had entered into an agreement for the laying of 370-km-long subsea cable from the island to the German coast for transmission of OSW energy to the German grid. A new substation will also be built at Bornholm to connect the cable. The costs associated with the project were

previously estimated at EUR3 billion for the infrastructure and EUR6 billion for the construction of the OSW farm.

Following the above agreement, in September 2023, 50Hertz signed framework agreements with two leading cable manufacturers – Danish NKT and Prysmian PowerLink s.r.l (part of Italian Prysmian Group), for the production and installation of submarine and land cables. The agreement included five projects, including the offshore interconnection of the Bornholm Energy Island (German part), for approximately 490 km of core cables.

(EUR1=USD1.07)

Finland's Fingrid launches study to identify grid connection points for OSW projects

Finnish TSO Fingrid has launched a study to preliminarily identify potential grid connection points for offshore wind projects. The results of the study are expected to be available by mid-2024.

By mid-October 2023, Fingrid had received initial connection requests for nearly 90 GW, stating the exponentially growing interest in offshore wind power in the country.

Lithuania–Sweden NordBalt interconnector to undergo repairs

Lithuania's electricity TSO Litgrid has announced that the ±300 kV HVDC NordBalt power interconnection between Lithuania and Sweden will undergo planned repair work from October 23 to October 29, 2023, and hence will be temporarily disconnected.

During the repair, it is planned to carry out preventive maintenance work and defect removal of the main devices – converter, control system, cooling system, open switchboard, which cannot be performed while the devices are operating.

The 700 MW NordBalt interconnector, valued at EUR550 million, was jointly executed by Litgrid and Sweden's TSO Svenska Kraftnat and has been operational since 2016.

During 2023, 3.58 TWh of electricity has been imported from Sweden to Lithuania through this connection.

(EUR1=USD1.07)

Croatia's Dalekovod completes transmission line in Sweden

Croatian power transmission equipment manufacturer Dalekovod, has completed a transmission line project in Sweden commissioned by Swedish electricity transmission system operator, Svenska Kraftnat (SvK). The project involved replacement of the 28-km Barseback–Sege transmission line by removing 78 existing pillars, constructing new foundations and pillars, and electrical assembly work.

Swedish Vattenfall installs 20 MW BESS at British Ray wind farm

Swedish utility Vattenfall AB has installed a 20 MW/45.5 MWh BESS next to its Ray wind farm in Northumberland, North East England, to help keep the electricity grid stable. At times of peak wind power production, where supply may not match the demand, excess electricity can be stored and then released from the BESS back into the grid when customers need the power most. One charge from the BESS could meet the electricity demand of 3,500 UK households for 24 hours.

The Ray wind farm has been operating for over six years and produces around 10 per cent of Northumberland's energy needs. The 16-turbine plant generation is enough to meet the electricity demand of over 30,000 homes annually.

Dutch Alfen installs 5 MW BESS for Nybro Energi in Sweden

Netherlands-based smart energy solutions provider, Alfen, has announced the installation of a 5 MW/5 MWh BESS for the municipal energy company, Nybro Energi, in Nybro, Sweden.

The system was commissioned in April 2023 for use in the Swedish ancillary services market and started operations in May 2023. It features a proven industrial modular energy storage solution for stationary applications ranging from 1 to 100 MW+.

The project ensures a stable energy supply through ancillary services for Swedish transmission system operator, Svenska Kraftnat, primarily frequency containment reserves, real-time grid frequency balancing, and peak shaving during cold winter days.

GREGY interconnector added to EU's PCI list proposal

EU has included the Greece–Egypt electrical interconnection project (GREGY), which is being developed by Elica SA, a subsidiary of Greece's Copelouzos Group, to its draft list of projects of mutual interest (PMI).

The EC's list of PMIs, which include projects connecting the EU with third countries and projects of common interest (PCIs), is expected to finalise the list by November 30, 2023. It submit the same to the European Parliament and the European Council for approval.

The ratification process is likely to take up to three months. PMIs and PCIs are considered strategic to achieving the EU's climate and energy goals, and are eligible for substantial grants through the Connecting Europe Facility (CEF). The list is renewed every two years.

GREGY Green Energy Interconnector is a proposed 3 GW HVDC interconnection from Wadi-El-Natroon (Egypt) to the Attica area of Greece. The 954-km, double-circuit, subsea cable will transmit low-cost green energy, of which one-third will be provided to local industries and the balance exported to fellow EU countries. The project has a budget of around USD4.4 billion.

Earlier in August 2023, it was announced that the project would undergo three important studies to ensure further progress on the project. These include an environmental study, a final engineering study and a seabed mapping survey. The seabed survey will involve imaging of the seabed with a special vessel along the project's subsea route, with an expected completion time of six months. The cost of the scan as stated by Elica SA, is estimated to be EUR15 million. The final investment decision (FID) is expected to be taken in 2024, once all these requisite studies are concluded.

The project is expected to be completed by 2028.

Greek IPTO becomes project promoter to EuroAsia Interconnector

Greece's Independent Power Transmission Operator (IPTO), Anexartitos Diacheiristis Metaforas Ilektrikis Energeias (ADMIE),

has become the project promoter for EuroAsia Interconnector, which will connect Greece, Cyprus and Israel. The interconnector is a flagship European PCI and has been included in all five PCI lists since 2013.

The designation of ADMIE as a project promoter will ensure the technical and financial adequacy of the project and lay the foundations for its timely completion.

IPTO has been involved in the interconnector as a technical consultant since 2021 and contributed to the project's progress and in securing EUR657 million in funding through the EU CEF. Later in June 2023, ADMIE entered into a strategic agreement with EuroAsia Interconnector Limited (EIL), a subsidiary of Cyprus-based Quantum Energy Limited, for acquisition of a 25 per cent stake in the interconnector. EIL and ADMIE will work closely together so as to ensure smooth transition to the new implementing agency.

The EuroAsia Interconnector is a 2 GW multi-terminal interconnection between the national electricity grids of Israel, Cyprus and Greece (Crete), and Europe.

When completed, the interconnector between Greece and Cyprus will be the longest and deepest HVDC subsea cable project globally, with bi-pole cables of 2×900 km and a water depth of 3,000 metres. The interconnector will end Cyprus' energy isolation, ensuring security of supply for Israel, Cyprus and Greece, and will create a reliable green interconnection for Europe. It plans to significantly reduce carbon dioxide emissions and serves the vision of the "Green Deal" of the EC. Following the approval of a EUR658 million CEF grant and EUR100 million from the Recovery and Resilience Fund, the EuroAsia Interconnector is moving into the construction phase and is expected to complete in 2027.

(EUR1=USD1.07)

Bulgarian ESO to invest EUR760 million in grid upgrade project

Bulgaria's Elektroenergien Sistemen Operator EAD (ESO EAD) will be investing EUR760 million to modernise and expand its grid through a project named "Sustainable adaptation of the national electricity grid – Greenabler". The investment though, will first require an EIA.

The upgrade will increase transmission capacity and strengthen internal connectivity, enabling the integration of additional renewable energy sources in the future. The project aims at upgrading the grid to 400 kV from the current 220 kV and includes the reconstruction and conversion to 400 kV voltage of 12 existing power lines with a total length of 965.65 km, along with associated substations. The power lines are located in the regions of Pleven, Varna, Veliko Tarnovo, Sliven, Plovdiv, Ruse, Shumen, Gabrovo and Pazardzhik. As part of the Greenabler programme, there are plans to repair nearly 900 km of 110 kV power lines, double the voltage capacity of 92 km of 110 kV power lines, build new 400 kV power lines and substations, and repair 20 existing substations.

(EUR1=USD1.07)

Romanian and Ukrainian TSOs to hold first joint auction for cross-border transfer capacity

Ukraine's power utility Ukrenergo and Romania's TSO Transelectrica will hold the first joint auction for cross-border transfer capacity, on November 2, 2023, for the power delivery day on November 3, 2023. The allocation mechanism will be aligned with the relevant regulations of the EU.

Ukrenergo has already signed agreements with the TSOs of Hungary, Slovakia and Poland to join the pan-European Joint Auction Office (JAO) auction platform.

After receiving approval from the regulators of neighbouring countries, Ukraine will be able to start joint auctions in all European directions.

Russian RusHydro to commission second phase of 110 kV Pevek–Bilibino in 2024

Russian energy group, Public Joint Stock Company (PJSC) RusHydro, has announced that it may be able to prepone the commissioning of the second phase of the 110 kV Pevek–Bilibino OHL to end-2024, from the initial deadline of 2025. The 490-km transmission line plays a crucial role in delivering power from the floating nuclear thermal power plant, Akademik Lomonosov, located in Pevek, to consumers

in Bilibino. This power supply also supports major mining enterprises, including the Baimsky GOK.

The OHL project is being implemented in two stages. The first stage involved constructing the initial OHL circuit, establishing a 110 kV Bilibino distribution point with two transformers having a total capacity of 12.6 MVA, and revamping the 110/35/6 kV Komsomolsky substation. The second stage encompasses building the second OHL circuit, renovating the 110 kV Yuzhny substation, and establishing the new 110 kV Beta switching point. The first stage of the project commenced at the end of 2020 and was commissioned in September 2023. Meanwhile, the second stage is ongoing, with 45 per cent of the OHL supports already in place. This new transmission line replaces an aging OHL on wooden supports dating back to the 1960s.

Middle East and Africa

Oman's OETC completes first phase of Rabt interconnection project

Oman Electricity Transmission Company (OETC), a member of Nama Group and Oman's high voltage grid developer, has completed of Phase 1 of its North-South Interconnection Project (Rabt). This initiative, aimed at integrating Oman's disparate grids into one cohesive national network, has reached a significant milestone.

The first phase, which spanned 670 km and included five major grid stations (at Nihada, Barik, Suwaihat, Al Duqm and Mahout) interconnected by overhead transmission lines, now operates at voltages of up to 400 kV. With this, the country's Main Interconnected System (MIS) serving the northern part of Oman's grid, now extends from Nihada in Al Dhahirah Governorate to Duqm Special Economic Zone (SEZ) in Al Wusta Governorate.

Further, under this phase the isolated networks of Petroleum Development Oman (PDO) and Rural Areas Electricity Company (Tanweer) in Duqm SEZ have been interconnected. With a total investment of approximately OMR372 million, the completion of Phase 1 sets the stage for the second phase, scheduled to launch in 2023.

This upcoming phase will extend 400 kV transmission lines from Duqm further south, covering a distance of about 502 km to link up with the existing Dhofar System.

The Rabt project, beyond its primary goal of integrating Oman's networks, holds immense strategic significance. It opens avenues for the development of solar and wind power projects in Al Wusta Governorate, contributing significantly to Oman's green energy ambitions.

Furthermore, the interconnection enhances energy efficiency, bolsters security of supply, and strengthens electricity provision to PDO areas, reducing the organisation's reliance on gas-fired power generation.

(OMR1=USD2.60)

Kenya's KETRACO to strengthen transmission grid

State-owned Kenya Electricity Transmission Company Limited (KETRACO) will build a new D/C, 132 kV Rabai Bamburi Kilifi line to replace the older line that was built on timber poles.

The existing line was facing several challenges that affected power reliability, due to its age. With additional capacity from the new line, electricity consumers in Kilifi, Vipingo, Mtwapa, Shanzu and Bamburi will have more reliable electricity supply.

KETRACO has several projects under development as it plans to improve the country's electricity network. This includes the 94-km, 132 kV Isinya-Namanga transmission line, and the Kenya-Tanzania interconnector – which is 93 per cent complete.

The latter will help power exchange between Ethiopia, Kenya, Tanzania, the Southern African Power Pool (SAPP), and Sudan and Egypt in the north.

In another development, KETRACO has invited prequalification bids for the design, supply and implementation of the 400/132 kV air-insulated switchgear (AIS) Makindu substation project, which is being financed by Agence Française de Développement (AFD).

Two circuits of the 400 kV Isinya-Mariakani transmission line will be diverted into the substation as a LILLO connection of about 2.4 km; and a 132 kV, 4.2-km LILLO of the existing 132 kV Juja-Rabai single-circuit line will be constructed under the project. Further, two 400/132/11 kV, 90 MVA inter-bus transformers (IBT) will feed the new 132 kV switchyard and provide the auxiliary supply, for which two 500 kVA, 11/0.415 kV auxiliary earthing transformers will be used.

The prequalification bids are due on October 26, 2023, while the final bids for the project are expected in December 2023. The construction period of the entire project is 20 months.

Earlier in September 2023, KETRACO secured financing from the African Development Bank and the Korean Exim Bank for the Kenya Transmission Network Improvement Project (KTRNIP), which involves the construction of 132 kV and 220 kV lines from Kabernet to Rumuruti; Narok to Bomet; and Weru to Malindi and Kilifi; along with the associated substations.

Through its ongoing efforts, KETRACO plans to increase the transmission line length to 10,200 km by the end of the financial year ending in June 2024.

Kenya's KLPC to continue O&M of transmission lines for 10 years

Kenya's state-owned power utility, Kenya Power and Lighting Company (KPLC), will continue with its operation and maintenance (O&M) of the country's transmission lines for at least 10 years at a fee, after it sells them to state-owned KETRACO.

The transfer of transmission lines to KETRACO was a major recommendation made by the Presidential Taskforce on the review of PPAs, which submitted its report to the former President in September 2021. KPLC has also issued an EOI to search for a transaction advisor that will be responsible for evaluating the market value of the assets before they sell them to KETRACO.

Previously in January 2022, as part of the task force's recommendations, the Energy and Petroleum Regulatory Authority (EPRA) also transferred the role of the system operator of the national power grid from KPLC to KETRACO.

Ghana EPA allows diversion of transmission line for Ewoyaa Lithium Project

Atlantic Lithium, an Australia-based, Africa-focused lithium exploration and development firm with assets in Ghana and Ivory Coast, has announced that Ghana's Environmental Protection Agency (EPA) has granted authorisation to divert two transmission lines that run across planned mining areas within the Mankessim prospecting licence, which holds the company's Ewoyaa Lithium Project.

The planned diversion of the transmission lines, which currently traverse the proposed project site, forms part of the company's mining plan. In June 2023, the company, under its Ewoyaa Definitive Feasibility Study, requested the EPA to diverge the transmission lines to the northern border to enable the company to commence early works at the mine project, including early spodumene concentrate production through a Modular Dense Media Separation (DMS) processing unit.

EPA has granted its approval for up to March 24, 2025, enabling Ghana Grid Company Limited (GRIDCo), which owns the national interconnected transmission system in Ghana, to carry out the diversion of the lines on behalf of the company.

South Africa's Eskom launches CBSOP to secure 1,000 MW electricity imports

South Africa's state-owned energy company, Eskom, has initiated a cross-border standard offer programme (CBSOP) with the goal of contracting 1,000 MW of additional electricity from regional neighbours.

The CBSOP, officially introduced on October 18, 2023, streamlines the procurement process for energy from both existing and new facilities within the region.

Under this programme, Eskom intends to establish short-term energy agreements with utilities and IPPs in neighbouring countries, aiming to alleviate the impact of load-shedding, a recurring concern in South Africa. The CBSOP enables Eskom to purchase electricity at a predetermined price, calculated based on the avoided cost

of Eskom's own generation, encompassing long-term energy purchases from local IPPs.

Eskom has published fixed rates for peak, standard, and off-peak periods throughout the 2024 financial year, ending on March 31, 2024. The high-season rates for peak periods stand at ZAR3,638.90 per MWh, and for low-season at ZAR1,510.14 per MWh. Meanwhile, the standard rates for high-season and low-season are ZAR909.73/MWh and ZAR849.08 per MWh respectively. The off-peak rate remains constant at SAR606.48 per MWh across both seasons. Thus, the CBSOP ensures a predictable tariff, adjusted annually based on the regulatory-approved cost recovery mechanism, covering the variable cost of local generation.

Earlier announcements revealed that Eskom has already secured agreements for 1,100 MW under the domestic standard offer, which was made available to local companies with surplus electricity to alleviate the strain on the grid during load-shedding. The domestic standard offer, launched in September 2022, enables Eskom to purchase power at a predetermined rate from existing electricity producers with capacities exceeding 1 MW.

(ZAR1=USD0.054)

South Africa's Eskom secures second debt relief payment amidst power crisis

South Africa's state-owned energy company Eskom is set to receive a substantial financial boost as it grapples with the nation's ongoing power crisis.

The company announced that it will receive up to SAR20 billion from the National Treasury, marking the second instalment of a vital debt relief package from the government. It further disclosed that Eskom is likely to receive an additional tranche in December 2023.

The government's decision to aid Eskom was initially unveiled by the National Treasury in February 2023 as a measure to assist the debt-laden power generator and supplier in meeting its financial obligations and averting defaults. At that time, the government decided to finance SAR254 billion over the next three years, of Eskom's total SAR423 billion debt that was at risk of

default, to help the utility pay its debt and interest obligations.

Eskom had previously received a SAR16 billion tranche in August 2023, alleviating some of its financial strain. However, the company's total debt mirrors the entire national budget for education, and surpasses allocations for health and social development combined.

The power crisis in South Africa has been exacerbated by record power blackouts, lasting up to 10 hours a day, due to the incapacity of Eskom's ageing coal-fired power plants to meet the high demand. While the situation has recently improved, with daily power cuts reduced to two hours, the company remains under pressure.

(SAR1=USD0.27)

South African NUM demands halt of 'Just Energy Transition' programme

South Africa's National Union of Mineworkers (NUM) has demanded that the 'Just Energy Transition (JET)' programme be stopped until all stakeholders are convinced that such a transition will be fair to workers and communities. They have also demanded that the unbundling processes of Eskom be put on hold pending proper consultation.

As per NUM, though a transition from high-emission energy to low-emission/carbon energy generation is needed, yet the transition must be fair and just to the working class and their immediate communities.

The current energy transition seems to be pushing for equitable distribution in reducing carbon emissions, thus allowing the developed countries not to be held accountable for the significant and historic contribution of carbon emissions; thus creating environmental injustice and inequity.

As per NUM, the rapid pace of the energy transition (based on accelerated decommissioning of power stations by 2030) will exacerbate South Africa developmental challenges such as unemployment, poverty and inequality. The union is highly concerned that about 25,000 direct jobs and 26,000 indirect jobs will be lost as a result of the current speed applied to this energy transition process.

The union also feels that the unbundling of Eskom and introduction of a competitive electricity market signifies privatisation of the state-owned enterprise (SOE).

They further stated that there is a clear lack of consultation with organised labour regarding the unbundling of Eskom, drafting of the JET Investment Plan (JET IP) 2023-27, as well as decommissioning of the Komati power station.

In all these processes, a total of 90 per cent of the funds will come in the form of loans rather than investments, creating additional debt for the South African government.

NUM further states that the decision to unbundle Eskom does not take into consideration the latter's core mandate of providing electricity in an efficient and sustainable manner to the South African population.

Namibia inaugurates 400 kV Kunene–Omatando line project

Namibia has inaugurated the Kunene and Omatando substations. With this, the 400 kV Kunene–Omatando line project has been completed and energised, which will strengthen the backbone of northern Namibia, and be a connection point between Namibia and Angola. The NAD1 billion project included, the construction of two substations and a 190-km transmission line to connect them from the Kunene substation, which is 30 km south of the Angola–Namibia border at the Ruacana Power Station, and the Omatando substation in Ongwediva. The line was completed in June 2018 and was energised at the 132 kV level to support Namibia's grid. Under the recent development, both the substations have been completed and initially energised at 330 kV. The project has been developed by Namibia

Power Corporation Limited (NamPower), which awarded the two-year line design, construction and management contract to a joint venture (JV) of Power Line Africa and Ohalula Construction. The substations' construction contract was signed with a JV of Chinese Sinohydro's Corporate and Namibia's Adoptive Building Land Construction Company in June 2021, which procured high-voltage power equipment for the substations from Hitachi Energy. Of the total cost of the project, NAD741 million was spent on the substations.

The line forms part of the bigger 400 kV Northern Ring project to ensure redundancy of power evacuation from the Ruacana power station and of power supply to the northern regions, and help in the integration of the future Baynes power station. The entire Northern Ring project was funded by the European Investment Bank (EIB).

(NAD1=USD0.051) ♦

Global Transmission Report

Information and analysis on the global electricity transmission industry

The mission of **Global Transmission** is simple and modest – to provide you with comprehensive and up-to-date information and analysis on the global electricity transmission industry.

Global Transmission will keep you informed on all the key developments, trends and issues. It will track major projects, contracts and investments. It will profile leading transmission system operators. It will report on regulatory initiatives and examine their implementation. It will provide the latest data and statistics. It will also feature the views and perspectives of top industry experts and players.

Our service package consists of three elements – **Global Transmission Report** (a monthly newsletter), **Global Transmission Weekly** (a weekly update) and **www.globaltransmission.info** (an information-packed website).

Global Transmission Weekly, published every Monday, will provide you with a summary of key developments in the transmission sector from across the world, events that took place during the previous week.

The **Global Transmission Report**, a monthly newsletter, will have ten distinct sections:

- **Features:** Analytical, insightful and topical write-ups on major trends and developments
- **News:** Latest news and developments from across the world, with sub-sections on North America, Latin America, Asia-Pacific, Europe and Middle East & Africa
- **TSO Focus:** Profile of a leading TSO operator, covering its history, present status and future plans
- **Policy Review:** An examination of recent policy and regulatory initiatives
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- **Data & Statistics:** Tables and charts with relevant and latest information
- **Deal Watch:** Reports on major debt, equity and M&A deals
- **Project Update:** Current status of key projects
- **Company News:** News on transmission equipment and service providers
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Agenda/Structure

- ❖ State Programs and Support
- ❖ Building the Infrastructure of the Future
- ❖ Digitalization at EV Charging Stations
- ❖ Electrifying Fleets
- ❖ Charging at Parking Facilities
- ❖ MUD Charging Strategy
- ❖ Business Challenges and Solutions
- ❖ Emerging V2X Opportunity
- ❖ Site Selection, Permitting and Development
- ❖ Partnering with Utilities

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Ecuador's CELEC EP

Investing in strengthening grid

Ecuador is a western South American country, bordering the Pacific Ocean at the equator, between Colombia and Peru. Its power sector is predominantly handled by state-owned Corporación Eléctrica del Ecuador (CELEC EP). The company is the country's largest electricity company responsible for managing the electricity sector of Ecuador and generates, transmits, markets, as well as imports and exports power in the country.

Ecuador's electricity sector lacks investment, which has resulted in frequent blackouts and high transmission and distribution (T&D) losses. The country relies heavily on hydropower and electricity imports from Colombia to meet its domestic demand. Recently, reduced domestic generation due to reduced water levels in reservoirs coupled with the rising cost of power from Colombia caused several blackouts in Ecuador in October 2023.

As a result, the Ministerio de Energía y Minas (MEM) or the Ministry of Energy and Mines declared an electricity emergency to prevent future blackouts due to the reduction in the flow of the rivers that feed the hydroelectric plants due to lack of rain in the Andean Mountain range and the Amazon region caused by the phenomenon called El Niño. The emergency aims at accelerating energy contracting processes (especially from private players) and optimising the resources of the country's electrical companies.

In order to maintain reliable power supply, CELEC EP has started investing in diversifying its generation resources to harness the country's renewable energy potential. It is also investing in strengthening the transmission network and establishing a reliable interconnection with Peru for improved power exchange. As per the estimates of Global Transmission Report, the company is likely to invest about USD1.7 billion to add more than 1,760 km of line

length capacity and 3.5 GVA of transformer capacity in the country during 2023–27. Of this amount, 62 per cent will be invested in the 500 kV network, 36 per cent in the 230 kV network, and the rest on 138 kV projects.

Background

Ecuador's power sector has undergone significant transformations during the past two decades. After having privatised almost the entire sector during the mid-1990s, the government in 2008 decided to bring the sector back under state control. The nationalisation decision was primarily due to dissatisfaction with the level of investments made by the erstwhile private players in the sector.

The consolidation process, which was the result of a constitutional mandate passed by the government in July 2008, led to the establishment of the state-owned CELEC EP and Corporación Nacional de Electricidad (CNEL). CELEC manages power generation, transmission (through Transelectric), distribution, commercialisation, and import and export of electric power in the country. CNEL is the country's largest power distributor.

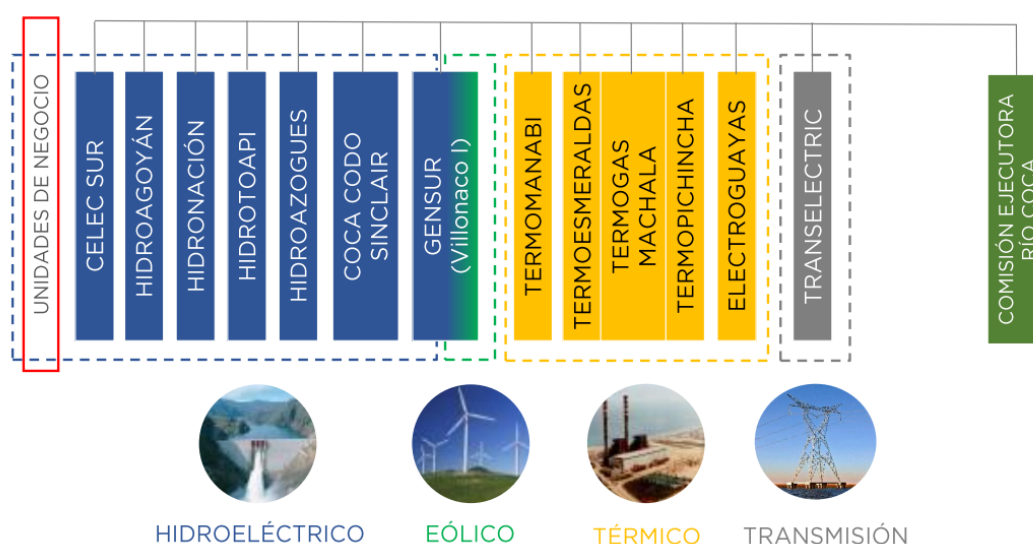
Presently, Ecuador's power generation and distribution segments are open for private players, while the transmission segment is solely managed by CELEC EP. The latter also has a significant share in the domestic installed power generation capacity.

Existing network

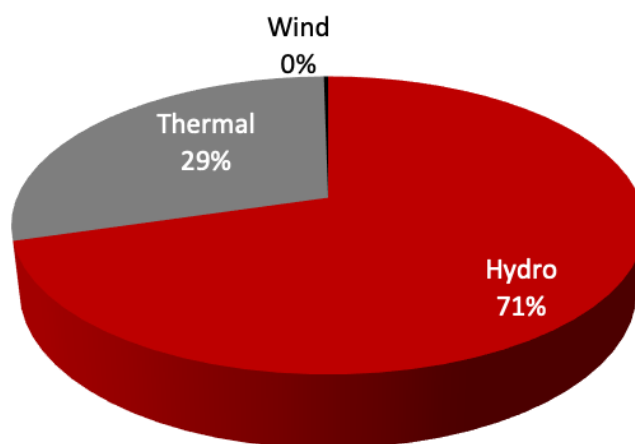
CELEC EP manages electricity generation and transmission in the country through its 13 subsidiaries.

As of 2022, the company had an installed generation capacity of over 6.4 GW, with a 77 per cent share in the total installed capacity of the country. Of the 6.4 GW, 70 per cent was based on hydropower and 29 per cent on thermal electricity. In addition, the company also had 16.5 MW of wind capacity.

Figure 1: Subsidiaries of Ecuador's CELEC EP



Note: English translation of Spanish terms are as follows: hidroeléctrico – hydroelectric; eólico – wind; térmico – thermal; transmisión – transmission
Source: CELEC EP

Figure 2: Installed capacity of CELEC EP in Ecuador as of 2022 (MW)

Total installed capacity: 6,400 MW

Source: CELEC EP

CELEC EP manages Ecuador's electric system, which comprises the Sistema Nacional Interconectado (SNI) or the main national interconnected system, and Sistema No Incorporado, or the isolated system, through its transmission unit Transelectric. As of October 2023, its transmission network comprised about 6,268 km of line length and about 16,886 MVA of transformer capacity at 70 substations at the 138 kV to 500 kV voltage levels. The majority of the network, or about 52 per cent of the total line length, comprises 230 kV transmission lines. In addition, the company had 6,115.8 km of fibre optical cable network.

Since 2022, there has been no addition to the company's transmission network. It invested USD1.96 million to add 245 km of fibre optical cable network, to increase it by 5 per cent from 5,871 km in 2021 to 6,116 in 2022.

Financial and operational performance

During 2022, CELEC EP earned USD826 million and incurred USD589 million in expenditures. According to its budget execution during 2022, the company has been investing in the operation and maintenance (O&M) of its assets. Of the total budget execution of USD810 million, 66 per cent or USD532 million was spent on administration and O&M expenses.

The company's revenue witnessed a declining trend between 2017 and 2021. However, this was reversed in 2022 with the total revenue recording a year-on-year growth of 20 per cent, mainly on account of reduced costs and expenditure.

CELEC EP's transmission losses increased significantly during 2015–22, almost doubling from 680 GWh in 2015 to 1,293 GWh in

Table 1: Growth in transmission network of Ecuador

Voltage	2015	2016	2017	2018	2019	2020	2021	2022	October 2023
Line length (km)	4,691	5,400	5,399	5,867	6,016	6,092	6,268	6,268	6,268
–500 kV	-	264	264	461	610	610	610	610	610
–230 kV	2,439	2,918	2,917	3,199	3,199	3,240	3,249	3,249	3,249
–138 kV	2,252	2,218	2,218	2,207	2,207	2,242	2,409	2,409	2,409
Transformer capacity (MVA)¹	9,562	11,495	13,078	15,748	16,295	16,661	16,886	16,886	16,886
Number of substations	51	55	57	66	66	69	70	70	70
–230 kV	17	17	48		25	26	27	27	27
–138 kV	27	27		62	28	29	29	29	29
–Sectioning	3	4	5		9	10	10	10	10
–Mobile	4	7	4	4	4	4	4	4	4

Note: 1 – Does not include reserve transformer capacity.

Source: Consejo Nacional de Electricidad; CELEC EP

Table 2: Key financial indicators of Ecuador's CELEC EP (USD million)

	2017	2018	2019	2020	2021	2022
Revenue¹	849	735	730	710	690	826
–Transmission revenue	97	122	112	108	130	NA
EBITDA	302	239	NA	NA	NA	237
Net income (loss)	85	9.00	(13.91)	(23.78)	(57.42)	NA
Capital expenditure on transmission	250	NA	NA	186	146	NA
Cost and expenditure	638	653	682	668	669	589

Note: 1 – Revenue figures represent the total billing for fixed transmission rate invoiced to distributors, auto-generators and non-regulated consumers; NA: not available
Sources: Transelectric SA; CELEC EP

Table 3: Operational performance of CELEC EP

	2015	2016	2017	2018	2019	2020	2021	2022
Transmission loss (%)	3.06	3.50	3.80	4.30	4.60	4.60	4.20	4.50
Transmission loss (GWh)	680	808	898	1,078	1,293	1,260	1,192	1,293
Line reliability (%)	NA	99.76	99.63	99.92	99.96	99.96	99.96	99.98

Note: NA-not available

Sources: Transelectric SA; CELEC EP

2022. Its share in total electricity transmitted also increased, from 3.06 per cent in 2015 to 4.50 per cent in 2022. This shows poor O&M of the company's transmission assets. However, the company increased its O&M expenses during 2022, which may start yielding results in the coming years.

Future plans

Some of Transelectric's key upcoming projects are the 500 kV Peru–Ecuador interconnection; the 500 kV Sistema de Transmisión Santiago; the 230 kV Delsitanisagua–Cumbaratza–Bomboiza line; the 230 kV Chorrillos–Lago de Chongón line; the 230 kV El Sistema de Transmisión Nororiental or the North-eastern transmission system (STNO); the 230 kV Milagro–Machala line; the 230 kV Tanicuchí transmission system project; the 230 kV Sopladora–Cardenillo–Taday line; and the 230 kV Chorrillo–Lago de Chongón line projects.

The 500 kV Peru–Ecuador interconnection is part of the Andean interconnection initiative known as the Sistema de Interconexión Eléctrica Andina (SINEA).

The project entails establishing a 635-km-long, 500 kV line from the Chorrillos substation in Ecuador to the La Niña substation in Peru.

The Peruvian section of the project has been awarded to private players and includes the construction of the 87-km Piura Nueva–La Niña and the 264-km Piura Nueva–Frontera 500 kV lines; and expansion of the existing 500/200 kV Piura Nueva substation.

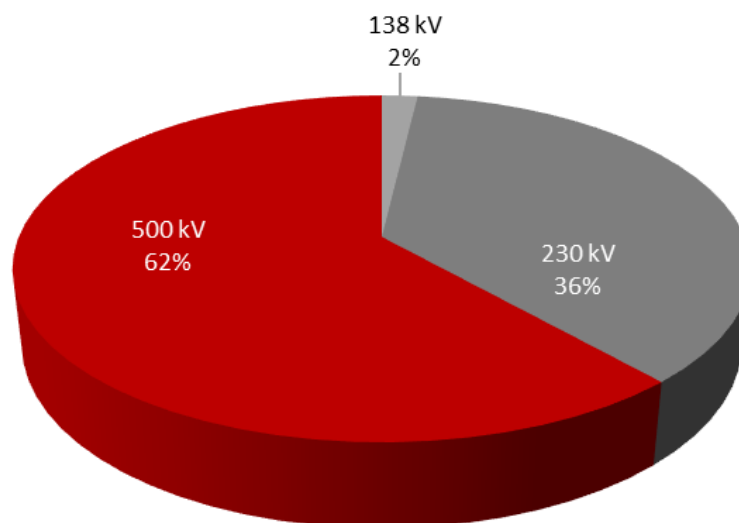
Transelectric is responsible for the USD290 million Ecuadorian section of the project, which entails the construction of the 210-km Chorrillos–Pasaje and 71-km Pasaje–Frontera 500 kV lines; the 500/230 kV Pasaje substation; and amplification of the 500 kV Chorrillos substation.

Table 4: Planned transmission network additions in Ecuador during 2023–27

	Voltage	2023–27
Transmission line length (km)		1,768
–230 kV		621
–500 kV		1,147
Transformer capacity (MVA)		3,542
–138 kV		463
–230 kV		1,998
–500 kV		1,081

Note: Planned network additions are as per the Draft Plano Decenal de Expansão de Energia 2032 and could be revised post approval of the final version.

Source: EPE, Ecuador; Global Transmission Research

Figure 3: Planned investment in transmission network by category, 2023–27, (%)

Note: Data is based on upcoming projects in the country for which cost data was available.

Source: Global Transmission Report

Table 5: Key upcoming transmission projects of CELEC EP

Project	Voltage level (kV)	Substation capacity (MVA)	Line length (km)	Scheduled completion date
Delsitanisagua–Cumbaratza–Bomboiza line	230	225	106	2023
Milagro–Machala line	230	-	113	2023
Chorrillos–Lago de Chongón line	230	225	30	2023
Sistema de Transmisión Nororiental (STNO) or the North-eastern transmission system	230	540	290	2023
Sistema de Transmisión Tanicuchi or Tanicuchi transmission system	230/138	150	30	2023
Sistema de Transmisión Cajas or Cajas transmission system	230/69	75	4	2023
Sopladora–Cardenillo–Taday line	230	-	48	2025
Sistema de Transmisión Santiago or Santiago transmission system	500	-	860	2026
Ecuador–Peru interconnection	500	800	281	2027

Source: Transelectric; Global Transmission Report

Inter-American Development Bank (IaDB) and European Investment Bank (EIB) are contributing USD125 million each for the Ecuadorian section while Transelectric will arrange the remaining USD39.5 million through own resources. The interconnection project is scheduled for completion in 2027.

As per the estimates of Global Transmission Research, about USD1.7 billion is expected to be invested in Ecuador's transmission

network during 2023–27. The majority of this investment, USD856 million, is likely to be invested during 2023–24.

Conclusion

CELEC has a key role to play in the transition of the country towards renewable energy as well as in strengthening the transmission grid to restore resource adequacy and supply security in the country. ♦

US DOE Issues NOPR

CITAP Program to accelerate transmission permitting

The US government's Investing in America agenda seeks to make a transformative investment in US infrastructure and clean energy for the future. The country has dedicated significant funds under the Infrastructure Investment and Jobs Act (IIJA) [also known as the Bipartisan Infrastructure Law (BIL)] and the Inflation Reduction Act (IRA) for clean energy.

The full benefits of these investments will not be realised unless the US accelerates the expansion of critical transmission capacity. Currently, constructing new transmission projects can take over a decade in the country.

While several factors contribute to these timelines, the US Department of Energy (DOE) recently proposed to revise regulations to accelerate the federal environmental review and permitting processes for qualifying onshore electric transmission facilities.

NOPR: On August 10, 2023, DOE released the Coordination of Federal Authorization for Electric Transmission Facilities Notice of Proposed Rulemaking (NOPR). It proposes to establish an integrated and comprehensive Coordinated Interagency Transmission Authorizations and Permits (CITAP) Program; make participation in the Integrated Interagency Pre-application (IIP) process a pre-condition for decision under the CITAP Program; require project developers to prepare and submit resource reports and public engagement plans; ensure that DOE carries out its obligation of preparing a single environmental impact statement (EIS) sufficient for all federal authorisations required to site a qualifying project; and to harmonise the IIP process and implementation of the Federal Power Act (FPA) with Title 41 of the Fixing America's Surface Transportation Act (FAST-41) (which deals with federal environmental review and the authorisation process for infrastructure projects). DOE has also released a draft standard schedule that indicates how DOE plans to streamline the application review process for transmission projects into the two-year timeline.

CITAP Program will reduce the time required for transmission project developers to receive decisions on federal authorisations for transmission projects. It is intended to improve the efficiency of the permitting and environmental review process; enhance communication and coordination and reduce duplication of work among federal agencies; provide more certainty for developers through a standard and transparent process; ensure early community engagement; and require heightened readiness on the part of developers to proceed to the National Environmental Policy Act (NEPA) review, reducing the potential for later delays.

Interagency MoU and NOPR: DOE's latest releases are in line with a memorandum of understanding (MoU) finalised earlier in May 2023 by nine federal agencies to coordinate environmental reviews and permitting of interstate transmission projects consistent with FPA 216(h), which provides DOE authority to act as the lead agency for such reviews and authorisations. Under the MoU, the agencies committed to a two-year environmental permitting review schedule [from the Notice of Intent (NOI) to

the Record of Decision (ROD)] in compliance with NEPA. Further, DOE committed to creating a standard schedule and updating the implementing regulations [through amendments to 10 Code of Federal Regulations (CFR) Part 900] within 60 days and six months of signing the MoU respectively.

The NOPR is consistent with Section 107 of the Fiscal Responsibility Act of 2023, which requires the designation of a NEPA lead agency to perform a coordinating and schedule-setting function. As per the NOPR, DOE will serve as the lead agency in the preparation of a single EIS consistent with the MoU. It will improve the existing IIP process and establish a standard schedule template. It commits participating federal agencies to project-specific environmental permitting review schedules to complete the authorisations within two years. It also requires the submission of resource reports to help inform federal decision-making and project participation plans for stakeholder engagement.

Qualifying projects: In particular, in the NOPR, DOE is proposing regulatory amendments to the 10 CFR Part 900. Qualifying project refers to a transmission line of 230 kV or above voltage or other regionally or nationally significant transmission lines, and associated facilities that are used in interstate or international commerce and are expected to require an EIS or other projects (900.3) approved by the director of the DOE's Grid Deployment Office (GDO). It excludes projects authorised under the outer continental shelf (OCS) along with a specific project; those entirely located in the Electric Reliability Council of Texas (ERCOT) and those seeking permits from the Federal Energy Regulatory Commission (FERC) under 216(b) of FPA.

The latter applies to projects designated as national interest electric transmission corridor (NIETC) by DOE. However, the NOPR provides that offshore marine transmission lines may be allowed to participate in the CITAP Program under discretionary provisions for accepting other projects by the GDO director (900.3).

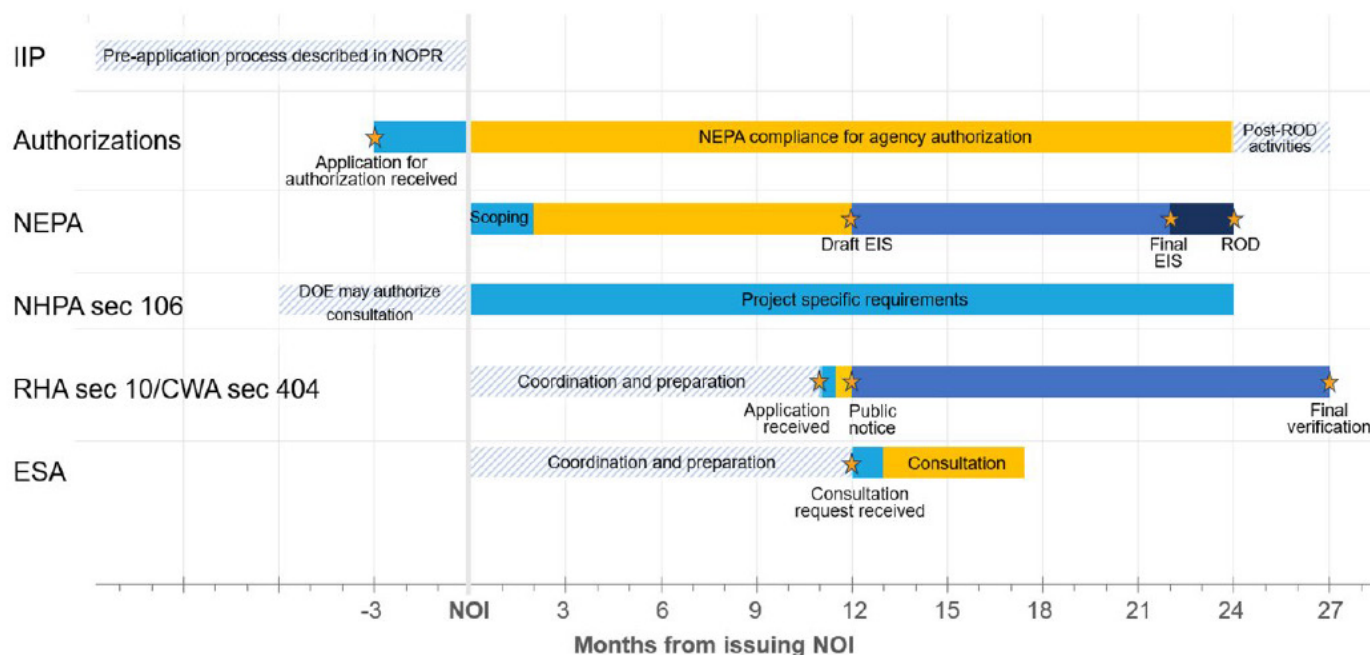
IIP Process: The NOPR makes the IIP process, which is currently voluntary, a mandatory part of the CITAP Program. It is iterative and includes procedures to evaluate the completeness of submitted materials and the suitability of materials for the relevant federal entities' decision-making. It broadly comprises three milestone meetings: the initiation request and initial meeting (900.5); a review meeting (900.8); and a close-out meeting (900.9) that ends the IIP and starts the two-year review process.

Two key components will be created during the IIP process – 13 project proponent resource reports (900.6) and standard and project-specific schedules (900.7).

It may be noted that the developer will request the meetings when they are ready with the requirements. The NOPR proposes the requirements and the timelines within which DOE will then respond. Prior to each meeting, the developer must submit requisite materials to DOE, as defined in the NOPR.

After the initiation request is submitted, DOE must convene the initial meeting within 30 days of confirming the completeness of the initiation request.

The elements that must be submitted as part of the initial request include a project summary, including maps, a project participation plan, and the FAST-41 statement.

Figure 1: Proposed standard schedule for transmission projects

Source: US DOE

The resource reports (900.6), which must be submitted before the review meeting, include general project description; water use and quality; fish, wildlife and vegetation; cultural resources; socioeconomic; geological resources; soil resources; land use, recreation and aesthetics; communities of interest; air quality and noise effects; alternative options; reliability, resilience and safety; and tribal interests. Within 60 days of submission, DOE will have to review the reports and convene the meeting if found complete. At this meeting, DOE and the federal entities as well as the developer will establish the project details and the baseline resource information for the NEPA review that will follow. Based on this meeting, the developer must update the resource reports before requesting the close-out meeting.

Again, DOE reserves a 60-day period for completeness checks on these final submissions. DOE will present the draft and final project-specific schedules at the review and close-out meetings respectively.

Further, it will maintain a consolidated administrative docket (900.10) which will include all the materials and information received during the IIP process and will be made available to non-DOE entities including the NEPA co-lead agency responsible for authorising the project.

After the IIP process concludes, the developer submits the application to the necessary federal agencies as per the established schedule.

This triggers the issuance of a NOI by DOE and the NEPA co-lead agency to prepare an EIS and commencement of the NEPA review.

Standard schedule: As mentioned earlier, DOE has prepared a draft standard schedule, which will be subject to revision and finalised concurrently with the final rule for 10 CFR Part 900.

The proposed standard schedule is based on the Federal Permitting Improvement Steering Council's (FPISC) 2023 draft recommended performance schedule with a few adjustments.

Various authorisation and review timelines begin earlier on the standard schedule than on the FPISC schedules due to the robust information gathered during the IIP Process that is expected to occur before EIS NOI.

The Endangered Species Act (ESA) Section 7 consultation and the Rivers and Harbors Act (RHA) Section 10/Clean Water Act (CWA) Section 404 permitting compliance coordination could start right after NOI due to information collection guidance in the IIP process.

The National Historic Preservation Act (NHPA) Section 106 compliance may be authorised before the NOI, as proposed in the NOPR. The schedule, which is a guidance document, allows for project-specific flexibility and timeline uncertainty.

The way forward

Comments on the NOPR were due on October 2, 2023. In particular, DOE sought comment on the IIP process requirements for transmission developers. It is acknowledged that the IIP process may add to the developers' burden.

Further, it has to be seen if the process can deliver the approvals within two years. However, industry experts believe that projects with a significant federal permitting component may find the burden and cost associated with the IIP process worth the outcome of the accelerated CITAP Program timeline to create a more structured NEPA process.

Notwithstanding the implementation challenges, the long-pending transmission permitting reforms are certainly a welcome move. ♦

US Transmission Plans

Report identifies three dozen shovel-ready projects

The US electricity industry is focusing on ramping up investments in transmission infrastructure as the country races ahead to meet its clean energy and climate change goals of reaching 100 per cent clean electricity by 2035 and net zero emissions by 2050. Several factors such as substantial load growth, increased domestic manufacturing, rising demand from data centres, customer preferences for clean energy, and improved economics for renewable energy sources (RES) are driving the need for increased transmission capacity in the US. Transmission upgrade and expansion efforts have often been stymied by multiple regulatory requirements, complex permitting procedures and constrained financial markets. Policymakers and regulators have started recognising that the exponential RES growth including offshore wind (OSW) must be matched by adequate grid investments at an accelerated pace to ensure that electricity generation reaches the load centres. Recent federal government initiatives and funding support through the Infrastructure Investment and Jobs Act (IIJA), and Inflation Reduction Act (IRA) to modernise electricity grids, boost system resiliency and fast-track permitting have put the spotlight on transforming the transmission infrastructure to meet the energy transition vision. Further, the Federal Energy Regulatory Commission's (FERC) proposed rule on regional transmission planning is also expected to bring about a paradigm shift.

Significant activity and progress can be seen in the high-voltage transmission segment particularly backed by the federal government fast-tracking the permitting process for key interstate transmission lines that cross federally managed lands besides advancing environmental reviews for several lines. This is validated by a recently released report by Americans for a Clean Energy Grid (ACEG) and Grid Strategies titled 'Ready-to-go Transmission Projects 2023: Progress and Status since 2021', which identifies 36 ready-to-go or shovel-ready projects that could connect approximately 187 GW of RES capacity to the grid. The report defines ready-to-go projects as those that have either secured all the necessary federal and state permits or are in the advanced stages of obtaining them. They are also actively working on cost recovery, allocation or generator subscriptions. The identified projects (after a review of over 60 projects) are being spearheaded by a diverse range of utilities and renewable energy companies, including Ameren Transmission, Avangrid, Berkshire Hathaway, Invenergy Transmission, LS Power, NV Energy, Ørsted, Pattern Energy Group, and Xcel Energy. These projects could potentially increase the country's wind and solar generation by 87 per cent through the addition of approximately 10,110 miles (16,270 km) of transmission lines and 132 GW of transmission capacity.

Presently, the US transmission system comprises approximately 2,40,000 circuit miles (3,86,242.56 circuit km) of transmission lines that operate at the 230 kV and above voltage levels, so these new projects add only about 4 per cent to the total mileage of the high-voltage transmission system. However, given that most of the projects are extra-high voltage (EHV), which allows them to carry more power with lower losses than typical existing transmission lines, these projects increase the transmission system's capacity

by about 15 per cent. Further, the portfolio includes some major regional or interregional lines that, if built, would improve system resilience and reliability with enhanced transmission capacity between regions. The need for increased interregional transmission capacity has been highlighted by recent extreme weather events such as the winter storm Elliott in December 2022 and winter storm Uri in February 2021, as well as other recent electric reliability events.

The report highlights that despite progress, a key challenge lies in determining who should bear the costs of these identified lines, especially when they provide multiple benefits to the grid. Projects that have advanced to construction have clearer paths for cost recovery, often by generators using the lines or through allocation by state regulators. Global Transmission Report presents the highlights of the report.

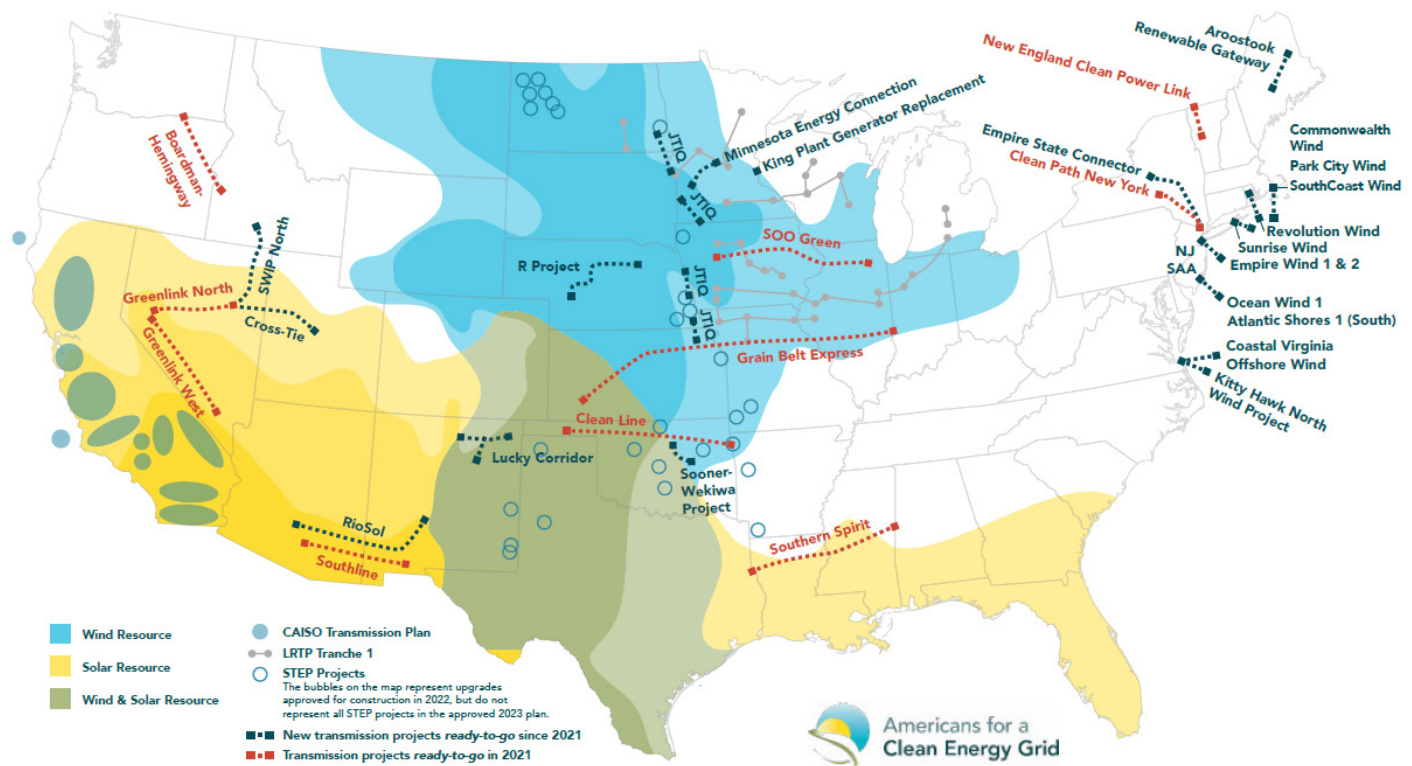
National transmission needs

Construction of new transmission lines at 345 kV and above voltages has fallen steadily over the last decade to about 100 miles (161 km) in 2021 from a peak of approximately 4,000 miles (6,437 km) of lines added in 2013. Recent transmission spending focuses on lower-voltage lines and is paid for outside of the regional transmission planning process. These projects are sub-optimal as they are too small and not designed to optimise multiple benefits through a regional planning process. This trend is expected to be reversed in some regions like Midcontinent Independent System Operator (MISO), which will see a significant increase in regional transmission construction in the coming years due to the approval of the Long-Range Transmission Planning (LRTP) Tranche 1 portfolio and the potential approval of three additional tranches in the future.

Further, MISO and Southwest Power Pool (SPP) are advancing the Joint Targeted Interconnection Queue (JTIQ) portfolio of network lines to more efficiently address interregional upgrade needs repeatedly identified in generator interconnection studies. However, they are yet to finalise a cost-allocation framework for these projects. For uniform progress across regions, a clear federal policy on regional transmission planning and cost allocation is essential.

Several independent studies confirm the need for more transmission capacity. The US Department of Energy's (DOE) draft National Transmission Needs Study (Needs Study) released in February 2023 indicates the need for additional transmission capacity to connect a changing resource mix to growing demand and to maintain overall grid reliability.

To achieve the 2035 clean energy goal, the geographic distribution of transmission additions is robust across many sensitivities studied in the report. Moderate load estimates required a 57 per cent growth in transmission capacity by 2035 over today's system, while a similar scenario with higher load estimates necessitated doubling US transmission capacity by 2040. Other studies have estimated that new generation build-out and load growth will require doubling or tripling of transmission capacity by 2050. The current US transmission system is about 1,50,000 GW-miles (a one-mile line that can deliver 10 MW of power provides 10 MW-miles). Various studies indicate an additional requirement varying from 1,50,000 GW-miles to 820,000 GW-miles by 2050.

Figure 1: Map of ready-to-go transmission projects in the US

Source: Grid Strategies and Americans for a Clean Energy Grid (ACEG) report

Transmission progress – is it adequate?

The report marks a notable increase from a previous similar report by Grid Strategies, published two years earlier, in which 22 ready-to-go projects were identified, with the potential to access 60 GW of renewable energy. The increase in ready-to-go transmission projects can be attributed largely to plans to connect East Coast OSW projects to the grid. Of the previous list, 10 projects have entered into the construction stage (representing 8,300 GW-miles of new transmission capacity and interconnecting 19,500 MW of new generation capacity), two are on hold (ITC Holdings' Lake Erie Connector connecting Ontario with PJM and Colstrip Transmission System upgrade proposed by Pacific Northwest Utilities and Bonneville Power Administration), while the remaining 11 projects remain on the list from 2021. Among the successful lines, a large share of projects such as Transwest Express, SunZia and the OSW upgrades function as generation tie-lines that are paid for by generators delivering capacity over the lines. Other successful lines, like the New York, Colorado and Gateway projects, are located within a single state or utility service area, which makes cost allocation easier.

In contrast, the success rate for regional and interregional transmission projects has been far lower, likely because the benefits are more broadly dispersed and most regions lack effective tools to plan and allocate costs for such lines. In fact, cost recovery is a major challenge and was the most important barrier to transmission identified in the 2021 report. The projects that are moving forward have found a way to recover their costs.

The latest report identifies 25 new projects including a dozen projects associated with OSW projects. It estimates about 22,500 GW-miles of new high voltage transmission capacity ready to go in addition to that currently under construction. However, the report flags that this is just about 13 per cent of the transmission investment needed to cost-effectively decarbonise the power system. Given the lengthy lead times required for planning and permitting transmission projects under current policies, the report highlights the importance of initiating planning efforts promptly. The previous track record indicates long lead times of almost 10 years (on average from proposal to start of construction) for large regional and interregional transmission lines as they are difficult to plan, approve and construct. The identified list of shovel-ready projects in the report records an average time of seven years from the project proposal. These projects require some additional years for permitting, cost allocation approval, finding subscribers, engineering and land acquisition, and construction.

Policy progress and needs

The report identifies key areas of policy reform required to enable greater transmission investment as the three Ps—planning, paying for and permitting transmission. While some helpful provisions are included in the IIJA and IRA, they fall short of the need. FERC and DOE are also advancing policies to promote transmission investment.

The report emphasises that significant reforms are still required notwithstanding the recent modest permitting reforms. The latter

Table 1: Key transmission projects under construction in the US

Project	Details	Year proposed	Year broken ground	Length (km)	Voltage (kV)	Technology (AC/DC)	Investment (USD million)
New York							
Champlain Hudson	Merchant DC line mostly running under Lake Champlain and the Hudson River, delivering Canadian power to New York City.	2010	2022	531	300	DC	6,000
Public Policy Transmission	Central East Energy Connect and New York Energy Solution	2019	2021	161	345	AC	1,230
MISO							
Cardinal–Hickory Creek	New AC line from near Dubuque (Iowa) to Madison (Wisconsin) and is the last of MISO's Multi-Value Projects (MVPs)	2014	2021	161	345	AC	582
Offshore							
Multiple projects	AC line connecting the 132 MW Southfork Wind OWF to New York AC line connecting 800 MW Vineyard Wind OWF to Massachusetts	2016 and 2017	2021 and 2022	48	300	AC	1,902
Northwest							
TransWest Express	New DC line to deliver power from Wyoming's proposed Chokecherry and Sierra Madre wind project to a market hub near Las Vegas, Nevada	2007	2023	1,175	600	DC	3,000
Colorado's Power Pathway	New AC lines and upgrades proposed by Xcel's Public Service Company of Colorado to interconnect eastern Colorado renewable resources	2021	2023	901	345	AC	1,700
Gateway South	PacifiCorp AC project to deliver Wyoming wind to Utah and the Southwest	2007	2022	644	500	AC	1,900
Gateway West	PacifiCorp and Idaho Power AC project to deliver Wyoming wind to the Pacific Northwest	2007	2020	1,609	500	AC	2,880
Southwest							
SunZia	Pattern Energy Group DC merchant project being co-developed with NM RETA delivering New Mexico renewable resources to Arizona and points westward	2006	2023	885	500	DC	3,000
Ten West	New AC line between Arizona and California, connecting the Delaney and Colorado River substations and allowing more solar development	2015	2023	183	500	AC	300
Total				6,299			22,494

Note: AC – alternating current; DC – direct current; MISO – Midcontinent Independent System Operator; OWF – offshore wind farm

Source: Grid Strategies and Americans for a Clean Energy Grid (ACEG) report

includes the proposed rule for DOE to be the lead agency for federal authorisation and permits and a two-year environmental permitting review schedule for transmission lines.

Limited funding has been allocated for new large-scale transmission under IIJA and IRA relative to the need. The report acknowledges that IIJA's Transmission Facilitation Program (TFP) (USD2.5 billion) may be beneficial for new lines although the amount for the revolving loan programme may not be sufficient to meet the demand for new high-capacity transmission. The scope of IIJA's Grid Resilience Innovative Partnership (GRIP) (USD10.5 billion) includes grid hardening efforts and smart grid technology. Most of this funding is intended to strengthen existing systems. Overall, the funding is relatively insignificant as private industry already spends USD25 billion annually on transmission, most of which is spent on small local reliability upgrades.

Providing FERC plenary federal jurisdiction in siting high-capacity transmission lines – similar to its authority over natural gas pipeline siting – is a change that would require amendments to existing law.

However, it would have an important impact by clarifying and streamlining the siting and permitting process for new transmission lines in the national interest.

It recommends a transmission investment tax credit (ITC), which was excluded from the final version of the IRA. This will help address the issue of free riding by covering 30 per cent of the cost reflecting the broad benefits of high-capacity transmission and making the remaining cost allocation that much easier. Assuming that only half of the identified projects worth USD30 billion proceed to construction in the near term, the total federal budget impact of 30 per cent ITC for such projects is likely to be USD9 billion. There may be opportunities to pass a transmission ITC in the upcoming tax bills as soon as the end of 2023.

FERC's much-awaited proposed rule on regional transmission planning and cost allocation is expected to have the most significant impact. The report recommends that plans should be based on the anticipated future generation mix and all of the electricity system benefits should be included by planners. Further, FERC should build on its momentum and pursue similar reforms to support interregional transmission planning. Parallely, clarification by Congress about FERC's authority over cost allocation and instituting processes for cost allocation and recovery for regional and interregional lines would help spur the urgently needed progress.

Ready-to-go transmission projects

The report has identified three dozen shovel-ready transmission projects. Notably, some of these do not necessarily equate to a single line but a portfolio of lines, such as California Independent System Operator's (CAISO) transmission plan, which includes 45 reliability and policy-driven projects, or MISO's first tranche of 18 regionally planned lines.

CAISO Transmission Plan – CAISO's 2022-23 transmission plan includes 45 alternating current (AC) and high voltage direct current (HVDC) transmission projects (worth USD7.3 billion) designed to deliver over 30 GW of new generating capacity to

its grid over the next decade. Of these, two dozen projects worth USD1,764 million are reliability projects, which are driven by load growth and evolving grid conditions. Further, CAISO has identified 21 policy-driven projects worth USD5,528 million to achieve the state's renewable generation targets.

Southern Spirit – The project entails a merchant HVDC line connecting the Electric Reliability Council of Texas (ERCOT) grid with south-eastern power markets through a proposed converter station in Mississippi. The 525 kV project, which spans 320 miles (515 km) across Louisiana and Mississippi, received approval from FERC in 2011 that allows the project to interconnect with ERCOT while continuing to exempt all transmission providers and entities within ERCOT from FERC regulation. The project is still seeking approval in both states.

King Plant Generator Replacement – The project, which is part of Xcel's Integrated Resource Plan (IRP), entails the construction of a new 345 kV AC line connecting the new generation to the grid at Xcel's retiring Allen S. King coal plant utilising MISO's generator replacement interconnection process.

Long-Range Transmission Planning (LRTP) Tranche 1 – It is MISO's first of four planned subregional or regional portfolios of transmission projections, which involves a USD10.3 billion portfolio of 18 lines meant to connect over 50 GW of new generation in the MISO north subregion. The plan has approved cost allocation, but the individual projects must still obtain state approvals and in some cases federal permits.

Minnesota Energy Connection – The project, which is part of Xcel's IRP, entails the construction of a new 345 kV AC line connecting new generation at the retiring Xcel Sherco coal plant utilising MISO's generator replacement interconnection process. Xcel has filed for a Certificate of Need for the project with the Minnesota Public Utilities Commission (PUC).

SOO Green – The project entails an underground merchant HVDC line running along an existing railroad right-of-way (RoW) from Mason City, Iowa, to the Chicago metropolitan area. It will link the MISO and PJM Interconnection markets. Proposed in 2019, permitting for the project is progressing, but has been delayed as PJM considers the line to be a generation project and is processing the line in its interconnection queue process, which is currently paused until 2024.

MISO-SPP JTIQ Projects – This entails the construction of four 345 kV AC transmission lines and one transmission upgrade at the MISO-Southwest Power Pool (SPP) seam to connect at least 28 GW of new generation. Further, two other 345 kV projects are also part of MISO's LRTP Tranche 1. The JTIQ projects will help reduce pressure on the interconnection queues of both regional transmission operators (RTOs). The two RTOs are currently working on a cost-allocation process that could be filed at FERC in 2023. In May 2023, the Minnesota Department of Commerce, MISO, SPP and participating transmission owners requested DOE Infrastructure and Jobs Act (IIJA) Grid Resilience and Innovation Partnerships (GRIP) funding to defray up to 50 per cent of the cost of constructing the projects.

Aroostook Renewable Gateway – The new LS Power AC transmission line will connect the Longroad Energy King Pine

wind farm to the ISO New England (ISO-NE) grid in Maine. The Maine PUC has approved the plan, and the Massachusetts Department of Energy Resources (DOER) has directed the state's investor-owned utilities (IOUs) to purchase up to 40 per cent of the wind generation.

New England Clean Power Link – The project entails a new merchant HVDC line from the Canadian border at Alburgh, Vermont, to Ludlow, Vermont, mostly running under Lake Champlain, and will deliver about 1,000 MW of Canadian power through Vermont into New England. The developer, TDI-New England (TDI-NE), will also construct a converter station and other associated facilities in Ludlow. First proposed in 2013, the project could not secure power contracts with Massachusetts despite receiving the required permits and ISO-NE authorisation to interconnect. Resultantly, it was shelved in 2017 to be revived again in early 2023 when the Vermont governor supported the project. TDI-NE has applied for DOE's Transmission Facilitation Program.

Clean Path New York – The project entails a new merchant underground HVDC line delivering renewable energy from upstate and western New York to New York City (NYC). The project is a joint venture between New York Power Authority (NYPA), energyRe and Invenergy, and has contracted with the New York State Energy Research and Development Authority (NYSERDA). It will become operational and start delivering power in 2027.

Empire State Connector – The project entails a new merchant DC line, delivering renewable resources from upstate to downstate New York along existing RoWs. It will run from Utica to Brooklyn, NYC, mostly below the Erie Canal and Hudson River, with some segments buried to bypass Albany and Haverstraw Bay. The developer, Empire State Connector Corporation (ESC) (a subsidiary of Toronto-based oneGRID Corporation) will also build two converter stations at both ends.

Boardman to Hemingway (B2H) – A new AC project, being jointly developed by PacifiCorp and Idaho Power, to allow Wyoming wind delivered via Gateway West to fully reach the Pacific northwest. It entails the construction of a 300-mile (483-km), 500 kV power line, which will create a link between Boardman, Oregon, and Melba, Idaho. The project will be in service in 2026.

Cross-Tie Transmission Line – A new AC line connecting Clover, Utah, and Robinson Summit, Nevada, tying in Greenlink North with the Gateway South Project and potentially TransWest Express, increasing the ability of California, Nevada, Utah and Wyoming to import and export renewable energy. TransCanyon (a Pinnacle West Capital and Berkshire Hathaway Energy joint venture) is developing the project, which will be in service in late 2026.

Greenlink North and Greenlink West – It is part of NV Energy's Greenlink Nevada initiative, which will form a two-section 525 kV transmission network to enable the addition of more RES capacity. The 235-mile (378-km) Greenlink North will run between Ely and Yerington while the 351-mile (565-km) Greenlink West line will link Las Vegas and Yerington. The latter project also includes three 345 kV lines from Yerington to the Reno and Innovation Park areas. Greenlink North will connect Greenlink West with the existing 500 kV One Nevada project. This will help connect southern and

northern Nevada via a path through the western part of the state. Cost recovery for both sections has been approved through the state regulatory commission and is expected to be operationalised in 2031.

Southwest Intertie Project North (SWIP North) – The AC merchant project, being developed by Great Basin Transmission LLC (a subsidiary of LS Power) in a joint venture with NV Energy, will connect Idaho and Wyoming wind resources to Nevada and California solar resources and loads, interconnecting with the proposed Greenlink North project and the existing One Nevada line. The line passes through the White Pine and Elko counties in Nevada, and the cities of Twin Falls and Jerome in Idaho and will be completed in 2024.

OSW projects – This includes the undersea transmission to interconnect the first phases of proposed OSW projects under federal permitting in New Jersey, New York, New England and Virginia, as well as onshore AC upgrades being built in New Jersey under the State Agreement Approach (SAA). The latter has been devised by the New Jersey Board of Public Utilities (NJBPUI) and PJM to help connect 6.4 GW of OSW (Ocean Wind 2 and an additional 3742 MW) to New Jersey. Overall, the project portfolio of OSW interconnections includes new AC lines connecting OSW generation from 1.5 GW Atlantic Shores 1 (South) and 1.1 GW Ocean Wind 1 to New Jersey; 2.6 GW Coastal Virginia Offshore Wind (CVOW) and 800 MW Kitty Hawk North Wind Project to Virginia; 1.2 GW Commonwealth Wind and 1.2 GW SouthCoast Wind (formerly Mayflower Wind) (potentially DC lines) to Massachusetts; 900 MW Sunrise Wind, 800 MW Empire Wind 1 and 1.2 GW Empire Wind 2 to New York; 800 MW Park City Wind to Connecticut; and 700 MW Revolution Wind to Connecticut and Rhode Island.

Lucky Corridor – The AC project, originally proposed in 2009, is being jointly developed by the New Mexico Renewable Energy Transmission Authority (NM RETA) and Lucky Corridor LLC (Ameren Transmission Company) to add transmission capacity in northern New Mexico. The project includes the construction of two lines – the Mora transmission line comprising the 115 kV Mora–Ariba and 345 kV Don Carlos–Mora lines, and the Vista Trail line comprising the 345 kV Springer–Taos line. These lines will deliver power to the Four Corners trading hub, which connects to major transmission lines across the Southwest. The Mora line is anticipated to be in service by 2025 and the Vista Trail line by 2027.

RioSol – The SouthWestern Power Group AC project is being jointly developed with NM RETA, which utilises mostly the same route as SunZia, delivering New Mexico RES to Arizona and New Mexico and points westward. The project from Torrance County, New Mexico, to Pinal Country, Arizona, was originally proposed in 2006 along with SunZia. Based on the completion of SunZia, RioSol's construction commences in 2026 and is planned to be in service by 2028.

Southline – The AC project between southern New Mexico and Arizona will facilitate RES development in the region. The project, initially proposed in 2010, received all necessary federal permits in 2016 and state processes were completed in 2017. Being jointly developed by Grid United and Black Forest Partners, the project is expected to begin construction around 2025 to be completed by

Table 2: Key upcoming transmission projects in the US

Project	Details	Year proposed	Length (km)	Voltage (kV)	Technology (AC/DC)	Investment (USD million)
CAISO						
CAISO Transmission Plan	Forty-five AC and DC projects to deliver over 30 GW of new generating capacity to the CAISO grid over the next 10 years	2023	740	Varies	AC/DC	7.30
ERCOT Southeast						
Southern Spirit	Merchant HVDC line across Louisiana and Mississippi connecting the ERCOT grid with the south-eastern transmission grid	2009	515	525	DC	2.50
MISO						
King Plant Generator Replacement	New 345 kV AC line connecting the new generation to the grid at Xcel's retiring coal plant	2021	24	345	AC	0.05
LRTP Tranche 1	Portfolio of 18 lines to connect over 50 GW of new generation in the MISO north subregion	2022	3,219	345	AC	10.30
Minnesota Energy	New 345 kV AC line connecting the new generation to the grid at Xcel's retiring coal plant	2021	257	345	AC	0.48
SOO Green	Underground merchant HVDC line running along an existing railroad RoW from Iowa to near Chicago	2019	562	525	DC	4.00
MISO-SPP						
JTIQ Projects	Four 345 kV AC lines and one upgrade at the MISO-SPP seam to connect at least 28 GW of new generation	2022	636	345	AC	1.90
New England						
Aroostook Renewable Energy Gateway	New AC line connecting Longroad Energy King Pine wind farm to the ISO-NE grid in Maine	2022	225	345	AC	2.90
Commonwealth Wind	New AC line connecting over 1.2 GW of OSW to Massachusetts	2018	121	220-345	AC	0.85
NE Clean Power Link	Merchant HVDC line across Louisiana and Mississippi connecting the ERCOT grid with the south-eastern transmission grid	2013	241	320	DC	1.60
Park City Wind	New AC line connecting over 800 MW of OSW to Connecticut	2018	97	220-275	AC	0.56
Revolution Wind	New AC line connecting over 700 MW of OSW to Connecticut and Rhode Island	2016	68	275	AC	0.49
SouthCoast Wind (formerly Mayflower Wind)	New AC line or potentially DC line connecting 1.2 GW of OSW to Massachusetts	2019	286	320/200-345	AC/DC	0.83
New York						
Clean Path New York	Merchant underground HVDC line delivering RES from upstate and western New York to New York City	2021	282	400	DC	3.50
Empire State Corridor	Merchant DC line, delivering RES from upstate to downstate New York along existing RoW	2017	426	320	DC	1.50

Project	Details	Year proposed	Length (km)	Voltage (kV)	Technology (AC/DC)	Investment (USD million)
Empire Wind 1	New AC line connecting over 800 MW of OSW to New York	2018	74	230	AC	0.57
Empire Wind 2	New AC line connecting 1.2 GW of OSW to New York	2018	56	230	AC	0.83
Sunrise Wind	New AC line connecting over 900 MW of OSW to New York	2017	40	320	DC	0.64
Northwest						
Boardman to Hemingway	AC project to allow Wyoming wind delivered via Gateway West to fully reach the Pacific northwest	2007	467	500	AC	1.20
Cross-Tie Transmission line	AC line connecting Utah and Nevada to increase the ability of California, Nevada, Utah and Wyoming to exchange RES	2016	343	500	AC	0.67
Gremlink North	New AC line across northern Nevada between Ely and Yerington	2020	378	525	AC	0.81
Greenlink West	New AC line between Las Vegas and Yerington connecting southern and northern Nevada	2020	565	525	AC	1.61
SWIP North	New AC merchant line between Nevada and Idaho connecting Idaho and Wyoming wind resources to Nevada and California solar resources and loads	2016	443	500	AC	0.55
PJM						
Atlantic Shores 1 (South)	New AC line connecting over 1.5 GW of OSW to New Jersey	2019	159	230-275	AC	1.05
Coastal Virginia Offshore Wind	New AC line connecting over 2.6 GW of OSW to Virginia	2016	114	230	AC	1.83
Kitty Hawk North Wind project	New AC line connecting 800 MW of OSW to Virginia	2019	89	275	AC	0.55
Ocean Wind 1	New AC line connecting 1.1 GW of OSW to New Jersey	2017	230	275	AC	0.76
State Agreement Approach (SAA): NJ OSW	NJBPU and PJM plan to connect 6.4 GW of OSW to New Jersey	2022	161	Varies	AC	1.08
Southwest						
Lucky Corridor	Mora transmission line comprising the 115 kV Mora–Ariba and the 345 kV Don Carlos–Mora lines; Vista Trail line comprising the 345 kV Springer–Taos line	2007	288	115/345	AC	0.08
RioSol	New AC line from Torrance, New Mexico, to Pinal, Arizona, following the same route as SunZia	2006	885	500	AC	1.30
Southline	New AC line from Afton in southern New Mexico to Apache and Vail in Arizona	2010	386	345	AC	0.80
SPP						
Clean Line	A DC merchant line to deliver RES from Oklahoma Panhandle to southeast markets (Oklahoma portion)	2009	805	600	DC	1.20
Grain Belt Express	A merchant DC line connecting the four states of Kansas, Missouri, Illinois and Indiana to deliver RES from southwest Kansas	2010	1,287	600	DC	7.00

Project	Details	Year proposed	Length (km)	Voltage (kV)	Technology (AC/DC)	Investment (USD million)
R Project	A new AC line in Nebraska to increase reliability, relieve congestion and provide additional opportunities for RES development	2012	364	345	AC	0.42
Sooner–Wekiwa project	A new AC line between Noble and Tulsa counties, Oklahoma, to relieve congestion and provide access to new RES for customers in Oklahoma as well as Arkansas, Missouri, Texas and Louisiana	2021	122	345	AC	0.10
STEP projects	Projects identified through SPP's regional transmission planning process	2023	1,315	Varies	AC	2.24
Total			16,270			64.04

Note: AC – alternating current; CAISO – California Independent System Operator; ERCOT – Electric Reliability Council of Texas; HVDC – high voltage direct current; MISO – Midcontinent Independent System Operator; OSW – offshore wind; RoW – right-of-way; RES – renewable energy sources; SPP – Southwest Power Pool
Source: Grid Strategies and Americans for a Clean Energy Grid (ACEG) report

2028. It includes two sections – the new 387-km, 345 kV Afton, New Mexico, to Apache, Arizona, segment; and the rebuild and uprating of the 193-km Apache, Arizona, to Saguaro (Vail), Arizona, segment to 230 kV from 115 kV. Each of these segments will provide up to 1,000 MW of capacity.

Clean Line – Originally proposed in 2009 by Clean Line Energy Partners to deliver RES from the Oklahoma Panhandle to Southeast markets, the Oklahoma portion of this HVDC merchant line was purchased and is now being developed by NextEra Energy.

The project will provide 3.5 GW and 500 MW of wind power from Oklahoma to Tennessee and Arkansas respectively.

Grain Belt Express – Invenergy's merchant DC line connecting the four states of Kansas, Missouri, Illinois and Indiana across 800 miles (1,287.48 km) to deliver RES from southwest Kansas to interconnection points in Missouri and Indiana.

The 5 GW project would be the country's highest capacity transmission line and link four balancing authorities [SPP, Associated Electric Cooperative Incorporated (AECI), MISO and PJM] with bi-directional capability.

Phase one of the project (Kansas to Missouri interconnection points) is undergoing federal review by the DOE Loan Program Office, with a decision expected in fall 2024.

Phase I comprises a 530-mile (853-km) HVDC line between Ford County, Kansas, and Monroe County, Missouri, and two HVDC converter stations. Phase II of the project will extend the line from Missouri into Indiana, south of Terre Haute.

R-Project – An AC project between Gerald Gentleman, Cherry County and Holt County substations in Nebraska, being developed by Nebraska Public Power District (NPPD) to increase reliability, relieve congestion and provide additional opportunities for RES development in Nebraska.

The project is facing delays due to the requirement of a new Record of Decision by the US Fish and Wildlife Service (USFWS)

for an incidental take permit (under the Endangered Species Act) as the project crosses the habitat of the endangered American burying beetle. The previous permit granted in 2020 by USFWS was remanded after opponents won a lawsuit in a district court.

Sooner–Wekiwa Project – A new AC project in Oklahoma identified by SPP and awarded to Transource to relieve congestion and provide access to new renewables for customers in Oklahoma as well as Arkansas, Missouri, Texas and Louisiana.

The final route, which passes from Oklahoma Gas & Electric's Sooner substation in Noble County to Public Service Company of Oklahoma's (PSO) Wekiwa substation in Tulsa County, does not require regulatory approval if SPP has identified the transmission project as a need. Construction on the project is expected to begin in 2024 and will be completed in late 2025.

STEP Projects – This includes the 2023 SPP Transmission Expansion Plan (STEP) worth USD2.76 billion comprising 260 Integrated Transmission Plan (ITP), 20-year assessment (ITP20), as well as AQ (process for identifying local delivery point additions) transmission lines and upgrades identified through the regional transmission planning process.

Conclusion

The US has recently been witnessing considerable activity in the clean energy and transmission segments.

To achieve the national transmission needs by 2030 and 2035, significant reforms are required in how transmission is planned, paid for and permitted to considerably increase the number of projects being developed and the success rate for projects proposed as well as reduce the time needed to obtain required approvals and secure cost recovery.

At the federal level, the government has been proactively making efforts to resolve the challenges facing the sector, which are expected to start yielding results in the coming years and enable smooth energy transition. ♦

Brazil: Installed Capacity, Generation and Consumption

Brazil is focusing on interconnecting various regions of the country driven by rising demand and the significant expansion of the generation capacity (predominantly renewables) expected to occur over the next few years, especially in the northeast region. Brazil's Ministério de Minas e Energia (MME) or Ministry of Mines and Energy (MME) also announced its Transmissão para Transição or Transmission for Transition policy to attract investment in the power transmission sector for the expansion of the Brazilian transmission system to harness the abundant renewable energy potential, particularly wind and solar, concentrated in the northeast region of Brazil.

As of 2022, the installed capacity in Brazil stood at 1,89,127 MW, comprising 58 per cent hydro, 25 per cent thermal, 16 per cent renewable energy and 1 per cent nuclear energy. Renewable energy grew at a compound annual growth rate (CAGR) of 13.26 per cent from 2018 to 2022, followed by thermal energy, which grew at 3 per cent.

Overall, the installed capacity grew at a CAGR of 3.7 per cent between 2018 and 2022, from 1,63,442 MW in 2018 to 1,89,127 MW in 2022.

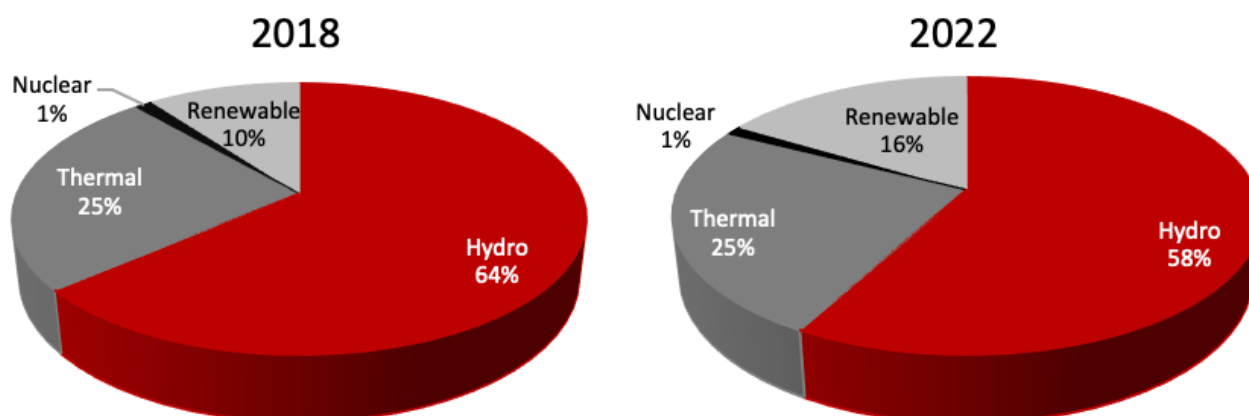
Table 1: Growth in Brazil's installed electricity capacity (MW)

	2018	2019	2020	2021	2022
Hydro	1,04,195	1,09,155	1,09,271	1,09,350	1,09,721
Thermal	40,560	41,282	43,057	44,866	46,285
Nuclear	1,990	1,990	1,990	1,990	1,990
Renewable energy	16,697	17,691	20,418	25,403	31,131
Total	1,63,442	1,70,118	1,74,737	1,81,609	1,89,127

Note: Thermal includes biomass and biodiesel. Renewable energy includes wind and solar. Data does not include distributed generation.

Source: Brazil's Ministry of Mines and Energy; Agencia Nacional de Energia Eletrica (ANEEL); Empresa de Pesquisa Energética (EPE); Global Transmission Report

Figure 1: Installed electricity capacity by source, 2018 and 2022 (%)



Note: Thermal includes biomass and biodiesel while renewable energy includes wind and solar energy.

Source: MME; ANEEL; EPE; Global Transmission Report

During the 2018-22 period, the country's generation increased at a CAGR of 1.28 per cent and consumption increased by 1.38 per cent.

Table 2: Growth in Brazil's generation and consumption (GWh)

	2018	2019	2020	2021	2022
Generation	5,56,412	5,69,461	5,28,681	5,78,990	5,93,090
Annual growth rate (%)	-	2.87	(7.16)	9.51	2.43
Consumption	4,74,820	4,82,237	4,74,209	5,01,774	5,08,506
Annual growth rate (%)	-	1.56	-1.66	5.81	1.34

Source: MME; ANEEL; EPE; Global Transmission Report

Brazil: Growth in Electricity Transmission Network

Brazil has a few major vertically integrated players in the energy sector that are involved in generating, transmitting and distributing electricity. These include Furnas Centrais Elétricas S.A. (Furnas), Companhia Hidro Elétrica do São Francisco (CHESF), Companhia de Transmissão de Energia Elétrica Paulista (CTEEP), Eletrosul Centrais Elétricas S.A. (Eletrosul), Centrais Elétricas do Norte do Brasil S.A. (Eletronorte), Companhia Energética de Minas Gerais (Cemig) and Copel Geração e Transmissão S.A. (Copel GeT).

As of 2022, Brazil's transmission network comprised about 1,78,764 km of transmission lines at voltage levels of 230 kV AC, 345 kV AC, 440 kV AC, 500 kV AC, ± 600 kV DC, 750 kV and ± 800 kV DC. Of the total installed line length, 39 per cent was at 500 kV AC, followed by 37 per cent at 230 kV. The transmission line network saw a growth of 5.2 per cent from 2021 to 2022.

Between 2018 and 2022, the transmission line network grew at a CAGR of 4.19 per cent. Transformer capacity grew at a CAGR of 3.68 per cent during the same period.

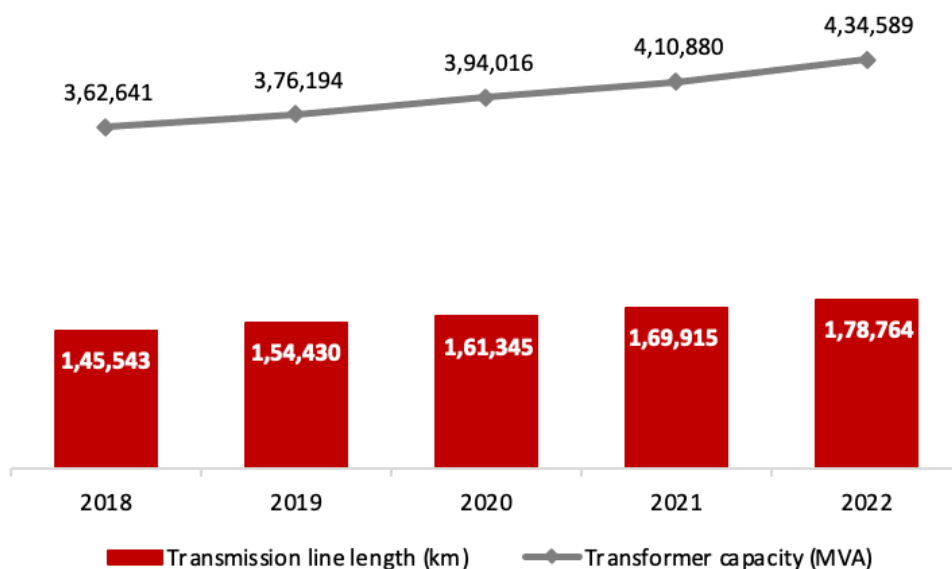
Table 1: Growth in Brazil's transmission line length, voltage-wise break-up (km)

Voltage (kV)	2018	2019	2020	2021	2022
230 kV AC	58,438	59,590	62,282	64,333	67,008
345 kV AC	10,319	10,321	10,351	10,359	10,492
440 kV AC	6,756	6,756	6,756	6,859	6,897
500 kV AC	50,363	53,060	57,253	63,661	69,664
± 600 kV DC	12,816	12,816	12,816	12,816	12,816
750 kV AC	2,683	2,683	2,683	2,683	2,683
± 800 kV DC	4,168	9,204	9,204	9,204	9,204
Total	1,45,543	1,54,430	1,61,345	1,69,915	1,78,764

Note: AC – alternating current; DC– direct current

Source: MME; ANEEL; Global Transmission Report

Figure 1: Growth in Brazil's transmission network

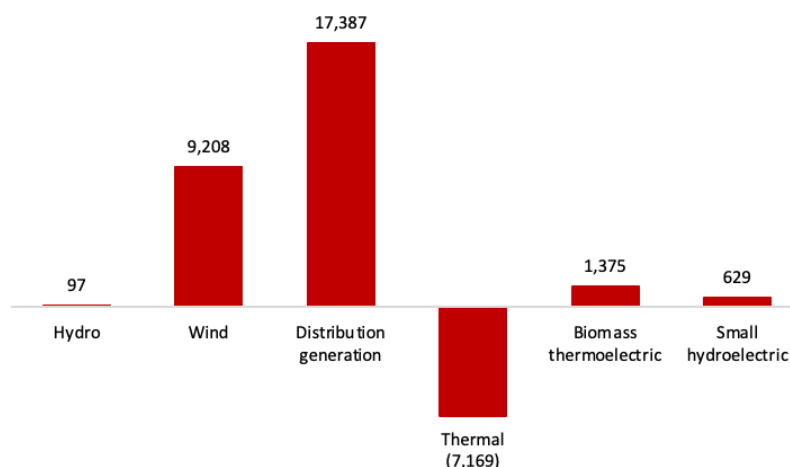


Source: MME; Global Transmission Report

Brazil: Planned Generation and Transmission Capacity

As per the Plano Decenal de Expansão de Energia 2032 or Ten-Year Energy Expansion Plan 2032 presented by the Empresa de Pesquisa Energética (EPE) or Energy Research Office, Brazil, it is anticipated that by 2032, an additional 28,696 MW of generation capacity will be introduced. Brazil aims to retire 7,169 MW of thermal capacity, and the majority of the new additions, comprising 61 per cent, will be from distributed generation. Wind power is expected to contribute around 32 per cent, while biomass thermoelectric and small hydroelectric sources will collectively contribute 7 per cent.

Figure 1: Expected generation capacity addition in Brazil during 2023-32 (GW)

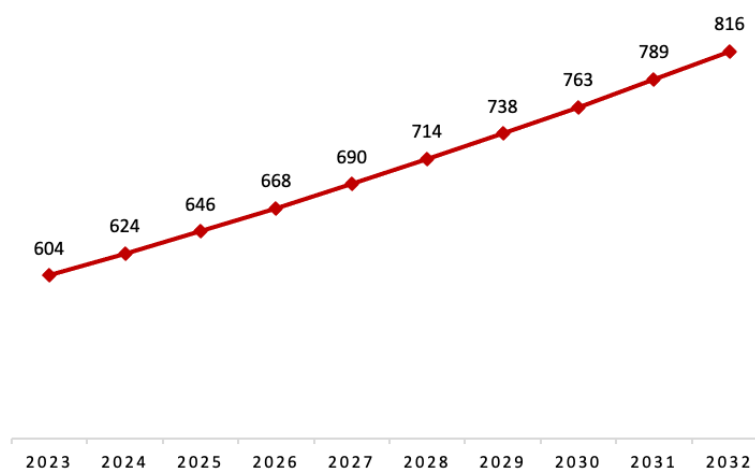


Note: Planned capacity additions are as per the studies for Plano Decenal de Expansão de Energia 2032 and could be revised after the approval of the final version.

Source: EPE, Brazil; Global Transmission Report

Electricity demand in Brazil is expected to reach 816 TWh by 2032 from 604 TWh in 2023. It is expected to grow at a CAGR of approximately 3.39 per cent during the period 2023-2032.

Figure 2: Expected growth in electricity demand in Brazil, 2023-2032 (TWh)



Note: Forecasted electricity consumption figures are as per the studies for Plano Decenal de Expansão de Energia 2032 and could be revised after the approval of the final version.

Source: EPE; Global Transmission Report

According to Empresa de Pesquisa Energética (EPE), Brazil plans to add 41,460 km of transmission line length between 2023 and 2032 with a total investment outlay of BRL158 billion. One of the major challenges faced by transmission planning is the ageing of the system. It is becoming necessary to ensure the rational replacement of the electrical system infrastructure that is at the end of its useful life so the transmission network can operate with reliability. There are several key projects in the pipeline for completion over the next decade. These include the 500 kV Ponta Grossa–Assis and Bataeias–Curitiba Leste lines and associated network projects, which are

expected to be energized in 2027; the 334-km, 500 kV Padre Paraíso 2–Mutum C1 single circuit (S/C) line; the 175-km, 500 kV São João do Paraíso–Padre Paraíso 2 C1 S/C line; and the 500 kV Ouarolândia II–Jussiape C1 and C2 S/C lines of 318 km each located in the states of Bahia and Minas Gerais.

Table 1: Key planned transmission projects in Brazil

Project	Voltage (kV)	Length (km)	Cost (USD million)	Scheduled completion
Guaíra–Sarandi, Foz do Iguaçu–Guaíra, Londrina–Sarandi, and Sarandi–Paranavaí Norte transmission project	525 AC	1,200	375.16	2023 (partially energised)
Areia–Joinville Sul C1 line, 525 kV Joinville Sul–Itajaí 2 C1 line, 525 kV Itajaí2–Biguaçu C1 line and associated transmission network	525/230 kV AC	1,097 (500 kV: 661 km; 230 kV: 426 km; 138 kV: 10 km)	541.03	2024
500 kV Morro do Chapéu II–Poções III C1 line and associated transmission network	500 kV and 230 kV AC	1,031 (500 kV: 971 km; and 230 kV: 60)	462.75	2026
500 kV Buritizeiro 3–São Gotardo do Pará 2 C1, 500 kV Pirapora 2–Buritizeiro 3 C1 and C2 lines, 500 kV Jaguará–Estreito C2 line, 500 kV Presidente Juscelino–Vespasiano 2 C1 and C2 lines, 500 kV Itabirito 2–Santos Dumont 2, and associated transmission network	500/345 kV AC	1,083.8 (500 kV: 961.2 km; and 345 kV: 122.6 km)	713.30	2027
500 kV Arinos 2–Paracatu 4, C1 and C2 lines, 500 kV Paracatu 4–Nova Ponte 3, C1 and C2 lines, 500 kV Nova Ponte 3–Araraquara 2, C1 and C2 lines, 440 kV Araraquara 2–Araraquara line and associated transmission network	500/440 kV AC	1,707 (500 kV: 1,696 km and 440 kV: 11 km)	956.69	2027
500 kV Morro do Chapéu II–Poções III; 500 kV Poções III–Medeiros Neto II; 500 kV Medeiros Neto II–João Neiva 2; and 500 kV João Neiva 2–Viana 2 lines	500 kV AC	1,006	520.49	2028
500 kV Juazeiro III–Campo Formoso II C1 line; Campo Formoso II–Barra II C1 line; 500 kV Buritirama–Barra II C1 line; 500 kV Barra II–Correntina C1 line; 500 kV Correntina–Arinos 2 C1 and other associated network	500 kV AC	1,116	612.73	2028/29
500 kV Gentio do Ouro II–Bom Jesus da Lapa II C2 and C3, lines, 500 kV Bom Jesus da Lapa II–Jaíba C1 and C2 lines; and 500 kV Jaíba–Buritizeiro 3 C1 and C2 lines	500 kV AC	1,610	841.97	2028/29
500 kV Quixadá–Crateús C1; Crateús–Teresina IV C1; Teresina IV–Graça Aranha C1; Boa Esperança–Graça Aranha, C1; Curral Novo do Piauí II– São João do Piauí II, C1; São João do Piauí II–Ribeiro Gonçalves, C3; Ribeiro Gonçalves–Colinas, C3; Morada Nova–Pacatuba, C1 lines and associated network	500 kV AC	1,901	NA	2029/30
500 kV Bom Nome II–Zebu III, C1; Garanhuns II–Messias, C1; João Pessoa II–Pau Ferro, C1; Ceará Mirim II–João Pessoa II C1; Bom Nome II–Campo Formoso II C1, Zebu III–Olindina C1, lines and associated network	500 kV AC	1,113	NA	2029/30
±800 kV Graça Aranha–Silvânia transmission DC line; 500 kV Presidente Dutra–Graça Aranha C3 line, and associated transmission network	±800/500 kV HVDC	1,517 (±800 kV: 1,468 km and ±500 kV: 49 km)	3,081.10	2029/30
500 kV Ouarolândia II–Jussiape C1 and C2 lines, 500 kV Jussiape–São João do Paraíso C1 and C2 lines; 500 kV São João do Paraíso–Capelinha 3 C1 line; 500 kV São João do Paraíso–Padre Paraíso 2 C1 line, 500 kV Capelinha 3–Itabira 5 C1 line, 500 kV Padre Paraíso 2–Mutum C1 line, and 500 kV São João do Paraíso substation project	500 kV AC	2,090	NA	2030

Note: AC – alternating current; HVDC – high voltage direct current

Source: ANEEL; Global Transmission Report

North America

Plus Power LLC raises USD1.8 billion for standalone BESS projects

Plus Power LLC has completed a financing round, raising USD1.8 billion for standalone battery energy storage system (BESS) projects. The capital raised through this financing will be utilised to fund the construction and operation of five projects aggregating 1,040 MW/2,760 MWh capacity.

These projects aim to support grid reliability during peak electricity demand, especially during extreme weather conditions.

The financing commitments from this round will not only support the construction of new projects but also their ongoing operations.

The deals encompass a range of financial instruments, including construction financing, term financing, letters of credit, and tax equity investments. These investments are the result of partnerships with 11 leading industry lenders and investors.

This announcement includes USD707 million in financing for the 250 MW Sierra Estrella Energy Storage facility in Avondale, Arizona, west of Phoenix.

This project, set to be the largest standalone BESS, features an 11-acre footprint, enabling it to be situated closer to load. The financing includes USD202 million tax equity from Bank of America, a USD505 million construction term loan, and a letter of credit (LoC) facility.

Another landmark project receiving financing is the 90 MW/360 MWh Superstition Energy Storage project in Gilbert, southeast of Phoenix, which received USD196 million as a construction term loan and LoC facility.

Both projects are supported by 20-year energy storage services agreements with Salt River Project.

These projects are under construction and are scheduled to come online by the second quarter of 2024.

Coordinating lead arrangers for these projects include Norddeutsche Landesbank and Société Générale, with joint lead arrangers such as Mizuho, U.S. Bank, Bank of America, CoBank, and Siemens Financial Services, Inc.

Other projects that received financing are the, 300 MW/600 MWh Rodeo Ranch Energy Storage facility in Pecos, which received USD212.2 million of tax equity financing and USD276 million of construction and term financing from Foss & Company; 200 MW/400 MWh Ebony Energy Storage facility in Comal County, northeast of San Antonio, which received USD196 million of construction and term financing; and the 200 MW/400 MWh Anemol Energy Storage facility in Hidalgo County, on the Mexican border northwest of Matamoros, which received USD200 million of construction and term financing.

For these three projects, Deutsche Bank and First Citizens Bank were the coordinating lead arrangers, with the latter as the administrative agent and Siemens Financial Services, Inc. acting as the joint lead arranger.

Asia Pacific

China's SGCC and Indonesia's PT PLN sign MoU for developing smart grids

Indonesia's state-owned electricity company PT PLN (Persero) has entered into a memorandum of understanding (MoU) with China's State Grid Corporation of China (SGCC) and Trina Solar China, for developing smart grids as a clean energy electricity backbone in Indonesia.

The MoU was signed on the sidelines of the Indonesia-China Business Forum (ICBF) held on October 16, 2023, in Beijing, China. ICBF is part of the third Belt and Road Forum for International Cooperation (BRF), which was initiated by the Chinese Chamber of Commerce Committee and held on October 17-18, 2023.

BRF aims to establish an international collaboration that includes extensive consultations, mutually beneficial contributions, and establishing open, green, clean and high-standard cooperation to improve people's lives and encourage sustainable development.

Through collaboration with SGCC, PLN plans to build environment-friendly "supergrid" transmission lines, smart grids, and expand partnerships in the future.

The collaboration will also include joint studies in the use of renewable energy, electricity storage, electricity network integration and smart network management, for a reliable, quality and economical electric power system.

Meanwhile, PLN, through its subsidiary PLN Indonesia Power Renewables, has entered into an MoU with Trina Solar, Sinar Mas, and Agra Surya Energi to construct Indonesia's largest solar cell and solar panel factory in Kendal Industrial Zone, Central Java. It is a significant step to harness Indonesia's vast solar energy potential of 207 GW.

In addition to the two MoUs with SGCC and Trina Solar, PLN also signed seven other MoUs with the Export-Import Bank of China, Sinosure, Bank of China, Industrial and Commercial Bank of China, State Development & Investment Corporation Limited, Huawei Tech Investment, and China Energy International Group with a total collaboration valuation (including funding) of more than USD54 billion.

PLN thus plays an important role in increasing investment between the two countries in the energy sector to support the government's commitment to accelerate the energy transition in Indonesia.

POWERGRID acquires Beawar Dausa Transmission in Rajasthan, India

India's largest transmission network developer, Power Grid Corporation of India Limited (POWERGRID), has acquired Beawar Dausa Transmission Limited (BDTL) from PFC Consulting Limited (PFCL), the bid process coordinator (BPC) for awarding the project through tariff-based competitive bidding (TBCB).

The special purpose vehicle (SPV), which was incorporated in May 2022 by PFCL as its wholly-owned subsidiary, is responsible

for the development of an interstate transmission system (ISTS) scheme titled as 'Transmission system for evacuation of power from a renewable energy zone (REZ) in Rajasthan (20 GW) under Phase-III Part H'.

POWERGRID will develop the project on a build, own, operate and transfer (BOOT) basis with an estimated completion period of 18 months from the acquisition date.

The project comprises of the establishment of a new 765/400 kV substation at a suitable location near Dausa, and 400 kV and 765 kV double-circuit (D/C) transmission lines traversing the state, in addition to associated bay extension works.

The entity was acquired for a total value of approximately INR213.7 million, which includes 10,000 equity shares at a par value of INR10 each, along with the assets and liabilities of BDTL as of the acquisition date.

The final acquisition price is subject to adjustments based on the audited accounts of BDTL.

(INR1=USD0.012)

Adani Energy Solutions acquires STSL from RVPN in India

Indian private transmission developer, Adani Energy Solutions Limited (AESL), formerly Adani Transmission Limited (ATL), has completed its acquisition of the entire equity shares of Sangod Transmission Service Limited (STSL) from Rajasthan Rajya Vidyut Prasaran Nigam Limited (RVPN).

The latter incorporated the SPV in February 2021 for the implementation of the Transmission Project – RAJ/PPP-11. This involves the construction of a 2x400/220 kV, 500 MVA grid substation (GSS) at Sangod, Kota, Rajasthan, along with a 220/132 kV, 160 MVA transformer and the associated transmission line infrastructure. This includes a 7.5-km line-in-line-out (LILO) of one circuit of the 400 kV Kalisindh–Anta D/C line at the 400 kV Sangod GSS.

In 2022, RVPN released the request for proposal for the project on a build, own, operate and maintain (BOOM) basis through the TBCB process.

Indian Sterlite Power and Singapore's GIC plan USD1 billion transmission JV

India's private transmission developer, Sterlite Power Transmission Limited (SPTL)—a Vedanta Group company, has joined hands with Singapore's sovereign wealth fund, GIC Private Limited, to create a USD1 billion joint venture (JV) platform to tap the growing demand for power evacuation networks in India for upcoming large-scale RES capacity.

SPTL is currently in the process of demerging into two businesses – the infrastructure division that develops and operates power transmission assets on a build, operate and transfer (BOT) basis, and the domestic manufacturing division that deals with cables, conductors and optical phase ground wires (OPGW) on a turnkey basis for third-party buyers such as state transmission utilities.

As per the deal, GIC will be deploying USD500 million in the infrastructure business for a 49 per cent stake. The investment will take place in tranches, with an initial USD100 million followed by USD400 million over the next two to three years on a need-to-draw-down basis.

This will be linked to SPTL winning transmission project tenders and planned capital expenditure (capex).

GIC's plan is to be the exclusive partner of SPTL in India in the transmission segment to gain a larger share of the market, which has seen annual cumulative projects worth INR100-120 billion bid out every year between 2010 and 2022. GIC is also committed to deploying capital even beyond the USD500 million earmarked initially.

On its part, SPTL will transfer four assets with an enterprise valuation of INR60 billion into this JV. Additionally, SPTL is expected to invest around INR17-25 billion in cash over a similar two to three-year period as well as deploy its capabilities to maintain its 51 per cent stake in the JV.

Spanning over 700 km with three substations and a transmission capacity of 800-2,000 MW, two of the transmission assets are in Rajasthan, and one each in Assam and Kashmir.

Based on this USD1 billion equity funding, the plan is to raise three to four times the debt to fully capitalise the platform into a UDD4-billion scaled operation.

The JV is aiming to win projects worth INR100 billion annually, which would need INR30 billion of annual equity. Reportedly, the two sides are awaiting the mandatory regulatory, lender and customer approvals. Deutsche Bank is the adviser to the transaction.

(INR1=USD0.012)

European Investment Bank signs MoU with Vietnam for JETP

EIB Global, the European Investment Bank (EIB) Group's specialised arm devoted to increasing the impact of international partnerships and development finance outside the European Union (EU), signed a MoU with Vietnam to support the implementation of Vietnam's Just Energy Transition Partnership (JETP).

The MoU signifies a mutual commitment to put in place a multi-project credit facility of EUR500 million. Once the credit facility is finalised and signed shortly, it will allow projects supporting decarbonisation and energy transition in Vietnam to be financed under a framework loan.

The MoU was signed at the Global Gateway Forum held in Brussels on October 25, 2023. The agreement demonstrates EIB Global's commitment to promoting investment in climate mitigation and resilience as part of the EU's Global Gateway initiative.

The latter is the EU's strategy to reduce the worldwide investment gap and boost smart, clean and secure connections in the digital, energy and transport sectors, and to strengthen health, education and research systems. The Global Gateway strategy embodies a Team Europe approach that brings together the EU, member countries, and European development finance institutions.

The EU will also make available EUR16.6 million in technical assistance for Agence Française de Développement (AFD) to support Electricity of Vietnam (EVN) in the preparation and implementation of projects linked to the JETP. The technical assistance facility will accompany a total of EUR1 billion in sovereign and non-sovereign loans provided by Team Europe [AFD, Kreditanstalt für Wiederaufbau (KfW), and EIB].

Separately, the EU is supporting reforms in Vietnam's energy sector, including establishing legislative and technical conditions on renewable energy, energy efficiency, and transmission lines and grids for the JETP, through the Sustainable Energy Transition Program (SETP), to the tune of EUR142 million.

(EUR1=USD1.07)

Taiwan Power raises TWD4.8 billion through green bonds

Taiwan Power Company Limited, a Taiwan-based integrated state-owned power utility that offers electricity generation, transmission and distribution services, has raised green bonds in a public offering, for proceeds of TWD4.8 billion. The bonds bear a coupon rate of 1.6 per cent per annum and will mature on October 18, 2030.

(TWD1=USD0.031)

Europe

Norway's Statnett secures NOK1 billion loan from NIB

Norwegian transmission system operator (TSO), Statnett, has secured a NOK1 billion loan from the Nordic Investment Bank (NIB) to finance two key projects.

The first project envisages upgradation of the transmission line between Aurland and Sogndal from 300 kV to 420 kV, by building a new power line parallel to the existing one, which will be removed after the new line is in use. At the same time, a part of the transmission power line between Hove and Sogndal will be replaced with a new one. In addition, the Sogndal substation will be renewed.

The second project involves the replacement of an existing 132 kV transmission line between Kvandal and Kanstadbotn in Northern Norway, which is approaching the end of its technical service life.

The above projects would add value to Norwegian power generation, support electrification, contribute to reduced price differences, and improve overall security of supply.

(NOK1=USD0.089)

Cypriot EIL to exit EuroAsia Interconnector

EuroAsia Interconnector Limited (EIL), a subsidiary of Cyprus-based Quantum Energy Limited, will reportedly exit the EuroAsia Interconnector project that will connect Greece, Cyprus and Israel. The interconnector is a flagship European Project of Common Interest (PCI) and has been included in all five PCI lists since 2013.

Earlier this month, it was reported that Greece's Independent Power Transmission Operator (IPTO), Anexartitos Diacheiristis Metaforas Ilektrikis Energeias (ADMIE), has become the project promoter for the interconnector.

EIL is reportedly in the process of transferring all the EU grants to IPTO. The project has received EUR658 million EU Connecting Europe Facility (CEF) grant and EUR100 million from EU's Recovery and Resilience Fund.

The EuroAsia Interconnector is a 2 GW multi-terminal interconnection between the national electricity grids of Israel, Cyprus and Greece (Crete), and Europe. When completed, the interconnector between Greece and Cyprus will be the longest and deepest HVDC subsea cable project globally, with bi-pole cables of 2×900 km and a water depth of 3,000 metres.

The interconnector will end Cyprus' energy isolation – ensuring security of supply for Israel, Cyprus and Greece, and create a reliable green interconnection for Europe. It plans to significantly reduce carbon dioxide emissions and serves the vision of the Green Deal [which targets net zero carbon emissions across EU by 2050] of the EC.

The interconnector will soon be moving into the construction phase and is expected to be completed in 2027.

FID reached for Polish 1.2 GW Baltic Power wind project

The Final Investment Decision (FID) has been reached for the 1.2 GW Baltic Power Offshore Wind Park being developed by Baltic Power Sp. z o.o., a joint venture between Poland's ORLEN S.A (51 per cent) and Canada's Northland Power (49 per cent).

The project, located 23 km to the north of the Polish coastline, off the coasts of Choczewo and Łeba, would entail an investment of EUR4.73 billion, including capital expenditure, insurance (totalling approximately EUR4.05 billion), as well as financing costs and an additional reserve.

The project will be financed under a project finance framework, for which, in September 2023, Baltic Power's shareholders signed loan agreements for a total of about GBP4.4 billion with 25 Polish and international financial institutions.

This is the largest financing obtained for a single investment in Poland's history and one of the largest transactions of its kind in the offshore area in Europe. The project has also secured a loan of up to EUR610 million from EIB through the InvestEU programme.

The latter brings together a multitude of earlier EU financial instruments, making access to finance and investments in European companies and projects simpler, and more efficient and flexible. EIB will provide a direct loan to Baltic Power Sp. z o.o., as well as an intermediated tranche for project-related on-lending made available to the Polish development bank, Bank Gospodarstwa Krajowego.

In a separate development, TELE-FONIKA Kable (TFK)—a global supplier of wire and cable systems for the renewable energy sector, alongside JDR Cable Systems (JDR)—a global subsea cable and umbilical supplier, has been awarded a contract to design, manufacture and install 340 km of land and subsea cables for the offshore wind farm (OWF).

The work will be carried out together with partners – Danish power cable manufacturer NKT and France's DEME Offshore, which have been awarded cable contracts in the past for the Baltic Power project.

TFK will manufacture and install the 230 kV land power cables and cores for inter-array cables at its manufacturing facility in Bydgoszcz, Poland.

As a consortium partner, NKT will develop the offshore export cables for the project – delivering power from the offshore substations to the shore.

TFK will manage the transportation and installation of the onshore cable section within the Baltic wind farm. JDR will design and manufacture 66 kV inter-array cables at its Hartlepool facility in the UK, which will be used to connect 76 offshore turbines to the offshore substation.

DEME Offshore will be responsible for the transportation and installation of all subsea cables.

The manufacture and delivery of all cables will be completed by the end of 2025.

An onshore substation is already underway for the project, designed to evacuate the power generated at sea.

The foundation laying for the wind farm is scheduled to commence in 2024.

Once operational in 2026, the offshore wind park will generate 4,200 GWh of electricity, equivalent to approximately 3 per cent of Poland's current electricity output, helping to avoid an estimated 2.8 million tonnes of carbon emissions annually.

(EUR1=USD1.07; GBP1=USD1.23)

Estonian and Latvian TSOs sign MoU to develop new interconnection

Estonian TSO Elering and Latvia's TSO, Augstsprieguma tīkls (AST) have signed a MoU to jointly develop the fourth Estonian-Latvian electricity interconnection.

The new interconnection is planned to be built in hybrid mode, that is, in addition to connecting the electricity systems of the two countries, it would also be possible to connect offshore and onshore production capacities to it.

The project will increase system security and stability, along with increasing the renewable energy capacity for both countries.

The exact location of the interconnection and other technical details will be agreed upon later.

Based on the previous evaluation and technical analysis, the working version of interconnection capacity is assumed to be 1 GW, and the connection could be completed by 2035 with the accompanying transmission infrastructure.

Elering and AST have agreed to cooperate on preparatory activities, including several studies, which are a prerequisite to select an environment-friendly and technically-economically preferable scenario for making future investment decisions regarding the interconnection.

Both the TSOs expect to receive co-financing from the EU CEF Energyfunding for the evaluation and construction of the interconnection.

The final decision on project implementation will be made after the EU's support becomes clear.

The third Estonian-Latvian electricity interconnection started operating in 2020.

The other two Estonian-Latvian interconnections are also under construction as a part of the Baltic States' synchronisation project with continental Europe, where the Valmiera-Tartu transmission line construction was finalised in June 2023, while Valmiera-Tsireguliina is under construction and will be completed by end-2024.

Middle East and Africa

Saudi's SEC secures USD3 billion funding for grid infrastructure

The state-run Saudi Electricity Company (SEC) has signed a USD3 billion international syndicated facility agreement with four major regional banks, namely Dubai Islamic Bank PJSC, Kuwait Finance House, Mashreq Bank, and Saudi National Bank.

This agreement was unveiled at the global economic event—Future Investment Initiative (FII), held in Riyadh during October 25-27, 2023.

The financing arrangement spans a period of five years and notably requires no guarantees from SEC.

The funding injection was part of its vision to invest approximately SAR500 billion in expanding its electricity sector and capex spending by 2030.

These investments are geared towards delivering electricity services to subscribers, enhancing the company's regulated asset base, and fortifying its financial standing, thereby boosting prospects for revenue growth.

These initiatives aim to create essential infrastructure for transmission and distribution (T&D) grids, thereby optimising electricity generation efficiency levels and aligning with the goals of Vision 2030, Saudi Arabia's ambitious long-term development plan.

SEC has announced plans to double its investments over the next five years in response to the escalating demand for electricity. Over the past three years, SEC invested over SAR30 billion in modernising its T&D networks.

(SAR1=USD0.27)

EBRD approves loan for Egypt's NWFE Grid Reinforcement Project

European Bank for Reconstruction and Development (EBRD) has approved a provision of a sovereign loan of up to EUR165 million to the Arab Republic of Egypt, to the state-owned Egyptian Electricity Transmission Company (EETC), to finance the upgrade and

reinforcement of the electricity transmission grid under Egypt's Nexus Water, Food & Energy (NWFE) Grid Reinforcement project.

NWFE is a policy dialogue initiative developed by the EBRD and announced at COP27 in Sharm El Sheikh, with an aim to reduce greenhouse gas (GHG) emissions.

The proceeds of the loan will be used to finance (i) the upgrade of a 500 kV substation in the Cairo governorate in Egypt that is crucial for the stability of the network and is directly linked to the closing of a gas-powered power plant (Shoubra El Kheima) under the NWFE initiative, and (ii) the construction of a 200 km high-voltage overhead transmission line (OHL) that will evacuate 2.1 GW of renewable energy from the Gulf of Suez region, where several wind projects are currently under development or construction.

The project will require total financing of EUR200 million split between an EBRD loan of EUR165 million and EU grants (subject to EU approvals) of EUR35 million.

Up to EUR120 million of the blended facilities (60 per cent of total financing) will be used to finance the 200 km OHL, and the remaining EUR80 million (40 per cent of total financing) will finance the upgrade of the high-voltage substation.

The project will be the first grid investment under a USD2 billion investment programme to be implemented by EETC under the NWFE initiative.

Expansion and upgrade of the ageing transmission and distribution network is crucial in allowing Egypt to achieve its long-term strategy to generate 42 per cent of the electricity peak load through renewables by 2030.

(EUR1=USD1.07)

CrossBoundary Access and Mobile Power partner to deploy BESS across Nigeria

CrossBoundary Access and Mobile Power (MOPO) have announced a USD10 million partnership to deploy MOPO Hubs (BESS) across Nigeria, providing energy access to 300,000 people.

CrossBoundary Access, which is an investment company for solar mini-grids, has committed an initial USD2.25 million for the transaction, with the option to extend up to USD10 million.

For MOPO, this new partnership allows the company to accelerate deployment of its technology (MOPO Batteries) in Nigeria.

For CrossBoundary Access, MOPO Hubs complement its mini-grid portfolio by allowing faster, lower-cost deployment, and extending its service range.

CrossBoundary Access will finance the development and construction activities and will own the projects, while MOPO will ensure that residents receive clean, reliable electricity.

MOPO Hubs, powered by solar energy, allow customers to access energy without upfront costs with no consumer debt through secure pay-per-use MOPO batteries distributed by local MOPO agents.

This low-cost connection strategy, along with the ability to collect usage data, allows CrossBoundary Access to optimise the locations of its future mini-grid sites and connections.

The advisors for this transaction were Foley Hoag LLP for CrossBoundary Access and Knights PLC for MOPO.

World Bank approves USD1 billion loan for South Africa's energy reforms

The World Bank has sanctioned a development policy loan worth USD1 billion to bolster South Africa's energy sector, advance its low-carbon transition, and support the ongoing electricity market reforms in the country.

The funding, structured as a development policy loan, will be channelled to the National Treasury.

While specific details about the loan's terms and concessions remain undisclosed, the latter expressed optimism about the opportune timing of the loan.

This funding marks the third policy loan post the establishment of the JETP with several developed countries.

Notable contributions from the French and German development banks, AFD and KfW respectively, in November 2022, exemplify the collaborative international effort to bolster South Africa's energy reforms.

The loan, a joint endeavour involving the World Bank, the African Development Bank, KfW, and the governments of Canada and South Africa, aligns with the nation's development priorities outlined in the Energy Action Plan.

This plan addresses critical issues such as load-shedding and the energy transition, emphasising a shift toward sustainable energy practices.

The loan's objectives encompass the restructuring of the power sector through Eskom's unbundling and the redirection of resources towards vital investments in transmission and plant maintenance.

Additionally, the funding supports a low-carbon transition by encouraging private investments in renewable energy, strengthening carbon pricing instruments, and fostering a greener energy landscape.

This World Bank initiative follows recent pledges by the South African government, totalling nearly USD3.5 billion, in support of its JET Investment Plan (JET IP).

These pledges elevate the overall funding envelope, including concessional debt and grants, to USD11.9 billion, indicating a strong international commitment to South Africa's sustainable energy future.

The announcement comes ahead of the imminent approval of the JET IP implementation plan, set to be presented before the Cabinet, preceding the Conference of Parties (COP28) climate talks scheduled in Dubai, United Arab Emirates, from November 30, 2023, to December 12, 2023. ♦

North America

Big Stone South–Alexandria–Big Oaks Transmission Project, US

Developers: Great River Energy, Minnesota Power, Otter Tail Power Company, Missouri River Energy Services and Xcel Energy

Project details and status: This 345 kV project, situated in Minnesota and north-eastern South Dakota, aims to enhance the delivery of reliable energy to consumers and create new avenues for the incorporation of additional renewable energy resources within the Upper Midwest. By adding extra capacity, the project seeks to address current capacity limitations, maintain electric system reliability, alleviate grid congestion, and enable cost-effective wind energy from western Minnesota and the Dakotas to reach consumers across the region. The project includes two segments – Eastern (Alexandria–Big Oaks line) and Western (Big Stone South–Alexandria line). The Western segment entails establishing a new 100-mile (161-km) line from Otter Tail Power’s Big Stone South substation in South Dakota to the existing Alexandria substation in Minnesota, owned by Missouri River Energy Services. The Eastern segment would run 105 to 108 miles (169 to 174 km) and is designed to introduce a new transmission circuit on existing structures established as part of the CapX2020 Fargo–St Cloud and St Cloud–Monticello projects, connecting Alexandria and a new substation on Xcel Energy property near the Sherco power plant in Becker. The project is expected to cost between USD606.5 million and USD699.4 million.

In July 2022, the project was studied, reviewed and approved as part of the Long-Range Transmission Planning (LRTP) Tranche 1 portfolio by the Midcontinent Independent System Operator, Inc.’s (MISO) Board of Directors as part of its 2021 Transmission Expansion Plan (MTEP21) report. In September 2023, the project developers filed for a Certificate of Need and route permit with the Minnesota Public Utilities Commission (PUC) for the Eastern segment of the project between the Alexandria and Big Oaks substations. Xcel Energy is leading this Certificate of Need application for the Minnesota portion of the project and route permit application for the Eastern segment on behalf of the developers. Otter Tail will lead the route permit application for the Western segment and plans to file the application in the fourth quarter of 2024. Otter Tail and Western Minnesota also plan to file a facility permit application in South Dakota, along with any other applicable permits required within South Dakota, for the portion of the Western segment that will be located in South Dakota.

Otter Tail Power Company and Missouri River Energy Services sought public comments from key stakeholders on the Western segment of the project between October 16 and October 24, 2023.

Helix–Hiple Transmission Project, US

Developer: Michigan Electric Transmission Company, LLC (METC) [a subsidiary of ITC Holdings (ITC)]

Project details and status: The 345 kV project will be the first new interstate connection to Michigan’s transmission system in nearly 50 years. It is part of a bigger USD850 million LRTP project approved by MISO.

The project entails the construction of the new Helix substation along with an approximately 50-mile (80.5-km), 345-kV transmission line from the Michigan/Indiana border in Branch County to a new ITC Helix substation in Calhoun County. The broader LRTP project aims to interconnect Indiana and Michigan, which also includes the construction of an approximately 40-mile (64.4-km) line from the Oneida substation in Oneida Township to the Nelson Road substation in New Haven Township.

In August 2023, ITC finalised its primary and secondary route selections, following an extensive two-year review process.

In September 2023, METC unveiled its primary and secondary route selections for the line. The primary route, situated to the west, has been chosen over an alternative secondary route to the east within these counties. Within Branch County, after entering Michigan, the line angles northeast, reaching Steffey Road north of Southern Road. It proceeds northward through Bethel Township, west of Clearwater Road, and traverses between Batavia and Butcher roads near Lockwood Road. A substation is expected to be established near the Bethel Solar Farm. The line continues north, crossing US 12, before heading northeast towards Hodunk Road, where it proceeds north on the Batavia side of Hodunk into Union Township. It subsequently zigzags into Girard Township, located south of Sullivan Road. The route follows Hog Creek northeast, then turns east, just south of County Line Road, eventually crossing the old US 27 and I-69. From there, the transmission lines continue northeast, east of Tekonsha. Within Calhoun County, the route turns north, east of the Clarendon Township line at T Drive S. It further extends north into Eckford Township, angling northeast near 19 Mile Road, before proceeding north into Marengo Township. The route continues north-northeast through Marengo Township, briefly crossing the southeast corner of Lee Township before reaching Clarence Township. The journey concludes at the new Helix substation on V Drive N near 27 Mile Road. Once the Michigan Public Service Commission (PSC) approves the final route, ITC and METC will commence negotiations with landowners for the necessary right-of-way (ROW). In October 2023, ITC engaged with the public in various townships to discuss the construction of the project. The public meetings were planned to provide an informal opportunity for the project team to address questions and showcase detailed plans for the proposed transmission line. Representatives of ITC met with the public in several townships (Butler, Girard, Gilead, Bethel, Batavia and Union) and counties such as Branch, between October 12 and October 26, 2023. Construction on the Helix substation is scheduled to begin by the fourth quarter of 2025 and be completed by 2026. Transmission line construction works are scheduled for 2029 and 2030.

Hanmer–Mississagi Transmission Line Project, Canada

Developers: Hydro One and First Nations

Project details and status: The line is part of Hydro One’s efforts to facilitate the development of critical electricity transmission projects to support economic growth and electrification in northeast and eastern Ontario while advancing a shared goal of reconciliation by providing economic and partnership opportunities for indigenous communities.

The project involves a 205-km, 500 kV line from the Hanmer transformer station (TS) in Greater Sudbury to the Mississagi TS.

In September 2022, Hydro One introduced its First Nations 50-50 equity model, offering them the opportunity to become equal partners in large-scale transmission line projects.

In September 2023, the Ontario Ministry of Energy posted the line as a priority line for public consultation. In response, eight First Nations collectively expressed their support to the Ministry of Energy for Hydro One to undertake the project connecting Sault Ste. Marie and Sudbury. These First Nations, comprising Batchewana, Garden River, Thessalon, Mississauga, Serpent River, Sagamok, Atikameksheng and Wahnapiatae, have formed a consortium to pursue an equity partnership with Hydro One for transmission projects within their shared territories. They have formally requested the ministry to designate Hydro One as the licensee responsible for developing these transmission lines.

In October 2023, Hydro One announced plans to reinforce critical infrastructure in northeastern and eastern Ontario, including this project, responding to a directive from the state government aimed at addressing the escalating demand for electricity in the regions.

In response to the escalating demand for electricity, the Independent Electricity System Operator (IESO) has recommended that the transmission line should be operational no later than 2029.

New Brunswick (NB)/Nova Scotia (NS) Transmission Reliability Project, Canada

Developer: Nova Scotia Power, New Brunswick Power

Project details and status: In October 2023, the government of Nova Scotia (NS) in Canada unveiled its 2030 Clean Power Plan to help achieve the province's clean energy target. Under this, it has proposed the NS–New Brunswick (NB) Regional Transmission project to improve connectivity with the North American grid. With this, both provinces have agreed to invest in clean energy sources and have dropped their plan for the Atlantic Loop project, which aimed to link the power grids of Newfoundland and Labrador, Nova Scotia, New Brunswick, Prince Edward Island and Quebec, with an investment of CAD9 billion.

This new 345 kV, 160-km, NS–NB line is needed to manage renewables and boost reliability and resiliency. It will run from Onslow to Salisbury, enabling a power exchange of over 500 MW by 2028. Further, extending this line to Point Lepreau will enable greater access to NB, New England and Quebec. This new line and extension can be completed by 2029 at CAD1.4 billion, far less than the Atlantic Loop project. It will also support regional population growth, enhance power reliability, and enable more energy trading. The project will be implemented in two stages: Stage 1 entails the Salisbury (NB) to Onslow (NS) line, and Stage 2 entails the Salisbury (NB) to Point Lepreau (NS) line.

In October 2023, Nova Scotia Power formally submitted an application to the Nova Scotia Department of Environment and Climate Change for approval of the NS side of the project. Nova Scotia Power has already received significant funding from Ottawa for preliminary studies on the new transmission line, and it is exploring additional funding options, including programmes and tax credits from Ottawa and the Canadian Infrastructure Bank.

New Brunswick Power will be constructing 65 km of the new transmission line on its side of the border, along with the extension to Point Lepreau. It plans to officially register for environmental approval with the New Brunswick Department of Environment and Local Government by the end of 2023.

If approved, construction could begin in the fall of 2024, with the new transmission line expected to be operational by the end of 2027.

(CAD1=USD0.73)

Labrador Island Link Upgrade Project, Canada

Developers: Newfoundland and Labrador Hydro (NL Hydro)

Project details and status: In October 2023, NL Hydro announced its plans to invest CAD28 million over four years to add and replace components of the Labrador Island Link, which is a 1,100-km, 900 MW high voltage direct current (HVDC) transmission line that carries electricity from a generating facility at Muskrat Falls to the island of Newfoundland. The line runs from central Labrador, crossing the Strait of Belle Isle, and extending to Soldiers Pond on the Avalon Peninsula. The project was developed by Nalcor Energy, which was later merged into NL Hydro.

The decision to upgrade the line follows the findings of four investigations into failures on the link during the winter of 2022-23, with the most significant issue being the occurrence of galloping (a phenomenon that results from various factors, including wind and ice, causing power lines to move up and down), which caused turnbuckles on the transmission poles to snap.

The turnbuckles that hold the wires were not designed to withstand galloping, so NL Hydro plans to address this by swapping out some equipment, including the turnbuckles, and adding specialised devices to prevent galloping in high winds. The project will be carried out by an external contractor in remote areas of the province.

The first year of the four-year plan is nearly complete, with work concentrating on the most remote sections. The link was initially designed for 900 MW, but it is currently approved for 700 MW. NL Hydro had planned to perform tests at the maximum capacity in the fall, but these have been postponed to April 2024. The decision is based on the need to address a few items related to the software supporting the operation. The CAD28 million investment is expected to enhance the stability and reliability of the transmission line, especially during harsh winter conditions.

(CAD1=USD0.73)

Mississagi–Third Line Transmission Line Project, Canada

Developers: Hydro One and First Nations

Project details and status: The line is part of Hydro One's efforts to facilitate the development of critical electricity transmission projects to support economic growth and electrification in northeast and eastern Ontario while advancing a shared goal of reconciliation by providing economic and partnership opportunities for indigenous communities.

It entails an approximately 75-km, 230-kV transmission line connecting the Mississagi TS (located west of Sudbury) with the Third Line TS in Sault Ste. Marie.

In October 2023, Hydro One announced its plans to reinforce critical infrastructure in northeastern and eastern Ontario, including this project (among others), responding to a directive from the state government aimed at addressing the escalating demand for electricity in the regions.

In response to the escalating demand for electricity, IESO has recommended that the transmission line should be operational no later than 2029.

Greater Toronto Area East Transmission Line Project, Canada

Developers: Hydro One and First Nations

Project details and status: The line is part of Hydro One's efforts to facilitate the development of critical electricity transmission projects to support economic growth and electrification in northeast and eastern Ontario while advancing a shared goal of reconciliation by providing economic and partnership opportunities for indigenous communities.

It entails the establishment of an approximately 50-km, 230 kV transmission line that connects either the Cherrywood TS in Pickering or the Clarington TS in Oshawa with the Dobbin TS in Peterborough.

In October 2023, Hydro One announced plans to reinforce critical infrastructure in northeastern and eastern Ontario, including this project (among others), responding to a directive from the state government aimed at addressing the escalating demand for electricity in the regions.

In response to the escalating demand for electricity, IESO has recommended that the transmission line should be operational no later than 2029.

Latin America

Kimal–Lo Aguirre HVDC Transmission Line Project, Chile

Developer: Conexión Energía, comprising Chile's largest transmission firm Transelec, Colombia's Interconexión Eléctrica (ISA) and China Southern Power Grid International (CSG).

Project details and status: The project was proposed by Chile's national energy commission, Comisión Nacional de Energía (CNE), under its Annual Transmission Expansion Plan for the Sistema Eléctrico Nacional (SEN) or national electric system and zonal transmission system, for 2018.

The USD1,480 million project entails the construction of a 1,500-km-long, ± 600 kV HVDC line between the Kimal and Lo Aguirre converter substations, with the transmission capacity of each end being at least 2,000 MW. The use of HVDC technology is relatively new to Chile and is a distinctive feature of this project.

In September 2019, the Chilean government initiated the route

study for the ± 600 kV line. The project will be the first to be covered under the zone study system, devised by the government to reduce social conflicts linked to the construction of any infrastructure.

In September 2020, Chile's Ministry of Energy revoked its decision to conduct a field study to determine the route of the project. The COVID-19 pandemic played a role in this, as conducting a study would require on-site visits, which were difficult to carry out under the circumstances.

In October 2020, CEN published the tendering schedule for the HVDC project and launched its tender.

In November 2020, CEN gave interested parties access to the preliminary technical documents for the project. Around 60 parties showed interest in the project. The documents included the general technical specifications of the project, HVDC specifications, a series of addendums, forms and other technical documents.

In February 2021, CEN officially launched an international tender for awarding the rights of execution for the project.

In October 2021, two consortiums submitted bids to compete in the international tender for this transmission line. The first was Conexión Energía, comprising Chile's largest transmission firm Transelec, Colombia's ISA and China's CSG, while the second was the Meval consortium formed by Iberdrola Redes España, S.A.U and Celeo Redes Chile Limitada.

In December 2021, Conexión Energía, by submitting the lowest bid, was awarded the concession contract for the construction and operation of the project.

In March 2022, Chile's Fiscalía Nacional Económica (FNE) or National Economic Prosecutor's Office gave its approval to the Yallique consortium to build, operate and maintain this HVDC line in Chile.

Chile has set a goal of decommissioning all coal plants in the country before 2040. This HVDC project is therefore necessary as it will take advantage of the energy being produced by the upcoming renewable energy projects in northern Chile, which, due to the current congestion of transmission lines, are not being utilised at their full capacity.

In May 2022, Ministerio de Energía Chile or the Ministry of Energy announced that the project is scheduled to be operationalised in May 2029.

In November 2022, Conexión Energía officially launched the construction of the project.

In April 2023, Conexión Energía formally joined Transmisoras de Chile, an association that brings together the main electricity transmission companies in the country with a total high voltage (HV) transmission network of more than 16,000 km. Conexión was created by the shareholders for the construction of this project in Chile.

In October 2023, Conexión Energía submitted the environmental impact study (EIS) for the project to the Servicio de Evaluación (SEA) or Evaluation Service. The project's construction phase is expected to last 51 months, with the assembly of the converter substations being the most time-consuming aspect.

500 kV Huánuco–Tocache–Celendín–Trujillo Transmission Project, Peru

Project developer: Colombia's Interconexión Eléctrica SA (ISA)

Project details and status: The project aims to strengthen electricity supply, provide reliability and greater transmission capacity, and contribute to the promotion of industrial, commercial and service activities, and the growth of regional economies.

The project entails the installation of a high voltage alternating current (HVAC) electric power transmission line between the central and northern zones of the country, connecting the following 500 kV substations – Huánuco, Tocache (new), Celendín (new), Trujillo, La Niña, Piura and Chimbote. This covers the areas of Huánuco, San Martín, Cajamarca and La Libertad. The project will require an investment of USD411 million.

In July 2022, the Agency for the Promotion of Private Investment (ProInversión) announced the tender to award the concession contract for the project. The concession will be granted under the comprehensive projects tender mechanism to the bidder and involves the design, financing, construction, operation and maintenance of both projects, under the self-financed public-private partnership (PPP) modality. This will take place in the second quarter of 2023.

In January 2023, ProInversión announced an update for the tender of the project stating that the participation fee could be submitted by May 16, 2023, and the presentation of the qualification documents could be done by May 23, 2023. It planned to award the concession contract for the projects in July 2023.

In February 2023, ProInversión included the project in its portfolio, to cater to the increased demand for electric power with efficiency and quality in the area of La Libertad.

In May 2023, ProInversión announced modifications to the concession process timetable of the project. The modified date for submitting the participation fee was July 18, 2023, and that for the presentation of the qualification documents was July 25, 2023.

In October 2023, ProInversión awarded the project to Colombia's ISA. The project will be executed through the PPP model, with a commercial operation period of 30 years, in addition to the time required for the infrastructure development phase, totalling 66 months.

500 kV Celendín–Piura Transmission Project, Peru

Project developer: Colombia's Interconexión Eléctrica SA (ISA)

Project details and status: The project aims to strengthen the supply of electricity, provide reliability and greater transmission capacity, and contribute to the promotion of industrial, commercial and service activities, and the growth of regional economies.

The project contemplates an alternative axis of electric power transmission between the central and extreme north zones of the country, connecting the following 500 kV substations – Celendín, Piura, La Niña and Trujillo. This covers the regions of Cajamarca, Amazonas, Lambayeque and Piura. It entails an investment of USD200 million.

In July 2022, ProInversión announced the tender to award the

concession contract for the project. The concession will be granted under the comprehensive projects tender mechanism to the bidder and involves the design, financing, construction, operation and maintenance of both projects, under the self-financed PPP modality. This will take place in the second quarter of 2023.

In January 2023, ProInversión announced an update for the tender of the project stating that the participation fee could be submitted by May 16, 2023, and the presentation of the qualification documents could be done by May 23, 2023. It planned to award the concession contract for the projects in July 2023.

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In October 2023, ProInversión awarded the project to Colombia's ISA. The project will be executed through the PPP model, with a commercial operation period of 30 years, in addition to the time required for the infrastructure development phase, totalling 66 months.

Mantaro–Nueva Yanango–Carapongo Transmission Project, Peru

Developer: Consorcio Transmantaro S.A. (CTM), a subsidiary of Colombia's Interconexión Eléctrica (ISA)

Project details and status: The project will reinforce the transmission system in the central region of the country (Huancavelica and Junín), and enable the evacuation of surplus generation from the Mantaro zone to Lima. The project involves the construction of a 390-km-long, 500 kV transmission line from Mantaro to Carapongo.

It includes the construction of the 500 kV, 179-km Mantaro–Nueva Yanango line of 1,400 MVA capacity, and the 211-km Nueva Yanango–Carapongo line of 1,400 MVA capacity. It also includes the construction of a 220 kV transmission line from the existing Yanango substation to the new Yanango substation (10.2 km); extension of the 500/220 kV Mantaro (Colcabamba) substation; construction of the 500/220 kV Nueva Yanango substation; expansion of the 500/220 kV Carapongo substation; and extension of the 220 kV Yanango substation.

In September 2017, Peru's investment promotion agency ProInversión qualified nine bidders for the project. International competitive bids for the project were invited in February 2017. The selected developer would be responsible for the design, financing, construction, and operation and maintenance (O&M) of the project on a turnkey basis. Upon expiration of the term of the concession, the project will be transferred to the Peruvian State.

In November 2017, CTM won the concession for the 500 kV Mantaro–Nueva Yanango–Carapongo transmission line project for about USD150 million. In addition, it will bear the cost of O&M of the line.

In January 2018, Peru's Ministerio de Energía (MINENERGIA) and CTM signed the Concession and Securities and Guarantees contracts for the project.

In June 2018, CTM initiated the environmental permitting process for the project.

In April 2019, CTM launched its first green bond issue without guarantees, for USD400 million, for a term of 15 years at an interest rate of 4.7 per cent. Part of the money raised will be used to finance the transmission project.

In November 2019, the Peruvian government published Emergency Decree (No. 018/2019) establishing “Extraordinary Measures for the Promotion and Implementation of Prioritised Projects in the National Infrastructure Plan for Competitiveness (PNIC)”. This is to promote investment to boost economic growth through accelerated implementation of a portfolio of 52 prioritised projects including the 500 kV Mantaro–Nueva Yanango–Carapongo project.

As per the August 2021 update of Peru’s energy and mining investment regulator Osinergmin, it was expected that the project could face delays due to the COVID-19 situation. Its developer, CTM, invoked force majeure due to the impact of the state of emergency and mandatory quarantine on the project management and construction activities.

As of April 2023, the project was 96.8 per cent completed, and is expected to be online by end-2023.

In June 2023, the Ministerio de Energía y Minas del Peru (MINEM) or the Ministry of Energy and Mines accepted CTM’s request and granted it the definitive concession for the transmission project.

In October 2023, Grupo ISA officially completed the project. The project’s implementation met with significant technical and logistical challenges due to its complexity and unique geographical conditions, with numerous transmission towers being erected at high altitudes.

It is expected to benefit the regions of Lima, Junín and Huancavelica. It will be able to transport energy from upcoming renewable energy sources by facilitating the connection of new energy generation projects across multiple regions.

500 kV Colectora–Cuestecitas–La Loma Transmission Project, Colombia

Developer: Colombia’s Grupo Energía Bogotá’s (GEB)

Project details and status: The project is considered of vital importance as it will connect a slew of new solar and wind developments in the country’s north in the Department of La Guajira to the national transmission grid.

The project aims to connect 1.05 GW of future wind capacity generated in the northern Guajira department to the Colombian grid via a 475-km-long, 500 kV power line. It will be developed in two parts—the 114-km Colectora–Cuestecitas line, and the 247-km, double-circuit Cuestecitas–La Loma line. The project also involves the expansion of existing substations at Cuestecitas and La Loma. While the substation in La Loma is owned by GEB and has made significant headway, challenges have arisen with the Cuestecitas substation, which is not under GEB’s ownership. The Colectora–Cuestecitas–La Loma transmission line is valued at over USD2 billion. In February 2018, Unidad de Planeación Minero Energética (UPME), Colombia’s mining and energy planning unit, awarded the contract for the USD174 million project to GEB.

In September 2021, Hitachi ABB Power Grids received a contract from GEB to supply power reactors for the project. It will be responsible for designing, manufacturing, transporting, installing, training and delivering the single-phase, 500 kV line reactors in La Guajira.

According to an update from GEB in March 2023, the lengthy consultation process with more than 200 indigenous and Afro-Colombian communities, which is still underway, has extended the time frame for the project. This is also likely to affect the development of renewable energy projects in the Upper and Middle Guajira region.

As per a recent update in June 2023, GEB is approaching the final stages of the prior consultation process and is planning to close the process for the project soon. There have now been 231 completed consultations after GEB secured agreements with six more communities in the La Guajira area.

In October 2023, GEB officially initiated construction activities for the project.

The project was originally scheduled to be completed in November 2023 with an investment of USD174 million. However, due to the extended delays in the Colectora project, GEB has incurred costs of nearly USD90,000 million, compromising a notable portion of the project’s initial profitability. GEB now aims to complete the transmission line by mid-2024.

500 kV Carrasco Transmission Line, Bolivia

Developer: Bolivia’s state-owned power utility company, Empresa Nacional de Electricidad Corporation (ENDE)

Project details and status: The 500 kV Carrasco transmission line is expected to enhance electrical supply in the Cochabamba and Santa Cruz departments and facilitate the export of electricity. This extra-high voltage line is the second 500 kV electrical transmission line in the country. The line will establish a high-capacity energy transmission corridor, connecting the eastern and central regions of the Sistema Interconectado Nacional (SIN) or National Interconnected System. This, in turn, will bolster the electrical supply in eastern Bolivia and enable the export of surplus energy.

The project encompasses the construction of the 186.3-km transmission line, running from the Carrasco substation in Entre Ríos, Cochabamba province, to the Brechas substation in the Cordillera province of Santa Cruz. The transmission infrastructure will comprise 427 reticulated metal structures. ENDE is playing a vital role in engineering the line and associated substations. As of October 2023, the project is progressing steadily, with significant headway in the construction of line structure foundations.

Asia Pacific

Kaligandaki Transmission Corridor Project, Nepal

Developer: Nepal Electricity Authority (NEA)

Project details and status: The Kaligandaki transmission corridor project is a sub-part of the Asian Development Bank (ADB)-funded South Asia Subregional Economic Cooperation (SASEC)

Power Expansion Project, which aims to evacuate power from the hydroelectric projects (HEPs) at the Kaligandaki river basin. The power generated from the HEPs will be connected to the national grid at the New Butwal substation via the 220 kV Kaligandaki corridor power line.

The larger SASEC Power Expansion Project entails the construction of 45 km of 400 kV transmission lines and 307 km of 220 kV transmission lines along the Kaligandaki (Dana–Kushma–Butwal–Bardaghat lines) and Marsyangdi (Manag–Khudi–Markichok–Bharatpur lines) corridors and the Marsyangdi–Kathmandu (Marsyangdi–Matatirtha lines) route. It also entails the construction, augmentation and replacement of grid substations in various parts of the country.

Specifically, the Kaligandaki corridor project entails the construction of the 40-km, 220 kV Dana–Kushma power line, which connects Myagdi (Dana) to Parbat (Kushma); the 100 MVA, 220/132 kV Kushma, Dana and New Butwal substations; and the 220 kV, 88-km Kushma–New Butwal, and 20-km New Butwal–Bardaghat power lines.

In 2015, NEA invited international competitive bids for the design, supply, installation and commissioning of the 220 kV Dana–Kushma transmission line and associated substations. During 2016, the environmental impact assessment (EIA) and land acquisition for the line were completed and the contract award process for the project was initiated.

In 2017, Indian company L&T was signed up as the contractor for the project.

As of May 2020, the 220 kV Dana–Kushma power line was in its final construction phase, with installation work of only one of the 110 towers yet to be completed. The works had been halted for a long while owing to the project facing ROW issues from the locals in the Myagdi region. Due compensation has now been provided to the affected people, thus resolving the RoW issues.

Construction of the Dana–Kushma power line was delayed due to the COVID-19 pandemic and was finally completed along with the two substations in January 2021. In March 2023, a high-level team from NEA was sent to remove obstacles in the way of the line construction in Phalewas, Parbat district. Locals have been opposing the construction of the transmission line for the past three years by demanding that the path be changed to avoid potential harm to Devasthan's school and playground. After conducting an onsite survey, NEA clarified that the tower will be constructed to minimise its impact on the playground while ensuring the protection of the school to the technically feasible extent.

In October 2023, NEA announced the completion of the Kaligandaki transmission corridor project.

(NPR1=USD0.0075)

550 kV Zambales–Pangasinan Line Project, Philippines

Developer: National Grid Corporation of the Philippines (NGCP)

Project details and status: The transmission line will support the increasing energy demand in the area and the existing lines in western Pangasinan and Zambales. It will also support the upcoming power plants in the provinces.

It entails the construction of a 174-km, 550 kV transmission line between the provinces of Zambales and Pangasinan in Luzon. The line will begin in Candelaria, and pass through the towns of Santa Cruz (in Zambales), Infanta, Dasol, Mabini, Burgos, Sual and Alaminos City (these six being in Pangasinan).

In October 2023, NGCP announced its plans to develop the project.

The transmission line is expected to become operational by June 2025.

500 kV Quang Trach–Pho Noi Project, Vietnam

Developers: Vietnam Electricity National Power Transmission Corporation (EVNNPT), a subsidiary of state utility Vietnam Electricity (EVN)

Project details and status: The 500 kV transmission line is part of the Power Development Plan VIII (PDP VIII) approved in May 2023. It aims to boost interregional connections and help ensure power supply for the northern region of Vietnam.

It is a 513-km project, comprising four sections, namely, Quang Trach–Quynh Luu (226 km), Quynh Luu–Thanh Hoa (91 km), Thanh Hoa–Nam Dinh 1 (73 km), and Nam Dinh 1–Pho Noi (123 km).

As of August 2023, EVNNPT is working with Vietcombank and Asia Commercial Bank (ACB) to arrange capital for the transmission line, which requires a loan of VND16 trillion. EVNNPT is also in talks with the Bank of China, the Bank for Investment and Development of Vietnam (BIDV), Vietinbank and Vietnam International Bank (VIB) for funding the project.

In October 2023, Vietnam's deputy prime minister (PM) approved the investment and implementation plan of the 500 kV, 74.4-km Nam Dinh I thermal power plant–Thanh Hoa transmission line section of the project at an investment of VND3.09 trillion, besides approving EVNNPT as the investor of the project. EVNNPT will contribute VND925.83 billion for project development, while over VND2.16 trillion will be funded by commercial bank loans.

The deputy PM also directed EVNNPT to start the construction of the remaining three sections of the 500 kV Quang Trach–Pho Noi transmission line project [Quang Trach–Quynh Luu (226 km), Quynh Luu–Thanh Hoa (91 km) and Nam Dinh 1–Pho Noi (123 km)] in the following months.

The line is considered vital to meet the expected consumption in northern Vietnam during the peak period of 2024 and the following years to ensure energy security.

The Ministry of Natural Resources and Environment and the Ministry of Construction have also increased their efforts to help EVNNPT start construction works of the 500 kV Nam Dinh I–Thanh Hoa section of the project by December 2023.

For the Quynh Luu–Thanh Hoa and Quang Trach–Quynh Luu sections, the Ministry of Industry and Trade (MOIT) will prepare a plan to implement the project's steps and need to send this to the PM by December 30, 2023.

(VND1= USD0.000041)

500 kV Victoria to NSW Interconnector West (VNI West), Australia

Developer: Transgrid, Australia's transmission network developer for New South Wales (NSW)

Project details and status: VNI West proposes to connect Western Renewables Link from a new terminal station north of Ballarat, Victoria, with the EnergyConnect project at a new Dinawan substation between Jerilderie and Coleambally, NSW. The project also involves enhancing the EnergyConnect transmission lines between Dinawan and Wagga Wagga to operate at 500 kV rather than 330 kV. Transgrid has received AUD75 million in funding for the project. The Australian Energy Market Operator (AEMO) has identified VNI West as an actionable project in the Integrated System Plan (ISP) for the National Electricity Market (NEM). The project is in the early regulatory assessment stage and is yet to be validated, committed or approved. Regulatory assessment is expected to be completed by early 2023. Transgrid and AEMO are progressing on a joint Regulatory Investment Test for Transmission (RIT-T) to assess the technical and economic viability of expanding the transmission interconnector capacity between Victoria and NSW.

In April 2022, Transgrid entered into an underwriting agreement with the Commonwealth Government to develop the 500 kV VNI West, a major transmission infrastructure project proposed to secure electricity supply and boost sharing between the two states. Under this, Transgrid has received AUD75 million in funding for the project. In July 2022, Transgrid and AEMO published the project assessment draft report (PADR) for the project as part of the RIT-T process. The PADR identifies that VNI West (via Kerang) is the preferred option for reinforcement of the transmission network in the region to secure electricity supply and boost sharing among the states of South Australia, Victoria and NSW. It will provide the best outcome for energy consumers, with net market benefits of AUD687 million.

In September 2022, Transgrid expressed concerns regarding delays in the implementation of the project. In the same month, the Australian Energy Market Commission (AEMC) sought feedback on ways to simplify the regulatory framework for major transmission projects to ensure their timely completion. As per AEMO announcements, the USD3.6 billion VNI West connection is one of the priority projects to connect new wind and solar plants and efficiently deliver power to consumers as coal plants shut down.

In November 2022, Transgrid announced its commitment to finish the project ahead of schedule, as it accelerates efforts to integrate renewable energy into the national electricity market.

In February 2023, Victoria's Ministry for Energy and Resources decided to accelerate the development of the project allowing local communities to provide feedback beyond the opportunities already made as part of the RIT-T process and accelerate planning for early works on the project.

In March 2023, Transgrid announced plans to procure equipment, transformers, steel and cables for three projects – VNI West, HumeLink and EnergyConnect – with AUD385 million in funding secured from the Commonwealth Government as part of the 'Rewiring the Nation' programme. The TSO has already

awarded first contracts with a combined value of around AUD150 million for use on the HumeLink and VNI West projects. This includes 25 single-phase 500 kV transformers (to arrive in late 2024/early 2025) from Hyosung in South Korea and 15 500 kV shunt reactors (to arrive in early 2025) from Hitachi Energy.

In April 2023, AEMO and Transgrid received more than 500 submissions in response to the VNI West Consultation Report, which will be used to determine the best route option. This includes the submission of the Victorian Energy Policy Centre (VEPC), which claims that the proposed renewable energy generated in the Gippsland region of Victoria could be transported using existing transmission lines, thereby offsetting the need for the VNI West project. AEMO officials have described VEPC's claims as contrary to both government policy and AEMO's independent economic analyses as well as to the views and analysis of transmission and generation companies that participated in the consultation. AEMO's response to all the written submissions to the consultation will be published following the publication of the final regulatory report for the project in May 2023. Meanwhile, some industry analysts have also suggested that the expansion of Latrobe Valley's transmission capacity along existing power line easements could be less disruptive than the VNI West project for bringing renewable energy into Melbourne. The Gippsland region of Victoria, which includes the inland Latrobe Valley, has been designated as the nation's first offshore wind (OSW) zone.

In July 2023, AEMO and Transgrid published a draft corridor report, which evaluates various corridor possibilities and suggests an initial preferred option. The report was open for public access and feedback until August 4, 2023. Once the preferred corridor is confirmed considering the feedback, a specific route will be determined. Several potential route options will be assessed within the preferred corridor, and a thorough consultation process will involve affected landowners before the environmental assessment phase commences.

In October 2023, NSW announced the expansion of the preferred corridor for the VNI project which was supported by the community and landowner feedback collected during the consultation period for the draft corridor report released in July 2023. Based on the landowner feedback, Transgrid has amended the VNI West corridor in several locations. Public consultation on the recommended preferred route option will take place in the first half of 2024. Following this, Transgrid will confirm the preferred route option and commence the detailed environmental assessment and approvals phase.

During the same month, the Australian Energy Regulator (AER) rejected a legal challenge made by affected landowners and community members against the VNI West project.

The Regional Victoria Power Alliance, formerly Moorabool and Central Highlands Power Alliance, had challenged the project on 10 different grounds, calling for the design process to be redone. While AER dismissed the alliance's challenge, it stated that the group had a right to dispute the project as they had the potential to suffer any adverse impacts. According to the AEMO, VNI West is scheduled to be energised by July 2031.

(AUD1=USD0.64)

Europe

A-Nord HVDC Project, Germany

Developer: Amprion GmbH, one of the four transmission system operators (TSOs) in Germany

Project details and status: The ± 525 kV HVDC connection will transport the rapidly growing wind power from the North Sea to the large consumer centres in North Rhine-Westphalia.

The project entails the construction of underground cables along the 300-km route from Emden East to Osterath. Further, the project also includes the parallel construction of the offshore grid connection systems—BorWin4 and DolWin 4—over a distance of about 100 km. It is part of the approved National Development Plan or Netzentwicklungsplans (NEP) 2021-35 for the country.

In October 2022, Amprion signed a contract with Germany-based energy infrastructure company Freidrich Vorwerk for the implementation of the project.

Amprion has signed an integrated project execution (IPA) contract with Friedrich Vorwerk subsidiary, Bohlen & Doyen, and seven other partner companies.

As part of the contract, the initial works will involve determining the reference construction scope and the associated reference costs, which is expected to be completed in the first half of 2023. In case of a successful agreement and commissioning of the next project phase by Amprion, the total contract value is expected to be EUR850 million to EUR1,100 million, in which Bohlen & Doyen would have a share of at least 30 per cent.

The scope of work for the company includes civil engineering work and construction of the underground protective pipeline system.

In October 2023, Germany's energy regulator, Bundesnetzagentur (BNetzA) or Federal Network Agency, gave provisional approval to Amprion to commence construction on the connection. However, the decision is reversible in case any change is made in the current planning approval procedure. Amprion must have a planning approval decision before it can proceed with any further construction on the project. The final approval is expected in 2024.

Preliminary construction work is approved to begin in Haren (Ems), Meppen, and Wietmarschen north of the municipal boundary to Nordhorn, up to Kortenberken Street. The approval also covers the BorWin4 and DolWin4 offshore grid connections since the projects run parallel to one another and the A-Nord project for over 100 km on land.

The approval to start construction early applies to the building of a cable protection tube system and all the necessary measures to build it. This includes work to clear the way for the cables, digging the cable trenches, drilling as needed, laying the cables inside the cable protection tube system, installing the connecting points, and the necessary preparatory measures.

The A-Nord DC connection is expected to be commissioned by mid-2027.

(EUR1=USD1.07)

DolWin5 Offshore Grid Link, Germany

Developer: Germany's TSO TenneT

Project details and status: The grid connection project aims to connect three offshore wind farms, namely, the Borkum Riffgrund West I and II, and the Northern Energy OWP West, to Germany's HV onshore grid.

Under the project, TenneT will construct a 66 kV, 900 MW offshore grid connection system in the North Sea with HVDC transmission technology. The associated offshore platform DolWin epsilon will be installed in the DolWin cluster in the German section of the North Sea, where the other three DolWin platforms are already operating. From here, a 100-km-long undersea cable (USC) will be laid past Borkum towards the landing point at Hamswehrum (in Ostfriesland). Following, another 30-km-long land cable will be laid towards the Emden converter station.

The project is the first of its kind wherein TenneT will construct a DC line between the wind turbines and its offshore platform without any further substations.

In May 2019, TenneT awarded a contract to a consortium that includes Norway-based energy services provider Aibel and Keppel FELS Limited (Keppel FELS) [a wholly owned subsidiary of Keppel Offshore and Marine Limited (Keppel O&M)] with ABB as subcontractor for the design, engineering, procurement, construction, installation and commissioning of a 900 MW offshore HVDC platform and an onshore converter station associated with the project.

Recently, in June 2019, TenneT awarded a EUR140 million turnkey contract to Italy's Prysmian Group for the project. Prysmian will be responsible for the supply, installation and commissioning of an extruded cross-linked polyethylene (XLPE) insulated, 320 kV, HVDC USC (100 km) and land power cable (30 km) connection, as well as the associated fibre optic cable system. The turnkey connections will connect the offshore converter platform DolWin epsilon to the mainland. The European Commission (EC) has designated the project as a Project of Common Interest (PCI).

In October 2023, TenneT shipped out the 900 MW offshore platform DolWin epsilon from Singapore for the grid connection project. The platform is expected to arrive at the Aibel shipyard in Haugesund, Norway, in December 2023 after which, Aibel – as a partner of the Aibel-Seatrium consortium (formed by Sembcorp Marine and Keppel Offshore & Marine) – will supply and install the final technical equipment. Further, Hitachi Energy – as Aibel's subcontractor and supplier for the HVDC technology – will install the converter and transformers. In 2024, the platform will be transported (self-floating) and installed at its final destination in the German North Sea.

(EUR1=USD1.07)

Biscay Gulf France–Spain Interconnection, France–Spain

Developer: INELFE (Interconexión Eléctrica Francia-España or Electricity Interconnection France-Spain), jointly owned by France's TSO Réseau de Transport d'Électricité (RTE) and Spain's power grid operator Red Eléctrica de España (REE)

Project details and status: The project entails the construction of a HVDC voltage source converter (VSC) 400-km link (mainly subsea) in the Biscay Gulf, between Gatica (Basque Country, Spain) and Cubnezais (Nouvelle Aquitaine, France). The 400-km route will be divided underwater (300 km) and underground (100 km) to reach the Cubnezais substation from the Medoc coast and includes the Capbreton Canyon crossing.

The section in Spain comprises a 13-km underground direct current (DC) line that will run from the new Gatica converter station, pass through the municipalities of Maruri-Jatabe and Lemoiz, and reach the sea. From there, the route continues for 300 km through an underwater DC link to the French coast, except for a short underground section in French territory to avoid the Capbreton Canyon. It will finally run 80 km underground onshore to the new Cubnezais converter station.

The project also involves the construction of two converter stations, one at each end of the link, to convert the DC to alternating current (AC) for connection to the electricity transmission grids of each country.

The link will strengthen the interconnection between the two countries by improving security and guarantee of supply, increasing the efficiency of both electricity systems, and allowing greater integration of renewable energies. The project is expected to double the electricity exchange between the two countries to 5 GW, equivalent to the electricity consumption of around five million households. The link is estimated to require an investment of EUR1,950 million, of which the EC will finance 30 per cent, Spain will provide 43 per cent and France will fund the remaining 27 per cent.

In 2013, the EC declared the interconnection as a PCI.

In October 2017, INELFE invited bids to undertake unexploded explosive ordnance (UXO), geophysical and geotechnical surveys for the project, with a contract duration of six months from the date of award.

In March 2018, the project received a EUR578 million Connecting Europe Facility (CEF) grant, the largest such grant ever awarded by the European Union (EU).

In April 2021, REE presented the preliminary project study and the EIS of the project.

In September 2021, France's Ministry of Ecological Transition approved the route for the power line.

In June 2022, REE reported that the interconnection had been delayed by two years from its expected deadlines. It would now be completed by 2027 instead of in 2025, which was the original commissioning date.

The instability of the seabed near Capbreton, France, was one of the reasons for the delay in the project's implementation.

The project is currently waiting for the environmental assessment by Ministerio para la Transición Ecológica y el Reto Demográfico (MITECO) or the Ministry for Ecological Transition and Demographic Challenge of Spain.

In December 2022, the developer announced that the cost of the interconnection had increased by over 50 per cent of the initial

investment due to the sharp increase in prices of materials for cable construction. The project cost, initially estimated at EUR1.75 billion in 2017, increased to EUR1.95 billion in 2019 due to the instability in the Capbreton Canyon, which necessitated a change in the route.

In March 2023, the cost of the project was re-evaluated by the Spanish and French regulators at EUR2.85 billion, and the distribution of the cost between the two countries was also modified. In the same month, INELFE awarded the engineering, procurement and construction (EPC) contracts for the interconnector to NKT HV Cables and Prysmian Powerlink. In addition, the EPC contract for the converter stations has been awarded to the Hitachi Energy/Vinci consortium. Further, the final EPC contract for the civil works associated with the terrestrial cables is still in the tendering phase and will be awarded later this year.

In May 2023, INELFE awarded the cable contracts for the interconnection to Danish and Italian cable manufacturers – NKT and Prysmian. NKT has bagged a turnkey power cable contract worth EUR600 million involving the design, production, offshore installation and commissioning of one of the two HVDC XLPE cable systems (Cable Link 1). The order includes about 100 km of onshore cables and 300 km of offshore cables divided into three onshore and two offshore sections to avoid cable-laying in the submarine Capbreton Canyon.

Prysmian was awarded the engineering, procurement, construction and installation (EPCI) contract worth EUR800 million for Cable Link 2 of the Biscay Gulf project. It will be responsible for the design, installation, testing and commissioning of two 400 kV HVDC single-core cables with XLPE insulation and fibre-optic cable for telecommunications and monitoring purposes, covering both submarine and land sections. It will also be responsible for the construction of the four landfall sites for both the links of the projects.

In June 2023, INELFE awarded an order for the supply of four HVDC converter stations for the interconnection to Hitachi Energy in partnership with VINCI, an industry leader in energy and construction. Hitachi Energy will supply HVDC Light®, which is a VSC technology developed by it. The HVDC solution combines expertise in HVDC converter valves; the MACH™ digital control platform, converter power transformers and high voltage switchgear; as well as system studies, design and engineering, supply, installation supervision and commissioning.

In October 2023, France's Ministry of Ecological Transition declared the interconnection as a public utility.

The declaration of public utility (DUP) concludes a consultation phase of about five years and two public inquiries carried out respectively under the aegis of the National Commission for Public Debate (CNDP) and the investigating commissioners, thus making it possible to begin the works phase.

The work will carry on till 2027 in several phases and on several sites: in Gironde, the Landes, and the Pyrénées-Atlantiques. Work at sea, over nearly 300 km, will begin at the end of 2025.

The commissioning of the Bay of Biscay interconnection is planned for 2028.
(EUR1=USD1.07)

GR.ITA 2, Greece-Italy interconnection

Developers: Italy's TSO Terna and Greek independent power transmission operator (IPTO), Anexartitos Diacheiristis Metaforas Ilektrikis Energeias (ADMIE)

Project details and status: The project involves an HVDC USC to double the current exchange capacity between the two countries. Two 250-km submarine cables with up to 1,000 MW of power and two 50-km underground DC cables will connect the landing site in Melendugno to Galatina through the municipalities of Soletto, Sternatia, Martignano, Calimera and Carpignano Salentino. The new conversion station that will be connected to the national grid via an underground AC cable will be built in Galatina.

The EUR750 million interconnection will guarantee more reliable exchange between the two countries and reinforce Italy's role as a Mediterranean energy hub. The planning of this second interconnection responds to the objective of ensuring greater integration of the new renewable energy generation expected in Italy and Greece. The interconnection will increase the transport capacity towards Greece and neighbouring EU countries, with consequent benefits in terms of market efficiency, reduction of national electricity supply costs, and sharing of flexibility services for the balanced and safe management of the national transmission grid (NTG).

In October 2023, Italy's TSO Terna launched a public consultation for the HVDC interconnection. The first meeting with local communities and institutions was held online on October 13, 2023, and another four in-person meetings were scheduled to guarantee the widest possible participation and interaction with the seven municipalities in the province of Lecce that are affected by the work.

This second interconnection project is expected to be commissioned in 2031.

(EUR1=USD1.07)

Aurora Line, Finland and Sweden

Developers: Finland's TSO FingridOyj and Sweden's TSO Svenska kraftnät

Project details and status: The 400 kV Aurora cross-border transmission line will run from Pyhänselkä in Muhos via Keminmaa in Finland to Messaure in northern Sweden. Furthermore, it will improve the security of power supply and enable the integration of renewable energy systems in the Nordic and Baltic Sea areas. In Sweden, the project involves the construction of the Messaure–Dockasberg–Risudden (Finnish border) section.

The execution of the project requires Finland's internal grid to be strengthened, as more electricity needs to be taken from the north to the south. Hence, the Forest line from the Oulu region to Central Finland will serve the country's needs by enabling renewable energy from the north to be transmitted to consumption facilities in the south.

In November 2017, the project was granted PCI status by the EU, which offered EUR4.34 million in funding from the CEF for the design of the line.

In March 2020, the national energy regulators of Finland and Sweden made the cross-border cost allocation decision on the project.

In October 2021, Fingrid received approval from the Ministry of Economic Affairs and Employment to build the interconnector.

In January 2022, the TSOs received EUR127 million as CEF co-funding to build the transmission line. The construction phase of the interconnector is estimated to cost EUR254 million and the TSOs have received 50 per cent CEF co-funding for the same.

Construction work is already underway on the Forest line, while large-scale construction will begin on the Aurora line in the autumn of 2022 and be completed in 2025.

In June 2022, Fingrid and Svenska kraftnät announced that the construction work on the line, including the substations, is set to begin this year in Finland. The contracting agreements for the first phase have also been signed. The construction is set to progress in three phases. The first will begin in autumn with construction of the 153-km, 400 kV transmission line from Muhos to Keminmaa in the Finnish section and the new Viitajärvi substation in Keminmaa. The Pyhänselkä substation has already been expanded to cater to the Aurora line, under the Forest line project.

Fingrid has signed three contracts for the first phase of construction. The Herva–Pyhänselkä transmission line contract has been awarded to Enersense PN, the Isomaa series compensation station to Hitachi Energy, and the Viitajärvi substation to Infratek/Omexom. The Viitajärvi–Herva transmission line contract had already been signed with Tecnolines Italia. The total estimated value of the contracts is EUR50 million, and the work is scheduled for completion by the end of 2024.

In December 2022, Fingrid announced that it was making steady progress on the construction of the Aurora line. Fingrid began construction on the first phase of the connection, involving the Pyhänselkä–Vitajari line. This phase will be completed in 2023. In the same month, Finland-based company Nyab and SvK signed an agreement to prepare for the construction of the entire Swedish section.

In October 2023, SvK signed an agreement with Nyab for the construction of the second phase of the project involving an approximately 90-km transmission line between Dockasberg and Risudden in Sweden. Work under the EUR89 million agreement will commence shortly to be completed in December 2025.

(EUR1=USD1.07)

EuroAsia Interconnector Project, Greece–Cyprus–Israel

Developer: Greek independent power transmission operator (IPTO) Anexartitos Diacheiristis Metaforas Ilektrikis Energeias (ADMIE) [formerly proposed by EuroAsia Interconnector Limited (EIL), a subsidiary of Cyprus-based Quantum Energy Limited]

Project details and status: The project proposes to link the power grids of Israel, Cyprus and continental Greece (via Crete) through a ±400 kV or more DC submarine cable and HVDC onshore stations in each country/location. It will have a capacity of 2,000 MW.

The project will create an energy bridge between Europe and Asia. The 1,208-km-long subsea interconnector (Israel–Cyprus 310 km; Cyprus–Greece 898 km) will provide a reliable alternative corridor for transferring electricity between the two continents. The first stage entails the construction of a ± 500 kV, 1,000 MW submarine cable and eight HVDC onshore stations. The second stage will upgrade the electricity interconnector to 2,000 MW.

In July 2016, EIL, with the participation of Greece's Public Power Corporation (PPC) S.A., announced four global consultancy tenders for undertaking various studies and providing services for the EuroAsia interconnector project. The first tender entails undertaking a detailed geophysical and geotechnical route study, the second tender is for conducting a power system cable installation study, the third tender involves carrying out territorial civil work studies and the fourth tender is for providing technical, engineering and analysis services.

In April 2017, the EC's Innovation and Networks Executive Agency (INEA) signed a grant agreement for undertaking project studies. For this, EUR29 million in funding was extended under the second 2016 CEF energy call for proposals as it is listed among the EU's PCI.

In January 2018, Elia Grid International (EGI), a unit of Belgium's grid developer Elia, entered into an agreement for the development and implementation of the interconnector as a strategic partner.

In April 2018, EIL issued tenders for the design, manufacturing, testing, supply, installation and commissioning of four HVDC VSCs and four sea electrodes, and for HVDC submarine cables for the Israel–Cyprus link, including the supply of HVDC, MVDC and HVAC land cables in Israel.

In November 2019, EIL issued a EUR1.7 billion tender for EPCI of an HVDC cable system for the project. The published tender was divided into four lots, wherein Lot I entailed EPCI of the submarine HVDC cable system, including all required offshore and onshore joints for Pole 1 of Link 1 (Israel–Cyprus); and Lot II entailed EPCI of the submarine HVDC cable system, including all required offshore and onshore joints for Pole 2 of Link 1. Additionally, Lot III entailed EPCI of the HVDC cable system, including all required offshore and onshore joints for Pole 1 of Link 2 (Cyprus–Crete); and Lot IV entailed EPCI of the HVDC submarine cable system, including all required offshore and onshore joints for Pole 2 of Link 2.

However, EIL made small budgetary changes and reissued the tender in January 2020.

In March 2020, EIL selected Germany-based Siemens AG as the preferred bidder for the construction of the VSC stations associated with the interconnector.

In February 2021, EIL again tendered a EUR1,246 million contract for EPCI of the HVDC cable systems for the Cyprus–Greece (Crete) link of the EuroAsia interconnector. In April 2021, the company announced the receipt of binding offers from Nexans Norway AS and Prysmian Powerlink s.r.l. for the award of the EPCI contracts.

In September 2021, EIL published a EUR30 million tender for the provision of project management and owner's engineer services for the interconnector. The submission deadline for this tender was December 6, 2021.

In 2021, Greece's IPTO, ADMIE, became the technical consultant for the interconnector.

In January 2022, the EU approved EUR657 million under its CEF for the interconnector. The total cost of the project is estimated at EUR1,037 billion.

In July 2022, EIL announced that French cable manufacturer Nexans had emerged as the preferred bidder for the supply and installation of 500 kV HVDC mass-impregnated (MI) cables for the 1,000 MW Cyprus–Greece interconnection.

In October 2022, EIL commenced construction on the first phase of the project.

In December 2022, EIL invited competitive bids for owner's engineer services for the Cyprus–Greece (Crete) section of the EuroAsia interconnector.

The consultant's scope of work includes providing EIL with the specialised technical engineering support necessary for the project's execution through the phases of procurement, design, production, construction, installation and commissioning. The total estimated value of the contract is EUR5 million.

In June 2023, Greece's ADMIE entered into a strategic agreement with EIL for the acquisition of a 25 per cent stake in the EuroAsia interconnector. IPTO's contribution to the interconnector's capital meets the European Commission Directorate General for Energy requirement for the equity participation of a TSO as a guarantor of the electricity supply security of the three countries of the eastern Mediterranean.

IPTO's equity participation is expected to be completed following due diligence shortly. This should expedite the signing of contracts with the companies selected following a tender process to construct the subsea cables and converter stations in Crete and Cyprus.

In July 2023, EIL awarded a EUR1.43 billion cable contract to Nexans, which was selected as the preferred bidder earlier in July 2022. Nexans will supply subsea HVDC mass-impregnated cables for the interconnector. The cables will be manufactured in Nexans' facilities in Halden, Norway, and Futtsu, Japan, and will be installed by the cable-laying vessels Nexans Aurora and Nexans Skagerrak.

When completed, the interconnector between Greece and Cyprus will be the longest and the deepest HVDC subsea cable project ever, with bi-pole cables of 2×900 km and a water depth of 3,000 metres.

In October 2023, it was announced that EIL would exit the EuroAsia interconnector project. Following this development, in November 2023, it was reported that ADMIE had become the project promoter for the interconnector.

EIL is reportedly in the process of transferring all the EU grants to IPTO. The designation of ADMIE as a project promoter will ensure the technical and financial adequacy of the project and lay the foundations for its timely completion.

The interconnector will soon be moving into the construction phase and is expected to be completed in 2027.

(EUR1=USD1.07)

Fourth Estonian–Latvian interconnection

Developers: Estonian TSO Elering and Latvia's TSO, Augstsprieguma tīkls (AST)

Project status and details: The fourth Estonia-Latvia electricity interconnection is planned to be built in hybrid mode, that is, in addition to connecting the electricity systems of the two countries, it will also be possible to connect offshore and onshore production capacities to it.

The project will increase system security and stability, along with increasing the renewable energy capacity for both countries.

In October 2023, Estonia's TSO Elering and Latvia's AST signed a memorandum of understanding (MoU) to jointly develop the fourth interconnection between the two countries.

Elering and AST have agreed to cooperate on preparatory activities, including several studies, which are a prerequisite to select an environment-friendly and technically-economically preferable scenario for making future investment decisions regarding the interconnection.

The exact location of the interconnection and other technical details will be agreed upon later. Based on the previous evaluation and technical analysis, the working version of the interconnection capacity is assumed to be 1 GW, and the connection could be completed by 2035 with the accompanying transmission infrastructure.

Both TSOs expect to receive co-financing from the EU's CEF Energy funding for the evaluation and construction of the interconnection. The final decision on project implementation will be made after the EU's support becomes clear.

Middle East Africa

Nexus Water, Food & Energy (NWFE) Grid Reinforcement Project, Egypt

Developer: Egyptian Electricity Transmission Company (EETC)

Project details and status: Egypt's Nexus Water, Food & Energy (NWFE) is a policy dialogue initiative developed by the European Bank for Reconstruction and Development (EBRD) and announced at COP27 in Sharm El Sheikh, intending to reduce greenhouse gas (GHG) emissions.

The NWFE Grid Reinforcement Project is a part of this initiative and aims to strengthen Egypt's grid to meet the country's long-term strategy to generate 42 per cent of the electricity peak load through renewables by 2030.

The project involves (i) the upgrade of a 500 kV substation in the Cairo governorate in Egypt that is crucial for the stability of the network and is directly linked to the closing of a gas-powered power plant (Shoubra El Kheima) under the NWFE initiative; and (ii) the construction of a 200-km high-voltage overhead transmission line (OHL) that will evacuate 2.1 GW of renewable energy from the Gulf of Suez region, where several wind projects are currently under development or construction.

In November 2023, EBRD approved the provision of a sovereign loan of up to EUR165 million for the project.

The project will require financing of EUR200 million split between an EBRD loan of EUR165 million and EU grants (subject to EU approvals) of EUR35 million.

Up to EUR120 million of the blended facilities (60 per cent of total financing) will be used to finance the 200-km OHL, and the remaining EUR80 million (40 per cent of total financing) will finance the upgrade of the high-voltage substation.

The project will be the first grid investment under a USD2 billion investment programme to be implemented by EETC under the NWFE initiative.

Expansion and upgrade of the ageing transmission and distribution network is crucial in allowing Egypt to achieve its long-term strategy to generate 42 per cent of the electricity peak load through renewables by 2030.

(EUR1=USD1.07)

400 kV Kunene–Omatando Line, Namibia

Developer: Namibia Power Corporation Limited (NamPower)

Project details and status: The project aims to strengthen the backbone of northern Namibia and will be a connection point between Namibia and Angola.

The NAD1 billion project included the construction of two substations and a 190-km transmission line to connect them from the Kunene substation, which is 30 km south of the Angola-Namibia border at the Ruacana Power Station, and the Omatando substation in Ongwediva.

The line forms part of a bigger 400 kV Northern Ring project to ensure redundancy of power evacuation from the Ruacana power station, redundancy of power supply to the northern regions, and help in the integration of the future Baynes power station.

The line will initially be operated at 330 kV. The project was funded by the European Investment Bank (EIB).

The line was completed in June 2018 and was energised at the 132 kV level to support Namibia's grid.

The 400 kV line was constructed by the joint venture (JV) formed between two Namibian companies—Power Line Africa and Ohalula Construction.

In June 2021, the substations' construction contract was signed with a JV of China's Sinohydro and Namibia's Adoptive Building Land Construction Company, which procured high-voltage power equipment for the substations from Hitachi Energy.

In October 2023, Namibia inaugurated the Kunene and Omatando substations. Of the total project cost, NAD741 million was spent on the substations.

With this, the 400 kV Kunene–Omatando line project has been completed and energised.

(NAD1=USD0.053) ♦

North America

Prismian inks EUR900 million deal for Clean Path New York Energy project

Prismian Group has formalised an agreement worth approximately EUR900 million for the Clean Path New York project, to provide submarine and land power cable systems for it. The project is a public-private collaboration involving the New York Power Authority (NYPA), Invenergy and energyRe. The USD11 billion project is set to generate 3,800 MW of wind and solar power from over 20 new wind and solar generation resources. Furthermore, it includes the establishment of a 175-mile (281.6-km), 400 kV high-voltage direct current (HVDC) transmission link, both underground and submarine. These combined efforts will facilitate the delivery of more than 7.5 million MWh of emissions-free energy annually.

Prismian Group has been entrusted with a comprehensive range of responsibilities including the design, manufacturing, construction, installation, and commissioning of 400 kV, single-core cable system with cross-linked polyethylene (XLPE) insulation for the project. Routing and environmental work is underway on the line route from Delaware County in New York's Southern Tier economic development region, through the Mid-Hudson region to New York City. A majority of the transmission line will be built on existing right-of-way (ROW) already used by roads and transmission lines. The project route is designed to minimise potential impacts on the Hudson River and avoid Haverstraw Bay.

(EUR1=USD1.07)

Asia Pacific

Sterlite Power secures orders worth INR13 billion in Q1 2023-24

Sterlite Power Limited secured orders worth INR13 billion in the first quarter (Q1) of 2023-24 ending June 30, 2023, across its global products and services business. These contracts extend across both domestic and international markets, further adding to the company's existing order book of over INR52 billion from the preceding fiscal year. During Q1, the company won an order to supply high-performance conductors for India's Power Grid Corporation of India Limited's (POWERGRID) Part E Green Energy Corridor Project in Rajasthan. In the power cables business, the company acquired several strategic orders that include the delivery of extra high voltage cables to a solar park in Rajasthan, and multiple cable delivery projects for Uttar Pradesh Power Transmission Corporation Limited (UPPTCL) and Nepal Electricity Authority (NEA).

(INR1=USD0.012)

GE T&D India wins INR5 billion orders from POWERGRID

GE T&D India, a part of GE Vernova's Grid Solutions business, has bagged INR5 billion orders from state-owned Power Grid Corporation of India for grid modernisation projects, which will facilitate the integration of renewable energy into the national grid, including in Rajasthan.

The scope of the contract includes the design, engineering, manufacturing, testing and supply of 765 kV power transformers and shunt reactors for POWERGRID'S various transmission system projects in India. Additionally, the company will oversee the erection and commissioning of the 765 kV class transformers and reactors at the designated transmission substation sites. The company will manufacture the equipment at its production facility in Vadodara, Gujarat, in alignment with the government's Make in India initiative. The equipment is scheduled for delivery from the beginning of 2024 until 2025.

(INR1=USD0.012)

Indian KEC wins contract for 765 kV transmission lines and substation

Indian engineering, procurement and construction (EPC) company, KEC International Limited, has won a contract for a 765 kV transmission line and air-insulated switchgear (AIS) substation in the state of Rajasthan, from India's largest grid network developer, POWERGRID. Additionally, KEC's cable business has secured orders for the supply of various types of cables in India and overseas.

Fluence secures contract for 40 MW BESS in Philippines

Fluence Energy Inc. has secured a contract for the deployment of a 40 MW battery energy storage system (BESS) at three geothermal sites in the Philippines – in the city of Sorsogon, the island of Leyte, and the municipality of Negros Occidental. The BESS assets will charge and store energy generated by the geothermal plants during off-peak times, and supply the power to the grid when demand rises. Fluence Energy will work with First Balfour, which will be responsible for managing the engineering, procurement and construction duties associated with the complete balance-of-plant and transmission grid-related connection assets.

Mitsubishi bags frequency converter station order from Japan's J-Power

Japan's J-Power Transmission Network Company Limited has awarded a contract to Mitsubishi Electric Corporation to supply a 300 MW HVDC transmission voltage source converter (VSC) for the Shin-Sakuma frequency converter station in Hamamatsu, Shizuoka prefecture. The project aims to enhance interconnectivity between Eastern and Western Japan by constructing a new 50/60 Hz frequency conversion station on their border. Currently, electricity in Japan is supplied at two different frequencies; principally 50 Hz in Eastern Japan and 60 Hz in Western Japan. Since grids operating at different frequencies cannot be directly connected, frequency converter stations are required to exchange power between the two regions. This is part of the improvements being made to Japan's wide-area grid by the Organization for Cross-regional Coordination of Transmission Operators, an initiative undertaken to achieve more stable and efficient power supplies across Japan after the 2011 Great East Japan Earthquake. Mitsubishi Electric's frequency converter station using VSC HVDC power transmission, incorporating the latest generation of modular multi-level converters (MMCs), includes static synchronous compensator (STATCOM) technology.

MMCs utilise extremely efficient, high-performance, high-capacity insulated gate bipolar transistors (IGBTs), allowing more compact converter stations. The resulting high reliability and unique control technology were key factors for the contract award. The system is expected to be in service by the end of March 2028 and will contribute to the stability and efficiency of power systems in Japan.

SRG Global secures contract extension from New Zealand's Transpower

New Zealand's national grid operator Transpower has awarded an NZD121 million contract extension to SRG Global, a diversified industrial services company, for enhancement of its high voltage tower network. This 10-year maintenance contract strengthens SRG's long standing 30-year partnership with Transpower. Under the terms of the contract, SRG Global will deliver specialised industrial services, encompassing the meticulous removal of existing coatings through advanced blasting techniques, the application of protective coatings, and minor steel replacement.

(NZD1=USD0.60)

Europe

Hellenic Cables bags contract for UK's East Anglia THREE OWF

The UK-based subsea engineering, construction and services company, Seaway7 (the renewables business unit of Subsea7 S.A) has awarded an inter-array cables contract to Hellenic Cables – a subsidiary of Cenergy Holdings, for the East Anglia THREE offshore wind farm (OWF). The scope of work includes the engineering, manufacturing, testing and supply of approximately 275 km of 66 kV three-core inter-array submarine cables and associated accessories. The production of the submarine cables will take place at Hellenic Cables' vertically integrated state-of-the-art manufacturing facility in Corinth, Greece. In June 2023, Seaway7 was awarded a contract by ScottishPower Renewables for the transport and installation of foundations and inter-array cables for the OWF. The former's scope of work includes the transport, logistics and installation of 95 monopile foundations, seabed preparation, scour protection, and the engineering, supply and installation of the 95 inter-array cables. The 1.4 GW project, located in the Southern North Sea off the Suffolk coast, will be the world's second-largest OWF, capable of powering over 1.3 million homes. The OWF is expected to be completed in 2026.

Norway's Reach Subsea signs survey contract for UK's HVDC link

The UK's SSE Networks Transmission (SSEN Transmission), the transmission business of Scottish and Southern Energy (SSE), has awarded a survey contract to Norway-based data and subsea service provider, Reach Subsea, for the ±525 Spittal to Peterhead HVDC link. The notice of a contract award was given on August 17, 2023 and the signing of the final contract with further details on the assignment have been carried out now. The contract constitutes a detailed corridor survey for the link and the data will be used for

engineering and environmental assessment of potential cable routes within the survey corridor. The work is scheduled for execution and completion before end-2023. The Spittal (Caithness)–Peterhead (Aberdeenshire) power link will constitute of 550 km undersea cable (USC) and 12 km of underground cable (UGC). The project will also include new HVDC converter stations at both Spittal and Peterhead, and is expected for commissioning in 2030.

Hitachi Energy surpasses 150 GW in HVDC links

Switzerland-based Hitachi Energy has announced that it has enabled more than 150 GW of HVDC links around the world to be integrated into power systems. The development comes after the Dogger Bank A OWF located in UK waters of the North Sea, produced power for the first time on October 7, 2023, via the UK's first-time use of HVDC technology on a wind farm. Since 2020, the company has also invested USD3 billion in manufacturing and engineering footprint, research and development (R&D), and in expanding collaborations. The continuing investments are in line with the Hitachi Energy 2030 Plan and Hitachi's Mid-term Management Plan 2024. The former focuses on investing in three core areas, viz. continuously strengthening the power grid core business; doubling efforts on digital services and expansion at the edge of the energy system; and innovation, synergies, partnerships, and mergers and acquisitions (M&A) to accelerate growth.

French Dorsalys secures substation contract from French RTE

French transmission system operator (TSO), Réseau de Transport d'Électricité (RTE), has awarded a substation contract to French company Dorsalys for the Dieppe Le Tréport OWF in France, located in the English Channel. The Grande Sole substation to be built by Dorsalys will be linked to the wind farm's offshore station by a double 225 kV and 23-km undersea link, going underground for 3 km from the Penly landing junction. It is to be used to transform the 225 kV electricity generated at sea into 400 kV current that can be fed directly into the national grid. The substation is scheduled for delivery in 2025. The 496 MW Dieppe Le Tréport OWF is being developed by Eoliennes en Mer Dieppe-Le Tréport (EMDT), a special purpose company owned by a consortium made up of Ocean Winds (Engie-EDPR), Sumitomo Corporation and French Banque des Territoires. It is located 15 km off the city of Tréport and 17 km off the city of Dieppe. The OWF will consist of 62 turbines of 8 MW each installed on jacket foundations, with one offshore substation connected via inter-array cables, and is expected to be commissioned in 2026.

Portuguese Efacec secures grid modernisation contract from French RTE

French TSO, RTE, has awarded a contract to Portuguese engineering company Efacec for the modernisation and development of France's electricity grid.

The new contract will be carried out under a multi-year contract programme, scheduled to run until 2028. It includes the manufacture, supply, and installation of several dozen power transformers, EcoDesign Tier 2, from 100 MVA, 155 kV to 170 MVA, 235 kV.

NHOA Energy selected to supply 39 MWh BESS in Central Italy

Italy's TSO, Terna, has awarded a turnkey contract to Italy-headquartered NHOA Energy (formerly Electro Power Systems – Engie EPS), an NHOA Group's company, for a 39 MWh BESS. Located in central Italy, the system will be strategically positioned within the perimeter of the existing combined cycle gas plant, enabling the connection of the battery storage system with the existing power plant, and fully integrating into the plant's control architecture while, at the same time, ensuring optimal performances and reliability. The project was selected by Terna in the 2024 Capacity Market auction, with the remuneration system created to guarantee that long-term price signals and adequacy conditions of the electricity system are consistent with the European Union (EU) decarbonisation objectives. The construction phase is expected to start before end-2023 while commercial operation is expected by December 2024.

German RWE selects Fugro for pre-construction survey of Danish Thor OWF

The Netherlands-based offshore and onshore geotechnical and survey services company, Fugro, has been selected by German energy company, RWE Offshore Wind GmbH, to carry out a pre-construction survey for the Thor OWF, which will be constructed in the Danish North Sea, about 22 km from Thorsminde on the west coast of Jutland. Fugro had already conducted a comprehensive geotechnical site investigation for the wind farm in 2022. Up to three survey vessels will be deployed to carry out a detailed pre-construction survey, including a search for unexploded ordnance (UXO) approximately 34 km off the coast of Thorsminde. The data acquired is important and will define the cable routes and exact turbine locations for the OWF. The survey will run until December 2023. The 1 GW Thor OWF, which is the biggest OWF in Denmark, is expected to be fully operational by 2027. The total investment costs for Thor have been estimated at around DKK15.5 billion. It would be capable of producing enough green electricity to supply the equivalent of more than one million Danish households.

(DKK1=USD0.14)

Valmet to deliver automation system to Fingrid's Jylkkä substation

Finland-based global developer and supplier of process technologies, Valmet, will deliver a distributed control automation system to Finnish TSO Fingrid's Jylkkä substation in Kalajoki. The system is being supplied as part of Finland-based infrastructure service company Destia's turnkey delivery. The automation system will monitor and control the synchronous condenser and auxiliary equipment at the plant. The local control room will be based on a virtual system, and the automation field connections will be managed through redundant process controllers. The automation system will be connected to Fingrid's main control room from which Finland's electricity transmission system is operated. This is the first time that a synchronous condenser will be built to balance the main grid in Finland. In another development, Fingrid selected Enersense International as one of its partners for maintenance services for its substations and power lines in 2024-26. The upcoming period is a continuation of the agreement made for 2021-23.

Norway's Statnett signs framework agreements

Norwegian TSO Statnett has awarded several framework agreements worth NOK.6 billion to Ramboll, a leading engineering, design and consultancy firm, to help it increase the capacity of the electrical grid by providing design and owner's engineering services. In another development, Statnett has nominated Norwegian engineering consultancy Multiconsult for two new four-year framework agreements for the development of the country's power transmission system. These agreements include engineering services for substations, power cables and lines, as well as owner's engineering services. The four-year agreements are valued at a total of more than NOK1 billion and include options for up to four-year extensions. The nomination of the contracts was subject to a standstill period, which expired on October 16, 2023.

The assistance will help Statnett reduce the lead times caused by the increasing number of grid connection applications in recent years. According to Statnett's Long-term Analysis from March 2023, power consumption is expected to increase by more than 50 per cent by 2050, and therefore the Norwegian power grid requires a rapid and massive expansion. Separately, Statnett selected Croatian power transmission equipment manufacturer Dalekovod's offer in the tender for the construction of a new 420 kV, 54-km-long transmission line on the Skaidi-Hyggevatn section in northern Norway.

(NOK1=USD0.089)

Swedish SvK signs agreement with Finland's Nyab for Aurora line construction

Swedish electricity TSO, Svenska Kraftnat (SvK), has signed an agreement with Finland-based company Nyab for the construction of the second phase of the 400 kV Aurora line, an interconnector between Sweden and Finland. This phase includes approximately 90 km of transmission connection between Dockasberg and Risudden in Sweden. Work under the EUR89 million agreement will commence shortly and complete in December 2025. Earlier in December 2022, Nyab and SvK had signed an agreement to prepare for the construction of the entire Swedish section. Aurora Line will run from Pyhänselkä in Muhos via Keminmaa in Finland to Messaure in northern Sweden. In Sweden, the project involves the construction of the Messaure–Dockasberg–Risudden (Finnish border) section. SvK has contracted Vic Energy for the Messaure–Dockasberg section, while Nyab is responsible for the planning work for the Dockasberg–Risudden section. The interconnection will increase the transmission capacity between Sweden and Finland by 700 MW on completion.

(EUR1=USD1.07)

Kanonaden Entreprenad and Hitachi Energy win contract from Sweden's SvK

Swedish TSO, SvK, has awarded a turnkey contract to a consortium of Norwegian civil engineering and construction company AF Gruppen's subsidiary Kanonaden Entreprenad, and Hitachi Energy, for the construction and installation work for a new series compensation station in Isovaara. The latter station will enable improved transmission capacity for electricity from the Aurora Line between Sweden and Finland.

Kanonaden's contract includes construction and assembly/installation work, with a share of approximately SEK123 million, excluding VAT.

(SEK1=USD0.091)

Hellenic Cables, Jan De Nul win cable contracts for Polish Baltyk OWFs

Norwegian state-owned multinational energy company Equinor and Polish electric services company Polenergia have awarded an export cable contract to a consortium of Hellenic Cables—the cables segment of Cenergy Holdings, and Belgian offshore service provider Jan De Nul Group. The scope of the contract includes the design, manufacture, transport and installation of a package of four 220 kV export cables for the Polish Baltyk II and Baltyk III bottom-fixed OWFs situated within the Polish exclusive economic zone of the Baltic Sea. The development of these OWFs is a crucial step towards Poland's transition to a greener and more sustainable energy future. In 2018, Polenergia established cooperation with Norwegian Equinor for the joint execution of Baltyk II and Baltyk III with a total installed capacity of 1.44 GW and subsequently in December 2019, signed a separate cooperation agreement for the execution of the 1,560 MW Baltyk I project. The electricity produced from Baltyk II and Baltyk III OWFs will be transmitted to the onshore grid via four high voltage alternating current (HVAC) submarine cables, with a combined length of 256 km. The Polish TSO, Polskie Sieci Elektroenergetyczne S.A., will manage the power transmission from the wind farms, each of which will be equipped with a dedicated offshore substation. Hellenic Cables will be responsible for the design and manufacture of the 220 kV HVAC cables at their factory in Corinth, Greece, while Jan De Nul Group will transport, install and bury the four export cables.

In another development, Equinor and Polenergia awarded an inter-array cable contract to the UK-based subsea engineering, construction and services company, Seaway7 (the renewables business unit of Subsea7 S.A) for the MFW Baltyk II and III OWFs. Seaway7's scope of work covers the engineering, procurement, construction and installation (EPCI) of 66 kV inter-array cables, measuring approximately 200 km in length. The final investment decision for these two Baltyk OWFs is expected in 2024, with their connection to shore to conclude in 2026. The initial power is anticipated to be delivered to the grid in 2027.

DNV Netherlands signs contract with Lithuanian Litgrid

Lithuania's TSO, Litgrid, has signed a EUR1.16 million contract with DNV Netherlands for an emergency restoration system for its electricity transmission lines. The 'Airline Emergency Recovery System' will be supplied by June 2024. The equipment will allow faster restoration and maintenance of the transmission network, shortening the disconnection times of high-voltage power lines. The modular overhead line (OHL) emergency restoration system can also be used to install temporary line sections when high voltage network repairs are being carried out and it is necessary to ensure power supply to residents and businesses. The system will allow the restoration of electricity supply within five to seven days. In the meantime, it would take 32-38 weeks to restore the network while waiting for the OHL supports to be manufactured and delivered.

The system is compact and fits into a standard sea container with all parts (galvanised steel supports, insulators, foundations and other accessories), making it easy to transport to the scene. The assembly of supports takes place at a height of no more than 5 metres, which facilitates work in the facility.

(EUR1=USD1.07)

Middle East and Africa

India's L&T subsidiary secures major power infrastructure orders across GCC

Indian engineering, procurement and construction (EPC) major, Larsen & Toubro (L&T), has secured several power infrastructure orders through its Power Transmission & Distribution (PT&D) division. These orders, valued between INR25 billion and INR50 billion, have been obtained from key markets within the Gulf Cooperation Council (GCC) region and beyond.

The company has secured an order from Saudi Arabia for the complete construction of a 380 kV substation, accompanied by overhead transmission lines. Additionally, a major order has been awarded from Kuwait for the construction of five substations, aimed at ensuring dependable and efficient power supply to an upcoming residential city.

It has also secured additional orders related to ongoing substation projects in Qatar, reinforcing its commitment to enhancing power infrastructure.

In Asia, it has received an order for establishing 400 kV and 220 kV transmission lines in the Indian state of Chhattisgarh and an order in Malaysia as part of a consortium, to establish a 275 kV underground cable (UGC) system to double the power transmission capacity in the existing network.

(INR1=USD0.012)

Egypt approves EETC's MoU with Belgium's Jan De Nul for electricity export project

The Egyptian government has approved the memorandum of understanding (MoU) signed between the Egyptian Electricity Transmission Company (EETC) and Belgian construction company Jan De Nul. The agreement aims to initiate comprehensive studies on exporting electricity generated from RES in Egypt to Europe via a dedicated Mediterranean Sea line.

The collaboration between Egypt and Jan De Nul signifies a strategic step toward leveraging the former's renewable energy potential to contribute to Europe's energy needs. The project's focus on utilising RES underlines Egypt's commitment to sustainable energy practices and its role in the global shift towards cleaner power generation.

The Mediterranean Sea line, serving as the conduit for this electricity transfer, is poised to become a vital channel for green energy exchange between continents. Further details about the project's specifics and the scope of collaboration between the EETC and Jan De Nul are expected to emerge as the studies progress. ♦

North America

RFI from vendors specialising in non-inverter-based LDES

Country: USA

Organisation: Salt River Agricultural Improvement and Power District (SRP)

Description/Scope of work: Request for information (RFI) has been issued to solicit insights from vendors specialising in non-inverter-based long-duration energy storage (LDES) technologies. SRP's objective is to enhance its understanding of the performance and cost dynamics associated with these specific LDES technologies.

The insights garnered from this RFI will play a pivotal role in shaping SRP's approach for an upcoming request for proposals (RfP), which is anticipated to be issued in mid to late 2024. The RfP will target pilot LDES projects with a commercial operation date set for 2027-28. SRP is inviting information for demonstration projects with a minimum capacity of 5 MW, extending up to 50 MW. While proposals for larger projects are not ruled out, projects exceeding 50 MW are unlikely to be included in the subsequent RfP, although SRP may contemplate them under future procurement endeavours. The storage technologies eligible for consideration must be non-inverter-based or possess mechanical inertia. SRP is open to exploring technologies that can be integrated with existing gas or steam turbines, but for the purposes of the demonstration project, respondents are expected to provide a completely new system, encompassing the turbine.

SRP is aiming for a target duration of 10 hours at the rated discharge capacity. LDES technologies offering durations ranging from 8 to 12 hours will be considered. While SRP's primary interest lies in the power purchase agreement (PPA) options for the future RfP, the RFI mandates respondents to furnish a capital cost estimate. Additionally, operational and maintenance cost details are sought to support the RFI process.

Closing date: December 22, 2023

Contact: 1500 N. Mill Avenue, Tempe, Arizona, 85288

Phone: +1 602 2365900

Email: Innovation@srpnet.com

Website: www.srpnet.com

Asia Pacific

Supply of 132 kV outdoor sealing end, indoor sealing end and cable joint kits

Country: Bangladesh

Organisation: Power Grid Company of Bangladesh Limited (PGCB)

Description/Scope of work: International competitive bids are invited for the supply of 132 kV outdoor sealing end, indoor sealing end and cable joint kits including all related accessories for cross-linked polyethylene (XLPE) copper conductor under GMD, Dhaka-Central, PGCB.

Closing Date: November 21, 2023

Contact: PGCB, Avenue-3, Jahurul Islam City, Aftabnagar, Badda, Dhaka-1212, Bangladesh.

Phone: +880-2-9553663,9560064,9558054, 9550514, 9582184

Fax No.: +880-2-9582382

E-mail: se.contract@pgcb.gov.bd

Website: www.pgcb.gov.bd

Repair work of existing cable trench at Wagoora substation

Country: India

Organisation: Power Grid Corporation of India Limited (POWERGRID)

Description/Scope of work: Competitive bids are invited for repair work of the existing cable trench at 400/220 kV Wagoora substation, Srinagar, Jammu and Kashmir.

Closing Date: November 16, 2023 (soft copy)

Contact: Bhuvnesh Ch. Sharma, Assistant Manager (C&M), POWERGRID, Grid Bhawan, OB-26, Rail Head Complex, Jammu, Jammu and Kashmir- 180012

Phone: +91 191-2470414

Website: www.powergridindia.com

Preliminary survey, and detailed survey for transmission line

Country: India

Organisation: POWERGRID

Description/Scope of Work: Competitive bids are invited for empanelment of the agency for preliminary survey, route alignment, and detailed survey for transmission line diversion works only in western region-I (WR-I).

Closing Date: November 20, 2023 (Soft Copy)

Contact: Vijay R Likhar, Chief Manager, POWERGRID, Nagpur, India

Phone: +91- 9511702184

Email: vijayrlikhar@powergrid.in

Website: www.powergridindia.com

Construction of various transmission elements in Rajasthan

Country: India

Organisation: Rajasthan Rajya Vidyut Prasaran Nigam Limited (RRVPN)

Description/Scope of work: Domestic competitive bids are invited for the construction of various transmission elements, supply of all equipment, erection (including civil works), testing and commissioning of the following:

400 kV transformer augmentation at Babai, Kalisindh thermal power station (TPS) and Hindaun in Rajasthan including survey 1X500 MVA, 400/220kV transformer along with associated 400 kV and 220 kV bays at 400 kV Ramgarh substation, 1X500MVA, 400/220 kV transformer along with associated 400 kV and 220 kV bays at 400 kV Jodhpur (Surpura) substation , 1X500 MVA, 400/220kV transformer along with associated 400kV and 220 kV bays and one 400 kV line bay work at 400 kV Bhadla substation

220 kV substations with associated lines at Jajawar, Raipur, Kelwara

Closing Date: November 20, 2023

Contact: RRVPN, SE Civil Jodhpur, New Poer House, Jodhpur, Rajasthan 342001

Phone: 91-2912742125

Email: se.civil.jodhpur@rvpn.co.in

Website: www.sppp.rajasthan.gov.in

Supply of 132/33 kV substations along with associated lines and bays

Country: India

Organisation: RRVPN

Description/Scope of work: Domestic competitive bids are invited for the supply of the following 132/33 kV grid substations (GSS) along with associated lines and bays:

132 kV GSS at Arnod, Pratapgarh along with associated lines [line-in-line-out (LILO) of 132 kV single-circuit (S/C) Dalot-Mokhampura line (18 km)]

132 kV GSS at Chitamba, Bhilwara along with associated lines [132 kV S/C Karera-Chitamba line (10.5 km)] and a bay at 132 kV Karera GSS

132 kV GSS at Devri, Baran along with associated lines [132 kV S/C Mamoni-Devri line (25 km)] and a bay at 132 kV Mamoni GSS

132 kV GSS at Jarkhoda, Bundi along with associated lines [LILO of 132 kV S/C Uniara-Nainwa line (11 km)]

132 kV GSS at Peelwa Nadi, Sawai Madhopur along with associated lines [LILO of 132 kV S/C Ajnoti-Bhadoti line (16 km)]

132 kV GSS at Ralawata, Ajmer along with associated lines {132 kV S/C Kishangarh (220 kV GSS)- Ralawata line (12 km) & 132 kV S/C Patan-Ralawata line (20 km)} and a bay at 220 kV Kishangarh and 132 kV Patan GSS

132 kV GSS at Seeswali, Baran along with associated lines [132 kV S/C Mangrol-Seeswali line (18 km)] and a bay at 132 kV Mangrol GSS

132 kV GSS at Tarnau, Nagaur along with associated lines [132 kV S/C Sanjoo-Tarnau line (14.5 km)] and a bay at 132 kV Sanjoo GSS

Closing Date: November 20, 2023

Contact: RRVPN, SE Civil Jodhpur, New Poer House, Jodhpur, Rajasthan 342001

Phone: 91-2912742125

Email: se.civil.jodhpur@rvpn.co.in

Website: www.sppp.rajasthan.gov.in

Construction of 132 kV equipment at Kamakhyaguri substation

Country: India

Organisation: West Bengal State Electricity Distribution Company Limited (WBSEDCL)

Description/Scope of work: National competitive bids are invited for the construction of various 132 kV equipment foundation for one feeder bay and other associated works at the 132/33/11 kV Kamakhyaguri substation under the Alipurduar area office.

The value of the tender is INR855,156.

Closing date: November 22, 2023

Contact: Chief Engineer, Siliguri, West Bengal, India 735135

Phone: +91-120-4200462

Email: support-eproc@nic.in, Website: www.wbtenders.gov.in

Construction of UGC LILO at Bamunara substation

Country: India

Organisation: WBSEDCL

Description/Scope of work: National competitive bids are invited for the construction of 132 kV double circuit (D/C) underground cable (UGC) line-in-line-out (LILO) at Bamunara substation I.R.O. 132 kV Durgapur-Barjora transmission line and allied work on turnkey basis.

The value of the tender is INR559.175 million.

Closing date: November 22, 2023

Contact: Chief Engineer, (Oandm), West Bengal State Electricity Transmission Company Limited Vidyut Bhaban, 10Th Floor (D Block), Salt Lake, Kolkata 700091

Phone: +91-120-4200462

Email: support-eproc@nic.in

Website: www.wbtenders.gov.in

Construction of 132 kV underground transmission line

Country: India

Organisation: Madhya Pradesh Power Transmission Company Limited (MPPTCL)

Description/Scope of work: Domestic competitive bids are invited for the construction of 132 kV, 8-km, double-circuit double stringing (DCDS) underground transmission line from 220 kV Manglia substation to RSS Khajrana for power supply to Metro Rail Project at Indore on turnkey basis.

Closing Date: November 23, 2023

Contact: MPPTCL, Block No.2, Shakti Bhawan, Rampur, Jabalpur 482008 (MP), India

Phone: 91-0761-2664450

Email: wm@mptransco.nic.in

Website: www.mptransco.in

Construction of 220 kV grid substation

Country: India

Organisation: RRVPN

Description/Scope of work: Domestic competitive bids are invited for the construction of 220 kV GSS along with associated lines and upgrades at Menar and Lakhni.

Closing Date: November 30, 2023

Contact: RRVPN, SE Civil Jodhpur, New Poer House, Jodhpur, Rajasthan 342001

Phone: 91-2912742125

Email: se.civil.jodhpur@rvpn.co.in

Website: www.sppp.rajasthan.gov.in

Construction of 115 kV substations

Country: Thailand

Organisation: Electricity Generating Authority of Thailand (EGAT)

Description/Scope of work: Competitive bids are invited for the supply and construction for expansion of 115 kV Sawankhalok, Chom Thong and Mae Sot substations.

Closing date: July 16, 2024

Contact: Chalita, International Procurement Department, Transmission Segment, EGAT, Room No. 1202/2, 12th Floor,

Building Number 101, Procurement and Inventory Management Division, Bangkruai, Nonthaburi, 11130, Thailand
Phone: +(66) 08 4008 3231
Email: 598637@egat.co.th
Website: www.egat.co.th

Europe

Construction transformer station at Zamosce substation

Country: Croatia

Organisation: HEP-Operator distribucijno sistema d.o.o.

Description/scope of work: International competitive bids are invited for the construction of the 110/10(20)-35/10(20) kV Izgradnja transformer station at Zamosce substation.

Closing date: November 15, 2023

Contact: Kupska 4, 10000 Zagreb, Croatia

Email: josko.puttilli@hep.hr

Phone: +385 20468162

Website: www.hep.hr

Purchase of distribution equipment for Viljandi substations

Country: Estonia

Organisation: Enefit Connect OÜ

Description/Scope of work: Purchase of distribution equipment for the 110/35/15/6 Viljandi substation in accordance with the conditions stipulated in the basic procurement documents.

Closing date: November 16, 2023

Contact: Aare Lökk, Veskpostit tn 2, Tallinn, Estonia 10138

Phone: +372 5035316

Email: enefit@enefitconnect.ee

Website: www.energia.ee

Supply of HV-MT transformer

Country: Italy

Organisation: AGSM AIM SPA

Description/Scope of work: Competitive bids are invited for the supply of a high voltage- measurement transformer (HV-MT) transformer at the 132 kV Pace 2 primary substation in Vicenza.

Closing date: November 16, 2023

Contact: Cristina Munarini, Lungadige Galtarossa, 8, Verona, Italy, 37133

Email: acquisti@pec.agsm.aim.it

Website: www.agsm.aim.it

Design services for the 330 kV Lietuvos E–Neris project

Country: Lithuania

Organisation: Litgrid AB

Description/Scope of work: International competitive bids are invited to carry out the design services for the 330 kV Lietuvos E –Neris overhead line reconstruction project. The contract is a Government Procurement Agreement (GPA).

Closing Date: November 15, 2023

Contact: Sandra Kuzminskaitė, Litgrid AB, Karlo Gustavo Emilio Manerheimo st. 8, Vilnius LT- 05131, Lithuania

Phone: +370 69414937

Email: sandra.kuzminskaite@litgrid.eu

Website: www.litgrid.eu

Expansion and modernisation of Piła Krzewina station

Country: Poland

Organisation: Polskie Sieci Elektroenergetyczne SA (PSE)

Description/Scope of work: International competitive bids are invited for the expansion and modernisation of the Piła Krzewina station along with switching the track of the 400 kV Piła Krzewina Plewiska line operating at 220 kV to 400 kV. The contract is a GPA.

Closing date: November 17, 2023

Contact: Robert Śledzik, 165 Warszawska Street, Konstancin-Jezorna 05-520, Poland

Phone: +48 223213101

Fax: +48 224681977

Email: robert.sledzik@pse.pl

Website: www.pse.pl

Delivery of 400 kV, 220 kV and 110 kV circuit breakers for Wielopole substation

Country: Poland

Organisation: PSE

Description/Scope of work: International competitive bids are invited for the delivery of 400 kV, 220 kV and 110 kV circuit breakers for the modernisation of the 400/220/110 kV Wielopole substation. The contract is a GPA.

Closing date: November 22, 2023

Contact: Mariusz Smela, 165 Warszawska Street, Konstancin-Jezorna 05-520, Poland

Phone: +48 505021323

Email: mariusz.smela@pse.pl, Website: www.pse.pl

Delivery of 400 kV, 220 kV and 110 kV circuit breakers for Stalowa Wola station

Country: Poland

Organisation: PSE

Description/Scope of work: Competitive bids are invited for the delivery of 400 kV, 220 kV and 110 kV circuit breakers for the expansion of the 400/110 kV Lublin system station, modernisation of the 220/110 kV Zamo station and expansion of the 220/110 kV Stalowa Wola station.

Closing date: November 22, 2023

Contact: Mariusz Smela, 165 Warszawska Street, Konstancin-Jezorna 05-520, Poland

Phone: +48 223213101

Fax: +48 223213101

Email: mariusz.smela@pse.pl, Website: www.pse.pl

Construction of 110 kV double circuit line

Country: Poland

Organisation: ENEA Operator Sp. z o.o.

Description/Scope of work: International competitive bids are

invited for the development of design documentation as well as construction of new 110 kV D/C line sections from the 220 kV/110 kV Żagań substation to the 110 kV Jankowa-Żagań, Żagań-Kożuchów, and Żary-Zakładowa lines.

Closing date: November 30, 2023

Contact: Łukasz Kwiatkowski, ENEA Operator Sp. z o.o., Ul. Strzeszyńska 58, Poznań 60-479, Poland

Phone: +48 618843942

Email: lukasz.kwiatkowski@operator.enea.pl

Website: www.operator.enea.pl

Expansion of the 220/110 kV Stalowa Wola station

Country: Poland

Organisation: PSE

Description/Scope of work: Competitive bids are invited for the expansion of the 220/110 kV Stalowa Wola station with the installation of a 220/110 kV transformer.

Closing date: May 15, 2025

Contact: Elżbieta Janeczek, 165 Warszawska Street, Konstancin-Jezorna 05-520, Poland

Phone: +48 223213101

Fax: +48 223213101

Email: elzbieta.janeczek@pse.pl, Website: www.pse.pl

Construction of 400 kV OHL lines

Country: Romania

Organisation: Transelectrica

Description/Scope of work: International competitive bids are invited for the construction of 400 kV Resita-Icloda D/C line running parallel to the existing 220 kV Resita-Timişoara line; construction of section of 400 kV Icloda-Săcălaz (new route) S/C line; connecting 400 kV Resita-Icloda D/C line with 400 kV Icloda-S/C line, thus achieving a 400 kV overhead line (OHL) circuit between Resita station and Săcălaz station; – construction of the 400 kV Icloda-Timisoara S/C OHL; – connecting 400 kV Resita-Icloda S/C OHL with 400 kV Icloda-Timisoara S/C OHL, thus achieving a 400 kV OHL circuit between Resita station and Timișoara station; – dismantling of 220 kV Resita-Timisoara D/C OHL.

Closing date: November 27, 2023

Contact: Transelectrica, Transmission Branch, Olteni no. 2-4, sector 3, Bucuresti Romania

Phone: +40 213069956

Fax: +40 213035670

Email: cristina.oprisa@transelectrica.ro

Website: www.e-licitatie.ro

Maintenance and operation of 220/25 kV substation

Country: Spain

Organisation: Presidency of the Board of Directors of the Port Authority of Barcelona

Description/Scope of work: International competitive bids are invited for drafting, execution and project management of the maintenance and operation of a 220/25 kV substation and the 220 kV transportation network.

The value of the tender is EUR14 million.

Closing date: November 16, 2023

Contact: Portal of the Pau 6, Barcelona, 08039 Spain

Phone: 932982100

Email: sau@portdebarcelona.cat

Replacement of transformers in St. Lada substation

Country: Spain

Organisation: Ministry of Ecological Transition, Industry and Economic Development, Asturias

Description/Scope of work: Competitive bids are invited for undertaking the replacement of the 400/132 kV transformer in the St Lada substation in Langreo.

Closing date: December 1, 2023

Contact: C / Coronel Aranda 2, plaza floor (33005) Oviedo, Spain

Phone: +985105764, 985279100, 985279100

Email: sac@asturias.org

Website: www.asturias.es

Procurement of 330 kV and 250 MVA autotransformers

Country: Ukraine

Organisation: Private Joint Stock Company (PJSC) National Power Company Ukrenergo

Description/Scope of work: International competitive bids are invited for the procurement of 330 kV and 250 MVA autotransformers as part of the 'Restoration Project of Winterization and Energy Resources' for which it has received funding from the World Bank.

Closing date: December 7, 2023

Contact: Victor Lysykh, 01032, Kyiv region, Kyiv, st. S. Petliury, 25, Kyiv, Ukraine

Phone: +38-044-238-30-14

Email: Lyssykh.VV@ua.energy

Website: www.ua.energy

Middle East and Africa

Extension of 400/225 kV and 225/60/11 kV substations

Country: Morocco

Organisation: Office National de l'Electricité et de l'Eau Potable (ONEE)

Description/Scope of work: International competitive bids are invited for the supply, civil engineering works, electrical equipment, assembly work and commissioning tests relating to the extensions of the 400/225 kV Bourdim substation and 225/60/11 kV Selouan substation and the construction of the 225 kV connection lines.

Closing date: November 15, 2023

Contact: Abdelhak Bentchichia, ONEE, Casablanca Headquarters, 65, Rue Othmen Ben Affan Casablanca, B.P. 13 498,

Morocco

Phone: +212 05 22 75 45 01

Fax: +212 05 22 75 47 14

Email: a.bentchichia@onee.ma

Website: www.onee.org.ma ♦

Global Transmission Report

Information and analysis on the global electricity transmission industry

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