



Department for
Energy Security
& Net Zero

Government response to the energy system 'digital spine' feasibility study

Launching a data sharing infrastructure in the energy sector

August 2024



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Executive Summary

Data and digitalisation will play a critical role in decarbonising the power sector by 2030. A decarbonised, flexible, and secure energy system needs to be managed in a modern, dynamic and accurate manner. Overall, our energy system will become more distributed, with more sites of renewable, intermittent generation across the country. Today, consumers and businesses are increasingly able to use electricity when it is cheaper, greener or both. Making the right decisions on new infrastructure, balancing generation with flexible demand, and managing a complex energy system will require access to trusted data, and new digital infrastructure. The government will ensure the necessary digital capabilities are in place to achieve our 2030 clean power and energy security objectives.

In January 2022, the Energy Digitalisation Taskforce published a report¹ with several recommendations for the government, Ofgem and industry to accelerate the digitalisation of the energy system. This included the concept of a ‘digital spine’ for the system, a thin layer of digital functions that allow for swift, secure sharing of energy data. Alongside this government response we are publishing a feasibility study for an energy system ‘digital spine’,² otherwise known as a data sharing infrastructure. The Digital Spine feasibility study was funded by the Net Zero Innovation Portfolio (NZIP),³ and has been undertaken by a consortium of Ove Arup, Energy Systems Catapult, and the University of Bath. It encompasses a blueprint for a minimum set of responsibilities, functions, processes and governance for secure, interoperable data sharing across the energy system.

The study describes the various challenges in the current energy sector that could be addressed by a data sharing infrastructure. These include poor data interoperability, a lack of common data sharing practices and largely disconnected approaches to development of digital energy infrastructure. The study states that further action is needed, and recommends building a minimum viable product, launching a task group, and government publishing a decision on next steps.

The government believes that the feasibility study represents a positive contribution to the digitalisation of the energy system and the decarbonisation of the power sector. We agree that a data sharing infrastructure would bring significant benefits to the energy sector but recognise that delivering it will require industry collaboration to address technical and cultural challenges. We believe the recommendations made in the feasibility study are sensible foundations on which new digital energy infrastructure can be built.

The Electricity System Operator (ESO) is well-placed to launch technical development of a data sharing infrastructure over the next two years. Government also expects to work with Ofgem on the development of governance options for the data sharing infrastructure. We will scrutinise progress in this space and expect to publish a progress update in 2025.

¹ [Energy Digitalisation Taskforce report](#), Energy Systems Catapult, January 2022

² [Digital spine feasibility study](#), GOV.UK, 19 August 2024

³ [Net Zero Innovation Portfolio \(NZIP\)](#), GOV.UK

Part 1: Policy context to the feasibility study

Data sharing is crucial for decarbonising the power sector while maintaining energy security and minimising costs to consumers. Since the publication of the Energy Digitalisation Taskforce report in 2022 there have been positive developments in the sector, with the energy regulator having been at the forefront of driving the change. Ofgem's Data Best Practice Guidance⁴ is clarifying how regulated companies should share data, and what data they should share. Ofgem's decision on its Future System and Network Regulation consultation⁵ described the need to establish an energy system data sharing infrastructure (or a 'digital spine') over the coming years, and its recent data sharing infrastructure consultation⁶ sets out governance options for taking work forward.

Our energy system is becoming more complex. More of our energy is being generated from multiple renewable sources, and at different times and locations - when the sun is shining, or when the wind is blowing. This is increasing the demands on our electricity networks, which need to grow and evolve to ensure that decarbonised energy is delivered by an effective, modernised grid.

At the demand side, there are new opportunities and market participants emerging. The uptake of smart and advanced meters, smart appliances, and time of use tariffs will make it easier for consumers and businesses to use energy when it is cheaper, greener or both. In turn, new flexibility offerings from demand side response service providers and energy suppliers are emerging, driving further innovation and providing services to those responsible for balancing the system.

As a result of these changes to generation and demand, system-wide coordination is increasingly challenging. The UK's energy security will depend on organisations having the right information available at the right time. Those responsible for operating and maintaining the energy system need accurate, timely information to ensure that the country's energy needs are fulfilled. Investment decisions in our energy network infrastructure will need to be data-led, to minimise any costs passed onto UK citizens. Renewable generation and flexible demand will need to be balanced through second-by-second decision making.

Without secure system-wide access to data, the UK's ability to decarbonise the power sector by 2030 is at risk. A revolution in the way that the energy sector shares information needs to take place. Exchanges of data must be dynamic, accurate, and appropriately secure. Getting this right for the UK will be challenging, and will require technical, security, governance, and regulatory compliance considerations. People are crucial to this too – how we interact with data and digital technologies will require new processes and organisational structures. Furthermore,

⁴ [Decision on updates to Data Best Practice Guidance and Digitalisation Strategy and Action Plan Guidance](#), OFGEM, August 2023

⁵ [Decision on frameworks for future systems and network regulation](#), OFGEM, October 2023

⁶ [Governance of the Data Sharing Infrastructure](#), OFGEM, July 2024

the energy sector is not the only sector digitalising, and it is becoming more intertwined with other sectors. Impacts across the UK economy must be understood and accounted for.

The UK is well placed to tackle these challenges. Today, the government, Ofgem and industry have a sharper vision of a digitalised, decarbonised energy system. For example, there are standards and regulatory frameworks that encourage best practice for datasets and open data approaches, with Ofgem driving positive behaviours through digitalisation licence conditions and Data Best Practice Guidance. There is growing momentum from Ofgem and industry activities on improving the visibility of assets⁷ across the system, but common, comprehensive approaches have not yet been established. Work to determine the functions and responsibilities necessary to establish the right governance models for data sharing is underway,⁸ but there is much more to do.

The ability of energy organisations to share quality data at pace is improving, and the UK is positioned well to be a global leader for digitalisation of the energy sector. However, the Digital Spine feasibility study, published alongside this document and described in the next section, provides evidence that achieving the vision of energy system-wide digitalisation will require further concerted effort.

As the energy sector evolves, the government and Ofgem need to establish how to encourage the sector-wide collaboration needed to deliver data sharing and digitalisation. Our energy security and our contribution to global decarbonisation depends on it. This response describes the contribution of the Digital Spine feasibility study, the government's view of the study, and next steps in the energy sector.

⁷ [Automatic Asset Registration Innovation Programme](#) GOV.UK, April 2022

⁸ [Decision on frameworks for future systems and network regulation](#), OFGEM, October 2023

Part 2: The feasibility study

An energy system ‘digital spine’

The energy system ‘digital spine’ concept was first put forward by the Energy Digitalisation Taskforce (EDiT) in January 2022.⁹ A consortium of Arup, Energy Systems Catapult and the University of Bath was then commissioned by government to deliver a Digital Spine feasibility study, funded by the Net Zero Innovation Portfolio (NZIP).

A ‘digital spine’ is a data sharing infrastructure: a minimum set of responsibilities, governance, functions and processes for secure, interoperable data sharing across the energy system. The consortium investigated market need, potential scope, architecture and delivery options for a data sharing infrastructure, and made recommendations to progress further. We thank Arup, Energy Systems Catapult and the University of Bath for their expertise and passion in delivering the study. The work involved a huge amount of open, stakeholder engagement which we believe has had a positive impact on the sector. We thank all stakeholders for their contribution.

The feasibility study

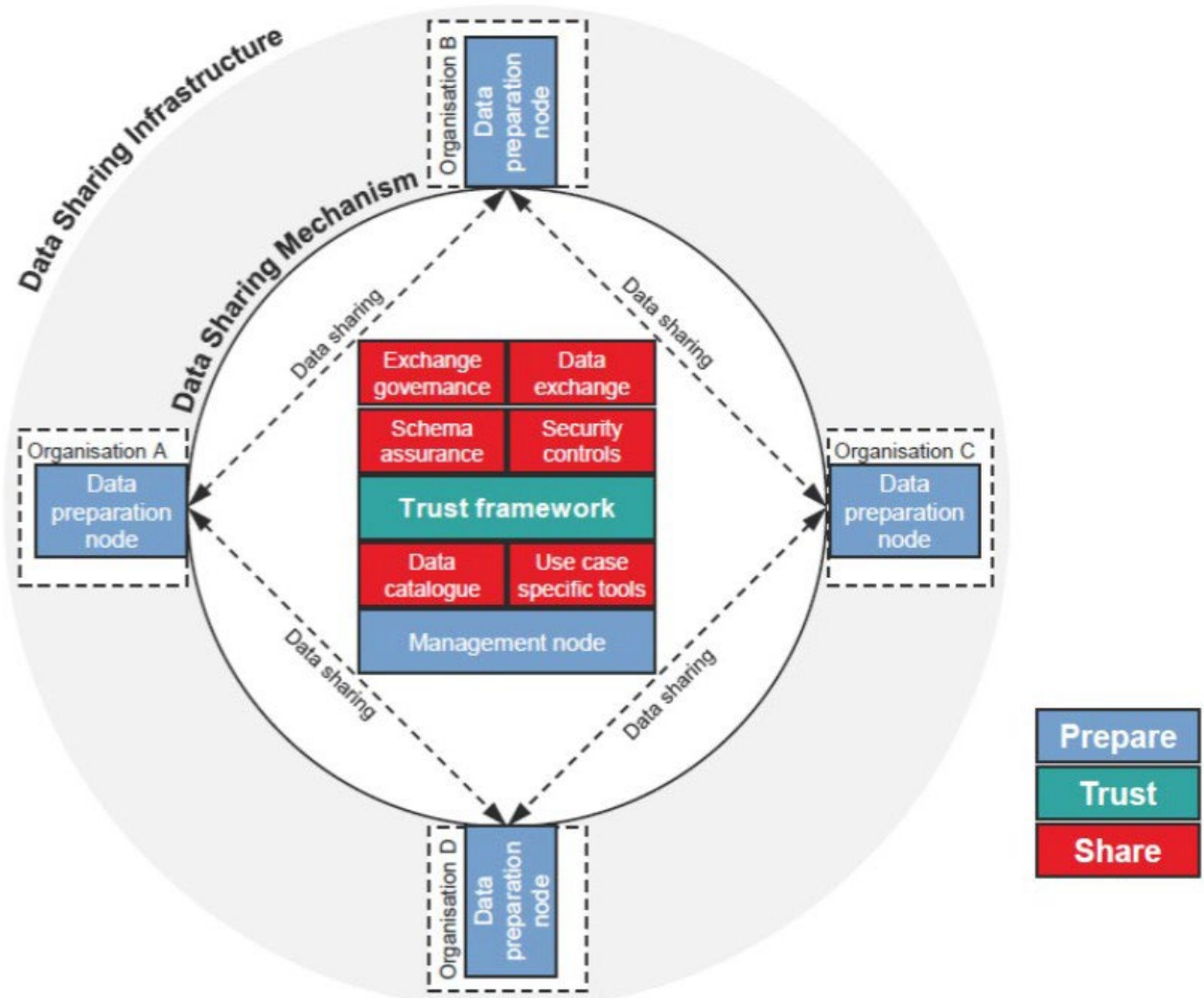
The consortium examined the various challenges the sector currently faces that could be addressed by a data sharing infrastructure. These include poor data interoperability, a lack of common data sharing practices and the largely disconnected approaches to development of digital energy infrastructure. The study stated that without further action, organisations will continue to build solutions to data and digital problems without broader interoperability in mind. There is a risk that siloed activities and duplication could compound inefficiencies, that later require costly retrofitting.

The study also included analysis of specific use cases where a ‘digital spine’ data sharing infrastructure could provide immediate and long-term benefits. Use cases explored in detail included those related to local area energy planning, identification of vulnerable consumers, electricity flexibility, electricity market reform and multi-vector energy systems (or ‘sector coupling’). The analysis included information on data needs, key users, and the functions of an effective data sharing infrastructure in these areas.

This informed a proposed architecture for a cross-sector data sharing infrastructure, the ‘Prepare, Trust, Share’ model summarised in Figure 1 below. The study explored delivery and governance options for the various components of the architecture, as well as considerations around costs. Finally, the consortium put forward recommendations for next steps.

⁹ [Delivering a digitalised energy system](#), Energy Systems Catapult, January 2022

Figure 1: diagram representing the Prepare, Trust, Share model as described in the Digital Spine feasibility study



The government's view

The feasibility study represents a positive contribution to the vision of a digitalised energy system. The objective of funding the study was to provide information for the government to support policy development and determine the feasibility of an energy system data sharing infrastructure. We believe it has achieved these objectives.

In terms of the delivery of the work, the open approach to stakeholder engagement throughout the six-month period prompted a lot of activity beyond the study itself. It drove networking and collaboration that has led to new projects, and has raised the profile of energy digitalisation across the public and private sector. We are pleased that the funding has delivered more value than the feasibility study alone.

In terms of the content of the study, it provides a foundation on which to explore the functions, characteristics and delivery models for a 'digital spine' data sharing infrastructure. It sets out a strong case that further actions from the government, Ofgem and industry are needed to improve data sharing in the energy sector. Further, it describes the crucial role of data and technology as an enabler for a decarbonised power sector. It identifies the benefits that better

data sharing can bring when applied to specific use cases, and the functions needed to enable that data sharing. We believe that for some use cases, developing the technical and organisational functions can begin now. Part 3 of this response sets out how that work should move forward.

The study sets a considerable challenge around the long-term functions, governance and delivery model needed to deliver a scalable, system-wide data sharing infrastructure. As the applications of a data sharing infrastructure become more complex, further detail on architectures, functions, governance options and costs will be necessary for the government to decide on the enduring approach. Furthermore, any data sharing infrastructure in the energy sector must be built with security as a core pillar, with risks and impacts understood in detail, and appropriate mitigations designed in from the start. Part 3 of this response describes how we intend to build the evidence base in these areas.

We also recognise that broader changes across the energy system will have an impact on the future data sharing functions necessary. Certain use cases explored in the Digital Spine feasibility study, such as electricity market reform and sector coupling, require fundamental decisions and changes to take place before data sharing infrastructure governance questions can be answered. Key institutions, new regulations and legislation, are not yet established or matured. What is more, many data and digitalisation applications and opportunities may not even be envisaged yet. As such we will not decide on enduring approaches at this time, but set out next steps in Part 3 of this response to reduce that uncertainty.

There are opportunities to act now to build on the conclusions of the study. The long-term development journey of delivering a data sharing infrastructure will be built on some key foundational activities, which should be launched immediately.

Part 3: Responses to the feasibility study's recommendations

The study includes three recommendations to progress work on a data sharing infrastructure, which we respond to below with six commitments from government, Ofgem and ESO.

Recommendation 1: Develop a minimum viable product (MVP)

The government agrees that developing the technical functionalities of a data sharing infrastructure for a small number of focussed, achievable use cases to deliver early learnings and benefits should be prioritised. The study has provided the government with confidence of feasibility, but until an MVP infrastructure is launched and delivering benefits for a tangible use case it will remain abstract to most stakeholders.

The ESO's Virtual Energy System¹⁰ is a leading area of work in this space. Launched in 2021, the project has been focussed on the development of a common mechanism needed for data sharing, described as 'an ecosystem of digital twins'. More recently, the ESO delivered technical alignment work¹¹ in collaboration with the government's National Digital Twin Programme (NDTP).¹²

NDTP is working on development of a sector-agnostic, open source, distributed data sharing infrastructure, called the Integration Architecture (IA). The IA combines technology and policy to enable trusted, secure, resilient sharing of interoperable information. It is functionally similar to the 'Prepare' component of the 'Prepare, Trust, Share' architecture put forward in the Digital Spine feasibility study. It is being built to be realistically deployable and useable by all organisations, irrespective of size, with low barriers to adoption to minimise disruption.

We support the continued collaboration of these projects. We believe that the initial work should be focussed on areas that contribute to strategic priorities, particularly as ESO transitions into the National Energy System Operator (NESO).¹³ We expect the ESO to take forward initial development of a data sharing infrastructure, first through a pilot, and then through the development of a minimum viable product. Strategic planning is a high priority item for the government, to ensure that networks and systems are in place to transfer energy from new sources of renewable generation. We expect to see this area prioritised. Additionally,

¹⁰ [Virtual Energy System, powered by National Grid ESO](#), National Grid Energy System Operator, 2021

¹¹ [ESO and NDTP Memorandum of Understanding](#) National Grid ESO, 2024

¹² [National Digital Twin Programme](#) GOV.UK, 2023

¹³ The Energy Act 2023 took powers to establish a new, publicly owned Future System Operator, which will be known as the National Energy System Operator (NESO). NESO will be a trusted and expert body at the heart of the energy sector, with objectives to drive progress towards Net Zero while maintaining energy security and minimising costs for consumers. NESO will take on responsibilities across electricity, gas and hydrogen, including all the existing functions of the Electricity System Operator (ESO), so it is able to take an enhanced whole system approach to planning and operating the energy sector. We are aiming for NESO to be operational in 2024, subject to agreeing timelines with key parties.

Ofgem has confirmed in their data sharing infrastructure governance publication that they will support the ESO in this development.

Commitment 1: In 2024, the ESO (soon to be NESO) will deliver a pilot data sharing infrastructure based on an outage planning use case.¹⁴

Commitment 2: NESO will build on this in 2025, by delivering a minimum viable product of a data sharing infrastructure focussed on strategic planning.

A core characteristic of an energy system data sharing infrastructure is security. Appropriate risk management should be inherent to design principles of the infrastructure, and will inform approaches to data sharing and governance. The government, Ofgem and industry should collaborate on the approach from the start, to ensure that the security approach for the data sharing infrastructure is compliant with existing regulatory requirements and expectations. Any security framework should therefore be compatible with existing regulatory requirements in the sector, such as the National Cyber Security Centre (NCSC) Cyber Assessment Framework.

Commitment 3: The ESO (soon to be NESO) will seek advice and guidance from NCSC to support the development of a security framework for the data sharing infrastructure pilot and minimum viable product.

One characteristic of a potential data sharing infrastructure is that it is as ‘thin’ as possible, so that costs and potential barriers to organisations are minimised. As applications are investigated that involve a broad range of organisations, understanding the costs of integration will become more important. Furthermore, any decision-making from the government on governance and delivery approaches should be informed by quality evidence of costs and benefits. We expect that the commitments referenced in this response will provide that evidence.

Looking forward, we can see that a successful data sharing infrastructure should be adaptable and scalable, so that new applications can be explored. For example, evidence from the study, government’s existing innovation and policy activities, and other industry work indicate that dynamic data sharing will be a foundational aspect of a smart and flexible energy system. We do not intend to commit to further use cases until the evidence base has been bolstered, and that insights from the first phase of technical development are understood.

We recognise that there will be particular interest in use cases associated with flexibility, and we will gather information through the various other workstreams relevant in this space. We expect that evidence from various existing policy programmes, the government’s innovation projects¹⁵ and Ofgem’s forthcoming publications will bolster the rationale for policy positions in the next phase.

We can also see that there will likely be a role for new standards and common approaches to support a data sharing infrastructure. Across a wide range of potential use cases, it is

¹⁴ Outage planning relates to facilitating access to the network to carry out maintenance, add new infrastructure and make upgrades

¹⁵ [NZIP Flexibility Innovation Programme](#), GOV.UK, 2021

important that we have a strong understanding of the standards that could support a data sharing infrastructure in future, and identify if there are any areas where further development is needed.

Commitment 4: The government will procure work in 2024 to assess the landscape of data standards related to the use cases described in the Digital Spine feasibility study.

Recommendation 2: Establish a Task Group

We agree that an authorised industry group responsible for coordinating the development of a data sharing infrastructure could have an important role as the delivery model. A collaborative culture will be the first driver for successful uptake of a data sharing infrastructure, and this could be designed in from the start. A collective approach should be beneficial for accessing the funding and expertise necessary to accelerate development whilst a long-term governance solution is analysed, agreed and deployed.

Responsibilities of such a group could include developing detailed design work (described as ‘blueprints’ in the study) and testing against agreed use cases, scrutinising existing development, driving adoption of data sharing principles and processes, and making recommendations for governance approaches. We would also expect the group to monitor progress, and advise the government and Ofgem on industry impacts and adaptation to new policy approaches.

We recognise the importance and progress of existing groups in the sector. The Energy Network Association (ENA)’s Data and Digitalisation Steering Group is playing a fundamental role, working to align network companies in their practical application of digitalisation licence conditions and Ofgem’s Data Best Practice, and driving interoperability. Ofgem’s Digitalisation Technical Advisory Group launched in December 2023 and will play an important role as an advisory group to Ofgem. However, the ‘Task Group’ as described in the feasibility study would require a significant increase in scope and authority compared with these groups.

The feasibility study effectively describes the Task Group as an early form of governance for the delivery of a data sharing infrastructure. We recognise that establishing the enduring governance approach to delivering a data sharing infrastructure, and a strategic approach to delivering it, will require industry engagement and further research. Establishing the need, role, authority and funding of such a group should be done with this long-term governance strategy in mind, with a detailed understanding of the evidence, and with input from the industry itself.

For the ‘Build an MVP’ commitments mentioned previously we expect the ESO, or NESO when established, to work closely with Transmission Operators, Distribution Network Operators and other parties to ensure that the solutions are effective for all necessary parties. As such, any new group should focus primarily on the outage planning and strategic planning use cases, and then scaled up once new priority use cases are identified by the government, Ofgem and industry.

Ofgem published a consultation assessing governance options for a data sharing infrastructure in July 2024, which includes assessment of an authorised industry working group.

Commitment 5: In Winter 2024, Ofgem will publish a further consultation on data sharing infrastructure governance, setting out their view of an enduring governance structure.

Recommendation 3: Publish a decision

The development of a data sharing infrastructure across the energy sector is a multi-phase programme of work, requiring coordinated effort from the government, Ofgem, and industry. The steps set out in this response are only initial steps. The long-term delivery model will require detailed understanding of the different phases of implementation, associated governance approaches, regulatory and financial enablers, approaches for adoption, and the role of the government, Ofgem and industry throughout.

It will be crucial to provide clarity to industry as part of this journey, especially so that regulated entities can have increased confidence in investments ahead of the next price control periods. We agree that publishing proposals, decisions and clear plans throughout will be necessary. We will work closely with Ofgem on the outcomes on their consultation on data sharing infrastructure governance and funding mechanisms throughout 2024. We will use the evidence to examine how the existing regulatory framework can support the development and uptake of a successful data sharing infrastructure, and identify the need for new measures as necessary.

We will monitor the progress of these commitments throughout the next two years, and will ensure that the government, Ofgem and all organisations involved remain accountable for delivery. We recognise the need to be transparent to the sector about progress, how the work has contributed to the development of a data sharing infrastructure, and how it is driving the digitalisation as part of a decarbonised power sector.

Commitment 6: The government expects to publish a progress update against these commitments in 2025.

Summary of commitments

- 1:** In 2024, the ESO (soon to be NESO) will deliver a pilot data sharing infrastructure based on an outage planning use case.
- 2:** NESO will build on this in 2025, by delivering a minimum viable product of a data sharing infrastructure focussed on strategic planning.
- 3:** The ESO (soon to be NESO) will seek advice and guidance from the National Cyber Security Centre (NCSC) to support the development of a security framework for the data sharing infrastructure pilot and minimum viable product.
- 4:** The government will procure work in 2024 to assess the landscape of data standards related to the use cases described in the Digital Spine feasibility study.
- 5:** In Winter 2024, Ofgem will publish a further consultation on data sharing infrastructure governance, setting out their view of an enduring governance structure.
- 6:** The government expects to publish a progress update against these commitments in 2025.

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