The customer-focused smart grid: Next steps for regulatory policy and commercial issues in GB

Report of Workstream Six of the Smart Grid Forum, 2015

1. Executive Summary

1.1. This report marks the final stage in the existing Workstream Six (WS6) programme of the smart grid forum (SGF). We have identified 17 high-level recommendations that we consider necessary to remove the commercial, regulatory and technical barriers to realising an efficient smart grid in GB. Each of these high-level recommendations is associated with a number of actions to be taken by identified responsible parties, together with indicative timescales for implementation.

1.2. Different people have different understandings of the term smart grid. By smart grid, we mean an electricity network that can intelligently integrate the actions of all the users connected to it - generators, consumers and those that do both - in order to efficiently deliver sustainable, economic and secure electricity supplies. There are a number of ongoing technical and physical developments that will either drive the need for (eg more intermittent generation) or enable (eg smart meters) a more efficient use of the electricity network.

1.3. In our Interim Report from April 2014 we identified high level options through which customers can participate in smart grids, alongside the new roles and relationships that different industry parties will need to develop between each other, and with customers. This report builds on the Interim Report by identifying and proposing actions to maximise customer benefits from smart grid development. We outline below our high-level recommendations, while the detailed individual actions which flow from these are contained in the main body of the report. We have not attempted to prioritise the actions; we have listed them in sequential order under each recommendation.

Achieving value in a fragmented value chain – facilitating multiple or combined offers and managing conflicting requirements

1.4. The GB energy market is unique in the number of different bodies, both commercial and regulated, involved in energy provision. As a consequence we face distinct challenges in realising an efficient smart grid without undermining the operation of the market and protection for consumers already in place.

1.5. Multiple parties may benefit from demand side response (DSR) actions, but **we recommend actions to enable value from DSR and facilitate commercial arrangements**. This will involve monitoring arrangements to ensure value can be combined where it is beneficial to customers, eg the use of multiple services in a single product.

1.6. Such arrangements will need appropriate management of different DSR signals that may undermine the value of the original action. **We recommend actions to manage conflicting DSR signals** to maximise value, such as notification procedures for communicating DSR activities to relevant parties.

Enabling visibility of service requirements and potential providers

1.7. As DNOs take a more active role in local network management **we recommend actions to enable a market for services and visibility of requirements by location**. We propose actions for a number of parties to enable a staged approach to the realisation of a flexibility market at a local level to complement national balancing services.

1.8. **We recommend enhancing visibility of the potential flexible demand in order to improve DSR services** as a prerequisite for efficient functioning of local flexibility markets. We propose actions which will improve the visibility of local flexible loads, including an enhanced notification process.

1.9. **We recommend changes to industry arrangements to enable third parties to take a more active role in flexibility markets**. At the same time, we have proposed other actions to help ensure that participants do not undermine the value available from DSR.

Consumer protections in a smart energy sector

1.10. **We recommend actions to mitigate potential difficulties for consumers in understanding different DSR offers**. Both domestic and commercial consumers may be affected. The potential difficulties relate to both the potential for greater interaction with third parties, and to consumers' adoption of smart appliances and domestic level electricity storage. In both cases, we highlight the need to ensure that the regulatory framework provides sufficient protection to consumers.

1.11. In particular, **we recommend ensuring appropriate consumer protections are in place for the transition to 'smart' energy**. We propose safeguards to ensure that any proposals for consumer load limiting involve the regulator and consumer representatives to protect the interests of consumers, while not disadvantaging those unable to actively engage with the smart grid.

Realising value through load control

1.12. **We recommend actions to enable consumer benefits through the use of smart meter load control switches**, which will require commercial arrangements and cooperation between parties. We propose a series of actions accompanying the rollout of smart meters to ensure that working practices between parties are appropriate. In addition, further investigation of industry-facing regulatory requirements may be required to facilitate the use of load control switches.

Enablers for realising smart meter benefits in the interests of consumers

1.13. **We recommend actions to enable network companies to realise smart meter benefits in the interests of consumers.** The actions cover a range of issues, from accessing smart meter data, to technical smart meter functionality.

Enabling effective time of use price signals and cost-reflectivity

1.14. We have identified half-hourly settlements for domestic customers as an enabler to our **recommended industry and consumer arrangements to help enable effective time of use price signals.** We recommend further investigation of some areas relating to the effectiveness of price signals, including trialling alternative network charging arrangements and the visibility of local price signals to customers.

Realising network and system benefits of energy efficiency and losses reduction and wider environmental impact

1.15. **We recommend arrangements which enable environmental benefits from smart grids and DSR services.** Greater local network management has the potential to reduce losses, while a distribution system operator (DSO) role could also involve promotion of energy efficiency measures. Enabling DSR for peak shaving can realise a reduction in carbon intensity from peaking plant, as can facilitating the connection of distributed generation and low carbon technologies.

Realising the potential value of distributed generation and storage service provision

1.16. **We recommend a series of regulatory and commercial enablers to help facilitate an active role for storage and distributed generation (DG).** This would provide additional actors in a local (and national) flexibility market. The actions range from recognising the value of reactive power from distributed generation to clarifying the regulatory treatment of storage.

Facilitating grid connections and managing curtailment risk

1.17. **We recommend options for how reinforcement costs associated with DG and storage connections can be modelled to improve the connections process.** This would help provide a cost signal to inform DNOs where it may be appropriate to invest ahead of need to facilitate DG and storage connections.

1.18. Our **recommended actions to improve cost reflectivity in flexible connections** should help manage the risk of curtailment of generators which provide a tool for local network management. Any such flexible connection approach would first need to be assessed in terms of the overall value for money for network customers.

1.19. **We also recommend actions to facilitate grid connections for community energy projects.** This would involve considering the specific needs of community energy projects in grid connection rules.

Enabling active community energy engagement in smart grids

1.20. **We recommend options to remove barriers to community groups' participation and engagement in flexibility services**. This would involve facilitating a move from a DNO to a DSO model to enable the procurement of flexibility services at a local level. It would also consider industry arrangements which could remove barriers to local energy supply.

1.21. **We recommend actions to enable community heat projects**. Such projects can be better realised by highlighting them as a potential alternative to generation projects in areas where the network is heavily constrained. This will also involve investigating the need for regulation of heat, in particular, the price of supplying heat to consumers.

Next steps

1.22. We have achieved a great deal in this work programme, exploring a range of parties and applications. This assessment of the smart grids landscape is not exhaustive, but has covered new ground in the commercial and regulatory development of a smart grid. Table 3 gives a full list of the actions.

1.23. As demonstrated by the number of actions, there is a considerable amount of work left to do and we are keen that momentum is maintained. To that end we have adopted a collaborative, cross-industry approach in refining the actions and timescales. We have developed an implementation framework that highlights the importance of monitoring progress against the actions. Annex 1 highlights the actions by the party responsible for next steps, with a diagram of actions against a timeline for different parties. We cannot compel anyone to undertake the actions; they remain recommendations for action.

Proposed Responsible Party	**No. actions within indicative timescales**			**Diagram reference**
	2015-2016	**2017-2020**	**2020 onwards**	
Ofgem	17	10	6	A.1, p.47
DECC	11	6	1	A.2, p.48
SGF	4	2	0	A.3, p.49
DNOs & ENA	20	7	4	A.4, p.50
National Grid	8	1	3	A.5, p.51
Suppliers & Energy UK	3	3	4	A.6, p.52
All other actors	16	5	4	A.7, p.53

2. Vision, Purpose and Approach

Vision

2.1. The Department of Energy and Climate Change (DECC) and Ofgem created the Smart Grid Forum (SGF) to support the UK's transition to a secure, safe, low carbon, affordable energy system. Given this broad scope of work a number of workstreams have been set up under the SGF to help achieve this aim, of which Workstream Six (WS6) is one. WS6 (in this document, we) is chaired by Ofgem and comprises representatives from the electricity Distribution Network Operators (DNOs), National Grid, electricity suppliers, consumer groups and other industry stakeholders.[1]

2.2. We have investigated the commercial and regulatory challenges of implementing a smart grid in GB. In this report we describe how we believe such challenges can be overcome and makes a number of recommendations to address the challenges.

2.3. The development of smart grids is becoming an increasingly important topic, and is actively being discussed at a European level. Both DECC and Ofgem are actively engaged with the relevant European level; monitoring of the actions from this report should take into account European developments.

Purpose of the Report

2.4. This report concludes our current work programme. It updates the SGF on our work since the publication of our Interim Report in April 2014.[2] This report builds on the recommendations of the Interim Report, by investigating the commercial and regulatory challenges of implementing the smart grid solutions identified in that work. It is complementary to the Interim Report but does not replace it; the findings of the Interim Report remain pertinent. The views expressed in this main report are those of WS6 as a collective.

Background and Summary of Approach

2.5. In April 2014, we published an Interim Report which set out high level options through which customers can participate in smart grids, alongside the necessary roles and relationships between industry parties and with customers. The SGF vision and route map[3] identified a number of 'gaps' and actions which should be taken to help progress the development of smart grids in GB. It identified several gaps on customers' engagement with smart grids which could be taken forward by WS6. Accordingly we updated our terms of reference to incorporate the following issues:

i) Develop further understanding of factors which influence customer behaviour and what incentives are needed to achieve lasting change to ensure consumer offers are tailored to customer needs.
ii) Improve understanding about who is best placed to engage and inform consumers to help them participate in new smart electricity markets.
iii) Improve understanding of how best to balance benefits among active 'smart' customers and the customer base as a whole.
iv) Explore different smart pathways to deliver DSR and examine the commercial and regulatory arrangements and requirements for consumer engagement.

[1] A full list of participating stakeholders is available at Annex 2. We do not claim to be fully-representative of the industry.
[2] https://www.ofgem.gov.uk/ofgem-publications/86549/ws6reportapril2014finalforpublicationaugust2014.pdf
[3] Smart Grid Vision and Route Map, February 2014

2.6. We established six subgroups to assess and explore the options from the Interim Report and the objectives in our updated terms of reference. Work undertaken by the following subgroups has informed this report:

1. **Community Energy and Energy Efficiency:** assessed how community energy schemes can engage with the smart grid options set out in the WS6 Interim Report, and identified synergies with energy efficiency projects and Option 6 of the Interim Report which related to deployment of energy efficiency measures.
2. **Consumer Protection:** ensured that commercial arrangements developed for the options are considered thoroughly from a consumer perspective.
3. **Distribution of Value:** assessed specifically how the benefits of demand-side response (DSR) are distributed across different users of the services – either direct participants or those affected by DSR actions – under different scenarios. The group developed an understanding of how benefits are distributed, in order to inform the development and assessment of regulatory and commercial arrangements and any barriers to be addressed. The group also developed an understanding of mechanisms for value to flow back to consumers offering DSR services, and across the customer base as a whole.
4. **Smart Metering:** focussed on potential barriers and enablers for Distribution Network Operators (DNOs) to utilise smart meters and their data to deliver benefits to consumers, including those arising from reduced network losses and load control.
5. **Storage and Distributed Generation (DG):** identified opportunities for storage and DG to offer smart grid services which had not already been captured in the WS6 Interim Report. The group also set out issues specific to storage and distributed generation for all options for providing smart grid services.
6. **Visibility:** explored the various parties' requirements for visibility of DSR actions taken by other parties, particularly regarding data flows between different parties participating in, or affected, by DSR. This provided a key input to identifying barriers to realising the full economic value of DSR, to enable them to be addressed, in order that consumer benefit can be maximised.

Structure of the Report

2.7. This report sets out a number of high-level recommendations and associated more detailed actions that we consider necessary in order to remove the commercial, regulatory and technical barriers to a smart grid.

- Section 3 – a summary of the 17 high-level recommendations, grouped by ten overarching themes. Each of the detailed actions is referred to in the narrative.
- Section 4 – a table of detailed actions grouped under each high-level recommendation. For each action we identify the party (or parties) responsible for next steps and an indicative timescale.
- Section 5 – our proposed framework for implementing the actions and potential next steps.
- Appendix A: diagrams presenting the actions grouped by proposed party responsible for next steps.
- Appendix B: for reference, a list of the 17 high-level recommendations grouped under the ten headings.

- Appendix C: Glossary.

2.8. We have also produced a series of annexes, which will be of use to readers seeking more detailed information on the work and findings of WS6. These annexes represent the outputs of the individual subgroups and have been used to inform the main report. Each of the actions stemmed from the work of the subgroups. However, the final actions in this report have been agreed by the plenary WS6 body and so the wording between this report and the annexes main not align precisely.

2.9. Annex 1 contains the individual subgroup chapters (collated):

- Community energy & energy efficiency
- Consumer Protection
- Distribution of Value
- Smart Metering
- Storage & DG
- Visibility

2.10. Annex 2 contains further background on WS6, subgroups and supporting evidence and analysis used to inform the subgroup chapters in Annex 1 and the recommendations and actions in this report. For each subgroup, we include its:

- Background approach
- Summary of approach
- Scope
- Terms of reference

2.11. Each of the subgroups produced different supporting documents.

- Community energy & energy efficiency:
    - List of smart community energy projects
    - Energy Efficiency support mechanisms across the UK
- Consumer Protection
    - Consumer Protections Toolkit and Risk Matrix
    - Note from consumer protection subgroup to smart metering subgroup on use of load limiting or control in emergency situations
- Distribution of value
    - Table of industry value estimation and summary of findings
- Smart Metering (SM)
    - SM benefits' spreadsheet produced to consolidate the potential SM benefits
    - Q&A sheets on potential barriers and enablers for smart meter benefits
    - Smart meter benefits barriers and enablers summary
    - Demand diversity note
    - Losses note
    - Load control note
- Storage and DG
    - Table of Potential Services from Network Connectees (DG and Storage) to Various Industry Players
    - Flexible Connections – Considerations, Risk and Issues
- Visibility:
    - Table of visibility requirements and summary of findings

3. Key findings and recommendations

Background to the recommendations

3.1. The work undertaken by the subgroups identified various enablers for, and barriers to, maximising customer benefit from smart grid development. This work has been informed by discussions at the plenary WS6, and has considered customer engagement with smart grids throughout. Where issues were identified, we proposed recommendations from both a regulatory and commercial perspective, as applicable.

3.2. This report describes 17 high-level recommendations to remove barriers identified and to develop enablers for the development of smart grids with the aim of delivering customer benefits. For each high-level recommendation, we propose a series of actions providing more detail on how each recommendation may be realised. In some cases, actions identify specific solutions, while in others, further work is proposed to review, monitor or assess developments. In some cases, a trigger point for future review or action is identified. Our proposed Implementation Framework in Section 5 outlines the approach to taking forward action on our findings and the plan for monitoring progress on the recommendations.

3.3. The subgroups have also undertaken detailed work and developed other relevant findings, which are available collectively at Annex 1, as well as a suite of working documents and further background information at Annex 2.

Earlier work and interim report

3.4. This phase of work builds on, and is complementary to, the work programme that led to publication of our Interim Report in April 2014.

Interim report options

3.5. In the Interim Report we outlined options for DNOs or other parties to engage with consumers and other potential service providers (DG and storage operators) in smart grids. While these may not be exhaustive, the current work sought to identify barriers and proposed solutions against the backdrop of these options (and any others identified). Although we did not exhaustively assess the options during this exercise, the options outline the possible routes to engagement with smart grids and DSR previously identified, and as such formed the backdrop to the issues considered in this phase of work.

3.6. Some findings relate to specific options outlined in the Interim Report, while others apply more generally, whichever route to engagement is followed. The work proposes recommendations to realise benefits of the options – it does not seek to identify preferred options, or rule out any options. The key features differentiating the options in the Interim Report are summarised below – for full detail, please refer to the Interim Report.

Table 1: Summary of domestic options outlined in the Interim Report

Restructured Distribution Use of System (DUoS) charging (static or dynamic tariff)	Changes to DUoS may be used to send time of use or locational signals, either directly to consumers or via suppliers.
Capacity charging (with banding)	A capacity charge with banding could be used to send price signals where a certain capacity was exceeded.
Critical event arrangement	With remote automation.
Load limiting	Overall load limiting or direct load control of appliances could be used.
Community energy and demand reduction (energy efficiency, including through information provision)	To realise potential value which community energy can provide locally and achieve system benefits.

3.7. For most of the above (with the exception of critical event tariffs, as indicated), variants considered could include:

- **With or without automation -** where smart appliances respond automatically to time varying price signals.
- **Mandated arrangements -** such as through product standards, with or without override; this could theoretically apply to any option.
- **Direct engagement or via suppliers -** both options were included and some considerations for each identified.

3.8. Additionally, specific options for engagement with distributed generators through flexible connections were considered and a set of options for industrial and commercial (I&C) customers to engage with DSR were developed, see Table 2, below.

Table 2: Summary of engagement options for DG and I&C from Interim Report

DG options summary:	• Last in first out or pro-rata • Upfront auction (all or connecting generators only bidding) • DNO parameters (reduced connection charge with curtailment)
I&C options summary:	• Restructuring DUoS charges (via supplier or direct) • Availability and utilisation payment • Pay as you go response payment

Future activities of DNOs

3.9. Another key area considered in the interim paper was the potential new role of Distribution System Operator (DSO) role and the transition to this. We did not explicitly revisit this broader question during the latest phase of work and we have not attempted to define DSO. Nonetheless, several recommendations from the recent work programme are relevant to this role. The Interim Report's paper on the DSO transition outlined potential evolutionary stages that would characterise a move to a DSO role, as follows:

1. Enhanced network monitoring and planning
2. Real time reconfiguration of the network
3. Commercial arrangements to manage the network under fault conditions
4. Active network management to manage voltage or thermal constraints
5. Distribution system balancing.

3.10. The Interim Report also outlined several key questions including: considering options for arrangements to provide visibility of parties' generation and demand side contracts and actions; options for ensuring system-wide costs or benefits of actions are reflected and internalised (or absorbed) by the relevant parties; as well as questions relating to the transition itself. Some aspects of these have been addressed by the Visibility and Distribution of Value groups' findings, but we have not exhaustively explored these issues and are conscious of parallel work at the European level.

3.11. The main recommendations identified in the latest phase of work and presented in the current report which relate to the DSO role as described above are:

- The provision of flexibility services by community energy and energy efficiency providers, informing the question of whether the DSO role includes different treatment of specific groups (Actions 3C & 13A).
- The value of DSR spread across parties – the scope of DSO role needs to consider how to get full value from DSR across the supply chain (Action 3A).
- Electric vehicle (EVs) and heat pumps – DNOs may need visibility/consent to manage load to effectively carry out a local balancing role. (Action 9H).
- Losses modelling and measuring – the design of a losses incentive might be different with a substantially changed DNO role as DSO (Action 11C).
- Several recommendations relate to DNO and SO procurement of services – the interaction between who procures what and how needs to be considered in the shift to a DSO role (Actions 12A-C, 11B).
- Recommendations for a market based mechanism for flexible connections could constitute an integral part of a DSO role and a cap and compensation model would also be possible (Actions 15B-C).
- Most of the recommendations relating to visibility take forward the questions on visibility within the DSO role posed in the Interim Report (eg Action 2C)

Scope of recommendations and actions

3.12. The scope of the task for WS6 was to assess regulatory and commercial issues related to smart grid development, building on the options for consumer engagement with smart grids identified in the Interim Report. The actions identified can be broadly divided between: regulatory requirements and commercial arrangements; and actions relating to the interaction with the consumer and those relating to 'energy industry-facing' interactions between industry parties. This results in four categories, as shown in Figure 1, below.

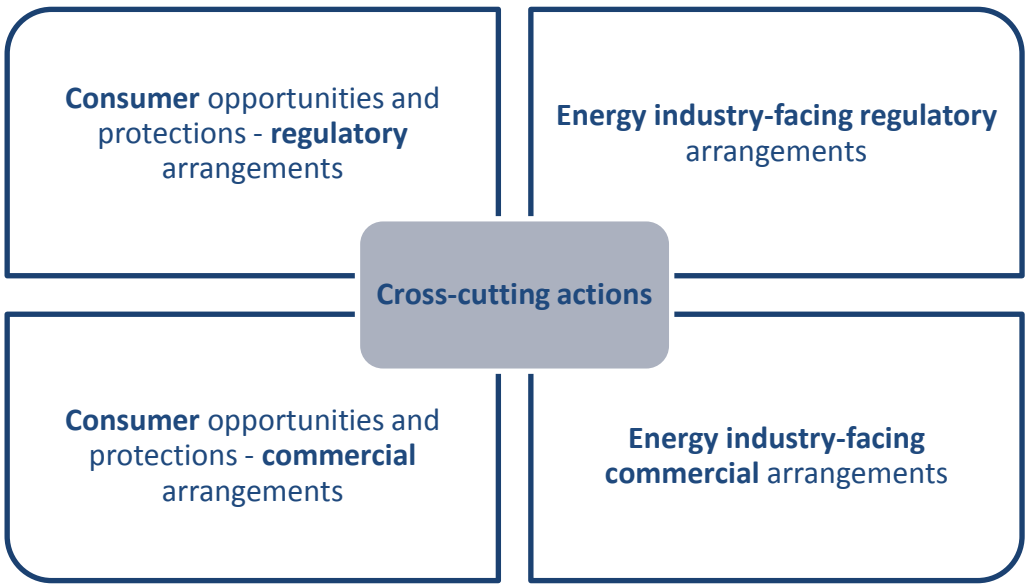


Figure 1: Four categories of action

3.13. This categorisation is illustrative and does not imply that, for instance, an issue designated as 'regulatory' requires no supporting commercial arrangements, or vice versa. Additionally, some core cross-cutting actions address issues relating to multiple subgroups, and potentially require actions in multiple quadrants. A brief summary of key aspects considered under each category is outlined here.

3.14. **Consumer opportunities and protections – regulatory requirements.** Several actions relate to:

- Achieving value and returning this to consumers, across the consumer base as a whole.
- Facilitating consumers' active engagement in smart grids and providing DSR services, while minimising their risks and ensuring vulnerable consumers are protected.
- Provisions for engagement with third parties and ensuring new smart appliances are 'DSR-ready'.
- Efficient management of conflicting requirements for flexibility services which could be sent to the same consumer by different industry parties to maximise the value returned to consumers, while avoiding the risk of confusion and any associated detriment to the consumer or any other party.

3.15. **Consumer opportunities and protections – commercial requirements.** Several findings relate to consumer-focused commercial requirements, including:

- The need for commercial arrangements which ensure industry parties' needs and value are reflected in consumer offerings, and that value flows through to consumers. Arrangements will also be needed to facilitate offers being combined to enable value to be realised.
- Particular enablers for community energy groups to realise value for local consumers while contributing to wider system benefits.
- The need to remove barriers to consumers realising potential value through DSR, through visibility or provision of services, balanced against the need for data protection and minimising risks of (for example) targeting for advertising.

- The need for industry parties to ensure clarity of terminology and simplicity in the description of offers.

3.16. **Energy industry-facing regulatory requirements:** These recommendations relate to several market and service types including DSR, DG and storage providing energy and system services, such as:

- Incentives and charging arrangements enabling the value of DSR to be realised and conveyed between industry parties and customers.
- Visibility and associated requirements to enable mitigation of adverse impacts, and approaches to coordination.
- Addressing specific regulatory barriers to realising the potential value of storage.
- Technical requirements relating to the configuration of and use of data from smart meters and smart appliances.

3.17. **Energy industry-facing commercial requirements:** Recommendations include:

- Provision for the 'stacking' of various services and contracts while ensuring visibility of DSR actions.
- Facilitating DSR providers' entry into emerging and established markets through developing appropriate contractual and product requirements.
- Coordination and visibility arrangements between DSR participants and other industry parties, as well as installers, and ensuring signals are clear on the location of value, for community energy groups or connecting industry customers.
- Clarity on the roles which industry parties play, particularly the potential role of the DSO at a local level, including engagement with community providers and those seeking to connect to the network.
- Options for service provision by DG and storage, including new approaches to flexible connections and risk sharing.

High-level recommendations

3.18. Several themes became apparent in the findings as we collated them from the subgroups' work. We have grouped these themes into 17 high-level recommendations. We present these recommendations below, grouped under ten headings to help navigate the report, each with a series of actions.

3.19. This section gives a summary of each of the actions, while Section 4 presents them in more detail. The derivation of the individual actions can be traced back to the subgroup chapters and supporting papers at Annexes 1 and 2.

Achieving value in a fragmented value chain – facilitating multiple or combined offers and managing conflicting requirements

Recommendation 1: Enabling value from DSR and facilitating commercial arrangements

3.20. Multiple parties may benefit from DSR actions, but action is needed to enable value from DSR and facilitate commercial arrangements. This will involve monitoring arrangements to ensure value can be combined where it is beneficial to customers, eg the use of multiple services in a single product. Options need to be developed for ensuring system-wide costs or benefits of actions are reflected and internalised by the relevant parties.

3.21. The Distribution of Value subgroup highlighted the issue that, if the value of DSR is spread across several parties then there may be insufficient incentive for any single participant to create a DSR product. We recommend that no barriers should be placed against actors working together to have joint contracts providing several services in a single product, or a method of multiple parties paying for the DSR proposition. Each party can of course individually contract for DSR if it has enough value by itself. No current barriers to this taking place were identified by the subgroup, but updating the code/licence modification assessment criteria should take this risk in to account in future (see **Action 1B**).

3.22. The Storage & DG subgroup highlighted issues relating to service contractual arrangements for multiple service provision. We recommend that the exploration of users of flexibility services by the Energy Networks Association (ENA) Shared Services Working Group should continue, including DG and storage providers. We recommend that National Grid leads an assessment of the interaction of tender processes, as well as exploring the scope for standard contracts for multiple service provision, and opportunities for aligning tender timescales. We also recommends National Grid be as specific as possible on the commercial proposition for the technologies expected to be used for procuring services (see **Action 3A**).

3.23. From a consumer perspective, the Consumer Subgroup highlighted that different parties may compete for a consumer's DSR, which could lead to conflicting signals for the consumer. We recommend considering a potential 'second-comer' rule in which any party contracting for domestic DSR could be notified if a consumer was already contracted for DSR and that party could either match its signals to those already being sent or discuss with the consumer so the consumer has the chance to evaluate which contract offers greatest utility **(**see **Action 1A)**.

3.24. On a related issue, the Visibility subgroup highlighted the need to facilitate commercial arrangements where more than one party shares access to a customer's DSR. We recommend that the ENA Shared Services Framework be used as a starting point and expanded to include all relevant actors (see **Action 1D**).

3.25. Achieving a substantial DSR from domestic and small and medium enterprises (SME) customers is likely to require significant numbers of customers. Furthermore, the associated transactional costs are likely to be more expensive to set up and manage than for larger I&C customers providing an equivalent response. The role of aggregators is to manage multiple customer contracts and form a single DSR product. It is likely that the 'low hanging fruit' of I&C flexible demand will prove more attractive to aggregators in the shorter term, and DSR products for smaller customers will be relatively slow to emerge. We recommend that the situation is reviewed in the future to identify if any barriers to this evolution need to be removed (see **Action 1E**).

3.26. The potential impact if the required level of DSR were not delivered at a critical time could exceed the benefit of success, which could lead to the actor or aggregator contracting more capacity than it needs. However, this might not be possible in some cases. For example, where the number of DSR providers in a DNO's location is limited, or the failure may be due to an aggregator or national process (such as a DCC outage). Suppliers, DNOs, System Operator (SO), Transmission Owners (TOs) and aggregators should identify how and in what circumstances the impact of DSR not being delivered at a critical time would far outweigh the expected benefits of successful DSR delivery. Ofgem can then consider whether this inefficiency disincentivises contracting for DSR, and whether incentives and penalties should be re-designed (see **Action 1F**).

3.27. The Distribution of Value subgroup noted that the full value of the DSR is not visible or available to the customer or industry. If this becomes a blocker to value

being achieved, a review of how costs are allocated may be needed; we identify half-hourly settlement as a partial solution but recommend that this area is kept under review (see **Action 1G**). Further detail is provided in the later section on time of use price signals and cost-reflectivity.

3.28. It is important that the costs and benefits of DSR are appropriately apportioned between individual participants and the wider system/society. There is a risk that issues become apparent which could impede DSR value reducing the average customer bill, in addition to any payment to participants required to deliver a response. We recommend that the development of products and uptake of DSR should be monitored to identify whether or not this risk materialises. Where necessary, regulation and/or the market model may need to be developed to address issues which may impede DSR value reducing the average customer bill (**Action 1G**).

Recommendation 2: Options to manage conflicting DSR requirements

3.29. Successful DSR arrangements need options to manage conflicting DSR signals that may undermine the value of the original action. We recommend actions to appropriately manage different signals to maximise value, such as notification procedures for communicating DSR activities to relevant parties.

3.30. The Visibility Subgroup proposed designing a quick and simple method for notifying relevant actors when there is a DSR action in the near term, both before and post-event. Several possible options exist, using existing or new mechanisms, and these will need to be explored in more detail to enable the design and implementation of a cost-effective solution **(**see **Action 2A)**.

3.31. The question of compensatory payments and whether they should be used can also be considered within this work. Development of any system would need to identify in what circumstances post event notification would be required and what additional post event information would need to be shared. This process would also need to include a mechanism for resolving any conflicts of requirements and information should they occur.

3.32. The Visibility Subgroup developed a subsequent recommendation to design a wider industry mechanism for a future point when DSR becomes more common. Indicative thresholds are outlined in the Visibility chapter included in Annex 2. As it is still unknown whether and when such a system will be needed, we consider it would be presumptuous to implement a solution now, but suggest a specification could be designed in the interim **(**see **Action 2D).**

3.33. In particular, both the Visibility and Distribution of Value subgroups identified a specific scenario where potential conflicts may occur: reducing the winter peak at a national level may, in some instances, cause issues at a local level that negate some of the value created. Figure 2, below, illustrates a potential situation where, if the local peak is one hour after the national peak, then customers being incentivised to move away from the national peak may inadvertently cause a local peak issue to be exacerbated (the times used are illustrative only).

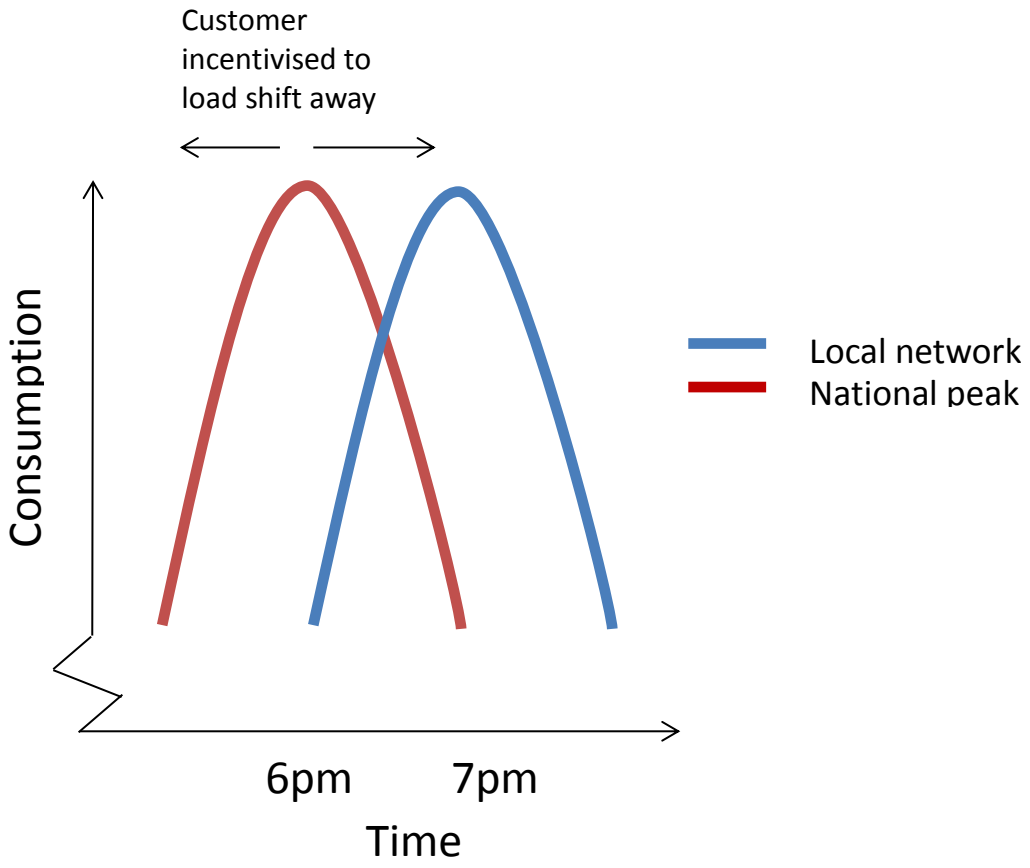


Figure 2 Different local and national network peaks

3.34. It is important that, should DSR actions reduce the national peak load, they don't compound local issues of moving load to periods where local capacity is limited. DSR which shifts demand to a later time period should not result in a cost to DNOs that would negate the value of the original action.

3.35. We suggest a method is needed to identify customers in areas where peak load on the local electricity network occurs at a different time from the national system peak (see **Action 2B**). This would ensure that no aggregator or supplier offers a tariff to that customer that shifts peak usage to the time of local peak. (We identified a similar issue in relation to reactive-power in **Action 12A**).

3.36. The DNOs would need a means of notifying the rest of the industry about customers who have a different local peak compounded by limited head room (see **Action 2C**). We propose the future central registration system(s) could have new 'flags' added to them to highlight the relevant meter points within Load Managed Areas, but a simpler online solution may be required for aggregators. We propose that this recommendation is picked up in Ofgem's Target Operating Model work under the Smarter Markets Change of Supplier project.

3.37. The Distribution of Value Subgroup also highlighted that, if EVs, storage and hybrid heat pumps (which are relatively uncommon at present) are excluded, the potential flexible demand for residential customers may be small and create little opportunity within small geographic areas. LCNF ToU tariff trials (LCL and CLNR) found domestic customers were, on average, willing to shift demand, but also indicated time of use (ToU) price signals at critical peaks do not necessarily lead to

less demand when the network operator needs it most – on the winter peak evening for which the network is sized[4].

3.38. Critical peak tariffs may show potential to make a difference but have not been properly tested in GB. This may particularly affect DNOs with a limited number of customers on a feeder. **Action 2E** proposes a trial of critical peak tariffs in properties with and without EV, heat pumps and storage. This trialling could be done by DNOs, aggregators or suppliers. Other options may also need to be considered.

Enabling visibility of service requirements and potential providers

Recommendation 3: Enable a market for services and visibility of requirement by location

3.39. As DNOs take a more active role in local network management this may enable a market for services and visibility of requirements by location. We propose actions for a number of parties to enable a staged approach to the realisation of a flexibility market at a local level to complement national balancing services.

3.40. The Storage & DG Subgroup noted that the market for providing (multiple) services to the DNO/DSO is underdeveloped, with details now emerging from Low Carbon Networks Fund (LCNF) projects with regard to potential services and contract terms. The subgroup noted that, as this is a new market, there is limited information of the potential size of the market under different future DNO/DSO scenarios for new entrants, particularly if the move to DSOs better supports the use of storage on the distribution network.

3.41. DNOs currently produce "heat maps" to show where the network is stressed or otherwise and these could be developed to include additional content to facilitate the entrance of new services providers. This could indicate the amount of available capacity, location and services that could be offered by providers to parties such as generators facing high connection costs. We also propose that the ENA should coordinate DNO heat maps into the national picture, identifying constraints and possible services (see **Action 3B**).

3.42. Sharing services is being examined by the ENA Shared Services Group and the market for services on the distribution network will emerge in time, but it is important that no actions are taken that may limit the potential uptake of storage (or other services, eg DSR). **Action 3A** proposes to continue the exploration of users of flexibility services, including DG and storage providers as well as a review of the procurement process used for these services.

3.43. The Community Energy Subgroup highlighted that it is not clear how a DNO would indicate to the local network that flexibility services are required, as there is not an established local flexibility market. Flexibility services tend to be procured on the transmission system level, as opposed to locally by DNOs. The subgroup also noted that use of system charges do not currently reflect the actual cost of transporting power in a local area when generation and demand are being actively controlled and balanced.

3.44. **Action 3C (i)** recommends that Ofgem facilitates a move from a DNO to a DSO model which would facilitate the procurement of flexibility services at a local level. In the interim, the subgroup encourages the use of bilateral contracts between the DNO and the service provider. It notes that EU codes will soon require all renewable generators, above a certain size, to provide balancing and ancillary services, which may further drive the need for local markets. **Action 3C (ii)** recommends further

[4] http://www.networkrevolution.co.uk/project-library/developing-the-smarter-grid-the-role-of-domestic-and-small-and-medium-sized-enterprise-customers/

consideration should be given to the trialling of alternative DUoS charging methodologies for networks where there is a high percentage of local generation and local use.

3.45. In relation to reactive power services to DNOs, the Storage & DG Subgroup noted that DNOs have a need for reactive power support on occasion.[5] Individual DNOs may include reactive capability in a connection agreement, but mandating may not be the most economic and efficient solution. This is because different providers may be more cost-efficient than others, and mandating would not facilitate the development of a more dynamic market for reactive provision.

3.46. In **Action 3D**, we propose reactive power services to DNOs could be enabled by the development of a mechanism, in collaboration with the off-takers of distributed generation, to enable DNOs to communicate to DG and storage, and to remunerate these for reactive services.[6] This may be another step towards the development of a DSO, with the DNO engaging more actively with those connected to the network.

3.47. **Action 3D** recommends that DNOs identify "voltage hotspots" where the provision of reactive services is a priority, as a potential pilot or learning areas to build on the subgroup's analysis.[7] We also propose that: the Distribution Code Review Panel (DCRP) should develop a mechanism for communicating reactive power needs to DG, storage, and affected off-takers; and that Distribution Connection and Use of System Agreement (DCUSA) parties contribute to the development of the DCP 222[8] charging methodology proposal and wider charging methodology changes under the Distribution Charging Methodology Forum (DCMF).

Recommendation 4: Enhancing visibility of the potential flexible demand in order to improve DSR services

3.48. Enhancing visibility of the potential flexible demand in order to improve DSR services is a prerequisite for efficient functioning of local flexibility markets. We propose actions which will improve the visibility of local flexible loads, including an enhanced notification process.

3.49. The Visibility Subgroup highlighted the risk that flexible demand may not be notified to DNOs. To manage network stress, it is important that when large flexible loads are connected to the network (eg EVs, heat pumps, etc.) networks are notified. Currently these loads are notified to DNOs in an inconsistent or inaccurate manner (eg only around half of the photovoltaic installations reported to Ofgem are also notified to DNOs[9]).

3.50. The DNO will need to know the capacity of the load and its operating window to ensure it can manage this extra load on its network. This process will need to be improved and legislative/regulatory intervention may be needed to achieve this.

3.51. In **Action 4A**, we propose the introduction of a way for relevant installations and their capacities to be notified to DNOs. This affects Ofgem, DNOs and DG, and should be taken forward by Ofgem and DNOs working together. This could involve

[5] The new European Network Code on Demand Connections is also expected to require DNOs to meet voltage control obligations in relation to the TSO.
[6] SNS is expected, through a trial, to quantify the potential for reactive power support from storage and provide recommendations for further steps. However, this work will not address reactive power from DG.
[7] Initial findings from the first reactive power trial as part of SNS showed that up to 0.09MVA/hour can be saved using 3.75MVAR (half the capability of SNS). This could reduce line loss factors.
[8] For more information on DCP222 click here.
[9] One indication is found in UKPN's PV assessment tool reports which analysed UKPN's networks and found this estimated value - see Figure 12: https://www.ofgem.gov.uk/ofgem-publications/93938/pvtoolcdrfinal-pdf

placing more robust requirements on installers, possibly by expanding or combining existing notification processes.

3.52. There is a potential risk of information asymmetry resulting in competitive advantage in contracting for DSR, noting it may be important for suppliers and DNOs to have visibility of customers who are able to provide DSR (for billing purposes and network management respectively). Visibility is important as it enables each market actor to take the most efficient course of action. For example, DNOs using DSR instead of reinforcing, or suppliers providing services to customers that can help with suppliers' hedging and imbalance management.

3.53. We acknowledge that the above point raises a risk of giving competitive advantage to some parties over others who do not have access to this information (such as other suppliers and aggregators looking to offer services to DNOs and suppliers). While use of DSR may be part of a DNO's regulated activities, there is still competition between different parties who may want DSR availability for different purposes, e.g. network stability versus imbalance management and hedging.

3.54. There may need to be a process to ensure that all parties have access to the same data to ensure a level playing field. Otherwise, parties with access to a list of a customer's smart appliances and on-site storage / generation may be better able to target customers with DSR offerings. One solution may be that this data is kept in one part of a DNO business for network management purposes but cannot be used when targeting customers for DSR. Alternatively, this data could be restricted to one part of a DNO business and not used by the part of the business that procures DSR services from customers, such as load shifting or reduction.

3.55. This would only be an issue if the DNO starts contracting directly with domestic customers. We note that there is nothing preventing DNOs from contracting with domestic consumers now, though the view of the subgroup is that this is unlikely; rather it considers that DNOs would most likely to utilise domestic DSR via an aggregator or supplier, while potentially retaining the ability to pay customers for DSR directly. This risk could be addressed by requiring information on all 'DSR capable' customers to be made available across all interested parties. However, this would raise a data privacy risk and customers may not want their details available to avoid the potential for unwanted targeted sales activities.

3.56. The aim of **Action 4B** is to ensure that any DNO information asymmetry does not adversely affect domestic customers. It suggests all DNOs could agree to notify and seek input from Ofgem and Citizens Advice before they contract directly with domestic and microbusiness customers. It is important to note that any approaches to data sharing need to be aligned with the provisions of the Data Protection Act which places restrictions on the onward processing of personal data.

3.57. Visibility of potential flexible demand may vary across the energy industry. The party able to contract for DSR may not be based on value, but rather which industry player has the best visibility of or access to the customers who could provide flexible demand.

3.58. **Action 4C** proposes that Ofgem monitors DSR as it develops to determine if the market is flawed, ie value is not being captured by the party or parties who can provide the most back to the customer. Half-hourly (HH) settlement should resolve some possible issues and should be monitored post implementation.

Recommendation 5: Changes to industry arrangements to enable third parties to take a more active role in flexibility markets)

3.59. We recommend improvements to industry arrangements for third parties to enable them to take a more active role in flexibility markets. At the same time, we have proposed other actions to help ensure that participants to do not undermine the value available from DSR.

3.60. An issue highlighted by the Visibility Subgroup relates to managing DSR in load managed areas for both aggregators and suppliers. The risk of aggregators shifting load in load managed areas will be passed on to Ofgem's working group looking at third party intermediaries (TPIs) as noted in **Action 5B**. There is a wider finding from the Visibility Subgroup about the role of aggregators, but the group does not make a further specific recommendation.

3.61. The Community Energy subgroup raised a number of issues in relation to local supply. Current trading arrangements generally assume that contractual positions for supply and demand will be achieved at a national or supplier portfolio level. This arrangement doesn't exclude local operators per se, but puts them in a weak position, compared with national operators. They also highlighted that the costs associated with setting up and running a supply licence (even "licence lite") are considerable and partnerships require a third party licensed supplier to deliver services on behalf of local suppliers.

3.62. **Action 5A** recommends that the DECC Community Energy Hub includes support material with policy and regulatory advice for local supply stakeholders. We also recommend a review of regulatory issues for community groups supplying locally, and clarification of the exemptions relating to license exempt supply and distribution of electricity. We recommend an exploration of the viability of local balancing of generation and demand as part of the settlement process through the creation of a Local Balancing Unit (LBU). In addition, we propose a review of the treatment of demand-reduction centred business models in regulation and policy.

Consumer protections in a smart energy sector

Recommendation 6: Difficulties understanding different DSR offers

3.63. We propose actions to mitigate potential difficulties for consumers in understanding different DSR offers. These relate both to the potential for greater interaction with third parties as well as consumers' adoption of smart appliances and domestic level storage. In both cases, we highlight the need to ensure that the regulatory framework provides sufficient protection to consumers.

3.64. DSR offers may take different forms, be confusing and hard to compare. To facilitate simple, straightforward and consistent initial DSR offerings**, Action 6A** proposes that market actors should agree a shared set of terminology building on the standard terms guidance agreed by Energy UK members for other parts of the market.

Recommendation 7: Ensuring appropriate consumer protections are in place for the transition to the 'smart' energy sector

3.65. We recommend ensuring appropriate consumer protections are in place for the transition to the 'smart' energy sector. We propose safeguards to ensure that approaches to load limiting involve the regulator and consumer representatives to protect the interests of consumers.

3.66. The Consumer Subgroup found there is no regulatory framework for aggregators. It noted that Ofgem is leading a programme of work on third parties focused on known harm associated with energy purchase in the domestic and non-domestic sectors. It also highlighted that Ofgem is intending to explore further how markets for aggregators could develop and what protections may be necessary.

3.67. We recommend that Ofgem reviews whether or not regulatory provisions are 'DSR Ready'. In **Action 7C** we note that such a review should aim to ensure consumer protections are sufficient to cover new business models but do not place unnecessary barriers to DSR.

3.68. A recommendation relevant to consumer protection relates to the fact that new smart appliances or domestic level storage may create accountability problems. For example, one party may manufacture a device, a second sells and installs it and a third then controls it on behalf of a fourth. In such instances, there needs to be a clear route of contact if there is a technical problem or the consumer wants to end the contract or raise other issues.

3.69. The Consumer Subgroup noted that there is little regulation around the installation, maintenance and the information provided about smart appliances. **Action 7A** notes that the consumer protection frameworks for different appliance types should join up existing technology-specific schemes, and address new issues that connected devices, multi-party arrangements and the Internet of Things may create around information provision and routes of redress. This will give consumers confidence in accepting DSR equipment and offers, along with a clear understanding of who to contact if equipment fails. Information should be clear and comparable and align with information provided by the EU Energy Label.

3.70. If DSR causes more complexity in the energy market, this could have a particularly negative impact on vulnerable consumers. **Action 7B** proposes that future policy on DSR tariffs and offers should consider identifying a subset of vulnerable consumers, using the Priority Service Register (PSR) classifications or similar, as a special group needing special protections.

Realising value through load control

Recommendation 8: Enabling consumer benefits through the use of smart meter load control switches

3.71. Enabling consumer benefits through the use of smart meter load control switches will require commercial arrangements and cooperation between parties. We propose a series of actions accompanying the rollout of smart meters to ensure that working practices between parties are appropriate. In addition, further investigation of industry-facing regulatory requirements may be required to facilitate the use of load control switches.

3.72. All smart meters contain a load switch (controlling supply to the home). An Auxiliary Load Control Switch (controlling supply to a specified load) is optional. Only suppliers are able to send 'critical commands' via the Data Communications Company (DCC) to use these load control switches to control all, or a proportion, of load to households.

3.73. **Action 8A** highlights that if other parties (eg DNOs and the TSO) are to use load control switches through suppliers to deliver benefits, commercial arrangements and cooperation will be essential. Working practices will need to develop and this will be an important area to monitor as smart meter penetration increases. At this stage, we do not recommend a change in the Smart Energy Code (SEC) to allow parties other than suppliers, direct access to load control switches. However, this should be kept under review as smart meters are rolled out and new commercial

arrangements develop. The Smart Metering Subgroup has produced a detailed note in relation to DNOs' use of load control switches in smart meters.[10]

3.74. The Distribution of Value Subgroup also reported some findings relating to critical commands. If barriers to realising DSR value persist, a business case could be developed to demonstrate that additional benefits can be realised if multiple parties can directly access load control or load limiting functionality through smart meters. Changes to the current arrangements could then be considered, to allow certain critical commands to be sent by more than one party (**Action 8F**).

3.75. Additionally, we have identified, in **Action 8B**, the potential use of smart meter load control switches to mitigate the need for global demand control actions under Electricity Supply Emergency Code (ESEC) and potentially Grid Code OC6. The need for, frequency, and level of demand disconnection could be reduced in an emergency period using smart meter functionality. DNOs are considering a NIC submission for a trial in 2017 we recommended that the SGF monitors progress of this work.

3.76. **Action 8C** highlights that use of smart meters' load limiting functionality has not always been well understood among all stakeholders. In 2011, suppliers committed to consult with Ofgem and Citizens Advice before using smart meters' load limiting or remote disconnection functionality.[11] Besides those suppliers that have already committed to consult before using load limiting functionality or remote disconnection, we recommend that any new suppliers and any other parties gaining access in future to smart meter critical commands should make the same commitment.

3.77. This is in addition to Ofgem's existing guidance[12] that load limiting is to be classed as a form of remote disconnection and treated accordingly in terms of protections. This includes the requirement that suppliers check the vulnerability status of consumers before undertaking load limiting. The additional requirement to consult with the regulator and consumer representatives, however, will allow an approach that is both more failsafe and more flexible, and will ensure all parties are kept up-to-date.

3.78. We have identified two actions to help enable the utilisation of auxiliary load control switches:

- **Action 8D** explains why DNOs (and other parties) may not have full visibility of the amount of load under control through auxiliary load control switches and sets out short and long-term steps to aid estimation of the available load to control.
- **Action 8E** notes that the availability of smart meter data is an enabler for DNOs to make proactive use of auxiliary load control switches for low voltage (LV) constraint management. While no immediate barriers have been identified in this area (other than **Action 9A)** this should be monitored to understand what progress is being made.

[10] See Annex 2, section 5, terms of reference (v). The note can be also be found in the 'Smart metering subgroup supplementary material' zip folder, see 'TORv Load control'. Further detail on load control and critical commands can also be found in the Smart Energy Code.
[11] https://www.ofgem.gov.uk/ofgem-publications/57325/ofgem-statement-17122012.pdf
[12] (https://www.ofgem.gov.uk/ofgem-publications/57395/remote-disconnection-and-ppm-guidance-open-letter-160810.pdf)

Enablers for realising smart meter benefits in the interests of consumers

Recommendation 9: Network company enablers for realising smart meter benefits in the interests of consumers

3.79. We have proposed a number of actions to tackle several barriers and enablers, largely relating to DNOs realising smart meter benefits in the interests of consumers. The actions cover a range of issues from accessing smart meter data to technical smart meter functionality.

3.80. **Action 9A** identifies that DNO access to smart meter half hourly consumption data may be important to realising benefits, such as enhancing DNOs' proactive LV planning. The ENA are producing, and will consult on, a strategy document covering smart meter data anonymity and privacy for customers. From this, each DNO will then produce individual data privacy plans that will need to be approved by Ofgem, before DNOs can access and use this granular smart meter data.

3.81. **Action 9B** highlights that if large numbers of SMETS1 meters are fitted, certain smart meter benefits may be reduced and that this should be monitored. For example, SMETS1 meters do not have outage detection used by DNOs. DECC has consulted on setting an end date for installation of SMETS1 meters.[13] A decision was published in July 2015 – SMETS1 end-date should be 1 August 2017 (i.e. DCC Live plus 12 Months), after which point the installation of SMETS1 meters will no longer meet the requirements of the rollout licence condition.[14] It is recommended that the SGF consider the outcomes of this decision and whether any further analysis is required.

3.82. **Action 9D** also identifies a specific SMETS1 issue. Voltage monitoring within smart meters provides DNOs with an early warning of emerging power quality problems. At present there are no "standard" settings for voltage thresholds or measurement periods. A universal standard would be beneficial so suppliers (or potentially manufacturers) can address this as part of the rollout. The ENA is currently investigating this.

3.83. **Action 9C** notes that further work is required by National Grid to investigate its access to aggregated smart meter to improve forecasting accuracy of both real demand and embedded generation. Meanwhile, **Action 9F** highlights the need for mechanisms to allow smart meter data exchange between network operators (including independent network operators).

3.84. **Action 9E** focuses on the need for parties to monitor the development of the DCC User Interface, to ensure its roll out will enable the full realisation of smart meter benefits.

3.85. **Action 9G** highlights that smart meter data is expected to help enable the delivery of consumer benefits, through more efficient access to the network. In particular, DNOs use diversity assessments as part of the process for assessing new connections. No substantive barriers/enablers have been identified and we recommend that activities are monitored as the rollout of smart meters progresses.

3.86. **Action 9H** highlights a potential risk that devices connected to smart meters, at present, are not fully integrated into the energy system, which could potentially impact the available value. In particular, devices such as electric vehicles and heat pumps are not Trusted Devices, so only one-way communication is possible with smart metering.

[13] https://www.gov.uk/government/consultations/smart-metering-rollout-strategy

[14] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/450167/Smart_Meters_Rollout_Strategy_Government_response_FINAL.pdf

Given the core role of these technologies in smart grids, as they are potentially flexible (notably more so where storage is combined with heat pumps), they are likely to become a core part of the GB energy infrastructure.

3.87. We recommend that DECC works with the ENA, Energy UK and BEAMA to review if and when they become Trusted Devices, to play a more integrated role in lowering the cost of energy to all customers. Other devices, such as storage and DG, could also be reviewed.

Enabling effective time of use price signals and cost-reflectivity

Recommendation 10: Industry and consumer arrangements to help enable effective time of use price signals

3.88. We have identified half-hourly settlements for domestic customers as one of the key industry and consumer arrangements to help enable effective time of use price signals**.** We recommend further investigation of some areas to ensure effective price signals, including trialling alternative network charging arrangements and the visibility of local price signals to customers.

3.89. The Distribution of Value Subgroup identified the issue that domestic customers' energy bills are not reflective of the cost of their individual energy consumption patterns. Instead costs are spread across the customer base or time of day / year. The full value of DSR is not visible or available to the customer or industry. If this becomes a blocker to value then a review of how costs are allocated may be needed; however simplification and customer protection will be factors to ensure some customers do not become unfairly disadvantaged.

3.90. Half-hourly settlements should facilitate more cost-reflective charging. Industry bodies should alert Ofgem and DECC if lack of visibility of value continues beyond half-hourly settlement implementation, with DECC/Ofgem to undertake a review if necessary. Costs are smeared for a purpose, so the issue is whether the driver to smear a cost is larger or smaller than the driver for greater price reflectivity in future.

3.91. In **Action 10A**, we note that the introduction of half-hourly settlements for Profile Classes (PC) 1-4 is the primary item needed to create a value incentive for a mass market proposition for domestic and SME customers and is required to create DSR value. This will allow changing customer demand to be directly rewarded via the settlements system, whereas today the value is lost in the profile smearing process.

3.92. We highlight an issue relating to DNO/supplier/customer relationships for DUoS ToU charging. DNOs' benefits from ToU charging may be limited in cases where the DNO price signal is not visible to customers or is superseded by other industry price signals. As described in **Action 10B**, half-hourly settlement, or similar functionality, is required for the success of DUoS ToU programmes. The issue of signals being superseded is dependent on a number of market factors, which should be considered by industry in the appropriate forums as the roll out of smart meters progresses.

3.93. The Visibility and Distribution of Value subgroups also identified some findings about payment processes and cost-reflective DUoS charging. Further details are provided in the relevant chapter of Annex 2 of this report.

Realising network and system benefits of energy efficiency and losses reduction and wider environmental impact

Recommendation 11: Enabling environmental benefits from Smart Grids and DSR services.

3.94. We propose actions to enable environmental benefits from smart grids and DSR services. Greater local network management has the potential to reduce losses, while a DSO role could also involve promotion of energy efficiency measures. DSR arrangements can help realise reductions in carbon intensity from peaking plant through peak shaving, and in facilitating the connection of distributed generation and low carbon technologies, which several of the actions outlined here are designed to enable. The Distribution of Value subgroup also highlights the potential flexible demand offered by new types of LCTs, such as EVs.

3.95. The Community Energy and Energy Efficiency Subgroup noted that more understanding is required of the opportunities and challenges of reducing peak load (through energy efficiency measures) as an alternative to network reinforcement. This can be achieved by understanding how network companies are currently delivering demand reduction measures to consumers. The subgroup identified a need for increased engagement across network companies (including GDNs), local authorities, housing associations and suppliers.

3.96. In **Action 11A**, we recommend a series of seven actions to enable greater environmental benefits from smart grids and DSR services. For innovation, we recommend that Ofgem produces detailed guidance on how DNOs could make best use of the learnings from LCNF and other projects. We also propose that Ofgem considers further annual reporting on what DNOs and GDNs are doing to stimulate alternatives to reinforcement, including adoption of LCNF insights in this area.

3.97. A number of the sub actions in **Action 11A** relate to the funding of energy efficiency measures, including allowing DNOs to engage in energy efficiency measures to offset or defer network reinforcement, and to address the insufficient funding available for low income householders' 'in-house' energy efficiency works.

3.98. We recommend a review of ECO to address two issues. Firstly, to see how it could be designed to improve consumer access, in particular, access for community energy groups. Secondly, to consider the extent to which low income households are only able to access ECO by making capital contributions towards the cost of energy saving measures.

3.99. The subgroup noted that there are a number of energy efficiency services for households at a local and national level. However, there is a lack of clarity about what is available, the risk being that there is a duplication of services and that householders may be unsure of which provider to access. We recommend in **Action 11A** that national support schemes are reconciled with those provided locally. The government commissioned Bonfield Review (which is looking at standards, consumer protection and enforcement of energy efficiency schemes to ensure that the system properly supports and protects consumers) may have a positive impact in this area.

3.100. Our recommendations under **Action 5A** relate to local balancing, which may contribute to reducing losses, and which community energy schemes may facilitate. We highlight the issue of how the value of this benefit can be captured.

3.101. We outline considerations for a potential future incentive on losses and propose further work to develop these arrangements, which would internalise the value of losses to the DNOs. Alongside environmental benefits, reducing losses would also

deliver direct cost savings to consumers. **Action 11C** makes recommendations relating to losses modelling and measurement, and the development of a future losses regulatory incentive for DNOs.

3.102. In addition, smart meter data could help enable DNOs to more accurately determine losses, if suppliers use smart meters to base FIT export payments on actual exported volumes. For example, smart meter export registers will allow line loss factors to be calculated for DG. **Action 11D** notes that suppliers and DECC should consider options to enable this once the roll out of smart meters has progressed and the volume of associated data has increased. It is worth noting that this is similar to proposals in DECC's recent FITs consultation.[15]

3.103. We have identified synergies between energy efficiency and heat in **Action 17A**. In considering the role of the DSO we make recommendations relating to enabling understanding and use of energy efficiency measures.

3.104. On storage and support schemes, incentives that low carbon generation may receive when partnering with storage to manage their connection may be adversely affected by adding storage to the site. These issues may act as a disincentive for renewable generators to partner with storage, even if doing so results in a more stable system or is a cost-effective approach to managing constraints. **Action 11B** proposes that DECC and Ofgem should produce guidance on the applicability of support schemes for renewables with storage.

Realising the potential value of distributed generation and storage service provision

Recommendation 12: Regulatory and commercial enablers to help facilitate an active role for storage and DG

3.105. We have identified a series of regulatory and commercial enablers to help facilitate an active role for storage and DG. This would provide additional actors in a local (and national) flexibility market. The actions range from recognising the value of reactive power from distributed generation to clarifying the regulatory treatment of storage.

3.106. For reactive services from distribution connectees to the TSO, there is currently no provision in the charging methodology or a mechanism for appropriate reward to DG for this service. **Action 12A** notes that NGET should: (i) further update need for reactive power in the SOF and (ii) continue discussions with industry and other stakeholders via the ENA ENFG workstream. This would help identify the value of these services to the industry. (We identified a related, load-specific case, in **Action 2B**).

3.107. On transmission constraints management, there is currently no appropriate constraint management arrangement between the TSO, DNO and generator to enable planned transmission outages to be taken, without the DG unduly losing revenue. **Action 12B** notes that NGET should initiate the process of constraints management using distribution connectees.

3.108. On TSO balancing services, most DG is not required to sign-up to the Balancing Mechanism (BM). Hurdles to BM participation include a requirement for two-way communication and a 24/7 control point. **Action 12C** notes that NGET should review the scope for smaller players and aggregation in balancing services provision. We also propose that aggregators and other service providers should consider commercial solutions.

3.109. A more radical approach to providing flexibility on a constrained network is to use "excess" electricity to create another commodity, such as heat, hydrogen or ammonia.

[15] https://www.gov.uk/government/consultations/consultation-on-a-review-of-the-feed-in-tariff-scheme

One barrier to a third party operating such a process is where gas quality regulations may block hydrogen injection into the gas network. It is not clear whether a DNO could trade heat, hydrogen, ammonia or other vector under current licence conditions. **Action 12D** proposes that the GS(M)R 1996 Gas Safety (Management) regulations should be assessed. In addition, DNOs should assess the licence implications of trading commodities such as heat, hydrogen and ammonia.

3.110. Levies are applied on suppliers to fund various low carbon incentive programmes. These include the Climate Change Levy (CCL), Renewable Obligation and Feed-in-Tariff Obligation (and potentially Contracts for Difference). Storage is not defined in any legislation and is treated as an "end user", which obliges any supplier operating storage to pay these obligations and levies twice: once when electricity enters the storage and again when the electricity reaches the true "end user".

3.111. For a single specific project HMRC, which administers the CCL, has agreed that storage is not an "end user" and so for the CCL, on this project only, there is no double charge. However Ofgem, which administers the other mechanisms, continues to apply the regulations as required, which means the supplier incurs double charges. These double charges would be recovered by the supplier through any operator of storage (who would contract with a supplier to charge and perhaps discharge the device).

3.112. The approach taken by HMRC to define storage as a non-end user for the CCL could be applied as standard to all storage projects and also for other levy/obligation recovery mechanisms. **Action 12E** recommends that DECC reviews options for defining storage, including considering a separate regulatory classification. It also recommends that HMRC issues guidance on how levies should apply in relation to storage.

3.113. **Action 12F** recommends that the Transform Model, used by DNOs to inform smart grid network interventions, should be updated to ensure storage costs are appropriately reflected. Storage costs are rapidly falling so this will enable DNOs to consider storage in their network investment planning.

3.114. It is unclear how storage should be accounted for in UoS charges. UoS charges may be applied when storage charges and discharges, however it is not "demand" or "generation". DNOs need to assess how current UoS charges impact on the viability of storage and whether charging specifically designed for storage (eg single charge) is required. **Action 12G** recommends that these options on how charging and discharging should be accounted for in UoS charging should be taken to DCMF.

3.115. The connection of storage to a constrained network may trigger reinforcement, even though storage may resolve or may be being used to resolve the constraint. There is a need to distinguish between storage that is contracting to offer a service to avoid reinforcement, and storage that is being used for other purposes (eg smoothing generator output). **Action 12H** recommends that DNOs expand flexible connection terms to address storage connections.

3.116. Regarding the ancillary services policy framework, if the TSO and DNOs want access to new services from new providers and new technologies, including low-carbon solutions and electricity storage, the DG & Storage subgroup found that longer term contracts will be necessary to create a "level playing field" for new technologies or incentivise investment. In **Action 12I** we recommend that Ofgem consults on SO Incentives for facilitation of investment in new ancillary services technologies. We also recommend that DECC considers the interaction between the Capacity Market and other tools in the market to understand how they are affecting system flexibility.

Facilitating grid connections and managing curtailment risk

Recommendation 13: Assessment of community energy connections that may enable quicker and more efficient connections

3.117. The Community Energy and Energy Efficiency subgroup considered the unique barriers for community generation, which had been identified by the Community Energy Grid Connections Working Group. One of the notable barriers is that community energy is at a disadvantage to commercial generation as it takes projects longer to develop, and they are geographically fixed. One of the issues arising from non-firm connections to the grid is that if a community energy project cannot export at full capacity, it can be prevented from securing feed-in tariff (FIT) accreditation.

3.118. **Action 13A** proposes that Ofgem considers whether community energy applications for non-firm connections should be subject to different connection charges from commercial developers and/or different curtailment rules. We also propose that DECC considers accreditation legislation in relation to non-firm connections.

Recommendation 14: Consider how reinforcement costs associated with DG and storage connections can be modelled to improve the connections process

3.119. We identify options for how reinforcement costs associated with DG and storage connections can be modelled to improve the connections process. This would help provide a cost signal to inform DNOs where best to invest for facilitating connections.

3.120. Currently there is no operational cost signal to inform DNOs where best to invest for facilitating DG connections, whereas the constraint applied to flexible connections could potentially become a proxy for such a signal. The present charging framework typically anticipates a single pre-connection user as the trigger for reinforcement, requiring up-front capital contributions which can represent a very high proportion of the total connection cost.

3.121. **Action 14A** includes a number of actions related to understanding cost signals for improving the connections process. Firstly, exploration of how specific reinforcement work is identified and consider how to value constrained energy under flexible connections as an investment signal. We also recommend that DNO connection teams develop a clear and transparent methodology for constraint modelling used to trigger reinforcement, ensuring that energy constrained is being recorded to enable this.

Recommendation 15: Cost reflectivity in flexible connections

3.122. Our proposals to improve **cost reflectivity in flexible connections** should help manage the risk of curtailment of generators which provide a tool for local network management. Any such flexible connections approach would first need to be assessed in terms of value for money for network customers.

3.123. The Storage & DG Subgroup highlighted the need for consideration of how and when to trigger and recover the costs of reinforcement, after a flexible connection. This should be done in a manner which permits network development and facilitates new connections, without adding undue cost to existing customers. One specific consideration includes how to determine when the network has reached a certain level of curtailment which makes it optimal to reinforce instead of continuing to curtail generation.

3.124. We recommend several actions including exploration of the issues around how specific reinforcement work is identified. We propose that Ofgem considers valuing constrained energy under flexible connections as an investment signal. In addition, DNOs' connections teams should develop a clear and transparent methodology for constraint modelling used to trigger reinforcement, in ensuring that the amount of energy constrained is being recorded.

3.125. In **Action 15A,** we recommend that the DG Forum ensures that any proposed flexible connections approach, including, but not limited to, the identified mitigation options, represents value to DUoS customers. The mitigation proposals are:

- Mitigation 1 - Cap and compensation: One option for mitigating the risks to generators of a flexible connection is by capping the level of curtailment, above which financial compensation would be received. **Action 15B** proposes that this concept is taken to Code Panels and the DG/DNO Steering Group. Once the concept has been validated, DNOs connections teams should develop contractual arrangements.

- Mitigation 2 - Market Based Mechanisms: An alternative mitigation option with flexible connections, where a balancing mechanism operates at the distribution-level. **Action 15C** proposes that the ENA DNO/DG steering group along with Ofgem and DECC develop a consistent approach across DNOs and consider the role of flexibility in supporting flexible connections.

Enabling active community energy engagement in smart grids

Recommendation 16: Options to remove barriers to community groups' participation and engagement in flexibility services

3.126. We propose options to remove barriers to community groups' participation and engagement in flexibility services. This would involve facilitating a move from a DNO to a DSO model to enable the procurement of flexibility services at a local level. It would also consider industry arrangements which could remove barriers to local energy supply.

3.127. **Action 16A** notes the barriers to community groups' participation and engagement including the limited ability for community energy projects to innovate and the uneven distribution of skills and knowledge. To address these issues, we propose:

i) Establishing a pilot 'Smart Community' fund to allow local supply actors to experiment, innovate and learn from each other.

ii) Ensuring DECC's Community Energy Hub is 'fit for purpose' by feeding back to DECC's Community Energy Unit.

iii) Exploring the potential role of community groups in the smart meter roll-out and education on sharing data.

Recommendation 17: Enabling community heat projects

3.128. Enabling community heat projects can be better realised by highlighting them as a potential alternative to generation projects in areas where the network is heavily constrained. This will also involve investigating the need for regulation of heat, in particular, the price of supplying heat to consumers. **Action 17A** makes two proposals. Firstly, community energy groups in localities where the electricity distribution network is constrained for distributed energy connections should be encouraged to consider heat projects. Secondly, to investigate the need for regulation of heat, in particular, the price of supplying heat to consumers.

4. Summary of issues and actions

4.1. This section contains a table summarising the actions under each of the high-level recommendations. Table 3 sets out the issue to be addressed and our proposed action. For each action we have proposed a party or parties that we consider will be most appropriate for taking forward the action. We have also given an indicative timescale for each of the actions, by which time we would expect some action to have begun. The cross reference column highlights where you can find a more detailed explanation for the derivation of an action, with reference to paragraphs of the individual subgroup chapters collated at Annex 1. We explain our proposed framework to promote implementation of the actions in Section 5.

Table 3: Summary of issues and actions

#	Issue (barrier or enabler)	Action	Proposed party responsible for next steps	Timescale (initial response)	Cross-ref
1	**Enabling value from DSR and facilitating commercial arrangements**				
A	**Possible conflicting domestic DSR signals:** if different parties are competing for a consumer's DSR.	Consider a second-comer rule in which any party contracting for domestic DSR could be notified if consumer was already contracted for DSR and either match its signals to those already being sent, or discuss with the consumer so the consumer has the chance to evaluate which contract offers greatest utility.	Ofgem/SEC	Q4 2015	2.15-2.25
B	**A market that allows value to be combined across multiple parties offering a DSR product may be important for them to be viable:** • if the value of DSR is spread across several parties then there may be insufficient incentive for any single participant to create a DSR product • combining value may enable long-term DSR products to be offered which may be beneficial to parties such as DNOs who require more certainty of their DSR portfolio and the response it can offer.	No barriers should be placed against actors offering DSR products working together to have joint contracts providing several services in a single product or allowing multiple parties to use this DSR proposition. (i) Updating the code/licence modification assessment criteria should take this risk into account going forward. By enabling value to be combined, the risk of DSR being only a short term solution to some situations may be reduced. (ii) Design contracts so that service providers are not locked into exclusivity clauses and can stack contracts for the same service with different parties.	(i) All industry parties involved in code / licence modification. (ii) All parties procuring flexibility services.	Q4 2016	3.12-3.13.
C	**Facilitating commercial agreements where more than one party shares access to a customer's DSR.**	(i) Expand the ENA's shared services framework to include all relevant actors. (ii) If this cannot be resolved commercially, then regulatory intervention may be required.	(i) ENA/ industry parties (ii) Ofgem	(i) Q2 2016 (ii) 2018-19	6.17-6.18

#	Issue (barrier or enabler)	Action	Proposed party responsible for next steps	Timescale (initial response)	Cross-ref
D	**High implementation costs of domestic DSR:** A substantive domestic and SME customers' DSR response is likely to require thousands of customers and therefore be more expensive to set up and manage than for I&C customers**.**	The role of aggregators is to manage multiple customer contracts and form a single DSR product. It is possible that until all the easiest I&C flexible demand is used DSR products for smaller customers will be limited. No barriers have been identified at present, but this should be reviewed in the future.	Ofgem	2018-2020	3.15
E	**The potential impact, if the level of DSR were not delivered at a critical time, could exceed the benefit of success**: This could lead to the actor or aggregator contracting more capacity than it needs. However, this might not be possible in some cases eg where the number of DSR providers in a DNO's location was limited, or the failure may not be due to one or two customers but with the aggregators or national processes (such as a DCC outage).	(i) Identify how and in what circumstances the impact of DSR not being delivered at a critical time would far outweigh the expected benefits of successful DSR delivery. (ii) Review whether this inefficiently disincentivises contracting for DSR, and whether incentives and penalties should be re-designed.	(i) Suppliers, DNOs, SO, TO, aggregators (ii) Ofgem	2018-23	3.9-3.11
F	**The full value of the DSR is not visible or available to the customer or industry:** In particular, industry costs are not reflective in the customer tariff or profiled settlements, but spread across the customer base or time of day / year.	HH settlements will resolve a large part of the issue because generation costs will be settled against individual customer usage and not smeared as at present. (i) Alert Ofgem and DECC if the issue continues post HH settlement implementation. (ii) If this becomes a blocker to value, review how costs are allocated (should they be spread or become more price reflective?).	(i) Any industry party (ii) Ofgem / DECC	2020-2030	3.14
G	**Distribution of DSR value:** It is important that the costs and benefits of DSR are appropriately apportioned between individual participants and the wider system/society. There is a risk that issues become apparent which could impede DSR value reducing the average customer bill, in addition to the payment required to deliver a response.	Monitor the development of products and uptake of DSR, to identify whether this risk materialises. Where necessary, develop regulation and/or the market model to address issues which may impede DSR value reducing the average customer bill.	Ofgem	2020-2030	3.16
2	**Options to manage conflicting DSR signals**				
A	**Designing a quick and simple method for notifying relevant actors when there is a DSR action, both before and post-event.**	Explore in detail options to design and implement a cost-effective solution for notification of DSR actions. This should consider: • in what circumstances post-event notifications would be required and	ENA/ Ofgem	Q2 2016	6.13-6.16

#	Issue (barrier or enabler)	Action	Proposed party responsible for next steps	Timescale (initial response)	Cross-ref
		• what additional post-event information needs to be shared • the process to resolve any conflicts of requirements • whether the use of compensatory payments is within scope of this work.			
B	**A method is needed to identify customers in load managed areas where peak load occurs later locally than nationally.** This is so a tariff is not offered that delays peak usage causing local issues by shifting demand at a national level.	Investigate whether the central registration service for switching could have new 'flags' added to highlight the relevant meter points within load managed areas. A simpler online solution may be required for aggregators.	Ofgem	2019	6.20-6.28.
C	**Using DSR to reduce the winter peak at a national level may cause local network issues for DNOs if their capacity is limited:** shifting demand to a later period in the day could cause new issues whereby the action needed to resolve them would negate the value of the original action.	DNOs need a means of notifying the rest of the industry about limited capacity on their network if it falls at different times from the national winter peak. This should also consider how any notification would work for domestic winter peaks led by storage heaters overnight.	SGF (or appropriate workstream)	2019	3.13
D	**Designing a wider industry mechanism for when DSR becomes more common.**	It is unknown whether, and when, a wider industry mechanism would be needed. It would be presumptuous to implement a solution but a specification could be designed in the interim. This process would also need to resolve any conflicts of requirements and information occurred.	Ofgem	2020	6.13-6.16.
E	**ToU tariff critical peak response may be limited:** LCNF ToU tariff trials (LCL and CLNR) indicate that most customers are unable or unwilling to change behaviour despite TOU price signals at critical peaks – the winter peak / cold evenings. Critical peak tariffs may show potential to make a difference but have not been properly tested in GB. This may have a particular impact for DNOs with a limited number of customers on a feeder.	Trial critical peak tariffs in properties with and without EV, heat pumps and storage. This trialling could be done by DNOs, aggregators or suppliers. Other options may also need to be considered. HH settlements as the driver to test these riffs, with the timescale of a slight time lag beyond HH settlements for all PC1-4 customers.	Industry including BEAMA	2021-31	3.7-3.8
3	**Enable a market for services and visibility of requirements by location**				
A	**Service contractual arrangements:** some parties believe it is not currently possible to provide services to both the TSO and the DNO with a single asset due to visibility and sharing issues, notably exclusivity and penalty clauses.	(i) Continue exploration of users of flexibility services, and including DG and storage providers (ii) Consider procurement process used for DG and storage including: • an assessment of the interaction of various services'	(i) ENA Shared Services WG (ii) National Grid	(i) Ongoing (ii) Q2 2016	5.11. – 5.13.

#	Issue (barrier or enabler)	Action	Proposed party responsible for next steps	Timescale (initial response)	Cross-ref
		tender processes. • scope for making improvements to services in order to make them more accessible, for example standard contracts for multiple service provision, and opportunities for aligning tender timescales. • how to improve clarity on requirements and route to market for new technologies/approaches.			
B	**Information provision:** The market for providing (multiple) services to the DNO/DSO is underdeveloped with details emerging now from LCNF projects with regard to potential services and contract terms.	(i) Develop additional content that indicates location and services required. (ii) Coordinate DNO heat maps into national picture identifying constraints and possible services.	(i) DNOs (ii) ENA	(i) Q4 2015 (ii) Q2 2016	5.26-5.28
C	**Potential constraints for local generation flexibility Services:** (i) Communities are capable of providing services to the system. The current regulatory arrangements in the UK do not provide for this and therefore limited use is currently made of this resource. Consideration should be given to exploiting this resource. This could be through changes to regulatory frameworks or through the development of aggregators. (ii) Distribution use of system charges (DUoS) do not reflect the actual cost of transporting power where generation and demand are being actively controlled.	(i) As part of its Flexibility programme, consider the transition from a DNO to DSO model. This would help to facilitate the procurement of flexibility services at a local level, including use of bi-lateral contracts between DNOs and service providers. Review community energy access to market and address any barriers. (ii) Explore the trialling of alternative DUoS charging methodologies for networks where there is a high percentage of local generation and local use.	Ofgem	(i) From 2016 (ii) Q2 2016	1.1-1.11
D	**Reactive services from distribution connectees to DNOs:** These services could be enabled by a mechanism for communication and remuneration.	(i) Identify voltage "hotspots". (ii) Develop mechanism for communication of reactive service needs. (iii) Contribute to DCP 222 charging developments or wider changes under DCMF.	(i) DNOs (ii) DCRP (iii) DCUSA parties	(i) Q4 2015 (ii) Q1 2016 (iii) Ongoing	5.5-5.6
4	**Enhancing visibility of the potential flexible demand in order to improve DSR services**				
A	**Introducing a robust process for relevant flexible load / generation installations and**	Consider more robust requirements upon installers of equipment, building on existing requirements for installers	Ofgem / DECC	Q2 2016	6.29-6.30

#	Issue (barrier or enabler)	Action	Proposed party responsible for next steps	Timescale (initial response)	Cross-ref
	their capacities to be notified to DNOs.	to notify Ofgem and DNOs. There is a potential data privacy risk associated with the sharing of this information.			
B	**Ensure that any information asymmetry between DNOs and other industry parties relating to installed flexible load does not adversely impact domestic customers.**	All DNOs could agree to notify and seek input from Ofgem and Citizens Advice before they contract directly with domestic and microbusiness customers for DSR services.	DNOs / Ofgem	2018	6.32-6.37
C	**Visibility of potential flexible demand may vary across the energy industry:** the party able to contract for DSR may not be based on value, but rather which industry player has the best visibility of / access to the customers who could provide flexible demand.	Monitor DSR as it develops to determine if the market is flawed, i.e. value not being captured by the party or parties who can provide the most back to the customer. HH settlement should resolve some possible issues and should be monitored post its implementation.	Ofgem	2020-2030	3.7
5	**Changes to industry arrangements to enable third parties to take a more active role in flexibility markets**				
A	**Challenges for community energy to be local suppliers:** (i) Complexity of supply licencing is a barrier to local supply.	(i) Provide a link to the Ofgem support materials for independent suppliers on the Community Energy Hub (a website DECC is creating to support community energy groups). Review regulatory issues for local suppliers, including community groups, supplying locally. Clarify the exemptions relating to license exempt supply and distribution of electricity.	(i) DECC Ofgem (review reg issues)	(i)Q1 2016	1.12-1.22
	(ii) Contractual positions for supply and demand are generally assumed to be at a national level, which makes it difficult for local suppliers.	(ii) Explore the viability of different balancing approaches and how they could contribute to an efficient system. This should include consideration of local balancing of generation and demand for instance through the creation of a Local Balancing Unit (LBU).[16]	(ii) Elexon/ Ofgem	(ii)-(iii) From 2016 (consider in the context of Flexibility project)	
	(iii) Uncertainty of revenue for local suppliers which are designed to reduce demand, not grow it.	(iii) Review the treatment of demand-reduction centred business models in regulation and policy.	(iii) Ofgem		
B	**Managing DSR in load managed areas for**	Investigate the risk of aggregators shifting load in load	Ofgem	Q1 2018	6.20-

[16] The concept of a LBU was developed by Elexon as a solution to the barriers to local supply and would enable local generation and consumption to be netted off before entering the national balancing settlement, therefore reducing balancing charges for the local supplier and enabling it to claim the value of embedded benefits.

#	Issue (barrier or enabler)	Action	Proposed party responsible for next steps	Timescale (initial response)	Cross-ref
	both aggregators and suppliers.	managed areas.			6.28
6	**Difficulties understanding different DSR offers**				
A	**Difficulties understanding different DSR offers:** offers may take different forms but may be confusing and hard to compare between them.	(i) To facilitate simple, straightforward and consistent initial DSR offerings, market actors should agree a shared set of terminology building on the standard terms guidance agreed by EnergyUK members for other parts of the market. (ii) Consider how to expand to other market actors at an appropriate time in future.	(i) EnergyUK building on existing guidance. (ii) Ofgem	(i) Q4 2015 (ii)2017	2.37-2.39
7	**Ensuring appropriate consumer protections are in place for the transition to the 'SMART' energy sector**				
A	**Need for consumer protection frameworks for new smart appliances or domestic level storage:** there is little regulation around their installation, maintenance and the information provided about them. This could lead to potential issues of inadequate or faulty equipment being installed that cannot support DSR.	Develop a consumer protection frameworks for different appliance types to: • join up existing technology specific schemes • address new issues that connected devices, multi-party arrangements and the Internet of Things may create around information provision (including routes of redress). The framework should align with information provided by the EU Energy Label and be developed in step with European standards and labelling work led by the EC (DG Connect and Ecodesign).[17]	DECC/ Ofgem/ BEAMA	From Q4 2017	2.40-2.42
B	**Impact of DSR on consumers in vulnerable situations:** if it causes more complexity in the energy market.	Future policy on DSR tariffs and offers, should consider consumers in vulnerable situations, using a definition to be agreed, as a special group needing special protections. This work should be ongoing.	DECC/ Ofgem	From Q4 2017	2.25
C	**Potential barriers to innovation in domestic DSR:** driven by consumer protection rules in relation to, for example, potential growth of time-of-use tariffs, household automation, contracts involving multiple parties, and bundled energy services.	Review whether regulatory provisions are 'DSR ready'. The Consumer Protections Toolkit should be used as a resource through this process.[18] The aim of this review should be both to ensure consumer protections are sufficient to cover new business models and offers as far as foreseeable, and to check that they do not place unnecessary barriers to DSR (nor give it an advantage over other options).	Ofgem	Q4 2017	2.1-2.13
8	**Enabling consumer benefits through the use of smart meter load control switches**				

[17] http://ec.europa.eu/growth/industry/sustainability/ecodesign/index_en.htm
[18] See Annex 2, section 3, Consumer Protections Toolkit and Risk Matrix. The document can also be found in the 'Consumer Protection subgroup supplementary material' zip folder published alongside this document.

#	Issue (barrier or enabler)	Action	Proposed party responsible for next steps	Timescale (initial response)	Cross-ref
A	**If parties are to use smart meter load control switches[19] through suppliers to deliver benefits, commercial arrangements and cooperation will be essential and will need to develop.**	Developments in this area should be kept under review as smart meters are rolled out and new working practices and commercial arrangements develop between suppliers, DNOs and other parties. Evidence of this happening should be revisited as smart meter penetration increases and any barriers and enablers assessed at this point.	SGF	Q4 2016	4.36-4.37
B	**Use of smart meter auxiliary load control switch to mitigate the need for disconnection under ESEC and potentially Grid Code OC6:** The need for, frequency, and level of demand disconnection could be reduced in an emergency period using smart meter functionality.	(i) SGF to monitor progress of this work. (ii) An initial technical evaluation by the ENA SMG and National Grid has concluded that this potential benefit is technically feasible and of merit to explore further. DNOs are considering a NIC submission for a trial in 2017.	(i) SGF (ii) ENA SMG & ESEC	(i) Q3 2016 (ii) Q4 2017	4.12-4.14
C	**Smart meters' load limiting functionality used as a form of DSR**: suppliers committed in 2011 to consult with Ofgem and Citizens Advice before introducing any load limiting tariff (which may include remote disconnection).[20]	Consider how to ensure suppliers are aware of this commitment, and that any other parties in the future gaining access to smart meter load control make the same commitment.	Ofgem	2016	2.30-2.38
D	**The amount of load under control via the smart meter ALCS may not be visible to DNOs (or other parties) wishing to make use of it**	(i) DNOs have requested access (via a DCC service request) to the descriptions of the load under control by ALCS which would aid estimation of available load to control. If the DCC service request is approved then industry guidance for load estimation in this area would be useful. In addition, work to develop industry guidance on how to consistently register a description of the load connected to ALCS would be beneficial. (ii) Where there is more than one device using an ALCS that is connected to the same smart meter register, a future option might be to enable individual metering of each device using an ALCS into the SMETS standard if justified by the benefits.	(i) ENA SMG (ii) industry (through SEC)/DECC	(i) Q3 2016 (ii) 2019	4.33-4.35
E	**An enabler for DNOs to make proactive use of ALCS for LV constraint management is their ability to analyse smart meter data to predict**	Proactive DNO LV analysis for network constraint identification is not common practice, but is being developed. No substantive barriers have been identified in	DNOs / SGF	Q4 2016	4.38-4.42

[19] For clarity, all SMs contain a load switch (controlling supply to the home). An Auxiliary Load Control Switch (controlling supply to a specified load) is optional. This recommendation considers the use of both types of switch.

[20] https://www.ofgem.gov.uk/ofgem-publications/57325/ofgem-statement-17122012.pdf

#	Issue (barrier or enabler)	Action	Proposed party responsible for next steps	Timescale (initial response)	Cross-ref
	network constraints.	this area other than smart meter data aggregation issues (see action 9A). SGF should revisit this issue to understand what progress is being made.			
F	**Direct access to smart meter critical commands is limited to suppliers**: This means third parties wishing to make use of this smart meter functionality must do so through suppliers, potentially limiting some DSR value.	Keep arrangements under review as smart meters are rolled out and new working and commercial arrangements develop. Implement action 8A. If barriers to realising DSR value persist, a business case could be developed to demonstrate that additional benefits can be realised if multiple parties can directly access load control or load limiting functionality through smart meters. Changes to the current arrangements could then be considered.	DNOs would approach the SEC to change the smart meter access rules and evaluate the impacts	2017-2023	3.5
9	**Network company enablers to realising smart meter benefit in the interests of consumers**				
A	**DNO access to granular smart meter data may be important to maximise smart meter benefits for consumers:** New analysis commissioned by ENA on behalf of the DNOs suggests that DNO access to households' smart meter half hourly consumption data may be important. To access this data DNOs need to produce a data privacy plan that complies with their licence and is approved by Ofgem.	The ENA SMG is developing and will consult on an industry wide standard (including for gas distribution) for smart meter data privacy.	ENA SMG & Ofgem	Q4 2015	4.2-4.8
B	**SMETS1 and Advanced meters have some different functionality to SMETS2 meters:** If large numbers of SMETS1 meters are fitted, certain smart meter benefits may be reduced. For example, SMETS1 meters do not have outage detection used by DNOs.	As part of the existing smart meter programme measures, DECC has consulted on setting an end date for installation of SMETS1 meters and a decision was published in July 2015.[21] It is recommended that the SGF consider the outcomes of this decision and whether any further analysis is required.	DECC / SGF	Q1 2016	4.15-4.17
C	**National Grid access to smart metering data for visibility and forecasting:** As embedded generation continues to increase and demand is flexed in response to new signals such as ToU tariffs, the ability to accurately estimate Transmission demand becomes increasingly difficult and is likely to result in increasing system	Approach DCC/DECC for access to aggregated Smart Metering data to enable it to calculate embedded generation (by subtracting smart meter data from Transmission demand) which would improve forecasting accuracy of both real demand and embedded generation.	National Grid	Q3 2016	4.25

[21] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/450167/Smart_Meters_Rollout_Strategy_Government_response_FINAL.pdf

#	Issue (barrier or enabler)	Action	Proposed party responsible for next steps	Timescale (initial response)	Cross-ref
	balancing costs on consumers.				
D	**SMETS 1 meters not enrolled with the DCC cannot be configured remotely by DNOs via the DCC**: Once a universal standard on the initial configuration of voltage alarm is agreed, suppliers can address this as part of the rollout.	ENA SMG to define standard settings and determine how these will be communicated to installers.	ENA SMG	Q2 2016	4.9-4.11
E	**The final DCC User Interface Specification, its development and roll out may not enable the full realisation of smart meter benefits.**	ENA SMG and DCC governance structures are in place to ensure delivery of the contracted services.	ENA SMG/DCC	Q2 2016	4.43
F	**Current governance arrangements may limit DNOs' access to smart meter data of other parties, and therefore their ability to incorporate it into their decision making.** For example, DNOs' access to: (i) smart meter data for customers fed from their networks (eg those connected to IDNOs); and (ii) some larger customers' consumption data.	Explore options to facilitate sharing/obtaining information.	DNOs (via DCUSA sub-group)	Q4 2017	4.23-4.24
G	**Smart meter data is expected to help enable the delivery of consumer benefits, through more efficient access to the network:** DNOs use diversity assessments as part of the process for assessing new connections. Smart meter data is expected to enhance the datasets used for this analysis.	At present, there are no substantive barriers/enablers to improving and applying diversity assessments following the national rollout of smart meters. SGF should revisit this issue to understand what progress is being made.	DNOs / SGF	Q4 2017	4.44-4.45
H	**Devices connected to smart meters, at present, are not fully integrated into the energy system potentially causing value to be lost:** devices such as Electric vehicles (EVs) and heat pumps are not Trusted Devices, so only one-way communications is possible with smart metering (from the meter to the device). Heat pumps and EVs are key drivers of the need for the smart grid and are potentially flexible (Heat Pumps more so with storage attached). It therefore seems natural they become a core part of the GB energy infrastructure and not remote from it.	Once heat pumps and EV sales proliferate, a review should take place to see if, and when, they become trusted devices and can play a more integrated role in lowering the cost of energy to all customers. Other devices such as storage and DG could also be reviewed.	DECC / EUK / ENA members / BEAMA	2018	3.4
10	**Industry and consumer arrangements to help enable effective ToU price signals**				

#	Issue (barrier or enabler)	Action	Proposed party responsible for next steps	Timescale (initial response)	Cross-ref
A	**Half-Hourly (HH) settlements needed to create DSR value:** seen as the primary item needed to create a value incentive for a mass market DSR proposition for domestic and SME customers.	HH settlements for all Profile Class (PC) 1-4 customers. Value will be created as the use of electricity by a customer will be settled at a more reflective value of the industry cost. This means changes in demand for c30m customers can be attributed to the customers making the change and value can be tracked, unlike the smeared profiles of today.	Ofgem and the industry	2020 – 2030	3.2-3.4
B	**DNOs' benefits from DUoS TOU charging may be limited** in cases where the DNO price signal is: (i) not visible to customers (ii) superseded by other industry price signals.	(i) HH settlement, or similar, functionality is required for the success of DUoS TOU programmes. (ii) Issue is dependent on a number of market factors which should be considered by industry in the appropriate forums as the roll out of smart meters progresses.	Ofgem and the industry	2020–2030	4.18-4.22
11	**Enabling environmental benefits from Smart Grids and DSR services**				
A	**Enabling understanding and use of energy efficiency measures:** (i) More understanding of opportunities and challenges of reducing peak load as an alternative to network reinforcement.	(i) Work with relevant stakeholders to produce detailed guidance on how DNOs could make best use of the learnings from LCNF and other projects.	(i) Ofgem	(i) 2016	1.51-1.64
	(iii) Greater understanding required of how network companies are currently delivering demand reduction measures to consumers.	(iii) Consider further annual reporting on what DNOs and GDNs are doing to stimulate alternatives to reinforcement including adoption of LCNF insights in this area.	(iii) Ofgem	(iii) Q1 2016 for reporting 16/17	
	(iv) Appropriate alternatives to reinforcing the network should include energy efficiency measures. Need for increased engagement across network companies (including GDNs), local authorities, housing associations and suppliers.	(iv) DNOs should be able to pay the cost of in-house measures to offset or defer network reinforcement and count on the willingness of third parties to engage on this agenda. DECC should continue work with Ofgem to create a more deliberate policy framework for DNOs to engage on opportunities for energy efficiency to offset the need for wider network reinforcement.	(iv) DECC/Ofgem	(iv) Q1 2017	
	(v) Ensure connections under the gas fuel poor extension scheme are accompanied by appropriate levels of 'in-house' energy efficiency works.	(v) Whilst GDNs can try and leverage ECO and other national schemes to deliver this outcome, DECC should address the insufficient funding available for low income householders 'in-house' energy efficiency works.	(v) DECC	(v) Q1 2016	
	(vi) Access to ECO can be challenging for consumers to access, in particular low income households and community energy groups.	(vi) Review ECO to see how it could be designed with consumer access, in particular, access for community energy groups and the extent to which low income	(vi) DECC/ Ofgem	(vi) 2017	

#	Issue (barrier or enabler)	Action	Proposed party responsible for next steps	Timescale (initial response)	Cross-ref
		households are only able to access ECO by making capital contributions towards the cost of energy saving measures.			
	(vii) Ambiguity at a European level over the role of DSO participating in energy efficiency works.	(vii) Continue to work with CEER to help it highlight the positive economic, environmental and social outcomes of this model.	(vii) Ofgem	(vii) Ongoing	
	(viii) There is a lack of clarity as to what energy efficiency services are currently available for households at a local and national level. This lack of clarity runs the risk of duplication of services across a national and local level. There is also a risk that households will be unsure of which service provider to access.	(viii) Reconcile national support schemes with assistance that can be provided locally.	(viii) DECC	(viii) Q1 2016 onwards	
B	**Storage and support schemes:** incentives that low carbon generation may receive when partnering with storage to manage their connection may be adversely affected by adding storage to the site. These issues may act as a disincentive for renewable generators to partner with storage, even if doing so results in a more stable system or is a cost-effective approach to managing constraints.	Produce guidance on the applicability of support schemes for renewables with storage.	DECC/Ofgem	2016	5.29-5.30
C	**SM data enabling DNOs' modelling and measuring of electricity distribution losses**	(i) Explore the modelling of losses with smart meter data and consider the merits of a consistent approach for doing this. (ii) Explore options for a future losses incentive design using the smart metering subgroups' 'losses note' as a guide.[22] SGF should revisit this issue to understand what is progress is being made.	(i) DNOs (ii) ENA Regulatory Managers Group / SGF	Q3 2016	4.27-4.30
D	**Smart meter data could enable suppliers to base FIT export payments on actual exported volumes providing a more accurate data set for DNOs to determine losses.** For example,	Consider options once the roll out of smart meters has progressed and the volume of associated data has increased.	Suppliers/DECC	Q4 2017	4.31-4.32

[22] The 'losses note' can be found in Annex 2, section 5, TOR (iv).

#	Issue (barrier or enabler)	Action	Proposed party responsible for next steps	Timescale (initial response)	Cross-ref
	smart meter export registers will allow line loss factors to be calculated for DG.				
12	**Regulatory and commercial enablers to help facilitate an active role for storage and DG**				
A	**Reactive services from distribution connectees to TSO:** There is currently no provision in the charging methodology or a mechanism for appropriate reward to DG for this service.	(i) Further update need for reactive power in SOF. (ii) Continue discussions with industry and other stakeholders via the ENA ENFG workstream.	NGET	Ongoing	5.2-5.4
B	**Transmission constraints management:** There is currently not an appropriate constraint management arrangement between the TSO, DNO and generator to enable planned transmission outages to be taken without the DG unduly losing revenue.	Continue process of constraints management using distribution connectees and increase the number of DG providers.	NGET	Ongoing	5.7-5.9
C	**TSO balancing services:** Most DG is not required to sign-up to the Balancing Mechanism. Hurdles to participation include a requirement for two-way communication and a 24/7 control point.	(i) Review scope for smaller players and aggregation in balancing services provision. (iii) Consider commercial solutions.	(i) NGET (ii) Aggregators and other service providers	Q4 2015 (less urgent for System Operability)	5.10
D	**Energy shift:** One approach to providing flexibility on a constrained network is to use "excess" electricity to create another commodity, such as heat, hydrogen or ammonia. One barrier to a third party operating such a process is where gas quality regulations may block hydrogen injection into the gas network. It is not clear whether a DNO could trade heat, hydrogen, ammonia or other vector under current licence conditions	(i) Confirm that GS(M)R 1996 Gas Safety (Management) regulations are being assessed. (ii) Assess licence implications of trading commodities such as heat, hydrogen and ammonia. Undertake after SNS report.	(i) Ofgem/DECC/ HSE/industry (ii) DNOs	(i) 2016 (ii) Q1 2016	5.39-5.42
E	**Regulatory treatment of storage:**. Storage may be double-charged for both import and export in terms of levies related to sustainability.	(i) Review options for defining storage, including considering a separate regulatory classification. Undertake after SNS report. (ii) Issue guidance on how levies should apply in relation to storage.	(i) DECC (ii) HMRC	(i) Q1 2016 (ii) Q1 2016	5.15-5.16, 5.20-5.25, 5.31-5.32
F	**Transform model should be updated to ensure storage costs are appropriately reflected:** Storage costs are rapidly falling so this	Request EA Technology to update Transform model and allow review of these.	DNOs	Q1 2016	5.37-5.38

#	Issue (barrier or enabler)	Action	Proposed party responsible for next steps	Timescale (initial response)	Cross-ref
	will enable DNOs to consider storage in their network investment planning.				
G	**Unclear how storage should be accounted for in UoS charges:** UoS charges may be applied when storage charges AND discharges (it is not "demand" or "generation").	Take options to DCMF after the publication of the SNS report.	DNOs	Q2 2016	5.33-5.35
H	**Role of storage on the network:** The connection of storage to a constrained network may trigger reinforcement, even though storage may resolve or may be being used to resolve the constraint. There is a need to distinguish between storage that is contracting to offer a service to avoid reinforcement, and storage that is being used for other purposes (eg smoothing generator output).	Expand flexible connection terms to address storage connections.	DNOs	Q2 2016	5.36
I	**Ancillary services policy framework:** If the TSO and DNOs want access to new services from new providers and new technologies, including low-carbon solutions and electricity storage, then longer term contracts will be necessary to create a "level playing field" for new technologies or incentivise investment.	(ii) Consult on SO Incentive facilitation of investment in new ancillary services technologies. (ii) As part of planned reviews of the Capacity Market (every five years) consider the policy's interaction with other tools in the market such as balancing services, to understand how they are affecting flexibility, and the pipeline of new/less mature technologies such as storage.	(i) Ofgem (ii) DECC	(i) 2017 (ii) 2019	5.17-5.19
13	**Assessment of community energy connections that may enable quicker and more efficient connections**				
A	**Community Energy Connections:** (i) Community generation is at a disadvantage to commercial generation as it takes projects longer to develop, and they are geographically fixed. (ii) If a community energy project cannot export at full capacity, it can be prevented from securing feed-in tariff (FIT) accreditation. (iii) The Community Energy Grid Connections Working Group identified grid connection barriers which are unique to community projects	(i) Assess whether community energy applications for non-firm connections should be subject to different connection charges from commercial developers and/or different curtailment rules. (ii) Through 2015 FIT review, consider accreditation legislation in relation to non-firm connections. (iii) Models examined in Ofgem's current project on "Quicker and More Efficient Distribution Connections" may be applicable to community energy schemes.	(i) Ofgem (ii) DECC (iii) Ofgem	(i) 2016 (ii) Q4 2015 (iii) Q4 2015	1.23-1.33
14	**Consider how reinforcement costs associated with DG and storage connections can be modelling to improve the connections process**				
A	**Reinforcement Cost Recovery:** Currently there is no operational cost signal to inform DNOs where	(i) Explore issues around how specific reinforcement work is identified.	(i)-(ii) DG Forum	(i)-(ii) Q2 2016	5.80-5.88

#	Issue (barrier or enabler)	Action	Proposed party responsible for next steps	Timescale (initial response)	Cross-ref
	best to invest for facilitating DG connections, whereas the constraint applied to flexible connections could potentially become a proxy for such a signal. The present charging framework typically anticipates a single pre-connection user as the trigger for reinforcement, requiring up-front capital contributions which can represent a very high proportion of the total connection cost.	(ii) Identify appropriate measure(s) to define an investment signal, reflecting benefits of reinforcement to generators and DUoS customers (iii) Develop a clear and transparent methodology for constraint modelling used to trigger reinforcement. (iv) Ensure that MWh constrained is being recorded.	(iii)-(iv) DNO Connections Teams	(iii)-(iv) Q2 2016	
15	**Cost reflectivity in flexible connections**				
A	**Validation of flexible connections options:** Mitigation measures 1 and 2 (below) may help manage the risks to generators of curtailment with flexible connections. Further work needs to be undertaken before any or either of the mitigation measures below could be recommended	(i) Ensure that any proposed flexible connections approach represents value for money to DUoS customers, including determining an appropriate counterfactual. (ii) Examine the interaction between flexible connections and existing connections.	DG Forum	Q4 2015	5.43-5.48
B	**Mitigation 1: Cap and compensation:** One option for mitigating the risks to generators of a flexible connection, capping the level of curtailment, above which financial compensation would be received.	(i) Take mitigation measure 1 concept to Code Panels and DG/DNO Steering Group. (ii) Develop contractual arrangements, once concept has been validated.	(i) DG Forum (ii) DNO Connections Teams	Q2 2016 (depending on outcome of 15A)	5.49-5.71
C	**Mitigation 2: Market Based Mechanisms:** An alternative mitigation option with flexible connections, where a balancing mechanism operates at the distribution-level.	(i) Develop consistent approach across DNOs and consider role of flexibility in supporting flexible connections. (ii) Review of regulatory changes required to enable/incentivise DNOs to operate market based mechanisms.	ENA DNO/DG steering group; Ofgem; DECC; other Flexibility Projects	Q2 2016 (depending on outcome of 15A)	5.72-5.79
16	**Options to remove barriers to community groups' participation and engagement**				
A	**Barriers to community groups' participation and engagement:** (i) Limited ability for community energy projects to innovate. (ii) Skills and knowledge are not evenly distributed between communities, which could limit the potential of community energy. (iii) Community groups are well placed to assist with smart meter roll out, including educating consumers on the pros and cons of sharing their data.	(i) Establish a pilot 'Smart Community' fund to allow local supply actors to experiment, innovate and learn from each other. (ii) Ensure DECC's Community Energy Hub is 'fit for purpose' by feeding back to DECC's Community Energy Unit. (iii) Explore the potential role of community groups in the smart meter roll-out and education on sharing data.	(i) DECC (ii) Community Energy (iii) Smart Energy GB	(i) Q1 2016 (ii) Ongoing (iii) Q1 2016	1.34-1.41

#	Issue (barrier or enabler)	Action	Proposed party responsible for next steps	Timescale (initial response)	Cross-ref
17	**Enabling of community heat projects**				
A	**Enabling of community heat projects:** (i) Lack of awareness among communities of heat projects compared to renewable generation projects. (ii) Heat generation, distribution and supply is unregulated (there is an industry-led customer protection scheme)	(i) Community Energy groups in localities where the electricity distribution network is constrained for distributed energy connections should be encouraged to consider heat projects. (ii) Investigate the need for regulation of heat, in particular, the price of supplying heat to consumers.	(i) DECC/CEE through the Community energy hub (ii) DECC	(i) Q1 2016 (ii) Q1 2016	1.42-1.49

5. Implementation Framework and Next steps

Workstream 6 Implementation Framework

[This is the version of the report that was submitted to the October 2015 SGF.]

5.1. In finalising the actions, including proposing responsible parties and timescales, we have, where possible, contacted the relevant parties in an attempt to align with existing work programmes. We have incorporated their feedback to help ensure that the final actions are realistic and have a better chance of being implemented. However, we cannot compel anyone to undertake the actions; they remain recommendations for action.

5.2. We also propose that a body is responsible for monitoring progress against these actions. This may become the responsibility of the SGF or one of its workstreams. We propose that the monitoring is fluid such that the precise actions, responsible parties and timelines may be adapted according to changing circumstances.

5.3. The role of Workstream 8, which developed the Smart Grid Vision and Routemap, may be complementary to the more detailed monitoring of the actions. WS8 is developing a set of indicators to help understand what smart grid deployment has taken place. These indicators will be high level and measurable. The progress of these will be reported back to the Smart Grid Forum. Many of these indicators will help track the progress of the recommendations such as:

- Number of customers on ToU tariffs settled half-hourly.
- System Load Factor (load shape).
- Network capacity released through smart solutions to avoid network reinforcement broken down by smart solution.
- Avoided investment in distribution networks and transmission networks through smart grids.
- Number of contracts and capacity contracted DNOs have with aggregators and other parties to provide network support services to DNOs.
- Contribution made by Smart meters to reductions in Customer minutes lost (CML).
- Number of smart grid interventions for Security & Quality of Supply.
- Connection costs saved by smarter low carbon DG connections.

Actions by 'proposed party responsible for next steps'

5.4. We have presented the actions as a series of diagrams grouped by responsible party. These should provide a helpful reference to each body to identify all of the actions that relate to that organisation.

5.5. The actions in the flow charts are colour-coded according to the sub group that devised the action using the following key in Table 4, below. The diagrams can be found at Appendix A.

Table 4: Key for WS6 sub-group actions

WS6 sub-groups	Flow chart action colour
Community Energy and Energy Efficiency	
Consumer Protection	
Distribution of value	
Smart Metering	
Storage & DG	
Visibility	

Next steps

5.6. While we have achieved a great deal, one issue that we have not been able to address is the prioritisation (rather than simply timescales) of the identified actions. We consider this is necessary to help identify the key drivers for implementation of the recommendations. This exercise should also identify any gaps in responsible bodies, potentially prompting the creation of a new cross-industry body (possibly under the auspices of the SGF) to address those actions. There are also a number of actions allocated to industry more generally, that may benefit from having a cross-industry forum for discussion.

5.7. We have identified some key areas for development that may merit a separate Workstream:

- A strategic approach to achieving value in a fragmented chain (we have identified individual actions related to this point, but a body with oversight may be beneficial).

- Further developing commercial arrangements between parties to complement the development of the smart grid (in prioritising the identification of barriers and enablers to the development of a smart grid in GB, we elected not to address this original term of reference).

- In this report we have highlighted some other developments that may benefit from a cross-industry forum, not least discussions around a potential transition from a DNO to a DSO role.

5.8. Given the amount of work undertaken and learning gained through involvement in the delivery this work programme, WS6 members would appear to be well-placed to continue to contribute to these areas.

Appendix A: Diagrams of actions by proposed party responsible for next steps

Diagram A.1: Actions where Ofgem is proposed party responsible for next steps

Q4 2015 to 2016

Possible conflicting domestic DSR signals (1A)
Work with Smart Energy Code Parties to consider a second-comer rule for parties contracting for domestic DSR.

Designing a quick and simple method for notifying relevant actors when there is a DSR action, both before and post-event (2A)
Explore in detail options to design and implement a cost-effective solution for notification of DSR actions.

Potential constraints for local generation flexibility Services (3C (i))
As part of its Flexibility programme, consider the transition from a DNO to DSO model. This would help to facilitate the procurement of flexibility services at a local level, including use of bi-lateral contracts between DNOs and service providers. Review community energy access to market and address any barriers.

Potential constraints for local generation flexibility Services (3C (ii))
Explore the trialling of alternative DUoS charging methodologies for networks where there is a high percentage of local generation and local use.

Introducing a way for relevant installation and their capacities to be notified to DNOs (4A)
Consider more robust requirements upon installers of equipment, building on existing requirements for installers to notify Ofgem and DNOs.

Challenges for community energy to be locally supplied (5A (i))
Review regulatory issues for local suppliers, including community groups, supplying locally. Clarify the exemptions relating to licence exempt supply and distribution of electricity.

Challenges for community energy to be locally supplied (5A (ii))
Work with Elexon to explore the viability of different balancing approaches and how they could contribute to an efficient system. This should include consideration of local balancing of generation and demand for instance through the creation of a Local Balancing Unit.

Challenges for community energy to be locally supplied (5A (iii))
Review the treatment of demand-reduction centred business models in regulation and policy.

Smart meters' load limiting functionality used as a form of DSR (8C)
Consider how to ensure suppliers are aware of this commitment to consult with Ofgem and Citizens Advice, and that any other parties in the future gaining access to smart meter load control make the same commitment.

DNO access to granular SM data may be important to maximise SM benefits for consumers (9A)
The ENA SMG is developing and will consult on an industry wide standard (including for gas distribution) for SM data privacy.

Storage and support schemes (11B)
Work with industry to produce guidance on the applicability of support schemes for renewables with storage.

Reinforcement Cost Recovery (12A)
Work with WS6 successor and DNO connection teams to consider how reinforcement costs associated with DG and storage connections can be modelled to improve the connections process.

Energy shifts (12D (i))
Confirm that GS(M)R 1996 Gas Safety (Management) regulations are being assessed.

Community Energy Connections (13A)
Work with DECC on assessment of community energy connections that may enable quicker and more efficient connections.

Mitigation 2: Market Based Mechanisms (15C)
Develop consistent approach across DNOs and consider role of flexibility in supporting flexible connections. Review of regulatory changes required to enable/incentivise DNOs to operate market based mechanisms.

2017 to 2020

Facilitating commercial agreements where more than one party shares access to a customer's DSR (1C (ii))
If this cannot be resolved commercially, then regulatory intervention may be require.

Ensure that any DNO information asymmetry does not adversely impact domestic customers (4B)
All DNOs could agree to notify and seek approval from Ofgem and Citizens Advice before they contract directly with domestic and microbusiness customers.

High Implementation costs of domestic DSR (1D)
The role of aggregators is to manage multiple customer contracts and form a single DSR product. It is possible that until all the easiest I&C flexible demand is used DSR products for smaller customers will be limited. No barriers have been identified at present, but this should be reviewed in the future.

A method is needed to identify customers in load managed areas (2B)
Investigate whether the central registration service could have new 'flags' added to highlight the relevant meter points within load managed areas. A simpler online solution may be required for aggregators.

Difficulties understanding different DSR offers (6A (ii))
Consider how to expand to other market actors at an appropriate time in future.

Managing DSR in load managed areas for both aggregators and suppliers. (5B)
Investigate the risk of aggregators shifting load in load managed areas.

Need for consumer protection frameworks for new smart appliances (7A)
Work with DECC and BEAMA to develop a consumer protection frameworks for different appliance types. It should align with information EU Energy Labels, European standards and labelling work led by the EC.

Potential barriers to innovation in domestic DSR (7C)
Review whether regulatory provisions are 'DSR ready'. The Consumer Protections toolkit should be used as a resource through this process (see Annex 2).

Enabling understanding and use of energy efficiency measures (11A)
Work with DECC on enabling energy efficiency measures.

Impact of DSR on vulnerable consumers (7B)
Future policy on DSR tariffs and offers, should consider consumers in vulnerable situations, using a definition to be agreed, as a special group needing special protections.

Ancillary services policy framework (12I (i))
Consult on SO Incentive facilitation of investment in new ancillary services technologies.

Activities to enable HH settlement for PC1-4 customers are being driven by existing work programmes.

2020 and beyond

The potential impact if the level of DSR were not delivered at a critical time could exceed the benefit of success (1E (ii))
Review whether this inefficiently disincentivises contracting for DSR, and whether incentives and penalties should be re-designed.

The full value of the DSR is not visible or available to the customer or industry (1F (ii))
If this becomes a blocker to value, review how costs are allocated (should they be spread or become more price reflective?).

Distribution of DSR value: (1G)
Monitor the development of products and uptake of DSR, to identify whether this risk materialises. Where necessary, develop regulation and/or the market model to address issues which may impede DSR value reducing the average customer bill.

Designing a wider industry mechanism for when DSR becomes more common. (2D)
It is unknown whether, and when, it will be needed. It would be presumptuous to implement a solution but a specification could be designed in the interim

Visibility of potential flexible demand may vary across the energy industry. (4C)
Monitor DSR as it develops to determine if the market is flawed i.e. value not being captured by the party or parties who can provide the most back to the customer.

Half-Hourly (HH) settlements needed to create DSR value (10A)
HH settlements for all Profile Class (PC) 1-4 customers. Value will be created as the use of electricity by a customer will be settled at a more reflective value of the industry cost.

DNOs' benefits from DUoS ToU charging may be limited (10B)
HH settlement, or similar, functionality is required for the success of DUoS ToU programmes. Issue is dependent on a number of market factors which should be considered by industry in the appropriate forums as the roll out of smart meters progresses.

Diagram A.2: Actions where DECC is proposed party responsible for next steps

Q4 2015 to 2016

Introducing a way for relevant installation and their capacities to be notified to DNOs
Consider more robust requirements upon installers of equipment, building on existing requirements for installers to notify Ofgem and DNOs.
4A

Challenges for community energy to be locally supplied
Provide a link to the Ofgem support materials on the Community Energy Hub (a website DECC is creating to support community energy groups).
5A (i)

SMETS 1 and Advanced meters have some different functionality to SMETS2 meters
As part of the existing smart meter programme measures, DECC has consulted on setting an end date for installation of SMETS1 meters and a decision was published in July 2015.
9B

Storage and support schemes
Work with Ofgem to produce guidance on the applicability of support schemes for renewables with storage.
11B

Regulatory treatment of storage
Review options for defining storage, including considering a separate regulatory classification. Undertake after SNS report.
12E (i)

Energy shifts
Confirm that GS(M)R 1996 Gas Safety (Management) regulations are being assessed.
12D (i)

Community Energy Connections
Work with Ofgem assessment of community energy connections that may enable quicker and more efficient connections.
13A

Mitigation 2: Market Based Mechanisms
Develop consistent approach across DNOs and consider role of flexibility in supporting flexible connections. Review of regulatory changes required to enable/incentivise DNOs to operate market based mechanisms.
15C

Barriers to community groups' participation and engagement
Establish a pilot 'Smart Community' fund to allow local supply actors to experiment, innovate and learn from each other.
16A (i)

Enabling of community heat projects
Work with CEE through the Community Energy Hub to encourage heat projects in localities where the electricity distribution network is constrained. Investigate the need for regulation of heat, in particular, the price of supplying heat to consumers.
17A

2017 to 2020

Enabling understanding and use of energy efficiency measures
Work with Ofgem on enabling energy efficiency measures.
11A

Need for consumer protection frameworks for new smart appliances
Work with Ofgem and BEAMA to develop a consumer protection frameworks for different appliance types. It should align with information EU Energy Labels, European standards and labelling work led by the EC.
7A

Impact of DSR on vulnerable consumers
Future policy on DSR tariffs and offers, should consider consumers in vulnerable situations, using a definition to be agreed, as a special group needing special protections.
7B

The amount of load under control via the SM ALCS may not be visible to DNOs
Work with industry (through SEC) to consider where there is more than one device using an ALCS that is connected to the same SM register, a future option might be to enable individual metering of each device using an ALCS into the SMETS standard if justified by the benefits.
8D (ii)

Devices connected to smart meters, at present, are not fully integrated in to the energy system potentially causing value to be lost
Work with ENA, EUK and BEAMA once HP and EV sales proliferate to review if, and when they can become trusted devices and can play a more integrated role in lowering the cost of energy to all customers.
9H

SM data could enable suppliers to base FIT export payments on actual exported volumes providing a more accurate data set for DNOs to determine losses
Work with Suppliers to consider options once the roll out of SMs has progressed and the volume of associated data has increased.
11D

Ancillary services policy framework
As part of planned reviews of the Capacity Market (every five years) consider the policy's interaction with other tools in the market such as balancing services, to understand how they are affecting flexibility, and the pipeline of new/less mature technologies such as storage.
12I (ii)

2020 and beyond

The full value of the DSR is not visible or available to the customer or industry
If this becomes a blocker to value, review how costs are allocated (should they be spread or become more price reflective?).
1F (ii)

Diagram A.3: Actions where SGF is proposed party responsible for next steps

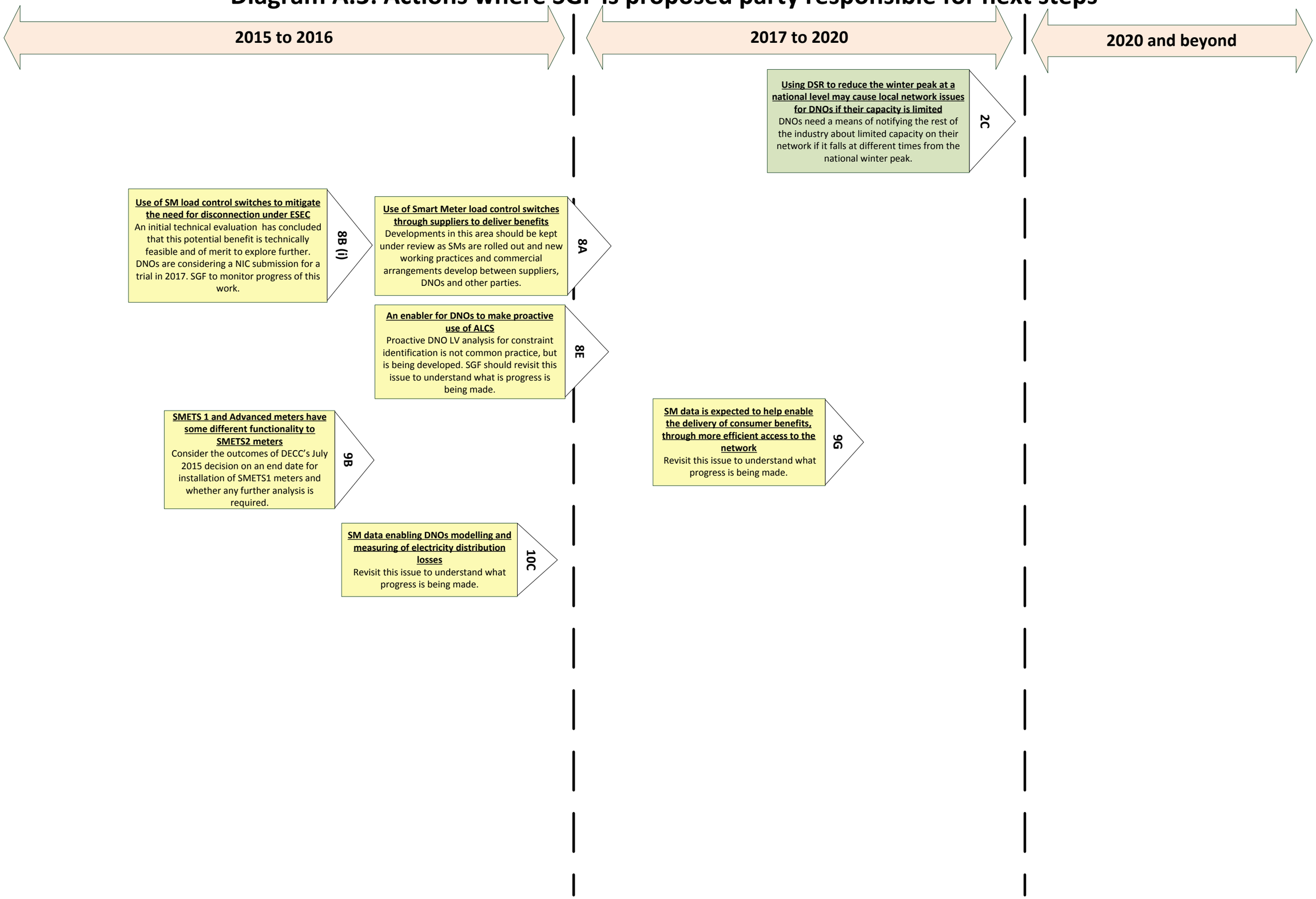


Diagram A.4: Actions where DNOs/ENA are proposed party responsible for next steps

Q4 2015 to 2016

Facilitating commercial agreements where more than one party shares access to a customer's DSR (1C (i))
Expand the ENA's shared services framework to include all relevant actors.

No barriers should be placed against actors offering DSR products working together to have joint contracts (1B)
All industry parties involved in code / licence modifications or all parties procuring flexibility services should take this risk in to account.

Service contractual arrangements (3A (i))
Continue exploration of users of flexibility services, including DG and storage providers.

Designing a quick and simple method for notifying relevant actors when there is a DSR action, both before and post-event (2A)
Explore in detail options to design and implement a cost-effective solution for notification of DSR actions.

Reactive services from distribution connectees to DNOs (3D (i))
Identify voltage "hotspots".

Information provision (3B)
DNOs to develop additional content that indicates location and services required. ENA to coordinate DNO heat maps into national picture identifying constraints and possible services.

Reactive services from distribution connectees to DNOs (3D (iii))
DCUSA parties to contribute to DCP 222 charging developments or wider changes under DCMF.

Configuring SMETS1 voltage monitoring and voltage anomaly alerts (9D)
ENA SMG to define standard settings and determine how these will be communicated to installers.

An enabler for DNOs to make proactive use of ALCS (8E)
Proactive DNO LV analysis for network constraint identification is not common practice, but is being developed. No substantive barriers have been identified in this area other than smart meter data aggregation issues (see action [9A]).

The final DCC User Interface Specification, its development and roll out may not enable the full realisation of SM benefits (9E)
ENA SMG and DCC governance structures are in place to ensure delivery of the contracted services.

DNO access to granular SM data may be important to maximise SM benefits for consumers (9A)
The ENA SMG is developing and will consult on an industry wide standard (including for gas distribution) for SM data privacy.

The amount of load under control via the SM ALCS may not be visible to DNOs (8D (i))
If the DNO's DCC service request is approved then industry guidance for load estimation in this area would be useful. In addition, work to develop industry guidance on how to consistently register a description of the load connected to ALCS would be beneficial.

Energy shifts (12D (ii))
Assess licence implications of trading commodities such as heat, hydrogen and ammonia.

SM data enabling DNOs modelling and measuring of electricity distribution losses (11C)
DNOs explore the modelling of losses with SM data and consider the merits of a consistent approach for doing this. The ENA regulatory managers group should explore options for a future losses incentive design using the Smart Metering Subgroups' 'losses option paper' (Annex 2) as a guide.

Transform model should be updated to ensure storage costs are appropriately reflected (12F)
Request EA Technology to update Transform model and allow review of these.

Unclear how storage should be accounted for in DUoS charges (12G)
Take options to DCMF after the publication of the SNS report.

Role of storage on the network (12H)
Expand flexible connection terms to address storage connections.

Reinforcement Cost Recovery (14A (iii)-(iv))
DNO connection teams to develop a clear and transparent methodology for constraint modelling used to trigger reinforcement. And, ensure that MWh constrained is being recorded.

Mitigation 1: Cap and compensation (15B (ii))
DNO connection teams to develop contractual arrangements, once concept has been validated.

Mitigation 2: Market Based Mechanisms (15C)
Develop consistent approach across DNOs and consider role of flexibility in supporting flexible connections. Review of regulatory changes required to enable/ incentivise DNOs to operate market based mechanisms.

2017 to 2020

The potential impact if the level of DSR were not delivered at a critical time could exceed the benefit of success (1E (i))
Identify how and in what circumstances the impact of DSR not being delivered at a critical time would far outweigh the expected benefits of successful DSR delivery.

Ensure that any DNO information asymmetry does not adversely impact domestic customers (4B)
All DNOs could agree to notify and seek approval from Ofgem and Citizens Advice before they contract directly with domestic and microbusiness customers.

Direct access to SM critical commands is limited to suppliers (8F)
Approach SEC if barriers to realising DSR value persist and a business case demonstrates that additional benefits can be realised from directly access to load control or load limiting functionality.

Use of SM load control switches to mitigate the need for disconnection under ESEC (8B (ii))
An initial technical evaluation has concluded that this potential benefit is technically feasible and of merit to explore further. DNOs are considering a NIC submission for a trial in 2017.

SM data is expected to help enable the delivery of consumer benefits, through more efficient access to the network (9G)
At present, there are no substantive barriers/enablers to improving and applying diversity assessments following the national rollout of smart meters.

Devices connected to smart meters, at present, are not fully integrated in to the energy system potentially causing value to be lost (9H)
Work with DECC, EUK and BEAMA once HP and EV sales proliferate to review if, and when they can become trusted devices and can play a more integrated role in lowering the cost of energy to all customers.

Current governance arrangements may limit DNOs' access to SM data of other parties, limiting their ability to incorporate into their decision making (9F)
It is recommended that a DCUSA sub-group be tasked with exploring options to facilitate sharing/obtaining information.

Activities to enable HH settlement for PC1-4 customers are being driven by existing work programmes.

2020 and beyond

The full value of the DSR is not visible or available to the customer or industry (1F (i))
Alert Ofgem and DECC if the issue continues post HH settlement implementation.

ToU tariff critical peak response may be limited (2E)
Industry including BEAMA to trial critical peak tariffs in properties with and without EV, heat pumps and storage. This trialling could be done by DNOs, aggregators or suppliers.

Half-Hourly (HH) settlements needed to create DSR value (10A)
HH settlements for all Profile Class (PC) 1-4 customers. Value will be created as the use of electricity by a customer will be settled at a more reflective value of the industry cost.

DNOs' benefits from DUoS ToU charging may be limited (10B)
HH settlement, or similar, functionality is required for the success of DUoS ToU programmes. Issue is dependent on a number of market factors which should be considered by industry in the appropriate forums as the roll out of smart meters progresses.

Diagram A.5: Actions where National Grid is proposed party responsible for next steps

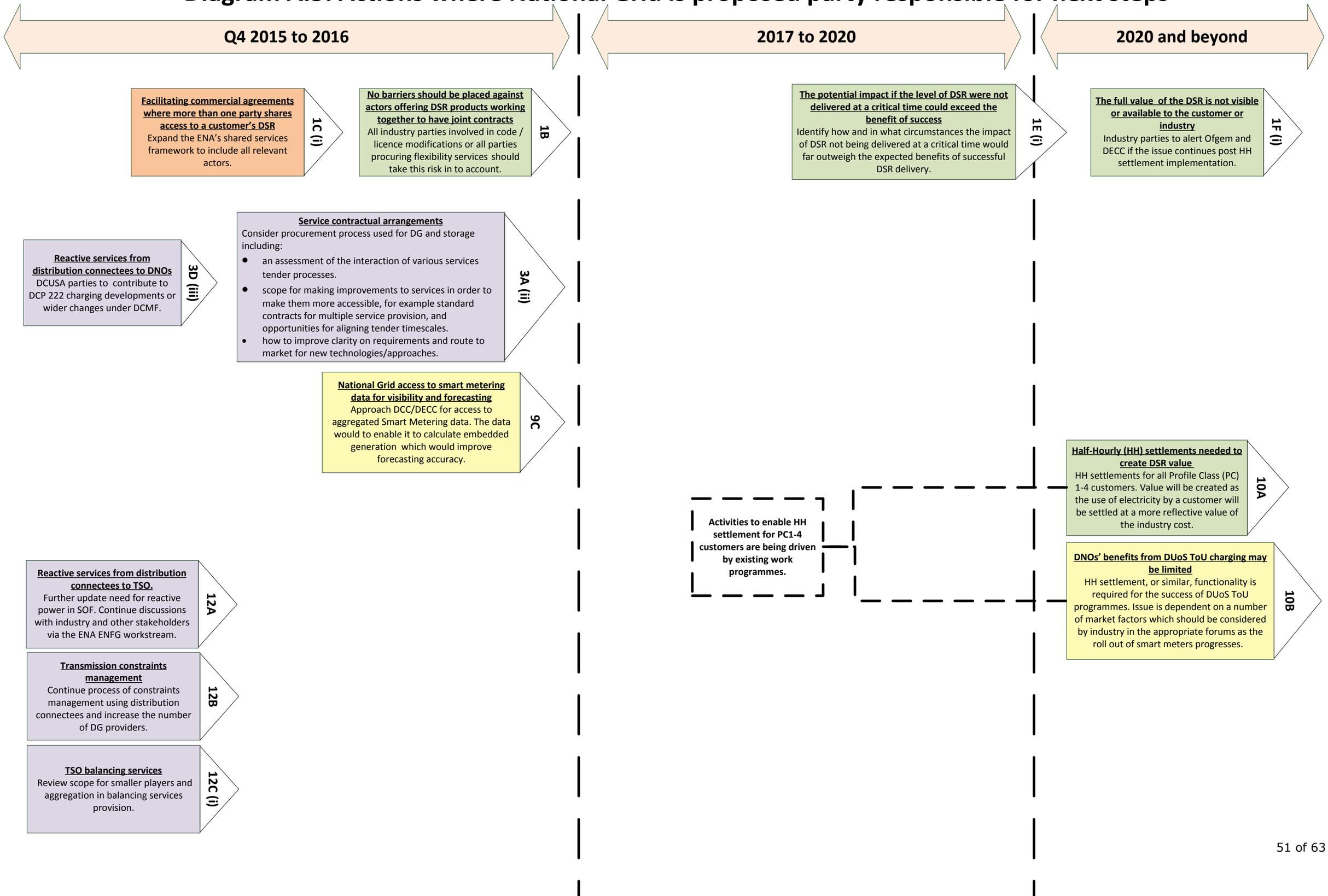


Diagram A.6: Actions where Suppliers/EUK are proposed party responsible for next steps

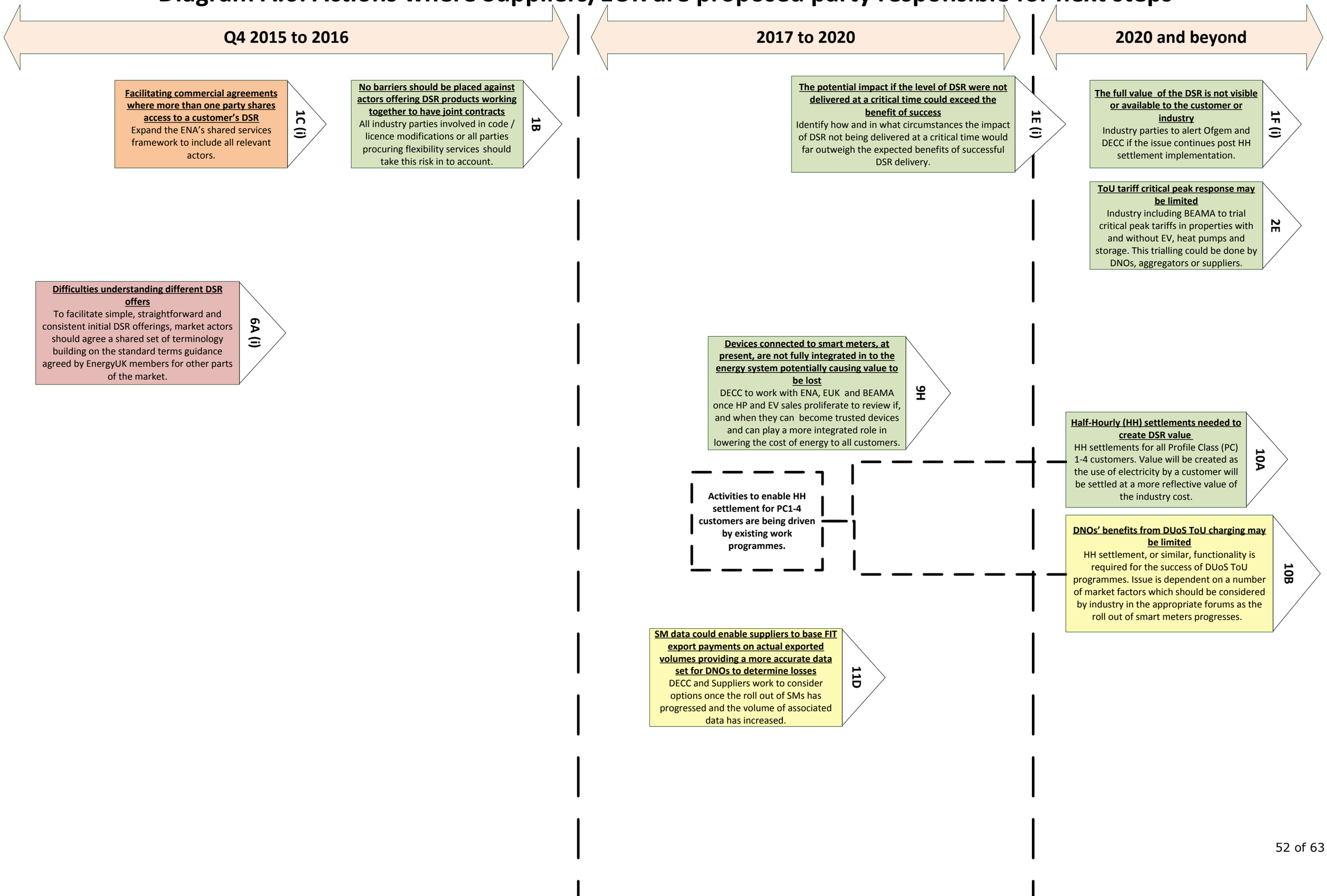
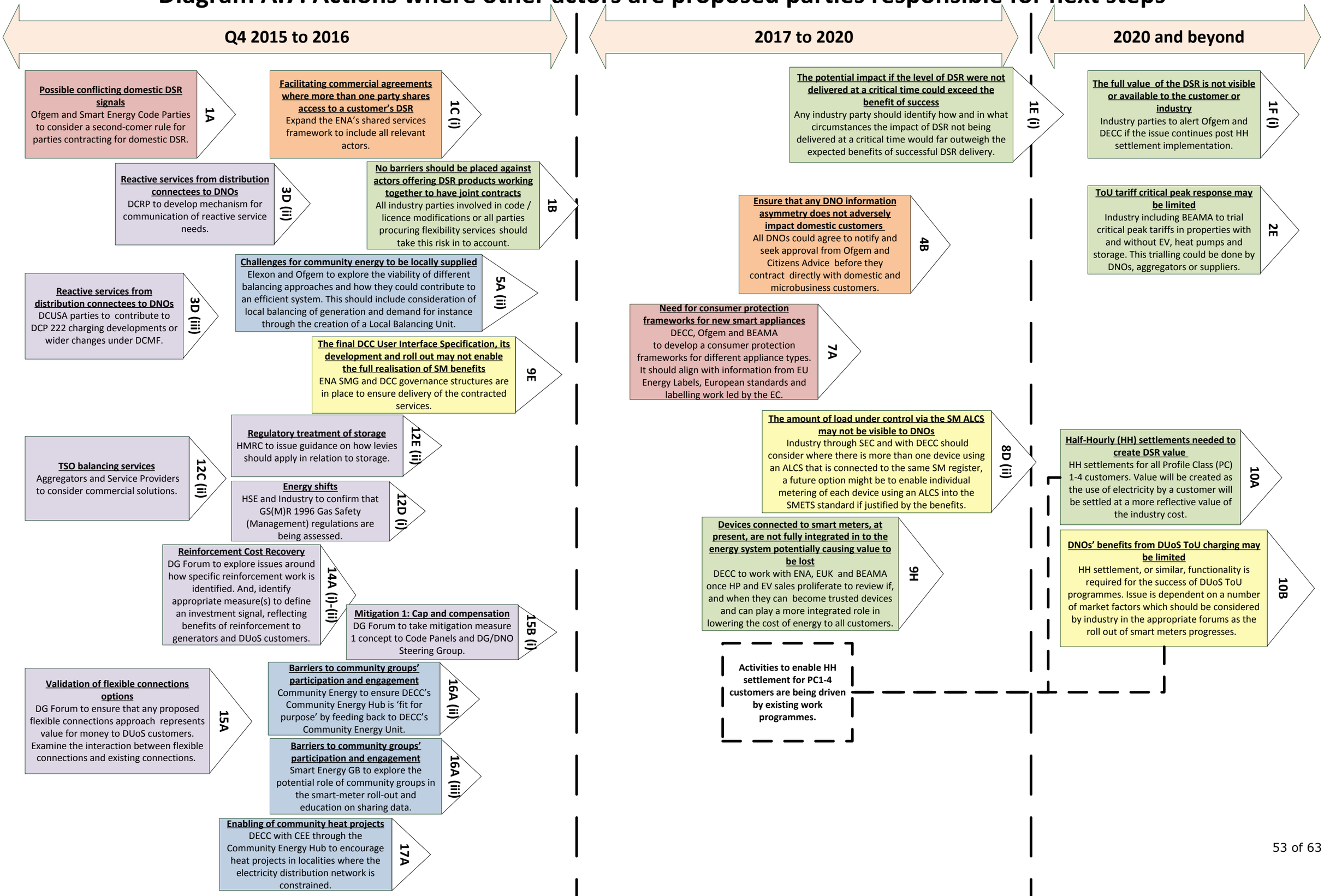


Diagram A.7: Actions where other actors are proposed parties responsible for next steps



Appendix B: Headings and high-level recommendations

For reference, we have included a list of the 17 high-level recommendations grouped under the ten headings.

Achieving value in a fragmented value chain – facilitating multiple or combined offers and managing conflicting requirements

1: Enabling value from DSR and facilitating commercial arrangements
2: Options to manage conflicting DSR requirements

Enabling visibility of service requirements and potential providers

3: Enable a market for services and visibility of requirement by location
4: Enhancing visibility of the potential flexible demand in order to improve DSR services
5: Changes to industry arrangements to enable third parties to take a more active role in flexibility markets

Consumer protections in a smart energy sector

6: Difficulties understanding different DSR offers
7: Ensuring appropriate consumer protections are in place for the transition to the 'smart' energy sector

Realising value through load control

8: Enabling consumer benefits through the use of smart meter load control switches

Enablers for realising smart meter benefits in the interests of consumers

9: Network company enablers for realising smart meter benefits in the interests of consumers

Enabling effective time of use price signals and cost-reflectivity

10: Industry and consumer arrangements to help enable effective time of use price signals

Realising network and system benefits of energy efficiency and losses reduction and wider environmental impact

11: Enabling environmental benefits from Smart Grids and DSR services.

Realising the potential value of distributed generation and storage service provision

12: Regulatory and commercial enablers to help facilitate an active role for storage and DG

Facilitating grid connections and managing curtailment risk

13: Assessment of community energy connections that may enable quicker and more efficient connections
14: Consider how reinforcement costs associated with DG and storage connections can be modelled to improve the connections process
15: Cost reflectivity in flexible connections

Enabling active community energy engagement in smart grids

16: Options to remove barriers to community groups' participation and engagement in flexibility services
17: Enabling community heat projects

Appendix C: Glossary

The terms described this glossary are provided to aid interpretation of the WS6 Report and are not intended to be used as wider definitions for the energy industry.

A

Active Network Management (ANM)
Control systems that actively manage generation output and/or actively manage network load for a specific purpose flows (including rerouting power flows) in order to achieve a network efficiency benefit (i.e. voltage control to relieve constraints, release capacity, maximise security of supply, minimise losses, etc.).

Advanced Meters
Provides half-hourly electricity or gas data that can be remotely accessed by a supplier.

Aggregator
An aggregator is a party that enters into contracts with a portfolio of consumers and/or distributed generators who are prepared to allow some control of their demand or output in exchange for availability and utilisation payments in order to provide services to other parties in the electricity supply chain. Typical of such services would be reserve services (such as STOR) to the GB System Operator, TRIAD management services, power purchase tolling agreements with Suppliers, and DSR services to DNOs.

Auxiliary load control Switch (ALCS)
See 'Load control switches'.

Availability payment
Payment made by National Grid to secure the availability of sources of additional power (in the form of either generation or energy storage) or demand reduction, to be able to deal with unforeseen demand increase and/or generation unavailability. Similarly, a payment made by a DNO (to a generator, consumer or Aggregator) to make available on demand additional power or demand reduction to deal with a network outage (as an alternative to investing in additional network capacity). See also 'Utilisation payment'.

The Authority/ Ofgem
Ofgem is the Office of the Gas and Electricity Markets, which supports the Gas and Electricity Markets Authority (GEMA), the body established by section 1 of the Utilities Act 2000 to regulate the gas and electricity markets in GB.

B

Balancing
Balancing supply and demand to ensure security of energy supplies.

Balancing Mechanism (BM)
The balancing mechanism is used by National Grid to balance supply and demand in each half hour trading period of every day.

Balancing services
Services procured by National Grid to balance demand and supply and to ensure the security and quality of electricity supply across the GB Transmission System.

Bilateral Embedded Generation Agreement (BEGA)
BEGA applies to non-transmission connected generators, and states how they will comply with the grid code, connection and use of system code and balancing and settlement code. The BEGA will also provide the customer with Transmission Entry Capacity (TEC) as the

customer will have the right to operate in the electricity balancing market and export onto the National Electricity Transmission System (NETS).

C

Combined heat and power (CHP)
The simultaneous generation of usable heat and power (usually electricity) in a single combined process, thereby leading to increased overall efficiency of energy production and reductions unless the amount of wasted heat. (A variation is CCHP – combined cooling and heating power whereby the heat produced from the electricity generator used in in conjunction with an absorption chiller to produce cooling instead of heating – ie in summertime).

Community Energy
Community projects or initiatives focused on reducing energy use, managing energy better, generating energy or purchasing energy at competitive rates. More advanced Community Energy Schemes include 'Licence Lite' arrangements whereby local generation is able to supply consumer within the community directly.

Connection boundaries: shallow, shallowish, deep
- Shallow– connecting customer charged for new sole use connection assets.
- Shallowish – connecting customer charged for new sole use connection assets and a proportion of the wider reinforcement costs (if any).
- Deep – connecting customer charged for new sole use connection assets and all reinforcement costs triggered by that connection.

Constrained connection
A network connection agreement which limits the amount of energy that can be imported or exported under certain conditions. This might be a simple seasonal constraint, or a real-time constraint arrangement whereby the energy imported or exported is actively curtailed as necessary to manage the network constraint (see Active Network Management above).

Council for European Energy Regulators (CEER)
A representative body for European gas and electricity network regulators.

Customers
A person or entity that purchases electricity

D

Daily peak
The period when electrical power is expected to be provided for a sustained period at a significantly higher than average supply level.

Data Communications Company (DCC)
Licenced body that manages the data and communications network to connect smart meters to the business systems of energy suppliers, network operators and other authorised service users of the network.

Data Transfer Service (DTS)
The DTS is the regulated service that allows electricity suppliers to exchange information about domestic customers for processes such as settlement, change of supplier and metering. This information interchange uses a common set of industry requirements, which are implemented through a centralised communications service: the DTS.

DCP 222

DCUSA Change Proposal 222 is on the 'Non billing of excess Reactive Power charges" for distributed generators who have been asked by the network operator to provide reactive power control.

Demand Diversity
The degree of non-coincidence of electricity consumption behaviour amongst different users connected to the electricity network. Not all customers connected to the network will use electricity at the same rate at the same time and because of this the peak network demand on the network assumed when planning and building infrastructure is smaller than the sum of the individual customers' loads. By how much the assumed peak network demand can be reduced from the sum of individual peak loads is the percentage diversity factor applied.

Demand Side Response (DSR)
When consumers adjust the amount of electricity they use at particular times in response to a signal (i.e. either a control signal or price signal) from a supplier, system operator or network operator provided either directly or via a third party such as a supplier or aggregator.

- DSR provider: the provider of a demand side response service (e.g. demand facility or aggregator).
- DSR taker: the procurer of a demand side response service (e.g. network operator, supplier)
- DSR product: the demand side response service that has been developed by the DSR provider to be procured by the DSR taker.
- Contracting for DSR: to create a DSR product the DSR provider is likely to need contracts in place with parties to ensure that some level of response can be delivered when called on (e.g. an aggregator may have contracts in place with several factories to ensure that the factories will decrease or increase their energy use when required).

Department of Energy and Climate Change (DECC)
Government department responsible for Energy Policy and also for meeting the climate change targets detailed in the Climate Change Act (2008).

Distributed generation (DG)
Distributed generation is also known as embedded or dispersed generation. It is an electricity generating plant connected to a distribution network rather than the transmission network.

Distribution Charging Methodology Forum (DCMF)
Where distribution network operators and other industry parties can discuss the further development of the Common Distribution Charging Methodology and the EHV Distribution Charging Methodology, which form part of the Distribution Connection and Use of System Agreement (DCUSA).

Distribution Connection and Use of System Agreement (DCUSA)
A multi-party contract between licensed electricity distributors, suppliers and generators in Great Britain concerned with the use of the electricity distribution system.

Distribution network operators (DNOs)
A DNO is a company which operates the electricity distribution network which includes all parts of the network from 132kV down to 230V in England and Wales. In Scotland 132kV is considered to be a part of transmission rather than distribution so their operation is not included in the DNOs' activities.

Distribution Price Control Review
The price control applied to the electricity distribution network operators. DPCR4 ran from 1 April 2005 until 31 March 2010. DPCR5 ran from 1 April 2010 until 31 March 2015.

Distribution system operator (DSO)
A DSO is a DNO that emulates some activities of the GB System Operator by actively (rather than passively) managing the distribution system. DSO activities typically include ANM (see above) in order to balance local generation and demand sufficiently to relieve network constraints, but may also include procuring services such as generation support and DSR (see below) from distribution connected generators and consumers. A DSO might also offer ancillary and/or reserve services to the GB System Operator as a by-product of applications such as energy storage and DSR deployed primarily to provide network support.

Distribution Use of System Charges (DUoS)
Charges that are levied by DNOs for the operation, maintenance and development of the electricity distribution networks.

Domestic and small commercial customers
Customers falling within profiles 1-2 of DCUSA (domestic) and profile class 3-4 (small commercial customers)

E

Electricity distribution (technical) losses
Energy dispersed from the electricity network (mainly in the form of heat) as a result of passing electricity through conductors which have the physical property of electrical resistance, or as a result of transformer action which results in eddy current and hysteresis losses (there are also other forms of technical losses including corona losses but these are much less significant).

Electricity Supply Emergency Code (ESEC)
Describes the steps which UK Government might take to deal with an electricity supply emergency. It also sets out the actions, which companies in the electricity industry should plan to take and which may be needed to deal with such an emergency.

Energy Company Obligation (ECO)
A government scheme to obligate larger suppliers to deliver energy efficiency measures to domestic premises in Britain.

Energy Efficiency
Reducing the amount of energy required to provide a product or service.

The Energy Networks Association (ENA)
A trade body that represents the gas and electricity transmission and distribution companies in the UK.

The Energy Networks Futures Group (ENFG)
The ENA established the Energy Networks Futures Group (ENFG) for the energy network companies collectively to take a leading role in the transition to smart grids.

Energy shift
Energy shift uses electricity to create another commodity, such as heat, hydrogen or ammonia, which is then used elsewhere (not in the electricity system).

Eurelectric
The association of the electricity industry in Europe, including producers, suppliers, traders and distributors from the EU and other European and Mediterranean countries.

F

Feed in tariffs (FITs)

The price per unit of electricity that a utility or supplier has to pays for renewable electricity produced from private eligible generators. These are used to encourage distributed renewable generation through private generators. (Note: additional payments are also made for electricity spilled onto the network – i.e. not consumed on the premises).

Firm Connection
A connection arrangement to an electricity system such that is able to continue to maintain supply in the event of a local outage (typically through a switched alternative supply).

Future Energy Scenarios (FES)
An annual report produced by National Grid which outlines their analysis of credible future energy scenarios.

G

Gas distribution networks (GDNs)
GDNs transport gas from the National Transmission System to final consumers and to connected system exit points. There are currently eight GDNs in Great Britain which comprise twelve local distribution zones, owned by four groups.

F

Firm connection
A connection that is unaffected by a single point of failure or outage (sometimes referred to as N-1), for example the connection is made using two circuits both of which are capable of supporting the connection if the other is unavailable.

Flexible connection
A connection where the agreed capacity provided can vary over time and may be conditional on other parameters. For example capacity may not be available during maintenance periods or may only be available when other connectees are not utilising all of their contracted capacity. Flexible connections are usually agreed as an alternative to the connectee facing a higher charge for connection which includes a contribution to the costs of upstream strengthening of the network or to facilitate a quicker connection to the network.

Flexible load
An amount of individual or aggregated demand that consumers are willing to make available to can respond to a control or tariff price signal, for example from a Supplier, a DNO, The System Operator, an Aggregator or a Non-Traditional Business Model player's signals from the system operator.

Flexibility Services
Energy services which can be procured to balance the system or to relieve a network constraint (eg demand side response or inertia).

H

Half hourly settlement (i.e. based on actual HH consumption rather than profiled consumption)
Electricity settlement process which incentivises suppliers to buy energy to meet their customers' demand in each half hour of the day.

High-cost cap (HCC)
The HCC is triggered if the connection of a generator leads to direct reinforcement costs in excess of £200p/kw. The generator funds the required additional investment through connection charges.

I

Independent Distribution Network Operator (IDNO)
Any electricity distribution company whose licence was granted after 1 October 2001 is defined as an IDNO. IDNOs do not have distribution services areas. They own and operate electricity distribution networks which are predominantly extensions (e.g. to serve new housing developments). These companies are allowed to operate independently of the DNOs under the Utilities Act 2000.

Industrial and commercial customer
A HH metered customer connected at extra high voltage (EHV), high voltage (HV) or lowe voltage (LV).

Inertia
Inertia is a physical constant of each turbine-generator that defines its ability to store rotational kinetic energy, and is analogous to mass.

L

Line loss factors (LLFs)
LLFs are multipliers which are used to scale energy consumed or generated in order to account for losses on the distribution networks. Line Loss Factors are applied in both Central Volume Allocation (CVA) LLF and Supplier Volume Allocation (SVA) LLF.

Load control switches
Smart meters contain a load switch (controlling supply to the home). An Auxiliary Load Control Switch (controlling supply to a specified load) is optional.

Load managed areas
A DNO can designate part of the distribution system as a load managed area if it has been identified a need to reinforce or extend the capacity of such areas and, has avoided such need for reinforcement by a reduction in coincidence of demand by using either customer demand management or reasonably believes it would be avoided by Suppliers adopting customer demand management.

Local supply
Energy which is generated and consumed within a set location.

Low Carbon Networks Fund (LCNF)
A mechanism proposed under the fifth distribution price control review to encourage the DNOs to price control period to prepare for GB moving to a low carbon economy. The fund was available for DNOs and partners to innovate and trial new technologies, commercial arrangements and ways of operating their networks.

Low Carbon Technologies (LCT)
Low carbon power that comes from processes or technologies that, produce power with substantially lower amounts of carbon dioxide emissions than is emitted from conventional fossil fuel power generation.

M

Meter Point Administration Number (MPAN)
Reference number used to identify electricity supply points such as individual domestic residences.

N

National System Peak

Peak demand for electricity across the whole of the transmission system.

Networks
Distribution and transmission electricity networks

Network Innovation Allowance (NIA)
The NIA was introduced as part of the RIIO price controls. The NIA is a set allowance each RIIO network licensee receives as part of their price control allowance. It provides limited funding to fund smaller technical, commercial or operational projects and to fund the preparation of NIC (see below) submissions.

Network Innovation Competition (NIC)
An annual opportunity for gas and electricity network companies to compete for funding for the development and demonstration of new technologies, operating and commercial arrangements.

Network operator
The licenced operator of a distribution or transmission network.

Non-synchronous generation
Generation technologies whereby the frequency of the generated AC voltage waveform is not synchronized with (or is not dependent on) the rotational speed of a generator rotor. Examples include asynchronous rotating generators such as induction generators and generators which are connected to the AC system through DC/AC inverters (such as solar PV generators) or through AC/DC/AC interfaces (such as doubly-fed induction generators typically used for wind and solar generation).

P

Peak load
Period in which electrical power is expected to be consumed for a sustained period at a significantly higher than average load level

Priority Services Register (PSR)
The Priority Services Register is a scheme which offers extra free services to people who are of pensionable age, are registered disabled, have a hearing or visual impairment, or have long term ill-health. It is run by energy suppliers and distribution network operators.

R

Radio Teleswitch
A device used to allow electricity suppliers to switch large numbers of electricity meters between different tariffs, by broadcasting an embedded signal in broadcast radio signals.

Reactive power
The vector difference (ie with reference to phase angle) between real power (measured in kW) and apparent power (measured in kVA).

RIIO-Electricity Distribution Price Control Review 1 (RIIO-ED1)
The price control review to be applied to the electricity distribution network operators, following the DCPR5 rollover. This price control will run from 1 April 2015 to 31 March 2023.

S

Shared services framework

A framework to establish a set of contractual rules and processes to facilitate multiple electricity network operators being able to utilise DSR from the same providers in a manner that delivers the best end consumer benefit in security and cost.

Shared services group
A working group established by the ENA ENFG with the aim of developing a Network DSR Shared Service Framework.

Smart appliance
An appliance can either respond remotely to signals to deliver demand response or provides information to the user to help them determine if they want to respond.

Smart Energy Code (SEC)
A multi-party agreement which defines the rights and obligations of energy suppliers, network operators and other relevant parties involved in the end to end management of smart metering.

Smart Grid
Different people have different understandings of the term smart grid. By smart grid, we mean an electricity network that can intelligently integrate the actions of all the users connected to it - generators, consumers and those that do both - in order to efficiently deliver sustainable, economic and secure electricity supplies.

Smart Grid Forum (SGF)
The DECC/Ofgem Smart Grid Forum was created by the Department of Energy and Climate Change (DECC) and Ofgem to support the UK's transition to a secure, safe, low carbon, affordable energy system.

Smart meter
A gas and electricity metering technology which has additional features to an advanced meter (see above) and which offers customers more information about, and control over, their energy use (such as providing information on total energy consumption in terms of value, not only volume), and also allows two-way communication for automated and remote measurements and generation of alerts.

SMETS 1
The minimum smart metering equipment specification which a Supplier must adhere to in order to meet his licence obligation regarding the national smart metering programme until SMETS 2 metering equipment is available, and subject to installing a specified minimum level or proportion of SMETS 2 meters overall.

SMETS 2
Smart metering equipment having additional features and functionality over SMETS I equipment, and required to comply with specified communications hub requirements. In particular, SMETS 2 meters are required to be interoperable and DCC compatible.

Sole-use assets
Connection asset which is solely used to connect a customer and is not shared by other customers.

Storage
Storage refers to any mechanism that converts electricity into a storage medium and then releases the stored energy as electricity. This can be primary (super-conducting and capacitor technologies); mechanical (pumped hydro, compressed air, flywheels); and electrochemical (batteries).

System Operator (SO)

NGG as the gas system operator has responsibility to construct, maintain and operate the NTS and associated equipment in an economic, efficient and co-ordinated manner. NGET as the electricity system operator has responsibility to construct, maintain and operate the NETS and associated equipment in an economic, efficient and co-ordinated manner. In their roles as SOs, NGG and NGET are responsible for ensuring the day-to-day operation of the transmission systems.

T

Target Operating Model
A description of the desired state of the operations of a business. It sets out the vision for organisations undergoing change.

Time of use tariff
A tariff which charges users different prices according to when the electricity is used.

TPI (Third party intermediary)
Organisations or individuals that give energy related advice or help you to procure energy or mange your energy needs. They act as an interface between consumers and energy suppliers and can help you to make better energy choices.

Transform Model
A tool for providing guidance to electricity distribution companies in order to determine the optimum mix and levels of smart and conventional investment in network solutions to meet the requirements of low carbon technologies under a range of future scenarios.

Transmission Network Use of System Charges (TNUoS)
Charges to recover the cost of installing and maintaining the transmission system

Transmission Owners (TO)
Companies which hold transmission owner licenses. Currently there are three electricity TOs: NGET, SPTL and SHETL. NGG NTS is the gas TO.

Transmission System
The system of high voltage electric lines providing for the bulk transfer of electricity across GB.

Transmission System Operator (TSO)
See system operator

U

Utilisation Payment
Payment made by National Grid to secure the dispatch of additional power (in the form of generation or energy storage) or demand reduction, to deal with unforeseen demand increase and/or generation unavailability. Similarly, a payment made by a DNO (to a generator, storage operator, consumer or Aggregator) to secure the dispatch of additional power or demand reduction to deal with a network outage (as an alternative to investing in additional network capacity). See also ‘Availability payment’.