



Milestone 2

FMT (MERLIN) Requirement Specification

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CGI



This document details the requirements necessary for the creation of a Financial Management Tool (FMT). The purpose of the tool is to assist DSO's with the financial decision making in a future world where possibly hundreds/thousands of financial transactions are taking place between a DSO and third party flexible service providers.



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1. Introduction

1.1 Background

As our use of electricity changes over time, so too must the provisions which ensure that supply meets demand, including the physical network infrastructure, and the information systems and commercial arrangements that support it. For Distribution Network Operators (DNOs) considering their long-term planning and investment, this means moving from an operating model in which steady growth is assumed, and the network reinforced as required to overcome expected constraints and meet forecast demand levels, to a more complex one in which both demand and supply are more unpredictable, leading to new challenges but also new opportunities. As DNOs transform to take on the role of Distribution System Operator (DSO), it will be increasingly important to harness those new sources of demand and supply, and use the flexibility they offer to minimise the need for additional capital expenditure.

- This growing availability of flexibility services as a viable alternative to traditional reinforcement will mean the relative costs, benefits and economic timeframe of very different solutions to each individual problem must be considered and compared with each other on a rigorous and consistent basis, so that rational decisions can be made on the best option in each case, in line with business strategy and priorities. Scottish and Southern Electricity Network (SSEN) is developing the concept of a Financial Modelling Tool (FMT) to perform this comparison, using a variety of historical data and forecasts to generate clear guidance to support the business in making those decisions.

1.2 Purpose

This document defines the requirements for a Financial Modelling Tool (FMT) system. The FMT aims to:

- Estimate, for each identified constraint, the costs of each alleviation option (e.g. traditional reinforcement or flexibility) as well as the costs of taking no action;
- Calculate an overall indicative cost for each option which allows them to be compared on a like-for-like basis;

- Present the information clearly to users to support their decision making;
- Provide the business with documentary evidence which may be used to justify the basis of the decisions taken.

The FMT is intended to be a decision support tool and will not replace any existing business functions. For the avoidance of doubt, it will not perform any aspect of planning, tendering, procuring or contracting for either network reinforcement or flexibility services.

1.3 Scope

The scope of this document is limited to:

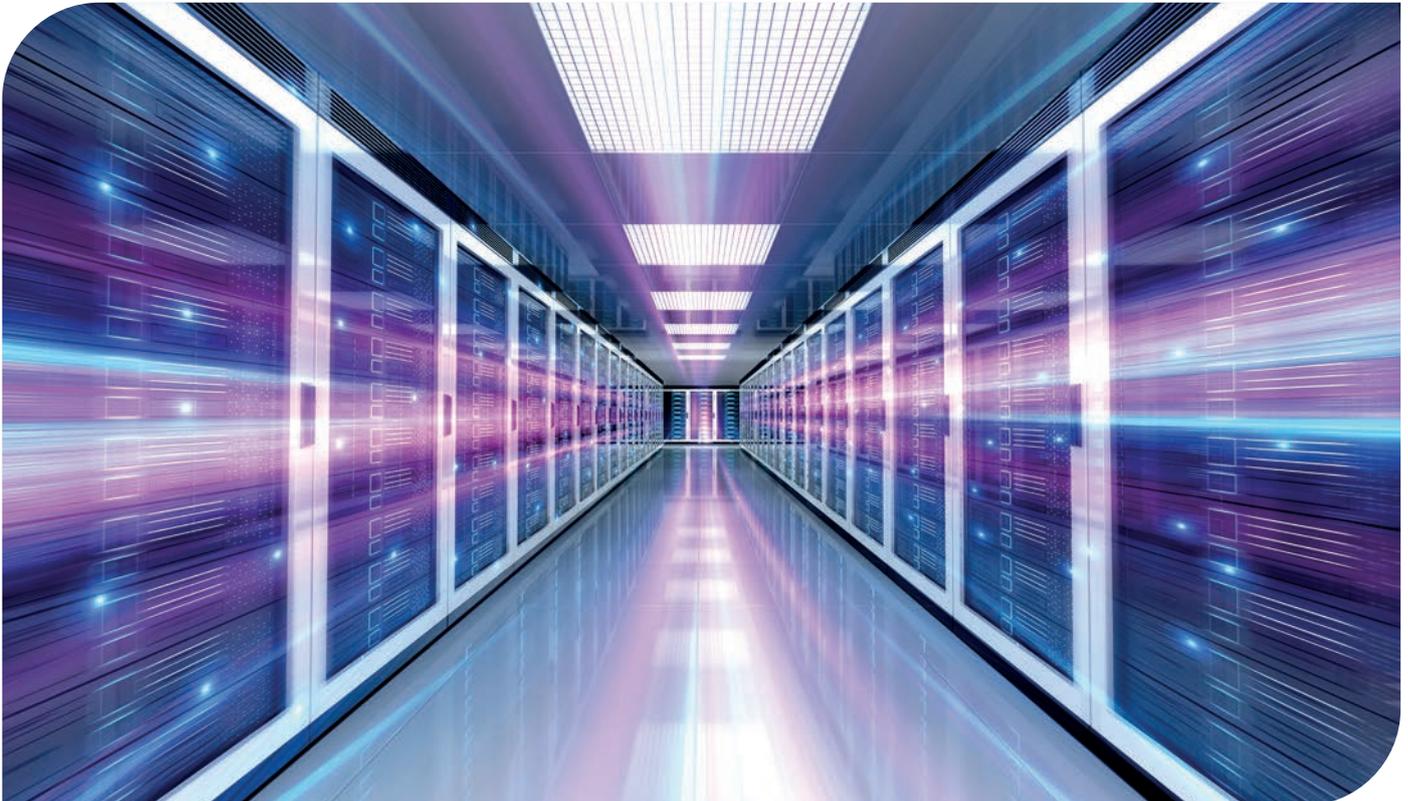
- Interactions between the FMT and the various systems or teams providing input data;
- Calculations and analysis performed by FMT;
- The delivery of outputs to the business;
- A reporting capability for analysis of FMT data;
- Technical functionality to manage the day-to-day operation of the FMT.

As the algorithms that would be used by the FMT have yet to be defined, this document does not attempt to describe their content or operation. Furthermore, it is recognised that the algorithms may require some data inputs not identified here, and/or it may be that some inputs that are described here will not be required by the eventual algorithms. As such it is recommended that this document is reviewed and revised when the algorithms have been finalised. At that point it may also be appropriate to include additional requirements supporting the use of FMT in "experimental mode" to adjust and fine tune the algorithm and its parameters, once it is better understood.

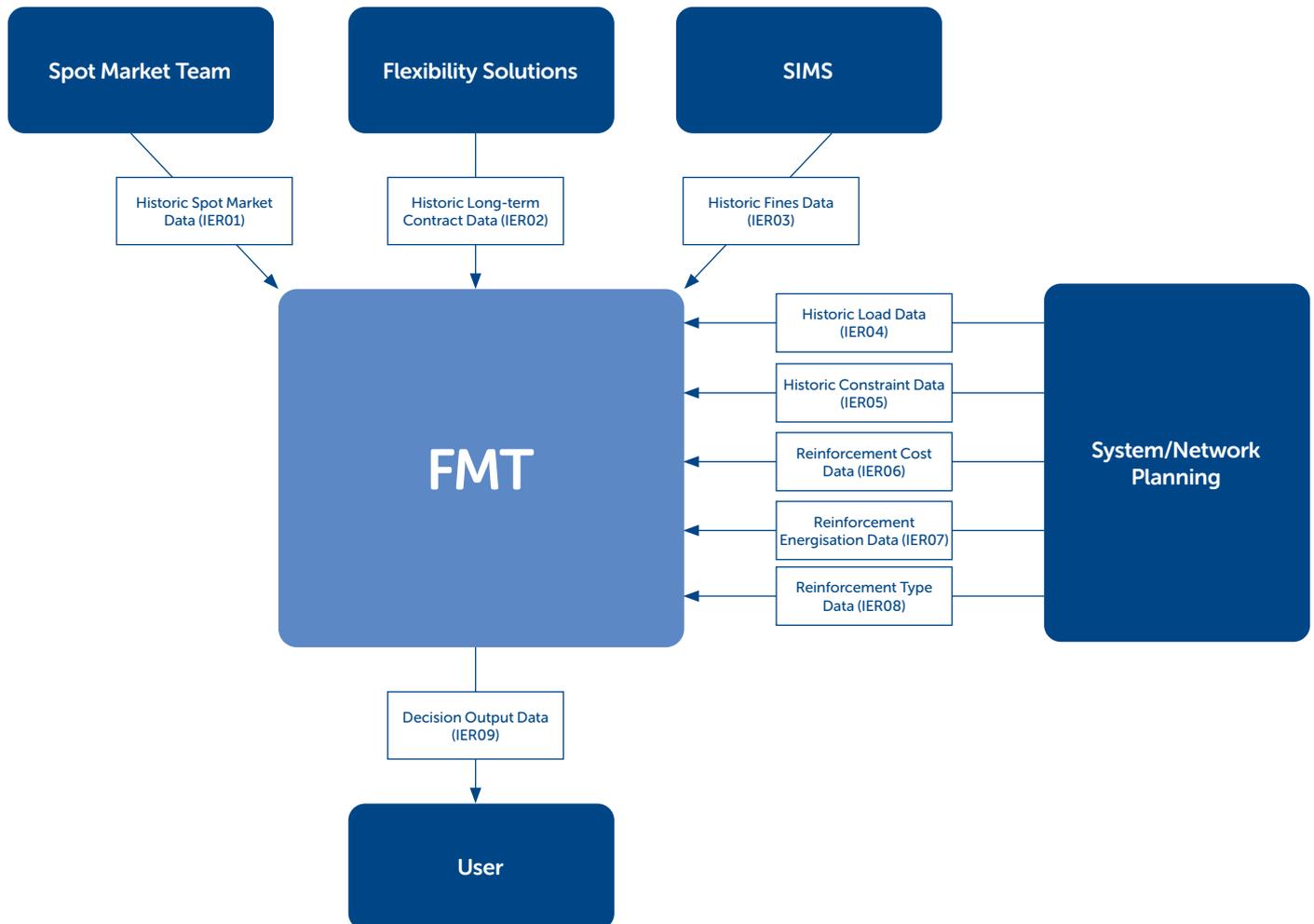
1.4 Document Structure

This document contains the following chapters:

- **Introduction**, this chapter;
- **To-Be Business Model (TBBM)**, outlining the overall context of the FMT and aspects of the TBBM that are common to all the remaining chapters;
- **Business Use Cases (BUCs)**, that define the business processes and business rules for the FMT;
- **Management Reports**, outlines specific reports that should be output by the FMT, for example statistical reporting for senior management decision making;
- **Non-Functional Requirements**, those business requirements which cannot easily be specified as functional requirements (ie in the BUCs) but nonetheless have significance to the FMT;
- **Appendices**, containing supporting information referenced elsewhere in the TBBM.



2. To-Be Business Model



2.1 Introduction

The TBBM consists of the following chapters of this document:

- To-Be Business Model (§2);
- Business Use Cases (§3);
- Management Reports (§4);
- Non-Functional Requirements (§5).
- This chapter addresses requirements which have relevance across all aspects of the TBBM.

2.2 Context diagram

The external scope of the FMT is shown in the Context Diagram below. Each external entity (ovals) exchanges data with the FMT as noted by the arrows. The arrows reference the Information Exchange Requirement (IER) which is presented in Appendices §6.1. The IER provides more details (including a reference to the relevant BUC) for each data flow.

The following table describes the entities in the Context diagram (clockwise from Spot Market Team).

Entity	Description
Spot Market Team	The team responsible for procuring flexibility services on the spot market. (Note: this team does not exist yet.)
Flexibility Solutions	The team responsible for procuring flexibility services under long-term contracts.
SIMS	A system that keeps records of Customer Interruptions (CI) and Customer Minutes Lost (CML) fines paid.
System/Network Planning	The teams responsible for system (33kV) and network (11kV) planning, and the systems they use including SINICAL and PSSE.
User	The person using FMT and receiving its output.

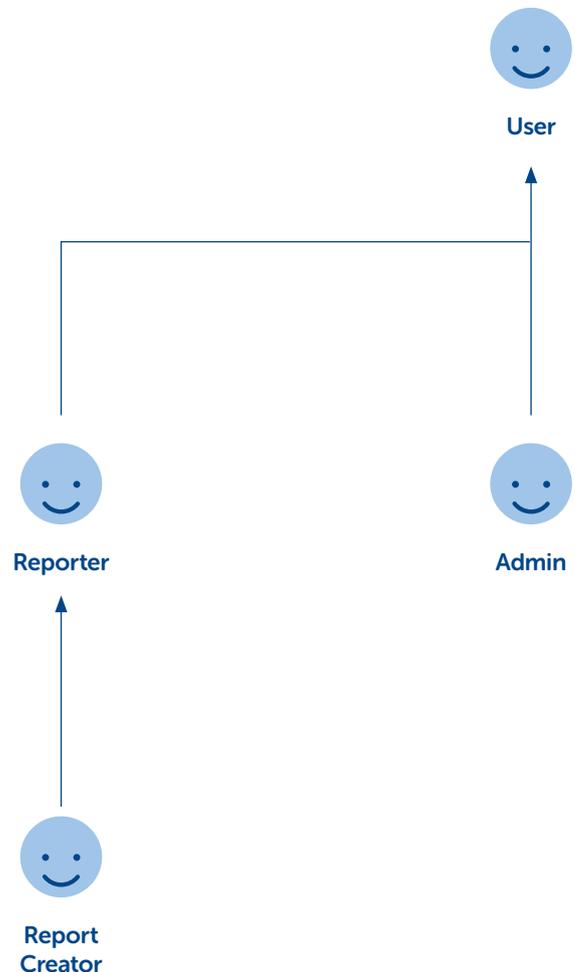
2.3 Roles

The following roles are required by the FMT system. These roles are specific to the FMT system and are unrelated to any similarly named roles within any other system or company. A detailed explanation about roles can be found in the TBBM Guide §6.1.6.

Role	Description
Admin	A User with technical administration rights for the FMT.
Reporter	A User entitled to produce management reports.
Report Creator	A Reporter with additional rights to create and maintain report templates.
User	The most generic role for FMT users. Users have view only access to some FMT content.

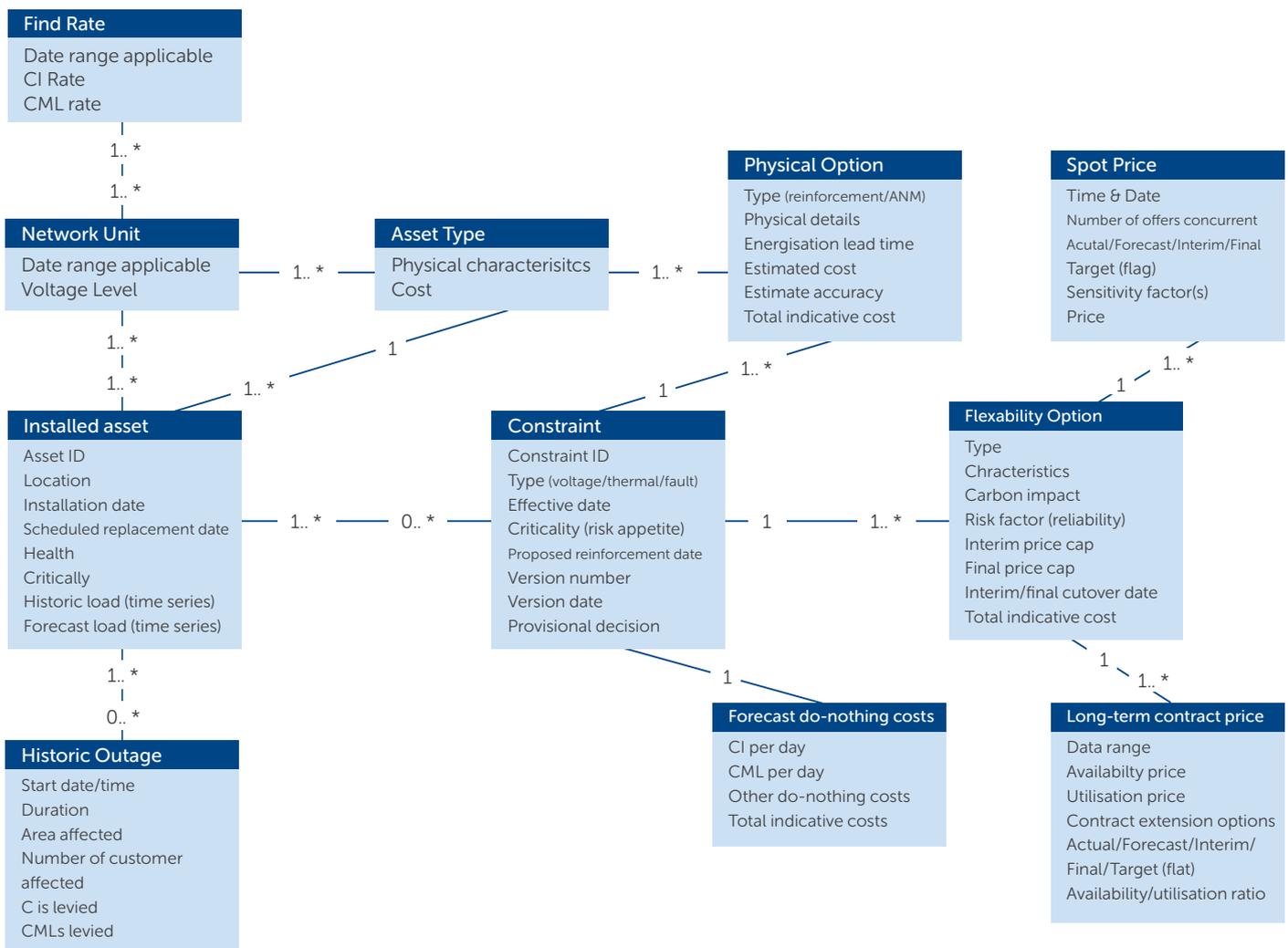
Role inheritance

The following diagram illustrates the FMT system role inheritance model. Inheritance is a means of describing cumulative increases in access rights and authority. In the diagram, the Reporter role inherits the basic User capabilities and has additional rights to run pre-defined management reports (see §4). The Report Creator role inherits the Reporter role's capabilities and has additional rights to prepare new management report designs.



2.4 Domain model

The following conceptual data model illustrates the data domain for the FMT system. Each rectangle is a data entity which contains a list of data attributes.



Data Entities

The following table describes the entities noted in the Domain Model above.

Entity	Description
Network Unit	A specific portion of the overall distribution network. It covers a defined area and has a particular Voltage level (e.g. 33kV). Each Network Unit consists of multiple Installed Assets.
Installed Asset	A specific physical asset (e.g. a line or transformer). Each Installed Asset is part of one or more Network Units (for example, a transformer between two Network Units of different Voltage levels will be part of both Network Units).
Asset Type	A generic physical asset (e.g. a particular model of transformer) with defined physical characteristics and a known cost. Each Installed Asset has precisely one Asset Type, while each Asset Type can be associated with one or more Installed Assets that exist within one or more Network Units.
Fine Rate	A set of CI and CML fine rates that apply for a particular range of dates. Each Fine Rate applies to one or more Network Units, and each Network Unit may have one or more Fine Rates (e.g. different sets of rates over time as the fines are adjusted).
Historic Outage	An actual outage that affected one or more Installed Assets over a specific period of time in the past. Each Installed Asset may have zero, one or multiple Historic Outages associated with it.
Constraint	A predicted constraint (i.e. one that is expected to lead to an outage if not mitigated) that is forecast to affect one or more Installed Assets from a specific date in the future.
Forecast Do-nothing Costs	The expected costs of not mitigating a particular Constraint, including the fines expected to be payable if the Constraint is not mitigated either with a Physical Option or a Flexibility Option.
Physical Option	An option for mitigating a particular Constraint using either traditional reinforcement or ANM. Each Physical Option will include one or more Asset Types and be associated with precisely one Constraint, while a Constraint may have one or more Physical Options available for consideration.
Flexibility Option	An option for mitigating a particular Constraint using flexibility services, either via the spot market or under a long-term contract. Each Flexibility Option will be associated with precisely one Constraint, while a Constraint may have one or more Flexibility Options available for consideration.
Spot Price	A spot market price for the provision of a particular Flexibility Option. Each Flexibility Option will have multiple Spot Prices associated with it, of different types, as described in sections 3.4 and 3.5.
Long-term Contract Price	A long-term contract price for the provision of a particular Flexibility Option. Each Flexibility Option will have multiple Long-term Contract Prices associated with it, of different types, as described in sections 3.4 and 3.5.

3. Business use cases

3.1 Introduction

The Business Use Cases are high level descriptions of the main business processes that an FMT system should support. This chapter contains most of these BUCs.

The BUCs in this chapter are divided into logical packages. These packages have no special significance and merely provide an aid to understanding related BUCs. The packages are as follows:

- **Package A:** System Access
- **Package B:** Input Data Processing
- **Package C:** Financial Analysis Processing
- **Package D:** Miscellaneous

Each package has an associated diagram illustrating the relationship between BUCs in the package and the main actors to which they apply.

It should be noted that BUC identity numbers are purely to provide a unique reference. They do not follow any particular sequence nor imply an order of processing.

The BUCs are supported by the TBBM Roles (§2.3.3) and TBBM Domain Model (§2.5).

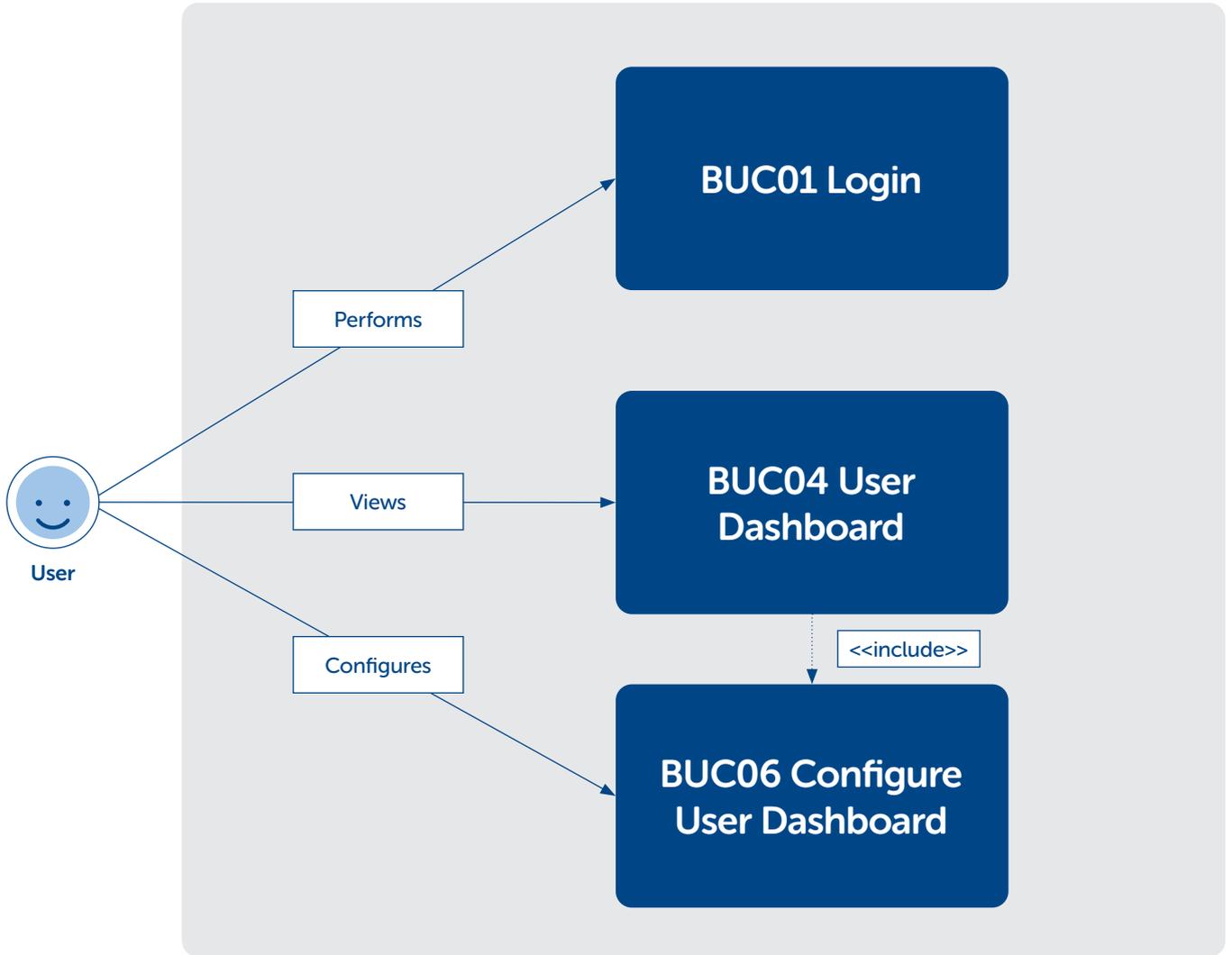
Any BUCs shown as being controlled by a User of any type may be configured to be accessed by an external system via an automated interface. This is a design consideration and so is not explicitly mentioned for any particular BUC in this Requirement Specification.

3.2 General Rules & Assumptions

There are a number of business rules and assumptions that are applicable across a range (or all) BUCs. These rules are stated in this section. Except where explicitly identified, BUCs should be read as having these rules applied as well as any specific to a given BUC.

- The FMT system is assumed to be functioning correctly.
- The FMT system has the ability to add/change input data (items) as new contract types emerge or the process of contracting for flexibility is developed.





3.3 Package A: System access

The diagram below illustrates the relationships between the set of BUCs relating to basic user access to the FMT.

BUC01 Login

Users must be able to gain access to the FMT by a simple but secure mechanism. The precise credentials necessary will be determined in conjunction with SSEN security group.

Extend/Include	None.
Roles	User.
Success Criteria	The User is able perform their work with the FMT.
Preconditions	None.
Trigger	User chooses to access the FMT system through their browser.

Main Path

- User provides their credentials.

Post Conditions

User can access the FMT system.

Alternative Paths

1a. Already logged in

Post: User continues to access the FMT system without further challenge.

1b. Existing login has expired

1b1. User is asked to provide their credentials again. Resume at step 1.

1c. Forgotten credentials

1c1. User is directed to information allowing them to recover their credential.

Post: User is does not gain access to FMT.

1d. Incorrect credentials

1d1. User is warned that their credentials are not valid. Resume at step 1.

1d1a. Too many login attempts

1d1a1. User account is suspended.

Post: User can no longer access FMT until their account is restored.

1e. First time access

1e1. User is asked to enter a new password and other credentials.

1e1a. Credentials are not valid

1e1a1. User is warned that their credentials are not valid. Resume at step 1e1.

1e1b. Too many attempts

1e1b1. Follow step 1d1a.

1f. Password has expired

1f1. User is asked to provide a new password and/or other credentials. Resume at step 1.

1g. Account is suspended

Post: User is prevented from accessing FMT.

1h. Logout

Post: User does not have access to FMT until they provide their credentials again.

1i. Timed out

Post: User does not have access to FMT until they provide their credentials again.

Business Rules

R1. See Security (§5.3) for details regarding valid User credentials.



BUC04 User Dashboard

This BUC presents the starting point for User activities within the FMT system following login. The intent is that the dashboard content may be configurable through BUC06 Configure User Dashboard.

Includes	BUC06 Configure User Dashboard
Roles	User
Success Criteria	User has summary information pertaining to their work in the FMT and can access all functionality relevant to that work.
Preconditions	None
Trigger	User has navigated to their dashboard.

Main Path

- User has various containers of information and navigation tools.

User chooses an information container or navigation item.

Post Conditions

User is navigated to content related to the selected item.

Alternative Paths

2a. Configure dashboard

2a1. User follows BUC06 Configure User Dashboard.

2a2. Resume at step 1.

Business Rules

R1. Examples of content that might be presented in the User dashboard include:

- Options for inputting data to the FMT using the BUCs defined in section 3.4.
- Options for viewing the progress and status of the FMT's calculations
- Options for viewing the outputs generated by the FMT

BUC06 Configure User Dashboard

A means to provide configuration tools to those accessing the FMT through the User Dashboard may be desirable.

Included in	BUC04 User Dashboard
Roles	User
Success Criteria	User has the optimum set of items on their dashboard to efficiently perform their tasks in the FMT system.
Preconditions	None.
Trigger	User has chosen to configure their dashboard.

Main Path

- User has a list of all available dashboard items for the role(s).
- User chooses the dashboard items that they want to appear in their personal dashboard.

Post Conditions

Resume in parent BUC.

Alternative Paths

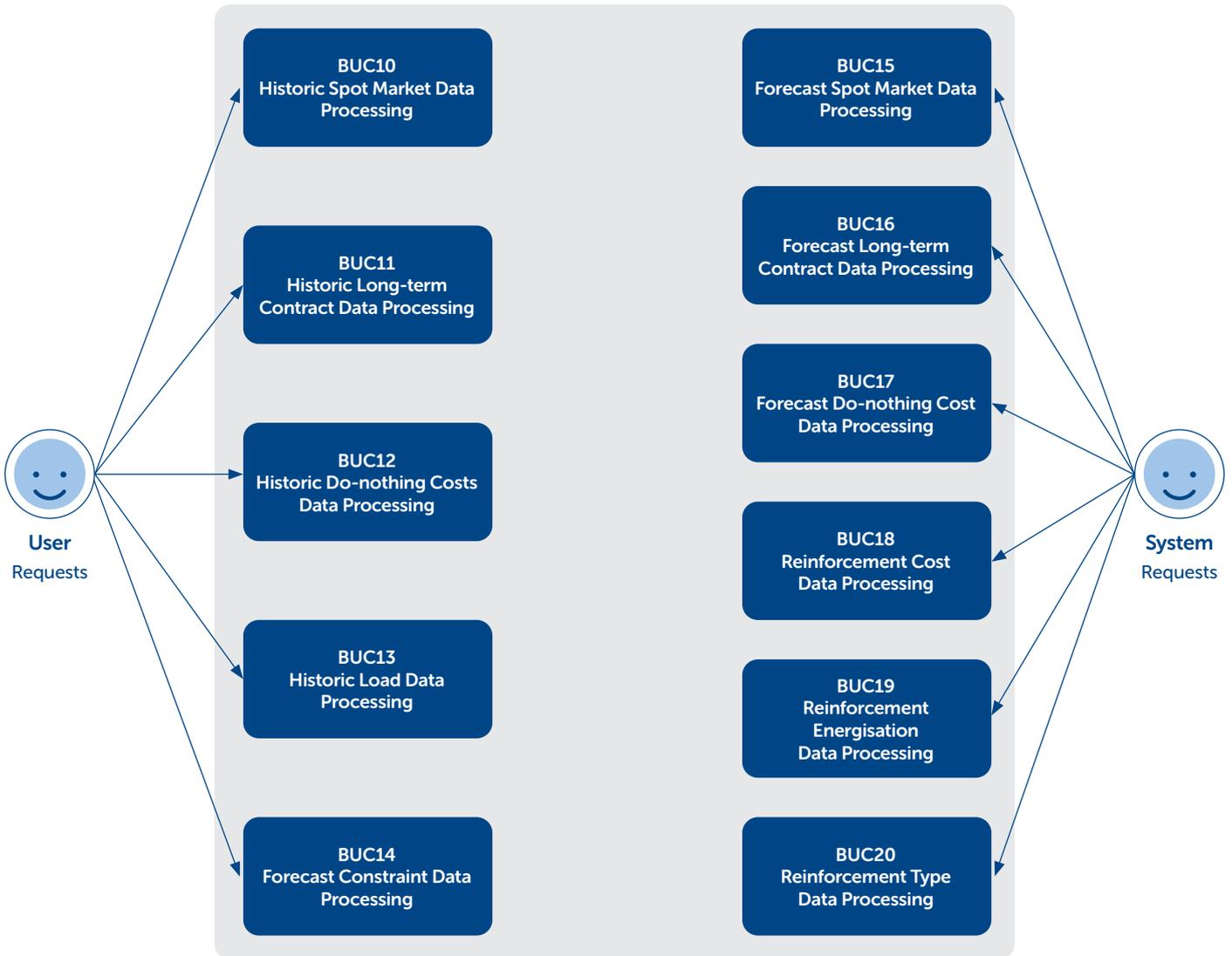
None.

Business Rules

R1. Dashboard items might include:

- Options for inputting data to the FMT using the BUCs defined in section 3.4.
- Options for viewing the progress and status of the FMT's calculations
- Options for viewing the outputs generated by the FMT





3.4 Package B: Input Data Processing

The diagram below illustrates the relationships between the set of BUCs relating to Input Data Processing.

These are the use cases for obtaining and collating the input data used in the financial analysis calculations.

General requirement: the FMT system should have the ability to take in additional parameters/input data in the future, above and beyond those already identified, as the model evolves.

Risk: additional inputs may be required, beyond those identified, depending on the details of the algorithm used (to be defined).

BUC10 Historic Spot Market Data Processing

This use case obtains historic spot market data (from the spot market system or WSC) which is used to build up a view of typical historic prices and the factors that affect them, and feed into the calculation of forecast spot market prices.

Extend/Include	
Roles	User [alternative: System]
Success Criteria	FMT database has been updated with the obtained data.
Preconditions	Data is available at source(s).
Trigger	FMT database needs updating with latest data. [alternative: automatic periodic trigger (e.g. daily/weekly/monthly)]

Main Path

- System obtains historic spot market data from source(s).
- System updates FMT database with the obtained data.

Post Conditions

System has successfully updated the FMT database with the obtained data.

Alternative Paths

None.

Business Rules

R1. The historic spot market data should include:

- Historic spot prices per constraint flex option
- Additional data per spot price (time of day, time of year, number of offers, etc.)
- Risk factor per constraint flex option (i.e. confidence in delivery)

BUC11 Historic Long-term Contract Data Processing

This use case obtains historic long-term contract data which is used to build up a view of typical historic prices, and feed into the calculation of forecast long-term contract prices.

Source: currently unclear, possibly a spreadsheet

Extend/Include	
Roles	User [alternative: System]
Success Criteria	FMT database has been updated with the obtained data.
Preconditions	Data is available at source(s).
Trigger	FMT database needs updating with latest data. [Alternative: automatic periodic trigger (e.g. daily/weekly/monthly)]

Main Path

- System obtains historic long-term contract data from source(s).
- System updates FMT database with the obtained data.

Post Conditions

System has successfully updated the FMT database with the obtained data.

Alternative Paths

None.

Business Rules

R1. The historic long-term contract data should include:

- Historic long-term contract prices bid by providers (including those not accepted)
- Date range for each long-term contract price
- Remaining asset life of the unreinforced asset
- Any options to extend the initial contract period
- Risk factor per constraint flex option (i.e. confidence in delivery, determined by ratio of delivery vs non-delivery)

BUC12 Historic Do-nothing Costs Data Processing

This use case obtains historic data on the costs of not mitigating constraints and outages, including fines for non-supply, which is used to build up a view of typical historic costs, and feed into the calculation of forecast do-nothing costs.

Source: SIMS system

Extend/Include	
Roles	User [alternative: System]
Success Criteria	FMT database has been updated with the obtained data.
Preconditions	Data is available at source.
Trigger	FMT database needs updating with latest data. [alternative: automatic periodic trigger (e.g. daily/weekly/monthly)]

Main Path

- System obtains historic cost data from source.
- System updates FMT database with the obtained data.

Post Conditions

System has successfully updated the FMT database with the obtained data.

Alternative Paths

None.

Business Rules

R1. The historic cost data should include:

- Historic interruptions/outages
- For each interruption/outage: date, time, duration, fines levied (CI and CML), and any other costs incurred

BUC13 Historic Load Data Processing

This use case obtains historic data on network load for each installed asset, which is used alongside the historic price and do-nothing costs data to feed into the calculation of forecast market prices and do-nothing costs.

Source: Data historian (Pi)

Extend/Include	
Roles	User [alternative: System]
Success Criteria	FMT database has been updated with the obtained data.
Preconditions	Data is available at source.
Trigger	FMT database needs updating with latest data. [alternative: automatic periodic trigger (e.g. daily/weekly/monthly)]

Main Path

- System obtains historic load data from source.
- System updates FMT database with the obtained data.

Post Conditions

System has successfully updated the FMT database with the obtained data.

Alternative Paths

None.

Business Rules

R1. The historic load data should include:

- For each network asset, details of historic loads (time series of actual loads)

BUC14 Forecast Constraint Data Processing

This use case obtains details of future constraints identified in PSSE (planning tool), which is the trigger for FMT to produce its analysis of the various options available for alleviation of each constraint.

Source: PSSE (planning tool)

Extend/Include	
Roles	User [alternative: System]
Success Criteria	FMT database has been updated with the obtained data.
Preconditions	Data is available at source.
Trigger	FMT database needs updating with latest data. [alternative: automatic periodic trigger (e.g. daily/weekly/monthly)]

Main Path

- System obtains forecast constraint data from source.
- System updates FMT database with the obtained data.

Post Conditions

System has successfully updated the FMT database with the obtained data.

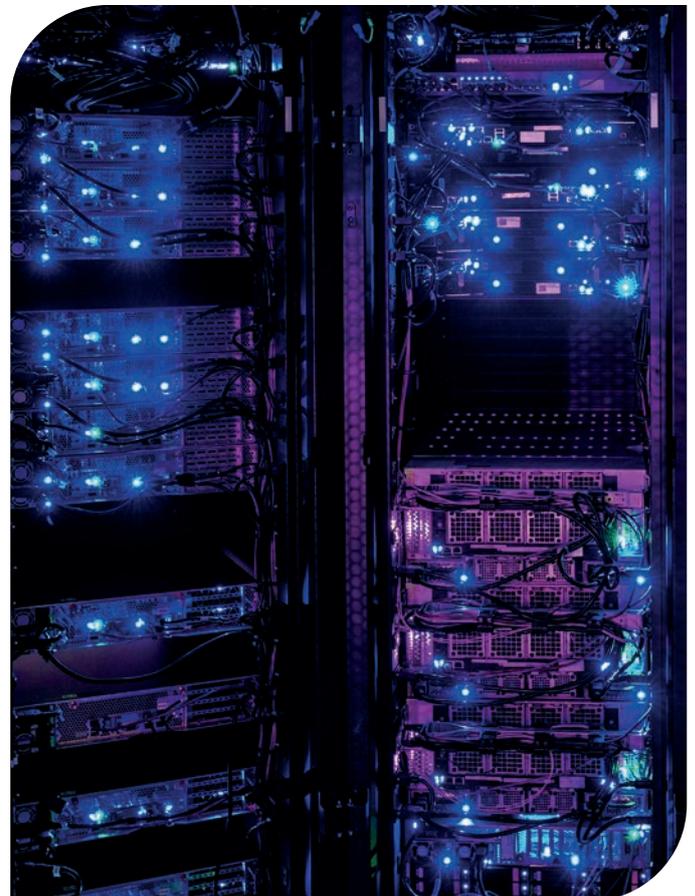
Alternative Paths

None.

Business Rules

R1. The forecast constraint data should include for each identified constraint:

- Location (network asset)
- Type (Voltage/thermal)
- Date constraint will become “active” (i.e. when load is forecast to exceed capacity)
- Load forecast (time series of forecast loads)
- Physical options (e.g. reinforcement/ANM)
- Flexibility requirement (e.g. unrestricted, demand reduction only, generation only, etc.)
- Criticality (suitability for risky flexibility vs reliable reinforcement)



BUC15 Forecast spot market data processing

This use case estimates future spot market prices for a flexibility option based on historic payments and demand/load forecasts. It generates a forward price curve per flexibility option for each forecast constraint and sensitivity analysis for each curve.

[Alternative method: follow the Transition NMF approach: go to market with requests for offers of flexibility from providers; use these offers to produce the forecast price curve.]

Extend/Include	
Roles	System
Success Criteria	FMT has generated a forward price curve per flexibility option for each forecast constraint and sensitivity analysis for each curve.
Preconditions	BUC10, BUC13, BUC14 completed.
Trigger	Automatic periodic trigger (e.g. daily/weekly/monthly)

Main Path

- System identifies forecast constraints with flexibility options for which spot market price forecasts are required.
- System calculates, for each flexibility option, a forward price curve showing estimated spot prices over time, and sensitivity analysis for the curve based on external factors (e.g. number of offers)
- System updates the FMT database with the calculated price curves and sensitivity analysis.

Post Conditions

System has successfully updated the FMT database with the calculated data.

Alternative Paths

2a. Insufficient data

- 2a1. System determines that it has insufficient data on which to base the calculation for a particular constraint or flexibility option.
- 2a2. System prompts the user to provide the required data via BUC(s) 10, 13 and/or 14 as appropriate.
- 2a3. System resumes at step 2 once the required data is provided.

Business Rules

N/A

BUC16 Forecast long-term contract data processing

This use case estimates long-term contract prices for a flexibility option based on historic payments and demand/load forecasts. The forecast includes both availability and utilisation prices.

Extend/Include	
Roles	System
Success Criteria	FMT has estimated long-term contract prices for each flexibility option associated with each forecast constraint.
Preconditions	BUC11, BUC13, BUC14 completed.
Trigger	Automatic periodic trigger (e.g. daily/weekly/monthly)

Main Path

- System identifies forecast constraints with flexibility options for which long-term contract price forecasts are required.
- System calculates, for each flexibility option, estimated long-term contract prices for availability and utilisation.
- System updates the FMT database with the calculated long-term prices.

Post Conditions

System has successfully updated the FMT database with the calculated data.

Alternative Paths

2a. Insufficient data

- 2a1. System determines that it has insufficient data on which to base the calculation for a particular constraint or flexibility option.
- 2a2. System prompts the user to provide the required data via BUC(s) 11, 13 and/or 14 as appropriate.
- 2a3. System resumes at step 2 once the required data is provided.

Business Rules

N/A

BUC17 Forecast do-nothing costs data processing

This use case estimates the future costs associated with not mitigating a constraint, including fines for non-supply, based on historic costs and payments, the prevailing fine rates, and demand/load forecasts.

Extend/Include	
Roles	System
Success Criteria	FMT has estimated the future costs of not mitigating a constraint, including the fines payable for non-supply, at each forecast constraint.
Preconditions	BUC12, BUC13, BUC14 completed.
Trigger	Automatic periodic trigger (e.g. daily/weekly/monthly)

Main Path

- System identifies forecast constraints for which do-nothing cost forecasts are required.
- System calculates, for each forecast constraint, the costs that would be incurred if the constraint was not mitigated, including the fines that would be payable for non-supply.
- System updates the FMT database with the calculated costs.

Post Conditions

System has successfully updated the FMT database with the calculated data.

Alternative Paths

2a. Insufficient data

- 2a1. System determines that it has insufficient data on which to base the calculation for a particular constraint.
- 2a2. System prompts the user to provide the required data via BUC(s) 12, 13 and/or 14 as appropriate.
- 2a3. System resumes at step 2 once the required data is provided.

Business Rules

N/A

BUC18 Reinforcement cost data processing

This use case obtains the estimated costs for each physical option (e.g. traditional reinforcement or ANM) for the alleviation of a forecast constraint. These cost estimates are obtained from System/Network Planner applications.

Extend/Include	
Roles	System
Success Criteria	FMT has obtained the cost of traditional reinforcement or ANM per physical option at each forecast constraint.
Preconditions	BUC13, BUC14 completed.
Data is available at source.	
Trigger	Automatic periodic trigger (e.g. daily/weekly/monthly)

Main Path

- System identifies forecast constraints with physical options for which cost forecasts are required.
- System obtains from System/Network Planner applications, for each physical option, the estimated cost.
- System updates the FMT database with the estimated costs.

Post Conditions

System has successfully updated the FMT database with the obtained data.

Alternative Paths

None.

Business Rules

N/A

BUC19 Reinforcement energisation data processing

This use case obtains the estimated energisation date (lead time to energisation) for each physical option (e.g. traditional reinforcement or ANM) for the alleviation of a forecast constraint. These lead time estimates are obtained from System/Network Planner applications.

Extend/Include	
Roles	System
Success Criteria	FMT has obtained the lead time to energisation per physical option at each forecast constraint.
Preconditions	BUC13, BUC14 completed.
Data is available at source.	
Trigger	Automatic periodic trigger (e.g. daily/weekly/monthly)

Main Path

- System identifies forecast constraints with physical options for which reinforcement energisation lead times are required.
- System obtains from System/Network Planner applications, for each physical option, the estimated reinforcement lead time.
- System updates the FMT database with the estimated lead times.

Post Conditions

System has successfully updated the FMT database with the obtained data.

Alternative Paths

None.

Business Rules

N/A

BUC20 Reinforcement type data processing

This use case obtains the typical characteristics and parameters for each physical option (e.g. traditional reinforcement or ANM) for the alleviation of a forecast constraint. These are obtained from planning.

Extend/Include	
Roles	System
Success Criteria	FMT has obtained the characteristics and parameters per physical option at each forecast constraint.
Preconditions	BUC13, BUC14 completed.
Data is available at source.	
Trigger	Automatic periodic trigger (e.g. daily/weekly/monthly)

Main Path

- System identifies forecast constraints with physical options for which physical characteristics are required.
- System obtains from PSSE, for each physical option, the typical characteristics and parameters.
- System updates the FMT database with the information.

Post Conditions

System has successfully updated the FMT database with the obtained data.

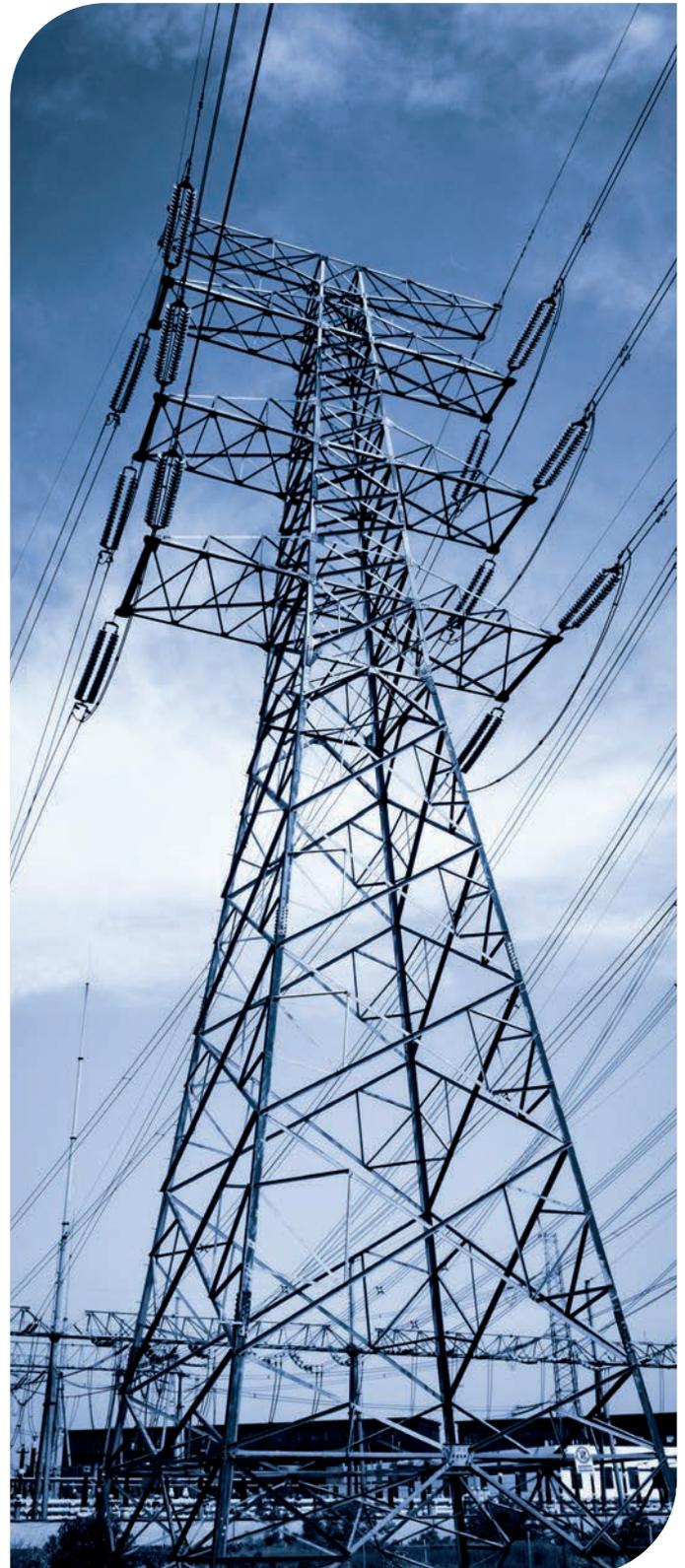
Alternative Paths

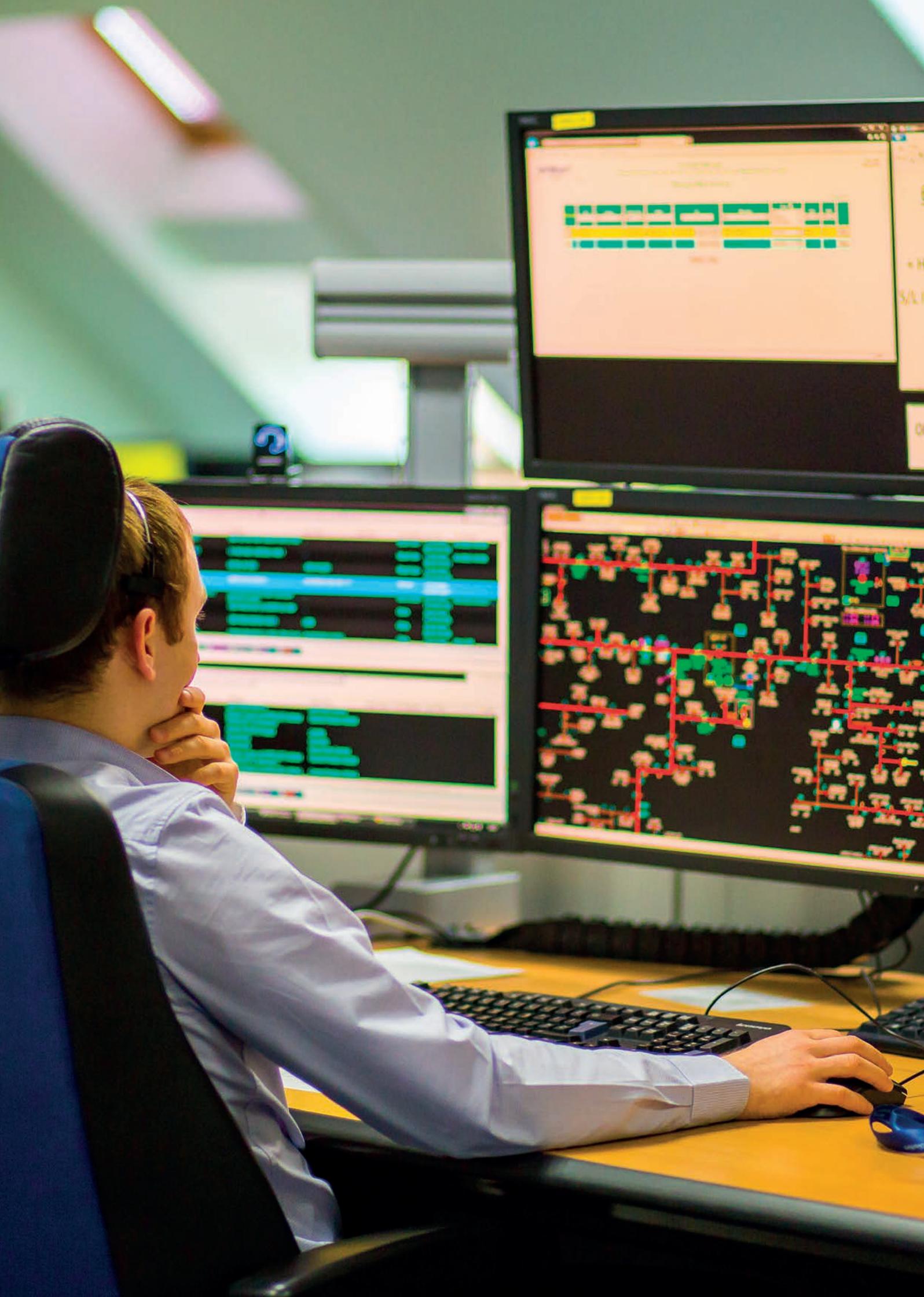
None.

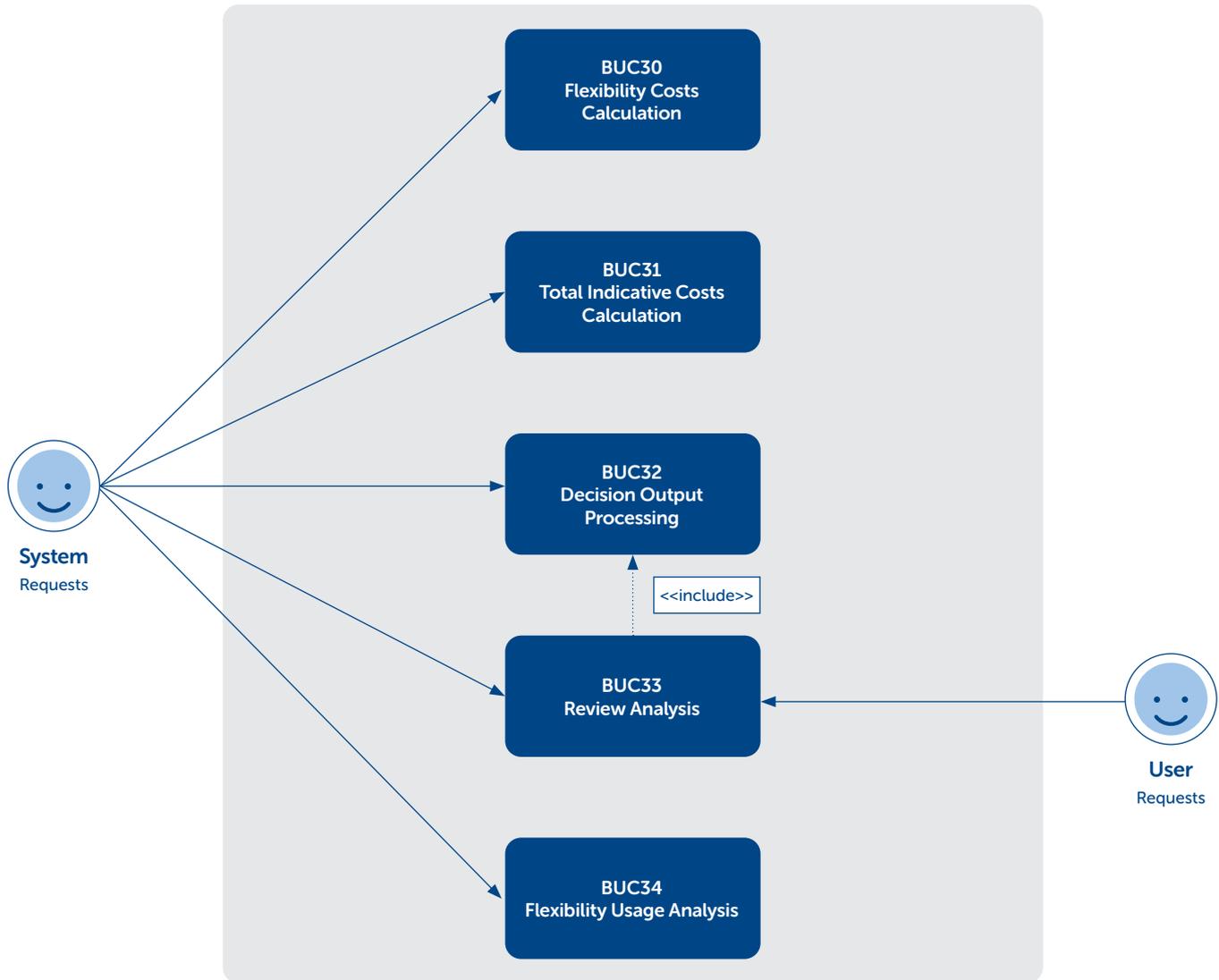
Business Rules

R1. The information should include for each physical option:

- Asset type(s) and quantities







Package C: Financial analysis processing

The diagram below illustrates the relationships between the set of BUCs relating to Financial Analysis Processing.

These are the use cases for performing the financial analysis based on the input data to calculate the optimal actions for each constraint and presenting the output.

BUC30 Flexibility costs calculation

This use case performs the calculations at the heart of the FMT's analysis. It performs the following for each flexibility option:

- Calculate the final price cap for flexibility, based on the estimated cost of traditional reinforcement
- Identify whether the constraint is expected to occur before traditional reinforcement is possible, based on the energisation date, and if so:
 - Calculate the interim price cap for flexibility, based on the forecast do-nothing costs
- Calculate ceiling price(s) for flexibility, based on the price cap(s) (final, and interim if applicable) and the reliability of the flexibility option (i.e. the lower the reliability of flexibility, the less valuable it is, and the lower the ceiling price should be)
- Calculate the maximum availability and utilisation payments for long-term flexibility contracts, based on the ceiling price(s) (final, and interim if applicable) and availability/utilisation forecasts
- Identify whether sufficient historic data is available to estimate expected market price(s) for flexibility, and if so:
 - Calculate the target price(s) for spot and long-term flexibility contracts based on historic and future spot and long-term market data

The result is, for each flexibility option, the maximum worthwhile payment (ceiling price) for flexibility, above which it becomes uneconomical, but below which it is worth considering as a viable alternative to traditional reinforcement and/or incurring no-supply fines and associated costs, and (if available) an expected price for the flexibility option that might be offered by the provider.

Extend/Include	
Roles	System
Success Criteria	FMT has calculated ceiling prices and expected prices (if available) for each flexibility option.
Preconditions	BUC15, BUC16, BUC17, BUC18, BUC19, BUC20 completed.
Trigger	Completion of BUC14 OR triggered by BUC33

Main Path

- System calculates the maximum daily payment (final price cap) for a flexibility option based on the estimated cost of its associated physical option.
- System calculates the final ceiling price for a flexibility option based on its final price cap and the reliability of the flexibility option.
- System calculates the maximum final availability price under a long-term contract for a flexibility option based on its final ceiling price and forecast availability requirements.
- System calculates the maximum final utilisation price under a long-term contract for a flexibility option based on its final ceiling price and forecast utilisation requirements.
- System confirms that the physical option is available for deployment before its associated constraint becomes active.
- System confirms that sufficient historic flexibility market data exists to support estimation of target prices.
- System calculates estimated market prices (target prices) for the long-term contract market (availability and utilisation prices) and/or the spot market.
- System updates the FMT database with the information.

Post Conditions

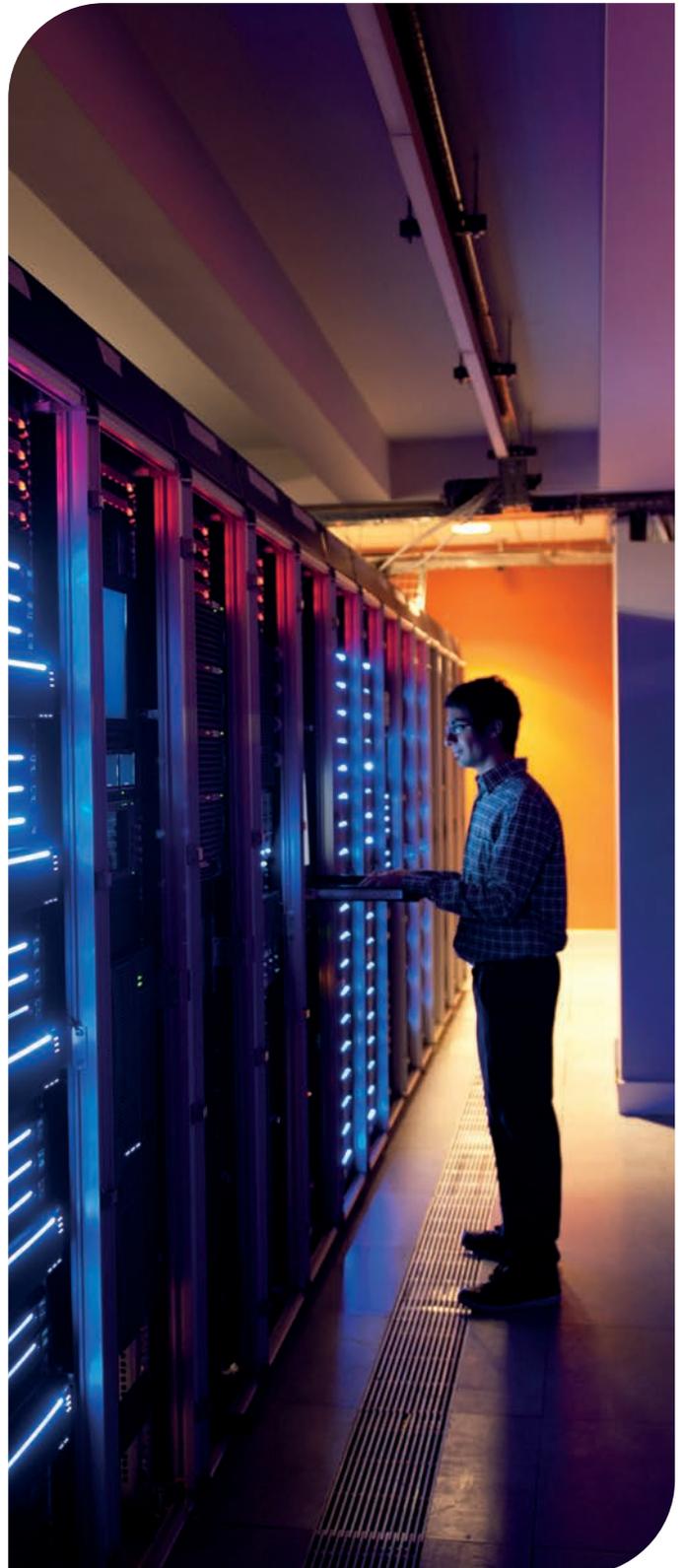
System has successfully updated the FMT database with the calculated data.

Alternative Paths

- 5a. Constraint occurs within lead time to energisation of physical option
 - 5a1. System calculates the maximum daily payment (interim price cap) for a flexibility option based on the forecast do-nothing costs for its associated constraint.
 - 5a2. System calculates the interim ceiling price for a flexibility option based on its interim price cap and the reliability of the flexibility option.
 - 5a3. System calculates the maximum interim availability price under a long-term contract for a flexibility option based on its interim ceiling price.
 - 5a4. System calculates the maximum interim utilisation price under a long-term contract for a flexibility option based on its interim ceiling price.
 - 5a5. System resumes at step 6.
- 6a. Insufficient historic market data
 - 6a1. System sets target prices to default values.
 - 6a2. System resumes at step 8.

Business Rules

- R1. All calculations will be performed in accordance with algorithms TBD.



BUC31 Total Indicative Costs Calculation

This use case takes the data for the options for alleviating a constraint (i.e. do nothing, physical option, flexibility option) and calculates a "total indicative cost" for each one, so that they can be compared with each other on a consistent basis. It then calculates the proposed reinforcement date, i.e. the date at which the physical option becomes preferable.

Extend/Include	
Roles	System
Success Criteria	FMT has calculated total indicative costs for each option associated with a constraint.
Preconditions	BUC30 completed.
Trigger	Completion of BUC30.

Main Path

- System calculates the total indicative cost of the "do nothing" option for a constraint based on the estimated do-nothing costs including the associated no-supply fines.
- System calculates the total indicative cost of the physical option for a constraint based on the estimated cost of that physical option.
- System calculates the total indicative cost of the flexibility option for a constraint based on the estimated target prices and/or ceiling prices calculated for that flexibility option.
- System calculates the proposed reinforcement date for a constraint based on the relative total indicative costs of each option.
- System updates the FMT database with the information.

Post Conditions

System has successfully updated the FMT database with the calculated data.

Alternative Paths

None.

Business Rules

- R1. All calculations will be performed in accordance with algorithms TBD.

BUC32 Decision Output Processing

This use case takes the results of the calculations performed in BUC30 and BUC31, along with other relevant information relating to the options for alleviating a particular constraint, and presents them for consideration by the business.

Extend/Include	Extends BUC33.
Roles	System
Success Criteria	FMT has presented the results of its financial analysis for a constraint.
Preconditions	BUC30 and BUC31 completed.
Trigger	Completion of BUC31.

Main Path

- System outputs information regarding the options for a constraint (see Business Rules for details).
- User selects a preferred option for further investigation (e.g. obtaining quotes for flexibility provision) or specifies that there is no clear preference.
- System records the specified provisional decision in its database.

Post Conditions

System has successfully output the information and recorded the user's provisional decision.

Alternative Paths

None.

Business Rules

R1. The information should include for each constraint:

- Constraint characteristics
 - Constraint ID
 - Type (Voltage/thermal/fault)
 - Effective date
 - Criticality (risk appetite)
 - Proposed reinforcement date
 - Version number
 - Version date
- Constrained asset(s)
 - Asset ID
 - Asset type
 - Location
- Do-nothing option
 - CI cost per day
 - CML cost per day
 - Total indicative cost
- Physical option
 - Physical details
 - Estimated total cost
 - Estimate accuracy
 - Energisation lead time
 - Type (e.g. reinforcement/ANM)
 - Total indicative cost
- Flexibility option
 - Type
 - Characteristics
 - Reliability
 - Interim ceiling price
 - Date effective to
 - Final ceiling price
 - Interim maximum long-term availability price
 - Date effective to
 - Final maximum long-term availability price
 - Interim maximum long-term utilisation price
 - Date effective to
 - Final maximum long-term utilisation price
 - Target spot price
 - Target long-term availability price
 - Target long-term utilisation price
 - Total indicative cost

BUC33 Review analysis

This use case allows a user to search for the results of analyses previously carried out by FMT, and to initiate the recalculation of the analysis for a particular constraint, for example if more accurate cost estimates for the physical option have been produced since the previous analysis was performed.

Extend/Include	Includes BUC32.
Roles	User
Success Criteria	FMT has presented the results of a user search and initiated the recalculation of a selected result, if requested.
Preconditions	None.
Trigger	User wants to review previous analysis and/or recalculate results based on changed input data.

Main Path

- System prompts user to specify search criteria.
- User enters search criteria.
- System displays a list of all previous analyses that meet the search criteria.
- User selects a specific result from the list displayed.
- System displays the detailed output (as per BUC32) for the selected analysis.
- User indicates the selected analysis must be repeated.
- System triggers BUC30.

Post Conditions

System has successfully displayed the relevant results, and initiated recalculation if requested.

Alternative Paths

- 4a. Detailed information not required
 - 4a1. No further processing.
- 6a. Recalculation not required
 - 6a1. No further processing.

Business Rules

- R1. If recalculation is required based on changed input data, the user must ensure the revised data is input into the system using the appropriate Input Data Processing BUC(s) before initiating the recalculation via this BUC.

BUC34 Flexibility usage analysis

This use case compares the actual usage and costs of flexibility options that have been utilised with the latest version of the system's previous analysis for that option, and highlights any significant discrepancies, for example where the actual usage and costs are substantially higher than expected. This allows the business to reconsider the usage of the flexibility option, including repeating the analysis based on the actual cost data using BUC33.

Extend/Include	
Roles	System [alternative: User]
Success Criteria	FMT has highlighted any significant discrepancies between the actual usage/ costs of utilised flexibility options and its own previously conducted analysis.
Preconditions	BUC10, BUC11, BUC31.
Trigger	Automatic periodic trigger (e.g. monthly/quarterly) [alternative: User wants to assess actual costs against expectations].



Main Path

- System identifies flexibility options for which actual usage/cost data is available (as obtained via BUC10 and BUC11).
- For each flexibility option identified in step 1, system compares the actual usage/cost with the results of its own analysis previously conducted via BUC31.
- System identifies any such flexibility options for which the discrepancy between the actual and predicted usage/cost is beyond a defined tolerance.
- System outputs details of any such discrepancies.

Post Conditions

System has successfully output details of any discrepancies between expected and actual flexibility usage/costs.

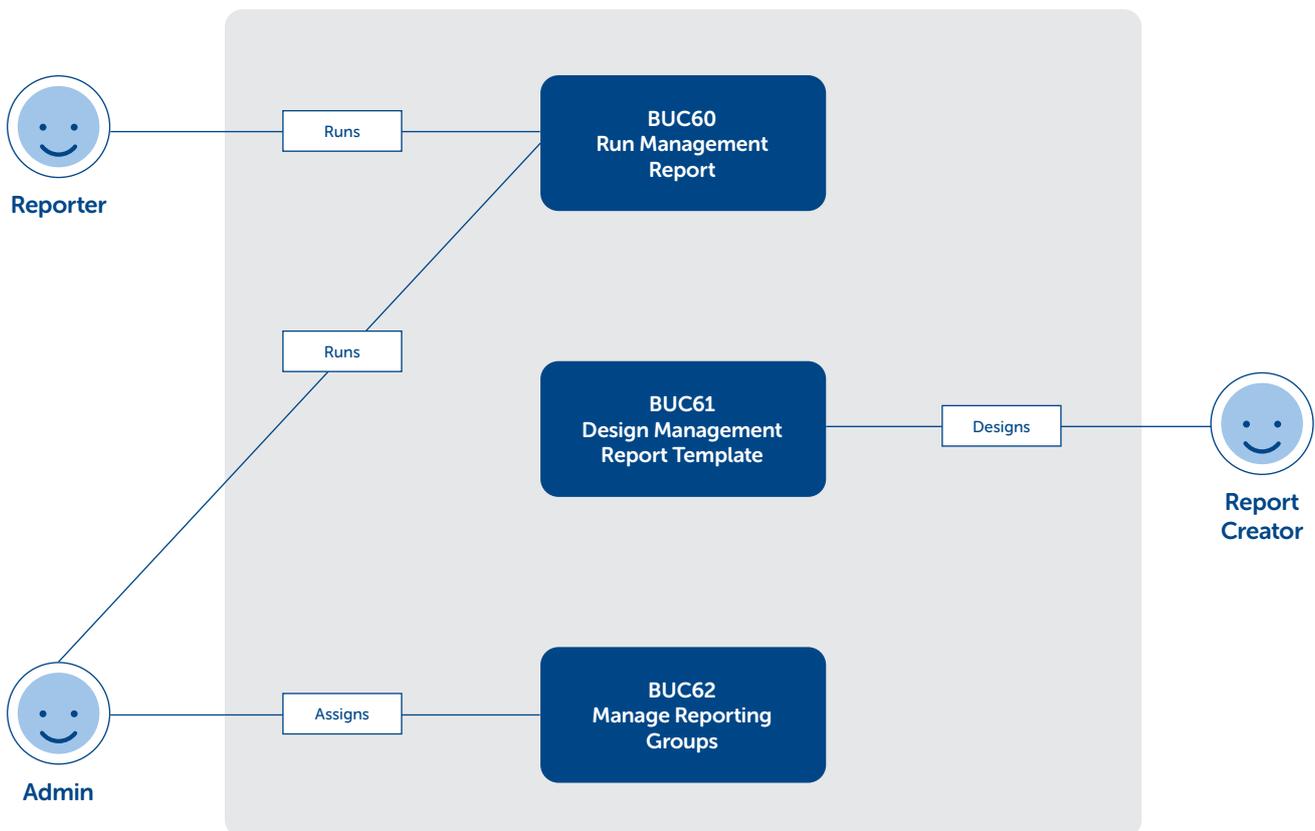
Alternative Paths

- 1a. No actual flexibility data available
 - 4a1. No further processing.

Business Rules

- R1. The tolerance beyond which discrepancies are highlighted is a parameter that may be adjusted by the user.

4. Management Reports



Introduction

This chapter outlines the management reporting requirements for FMT.

Required Reports

Not yet defined.

Use Cases

The diagram below illustrates the relationships between the set of BUCs relating to FMT management reporting.

BUC60 Run Management Report

Complex reports, statistical reporting and dashboard-type reports may need to be produced. This BUC addresses the need for executing these reports as pre-designed templates suitable for use by non-specialist staff.

Extend/Include	None.
Roles	Reporter, Admin.
Success Criteria	Information has been produced that enhances management decision making.
Preconditions	A management report is needed.
Trigger	Reporter navigates to the Management Reports capability.

Main Path

- Reporter selects report template to run.
- Reporter enters run time criteria.
- Reporter chooses protective marking for the output.
- Reporter sees report output.

Post Conditions

The report output is saved for future viewing.

Alternative Paths

1a. View saved report

- 1a1. Reporter selects a previously run report to view its output. Resume at step 3.

1b. Delete report

- 1b1. Reporter selects a previously run report to delete.

Post. The selected report is deleted.

2a. Background report

- 2a1. Reporter chooses to run the report in background.

Post. The report is executed and output saved for future viewing.

2b. Future report

- 2a1. Admin sets a date and time when a report must be run.

Post. Admin can view the report output after it has been run at the designated time.

2a1a. Recurring report

- 2a1a1. Admin sets a recurring pattern of execution for the report.

Post. Admin can view the report output after each designated execution.

4a. Drill down

- 4a1. Reporter chooses to view details of summary report data. Resume at step 3.

4b. Download report

- 4b1. Reporter chooses a format for the downloaded report.

- 4b2. Reporter has a file containing the report output saved on their workstation. Resume step 3.

Business Rules

R1. Report output must include the run time criteria used in its execution.

R2. The default file format for report output is Adobe Acrobat (.pdf). It should also be possible to download in Microsoft Excel format.

R4. Report criteria options must be presented in a graphical manner and not be dependent on Reporter understanding a query language such as SQL.

R5. Reporter will only be able to run reports to which they have been granted access (see BUC61 Design Management Report Template).

BUC61 Design management report template

It is likely that, over time, it will become necessary to create new management report designs.

Extend/Include	None.
Roles	Report Creator (RC).
Success Criteria	A report template becomes available for others to execute.
Preconditions	The specification of a new or amended report template is made available to RC.
Trigger	RC navigates to the management report design capability.

Main Path

- RC selects a report template from a list of report templates.
- RC designs the report template.
- RC chooses a group of reporters with which to share the report template.

Post Conditions

Reporters can produce reports based on the report template.

Alternative Paths

- 1a. Create a report template
 - 1a1. RC chooses to create a new report template. Resume at step 2.
- 1b. Copy a report template
 - 1b1. RC selects an existing report template to copy.
 - 1b2. RC resume at step 2 with the copied design.

2a. Withdraw report template

- 2a1. RC marks the report template as withdrawn.
- Post. Reporters can no longer produce reports based on the withdrawn template.

3a. Report template is incomplete

- 3a1. RC chooses not to share the report template.
- Post. Revised report template is not available to Reporters.

3b. Test a report template

- 3b1. RC chooses to undertake a test execution of the template.
- 3b2. RC reviews the output of the tested report template. Resume at step 2.

Business Rules

- R1. The report design capability should be primarily graphical in nature. Both data selection and output presentation design should be performed through a graphical user interface.
- R2. A report designer should not have to have knowledge of SQL, HTML or other data manipulation languages to successfully prepare a report template.
- R3. It should be possible to limit sharing of a report template to named Reporter groups. Reporter groups are those processed through BUC62 Manage Report Groups.

BUC62 Manage reporting groups

This BUC addresses the granting of rights to access management report designs by assignment to reporting groups.

Extend/Include	None.
Roles	Admin.
Success Criteria	Individuals have the appropriate level of access to the management reporting capability.
Preconditions	Changes to access rights to management reports are needed.
Trigger	Admin navigates to the management report administration capability

Main Path

- Admin selects a reporting group.
- Admin adds/removes Reporters from the group.

Post Conditions

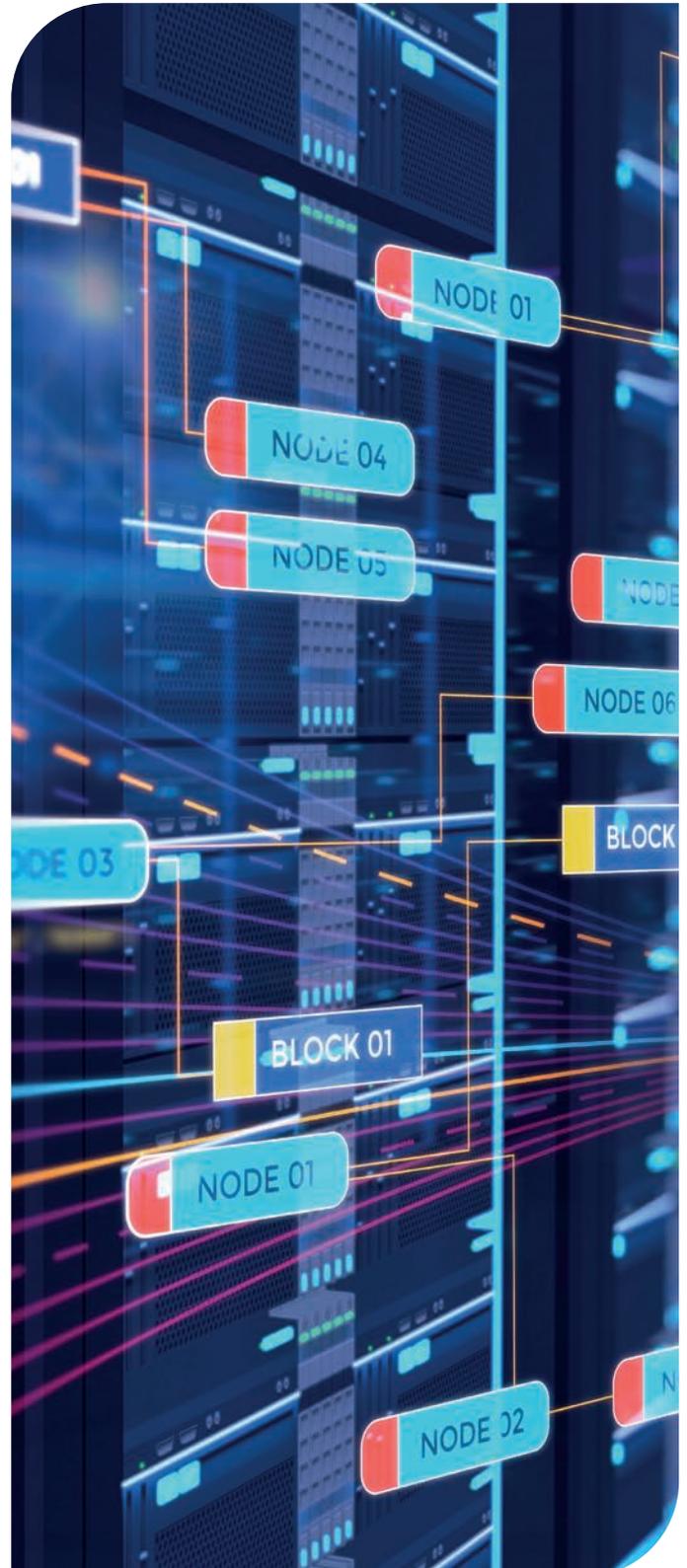
Reporters have access to the reporting capabilities they have been granted.

Alternative Paths

- 1a. Create reporter group
 - 1a1. Admin chooses to create a new reporting group. Resume at step 2.
- 2a. Drop reporter group
 - 2a1. Admin chooses to drop the reporting group.

Business Rules

- R1. There should always be a Report Creator group which cannot be dropped and grants access to the facilities outlined in BUC61 Design Management Report Template.



5. Non-functional requirements

Volumetrics

Volumetric information is not yet known.

Audit & compliance

All additions, changes and deletions of data in the FMT will generate a clear audit trail of the events.

The audit trail(s) must be readily accessible to appropriate reviewers and be provisioned with tools to allow selective analysis.

Security

Users of FMT are assumed to be accessing the system through a browser from an appropriately secured network and location.

Security aspects of the FMT system will be specified by SSEN.

Archiving

The FMT has no specific data archiving requirements.

Data migration

No automated data migration from existing systems to the FMT is expected. Any data needed by the FMT will be input using the defined BUCs.

Training

No specific training requirements are identified.



6. Appendix

ID	Information	I/O	From	To	Send	Receive	Data Summary
01	Historic Spot Market Data	In	Spot Market Team	System		BUC10	[Spot Price]
02	Historic Long-term Contract Data	In	Flexibility Solutions	System		BUC11	[Long-term Contract Price]
03	Historic Fines Data	In	SIMS	System		BUC12	[Historic Outage]
04	Historic Load Data	In	System/Network Planning	System		BUC13	[Installed Asset]
05	Forecast Constraint Data	In	System/Network Planning	System		BUC14	[Installed Asset] [Constraint] [Physical Option] [Flexibility Option]
06	Reinforcement Cost Data	In	System/Network Planning	System		BUC18	[Physical Option]
07	Reinforcement Energisation Data	In	System/Network Planning	System		BUC19	[Physical Option]
08	Reinforcement Type Data	In	System/Network Planning	System		BUC20	[Physical Option]
09	Decision Output Data	Out	System	User	BUC32		[Constraint] [Forecast Do-nothing Costs] [Physical Option] [Flexibility Option] [Spot Price] [Long-term Contract Price]

Information exchange requirement

The Information Exchange Requirement given in the table below supports the Context Diagram (§2.3) The columns of the IER have the following meanings:

- **ID** A unique Identifier for each dataflow. These are as found in the Context Diagram of the FMT Requirement Specification.
- **Information** A brief description of the dataflow content.
- **I/O** Whether the dataflow is inbound to, or outbound from, FMT.
- **From** The external entity name (or FMT Role name) sending the information.
- **To** The external entity name (or FMT Role name) receiving the information.

- **Send** The BUC that is responsible for initiating to an outbound dataflow.
- **Receive** The BUC that is responsible for consuming an inbound dataflow.
- **Data Summary** A summary of the main data items contained in the dataflow. Where these are related to data entities from the Domain Model (§2.5), the name of the data entity is enclosed in square brackets, for example [Constraint]. Depending on the business purpose of the dataflow, only a subset of attributes of the Domain Model entity may be included.

Automatic acknowledgements of the receipt of a message are not noted below. Entities should provide these acknowledgements for all data flows.

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