WORLD POWER SYSTEMS REVIEW

15 January 2019

2 January 2019

Chinese SGCC commissions ±1,100 kV Changji–Guquan UHV DC project

Chinese grid company State Grid Corporation of China (SGCC) has commissioned the world's first ±1,100 kV ultrahigh voltage direct current (UHV DC) project with an investment of CNY40.7 billion.

The project spans 3,293 km, linking Changji converter station in Changji Hui Autonomous Prefecture in Xinjiang in the northwest, and Guquan in Anhui Province in eastern China, and has a transmission capacity of 12 GW. The line crosses the provinces of Xinjiang, Gansu, Ningxia, Shaanxi, Henan, and Anhui.

The transmission line will enable the supply of 66 billion kWh of electricity from Xinjiang, one of China's five major energy bases with resource potential to construct large-scale coal and wind power plants, to East China every year to meet the electricity demand of 50 million households.

ABB and Siemens were responsible for the supply of converter transformers for the project.

The project received approval in December 2015 and construction works began in January 2016.

Global Transmission
http://www.globaltransmission.info

3 January 2019

Rosatom retires Leningrad I-1 nuclear reactor

Russian state-run nuclear energy firm Rosatom has withdrawn the 925 MW Leningrad I-1 nuclear reactor in Sosnovy Bor (Russia) from service after 45 years of operation. Construction started in 1970 and entered commercial operation in 1974.

The design life of the light water graphite reactor (LWGR) RBMK-1000 reactor was initially 30 years but a modernisation programme was implemented, enabling its extension for another 15 years.

Even though the Leningrad I-1 unit is now stopped, the Leningrad nuclear plant remains Russia's largest nuclear facility and provides more than 50% of the energy consumption of Saint Petersburg and the Leningrad Region. The facility combines two different plants, namely Leningrad I and Leningrad II. Leningrad I entails four RMBK-1000 units, while Leningrad II is to include four VVER-1200 units as it is under construction: Leningrad II-1 was connected to the grid in March 2018. Leningrad II-2 is expected to be connected to the grid in late 2019 and commissioned in 2020. Units 3 and 4 are expected to be operational in 2023-2024.

Enerdata
http://www.enerdata.net

3 January 2019

Germany closed its last black coal mine

Germany decommissioned the Bottrop mine, its last bituminous coal mine on December 21st, 2018. The closure happened eleven years after government's decision of

2007 to phase out the aid and shutter the last black coal mines by 2018. According to RAG Foundation, the only hard coal producer in Germany in charge of the black coal phase-out, hard coal producing costs in Germany (€250/t) are significantly above the market price of €80/t. Consequently, most of the black coal consumed in German coal-fired power plants comes from Russia, the United States, Australia and Colombia.

The Hard Coal Mining Financing Law (Steinkohlefinanzierungsgesetz, 2007) defines the conditions of termination of subsidies to the coal industry by end-2018: the €20bn financial burden for the period 2009-2019 was split between the Federal Government (€15.6bn), the Land of North Rhine-Westphalia (€3.9bn) and RAG AG (€965m as from 2012).

A government-appointed commission is to announce in February 2019 a roadmap for exiting coal as part of efforts to make Germany carbon-neutral by 2050. However, the government plans to adopt a gradual phase-out of coal-fired power to safeguard jobs and ensure power supply stability, alongside the planned exit from nuclear power by 2022. The persistently low wholesale electricity prices worsen the profitability of large conventional power plants but this is expected to improve after the nuclear phase out.

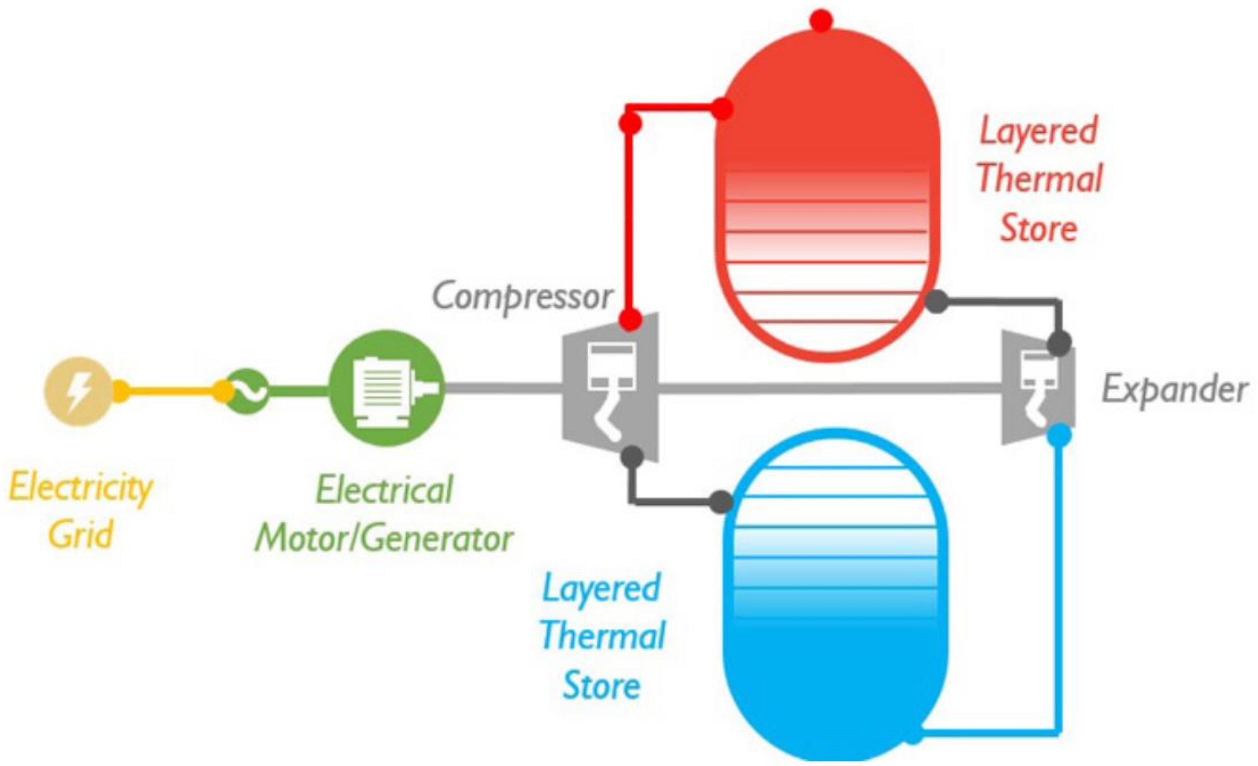
Enerdata
http://www.enerdata.net

8 January 2019

Ground-breaking energy storage operational in Newcastle

The world's first grid-scale pumped heat energy storage system is now up and running at Newcastle University, the Energy Technologies Institute (ETI) has announced.

The ETI said the ground-breaking technology could offer a low-cost method of storing large volumes of excess renewable electricity.



The system consists of two containers – a cold store and a hot store – filled with gravel and an inert gas. They are connected via a reversible heat pump/engine.

When surplus energy needs to be stored, gas is withdrawn from the cold store and compressed using an electrically-powered pump, thereby raising its temperature.

The gas is injected into the hot store where the heat is transferred to the gravel. It is then withdrawn from the hot store, expanded to further lower its temperature and returned to the cold store.

To recover the stored energy, the process is reversed. Gas from the cold store is compressed and injected back into the hot store, where it is reheated by the gravel. The gas is then expanded to drive the engine, before being returned to the cold store once again.

The system has been installed at the Sir Joseph Swan Centre for Energy Research at Newcastle University. It has a maximum power output of 150kW and a storage capacity of 600kWh.

“Given the thermal power cycle’s enormous potential, there has been a tremendous amount of research and commercial interest in PHES technology over the last ten years,” said Swan Centre director Tony Roskilly.

“However, until now nobody has managed to get as far as to demonstrate a real-world working system.

“What is exciting is that the UK is the first to do it and, as such, is now leading the world in what looks like a highly disruptive and cost-effective technology which can balance renewable energy supply and demand.”

Andrew Smallbone, co-director of Newcastle University’s National Facility for Pumped Heat Energy Storage, said the initial tests of the system have been very promising: “We can very quickly change our system control from charge to discharge in a few milliseconds.

“The analysis of system performance indicated that the current system operates with an efficiency which yields a round trip efficiency of 60 to 65 per cent.”

Smallbone said the facility’s research indicates the technology could provide one of the “lowest cost and most flexible” forms of grid-scale energy storage.

He said the initial tests also indicate there is plenty of room to improve the system’s performance by tweaking its design and enhancing its operation. “This will now continue over the next few months,” he added.

Last year, Highview Power opened the world’s first grid-scale liquid air energy storage system near Manchester.

Utility Week
http://www.utilityweek.co.uk

8 January 2019

Hawaiian Electric submits more than 1 GWh of battery projects for regulatory review

Hawaiian Electric (HECO) submitted seven solar-plus-storage projects on three islands on Thursday to the Public Utilities Commission for review, totaling over 260 MW of solar and 1 GWh or storage, the second-largest announcement of energy storage projects in the country.

The projects' costs range from $0.08 to $0.12 per kWh, which HECO said are lower than the cost of fossil fuel generation in the state. Due to the need to import petroleum for power generation, Hawaii has some of the highest energy bills in the country.

The projects are expected to come online in 2022, and the utility will likely be doing another request for proposals this year, "because we've got to keep the momentum going," HECO senior spokesperson Peter Rosegg told Utility Dive.

Utility Dive
http://www.utilitydive.com

8 January 2019

Turkey's wind power capacity forecast to reach 8 GW in 2019

According to data released by the Turkish Wind Energy Association (TÜREB), the country's total installed wind energy capacity rose from over 6,800 MW in 2017 to around 7,400 MW at the end of 2018. Wind capacity in Turkey is forecast to reach 8 GW by the end of 2019 thanks to the addition of about 600 MW.

The Turkish wind power industry is booming as the Ministry of Energy and Natural Resources launched the last tender for Renewable Energy Resource Areas (YEKA) in November 2018, offering 1,000 MW of onshore wind power capacity divided into four 250 MW zones. Applications for the tender will be accepted until March 2019. The power plants will be deployed in the Aegean provinces of Balıkesir, Çanakkale, Aydın and Muğla. The ceiling price has been set at US$5.5c/kWh over a 15-year period. The power projects will each receive a 49-year power plant license.

According to preliminary statistics released by the Turkish Electricity Transmission Corporation, Turkey's installed capacity rose by 3.7% in 2018, from 85 GW to more than 88 GW. Renewables accounted for a significant part of capacity additions, with 980 MW of new hydropower and 852 MW of new solar capacity installed during the year. In addition, wind and geothermal power added 433 MW and 218 MW, respectively, to the national transmission grid.

Enerdata
http://www.enerdata.net

8 January 2019

National Grid unveils proposed terms, de-rating factors for renewables in the Capacity Market

National Grid has outlined how renewables could participate in the Capacity Market, unveiling technology-specific de-rating factors that range from 1–15%.

The Electricity System Operator announced its proposed methodologies at an industry consultation event held in London yesterday and attended by Current±, starting its work of establishing the finer details of how renewables could compete for capacity contracts in practice.

However renewables, and especially solar, stand to provide only a marginal contribution to how the energy system can respond to stress events if the ESO’s de-rating factors are anything to go by. The indicative de-rating factor for solar for forthcoming delivery years ranges from 1.17% to 1.76%, representing how solar’s contribution to stress events, which predominantly occur outside of daylight hours, is negligible. Instead, solar’s contribution is almost strictly limited to enabling battery storage units to reserve their output until a stress event requires it.

Onshore and offshore wind meanwhile stand to have a more meaningful contribution with wind factors ranging from 8.2% to 14.6%. Battery storage technologies meanwhile will retain the de-rating factors applied to them last year.

The Department for Business, Energy and Industrial Strategy (BEIS) published a call for evidence on the prospect of renewables being eligible for capacity market contracts in August last year, but it is down to National Grid as the Electricity Market Reform delivery body to determine how it will work in practice.

Equivalent Firm Capacity

National Grid confirmed it had used Equivalent Firm Capacity (EFC) as a basis to determine de-rating factors, describing it as a “very useful construct to normalise the security of supply contribution of non-conventional adequacy resources” such as variable renewable generators.

It’s not the first time EFC has been used by National Grid. It is principally used to determine the contribution of wind power when producing its annual Winter Outlook document and was also used to determine the de-rating factors applied to short-duration battery storage technologies in the Capacity Market last year.

An EFC is defined as the precise amount of perfectly reliable firm capacity a resource can displace while maintaining the exact same level of risk on the system. Naturally, the more variable a generator is the less reliable firm capacity it maintains, and in relation to battery storage the shorter the duration of the battery the less reliable firm capacity it maintains.

However there remains debate over distinctions within EFC calculations, whether an incremental, average or combined EFC is taken across all technology types. National Grid has recommended that an incremental EFC is adopted, deciding that it makes more sense as the capacity value of renewables depends on the build-out rate (i.e. more significant quantities of wind and solar on the grid would seemingly increase system volatility at particular times).

Power curves

Technology power curves also play a central role in contributing towards the development of de-rating factors. National Grid uses NASA’s MERRA atmospheric dataset against site performance data to calculate the ‘long run average contribution’ of weather-dependent resources to determine how they can contribute to security of supply.

For wind technologies, this is made simpler by high levels of data and National Grid took the step of updating its notional power curves for both onshore and offshore wind, something it had not done since 2015 and 2016 respectively.

These updates, made using new data compiled and analysed from a number of operational wind farms in the UK, resulted in “meaningful updates” to their respective power curves.

Furthermore, given the differences in generation patterns and production between onshore and offshore wind, National Grid has elected to separate them into individual asset classes and apply different de-rating factors.

Solar however was complicated by a lack of available data given that the technology has only been deployed in meaningful scales since 2014. To determine the solar PV power curve, National Grid partnered with the University of Reading to develop a single power curve for all PV resources (domestic, C&I and utility-scale) using past solar PV power measurements provided by Sheffield Solar and NASA's MERRA solar irradiance data set.

At the event yesterday, National Grid was questioned by the audience on the sense of producing a single power curve for all types of solar PV. Utility-scale PV plants, given the siting and technology advantages they have over most residential systems, stand to be significantly more productive per megawatt than residential systems and it was argued that they could be treated differently. National Grid replied by stating that it is wholly reliant on the data it has at its disposal and implored the solar industry to respond to the consultation with relevant datasets if possible.

Capacity assumptions and de-rating factors

The final piece of the puzzle is National Grid's capacity assumptions which are taken into consideration for its base cases in the T-1 2020/21, T-3 2022/23 and T-4 2023/2024 delivery years. The chart below indicates National Grid's base cases for all renewables and storage technologies (storage's figure includes a notional 2.7GW of long-duration pumped storage).

Base Case and Sensitivity Wind, Storage, Solar PV Capacity Assumptions (MW)

Base Cases	Onshore Wind	Offshore Wind	All Wind	Storage	Solar PV
T-1 2020/21	12784	9990	22774	3786	14379
T-3 2022/23	13005	11740	24745	4415	15569
T-4 2023/24	13022	13960	26982	4464	16356
Sensitivities					
"Medium" Case	15000	15000	30000	6086	22500
"High" Case	20000	20000	40000	7757	30000

As a result, onshore wind's de-rating factor for the delivery years ranges between 8.2–9%, offshore wind's are between 12.1 and 14.6% and solar, given its notional contribution to grid supply when stress events are most likely to occur, has been handed de-rating factors of between 1–2%.

	De-Rating Factors (%)		
Base Cases	**Onshore Wind**	**Offshore Wind**	**Solar PV**
T-1 2020/21	8.98%	14.65%	1.17%
T-3 2022/23	8.40%	12.89%	1.76%
T-4 2023/24	8.20%	12.11%	1.56%

National Grid said solar's EFC would have been "almost negligible" had it not been for the introduction of short-duration storage technologies. The thinking behind this is by contributing towards the country's energy demand during daylight hours, solar can delay the introduction of battery storage output, providing a small but meaningful contribution towards meeting stress events.

There is, however, the potential for trends to change as renewables penetration on the grid continues to grow. While the incremental EFCs of renewables generally fall slightly with increasing penetrations – the more wind there is on the system, the less valuable wind is during a stress event – solar and storage were described as having a "mutually beneficial interaction" as their penetrations grow.

As a result, the System Operator said it remained open to altering the de-rating factors attached to these technologies as the system continued to evolve.

Next steps

The full list of methodologies, base cases, assumptions and recommendations have been published this morning on the EMR Delivery Body website, and National Grid is accepting responses to the de-facto consultation until the end of the month.

These will feed into a response to be published by National Grid by the end of February.

However National Grid's Daniel Burke warned that there remains a long way to go before renewables can participate in CM auctions, not least because of the need for policy reform.

Any introduction of renewable energy into the CM would require regulatory overhaul from BEIS and Ofgem, matters which, Burke said, mean it is "quite feasible" to "take some time".

Current News Solar Media Limited
http://www.current-news.co.uk

8 January 2019

India plans to commission 21 nuclear reactors by 2031

The Indian Department of Atomic Energy has outlined plans to commission 21 new nuclear power reactors with a combined generating capacity of 15,700 MW by 2031. 9 units are currently at various stages of construction and scheduled for completion by 2024-2025, including two units in each of the states of Gujarat, Rajasthan and Haryana along with an additional three units in Tamil Nadu. Besides, 12 additional reactors have reached financial close and have been granted administrative approval by the government, of which 10 new Pressurised Heavy Water Reactors (PHWRs) with a capacity of 700 MW each and 2 Light Water Reactors (LWRs) of 1,000 MW each.

Five other sites (namely Jaitapur in Maharashtra, Kovvada in Andhra Pradesh, Chhaya Mithi Virdi in Gujarat, Haripur in West Bengal and Bhimpur in Madhya Pradesh) have been conditionally approved by the government for the construction of a further 28 reactors.

The country currently has 22 operational reactors spread across 8 sites with a combined capacity of 6780 MWe. The largest site, Kudankulam in Tamil Nadu has two reactors VVER (917 MW each), commissioned in 2014 and 2016.

Enerdata
http://www.enerdata.net

8 January 2019

Eskom asks for a massive 45% electricity increase

South African state-run power utility Eskom is asking the National Energy Regulator (Nersa) for a 45% electricity increase spread over three years.

Public hearings on Eskom's demand for a 45% electricity tariff increase over the next three years will start in Cape Town next week and advocacy groups are seeing red, saying the government's timing is a clear sign that it wants increases pushed through.

Last year, President Cyril Ramaphosa intervened in the crisis at Eskom by appointing a team of eight to steer the board in the right direction by the end of this month.

Energy Expert Coalition's Ted Blom said Eskom's application should be scrapped as the still-captured and corrupt utility should not be granted any increases until a full forensic audit was completed. "The many futile interventions point to an unsalvageable and bankrupt Eskom. In fact, the pillaging is still continuing, this time by another 'third force' which has replaced the Zupta gang. Questions remain as to why no one has been prosecuted and no monetary recovery has occurred," Blom said.

Nersa said it had received Eskom's third Multi-Year Price Determination Regulatory Clearing Account (RCA) Year 5 (2017/18) application totalling R21million and fourth Multi-Year Price Determination application totalling R219billion, R252bn and R291bn for the 2019/20, 2020/21 and 2021/22 financial years respectively. The energy regulator said that it would assess Eskom's applications following due regulatory processes.

Eskom said that it continued to implement a short-to-medium-term nine-point recovery programme that would see steady and sustained improvement in plant performance and coal stock levels. It added that steady progress was made with regard to fixing coal stockpiles as 35 new coal contracts were concluded in the last year. It added that the probability of load shedding remained low until January 13. This increase is on top of the 4.41% hike that was already granted to Eskom by Nersa. Eskom has argued that this 15% increase was needed to ensure that it maintained its stability and growth trajectory.

"As we now enter 2019, Eskom is rudderless. The Eskom board has proved to be dysfunctional and required ministerial intervention on several occasions," Blom said. Although appointed 12 months ago, they were unable to carve out a credible turnaround plan despite the use of expensive outside consultants," he said.

DFA
http://www.dfa.co.za