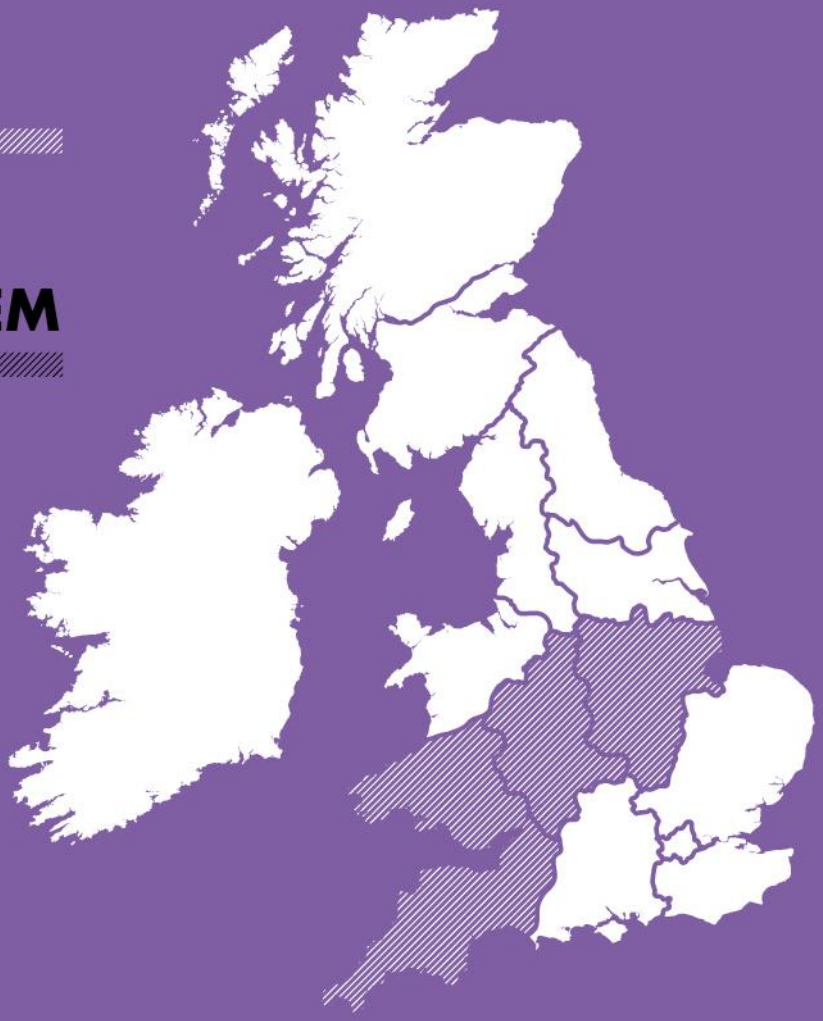
WESTERN POWER DISTRIBUTION

EFFS

ELECTRICITY FLEXIBILITY AND FORECASTING SYSTEM

EFFS
WPD_EN_NIC_003

NIC PROJECT
System Design: Conflict Avoidance / Synergy Identification



RIIO NIC NETWORK INNOVATION COMPETITION

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Contents

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1 Purpose of this document

The purpose of this document is to specify how the conflict avoidance and synergy identification requirements defined in the EFFS project's DSO Requirements Specification will be delivered from a functional perspective. The document forms one of eight system design documents (listed below), namely the conflict avoidance and synergy identification design document. The system design documents complement the System Design Summary Report, which contains an overview each functional area and the relationships between them.

- Forecasting;
- Capacity Engine;
- Service Management;
- Optimisation;
- Scheduling;
- **Conflict avoidance and synergy identification**;
- Market Interface;
- Reporting.

In accordance with the EFFS Project Direction, this document forms part fulfilment of the project's fourth deliverable to Ofgem, the 'EFFS system design specification'.

2 Executive summary

The Electricity System Operator (ESO) has utilised flexibility for many years and involves sending short notice instructions to participants connected to the distribution system, requiring them to alter their demand or generation in return for payment. The options for customers to sell this type of service are growing with opportunities extending beyond the ESO to include Distribution Network Operators (DNO) and traders within energy markets. As the number of flexibility service users increases, so does the potential for conflicts arising between services. There is a very clear requirement to consider how the actions of different actors within system can operate without reducing efficiency, increasing costs or presenting unnecessary risks to the system resilience, both locally and as a whole. The functionality explored surrounding conflict avoidance reflects that EFFS is designed to operate in Open Networks Future World B, where DNO and ESO are both involved in the co-ordination of flexibility services and exchange data to facilitate this.

Synergies between services have also been considered in the context of how the system might identify them. This is purely to support information gathering to assist policy development. There are no activities in the scope of EFFS to reduce the services procured or scheduled on the basis that there may be a beneficial effect from a third-party service.

Key design considerations are summarised below.

2.1.1 Conflict definition

There are many types of conflict between users of the network, but they have sufficient predictability or low impacts that they can feed into the forecasting but do not necessarily cause network issues. This could for example be two embedded generators shutting down to carry out annual maintenance at the same time. The impact would result in increased demand through the upstream network to supply more electricity from elsewhere, but it wouldn't necessarily result in any real risk to the network.

Our definition of conflicts between flexibility services are events that result in flexibility services being unavailable due to scheduling errors between multiple parties, services being counteracted by third party actions and combined actions that result in network issues for either the DNO or ESO. For example, EFFS could have a situation where the ESO requires a Flexibility provider to start a generator to support national system balancing, but this would then trigger a nearby windfarm equipped Active Network Management (ANM) to reduce output by the same capacity and cancelling out the initial request.

2.1.2 Conflict identification

The different types of conflict require different data and approaches to identify them. For a scheduling conflict, a simple comparison can be made for the asset ID, the date and time of the service to be delivered along with the type of service being delivered (demand turn up that benefits both DNO and ESO would not necessarily constitute a conflict). Determining whether one service will negate or partially negate another will require some consideration of where the services are impacting the network and the locations of the desired change. Where possible this will use network hierarchy information, however where a simplified process is not sufficient then power flow analysis will be used to determine whether one service is reducing the impact of another.

Conflict identification and quantification would be a beneficial activity whether or not conflict resolution activities were in place as it would provide much needed information to the industry. It is quite possible that where certain types of conflict present a low risk the most practical solution is

not to require one party to alter their planned use of services, but rather to factor the risk of impact of that type of service into the safety margin applied within the capacity engine.

2.1.3 Conflict resolution

The potential principles for conflict resolution have been investigated. One potential option is to compare the marginal cost of using an alternative flexibility service for both parties. For the purposes of the EFFS trial it is sufficient to simply have values that can be compared by the resolution algorithm. The methodology to calculate marginal costs is likely to be best addressed within an industry wide forum, such as Open Networks. Similarly, as the objective of the EFFS trials in relation to conflict avoidance are to prove that the data exchanges and processes are sufficient this can be achieved without engineering real conflicts in services and complete system-to-system interfaces but by using representative data.

3 Glossary

Term	Definition
ANM	Active Network Management
API	Application Programming Interface
BAU	Business As Usual
Contingency scenario	These are scenarios to consider when modelling the network in order to identify constraints (for example an N-1 or N-2 scenario) As per current WPD policy this will be every combination of the following for the relevant part of the network to define the next credible fault: • Each circuit fault • Each busbar fault
Constraint	For EFFS purposes this refers to thermal network constraints (as opposed to voltage constraints)
DNO	Distribution Network Operator
DSO	Distribution System Operator
Durabill	WPD Primary Billing Tool which contains details of half hourly metered customers consumption or generation.
EFFS	Electricity Flexibility and Forecasting Systems
ENA	Energy Networks Association (specifically the Open Networks Project)
EMN	Electricity Margin Notice: a notice issued to the market by National Grid ESO to request extra generation
ESO	Electricity System Operator, i.e. the role carried out by National Grid ESO that includes national system balancing and frequency control
HH	Half Hourly electricity metering
kV	Kilovolt
kW	Kilowatt
MPAN	A Meter Point Administration Number is a 21-digit reference used in Great Britain to uniquely identify electricity supply points such as individual domestic residence
NIC	Network Innovation Competition
MVA	Mega Volt Amp

Term	Definition
Network hierarchy	The relative configuration of the key locations of the network by voltage level. This is simpler than the integrated network model but would allow an understanding of how actions at a particular primary, for example, would impact on 33kV feeders, bulk supply points, 132kV feeders and GSPs.
Ofgem	Office of Gas and Electricity Markets
PowerOn	WPD's Distribution Management System provided by GE
Service types	Types of peak shaving flexibility services that will be supported by EFFS (namely scheduled constraint management, pre-fault constraint management, post-fault constraint management, restoration support)
SVO	System Voltage Optimisation
T.E.F.	TRANSITION, EFFS, FUSION
User	Users of the EFFS system are anticipated to be: • **Forecaster and flexibility co-ordinator** up until the real time management, dispatch and monitoring. Note: both these roles do not currently exist but are required, as they do not map onto an existing business function. The flexibility co-ordinator role will have a very similar skill set to that of an outage planner, whereas the forecaster role will require individuals with a mathematical / statistical background and possibly some programming experience. • **Control engineer** for real time dispatch and monitoring of the network. • **System administrator** system and interface support, maintenance of master data, data cleansing.
WPD	Western Power Distribution

4 Related documents

Ref	Document title	Version	Date issued	Prepared by	Location
1	Revised_EFFS_FSP_Redacted_v2	2.0	06/07/2018	EFFS	Link
2	WPD_EFFS_DSO Requirements Specification_v1.0	1.0	24/05/2019	EFFS	Link
3	System Design Summary Report	2.0	25/10/2019	EFFS	Link

5 System overview

5.1 Core functions overview

Figure 1 below is a diagrammatic representation of the functional areas within the EFFS project. The area that is subject of this document is highlighted in red.

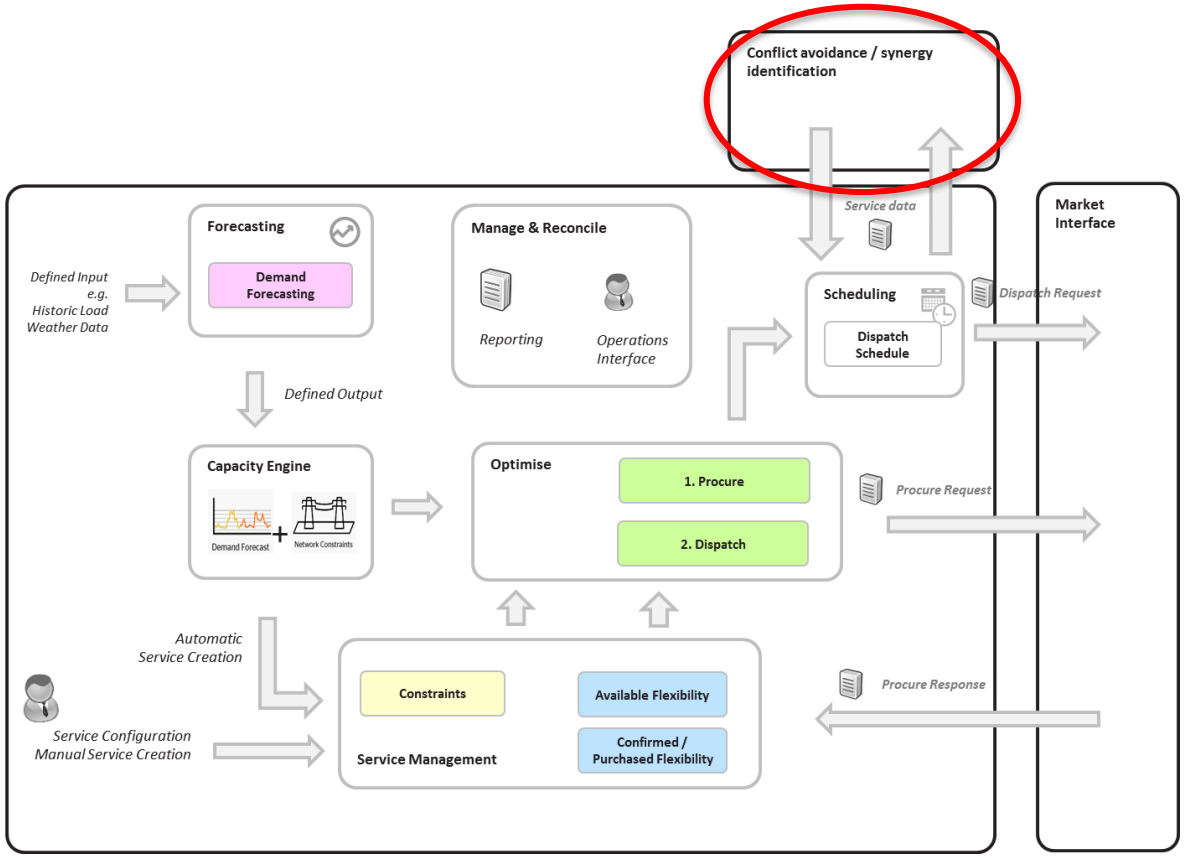

Figure 1: EFFS core functions

6 Conflict avoidance

6.1 Scope

In scope	Out of scope
• Agree a suitable interaction to notify other parties (e.g. ESO) when flexibility services are to be used; and • Conflict avoidance.	• Co-ordination; and • Under world B both DSO and ESO are responsible for identifying and resolving conflicts, which requires an ongoing exchange of network hierarchy information. The mechanism of doing so is still to be determined and therefore is out of scope of this document. However, a number of options are detailed in Appendix 2.

Table 1: Scope for conflict avoidance

6.2 Description

The terms conflict avoidance and co-ordination are both used in relation to flexibility services. While both activities will involve exchanges of information and aim to improve the outcomes when using flexibility services, EFFS believes these represent different activities.

Coordination refers to flexibility service providers and purchasers working together to aid wider system optimisation. Typically, these are longer term activities that aim to align policy rather than relating to the control of specific assets at specific times. Coordination activities are not limited to but should include:

- Using common terminology (EFFS will be sought to define or adopt common terminology that may be used within other working groups including Open Networks to avoid added confusion resulting from EFFS);
- Defining service requirements to maximise continuity between flexibility users and the need for services to be sold into more than one market;
- Defining procurement timescales to allow for coordination;
- Sharing real time data; and
- Supporting service provision to the TSO via DSO connected assets e.g. reactive power; and services via Power Potential.

Conflict avoidance relates to shorter term actions aimed at resolving conflicts in how specific assets are used to provide flexibility services.

What is or is not considered a conflict has not yet been ratified by Open Networks but would be expected to include some of the following scenarios which were agreed at EFFS workshops which included representatives from other DNOs and National Grid ESO:

- More than one user of flexibility services trying to use the same asset at the same time (regardless of whether they want the same action);

- More than one flexibility service user trying to user the same asset, only if working on opposite directions;
- Different flexibility service users procuring/dispatching services on different assets that are electrically arranged so that one service negates or partially negates the other;
- DNOs smart grid schemes reducing generation (or load restriction on Load ANM scheme) which negates the impact of a flexibility service procured/dispatched by a third party. This would also include any typical automated network operation / reconfiguration action (switching etc.);
- A flexibility service operator (other than a DNO) procuring/dispatching a service that results in a capacity threshold being breached on the DNO network, and then causes the DNO to act (may or may not be flexibility service) to avoid that threshold. This could be intentional (market manipulation) or unintentional;
- A DNO procuring/dispatching a service that results in a capacity threshold being breached at the Grid Supply Point and then causes the ESO a problem;
- Significant changes to customer behaviour, in either direction that may cause a conflict (Note: this is almost impossible to predict and there is a level of expectation that this will occur through changing use patterns but should in time be reflected in underlying behaviour that contributes to future forecasts).

Due to the focus on operational timescales, EFFS is only concerned with conflict avoidance. The 'in scope' conflicts have been investigated and identified through stakeholder engagement and a follow-up workshop. A summary of the outputs has been included in this document (Section 6.3.4).

6.3 Solution

Conflict Resolution and Coordination are very important topics that are understandably the subject of wider discussion at all levels of the industry. Ofgem recognise the significance of getting this right in order to ensure the efficient and stable running of the wider system as well as ensuring that the cost of operating flexibility does not overly burden customers. It is for this reason that there is a dedicated working group within Open Networks (Workstream 1a – Product 5 DSO Services Conflict Management) that are discussing options on how conflict avoidance and coordination can be achieved.

The topic also relates heavily to some other products in Workstreams 1 – 3 including the 'System Wide Resource Register' and defining good practice principles for 'Customer Experience'. With the breadth and depth of existing discussion around 'Conflict Avoidance' the approach within the trial requires to take its lead from these more established approaches and avoid deviating into areas that are likely to significantly impact the work already underway.

The trial will therefore not attempt to build any software or processes that would carry out a conflict avoidance capability that requires real operational data from National Grid ESO's Balancing Services systems, which is where it is assumed that the majority of 'flexibility service' conflicts will originate.

During the initial design phase of the project, EFFS already consulted stakeholders from the T.E.F. teams as well as National Grid ESO to ensure that EFFS has a common approach to the identification general conflicts, which have been outlined within this document (6.3.4). Some of the conflicts will not be technical or operational, instead these will come from the commercial agreements and contracts, but these have been determined to be 'out of scope' within the project.

The responsibility therefore lies with flexibility providers who may wish to offer services to multiple programmes to ensure that they don't find themselves in breach of contract by offer services to one party if that is not permitted by a prior agreement with another.

Whilst the trial is focussing on interaction with National Grid ESO the same principle could be applied to other participants (e.g. suppliers, aggregators, DNOs). The aim of the EFFS trial is to prove the principles of conflict identification and resolution that should then be a common foundation for resolving conflicts involving other participants.

6.3.1 Pre-requisites

The following pre-requisites are needed for the conflict avoidance function:

- Consistent network hierarchy information must be available and shared between industry parties (see Appendix 2 for details);
- Emergency Margin Notice (EMN) scenarios/ notifications must be visible within the system in order to determine when National Grid ESO services must take priority;
- There is a dependency on rules for calculation of the cost of having to take alternative action to avoid a conflict occurring being defined; and
- Agreement of resolution paths for conflicts with National Grid ESO.

6.3.2 Input

The conflict avoidance function requires the following inputs:

- A view of the services schedule and associated statuses for EFFS;
- A view of the service schedule and associated statuses for National Grid ESO;
- Network hierarchy, used to identify conflicts;
- Power flow analysis tool and model, used to identify conflicts; and
- Conflict resolution matrix containing resolution rules / algorithms.

6.3.3 Output

The conflict avoidance function will produce the following outputs:

- An amended service schedule to reflect any changes made as the results of conflict resolution within EFFS;
- Notifications to third parties about these changes;
- Notifications to National Grid ESO of a conflict where the resolution matrix suggests changes to the schedule are required to be made by National Grid ESO; and
- An amended service schedule to reflect any changes made as the results of conflict resolution within National Grid ESO.

6.3.4 Conflict avoidance principles

Conflicts will be established through the different DSO service types. The sections below define the rules to be applied to conflict avoidance based on the National Grid ESO service types which National Grid ESO have suggested are best split into the following categories;

- Pre-fault;
- Post fault locational; and
- Post fault non locational.

These are considered in relation to the DSO service types, i.e.;

- Scheduled constraint management;
- Pre-fault constraint management;
- Post fault constraint management; and
- Restoration support.

These principles were agreed with T.E.F. stakeholders and National Grid ESO.

The following sections describe these conflicts as shown in table 2 below.

	DSO Service			
National Grid ESO Service	**Scheduled constraint management**	**Pre-fault constraint management**	**Post fault constraint management**	**Restoration support**
Pre-fault	6.3.4.1	6.3.4.1	6.3.4.4	6.3.4.7
Post fault Locational	6.3.4.2	6.3.4.2	6.3.4.5	6.3.4.8
Post fault non locational	6.3.4.3	6.3.4.3	6.3.4.6	6.3.4.9

Table 2: Areas in the document that describe ESO and DSO conflicts

6.3.4.1 Pre-Fault (ESO)/Scheduled Constraint Management or Pre-Fault Constraint Management (DSO)

Identification

The process to identify a constraint could rely on the asset ID, network hierarchy information or require power flow analysis. Some high level filtering by location may provide a means to determine whether any further conflict identification is required. For examples if services are associated with locations that are served by Grid Supply Points (GSPs) that are not directly connected to each other, then the chances of these flexibility services being in conflict are very low and no further action is required. However, services that progress through this high level locational filter conflict would then have the following checks:

- ***Conflict type 1*** (more than one user of flexibility services trying to use the same asset wanting the same action): compare Asset ID[1] to determine if the service relates to the same asset. If so then this may be in breach of the service provider's contract.

- ***Conflict type 2*** (more than one flex service user trying to use the same asset – only if working on opposite directions): Asset ID check to determine if the service relates to the same asset. If yes, then compare service details for the direction that the services are operating. If these are different then this is a conflict (and may be in breach of the service provider's contract). If not, then this is not a conflict and is legitimate revenue stacking.

- ***Conflict type 3*** (Different flex service users procuring/dispatching services on different assets that are electrically arranged so that one service negates or partially negates the other): It may be possible to determine whether these services conflict based on a simplified network hierarchy that would be shared with service providers to allow them to associate their assets with the points on our network which are affected by their services. Further analysis is required to determine whether this simplified approach is viable. If a hierarchy approach is not suitable then power flow analysis can be used to determine if the services conflict. This will consider multiple contingency scenarios for the DSO service reflecting the analysis carried out to support the procurement and dispatch services. The analysis will model the impact of all services currently planned by the relevant party plus the planned services for the party they are co-ordinating with. The sequence for running the power flow analysis will be as follows:

    1. Run base study (study of as built network);
    2. Run DSO services study (study of the as built network plus all planned DSO services);
    3. Run ESO services study (study of the as built network plus all planned ESO services); and
    4. Run ESO and DSO services study (study of the as built network plus all planned DSO and ESO services).
    5. These runs will then be compared in order to identify any issues created due to this combination of services and also to determine the relative benefits. i.e. the benefit to the DSO of their services is calculated using the results of study 2 compared to study 1. If there are any assets that exceed their thermal thresholds in study 4 that are under their threshold in study 2, then the services are conflicting. It is possible that ESO services reduce headroom without causing a breach of thresholds. Industry consultation is required to determine whether this should be considered a conflict and if so at what level of materiality, as such this is out of scope for EFFS.

- ***Conflict type 4*** (DSO dispatching multiple services within a GSP, none of which individually create an issue for the DSO, but the aggregation effect at GSP could create an issue for the ESO): as per *conflict type 3*.

If the outcome of every check is 'no' then no further action required. If the outcome of one or more checks is 'yes' then a conflict has been identified.

Principle of resolution if a conflict has been identified

[1] This requires a common Asset ID which would most likely be provided by an industry wide service register.

The workshops envisaged a matrix where the resolution process could be different for each combination of conflicting services. However, if the impacts from various factors could be represented financially, then the resolution processes could be simplified to a single principle. i.e. the party with the highest marginal / alternative cost / greatest value at risk takes precedence in order to provide the best value for money.

This is on the assumption that both network requirements can be met, and the operator is given sufficient time to look at alternatives. This also assumes that alternative actions are available to at least one party.

Action to resolve

Within the workshops it was generally agreed that the resolution responsibility will lie with the party that identifies the conflict to determine which party has the highest marginal cost. It is proposed that this will be achieved using the 'marginal cost' (£) value provided in the 'Flexibility Services' file. NB this is dependent on a fair, agreed and published mechanism for calculating marginal / alternative costs being in place and a sufficient level of data being available from the conflicting parties as to carry out a cost comparison.

Marginal cost calculation is likely to rely on not just the rate payable, but the volume delivery so it would be necessary to know in advance what the likely duration of events would be, which in many cases is an unknown and likely to result in the need for additional criteria to estimate such values in order to complete the comparative analysis,

Where the party who identifies the conflict has the highest marginal cost: the identifying party cancels or amends the service via whatever mechanism the service was procured and notify the other party of the amendment via the 'Amend Flexibility Services' file.

Where the other party has the highest marginal cost: the identifying party notifies the other party via the 'Amend Flexibility Service File' (needs to contain conflict type, location etc so it can feed into the other parties' decision when determining their alternative course of action). This instructs them to cancel or amend the service via whatever mechanism the service was procured and the other party actions this instruction.

All disputes are managed via an offline exception process (i.e. no automated data exchange mechanism exists to challenge or respond to these assessments or instructions).

While the above has been agreed by the T.E.F. members as a preferred approach it is subject to several limitations which will rely upon the availability of information to accurately calculate the marginal costs for analysis. In lieu of this being available in a timely fashion there are other viable criteria for addressing a conflict and allocating the responsibility for notifying and resolving. These could include;

- 'First come' principle where the second party to seek a service is able to identify a conflict only because there is a requirement already established with which they are deemed to be in conflict with. It would therefore be the responsibility of the party with the most recent requirement to find an alternative approach;
- 'Optionality' should offer a more pragmatic resolution framework, especially in scenarios where one party has limited alternative options to call upon to resolve the conflict. This could be a very common outcome as the majority of National Grid ESO services are non-geographic, that means they often have a wide pool of participants affording them many other options for flexibility procurement. DNO / DSO programmes typically have limited

participation due to their locational requirements and therefore will have far fewer alternatives to avoiding conflicts;
- Priority for use of an asset is given to the party willing to pay most for its use at that time; and
- DNO's locational requirements always take precedence.

Exceptions
In an EMN scenario then the National Grid ESO service takes precedence.

6.3.4.2 Post-Fault – Locational (ESO)/Scheduled Constraint Management or Pre-Fault Constraint Management (DSO)

Identification
There are two types of post fault locational services that the ESO use.

- **Balancing Mechanism services**: these will be triggered automatically in real time meaning they will not be visible to this advance conflict avoidance mechanism. Therefore, they are not to be considered within EFFS.
- **DSO type service** (e.g. akin to the four defined by the Open Networks): these services are procured in advance and contain an availability payment. In this scenario conflict can be identified as per the above entry (scheduled constraint management vs pre fault)

Principle of resolution if a conflict has been identified
As above in in Pre-Fault/Scheduled Constraint Management
In a conflict the party with the highest marginal / alternative cost / greatest value at risk takes precedence in order to provide the best value for money.

This is on the assumption that both network requirements can be met, and the operator is given sufficient time to look at alternatives. This also assumes that alternative actions are available to at least one party.

Action to resolve
As above in in Pre-Fault/Scheduled Constraint Management. Within the workshops it was generally agreed that the resolution responsibility will lie with the party that identifies the conflict to determine which party has the highest marginal cost. It is proposed that this will be achieved using the 'marginal cost' (£) value provided in the 'Flexibility Services' file.

NB this is dependent on a fair, agreed and published mechanism for calculating marginal / alternative costs being in place and a sufficient level of data being available from the conflicting parties as to carry out a cost comparison. Marginal cost calculation is likely to rely on not just the rate payable, but the volume delivery so it would be necessary to know in advance what the likely duration of events would be, which in many cases is an unknown and likely to result in the need for additional criteria to estimate such values in order to complete the comparative analysis,

Where the party who identifies the conflict has the highest marginal cost: the identifying party cancels or amends the service via whatever mechanism the service was procured and notify the other party of the amendment via the 'Amend Flexibility Services' file

Where the other party has the highest marginal cost: the identifying party notifies the other party via the 'Amend Flexibility Service File' (needs to contain conflict type, location etc so it can feed into

the other parties decision when determining their alternative course of action) and instructs them to cancel or amend the service via whatever mechanism the service was procured. The other party actions this instruction.

All disputes are managed via an offline exception process (i.e. no automated data exchange mechanism exists to challenge or respond to these assessments or instructions).

While the above has been agreed by the T.E.F. members as a preferred approach it is subject to several limitations which will rely upon the availability of information to accurately calculate the marginal costs for analysis. In lieu of this being available in a timely fashion there are other viable criteria for addressing a conflict and allocating the responsibility for notifying and resolving. These could include;

- 'First come' principle where the second party to seek a service is able to identify a conflict only because there is a requirement already established with which they are deemed to be in conflict with. It would therefore be the responsibility of the party with the most recent requirement to find an alternative approach;
- 'Optionality' should offer a more pragmatic resolution framework, especially in scenarios where one party has limited alternative options to call upon to resolve the conflict. This could be a very common outcome as the majority of National Grid ESO services are non-geographic, that means they often have a wide pool of participants affording them many other options for flexibility procurement. DNO / DSO programmes typically have limited participation due to their locational requirements and therefore will have far fewer alternatives to avoiding conflicts;
- Priority for use of an asset is given to the party willing to pay most for its use at that time; and
- DNOs' locational requirements always take precedence.

Exceptions
As above in in Pre-Fault/Scheduled Constraint Management.

6.3.4.3 Post-Fault - Non-locational (ESO)/ Scheduled Constraint Management or Pre-Fault Constraint Management (DSO)

Identification
EFFS will not be able to identify or resolve conflicts with these services. The identification will not be possible as they impact the whole system (e.g. frequency response) and are not location specific (even the locations of contracts may not be available as many services are provided by aggregators).

Because of this (and the low probability of these services being used) it is felt these conflicts would be best managed in real time in the control room via real time links, therefore outside of the remit of EFFS.

Principle of resolution if a conflict has been identified: not applicable as cannot be identified or resolved by EFFS.

Action to resolve
Not applicable as cannot be identified or resolved by EFFS.

Exceptions
Not applicable as cannot be identified or resolved by EFFS.

6.3.4.4 Pre-Fault (ESO)/Post-fault Constraint Management (DSO)

Identification
The process to identify a constraint is the same as for the combination of Pre-Fault ESO services and Pre-fault DSO services as outlined in section 6.3.4.1. However in this scenario it is dependent on whether a fault occurs if the DSO service will be utilised.

Principle of resolution if a conflict has been identified
It is not possible to identify and resolve this conflict within operational timescales, therefore just flag and report when it occurs.

Action to resolve
How this is to be handled will depend on the relevant organisations attitude to risk (e.g. do you assume all post fault services will be required, none of them or some middle ground). This is assumed to be a very rare occurrence, plus in the event it does occur it is unlikely that anything can be done to resolve the conflict (i.e. the ESO having a locational requirement and the DSO a fault. Therefore, this conflict will be reported, but no action taken or notification to the other party triggered. The marginal costs will be included in the data exchange to support any manual process required.

Exceptions
In an ENM scenario the ESO requirements always take precedence.

6.3.4.5 Post-Fault – Locational (ESO) /Post-fault Constraint Management (DSO)

Identification
The process to identify a constraint is the same as for the combination of Pre-Fault ESO services and Pre-fault DSO services as outlined in section 6.3.4.1 however in this scenario it is dependent on whether a fault occurs if the DSO service will be utilised.

As above in post fault constraint management vs pre fault. It is not possible to identify and resolve this conflict within operational timescales, therefore just flag and report when it occurs

Action to resolve
As per the above in post fault constraint management vs pre fault.

How this is to be handled will depend on the relevant organisations attitude to risk (e.g. do you assume all post fault services will be required, none of them or some middle ground). This is assumed to be a very rare occurrence, plus in the event it does occur it is unlikely that anything can be done to resolve the conflict (i.e. the ESO having a locational requirement and the DSO a fault. Therefore, this conflict will be reported, but no action taken or notification to the other party triggered. The marginal costs will be included in the data exchange to support any manual process required.

Exceptions
- *As per the above in post fault constraint management vs pre fault*; and
- In an EMN scenario the ESO requirements always take precedence.

6.3.4.6 Post-Fault - Non-locational (ESO)/Post-fault Constraint Management (DSO)

Identification
EFFS will not be able to identify or resolve conflicts with these services. The identification will not be possible as they impact the whole system (e.g. frequency response) and are not location specific (even the locations of contracts may not be available as many services are provided by aggregators).

Because of this (and the low probability of these services being used) it is felt these conflicts would be best managed in real time in the control room via real time links, therefore outside of the remit of EFFS.

Principle of resolution if a conflict has been identified
Not applicable as cannot be identified or resolved by EFFS.

Action to resolve
Not applicable as cannot be identified or resolved by EFFS.

Exceptions
Not applicable as cannot be identified or resolved by EFFS.

6.3.4.7 Pre-Fault (ESO) /Restoration Support (DSO)

Identification
Low risk of a conflict up until the point the restoration service needs to be dispatched. At this point carry out the checks as per pre-fault constraint management vs pre-fault.

Principle of resolution if a conflict has been identified
DSO locational requirements and network security takes precedence.

Action to resolve
The identifying party notifies (assumed to be the DSO) the other party via the 'Amend Flexibility Service File' (needs to contain conflict type, location etc so it can feed into the other parties decision when determining their alternative course of action) and instructs them to cancel or amend the service via whatever mechanism the service was procured. The other party actions this instruction. In parallel the identifying party triggers the restore service.

Exceptions
In an ENM scenario the ESO requirements always take precedence.

6.3.4.8 Post-Fault –Locational (ESO)/Restoration Support (DSO)

Identification
EFFS will not be able to identify or resolve conflicts with these services as the conflict will occur and cannot only be identified in near real time. Because of this (and the low probability of these services being used), it is thought these conflicts would be best managed in real time in the control room via real time links, therefore outside of the remit of EFFS.

Principle of resolution if a conflict has been identified
Not applicable as cannot be identified or resolved by EFFS.

Action to resolve
Not applicable as cannot be identified or resolved by EFFS.

Exceptions
Not applicable as cannot be identified or resolved by EFFS.

6.3.4.9 Post-Fault - Non-locational (ESO)/Restoration Support (DSO)

As for section 6.3.4.8 , above.

6.4 Interfaces

Figure 2 provides an overview of the interfaces to be implemented in support of the EFFS conflict avoidance and synergy identification solution.

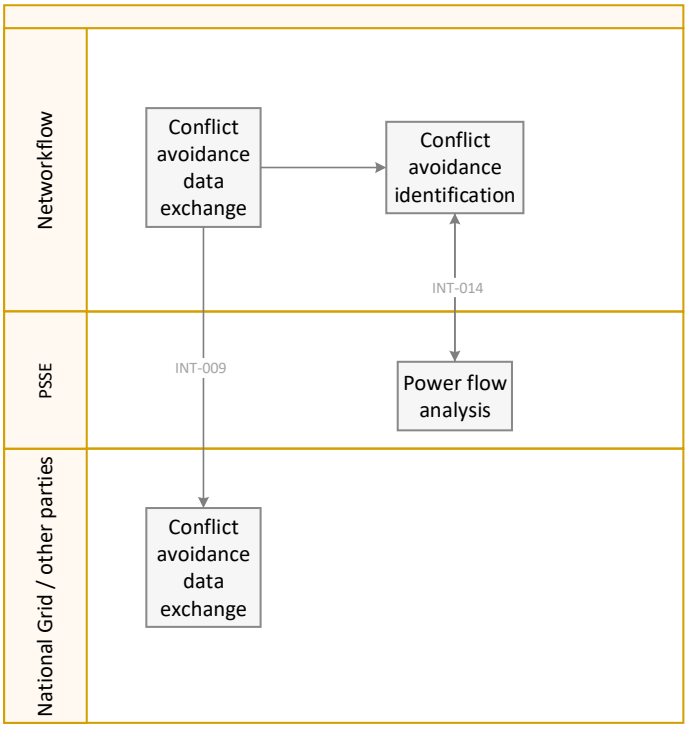

Figure 2: EFFS conflict avoidance interfaces overview

INT-014 will leverage the power flow analysis functionality as described in 'WPD EFFS_System Design_Capacity_Engine'.

INT-009 will issue a list of planned services to National Grid ESO, the proposed format of which is detailed in section 7.1. A two-way data exchange and also exchange of data to notify each party of the outcome of the conflict resolution process (as defined in the 'DSO Requirements Document') will be agreed with National Grid ESO in order to be implemented.

In terms of the nature of the interface with National Grid ESO best way to progress will depend upon the complexity of the process agreed, the frequency of data exchange required, the build and operational effort associated to the approach and the scope of conflict avoidance agreed to be covered within the EFFS trials. Below are options under consideration:

7 Data items

The following section lists the data items EFFS proposes contained in the interfaces described above. Further fields could be added as required to support National Grid ESO conflict avoidance processes.

The interfaces are described in an indicative, logical fashion rather than physically as this information is proprietary. The detailed physical interfaces will be agreed during the build phase of EFFS.

7.1 INT-009 Flexibility services file

Data item	Type	Units	Cardinality	Valid set value	Notes
Transaction type	VARCHAR(50)	N/A	1	'Flexibility services file'	
Transaction ID	NUMBER(10)	Numeric	1		Unique ID for the transaction. Should be included in any related responses generated by the generating system.
Transaction Datetime	TIMESTAMP	TIMESTAMP	1		Date and Time when the request was created in the following format 'YYYY-MM-DD HH24:MI:SS.FF'
Service Type	VARCHAR(50)	N/A	1-*		E.g. pre-fault constraint management, STOR etc
Service impact for this asset	VARCHAR(50)	N/A	1-*		E.g. generator turn up/down load turn up/down
MPAN(s)	NUMBER(13)	Numeric	1-*		
Asset ID(s)	String	N/A	1-*		
Network location (to be determined)	String	N/A	1-*		

Data item	Type	Units	Cardinality	Valid set value	Notes
Service status	VARCHAR(50)	N/A	1-*		
Availability windows (timestamp(s))	TIMESTAMP	TIMESTAMP	1-*		This will be defined by a DATE + TIME of the end of the HH period
Power / energy requirements	NUMBER(4)	MW	1-*		
Power / energy available	NUMBER(4)	MW	1-*		
Scenario	VARCHAR(10)	N/A	1-*	'BAU' 'EMN'	
Marginal price of alternative	NUMBER	MW	1-*		

Table 3: Data types for INT-009

8 Synergy identification

The opposite of conflict avoidance is identifying potential synergies of flexibility requirements between different industry parties. This will function in a very similar way to conflict avoidance. Within the scope of the trial, if synergies are identified this assumes this will most likely mean that more than one purchaser of flexibility requires a similar action such as demand reduction at the same time. This may be from the same asset or different assets within the same geographical region but is broadly assumed that in either case that the flexibility provider has the appropriate permission to take their action, for example a generator connection agreement devoid of any restrictions to operate their asset at the desired time. In such circumstances, EFFS would not expect there to be a particular need to trigger a re-assessment that would require a modified network flow. This may result in a greater than expected positive impact to the Flexibility purchasers but at this time EFFS is not required to consider this as an additional conflict from either technical or operational perspectives and therefore is 'out of scope' to determine a remedial action when such circumstances are identified.

While it is clear that conflicts must be resolved, there is less clarity over whether synergies should result in one or other flexibility purchaser adjusting their procurement. It could be argued that where two parties pay the same provider for the same service this is inefficient, but equally in a developing market provider expect to be able to benefit from as many sources of funding as possible. In fact, as long as both purchasing parties have an appropriately justified financial case for their purchases then there should be the basis for improved efficiency even if it doesn't achieve 'whole system' optimisation.

Therefore, the scope of EFFS does not include routines to try to "resolve" synergies automatically but rather will flag up potential opportunities for future consideration. Later in this document (section 8.3.4) EFFS has included the outputs of the 'conflict / synergy workshops' which proposes how synergies may be resolved. These have been included within this design document for completeness, however, EFFS will not attempt to actively manage synergies within the trial in favour of documenting any occasions these occur for wider industry consideration.

8.1 Scope

In scope	Out of scope
• Interface to notify other parties (e.g. National Grid ESO) when flexibility services are to be used; and • Synergy identification.	• Co-ordination or resolution of duplicated payments.

Table 4: Scope for synergy identification

8.2 Description

Synergy identification will operate in the same timescales as conflict avoidance and it will use the same data exchange mechanism and very similar processes.

8.3 Solution

As previously intimated in this document (section 6.3), Conflict Resolution and Coordination are very important topics that are the subject of wider discussion at all levels of the industry. Ofgem recognises the significance of getting this right in order to ensure the efficient and stable running of the wider system as well as ensuring that the cost of operating flexibility does not overly burden customers.

It is for this reason that there is a dedicated working group within Open Networks (Workstream 1a – Product 5 DSO Services Conflict Management) that are discussing options on how conflicts avoidance and coordination can be achieved. Not surprisingly, the topic also relates heavily to some other products in Open Networks Workstreams 1 – 3 including the 'System Wide Resource Register' and defining good practice principles for 'Customer Experience'.

With the breadth and depth of existing discussion around 'Coordination and Synergy' the approach within the trial requires to take its lead from these more established approaches and avoid deviating into areas that are likely to significantly impact the work already underway. The trial will therefore not attempt to build any software or processes that would carry out a synergy coordination capability that requires real operational data from National Grid ESO's Balancing Services or local trading markets.

During the initial design phase of the project, EFFS already consulted stakeholders from the T.E.F. teams as well as National Grid ESO to ensure that EFFS has a common approach to the identification of synergies which have been outlined within this document (section 8.3.4) but these have been determined to be 'out of scope' within the project. It is therefore expected that Flexibility providers who may wish to offer services to multiple programmes may attract benefits from more than one concurrently. The project will seek to identify any instances of this and document them to enhance learning.

8.3.1 Pre-requisites

As per conflict avoidance (section 6.3.1).

8.3.2 Input

As per conflict avoidance (section 6.3.2).

8.3.3 Output

As per conflict avoidance (section 6.3.3).

8.3.4 Synergy identification principles

Identification

Synergies will be identified using the same processes that compare Asset ID, network hierarchy and power flow analysis that are described in the sections for conflict identification with the difference that services will be identified that are operating so as to have the same effect.

8.4 Interfaces

No additional interfaces are required to support synergy identification.

8.5 Data items

As per conflict avoidance (see section 7).

9 Contact

If you have any questions relating to this document, please use the following points of contact:

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Appendix 1 – Worked examples

Scenario number	Scenario	Matrix reference	Outcome
1	ESO and DSO both procure pre fault flexibility services using the same asset	Conflict resolution - scheduled constraint management vs pre fault	Assuming the service provider contract doesn't rule out the use of the asset by multiple parties then a check will be made to ensure the service is operating in the same direction (assuming the direction the service operates in can be identified. If not, then this is a conflict and the party with the highest marginal / alternative cost must cancel their service and pursue alternative arrangements.
2	DSO dispatches restoration services in the same network ESO has dispatched pre-fault services.	Conflict resolution - restoration support vs pre-fault	This cannot be identified and resolved within EFFS as it requires immediate action. Resolution is done manually (i.e. by a control room engineer) in real time.
3	ESO and DSO both procure pre-fault flexibility services in the same network where the services may cancel or reduce each other impact.	Conflict resolution - scheduled constraint management vs pre-fault	Marginal costs of alternative actions must be understood. The service with a better marginal cost will continue and an alternative service will be found for the most onerous service.
4	ESO and DSO both procure pre-fault flexibility services in the same network where the services may	Conflict resolution - pre-fault constraint management vs pre fault	Marginal costs of alternative actions must be understood. The service with a better marginal cost will continue and an alternative service will be found for the most onerous service.

	cancel or reduce each other impact.		
5	ESO post-fault non locational services are dispatched in the same network as DSO restoration services are dispatched. Note: these cases are extremely unlikely.	Conflict resolution - post-fault non locational vs restoration support	Any conflict related to the ESO post-fault non locational cannot be identified and resolved within EFFS as it requires immediate action. Resolution is done manually (i.e. by a control room engineer) in real time.
6	ESO dispatches post fault non locational service at the same time the DSO has dispatched a restoration service.	Conflict resolution - restoration vs post fault non locational	This cannot be identified and resolved within EFFS as it requires immediate action. Resolution is done manually (i.e. by a control room engineer) in real time.
7	DSO procures post fault flexibility service in an area of the network that could cancel out a procured ESO pre-fault flexibility service.	Conflict resolution - post-fault constraint management vs pre fault	This will be reported on and a manual decision made as to how to progress dependent on the organisation in questions risk policy.

8	ESO procures a post fault locational service in the same network location as a DSO post fault service	Conflict resolution - post-fault constraint management vs post fault locational	This will be reported on and a manual decision made as to how to progress dependent on the organisation in questions risk policy.
9	DSO procures a pre-fault flexibility service on the same asset that the ESO has procured a post fault locational service for.	Conflict resolution - pre-fault constraint management vs post fault locational	Assuming the service provider contract doesn't rule out the use of the asset by multiple parties then a check will be made to ensure the service is operating in the same direction (assuming the direction the service operates in can be identified. If not, then this is a conflict and the party with the highest marginal / alternative cost must cancel their service and pursue alternative arrangements.

Appendix 2 – Network hierarchy

Currently the source and data items of the network hierarchy that need to be exchanged with National Grid ESO are to be agreed, therefore it has not been possible to specify this interface within this document. However, consideration has been put into where to source this data from within WPD. WPD will hold one version of the truth as the Integrated Network Model (INM). This can be exported as profiles that meet the Common Information Model (CIM) standards and should therefore be easy for third parties to interpret and use. The INM is currently in progress (and has been delivered for the South West as a trial) but will not be delivered within EFFS timelines.

Therefore, EFFS needs to source network hierarchy data from current WPD systems. Below are some potential options:

- The network capacity map published from Flexible Power – this does not contain all data required (for example the concept of a feeder is not included) however it may be possible to enrich the data by cross referencing it to other data sources such as PowerOn[2] and Durabill;
- Long Term Development Statements – these are text based and not easily machine readable; and
- A custom query to extract network hierarchy from the trial INM in the South West.

[2] https://www.gegridsolutions.com/products/brochures/uos/PowerOn_Control.pdf