NGESO and NGED

Coordinated Operational Methodology for Managing and Accessing Network Distributed Energy Resources (COMMANDER)

Workstream 5 Report – Final Conclusions and Recommendations

NG reference: NIA2_NGESO012
September 2024

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Glossary

Term	Definition
ADE	Association for Decentralised Energy
ANM	Active Network Management
BEIS	Department for Business, Energy and Industrial Strategy
CER	Consumer Energy Resource
DER	Distributed Energy Resource
DFR	Distributed Flexibility Resource
DNO	Distribution Network Operator
DSO	Distribution System Operator
ENA	Energy Networks Association
ENTSO-E	European Network of Transmission System Operators for Electricity
ESO	Electricity System Operator
TFDF	The Future of Distributed Flexibility
FSO	Future System Operator (National Energy System Operator from October 2024)
ICCL	Imperial College Consultants London
IWES	Integrated Whole Energy System
Ofgem	Office of Gas and Electricity Markets
ON	Open Networks (ENA initiative)
NESO	National Energy System Operator (ESO considered hereby)
NGED	National Grid Electricity Distribution
NGESO	National Grid Electricity System Operator
STOR	Short Term Operating Reserve

1 Executive Summary

Problem Statement: the end consumers, Distribution Network Operators (DNOs) and Distributed Energy Resources (DERs) are becoming active participants in providing or managing flexibility to the Great Britain (GB) electricity system but there is uncertainty in relation to "how distributed flexibility resources are used by Transmission and Distribution System Operators to maximise their system benefits. Efficient ESO-DSO Coordination will mitigate conflicts and improve synergies in the access to DERs in operational timescales, as well as planning and procurement challenges. As services from DERs are increasingly used to tackle both network management and energy balancing issues, there is a need to ensure they can provide multiple services to several entities, such as the ESO, the DSOs and Suppliers, in a techno-economic efficient and secure manner.

Project Commander had **three main objectives**. Firstly, identify and define alternative ESO/DSO coordination schemes for accessing and managing DERs with respect to their qualification, procurement, dispatch and settlement. In particular, the roles and responsibilities of the key actors involved, their high-level interfaces across different timescales and information exchanges as well as key market arrangements to facilitate the process. Secondly, quantify and assess the techno-economic feasibility of alternative ESO/DSO coordination schemes for accessing and managing DERs for service provision at operational timescales. Thirdly, develop an engineering-based roadmap and recommendations for the practical implementation of the preferred ESO/DSO coordination scheme.

To meet these objectives, **this project combined world leading scientific and engineering expertise in the analysis of the complex ESO-DSO coordination topic**, and in the improved modelling of the future ESO-DSO coordination schemes. The project enabled a focus on long term (2035-2050) and goes beyond existing and short-term challenges (e.g. primacy rules), provided independent thought-leadership on ESO-DSO coordination, while considering (but not depending on) policy and regulatory evolutions. The project scope was defined in 2022, and the project started in October 2022. The policy and regulatory context evolved significantly since the beginning of the project, namely when considering Ofgem's consultation on The Future of Distributed Flexibility and the definition of the roles of Market Facilitator, as well as the nomination of Elexon as Market Facilitator in July 2024. The project has considered the policy evolutions and has provided an independent analysis of the consultation outcomes and Ofgem's guidelines.

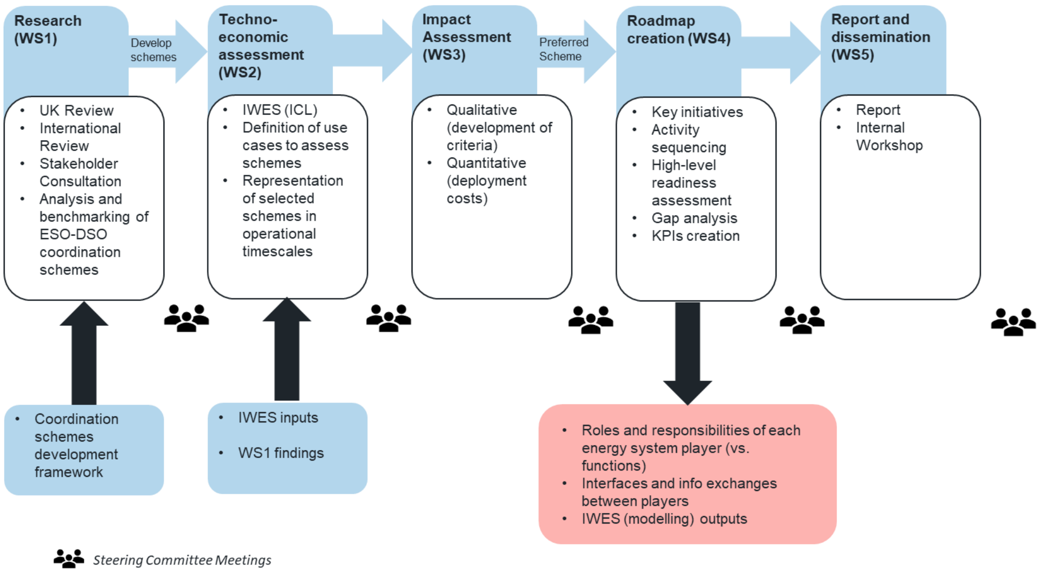
We defined and delivered a staged approach, over five work packages (Figure 1-1):

1) Work Package 1 entailed a literature review of UK and overseas projects and initiatives that focus on ESO-DSO coordination, as well as a stakeholder consultation (including all GB DNOs) and an analysis and benchmarking of ESO-DSO Coordination schemes. As a result, the two coordination schemes, Scheme 1 – Enhanced Coordination and Scheme 2 – Distributed Flexibility Coordinator, have been selected for further development and modelling.
2) In Work Package 2, the IWES software was used to enhance the modelling of the coordination schemes. A list of use cases has been defined, namely with the inclusion of operational scenarios, and the two selected coordination schemes were represented and assessed against the different stages of coordination and operational timescales (from procurement to settlement);
3) Work Package 3 delivered a comprehensive impact assessment, both qualitative (against a list of specific criteria) and quantitative (including costs of schemes implementation). Based on this impact assessment, a phased implementation of the two coordination schemes has

been recommended: Scheme 1 to be operational from asap until 2035, and Scheme 2 to be operational from 2035 onwards;

4) Work Package 4 included a gap analysis for the “business as usual” stages, Scheme 1 implementation and Scheme 2 implementation; also, a cost-benefit analysis on the implementation of the schemes and the roadmap for schemes implementation, considering a wide range of factors on policy, technology and data management.
5) Work Package 5 included a dissemination webinar with participants from not only ESO and NGED, but also a wide range of industry stakeholders, along with the final report that is presented hereby. Coordination Scheme 2 has been benchmarked against the currently planned roles of the Regional Energy Strategy Planner (RESP) and the Market Facilitator (MF).

Figure 1-1 - Project Commander approach and sequence of work packages



Key project conclusions:

1) A range of ESO-DSO coordination schemes and innovation projects in the UK and EU highlight a range of critical needs for efficient flexibility markets and access to DERs. Scheme 1 (Enhanced Coordination) and Scheme 2 (Distributed Flexibility Coordinator) have been selected for further development after a careful review;
2) Stakeholder engagement revealed that both suppliers and DNOs recognise that whole system solutions should deliver the best value for the end consumer and that the lack of visibility and participation of DERs in providing flexibility services is a primary challenge;
3) Our impact assessment showed clear long-term benefits and stronger scores for Scheme 2 (Distributed Flexibility Coordinator);
4) Implementation costs of both schemes are marginal (~1%) in comparison against total savings in system costs against business as usual. Although, there are multiple concerns over the potential complexity of the Scheme 2 implementation, given the creation of a new entity and further definition of roles and boundaries between energy system actors;

5) The gap analysis and roadmap creation revealed significant risks in areas such as coordination in the development and implementation of flexibility products, implementation of coordination schemes across multiple industry players, asset visibility and data exchanges;
6) The existing definition of roles for RESP and MF are an important step towards the implementation of Scheme 1 (Enhanced Coordination) and lay the foundations for the implementation of Scheme 2 (Distributed Flexibility Coordination). Scheme 2 also requires a further step change of coordination across all stages of flexibility services planning, qualification, procurement, dispatch and settlement, in conjunction with coordinated strategic network planning, with all the benefits demonstrated previously in this project.

Key recommendations:

1) Develop and implement Scheme 1 in the short term, taking effect in the period 2025-2030, and implement Scheme 2 from 2030 to take effect on the mid and later stages of the energy transition (2030 and onwards).
2) Create an industry-wide programme to effectively develop ESO-DSO coordination which aligns with and builds from existing industry programmes, with a focus on technical and operational coordination. The programme could develop clear goals for long term flexibility and network development coordination and reach consensus from key stakeholders as to how best deliver these goals, underpinned by a widely agreed roadmap that consider tangible targets for the network operators, service and technology suppliers and regulatory bodies (dissemination of the milestones and long term objectives, and agreement from the different stakeholders must be achieved. The scope of the programme shall consider the ultimate definition of MF and RESP roles in order to assure effectiveness in the development of ESO-DSO coordination.
3) Given the benefits of a whole energy system coordination for the consumer, the definition of MF and RESP roles could consider specific responsibilities in assuring effective coordination within the whole energy system. The implementation of Scheme 2 (DFC) would consider a whole energy system flexibility coordination and management between ESO and DSO (and relevant entities in other sectors).
4) Form an industry-wide Working Group to lead and monitor strategic developments in the ESO-DSO Coordination space. This could include the identification and review of existing issues and proposed solutions, establishment of priorities for long term enhanced coordination which promotes whole energy system optimisation, and establishment and monitoring of enablers and blockers for long term enhanced coordination, as well as specific implementation KPIs.
5) Identify where current trials and initiatives (e.g. FMAR consultation and future workstream) can strategically contribute to whole system coordination and where further trials are required.

2 Project findings

2.1 Research and selection of coordination schemes

The literature review identified several technical requirements, which must be met to successfully deliver flexibility coordination. These include:

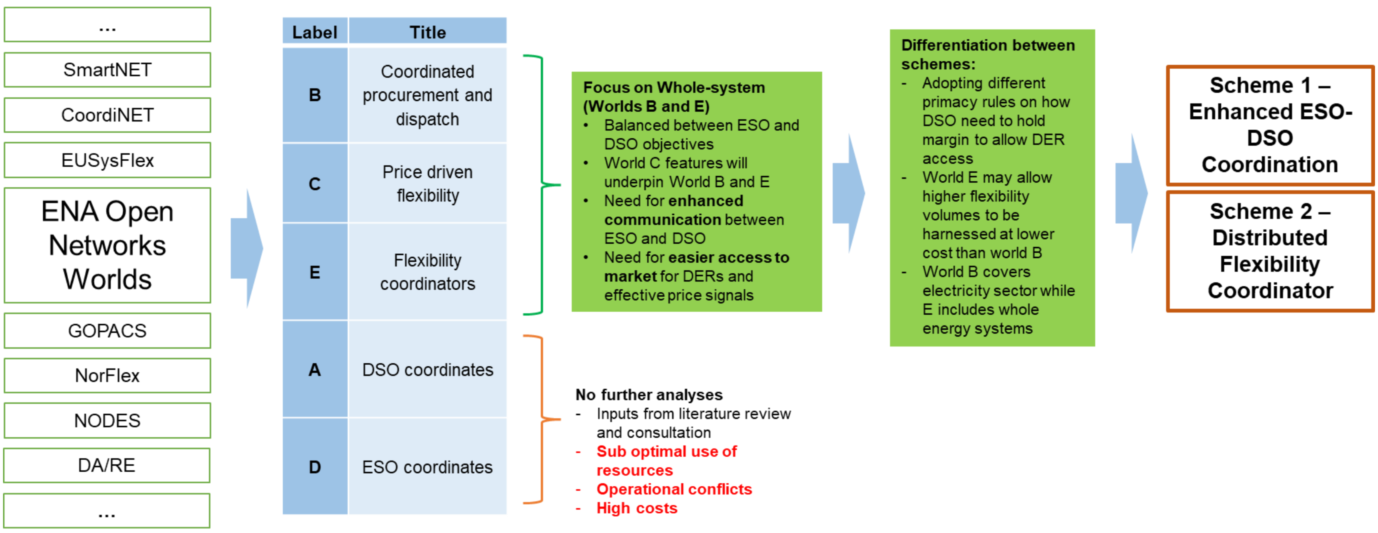
- Forecasting errors introduced within the procurement stage can negatively affect the coordination process. Recommended mitigations for this include bringing gate closure as close as possible to real-time and improving forecasting techniques and algorithms. Risk assessment around the ability to robustly forecast should also be incorporated into the process, based on technology type.
- Adequate network visibility, enhanced by data capture and sharing, is vital for effective coordination. This is a key challenge with achieving greater ESO-DSO coordination in GB, where visibility and controllability of DER at lower voltages is currently limited.
- Automation of operator interfaces, including during flexibility selection and activation processes, will allow for more effective real-time management of networks. To support this, the preferred solution is to implement robust APIs.
- Platforms used to facilitate flexibility should have standardised interfaces and communication, which will allow for scalable and replicable solutions, aligned with the CIM concept. Data harmonisation should involve input from FSPs to capture requirements from outside of network operators.

The EU TSO-DSO coordination projects highlight several preferences and technical requirements for future implementation. In terms of preferences for market structures and overall coordination mechanisms, the following conclusions can be reached from the projects surveyed:

- Stakeholder feedback from both SmartNet and NorFlex indicates a preference for TSO-DSO joint coordination, with selected models sharing assumptions with the ENA Open Networks' Future World B. A perceived advantage of these coordination mechanisms is the ability to incorporate common optimisation across all networks. This preference aligns with the GB perspective and has been taken into consideration for scheme selection in this project.
- It was identified that a potential transition measure towards a joint coordination model is a cascade market architecture, whereby procurement is achieved through local flexibility markets rather than allowing direct participation of distribution connected sources.
- Centralised schemes were identified as being more cost-effective than decentralised options, which introduce extra coordination steps, reducing overall efficiency. The lower cost option is to create a "common marketplace" solution, which share similarities with the Medium and Thick archetypes in Ofgem's CFI.
- Market platforms identified could be based on optimisation, using all available information about constraints, costs and availability, or could use hierarchy rules (similar to primacy rules) to make determinations about orders which could have adverse impacts on other grids.

ENA Open Networks "Worlds" represented the most mature and comprehensive definition of coordination schemes, within the range of projects and initiatives in the ESO-DSO coordination space that were investigated. From the group of five Worlds, following the conclusions from literature review, stakeholder engagement and discussions with ESO and NGED representatives, Worlds B, C and E were selected as the schemes that enabled a level playing field amongst flexibility market participants, a balance between ESO and DSO objectives, had the potential to enable better price signals and the underlying requirement for enhanced communication between system players. In symmetric fashion, Worlds A and D could bring sub optimal use of resources, exacerbate the probability of operational conflicts and thus creating a cost increase for the industry. Ultimately, both Scheme 1 and Scheme 2 shall enable price driven flexibility products, and further differentiation between the Schemes is underpinned by the creation of a new entity for coordination in Scheme 2, the Distributed Flexibility Coordinator, translated in different features from each scheme with regards to system benefits, coordination boundaries (single energy vector vs multiple energy vectors) and capability to manage flexibility volumes.

Figure 2-1 - Research and selection of coordination schemes



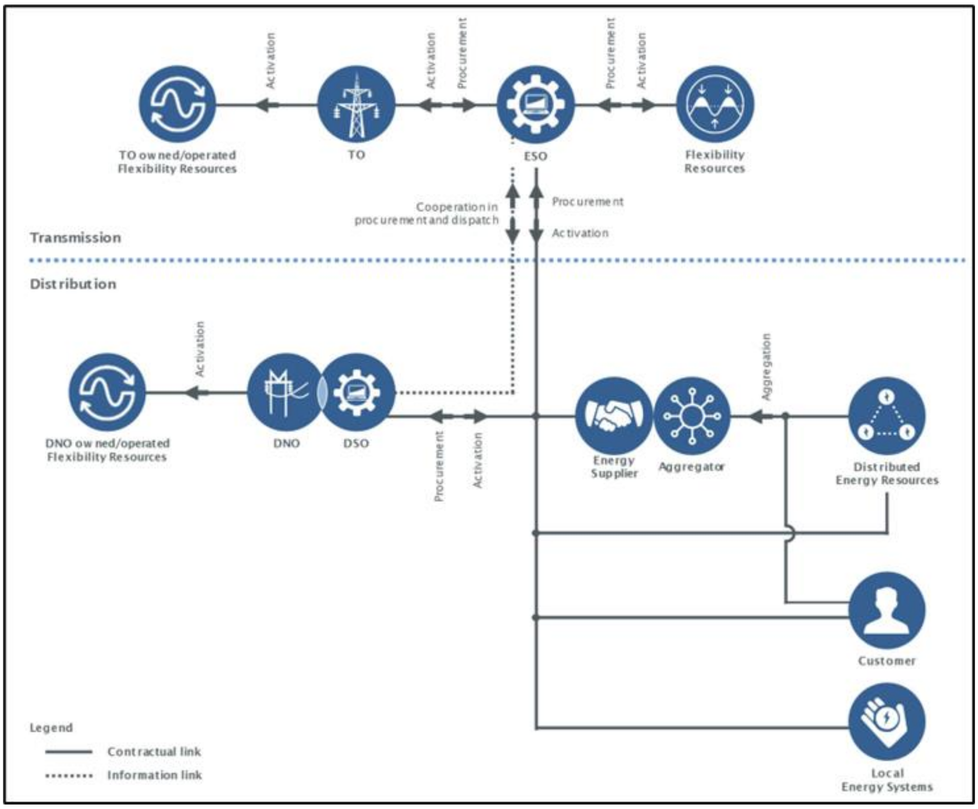
2.2 Definition of Coordination Schemes

2.2.1 Scheme 1 – Enhanced ESO-DSO Coordination

The **principles of Scheme 1** are as follows:

- ESO will maintain direct visibility and control access to large or aggregated distributed flexibility resources while DSO can access all distributed flexibility resources;
- The coordination between ESO and DSO is done iteratively or sequentially through agreed primacy rules to mitigate operation conflict while maximising the synergy across the procurement and dispatch activities.
- Share of DER capacity based on fixed thresholds and/or primacy rules, not on an optimal basis;
- There is a coordinated planning based on ESO and DSO flexibility needs. This planning is focused on the electricity vector and entails a limited coordination with other energy vectors (e.g. heat networks);

Figure 2-2 – High level information exchanges in Scheme 1 (Source: ENA Open Networks)



2.2.2 Scheme 2 – Distributed Flexibility Coordinator

The **principles of Scheme 2** are defined as follows:

- In Scheme 2, the independent distributed flexibility coordinator (DFC) acts as a neutral market facilitator for all distributed flexibility sources, ESO and DSO. ESO and DSO can access full potential of distributed flexibility capacities;
- DFC is responsible for collecting service requirements from both DSOs and the ESO, and volumes and costs associated with distributed flexibility services, optimising those across all timescales and optimise procurement solutions for both ESO and DSO;
- There are common flexibility procurement platform(s), in an integrated system with visibility and managed access for all relevant stakeholders;
- The DFC enables the visibility of flexibility volumes not only in electricity networks, but also gas, and heating/cooling systems enabling sector-coupling flexibility benefitting the electricity system.

Figure 2-3 - High level information exchanges in Scheme 2 (Source: ENA Open Networks)

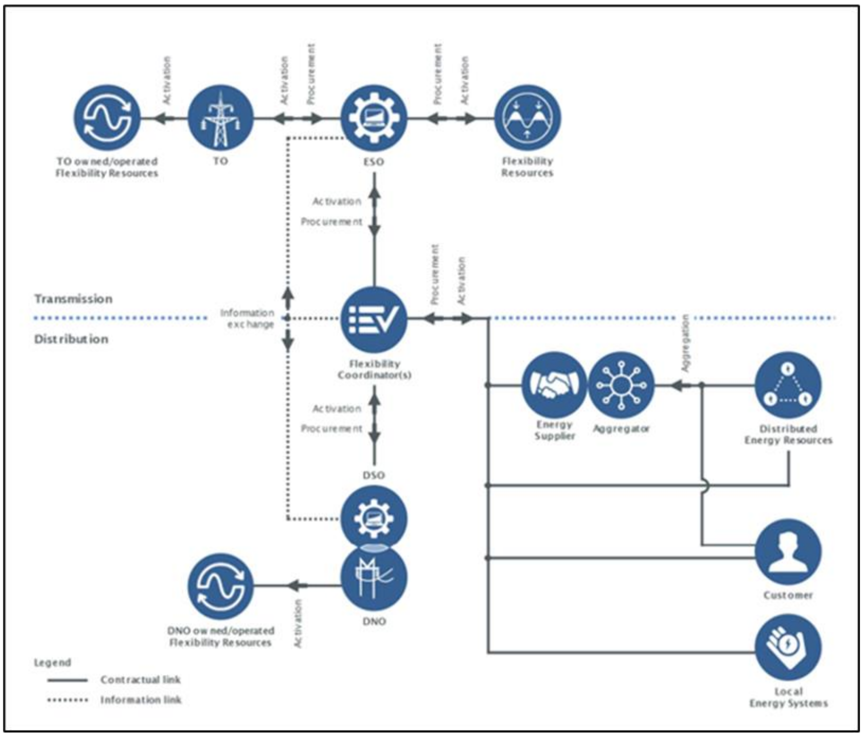


Table 2-1 shows the definition of a set of roles and responsibilities of the two key stakeholders involved for each stage of the process to access DERs.

Table 2-1 – Roles and responsibilities of system players in BAU, Scheme 1 and Scheme 2

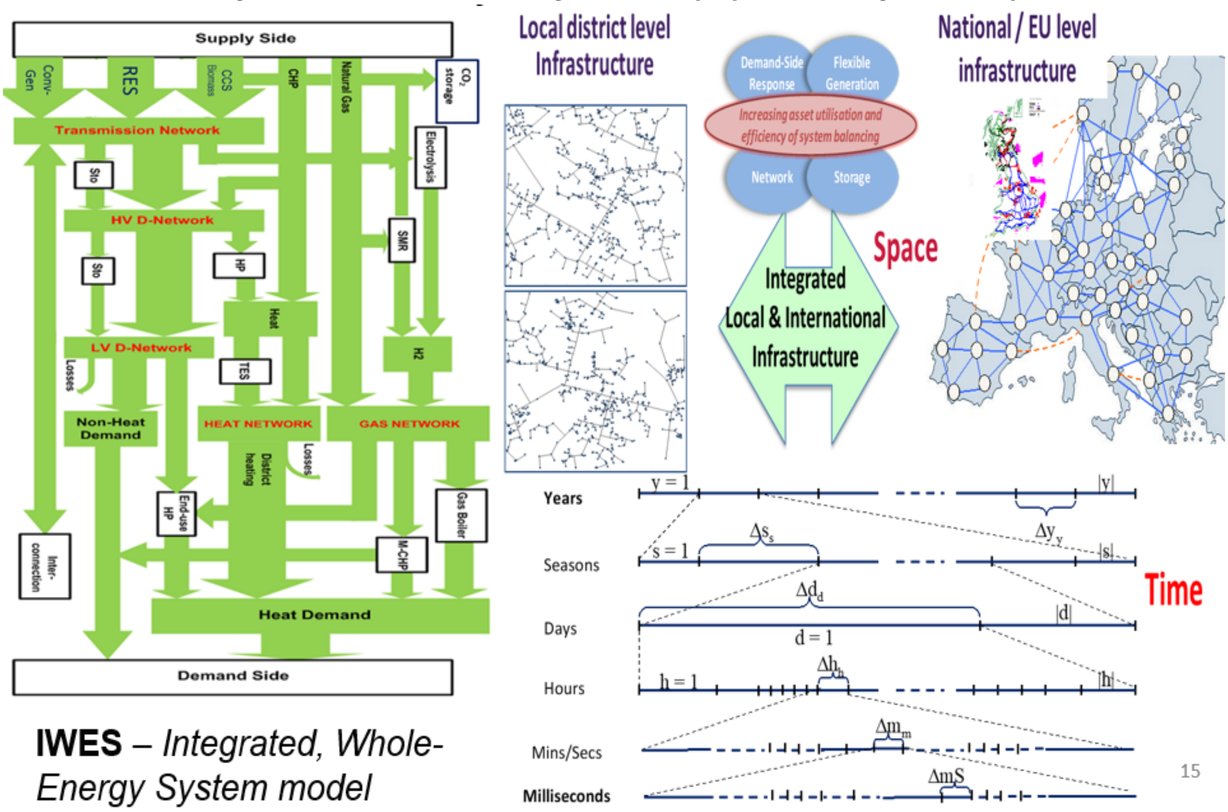
	BAU	Scheme 1 – Enhanced Coordination	Scheme 2 – Distributed Flexibility Coordinator(s)
Qualification	ESO and DSOs have their own separate qualification process	ESO and DSOs will have a coordinated qualification process to bring efficiency and avoid repetitive process for DSOs and ESO services	The qualification process will be fully standardised and integrated into one process via an independent flexible coordinator
Procurement	Contracted flexibility services up to 6 months in advance, confirmed during operational timescale i.e., Day Ahead and Intraday	ESO and DSOs will procure their flexibility services in a coordinated manner using forecasting their long- and short-term flexibility needs. This could potentially be through a continuous flexibility market	DFC(s) will coordinate the procurement of flexibility services in a continuous market according to needs of ESO and DSOs
Dispatch	ESO and DSOs dispatch flexible resources independently	While ESO and DSOs may still use their own dispatch platforms to instruct DERs for certain flexibility services, the services will be coordinated in advance through data exchange medium such as ICCP	ESO and DSOs indirectly activate DERs through the DFC(s), via a whole system platform that optimises flexibility volumes and pricing according to ESO and DSO requirements

Settlement	Settlement and baselining are done separately by ESO and DSOs	ESO and DSOs may still settle their required services with DERs, the settlement and baselining process will be standardised and will follow the same approach for both ESO and DSOs	The settlement and baselining will be fully carried out by DFC(s) in full coordination with ESO and DSOs.
Compliance	ESO and DSO have their own compliance process	The compliance process post flexibility services utilisation will be standardised and follow a similar approach for both ESO and DSOs	The compliance process will be overseen by the DFC(s). The DFC(s) will administer all flexibility related data.

2.3 Techno-Economic Assessment of Scheme 1 and Scheme 2

IWES is a model formulated as a least-cost optimisation problem to determine investment and operation of multi-energy systems involving electricity, gas (including hydrogen), heating, and CCUS systems to meet the carbon target while maintaining system security.

Figure 2-4 – IWES modelling software (Imperial College London)



2.3.1 Enhancement of modelling of whole system coordination schemes

We considered the counterfactual scenario as TSO-led (BaU). The key characteristics are that:

- DSOs use the flexibility resources to manage local network congestions.
- Flexibility sources will be shared between TSO and DSOs.

- TSO has a central role; distribution capacity is built to allow TSO and DSO to use distributed flexibility to support both local and national system
- Limited coordination through primacy rules demanding sufficient headroom of distribution capacity to ensure the deliverability of DFR services.

The key characteristics of the Enhanced ESO-DSO coordination (Scheme 1) are:

- A 2-stage sequential network optimisation process
- DER minimises distribution network reinforcement cost
- Rerun DER minimising the whole energy system cost with distribution capacity fixed to the outcome of step 1

The key assumptions for Distributed Flexibility Coordination (Scheme 2) are:

- An integrated single network optimisation process.
- DFC optimises the procurement and dispatch of all distributed flexibility resources to meet local and national system needs at minimum system cost.

A range of case studies has been analysed to analyse the techno-economic performance of different ESO-DSO coordination approaches, focusing on the 2050 net zero-emission system to ensure the effectiveness of the approaches on future sustainable energy systems. Flexibility from all technologies, including sector-coupling flexibility in electricity, gas and heating/cooling systems, has been considered. The key findings can be summarised as follows:

Distributed flexibility should be facilitated to minimise system costs

- Harnessing and utilising distributed flexibility resources saves the annual system costs between 7.4- 7.8 £bn/year in H2 and 9-11.3 £bn/year in ELEC.
- Electrification is one of the major drivers for utilising distributed flexibility resources. Therefore, the benefits of distributed flexibility are higher in deep electrification. Therefore, it requires a more holistic approach to coordinating distributed flexibility resources. It is worth noting that electrification occurs in both hydrogen and deep electrification pathways in different magnitudes; hence, deploying distributed flexibility resources is relevant in both scenarios.
- The savings can be achieved if there is some investment in flexibility sources such as heat storage, electricity storage, and demand response technologies. Given the cost assumptions used in the study, the cost of procuring and utilising distributed flexibility is much lower than its benefits.
- The main savings attributed to distributed flexibility are in the mitigation cost of investment in low-carbon power generation and distribution networks. Customers' flexibility also reduces end-users' appliance costs, such as heat pumps. Heat storage can reduce the size of heat pumps needed. Moreover, the savings happen not only in the electricity sector but also in other system costs, such as the reduced investment needed in electrolysers and hydrogen storage.

Benefits of improving ESO – DSO coordination schemes

- Improving the ESO-DSO coordination approach from the BaU to Scheme 1 and 2 will reduce the cost of the future system by 0.3 – 0.9 £bn/year in the hydrogen scenario and 1.1 – 4.3 £bn/year in the deep electrification scenario (Figure 2-5 and Figure 2-6). If the future system is moving towards full electrification of heat and transport, the case for improving ESO-DSO coordination would be stronger than the one with hydrogen heating. The performance of Scheme 1 and 2 would be relatively similar if all the coordination processes could be carried out smoothly. However, Scheme 1 may pose a higher risk for suboptimal conditions such as a lack of ESO's ability to incorporate small-scale DFR providers to its control centre, exposure of stricter primacy rules to DSOs to provide sufficient headroom to deal with uncertainty in the provision of services and network capacity, higher cost of DFRs and lower number of service providers due to lack of market competition and transparency. These suboptimality conditions may increase the system costs by up to £4.28bn/year. Therefore, Scheme 2 could be an option to derisk these conditions.

Figure 2-5 – Annual system costs for H2 and ELEC

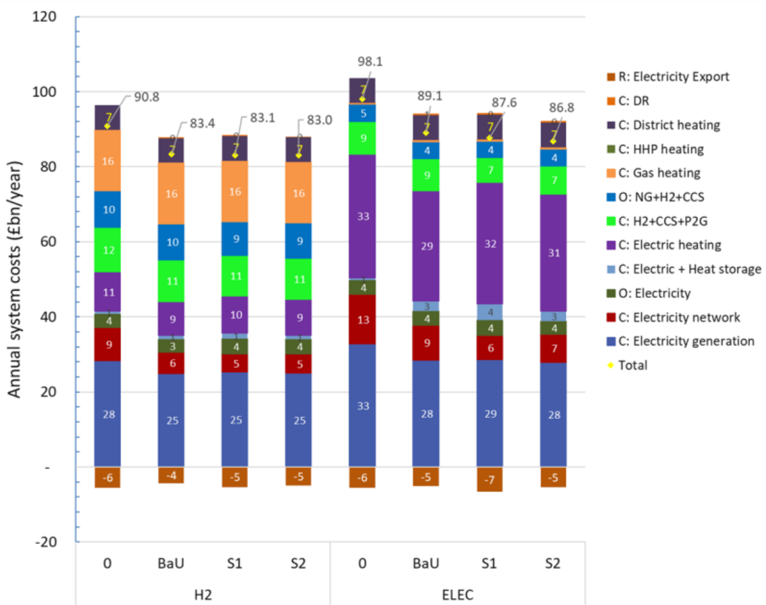
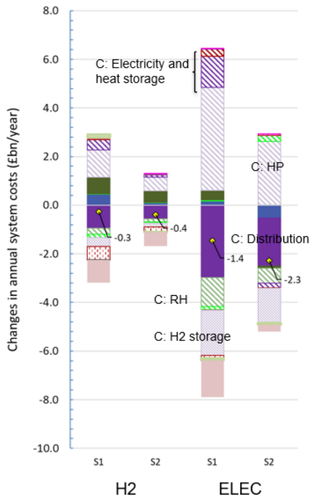


Figure 2-6 – Changes in annual system costs for sensitivities (Hydrogen and Electricity)



- Different coordination schemes will affect the energy system's investment and operational costs. The impacts are beyond the electrical transmission and distribution systems; therefore, it is crucial to decide carefully as it has long-term effects.
- The benefits of Schemes 1 and 2 are also higher in the FES 2022 "System Transformation" scenario (note: the core scenario used in the study is based on "Leading the Way"), which has a higher energy demand and without demand response. Without demand response, the amount of electricity storage needed in the system to provide flexibility increases substantially, and most of them will be located at distribution as it can also be used to manage distribution network constraints. Hence, this increased distributed electricity storage will also increase ESO and DSO's operational challenges; therefore, stronger coordination will be needed.
- Other conditions, such as the lower cost of wind, may also increase the need for coordination but not always occur in all cases we simulated. As the wind is already very dominant in the core scenarios, increasing slightly more wind due to its lower cost will not affect the system performance so much and the need for flexibility.
- Higher distributed flexibility costs may slightly reduce the case for improving coordination, but the impact is marginal, and the savings are still positive.

The studies also demonstrate that DFRs will be distributed across the GB system. Higher penetration of electricity storage can occur in the Northern GB due to high capacity factors of offshore wind in those areas but in general, both energy storage and demand response technologies will be spread across the GB. Therefore, ESO – DSO coordination will be required across the GB system.

2.4 Impact Assessment

This section involves the combination of all results of the qualitative and quantitative assessments, in line with the approach shown in 1.3. Both schemes are underpinned by a number of factors that are considered as assumptions for the study. For details of comparative strengths and weaknesses of each scheme, refer to Workstream 2 report.

The key findings of the impact assessment are presented in the following sections for the combined quantitative and qualitative assessments. These are followed by the recommendations for the preferred scheme. The summary tables utilise a colour indicator to represent concerns/weaknesses and strengths against the listed criteria, the colour key is shown below.

Table 2-2 – Impact Assessment tables indicators

Lowest Performance / Key Issues Identified	Some Issues Identified	Generally Good Performance, Minimal Issue	Strong Performance, any identified issues expected to be resolved

2.4.1 Quantitative Impact Assessment

The quantitative assessment of Schemes 1 and 2 is thoroughly described in Section 4 of the WS3 Report ("Impact Assessment of Coordination Schemes"). A summary of the quantitative assessment findings is provided in Table 2-3 below.

Table 2-3 - Quantitative Assessment Summary

Criteria	Scheme 1	Scheme 2
Scheme Projected Implementation Costs (from ENA Future Worlds)	The annual cost (£43m/year) is relatively small compared to the benefits.	The annual cost (£38m/year) is relatively small compared to the benefits.
System benefits of departing from BaU to the Schemes	Benefits of 0.3 (H2)–1.4 (ELEC) £bn/year	Benefits of 0.4 (H2)–2.3 (ELEC) £bn/year
Distribution capacity development	The scheme leads to a smaller distribution network capacity and may constrain access or hinder further deployment of distributed technology	Sufficient distribution capacity is built to enable optimal access and volume of distributed flexibility resources
Flexibility resources deployed	Less volume of flexibility from low-cost demand response and more on higher-cost distributed storage.	Enable optimal mix of different flexibility technologies
Annual Utilisation of flexibility services	Highly utilised across all operating snapshots	Highly utilised across all operating snapshots
Power generation development	Incentivises more Distributed Generation (DG) to participate in distribution network congestion management. Although, local DG could be more expensive than remote renewable energy sources (e.g. offshore wind) and inhibit development of larger generation capacity.	Enable optimal generation mix and facilitate integration of remote offshore wind farms.

Impact on other flexibility technologies	Distributed flexibility will offset the need for transmission-connected flexibility.	Distributed flexibility will offset the need for transmission-connected flexibility.

2.4.2 Qualitative Impact Assessment

The qualitative assessment of Schemes 1 and 2 is thoroughly described in Section 2 of the WS3 Report ("Impact Assessment of Coordination Schemes"). A summary of the qualitative assessment findings is provided in Table 2-4 below.

Table 2-4 - Qualitative Assessment Summary

Criteria	Scheme1 Phase1	Scheme2 Phase1	Scheme1 Phase2	Scheme2 Phase2
Key Issues Raised with no Mitigating Responses from Any Responders1	Issues noted with preparatory industry works	Issues noted with preparatory industry works, system design, regulatory changes	Main operational issues expected to be resolved. Some concerns over ability to resolve conflicts and optimise system	Identified issues expected to be resolved
Key Benefits Recognised for Implementation Process	Evolutionary approach generally assumed, reducing implementation hurdles	Concerns raised about the depth of change required in a short timescale, digital/ structural/regulatory. Some benefits recognised related to correct long-term alignment of functions	Implementation hurdles expected to be resolved for phase 2	Implementation hurdles expected to be resolved for phase 2
Key Benefits Recognised for Market Operations	As scheme 1 is more evolutionary from current BAU, it is expected to be able to reap some benefits in phase 1.	Some benefits noted for market operation but coupled with some concerns about how quickly the overall architecture and regulations can be delivered	Key Benefits over BAU recognised for implemented Scheme. Some inabilities to address long term requirements for net zero noted.	Key Benefits over BAU and Scheme1 recognised. In particular for system efficiency, whole system optimisation and stability.
Highest Combined Averaged Response Scores	Some responders scored higher overall scores for Scheme 1	Averaged combined scores were slightly higher for Scheme 2	One responder scored marginally higher overall scores, all others scored Scheme 1 lower than Scheme 2	Combined scores for Scheme 2 were notably higher than for Scheme 1, the majority of responders scoring Scheme 2 higher
Consistency of Response Scores	Large differences in opinions for scoring different criteria in phase 1	Fairly large differences in opinions for scoring different criteria in phase 1	Good alignment for scoring in phase 2	Very good alignment for scoring in phase 2

2.4.3 Recommended Coordination Scheme(s) and way forward

The quantitative assessment undertaken with the IWES modelling shows clear long-term benefits for an optimisation approach represented by Scheme 2, with significant annualised whole system cost reductions projected when the scheme is mature. These cost reductions are particularly evident for the deep electrification scenario (electric heat and EV dominated) and less so for the hydrogen heating scenario. There is however a much higher degree of uncertainty regarding the mass deployment of hydrogen for heating, than there is for the large-scale deployment of heat-pumps and advanced resistive heating.

Scheme 1 utilise a two-stage optimisation process which tends to minimise the distribution network reinforcement costs, and this may constrain the use of distributed flexibility to support the national energy system. Whereas Scheme 2 uses a single stage of optimisation leading to a more integrated ESO-DSO system. Therefore, in addition to providing the greatest economic system benefits, Scheme 2 also provides an overall energy network with greater capacity and ability to manage energy flows across the country than Scheme 1, providing increased overall system resilience and flexibility to adapt. The enhanced whole system approach of Scheme 2 also increases the ability to match future demand to the increasingly variable generation from renewable energy, improving utilisation factors across multiple asset groups in the energy system.

From the previous ENA Future Worlds implementation cost analysis, the total costs for World B (aligned with Scheme 1) are around £1.29B, versus around £1.15B for World E (aligned with Scheme 2), making World E the lower cost platform to implement. When considering the implementation costs on an averaged annual basis, World B (Scheme 1) is around £43m/annum and World E (Scheme 2) is around £38m/annum. When put into the context of the overall system costs and related savings against BAU projected by the IWES whole system modelling, it is evident that the coordination platform costs, and any variation from the selected scheme, are minimal in comparison and only represent in the region of 1% of the total system costs. Therefore, variations in the projections of the ENA Future World costs will have marginal impact on the whole system costs and should not be considered as an influencing factor in the selected coordination Scheme.

The qualitative assessment has shown a strong consensus for a preference for Scheme 2 when it is mature. There are however a range of mixed views and concerns over how quickly Scheme 2 can be implemented and the potential issues related to a sudden transition from current operational and market practices. When also taking into account the wider industry feedback which Ofgem have recently received from their consultation on The Future of Distributed Flexibility, it is considered to be preferable to transition to a Scheme 1 approach to coordination in the near term, whilst ensuring that a clear road map is in place to transition to Scheme 2 within a ten-year timeframe. This should enable the development of the necessary systems, regulation, and market interfaces to be established in an effective and well managed approach for the transition. Clear road mapping will also be vital to enable market investors to develop appropriate solutions without risking the stranding of flexibility assets due to unforeseen market changes.

2.5 Gap Analysis

Drawing on the historic ENA Future Worlds scheme definition maps, which include the key actors and processes, similar scheme definition maps are presented. The gap analysis of the coordination schemes actors and activities identified the need for improved operational and planning coordination between the ESO and DSOs and that series of new operational processes are required. For scheme 2, the ESO and DSO would need to further adapt their current working practices to provide their planning flexibility requirements to the DFC. It is expected that the dispatch signals would still be instructed by the ESO or DSO (ensuring that they retain overall operational control of dispatch), although these may either be transferred via the DFC or otherwise the DFC would be notified of the dispatch in real time.

Figure 2-7 – Gap analysis between BAU and Scheme 1

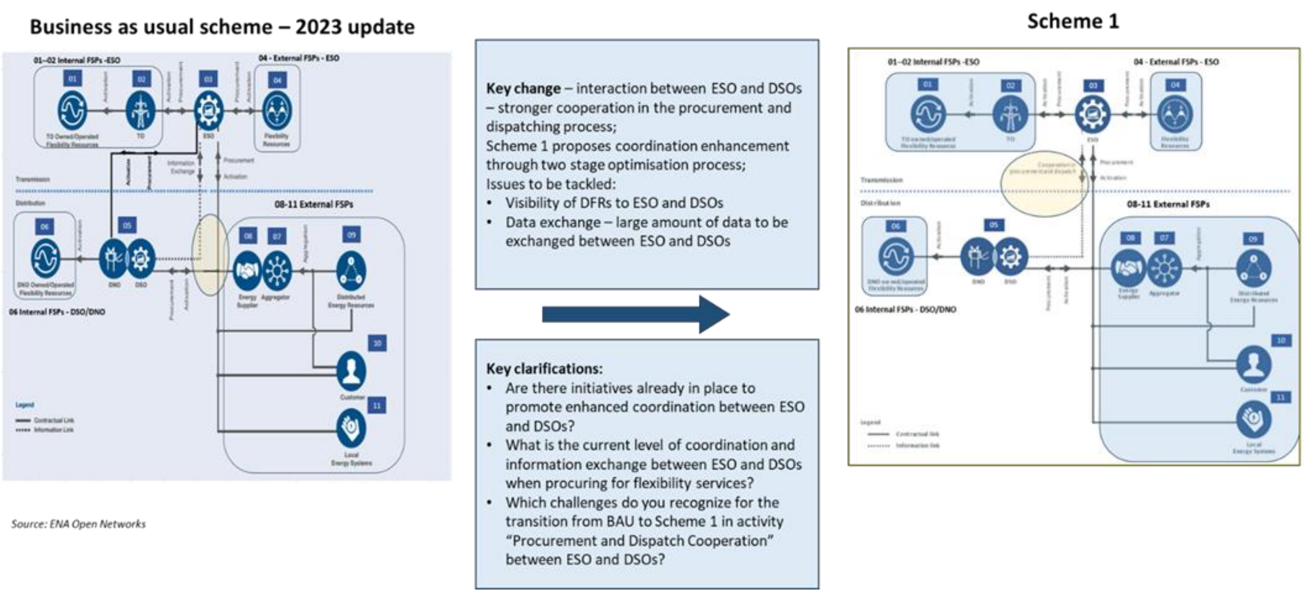
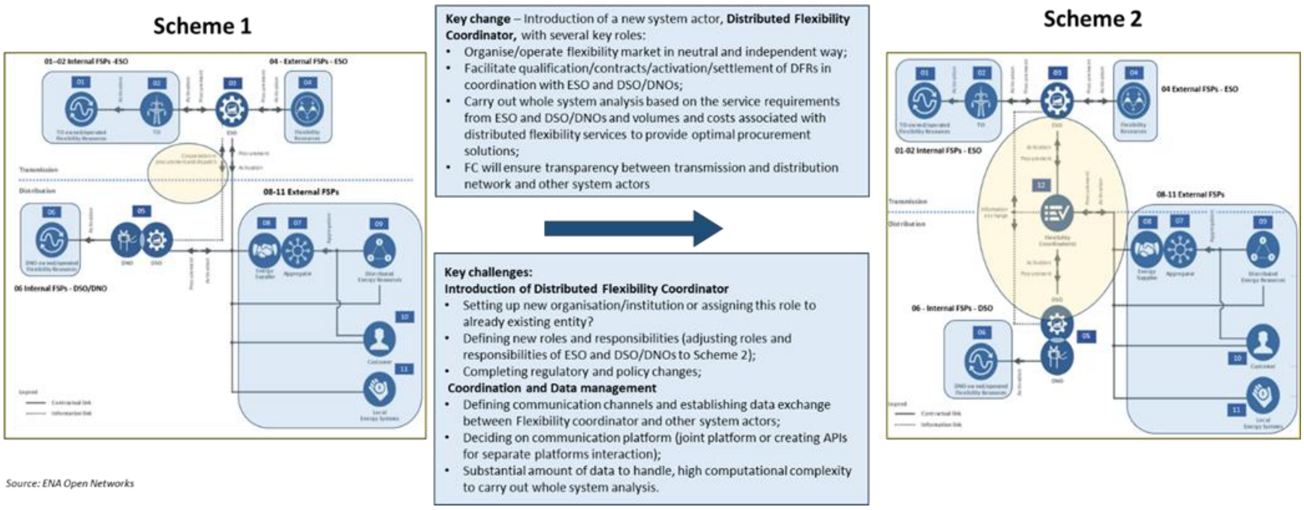


Figure 2-8 – Gap analysis between Scheme 1 and Scheme 2



2.6 Analysis – IWES

- System benefits of improving the coordination will be more visible when more electrification and variable RES become more prevalent by 2050. This is shown in Figure 2-9.
- Deep electrification drives the need for a more holistic approach to coordinating DER flexibility
- Main benefits of improving coordination are in CAPEX of distribution, H2 storage (alternative flex provider)
- More investment in efficient electric heating (HP), energy storage (electricity, heat)

As shown in Figure 2-10, the use of distributed flexibility will reduce distribution network capacity requirements, even in BaU. However, more distribution network cost savings can be achieved by Scheme 1 and 2. Whole-system approach requires a sufficiently strong distribution network to enable distributed flexibility to be utilised optimally. Using distributed flexibility resources to solely minimise distribution network capacity would be sub optimal.

Figure 2-9 – Changes in annual system costs for sensitivities (Hydrogen and Full Electrification) and legend

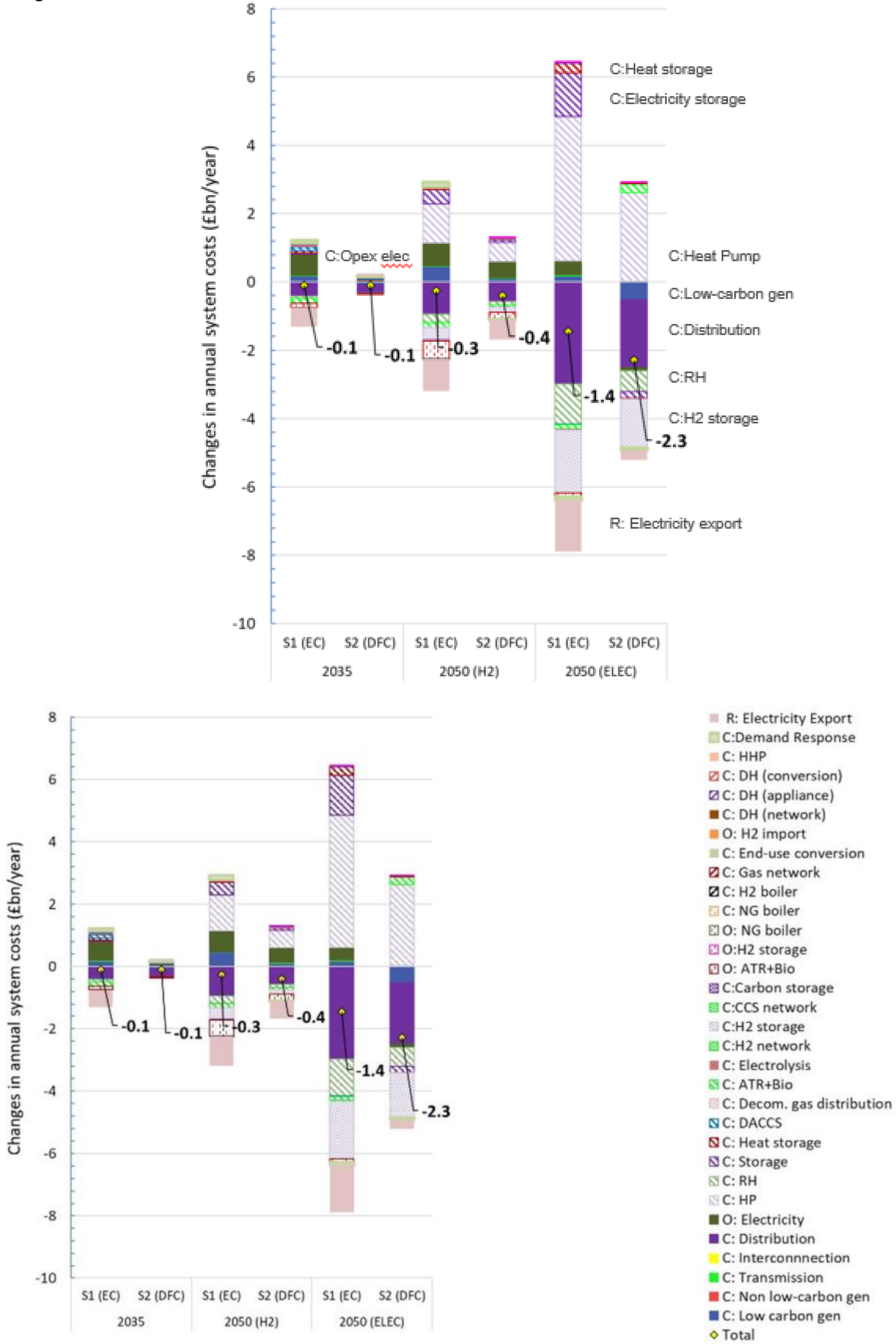
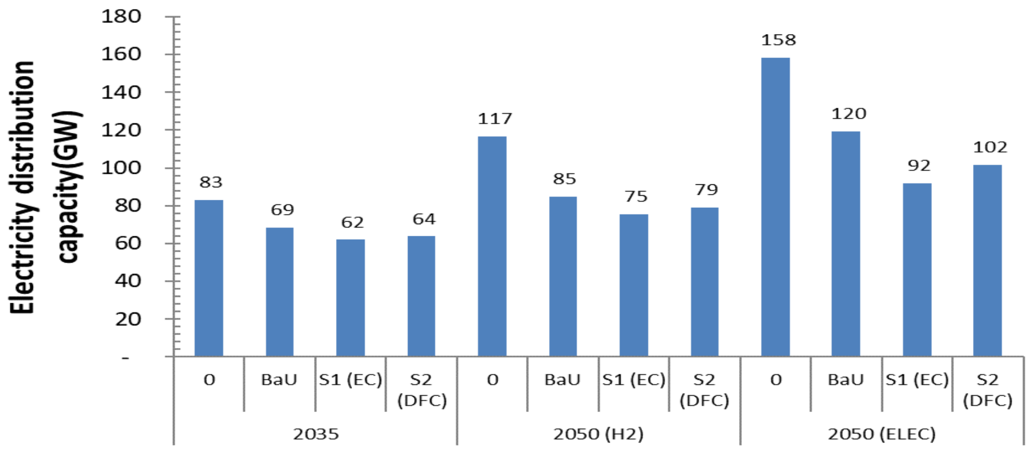


Figure 2-10 – Electricity Distribution Network capacity in 2035 and 2050 in BAU, Scheme 1 and Scheme 2



2.6.1 Risk of suboptimal coordination in Enhanced ESO-DSO coordination (Scheme 1)

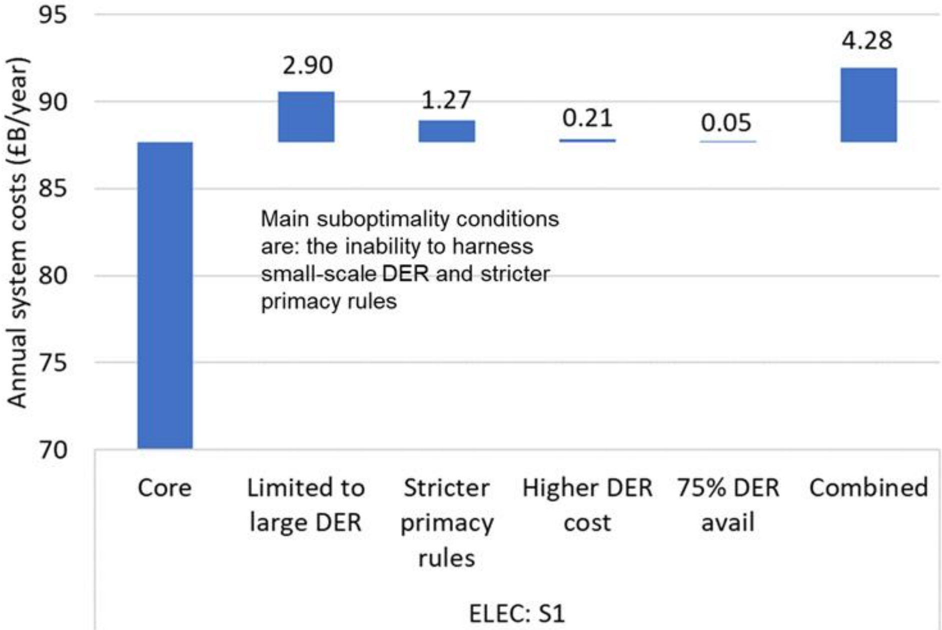
The coordination between ESO and DSO in Scheme 1 is prone to be suboptimal in practice due to:

- The lack of ability to incorporate small-scale distributed flexibility providers, which leads to prioritisation of larger-scale sources, e.g. connected at high voltage rather than small-scale low-voltage connected resources
- Exposure of stricter primacy rules to DSOs to provide sufficient headroom to deal with uncertainty in the provision of services
- Higher cost of distributed flexibility services due to insufficient transparency
- All factors above could lead to fewer service providers.

The incremental costs associated with each suboptimality vary between 0.05 and 2.9 £bn/year, as shown in Figure 2-11. The last bar (£4.28bn/year) shows the additional costs if all suboptimality conditions occur. Therefore, Scheme 1's annual system costs are in the range of 87.64 – 91.92 £bn/year. The study uses the deep electrification scenario, as the difference between Scheme 1 and 2 is more visible than in the H2 scenario.

The most important factor that increases the total annual system cost is the inability to incorporate services from small-scale providers through aggregators. It will cost £2.9bn/year to the system as substantial flexibility could be provided by low-voltage connected customers. The second factor is the exposure to stricter primacy rules through providing extra distribution capacity headroom and over-procurement of services to deal with uncertainty in the deliverability of the flexible services due to various reasons (e.g. network constraints, temporal unavailability of some service providers). The impact of the higher cost of distributed flexibility services and lower availability is not high as the cost of flexibility services is very small compared to the total system cost. Using all potential maximum flexibility resources is unnecessary, as the maximum volume of demand response and energy storage is sufficiently large. Having 75% of them is sufficient to meet the system's needs; therefore, the impact on cost is modest. Combining all suboptimality conditions will increase the total system cost by £4.28bn/year, similar to the sum of all incremental costs of each suboptimality condition being studied.

Figure 2-11 – Incremental costs associated with the suboptimality possibly occurred in Scheme 1



2.7 Cost-Benefit Analysis

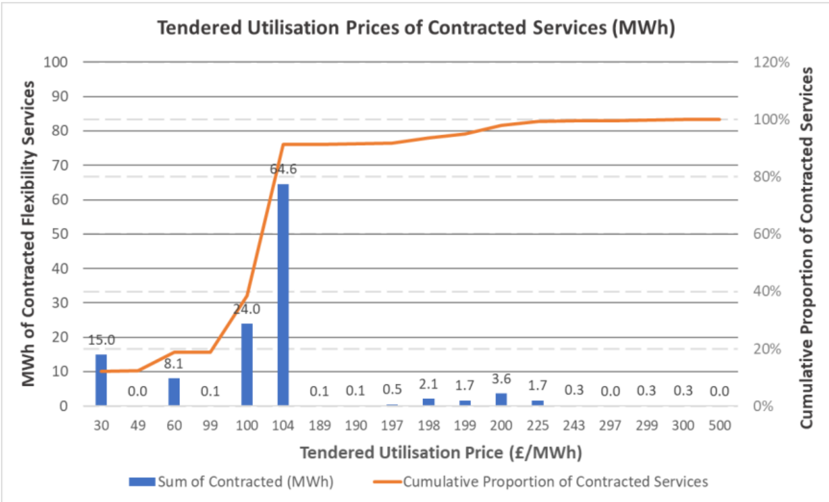
It is expected that improved coordination of flexibility services, especially when considering a whole system approach, will lead to overall system efficiencies which in turn will result in average costs per unit of flexibility being reduced. Efficiency based savings would be expected as a result in improvements in the following areas of flexibility market operations:

- Improved identification of flexibility requirements.
- Improved visibility resulting in improved Supplier targeting of needs.
- Improved resolution of potential conflicts.
- Overall improved coordination and management and dispatch handling.

To determine the potential whole system savings which can be achieved by improved coordination of flexibility services, a range of percentage efficiency gains were combined with the flexibility uptake profiles established from the IWES modelling, and typical flexibility prices sourced from analysis of historic contracted flexibility services.

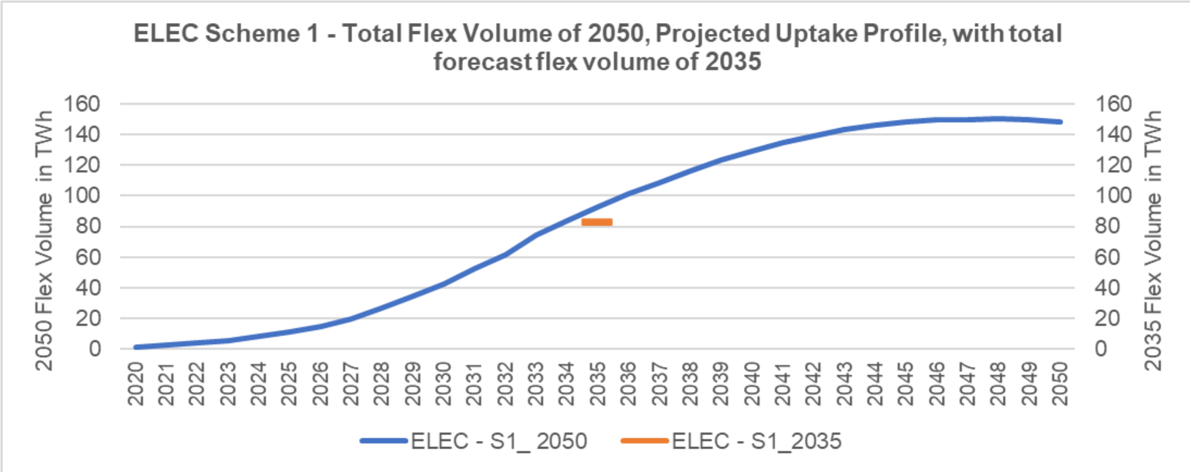
An example of contracted flexibility prices, represented as the cost of the utilisation rate per MWh flexibility, and the volumes and percentage of the contracted programme are illustrated in Figure 2-12. It is evident that the large majority of contracted flexibility had a utilisation rate between £30MWh and £104/MWh.

Figure 2-12 – Tendered Utilisation prices of contracted flexibility services



The IWES analysis generates volumes of flexibility for the fully decarbonised electricity system (2050) and also for an interim 2035 year. The IWES 2050 flexibility volume forecast was used in conjunction with a collection of FES projections for low/zero carbon asset groups to generate an indicative 's-curve' projection profile for annual flexibility volumes. The IWES 2035 flexibility volume forecast was used to correlate the flexibility 's-curve'. The results are shown in Figure 2-13. The peak annual flexibility volume is almost 150TWh.

Figure 2-13 – Estimated flexibility volumes by total flexibility volumes of 2035



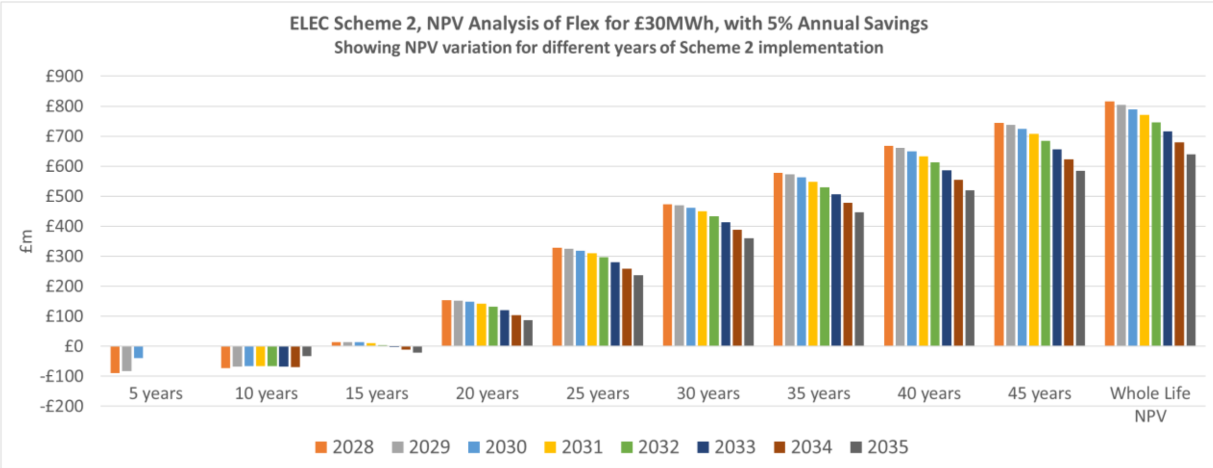
The results were compiled for a range of scenarios, including:

- Low to medium efficiency savings - ranging from 3% to 7%
- Low to medium average contracted flexibility prices – ranging from £30/MWh to £100/MWh
- Slow, Central and Fast Flexibility Uptake Profiles – based on IWES 2050 and 2035 projections, with a 2 year advanced and delayed volume for the 2025 projection.

The above data was used initially to look at the cumulative benefits which could be delivered by improved efficiency of coordination, and then subsequently within a tailored version of the standard Ofgem network investment appraisal CBA.

The simple annual and cumulative efficiency-based savings economic analysis illustrates that above certain volumes of flex there is a strong case for focussing on measures which can provide efficiency savings in the cost of flexibility. Scheme 2, which focusses on whole system optimisation is considered to be one of the key mechanisms which can facilitate the previously described efficiency savings. Illustrations of Flexibility volume increases, based on FES projections for a range of influencing technologies and asset groups, in combination with the IWES whole-system modelling have been utilised to set out volume uptake paths. The volume uptake profiles have been combined with low to medium flexibility average unit prices to determine the corresponding economic benefits which can be delivered by modest efficiency gains which could be delivered by improved whole system coordination. When considering the scenarios modelled, which are viewed to be on the conservative side for flexibility unit prices and potential efficiency gains, the cumulative savings from improved coordination-based efficiency gains surpass the project implementation costs for the improved coordination from between 2028 (£100/MWh flex, 7% efficiency gains) and 2037 (£30/MWh flex, 3% efficiency gains). The CBA results are shown in Figure 2-14.

Figure 2-14 – NPV analysis of flexibility



The application of the standard Ofgem network investment assessment CBA has been used to assess the investment case. Scenarios have been modelled across a range of flexibility unit price points (£30/MWh - £100/MWh), and for different efficiency gains (3%-7%). The initial year of operation of the improved coordination has been tested from 2028 to 2037, to determine which investment year will provide the best NPV, which for the modelled scenarios will reflect the best value for consumers. The illustrative capital expenditure being undertaken in the previous two years. For the large majority of tested scenarios, the optimal year of improved coordination was shown to be 2028, and only for the lowest flexibility unit rates (£30/MWh) and efficiency gains (3%), a later year was preferred (2030/31).

2.8 Schemes Implementation Roadmap

The roadmap can be seen in Appendix A.

The following factors have been considered:

- Findings from all previous Workstreams
- Workshop and ESO/DSO Client Feedback
- Ofgem Consultation on TFDF Responses

Key Milestones

- Indicative target years
- Key functionality needed for enhanced and whole system coordination

Key Groups of Stakeholders:

- ESO
- DSOs
- Facilitators and Planners
- Regulators and Policy Makers
- RESPs
- Market Facilitator

- Primacy Working Groups
- Suppliers and External Consumers
- Technical Requirements
- ENA Open Networks

KPIs

KPIs should be developed to be able to monitor and evaluate progress towards improved, and subsequently enhanced, coordination of flexibility services. These should target key metrics related to the procurement and dispatch of flexibility services and also the progress of the necessary facilitating measures and mitigation of associated risks.

3 Impacting policy developments

3.1 Ofgem's consultations and decisions impacting ESO-DSO Coordination

The scope of Project Commander included the assessment of the policy context that would impact the ESO-DSO coordination, with a view of assessing gaps and differences between the insights and conclusions from the project and the policy decisions, namely from UK Government and Ofgem. We have considered the inputs from *The Future of Distributed Flexibility*[1] and *Future of local energy institutions and governance consultation*[2] *and decision*[3]*.* The consultation on the Future of local energy institutions and governance aims to reform the governance of key energy system functions critical to distribution system operation. Ofgem's decision (November 2023) envisages the creation of two entities: the Regional Energy Strategic Planner ("RESP") and the Market Facilitator ("MF"). RESP roles focus on the strategic planning of national targets and scenarios aggregated with local insight, technical coordination of cross-vector plans to ensure whole system integration and the engagement and coordination of regional and local stakeholders, namely local authorities. The MF will be an independent expert body, accountable for decision-making and driving technical discussions forward through open, transparent, and participatory engagement. The creation of the MF paves the way to greater Consumer Energy Flexibility, in parallel with the launch of the consultation on FMAR (Flexibility Market Asset Registration). The Market Facilitator will have the key objectives of:

- reducing friction across DSO markets;
- aligning transmission and distribution market arrangements; and
- developing local flexibility markets.

On 29th July 2024, Ofgem published the decision to nominate Elexon as the Market Facilitator delivery body, closely interacting with the NESO. This decision has been considered within project Commander. A high-level assessment of how the roles and creation of RESP and MF relate to our recommendations to implement Scheme 2 and for the full operation of a "Distributed Flexibility Coordinator" by 2035. The consultation on Flexibility Market Asset Registration (2024)[4] will be finalised after the end of Project Commander and thus any further analysis in this project couldn't be accommodated within the project timescales. Work Package 4 report included a roadmap and facilitating factors that were recommended, related to data management and governance with a view to improve ESO-DSO coordination and ultimately the implementation of Scheme 1 and Scheme 2.

[1] Ofgem, available here
[2] Ofgem, available here
[3] Ofgem, available here
[4] Ofgem, available here

3.2 Benchmark between DFC (Scheme 2) and RESP and MF roles

A benchmarking of the roles defined in Scheme 2 (“Distributed Flexibility Coordinator”) and the roles of RESP and MF is shown in Table 3-1.

Table 3-1 – Benchmarking of DFC roles vs. RESP and MF roles

	BAU	Future of local energy institutions and governance	Scheme 2 – Distributed Flexibility Coordinator(s)**
Planning	Informal coordination at planning level, limited whole energy system planning. Key interactions between NESO and DSO focused on compliance and information exchange	RESP will aggregate national targets and scenarios with local insights, develop a regional system strategic plan and technically coordinate plans to ensure cross-vector integration	ESO and DSO exchange information relating to investment planning, operational planning and system operation states and requirements of each network with supervision of DFC
Qualification	ESO and DSOs have their own separate qualification process	The Market Facilitator to be responsible for the pre-qualification and design of standardised contracts to reduce friction of accessing markets[5]	The qualification process will be fully standardised and integrated into one process via an independent flexible coordinator.
Procurement	Contracted flexibility services up to 6 months in advance, confirmed during operational timescale i.e., Day Ahead and Intraday	DSOs (and ESO) to remain responsible for procurement and dispatch of flexibility. DNOs remain responsible for real time operations and to work closely with the ESO to ensure actions taken are coordinated.	DFC(s) will coordinate the procurement of flexibility services in a continuous market according to needs of ESO and DSOs.
Dispatch	ESO and DSOs dispatch flexible resources independently		ESO and DSOs indirectly activate DERs through the DFC(s), via a whole system platform that optimises flexibility volumes and pricing according to ESO and DSO requirements
Settlement	Settlement and baselining are done separately by ESO and DSOs	Settlement done separately by ESO and DSOs. Balancing and Settlement Code to be adapted accordingly	The settlement and baselining will be fully carried out by DFC(s) in full coordination with ESO and DSOs.

[5] “Future of Local Energy Institutions and Governance” consultation document, 4.7 and 4.12, Ofgem, March 2023

Compliance	ESO and DSO have their own compliance process	DNOs and ESO remain responsible for internal compliance processes	The compliance process will be overseen by the DFC(s). The DFC(s) will administer all flexibility related data.

At the planning stage, while the RESP performance is expected to bring significant changes at the local and regional energy planning level and to foster the growth and development of both DER and CER, the DFC would have a similar role in supervising the exchanges of information between ESO and DSOs. Secondly, the MF will have a significant role at the procurement stage, by aiming at standardising flexibility contracts, which we foresee to have a positive impact for market entry and access for CER and DERs.

Whilst being performed by existing entities, RESP and MF will cover a range of roles and responsibilities that go beyond flexibility and ESO-DSO coordination. Although it brings the benefit of holistic planning at an industry wide level, and institutional coordination from a policy making and a planning perspective, there is a lack of solutions specific to dispatch and operational coordination (incl. conflict resolution) between ESO and DSOs when accessing CER and DERs.

From a data management and systems implementation perspective, the existing proposal in the "Flexibility Market Asset Register" brings a very positive change in requiring a unique register for an asset participating in flexibility markets. Although, the implementation of the DFC would entail the creation of a centralised platform for the coordination of flexibility.

The RESP and MF entities will play a facilitation role in creating and developing plans and processes (and potentially tools and systems, to be defined during the detailed design stage of the MF) that, from Commander's point of view, would contribute to the implementation of Scheme 1 (Enhanced Coordination). Also, the MF won't have any responsibility from an operational point of view, whereas the DFC would have clear responsibilities in procuring and dispatching CER and DERs. The existing definition of roles for RESP and MF can be considered as aligned with the implementation of Scheme 1 (Enhanced Coordination), and will provide the foundations for Scheme 2 (Distributed Flexibility Coordination). Scheme 2, however, would also require yet a further step change across all stages of flexibility services planning, qualification, procurement, dispatch and settlement, with all the benefits demonstrated previously in this project.

Conclusions

A range of ESO-DSO coordination schemes and innovation projects in the UK and EU highlight a range of critical needs for efficient flexibility markets and access to DERs: automation of operator interfaces and accurate forecasting, an effective market architecture that facilitates greater E(T)SO-DSO coordination in operational timescales and integrated planning to manage the future system complexity and facilitate integration of DERs.

Stakeholder engagement revealed that both suppliers and DNOs recognise that whole system solutions should deliver the best value for the end consumer and that the lack of visibility of DERs is a primary challenge. Energy suppliers do not consider primacy rules as sufficient and favour structural change to mitigate conflicts of interest. DNOs' view is that they already have the best functions for delivering local flexibility recognising challenges with case-by-case rulings.

The impact assessment showed clear long-term benefits and stronger scores for Scheme 2 (Whole System approach delivered by a Distributed Flexibility Coordinator), which provides an overall energy network with greater capacity and resilience than Scheme 1. Several suboptimality conditions in Scheme 1 (Enhanced Coordination) that may increase the system cost up to £4.28bn/year have been identified. In both schemes, optimal whole energy system planning and coordination are essential, with Scheme 2 expected to deliver this more effectively than is possible with Scheme 1.

Implementation costs of both schemes are marginal (~1%) in comparison against total savings in system costs against business as usual. Although, there are multiple concerns over the potential complexity of the Scheme 2 implementation, given the creation of a new entity and further definition of roles and boundaries between energy system actors.

The gap analysis and roadmap creation revealed significant risks in areas such as coordination in the development and implementation of flexibility products, implementation of coordination schemes across multiple industry players, asset visibility and data exchanges. We understand that there are ongoing initiatives to address a number of topics identified in the gap analysis, namely within ENA's Open Networks and the Flexibility Market Asset Registration (FMAR).

At this stage (September 2024) the roles of MF and RESP are being further defined. Also, the FMAR consultation is ongoing and will bring significant improvements to visibility and access to DERs. The existing definition of roles for RESP and MF are an important step towards the implementation of Scheme 1 (Enhanced Coordination) and lay the foundations for the implementation of Scheme 2 (Distributed Flexibility Coordination). Given the increase in the required volumes of flexibility and access to decentralised generation, Scheme 2 requires a further step change of coordination across all stages of flexibility services planning, qualification, procurement, dispatch and settlement, in conjunction with coordinated strategic network planning, with all the benefits demonstrated previously in this project.

Recommendations

It is recommended that the insights, conclusions and recommendations of this project are considered by the ESO (NESO), where feasible, within their input into the detailed design stage of the MF, and in the scoping and development of tasks for the RESP. Adding to this point, there is a critical need to adequately plan resource allocation and establish accurate synergies between the high number of initiatives ongoing in the flexibility market space currently and to meet the ambitious decarbonisation targets.

These factors underpin the need for a wider change programme to be created in close collaboration between ESO and DSOs. It is recommended to create an industry-wide programme to effectively develop ESO-DSO coordination with a focus on technical and operational coordination, considering existing initiatives (as mentioned hereby), and accounting for developments in the following areas: a) Policy and Regulation (Ofgem's guidelines and consultation e.g. FMAR); b) Primacy Rules (ENA Open Networks); c) Asset Visibility (ESO and DNOs asset visibility innovation projects); d) Communication Protocols; e) Data access and governance; f) Whole system investment benefits; g) flexibility market platforms developments; h) level playing field for all participants. The scope of the programme shall consider the ultimate definition of MF and RESP roles in order to assure effectiveness in the development of ESO-DSO coordination.

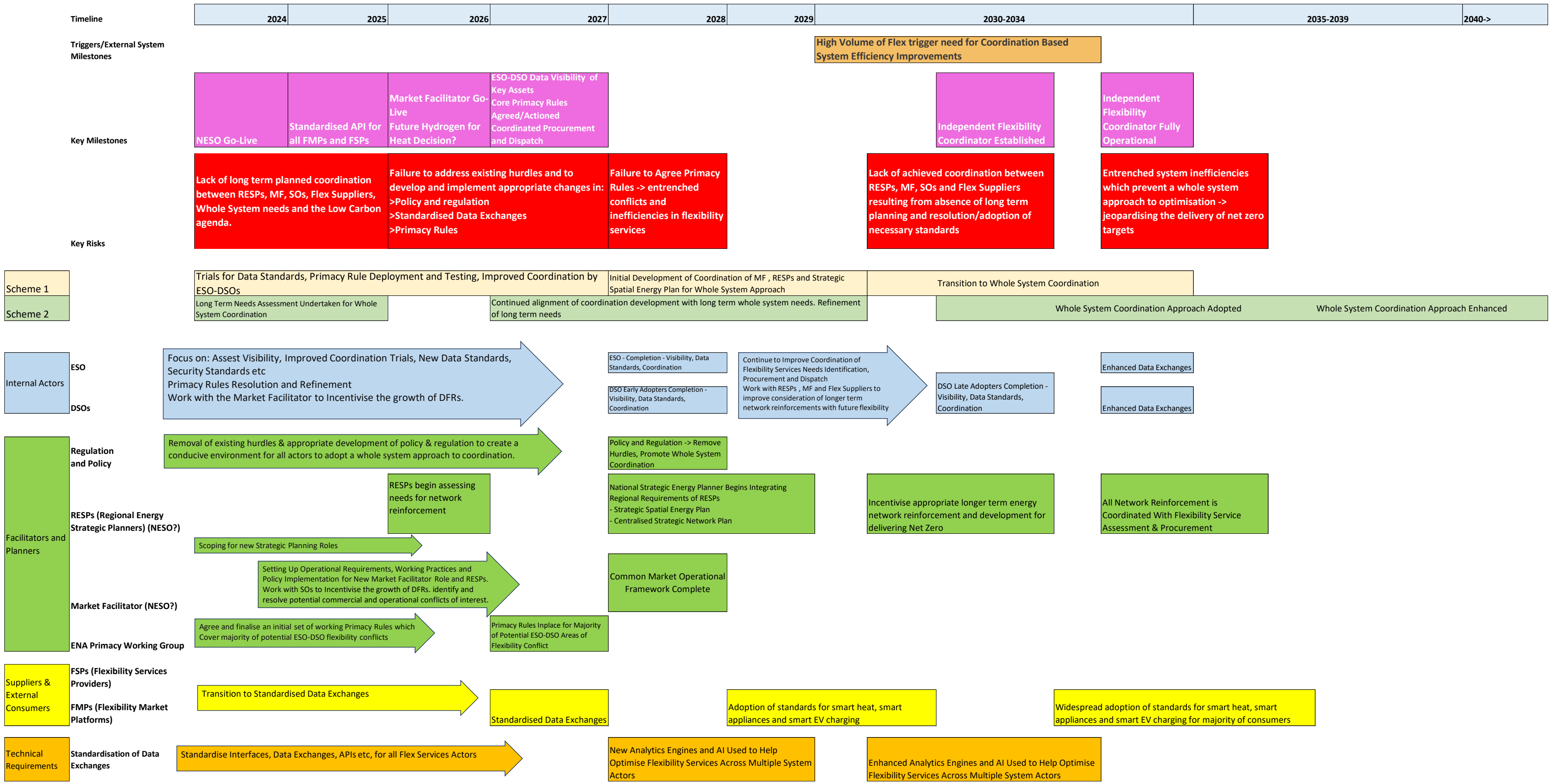
Based on our analysis, effective coordination within the whole energy system, ie including other energy vectors such as gas and heating and not only electricity, brings clear benefits for the consumer. Both roles of MF and RESP shall include specific responsibilities in assuring effective coordination within the whole energy system from planning down to the settlement stage. The implementation of Scheme 2 (DFC) would consider a whole energy system flexibility coordination and management between ESO and DSO (and relevant entities in other sectors).

To ensure governance, accountability and transparency in the delivery of the aforementioned programme and ongoing workstreams, it is recommended to form an industry-wide Working Group to lead and monitor strategic developments in the ESO-DSO Coordination space. This would build on the existing industry working groups (e.g. ENA Open Networks) and incorporate longer term strategic thinking that was supported across the key stakeholder groups. This should include the identification and review of existing issues and proposed solutions , establishment of priorities for long term enhanced coordination which promotes whole energy system optimisation, and establishment and monitoring of enablers and blockers for long term enhanced coordination, as well as specific implementation KPIs.

In a broader sense, a key recommendation relies on the phased implementation of the coordination schemes that were developed and modelled. We recommend that ESO and DSOs develop and implement Scheme 1 in the short term, taking effect in the period 2025-2030, and implement Scheme 2 by 2030 to take effect on later stages of the energy transition (2030 and onwards). The implementation of the schemes would be optimised by identifying where current trials and initiatives can strategically contribute to whole system coordination and where further trials are required.

Appendix A

Roadmap for Scheme Implementation


Timeline
2024
2025
2026
2027
2028
2029
2030-2034
2035-2039
2040->
Triggers/External System Milestones
High Volume of Flex trigger need for Coordination Based System Efficiency Improvements
Key Milestones
NESO Go-Live
Standardised API for all FMPs and FSPs
Market Facilitator Go-Live
Future Hydrogen for Heat Decision?
ESO-DSO Data Visibility of Key Assets
Core Primacy Rules Agreed/Actioned
Coordinated Procurement and Dispatch
Independent Flexibility Coordinator Established
Independent Flexibility Coordinator Fully Operational
Key Risks
Lack of long term planned coordination between RESPs, MF, SOs, Flex Suppliers, Whole System needs and the Low Carbon agenda.
Failure to address existing hurdles and to develop and implement appropriate changes in: >Policy and regulation >Standardised Data Exchanges >Primacy Rules
Failure to Agree Primacy Rules -> entrenched conflicts and inefficiencies in flexibility services
Lack of achieved coordination between RESPs, MF, SOs and Flex Suppliers resulting from absence of long term planning and resolution/adoption of necessary standards
Entrenched system inefficiencies which prevent a whole system approach to optimisation -> jeopardising the delivery of net zero targets
Scheme 1
Trials for Data Standards, Primacy Rule Deployment and Testing, Improved Coordination by ESO-DSOs
Initial Development of Coordination of MF , RESPs and Strategic Spatial Energy Plan for Whole System Approach
Transition to Whole System Coordination
Scheme 2
Long Term Needs Assessment Undertaken for Whole System Coordination
Continued alignment of coordination development with long term whole system needs. Refinement of long term needs
Whole System Coordination Approach Adopted
Whole System Coordination Approach Enhanced
Internal Actors
ESO
DSOs
Focus on: Assest Visibility, Improved Coordination Trials, New Data Standards, Security Standards etc
Primacy Rules Resolution and Refinement
Work with the Market Facilitator to Incentivise the growth of DFRs.
ESO - Completion - Visibility, Data Standards, Coordination
DSO Early Adopters Completion - Visibility, Data Standards, Coordination
Continue to Improve Coordination of Flexibility Services Needs Identification, Procurement and Dispatch
Work with RESPs , MF and Flex Suppliers to improve consideration of longer term network reinforcements with future flexibility
DSO Late Adopters Completion - Visibility, Data Standards, Coordination
Enhanced Data Exchanges
Enhanced Data Exchanges
Facilitators and Planners
Regulation and Policy
Removal of existing hurdles & appropriate development of policy & regulation to create a conducive environment for all actors to adopt a whole system approach to coordination.
Policy and Regulation -> Remove Hurdles, Promote Whole System Coordination
RESPs (Regional Energy Strategic Planners) (NESO?)
RESPs begin assessing needs for network reinforcement
National Strategic Energy Planner Begins Integrating Regional Requirements of RESPs
- Strategic Spatial Energy Plan
- Centralised Strategic Network Plan
Incentivise appropriate longer term energy network reinforcement and development for delivering Net Zero
All Network Reinforcement is Coordinated With Flexibility Service Assessment & Procurement
Scoping for new Strategic Planning Roles
Market Facilitator (NESO?)
Setting Up Operational Requirements, Working Practices and Policy Implementation for New Market Facilitator Role and RESPs. Work with SOs to Incentivise the growth of DFRs. identify and resolve potential commercial and operational conflicts of interest.
Common Market Operational Framework Complete
ENA Primacy Working Group
Agree and finalise an initial set of working Primacy Rules which Cover majority of potential ESO-DSO flexibility conflicts
Primacy Rules Inplace for Majority of Potential ESO-DSO Areas of Flexibility Conflict
Suppliers & External Consumers
FSPs (Flexibility Services Providers)
FMPs (Flexibility Market Platforms)
Transition to Standardised Data Exchanges
Standardised Data Exchanges
Adoption of standards for smart heat, smart appliances and smart EV charging
Widespread adoption of standards for smart heat, smart appliances and smart EV charging for majority of consumers
Technical Requirements
Standardisation of Data Exchanges
Standardise Interfaces, Data Exchanges, APIs etc, for all Flex Services Actors
New Analytics Engines and AI Used to Help Optimise Flexibility Services Across Multiple System Actors
Enhanced Analytics Engines and AI Used to Help Optimise Flexibility Services Across Multiple System Actors