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Energy Sector Digitalisation Plan

The digitalisation actions needed for Clean Power 2030

Iteration one (2025)

NESO National Energy System Operator

Contents

Glossary

API	Application Programming Interface
BSI	British Standards Institution
CPAP	Clean Power Action Plan
CLF	Consumer Led Flexibility
DCC	Data Communications Company
DESNZ	Department for Energy Security and Net Zero
DIP	Data Integration Platform
DNO	Distribution Network Operator
DSO	Distribution System Operator
DSR	Demand Side Response
DSRSP	Demand Side Response Service Provider
DSI	Data Sharing Infrastructure
ESA	Energy Smart Appliance
ETSI	European Telecommunications Standards Institute
FMAR	Flexibility Market Asset Registration
FSP	Flexibility Service Provider
HAN	Home Area Network
HEMS	Home Energy Management System
I&C	Industrial & Commercial
MHHS	Market-wide Half-Hourly Settlement
MVP	Minimum Viable Product
NCSC	National Cyber Security Centre
NESO	National Energy System Operator
OEM	Original Equipment Manufacturer
PAS	Publicly Available Specification
PQC	Post-Quantum Cryptography
PSTI	Product Security and Telecommunications Infrastructure (Act)
RECCo	Retail Energy Code Company
RIIO	Revenue = Incentives + Innovation + Outputs
SDR	Smart Data Repository
SGAM	Smart Grid Architecture Model
SSES	Smart Secure Electricity System
SMEDR	Smart Meter Energy Data Repository
SMETS	Smart Meter Equipment Technical Specifications
TSO	Transmission System Operator
WAN	Wide Area Network

Foreword

Shubhi Rajnish, Chief Information Officer

GB's energy system and the world's geopolitical landscape are going through a profound period of change. Decisions taken in the coming months and years will not only have significant implications on both the security and resilience of the energy system, but also how well Clean Power 2030 goals can be met.

To reach the milestone, GB needs robust digital infrastructure and seamless integration across systems, sectors and society. Without new and immediate action, the digital capabilities that underpin the clean power mission will not be achieved – keeping the benefits for consumers and the country out of reach.

To enable clean power, it is essential for the whole energy system to use advanced modelling, artificial intelligence, and understand other parts of the built environment, such as water and telecoms. These requirements demand a foundational digital energy system that supports the creation, processing, sharing, and interpretation of data with digitalised tooling and processes.

The Sector Digitalisation Plan is heavily informed from the expertise of the sector and details the digital capabilities and specific actions needed to deliver Clean Power 2030 and lay these foundations. Digitalisation underpins real-time system operability, enables the timely integration of low-carbon technologies, and creates the transparency and trust needed for consumer participation.

The steps to get to Clean Power 2030 must be guided by a long-term view, as GB needs an energy system that operates to benefit all and ensures readiness for 2050 and beyond. Success will depend on strong industry leadership, cross-sector collaboration, and sustained investment. By prioritising system integration and interoperability, as well as robust infrastructure, GB can unlock the full potential of digitalisation – delivering a cleaner, smarter, and more inclusive energy future for all.

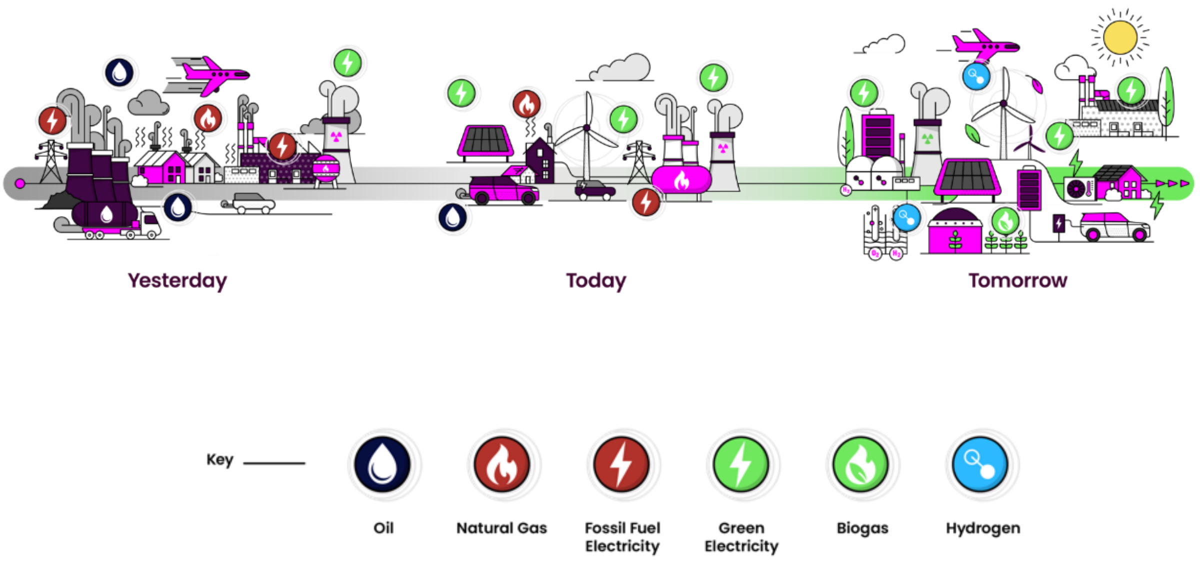

Figure 1 – The energy landscape

Acknowledgments

With thanks to the Department for Energy Security and Net Zero, Ofgem, and all industry partners and stakeholders for their active engagement and valuable contributions to the development of the Sector Digitalisation Plan. This collaboration is fundamental to not only shaping the plan but also making its delivery possible. It ensures that the digital transformation needed for a cleaner, more resilient energy system can be achieved at pace and scale.

Executive summary

The challenge

The journey to a clean, resilient and affordable energy system by 2030 is both ambitious and urgent – and impossible without digitalisation. But as digital technologies advance at pace and a host of independent, yet interconnected initiatives unfold, the complexity and momentum of change risks undermining progress. Clear coordination and a shared vision are needed from industry.

The Sector Digitalisation Plan

The Sector Digitalisation Plan is a response to this challenge. The plan brings together diverse perspectives and expertise from across the industry to review, consolidate and map current digitalisation efforts against future system needs. It identifies a clear set of deliverable, owner-assigned actions, needed to deliver Clean Power 2030. Gaps, where intervention is needed but ownership is yet to be established are also identified.

The plan is designed not only to address immediate priorities, but also to ensure the energy system remains resilient, efficient, and fit for purpose as we move towards 2050 and beyond. For this reason, the Sector Digitalisation Plan is an iterative document. Future iterations will incorporate ongoing sector feedback so that the plan evolves in line with technology, policy and system needs.

Focus areas and outcomes

To define future needs of the clean power system, six sector outcomes were identified by the Clean Power 2030 Action Plan. These are:

Consumer simplicity	
Consumer led flexibility	
Grid decarbonisation and security	
Networks, access and connections	
System operability	
Supply chain and workforce	

Digitalisation underpins each of these outcomes. As such, every action and gap in the Sector Digitalisation Plan is directly mapped to the clearest two key Clean Power 2030 outcomes. Together, they provide the practical steps required to build, deliver and coordinate the digital capabilities to make each possible.

Actions for the sector

Over the following pages are a table outlining all actions detailed in the Sector Digitalisation Plan alongside the two key outcomes from the Clean Power 2030 Action Plan that each most directly supports, as well as a summary roadmap detailing the timeframe.

Energy sector digitalisation requires close collaboration. As a result, the actions outlined are shared across multiple stakeholders – including the Retail Energy Code company (RECCo), the Department for Energy Security and Net Zero (DESNZ), the Data Communications Company (DCC), NESO and among other industry partners such as network licensees and Original Equipment Manufacturers (OEM's).

Action	Description	Outcomes
Action 1: Consumer consent design and implementation	RECCo to detail requirements and design for the consumer consent service and how it interfaces with other shared digital infrastructure by 2026	
Action 2: Continued operability	DESNZ to continue to work with DCC and wider industry to ensure that necessary smart metering capability will be in place as the industry transitions through mobile telecommunications technologies	
Action 3: Improved smart meter data access	Elexon, DESNZ, and RECCo to align smart meter access between the Smart Data Repository, Smart Meter Energy Data Repository and consumer consent solution by mid-2027	
Action 4: Network asset security	Networks to start developing organisational plans for the potential impact of quantum computing to existing cryptography and protect any relevant systems in line with NCSC guidance by 2028	
Action 5 Asset hardware security	DESNZ to work with industry to start developing plans for the potential impact of quantum computing to existing cryptography and protect any relevant systems in line with NCSC guidance by 2028	
Action 6: Smart device interoperability	Industry and DESNZ to agree device interoperability standards by January 2027 through existing workstreams	
Action 7: Register for asset information	Networks to implement an asset register that integrates with the Flexibility Market Asset Registration (FMAR) implementation by October 2027	
Action 8: Standardisation of market interfaces	The market facilitator to determine if early progress can be made on the creation of standards to accelerate development and deliver value for flexibility markets within 2026	
Action 9: Control room technology requirements	NESO to determine technology requirements to optimise large number of low carbon assets by mid 2028	
Action 10: Control room communications	NESO to work with Distribution System Operators (DSOs) on communication and coordination standards and data types by mid 2028	
Action 11: Requirements and DSI functionality	The Interim DSI Coordinator will, from its launch in 2026, capture and then prioritise user requirements in collaboration with its stakeholder advisory group with a priority given to supporting clean power outcomes	
Action 12: DSI operational requirements	NESO will determine a proposed service model for the DSI by the end of the MVP period (late 2026)	
Action 13: Data ontology	NESO to align its Data Sharing Infrastructure from 2027 to the emergent common ontology to ensure compliance, enabling harmonised, interoperable data to support Clean Power 2030	
Action 14: Alignment of trust framework(s)	DESNZ, Ofgem, NESO, RECCo to work together through 2025/6 to establish a view on how the various aspects to trust frameworks can be aligned.	
Action 15: Digital coordination role	NESO will undertake further work in early 2026 to help scope what a digital coordination role should achieve	
Action 16: Sector digitalisation plans	NESO to assume stewardship of the plan and establish a clear governance framework to guide future annual iterations	

Figure 2 – The Sector Digitalisation Plan Actions

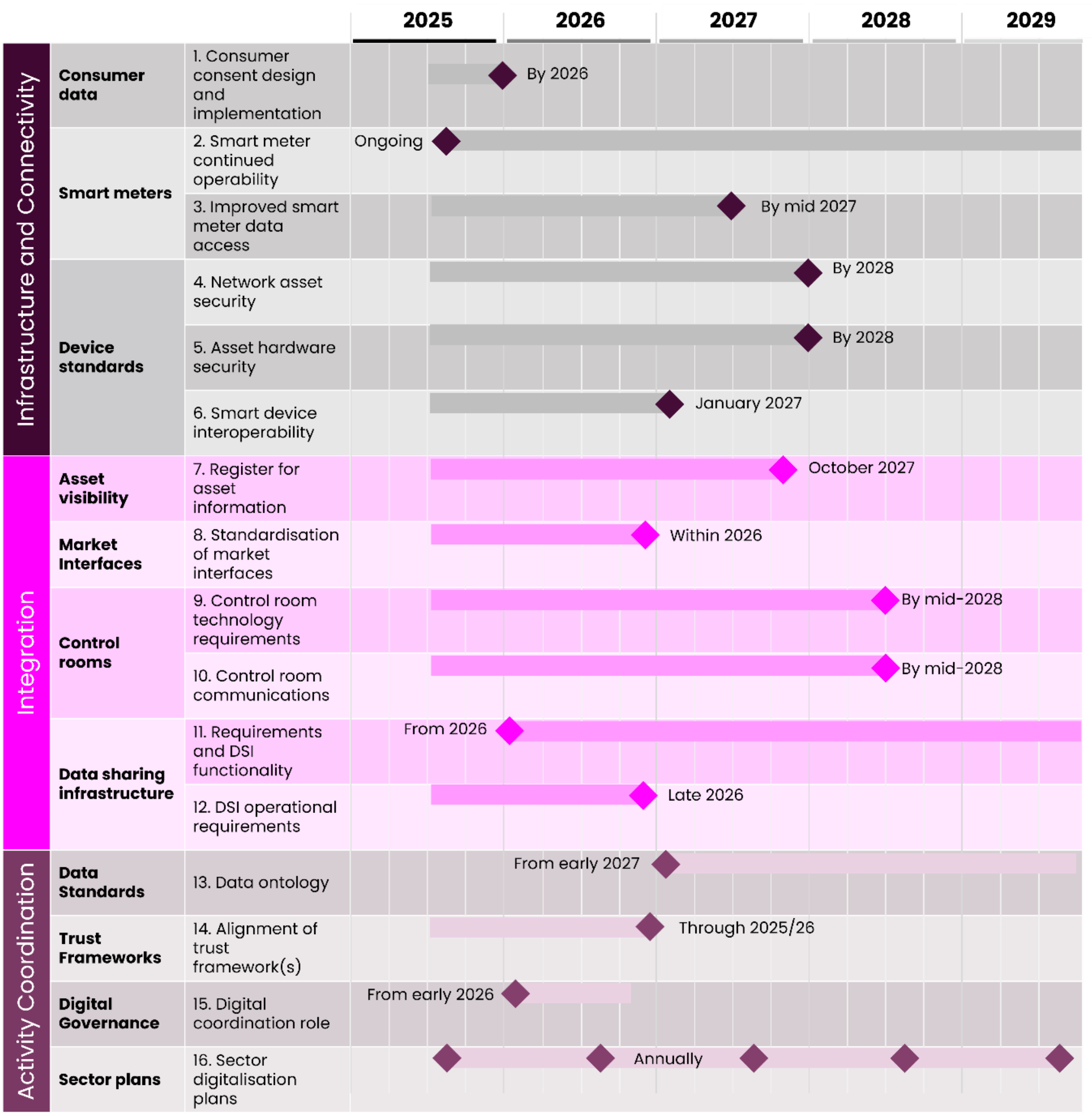

Figure 3 – The Sector Digitalisation Plan Actions as a roadmap

1. Introduction

The energy sector is entering a period of significant change. Clear coordination and a shared vision are crucial to enable progress in the face of accelerating digital technologies and a host of independent, yet interconnected initiatives[1].

To meet these challenges and to build on the work on digitalisation to date, NESO has worked collaboratively with industry to develop the Sector Digitalisation Plan. The plan brings together diverse perspectives and expertise from across the sector to review, consolidate and map current digitalisation efforts against future system needs. The plan outlines a clear set of SMART[2], owner-assigned actions. These actions have been identified as critical for delivery of Clean Power 2030 as well as for the challenges and opportunities that lie beyond.

This first iteration of the plan focuses on ensuring the clean power energy system is both deliverable and operable, in line with the Clean Power 2030 Action Plan. Future iterations will incorporate ongoing sector feedback, ensuring the Sector Digitalisation Plan remains relevant and actionable for all participants and energy vectors. By mapping ongoing developments, identifying gaps and tracking progress, the plan will help policy, regulation and technology move forward in step – in turn maintaining accountability and ensuring coordinated action. This ongoing approach will keep the UK energy system on track for 2030 and set strong foundations for meeting future challenges and opportunities.

Acting decisively on digitalisation is urgent and foundational. It will underpin the nation's transition to a clean, affordable energy future. By accelerating progress today, Great Britain will be well-placed to achieve its ambitions for 2030, 2050 and beyond.

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[1] Energy Geeks, Utility Week, Clean Power 2023 Does anyone know who is doing what?

[2] SMART is specific, measurable, achievable, relevant and time bound.

2. The case for sector digitalisation

2.1. Why is digitalisation essential?

Digitalisation is the act of using digital technologies to change the way a system operates, with the goal of increasing efficiency, supporting decision making and unlocking new value and opportunities.

As the country moves to a cleaner, more decentralised power system, the energy sector faces greater complexity and urgency than ever before. Digitalisation is no longer just a helpful addition – it is now essential for delivering the Clean Power 2030 vision and for laying the foundations for a resilient, decarbonised energy system to 2050 and beyond. Moving to a decentralised, low-carbon generation mix with greater consumer-led flexibility makes the system much more complex to operate.

In this environment, digital technologies and high-quality data are vital for real-time coordination across generation, networks, storage and consumers. Digitalisation is also vital to changing processes. Using digitalisation across these enables efficient system operation, better-informed investment and planning decisions, and smarter, fairer consumer tariffs.

Digitalisation is essential for dynamically balancing supply and demand, enabling the sector to minimise inefficiencies and manage costs effectively. By optimising how assets are used and automating processes, digitalisation allows the sector to deliver more value with fewer resources. At the same time, it supports the development of simpler, fairer consumer tariffs and enables consumers to participate more easily in the energy system through consumer led flexibility.

The need for digitalisation is clearly evidenced in NESO's own Clean Power Implementation Plan[3] which identifies digitalisation and innovation as key enablers for all the plan's focus delivery areas. The plan states "digital and data underpins everything in our implementation plan for Clean Power 2030". With this, NESO recognises the importance of ensuring that its operations, processes and systems are prepared for the drive to clean power.

The benefits of digitalisation are already clear. For example, digital transformation can reduce utility operating costs by up to 25%.[4] Predictive maintenance using artificial intelligence (AI), and Internet of Things (IoT) technologies could deliver savings of around £5.5 billion by 2030 across the UK economy,[5] while enhanced flexibility through digitalisation may lower overall GB system costs by as much as £10 billion a year by 2050.[6] These figures show not only the scale of opportunity, but also the real and quantified financial benefits that digitalisation is already delivering – reinforcing the case for continued investment and coordinated action.

International approaches

Other nations are responding to the complexities of a decentralised, low carbon energy system by embracing digital solutions at scale. In Australia, the rapid growth of rooftop solar systems led to grid instability and operational challenges, as system operators lacked real-time visibility and control over the distributed assets. Only through significant investment in advanced digital grid management – such as real-time monitoring and automated controls – was Australia able to restore stability and unlock greater value for consumers.[7] As the UK government's Solar Roadmap[8] aims to more than double solar capacity by 2030, this international lesson is directly relevant: building the necessary digital infrastructure is essential to ensure the connection, management, and maximised value of new solar capacity, while keeping the energy system reliable and efficient for consumers.

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[3] NESO, Clean Power 2030: Our Next Steps

[4] McKinsey & Company. *Accelerating digital transformations: A playbook for utilities.*

[5] Baringa. *Digitising the energy system: A pathway to net zero and economic growth.*

[6] Parliamentary Office of Science and Technology (POST). (2021). *Energy Sector Digitalisation*

[7] Australian Energy Market Operator (AEMO). *Managing Distributed Energy Resources in Operations*

[8] Department for Energy Security and Net Zero (DESNZ). *UK Solar Roadmap 2025*

Similarly, India is developing a national digital backbone, the India Energy Stack,[9] to manage the increasing complexity from renewables, electric vehicles and active consumer participation. This digital infrastructure is seen as vital for ensuring reliable operation, efficient planning and consumer empowerment.

2.2. What does digitalisation enable?

Digitalisation is not an end in itself; its purpose is to enable real improvements for the energy system, its users and its consumers. Below are the six sector outcomes described in the Clean Power Action Plan which underpin Clean Power 2030. Digitalisation is essential for each outcome. This section describes the changes required for each, alongside the role of digital technologies in addressing challenges and the risk of inaction. These outcomes directly shape the scope of the Sector Digitalisation Plan – every action in the plan is mapped to supporting two of these outcomes.

Consumer simplicity

The energy system is becoming increasingly complex. By 2030 residential consumers will face a complex home environment where 1 in 4 will have an electric vehicle, millions will have heat pumps, and rooftop solar panels and home battery storage will be part of daily life. Home devices will be increasingly smart, and suppliers will offer flexible tariffs to reduce bills in return for time of day adjusted consumption, for example with vehicle to grid technologies. Industrial and commercial consumers will see similar changes, but with added opportunities such as on-site generation and microgrids where they are likely to integrate local renewable generation and storage.

With accessible, intuitive digital solutions, managing these new assets will be simpler and easier for households and businesses and will enable

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[9] FSR GLOBAL. *Ministry of Power conceives an 'India Energy Stack' to build the Digital Backbone for the India's Power Sector*

flexibility at a GB system level. This will increase GB's ability to decarbonise and it must be designed around the customer journey.

Customer simplicity requires:

- **Digital inclusion:** Solutions must be accessible and based on customer needs, ensuring no household or commercial customer is left behind as the system evolves. This necessitates improved customer support, as well as customer trust in coordination and policy decisions.
- **Trusted, secure data sharing:** By 2030, over 27 million homes must have smart meters, supported by clear consent controls and privacy safeguards. These measures build consumer confidence and make participation in the energy system easy. It necessitates continued smart meter rollout, as well as continued operability and communicability – with clear customer control over how the data is used.
- **Reduced complexity:** Where consumers engage with the sector, that complexity should be minimised for them and expressed in a way that helps inform their decisions in a way that is relevant to them.

Digitalisation focused on customer simplicity will make new technologies easy to use, encourage rapid adoption, and help close inequalities, thereby supporting a smooth and inclusive pathway to Clean Power 2030.

Consumer led flexibility

Consumer led flexibility[10] will be a fundamental part of the future energy system. It will enable consumers to adjust their energy use in response to system needs and price signals and also help balance the grid and to reduce costs.

Ensuring consumer led flexibility is accessible, beneficial and secure requires addressing challenges around data privacy, consumer trust and digital inclusion to be addressed. By making participation simple and trustworthy, the industry can unlock new opportunities for consumers to save money and support a clean power grid.

[10] Description aligned to the Clean Flexibility Roadmap

The Clean Power 2030 10-12 GW flexibility goal relies on millions more electric vehicles, three million extra heat pumps, and tripled solar capacity. These assets will only help balance the grid if digital systems tie them together and are managed dynamically.

Successful, beneficial flexibility depends on three key things:

- **Customer trust:** Clear consent and data rules build confidence in participation. Electric vehicles need to be participating in smart charging to contribute to Clean Power 2030. This necessitates trust frameworks, consent portals and data standards.
- **Smart tariffs:** Smart meters and modern market rules let households respond. This makes high smart meter penetration, continued meter operability, Market-wide Half-Hourly Settlement (MHHS) and tariff interoperability essential.
- **System visibility:** Control rooms must know where flexible assets are to direct them. Asset registers, data sharing and control room technologies are all key to this.

By digitalising the energy system, the anticipated growth in new energy devices can be harnessed as flexible assets that reduce peaks and relieve strain on the network, maximising their value to the system and enabling the rapid electrification expected in the 2030's. Much of the detail of how flexibility in the energy system will be achieved is set out in the Clean Flexibility Roadmap[11] to which this document aligns.

Grid decarbonisation and security[12]

By 2030, Great Britain aims to have at least 95% of its electricity coming from clean sources – reducing exposure to volatile gas prices, driving economic growth, and improving air quality and public health. This transition will see the grid integrate up to 50 GW of offshore wind, nearly 47 GW of solar, and significantly increased battery and flexible demand capacity, as outlined in the Clean Power 2030 plan.

Digitalisation will be essential for planning and delivering this significant shift. The energy system will need to align geographically with the growth

[11] Gov UK, Clean Flexibility Roadmap

[12] Aligned to the NESO Clean Power Implementation Plan's Framework; 'Networks' workstream

in power needs to ensure it gets to where it is needed. Digitalisation will be key for balancing a system of increasingly complex flexible assets.
Grid decarbonisation requires:

- **Data-driven decision making:** The implementation of asset registers and a single source of truth for Distributed Energy Resources (DERs) enables all organisations to coordinate, optimise site selection, and assess network impacts. Adopting common data and information models across the sector enhances planning, design, and delivery of new grid infrastructure. This type of data driven decision making will be increasingly essential across most other processes too.
- **Cyber-security and resilience:** As digital systems expand, robust cyber-security measures are essential. Protecting control systems, data flows, and operational technology ensures safe, reliable operation as the system grows in complexity and decentralisation.
- **Real-time system management:** Advanced digital platforms and scenario modelling allow grid operators to predict, plan, and balance supply and demand with increasing volumes of variable renewables. This enables the integration of more clean energy without sacrificing reliability or efficiency.

Investments in secured digitalisation will play a key role in supporting the expansion of renewables and distributed generation and demand, helping to manage new system dynamics and ensure the full benefits of grid decarbonisation are realised.

Networks, access and connections

To connect 200-225 GW of new clean generation by 2030, the country must rapidly expand and modernise its electricity networks. This requires a step change in how networks are planned, built, and coordinated.

Currently, there are key challenges thwarting progress. The planning for network expansions and connections has been slow, sequential and reactive, leading to delays in both the identification and resolution of constraints.

Data sharing between organisations is often slow, fragmented, and non-standardised, causing misalignment across national, regional, and local

planning. This fragmentation hampers innovation, delays approvals, and creates inefficiencies in delivering network upgrades.
Digitalisation can support network access and connections through:

- **Digital project management platforms:** Automated connection queue management, and Geographic Information System (GIS)-based network planning enable multiple activities to run in parallel, resolving constraints earlier.
- **Consistent data sources:** Federated data platforms and digital asset registries provide organisations with consistent, trusted information to support coordinated decision-making.
- **Real-time data**: Interoperable systems accommodate the sharing of real-time data, streamline approvals and reduce bottlenecks, helping to align planning and investment at all levels.

By accelerating digital transformation, the sector can keep projects on track, align investments effectively, and manage cost more efficiently. Digital tools for ease network congestions, enabling faster connection of clean generation and flexibility projects to help deliver on 2030 targets while strengthening security of supply.

Coordinated, data-driven planning will unlock opportunities to reduce consumer bills and build a resilient, future ready grid that can grow into the 2030's.

System operability

A reliable, resilient energy system is essential to handle the growing complexity and variability of renewables while delivering stable, secure and affordable power for consumers.

This comes with new challenges. The system will become far more dependent on smart meters and distributed flexibility assets, creating concerns about data access, cyber security and the resilience of critical operational communications.

There are also gaps in understanding what assets are required, what ones exist and what they can do, making it harder to plan effectively, unlock flexibility and coordinate across the system. Different flexibility markets and users also rely on diverse, often incompatible data and platforms. This makes it hard for assets to move between services, limiting opportunities.

A resilient energy system needs:

- **Advanced digital technologies and system architectures:** Cyber-secure, resilient system architectures and technologies can transform control room operations, enabling real-time analytics, automated controls, and predictive monitoring. This ensures stability is maintained and any disruptions swiftly responded to.
- **Common data and information models:** Interoperable market platforms, and coordinated digital standards can unlock seamless integration across the sector, supporting real-time analytics, automated resilience testing, as well as remote monitoring.
- **Robust digital connectivity**: The reliability of smart meters, flexibility assets, and critical operational telecommunications is underpinned by connectivity. Digital capabilities will become increasingly fundamental to black start scenario– ensuring rapid recovery after major outages – and to managing distributed flexibility at scale while maintaining security.

Coordinated digitalisation will be essential to maintaining system stability and security as the sector decarbonises. With the right foundations, we can avoid rising costs, build consumer confidence, and minimise the risk of disruption. Just as analogue systems of the past were rigorously engineered, it is vital that the digital phase of the energy sector's evolution is approached with the same level of rigour and integrity that has reliably delivered energy to GB consumers for over a century.

Supply chain and workforce

Achieving the Clean Power 2030 target relies on mobilising around £40 billion of annual investment and building a skilled, diverse workforce to deliver infrastructure upgrades at pace and scale. This outcome is only possible with clear signals for investors, effective coordination between public and private sectors and effective matching of skills and resources to project needs.

There is currently a lack of coordinated, real-time visibility or modelling scenarios over investment flows, workforce requirements, manufacturing capability, and project delivery across the sector. This limits the ability to prioritise resources, align spending with system needs, and speed up construction.

Projects can be mobilised more effectively with:

- **Digital tools and platforms:** Such tools can provide real-time, transparent tracking of investments, skills, and project delivery, helping the sector to coordinate activities, match workforce skills to needs, and move resources quickly to where they are most needed.
- **Accessible, user-friendly platforms:** People from all backgrounds can connect with training and job opportunities, as well as investment information – supporting a just transition and helping to build public trust.
- **Shared digital infrastructure:** Coordinated data standards are essential to ensure that industry, government, and communities have the reliable information needed for long-term planning and accountability.

With coordinated digitalisation and a common language, the sector can gain greater visibility overspending and workforce needs, helping to direct investment effectively, speed up delivery, and stay on track to meet targets. This will not only accelerate decarbonisation but also strengthen the country's ability to seize clean energy opportunities, support job creation, and deliver long-term value for both consumers and the economy.

2.3. Delivering digitalisation responsibly

Digitalisation's value is clear but its implementation in the energy system is complex and not without risk. The Sector Digitalisation Plan thoroughly considers these challenges, balancing the drive to enable change with the need to maintain the engineering integrity of the system and manage risks. This is to ensure that both the opportunities and the threats are fully considered. The work has also been considering all energy vectors as the work has developed, so the approach can be expanded across the whole system.

As the energy system becomes more connected and data-driven, threats to cyber security grow, requiring robust protections to safeguard critical infrastructure and maintain consumer trust. Data privacy is also key. Clear consent controls, secure data-sharing agreements and transparent governance is needed to prevent misuse and ensure all consumers can participate confidently.

Understanding the data flows in the system, and how these data flows interact with processes, systems, organisations and people will become increasingly important as the system evolves. The sector must prioritise interoperable solutions that can adapt as needs evolve. Importantly, effective integration and coordination is key, otherwise digitalisation risks creating new silos and complexity.

Addressing these challenges directly – by enhancing cyber security and implementing strong data privacy measures, focusing on consumer-centric design and coordinated implementation – is vital to building a resilient, inclusive and future-ready energy system that delivers real benefits for everyone. Understanding the data flows in the system, and how these data flows interact with processes, systems, organisations and people will become increasingly important as the system evolves.

3. Approach

3.1. Defining the scope

The first iteration of the Sector Digitalisation Plan is focused on ensuring deliverability and operability of a clean power energy system, as set out in the Clean Power Action Plan. Future iterations of the plan will build on this foundation, extending coverage to other energy vectors as sector and digital requirements evolve.

The plan prioritises areas where digitalisation can deliver the greatest impact, while recognising the need for adaptability of evolving technologies, data requirements and cross sector interactions beyond the energy system. Many of the digital innovations needed for Clean Power 2030 are already mature, but embedding these into everyday business practices will require a detailed and consistent engineering approach. In some cases, it will require government or regulatory support.

With fewer than five years until 2030, the plan focuses on key actions for shared digital infrastructure that will have the greatest impact on achieving clean power. It also addresses areas where inaction could hinder progress, increase costs, or undermine system resilience, such as telecoms infrastructure and cyber security.

The plan is designed not only to address immediate priorities, but also to ensure the energy system remains resilient, efficient, and fit for purpose towards 2050 and beyond. Ongoing digital innovation, flexible approaches, and regular updates will be central to maintaining this long-term viability. For this reason, the Sector Digitalisation Plan is an iterative document – one that will evolve in line with technology, policy and system needs.

Interaction with the Clean Flexibility Roadmap

The Clean Flexibility Roadmap sets out the government’s policy framework and actions to unlock and scale flexibility across the energy system. The Sector Digitalisation Plan builds on the roadmap, taking forward relevant digitalisation actions and operationalising key policy decisions. This provides a clear pathway for their implementation in a way that ensures all of the wider benefits of digitalisation are met to achieve Clean Power.

In addition to this, the Sector Digitalisation Plan looks across other perspectives for digitalisation and details actions considering issues beyond the Clean Flexibility Roadmap scope. Clean Flexibility Roadmap actions within this document are direct lifts, and set out in the table at the head of every relevant section.

3.2. From outcomes to actions

The Sector Digitalisation Plan is comprised of actions and gaps. It also maps out required sector milestones. A definition for each is provided below:

- **Action**: A clear, specific task or set of tasks designed to address a critical sector need. Each action is SMART and has an assigned action owner who is responsible for its delivery and associated funding.
- **Gap**: An area requiring intervention is identified but lacks a clear action, assigned action owner, or clear problem statement. Subsequent iterations of the plan will focus on the conversion of gaps into actions.
- **Milestone**: A significant, clearly defined achievement or event that marks progress towards the delivery of an action or outcome.

To determine what is critical for Clean Power 2030, the previously defined sector outcomes required for a clean power system (see section 2.2) were reviewed to identify the crucial digital enablers for each outcome.

The plan actions and gaps were then derived so that collectively, they provide the practical steps needed to build, deliver and coordinate the digital capabilities for each.

A full review of the methodology used to arrive at the final list of actions and gaps can be found in the appendix.

3.3. Understanding the plan structure

The actions, gaps and milestones that make up the Sector Digitalisation Plan are organised into three layers: infrastructure and connectivity, integration, and activity coordination. Each layer represents a distinct aspect of the energy system:

- **Infrastructure and connectivity:** Focuses on the physical assets of the power system and the collection of data from these assets.
- **Integration:** Centres around transforming collected data into useful information and ensuring secure, efficient access to this information across the sector through systems and applications that are required.
- **Activity coordination:** The people and organisations that operate and govern the power system. This layer covers the mobilisation, organisation, and governance required to align activities and ensure coherence.

Smart Grid Architecture Model

These layers align with the five-layer Smart Grid Architecture Model (SGAM)[13] (figure 3), ensuring comprehensive coverage of the energy system – from generation through to consumers. The SGAM framework was applied to logically group and position actions, gaps, and milestones within each layer.

By structuring the plan in this way, it becomes easier to identify remaining needs, see how activities are interrelated, and understand how each element supports the Clean Power 2030 outcomes outlined in section 2.2. Furthermore, this model is scalable so it can be used to multiply out and incorporate other energy vectors in future iterations.

[13] SGAM is an architectural framework that helps describe large scale power systems

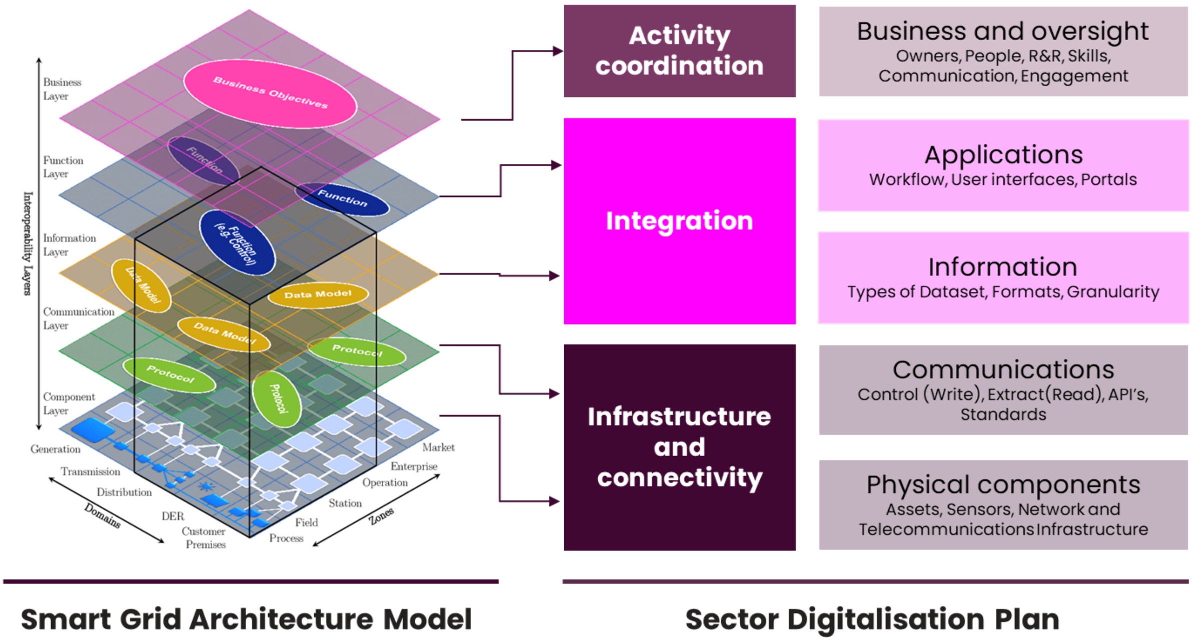

Figure 4 – The Smart Grid Architecture Model alongside the Structure Digitalisation Plan

3.4. Principles

A set of guiding principles was used to ensure the Sector Digitalisation Plan is focused, effective and directly addresses the challenges of responsible digitalisation delivery.

Minimum viable and future ready	Digital services should focus on well-engineered minimum viable solutions, designed to meet current needs while remaining adaptable to future systems beyond Clean Power 2030.
Focus on consumer simplicity and benefit	Investments should be justified by tangible benefits, ensuring that costs are proportionate and support better outcomes for energy consumers.
Market driven competition supported by coordinated shared infrastructure	Where viable, the market should drive competition in digital services. Where a single provider is necessary, it should be to provide the foundations to enable wider competition and innovation.
Ensure trusted data	Prioritise interoperability and secure connections between diverse data sources. Maintain data at its source where possible, with clear data sharing agreements to ensure reliability, consistency, and responsible use.
Prioritise cyber security	All data practices must be underpinned by robust cyber security and strong consumer data protection to safeguard privacy, maintain trust, and protect the energy system from emerging threats.
Aligned to existing standards and terminology	Where established guidance exists, this should be used to promote the consistent use of terminology and data processing.
Data access to support innovation	Where an appropriate level of anonymity and security can be achieved, data should be made available to wider industry, to help track progress towards Clean Power 2030 and identify remaining areas for innovation.

4. Infrastructure and connectivity

Achieving Clean Power 2030 requires reliable devices (such as heat pumps and transformers), accurate data about those devices, and the ability for that data to be shared effectively with the right people at the right time to enable well informed decision making and effective progress to clean power. We have identified three key areas – consumer data, smart meters, and device standards – as the key enablers in this section. The actions are set out below, with detail on the problem statements and relevant information in subsequent sections. We also highlight the relevant actions published in the Clean Flexibility Roadmap for reference. This section concludes noting the gaps that have been identified to date.

Key actions

Action name	Description
Action 1: Consumer consent design and implementation	RECCo to detail requirements and design for the consumer consent service and how it interfaces with other shared digital infrastructure by 2026
Action 2: Continued operability	DESNZ to continue to work with DCC and wider industry to ensure that necessary smart metering capability will be in place as the industry transitions through mobile telecommunications technologies
Action 3: Improved smart meter data access	Elexon, DESNZ, and RECCo to align smart meter access between the Smart Data Repository, Smart Meter Energy Data Repository and consumer consent solution by mid-2027
Action 4: Network asset security	Networks to start developing organisational plans for the potential impact of quantum computing to existing cryptography and protect any relevant systems in line with NCSC guidance by 2028
Action 5 Asset hardware security	DESNZ to work with industry to start developing plans for the potential impact of quantum computing to existing cryptography and protect any relevant systems in line with NCSC guidance by 2028
Action 6: Smart device interoperability	Industry and DESNZ to agree device interoperability standards by January 2027 through existing workstreams

4.1. Consumer data

Consumer data, both domestic and non-domestic, will underpin the sectors' ability to manage demand, operate the grid in a more distributed energy future, as well as provide the underlying data so consumers can directly benefit from their own efforts. Ensuring the data access regime meets the needs of a clean power system while respecting data privacy regulations is essential to achieving clean power.

Consumer consent design and implementation

Sector Digitalisation Plan	Problem statement	Consumers need to provide consent for their data to be used in a secure and trusted manner by various participants in the energy system so the benefits of flexibility can be realised. This includes consumption data, tariff data and other energy data attributable to consumers
	Outcome required	Consumers have a simple customer journey and trust the users of their data have appropriate permissions
	Action 1: Consumer consent design and implementation	RECCo to detail requirements and design for the consumer consent service and how it interfaces with other shared digital infrastructure by 2026
Clean Flexibility Roadmap	45a) Consumer consent	RECCo, with Ofgem oversight, to deliver a consumer consent mechanism by end 2026 to align with the delivery timescales of Market-wide Half-Hourly Settlement (MHHS). RECCo to consider proposed designs for both smart data and the DSI to ensure interoperability and alignment

Energy consumption data is one of the key enablers of a clean power system. It can provide high fidelity insight into the energy needs of the system with a high degree of local granularity. Utilising it will support more intelligent tariffs and innovation for consumers – by enabling demand to be modelled more accurately, providing price signals that reflect real-time grid conditions, and allowing control rooms to better manage both supply and demand. A long-term view will also support network planning and inform the build required to achieve clean power.

Ensuring that consumers are informed and agree to share their data is fundamental to supporting the wider efforts in rebuilding trust in the sector. It will also allow consumers to more easily benefit from their own actions in a clean power system.

There are several different types of consumer data (domestic and non-domestic) that will become increasingly relevant in the transition to clean power. Consumption data from smart meters, device data – such as static or dynamic data relating to heat pumps, EV chargers or other devices such as solar and household battery storage – as well as consumer preferences about how they want to use those devices or use their energy to match their life patterns. Commercial data, too, also requires a consenting mechanism that will be intrinsically linked to the types described above. Finding a solution for managing consent across all of these is important.

The Data Access and Privacy Framework (2012)[14] sets out the expectations for consent when using smart meter data. Elsewhere, processes to obtain consent across the sector for other types of data are not standardised, with the consumer journey hard to navigate to provide and manage consent to processing data. This can create barriers to entry for new market entrants who must develop their own consent solutions and makes it a challenging consumer journey for consumers to keep track of their data consent.

To make progress, Ofgem consulted on a consumer consent solution to provide standardisation for service providers and consumers, alongside a consumer-facing interface or portal.[15] In their decision document, Ofgem appointed RECCo as the delivery body for the consumer consent solution. The action from the Clean Flexibility Roadmap noted above (45a) highlights the commitment being taken forward to progress this scalable solution. The proposal is for RECCo to develop a solution that prioritises enabling consumption data and will include the scope of design, implementation and enduring service provision.

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[14] Department of Energy & Climate Change, Smart meter data access and privacy
[15] Ofgem, Consumer consent decision

The consumer consent project will establish the necessary trust framework to enable companies to trust each other and share consumer data based on consent. This will require separate contractual agreements between companies.

In addition, the following policy dependencies have been identified for the consumer consent solution:

- **Integration with other applications:** For the consumer consent solution to act as a single access point for consumers to manage consent, it should be integrated with other portals using consumer data, such as Flexibility Market Asset Register (FMAR[16]) or the Smart Data Repository (SDR). The consumer-facing interface and consent management framework developed as part of the MVP, expected winter 2026.
- **Government policy development**: The Department for Energy Security and Net Zero has published the government response to a call for evidence for the development of an Energy Smart Data scheme to provide the rules, standards and agreements that govern data sharing between customers and service providers.[17] The work aims to establish the UK as a global leader in data-driven innovation and content creation, with a robust, secure and interoperable data sharing infrastructure that supports sustainable economic growth. There may however be opportunities for a Smart Data Scheme to support the alignment of trust frameworks, ensuring that, at minimum, they are complementary, recognise each other's scope and principles, and provide a stronger legislative mandate for future adoption.

Similarly, the following digital functions are required to support consumer consent:

- **Granting consent**: Allowing consumers to give permission for their data to be shared.
- **Managing consent (consumers)**: Enabling consumers (domestic and non-domestic) to review and revoke their consent as needed.

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[16] Ofgem, Flexibility Market Asset Registration
[17] Department for Energy Security and Net Zero, Developing an energy smart data scheme

- **Managing consent (service provider)**: Ensuring service providers are confident appropriate levels of consent have been obtained for the data they are accessing or sharing.
- **Trust framework:** Technical framework which sets the standard for data holders and service providers to trust each other and enable the sharing of data.

From an operational perspective, alignment of the RECCo consumer consent service must be developed with an aim for digital infrastructure integration, so that more types of consumer data consents can be managed in the future. The key aligned developments in this space are the Smart Data Scheme and the Data (Use and Access) Act, the Data Sharing Infrastructure (DSI) – as well as Elexon's Data integration Platform (DIP) and Smart Data Repository (SDR). Similarly, both the Flexibility Market Asset Registration (FMAR) and the potential Smart Meter Energy Data Repository (SMEDR) should also be aligned with developments where appropriate.

As the 'first mover' in this space, the consumer consent solution will need to be strategically aligning with these emerging developments as it designs and runs its enduring service provision.

4.2. Smart meters

Smart meters are a critical enabler of a flexible, efficient, and data-driven clean power system. By providing energy consumption data, voltage data and other useful granular data in a timely and accessible format, smart meters help to increase energy efficiency as well as lower emissions and costs for consumers.

Milestone: Smart meter rollout

Sector Digitalisation Plan	Problem statement	Rollout of smart meters is a critical enabler of clean power and the rollout, currently at 70% and needs to reach 86-90% penetration to unlock the full value of flexibility
	Outcome required	The energy system has sufficient penetration of functioning smart meters by 2030 to support operability of a clean energy system
	Action	No action in the Sector Digitalisation Plan. This is a milestone

Clean Flexibility Roadmap	10a) CPAP Action	DESNZ is working with Ofgem to introduce new Guaranteed Standards of Performance relating to smart metering in 2025. These may include standards relating to the timely installation and maintenance of smart meters, compensating consumers where they are not met
	10b) Maximise the number of smart meters installed and in smart mode	Ofgem and DESNZ are committed to continuing to improve delivery and consumer experience of the smart meter roll out. DESNZ will shortly consult on regulatory interventions to improve the smart metering consumer experience, including by tackling the number of smart meters not sending automatic readings, and will continue to drive the rollout so that the vast majority of households and small businesses can benefit, to support the flexibility needed to deliver clean power by 2030
	10c) Implementation	industry to fulfil its obligations to install smart meters, and ensure they are operating correctly, to the timelines and standards set out in licence conditions. Ofgem will monitor suppliers' compliance with their obligations and take enforcement action where appropriate

The smart metering network already plays an important role in our energy system, and its importance will only grow as the system changes to, and beyond, 2030. Ensuring the metering network can meet the operability needs of the future energy system is a critical task for the late 2020 and activity should be undertaken to ensure metering supports the outcomes of clean power.
Smart meters can record consumption and production data, which in turn can be used to provide insights on energy usage to the customer via the In-Home Display (IHD) or applications, enable time of use (ToU) tariffs and send automatic meter readings to suppliers and others.

To support achieving a clean power system, a substantial portion of consumers must be equipped with smart meters. Current rollout rates are at 68% domestic and 67% non-domestic[18] (across gas and electric meters)

[18] *UK Gov. Smart Meters Statistics in Great Britain: Quarterly Report to end March 2025*

with the NESO clean power report highlighting 86-90% operational electricity meter coverage being required. Metering data is critical for many essential functions in the energy sector such as billing, but as the sector transitions to a more dynamic energy system where consumer led flexibility is essential to balance the system, other data from smart meters, such as voltage, becomes even more important.

The Smart Meter Implementation Programme (SMIP) is a government initiative responsible for ensuring the full-scale rollout of smart meters. At present, obligations are placed on suppliers to install smart meters. The initial target was to complete the rollout by 2019.

In August 2025 DESNZ published a consultation to set the policy framework for energy suppliers to deliver service improvements by ensuring smart meters operate as they should, and to continue installing smart meters after 31 December 2025, when the existing annual installation targets come to an end[19].

Additionally, Ofgem at the same time published a consultation on Guaranteed Standards of Performance around smart metering[20] to improve the consumer experience of getting, and having, a smart meter.

Smart meter deployment is currently not evenly distributed across the country with domestic electricity smart meter coverage being highest in the East Midlands, at 76%. Coverage in Wales (67%) is similar to the overall average in Great Britain, while Scotland is lower at 57%.[18]

The actions described in the Clean Flexibility Roadmap focus on ensuring that metering is placed in smart mode, and that suppliers are meeting expectations on their obligations for rollout. A specific action on metering has not been noted here, but it is highlighted due to the critical role it plays in the enablement of clean power.

Actions described in the Clean Flexibility Roadmap should continue to progress rollout to ensure clean power can be achieved.

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[19] Uk Gov. *Smart Metering Policy Framework Post 2025*

[20] Ofgem. *Smart Meter Guaranteed Standards: Supplier guaranteed standards of Performance*

Smart meter communications and continued operability

Sector Digitalisation Plan	Problem statement	Smart meters in the Central and South region of Great Britain rely on mobile networks to maintain connectivity. Equipment relying on 2G/3G technology will need to be replaced as the telecoms network operators withdraw these
	Outcome required	The smart metering system continues to provide reliable, secure and cost effective communication that is resilient to change and disruption for consumers is minimised.
	Action 2: Continued operability	DESNZ to continue to work with DCC and wider industry to ensure that necessary smart metering capability will be in place as the industry transitions through mobile telecommunications technologies
Clean Flexibility Roadmap	10a) CPAP Action	DESNZ is working with Ofgem to introduce new Guaranteed Standards of Performance relating to smart metering in 2025. These may include standards relating to the timely installation and maintenance of smart meters, compensating consumers where they are not met
	10b) Maximise the number of smart meters installed and in smart mode	Ofgem and DESNZ are committed to continuing to improve delivery and consumer experience of the smart meter roll out. DESNZ will shortly consult on regulatory interventions to improve the smart metering consumer experience, including by tackling the number of smart meters not sending automatic readings, and will continue to drive the rollout so that the vast majority of households and small businesses can benefit, to support the flexibility needed to deliver clean power by 2030
	10c) Implementation	industry to fulfil its obligations to install smart meters, and ensure they are operating correctly, to the timelines and standards set out in licence conditions. Ofgem will monitor suppliers' compliance with their obligations and take enforcement action where appropriate

The role of smart metering as part of the operability of a clean power system creates a strong dependency on the operability of those meters. The meters must be relied upon to provide timely and accurate information that supports operation in a highly flexible system. Ensuring the long-term operability of the metering network in a way that minimises disruption to consumers will be vital in securing consumer acceptance of clean power.

The smart metering network already provides reliable communication channels between smart meters and data collection systems, and as the system transitions to clean power it becomes even more essential to ensure timely and accurate data transmission. This involves robust infrastructure that can handle increasingly high frequency data transmission (meter readings) and less frequent larger data transfers (firmware updates). This data transmission is critical and must occur while maintaining secure connections to prevent data loss or tampering.

The Wide Area Network connecting smart meters to the Data Communications Company (DCC) are different across Great Britain. In the north, a dedicated Long-Range Radio network is predominantly used with a 4G network now rolling out. In the central and southern regions, communication relies on cellular (mobile) technology. Currently, these cellular connections use 2G, 3G, and some 4G networks.

These smart meters will need to be retrofitted with new communications hubs to communicate over the 4G network as 2G and 3G networks come to the end of their commercial lives. In 2023, it was estimated 7 million meters will need to be replaced due to the 2G and 3G networks closure[21]. Consideration for supply chain incentives is necessary to make sure technology updates are completed before end-of-life – to ensure continued positive experiences for consumers.

Mobile network providers have committed to switching off 3G networks in the coming years, and have already begun[22] to make room for the more advanced 4G and 5G networks. Commercial 2G networks are expected to follow the same path in early 2030.

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[21] House of Commons Committee of Public Accounts, Update on the rollout of smart meters
[22] Money Saving Expert. *The 3G mobile network switch off what you need to know*

The DCC have begun rolling out new 4G communications hubs in the summer of 2025. The plan recommends the Department for Energy Security and Net Zero works with DCC and energy suppliers to ensure any necessary communications hub changes minimise disruption and costs to consumers. As reliance on smart metering data grows and smart metering technologies develop – the operability of the system, as well as the impact on consumers must be a high priority consideration.

Improved smart meter data access

Sector Digitalisation Plan	Problem statement	Different user groups require smart meter data for varied purposes. Ensuring the digital architecture of the system enables these access routes is a critical enabler of Clean Power 2030
	Outcome required	There are clear, technically aligned, efficient data retrieval access routes for smart meter data that reduce barriers to entry
	Action 3: Improved smart meter data access	Elexon, DESNZ, and RECCo to align smart meter access between the Smart Data Repository, Smart Meter Energy Data Repository and consumer consent solution by mid-2027

Consent for using smart meter data is one part of the journey – the technical implementation routes to both the access and governance of data, as well as the process layers required, become the other critical enabler. How these layers interact with each other and align will determine the ease (or difficulty) different organisations will have in leveraging the benefits of using consumer smart meter data.

Access to smart meter data is already critical to the development of consumer centric products and services which can provide system flexibility and the basis of this access is already robust and in line with existing rules. In the future this data will provide even larger benefits for system operability and planning needs in a clean power energy system. While action 1 details the granting and management of consent, which has an initial focus on smart meter consumption data, consideration also needs to be given to the digital infrastructure that holds smart meter data and manages access to it to ensure the integrity of the smart metering system in the long term. Broadly, that digital infrastructure needs to be able to provide access to smart metering system data, granular meter point level data, as well as aggregated data to cover the varied use cases that would leverage smart meter data.

The industry has many existing routes to consumption data access, and concurrent developments to improve this, these include:

- **Other User reform** – There are existing initiatives in place from the DCC to streamline the process, which provides a user with the authorised third-party accreditation to use the smart meter network. The reforms in flight include process, cloud-based connectivity and a new digital portal by end 2026.
- **Managed Service Providers** – Some organisations offer commercial propositions that remove the complexities needed to become an 'other user' of the DCC systems.
- **Smart Meter Energy Data Repository (SMEDR)** – Funded by the Department for Energy Security and Net Zero, this innovation programme assessed the technical and commercial feasibility of a smart meter data repository that maintains or enhances existing levels of security and privacy. The programme finished in April 2025, and additional preparation activities are underway. Data includes smart meter electricity and gas, DNO and DCC system data.
- **Smart Data Repository (SDR)** – Elexon has released a consultation on the development of the SDR linked to the MHHS Data Integration Platform[23] which details its plan with Elexon delivering the SDR in Q4 2026. In Phase One, the SDR will allow SVA level data to be shared. Subsequent phases will incorporate the wider Elexon data estate, including Asset Metering, CVA and more.
- **Energy suppliers** – Suppliers, with consent, currently hold consumer data and are the interface for consumers to the energy system. This route could provide access for some types of data but has scaling challenges.
- **Distribution Network Operators (DNOs)** – DNOs are required to publish aggregated smart meter consumption data on their open data portals.

[23] Elexon, Data repository update - June 2025

- **Smart data scheme** – A smart data scheme could provide the secure framework for accessing data through any of the routes described above.

Ensuring that the right access routes are in place for different data needs will be important to protect the integrity of the smart metering system (for example, ensuring the volume of messages is manageable from a DCC system perspective) and that relevant organisations have access to the data they need in a timely manner.

The digital infrastructure developments in this space beyond commercial provisions from companies providing a service in this space, are the Smart Data Repository (SDR) and Smart Meter Energy Data Repository (SMEDR) which are detailed below.

	Description	Data types	Example use cases
SDR	An Elexon led repository to improve access to data that will be in the new Settlement Systems being developed as part of the MHHS Programme. It will be available from October 2026.	Electric domestic consumption data, Industrial and commercial consumption data, technical meter data	Price comparison, consumption comparison, data verification, network planning, academic research, carbon footprint accounting
SMEDR	An innovation project led by DESNZ which was establishing the feasibility of establishing a system-wide repository. Now progressing with work on implementation options	Smart meter Half-hourly electricity import and export, smart meter half-hourly gas, usage, voltage data, DCC system data.	Consumer lead flexibility; advice on low carbon technology choices; better network management; PPM data; reduced energy theft; energy savings, academic research

Elexon, as part of its MHHS mandate, is building a Smart Data Repository. As part of the MHHS programme, Elexon was appointed by Ofgem to manage the Data Integration Platform (DIP). Ofgem decided that the DIP would have two objectives, to:

1. Provide accurate and timely support for the settlement process and further consumer interests through the appropriately controlled use of data.
2. Provide access to data for third parties on fair and non-discriminatory terms.[24]

Due to the nature of the DIP design, a new data repository was identified to be needed to meet the second objective.

This Smart Data Repository will enable Elexon to make numerous datasets available to SDR users and it is expected to go live in October 2026. Later phases of development will allow data from elsewhere within Elexon's data estate to be shared via the SDR. The SDR will provide smart, advanced and non-half-hourly data as well as unmetered suppliers and estimated meter reads.

The Smart Meter Energy Data Repository is an innovation programme exploring the feasibility of a repository of smart meter data. The work concluded during 2025, and dissemination events took place in mid 2025 led by DESNZ's Smart Metering Implementation Team. The work looked to understand the technical and commercial feasibility of a smart meter energy data repository, with the intent that this will enable future innovation of products and services to benefit consumers while ensuring their data remains protected under the Smart Meter Data Access and Privacy Framework.

Clear alignment is needed across the sector on how smart meter data access will be delivered to support a fully decarbonised energy system considering the work undertaken by SMEDR and the other access routes detailed above. How the proposed SMEDR interacts with the SDR is a key question. Consumers, industry participants and system operators require

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[24] Ofgem, Decision on the governance, funding and operation of an Event Driven Architecture for Market-Wide Half-Hourly Settlement

access to smart meter data that is timely, secure, and equitable. Such access enables better system planning and balancing, drives consumer-focused innovation, and supports greater engagement in flexibility and demand-side services.

For this to be achieved, the technical approach to data access must maintain the operational integrity of the smart metering system in collaboration with the DCC. It must also remain consistent with the Data Access and Privacy Framework to preserve consumer trust and be capable of scaling to meet data demands of renewables, clean power system. Without coordinated action, there is a risk of inefficiencies, duplication and inconsistent experiences for consumers and data users.

4.3. Device standards

Devices, from fridges to heat pumps or substations are the underlying physical layer of our energy system and comprise of the hardware and software that supports their operation. As the operation of the energy system changes in nature to operate a clean power system with high volumes of flexibility, the requirements on those devices are expected to change. This section comprises of the key actions expected to be required to ensure secure operability of the overall system with respect to the role those devices play. The engineering of devices and how they interact in the new clean power system is vitally important. These devices need to be ready for future developments in technology, like AI and Quantum, and need to be ready in a secure and timely manner with minimal disruption to consumers and essential services. How industry manages the change from the current stock of devices to increasingly smart, secure, digitally enabled devices is paramount to deliverability of clean power.

Network asset security

Sector Digitalisation Plan	Problem statement	It is expected that quantum computers will be able to break existing cryptography protocols in the years following 2030.
	Outcome required	The energy networks are secure from quantum computers being able to break classical cryptography methods in the mid 2030's

Action 4: Network asset security	Networks to start developing organisational plans for the potential impact of quantum computing to existing cryptography and protect any relevant systems in line with NCSC guidance by 2028

Advances in quantum computing, though still some years away, are beginning to pose new risks to current methods of securing data. The energy sector must take proactive steps now to prepare for these emerging threats. By doing so, the transition to a clean, distributed power system is underpinned by robust cyber security, protecting critical infrastructure against future vulnerabilities.

Many modern digital security systems rely on public key asymmetric cryptography to keep information safe. These systems rely on the computational difficulty of a range of mathematical problems which are currently infeasible for classical computers to solve within a reasonable timeframe. However, it is expected that a sufficiently large quantum computer could solve these problems efficiently, rendering public key cryptographic systems vulnerable. This quantum threat to cybersecurity is gaining more prominence as a challenge that critical national infrastructure (CNI) providers must begin to address in the near-term.

The National Cyber Security Centre (NCSC) has set out a timeline for critical national infrastructure providers to upgrade their cryptography to be quantum-safe, aiming for completion by 2035.[25] This creates significant challenges for the security of energy network assets, especially just beyond 2030, as making these changes will require several years of work to implement fully.

Ensuring the resilience of these network assets is critically important. NESO's Network Security in a Quantum Future (NSiaQF) project[26] is an example of mitigation work. It explores tooling to help identify and prioritise systems requiring migration to post-quantum cryptography in a scalable way. Similarly, the DCC and the Smart Energy Code Security Sub Committee are currently working together on a proof of concept exploring

[25] National Cyber Security Centre, Timelines for migration to post-quantum cryptography
[26] National Energy System Operator (NESO). *Network Security in a Quantum Future innovation project wins Alpha phase funding.*

how post-quantum compliant security keys can be built into future connected devices, including smart metering communication hubs, with further analysis underway to identify the architectural changes required to deliver a post-quantum solution for the processing of data across the smart meter network.

Cybersecurity is a critical enabler of a highly digitalised and distributed clean energy system. Given the inherent complexity of operating a resilient system, early actions should be taken to ensure the safe operability of devices across the energy network as soon as practical. The action outlined recognises that coordinated effort across the energy system will be required for comprehensive resilience ahead of 2035. Given the complexity and changing nature of the energy system in alignment with wider clean power changes, other industry participants should begin to prioritise development of their plans for this changeover in a timely manner. NESO is committed to exploring this area further, and learnings from our NSiaQF project are available online[26] to support other projects.

Some consistency may be required across energy networks, and Ofgem should consider the long-term implications of these cutover plans as they relate to the price control periods from 2028 onwards. This should be continually reviewed to ensure the industry can react to any further changes in standards in the future.

Asset hardware security

Sector Digitalisation Plan	Problem statement	It is expected that quantum computers will be able to break existing cryptography protocols in the years following 2030.
	Outcome required	Consumer devices are secure from quantum computers being able to break classical cryptography methods in the mid-2030's.
	Action 5: Asset hardware security	DESNZ to work with industry to start developing plans for the potential impact of quantum computing to existing cryptography and protect any relevant systems in line with NCSC guidance by 2028

The vision of our future clean power energy system has significant volumes of distributed, consumer owned smart devices that will be participating in the day-to-day operability of the system and this area is being looked at by the Department of Energy Security and Net Zero's Smart Secure Electricity System (SSES) programme. In addition to the work being undertaken to date by the programme, consideration of how these devices can be secured against the emergence of quantum computing techniques is required to retain long term system resilience, with some expected to start mid-July 2025.

Distributed Energy Assets need smart functionality to enable them to participate securely and effectively in flexibility markets. This is an important enabler for achieving the flexibility identified as needed in the clean power action plan. Smart functionality requires components that enable connectivity, compute and storage. Given the cost and inconvenience of retrofitting this hardware for consumers, it is important to set clear expectations or clear guidelines for component requirements as early as possible, given the timelines involved in developing hardware for sale to consumers.

Distributed Energy Assets are likely to be deployed for an extended length of time (over 10 years), this means that there should be a strong focus on being able to support expected future requirements given these assets are a potential target for cyberattacks. As such, they should be capable of being updated 'over the air' (compliance with ETSI 303 645) if required and they should also be able to deploy current and future robust security technologies (for instance, the implementation of quantum safe cryptography). Factors that will influence a device's ability to run these quantum safe cryptographies include:

Factors	**Description**
Connectivity	For encrypted communications, the device should have connectivity that can support the additional bandwidth of the new key exchanges. This can be achieved in multiple ways and there may be a need to specify the exact method (similar to the Wide Area Networks (WAN) and Home Area Network (HAN) specifications for SMETS2, or second-generation smart meters). Validating certificates requires the authenticated connection of the asset as well as a certificate authority.

Compute	The device should have access to compute resources (cloud or in device) which allows the use of agreed security technologies, maintenance of control schedules, system patching and updates as required. The compute should be sufficient to encrypt/decrypt messages without introducing unacceptable latency into the communications. This can be achieved with either standard CPU or cryptographic hardware accelerators.
Storage	The device should have a level of storage that allows local storage of control schedules and failsafe modes. PQC certificates are larger than classical certificates. Storage should be adequate for storing all valid certificates to be stored over the lifetime of the device.

The Department for Energy Security and Net Zero's SSES programme is working with industry to define minimum technical and regulatory requirements for energy smart appliances with the highest potential for flexibility. The current phase of the programme is focussing on domestic and small non-domestic electric vehicle charging points, smart heating appliances, and battery energy storage systems.

Through its technical and security working groups, SSES is working with Original Equipment Manufacturers (OEMs) and flexibility service providers to ensure that appropriate interoperability and cyber security standards are put in place for these appliance categories. The programme is looking to align with industry and with international developments, including in Europe, to ensure regional alignment insofar as possible.

DESNZ published its SSES Enduring Governance Consultation[27], setting out proposals to transition the programme's current government-led governance into enduring, industry-led arrangements.

These arrangements would bring together industry, regulators, and government to maintain and evolve technical and security frameworks that safeguard consumer interests, protect grid stability, and address emerging risks, including those arising in a post-quantum future.

[27] Gov.uk; Smart Secure Energy Systems programme governance

Smart device interoperability

Sector Digitalisation Plan	Problem statement	Divergent device level standards will lead to increased consumer costs due to challenges in understanding and communicating with devices
	Outcome required	Distributed energy devices can communicate appropriately to enable more seamless integrations and utilisation of devices
	Action 6: Smart device interoperability	Industry and DESNZ to agree device interoperability standards by January 2027 through existing workstreams

The 2030 energy system will require continuous coordination with many distributed devices. Seamless communication will underpin the ability for the system to operate securely and resiliently as it becomes more reliant on these edge devices.

Distributed energy assets will need to communicate and coordinate with a variety of other systems to provide the flexibility that is expected from a smart device. The volume of flexibility required, and the associated markets and system operability requirements that emerge from that target will create a large demand for access to device level data by a variety of actors. Ensuring access to that data, as well as requiring it to be understandable and reliable is a core challenge of ensuring the trustworthiness of how these assets are responding to market or control signals.

Currently there are a range of different initiatives in place that are intended to support device interoperability. These include communications protocols such as Open Charge Point Protocol (OCPP)[28] and Open ADR,[29] as well as more detailed 'specifications' that support the interpretation of these and facilitate their consistent application, such as PAS1878 and

[28] An open-source solution that enables communication and management between electric vehicle chargers and back-end management systems.
[29] An open-source solution for Demand Response and Distributed Energy Resource management. Open ADR is a two-way information exchange model and smart grid standard.

Project Mercury. At present, no initiative has been proven to deliver interoperable Energy Smart Appliances (ESAs) at commercial scale.

The PAS 1878 requirement, developed by BSI and sponsored by the Department for Energy Security and Net Zero seeks to establish a minimum specification for an Energy Smart Appliance. That is while PAS 1879 is a code of practice for Demand Side Response. Its scope is limited to providing an approach to interoperable Demand Side Response (DSR) services based on devices generating and sending 'power profiles' to third parties, which is not widely use in prevalent DSR services in Great Britain

Project Mercury, led by a global alliance of organisations to set standards for integration of assets into smart energy systems, aims to support the most prevalent business models. It adopts a 'top down' approach, where devices have relatively simple functionality and third-party service providers generate 'power profiles'.

Different types of devices may have different requirements, and this may lead to differences in approach (for instance data structures). The debate as to when standards should be adopted in emerging technology areas is contentious. Early standardisation can stifle innovation and lock in sub-optimal operating models. Conversely, late standardisation may allow organisations to establish dominant positions, reducing customer choice and increasing costs.

The Department for Energy Security and Net Zero is working with industry to agree technical frameworks for energy smart appliances in Great Britain, to unlock a single interoperable eco-system.

In addition, there are commercial interoperability considerations – technical standards alone may not be sufficient to ensure consumers have a wide as choice as possible of service providers.

This action is framed in light of the clean power target for demand side flexibility, which means that alignment activities must take place well before 2030 to deliver any benefits ahead of that date. By focusing on standardising only the essential elements, the plan allows space for commercial innovation.

Decisions should be pragmatic, but there must also be flexibility to change course if early choices do not work as intended. It is also important to align with international standards, to avoid creating solutions that are unique to GB and risk adding unnecessary costs to devices sold only in our market.

4.4. Gaps

Initial stakeholder discussions highlighted several areas needing further validation before they can be included in this area of the plan.

The gaps highlighted below are not listed by order of priority but require further review and engagement with industry for inclusion into the next iteration of the plan.

Firmware updates

Problem statement	As the number of devices providing flexibility increases – the security of device firmware will be of vital importance. Should equipment manufacturers leave the market or stop providing firmware updates, the devices may become less secure or unusable.

Equipment manufacturers provide the hardware that will underpin the consumer led flexibility of the energy system, and the resilience of these devices is well understood, with programmes of work (such as the Smart Secure Electricity System programme) looking at increasing this resilience through a series of interventions. As more devices get sold and are utilised flexibly, the business models of the device manufacturers will also have implications on the resilience of these devices.

A possible resilience challenge relates to firmware updates – once out of warranty or should the Original Equipment Manufacturer (OEM) exit the market, devices may not receive the necessary over the air updates to retain the required resilience to participate securely in vital energy services.

Given these devices are consumer owned and may be in place for 10 years or more, this could leave parts of the flexibility market at higher risk of cyber-attack. OEM's leaving markets is to be expected in a functioning market, with an example being Google no longer providing support for some models of thermostats in Europe.[30]

[30] Techradar, Google ends support for older Nest thermostats – and will stop selling new models in Europe completely

The Product Security and Telecommunications Infrastructure act (PSTI) notes that manufacturers need to say how long they will support products, with European Telecommunications Standards institute (ETSI) guidance noting that manufacturers should keep software updated (principle 5.3).[31]

The role of OEM's and the incentives to participate within this system is vital, and these aspects should be considered moving forward as the role of flexibility grows. Determining how to best ensure the enduring security of legacy devices may become a larger challenge over time and should be considered in earnest in the coming years.

Resilient operational telecommunications for energy

Problem statement	As Great Britain's energy system increasingly relies on distributed flexibility, it becomes more dependent on telecommunications systems that facilitate communication between system operators, flexibility providers and distributed energy resources / remote network assets.

Operational telecommunication requirements for a clean power system are changing and therefore telecommunication methods need to have sufficient power autonomy to ensure system integrity.

Furthermore, operational communications resilience will become increasingly essential in the context of supporting monitoring of assets at the low voltage level (electric vehicles and heat pumps for instance) and embedded generation.

At present, there is a lack of clarity on the precise problem statement or outcome that needs to be achieved in how to deliver the changing telecommunications resilience required in a clean power system.

Further exploration is required to determine the precise problem statement in relation to GB's pursuit of clean power and how it materialises in the GB context. This can help determine possible options that will help the sector achieve clean power most effectively.

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[31] ETSI, CYBER; Cyber security for the Internet of Things: Baseline requirements

Cross sector telecoms strategy

Problem statement	The energy systems will become increasingly dependent on robust and resilient operational telecommunications for flexibility and adaptability as it transitions to 'Net Zero'. Whilst energy system (electricity) resilience and availability will increasingly impact a wider array of national infrastructure sectors. Plans should be in place that adequately provides security for all.

Ensuring that the operational communications requirements of the energy system are in line with wider national infrastructure is an important consideration give the transition away from fossil fuels and to an electricity centric economy. The UK Infrastructure 10-year strategy[32] notes that

"As the National Infrastructure Commission recommended, telecommunications needs must also be considered for individual infrastructure sectors – across the energy, water and transport sectors. The government will work with Ofcom and other relevant regulators to set out the government's assessment of the telecommunications needs for these sectors by the end of 2026, ahead of the next update to this Strategy.

In the longer term, National Infrastructure and Service Transformation Authority (NISTA) and the Department for Science, Innovation and Technology (DSIT) will continue to lead government's work on identifying and planning for digital infrastructure needs and challenges, across telecoms and non-telecoms digital infrastructure, for the coming decades."

The growing use of flexibility within the clean power action plan means the communications challenges may escalate significantly by 2030 and could impact further infrastructure sectors. Without prompt action, issues across infrastructure sectors may emerge before mitigations can be implemented. This could affect public confidence in an increasingly flexible and distributed energy system which is essential to achieving clean power.

[32] HM Treasury, UK Infrastructure: A 10 Year Strategy

Resilience requirements for critical energy sites

Problem statement	The changing dynamics of the system, as well as the emerging reliance on distributed flexibility will change operational telecommunications resilience requirements for critical energy sites or network assets, and may redefine what sites or network assets are critical.

Clean Power 2030 requires a large volume of both demand and generation flexibility. When there are significant events such as major outages, it will be critical that major control rooms (physical and virtual) are able to continue to operate effectively by coordinating with other control rooms and distributed energy assets as they come back online.

In the case of a major power outage, the control rooms will need power, operational telecommunications and access to mission critical digital systems to operate effectively. Major control rooms - including NESO's – already have robust power resilience requirements in place, and it is common to have mission critical systems available on site (such as physical servers hosting critical data and software) it is less clear if existing operational telecommunication capability (including resilience) is sufficient to meet the needs of the 2030 energy system.

There are a range of approaches that could provide greater levels of operational telecommunications capability such as satellite communications, point to point fibre private wireless networks or public cellular though these approaches in and of themselves have inherent weaknesses and complexity, for example if running platforms in parallel.

Engagement conducted as part of the plan suggests exploration should be done to ensure the operational telecommunications capability including resilience requirements for the operational integrity of critical network and third-party assets are suitable for clean power (including major control rooms) as well as identify if new types of sites or network assets require this type of resilience in this new system.

Transmission and 'supply side' data requirements

Problem statement	The 'supply side' and transmission data requirements that would support organisations making more effective decarbonisation decisions are not well articulated.

Through engagement with stakeholders, the challenge was highlighted that data from transmission and the supply side of the sector should be made more widely available, and its quality improved, to support wider applications in achieving clean power. This could include publishing more granular generation output, forecast data, and detailed network capacity and constraint information, to enable enhanced operational planning and allow relevant organisations to develop innovative solutions.

Stakeholders highlighted that high quality data would be valuable to a broader array of organisations than currently have access, and that by providing clarity on what data is available and how to improve access, tangible benefits could be realised to support clean power outcomes.

This data also needs to be created – meaning a proliferation of other types of smart devices, such as monitoring on substations and or other parts of the network, as well as generation sites. As the system digitalises, ensuring industry prioritises monitoring will mean some coordination is also required in how the system deploys and uses smart assets.

Through this project it has not been determined what data sources would be most valuable, nor who would benefit most from it and were therefore unable to formulate a clear action. While efforts have been made, including through the ENA, to standardise operational data sets, implementation of these changes is still pending.

The role of a market facilitator to support standardisation for distributed flexibility is beginning to take shape, but gaps remain across other key data sets. Further work and engagement is required to progress this at a later date.

Industrial and commercial data requirements

Problem statement	The lack of focus on data integration requirements for Industrial and Commercial actors limits the potential to unlock large-scale, cost-effective flexibility in existing and future energy markets

Stakeholders engaging with the plan noted the lack of attention given to the data and integration requirements of industrial and commercial actors. During the engagements, the digital and data needs of the actors were not brought to the fore. Instead, there appeared to be an underlying assumption that the commercial case for industrial and commercial participation in flexibility was stronger than for consumer-led flexibility – leading to a prioritisation of focus and actions for the latter.

The assumptions were underpinned by a perception that industrial and commercial actors, due or their size and resource, either lacked interest in flexibility services or could independently manage their own requirements without government or public sector input.

However, it is important to recognise that the industrial and commercial sector is expected to represent 1.5-2x[33] the demand of residential consumers by 2030 and therefore represents a significant opportunity to unlock and harness large-scale, cost-effective flexibility. It is therefore important to highlight as a gap, to ensure that it is addressed in future iterations of the plan.

Smart fallback operation modes

Problem statement	As more distributed devices participate in providing flexibility to the network, understanding how those devices operate when they are unable to receive market or command signals becomes more important to system operation.

Smart fallback operation modes are essential for maintaining system stability during unexpected disruptions. In scenarios where communication between NESO or the Distribution System Operator (DSO) and energy asset is disrupted – such as during temporary internet outages – fallback or fail-

[33] Electricity Demand Summary (ED1) 2025 | National Energy System Operator

safe operational modes are implemented to maintain system stability and safety. These modes ensure that energy systems continue to function appropriately even without real-time external commands.

There are existing simple ‘fallback’ operations embedded within assets but there is no intelligent fallback method or common standard. Common fallback strategies include:

- **Maintaining the last known setpoint:** The system continues to operate at the most recent settings received before the communication failure. This approach assumes that the last known state is safe and appropriate to maintain temporarily.
- **Switching to a default setpoint:** Predefined default operational parameters are activated. For instance, the system might reduce power output to a specific percentage or adjust energy consumption to a preset level to prevent overproduction or excessive demand.
- **Automatic grid disconnection:** In critical situations, the system may disconnect from the grid entirely to prevent potential hazards or equipment damage. This is typically a last resort measure when safe operation cannot be ensured.

With an increased reliance on distributed flexible assets, in the event of a smart grid communications failure, an advanced fallback method may be required. This could involve local voltages recorded over time. In the absence of smart grid communications, the distributed asset would then take actions based on its previous experience.[34] Such an approach would likely need to adhere to an agreed standard with appropriate functionality built into the device, to ensure consistent reliability across networks.

Our understanding of this space is that the PAS1878 drafting currently has provision for this type of loss of communications, detailing a ‘response mode’ where the ESA continues with its currently selected flexibility option and logs its power consumption periodically for transmission to the demand side response service provider whenever communications are resumed.

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[34] Lawton, P. (2020) *Fallback operations in the event of a smart grid communications failure*. CIRED, Open Access Proc. J. Vol. 2020, Iss. 1, pp. 309–311

Any technical implementation of PAS standards or another approach may require either specific market participation rules around notifications around device connectivity as well as specific licence requirements attached to the relevant aggregator of devices to ensure control rooms have sufficient visibility and understanding of the expected behaviour of devices being used. This may become a question of scope for incoming Load Controller licences and its interaction with industry codes.

Smart functionality requirements for smart appliances and home energy management systems

Problem statement	The lack of standardised smart functionality for smart appliances and Home Energy Management Systems (HEMS) hinders their integration into flexibility markets and asset visibility initiatives.

Distributed Energy Assets (DEAs) need smart functionality to enable them to participate securely and effectively in flexibility markets, this is also an important enabler for asset visibility. Smart functionality standards are in development for a range of assets (including heat technologies and electric vehicle chargers). However, stakeholders highlighted a potential gap in activity for smart appliances (which includes white goods such as washing machines) and Home Energy Management Systems (HEMS).

It is not yet clear how essential the standardisation of these assets is to achieve clean power or to what extent industry will be able to deliver standardisation without intervention. It is understood they are currently out of scope for the Smart Secure Electricity System (SSES) policy workstream. Therefore, further research is required before specific actions can be included in the plan.

5. Integration

Information is only valuable if it is accessible. To enable secure and efficient access to data, the GB energy sector needs integration structures that facilitate data sharing, and in turn enable the use of data for clean power. This will allow flexibility markets to be optimised and will fully equip control rooms, and ensure the resilience of critical infrastructure – key elements for a reliable energy supply that operates at the lowest cost for consumers.

Four areas have been identified – asset visibility, market interfaces, control rooms, and data sharing infrastructure – as the key actions in this section of the plan. The actions are set out below, with detail on the problem statements and relevant information in subsequent sections.

The key identified actions are set out below, alongside the related activities described in the Clean Flexibility Roadmap.

Key Actions

Action name	Description
Action 7: **Register for asset information**	Networks to implement an asset register that integrates with the Flexibility Market Asset Registration (FMAR) implementation by October 2027
Action 8**: Standardisation of market interfaces**	The Market Facilitator to determine if early progress can be made on the creation of standards to accelerate development and deliver value for flexibility markets within 2026.
Action 9**: Control rooms technology requirements**	NESO to determine technology requirements to optimise large number of low carbon assets by mid-2028
Action 10**: Control rooms communications**	NESO to work with Distribution System Operators (DSOs) on communication and coordination standards and data types by mid-2028
Action 11**: Requirements and DSI functionality**	The Interim DSI Coordinator will, from its early 2026, capture and then prioritise user requirements in collaboration with its stakeholder advisory group with a priority given to supporting clean power outcomes
Action 12**: DSI operational requirements**	NESO to determine a proposed service model for the DSI by the end of the MVP period (late 2026)

5.1. Asset visibility

The increased visibility[35] of distributed energy resources is crucial for the efficient and effective management of the energy system. Currently, information about small-scale flexible assets, such as EV chargers, batteries and heat pumps, is poor and difficult to access. Information such as its location, capacity, operational status, and connectivity is required by a wide variety of people and organisations – with the most developed use cases for network planning and enabling flexibility.

The DESNZ, Ofgem and NESO's *Clean Flexibility Roadmap* proposes steps to develop an asset visibility policy framework and a call for evidence was published at the same time[36]. It also recommends Ofgem consults on a new Distribution Network Operator (DNO) licence requirement to maintain asset registers and support improved access to asset data. The proposed actions in the plan build on these policy positions and argue for the technical requirements to enable progress to clean power. To ensure distributed assets are leveraged at scale for clean power, a solution roll out is required to enable greater asset visibility by mid-2027.

Register for asset information

Sector Digitalisation Plan	Problem statement	It is difficult to understand what energy assets exist, where they are and what their capabilities might be. This makes planning, flexibility, and operations more difficult, and limits the value the assets can create in the energy system
	Outcome required	Asset information is readily available to a wide variety of users with relevant permissions
	Action 7: Register for asset information	Networks should implement an asset register that integrates with the Flexibility Market Asset Registration (FMAR) implementation by October 2027

[35] The ability to identify and understand the capacity, location, and usage of devices that generate, store, or consume energy including those capable of altering these behaviours in response to market signals. This includes having real time, historic and forecasted data for assets' capacity, location and usage, as well as having static data on these parameters.

[36] DESNZ, Open call for evidence, Improving the visibility of distributed energy assets

Clean Flexibility Roadmap	40a) Policy Framework	DESNZ to issue a response to its asset visibility call for evidence by end-2025, setting out next steps and preferred approaches in developing policy frameworks that support asset visibility
	40b) DNO licences	Ofgem to consult by end-2025 on new Distribution Network Operator (DNO) licence requirements to maintain asset registers which support data exchange to improve asset visibility

Knowing the location, capability and status of distributed energy devices in a highly flexible energy system is critical. The lack of data, and therefore information on distributed devices acts as a bottleneck to the delivery of flexibility in NESO and DNO markets. Ensuring that information is available to the right organisations at the right time is vital to underpin the systems and processes that will help realise a clean power system by 2030.

Asset visibility is low in part due to the administrative burden on installers, resulting in fewer asset registrations. Even when assets are registered, the data quality is often poor and stored in isolated systems that don't communicate.

In August 2025, DESNZ published a call for evidence on asset visibility, looking for evidence on

- Views on a future vision for asset visibility, that considers the flow of asset data across its lifecycle from installation to day-to-day use.
- Reviews of Distribution Network Operator (DNO) processes, to promote consistency in the connection of small-scale assets and to ensure asset data is usable across the sector.
- Clarifying installer obligations for asset registration, while simultaneously easing compliance through the use of digital tools and streamlined solutions.
- Leveraging smart meter data and other industry datasets to identify assets.
- Enhancing DNO processes and standardising how asset data storage is accessed.

It is expected this input will help identify the best way forward to solve the challenge of capturing information at point of installation. The Energy Networks Association's work on Connect Direct[37] has partially solved this, providing a new, faster way to get approval to connect residential low-carbon technology to the grid. This information capture is valuable, but not the whole picture. However, timely action – that delivers towards an integrated digital solution – is crucial. In parallel, there is also a need to address the challenge of integrating existing asset data from current market platforms and ensuring a minimum data quality threshold for legacy assets.

An asset register; in addition to existing embedded capacity registers, consisting of either a single data repository or a set of federated data repositories with clear protocols for sharing information between them is essential to achieving clean power. Particularly where third parties are required to support access to asset information for a wide variety of use cases,[38] such as supporting network planning, system operation, and dynamic forecasting. System operability requirements (use cases), both at the DSO and at a NESO level will be driven by increasingly granular data needs.

To support asset visibility, Ofgem has proceeded with the development of a Flexibility Market Asset Registration (FMAR) solution. As the first intervention in the Flexibility Digital Infrastructure (FDI) workstream, it seeks to introduce public interest digital assets into the energy sector, to improve the efficiency of flexibility markets in Great Britian.[39]

The scope of the FMAR solution will be progressively refined through a collaborative, industry-led design programme during 2025/2026. Elexon has indicated[40] that the solution could ultimately support a broad range of flexibility market participant registration needs by establishing a shared, interoperable master data record for approved users. This record could

[37] ENA Connect Direct. An easier way to manage domestic connections
[38] Energy Systems Catapult, Automatic Asset Registration
[39] Ofgem, Call for Input: The Future of Distributed Flexibility
[40] Elexon, FAQs now added to Elexon webinar on Flexibility Market Asset registration programme

include: asset location and technical characteristics, FSP counterparty identity and contact information.

At a minimum, the FMAR solution will standardise the data required to port technical and commercial qualifications across multiple market platforms, reducing duplication and friction for flexibility service providers (FSPs) seeking access to various markets. However, a key consideration on FMAR is that it is limited in scope to collecting data at the point of market entry in select Ofgem-defined flexibility markets, whereas a comprehensive asset register would encompass the collection of data on all assets at the point of installation. If both types of registers are developed, close integration is required to maintain reliable source of verified information and any further solution would need to work with the consumer consent service (action 1).

Additionally, the data requirements of NESO's Single Markets Platform (SMP) for example, are significantly more granular and frequent than DSO markets; and ensuring both FMAR and any other asset registration solutions are aligned to those will be paramount in ensuring the benefits of increased visibility are realised. This will have implications on work identified in Action 9 and 10, detailed later.

Both data about distributed assets, as well as market information layered on top of that relating to how it is participating in flexibility markets will be critical enablers of system operability in a clean power system. These data sources have been identified as a key enabler of control room technology requirements.

To ensure that asset visibility is in place for MHHS, and in line with Ofgem's proposed licence requirement in the Clean Flexibility Roadmap, an asset register, or federated registers, will need to be developed and implemented relatively rapidly. Doing so requires careful integration between networks, but if achieved, it will create a high-quality dataset which can be used as a single source of truth for the increasing volumes of energy assets.

The most developed solution that provides granular asset visibility is the Automatic Asset Register (AAR) innovation programme work. Through the programme, proposals for a Central Asset Register (CAR) have been developed, which act as a single source of truth for asset information - including the technical capability to regularly monitor for updates. The AAR innovation programme ended in spring 2025 with both technical and policy recommendations being presented to Government and Ofgem.

As noted in the call for evidence, any register would need to be integrated with other existing registers of assets to cross pollinate information and build up a more robust picture of asset visibility. Additionally, any developed registers would need to align with future policy developments emergent from the call for evidence on asset visibility.

Some specific direction may be required though the proposed licence requirement to ensure technical alignment of any DNO developments in the future, this may come in the form of additional specific interoperability requirements above and beyond Ofgem’s Data Best Practice, if required.

Beyond this, consideration will need to be given to Independent Distribution Network licensees, and how requirements carry through to those licence holders to ensure high levels of asset visibility.

5.2. Market interfaces

NESO's Clean Power 2030 response to government highlighted the need for a significant scale up in flexibility. In particular, the need demand side flexibility to ensure a stable clean power system. Flexibility markets provide the financial framework to help drive consumption behaviours and increase uptake in distributed flexible energy resources. Market interfaces are essential digital capabilities that enable participants, such as aggregators, to access markets and provide new service offerings to consumers.

Milestone: MHHS central systems

Sector Digitalisation Plan	Problem statement	To unlock flexibility, we need to be able to reflect the true costs of the system at a more granular level and enable consumers to benefit from shifting their demand from high-cost periods to low-cost periods.
	Outcome required	Demand data is available and utilised to support the financial flows of the energy system.
	Action	No action in the Sector Digitalisation Plan. This is a milestone.
Clean Flexibility Roadmap	1b) Data consent rules	Ofgem to determine, by autumn 2025, whether existing data consent rules present a material barrier to the realisation of stated MHHS benefits and decide whether changes to relevant frameworks are needed.
	1c) Benefits realisation	Ofgem to produce a MHHS Benefits Realisation Plan by October 2026, track the realisation of MHHS benefits, and consider if further intervention is needed to expand or diversify the range of CLF products available.

The transition to a clean power energy system is being underpinned by many individual projects, all contributing to operational systems and markets. In the context of the digitalisation activities needed to achieve Clean Power 2030, Market-wide Half-Hourly Settlement (MHHS) is a critical enabler.

MHHS is a major programme of work to reform how energy in the power system is used and accounted for.[14] MHHS will expose suppliers to the true cost of supplying their customers in every half hour period. Suppliers will be able to offer incentives to their customers (for example via a smart tariff) to reward them for shifting their consumption away from peak periods. MHHS is crucial for Clean Power 2030 as it helps incentivise suppliers to offer a wider range of financial incentives (flexible tariffs) to encourage demand side response and uptake in smarter energy assets.

Essential to the rollout of MHHS are the digital systems required to support reconciliation of half hourly meter readings in a timely manner. The MHHS programme publishes regular updates to the programme plan on the website.[15] Development of MHHS digital systems is expected by October 2025, followed by an 18-month migration period.

MHHS is not included as an implementation in the plan, but rather a core milestone, around which other digital infrastructure, such as the consumer consent solution, Flexibility Market Asset Registration, must be ready in time for.

Stakeholders consistently noted during workshops and one-to-one sessions that the absence of coordinated digital infrastructure could undermine the impact of MHHS. Based on this feedback it appears ensuring all relevant infrastructure is in place ahead of MHHS offers the best chance for consumer propositions around flexibility to scale in the late 2020s.

Milestone: Tariff interoperability

Sector Digitalisation Plan	Problem statement	Customers, aggregators and energy assets need to have a good understanding of their tariff to in turn understand the cost of their energy and how shifting demand can impact their bills.
	Outcome required	Consumers understand and can compare their tariffs to get the best service for their needs.
	Action	No action in the Sector Digitalisation Plan. This is a milestone.

Clean Flexibility Roadmap	3c) Accessible tariff data	By end 2026, through the SSES programme, DESNZ will amend electricity suppliers' licence conditions, requiring them to make tariff data available to domestic consumers in a standardised format, making it easier to optimise appliances against smart tariffs including more advanced, 'dynamic' tariffs where the tariff rate updates frequently

Consumer led flexibility will rely on people, companies and devices being able to understand and respond to price signals, many of which will come in the form of a tariff. However, there are multiple ways in which a tariff can be designed and communicated. Without standardisation, it is possible devices will only be compatible with a subset of the available tariff options, which would limit the availability and utility of flexible energy assets.

By ensuring that both the underlying tariffs and how they are communicated is interoperable, consumers can be given the greatest level of choice and maximise the flexibility available within the system. Within the Smart Secure Electricity Systems (SSES) consultation response in April 2025[41], the Tariff Data Specification (TDS) was announced, designed to create tariff interoperability. This would be governed by the Retail Energy Code Company,[42] and is expected that energy suppliers will be required to comply with the TDS for electricity tariffs by Q3 2026.

The action described in the Clean Flexibility Roadmap will be important in setting out the requirements to ensure tariff information is available in a timely way, to a wider array of users. An action on the operability of the information published through the TDS is not included here, but its importance is noted as many devices and services will need this tariff data.

[41] Gov UK. Smart Secure Energy Systems Programme enduring governance
[42] RECCo, What is the Tariff Interoperability Project?

Standardisation of market interfaces

Sector Digitalisation Plan	Problem statement	Market platforms generally have bespoke registration mechanisms, data structures and operational processes. Energy assets cannot easily partake in or move between markets without significant manual effort. This limits the value of energy assets and limits the ability to share.
	Outcome required	Data can be easily moved between market participants.
	Action 8: Standardisation of market interfaces	The market facilitator to determine if early progress can be made on the creation of standards to accelerate development and deliver value for flexibility markets within 2026
Clean Flexibility Roadmap	41a) Flexibility market standards	Elexon to drive flexibility data standardisation and alignment across flexibility markets by end-2027, improving consistency, transparency and interoperability of data through the implementation of the Flexibility Market Rules and supported by the market facilitator governance
	40c) Flexibility Markets Asset Registration (FMAR)	Ofgem to finalise the market facilitator and FMAR policy framework, including NESO and DNO licence changes, by December 2025, streamlining the registration process to access flexibility markets
	41c) Flexibility Digital Infrastructure	Ofgem to publish, by the end of 2025, the intended approach for monitoring and achieving wider Flexibility Digital Infrastructure outcomes, beyond FMAR. This will consider what common IT systems might be needed across the end-to-end process, to support the participation of flexibility assets in NESO and DSO markets

Standardised data models, formats, and protocols ensure market users can engage with flexibility markets in a consistent and interoperable way. This is essential for creating cohesive and efficient flexibility markets where all participants can interact and share information without technical barriers. Without this, costs increase, and scalability of consumer led flexibility provisions will take longer to materialise.

Market data standards are required to underpin the coordination of flexibility service providers in market participation. Ofgem have appointed Elexon as Market Facilitator to deliver the Flexibility Market Asset Registration which is designed to support aggregators participating in multiple flexibility markets.

In addition, the Department of Energy Security and Net Zero initiated the Flexibility Markets Unlocked (FMU) programme in 2024/25[43] which funded the development of three projects, which down selected to one (Flexify)[44] for its final phase.

Stakeholders emphasised the need for clear rules and protocols for market engagement, such as for revenue stacking. Although the development of these flexibility rules is outside the scope of the digital capabilities outlined in this plan, they are essential for its success. Elexon is expected to set these rules and protocols as part of their role as the Market Facilitator and this is set out in the actions described in the Clean Flexibility Roadmap.

The Market Facilitator, as the organisation responsible for the FMAR, will need to consider how to detail clear data standards that are suitable to accelerate the development of objectives for the Flexibility Digital Infrastructure (FDI) and deliver early value to increase volumes of participating flexibility. Clarity on the data standards that flexibility service providers should develop to reduce barriers to entry is a necessity, as well as how this is transmitted to the relevant system operators.

Learning from the innovation programmes undertaken can maximise the value of prior government and industry investment and reduce the cost and time to deliver. Alignment with activities such as Consumer Consent, DSI and smart meter data access routes (SDR and SMEDR) will also be very important. Doing so will enable acceleration and alignment with the target for achieving outcomes ahead of Market-wide Half-Hourly Settlement (MHHS) implementation.

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[43] Arup, Flexibility Markets Unlocked Programme

[44] Electron, Flexibility Markets Unlocked: Flexify `

5.3. Control rooms

The operability of the energy system is constantly evolving. Given the profound period of change the sector is going through to achieve Clean Power 2030, the way in which control rooms interact with each other is of vital importance to retain the sector's highest standards of resilience, operability, and security.

Control rooms technology requirements

Sector Digitalisation Plan	Problem statement	Operation of a clean power system will change from the system of today. We need to ensure that the right data is provided to the right systems to ensure optimal operational decisions can be made across the system.
	Outcome required	The energy system control rooms are operable in a new flexibility dominated energy system.
	Action 9: Control room technology requirements	NESO to determine technology requirements to optimise large number of low carbon assets by mid-2028

Clean Power 2030 included the need for a significant scale-up of flexibility. This flexibility is crucial for balancing the intermittent nature of renewable energy sources and maintaining the stability of the national grid. Enhanced or new systems must be capable of managing large volumes of data and executing real-time decisions to adjust power flows based on current grid conditions. Advanced algorithms and automation are essential to ensure that flexibility resources are utilised efficiently and effectively.

The control rooms of the future will likely need to be driven by operational process changes, some of which are out of scope of the sector digitalisation plan. It is expected more effective forecasting is achievable using advanced technologies, such as artificial intelligence (AI), and better integration of existing data sources. AI can analyse vast amounts of data to predict energy demand and supply it more accurately, helping to optimise the use of flexibility resources. Improved forecasting capabilities enable better planning and decision-making, reducing the risk of imbalances in the grid. Additionally, the use of advanced techniques such as probabilistic forecasting, will help make more informed decisions based on accurate estimates of uncertainty.

The scale up in flexible distributed assets means demand can change as well as supply. That requires new tools for dispatching demand, which inherently need to be more probabilistic – as demand response is less deterministic than generation.

The following activity has been identified in this space:

- **Solar PV nowcasting**[45]: Using advanced machine learning techniques, this project aims to enhance the accuracy of solar electricity generation predictions. Improved predictions can significantly reduce the need for 'spinning reserve', thereby cutting carbon emissions, lowering costs for end users, and increasing the grid's capacity to handle solar generation.
- **Crowdflex**[46]: As part of the Ofgem Strategic Innovation Fund (SIF), Crowd Flex explores how domestic flexibility can be leveraged to manage the electricity grid more efficiently. Domestic flexibility refers to households shifting the times they use energy to help balance supply and demand.
- **Volta**[47]: The Volta project is dedicated to optimising forecasting and dispatch decisions in the control room through AI. Recommendations from the Volta programme are expected by 2027 and will subsequently feed into operational business planning. However, the success of Volta's AI development relies on accessible data, such as the implementation of an asset register and the FMAR programme, and good quality information on how market participants will utilise those assets.

Action is needed to identify digital technology requirements to enable and optimise a larger number of low carbon assets in control rooms by mid-2028. Delivering this action 18 months ahead of CP30 will help ensure we can operate a clean power system with confidence with the increased

[45] ENA, Solar VP Nowcasting
[46] NSEO, Crowdflex
[47] NESO, Volta: Model driven Strategy for Balancing Optimisation (MSBO)

volume of distributed flexibility being used, enabled by necessary digital capabilities. This will need to consider changes to the GC166 (grid code) and the Open Balancing Platform (OBP). The above activities primarily relate to the NESO control room. It is not clear what similar activity is being undertaken at the Distribution System Operator level and further work is required to explore this.

Control rooms communications

Sector Digitalisation Plan	Problem statement	System control and optimisation will change with a more distributed energy system in the future. Ensuring effective coordination between control rooms will be vital to maintain a secure and resilient energy system.
	Outcome required	The energy system control rooms are communicating necessary information between each other.
	Action 10: Control room communications	NESO to work with Distribution System Operators (DSOs) on communication and coordination standards and data types by mid-2028

With the large uptake in distributed energy resources and changing system dynamics, control rooms will need to communicate new information between each other in different ways as the clean power system matures.

Control rooms need to be able to communicate and coordinate to ensure that actions combine to deliver a stable energy system. Communication between NESO and Transmission System Operator (TSO) control rooms are relatively mature, however communication with Distribution System Operator (DSO) control rooms is in its infancy and requires more targeted activity to support the increase in distributed flexible energy assets needed for Clean Power 2030.

Effective communication channels (including technical and governance requirements) between different control rooms are necessary to synchronise efforts and avoid conflicts. Digital capabilities to support this use case are also dependent on clearly defined operational processes, such as primacy rules, to be truly successful.

NESO is delivering a multi-year project to provide visibility of and access to Distributed Energy Resources (DER) and Consumer Energy Resources (CERs) across all timescales (real-time to long-term) – receiving, procuring, storing, analysing, and making decisions on this data – to improve operation of the whole-energy system.

As with Action 9, delivering this action 18 months ahead of 2030 will help ensure we can operate a clean power system with confidence with the increased volume of distributed flexibility being used, enabled by necessary digital capabilities.

5.4. Data Sharing Infrastructure (DSI)

As the energy system grows in complexity, ensuring that organisations can share data between each other in a scalable way becomes increasingly important. Operability, whole system planning and investment, innovation and flexibility alike all will benefit from reducing friction from data being moved around the energy system.

Data Sharing Infrastructure (DSI) requirements

Sector Digitalisation Plan	Problem statement	The volume and type of data sharing required to achieve clean power means approaches to org-to-org data transfer need to change. Non-standardised ways of sharing data between organisations are slowing innovation and preventing new operational activities.
	Outcome required	Organisations can more readily share data between other organisations more frequently and at lower cost in a secure and trusted way.
	Action 11: Requirements and DSI functionality	The Interim DSI Coordinator will, from early 2026, capture and then prioritise user requirements in collaboration with its

		stakeholder advisory group with a priority given to supporting clean power outcomes
Clean Flexibility Roadmap	44a) Strategic planning use case	NESO to complete, by the end of 2026, the building and testing of an MVP use case through the DSI to support strategic planning of the energy system
	44b) Flexibility use case	Elexon, with support from NESO and Ofgem, to build a DSI-aligned flexibility use case of data exchange in 2027 as part of FMAR development
	44c) Data sharing alignment	NESO, in its role as Interim DSI Coordinator out to 2028, to ensure that the DSI evolution aligns with the development of other data sharing initiatives such as smart data and consumer consent

To achieve clean power there needs to be a greater sharing of data between parties in a trusted and secure way. As the requirement for data sharing continues to increase, merely expanding the web of bespoke, point to point data sharing solutions that exist today will become a large technical burden that the sector will need to manage – ultimately increasing costs for consumers. This creates the need for a common Data Sharing Infrastructure (DSI).

The requirement for a sector wide data sharing solution has been in discussion for several years with the Modernising Energy Data Access (MEDA)[48] innovation competition providing funding to explore solutions such as Open Energy.[49]

The Energy Digitalisation Taskforce[50] has also provided further support for the development and deployment of a solution at scale. This has been driven forward through the Digital Spine Feasibility Study[51], which evolved it into the DSI concept, and the subsequent DSI Pilot led by NESO.[52]

[48] Energy Systems Catapult, Modernising Energy Data Access
[49] Open Energy
[50] Energy Systems Catapult, Energy Digitalisation Taskforce
[51] Department for Energy Security and Net Zero, Digital spine feasibility study: exploring a data sharing infrastructure for the energy system
[52] NESO, Virtual Energy System Data Sharing Infrastructure (DSI) Pilot

The DSI is defined as a set of responsibilities, processes and technical functions that deliver secure data exchange for organisations in the energy sector. In practice, this manifests as a socio-technical solution which enable any energy sector participant to share information and data between each other using standardised approaches, comprising of the legal and technical enablers of sharing data at scale.

The DSI is composed of two core components: the Data Preparation Node (DPN) and the Data Sharing Mechanism (DSM). Together, they form a federated architecture that enables decentralised data sharing across the energy sector; one where participants retain ownership over their data and have a trusted mechanism through which to share it.

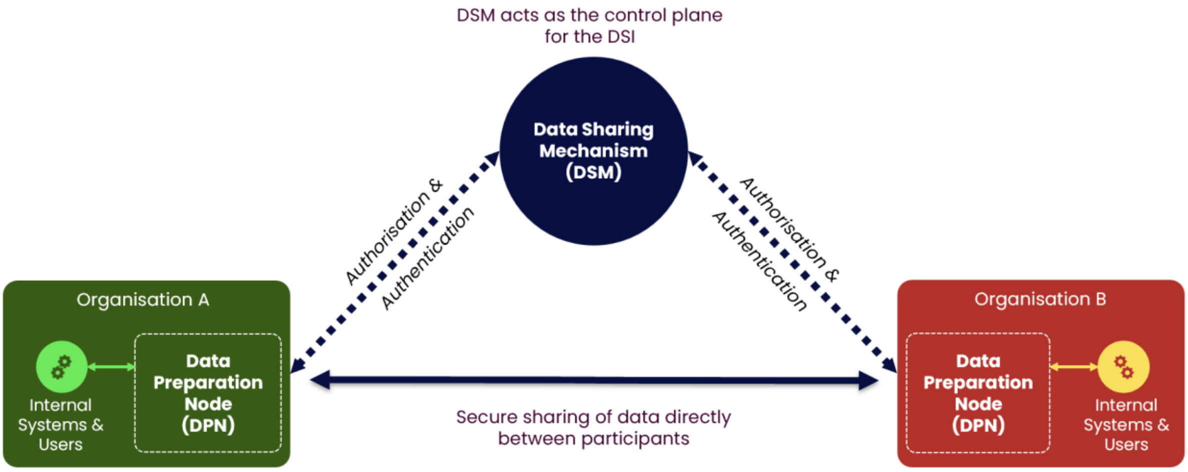

Figure 5 – DSI Conceptual Overview

The DSI pilot concluded in spring 2025 and focused on both developing the DSI capability and demonstrating scalability through an outage planning use case. The MVP will continue to develop the solution further with the private beta deployment planned for 2027 as part of a wider technology rollout.

There is a need for a DSI to be deployed as soon as possible to support many other digital requirements. By prioritising DSI development with an eye on supporting clean power, both the benefits of scalable data sharing will be accelerated and a clean power future realised.

DSI operational requirements

Sector Digitalisation Plan	Problem statement	Future users of the DSI require clarity on how the service provision will run so they can participate.
	Outcome required	A service model is defined for how the DSI will operate.
	Action 12: DSI operational requirements	NESO will determine a proposed service model for the DSI by the end of the MVP period (April 2027).

The DSI is being developed as a critical piece of shared digital public infrastructure, for the benefit of the whole energy sector. A small number of organisations within the regulated networks have been involved in the initial development of the solution through the DSI Pilot, with a greater range of regulated and non-regulated participants involved in the MVP. Participation and early adopters will increase throughout the MVP, as the DSI will ultimately be used to meet the needs of a wide range of potential users and all energy sector participants.

In addition, it will not be possible to support all use cases and users from day one, therefore there will need to be prioritisation of functional and non-functional requirements to ensure the delivery of value at pace.

A fair and transparent process is therefore essential to oversee the development and ongoing maintenance of the solution. This will be facilitated through the appointment of an Interim DSI Coordinator. Ofgem have announced the Interim DSI Coordinator as NESO to provide this governance layer for the MVP and initial roll out. This governance layer will provide the resources to continue development of the DSI in alignment with industry needs and Ofgem's direction.

In addition to this governance layer, identification of the service or operational model will need to be identified and put into place. This operational model will define how the service is operated, including service level agreements and other considerations related to running the DSI as a service for users. Clarity on this will need to be achieved within 2026 to provide network licensees and other participants clarity on how the DSI will operate in the long term and in alignment with RIIO3 licence changes.

5.5. Gaps

Initial stakeholder discussions highlighted several areas needing further validation before they can be included in this area of the plan. The gaps highlighted below are not listed by order of priority but require further review and engagement with industry for inclusion into the next iteration of the plan.

Planning data standard

Problem statement	Different layers of planning the energy system will need to use the same data to achieve an overall coherence in plans across the energy system.

A coherent approach to energy planning is essential to delivering a clean power future. Currently, different layers of the energy system planning – such as local energy planning, Regional Energy System Plans (RESP) and the Strategic Spatial Energy Plan (SSEP) and the Centralised Strategic Network Plan (CSNP) – could require access to the same underlying data. However, there is a lack of standardisation which could lead to inconsistencies in assumptions and hinders effective decision-making.

Data and process fragmentation remains a challenge across energy planning. While new mechanisms such as RESP, SSEP and the CNSP are being developed to bring energy planning together in a more integrated way, differences in how data is collected, formatted, and shared can make alignment challenging. For example, local authorities frequently hold the most relevant data on their energy plans, but this information is often in an inaccessible format – though progress is being made in digitalising this information in more easily sharable formats. As NESO develop the RESP there is increased need to collaborate and integrate how data is shared across the various planning layers.

Technical barriers also persist with data models used by network operators and local authorities not being interoperable, which prevents collaborative planning. Scenario modelling tools used by local energy planners and energy networks, such as Distribution Future Energy Scenarios (DFES) and Future Energy Scenarios (FES) rely on different data models, making it challenging for different user groups to interrogate or align them.

To address these barriers, digital tools that enable seamless data sharing, interoperability, and standardisation across all layers of planning are needed. Establishing common data standards and frameworks – supported by platforms that integrate and align to data models used by local authorities and network operators – will allow stakeholders to collaborate more effectively, ensure consistency in planning assumptions, and support robust, whole-system decision-making.

A project already is the Planning Regional Infrastructure in a Digital Environment (PRIDE) project, led by National Grid.[53] PRIDE is developing digital tools and frameworks that enable local authorities and network operators to plan together using a shared, interoperable data environment. The Geospatial Government Digital Service is also working on a pilot for Land use data interoperability, which aims to improve the consistency and integration of land use data to support more coordinated planning.[54] By creating a digital platform that brings together regional infrastructure data, building information, and demographic insights, PRIDE allows local authorities to produce more effective local area plans at lower cost and ensures these plans can be used for network planning. The project is also working to align data models used by local area plans and energy network scenario modelling, supporting collaborative workflows and making it possible for all stakeholders to interrogate and use the same data. These are the kinds of projects needed to overcome fragmentation and technical barriers in energy system planning, and NESO should play a key role in ensuring such initiatives are developed, adopted, and scaled across the sector.

In addition to technical barriers, local authorities are facing a shortage of skilled staff to manage and use energy planning data effectively - a

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[53] National Grid, Planning Regional Infrastructure in a Digital Environment (PRIDE Alpha)
[54] GDS Geospatial blog, How geospatial ai can help inform our land use choices

challenge which resides within the workforce and mobilisation gap (Section 6.4). Furthermore, something outside of the scope of this plan, but important to note, is the lack of sustainable funding for local area plans which currently rely on short-term innovation grants. Without stable funding, councils will struggle to build or maintain the necessary expertise, limiting their ability to engage with digital tools and share data, and ultimately hindering coordinated, whole-system energy planning.

Secondary suppliers and split metering requirements

Problem statement	The existing energy market structure, which requires service providers and manufacturers of smart energy assets to partner with a single energy supplier, limits access to revenue streams and could adversely affect the maintenance and flexibility of installed assets.

Currently most electricity consumers access energy tariffs from a single supplier. Service providers and manufacturers of smart energy assets (such as electric vehicle chargers) therefore typically need to partner with an energy supplier to access these customers and offer services that provide financial incentives to flex the asset. This impacts access to revenue streams, which could have knock on effects for the ongoing maintenance of installed assets and their ability to respond flexibly.

In 2019, a Balancing and Settlement Code (BSC) modification was proposed to enable multiple suppliers through the same meter. The proposal was eventually withdrawn after a cost benefit analysis revealed high costs of implementation and other schemes that may achieve similar aims of opening up the market (such as MHHS). The analysis recommended a review of the code proposal in five years, to allow time for the other schemes to be implemented. There have since been delays to the rollout of MHHS and smart meters which could limit the value of a review at this stage.[55]

[55] Elexon, Modification P379 is withdrawn but learnings can support future change

Areas of the supplier model debate, such as rules for revenue stacking and the regulation of Third-Party Intermediaries[56] are out of scope for the Sector Digitalisation Plan and RECCo are exploring these challenges through Retail Energy Code governance. These areas could impact digitalisation requirements should there be a change in policy, and so should be considered for subsequent iterations of the plan.

Back office and improving online customer care

Problem statement	The digitalisation of the energy sector can improve efficiency but risks increasing complexity and exclusion for some consumers. Accessible and responsive customer care will be essential in consumer engagement and acceptance.

There remains significant potential to improve consumer outcomes, particularly regarding billing experiences and customer care, as the energy sector becomes increasingly digital. Stakeholder engagement has highlighted that while digitalisation brings opportunities for greater efficiency and innovation, it can also introduce new complexities and challenges for consumers, especially in their interactions with suppliers. It is therefore essential that the sector remains attentive to the diverse needs and expectations of all consumers, taking particular care not to exclude those without sufficient financial empowerment or digital literacy. This means ensuring that support channels are accessible and responsive to a diverse range of consumer personas.

Improving customer outcomes is not only fundamental to delivering fair and transparent billing but also to building and maintaining trust in the energy sector. For most consumers, the supplier relationship is their main point of contact with the industry, making it a critical touchpoint for public perception. Currently, low levels of consumer trust have influenced the uptake of key initiatives such as the smart meter rollout, where some scepticism and hesitancy among consumers has challenged widespread adoption. By prioritising customer experience through clear communication and responsive, tailored support, the sector can begin to

[56] Department for Energy Security and Net Zero, Regulating Third Party Intermediaries (TPIs) in the retail energy market

rebuild confidence and foster a more positive relationship with consumers. This ultimately will support future digitalisation initiatives.

At present, there is insufficient information to prescribe specific actions to address these customer care challenges. However, it is important to flag this as a gap to be explored further in future iterations of the plan.

Network buildout process and tooling

Problem statement	The digitalisation of the energy sector requires coordinated effort as well as the acceleration and alignment of activities that meet the construction demand required to achieve Clean Power 2030.

The construction demands required to meet the clean power targets are highly ambitious. There are significant opportunities to accelerate the planning, design, and build management phases through process optimisation, digitalisation and tooling – measures that are essential to support these aggressive build objectives.

As the delivery of the 88 identified transmission network projects accelerate, the system impact on energy distribution of bringing those projects online will be important. Interactions with planned outages for maintenance, for example, may materially impact timelines.

During stakeholder engagement, there have been noted process improvements and digitalisation efforts across the transmission and distribution networks. However, there is currently no comprehensive survey or study of process and digitalisation initiatives, best practice sharing, or barrier removal across the network. The Clean Power Implementation Plan[57] notes a delivery tracker tool will be developed which may solve some challenges. Additionally, there is lots of investment within RIIO-3 frameworks, and similar is expected within ED3. Bringing these together to ensure alignment will be a significant challenge.

Ultimately, the primary goal is to ensure the network is built in the right place at the right time. Addressing this gap is expected to be crucial.

[57] NESO, Clean Power Implementation Plan

6. Activity coordination

Digitalisation enables better visibility and management of the entire energy network, from generation to distribution and consumption. By integrating modern digital technologies and high-quality data inputs, the energy system can operate more efficiently, reducing costs and improving service offerings for consumers and businesses while enhancing energy resilience.

However, without effective coordination, multiple digitalisation activities may overlap and create new digital silos, additional complexity and administrative burdens for third parties attempting to access data and provide innovative services to consumers.

Key actions

Action name	Description
Action 13: Data ontology	NESO to align its Data Sharing Infrastructure from 2027 to the emergent common ontology to ensure compliance, enabling harmonised, interoperable data to support Clean Power 2030
Action 14: Alignment of trust framework(s)	DESNZ, Ofgem, NESO, RECCo to work together through 2025/6 to establish a view on how the various aspects to trust frameworks can be aligned.
Action 15: Digital Coordination role	NESO to undertake further work in early 2026 to help scope what a digital coordination role should achieve
Action 16: Sector Digitalisation Plans	NESO to assume stewardship of the plan and establish a clear governance framework to guide future annual iterations

6.1. Data ontology[58]

Data is the lifeblood of a digitalised energy system. Ensuring that the data layer can be interpreted, transformed into reliable information, and that this information can be trusted and acted upon will be one of the greatest challenges in achieving clean power.

Data ontology

Sector Digitalisation Plan	Problem statement	High-quality, standardised energy system data is essential for planning, flexibility and consumer value. Without coordinated policy alignment and consistent adoption of standards, stakeholders face barriers to understanding, using and creating value from data which will hinder essential activities to achieve clean power
	Outcome required	Users across the energy ecosystem, and wider built environment, have a clear understanding of energy data and can use it for decision making purposes.
	Action 13: Data ontology	NESO to align its Data Sharing Infrastructure to the emergent common ontology to ensure compliance, enabling harmonised, interoperable data to support Clean Power 2030.
Clean Flexibility Roadmap	41 b) Data ontologies	DESNZ, with support from Ofgem and NESO, to explore a common ontology and foundational data model for interoperable data exchange in the energy system with some elements delivered by end of 2026

Utilising data from across the energy ecosystem is already a growing need of data users across the economy. Ofgem's work on standardisation, focused around Data Best Practice guidance and the associated licence condition has improved data quality and interoperability to date.

[58] An ontology provides a clear picture of all the key concepts in data and how they connect, so everyone shares the same understanding

Ensuring that energy data is understandable in the context of the rest of the built environment is a growing challenge, and one where there is no quick fix. Long term development of standards is required to ensure economic opportunities from cross-sector data uses can be maximised and supports the economic opportunity clean power creates. How these standards then enable data to move around the economy – where the data goes and what is done with it, will also be critical in creating the groundwork to leveraging artificial intelligence.

Electricity networks form the backbone of a clean power system. A shared and accurate understanding of how these networks operate is critical for achieving long-term strategic outcomes such as Net Zero and energy security, as well as more immediate goals like Clean Power 2030. To achieve optimal results, flexibility markets, network planning, connection processes all depend on the availability of consistent and high-quality network data.

There are two main categories of network data that underpin this and are a priority:

- **Network topology data:** Network topology data enables all flexibility participants to understand asset locations and the potential impacts of their actions on the network. Additionally, when connecting assets to the network, they can use this data to maximise value for the overall energy system.
- **System status data**: Datasets including features such as headroom at substations, and how it varies over time, enables flexibility providers to avoid unintended consequences, while proposing products and services that best meet system needs

Network information is critical to clean power, but its value is significantly reduced if it is shared in inconsistent formats or without sufficient clarity. Given the fragmented ownership and operational models across electricity networks in Great Britain, the risk of data being delivered in different, non-aligned formats is high and has been realised. This places a heavy burden on market participants and innovators who must invest in bespoke integrations. The result is reduced interoperability, inefficiency, and barriers to scaling delivery – especially in processes requiring visibility across multiple network areas.

To address this, network operators in Great Britian have increasingly adopted the Common Information Model (CIM) - a series of standards developed under the International Electrotechnical Commission (IEC). CIM provides a data model for describing network assets and has been widely used in Great Britian for publishing network topology data. However, CIM is a broad standard with multiple variants and different interpretations can lead to divergent implementations. In GB, CIM is being adopted within the Long Term Development Statements requirement for DNO's to provide updates about network development through time. There is a high bar to understanding this data for non-expert users.

To enable long-term interoperability, including integration with adjacent sectors (such as transport, buildings, and water) the sector will need to incrementally evolve toward a robust, ontologically grounded foundation model that is supported by smart assets. A report done for the Department for Energy Security and Net Zero (unpublished) highlights the utility in developing CIM further to support the development of that proposed foundation model. This allows for existing work in CIM to continue creating near-term value while preparing for a future where data models can extend across use cases and sectors, enable tracking of data across the economy and help realise the value of artificial intelligence layered on top of this data.

This approach will not be quick and will take many years to mature. Deep collaboration will be required to develop a foundation model that meets a wide range of user needs, with strong governance of the GB CIM and broader adoption playing a major role in its success. The noted Clean Flexibility Roadmap action frames the starting point to undertake that journey, with this plan's action focused on providing a first route for technical implementation and use that will need to follow on from it. As the work noted in the Clean Flexibility Roadmap develops, and a clearer proposal emerges for undertaking this work, more specificity can be provided in implementation routes to realise benefits of the ontology work.

6.2. Trust frameworks

The energy system of 2030 will require a significant volume of data to be shared for planning, flexibility, system operation and consumer benefits. The data that needs to be shared could be personal, commercial or even about critical national infrastructure. In each scenario, it will be critical to ensure that there is trust between the party sharing the data and those using it and that it is shared with authorised users while being treated securely. That requires robust security standards and clear audit trails to evidence good practice.

Alignment of trust framework(s)

Sector Digitalisation Plan	Problem statement	Data subjects or owners need to be able to trust those who will be processing their data, without this they may refuse access, which could significantly and negatively impact planning, flexibility and system operation.
	Outcome required	Consumers and industry participants can easily enable secure data to move around the energy system with minimal duplication,
	Action 14: Alignment of trust framework(s)	DESNZ, Ofgem, NESO, RECCo to work together through 2025/6 to establish a view on how the various aspects to trust frameworks can be aligned.
Clean Flexibility Roadmap	43a) Smart data scheme	DESNZ to continue work over the course of 2025 to consider whether to introduce an energy smart data scheme. DESNZ will identify and cost options on scheme design and implementation to support a potential consultation on detailed proposals

Trust frameworks enable data consumers and producers to move shared data (i.e., data that can be shared but not made open) between each other in a more secure and scalable way. Multiple existing initiatives in the sector are progressing by using trust frameworks in their approaches. This mix of co-development, duplication, requirement differences and timings are hard to follow.

Accessing datasets usually requires some form of approval from the data owner or data subject. Access to many energy data sources, especially smart meter data, requires consent due to both General Data Protection Regulation (GDPR) and the Data Access and Privacy Framework (DAPF) and organisations will complete Data Privacy Impact Assessments (DPIAs). However, there is no standardised way for companies to obtain informed consent and perhaps more critically, there is no easy way for a consumer to manage consent they have previously provided.

Where the data is not personal, for example commercially sensitive data, there is often still a need for an approval process where the terms need to be agreed regarding the use and management of the data. Again, there is currently no universally adopted solution for this challenge though there is progress being made by the initiatives set out below.

Initiatives in this area include:

- **Smart Data Scheme** - the Data (Use and Access) Act received royal assent in June 2025. Amongst other things, this act gave the Department for Energy Security and Net Zero the power to implement a Smart Data Scheme in the Energy Sector. There has already been a call for evidence on this topic and further work will continue in 2025
- **Data Sharing Infrastructure Trust Framework** – as part of the 'prepare, trust, share' approach of the Data Sharing Infrastructure, a Trust Framework is expected to be implemented to facilitate the legal sharing of information during 2026.
- **Consumer consent service** - Ofgem has appointed RECCo to support the development of a consumer consent service which will use a trust framework. An MVP is expected in Autumn 2026 with the enduring solution being rolled out iteratively after that point.
- **Open Energy** – Icebreaker One have been working on an industry trust framework for the energy sector since 2019. The proposed solution takes inspiration from Open Banking and focuses on the socio-technical challenges related to trust, verification and security. Note, Open Energy focuses on non-personal data.

These initiatives are clearly considering very similar issues. While they have the potential to be highly complementary, and work is already underway to reduce duplication and improve alignment, there remains a risk of overlap or misalignment without continued coordination. However, with some concerted effort to align technology choices, these initiatives could be integrated to create a holistic solution which crosses personal and business centric data.

Technical, policy and regulatory choices to determine approaches are required. The proposed Smart Data Scheme action described by the Clean Flexibility Roadmap could provide the policy framework that drives deployment and uptake. Building from this, this plan of action looks to drive the technical choices that energy can achieve while delivering value for the individual components of the shared digital infrastructure. Collaboration with the Smart Data Scheme should focus on taking note of progress and seek to align and accelerate all agendas collaboratively where possible.

6.3. Digital governance

Shared digital infrastructure, and all the facets of a digitally enabled energy system, require a cohesive approach to governance, architecture and delivery. This is fundamental to enable a clean power system, as the complexity of the digital journeys that need to be taken may have significant implications to the viability and uptake of the new energy paradigm.

Digital coordination role

Sector Digitalisation Plan	Problem statement	There is a lack of coordination of digital activities in the energy system. Overarching coherence in systems architecture and integration is a core requirement to ensure an operable energy system and associated energy markets to 2030 and beyond.
	Outcome required	Clarity on roles and responsibilities around how digital infrastructure and solutions are developed through the 2020s and beyond.
	Action 15: Digital Coordination role	NESO to undertake further work in early 2026 to help scope what a digital coordination role should achieve.

Clean Flexibility Roadmap	47a) Digitalisation vision	DESNZ and Ofgem to publish, by Q1 2026, a vision outlining the technical and nontechnical aspects of coordinating digitalisation initiatives and how these can be brought together and align with other sectors of the economy to ensure interoperability and coherence

There are numerous initiatives, many highlighted in this document, that will significantly influence the role of digital infrastructure in a clean power energy system. Today, the system lacks an integration or 'architecting' layer, that takes direction and requirements from the governance layer and ensures digital cohesivity of the delivery layer.

This initial work has underscored the need for improved coordination across digitalisation activities, and this need is being identified by others[1]. The current lack of coordination leads to inefficiencies and missed opportunities for integration and interoperability.

A clean power system requires well thought out digital integration. Achieving the digital systems needed to enable scalable consumer benefits is on its own a challenge that requires digital architecture consideration. Other elements of enabling clean power, such as communications requirements to exchange messages between control rooms, will require similar levels of attention but at different points in time.

In undertaking this plan, the following needs were identified that help define what the coordinating layer should do:

- **Being a key decision maker for shared digital infrastructure design**: Involvement in relevant working groups and industry codes where the development of shared digital infrastructure is considered. This improves coordination and alignment, reducing the risk of inefficient or conflicting digital processes.
- **Rationalising the consumer journey**: Ensuring that all activities undertaken prioritise making the system work for consumers, particularly where consumers have direct interaction with the energy system.

- **Identifying and promoting standardisation requirements managed at a sector level**: Establishing, harmonising and promoting common standards for data exchange, API interfaces, and other technical specifications to ensure interoperability and reduce duplication of efforts.
- **Enabling competition for digital solutions**: Ensuring that the sector is leveraging market mechanisms to deliver digital infrastructure solutions. Ensuring market participation in the design and implementation of these solutions fosters competition and innovation.
- **Risk management**: Identifying and managing strategic risks associated with digital infrastructure, including cybersecurity threats and system vulnerabilities.
- **Enabling system integration**: Identifying and tasking specific parts of the sector to integrate key digital systems and processes to ensure digital system coherence.

Building on the work of the Energy Digitalisation Taskforce, NESO (as ESO) commissioned a consortium of Arup, Energy Systems Catapult and Zuhlke, published a proposal for a Digitalisation Orchestrator[59] to strategically plan and coordinate the energy sector's shared digital infrastructure. The proposed solution was positioned as an independent body to ensure efficient and effective digital infrastructure design, leveraging market solutions where it makes sense. It was described that this coordination should lower costs, accelerate decarbonisation, support consumer vulnerabilities, and manage strategic risks.

Similarly, should this route be explored, questions exist around how a coordination role would interface with existing Data Sharing Infrastructure (DSI) governance (whether the DSI would eventually fall under it or be a separate responsibility) as well as the governance of other initiatives, such as the RECCo-led consumer consent solution. There are many questions that need to be resolved on scope, purpose and remit, and any coordinator will need to be in place within a timeframe that ensures considerable impact ahead of 2030.

The action in the clean flexibility roadmap, therefore, starts the discussion

[59] NESO, Delivering energy sector digitalisation

with industry on the scope and purpose of a potential digital coordination role. The action outlines a way to accelerate that to ensure it can deliver benefits to support the realisation of clean power in 2030 and beyond.

Sector digitalisation plans

Sector Digitalisation Plan	Problem statement	The emerging digital energy system is complex and lacks a coherent architecture, roadmap and plan that is well articulated.
	Outcome required	Stakeholders understand the overarching direction of energy digitalisation and can see what is being prioritised, as well as engage with the process.
	Action 16: Sector Digitalisation plans	NESO to assume stewardship of the plan and establish a clear governance framework to guide future annual iterations.

Within the governance layer of the energy system, there is recognition of the importance of digitalisation. Many activities have been stood up to help identify challenges, opportunities and actions in the past, such as the Data and Digitalisation Taskforces. Given the proximity to 2030, recommendations are no longer sufficient, and clear actions with responsible owners are required to ensure coordination across the sector.

The process of developing this Sector Digitalisation Plan has underscored the complexity of the rapidly evolving digital ecosystem required to achieve Clean Power 2030. It has also served as a valuable opportunity to make sense of the complexities by mapping and consolidating existing initiatives, identifying key interdependencies, and highlighting areas where gaps remain.

In recognition of the fast-moving nature of the sector and the pace of technological advancement, the plan is intentionally designed as an iterative document. This approach ensures that it can continue to serve as a practical guide as sector needs, priorities, and technologies evolve on the path towards Clean Power 2030.

NESO is committed to resourcing to support the ongoing stewardship of the plan. As part of this commitment, NESO will deliver annual iterations of the plan before 2030. Each new version will build on the foundations laid here, incorporating the latest developments, addressing the gaps identified in this iteration, and broadening the scope to include additional energy vectors.

To ensure the plan's actions are delivered effectively, NESO will work closely with the Clean Power Unit and other relevant bodies with the objective to create a governance framework that is both agile and collaborative, enabling timely action, transparent oversight, and clear accountability as the sector continues to progress towards the outcomes of this plan.

6.4. Gaps

Initial stakeholder discussions highlighted several areas needing further validation before they can be included in this area of the plan.

The "Gaps" highlighted below are not listed by order of priority but require further review and engagement with industry for inclusion into the next iteration of the plan.

Policy changes

Problem statement	The energy system's transition to clean power requires extensive policy changes, and the implications of these changes on shared digital infrastructure need thorough analysis and consideration

The pace and scope of change required to achieve a clean power system is extensive, and energy policy is evolving in response to this. For instance, changes in policy areas such as market reform will likely have knock on implications for the development of the shared digital infrastructure for the energy system, for example the implementation of load controller licenses; or a scenario where 15 or 5-minute settlement is pursued in the future.

This plan has focused on identifying how to operationalise decisions that have already been made. Future iterations of the Sector Digitalisation Plan will consider energy policy developments and the impact on digital implementation.

Consumer journey

Problem statement	Consumers interactions with the energy system are duplicative and complex to manage, thereby increasing friction to participation.

The consumer journey in the GB energy sector is fragmented and complex for consumers who interact with multiple devices, services, and providers. While the average domestic consumer typically engages with the system through a single energy supplier, more engaged consumers must juggle multiple accounts, logins and platforms across different providers and services. Each have their own sign-up process and data consent requirements.

This fragmentation also presents a challenge for providers seeking to offer innovative services. Such a system creates hassle and friction, making it difficult for consumers to gain benefits. As the sector digitalises it is likely that this complexity and consumer burden is expected to rise, making it important to plan now for a more streamlined and consumer friendly experience.

There is a gap in the lack of a clear organisational accountability for coordinating the end-to-end consumer journey. No single body is responsible for harmonising new digital interfaces and ensure consistent, user friendly experience as new services come to market. Some elements within the retail market are coordinated, for example RECCo and the central switching service.

Without wider coordination, consumers face inconsistencies, duplicated effort and higher risk of digital exclusion. Even well-intentioned innovations risk adding to the problem unless they are designed with secure, interoperable data platforms, consistent consent and privacy controls and user-centric interfaces that genuinely simplify engagement.

The sector has an urgent need to steward this integration. As the sector decarbonises and new business models emerge, the number of consumer interactions and the need for active participation will only increase. Thoughtful digital design and seamless integration are now more important than ever to deliver a transition that is genuinely accessible to all, while ensuring that vulnerable consumers are not excluded and disadvantaged. The accountability for this integration sits with everyone designing services, digital focussed or not – and is therefore very complex to solve.

Workforce mobilisation

Problem statement	The energy sector's transition to clean power demands a skilled workforce, particularly in digital competencies, to support extensive infrastructure upgrades and system-wide transformation.

The scale and pace of transformation required to deliver Clean Power 2030 outcomes is significant, and stakeholder engagement has consistently highlighted the urgent need for a suitably skilled workforce across the energy system.

Analysis suggests that upgrading the onshore domestic network alone could require 50,000–130,000 additional jobs by 2050[60]. In response, the Clean Energy Industries Plan was published in summer 2025[61].

While the strategy addresses reskilling and workforce development, there remains a gap in clarity regarding the digital capabilities and tools this workforce will need to support delivery.

At this stage, there is limited visibility on how digital competency will be embedded or how this aligns with system-wide digital transformation efforts.

Further review will likely be required to determine how the strategy interfaces with evolving digital infrastructure and where responsibility for coordination will sit.

[60] Ofgem, Electricity Networks Strategic Framework: Enabling a secure, net zero energy system
[61] Department for Business and Trade and Department for Energy Security and Net Zero, Clean Energy Industries Plan

Risk register of digital infrastructure and cyber security

Problem statement	Managing the emergent risks and dependencies of a shared digital infrastructure presents challenges in governance and risk management responsibilities.

During the development of this plan, it was highlighted that many different facets of a shared digital infrastructure creates multiple dependencies and risks. Managing this emergent digital infrastructure from a risk and assurance perspective is expected to become a growing challenge and one where there is an open question as to where that risk should be managed. For example, the concept of 'Algorithm governance'[62], discussed in the Energy Digitalisation Taskforce and in a follow up paper

Existing risk registers exist in the energy system, across NESO, DESNZ, Ofgem and the Smart Energy Code (SEC). Given the proposed coordination role and the specialism that a new governance layer could facilitate, it is currently unclear how to treat emerging risks in the development of a more fully digital energy system. This should become clearer after industry engagement on the vision for digitalisation governance, which the Department for Energy Security and Net Zero and Ofgem plan to publish in early 2026.

Financing, cost-benefit and the value of digitalisation

Problem statement	The financial viability and value of developing shared digital infrastructure in the energy system requires thorough assessment and strategic alignment.

Stakeholder engagement highlighted the development of shared digital infrastructure must also come with considerations for the financial layer. Including alignment with an end-to-end view on investment planning around the requirements identified across the energy system from a digital perspective. This is currently approached through the RIIO processes with respect to energy networks, however shared digital infrastructure expands beyond the remit of those regulated in this way. Business models are

[62] Energy Systems Catapult, Algorithm Governance

changing in the energy system, and shared digital infrastructures will help underpin the opportunities this creates.

Considering financing, costs and the value of digitalisation will help better shape the development of a shared digital infrastructure as well as highlight the digitalisation interventions needed to enable a clean power system. The publication of the Industrial Strategy[63] noted the action to develop and implement a data valuation framework by April 2026. This activity may provide guidance and support in framing the financial aspect of digitalising the evolving energy system.

In addition to the work being undertaken in the Industrial Strategy, consideration should be given to the new data demands of the energy system. Data must be paid for in its creation, maintenance and sharing. Ensuring that critical data, and the data owners, can provide reliable information for the wider system needs will be vital in enabling clean power.

[63] Department for Business and Trade, The UK's Modern Industrial Strategy 2025

7. Conclusion

The Sector Digitalisation Plan reflects a shared commitment to acting decisively. It recognises that system transformation must be inclusive, transparent, and equitable – designed and delivered in collaboration with society and with a clear focus on consumer benefit.

As the country moves toward Clean Power 2030, and ultimately Net Zero, the digital foundations laid now will determine the system's future ability to adapt, innovate, and thrive. These foundations are more than just technology — they are about ensuring everything we do is purposeful and aligned to what matters for people, businesses, and the planet.

Each action within this plan is explicitly linked to the clean power outcome it supports. By mapping every step to specific consumer and system benefits, we reinforce clear accountability and maintain a direct line of sight to real-world impact.

The need for digitalisation is no longer in question. With continued progress, the benefits include:

- **Consumer trust and simplicity will grow:** Digital integration will deliver a smoother consumer experience with simple accounts and apps, consistent tariff visibility, and aligned data consent processes. This will strengthen consumer engagement and confidence in participating in flexibility markets.
- **Consumer-led flexibility will become accessible at scale:** With the digital coordination of millions of devices such as EVs, heat pumps, and smart appliances, GB can mobilise the 10-12 GW of consumer led flexibility needed to balance the gird effectively through consumer participation.
- **System inefficiencies and lower bills:** Managing flexibility digitally will help reduce peak demand and avoid the need for inefficient

over-sizing of the supply side, ultimately supporting lower bills for consumers.

- **Real-time system operability and resilience will be strengthened:** Advanced digital data analytics, automated resilience testing and robust cyber-secure architectures will reduce the risk of outages and enhance the system's ability to manage the variability and distributed nature of renewables.
- **Improved data visibility and sharing**: Comprehensive, interoperable asset registers and standardised market interfaces will give operators clear insight into the location, capability, and usage of assets, enhancing optimisation and planning ability.
- **Standardisation will enhance interoperability:** Aligned device standards and coordinated data sharing frameworks will enable seamless integration and mobility of assets across platforms and markets, reducing costs and improving market efficiency.
- **Control room communication and coordination will be strengthened:** The evolution towards a distributed, flexibility-driven system will be supported by advanced data sharing and communication standards between Transmission and Distribution System Operators, helping to maintain system stability.

Sixteen priority actions must now move forward, with a further seventeen gap areas identified where more certainty is required, or delivery mechanisms are yet to be established. These actions and gaps are mapped across the three plan layers — communication and infrastructure, integration, and activity coordination — together with six outcomes from the Clean Power 2030 Action Plan (section 2.2), and shown in the table overleaf:

From this mapping, several clear conclusions emerge:

- **Integration and Coordination are critical:** Modernising the energy system depends on seamless data sharing, well-defined digital roles, and alignment across the sector. Coordinated plans and clear accountability will be vital to deliver change at pace.

- **Gaps exist in every focus area:** Each category, from cyber security to consumer engagement and workforce development, faces significant challenges. Closing these gaps through targeted action is essential for a flexible, resilient system.
- **A consumer-first approach to digital infrastructure is needed:** Smooth operation of the smart metering system, strong interoperability standards, clear data sharing obligations, and an easy, secure experience must be at the core of the sector's response, ensuring everyone can benefit.
- **Data and cyber security must not be compromised:** Managing an expanding range of digital assets risks introducing new vulnerabilities, requiring enhanced protocols and strong industry collaboration to keep the system resilient.
- **Standardisation and shared data models are key:** A lack of common data and operational standards continues to slow progress. Tackling this will unlock interoperability and strengthen efficiency across the sector.

This plan gives purpose and direction to the journey ahead. By closing gaps, driving coordination, and putting people at the heart of the energy transition, the sector can lay the foundations for a digital, net zero future.

	Infrastructure and connectivity	Integration	Activity coordination
Consumer simplicity	**1.** Consumer consent design and implementation **2.** Smart meter continued operability **6.** Smart device interoperability **Gap**: Smart functionality requirements for smart appliances and HEMS	**8.** Standardisation of market interfaces **Gap:** Secondary suppliers and split metering requirements **Gap:** Back office and improving online customer care	**14** Alignment of trust framework(s) **Gap:** Policy changes **Gap:** Consumer journey
Consumer led flexibility	**1.** Consumer consent design and implementation **3.** Improved smart meter data access **5.** Asset hardware security **6.** Smart device interoperability **Gap**: Device firmware updates **Gap**: Resilient telecoms **Gap**: Smart fallback operation modes **Gap**: Smart functionality requirements for smart appliances and HEMS	**7.** Register for asset information **8.** Standardisation of market interfaces **9.** Control room technology requirements **10.** Control room communications **Gap:** Secondary suppliers and split metering requirements **Gap:** Back office and improving online customer care	
Grid decarbonisation and security	**Gap:** Transmission and 'supply side' data requirements **Gap:** Industrial and commercial data requirements	**11.** Requirements and DSI functionality **12.** DSI operational requirements **Gap:** Planning data standard	**13.** Data ontology **14** Alignment of trust framework(s) **15.** Digital coordination role **16.** Sector digitalisation plans **Gap:** Risk register of digital infrastructure **Gap:** Financing, cost-benefit and the value of data
Network access and connections	**4.** Network asset security **Gap:** Cross sector telecoms strategy **Gap:** Resilience requirements for critical digital energy assets **Gap:** Transmission and 'supply side' data requirements	**7.** Register for asset information **11.** Requirements and DSI functionality **12.** DSI operational requirements **Gap:** Planning data standard **Gap:** Network buildout process and tooling	**Gap:** Workforce mobilisation
System operability	**2.** Smart meter continued operability **3.** Improved smart meter data access **4.** Network asset security **5.** Asset hardware security **Gap:** Device firmware updates **Gap:** Resilient telecoms **Gap:** Cross sector telecoms strategy **Gap:** Resilience requirements for critical digital energy assets **Gap:** Industrial and Commercial Data Requirements **Gap:** Smart fallback operation modes	**9.** Control room technology requirements **10.** Control room communications	**13.** Data ontology **Gap:** Risk register of digital infrastructure
Supply chain and workforce		**Gap:** Network buildout process and tooling	**15.** Digital coordination role **16.** Sector digitalisation plans **Gap:** Policy changes **Gap:** Consumer journey **Gap:** Workforce mobilisation **Gap:** Financing, cost-benefit and the value of data

Figure 6 – Actions and gaps sorted by functional layer

8. Appendix

The appendix outlines the methodology used to develop the Sector Digitalisation Plan (seen diagram below for an overview). Experts from NESO and partners shared their specialist knowledge and engaged a broad range of industry stakeholders through workshops and interviews to map ongoing developments, identify key dependencies, and highlight areas for further action. This process enabled the consolidation of a wide range of activities into a clear set of actions, creating a deliverable plan that supports the achievement of Clean Power 2030.

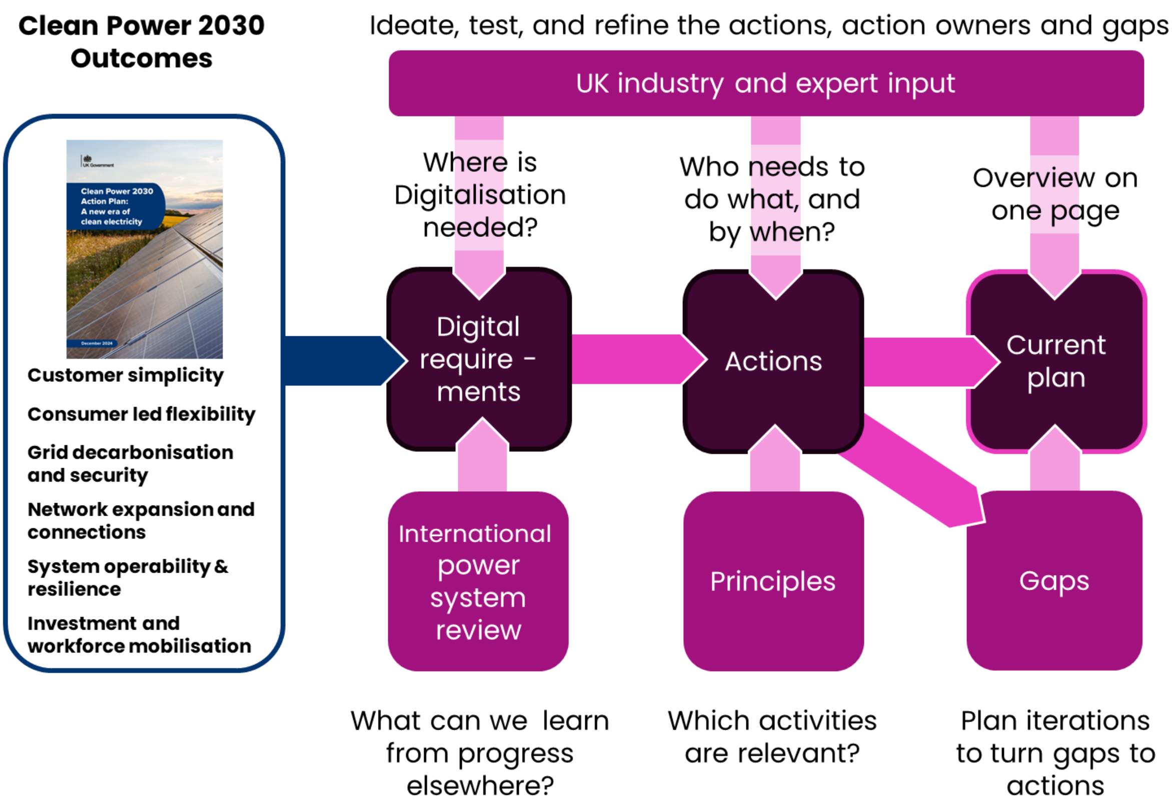


Figure 7 - Overview of the methodology followed to develop the Sector Digitalisation Plan

8.1. Key participants and relationships

To support the digitalisation plan for Clean Power 2030 in Great Britain, it is essential to understand the roles and interactions of the main stakeholders within the electricity sector in the context of digitalisation. The following table provides a concise overview of each key entity, highlighting their primary responsibilities and the nature of their relationships with other sector participants through this digital transformation.

Name	Role	Digitalisation Interest & Relationships
Consumers (I&C and Residential)	End users of electricity (customers): businesses (I&C) and households (Residential)	Digitalisation empowers consumers with flexible tariffs, near real-time usage data, and new energy services, enabling cost savings and participation in demand-side response
Suppliers	Purchase electricity from the wholesale market and sell it to Consumers	Suppliers benefit from digitalisation through innovative tariffs, improved customer engagement, efficient billing, and new business models such as demand response
Ofgem	Regulates the electricity and gas markets; protects consumer interests; enforces rules.	Ofgem uses digitalisation to enhance market transparency, regulatory oversight, and consumer protection
DESNZ	Sets national energy policy & regulatory framework.	DESNZ leverages digitalisation for better policy design, real-time monitoring, and evidence-based regulation to achieve net zero
NESO	Balances electricity supply and demand in real time	NESO relies on digital tools for real-time system management, integration of renewables, and improved forecasting, which are essential for balancing a complex, decentralised grid
Wholesale Market	Platform where electricity is traded between Generators (including imports) and Suppliers	Digitalisation makes trading more efficient and transparent in the Wholesale Market, reducing transaction costs and supporting the integration of distributed and flexible resources
Elexon	Administers the market settlement	Elexon will take on the role of Market Facilitator, and currently streamlines market settlement

	system (Balancing and Settlement Code)	and reconciliation through digitalisation, improving accuracy and supporting the integration of new market participants and products It receives data from NESO, Networks, Suppliers, Data Aggregators, Generators, and the Wholesale Market, calculates financial positions, and ensures accurate payments, operating within Ofgem's regulatory framework
Data Aggregators	Collect and process meter data from Consumers	Data Aggregators are at the core of digitalisation, enabling accurate, timely data collection and analysis for settlement, billing, and market innovation They gather data from Consumers, provide processed data to Suppliers and Elexon, support Generators for settlement, and must comply with Ofgem's data and privacy standards
Networks	Own and operate the infrastructure that transports electricity from Generators to end users	Networks use digitalisation for smarter grid management, predictive maintenance, and greater visibility of distributed assets, which helps accommodate more renewables and improve resilience They receive instructions from NESO, deliver electricity from Generators and foreign suppliers to Suppliers and Consumers, share data with Data Aggregators and Elexon
Generators	Produce electricity within GB and import electricity from import markets (via interconnectors)	Generators use digitalisation for better asset optimisation, integration with renewables, and efficient trading—including imports—by leveraging real-time data and analytics
Flexibility Service providers	Offers demand and supply side services that help balance the grid, manage constraints and support system stability	Leverage digital capabilities and tools for forecasting, dispatch, and real-time market participation, including using data and consumer engagement to optimise performance and demonstrate service delivery
Original Equipment Manufacturers (OEM's)	Manufacture devices that operate on the grid	Many system operators, aggregators, suppliers and consumers will be using devices made by these organisations to benefit from the energy transition. The data held by these devices, and

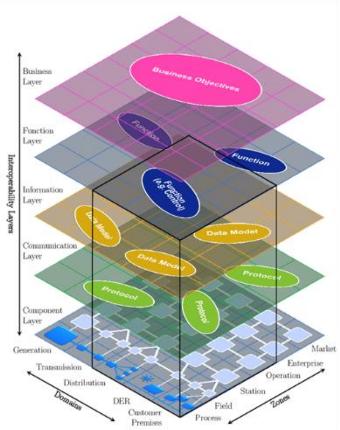
		the OEM's themselves, will be vital to enabling clean power
Retail Energy Code Company (RECCo)	Manage and evolve the Retail Energy Code, deliver and improve vital REC services.	RECCo are developing key industry programmes that enable tariff information, and consumer information to flow more easily around the market, as well as facilitating switching. The data from these services will be foundational to enabling flexibility
Department for Business and Trade (DBT)	Responsible for business growth, trade policy, and investment.	DBT are committed to advancing digital trade through electronic documentation and adopting technologies to encourage economic growth, trade competitiveness, smarter regulation, digital markets and attracting technology-driven investment
Department for Science, Innovation and Technology (DSIT)	Responsible for driving science, technology, and innovation policy.	DSIT are committed to driving digital infrastructure, the adoption of AI while investing in connectivity, digital inclusion, and capabilities to boost the UK's leadership in technology. They are leading the Smart Data work across government

8.2. International Power System Review

The country has lessons to learn from the world's top-performing smart grids. To build on this existing knowledge and experience, and avoid duplicating efforts, a comprehensive literature review was conducted. This not only helped to identify useful references for GB, but a common, rigorous framework to use as a basis for the Sector Digitalisation Plan – the Smart Grid Architecture Model (SGAM).

Smart Grid Architecture Model (SGAM)

Developed in the early 2010s by the European Standardisation Organisations (CEN, CENELEC, and ETSI) under an EU mandate, the Smart Grid Architecture Model (SGAM) provides a structured approach to support the deployment of smart grids across Europe and remains a valuable reference today. While the Sector Digitalisation Plan focuses on the minimum viable elements needed for Clean Power 2030, rather than a fully realised smart grid, SGAM has been used as a guiding structure for this assessment. The framework helps map dependencies and align digital actions, supporting a coordinated approach. Importantly, 2030 is a key milestone rather than the final destination; SGAM can continue to support the sector's progress towards Net Zero 2050 as the plan is updated and evolves over time.



Business layer: used to map regulatory and market structures and policies, business-related models, business portfolios of market parties involved.

Function layer: describes functions and services including their relationships following business needs. Functions are represented independent of their physical implementation (represented by elements in the component layer).

Information layer: describes the information that is being used and exchanged between functions. It contains information objects and the underlying data models.

Communication layer is to describe mechanisms and protocols for the interoperable exchange of information between functions.

Component layer describes all physical elements that realise a function as well as their logical relations. Physical elements can, for instance, include power system equipment (typically located at process and field level), protection and tele-control devices, network infrastructure (wired / wireless communication connections, routers, switches), or any kind of computers.

Figure 8 - The SGAM framework including description of each layer

In addition, SGAM was designed to apply across multiple utility sectors, including gas and hydrogen, which increases its value for the electricity sector by enabling integrated planning across different energy vectors. This flexibility supports future developments that model cross-vector interactions – such as electricity-to-gas conversion or combined heat and power networks – within a single, cohesive framework. Using this approach helps optimise the whole system and ensures interoperability, so the electricity sector can evolve in step with other energy vectors.

For this assessment, the SGAM model was used to ensure comprehensive coverage of all relevant domains, from generation to consumer, and to organise actions logically across the framework's layers. To aid clarity and understanding, the original five SGAM layers have been grouped into three focus areas: infrastructure and connectivity, integration and activity coordination. This structure helps us interpret the required activities and show how they align to enable the outcomes described in the following section.

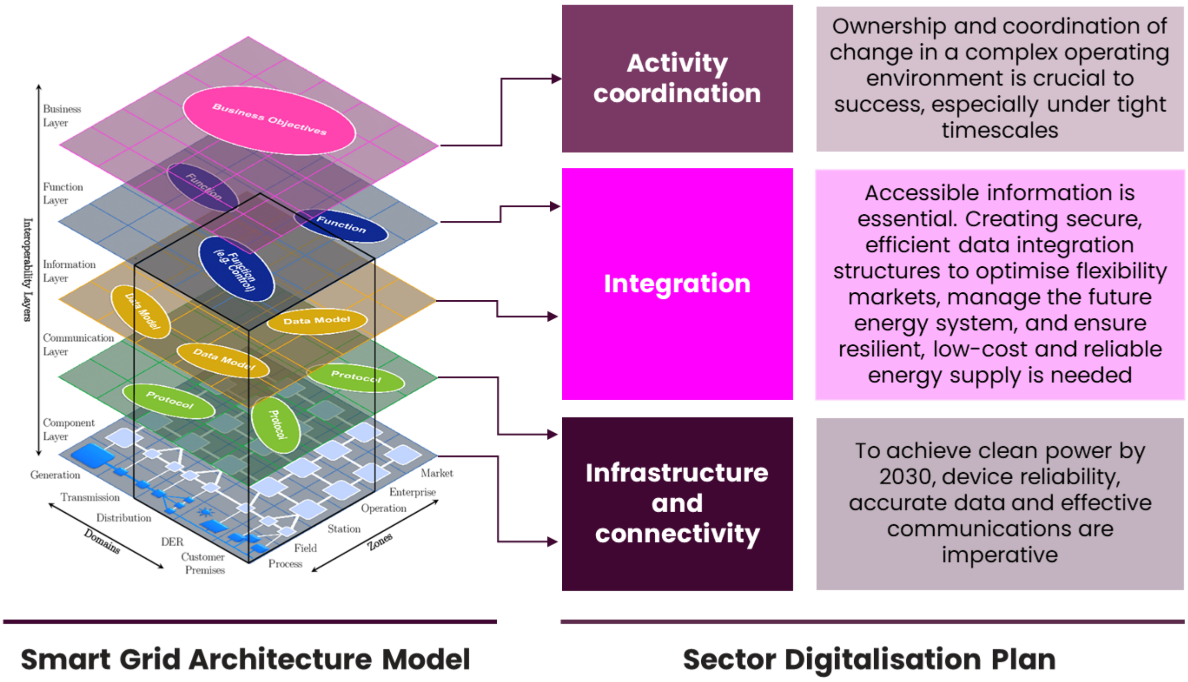


Figure 9 - The Smart Grid Architecture Model alongside the Structure Digitalisation Plan structure

Inputs from leading international smart grids

A review of three leading international smart grids – Enedis (France), TaiPower (Taiwan), and CitiPower & Powercor (Australia) – was carried out to identify practices relevant to the Sector Digitalisation Plan. The analysis highlighted several common themes in their digitalisation efforts, including widespread smart meter deployment, the use of advanced analytics and AI, and early investment in customer education and engagement. For example, CitiPower partnered with AWS and Vibrato to develop a cloud-based platform for analysing large volumes of smart grid data. These utilities also demonstrated the benefits of moving from reactive to predictive, data-driven operations – prioritising automated voltage control to manage distributed energy resources and network reliability.

Not all themes identified were adopted, as differences in market structure and regulation limit their direct applicability. The review focused on digital tools and roadmaps used by these companies, and relevant insights were incorporated where appropriate.

Extensive smart meter deployment:

- Enedis leads globally with over 35.7 million 'Linky' smart meters deployed, achieving near-total national coverage in France.
- TaiPower has reached 79.2% coverage of national electricity usage with around 2.7 million meters.
- CitiPower and Powercor have deployed over 1.1 million meters across Victoria.

Use of advanced analytics and AI:

- Enedis employs digital twins for predictive interventions and to also help balance Distributed Energy Resources (DERs). This enables virtual simulations of the grid to be created to test scenarios and optimise responses.
- TaiPower's Siemens based Meter Data Management System (MDMS), serves as a central hub for ingesting, processing, and distributing data across key operational systems. This includes billing, demand response, outage management, and advanced distribution management systems (ADMS), allowing for real-time decision-making and seamless coordination across the utility's digital ecosystem.
- CitiPower and Powercor complement their smart metering infrastructure with AI tools that enhance DER management and grid reliability. Collectively, these capabilities move the utilities from reactive maintenance models to predictive, data-informed operations.

Voltage automation:

- Automated control of voltage and distribution networks has emerged as a shared priority.
- Enedis uses its 'Linky' infrastructure for appliance-level command and grid flexibility.
- TaiPower has automated 70% of its distribution grid and deployed smart substations for real-time control.
- CitiPower and Powercor's real-time Dynamic Voltage Management System ensures optimal voltage levels despite fluctuating solar input.

8.3. Review of existing digitalisation activities

The Sector Digitalisation Plan is responding to the need to clarify the growing complexity of digitalisation efforts. A thorough and comprehensive review of all digitalisation activities within the sector has therefore been essential to support the identification of clear actions to take. To do so, expert knowledge within NESO, stakeholder input, as well as public resources from government, the regulator, innovation funding agencies and industry were used. The resulting list was validated through additional stakeholder engagement.

The documented activities fell into three categories:

- **Implementation projects** – existing projects that have sustainable funding, industry backing and appropriate policy and regulatory support, such as Market-wide Half Hourly Settlement
- **Innovation projects** – ongoing projects which are being delivered with support from innovation funding including the Net Zero Innovation Portfolio (NZIP), Strategic Innovation Fund (SIF) and Network Innovation Allowance (NIA), like the Data Sharing Infrastructure (DSI) Pilot
- **Policy development** – active areas of policy or regulatory consideration with a specific digitalisation focus, such as the Smart and Secure Electricity System (SSES)

For each activity, the aims, current status, solution maturity, confidence in implementation, lead delivery organisation and partners, and links to Clean Power 2030 were all reviewed – including alignment of timelines.

8.4. As-Is and To-Be analysis

The gaps between the current state of digitalisation in the power system and the desired future state of digitalisation for Clean Power 2030 – 'As-is' and 'To-be' – were outlined first. Pinpointing the differences helped identify the actions needed to bridge them.

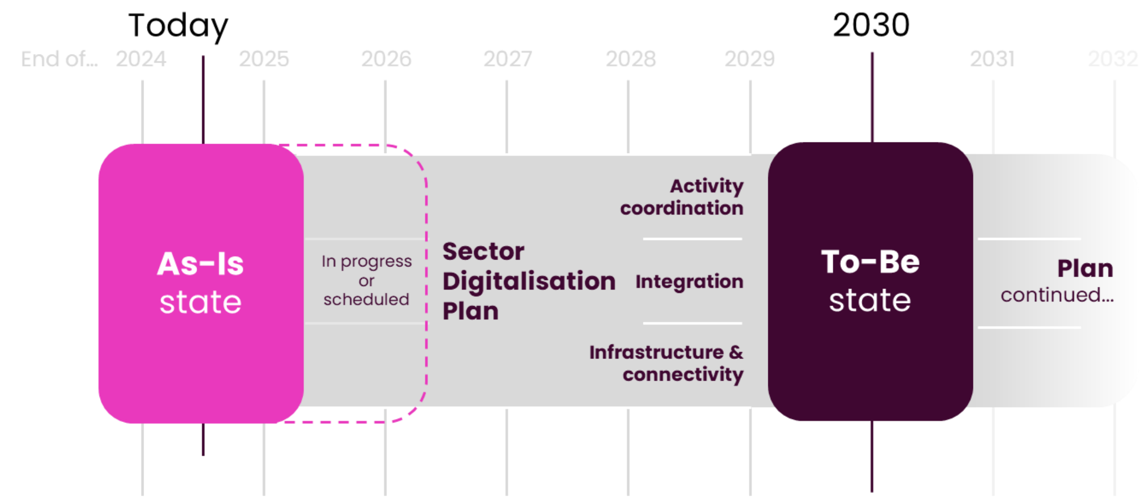


Figure 10 - Visual describing the Gap Analysis process, using digital capability categories to join the dots from the 'As-Is' state to the 'To-Be' state for 2030

This process consisted of:

- **Developing the 'As-Is' view** – compiling a list of existing digitalisation activities and relevant policy areas. Mapping out existing power system processes, specifically in the flexibility space, to improve understanding of where digitalisation requirements (such as data sharing) would be required
- **Developing the 'To-Be' view** – refining initial requirements into a set of digital capability specific requirements deemed essential to deliver Clean Power by 2030
- **Gap Analysis Data Model** – a data model to scrutinise each digital requirement and tag relevant existing activities. This was further iterated and tested with stakeholders
- **Validation with stakeholders** – through a series of internal and external workshops, a review was undertaken of which requirements were met by existing initiatives, where gaps in evidence and required actions existed and what was out of scope for Clean Power 2030

Developing the ‘As-Is’ digital energy system

To support the ‘As-Is’ review, Energy Systems Catapult’s systems mapping capability was leveraged to clarify relevant interactions within the energy system where digital requirements were identified. This approach helped better understand the existing system and determine the necessary actions to support the digitalisation of specific elements.

Developing the ‘To be’ view

To map the ‘To-be’ requirements for Clean Power 2030, a logic model was developed to clarify the digital capabilities needed across the sector. The model breaks down the future state into distinct layers: infrastructure and connectivity, integration, and activity coordination. For each Clean Power 2030 outcome – such as consumer simplicity, consumer led flexibility, and grid decarbonisation – a future digitalisation view was created, mapping how digitalisation can drive progress towards these goals. This ‘solution first’ approach identified key enablers, including real-time data, automation, and advanced analytics, which were then translated into specific digital capability requirements such as interoperable infrastructure, secure data platforms, and planning tools (this is depicted in the diagram below).

CP30 target outcomes	How digitalisation helps to progress	Digital capability requirements
Consumer simplicity Enable consumers to 'plug in and go green' with access to smart tariffs and the ability to participate in energy markets, reducing bills and supporting decarbonisation	User friendly digital platforms with real time access to consumption and market data enables consumers to **monitor, automate** and **trade energy**, lowering bills and allowing consumers to become active participants in the energy transition	• Interoperable smart meter infrastructure • Sufficient penetration of Smart appliances/meters • Secure consumer data portals/consent • Data exchange standards and platforms • User authentication and privacy controls • User friendly digital platforms (AI agents?) • Open APIs for third-party innovation (appliances)
Consumer led flexibility Harness 10-12 GW of flexibility from households, businesses, and suppliers to balance supply and demand. Support system operability and consumer savings through connection and aggregation of assets	Automated **demand response** at scale, shifting usage to off-peak times and reducing system strain Real-time **monitoring** and **verification** of flexibility events. Automated scheduling of distributed assets	• Sufficient penetration of smart appliances/meters • Ability to communicate and control • Digital asset registries to leverage advanced tech in control room • Common data model/regional data sharing • Smart contracts and digital payments • Data analytics and forecasting tools
Grid decarbonisation and security Achieve at least 95% of Great Britain's electricity from clean sources by 2030, with a major build-out of renewables including 43–50 GW offshore wind, 27–29 GW onshore wind, and 45–47 GW solar	Accelerate **Plan, Design and Build** of renewable generation with digital planning tools Enable rapid prioritisation/decision making to maximise value per effort exerted through advanced data analytics	• Digital asset registries to support plan, design and build • Cyber-secure/resilient system architecture • Common data/information models • Real-time emissions and consumption data integration • Aligned planning frameworks • Grid scenario modelling software
Networks, access and connections Efficiently connect 200–225 GW of generation projects by 2030, with clear regional and technological capacity limits and prioritisation of 'ready' projects	Accelerate **Plan, Design and Build** of transport and distribution network with digital planning tools Data access to enable rapid prioritisation / decision making to streamline grid connection process and queue management	• Digital project management platforms • Digital asset registries to support decision making • Automated connection queue management • GIS-enabled network planning • Federated data platforms
System operability Maintain security of supply and system stability while integrating high levels of variable renewables, ensuring the system is secure and operable	Real-time data analytics, forecasting and remote monitoring enhance grid stability and outage response **Control and visibility** of the power system, leveraging advanced technologies to support more complex distributed dispatch	• Cyber-secure/resilient system architecture • Machine readable data • Real-time operational analytics and predictive maintenance • Automated resilience and stress-testing • Digital asset registries • Advanced monitoring and control
Supply chain and workforce Deliver an investment programme averaging £40 billion annually, create local economic and job opportunities, and mobilise the supply chain for rapid deployment	Digital marketplaces and shared data to **accelerate supply chain and workforce coordination** and open up new opportunities for innovative services	• Digital workforce planning tools • Supply chain management systems • National digital skills registry

Figure 11 - Mapping the digital capability requirements for each Clean Power 2030 outcome

Gap analysis data model

A data model was developed to scrutinise each digital requirement and tag relevant existing activities against it. The tagging process involved systematically linking each requirement to specific activities, initiatives, or data sources across the sector. This enabled clear mapping and cross-referencing, helping to identify overlaps, dependencies, and any gaps in current provision. Tags were created in collaboration with stakeholders to ensure they accurately reflected sector priorities and language. By refining the tagging through stakeholder feedback, the model provided a transparent and coordinated view of progress and alignment opportunities within the Sector Digitalisation Plan.

8.5. SMART actions

By overlaying the analysis of what is already under way with a clear understanding of what still needs to change, the specific, practical steps needed to close the gap to Clean Power 2030 are outlined. Each action is designed to be clear, targeted, and directly linked to the sector's digital priorities, providing a focused and actionable pathway for implementation. To ensure this, each action was evaluated against a SMART criteria (see below):

	Smart criteria
Specific	Being specific about what action needs to happen. For instance, is there a specific decision required or an implementation phase that needs to be completed and what specific steps are part of that process. Being specific about who is responsible and who the delivery partners are.
Measurable	Clear outcome requirements quantified where possible. Where this is not possible, the action should include steps to fill evidence gaps.
Achievable	Realistic timeframes validated with relevant parties. Be clear where actions are dependent on other actions or other areas of policy/implementation.
Relevant	Actions should be relevant to Clean Power 2030 priorities and evidenced where possible.
Timebound	Clear dates should be provided for decision points and implementation phases. It needs to be clear when an action needs to be completed by, or whether it is business as usual.

Each action was also assigned an owner responsible for the delivery and associated funding of the action. If an owner could not be identified or agreed, the action became a gap so that it could be addressed in future iterations of the plan. This approach removes ambiguity and provides clarity to the sector about who is responsible for each area of work.

8.6. Industry and expert input

Sector engagement has underpinned the development of this initial iteration of the Sector Digitalisation Plan and will remain critical to its continued evolution. From the outset, the intent has been clear: this is a collaborative plan, developed for the sector, by the sector.

To gather insights from a range of stakeholders, numerous engagement activities have been conducted, capturing both breadth and depth of input. These activities have included interviews, in-person and online workshops, and a public call for input. Stakeholder groups consulted include industry, government, public bodies, and subject matter experts.

Two main rounds of engagement were conducted. The first focused on testing the concept, initial structure, and content of the plan. These sessions aimed to gather industry insights into ongoing activities and identify any gaps missed, ensuring the plan reflected wider sector dynamics and priorities. The second round, conducted during the later stages of the project, focused on testing the refined structure and content of the plan. Emphasis was placed on evaluating the clarity and effectiveness of the narrative used, ensuring that both structure and content communicated the intent and content of the plan.

These engagements have enabled the validation of the plan, resulting in a document that accurately reflects the current realities and future needs of the sector. More information on the different formats of engagement can be found below.

Incorporating stakeholder feedback

The table below details the main points of feedback received from all engagements and the actions taken to incorporate it within the plan.

Feedback	Action
	Principles
A 'Presumed Open' principle may not be well received due to increased cyber security concerns in the sector.	The principle was reworded to 'Data Access for Innovation' to balance data access and security needs (section 3.4).
The Sector Digitalisation Plan should be clear that it focuses on the minimum requirements for Clean Power 2030 and also ensures that these do not 'design out' any future solutions.	The 'Minimum viable and future ready' principle was added to promote minimum viable solutions while remaining adaptable to future systems (section 3.4).
A 'single-source-of-truth of data' principle is unfeasible.	The principle was reworded and replaced with 'Trusted data' to better capture this, and other feedback (section 3.4).
	Framing
It should be clarified that the Sector Digitalisation Plan is not solely a NESO initiative and is intended to be iterative.	This is explicitly stated in all engagements and the narrative around this is strengthened in the introduction to ensure the intent is clear (chapter 1 and section 3.1).
The definition of digitalisation for the sector is not clear.	A definition of digitalisation has been included – which was tested with stakeholders and iterated (section 2.1)
Achieving CP30 targets is not a strong enough rationale for all the actions within the plan.	Additional narrative was added to the relevant Clean Power 2030 outcome to ensure the tangible benefits for all consumers from the digitalisation initiatives are stated (Section 2.2)
	Data sources
The Sector Digitalisation Plan is heavily focused on the demand side and consumer-centric data	The 'supply side' of data sources has been recognised as a gap in the plan (section 4.4)

Smart meter targets need to go beyond Clean Power 2030 and the 2033 3G switch off.	Section 4.2 Smart Meters was framed around 'continued operational performance' of smart meters, working to the 'Minimum viable and future ready' principle
	Integration
Integration of planning data across different layers of energy system planning is missing from the Sector Digitalisation Plan.	Added a new 'gap' in the plan which covers this topic (section 5.5)
The data orchestration across different digital platforms is not clear.	Provided more clarity of interactions between these platforms as they relate to their relevant sections in the document (section 4.2)
	Activity coordination
There is insufficient focus on workforce development and mobilisation within the Sector Digitalisation Plan.	The need for workforce mobilisation to enable digitalisation and achieve clean power was recognised and added as a gap in the activity coordination layer (section 6.4)
A financial layer aligned with strategic planning is needed to highlight the lack of investment planning in the current digitalisation strategy.	The need for a financial layer was recognised and added as a gap to the activity coordination layer (section 6.4)

8.7. Actions mapped to Clean Power 2030 outcomes

The table below shows each action and gap mapped to the two most relevant Clean Power 2030 outcomes that each helps to achieve. Many actions support more than two outcomes, only the top two are shown.

Area	What is needed?	Action	Clean Power 2030 outcome map						Clean Flexibility Roadmap action map
			Consumer simplicity	Consumer led flexibility	Grid decarbon-isation and security	Network access and connections	System operability	Supply chain and workforce	
Infrastructure and connectivity	Consumer consent design and implementation	Action 1	✓	✓					44a
	Smart meter continued operability	Action 2	✓				✓		10a,10b,10c
	Improved smart meter data access	Action 3		✓			✓		
	Network asset security	Action 4				✓	✓		
	Asset hardware security	Action 5		✓			✓		
	Smart device interoperability	Action 6	✓	✓					
	Device firmware updates	Gap		✓			✓		
	Resilient telecoms	Gap	✓	✓			✓		
	Cross sector telecoms strategy	Gap				✓	✓		
	Resilience requirements for critical digital energy assets	Gap				✓	✓		
	Transmission and 'supply side' data requirements	Gap			✓	✓			
	Industrial and Commercial Data Requirements	Gap			✓		✓		
	Smart fallback operation modes	Gap		✓			✓		
	Smart Functionality for Smart Appliances and HEMS	Gap	✓	✓					
Integration	Register for asset information	Action 7		✓		✓			39a,39b
	Standardisation of market interfaces	Action 8	✓	✓					39c,40a,41c
	Control room technology requirements	Action 9		✓			✓		
	Control room communications	Action 10		✓			✓		
	Requirements and DSI functionality	Action 11			✓	✓			43a,43b,43c
	DSI operational requirements	Action 12			✓	✓			
	Planning Data Standard	Gap			✓	✓			
	Secondary Suppliers and Split Metering Requirements	Gap	✓	✓					
	Back Office and Improving Online Cust. Care	Gap	✓	✓					
	Network buildout process and tooling	Gap				✓		✓	
Activity coordination	Data ontology	Action 13			✓		✓		41b
	Alignment of trust framework(s)	Action 14	✓		✓				42a
	Digital coordination role	Action 15			✓			✓	46a
	Sector digitalisation plans	Action 16			✓			✓	
	Policy changes	Gap	✓					✓	
	Consumer Journey	Gap	✓					✓	
	Workforce Mobilisation	Gap				✓		✓	
	Risk register of digital infrastructure	Gap			✓		✓		
	Financing, cost-benefit and the value of data	Gap	✓		✓			✓	

Figure 12 - Sector Digitalisation Plan Actions and gaps, as they relate to clean power outcomes and the clean flexibility roadmap

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