

THE DIGITAL FUTURE OF ELECTRICITY NETWORKS

DNOs are scaling up investment in digitalisation at the next GB price control

2021

THE DIGITAL FUTURE OF ELECTRICITY NETWORKS

DNOs are scaling up investment in digitalisation at the next GB price control

CONTEXT

Great Britain's electricity distribution network operators (DNOs) recently submitted their draft business plans to the sector's regulator, Ofgem, setting out the investments they intend to make over the next price control period (RIIO-ED2). Running from 2023 to 2028, RIIO-ED2 will be critical for the decarbonisation of the energy system as the UK government charts a path towards its goal of net zero emissions by 2050. Effective digitalisation of electricity networks will have an important role to play in enabling this transition with Ofgem expecting meaningful progress to be made in the course of RIIO-ED2.¹ The draft business plans illustrate the scale and direction of investment that will occur at the DNO level, and offer a window into the digital future of electricity networks.

WHAT IS DIGITALISATION?

Digitalisation is a broad, sometimes nebulous term. It is often used to refer to the increased use of digital technology in the operations of an organisation or sector.

In July this year the UK government released its Energy Digitalisation Strategy, which defined the term as "the transformation of a business or industry by using digital technologies to improve its processes".² As part of the RIIO-ED2 methodology development process, Ofgem defined digitalisation

¹ The Government's Energy Data Taskforce (EDTF) recommended that Ofgem should ensure that all network companies undergo effective digitalisation, which both Ofgem and network companies agreed to support as part of the development of the RIIO-ED2 methodology. See p.47 here: https://www.ofgem.gov.uk/sites/default/files/docs/2020/07/ed2_ssmc_overview.pdf

² BEIS. Digitalising our energy system for net zero. Strategy and Action Plan 2021. July 2021. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1004011/energy-digitalisation-strategy.pdf

as “making better use of energy system data and digital technologies to generate value for consumers and stakeholders”; and energy system data as “facts and statistics ... that describe the energy system (current, historic and forecast), including: the presence and state of infrastructure, its operation, associated market agreements and their operations, policy and regulation.”³

Ofgem’s guidance and the draft business plans submitted by DNOs help further clarify what digitalisation means in the context of energy networks. It refers broadly to the deployment of digital capabilities, such as advanced data analytics, automation and artificial intelligence, as well as the installation of technologies and systems that support the monitoring and control of electricity distribution networks. Other key areas of DNO commitments, including helping connect low carbon technologies (or “LCTs”, most significantly, electric vehicles, heat pumps and distributed generation/storage), increasing use of flexibility, and enhanced data provision to customers and other stakeholders, all point towards the evolution of their role over and above ensuring sufficient pylons, cables and other pieces of physical infrastructure.

The combination of improved physical technology and enhanced data analytics can help DNOs to more accurately observe and manage power flows on their networks in a world where these are becoming increasingly complex alongside greater levels of LCTs connecting to the grid. This will help ensure that DNOs make more efficient investment decisions, both with respect to when and where investment is needed, and also when choosing between building more physical infrastructure or contracting with flexible generation/demand resources to help balance demand/supply on their networks.⁴ Equally, timely sharing of this information will be crucial to coordinate the wide range of actors (generators, suppliers, customers, local authorities, flexibility providers) taking on new roles in an increasingly decentralised energy system, ensuring better-informed decision making across the whole energy system.

DNOS ARE SCALING UP INVESTMENT IN DIGITALISATION

DNOs are proposing to increase investment in data and digital capabilities at RIIO-ED2. Northern Powergrid, for example, is planning to spend an annual average of £46.9m on data and digitalisation initiatives at ED2, compared with £36.9m at ED1.⁵ Scottish and Southern Electricity Networks is proposing to spend £400m on improving customer service and digitalising systems over ED2.⁶ This includes capital investment of £272m in its digital investment plan, compared with outlays on IT and operational technology (OT) of £214m over the eight years of ED1.⁷ Across the board DNOs are reporting substantial increases in IT and telecoms expenditure compared to ED1, a key cost category supporting digitalisation. A significant proportion of expenditure is intended to aid the transition to net zero. For example, all of

³ Ofgem. RIIO-ED2 Methodology Consultation: Overview. 1 October 2020. Available at: https://www.ofgem.gov.uk/sites/default/files/docs/2020/07/ed2_ssmc_overview.pdf

⁴ We wrote about the decision between investment in network infrastructure and flexibility in an earlier bulletin here: <https://www.frontier-economics.com/uk/en/news-and-articles/articles/article-i7714-building-electricity-networks-under-demand-uncertainty/>

⁵ Northern Powergrid. Our business plan for 2023-28: A draft for consultation. July 2021. Available at: https://ed2plan.northernpowergrid.com/sites/default/files/inline-files/Our_business_plan_for_2023_28_a_draft_for_consultation.pdf

⁶ SSE. SSEN Distribution publishes ambitious £4.1bn business plan. 1 July 2021. Available at: <https://www.sse.com/news-and-views/2021/07/ssen-distribution-publishes-ambitious-4-1bn-business-plan/>

⁷ SSEN. SSEN Distribution RIIO-ED2 Digital Investment Plan. July 2021. Available at: https://ssenfuture.co.uk/wp-content/uploads/2021/07/A_05_DigitalInvestmentPlan_MICROSITE_1.pdf

Northern Powergrid's investment in data and digitalisation above the ED1 average is earmarked to support the decarbonisation of the energy system.

WHY NOW?

Electricity networks have been pursuing digitalisation for some time. The current price control, RIIO-ED1, saw DNOs invest in smart grid technology to remotely monitor and control the network. DNOs also made progress towards making their data widely and more easily available through websites and self-service data portals.

However, the energy sector has lagged behind some others when it comes to digital transformation. A 2018 OECD study ranked electricity and gas in the bottom quartile of sectors for "digital intensity". Assessed on the basis of the technological components of digitalisation, this was intended to be a proxy for the pace of digital transformation.⁸

The slow progress may be in part due to the structure of the regulated energy networks sector. Historically, price control frameworks have remunerated networks for investing in conventional fixed assets. As natural monopolies, they have not necessarily faced the same competitive pressures to invest in digitalisation as some other sectors. Further, the uncertainty associated with both decarbonisation of the energy system and digital technology development has compounded the challenge of determining when and where to invest.

But this is changing, alongside a wider appreciation of what is driving the energy transition. Plus, there is a growing consensus around the end goal of achieving net zero emissions in the energy sector, even if the exact pathway remains uncertain. In a world where energy assets are increasingly widely distributed and intermittent renewable sources make up more of the energy mix, digitalisation is now broadly perceived as the third leg of the trifecta, alongside decentralisation and decarbonisation, required to ensure the effective management and reliability of a green energy system at optimal cost for consumers. There is growing consensus that achieving net zero will require a modern digital infrastructure that can cater to greater provision of reliable information across parties for effective whole system planning, operation and integration of technologies.

These are some of the motivations underlying Ofgem's decision to incentivise faster digitalisation of energy networks through the regulatory framework.⁹ At RIIO-ED2, DNOs will have to publish a Digitalisation Strategy and Action Plan, which must identify and respond to the data and digitalisation needs of the business and external stakeholders, both now and in the future. They must also comply with Ofgem's guidance on data best practices. Further, DNOs are required to set out how they will expand their capabilities and take on "distribution system operation" (DSO) functions, which largely revolve around better capture, management, analysis, use and sharing of data, and the facilitation of flexible solutions. This so-called DSO Strategy is subject to Stage 1 of Ofgem's Business Plan Incentive (BPI), which means

⁸ OECD. A taxonomy of digital intensive sectors. 15 June 2018. Available at : <https://www.oecd-ilibrary.org/docserver/f404736a-en.pdf?expires=1629908571&id=id&accname=guest&checksum=B2F62DAEB2A4CF0D5590EC2CE4BE6F31>

⁹ Ofgem. RIIO-ED2 Business Plan Guidance. 22 April 2021. Available at: https://www.ofgem.gov.uk/sites/default/files/docs/2021/04/riio-ed2_business_plan_guidance_-_april_2021.pdf

having an effective strategy is mandatory; network companies are subject to financial penalties if this requirement is not met.

Data and digitalisation are also a focus of the Strategic Innovation Fund (SIF), which Ofgem has established for RIIO-2. The SIF, which aims to find and fund projects that will accelerate the transition to net zero, expects to invest £450m from 2021-2026 (the duration of the transmission and gas distribution price control). Ofgem has signalled that it will extend the SIF to electricity distribution for RIIO-ED2.¹⁰

WHAT ARE THE CHALLENGES?

The sector will face a range of challenges as it moves towards a more digitalised energy system.

It is likely that companies will invest in digitalisation at different rates. They will be guided by what is optimal for their networks given, for example, the speed of uptake of LCTs in their region. This will have knock-on consequences for comparisons of efficiency between DNOs. Ofgem will need to consider whether digitalisation laggards should be penalised if they are found to be less efficient; at the same time the regulator will want to guard against incentives for companies to over-invest. The challenge for the regulator will be to understand whether and how investments in digitalisation will generate tangible benefits to customers, as opposed to being white elephants.

The sector will also face the challenge of striking the right balance between innovation and standardisation. This will require having the incentives in place to encourage innovation while ensuring a degree of coordination and interoperability across the sector to drive whole systems efficiencies. Elements of this approach can be seen in Ofgem's SIF where data and digitalisation projects funded under the first round are required to include a lead network and a partner network that hold different categories of licences (e.g. transmission, distribution) to ensure interoperability. Standardisation is also being driven by the Energy Networks Association's Open Networks programme that has seen the nine electricity grid operators in the UK and Ireland working together to align processes in key areas pertaining to the DSO transition, many of which are linked to digitalisation.

The UK government's Green Jobs Taskforce has identified digital and data skills as critical for achieving net zero. Energy networks will need to invest in recruitment and skills training. Given the scale of investment required, skills shortages may emerge, leading to cost pressures in the short term. Energy networks will face competition from within the sector and beyond for workers with the requisite digital skills, who may be in acutely short supply in some local job markets.

Moreover, cyber security will continue to grow in importance as the energy system comes to rely more on digital technologies. The expanding web of digital devices and platforms creates vulnerabilities. Further, the data held and used by networks will become more granular and increasingly subject to data privacy concerns. Networks will need to have robust policies, processes and controls in place, and make sure that systems and applications are designed with cyber security and data privacy in mind.

Finally, network companies will need to ensure that all customers are included in the digital transition and that those who are either not engaged with the sector or who lack digital skills are not left behind. Here

¹⁰ Ofgem. RIIO-ED2 Methodology Decision: Overview. 17 December 2020. Available at: https://www.ofgem.gov.uk/sites/default/files/docs/2020/12/ed2_ssmd_overview.pdf, paragraph 4.86.

technology may yet again offer solutions. For example, Northern Powergrid is creating a fully digitised one-stop app which will give vulnerable customers more choice in how they engage with their DNO and make it easier and quicker to contact them.

WHAT ARE THE BENEFITS?

If the sector is able to overcome these challenges, digitalisation promises to deliver tangible benefits to customers and wider society.

Through improved monitoring and control of the network, digitalisation will contribute to better coordination, planning and optimisation of network infrastructure, which will help to deliver efficient decarbonisation. Digitalisation can support the integration and management of large volumes of distributed renewable energy resources (such as solar and wind) and other LCTs, and by enabling a smarter and more flexible system, can bolster security of supply as we transition towards a greater mix of renewables in the energy system. Enhanced data and analytics can enable more efficient use of existing assets, for example by identifying pockets of available capacity on the network; and by maximising both network and customer flexibility they can help offset the need for conventional network reinforcement. Improved visibility from greater data openness can help steer investment into optimal technologies and locations, saving money for customers while cutting greenhouse gas emissions on the path to net zero.

AUTHORS

FREYA MCCORMICK

Consultant

ABBAS HUSSAIN

Manager

WANT TO KNOW MORE?

WWW.FRONTIER-ECONOMICS.COM

HELLO@FRONTIER-ECONOMICS.COM

+44 (0) 207 031 7000