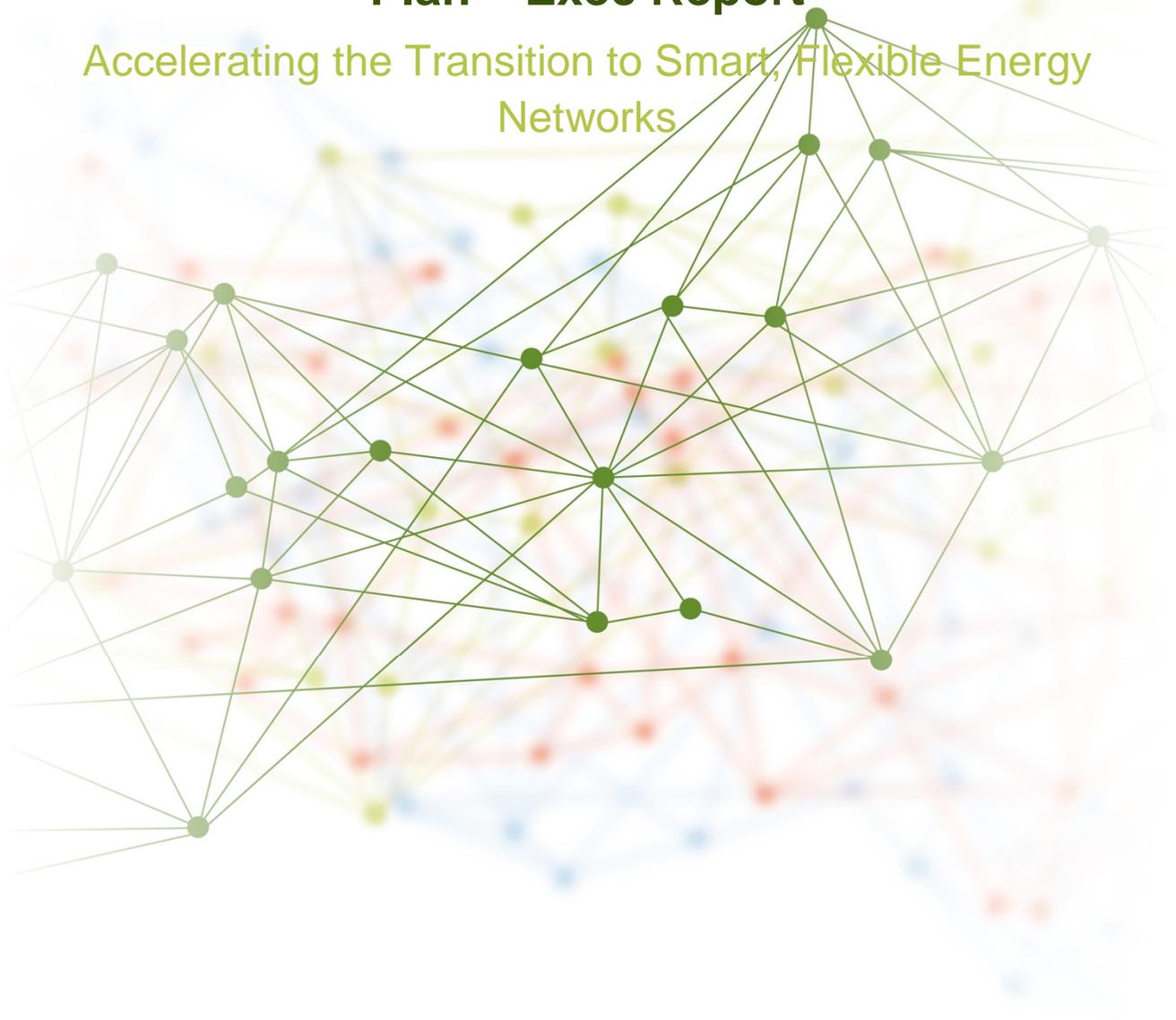




# FUSION

## Associated Changes to USEF Implementation Plan – Exec Report

Accelerating the Transition to Smart, Flexible Energy  
Networks



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- This document forms part of the deliverables set out in the Project FUSION Directions – Report on Associated Changes to USEF Implementation Plan.
- This document can be cross-referenced with our publications of USEF Due Diligence Report, and USEF Consultation Report on the FUSION Webpage.

## Version History

Author	Revision	Date	Status	Comments	Reviewed by
Rafiek Versmissen (DNV GL)	V0.1	08/10/2019	Initial View		Ehsan Mian (SPEN)
Rafiek Versmissen (DNV GL)	V0.2	22/10/2019	Revision	Title Change and Refinements	Ehsan Mian (SPEN)
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## Approval

Name	Position	Date	Signature
James Yu	Future Networks Manager	15/11/2019	



## 1. CONTEXT

This document has been prepared by DNV GL and SP Energy Networks, and summarises the changes to the USEF framework to ensure compatibility with current and future arrangements in Great Britain (GB). The document also draws on the outcomes of the due diligence and the consultation process to identify any practical implications for, or limitations of, the deployment of USEF in the FUSION trial (to be developed in WP4 and delivered in WP5) as well as to assess the high-level impact on the forthcoming report on USEF Implementation in GB.

In January 2019, work package 3 (WP3) of Project FUSION commenced with a due diligence of the USEF framework against legal, regulatory and market arrangements governing the GB energy sector. The due diligence was carried out by DNV GL and assessed the fit of USEF with the direction of reform of GB energy policy and regulation, as well as forward-looking industry initiatives like the Energy Networks Association's Open Networks (ENA ON) project, to inform the transition to a smart, flexible energy system.

The fit analysis considered key topics and areas that are essential for implementing a common flexibility market framework based on the open USEF model and, more generally, for maximising the value of flexibility for network operators and end-users:

- Flexibility Value Chain and routes to market for flexibility resources;
- Flexibility market organisation, covering new and changing market roles and interactions;
- Design of a flexibility market;
- Detailed requirements to facilitate DSO flexibility transactions;
- Detailed requirements to access specific flexibility markets; and
- Detailed requirements for privacy, cybersecurity and communications between market participants.

The due diligence results showed that across these topics there is a close fit between USEF and both the current market design and the likely direction of future market design in GB. The results also showed that there are several relevant and valuable innovative elements within USEF that could enrich current discussions and views on future energy market design, both broadening and deepening these views. Project FUSION subsequently sought the feedback of GB energy industry stakeholders on the merits and possible implementation of these innovative elements. The outcomes of this consultation are summarised in the FUSION Consultation report of 15 November 2019.

In addition to innovative concepts, the due diligence also uncovered a small number of conflicts, which may require changes in either USEF or GB arrangements, as well as areas where GB arrangements could add to USEF. However, the due diligence did not indicate areas that could prevent USEF from being implemented in GB, and our expectations are that only few modifications will be needed on USEF's side, and a limited set of recommendations to adjust current or (proposed) future arrangements in the GB energy system.

The following section refers to work undertaken as part of the Due Diligence and Consultation reports developed under Project FUSION. Both documents are available on the Reports & Publication section of the Project FUSION website. In addition, appendices A and B to this report provide a Glossary and a high-level introduction to USEF, for further reference.



## 2. ASSOCIATED CHANGES TO USEF IMPLEMENTATION PLAN

The following sections provide a brief overview of the (possible) modifications to the USEF framework. The changes have been informed by topics highlighted in the due diligence, as well as the innovative elements covered in the public consultation.

### 2.1. Post-fault products

**The USEF Flexibility Value Chain (FVC) will be expanded to include post-fault products.**

The due diligence (DD) exercise showed that DNOs and the Electricity Network Associations (ENA) Open Networks (ON) project consider both pre-fault and post-fault products for congestion management. USEF products do not distinguish between pre-fault and post-fault congestion management products. Currently USEF allows for availability contracts which could also support post-fault products. However, USEF does not support free bids in a post-fault product without additional requirements being put in place. USEF will need to accommodate post-fault products given that the use of post-fault products during the FUSION trial is highly likely.

### 2.2. USEF Flexibility Value Chain

**The USEF Flexibility Value Chain (FVC) could be enhanced to incorporate GB (future) products that are not fully aligned with USEF's products.**

The DD analysis identified that GB DNOs are considering restoration support services at distribution level, which USEF has considered concretely but only at TSO level. In addition, one GB DNO remunerates its customers based on “arming” (i.e. keeping on standby) availability. These products could be incorporated in USEF to enhance the USEF flexibility value chain and be supported by USEF arrangements.

DNV GL will map the USEF flexibility services and products against GB existing and future flexibility services and products during the development of the USEF GB implementation plan. The plan could then inform next steps for updating the USEF framework to include missing products.

Changes in this area are not related to DSO congestion management services and therefore are not relevant to the FUSION trial.

### 2.3. Roles & Interactions

**The USEF framework can be extended to reflect responsibilities currently carried by GB roles or ENA ON actors.**

The fit analysis highlighted that a few ENA ON actors are not fully aligned with, or set out in, USEF arrangements (e.g. Settlement Agent, Local Energy Systems, Local Market Operator). The ENA ON project has chosen not to relate responsibilities to specific roles, while USEF is a roles model. This implies that USEF roles could be undertaken by several existing entities or ENA ON actors and the USEF framework could be extended to account for responsibilities currently carried by ENA ON actors. These outcomes have no impact on the FUSION trial and therefore no further actions are required. However, DNV GL will include an updated mapping of USEF roles against GB future and existing roles/actors in the USEF GB implementation plan and highlight any actions to be taken forward.



## 2.4. System operator role

**USEF communication requirements and protocols will be updated to consider the independent role of the Electricity System Operator (ESO), if deemed necessary.**

In the GB energy system, the role of the system operator is legally separated from the role of the transmission owner, while in USEF the responsibility for both electricity transportations at HV networks and system balance lies with a single entity. In addition, in GB there are three transmission network owners that interact with a single system operator. These properties constitute a variation on communications requirements and protocols set out in USEF. However, these communications are not associated with balancing services and therefore do not form a barrier to the trial and have little impact on the potential implementation of USEF in GB.

## 2.5. Privacy and Cyber Security requirements for congestion point publication

**USEF's proposed congestion point publication (Common Reference) will need to comply with privacy and cybersecurity requirements as set out in the GDPR.**

Consultation responses vary on whether publication of connections identifiers in the Common Reference is in line with GDPR. The USEF GB implementation plan is likely to be informed by discussions with project partners and insights gained during the FUSION trial. FUSION project partners will consider the minimum level of information of the Common Reference according to USEF, which will also be subject to GDPR compliance. The Project FUSION team will also perform a GDPR compliance assessment as part of the trial set up.



## Appendix A: Glossary

Aggregator	A service provider that contracts, monitors, aggregates, dispatches and remunerates flexible assets at the customer side. (USEF terminology)
Aggregator Implementation Model (AIM)	USEF term that describes the relation of the aggregator with the supplier and the Balance Responsible Party (BRP). It covers relevant aspects of aggregation implementation, such as contractual arrangements, imbalance responsibility and transfer of energy.
Balance Responsible Party (BRP)	A market participant or its chosen representative who is responsible for balancing electricity supply and demand of its portfolio in each settlement period.
Balancing Service Provider (BSP)	A market participant who provides energy volumes to the TSO for the purposes of balancing the total system. In GB, this role is usually undertaken by aggregators, suppliers or customers directly connected to the transmission network.
Balancing Settlement Code (BSC)	The Balancing and Settlement Code (BSC) is a legal document which defines the rules and governance for the balancing mechanism and imbalance settlement processes of electricity in Great Britain. The BSC is administered by ELEXON, the Balancing and Settlement Code Company.
Central data hub	The central data hub is a repository where data for flexibility processes, such as the coordination of flexibility deployment, measurement, validation and settlement of flexibility services, is recorded.
Common Reference (or congestion point repository)	USEF defines the Common Reference as a repository which contains information about connections and congestions points in the network.
Common Reference Operator (CRO)	In USEF, the CRO is responsible for operating the Common Reference. The CRO's role is to ensure the publication of both the DSO flexibility requirements and the associated flexibility assets in each congested point as well as the standardisation of this publication for all distribution areas.
Congestion Management	The avoidance of the thermal overload of system components by reducing peak loads. The conventional solution to thermal overload is grid reinforcement (e.g. cables, transformers). Congestion management may defer or even avoid the necessity of grid investments.
Constraint Management Service Provider (CMSP)	A provider of constraint management services to a DSO or the TSO. This is a USEF role and is not currently used in GB. This role takes on specific responsibilities in communicating and coordinating flexibility transactions with the ESO and DSOs, to ensure effective deployment of flexibility as well as effective management of network constraints. Responsibilities also involve ensuring efficient dispatch of flexibility to maintain the safety and reliability of the networks.



D-prognosis	Aggregator forecast of the amount of energy to be consumed or produced at a given congestion point.
D-programmes	Aggregator forecasts of planned activations of flexibility (day-ahead and intraday) to be shared with DSOs in congested distribution network areas.
Distributed Energy Resources (DER)	Small scale power generation technologies (typically in the range of up to 10MW and including electric energy storage facilities) and larger end-use electricity consumers (e.g. industrial and commercial) with the ability to flex their demand (i.e. demand-side response) that are directly connected to the electricity distribution network.
Distribution Network Operator (DNO)	Company licensed to distribute electricity in GB.
Distribution System Operator (DSO)	As defined in DIRECTIVE 2009/72/EC: A natural or legal entity responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity.
Distribution Use of System (DUoS) Charges	Charges levied by distribution network operators on users to recover the cost of operating and maintaining the distribution network.
Energy Networks Association (ENA)	The industry association for operators of gas and electricity transmission and distribution networks in the UK and Ireland.
Flexibility Value Chain (FVC)	The potential of demand-side flexibility to create value to multiple participants through several markets and in the form of different products and services.
Flexibility Value Stacking	This is a concept where the Aggregator can provide multiple services from the same portfolio, or even from the same flexible asset(s), potentially to multiple parties to maximise the value of flexibility.
Flexibility	Ability of an asset or a site to purposely deviate from a planned or normal generation or consumption pattern.
Independent aggregation	Situation where a customer has an agreement with an aggregator to dispatch and market (parts of) its flexibility, whereas this aggregator operates without the consent from or a contract with the electricity supplier of the customer.
Independent Aggregator	A market party who performs the role of Aggregator and is not affiliated to a supplier or any other market participant.



Market Coordination Mechanism (MCM)	The Market Coordination Mechanism in USEF includes all the steps of the flexibility trading process, from contractual arrangements to the settlement of flexibility. USEF splits the flexibility trading process in five phases and describes the interactions between market participants and information exchange requirements in each phase of the MCM.
Operating Regimes	A USEF concept for a traffic light mechanism to govern the (un)restricted trade and dispatch of flexibility. The USEF market design of operating regimes aims to ensure well-functioning short-term electricity markets, where flexibility is dispatched based on market signals to where it is most essential and valuable.
Prosumer	This role refers to end-users who only consume energy, end-users who both consume and produce energy, as well as end-users that only generate (including on-site storage). (USEF terminology)
Post-fault products	Flexibility products under which the DSO procures, ahead of time, the ability of a Service Provider to deliver an agreed change in output following a network fault.
Re-dispatch	This is a mechanism that neutralises the impact of the activated flexibility on the overall system balance, by activating the same amount of flexibility in the opposite “direction” outside the congested area.
Restoration Support Services	Flexibility services provided following a loss of supply; the DSO instructs a provider to either remain off supply, or to reconnect with lower load, to support increased and faster load restoration under depleted network conditions.
Supplier	The role of the Supplier is to source and supply energy to end-users, to manage (hedge) delivery and imbalance risks, and to invoice its customers for energy.
Transfer of Energy (ToE)	USEF term for a wholesale electricity transaction between the Supplier and the Aggregator, triggered by a Demand Response activation by the Aggregator on the retail side, restoring the energy balance of both the Aggregator and the Supplier (and their BRPs).
Transmission System Operator (TSO)	<p>A physical or legal entity responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity.</p> <p>In GB, the party responsible for the system balance and operability is the Electricity System Operator (ESO), National Grid ESO. Separate parties, the electricity Transmission Owners (TOs), are responsible for investing, building and maintaining their electricity transmission network.</p>



## Appendix B: INTRODUCTION TO USEF

The Universal Smart Energy Framework (USEF) provides guidelines to build an integrated smart energy future. Its purpose is to accelerate the establishment of an integrated smart energy system which benefits all stakeholders, from energy companies to consumers. Through its work, USEF aspires to contribute to the harmonisation of these flexibility mechanisms throughout Europe. USEF's ongoing development is managed by the USEF Foundation, a dedicated core team tasked with coordinating expertise, projects and partners while safeguarding the integrity and objectives of USEF. A brief video introduction to the USEF framework is available online via this [link](#).

### Overview

The USEF framework aims to facilitate effective coordination across all the different actors involved in the electricity market by providing a common standardised roles model and market design while describing communication requirements and interactions between market roles. USEF turns flexible energy use into a tradeable commodity available for all energy market participants, separated from (but in coordination with) the traditional electricity supply chain, to optimise the use of resources. USEF focuses on explicit demand-side flexibility, in which prosumers are contracted by the aggregator to provide specific flexibility services using Active Demand and Supply (ADS) assets. USEF acknowledges, but does not provide detailed considerations for implicit demand-side flexibility or peer-to-peer energy trading.

To facilitate the transition towards a cost-effective and scalable model, the framework provides the essential tools and mechanisms which redefine existing energy market roles, add new roles and specify interactions and communications between them. In addition, the USEF standard ensures that all technologies and projects will be compatible and connectable to the energy system, facilitating project interconnection, hence fostering innovation and accelerating the smart energy transition. By delivering a common standard to build on, USEF connects people, technologies, projects and energy markets in a cost-effective manner. Its market-based mechanism defines the rules required to optimise the whole system, ensuring that energy is produced, delivered and managed at lowest cost for the whole system and effectively for the end-user.

The USEF framework provides:

- a **standardised common framework** designed to be implemented on top of current energy markets such as wholesale, retail and capacity markets.
- a description of the **flexibility value chain (FVC)** involving new and existing market players and giving a central role to the aggregator in facilitating flexibility transactions.
- a **roles model** and an **interaction model** to enable the implementation of different business models and interactions between actors.
- a market design described by the **Market Coordination Mechanism (MCM)** which sets out the phases and interaction requirements for flexibility transactions. The MCM provides all stakeholders with equal access to a smart energy system. To this end, it facilitates the delivery of value propositions (i.e. marketable services) to various



market parties without imposing limitations on the diversity and customisation of those propositions.

- detailed **communication and market access requirements** taking into consideration privacy and cybersecurity issues.

USEF’s basic principles underpin its arrangements, roles and interactions and are summarised below:

- USEF facilitates one overall energy system instead of one single flexibility customer;
- USEF enables a market-based approach to unlock the value of flexibility;
- Freedom of choice to participate in flexibility products must be guaranteed; and
- USEF describes a model of interoperable roles, centred around the Aggregator role.

In USEF, aggregators have a central role in maximising the value and use of demand-side flexibility. Aggregators are responsible for acquiring and accumulating flexibility from prosumers and offering that flexibility to market participants (e.g. DSO, TSO, Balance Responsible Parties - BRPs) via trading counter parties (e.g. Balancing Service Provider – BSP) in commercial transactions as illustrated in Figure 1. The reward that aggregators receive in return for providing flexibility to market participants is shared with the prosumers.

USEF, as a roles model (see section 3.3), positions the Aggregator role on the retail side. For example, where an aggregator business provides balancing services, it combines the USEF roles of Aggregator and Balancing Service Provider (BSP). According to USEF, all market parties (or actors) that aggregate flexibility undertake the role of the Aggregator.

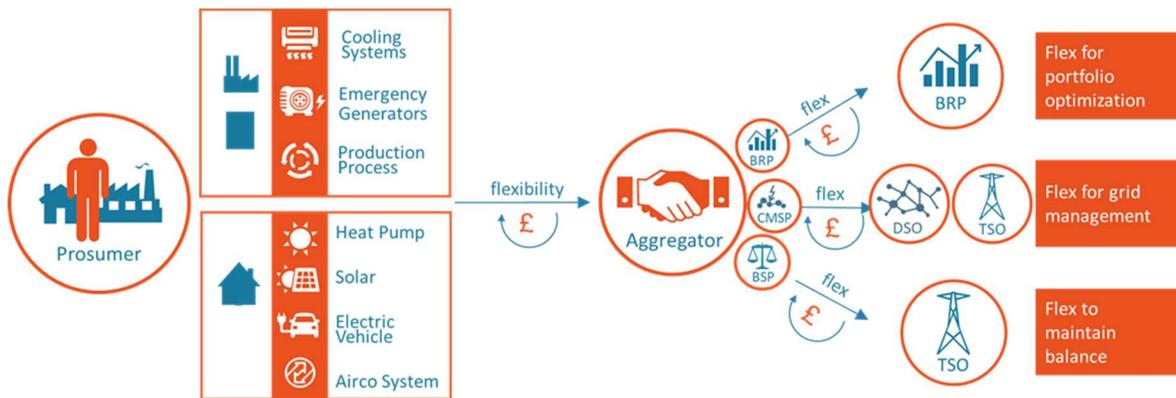


Figure 1: USEF Flexibility Value Chain

## USEF Market Design

The USEF market design aims to create well-functioning electricity markets, where flexibility is dispatched based on market signals to where it is most essential and valuable. The flexibility market, as proposed by USEF, runs from the day before the delivery of the electricity to the moment of consumption, enabling full access to flexible technologies. The USEF market design provides USEF operating regimes and a common Market Coordination Mechanism (MCM).



The USEF MCM allows optimisation of the value of flexibility across all roles in the system and provides all stakeholders with equal access to the system, whilst ensuring that all physical constraints (frequency and thermal limits of network components) are met. The USEF MCM respects the freedom of connection, transaction and dispatch of flexibility, to the extent possible and builds on top of existing European market arrangements. It consists of five phases, as illustrated in Figure 2. These phases are iterative in nature and occur concurrently for different time periods under consideration (i.e. while network operation is underway for the current time period, settlement is being undertaken for a past period, and planning is underway for the future). When examining the market process for a single time period, the five market phases can be categorised as occurring sequentially from years and months ahead of time, through real-time network operation, to post-settlement.



Figure 2: USEF MCM Phases





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