Electricity Regulation 2020

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Getting The Deal Through

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Overview

Rapid developments in energy technology and lower upfront investment costs mean that energy is becoming more measurable, decentralised, interconnected and intelligent than ever before. What was recently considered the future, is now considered the past. Things we thought about 10 years ago may no longer apply and technologies we thought were 10 years away are happening right now. This also means that energy regulators are having to keep pace with this change, reflected very aptly by the theme of the most recent summit of the World Forum on Energy Regulation (WFER), hosted in Mexico in March 2018: 'Regulating in a Time of Innovation'. The forum brought into focus three key themes:

- empowered consumers;
- dynamic markets; and
- sustainable infrastructure.

In addition to these, a fourth pillar should also be added: the decarbonisation and clean energy agenda, which is, in part, responsible for much of the change driving the first three pillars. The aims to reduce emissions, promote clean energy and the imposition of climate targets are shared by most developed and developing countries and, therefore, are prevalent in the changing regulatory landscape. By drawing on these themes, this keynote chapter reflects upon some of the recent changing technologies and business models across the globe and how our energy regulators are keeping pace with the unfolding energy revolution.

The decarbonisation of energy

By 2017, 150 countries had adopted renewable electricity generation targets; 126 of these had implemented dedicated policies, regulations and subsidies (the International Renewable Energy Agency (IRENA), the International Energy Agency (IEA), and the Renewable Energy Policy Network for the 21st Century (REN21) (2018)). Such policies and regulation include:

- quotas and tradeable certificates;
- competitively priced auctions; and
- feed-in policies.

Quotas and mandates

Renewable energy electricity targets permeate to electricity suppliers, generators and consumers through electricity quota obligations (known as renewable obligations (RO) in the United Kingdom, renewable portfolio standards (renewable portfolio standards) in the United States or renewable purchase obligations (RPO) in India). By the end of 2016, 100 jurisdictions had adopted some variety of electricity quota obligations, including 29 US states (IRENA, IEA and REN21 (2018)).

Taking South Korea as an example, which has put in place a 10 per cent renewable energy target by 2020, the government implemented its renewable portfolio standards to accelerate its renewable energy deployment by requiring the 13 largest power companies at the time (with installed power capacity larger than 500MW) steadily to increase their renewable energy mix in total power generation (International Energy Agency, 2018). For power companies to meet their renewable portfolio standards targets they can invest in renewable energy installations themselves or purchase renewable energy certificates (RECs) on the market.

Renewable energy certificates

Renewable energy certificates (RECs) are awarded to generators for each MWh of renewable energy produced. Market operators participate by receiving or buying a number of certificates to meet the quotas set each year. The implementation of a framework of tradeable certificates has become an internationally prevalent system for meeting such quotas.

Turning to the world's first (and largest) major carbon market, the European Union's Emissions Trading System (EU ETS) was revised in early 2018 to enable it to achieve the EU's 2030 emission reduction targets in line with the 2030 climate and energy policy framework and as part of its contribution to the 2015 Paris Agreement. The revision focuses on:

- consolidating the EU ETS as an investment driver by accelerating annual reductions in allowances to 2.2 per cent as of 2021 and reinforcing the Market Stability Reserve (the mechanism established by the EU in 2015 to reduce the surplus of emission allowances in the carbon market and to improve the EU ETS's resilience to future shocks);
- continuing the free allocation of allowances as a safeguard for the international competitiveness of industrial sectors at risk of carbon leakage, while ensuring that the rules for determining free allocation are focused and reflect technological progress; and
- assisting the energy sector to meet the innovation and investment challenges of the low-carbon transition via several low-carbon funding mechanisms.

Catching up with this tried-but-tested decarbonisation initiative is China, which last year announced via its National Development and Reform Commission (NDRC) the intention to launch a 'green certificate' trading and subsidy scheme that requires polluters, such as coal-fired power generators, to buy certificates from renewable energy suppliers (eg, wind and solar) in a bid to decrease the extent of government subsidies provided to the renewables sector (worth 75 billion yuan in 2017). The first rollout had been criticised as unsuccessful owing to its voluntary nature; however, this scheme was to be made mandatory in 2018 – although at the time of writing, few details had been provided.

Competitively priced auctions

An increasing number of countries are also relying on auctions to develop their energy capacity (often awarded on an annual basis), which are appealing owing to their flexibility in design and transparency in the market. In 2017 , the UK government awarded contracts worth £176 million to 11 low-carbon electricity schemes (in particular, offshore wind) underscoring the heavy competition with gas-fired generation. For example, two offshore wind schemes were awarded contracts for record lows of £57.50 per MWh. However, the limitations of auctions include the risk of underbidding to win the contracts and the risk of driving smaller entry-level players out of the market. Therefore, auctions are commonly implemented alongside other initiatives, such as RECs, or simply backed by government guarantees (as is the case in Argentina and Zambia).

Feed-in tariffs and feed-in premiums

Administratively set feed-in-pricing policies (FITs and FIPs) have been crucial in encouraging renewable projects worldwide, providing stable income to generators, in turn increasing the bankability of energy projects, such that in 2017, according to IRENA, 80 countries have now adopted FITs and FIPs (up from 34 in 2005). Feed-in pricing policies have proved to be successful across the globe, no more so than in Japan, which, marking a change in its energy policy following the disastrous Fukushima earthquake, introduced its FIT scheme in 2012. Since then, Japan's solar photovoltaic capacity has increased markedly, to more than 44GW at the time of writing.

Japan's regulatory reform

Japan's energy market and regulatory reform has not stopped there. The Organisation for Cross-regional Coordination of Transmission Operators (OOCTO) has been established to promote the development of electricity transmission and distribution networks, and better maintain the supply and demand balance of electricity in both standard and emergency situations. This, in effect, marks the start of the legal unbundling of Japan's transmission sector, which currently is to be separated into three sectors:

- generation;
- transmission and distribution; and
- retail.

By 2020, the licence unbundling will force the 10 largest utility companies legally to separate their transmission and distribution divisions by prohibiting a single entity from operating both a transmission and distribution business, and a retail and generation business.

In parallel, Japan has undertaken a steady liberalisation of its retail electricity market, establishing the Electricity and Gas Market Surveillance Commission (EGC) to monitor and make proposals to the government regarding network tariffs and retail electric power suppliers. Full liberalisation occurred in 2016 and has since created a competitive consumer market, which in turn has led to modernisation and disruption of traditional business models – discussed further below.

Empowered consumers

Innovative technologies are driving change by providing consumers with more service options and therefore disrupting the current offering provided by major and more traditional players in the market. Not limited to Japan alone, this is happening across all industries, and can be evidenced best in the UK electricity market by two recent initiatives from the UK regulator, the Office of Gas and Electricity Markets (Ofgem):

- 'Regulatory sandboxes', implemented by Ofgem's Innovation Link, for which applications for the first sandbox opened in February 2017 and the second in October 2017, allow trials of innovative business products, services and business models that cannot currently operate under the existing energy regulations. Sandboxes provide Ofgem with the opportunity to engage with new business models and the regulatory barriers they are experiencing with a view to identifying potential solutions. Ofgem's Innovation Link approved several projects to form the first sandboxes, including:
  - two separate projects, both trails of peer-to-peer local energy trading platforms (allowing residents in urban areas to source their energy from local renewables and trade that energy with their neighbours), the first by a consortium led by EDF Energy Research and Development UK and including Electron, PassivSystems, Repowering London and University College London, and the second by a new company, Empowered; and
  - a product designed to enable lower bills and warmer homes for customers with storage heaters who are currently limited to certain economy tariff options, with the ability to provide grid balancing capabilities, created and run by Ovo Energy;
- The 'Switching Programme', established in order to facilitate easier transitions between energy service providers for consumers and stimulate increased consumer engagement in the marke. (Around the same time, Japan established the OOCTO to, among other things, offer a switching support service.)

These Ofgem initiatives are framed towards the distribution and retail markets to directly to empower consumers. However, similar innovative technologies and business models have been implemented at the generation and transmission level – creating a more dynamic market, as discussed in the next section.

Dynamic markets

Known as the 'three Ds', the world's electricity systems are starting to 'decentralise, decarbonise, and democratise', each driven by the need to reduce electricity costs, replace aging infrastructure, improve resilience and reliability, reduce carbon emissions and provide reliable electricity to areas lacking electrical infrastructure (Hirsh, et al, 2018). Distributed Energy Systems (DES) is a term that encompasses a diverse array of generation, storage and energy monitoring and control solutions, offering building owners and energy consumers significant opportunities to reduce cost, improve reliability and secure additional revenue through on-site generation and dynamic load management (Arup and Siemens, 2016).

Two DES technologies reshaping the energy market in this way as are energy storage, and microgrids.

As the latter is significant to the provision of sustainable infrastructure, this is addressed in more detail below.

Energy storage

To ensure all electricity grids maintain a stable and safe electricity supply, consumption has to be perfectly balanced with the generation of electricity. The development of energy storage can help address fluctuations in demand and generation by allowing excess electricity to be 'saved' for periods of higher electricity demand. In turn, energy storage technologies can contribute to better use of renewable energy in the electricity system, as renewable energy produced can be stored when conditions are optimal but demand may be low. Similarly, the right of consumers to produce and consume their own electricity may lead to an increase in demand for storage services and small-scale storage solutions

However, the European Commission has noted several factors slowing the development of energy storage technologies, such as administrative and regulatory barriers, limited access to grids, and excessive fees and charges. In February 2017, the European Commission published a Staff Working Document entitled 'Energy Storage – the role of electricity' which, among other things, discusses the current issues and possible policy approaches. For example, treatment of electricity storage is not consistent between EU member states and so in several countries storage facilities pay grid fees both as consumer and producer, despite being unable to provide a positive net flow of electricity, which is used to justify double network usage charges (Gissey, Dodds and Radcliffe, 2018). The UK regulatory system currently suffers from this approach, such that electricity storage falls into the classification of generation under UK legislation and, therefore, requires a generation licence, and risks liability of being double-charged. Ofgem has acknowledged the unsatisfactory and obstructing nature of this designation and has recently prepared a report proposing clarifications to current regulation, in particular amending the existing electricity generation licence as follows:

- including new definitions of electricity storage in the generation licence:

  Electricity Storage in the electricity system is the conversion of electrical energy into a form of energy which can be stored, the storing of that energy, and the subsequent reconversion of that energy back into electrical energy.

  and

  Electricity Storage Facility in the electricity system means a facility where Electricity Storage occurs.

- introducing new licence conditions for electricity storage providers, such that licensees should ensure that they do not have self-consumption as the primary function when operating its storage facility;
- clarifying expectations and standards of compliance for storage and expecting storage providers to sign up to relevant industry codes; and
- noting that storage providers will not be subject to payment of final consumption levies.

It is understood that Ofgem has proposed that these amendments would be implemented in the latter half of 2018. However, at the time of writing there has been no announcement of such a change, although a statutory consultation was completed in July 2019. Nonetheless, as in July 2018 the UK's largest battery storage facility – the 49.9MW Pelham project – was built.

There has been further excitement regarding DES technologies in the UK. In March 2018 Abu Dhabi energy company Masdar and Norwegian multinational Equinor (formerly Statoil) unveiled the world's first energy storage battery connected to a floating windfarm in Scotland. Deployed at an onshore substation, the battery system known as Batwind has a storage capacity of 1.2MW and is aimed to mitigate peaks and troughs in electricity production. This combination of battery storage and microgrid technology is a prime example of innovative technologies creating a dynamic market; however, these technologies are equally significant in providing sustainable infrastructure.

Disruptive sustainable infrastructure technologies

Microgrids

Taking the US as an example, the majority of its current electrical grid is outdated and in constant need of repair, such that a combination of maintenance and power outages costs the US economy (and treasury) billions of dollars in losses (Arshavsky, 2017). This is illustrated by the fact that the US averages 360 minutes of outages each year, compared to 15 minutes in Germany and 11 in Japan (G Bakke, 2016). Coupling this with recent disastrous natural disasters in the US, such as the three successive hurricanes in the Gulf of Mexico and southern US in 2017, the usefulness and sustainability of microgrids is becoming increasingly apparent (Metelitsa, 2017). Many point to the following definition from the US Department of Energy as a commonly understood and easily digestible description of microgrids:

> *[A] group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that act as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both a grid-connected or island mode.*

Navigant Research, which has tracked the development of microgrids across the globe, suggests the US and Asia have similar capacity for operating, developing and proposed microgrids – each with 42 per cent of the market, with Europe on 11 per cent, Latin America on 4 per cent, and the Middle East and Africa currently sharing only 1 per cent (Hirch et al, 2018). African countries have been relatively slow to adopt the technology, however, Nigeria's Rural Electrification Agency announced plans to develop 10,000 microgrids by 2020 to meet its universal electrification ambitions, to be secured by a US$350 million loan from the World Bank (ClimateScope, 2017). Leading market players in microgrid technologies, such as Siemens, are paving the way in implementing innovative microgrid solutions. The WFER summit identified the following projects as recent leading examples in this sector:

- provision of stable energy supply for an off-grid island, Ventotene, in Italy;
- installation of a low-carbon based microgrid in Blue Lake, Rancheria, California, with the capacity to island and supply uninterrupted electric power for seven days during an outage – enough to power a Red Cross shelter during an emergency;
- operation of a self-sufficient island grid in Wildpoldsried, Germany, disconnected from the main grid, while using a hybrid structure of wind turbines and photovoltaic systems and battery storage systems; and
- developing a state-of-the-art dynamic combustion chamber with an energy back-up and integrated data network for the Minera Buenavista del Cobre, Mexico.

However, in a similar way to the regulatory treatment of battery storage, Hirch et al (2018) argues that a clear legal identity for microgrids is needed to achieve the regulatory certainty required to make microgrid projects 'bankable', otherwise the potential costs are too high and benefits too uncertain to justify investing time and money. Pointing to the US as its example, Hirch et al (2018) warns that state utility regulatory agencies may treat microgrid services as utilities, such that they can regulate the rates charged for utilities and decide whether to approve facility construction. On the other hand, should microgrids qualify as a distribution utility, it may inadvertently take on an obligation to service retail customers at request. Both of these designations pose significant implications for microgrid developers, owners and investors.

Elsewhere in the world, some countries are adopting more flexible approaches to their regulatory framework. For example, Tanzania has completely deregulated small-scale energy projects below 100kW, and microgrids with a capacity of less than 1MW do not need to apply for a generation licence, thereby promoting innovative technologies and lowering administrative costs (REN21, 2017).

Security of supply

Returning to the US and its grid sustainability, the North American Electric Corporation (NERC) and its parent regulator, the Federal Energy Regulatory Commission (FERC), have identified several areas subject to regulatory improvement (Deloitte Center for Regulatory Strategy, 2017) including:

- initiating FERC audits of compliance by entities subject to NERC critical infrastructure protection (such as cybersecurity) regulations;
- adopting supply chain standards and implementation plans to ensure that, prior to integrating with the utility environment, energy companies adequately secure their supply chain to risks associated with activities involving third parties; and
- working with the Institute of Electrical and Electronics Engineers, Power and Energy Society to undertake a reliability assessment of renewables.

In particular, the report produced by the Deloitte Center for Regulatory Strategy (2017) points to a prevailing focus on cybersecurity regulations with respect to data protection, cloud services and third-party supply chain compliance. Indeed, cybersecurity standards pose a particular problem for the US owing to its state and federal framework (the former retaining much more authority and jurisdiction than the latter). In the context of developing a smart grid in the US, the current state and federal balance risks disruption as there is increased support for expansion of federally set cybersecurity standards to protect against potential vulnerability caused by variable locally set standards (Anderson, 2018).

With the implementation of the General Data Protection Regulation (GDPR) in 2018 and the Network and Information Systems Directive (NIS) in 2016, it is clear data protection and cybersecurity standards are live issues across the pond. However, the GDPR and NIS are viewed by many as simply baselines for data protection and cybersecurity. Illustrating that this is only the start of regulatory developments in the sector, the Energy Expert Cyber Security Platform (EECSP) was given a mandate by the European Commission to scrutinise existing regulation and address any issues in need of strengthening. The EECSP report (2017) identified 39 gaps in existing legislation and identified several areas for regulatory improvement:

- develop a formalised and effective threat and risk management system in all subsectors of the energy industry;
- establish an effective cyber response framework that facilities a fast and coherent response in case of an emergency linked to cybersecurity;
- continuously improve cyber resilience in the energy sector by establishing a European cybersecurity maturity framework specific to the energy sector; and
- build up adequate capacity and competences in cybersecurity in the energy sector to address a lack of specialised resources and skills (technical and human) in the cybersecurity space.

Conclusion

Clearly, the significant changes arising from the decarbonisation of energy, the new empowerment of consumers, the ever-increasing dynamism of energy markets and the deployment of disruptive sustainable infrastructure technologies are all challenging the regulatory status quo and regulators will need to continue to respond to address the practical impacts of the fast-evolving global energy markets.

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