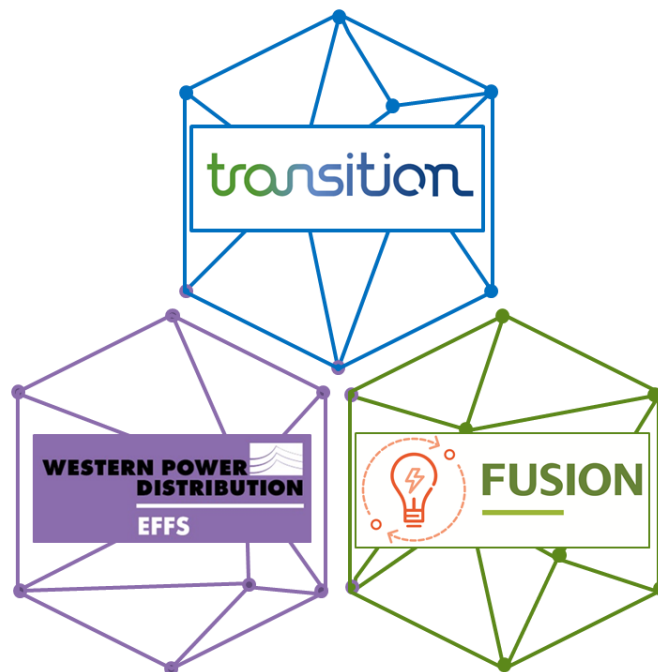**SP Energy Networks,
Scottish and Southern
Electricity Networks,
Western Power
Distribution**
July 2018

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Appendix 1: T.E.F. DSO Function Mapping

A1.1   Mapping Methodology

SPEN, SSEN and WPD agreed that to meet the criteria outlined within Section 2 of our Project Directions, a deeper understanding of each other's projects and quantification of functional outputs was required. To gain the appropriate level of quantification, we proposed to define a set of functions and competences which when presented in a matrix format would facilitate the mapping out of each project in a consistent, comparable format.

It was recognised that the ENA Open networks (ON) Project had developed a process to define the functional and system requirements for a DSO environment and to support alignment T.E.F. should seek to adopt the methodology. This allowed the three projects to be compared and contribution to the DSO transition defined in ON project format while strengthening the foundations for ongoing collaborative working.
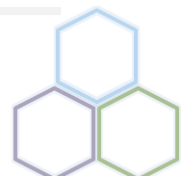
The scoring of the T.E.F. projects made use of the ON Workstream 3, Product 2 (ON WS3 P2) deliverable from the 2017 workplan; "*Functional and System Requirements*"[1]. As the three projects are all supporting the transition to a DSO environment, the functions and competencies defined in the associated report from the Workstream 3 deliverable were valid and allowed the score definitions for each functional competency to also be adopted.

A1.2   Competency Scoring

As part of the work undertaken by the Functional and System Requirements team (ON WS3 P2), the current DSO competency was derived for each of the eight functions. The associated matrix is presented in Figure A1.1.

Each of the T.E.F. teams revisited their project programs and deliverables presented as part of the NIC 2017 full submissions with the current DSO competency and score definitions in mind. The teams selected the description which best articulated the planned position on completion of the given project for each of the function and competency combinations. Associated scores were then presented in matrix form to aid assimilation of the data and comparison with other projects. The outputs from the individual project level exercise were circulated for review and discussion between the T.E.F. collaboration team. The overall contribution to the advancement of DSO competencies was defined by assessment of the three project matrices and selection of the highest element in each functional competency. This produced the resultant scoring matrix depicted through Figure A1.2.

---

[1] Functional and System Requirements, 18th August 2017
http://www.energynetworks.org/assets/files/electricity/futures/Open_Networks/ON-WS3-P2%20DSO%20Functional%20Requirements-170925%20Published.pdf

NIC 2017: Compliance Document Appendices

DSO Competency Matrix - Present

	Forecasting	Regulatory Codes & Frameworks	Commercial Relationships & Whole System Pricing	Whole System Coordination	Power System Analysis	Contractual Arrangements & Service Compliance	Dispach	Outage Planning	Data Management	Settlement	Customer Account Management
System Coordination	1			1		1	1		1		1
Network Management	1	1	1	1	2	1	1	1	1		1
Investment Planning	2	2	2	1	2				2		1
Connections and Connection Rights		3	1	1	2	2		1	2		1
System Defence and Restoration	1	1		1	1	1	1	1	1		1
Service / Market Facilitation	1		2	1		1			1	1	1
Service Provision		1	2			1	1	2	1	1	1
Charging		1	1	1		2			2	3	1

Figure A1.1: DSO Competency Matrix – Present capabilities

DSO Competency Matrix - Post T.E.F. Closedown

	Forecasting	Regulatory Codes & Frameworks	Commercial Relationships & Whole System Pricing	Whole System Coordination	Power System Analysis	Contractual Arrangements & Service Compliance	Dispach	Outage Planning	Data Management	Settlement	Customer Account Management
System Coordination	4	2	3	2		3	3		3	3	3
Network Management	4	1	2	2	4	3	3	2	3		3
Investment Planning	4	2	2	1	3				3		3
Connections and Connection Rights		3	3	2	2	2		2	3		2
System Defence and Restoration	4	3	2	2	3	3	4	1	3		3
Service / Market Facilitation	4	1	2	2		3		3	3	3	4
Service Provision	3	1	2	1	4	3	2	2	3	3	3
Charging		1	1	1		2			2	3	1

Figure A1.2: DSO Competency Matrix – Post T.E.F. closedown capabilities
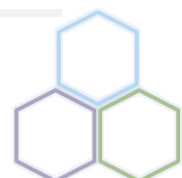
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A1.3   Core Competencies

T.E.F. as a collective is shown to advance the industry DSO transition in Figure A1.2. Competency of DSO functionality envisaged through the three projects is a significant shift from the current position, with seven of the twelve competencies being met[2].

1. Forecasting
2. Power System Analysis
3. Contractual Arrangements & Service Compliance
4. Dispatch
5. Data Management
6. Settlement
7. Customer Account Management

Further detail on the collaboration potential identified for each of these seven functional requirements is provided in the following pages.

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[2] In order to facilitate and structure collaboration activities, the T.E.F. collaboration teams identified five key workstreams to further explore the core competencies. The seven competencies were incorporated in to the five workstreams as shown below.
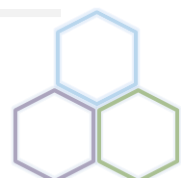
- Governance
- Programme alignment and Stage Gates
- Stakeholder and industry engagement
- Forecasting
- Trials

These workstreams have formed the basis on which collaboration efforts have been undertaken, and around which meetings and workshops have been held. Section 3 of the main document presents each in detail.

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Forecasting

Forecasting is a major element of the EFFS project.
The core of the EFFS project is to take a completely fresh approach to forecasting and develop new algorithms from first principles, rather than relying on existing techniques such as regression analysis.

FUSION and TRANSITION will also require forecasting as part of the platforms being developed to allow the trial of local flexibility markets.

WPD will share their algorithmic development with the other two projects.
FUSION and TRANSITION will be able to benefit from these algorithms in the development of their own forecasting systems[3].

The algorithms, which should be available prior to the Stage Gate, could be included in the FUSION and TRANSITION procurement as an option for suppliers to use.

The metrics created to determine the accuracy of the new forecast algorithms could also be used in assessing tenders, creating a consistent approach to scoring.

Power System Analysis

The management of Power System Analysis varies significantly for each DNO.

Given the unique nature of these management systems, and the extent of interpretation that would be required in order to allow useful exchange of data, direct collaboration is not considered to be a viable proposition at this stage.

There would be collaboration opportunities if this were a separate module that could be simply interfaced to other software. However, early estimates indicate that the interfacing requirements would outweigh the savings in module development costs. Sharing approaches and algorithms may be simpler and more beneficial than creating a shared module, which would also require shared support arrangements after the projects are completed. This should be assessed as part of the Stage Gate Review

Contractual Arrangements & Service Compliance

Each project will require contractual arrangements to support the trial of DSO models. The variance in models being trialled will result in different requirements for service contracts and incentive mechanisms, however this is an area where the projects can

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[3] Note:
- There is no budget within the FUSION and TRANSITION projects for development of algorithms.
- From the work SPEN and SSEN have done it is envisaged that it should be possible to undertake the trials using forecasting products which are already available in the market place.
- Due to the nature of the contractual agreements in place between WPD and their project partners the forecasting system is unlikely to be made available to FUSION and TRANSITION at zero cost.
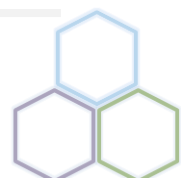
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share learning across T.E.F., with key stakeholders including other trial projects and with the Open Networks project. The physical trials will provide important feedback to Open Networks to inform the requirements of these contracts, and the level of service fulfilment achieved across different provider types and incentive mechanisms.

The systems are likely to require functionality to optimise the selection of flexibility services and determine how the risk of non-delivery of services will be managed. Once again, even if this could be developed as a common module, it is likely that the interfacing effort would outweigh the savings in applying the algorithms. However, there would be benefit in sharing proposed methodologies and assumptions.

Dispatch

Each T.E.F. project will be developing different dispatch procedures in accordance with their respective;

- Choices of DSO model to use.
- IT and operational technology integration requirements.

Although the differences in dispatch models will limit the potential for collaboration in their development, the difference between DSO models used by each DNO will allow for detailed comparison of dispatch models, which will provide valuable learning for the DNO to DSO transition, ENA Open Networks and wider industry. This learning will be presented at project dissemination and learning events.

In addition, where control equipment is installed to control customers' assets to support the FUSION and TRANSITION trials, there may be economies of scale in jointly purchasing this equipment. This should be assessed at the Stage Gate Review.
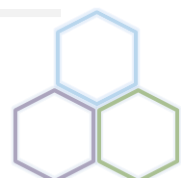
Data management

The three T.E.F. projects require suitable systems to facilitate the exchange of data and information. These are required to allow the flexibility system to accommodate the participation of both internal and external stakeholders. FUSION and TRANSITION will roll-out an operational flexibility trial, EFFS will not.

There may be potential for collaboration on the procurement of data and IT systems between FUSION and TRANSITION; however, this cannot be determined until both projects produce IT specifications, which will be specific to the IT infrastructure within each organisation.

This will be reviewed at the Common T.E.F. Stage Gate[4].

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[4] Data exchanges may or may not involve the Market Platform. This is likely to be tightly integrated with the other system specific elements. Whether this functionality is best satisfied with a separate module which could be shared will not be known until the design phases are complete and should be assessed as part of the Stage Gate Review.

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The following factors make direct collaboration non-viable:
There is significant variation in both:
- the data management and IT systems internal to the three DNOs, and
- the individual project aims (in terms of IT integration).

Settlement

All three projects will determine appropriate settlement procedures.

Each of the projects intend to use different DSO models, under which settlement procedures will vary, therefore a common settlement procedure would not be appropriate.

While this is likely to be a common feature of all systems, this is likely to use existing payment systems rather than be newly developed within the DSO systems.

Throughout their duration, the three projects will share their findings and the learnings and conclusions will also be shared with stakeholders as part of the Knowledge and Learning Dissemination process.

Customer Account Management

T.E.F. have committed to use consistent language, in line with the Open Networks definitions, to avoid confusion amongst industry and customers. This will include defining new types of customer which emerge in a DSO market; the T.E.F. trials will inform the types of new flexible customer and the needs of stakeholders and customers. T.E.F. will ensure consistent definitions are maintained.

EFFS is not intending to recruit new customers, but rather to use those already recruited for Cornwall Local Energy Market and ENTIRE. TRANSITION and FUSION can use similar customer information graphics and templates for recruitment across different regions.
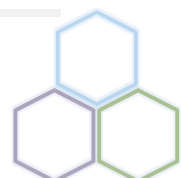
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Appendix 2: T.E.F. collaboration workshops

T.E.F. has held several workshops to progress the collaboration plan in addition to weekly conference calls. These workshops focused on specific topics; where required these workshops included subject matter experts from the business or the project partner organisations. A full list of the workshops undertaken, alongside the Open Networks Project Workstream engagement is presented in Table A2.1.

| Date	Workstream / Focus	Event (Location)
09/01/18	Overall	Collaboration workshop (SSEN offices)
07/02/18	Stakeholder Engagement	Stakeholder workshop (Conference call)
08/02/18	Forecasting	Forecasting workshop (WPD offices)
12/02/18	NG engagement ON mapping	Collaboration workshop (SP offices)
20/02/18	Open Networks	Workstream 1 introduction and presentation
21/02/18	Open Networks	Workstream 2 introduction and presentation
21/02/18	Forecasting	Follow up conference call
22/02/18	Stakeholder Engagement	Follow up conference call
22/02/18	Open Networks	Steering Group introduction
26/02/18	Trials	Collaboration workshop (SSEN offices)
26/02/18	Overall	Feedback to Ofgem (Ofgem Glasgow)
02/03/18	Stakeholder Engagement	Follow up conference call
08/03/18	Open Networks	Workstream 3 introduction and presentation
22/03/18	Open Networks	Steering Group draft document review

Table A2.1: T.E.F. and ON Workshops

The initial set of workshops took us up to submission of the initial Collaboration Document. Since this point work has been coordinated via email and conference calls with the weekly T.E.F. call keeping the team on track. See Appendix 5 for details of the most recent engagement.

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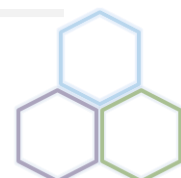
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Appendix 3: Governance structure

Each of the three projects will remain individually responsible for compliance with their Project Direction and the requirements of the NIC Governance document. However, there is an ongoing need for collaboration amongst the three projects in the longer term. The governance arrangements for achieving this are outlined in Figure A3.1 below.

The T.E.F. projects provide a crucial mechanism for demonstrating and trialling many of the Open Networks projects proposed solutions. The outputs from T.E.F. will be vital to support the successful delivery of the Open Networks project. Both by informing the development of various work packages and by providing validation of many of the Open Networks outputs. Therefore, it is essential that the T.E.F. projects are jointly aligned with the overall strategic direction of the Open Networks project.
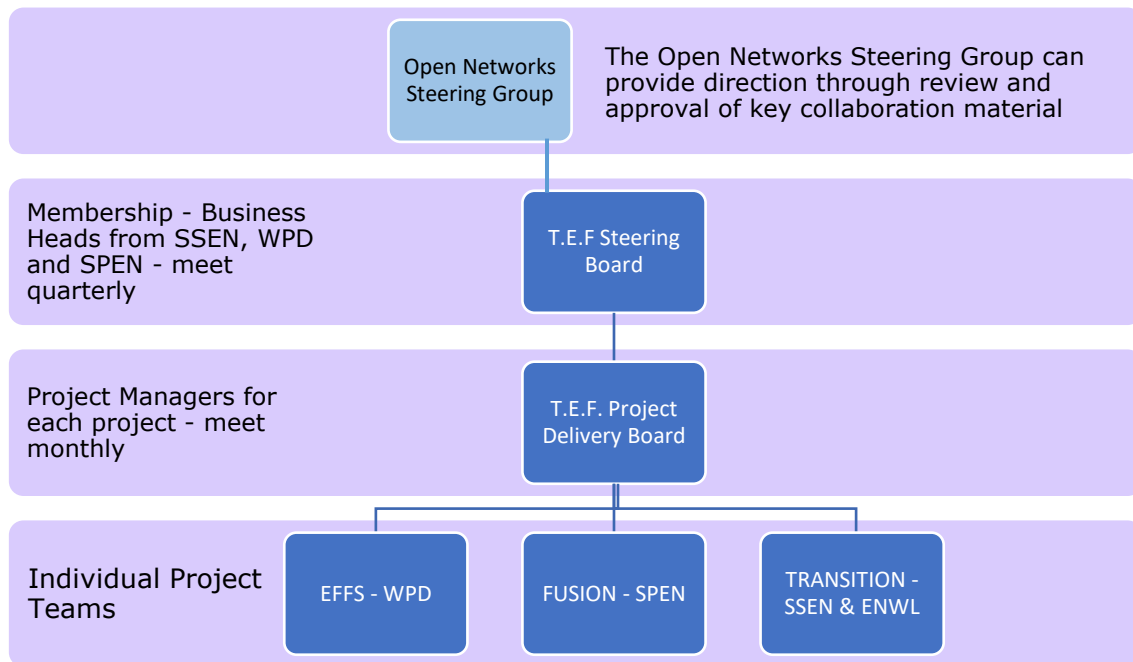

Figure A3.1: T.E.F. Governance Arrangements

### A3.1   T.E.F. Steering Board

The key function of the Steering Board is to provide direction and support for the delivery of all three projects to maximise benefits from collaboration, and alignment with wider industry strategy. Terms of reference for the T.E.F. Steering Board will include:

- Ensuring alignment with wider industry strategies and Open Networks to maintain relevance of T.E.F. project outcomes;
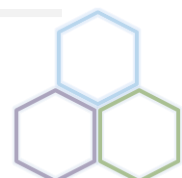
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- Ensure alignment with existing NIA/NIC innovation projects such as UKPNs Power Potential and NPGs Customer-Led Distribution System;
- Acting as strategic direction for delivery of the T.E.F. projects;
- Agreeing outcomes from collaborative work and identifying areas of unnecessary duplication which may arise as the projects develop;
- Approval of collaborative outcomes prior to dissemination to key stakeholders such as Open Networks Steering Board, Ofgem, NGET etc.;
- Providing an escalation route for any conflicts; and
- Approving recommendations at Stage Gate.

It is envisaged that the Steering Board should meet on a quarterly basis. Initial membership will consist of:

Name	Title	Organisation
Roger Hey	Future Networks Manager	Western Power Distribution
James Yu	Future Networks Manager	SP Energy Networks
Stewart Reid	Head of DSO and Innovation	Scottish and Southern Electricity Networks
Steve Cox	Engineering and Technical Director	Electricity North West Limited
TBC	TBC	Northern Power Grid

Table A3.1: T.E.F. Steering Board membership

The SSEN TRANSITION Project Manager will act as Secretary to the T.E.F. Steering Board.

A3.2 T.E.F. Project Delivery Board

The main function of the Project Delivery Board is to ensure that the T.E.F. projects are delivered in a collaborative fashion. This will include sharing project progress to ensure opportunities for collaboration are maximised and to mitigate against project duplication. The terms of reference for the Project Delivery Board include:

- Coordination of project programmes to ensure alignment of key project activities such as Stage Gates and engagement and dissemination activities;
- Identify work streams for collaboration and develop programmes to ensure delivery. Collaborative workstreams already identified include:
  - ENA engagement;
  - Stakeholder engagement;
  - Forecasting;
  - Electricity System Operator engagement; and
  - Trial management

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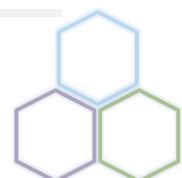
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- Provide combined reports for Steering Group on project progress, risks, interdependencies and outcomes, for approval prior to wider dissemination;
- Develop common project vocabulary, definitions etc. to aid knowledge dissemination;
- Deliver combined stakeholder engagement and dissemination activities to agreed target audience.

It is envisaged that the Project Delivery Board will meet on a monthly basis. Initial Membership includes:

| Name	Title	Organisation
Jenny Woodruff	Project Manager	Western Power Distribution
Michael Green	Project Manager	SP Energy Networks
Stevie Adams	Project Manager	Scottish and Southern Electricity Networks
Ben Ingham	Project Manager	Electricity North West Limited

Table A3.2: T.E.F. Delivery Board membership

The SPEN Project Manager will act as Secretary to the Project Delivery Board. SSEN will provide Kyle Murchie as the initial single point of contact for the ENA Open Networks Project.

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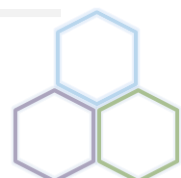
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Appendix 4 Stage Gates

A4.1   Project Timelines

The project timeline summary, below, shows the common Stage Gate for T.E.F. For TRANSITION and FUSION, the Stage Gate is at the end of the initial development phase prior to deployment. The work package structure for EFFS is such that the Stage Gate falls within a package of work. At this point, EFFS will have carried out some early development work which may usefully inform the Stage Gate. It should be noted that EFFS have added additional review points before prior to the formal Stage Gate, ensuring that the projects remain aligned during the development phase.
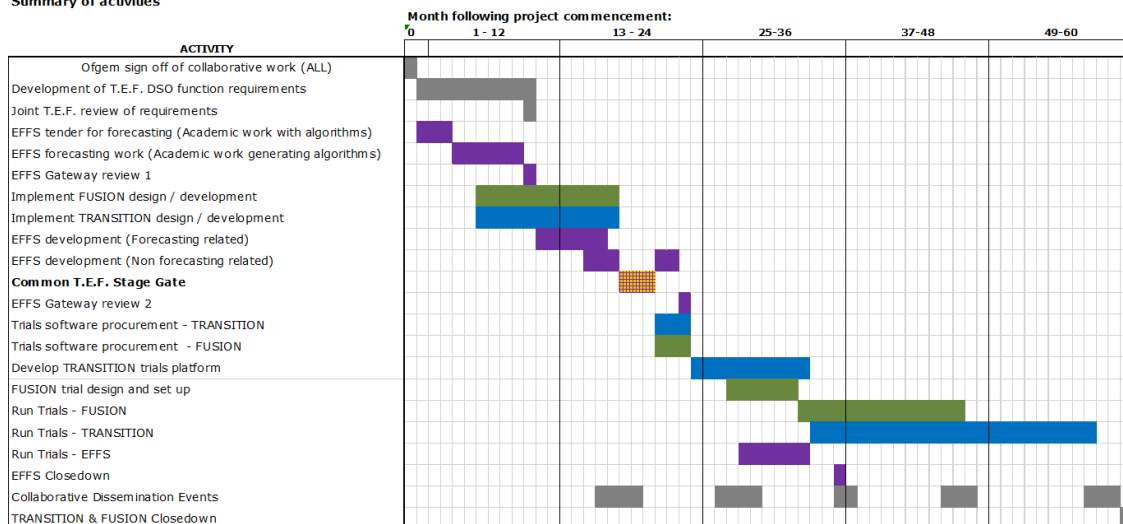

Figure A4.1: T.E.F. Activity Timeline

This is summarised in the graphic below. Following the Stage Gate, the TRANSITION and FUSION projects will move into the software development and trials phases, and EFFS will continue development and unit testing work up to a second review gate, where it will again check alignment with FUSION and TRANSITION, prior to seeking further approval from the Authority to deploy to the field.
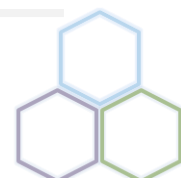
Project	Review stage description	Months after approval
EFFS	EFFS Gateway review 1, End of the forecasting work	10
All	Common T.E.F. Stage Gate, end of design phase	18
EFFS	EFFS Gateway review 2, Pre-trial authorisation. (End of the phase including functional specification, technical design, build and unit testing)	23

Table A4.1: T.E.F. Stage Gate summary

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A4.2 Operation of Common T.E.F. Stage Gate

The Stage Gate needs to consider many key issues for each T.E.F. project:

- Objectives still align with the objectives of the Open Networks project;
- T.E.F. have maintained alignment, avoiding unnecessary duplication;
- Review of increased detail around the trial locations, network requirements, number and scope of trials to identify areas of duplication or overlap. Importantly, this will also include the opportunity to test learning across the projects to provide validation of the outcomes;
- Review of the business cases to ensure that the scale and timing of benefits are still appropriate to justify the projects; and
- Review of stakeholder feedback to ensure projects remain relevant and reflective of stakeholder requirements.

All of these factors will be considered collectively by the three project teams to produce a report to the Project Steering Board with a recommendation on how the projects should proceed, as shown below:
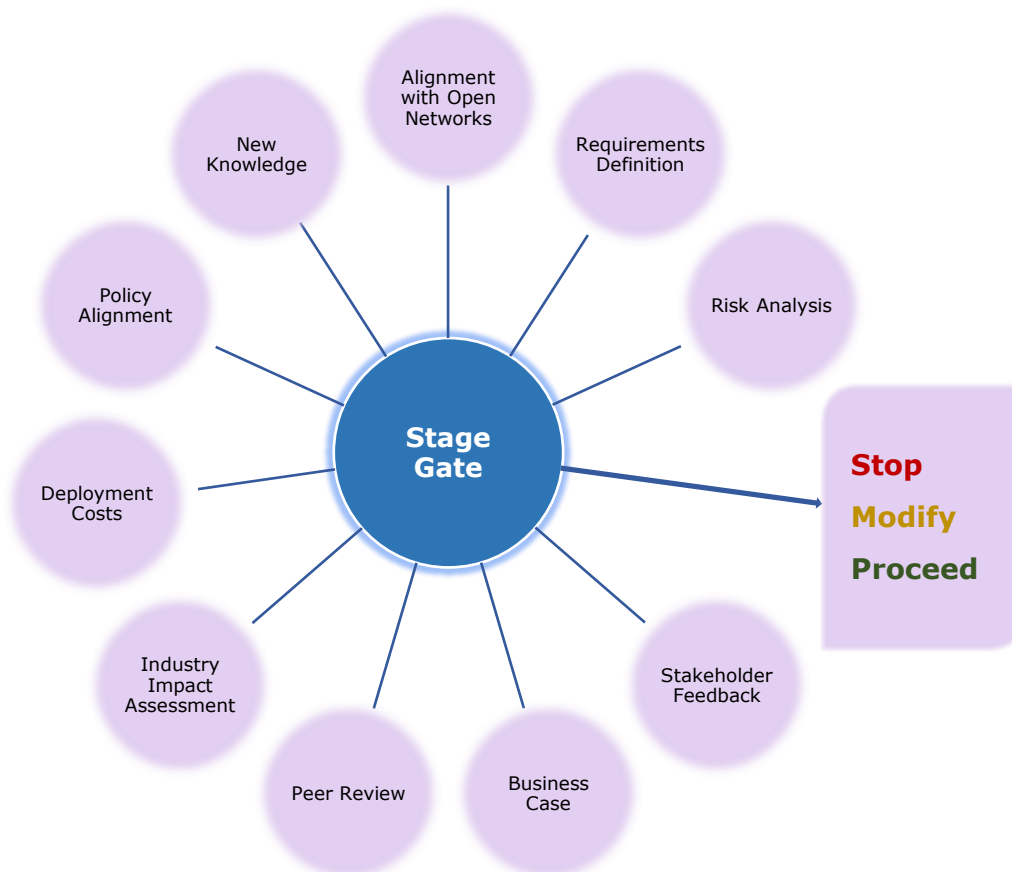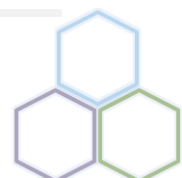

Figure A4.2: T.E.F. Stage Gate factors

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Prior to the report being presented to the Project Steering Board, approval will again be sought from the Open Networks Steering Board. This should allow the project outputs to be shared with BEIS, Ofgem and other key industry stakeholders, to ensure that the projects are still aligned with the wider ON project objectives.

During the Stage Gate process, we will need to demonstrate how the projects have taken on board and responded to the views of key market participants gathered from the stakeholder engagement activities described previously. This will form a key element of the report to the Steering Board and any subsequent recommendation.

At a local level, in the areas we are intending to trial we will need to engage with the local community, local providers of flexibility, renewable developers as well as customers. Potentially this could include other energy vectors such as gas and local government to gain a good oversight from a "whole system" perspective. This will give confidence to the Steering Board that the proposed trials can be successfully delivered to produce the learning in a timely manner.

The Project Steering Board will make a final decision with a recommendation to Ofgem on how the three projects should proceed beyond Stage Gate. This recommendation will then be forwarded to Ofgem for final approval, as shown below:
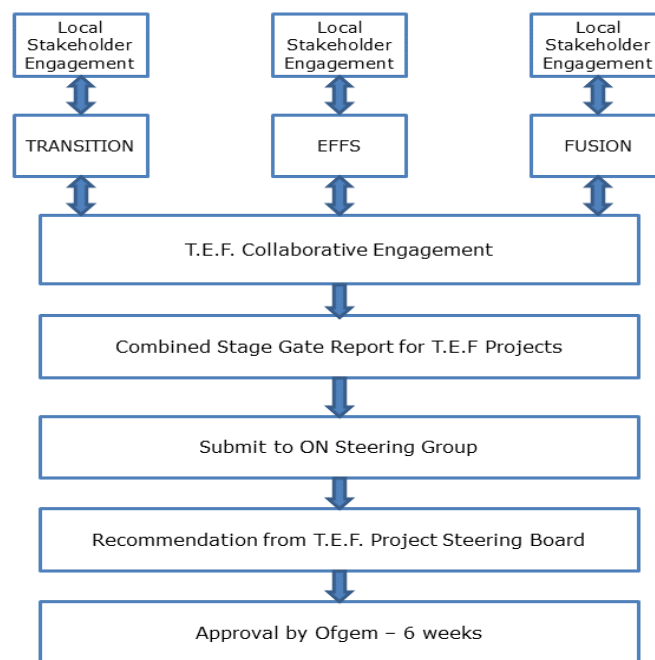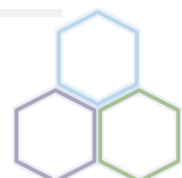

Figure A4.3: T.E.F. Stage Gate approval process

To summarise, the T.E.F. will not proceed unless there are clear benefits for consumers and without a clear consensus from stakeholders, industry and regulators.

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Appendix 5: ENA Engagement

A5.1   Initial Coordination

The three projects recognised the need to take a coordinated approach to external engagement. As many industry bodies and large stakeholders are represented on ENA working groups and projects, it is prudent for the T.E.F. team to engage via the ENA where practicable. While this incorporates all ENA working groups and projects, much of coordination will focus on the Open Networks (ON) project as it leads the transition to a DSO environment which all three projects propose to test elements of.

While the ON project is a separate project, funded from separate sources, it is important to align tasks where possible and directly draw and share relevant learning as it becomes available. To aid the ON workstreams scope their Products for 2018, the T.E.F. team organised presentations for Workstream 1, 2 and 3; the three workstreams we have identified as being most relevant at this stage to the T.E.F. projects (shall be reviewed as ON project develops). These presentations offered an introduction to each of the three projects, highlighting the core similarities or differences and where we foresee the greatest interaction with each workstream. The first engagement with the ON Steering Group saw the same presentation delivered, providing a high-level overview of the core engagement. The proposed methodology requires approval from the ON Steering Group, thus an initial proposal was shared in March 2018 to allow feedback. Formal approval sought at the June 2018 meeting, achieved through a minuted vote with the outcome determined by the majority.

The initial engagement timeline, up to approval of the ENA Open Networks related elements of this document by the Steering Group, is presented in Table 2 below:

Date (2018)	Audience	Title	Description
20th February	Workstream 1	T.E.F. Introduction	Summary of each project and the proposed interactions with the Workstream.
21st February	Workstream 2	T.E.F. Introduction	Summary of each project and the proposed interactions with the Workstream.
22nd February	Steering Group	T.E.F. Introduction	Introduction to the projects and explanation of the approval process.
8th March	Workstream 3	T.E.F. Introduction	Summary of each project and the proposed interactions with the Workstream.
22nd March	Steering Group	T.E.F. Update	Update on progress, with items to be reviewed. Materials circulated one week in advance.
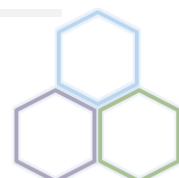
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12th April	Ofgem	Collaboration Document Review	T.E.F. Collaboration Document early review and comments.
16th May	Ofgem	Collaboration Document Discussion	T.E.F. Collaboration Document feedback session.
21st May	ENA	Collaboration Document Review	T.E.F. Collaboration Document early review and comments.
20th June	ENA	Compliance Document Review	T.E.F. Compliance Document review and comments.
21st June	BEIS	Compliance Document Discussion	T.E.F. Compliance Document and approach discussion.
25th June	Steering Group	Compliance Document Approval	Seek approval to submit to the regulator. Materials circulated one week in advance.

Table A5.1: T.E.F. Initial ENA Open Networks and key stakeholder engagement

A5.2   Ongoing Coordination

Following approval from the ON Steering Group and submission of this collaboration document, the three projects will require engagement with the ON project (and other relevant ENA led working groups) on an enduring basis. Several ON Products within Workstreams 1 to 3 are of common interest to TRANSITION, EFFS and FUSION, thus a common mode of interaction will be followed to facilitate efficient engagement. A strawman for engagement is described in this section, yet we realise the need to develop the process with the ENA and so propose a face to face meeting between the T.E.F. Project Delivery Board and the ENA Open Networks Project management to agree the approach. In addition, there will be a single point of contact for T.E.F. which should help ensure effective and economic ongoing engagement. The initial point of contact will be Kyle Murchie, but this role may rotate during the project.

Presently ON have only committed to their workplan for 2018. In subsequent years, the T.E.F. Project Delivery Board shall review the Open Networks Project Initiation Document (PID) and liaise with relevant Product Leads during the scoping phase to feed in cross project learning and facilitate alignment of key inputs and outputs. This will be approved by the T.E.F. Steering Board and ON Steering Group as required on an annual basis.

Steering Group	Advisory Group	WS1	WS2	WS3
23-Jan-18	12-Apr-18	09-Jan-18	10-Jan-18	11-Jan-18
22-Feb-18	04-Jun-18	30-Jan-18	31-Jan-18	08-Feb-18

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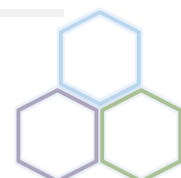
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22-Mar-18	02-Aug-18	20-Feb-18	21-Feb-18	08-Mar-18
26-Apr-18	26-Sep-18	13-Mar-18	14-Mar-18	05-Apr-18
06-Jun-17	04-Dec-18	03-Apr-18	04-Apr-18	03-May-18
25-Jun-18		24-Apr-18	02-May-18	01-Jun-18
26-Jul-18		15-May-18	30-May-18	28-Jun-18
30-Aug-18		05-Jun-18	27-Jun-18	24-Jul-18
27-Sep-18		26-Jun-18	25-Jul-18	23-Aug-18
25-Oct-18		17-Jul-18	22-Aug-18	20-Sep-18
22-Nov-18		07-Aug-18	19-Sep-18	18-Oct-18
20-Dec-18		28-Aug-18	17-Oct-18	15-Nov-18
		18-Sep-18	14-Nov-18	13-Dec-18
		09-Oct-18	12-Dec-18	
		30-Oct-18		
		20-Nov-18		
		11-Dec-18		

Table A5.2: Provisional ENA Open Networks Project meeting dates

ON Advisory Group

TRANSITION, EFFS and FUSION all have their project specific stakeholders, but it is recognised that a number will be common to all three parties. Our approach to engagement with such stakeholders is discussed in the Stakeholder Management section of this document, yet it is important to note that several these also sit on the ON Advisory Group. Therefore, to ensure transparent communication, the Advisory Group will be directly kept updated with progress in 2018. The Advisory Group meets once every two months as shown in Table 3 and the T.E.F. team propose to provide an update at the August and December meetings in 2018 (subject to change following agreement with the ENA ON Programme Director and Project Manager). These presentations shall be approved by the T.E.F. Project Delivery Board and delivered by an agreed suitable representative.

Steering Group

The ON Steering Group forms part of the governance structure discussed in a later section. TRANSITION, EFFS and FUSION should interface with the Steering Group via the ENA ON Programme Director and Project Manager alongside the T.E.F. Steering Board. The ON Steering Group shall receive an update once a quarter in 2018, aligning with the frequency of the T.E.F Steering Board. However, if a clarification is requested or additional presentation, the T.E.F. Project Delivery Board shall lead and seek approval of the presentation by the T.E.F. Steering Board outside of their meetings via a suitable communication method (e.g. email, meeting minutes).

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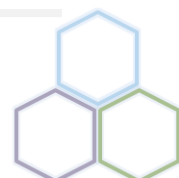
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<u>Workstream</u>

ON Workstream 1, 2 and 3 have been identified as being of common interest to TRANSITION, EFFS and FUSION at this time (we shall review the scope of other workstreams as ON project develops). While core interaction will take place between the Product Leads and T.E.F. Project Delivery Board, there may be a requirement to raise elements with the wider Workstream. This should be led by the relevant Product Lead and incorporated into their update at the regular Workstream meetings. In addition to Product specific engagement, it is recognised that keeping the workstreams regularly updated with general progress is of value. It is intended that this would take place at every fourth meeting, aligning with the quarterly cycle of the T.E.F. Steering Board meetings. The T.E.F. Project Delivery Board would lead and self-approve any information to be shared. The Workstream engagement process shall be developed in partnership with the product *Further Trials to Address Gaps in DSO Functionality* (WS3 P7). This will allow the product team to build on the work carried out by the T.E.F projects, exploring areas not touched by these projects and where further specific verification or validation is required, without duplication.
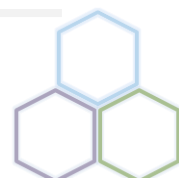
<u>Products</u>

During the monthly meetings of the T.E.F. Project Delivery Board, any proposed new engagement with Product Leads should be presented and reviewed. At this time, the most suitable method shall be agreed as this will vary depending on factors such as the level of engagement, number of interested parties and Product Lead's employer. Once a method is agreed, the ENA ON Project Manager (and Programme where applicable) shall be informed of the proposed engagement and invited to join any meetings or discussions, allowing any implications to be recorded in the ON project trackers. While the associated timeframe should be workable for the larger interactions such as during release of product outputs, consultations or information gathering exercises, it is recognised that in some instances a shorter timeframe will be necessary. In these cases, the project looking to communicate with a Product Lead should circulate an email to the agreed mailboxes for the other two projects and ON mailbox (opennetworks@energynetworks.org) in advance of initiating communication. This email should include brief details of the requirements to allow the other parties to understand whether the information is relevant to their project and if so, in what timeframe.

If TRANSITION, EFFS or FUSION wish to engage with another 2018 Product not specified in the following section, they can proceed without prior approval from the T.E.F. Project Delivery Board, although where possible this should have been raised as an intention at the previous meeting. At the proceeding meeting of the T.E.F. Project Delivery Board the project team should inform the board that such communication has taken place.

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A5.3   Open Networks Product Mapping

The Products of interest to the T.E.F. group are outlined in this section, including a short description of the form of engagement the group estimate based on the 2018 Project Initiation Document (PID) and associated Scope of Works.

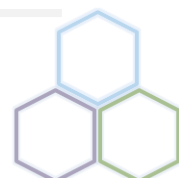<u>Workstream 1 – Engagement with TRANSITION, EFFS and FUSION (T.E.F.)</u>

The products in Workstream 1 where most engagement is required are WS1 P2, WS1 P5 and WS1 P13 as outlined below:

WS1 P2 - DER Services Procurement	
Product Description	Put in place the framework for providing contract visibility, conflict resolution and service optimisation across T&D networks. (Build on 2017 Product 4.) Consider the operational exchanges to schedule and despatch services. - Review key learnings from external & earlier ON activities including the 2017 consultation. - Establish the end-to-end process to roll-out of ancillary services in distribution networks. This should include communications and data transfers. - Establish mechanisms for the efficient shared procurement of services from DER providers. - Establish process to assess and resolve operational conflicts that might arise through flexible DER connections. - Define SO and DSO Products.
T.E.F. Engagement	The three projects aim to use part of the output of this product. As the projects will be trialling software and field based calling of DER services, it is important to follow the base framework developed through ON to maximise the value of the learning and replicability of trialled solutions. The timeframe for output delivery appears to align with the three NIC projects, yet discussion with the Product lead will be required to better understand the dependencies and depth of the output. T.E.F. believes it may be able to feed in learning in the longer term (post 2018) and feed into the 2018 review process ahead of publication.

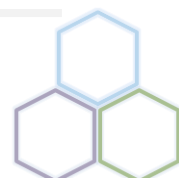# NIC 2017: Compliance Document Appendices

WS1 P5 - Whole System FES	
Product Description	Establish a whole system approach to FES: - Review current forecasting and look for best practice including input from academic research. - Develop and agree guidelines/ common methodology to produce a distribution style FES on a priority basis - per GSP and by region/licence area. - Establish process for FES coordination across T&D
T.E.F. Engagement	All three projects are interested in the output of this product, yet only TRANSITION believes it will actively incorporate the output. TRANSITION is building elements of a long term forecasting model, thus aligning with this product and drawing on some of the outputs could optimise the solution developed for the trial phase. This has the potential to increase the transferability of trialled TRANSITION learning. EFFS and FUSION consider short term forecasting only, but it has been noted that some of the learning may be suitable for either or both of the two projects to adopt. This product will use the outputs for reference and adjust if required, therefore the team suggest that they are notified when the product deliverables are available for early review.

WS1 P6 – Regional Service Requirements	
Product Description	- Define and publish regional service requirements and constraint heat maps. - i. Develop distribution network analysis to inform whole system capability needs - compliment to National Grid SOF, SNAPS - ii. Determine and publish requirements for services across whole system
T.E.F. Engagement	Constraint information is important for the deployment of flexibility services. Tools for sharing geographical information on constraints is of interest to the T.E.F. projects. In particular, FUSION, will consider how networks constraint information can be securely shared, in order to geographically enable flexibility market. Learning from FUSION may be developed in parallel to this product.

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WS1 P13 - Operational Data & Control Architectures	
Product Description	Further develop the architectures and mechanisms for operational data exchange. This will support other products. - Progress work/trials started under Phase 1 Products 5 & 6. Agree standards on operational data exchange. - Review learnings from key projects to date (e.g. RDPs, Innovation Projects) on data exchange & control architecture. - Establish whole system coordination of control schemes and emergency procedures. - Review and agree comms & control architectures for operational data/planning. Consider control room links between DNOs/SO/TOs and agree what protocols and systems should be established for GBSO / DNOs / DERs.
T.E.F. Engagement	In this product, the outputs developed will be assimilated by all three projects. As the projects will be trialling software and field based calling of services, it is important to follow the base control architectures and data exchanges developed through ON to maximise the value of the learning and replicability of trialled solutions. None of the T.E.F. projects foresee much opportunity to feed into this product in 2018, but once trials are complete, learning should be able to help direct successors to P13 in later years.

Table A5.3: Workstream 1 ON Product mapping

### Workstream 2 – Engagement with TRANSITION, EFFS and FUSION (T.E.F.)

The products in Workstream 2 where most engagement is required are WS2 P3 and WS2 P4 as outlined below:

| **WS2 P3 -** Explanation of 'Terms' & 'Definitions'	
Product Description	Produce a document that explains commonly used terms such as 'firm' and 'non-firm'. This would be published and used by network operators going forward to provide greater clarity for customers. *Note - this product needs to be aligned with Workstream 1 Products 10 and 11 on Facilitating Connections.*
T.E.F. Engagement	There is a need for clarity among all parties working towards the DSO transition. T.E.F. would like to use terms consistently with Open Networks and each other and so are interested in receiving this information when it is available. It is likely that the projects will come up with additional terms to be defined and can feed
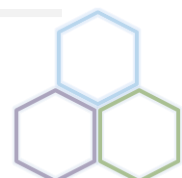
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	these back to the workstream product leader. T.E.F. request for the T.E.F. representatives to be notified when deliverables are available.

WS2 P4 - Information on Flexibility Services	
Product Description	– Review how information should be provided to customers on potential DNO requirements for flexibility services. Agree good practice. To Include: - Review and agree good practice for how DNOs signal flexibility requirements to developers and suppliers. - Consider information channels (including the production of heat maps) for flexibility services. - Explain how GBSO and DNO requirements are aligned (or how they differ) in the procurement of flexibility services. This work should address stakeholder observations that network operators are silent as to where on networks there may be value in siting storage or other flexibility services. *Note - this product needs to be aligned with Workstream 1 Product 6 on Regional Service Requirements.*
T.E.F. Engagement	All three projects see this as being an important input to their project and also something that they could potentially inform. To ensure that T.E.F. development reflects good practice, we request that information is provided to T.E.F. at the earliest opportunity, ahead of the publication of outputs via the ENA website. T.E.F. additionally requests 1) a copy of the programme of work for this package to be reviewed 2) to feed in to the development of the consultation audience - circa June/July

Table A5.4: Workstream 2 ON Product mapping

Other products within Workstream 2 are either not seen as relevant to EFFS due to their focus on new connections or are of interest to T.E.F. but there is no need for any special engagement and the projects expect to follow progress via the ENA website.
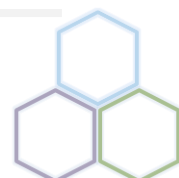
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Workstream 3 – Engagement with TRANSITION, EFFS and FUSION (T.E.F.)
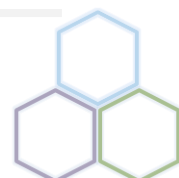
The products in Workstream 3 where most engagement is required are WS3 P1, WS3 P3, WS3 P4, WS3 P7 and WS3 P8 as outlined below:

WS3 P1 - SGAM Modelling of DSOs and DER Procurement	
Product Description	Future DSO Model SGAM Frameworks & Analysis (Continued from Phase 1). - Complete analysis of initial 3 market models for DER Services started in Phase 1. - Dissemination of SGAM modelling and report. Note - this product will draw on Workstream 1 Product 2 work on DER Service Procurement. The work should also take account of the T-D Gap Analysis carried out as part of Workstream 1 2017 Product 2. Further market models for DER Services are covered in Product 2.
T.E.F. Engagement	The T.E.F. requires the ON SGAM models for each project individually; the requirement for the SGAM modelling in relation to each project varies for each DNO. - Project TRANSITION is expected to use one of the SGAM model presented, however it is not solely reliant upon these, as is in coordination with Northern Power Grid Customer-led distribution network model. - FUSION will complete SGAM modelling of FUSION, which could be viewed as an unofficial 5th model. FUSION will align USEF with ENA model definitions. Commonalities between the models will be identified and indicate to DNO businesses critical investments. - EFFS expects to use processes that reflect the market model for joint procurement and dispatch or possibly the market model for DSO coordinated dispatch and would therefore require access to the relevant SGAM models. - The outputs of the T.E.F projects provide a means for trialling and comparing models, so there is potential for T.E.F to engage in the future with the ON and disseminate learnings/comparisons/lessons learned. - T.E.F to be informed of future models (if any), each DNO seeks to develop platforms such that any model can be rolled out, hence FUSION's alignment to SGAM definitions.

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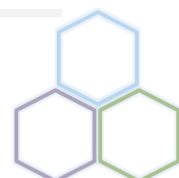| WS3 P3 - Market Agnostic DSO Elements	
Product Description	Complete Assessment of "Market Agnostic" DSO elements of DSO functionality such that no regrets DSO implementation actions can be identified and brought forward. - Identify "market agnostic" elements of DSO functionality and agree plan to progress "no regrets" DSO actions. - Follow through 'no regrets' action plan Supports Objective 5 *Note – this work should take account of the T-D Process Gap Analysis carried out as part of Workstream 1 2017 Product 2.*
T.E.F. Engagement	Outputs from market agnostic DSO elements will feed directly into T.E.F IT development and public consultation for each project. - T.E.F. requires timeline of work package product at earliest convenience such that it can feed into individual work packages.

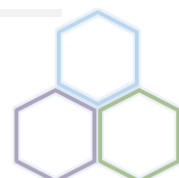| WS3 P4 - Independent Review of DSO Models incl. CBA	
Product Description	Commission and support an independent assessment of the transition to different DSO models. As well as cost benefit analysis (CBA), this should include dimensions such as UK/EU regulatory compliance, sustainability, customer satisfaction, complexity, Smart Network indicators and impacts on vulnerable consumers. The assessment is intended to compare models and underpin regulatory impact assessments. - Develop draft CBA & decision criteria including elements to be included in P5 consultation. - Tender for and select consultant. - Establish scope & methodology for CBA. Consider if this is better based on key enabling elements for DSO or on full DSO models. - Carry out assessment for relevant DSO models.
T.E.F. Engagement	Under T.E.F, TRANSITION and FUSION are to coordinate CBA activities where possible and remove duplication of project CBA in Stage Gate review. A common CBA to be used between ENA, project FUSION and TRANSITION, this will allow for direct assessment and comparison of models including USEF FUSION model.

NIC 2017: Compliance Document Appendices

WS3 P7 - Further Trials to Address Gaps in DSO Functionality	
Product Description	Identify and initiate further trials to address any gaps. This will look to utilise ongoing projects including those approved as part of the 2017 NIC competition that will be aligned through the ON project - FUSION, Electricity Flexibility and Forecasting System and TRANSITION. If necessary, further projects would also be considered. - Further proposals if required including initial NIC submissions. - Additions to ongoing projects and preparation of further project proposals. - Take forward industry trials (possibly NIC funded). - Identify and scope further trials following CBA results. Supports Objectives 4 & 6
T.E.F. Engagement	T.E.F. to feed in project activities, trials, outputs and assessments collectively so that product can derive the gaps. This will assist the product team identify further potential NIC projects, additions to the existing portfolio projects (NIA or BAU) and where the outputs of the T.E.F. projects can be taken further to add additional value. In addition, Workstream engagement will be aligned with this product to promote transparency and limit duplication.

WS3 P8 - Preferred DSO Models & Proposed Implementation Plan	
Product Description	Draw on earlier work to determine elements of DSO Models that have been agreed by network operators & Stakeholders and develop and propose a potential Implementation Plan. - Reach decision on agreed DSO functionality to be progressed. - Update DSO Roadmap and propose a potential implementation plan for agreed DSO functionality. Supports Objective 6 Note – the implementation plan is likely to cover DSO functionality for DER services. Any input to policy makers for regulatory change or Implementation would be part of Phase 3.
T.E.F. Engagement	T.E.F. will feed into product such Open Networks can incorporate T.E.F. outcomes.

Table A5.5: Workstream 3 ON Product mapping

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Appendix 6: Stakeholder Engagement

A6.1   Coordination

Stakeholder engagement and collaboration is an area early identified as having multiple common aims and objectives across all T.E.F. projects. It was agreed that the larger industry-wide events should be combined where timings allow, and that smaller localised events should continue as planned and be led by the relevant party.

Common graphics and consultations were also discussed as being key enablers for effective coordinated stakeholder engagement. Combining the three projects together under a single banner and ensuring each of the individual project websites recognises the input of the others by including brief introductions and links to the project websites has been agreed. Additionally, any consultation will be issued through the ON Project as part of their engagement plan to reduce stakeholder fatigue and prevent duplication in consultation topics.

Other topics of stakeholder related collaboration include stakeholder forum, common industry bodies, supplier engagement, conferences and collaboration efficiency.

While national events have been discussed between the three projects as common interest events, there will be other forms of engagement such as emails and mailers, which the T.E.F. will align. Those issued to stakeholders within individual trial areas can be separate, but it has been recognised that wider industry stakeholders would benefit from a coordinated approach.

Public Consultation

The T.E.F. will share public consultation at national events highlighted in Table A6.1, collaboration at these events will reduce costs to the T.E.F. but also ensure that public consultation conveys concise project and strategic information on behalf of all three projects. This will ensure that the same information is not communicated individually by each project. To ensure alignment with the wider ON project, the T.E.F is seeking from the ON Steering Group that collaborative project materials can be issued via the Open Networks Project.

There will also need to be project specific engagement activities for local stakeholder and individual project specific issues. These will be delivered individually by each of the projects as appropriate. It has been noted that any learning/key issues raised locally, will be able to be raised through the individual projects to the T.E.F. and disseminated to any wider national stakeholders if required.
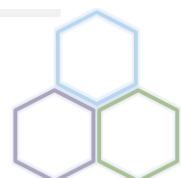
Common Graphics

The three DNOs agreed to produce a brand that captured a common theme and made the T.E.F identifiable in a single graphic brand (for presentations, published documentation, common website etc.). All DNO projects agreed the value in this as

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a means of demonstrating the collectiveness and collaboration efforts and common aims across the three projects. A common proposed graphic is illustrated below, with a DSO theme, of interconnectivity to the individual project and the projects together representing collaboration between the DNOs. All the main colours of each DNOs brand have been incorporated appropriately.
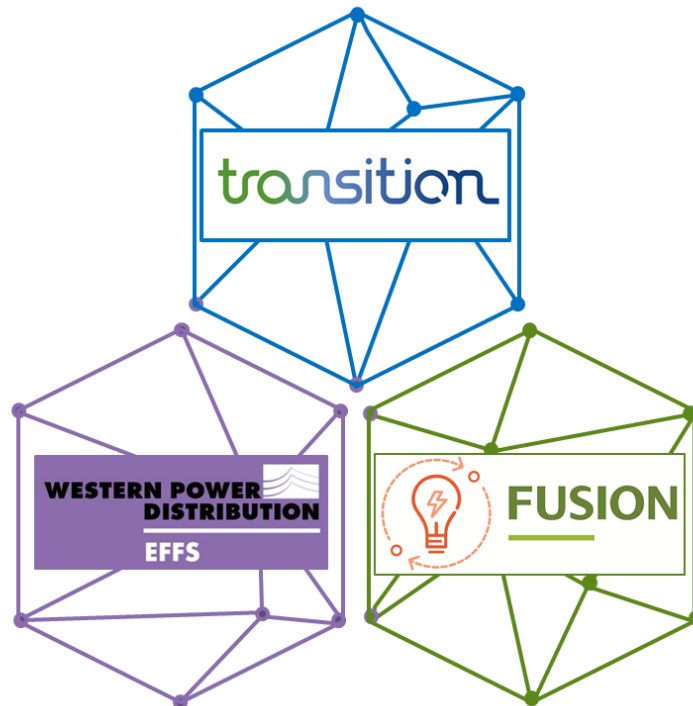

Figure A6.1: T.E.F. common graphic

Stakeholder Forum (GDPA issues, common publication)

A stakeholder forum will be established that will sit on issues associated to the T.E.F. or individual project issues that need to be escalated as means of knowledge dissemination. Each project will run an initial stakeholder event, at which stakeholders will be formally asked to agree to receiving updates via the T.E.F. route, removing the duplication of information sent from three projects. This list will form the base stakeholder invite list for collaborative events. The T.E.F. projects will arrange a shared mailbox for stakeholder updates and event coordination. This will form the basis of the stakeholder forum.

Level of confidentiality: **Public**

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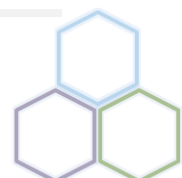
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Industry Bodies

All projects shared common additional industry bodies with documented region-specific bodies also highlighted. The following industry bodies have been identified and split into categories of how coordination engagement will occur. Those that will be informed directly by the T.E.F. (likely through national stakeholder events or additional attended conferences) those that will be informed via the ENA ON advisory group, and those industry bodies that are to be coordinated engagement as participants specifically to the T.E.F. projects.

Industry bodies to be informed directly	Industry bodies to be informed via the ENA ON advisory Group	Industry bodies requiring coordinated engagement as participants
OFGEM	Competitive Networks Association	ENA Open Networks
BEIS	Energy NGOs	Aggregators
ADE	House Builders	Elexon
Electricity Storage Network	National Citizens Advice Bureau	National Grid (NETSO)
Energy UK	Scottish Government	Suppliers
Software System Suppliers	Scottish Enterprise	
Hardware Suppliers		
Academia & HubNet		
ElectraLink		
Telecoms Companies		
Other DNOs		
National Grid (TO)		
Power Responsive		
IET and technical institutions		
Future Power System Architecture (FPSA)		

Table A6.2: Industry Bodies

Level of confidentiality: **Public**

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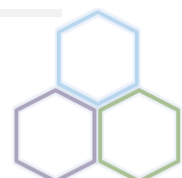
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Supplier engagement

Suppliers will be engaged during specification development phase of the T.E.F. projects. Alignment of programmes such that the specification phase runs concurrently across the three projects will allow for clearer and earlier engagement with suppliers, allowing T.E.F to capitalise on time-saving and possible reduction across procurement through collaboration. This is a potential area for collaboration specifically for projects TRANSITION and FUSION, which both will carry out IT platform specification, tendering and procurement activities.

Conferences

The group has agreed to coordinate attendance and presentation at conferences where applicable. The conferences identified include:

- DNO led events (e.g. T.E.F. presenting at WPD hosted Balancing Act on the 20th June 2018)
- ENA Dissemination events
- Low Carbon Networks and Innovation (LCNI)
- Cigre
- Research groups
- National Grid Events
- UK Energy Research Centre
- Energy Systems Catapult
- Energy UK events
- All Energy
- IET events (DSO related)

Website Commonalities

To demonstrate the close link between ON and T.E.F. it is proposed that T.E.F. will have a common information page on the ENA ON Project website with links to individual project details and documentation. While each project will have its own website or webpage, each will recognise the input of the other projects by including brief defined introductions and links to the project websites, including the ENA ON Project website.
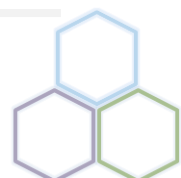
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Appendix 7: System Operator engagement

During project development, each of the three projects had separately approached the system operator (SO) to discuss engagement with their project. The SO is recognised as a key stakeholder for each project.

To ensure a collaborative approach and minimise the resource requirements the T.E.F. projects have developed a table showing areas of shared engagement with the system operator. This table is shown below and has been shared with the SO.

Additionally, the projects recognise that the SO will bring valuable knowledge to the T.E.F. projects through learning gained in numerous other innovation projects. The recently published Electricity System Operator Forward Plan 2018/19 outlines their approach and presents initiatives which form good triggers for discussion post progression decision from the regulator.

	Requirement (days)				Resource Year					Can be shared ?
	T	E	F	Total	2018	2019	2020	2021	2022	
Forecasting										
Learning from how NG did their forecasting	1	1	1	1	✓					Y
Review scope of forecasting work before issuing tender	-	1	-	1	✓					N
Investigate blended forecasting	-	5	-	5	✓	✓				N
Local FES input	1	-	-	1	✓					N
Conflict Avoidance										
Review of scope of academic partner's work and review of academic partner's output	-	2*	-	2		✓				N
Provide info on timescales for resolving conflicts for various services	0*	0*	0*	1	✓	✓				Y

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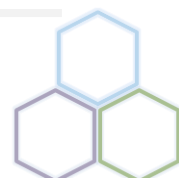
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Flexibility register interfaces	-	-	1	1	✓					N
Implementation of conflict avoidance across services	2	2	2	2		✓				Y*
CBA of conflict avoidance options	1	1	1	1		✓				Y
DSO Functional Requirements Specification										
Confirmation of data exchanges - Conflict avoidance - Other data exchanges Could inform selection of market models	0*	5	5	5	✓	✓				Y*
DSO Technical Requirements Specification										
Data exchanges	5	5	5	5		✓	✓	✓	✓	Y**
Platform/System build phase										
Involvement in integration testing	10	10	10	30		✓	✓			N
Trials										
Involvement in testing functionality	21	7	21	49			✓	✓	✓	N
Original Total	**47**	**40**	**47**	**134**						
Collaborative Total				**104**						
Saved Days				**30**						

Table A7.1: System Operator resource requirement

*And or via the ENA Open Networks Project
**And via the Power Potential project run by UK Power Networks
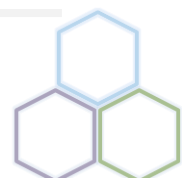
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Appendix 8: Forecasting

A8.1   Forecasting Requirements and Scope

The forecasting work packages within the three projects having differing objectives, with differing outputs and differing forecasting time horizons. As described in the main document, EFFS is looking at developing fundamentally new forecasting algorithms from first principles, primarily to support network operation, whilst FUSION and TRANSITION are looking to use existing products to provide forecasting functionality within a wider market platform, as shown in Table A8.1 below.

| Project	Forecasting use
TRANSITION	Used to implement ENA DSO models Used to assess dispatch requirements Used to assess investment decisions
EFFS	Used to plan and execute operational deployment of flexibility
FUSION	Used to iteratively assess aggregator forecasts prior to dispatch Used to develop baseline (counterfactual event)

Table A8.1: T.E.F. forecasting scopes.

Similarly, the projects are looking at forecasting over differing timeframes as outlined below in Table A8.2.

Project	Operational (day ahead)	Week ahead	Investment timescales
TRANSITION	✓	✓	✓
EFFS	✓	✓	
FUSION	✓	✓	

Table A8.2: Forecasting Time Horizons

Each project must also interface forecasting technical functionality with existing, new and legacy IT systems. Naturally, this means that forecasting interface requirements are likely to vary between projects, and a singular systems approach carries significant interdependency risks.

However, where requirements are being developed and assessed within the projects, the ongoing dialogue between the T.E.F. projects will ensure that this is done in a coordinated and aligned manner. This will enable assessment and comparison of the learning outputs to share best practice for DSO needs, thereby reducing the investment risks and facilitating a least-regrets investment appraisal. For example, the draft scope for the EFFS forecasting work has been shared with TRANSITION,
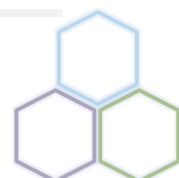
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FUSION and with the Product Lead, who is leading the most relevant Open Networks product in relation to forecasting, Workstream 1, Product 5.

A8.2 Forecasting product delivery and outcomes

Given that the three projects have differing objectives, they have differing approaches to delivering the forecasting elements of the project.

EFFS

The EFFS Project is designed around forecasting and software functionality, with the outputs primarily being aimed at the operational deployment of flexibility. Within the early stages of the project, development of forecasting algorithms will be procured through tendering to academic institutions. It is intended that these algorithms are designed to go beyond the existing methodologies, such as regression analysis, which have already been used in earlier innovation projects (Equilibrium, 2015-2019). Instead, academics will be encouraged to investigate novel approaches, such as machine learning, or using novel data sources to develop forecasting algorithms, which will then be tested, validated and analysed on network models for a range of geographies and network topologies. The latter part of the project will see the remainder of forecasting system development being carried out by EFFS Project Partner, AMT-Sybex. In response to a challenge on the degree and cost of development work for forecasting these elements have been subject to further assessment. The budget for the work outsourced to the academic partner was found to be in line with or significantly less than the proposed budgets for third party NIA bids for forecasting work with a similar scope. This was also the case for a recently registered NIA project by National Grid which relates to forecasting.

The scope of this work includes determining;

- the best methods to create forecasts at operational timescales
- the required data items required as inputs to the forecasts
- whether blending these forecasts with other forecasts, such as those generated by National Grid using a different methodology results in higher levels of accuracy
- whether forecasts for time periods several hours ahead can corrected and updated using real-time data rather than re-running the whole forecasting process

This is expected to be entirely transferable knowledge relevant not only to FUSION and TRANSITION projects but to other DNOs, aggregators, the system operator etc. This element of the work would be funded by the customer less the compulsory levels of contribution.
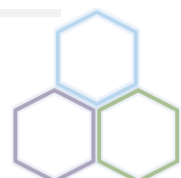
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The academic work will determine how best to create forecasts but will not provide the software required to generate the forecasts or to integrate the forecasting inputs and outputs with the software providing other DSO functionality. Therefore, there is additional development work planned by AMT-Sybex to;

1. Interface with the data sources required to support forecasting
2. Calculate the forecasts using the methodology established by the academic partner
3. Provide the resulting forecast data to the software modules where it is required for network analysis.

This is a minimal level of functionality required to support the testing of the DSO systems as a whole.

Item 1 is likely to be DNO specific reflecting their own means of storing historic load and generation data. Item 2, is likely to reflect the degree of complexity in calculating the forecasts. If this is relatively simple development, then this would favour some custom development of AMT Sybex software. However, if it were more complex, then it would suggest integration with a third party mathematical software package would be more cost effective. The way in which third party software had been integrated would potentially be of use to other projects, as that would be replicable. Item 3 is also likely to be system specific. In the case of the AMT-Sybex software the forecasting module would integrate with another module in the suite for network analysis. This system specific element of development, with outputs that are harder to replicate in other projects and that enhances the AMT software suite, is part of the development work funded by the large voluntary contribution to the project by AMT-Sybex of just under a million pounds. The costs are expected to be in the order of £300k, which are comparable to the budgets for FUSION and TRANSITION.

TRANSITION and FUSION

Concurrently, TRANSITION and FUSION will develop requirements and specifications for a forecasting module which will be developed as part of the NMF Platform. From the work to date, SPEN and SSEN feel confident that, it should be possible to secure a forecasting software solution that is capable of meeting the needs of the two projects from existing industry suppliers. However, the project timescales will ensure that the forecasting algorithms developed in the early part of EFFS will l be made readily available for TRANSITION and FUSION to include in tendering packages if this is appropriate. This twin track approach with continuous engagement has the potential to accelerate the development of forecasting capabilities, whilst minimising the interdependency risk. This will give TRANSITION and FUSION additional options for procurement of a forecasting system, whereby suppliers may opt to use their exiting forecasting algorithms or utilise those developed by EFFS.

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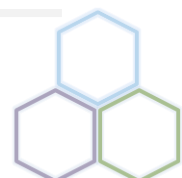
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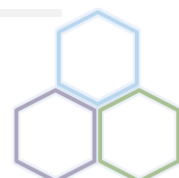| Project	Forecasting algorithms	Forecasting and modelling software
TRANSITION	Tendered as full system	Tendered – EFFS algorithms available
EFFS	Academic tendering	Developed by project partner
FUSION	Tendered as full system	Tendered – EFFS algorithms available

Table A8.3: T.E.F. forecasting procurement

The use of forecasting is different in each T.E.F. project. TRANSITION and FUSION will procure forecasting systems through a competitive tendering exercise. Each system will be required to interface and function on a bespoke basis. As specifications are being developed through the project, joint procurement cannot and should not be committed to at this early stage.

TRANSITION and FUSION have, however, elected to coordinate procurement strategies and timelines. This means that suppliers will be able to tender in both activities at the same time, reducing supplier fatigue. Similarly, the approach and specification development will be shared where appropriate. Procurement activities will be coordinated wherever possible.

To fulfil organisation-specific requirements, policies and procedures, procurement must be independent. Notwithstanding, in the event of a supplier winning both tendering exercises, TRANSITION and FUSION will assess the possibility of negotiating a discounted supplier rate, subject to procurement regulation. It is too early to commit or quantify the potential value of any savings that may materialise in this area, as it is caveated by numerous other potential outcomes.

A8.3   Development of Common metrics

EFFS will develop forecasting assessment metrics early in the project. TRANSITION and FUSION commit to using the same forecasting metrics produced by EFFS to determine requirements, build specification and evaluate the accuracy and precision of forecasts for the projects. This will allow the T.E.F. projects to validate inter-comparisons of forecasts within the projects, assimilate best practice, and share the learning in a consistent and easily digestible manner.

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A8.4   Supplier management

TRANSITION and FUSION will both engage and consult with the supply chain during the specification development of forecasting systems. This activity is designed to ensure that suppliers are capable of undertaking required tasks, and will guide the development of specifications where appropriate.

TRANSITION and FUSION will undertake supplier management in a coordinated manner. This includes the sharing of supplier engagement events and pre-qualification status where appropriate.

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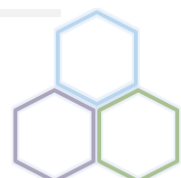
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Appendix 9: Trials

A9.1   Market Model

Our collaborative approach to Stakeholder Management as described previously, as well as the use of common language, will allow all stakeholders to understand and have confidence in the outputs from trialling a number of market models, and the ways in which they and other stakeholders may be able to participate. Each of the projects will approach both the identification of market models in a different but complementary way.

TRANSITION

TRANSITION's approach will be to determine which of the market models currently under development by ON they will utilise at an early stage in their project, and will ensure that whichever market model is chosen will not unnecessarily duplicate the learning outcomes from those being trialled on the other two projects. The progress made by Open networks in the development of DSO Worlds has helped the project commit to the removal of a trial.

EFFS

EFFS trials are limited in scale as they hope to build on learning already generated by related projects. They therefore focus on proving that the software performs the functions as required and that the assumptions underlying the market model implemented are valid. The EFFS trial was designed to be the minimum in terms of time and extent to achieve the learning objectives, and customer scope is minimised to ensure value for money. The learning objectives for EFFS do not include validating or comparing a market model, or customer recruitment (by using existing resources within NIA projects). EFFS is most likely to reflect the market model B, Joint procurement and/or dispatch, and this will be confirmed in the design phase. Model B is compatible with the approach taken by the Cornwall Local Energy Market/Visibility Plugs and Socket project and project Entire, which will maximise the chances of reusing these customers or market platform for EFFS. EFFS will use the SGAM model produced by Open Networks to inform the required functions and inputs/outputs. Within the design phase, working closely with Open Networks WS3 Product 3, EFFS will prioritise development of market agnostic elements of DSO systems.
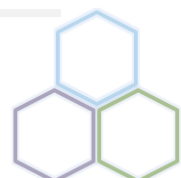
FUSION

FUSION will develop, trial and evaluate the USEF framework as a model for accessing flexibility in the distribution network. The USEF model in part reflects elements of the joint procurement ENA model, and elements of the price driven flexibility model. This is because of the role of the aggregator, who has visibility of multiple parties wishing to procure flexibility, facilitating a parallel dispatch. Concurrently, a process of open competitive bidding for flexibility services will drive a market approach to where and

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how flexibility is dispatched. FUSION will undertake trial specifically reflecting network constraint management in the East Fife distribution network.

A9.2 Trial Location

Each of the three projects will vary in the application of the proposed models in different trial areas, yet this approach enhances the learning when achieved through a coordinated delivery plan.

TRANSITION

TRANSITION will select preferred trial areas early in the project as described in their work packages; in addition to the considerations outlined in the original bid submission, TRANSITION will also select a location(s) which enable the delivery of most beneficial outcomes from all three projects. Discussions during the meetings outlined previously have recognised that there is a benefit to trialling different market models in similar network locations, to enable a more direct comparison of the results. TRANSITION also recognises the benefit of testing solutions in different networks but will now rely on learning from FUSION and EFFS in addition to some desktop based support from partners ENWL.

EFFS

EFFS intend to use locations associated with previous projects in Cornwall or the East Midlands to minimise the cost of recruiting customers.

FUSION

FUSION has identified their preferred trial area of East Fife. It is understood that this region provides a sufficient diversity of customers and a sufficient load profile to meet the needs of the project. Significant efforts have already been undertaken to garner participant interest in the trial, not least through large industrial customers and social housing organisations. Further, project partners Fife Council, the University of St Andrews, SAC Consulting, and Bright Green Hydrogen will all support trial management and local stakeholder engagement. FUSION will quantify the true level of flexibility in the region within the project to facilitate a trial. This will include generation, load and storage.
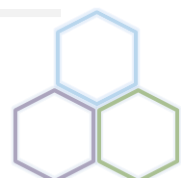
A9.3 Outcomes

The combined experience of all DNOs involved in the three projects has led us to expect that, as market models are deployed, we will learn from "actual" experiences and be able to match those to the expected outcomes set out at an earlier stage in each of the projects, as well as identifying any unintended or unforeseen consequences that may arise.

The transition to a DSO model represents a complete change in operation for the entire network including all DNOs, TOs, SO, service providers, customers and

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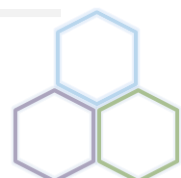Printed in black and white and only if necessary.

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stakeholders. The deployment of multiple trials to test various market models and network types is essential to adequately understand and prepare for this transition. The governance process as outlined, including the reporting of outcomes to the Open Networks project and collaboratively to stakeholders, will ensure that the risks and opportunities of this change can be understood by all.

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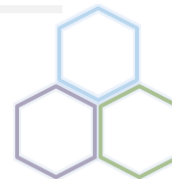Printed in black and white and only if necessary.

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Appendix 10 Learning Objectives

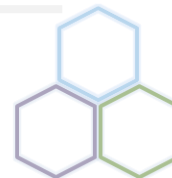|	TRANSITION	EFFS	FUSION
DSO functions	TRANSITION will determine the range of DSO functions that need to be supported in operational timescales by reference to the ENA Open Networks Project outputs and learning from other relevant industry projects. This builds on the Smart Grid Architecture Models for the DSO Worlds to be trialled by TRANSITION.	EFFS will determine the range of DSO functions that need to be supported in operational timescales by reference to the ENA Open Networks Project outputs and learning from the Cornwall Local Energy market. This builds on the Smart Grid Architecture Models for the DSO Worlds to be trialled by EFFS.	USEF is an established DSO model in Europe. FUSION will demonstrate USEF as a means to undertake DSO functions to UK requirements.
Data exchanges	TRANSITION will implement the data exchanges as specified in the SGAM work carried out by the ENA Open Networks Project. It will identify the data exchanges informed by Open Networks for DSO functions, map this against current technology (service provider) capabilities, and develop requirements for future technologies. A functional specification for connectivity model, data exchange and governance requirements will be created.	EFFS will implement the data exchanges as specified in the SGAM work carried out by the ENA Open Networks Project. Consider the use of the Common Information Model for referencing network locations. Determine whether sharing of forecasts is via market platforms or other means. It will examine factors affecting the timing of data exchanges and how effectively data exchanges can reduce conflicts in the use of flexibility resources.	Using the common language and standards of USEF to implement data exchanges

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	TRANSITION	EFFS	FUSION
Market model contingent data exchanges	TRANSITION will identify the data exchanges informed by Open Networks for DSO functions and compare for the market models to be trialled. Learning will include an understanding of which data exchanges are most critical to the DSO Models trialled and where external factors such as network type influence requirements. The project will also look at the cost and complexity of each data exchange implemented, highlighting if learning shows a market model could operate more economically with inclusion or removal of a data exchange.	EFFS will support the requirements of the SGAM work, but also support the data exchanges associated with the Cornwall local energy market / project ENTIRE to enable the participation in the trial. Learning will include the similarities and differences between these exchanges and those for the non-implemented SGAM market models.	USEF is an established trialled framework and will provide an international common standardised framework by its definition of products, market roles, processes and agreements; specifying data exchange, interfaces and control features. The framework turns flexibility into a tradable commodity for all market participants, and makes available a range of services to stakeholders requiring demand-side flexibility. Data exchanges with external parties will include the exchange of forecast data between aggregators and the DSO; the DSO and a cloud based market platform; settlements with flexibility providers/aggregators.
Flexibility trading services	TRANSITION will learn via demonstration how flexibility can resolve congestion management and be a viable alternative to network reinforcement. The project will explore a breadth of technology solutions to deliver an efficient solution, using	EFFS will confirm the degree to which the DSO functions defined and implemented in the software support the business requirements for flexibility services i.e. to identify requirements, optimise procurement and despatch services. Learning will include aspects	FUSION will learn via demonstration how flexibility can resolve congestion management under a N-1 scenario. FUSION will develop product descriptions for other flexibility products including voltage management and LV flexibility.

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|	TRANSITION	EFFS	FUSION
	existing, proven technology where this can deliver the requirements and considering new technologies which can deliver a more efficient solution. Learning should inform how to reduce the barriers for new technologies such as Internet-of-things devices and peer-to-peer trading.	such as the optimum network groupings for assessment and operation, the methodologies for optimising service selection, factors that may affect scalability, and the potential contribution to ER P2reliability from flexible resources.	
Technical requirements	TRANSITION will integrate with existing IT and communications infrastructure where practicable to replicate and ultimately enable a later transition to BaU. Interface specifications will be developed in the early stages of the project.	EFFS learning will include the options for technical implementation, e.g. which systems will EFFS integrate with and how will integration be achieved.	FUSION will integrate with existing IT and communications infrastructure where practicable to replicate and ultimately enable a later transition to BaU. Interface specifications will be developed in the early stages of the project.
Security arrangements	TRANSITION will demonstrate the secure sharing of information regarding constraint geographic location; tendering of flexibility and settlement. Market platform will be tendered and fulfil SSEN cyber security specification as well as UK legislation.	EFFS will generate learning by determining, implementing and testing the required security features.	FUSION will demonstrate the secure sharing of information regarding constraint geographic location; tendering of flexibility and settlement. Market platform will be tendered and fulfil SPEN cyber security specification as well as UK legislation.

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	TRANSITION	EFFS	FUSION
Market platform integration	SGAM will use a market platform, for the trial this will be maintained by SSEN, however will retain optionality for future management.	EFFS will integrate to existing market platforms i.e. that for the Cornwall Local Energy Market and for Entire. Learning will include the costs and issues associated with adapting to different platforms.	USEF will use a market platform, for the trial this will be maintained by SPEN, however will retain optionality for future management.
Forecasting timeframes	The TRANSITION trial architecture will provide the participating DSOs with short-term and near real-time forecasting capabilities that will enable them to understand the likely demands on their networks. TRANSITION will also draw on existing forecasting capabilities for the medium-term (one to four years ahead of delivery) and long-term (more than four years ahead of delivery) to refine forecasting requirements and methods for operating as a DSO.	EFFS will create different forecasts at different timescales for different purposes. Forecasts up to six months ahead will allow for additional purchasing to top up the services purchased on a longer term basis. Shorter term forecasts will be used to arm and dispatch services. EFFS will assess the accuracy of different methods at different timeframes.	FUSION will demonstrate forecasting at operational timeframes (day/week ahead).
Forecasting data requirements	TRANSITION investigates near real time forecasting. The project will examine whether input data is available at higher resolution and whether higher resolution forecasts add value.	EFFS starts with the assumption of half-hourly forecasting. The project will examine whether input data is available at higher resolution and whether higher resolution forecasts add value.	Forecasting will be at half hourly intervals with data received on a daily basis.

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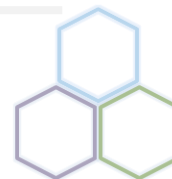
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Appendix 11 NIC Criteria

The full submissions for the three projects were judged against the following criteria.

> A. *Accelerates the development of a low carbon energy sector and/or delivers environmental benefits whilst having the potential to deliver net financial benefits to future and/or existing Customers;*
> B. *Provides value for money to electricity customers;*
> C. *Generates knowledge that can be shared amongst all relevant Network Licensees;*
> D. *Is innovative (i.e. not business as usual) and has an unproven business case where the innovation risk warrants a limited Development or Demonstration Project to demonstrate its effectiveness;*
> E. *Involvement of other partners and external funding;*
> F. *Relevance and timing; and*
> G. *Demonstration of a robust methodology and that the Project is ready to implement.*

This section considers how the revisions to the projects after the collaboration work would affect the assessment under each criterion. This demonstrates that the trio of projects continue to meet the criteria but that the overall position has improved.

Criterion A

Accelerates the development of a low carbon energy sector and/or delivers environmental benefits whilst having the potential to deliver net financial benefits to future and/or existing Customers.

Impact: The revisions to the project have not affected their core objectives and therefore the projects will continue to pave the way for DSO transition. This in turn will enable DER such as renewables and storage to connect to the network and for network operators to avoid or defer reinforcement, where appropriate, delivering financial benefits to customers.

Criterion B

Provides value for money to electricity customers.

Impact: The performance of the projects against this criterion has improved as a result of the co-ordination activities. As well as the net financial savings, there have been additional co-ordination costs that that projects have agreed to bear without an increase in budget. Collaborative activities are also likely to lead to an increase quality of the outputs and also have the potential to reduce project risk. These areas are highlighted within the sections for each T.E.F. workstream.
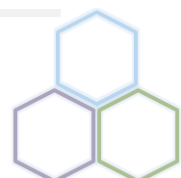
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Criterion C

Generates knowledge that can be shared amongst all relevant Network Licensees.

Impact: None of the original learning has been removed from the projects through the process of collaboration. Greater collaboration between the projects, e.g. via combined stakeholder events, is likely to improve knowledge transfer, as a greater number of participants will be reached. The coordinated approach and close alignment with ON will help make dissemination more effective and efficient

Criterion D

Is innovative (ie not business as usual) and has an unproven business case where the innovation risk warrants a limited Development or Demonstration Project to demonstrate its effectiveness.

Impact: The projects continue to meet this criterion. The DSO transition, introducing new roles and responsibilities requiring new skills and support systems, is clearly not business as usual. At these early stages, there is significant uncertainty that warrants developing multiple systems so that the best features of those can be incorporated in the final systems implemented by DNOs.

Even at the stage where systems were productionised, it is unlikely that a monopoly in DSO systems market would be beneficial, which suggests that supporting multiple innovation stage developments is reasonable and justified.

Criterion E

Involvement of other partners and external funding.

Impact: The collaboration work has not changed the project partners that have already been identified. The external funding from project partners has only decreased where this reflects a pro-rata impact of reducing the budget. In some cases, additional costs have been borne by the external partners, increasing the effective external funding.
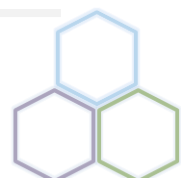
Criterion F

Relevance and timing.

Impact: The collaboration work has not resulted in a loss of relevance for any of the projects.

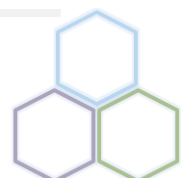# NIC 2017: Compliance Document Appendices

Criterion G

Demonstration of a robust methodology and that the Project is ready to implement.

Impact: The project management methodologies for the individual projects have not been altered by the collaboration work and remain robust. The inclusion of a combined Stage Gate and the continued collaborative work between the projects adds an element of risk management. It is likely that some risks are common to all projects, and collaborative working will help identify risks early and in the development of mitigations. The risk of the collaboration between the projects becoming ineffective is managed by the new governance arrangements that have been introduced and are described in the next section.

NIC 2017: Compliance Document Appendices

Appendix 12 Project Deliverables

A12.1   FUSION

Ref	Project Deliverable	Evidence	Collaboration Assessment
1	Report on flexibility quantification in E Fife [WP2]	1. Report on quantification of the flexibility market value in E Fife, including robust assessments across voltage levels, market sector, industry type.	Quantification methodology of interest to EFFS and TRANSITION. EFFS does not include a quantification assessment as part of the project, but rather the software reflects known providers and contracts.
2	Public consultation on USEF [WP3]	1. Deliver the consultation document on the basis of workshops. 2. Hold an open consultation for a three-month duration. 3. Report on consultation responses and analysis. 4. Report on associated changes to USEF implementation plan.	Some elements of the engagement for the consultation e.g. raising awareness of the project will be included in the collaborative events involving all T.E.F. projects. Cost savings are outlined in the Stakeholder Engagement section. Some location specific elements will not be appropriate for collaboration. T.E.F. intend to coordinate consultations and this will be combined with that for EFFS functionality (deliverable 3) and TRANSITION (deliverables 2 and 3). This collaboration will reduce stakeholder fatigue but is not expected to significantly reduce the costs or timescales.
3	USEF implementation plan [WP3]	1. FUSION USEF implementation. 2. Report on GB specific reference implementation of USEF.	This deliverable is USEF specific. While it is of interest to EFFS and TRANSITION, it is not an area of duplication.

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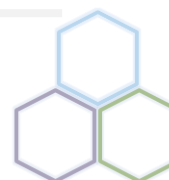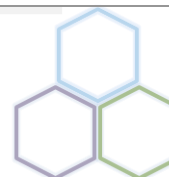
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4	USEF process implementation [WP4]	1. Provide specification of communication and procurement platform. 2. Provide specification of communication protocols between market participants. 3. Provision of template flexibility contracts. 4. Quantify market participant costs for implementing USEF interface compatibility.	There are some areas of commonality with TRANSITION which also involves the creation of a procurement and communication platform. EFFS will link to existing platforms supporting ENTIRE or the Cornwall Local Energy market. The specifications for the trading platforms projects will reflect the output from Open Networks and can build on learning from platforms such as the Cornwall Local Energy Market platform or National Grid's Platform for Ancillary services. The projects will use similar sources, but are unable to save resources by producing a single specification. There has been consideration of whether a joint procurement exercise could reduce the cost of acquiring and developing trading platforms. Reconciling the functional specifications of FUSION and TRANSITION into a single platform would result in an uplift in cost, but by far the greatest obstacle to the viability of procuring a common platform is that of the legal issues surrounding joint procurement.
5	Implement a minimum of two physical and live trials of commoditised flexibility based on the USEF framework [WP5]	1. Identify two trial locations. 2. Identify the required flexibility services available from flexibility providers. 3. Contract for flexibility services. 4. Undertake live trials. 5. Report on the implementation and analysis of USEF trials.	The different trial locations and learning objectives suggest that there will be limited potential for collaboration during the trials. However, there will be an opportunity to compare trial plans before the trials to share good practice and to determine whether the data from one trial can enhance the analysis of another.
6	Modelling report on commoditised flexibility benefits	1. Academic modelling report on GB flexibility.	While EFFS and TRANSITION are interested in this report, this does not duplicate the outputs of those projects.

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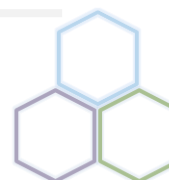|			
	for the UK (Imperial College London) [WP5 & 6]		
7	Open Networks report in coordination with the ENA Open Networks Programme [WP6]	1. Report on coordination and hierarchies of control for flexibility, in collaboration with the ENA Open Networks Programme	Co-ordination is an area of interest to both FUSION and EFFS. Once again both parties will liaise with the Open networks project on this area. There is potential for EFFS and TRANSITION to provide input to this report from their practical experience of hierarchies of control/ coordination from their trials. This would enable the report to reflect a broader base of experience, but would not reduce the resources required to complete it.

A12.2 TRANSITION

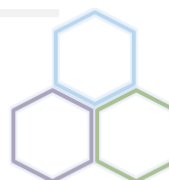| Ref	Project Deliverable	Evidence	Collaboration Assessment
1	WP6 Trial specification Produce and apply the site selection methodology and select the Trial networks.	1. Publish on the TRANSITION website a report detailing the site selection methodology, and a map of Trial areas. 2. Selection of networks to install monitoring (if required).	There is little opportunity to re-use the site selection methodology as EFFS aims to link to existing projects and FUSION has already identified East Fife as the trial location.
2	WP2 Requirements Design	1. Publish report detailing learning from relevant international DSO experience relating to trial objectives.	Learning from international DSO experience will be of interest to EFFS and FUSION, however, the USEF specific nature of the FUSION trial and the short duration of the EFFS trial, suggests

NIC 2017: Compliance Document Appendices

	Development Data Exchange requirements and updated data governance processes specified.	2. Functional specification for connectivity model, data exchange and governance requirements.	there may be limited scope for revising the trial specifications as a result. Please refer to the assessment for FUSION deliverable 4 which also relates to platform data exchanges.
3	Stakeholder feedback event (Stage Gate)	1. Stakeholder feedback event to disseminate and gather feedback on outputs from WP 2-6.	Please refer to the Stakeholder Engagement section of this document to see how the projects are collaborating on these activities.
4	WP7 Deployment Develop appropriate commercial arrangements and contract templates for flexibility services. Network adaptation for trial deployment.	1. Publish contract templates for flexibility services and commercial arrangements learning. 2. Publish equipment specifications and installation reports.	Please refer to the assessment for FUSION deliverable 4 which also relates to contract templates. Equipment specifications are likely to be project-specific.
5	WP7 Deployment Platform Full Acceptance Testing completed	1. Publish interface and configuration specifications and commissioning reports.	Please refer to the assessment for FUSION deliverable 4 which also relates to interface specifications.

NIC 2017: Compliance Document Appendices

6	WP8 Trials stage 1 Completion of one stage of trials	1. Publish monitoring and analysis results for Trials on TRANSITION website. 2. Stakeholder dissemination event showcasing learnings.	Post-trial dissemination events may be shared with FUSION as per the Stakeholder Engagement section.
7	WP8 Trials stage 2 Completion of second stage of trials	1. Publish monitoring and analysis results for Trials on TRANSITION website 2. Stakeholder dissemination event showcasing learnings.	Post-trial dissemination events may be shared with FUSION as per the Stakeholder Engagement section.

A12.3   EFFS

Ref	Project Deliverable	Evidence	Collaboration Assessment
2	Output from the forecasting and conflict avoidance	Publication of report showing forecasting and conflict avoidance options evaluated and selected options. Presentations at conferences and workshops to disseminate output.	Please refer to the Forecasting section for more information about how projects are collaborating in this area. Consultation with the relevant workstream of Open Networks has suggested that the academic work on conflict avoidance previously suggested may cause unnecessary duplication. That resource element will now support the forecasting work to increase the chances of the output being suitable for use in other projects. This avoids any unnecessary duplication with FUSION deliverable 7
3	Development of requirements	Production of requirements specification document outlining for DSO functionality, common protocols and	Please refer to FUSION deliverable 2 in terms of the public consultation on supported DSO functionality.

Level of confidentiality: **Public**

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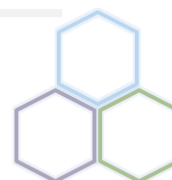Printed in black and white and only if necessary.

NIC 2017: Compliance Document Appendices

	specification for DSO functionality	approach to supporting these functionalities. ENA and stakeholder collaboration strategy document (delivered a fixed period of time following publishing of ENA workshop output). Letters of support from key stakeholders (e.g. ENA Working Group) outlining agreement with specification document.	As described for FUSION deliverable 4, there will be some common activities to specify data exchanges etc. that will reflect the Open Networks output but elements will be project specific e.g. USEF compliant versions. This will not include the specification of market platform functionality as this is excluded from EFFS.
4	Development of EFFS Design Specification document	Production of set of Design models and documents outlining specific EFFS functionality and approach to delivering this functionality. Report detailing review of functional specification document at key stages.	This relates to how the system will be implemented and link to WPD systems. There will be some common elements that can feed into TRANSITION and FUSION such as an assessment of cybersecurity requirements and interfaces with PowerOn.
5	Implementation and System Delivery	Build and delivery of the completed EFFS system, including technical design package release, deployment and configuration and system handover.	This is EFFS specific and is unlikely to lead to unnecessary duplication. Due to the implementation timescales it seems unlikely that the EFFS product could be re-used within TRANSITION or FUSION.
6	Completion of on-site system testing	Test report demonstrating completion of on-site testing to required standards; includes integration, user acceptance, operational and performance testing.	This may be of interest to FUSION and TRANSITION when developing their own system test plans, but is also likely to be too EFFS specific to result in any significant reduction in resources.

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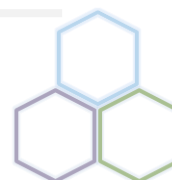Printed in black and white and only if necessary.

NIC 2017: Compliance Document Appendices

		Supply of additional supporting documentation evidencing this claim, to include test plans, scripts, exit reports and screenshots. Report detailing completed user training.	
7	Trials design and preparation	Strategy document outlining trials approach and methodology, detailing approach to plant, system operations, supplier / aggregator and tandem operations trials. Co-operation plan showing how duplication with other DSO NIC projects has been avoided and, if possible, how testing between projects will be carried out.	Please refer to the Trials section of this document for details about the different aims and learning objectives for the three projects. It appears that collaboration opportunities are somewhat limited but there may be opportunities to enrich analysis by sharing data.
8	Trials – execution and knowledge capture	Completion report demonstrating outcomes of trial phases alongside test scripts, exit reports etc. Letter of support from external stakeholders and partners confirming completion of project trial phase and acceptance of results.	As above.
9	Gateway reviews	Delivery of gateway report at the end of Workstream 1, Workstream 2 and Workstream 3, detailing progress against the project benefits and costs.	Please refer to the Stage Gate section of this document which shows how the planned common Stage Gate will complement these existing planned gateway reviews.

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NIC 2017: Compliance Document Appendices