Virtual Energy System

Common framework

Demonstrator wireframing

July 2023

ARUP

Contents

Executive summary

Demonstrating the VirtualES through wireframing

Background

ESO have launched the VirtualES programme to enable the creation of an ecosystem of connected digital twins of the entire energy system of Great Britain, which will operate in synchronisation to the physical system. It will include representations of electricity and gas assets and link up to other sectors.

Through research, expert interviews, and industry-wide engagement, 14 key socio-technical factors were identified which are considered necessary for the development and delivery of the VirtualES today.

Following the example set by the National Digital Twin programme and the Digital Twin Hub through their Climate Resilience Demonstrator project (CReDo), the VirtualES is developing a demonstrator that is focused on an *electricity system flexibility* use case.

This document contributes to the development of this demonstrator, currently being progressed through an NIA-funded project in Alpha phase. Its purpose is to assess the current user journeys for the use case, establish user journeys with the introduction of VirtualES, demonstrate those user journeys through wireframes and the use of case studies.

Overview

The purpose of this report is to help readers develop an understanding of the VirtualES using wireframes while also demonstrating proven aspects of the technology or processes required to deliver the use case.

To that extent the report builds on the use case and relates it to a specific instance of outage planning using an example on the distribution network.

Through this example the report builds user journeys looking at the processes of developing and sharing base models and operational scenarios.

These user journeys are then realised through the development of wireframes, depicting different functions of the VirtualES. The wireframes take the reader through different potential functions of the VirtualES in a step-by-step basis.

These wireframes should be considered as early concepts to help the wider audience develop an understanding of how VirtualES could work, they do not represent an explicit design for any future platform and will evolve in subsequent phases of work.

Outcomes

The user journeys highlight the existing challenges in the current approach of sharing data between organisations.

With the significant change underway in the energy sector and the move to a more flexible grid it is noted that more modelling will be required to ensure safe operation of the grid. The current approach to sharing data requires significant manual workarounds, increases the potential for errors and sharing is through inefficient means such as email.

The user journeys where the VirtualES is in use show the benefits of sharing data through a single platform that manages permissions and control and provides users access to data from multiple different organisations. In addition, aligning to a consistent data standard and defining specific use cases provides users with data that is easier to integrate and well-defined metadata that makes it easier to search and understand data.

The wireframes provide a visual demonstration of the potential data platform and some of the features that should be considered as part of its development.

Nomenclature

ABAC – Attribute Based Access Control
API – Application Programming Interface
BSP – Bulk Supply Point
CIM – Common Information Model
CReDo – Climate Resilience Demonstrator
DACF - Day Ahead Congestion Forecast
DNO – Distribution Network Operator
eNAMS - electricity Network Access Management System
ESO – National Grid Electricity Systems Operator
ENTSO-E – European Network of Transmission System Operators for Electricity
EVs – Electric vehicles
GSP – Grid Supply Point
HLD – High Level Design
NIA – Network Innovation Allowance
PDF – Portable Document Format
PVs - Photovoltaics
R/A – Running arrangement
RBAC – Role Based Access Control
SIF – Strategic Innovation Fund
SLA – Service Level Agreement
SSO – Single Sign-on
TNO – Transmission Network Operator
VirtualES – Virtual Energy System
WEN – Western Electric Networks (A fictitious DNO)
WP – Work Package

1 — Context

Introduction

Purpose of this document

Purpose

This document presents the findings of **WP2.3 – Demonstrator wireframing**, developed as part of the common framework demonstrator Alpha phase.

This document contains the following deliverables:

- Data sharing assessment demonstration (M7)

Electricity and gas network use cases

This NIA-funded Alpha phase is supported by ESO and National Gas. The objective of the VirtualES is to include and consider both the electricity and gas.

The user journeys discussed in this interoperability report are for the flexibility use case, which is an electricity network use case. In recognition of the future energy system, a separate demonstrator use case is recommended for the gas network, with separate user journeys developed.

Whilst the user journeys would differ between use cases the wireframes represent functionality that will be common to both use cases and different user types.

Demonstrating the VirtualES

This report is a continuation to the Interoperability Report (WP2.3), developing the user journeys and providing a demonstration of the VirtualES through wireframes and case studies of proven aspects of the technology or use case.

The report builds on the user journeys previously developed in the Interoperability report, by expanding on the central concepts of base model and operational scenario sharing and accessing. It does this through the specific example of the outage planning process and relates it to an example on the distribution network where rerouting power to a BSP (Bulk Supply Point) from one GSP (Grid Supply Point) to another GSP enables a planned outage for maintenance purposes.

The user journeys introduce the personas of Sarah and Mohamed, both network planners and John and Rehana, both operational modellers. Sarah and John work for a fictitious DNO called Western Electric Network (WEN) while Mohamed and Rehana work for ESO. The user journeys follow these personas through the as-is processes carried out today and the processes with the use of the VirtualES.

These user journeys, alongside the process maps developed in the Interoperability report form the primary input in the development of the wireframes. Specifying the series of interactions that a user has with the platform to perform a task and specifying the information required at each step of that process.

The wireframes show the interactions that John and Rehana have with the VirtualES to create an API endpoint, publish an operational scenario and to search and access a dataset.

The wireframes provide a tangible demonstration of how the VirtualES could be developed to provide publishing, searching and accessing of energy data between different organisations. To complement the wireframes demonstrations of the proven technology or process through evidenced case studies have also been provided

In conclusion, the report provides a summary of the key challenges to overcome and the benefits that have been evidenced through the user journeys and wireframes.

Context

What is the Virtual Energy System?

The Virtual Energy System

The ambition of the Virtual Energy System (VirtualES) programme is to enable the creation of an ecosystem of connected digital twins of the entire energy system of Great Britain, that will operate in synchronisation to the physical system. It will include representations of electricity and gas assets and link up to other sectors.

This ecosystem of connected digital twins will enable the secure and resilient sharing of energy data across organisational and sector boundaries, facilitating more complex scenario modelling to deliver optimal whole-system decision making. These whole-system decisions will result in better outcomes for society, the economy, and environment by balancing the needs of users, electricity and gas systems and other sectors.

Creating the VirtualES is a socio-technical challenge that requires a collaborative and principled approach, aligned with the National Digital Twin Programme, and other energy sector digitalisation programmes.

The VirtualES is delivered through three workstreams:

- Workstream 1 - Stakeholder engagement
- Workstream 2 - Common framework & principles
- Workstream 3 - Use cases

Workstream 2 - Common Framework & Principles

This report forms part of workstream 2.

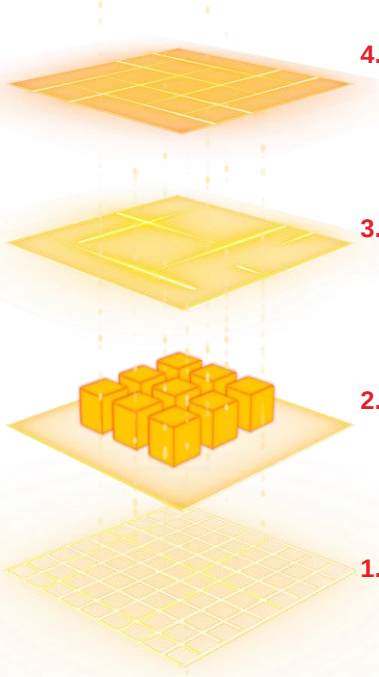
The objective of this workstream is to develop the socio-technical common framework that will form the foundation of the VirtualES – enabling the creation of this ecosystem of connected digital twins.

Through research, expert interviews, and industry-wide engagement, 14 key socio-technical factors were identified which are considered necessary for the development and delivery of the VirtualES today.

These 14 identified factors are grouped by the categories of People, Process, Data, and Technology. Six of these factors were prioritised based on their potential impact on the VirtualES objectives and their relative maturity across the wider energy sector.

Following the example set by the National Digital Twin programme and the Digital Twin Hub through their Climate Resilience Demonstrator project (CReDo), this workstream is now developing a demonstrator that is focused on a *whole-system flexibility* use case.

This document contributes to the development of this demonstrator, currently being progressed through an NIA-funded project in Alpha phase.



4. The data becomes more layered, these interactions will create valuable insight to help guide and govern how we generate, manage, store, and consume energy.

3. Populated by existing and new digital twins – replicas of physical components of our energy system

2. Each digital twin will contribute to and access real-time data on the status and operation of other elements of the system

1. A social-technical common framework, with agreed access, operations and security protocols

Figure 1: Virtual Energy System

Indicative components of the Virtual Energy System

Developing a common framework

Published research and reports for the common framework

Throughout the development of the common framework, the approach has been industry-led, consultative, and collaborative.

This approach, coupled with explicit and proactive engagement within the energy sector and with cross-sector stakeholders, is necessary for the successful development of the common framework, delivery of the VirtualES, and ultimately in achieving sector-wide adoption.

All work has been conducted openly, with the six reports completed to date all published online.

Following the SIF Discovery project (report #3), the demonstrator was further developed using the whole-system flexibility use case (report #4).

The demonstrator is currently progressing through an NIA-funded project in Alpha phase, and is being delivered in line with the project plan (report #6).

1. External benchmarking

Understanding the cross-sector and global best practice for connecting assets, systems, and digital twins.

Read the report

2. Defining the common framework

Determining the key socio-technical factors that need to be considered for the VirtualES to succeed. See the next page for more information.

Read the report

3. Demonstrating the common framework

Collaboratively prove and demonstrate, with industry, how the socio-technical principles work.

This was a Round 1 SIF Discovery project.

Read the report

4. Whole system flexibility use case definition

Further define the “whole-system flexibility” use case that is recommended as the initial use case to demonstrate the common framework.

Read the report

5. Demonstrator data standards, data portals, and data licensing

Identified data standards and outline data licensing considerations applicable to the use case. Initial review of currently available public energy sector ‘data portals’.

Read the report

6. Demonstrator project plan & advisory groups

Proposed delivery plan, governance structure, advisory groups approach, and cross-workstream collaboration that will enable the successful delivery of the demonstrator.

Read the report

Socio-technical factors

14 factors to develop the common framework

As detailed on the previous two pages, the defining the common framework report (report #2 on the previous page) identified 14 socio-technical factors which are considered necessary for the development and delivery of the VirtualES today.

These factors were derived through research, expert interviews, and industry-wide engagement. They are shown in the adjacent diagram, and are grouped by the categories of People, Process, Data and Technology. The titles of the factors intentionally include verbs, making their framing actionable.

These 14 factors were prioritised to highlight the six factors recommended for immediate consideration.

Best practice guidance notes are being developed for the six priority factors as part of WP3.

Figure 2: Summary of the 14 socio-technical factors

Delivery team

Supporting the development of the social-technical common framework

The development of the common framework has been delivered by Arup and supported by the Energy Systems Catapult and Icebreaker One. It has been sponsored by the Electricity System Operator (ESO) and National Gas Transmission (NGT) through the Network Innovation Allowance (NIA).

The purpose of the RIIO-2 NIA is to provide funding to Gas Transporter and Electricity Transmission Licensees to allow them to carry out innovative projects, that focus on the energy system transition or addressing consumer vulnerability, which are outside of business-as-usual activities.

- **Electricity System Operator (ESO):** ESO is responsible to ensure a reliable, secure system operation to deliver electricity when customers need it. ESO balances the supply and demand on the system day to day, second by second, and coordinates with networks to transfer electricity from where it is generated to where it is needed.
- **National Gas (NGT):** National Gas own and operate the national gas network in addition to maintaining and managing the 7,000,000 domestic industrial and commercial combined gas assets around the UK.
- **Arup:** An employee owned, multinational organisation with more than 15,000 specialists, working across 90+ disciplines, with projects in over 140 countries and the mission to ‘shape a better world’. Arup have extensive energy and cross-sector digital twin expertise, actively contributed to the National Digital Twin programme, and are members of the Digital Twin Hub.
- **Energy Systems Catapult (ESC):** An independent, not-for-profit centre of excellence that bridges the gap between industry, government, academia, and research. Set up to accelerate the transformation of the UK’s energy system and ensure businesses and consumers capture the opportunities of clean growth. ESC are responsible for the Energy Data Task Force (EDTF) & Energy Digitalisation Task Force (EDiT).
- **Icebreaker One (IB1):** An independent, non-partisan, non-profit organisation with a mission to ‘make data work harder to deliver Net Zero’ by creating open standards for data sharing across agriculture, energy, transport, water, and the built world.

Together the five organisations assembled a delivery team to effectively collaborate and deliver the objectives of this workstream.

ESO

national gas

ARUP

CATAPULT Energy Systems

IB1 Icebreaker One

2

User journeys

Demonstrator use case

Summary of the use case

Overview

The demonstrator is based on the published the VirtualES flexibility use case definition (an electricity network use case).

The use case considers the changing patterns of energy generation and demand and the need for a flexible grid that can be optimised to, for example, reduce the curtailment of renewable energy sources and facilitate bi-directional power from increased use of PVs and EVs.

The use case explores the opportunity to re-route electricity between GSPs, in certain configurations, by using existing infrastructure commonly used for maintenance.

Changing the network topology in this way would enable demand or generation to be moved between different locations, providing an example of achieving flexibility through a location shift.

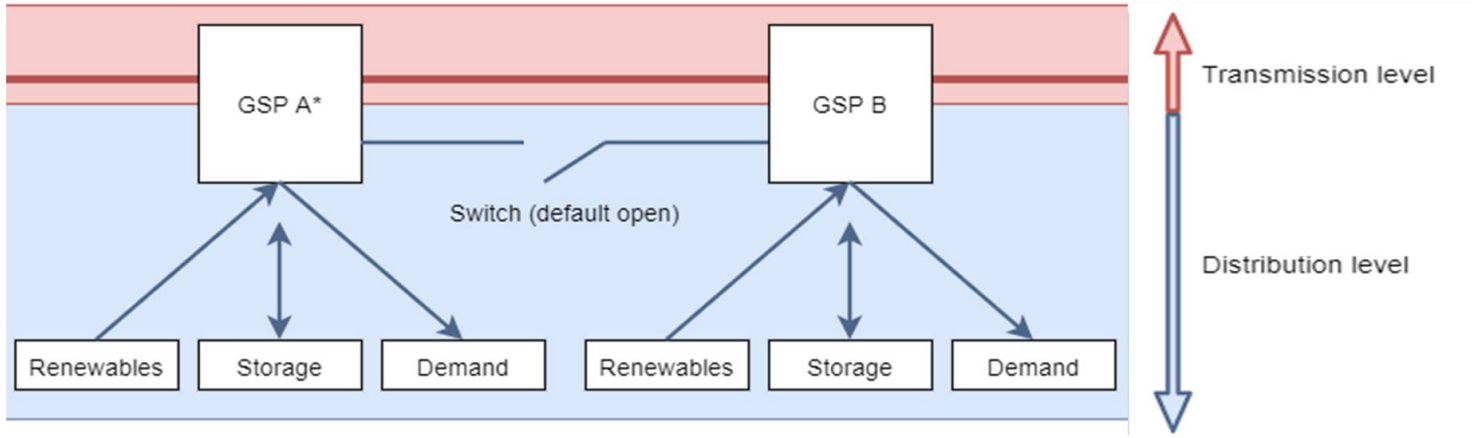
In instances of planned network outages, this bypass can re-route electricity from adjacent GSPs to provide resilience to the network. This will transfer all or part of the load from one GSP to the other, while keeping an electrical split. Or connect the two GSPs to operate as an interconnected group.

This reconfiguration follows a planning process and requires agreement in advance. It is documented in the Grid Code and System Operator / Transmission Owner Code.

Similar considerations in the operational planning process are required for interconnected, loosely coupled or radial GSP configurations, to maximise system availability and minimise system risk. This includes minimising generation restrictions, through an improved understanding of demand behaviour and flexibility services, using GSPs within a zone.

The Interoperability Report set out an overarching user journey that consider the personas of a network planner and operational planner from both the perspective of data producers and data consumers. It mapped the activities of base model publishing, merging of base models, operational scenario planning and running and updating operational scenarios.

This report expands on those activities and builds user journeys and wireframes that follow the current process for submitting base models and outage scenarios for a specific instance of the use case set out on the next slide.



Example GSP configuration (GSPs can be owned by the TNO or the DNO)

Example Group

Outage Management

Overview

The following example illustrates a real-world instance of the demonstrator use-case. The simplified diagram on the right shows a part of the distribution network area.

GSP A and GSP B are GSPs linking the transmission network with the distribution network. They are also both coupled at the 132kV distribution network level through the substation BSP A. The current running arrangements have specific switches open within BSP A so that the site BSP B, which provides power to the local area and is also connected to a 90MW wind farm, feeds or is fed by GSP A rather than GSP B.

Triggering event

A DNO outage affecting the red circuit connecting GSP A and BSP A. In this case, BSP B would be left with *Single Circuit Risk* (as it is fed only by the purple circuit) resulting in overall decreased network resilience.

If the purple circuit between GSP A and GSP B had an unplanned outage, all customers in BSP B would lose power, and/or any embedded generation would stop feeding into the main power grid.

Use case

To increase the network's resilience and eliminate BSP B's *Single Circuit Risk*, the coupling infrastructure between GSP A and GSP B can be employed.

Strategically changing the running arrangement within BSP A to allow BSP B to be fed by GSP B instead of GSP A would mean the substation is fed by two circuits (blue and green) rather than one, adding redundancy to the system and increasing network resilience.

Also, due to the risk of transmission power flowing through the distribution network causing overloads, only two of the circuits can remain open, meaning BSP A must be fed by one GSP, not both.

Outage process

The outage arrangement process is stipulated in the Grid Code and requires organisations to share data with ESO, enabling modelling and analysis of outage scenarios. To demonstrate the process, user journeys have been developed that consider the sharing of base model data and operational scenario data to enable the necessary modelling.

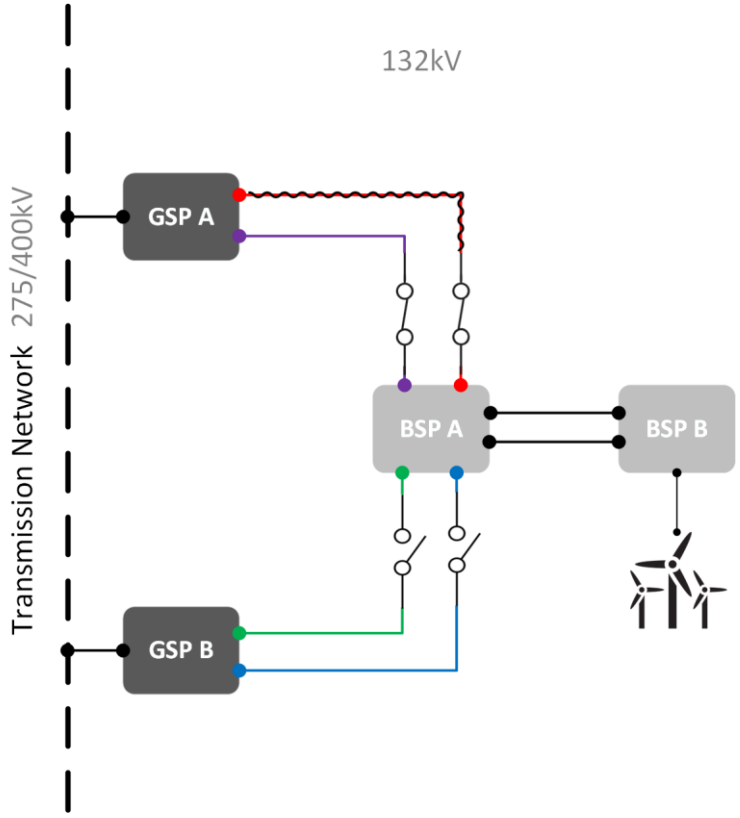


Figure 3: Simplified Distribution Diagram

Indicative components of a 275/400 kV transmission network

User journeys

Introducing the user journeys for sharing a base model and operational scenarios.

Overview

User journeys provide an indicative view of a process from the perspective of a particular individual. Through this they help describe the activities and interactions that individuals participate in.

The user journeys here follow on from those established in the Interoperability Report which set out the core interactions between data producers and data consumers. The report explored the sharing of a base model and operational scenario through the personas of a network planner and operational planner.

These user journeys expand on those previously created, identifying the existing mechanisms for sharing information between different parties, the activities that are required to convert and import data, and the challenges that these pose.

User journeys are then created that represent this process with the addition of the VirtualES as a platform. These user journeys do not look to change the established and regulated requirements of the process or prejudge proposed future changes such as Grid Code 139, but instead only demonstrate the benefits of sharing data that aligns to a common standard through a platform such as the VirtualES.

Base model sharing

The first user journey follows Sarah and Mohamed who are both network planners. Sarah works for Western Electric Networks (WEN), a fictitious DNO, while Mohamed works for ESO.

The user journey maps the process of the existing data sharing between DNO and the ESO as specified by the Grid Code. This flow follows the submission of data required for the Week 24 process where DNOs are required to submit data representing their network as well as peak demand data. This data is submitted in various excel spreadsheets as well as a PDF of a single line diagram representing the network.

The process also follows the production of the ESO GB Model and the submission of the week 42 planning data by ESO to the DNOs. This data represents the Winter Peak demand on the network and is used by DNOs for planning purposes.

It is important to note that the user journeys are simplified views of these processes and, in reality, there are multiple personas involved in different steps of the process.

Outage planning process

The second user journey follows John, an operational planner at WEN, and Rehana an operational planner at ESO.

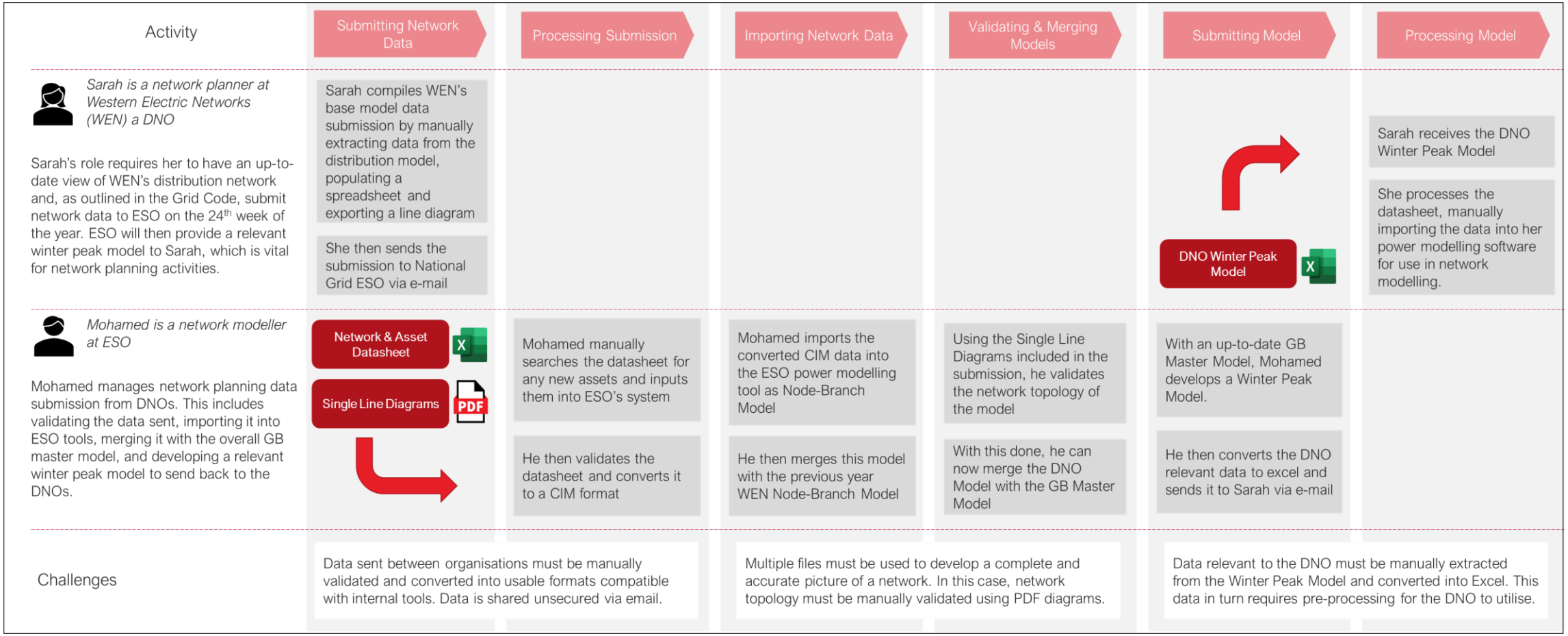
This user journey follows the steps involved when submitting an outage request and the necessary operational planning activities required to implement the outage.

Planned outages are an essential part of running the network and critical for asset maintenance and operational switching. As outages influence the surrounding network, the following process aims to ensure there are no unintended consequences and optimal network running arrangements are set.

The process requires the DNO to provide the necessary outage planning data to ESO, the outage is then logged in eNAMS either by the DNO or by ESO on their behalf. ESO compile this data, develop and test running arrangements on the GB Model. The running arrangement network data is then shared back with DNO to allow them to confirm the arrangement.

User journey: As-is base model sharing

A user journey of base network model data sharing between a DNO and the ESO



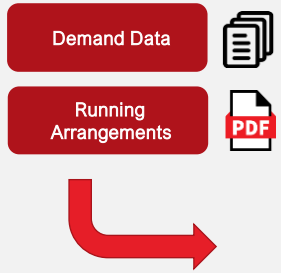
User journey: Base model sharing with the VirtualES

A user journey showing the impact that the VirtualES could make on base model data sharing

Activity	Submitting Network Data	Processing Submission	Importing Network Data	Validating & Merging Models	Submitting Model	Processing Model
Sarah is a network planner at Western Electric Networks (WEN) a DNO Sarah's role requires her to have an up-to-date view of WEN's distribution network and, as outlined in the Grid Code, submit network data to ESO on the 24th week of the year. ESO will then provide a relevant winter peak model to Sarah, which is vital for network planning activities.	Sarah puts together WEN's Base Network Model submission required by Grid Code, including a header with the required metadata She then moves it into the corresponding repository allowing it to be indexed and published by VirtualES				DNO Winter Peak Model CIM	Sarah accesses the transmission Winter Peak Model through VirtualES She can then import this model directly into her preferred power modelling tool
Mohamed is a network modeller at ESO Mohamed manages network planning data submission from DNOs. This includes validating the data sent, importing it into ESO tools, merging it with the overall GB master model, and developing a relevant winter peak model to send back to the DNOs.	Base Network Model CIM	Mohamed locates the submission through VirtualES, ensuring it is in the appropriate CIM format Mohamed selects the dataset making it accessible to ESO through the VirtualES API	Mohamed loads the CIM data into ESOs preferred modelling tool as a Switch-Level Model Mohamed is easily able to extract asset data from the Equipment Profile, with unique identifiers, from the model to input into ESO's system	Using the DiagramLayout profile, Mohamed visualises the topology Once the model has been checked, he merges it with the GB Master model, using a common node boundary set to identify shared network nodes	With an up-to-date GB Master Model, Mohamed develops a Winter Peak Model He then published a reduced version of this Winter Peak Model, relevant to the DNO, to VirtualES	
Benefits	VirtualES automatically validates the file's schema eliminating the previous requirement to manually validate submitted network data. Data is shared securely via API.		Accurate network model can can be easily imported into any modelling software without conversion or need for topology validation with external files.		DNOs can be sent reduction of GB Master Winter Peak Model eliminating the need for conversion into Excel and allowing the DNO to easily load the model into their preferred modelling tool.	

User journey: As-is outage planning process

A user journey of outage planning data sharing between a DNO and the ESO

Activity	Requesting Outage	Providing Data	Assessing Outage	Sending Running Arrangements	Assess Running Arrangements	Communicating Compliance
John is an operational planner at Western Electric Networks (WEN) a DNO John's role requires him to liaise with WENs asset management team to understand network outages and submit these outages to ESO. ESO then provide John with proposed running arrangements for him to review.	After being informed of required maintenance by the asset management team, John submits an outage request through eNAMS He then develops a model of the distribution network with these outages applied	Using the eNAMS operational notes functionality, John attaches relevant demand data as text for the outage. John also sends a PDF of the network running arrangements (R/A) to Rehana .			John reviews the attached files and uses it to manually configure the R/As into WEN's internal operational model. John then assesses whether the proposed R/As cause any issues to the network	If no issues arise, John communicates to Rehana that the R/As are compliant. If an issue does arise, John raises this with Rehana which may require a new R/A to be developed.
Rehana is an operational planner at ESO Rehana manages ESOs outage planning process. She receives asset outage data from DNOs and TOs that she uses to develop network running arrangements (RAs). These are fed into operational scenarios and the study development process.			Rehana receives the data from John and uses it in developing an operational plan. This process includes establishing optimal R/A configurations and developing an operational scenario.	Once the optimal R/As have been agreed, Rehana adds notes and PDF diagrams to the outage request within eNAMS to communicate these R/A to WEN.		
Challenges	Relevant running arrangement and demand data must be sent in text or PDF formats. Converting to these formats is a time-consuming activity and leads to data redundancy		Manual data manipulation is required to take the outage data, such as running arrangements, and configure it in a power modelling tool.		Further manual data manipulation is required to import the updated Running Arrangements into the DNOs operational model.	

User journey: Outage planning process with the VirtualES

A user journey showing the impact that the VirtualES could make on outage planning data sharing

Activity	Requesting Outage	Providing Data	Assessing Outage	Sending Running Arrangements	Assess Running Arrangements	Communicating Compliance
John is an operational planner at Western Electric Networks (WEN) a DNO John's role requires him to liaise with WENs asset management team to understand network outages and submit these outages to ESO. ESO then provide John with proposed running arrangements for him to review.	After being informed of required maintenance by the asset management team, John submits an outage request through eNAMS. He then develops a model of the distribution network with these outages applied.	John adds the appropriate header metadata to the model being worked on. He then moves the model from his working folder into a sharing repository that has been linked to VirtualES, allowing it to be indexed and published.		Running Arrangements CIM	John accesses the new operational scenario through VirtualES and loads it into his preferred modelling tool. He then tests the scenario's running arrangements using internal forecast data and identifies any issues	If no issues arise, John communicates to Rehana that the RAs are compliant. If an issue does arise, John will raise this with Rehana which may require new R/As to be developed.
Rehana is an operational planner at ESO Rehana manages ESOs outage planning process. She receives asset outage data from DNOs and TOs that she uses to develop network running arrangements (RAs). These are fed into operational scenarios and the study development process.		Operational Scenario CIM	Rehana locates the scenario in VirtualES and makes it available to ESO through the VirtualES API. Rehana uses this data to go through the ESO outage assessment process which includes ensuring optimal R/A configurations.	Once optimal R/As have been defined and any changes made, Rehana moves the updated operational scenario to the ESO VirtualES repository allowing it to be indexed and published.		
Benefits	Relevant running arrangement and demand data can be sent through a single operational scenario reducing time required to submit outage request and provide context.		The submitted data can be loaded into modelling tools with ease allowing ESO to begin their outage assessment process without the need for manual pre-processing activities.		Proposed Running Arrangements can be easily loaded into a modelling tool and assessed with internal forecasting data without manual activities.	

3 — Wireframes

Wireframe structure

What the wireframes show

The wireframes have been structured in three continuous user flows. These are:

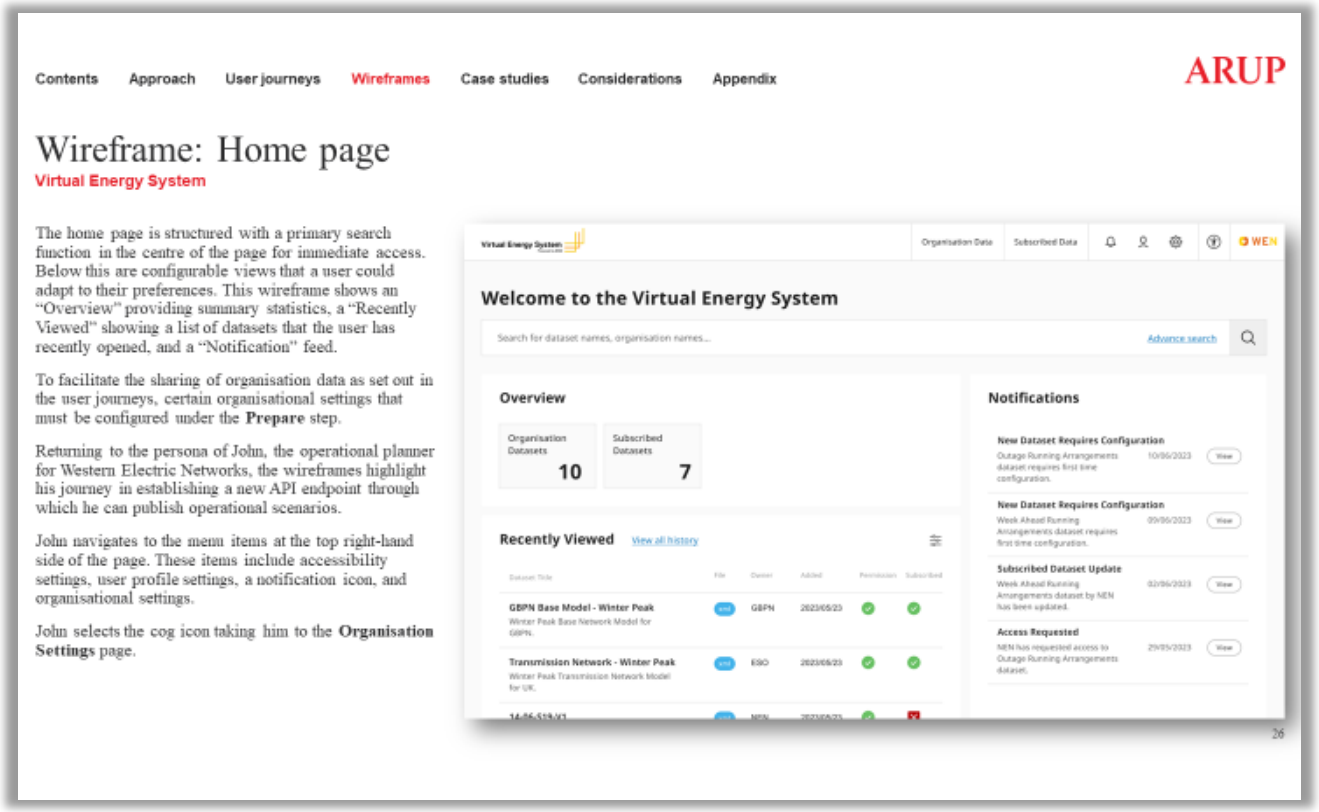
- Create an API endpoint
- Publishing an operational scenario
- Searching and accessing data

The first of these user flows, **Create an API endpoint**, relates to preparatory work carried out prior to the user journeys that were depicted in the previous section but is essential in allowing John to share data.

The second user flow, **Publishing an operational scenario**, follows John as he sets up the outage running arrangement dataset and publishes the network outage data as described in the user journey. While the third user flow, **Searching and accessing data**, follows Rehana in her user journey for the outage planning process as she searches and accesses the data.

Each set of wireframes is introduced in relation to the corresponding activity developed as part of the High-Level Design from the Priority Technical Factors report and detailed on the following slide.

All wireframes are provided uncropped in Appendix A.1.



How users will interact with the VirtualES

Defining the workflow and high-level steps for using the VirtualES

The Technical Factors report (WP3.2) introduces the image on the right which shows a simple process workflow composed of six key steps showing the interactions with the VirtualES. This workflow depicts how data producers and data consumers would interact with the VirtualES.

The aim of this workflow is to simplify the High-Level Design architectural view into a set of steps which are more consumable for a wider audience.

It is considered that these steps will broadly apply to all use cases.

Once the sixth step is complete, the process can start again. For example, if a data consumer wishes to share the dataset via VirtualES derived from one they have just consumed, the process will initiate again from step one.

Each of the steps have several associated activities and technology elements. The wireframes detail a number of these key interactions, and each set of wireframes is introduced in relation to this process.

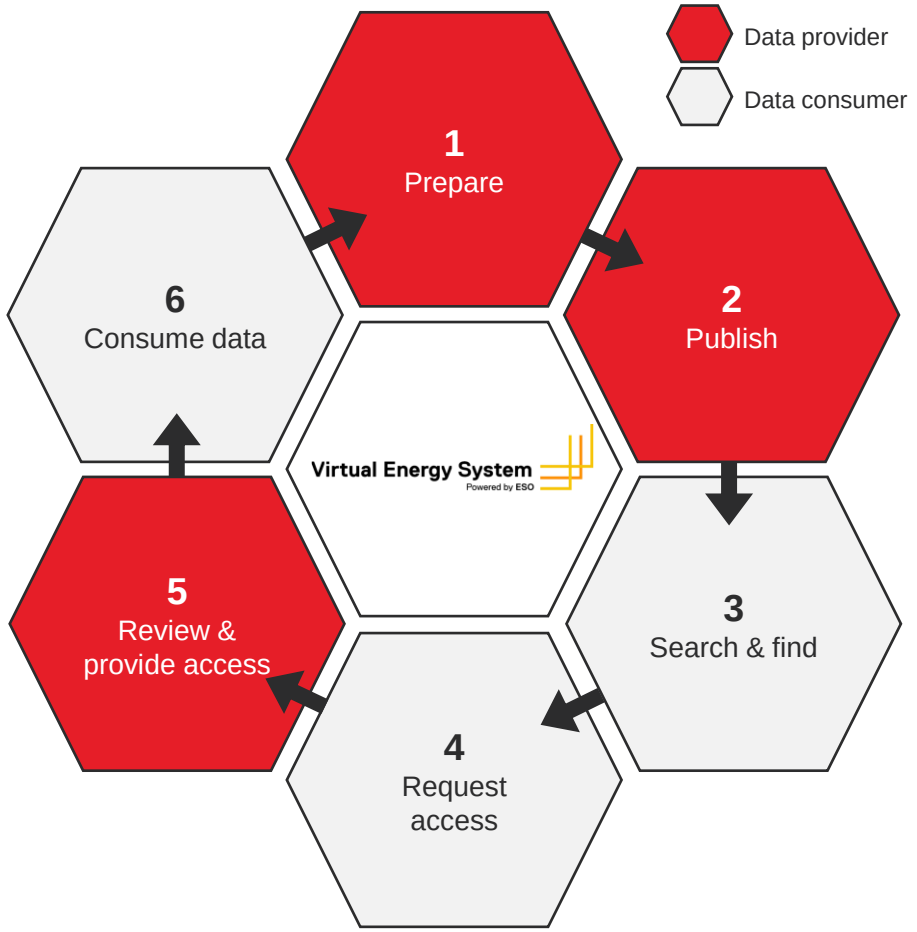


Figure 4: six-step user journey

Six steps that outline the end-to-end journey of a data being shared between a data producer and a data consumer

Prerequisites

Required processes for outlined user journey

Registration

Before sharing data using the VirtualES, participants will need to register through the trust framework via a registration portal. They will need to confirm their identity and additional details so that they can be registered in an identity management directory. Once this is done, the data producer can be assigned certifications and appropriate access roles and permissions based on their identity.

Registering using the trust framework will enable participants to access the VirtualES through Single Sign On (SSO) allowing them to publish and consume data with ease. This will also help ensure that any data shared has the correct data handling characteristics e.g., data usage, data licensing conditions, legal T&Cs and data contracts before it is consumed.

The registration process entails the following steps: (1) visiting the VirtualES registration portal, (2) providing relevant information including point of contact, security questions, and user identities, (3) the trust framework conducting validation checks to ensure accuracy of information provided, (4) reviewing and accepting the appropriate T&Cs, legal agreements, etc.

Base Model Publishing

Each published operational scenario will be required to have a link to the underlying base model it was developed on. Therefore, before an organisation initiates the process of making their Operational Scenarios accessible through the VirtualES, they must go through the steps to configure and publish the Base Models that represent their network.

This user journey will be almost identical to the one outlined in the wireframes regarding Operational Scenarios. The key differences will be within the Endpoint Management settings selected as well as the required and optional metadata as this information will be unique to the dataset being configured.

Defining a Dedicated Repository

To allow files to be easily and quickly published to the VirtualES, each data sub-domain (e.g. Operational Scenarios) will require a dedicated repository within the organisation’s database system. This repository can then be linked within the API Endpoint configuration process, allowing any files within it to be automatically indexed and published on the VirtualES.

Data Preparation

Before a data producer begins the process of configuring a dataset and ultimately publishing any type of data on the VirtualES, they must first go through critical data preparation activities.

An organisation must first consider a host of security, compliance, regulatory, governance, data licensing conditions, and legal implications associated with the data they aim to publish. Defining these factors in this stage allows the organisation to more confidently assign the proper data handling characteristics when configuring the dataset later, including who they wish to share their data with.

Moreover, the data producer will need to transform their data into the agreed common format and or standard suitable for sharing with the wider sector. This functionality could be provided by the digital spine, however without this, it would be the data producer’s responsibility to ensure all files within a linked repository align to the defined standard for that data type. Any files within a defined dataset that do not pass the schema validation will not be published on the VirtualES.

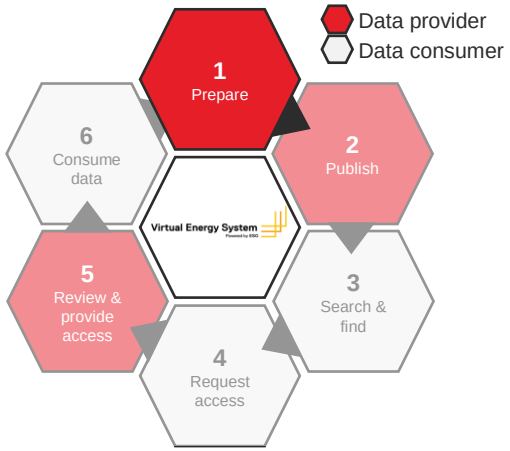
3.1 — Wireframe: Create an API endpoint

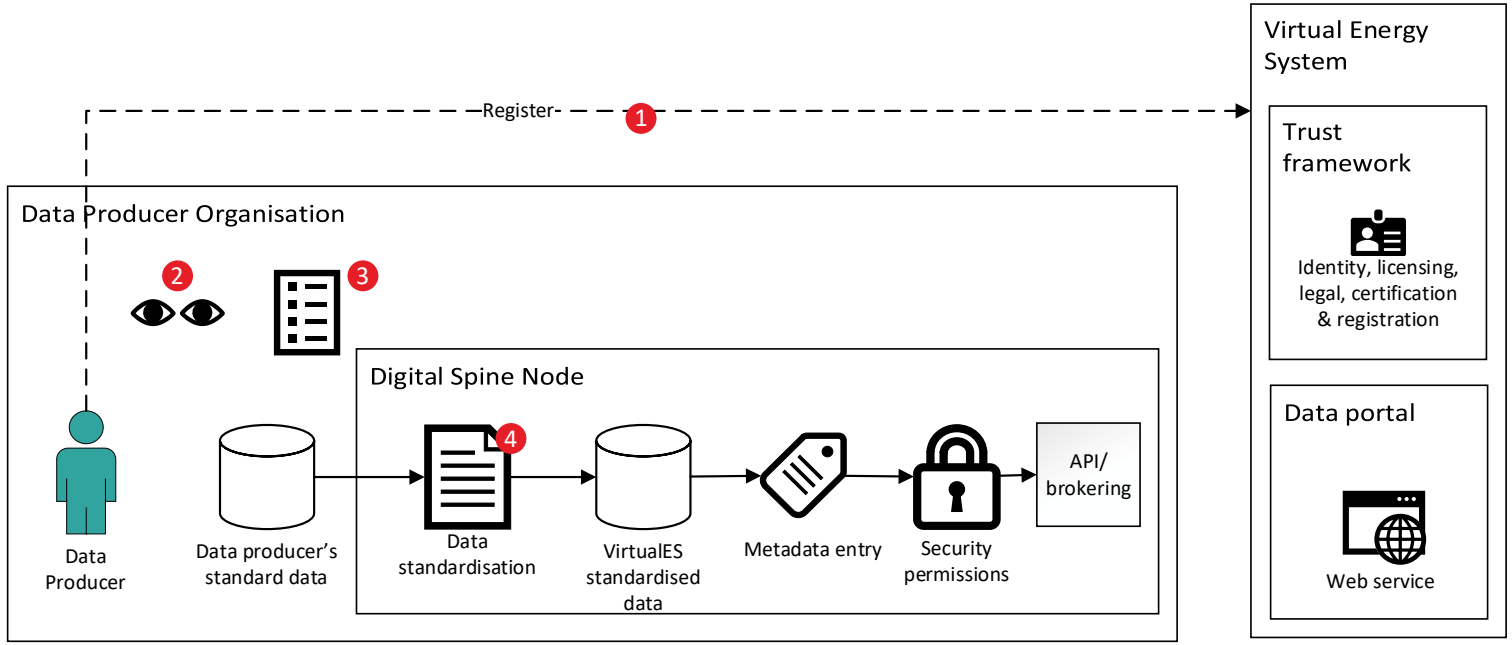
Wireframe: Create an API Endpoint

Overview

As defined in the Priority technical factors report the first set of wireframes responds to the Prepare stage of the high-level design workflow.

The wireframes demonstrate the process of establishing a connection between the data producers data repository and the VirtualES through the establishment of an API endpoint.





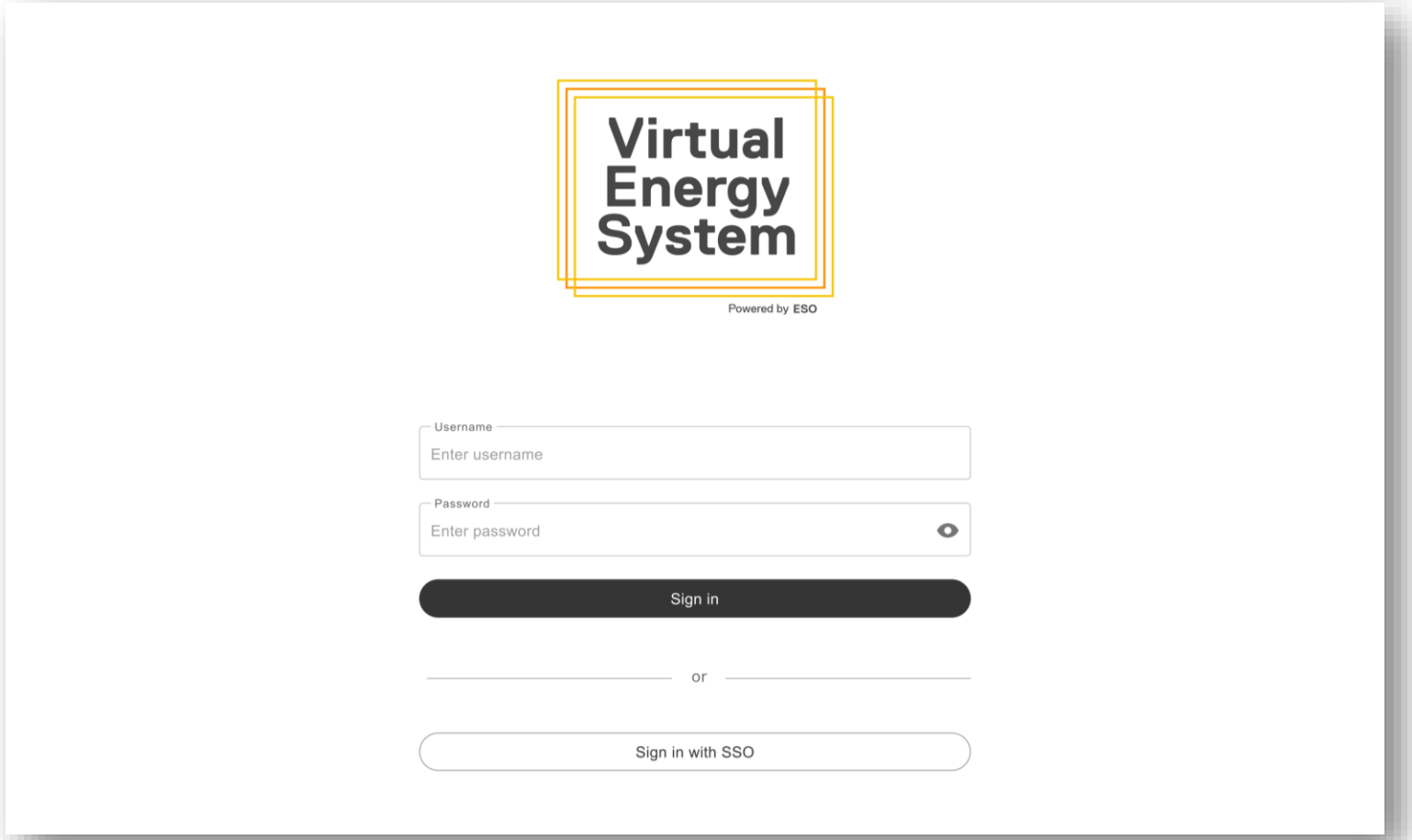
Wireframe: Login page

Virtual Energy System

The wireframe on the right provides a mock-up of the VirtualES login page. The VirtualES would be accessible through the web.

Individual users would have a username and password through which they could login but for organisations single sign-on (SSO) would the recommended approach for access.

As Western Electric Networks has configured the VirtualES with their identity management platform John selects “Sign in with SSO” and is taken through to the **Home Page**.



Wireframe: Home page

Virtual Energy System

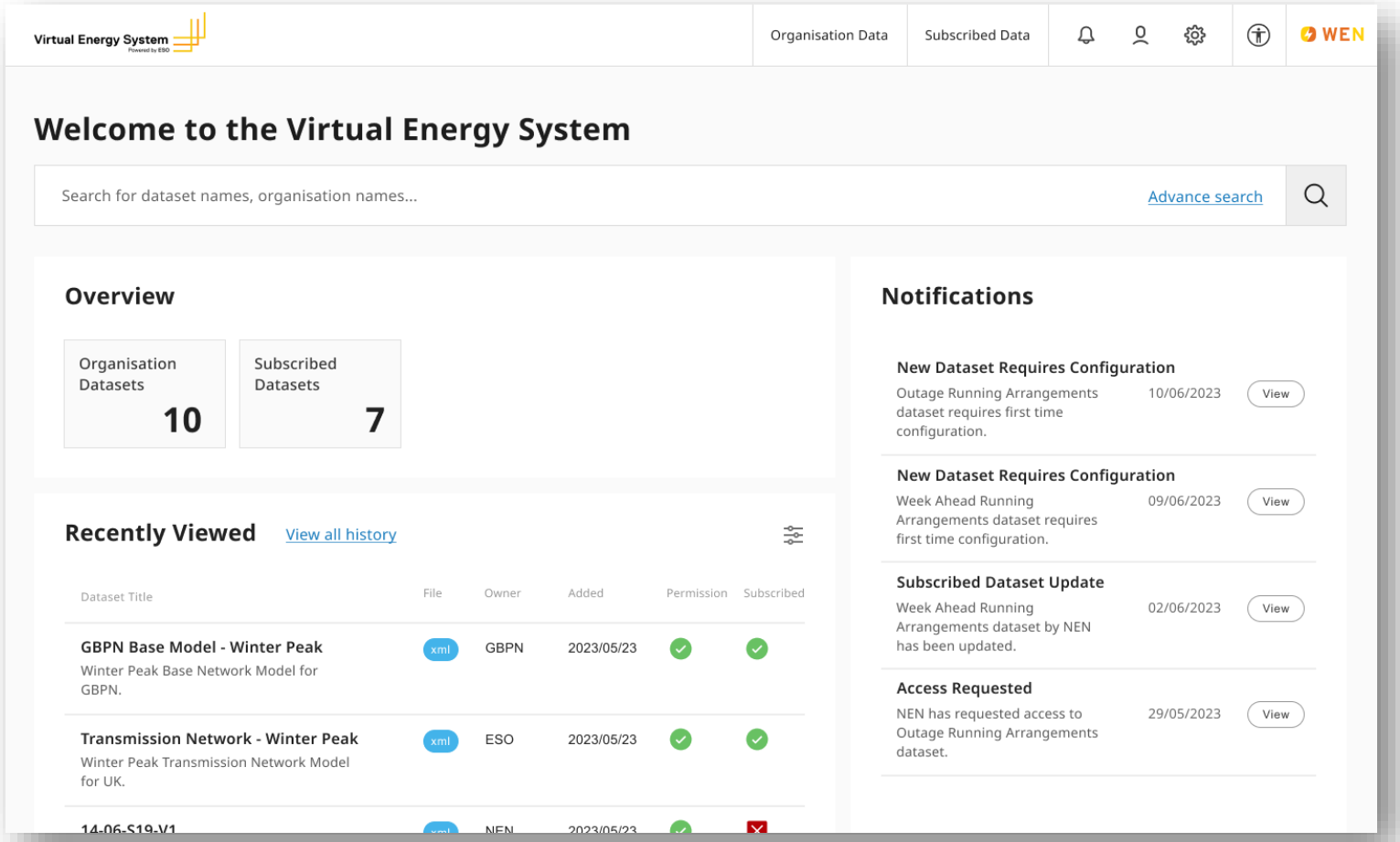
The home page is structured with a primary search function in the centre of the page for immediate access. Below this are configurable views that a user could adapt to their preferences. This wireframe shows an "Overview" providing summary statistics, a "Recently Viewed" showing a list of datasets that the user has recently opened, and a "Notification" feed.

To facilitate the sharing of organisation data as set out in the user journeys, certain organisational settings that must be configured under the **Prepare** step.

Returning to the persona of John, the operational planner for Western Electric Networks, the wireframes highlight his journey in establishing a new API endpoint through which he can publish operational scenarios.

John navigates to the menu items at the top right-hand side of the page. These items include accessibility settings, user profile settings, a notification icon, and organisational settings.

John selects the cog icon taking him to the **Organisation Settings** page.



Wireframe: Organisation settings

Creating an API endpoint

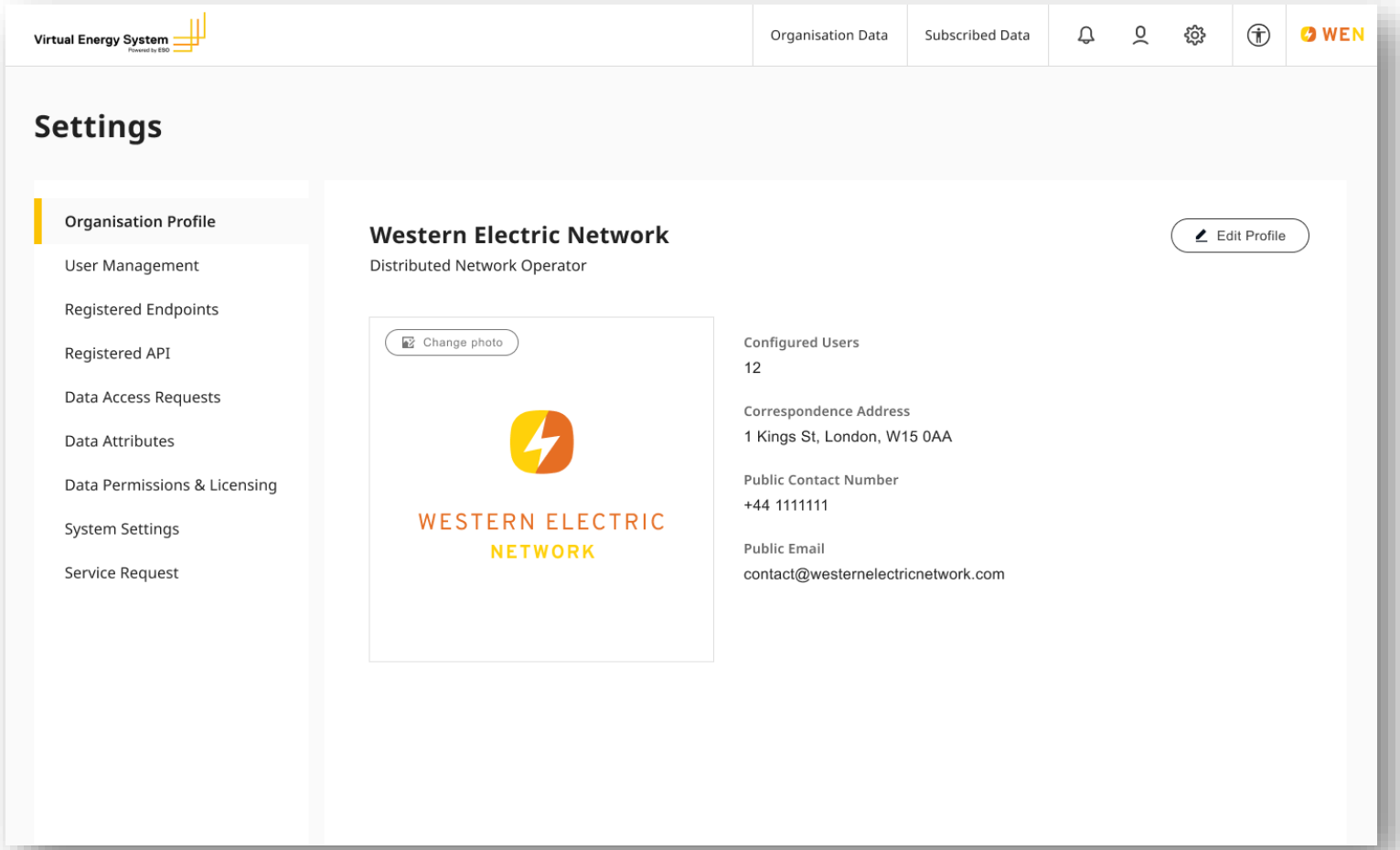
As John is a super user with organisational administration rights, he can access the organisation settings page.

This page provides an overview of the organisation with a menu bar on the left-hand side that provides links to various settings. These settings provide John and other organisational administrators with management and control tools to configure the platform.

These settings allow organisations to manage the organisations profile, their users, their data licensing, data permissions and access requests and broader system settings.

John needs to register a new API endpoint that connects to the repository where operational scenarios will be stored. This is a one-off activity required when publishing a new dataset type. This activity will allow WEN to **automatically publish outage arrangements as files are moved into the repository**. VirtualES will validate the schema and index files using the required metadata.

John navigates to and selects the “Registered Endpoints” menu item.



Wireframe: API endpoint– data publishing

Creating an API endpoint

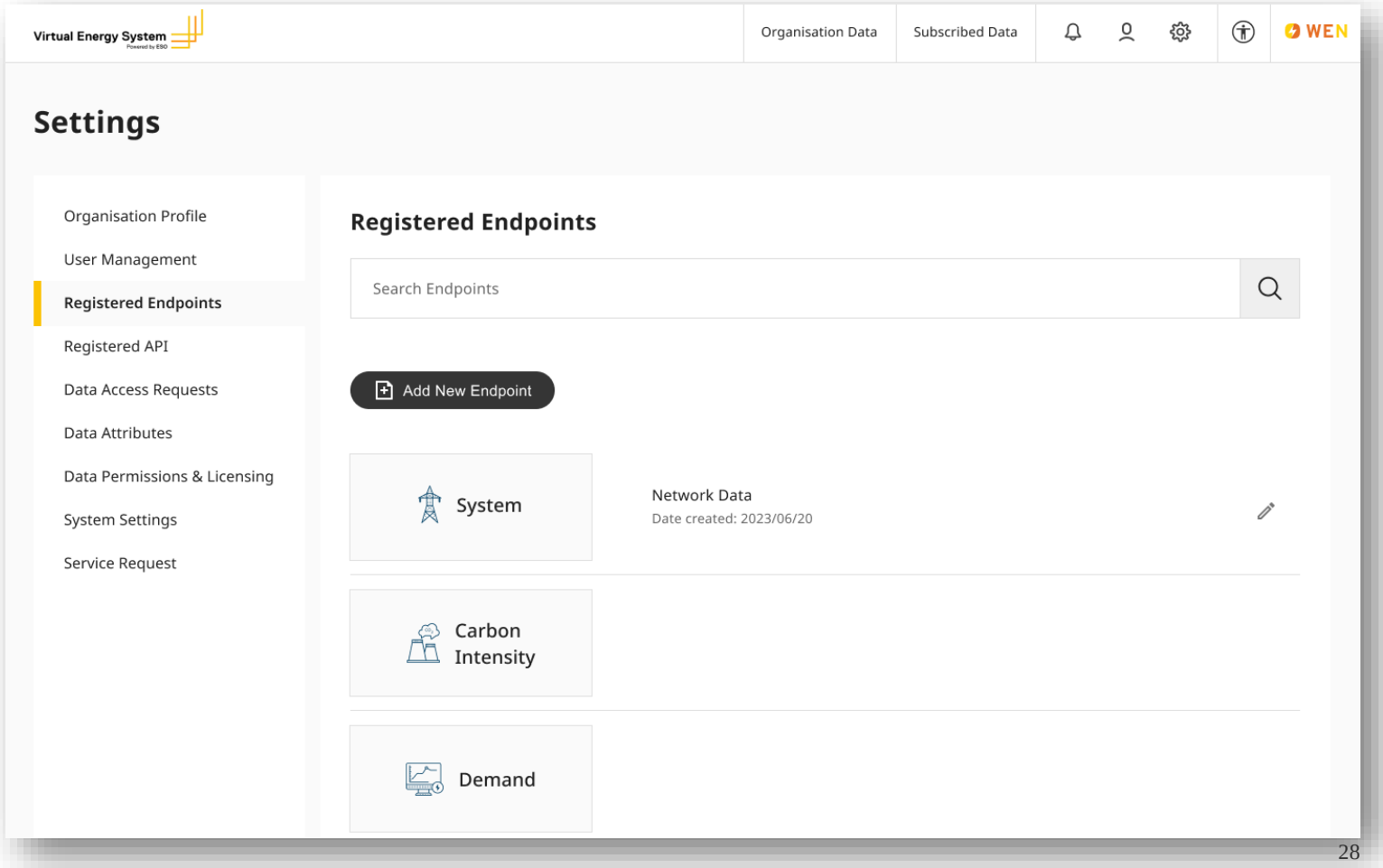
John is taken through to the Registered Endpoints management page. This page displays all the API endpoints that Western Electric Networks have created, categorized through the data domain they reside in.

An endpoint in this case constitutes a designated entry point to his organisation's API. It allows data consumers to query specific datasets and receive data responses in turn. It is assumed that the API endpoint has already been established by the organisation.

Each domain, such as System, contain several data sub-domains which further specify the type of data being shared. Each API endpoint will correspond to a specific data sub-domain. In this case, the endpoint being created is for Operational Scenarios.

This approach allows organisations to manage a large numbers of files by moving them to the corresponding sub-domain's repository with preconfigured publishing attributes. This leads to easy and efficient publishing, a priority due to the large number of individual data items published by organisations.

As there is no existing endpoint for operational scenarios, John selects the "Create new endpoint" option.



Wireframe: Create a new API endpoint

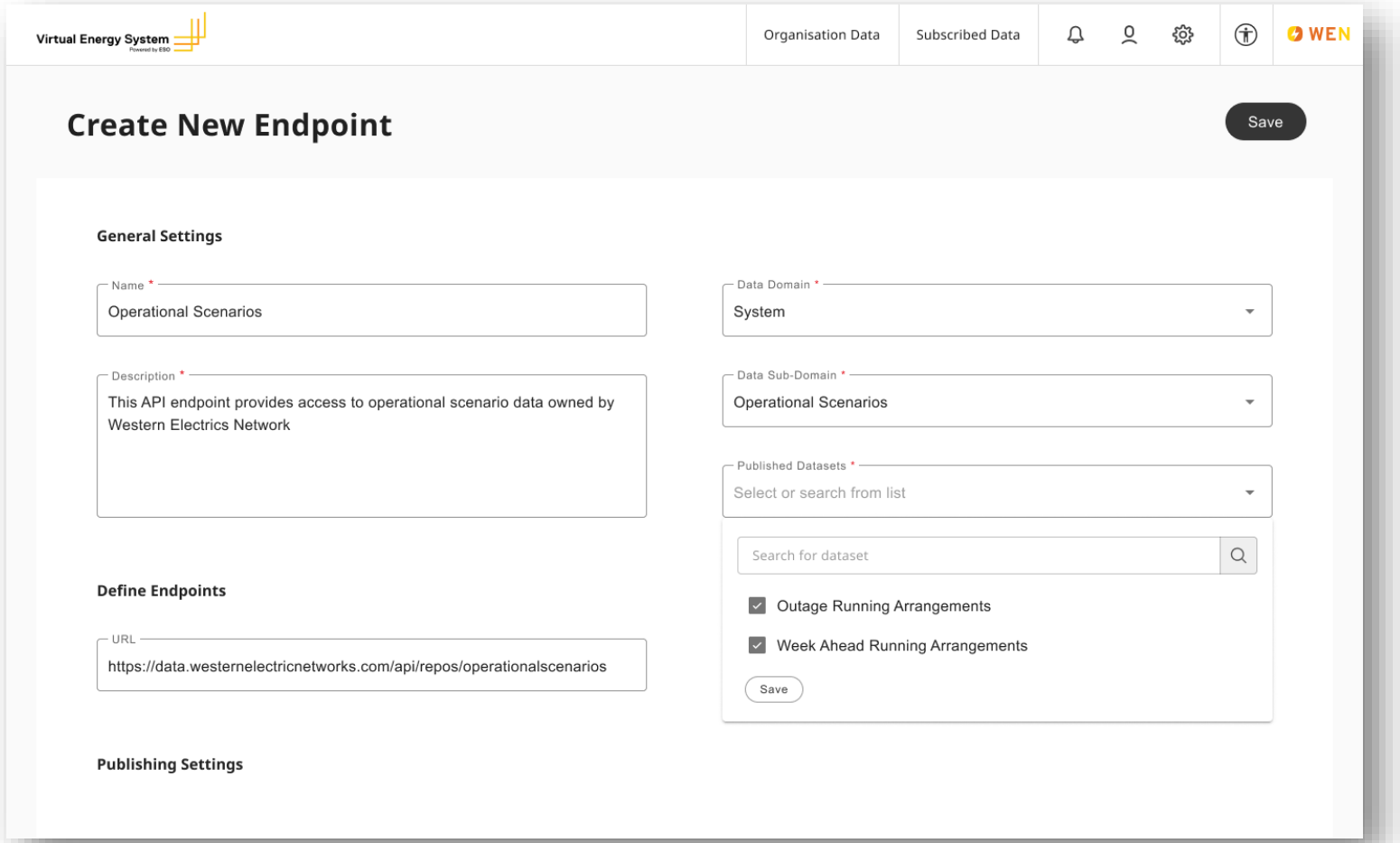
Creating an API endpoint

To establish a new endpoint John provides the necessary details including the endpoint name, a description of the endpoint and the endpoint URL that points to the organisations defined repository.

John will also set the parameters for the data that will be published through the endpoint. As described previously, each endpoint corresponds to a data sub-domain to ensure consistency and enable efficient publishing and searching. John selects the appropriate data domain and subsequent data sub-domain.

Each data sub-domain may respond to multiple use cases, in this instance John selects the Outage Running Arrangements use case, as detailed in the user journeys, and the Week Ahead Running Arrangements.

All data published through this endpoint will need to conform to the same data standards. This will allow the schema validation to operate irrespective of which use case the data is responding to.



ARUP

Wireframe: Publishing settings

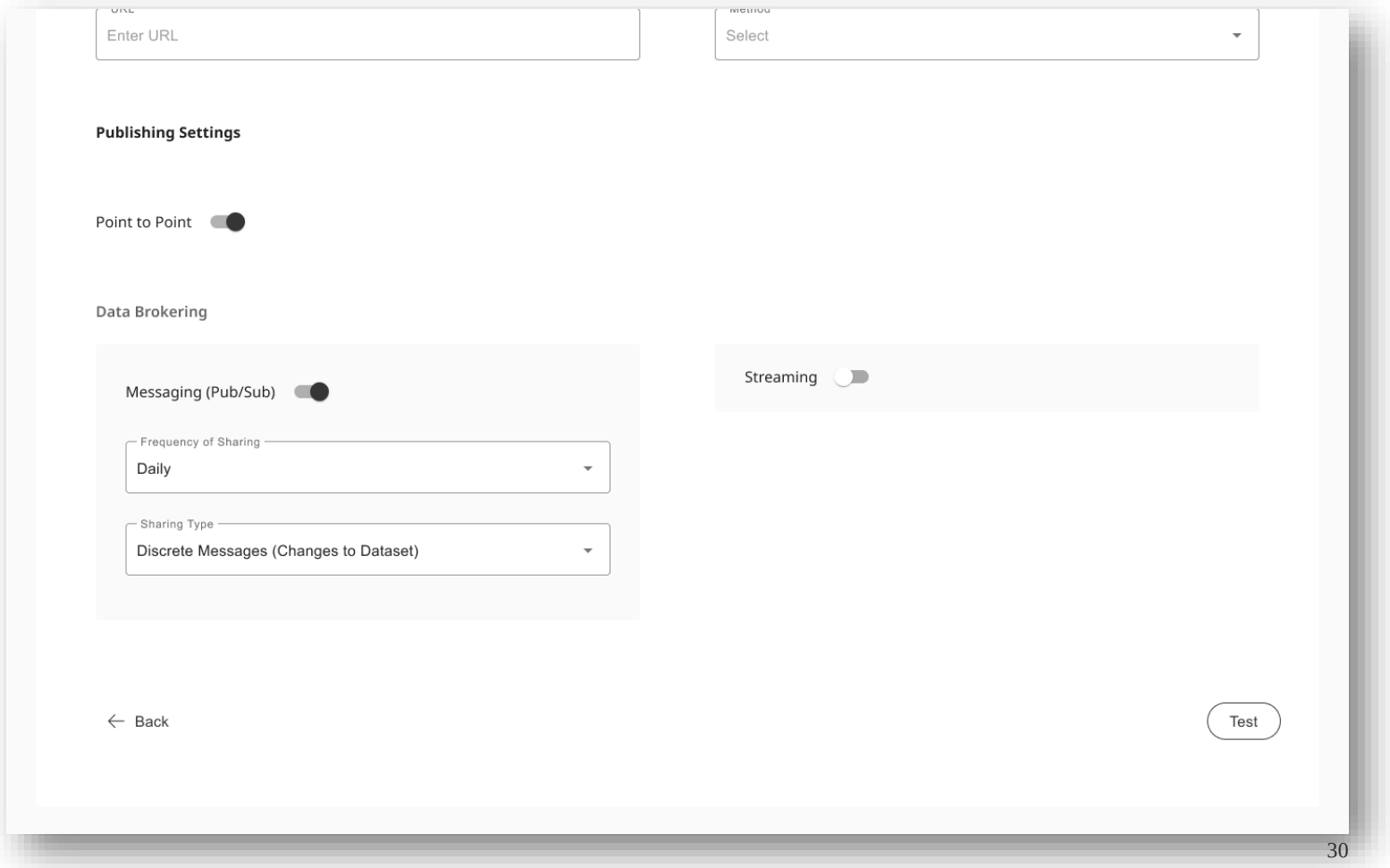
Creating an API endpoint

Further down the New Endpoint page, there are additional settings related to the way data consumers can access the files within the related datasets.

John can choose to allow data consumer to access files through Point to Point, Messaging (Pub/Sub), and Streaming mechanisms. As he is sharing Operational Scenarios, he decides to allow Point to Point and Messaging (Pub/Sub) accessing.

Once Messaging (Pub/Sub) is selected, John can define the frequency of sharing and the sharing type for those accessing through this mechanism. Since his organisation produces new Operational Scenarios every day, he decides to set a frequency of “daily”. Moreover, as the dataset within this endpoint will likely be quite large, he chooses to have the sharing type be “Discrete Messages” meaning that subscribers will receive only the new files published, and not the entire dataset.

Finally, there is a test function that allows John to check that the information is all correct before saving the endpoint.



3.2

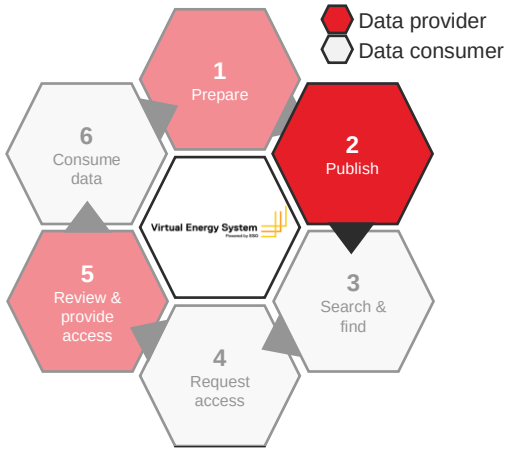
Wireframe: Publishing an operational scenario

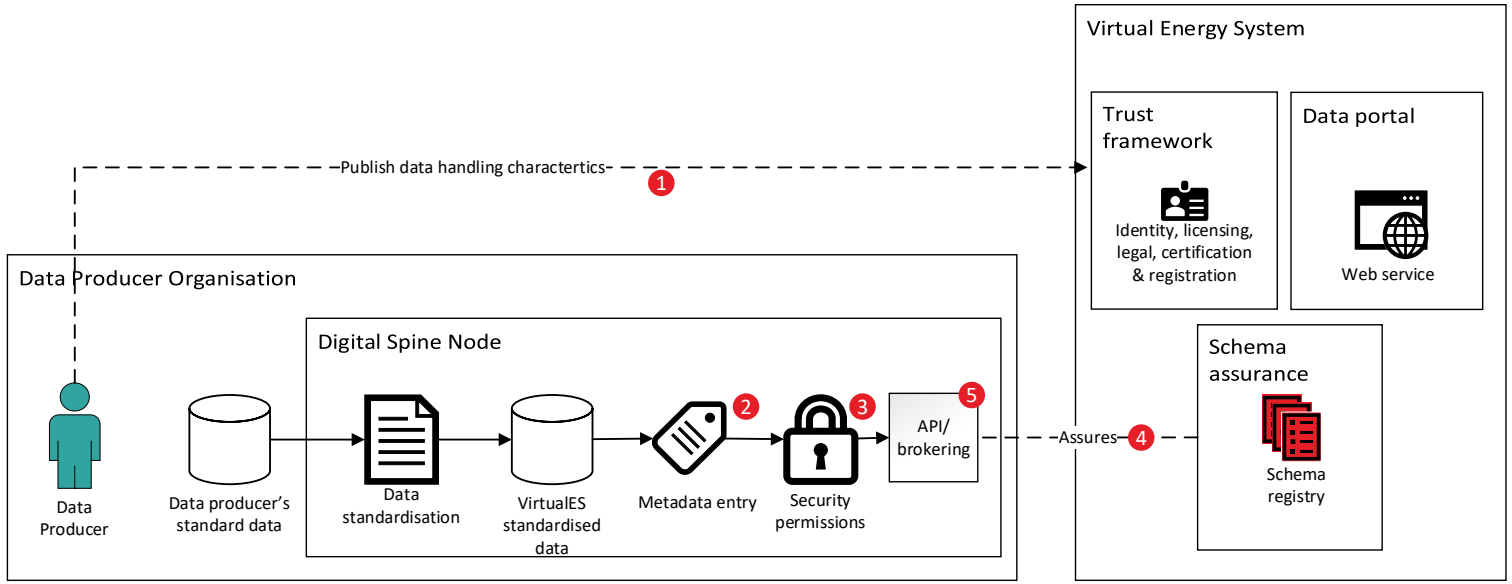
Wireframe: Publishing an Operational Scenario

Overview

This second set of wireframes considers the process of publishing a dataset once a connection between an organisations data repository and the VirtualES has been established.

The wireframes consider the actions of a user in selecting the data standard for schema validation, confirming the metadata, applying security and sharing controls and selecting a licence agreement that the data will be shared under.





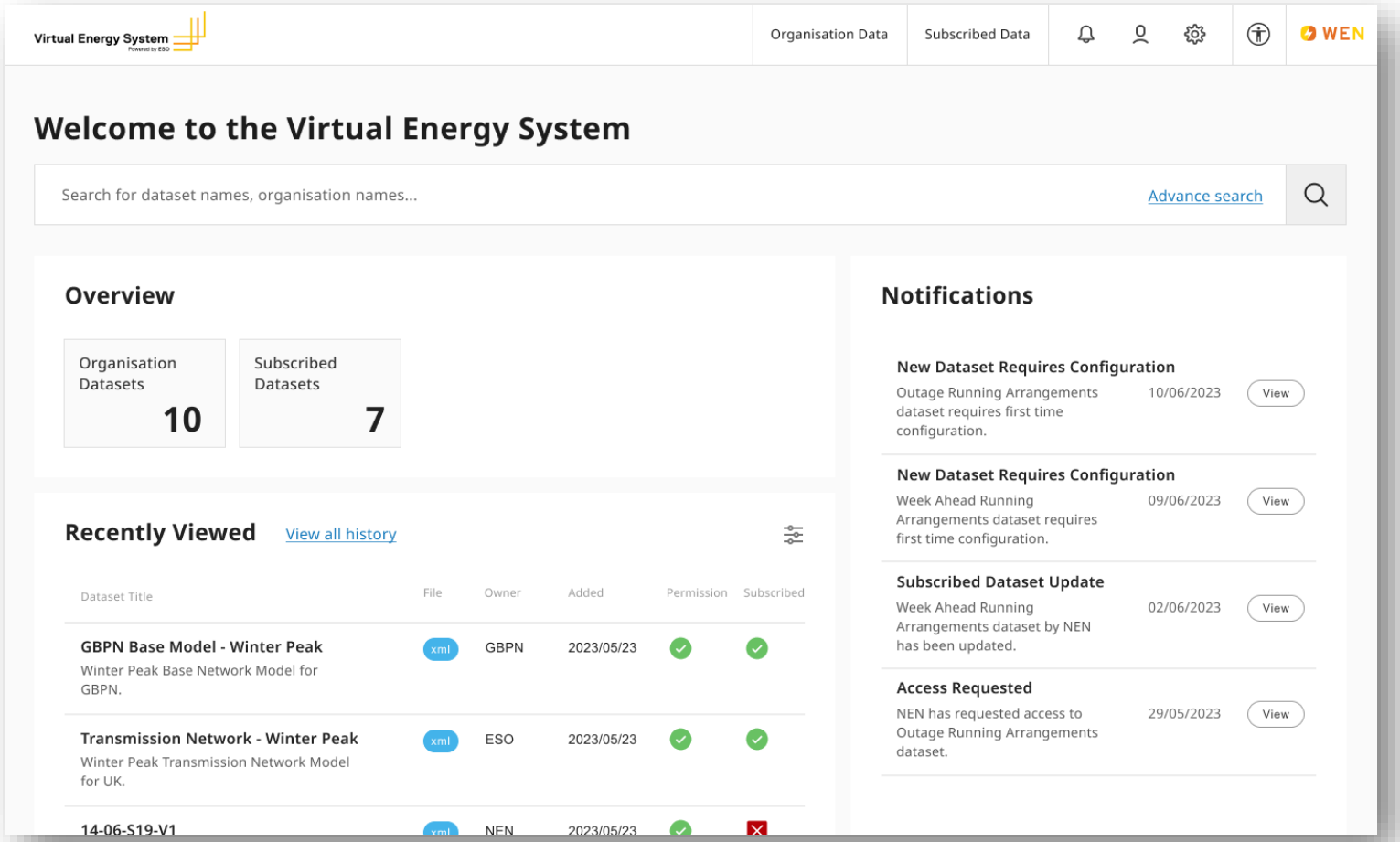
Wireframe: Home page

Publishing an operational scenario

With an endpoint pointing to Western Electric Networks repository for operational scenarios now established, John must now set and verify the necessary parameters and controls against which data will be published.

Upon returning to the home screen, John is met with several new notifications informing him further actions are required to finalise the configurations of the two datasets selected previously in the endpoint management screen, “Outage Running Arrangements” and “Week Ahead Running Arrangements”.

John could either select the notification or he could navigate to the menu items at the top of the page and select **Organisation Data**. This would take him through to the respective page where all organisation datasets being published are managed.



Wireframe: Organisation data

Publishing an operational scenario

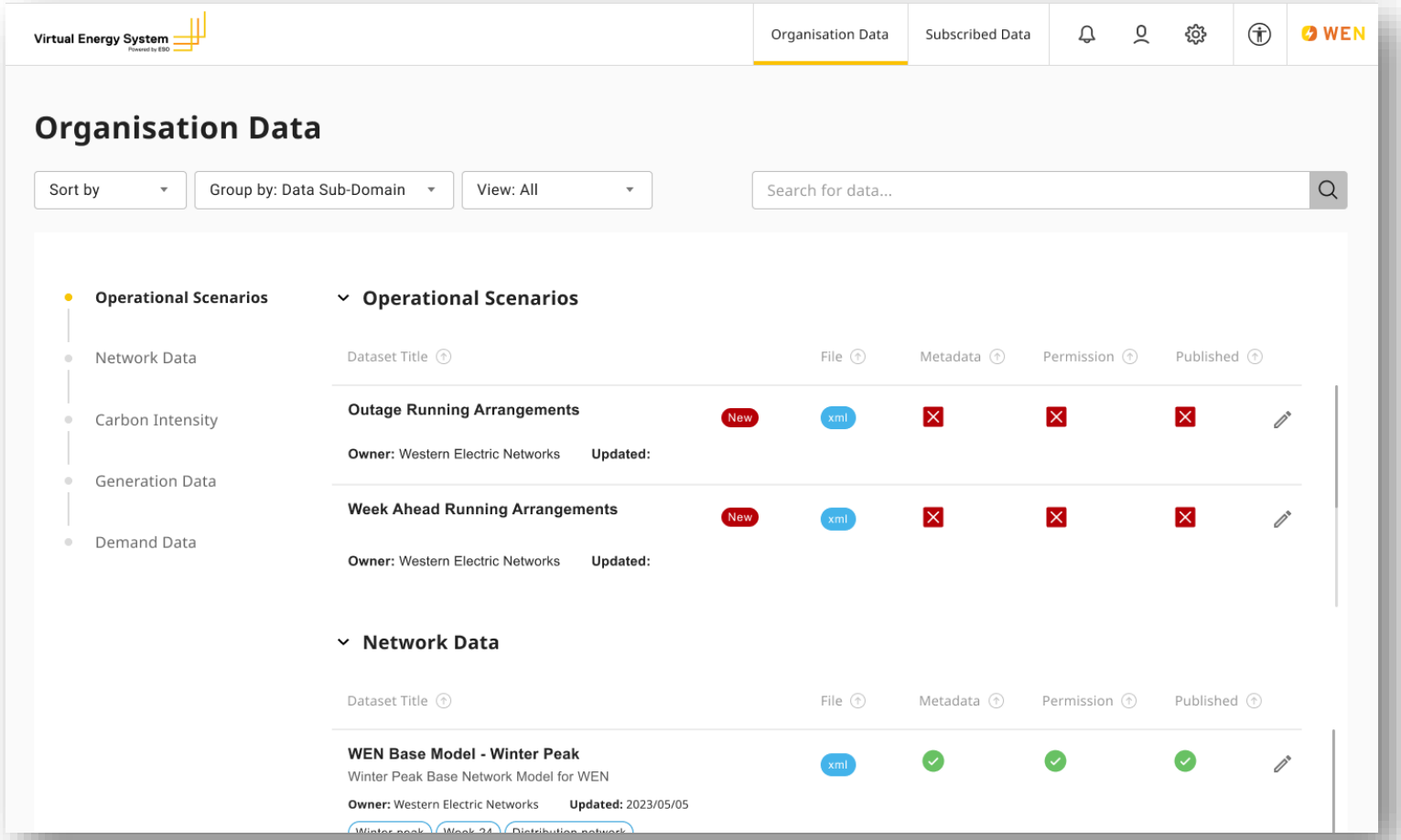
The **Organisation Data** page provides the functionality to manage all data sets being published by Western Electric Networks.

The page lists all the datasets currently being published by an organisation and provides functionality to structure this in different ways. Data can be grouped by different characteristics such as the data sub-domain, as is shown in the wireframe. For each grouping it is possible to sort the data within the group alphabetically, chronologically, and more.

Each entry within the list indicates a discrete dataset. The VirtualES indexes data items within a linked repository and, according to data scraped from the header, sorts it into the different datasets shown in the wireframe.

The “File” column indicates the accepted file type for this dataset. VES can be used for a multitude of file types, for this use case data is being published in CIM and therefore the XML filetype is shown.

The two newly added dataset are shown in the list with an icon identifying them as new. They are also shown with an incomplete status on key attributes including metadata, permissions and published status. John select the pencil icon to edit the dataset “Outage Running Arrangements”.



Wireframe: Data preview

Publishing an operational scenario

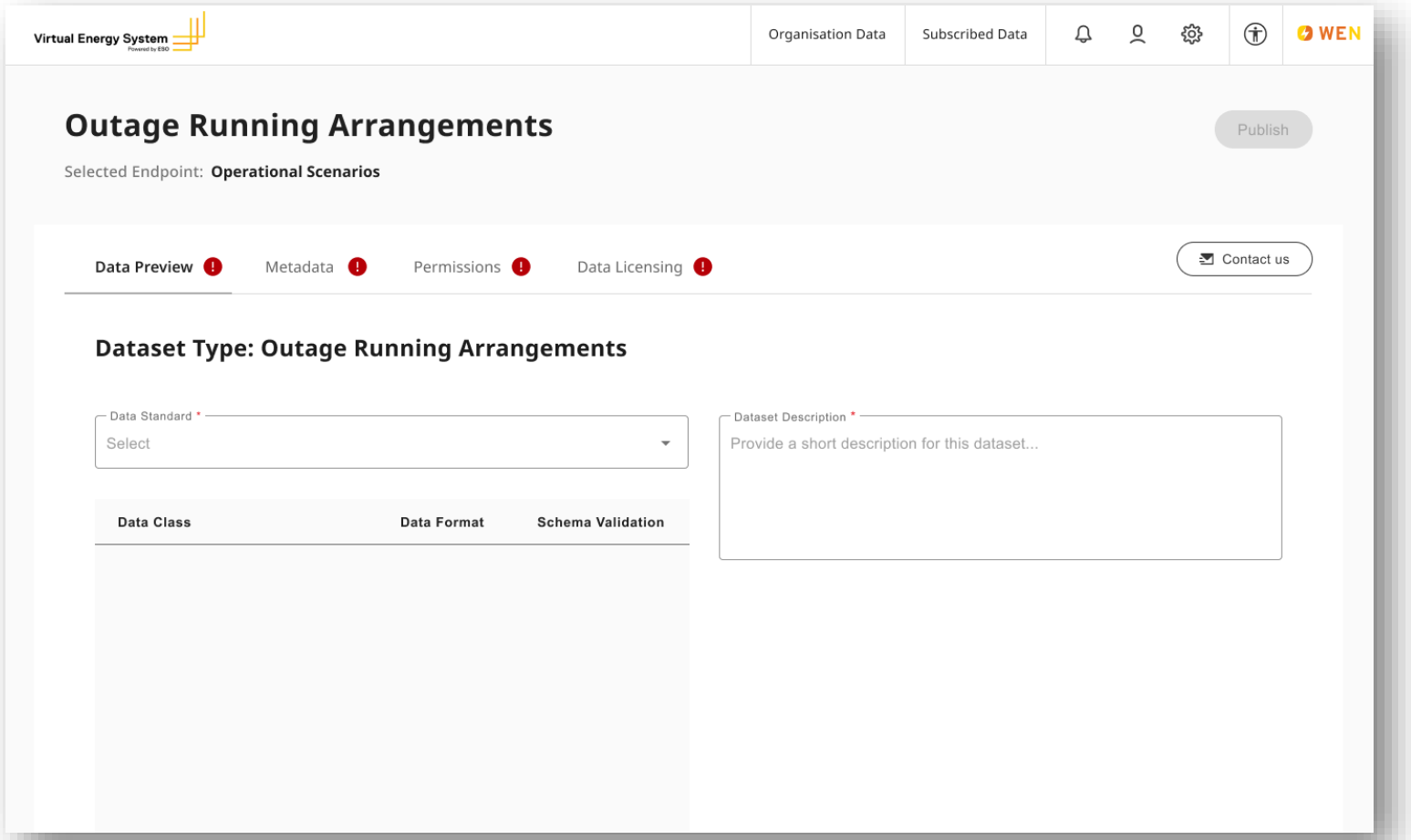
Selecting the new dataset takes John through to the **Data Preview** page.

As this is the first time this dataset is being published the screen shows blank fields. This screen requires the user to select the data standard under which this data is being published and provide a description for the dataset.

For the data standard there is a dropdown selection box which will have pre-agreed standards against which the data can be published. Standards will be pre-agreed for different use cases with the ability to centrally restrict the selection to a limited choice dependant on the use case.

For Outage Running Arrangements use case the standard chosen to demonstrate this is a CIM version: CGMES v.3 with CDPSM. The selection of this standard will determine the schema validation rules that are applied to published files.

This screen also requires the user to provide a description for data published under this data sub-domain.

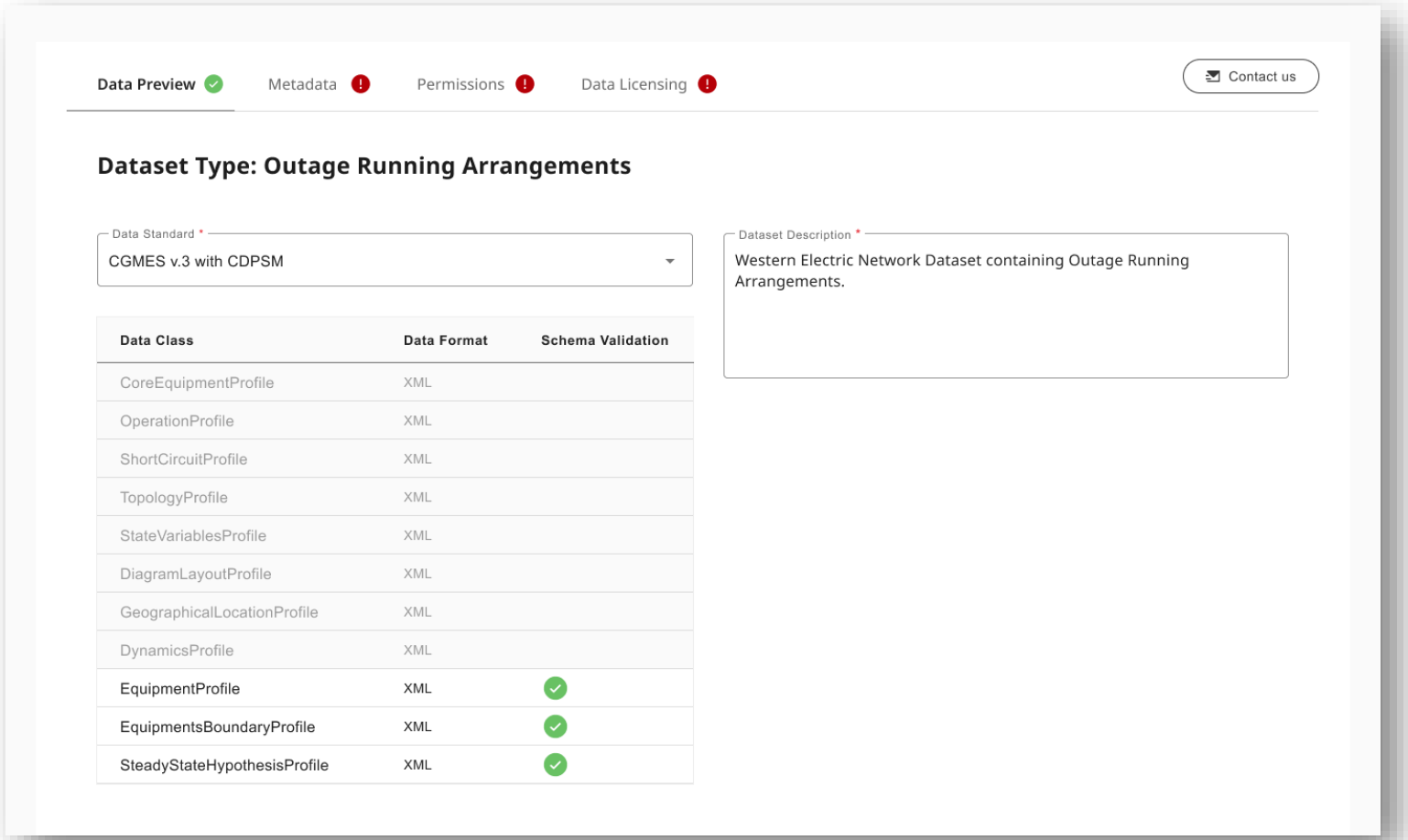


Wireframe: Dataset preview

Publishing an operational scenario

Once the data standard has been selected the data preview will appear showing the required data profiles to be published for the use case. In this example all the profiles for CGMES v.3 with CDPSM are shown but those not relevant to this use case are greyed out while those that are have a green tick indicating that the schema validation is configured to test these profiles.

As John progresses through this journey, the statuses of the individual page headings will turn green to indicate their completeness.



Wireframe: Metadata

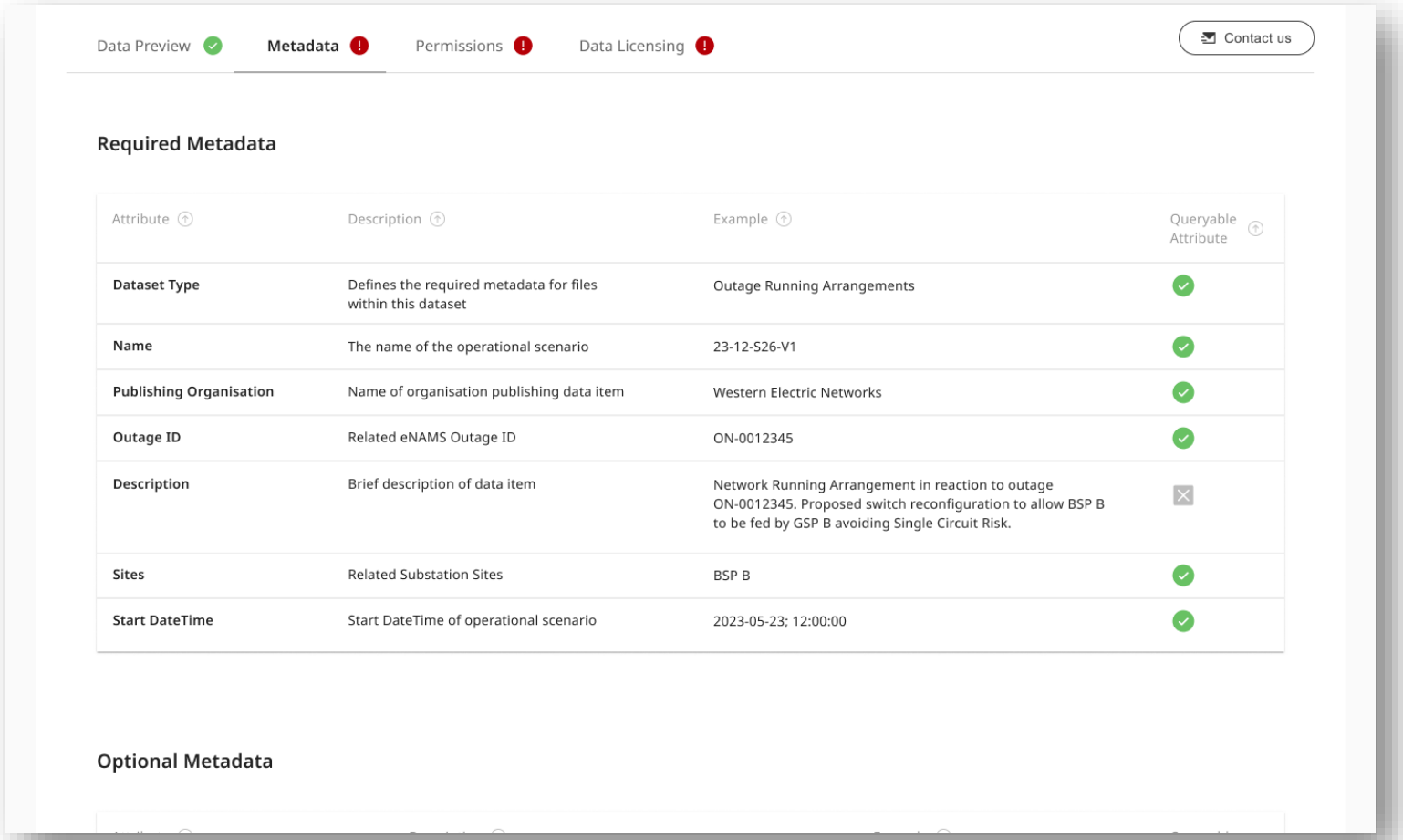
Publishing an operational scenario

The **Metadata** tab sets out the necessary metadata parameters for files within this specific dataset. Metadata is essential for the VirtualES to enable a searchable and discoverable platform.

Files placed in the repository linked to the Operational Scenarios Endpoint will be automatically indexed and published under the corresponding dataset type, in this instance Outage Running Arrangements. The metadata within the file's header is essential for VirtualES to correctly index the files.

This screen shows the user the required metadata to be included in the header. This metadata must be agreed on a use case by use case basis. Certain attributes will be consistent across use cases, such as those defined under the Dublin Core Metadata Initiative (DCMI). However, other attributes might be specific to the dataset type such as "Outage ID".

It's the responsibility of the data producer to ensure that each file's header has the appropriate attributes. The schema validation will also audit header attributes to ensure that files with incorrect metadata are not published to the VirtualES.



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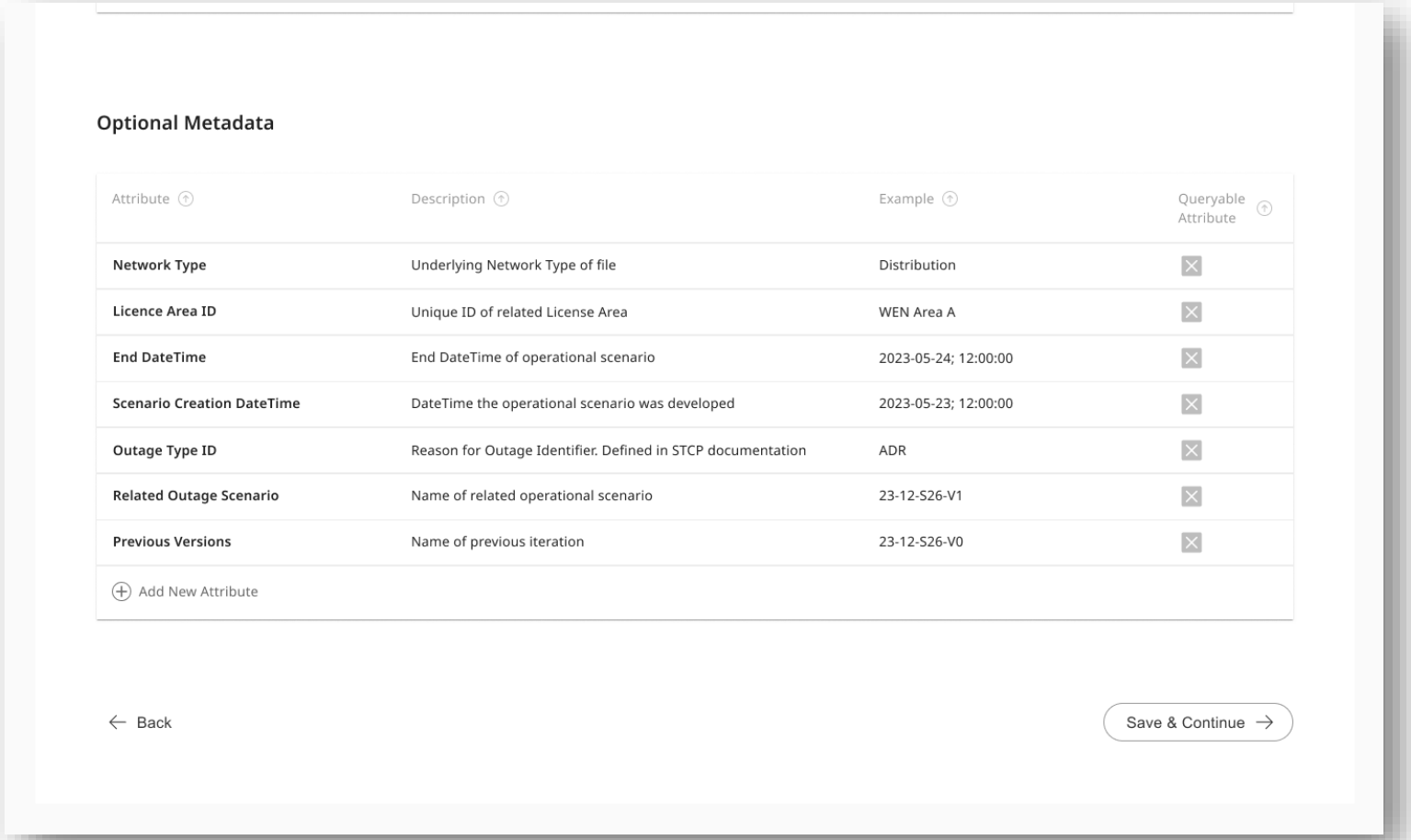
Wireframe: Optional metadata

Publishing an operational scenario

The **Metadata** tab will also show optional metadata that can be added to the dataset. These parameters will provide further contextual information for those accessing this data but are not a requirement for the files to be indexed.

John has the option to add new metadata attributes if necessary to provide additional information on data quality or other characteristics. An example could be the addition of an attribute to specify a more granular spatial or network area where the outage is located.



Optional Metadata

Attribute	Description	Example	Queryable Attribute
Network Type	Underlying Network Type of file	Distribution	☒
Licence Area ID	Unique ID of related License Area	WEN Area A	☒
End DateTime	End DateTime of operational scenario	2023-05-24; 12:00:00	☒
Scenario Creation DateTime	DateTime the operational scenario was developed	2023-05-23; 12:00:00	☒
Outage Type ID	Reason for Outage Identifier. Defined in STCP documentation	ADR	☒
Related Outage Scenario	Name of related operational scenario	23-12-S26-V1	☒
Previous Versions	Name of previous iteration	23-12-S26-V0	☒

⊕ Add New Attribute

← Back

Save & Continue →

Wireframe: Permissions

Publishing an operational scenario

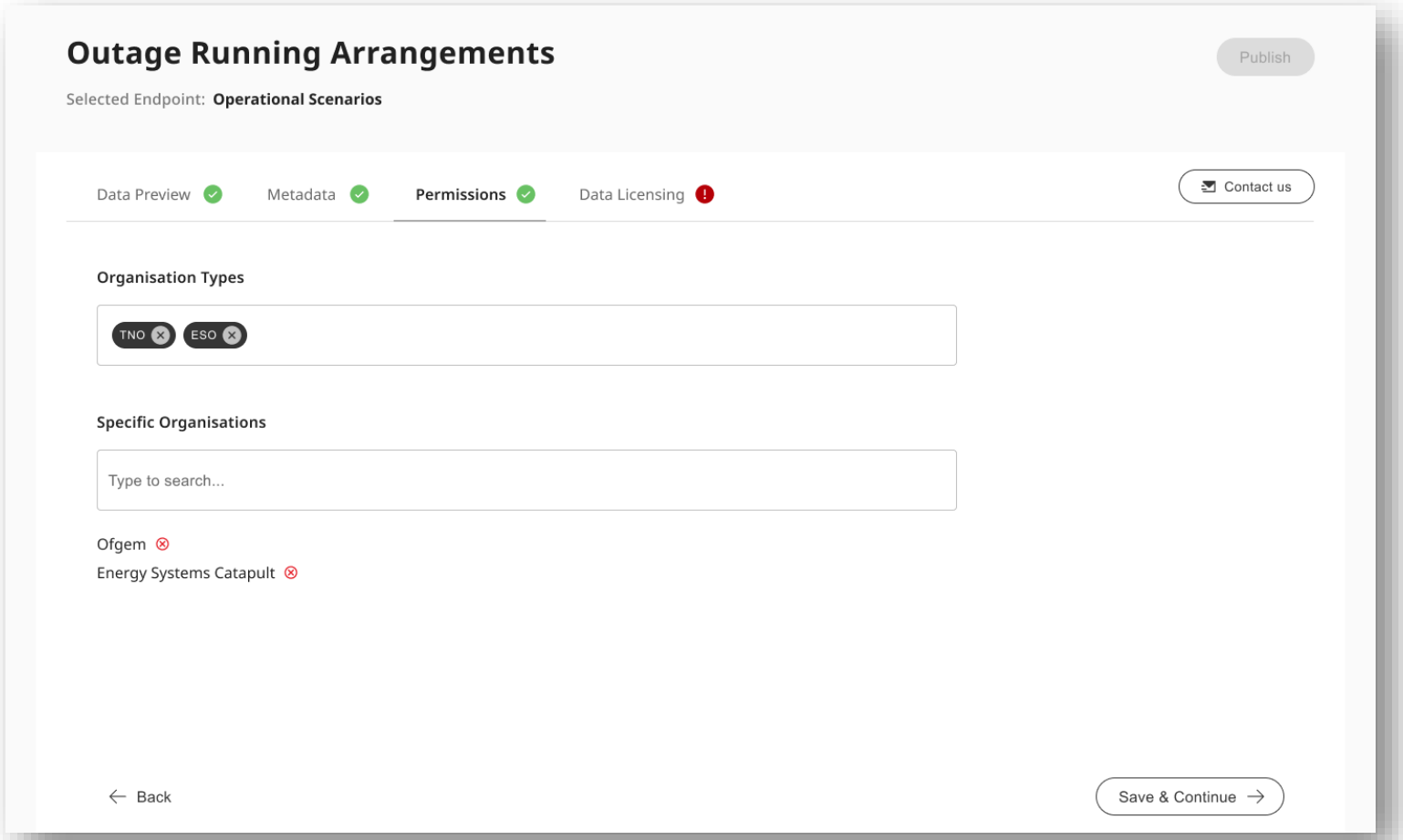
John then moves to the next section to set the **Permissions**. This provides the granular level control, as defined in the Trust framework, for organisations to select who can search and access the dataset. The Trust framework will store the relevant permissions and allow automatic access based on organisational level agreements regarding licencing and data contracts.

John can set permissions in two ways. The first is through group level permissions where he can select a broad organisational group such as “DNO” or “TNO” which will then allow sharing to all organisations within that predefined group.

The second way is through direct sharing with organisations. In this instance John has chosen to make the dataset available to Ofgem and Energy Systems Catapult.

Organisations not selected by John will be able to search for the dataset but will not have immediate access and will be required to send an access request that John can review.

The user will also be able to set additional security controls such as anonymisation or encryption of the data where relevant to the use case.



Wireframe: Data licensing

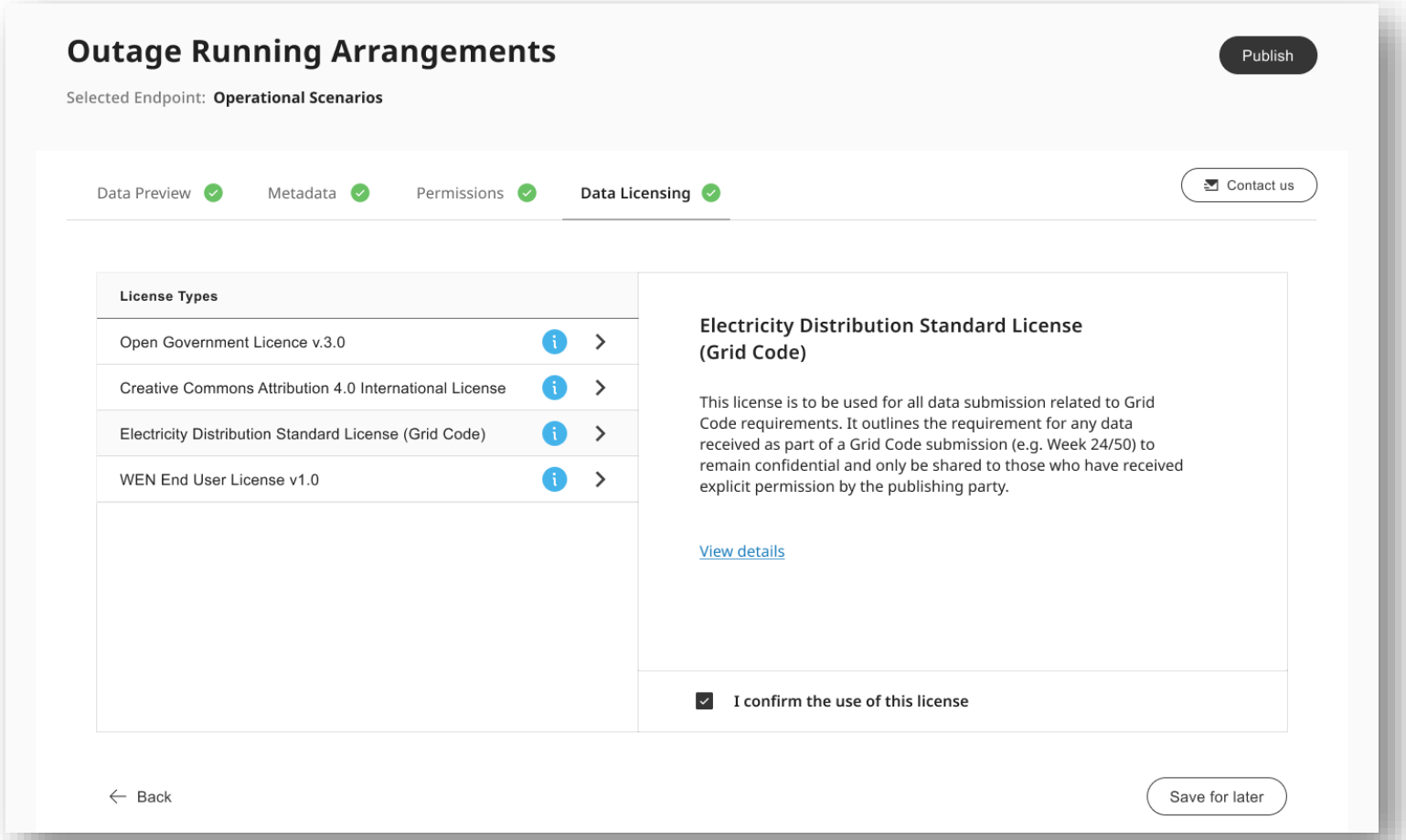
Publishing an operational scenario

The final step in the publishing process is **Data Licensing**. This view provides John with a summary of all the different licenses that the data could be published under. These licenses will be stored and managed by the TRUST framework.

The Energy Data Taskforce's strategy report for a modern digitalised energy system recommended embedding the principle Presumed Open. In considering whether to make a dataset open, an organisation should have a data triage process that aids in identifying risks that might impact different areas.

Having triaged his data, John is able to review the licenses available and select the one most appropriate. The wireframe shows the ability to browse the different license types and be provided with a summary overview of the license with a link to read the full license if required. John selects the box confirming the use of the Electricity Distribution Standard (Grid Code) License.

Once confirmed John can save his progress or publish the configured dataset. John chooses to publish, allowing the repository to be automatically indexed and published on the VirtualES.



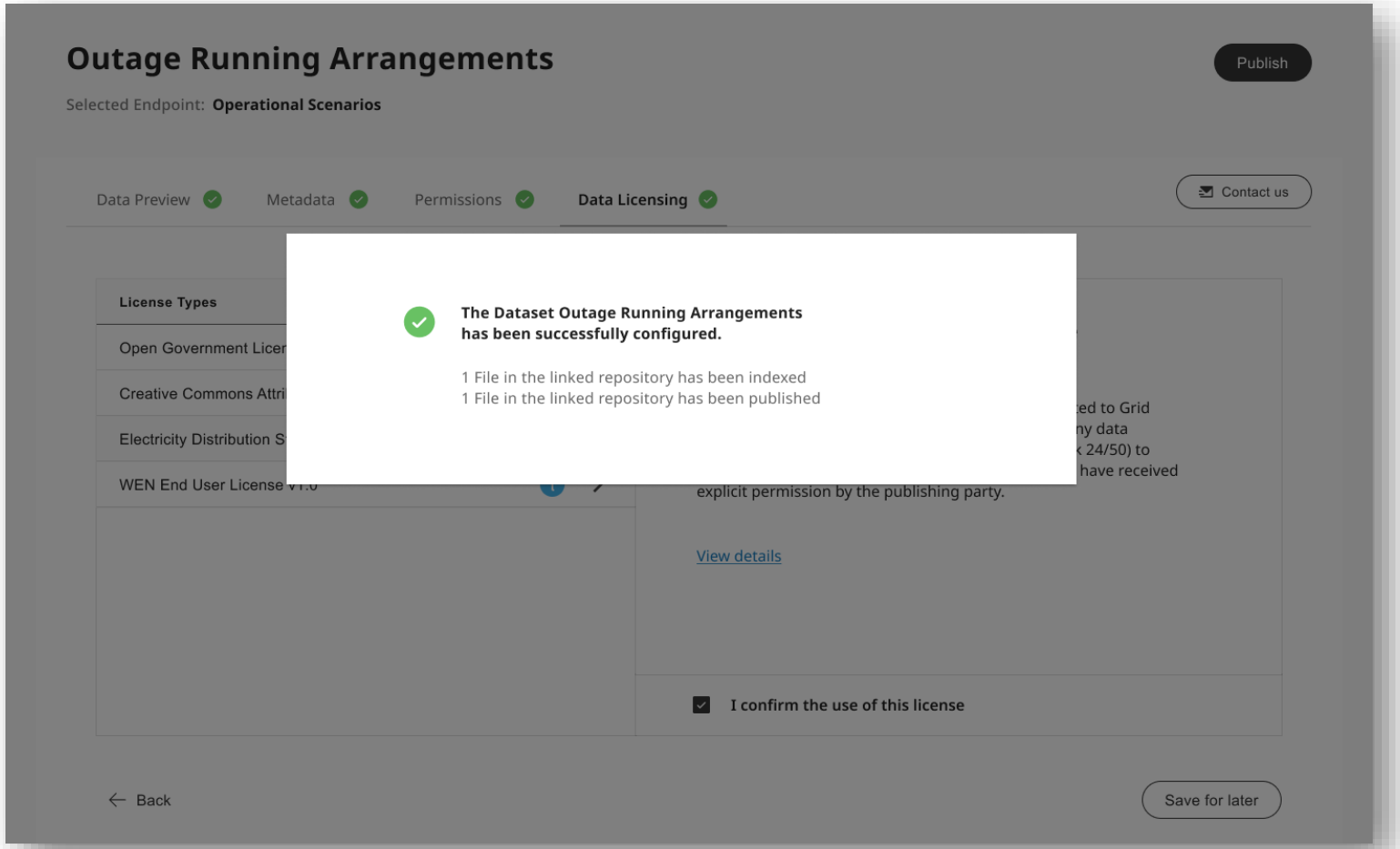
Wireframe: Publishing confirmation

Publishing an operational scenario

After John selects the “Publish” button, a pop-up appears informing him the dataset has been successfully configured.

If there are existing datasets within the repository VirtualES will index and publish these and provide summary statistics on these files.

John is now able to move files directly into Western Electric Networks defined repository and VirtualES will automatically run the schema validation and index and publish the dataset if everything is valid.



3.3 — Wireframe: Searching and accessing data

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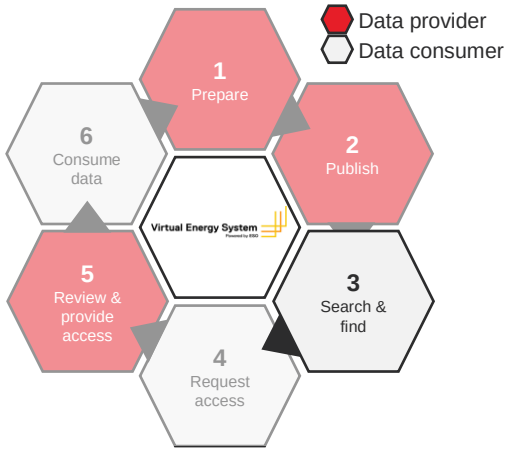
Wireframe: Publishing an Operational Scenario

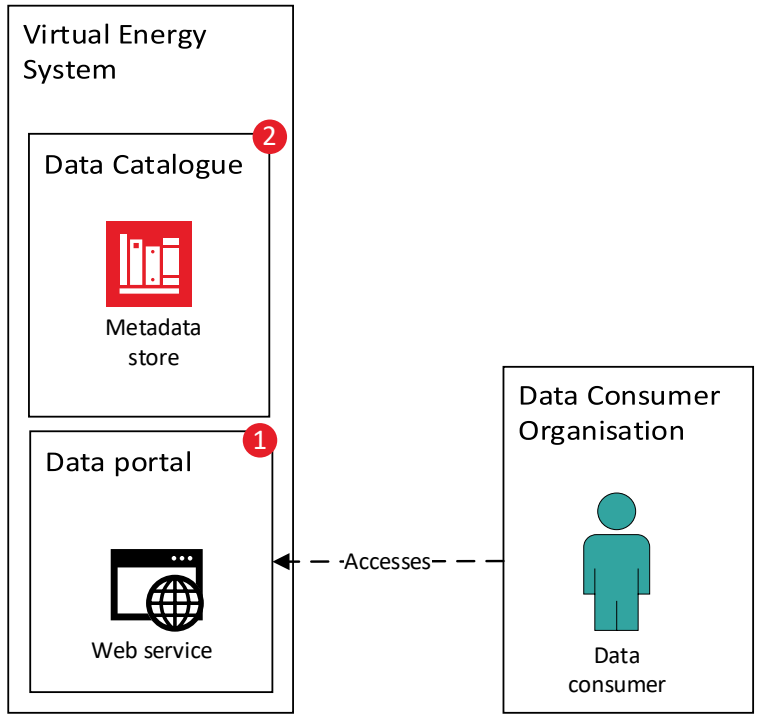
Overview

The final set of wireframes consider the perspective of the data consumer in searching and finding a dataset.

The wireframes demonstrate the search functionality of VirtualES and provide a view of a potential “data profile” page which summarises the dataset using key metadata. This page also provides navigation to the full data licence under which the data is being shared as well as the full metadata.

Finally, these views present how users can access the data through the provision of an API url, providing access to the specific dataset.





Wireframe: Home page

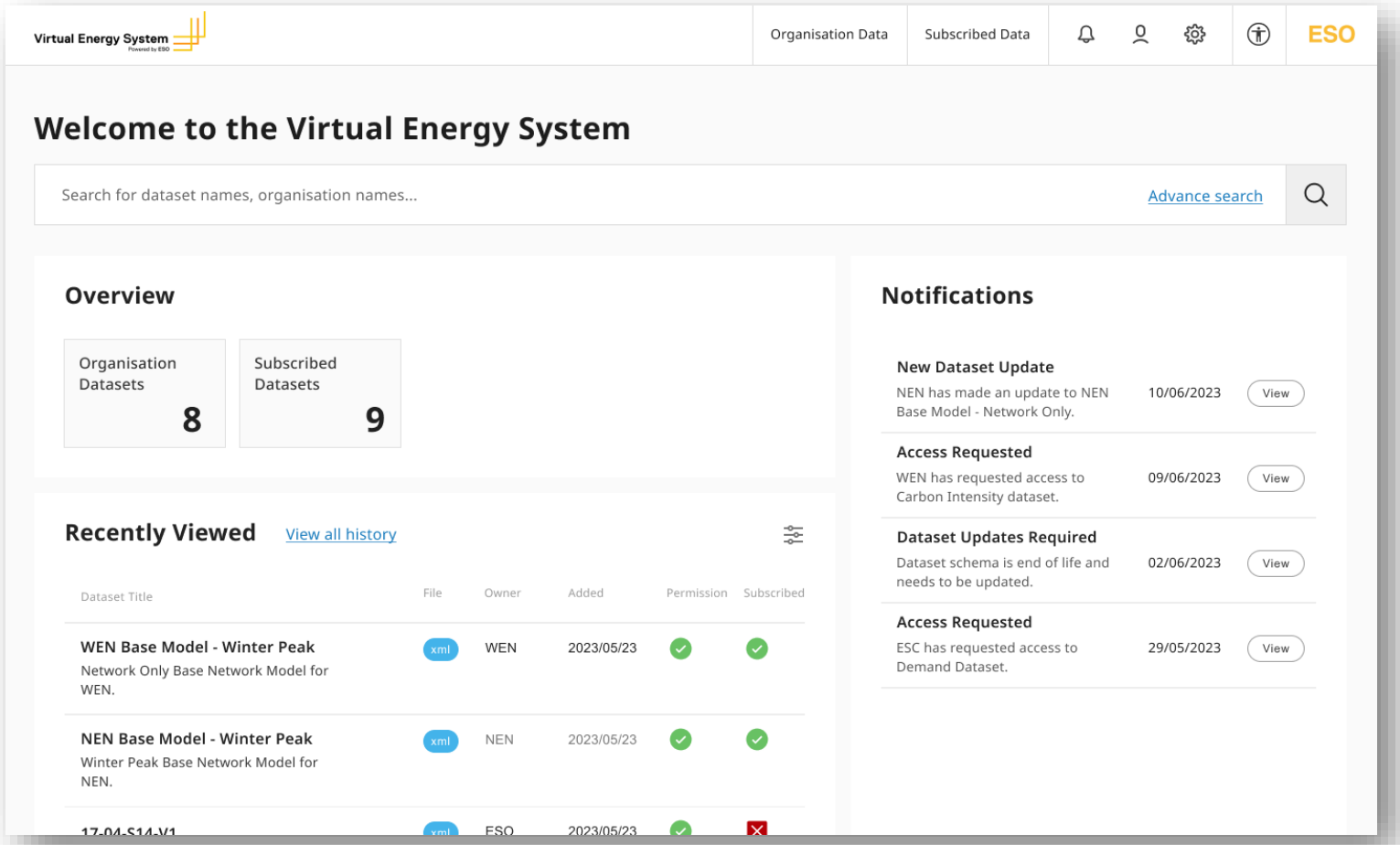
Accessing data

To access the data that John has made available, Rehana now logs in to the VirtualES. She lands on the same homepage view as John although she will be able to configure the page to her specific requirements and tailor it to show information specific to her.

If Rehana had previously subscribed to Western Electric Networks “Outage Running Arrangement” dataset, when she logs-in she would have a custom notification showing that a new outage running arrangement data file is now available.

Rehana could then select the notification and be taken through to the data file, but in this instance, she uses the search function to locate the dataset.

The purpose of these wireframes is to show the functionality of VirtualES from a search perspective. However, it is feasible for Rehana to access this data file directly from her end user application. By registering her local work machine under her organisation’s API, she could query datasets directly from her preferred modelling tool and access operational scenarios without having to use the VirtualES website.



Wireframe: Searching datasets

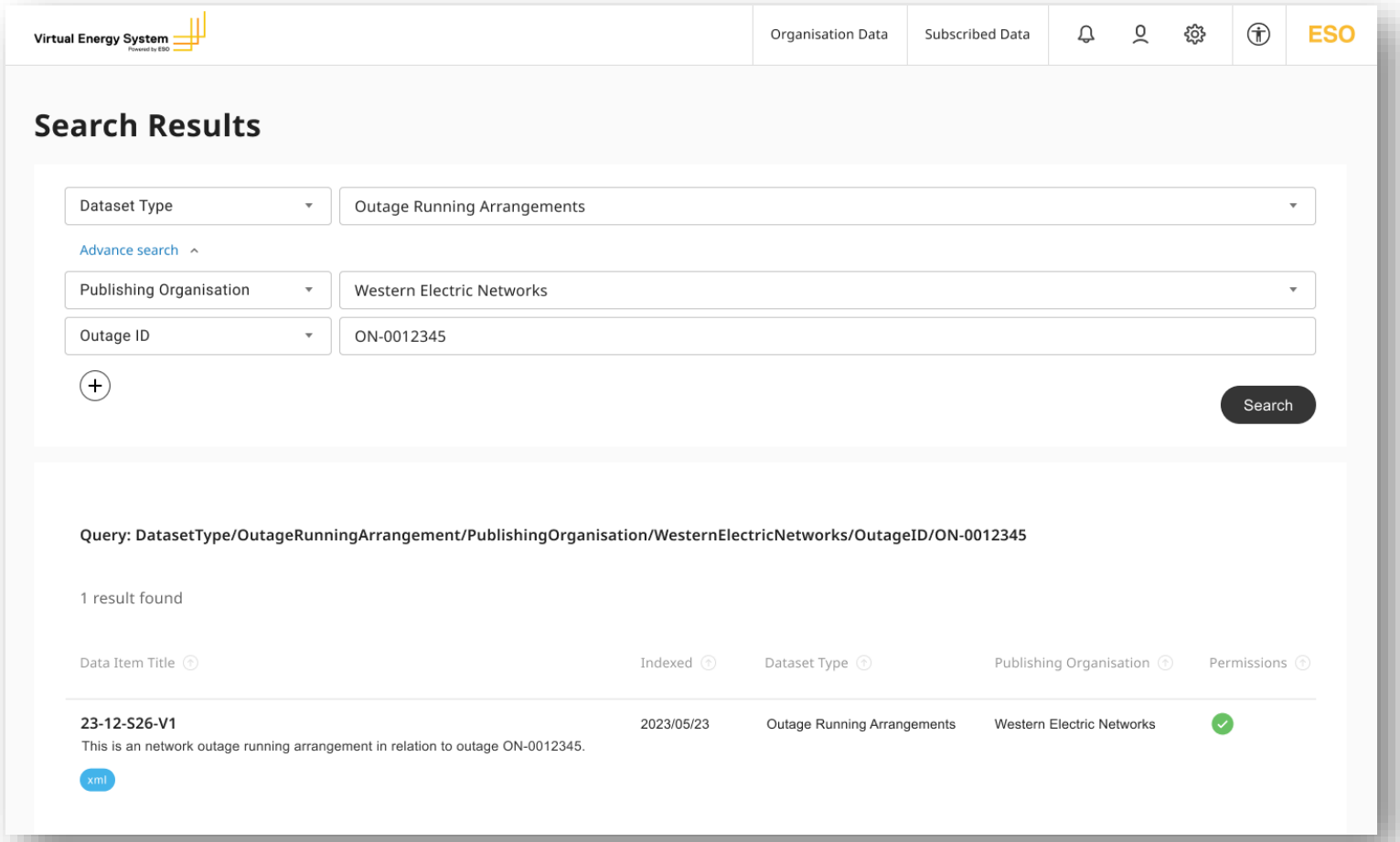
Accessing data

In searching for the data item, Rehana could either carry out a free text search or she could carry out an advanced search using the queryable metadata attributes.

For the advanced search shown on the right, Rehana would select the preferred metadata attributes to filter down her results. In this case, she decides to select Dataset Type, Publishing Organisation, and Outage ID. Rehana inputs the relevant search terms for each attribute and selects search, VirtualES then displays a list of results.

Each result provides the name of the data file, a one-line description, the data format, when it was indexed, the dataset type it belongs to, the publishing organisation and whether the user has automatic permissions to access the data.

In this instance the search returns one result due to the specificity of the query. She selects the result and is taken through to the **Data Preview** page.



Wireframe: Data preview

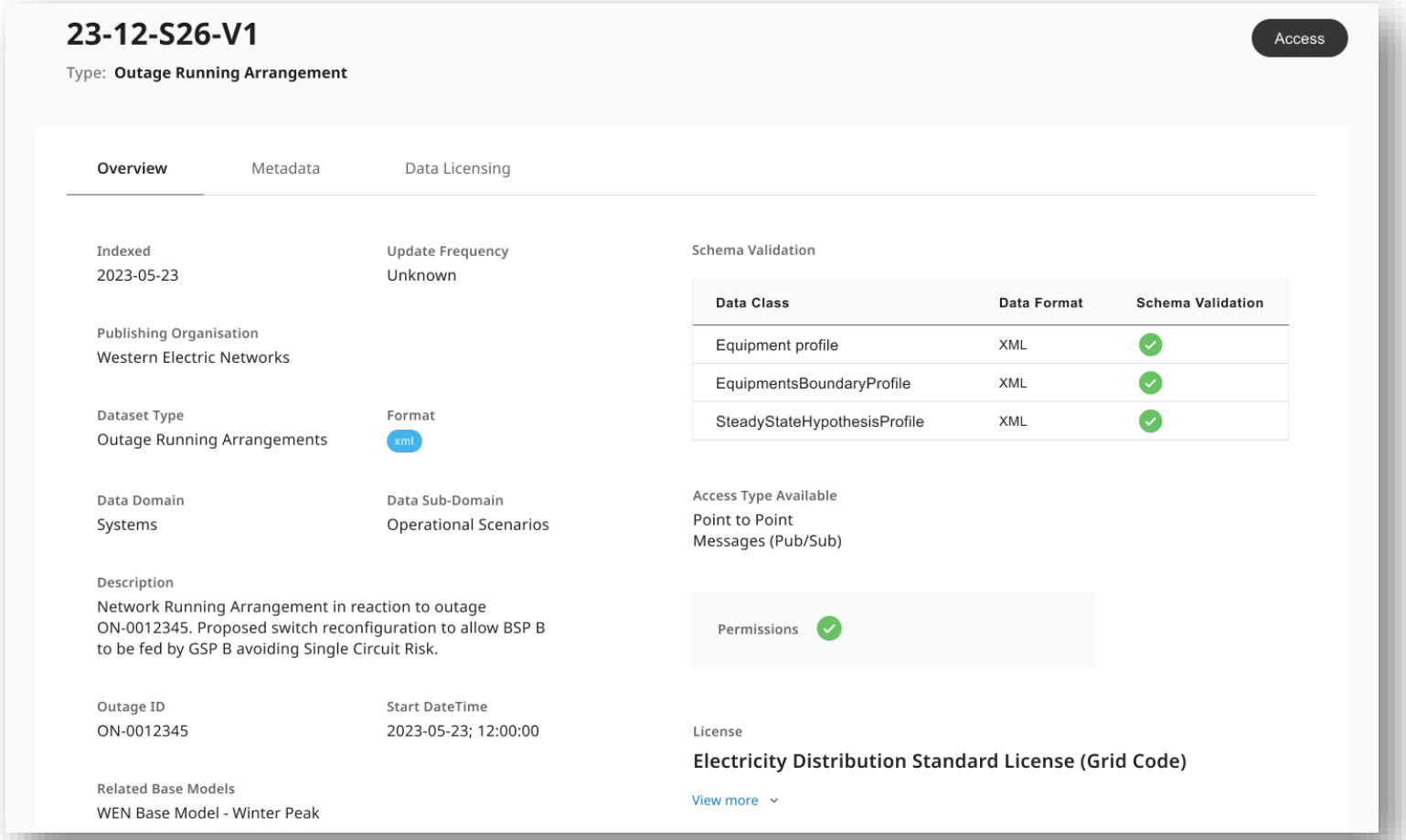
Accessing data

Having selected the data item, Rehana is provided with a summary view of the dataset. The **Data Preview** page provides an overview of the core metadata that John has provided including the description, the dataset type it belongs to, the publishing organisation, and dataset specific metadata such as related Outage ID.

In addition to the metadata, this view also provides a summary of the data classes within the file as well the related base model and finally the license under which the data is being shared.

If required, Rehana could select the tabs along the top of the page to access further information through the **Metadata** or **Data Licensing** information.

Rehana is happy that this is the dataset she requires so she selects “Access”.



Wireframe: Data Accessing

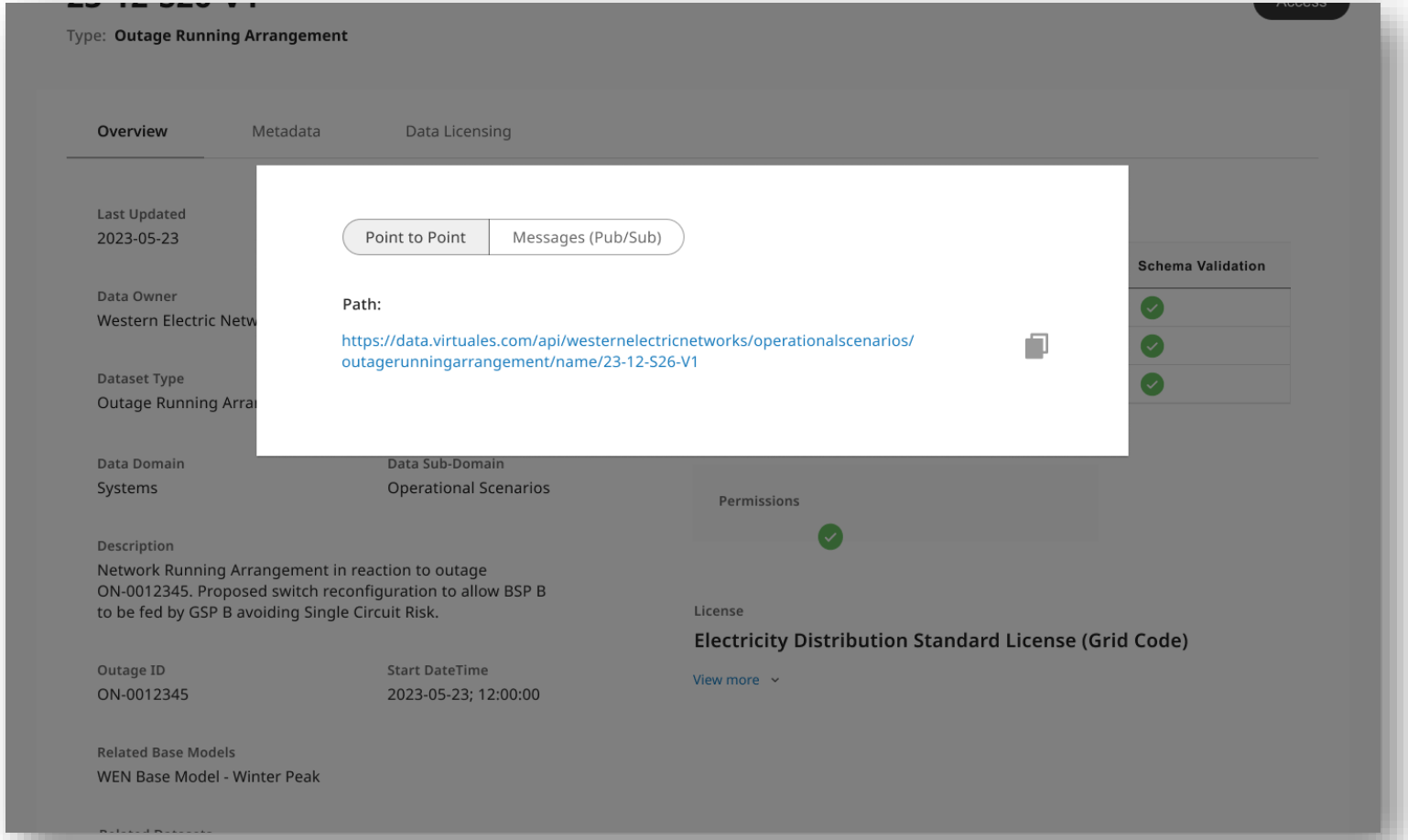
Accessing data

Rehana is registered on VirtualES through her organisation ESO. As this dataset has been made accessible to ESO Rehana has automatic access.

Upon selecting the Access button, a popup appears providing different options for how to access the data. The first option, and the one shown here is Point to Point, as explained in the Priority Technical Factors report, through an API Endpoint.

The API URL points to a VirtualES domain. The purpose of this is to provide the user with a single point of interaction and to allow the Trust framework to validate access rights when there is a request from the end user application. Data is not stored on this domain, the VirtualES will create the point-to-point connection between the data producer and consumer.

Other options for accessing the data may also be available, the wireframe on the right shows the potential to subscribe to the dataset via the Messages (Pub/Sub) button. How end users decide to access the data will be dependent on their requirements.



4

Case studies of the components of technology and process required for the demonstrator

Open Energy

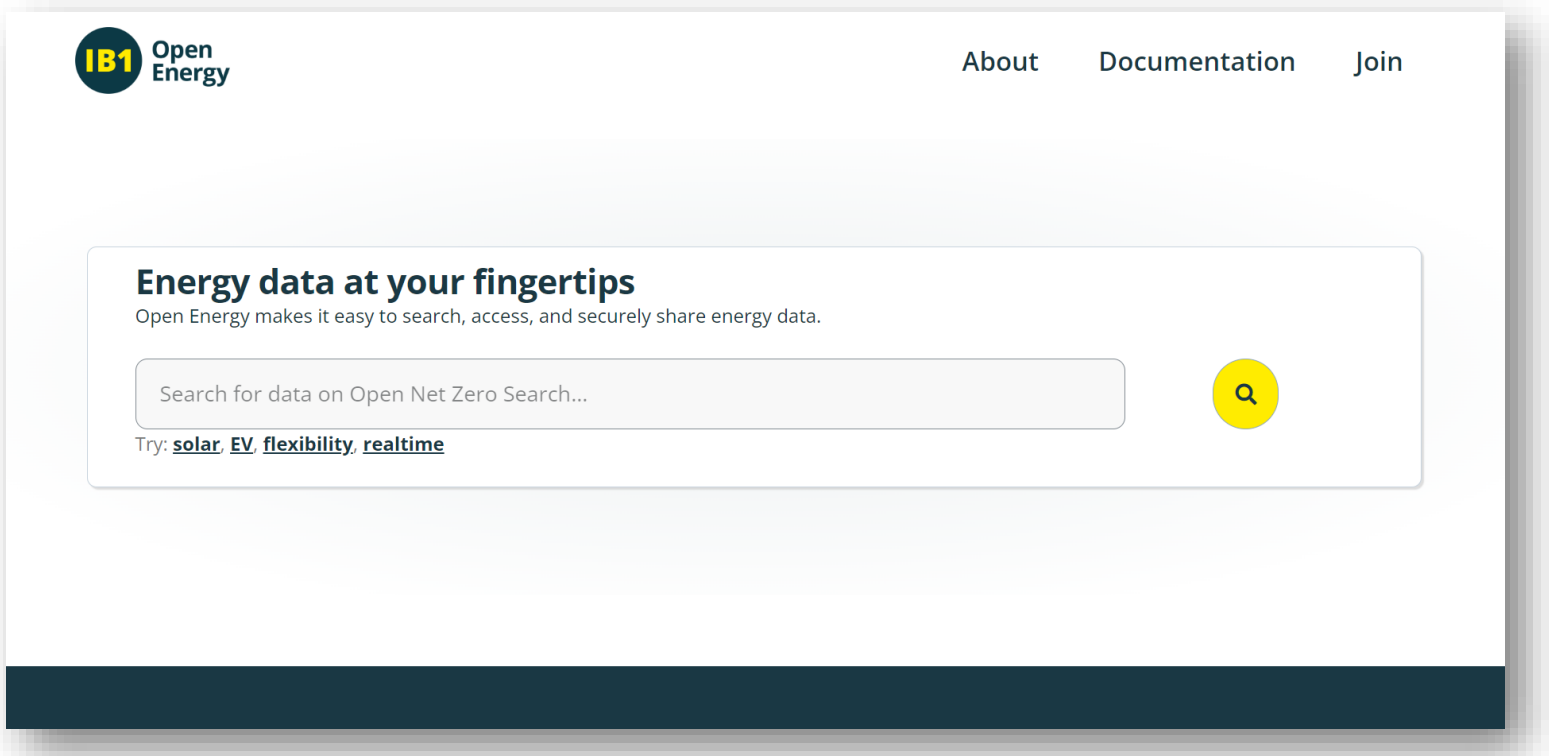
Icebreaker One

Open Energy is a web platform that provides search, discovery and secure access to energy datasets between data providers and data consumers.

The platform allows users to search and access datasets from across the energy sector, published by multiple different organisations. The platform does not store data, instead it provides a service through which organisations can provide secure access to both their Open and commercial Shared data with the appropriate access controls in place.

Key to Open Energy is the Trust Framework, a governance scheme that enables easier, more secure, trusted data sharing. The framework assures that organisations are who they say they are; consent is given to share data with the pre-agreed rules; and enables that consent to be linked to rules for licensing, liability transfer, legal and operational processes

https://openenergy.org.uk



Open Energy home page

Open Energy's home page from which users can search for energy datasets indexed on the platform.

ARUP

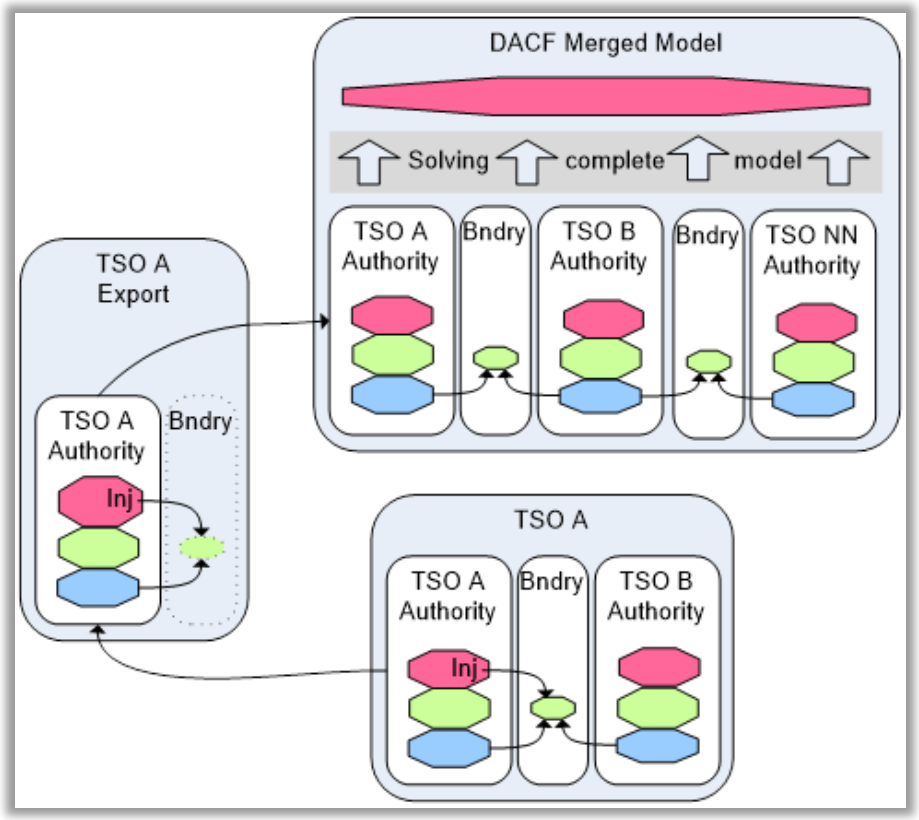
ENTSO-E CIM Model Exchange

Day-Ahead Congestion Forecast

The Day Ahead Congestion Forecast (DACF) process is a daily analytical operational process that is currently applied in Europe. It consists of each TSO preparing a power flow model covering its own territory and sending it to a central server. These models are then checked for mutual compatibility and combined to create a merged model that can be used by each of the TSOs to better understand the congestion in their region. This is primarily done by linking individual models through a predefined boundary node.

Accessing and merging models from different operators is a key function of the use case that was not explored in the wireframes. However, the DACF process proves that this functionality is feasible. The use of a boundary node mapping maintained by neighbouring operators along with the deployment of CIM standards to ensure data is interoperable, allows for the automatic merging of models at the shared boundary nodes.

120903_ENTSOE_CIM_Model_Exchange_2ndProfile_v2_3_35_DRAFTpostIOPversion.docx (live.com)



DACF Process
Visual representation of DACF process

5

Summary considerations

Key considerations

User journeys and wireframes of the VirtualES

Challenges

As the energy grid changes to enable net zero there will be a growth in both variable demand and generation. With more EVs, heat pumps and renewable energy sources such as solar and wind there will be a greater need for modelling of the energy system to ensure the balance of demand and generation.

With capacity upgrades required and new equipment to be installed there will be a greater number of planned outages to facilitate this maintenance. This requires an increase in modelling and a more robust sequence of checks and analysis to mitigate the impacts of variable demand and generation.

The current approach to sharing data for the outage management processes, as outlined in the user journeys, places undue burden on the time-scales against which outages can be addressed. Data is also shared through unsecure means such as email.

With a lack of standardisation in data between operators there is significant manual data conversion and validation. These activities are time-consuming, prone to human error, and can lead to information loss.

Benefits

The future user journeys demonstrated that by sharing standardised data through the VirtualES there was a significant reduction in the manual processing, converting and checking of data when shared by another organisations.

The use of standards that can be easily loaded into industry used modelling tools without conversion, reduces information loss and provides operators with greater confidence in the data.

The VirtualES provides an easy mechanism, as demonstrated by the wireframes, through which base models and operational scenarios can be shared and controlled, allowing the outage management process to become more collaborative

Moving away from the sharing of individual datasheets via email to a more automated and seamless approach of publishing data will reduce time spent on preparing data to model and allow for greater time on analysis of outputs or an increase in throughput.

Recommendations

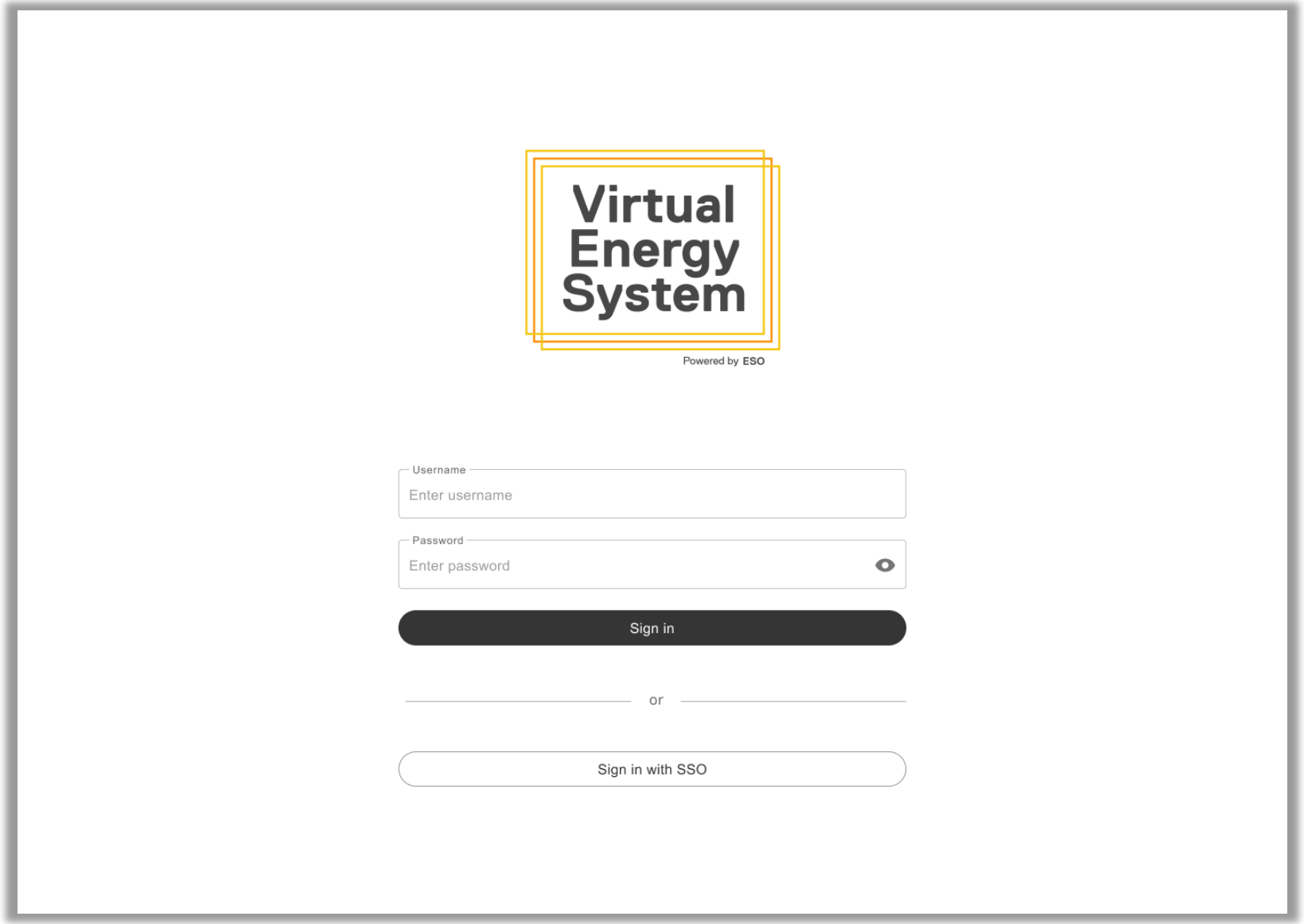
Accessing the data through the VirtualES provides the benefits of a single data portal to access data from different organisations rather than accessing that data from each individual organisation.

This report did not explore how users would connect and interact with the VirtualES API and how that API would structure and present data and what authentication would be required to connect to the API. This should be explored in next phase of work with further development of the technology solution.

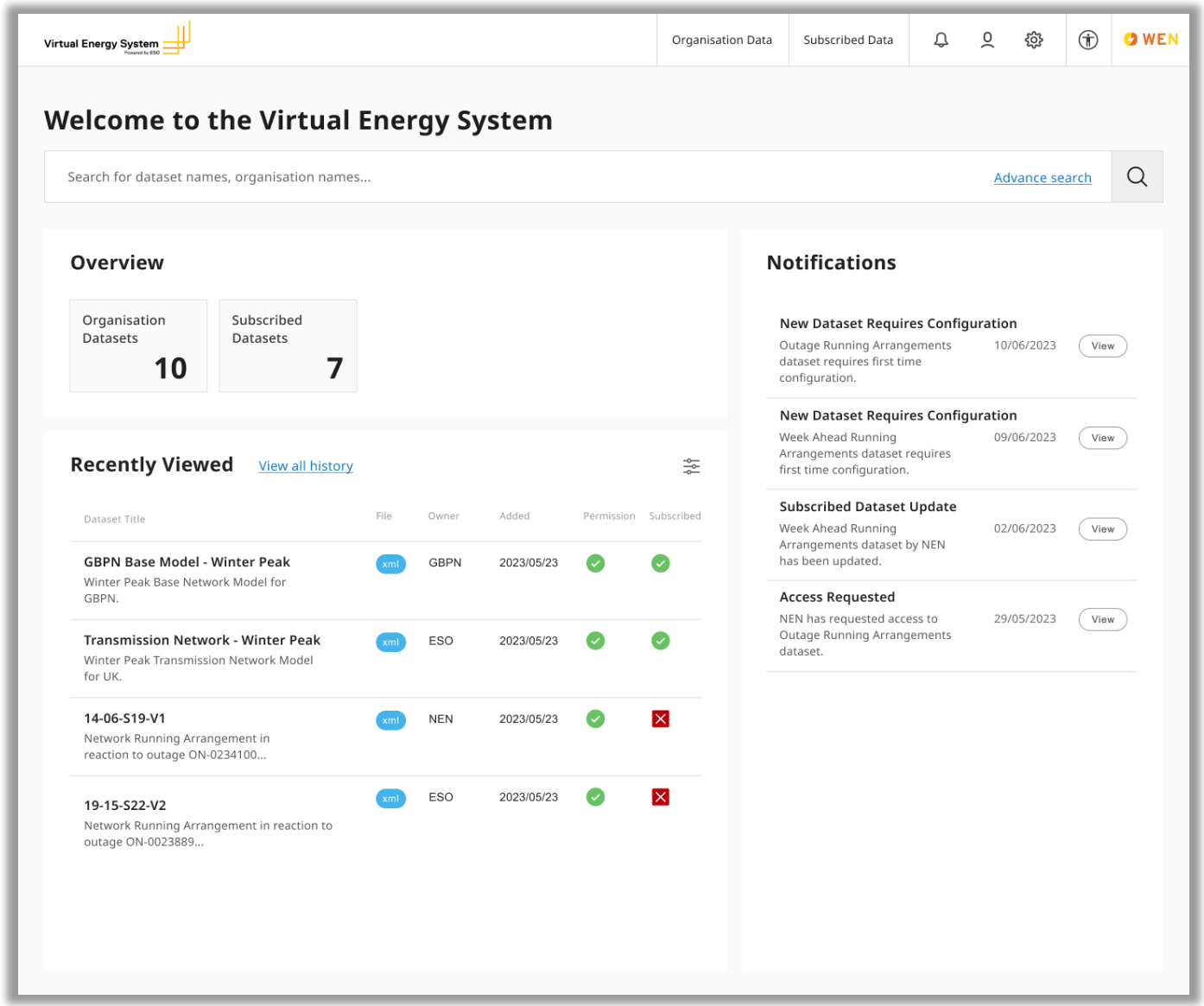
Appendix

A.1 — Wireframes

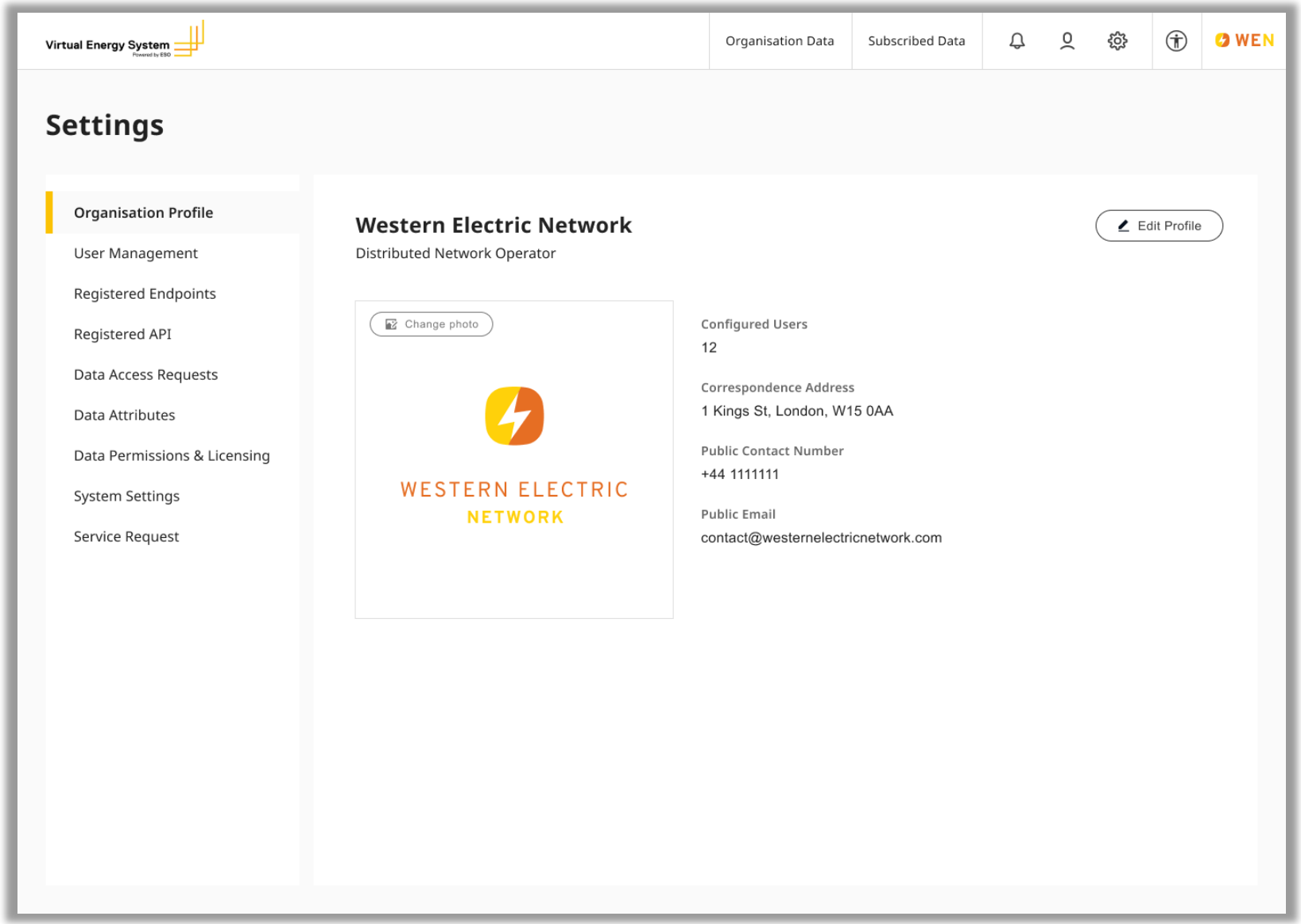
ARUP


Virtual Energy System
Powered by ESO
Username
Enter username
Password
Enter password
Sign in
or
Sign in with SSO

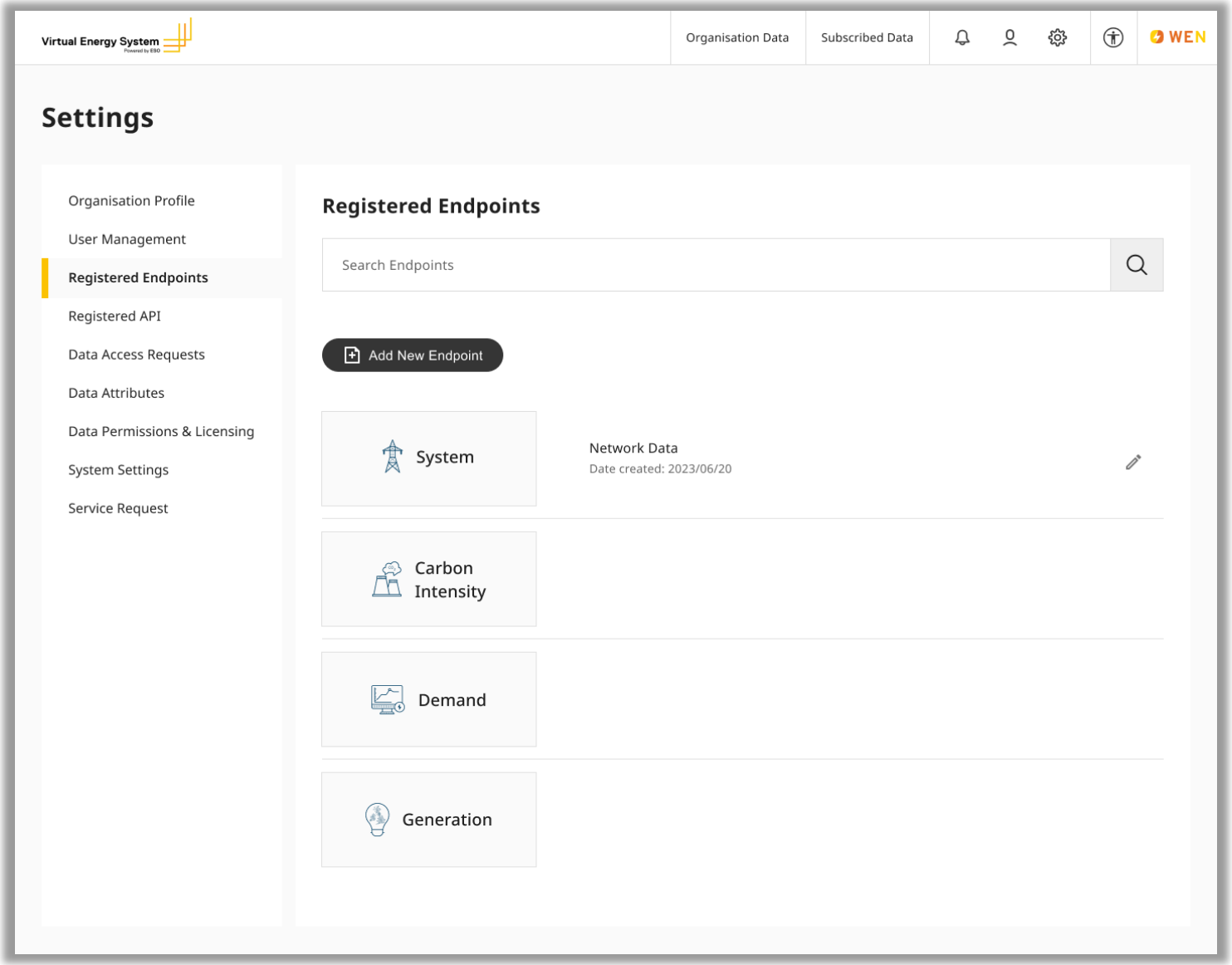
ARUP


Virtual Energy System
Organisation Data
Subscribed Data
WEN
Welcome to the Virtual Energy System
Search for dataset names, organisation names...
Advance search
Overview
Organisation Datasets
10
Subscribed Datasets
7
Recently Viewed
View all history
Dataset Title
File
Owner
Added
Permission
Subscribed
GBPN Base Model - Winter Peak
Winter Peak Base Network Model for GBPN.
xml
GBPN
2023/05/23
Transmission Network - Winter Peak
Winter Peak Transmission Network Model for UK.
xml
ESO
2023/05/23
14-06-S19-V1
Network Running Arrangement in reaction to outage ON-0234100...
xml
NEN
2023/05/23
19-15-S22-V2
Network Running Arrangement in reaction to outage ON-0023889...
xml
ESO
2023/05/23
Notifications
New Dataset Requires Configuration
Outage Running Arrangements dataset requires first time configuration.
10/06/2023
View
New Dataset Requires Configuration
Week Ahead Running Arrangements dataset requires first time configuration.
09/06/2023
View
Subscribed Dataset Update
Week Ahead Running Arrangements dataset by NEN has been updated.
02/06/2023
View
Access Requested
NEN has requested access to Outage Running Arrangements dataset.
29/05/2023
View

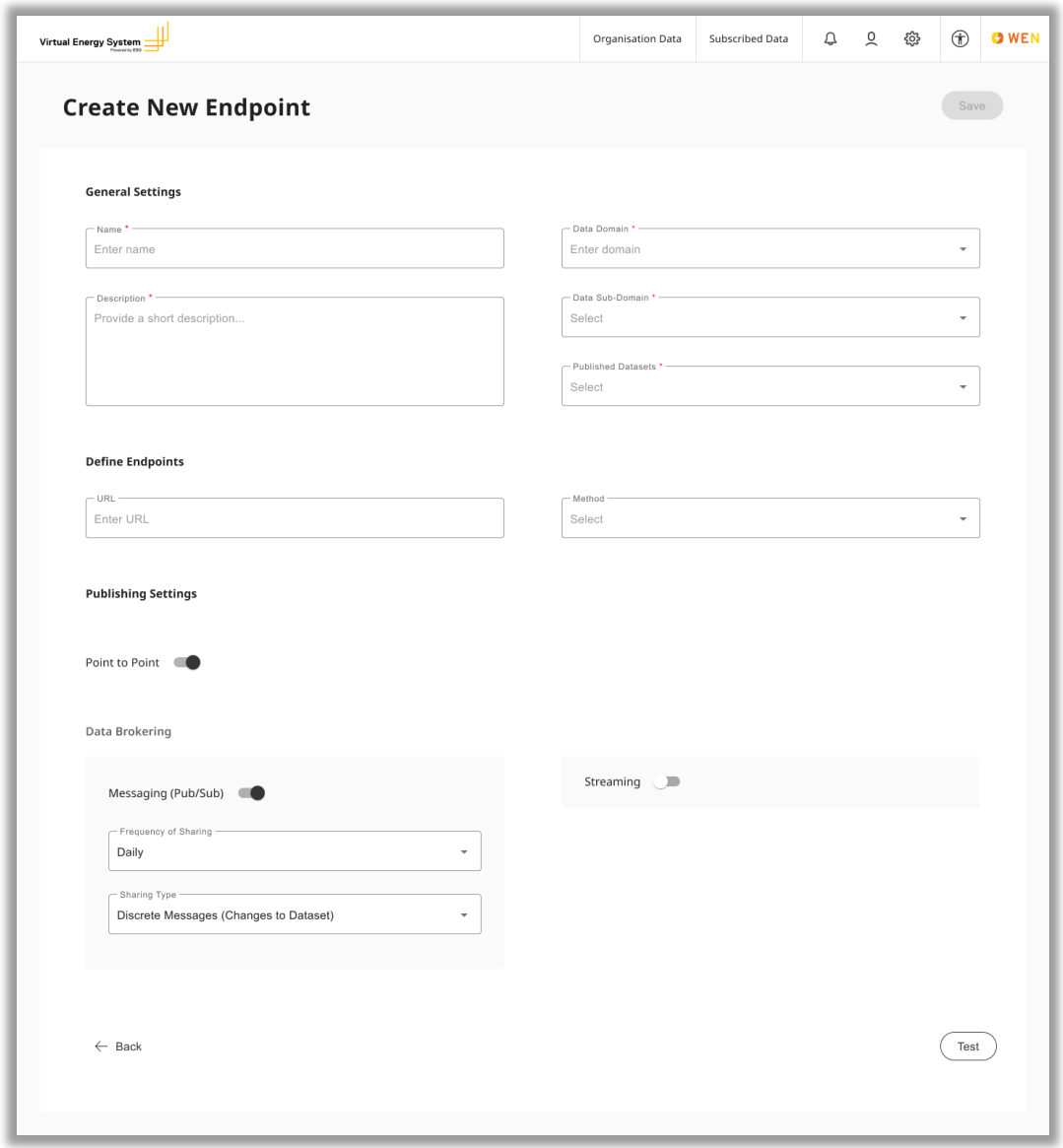
ARUP


Virtual Energy System
Organisation Data
Subscribed Data
WEN
Settings
Organisation Profile
User Management
Registered Endpoints
Registered API
Data Access Requests
Data Attributes
Data Permissions & Licensing
System Settings
Service Request
Western Electric Network
Distributed Network Operator
Edit Profile
Change photo
WESTERN ELECTRIC
NETWORK
Configured Users
12
Correspondence Address
1 Kings St, London, W15 0AA
Public Contact Number
+44 1111111
Public Email
contact@westernelectricnetwork.com

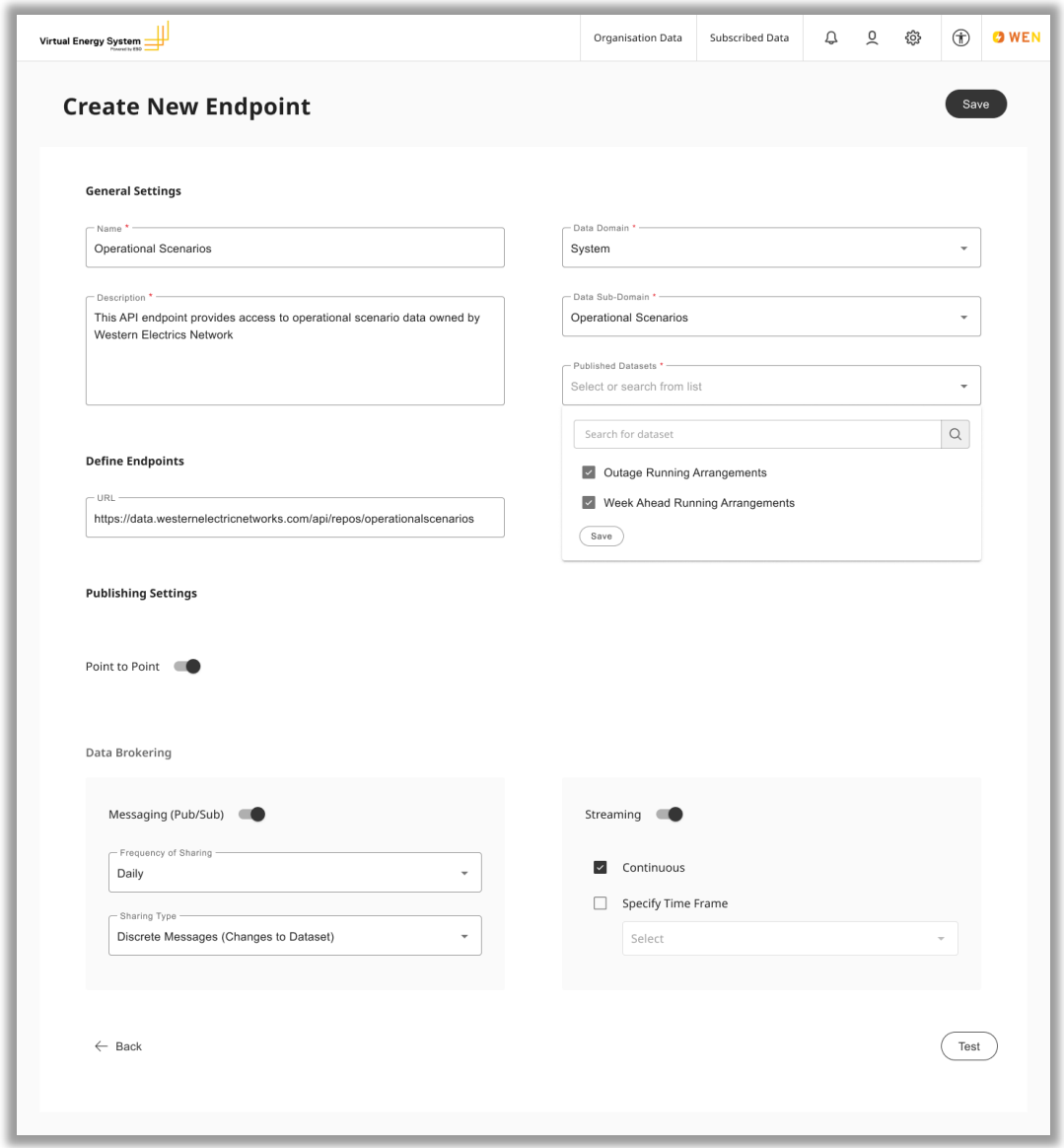
ARUP


Virtual Energy System
Organisation Data
Subscribed Data
WEN
Settings
Organisation Profile
User Management
Registered Endpoints
Registered API
Data Access Requests
Data Attributes
Data Permissions & Licensing
System Settings
Service Request
Registered Endpoints
Search Endpoints
Add New Endpoint
System
Network Data
Date created: 2023/06/20
Carbon Intensity
Demand
Generation

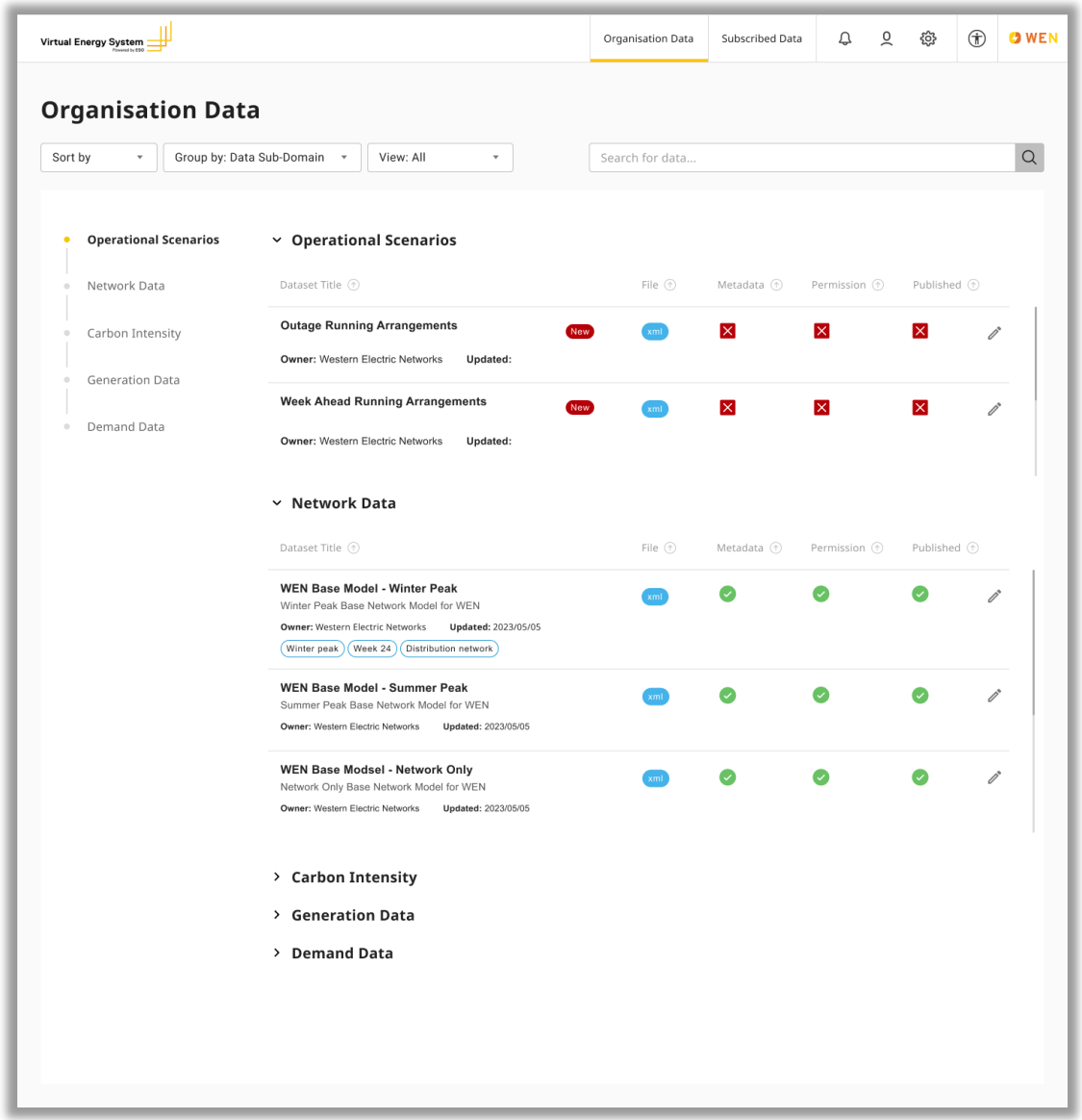
ARUP


Virtual Energy System
Organisation Data
Subscribed Data
WEN
Create New Endpoint
Save
General Settings
Name *
Enter name
Data Domain *
Enter domain
Description *
Provide a short description...
Data Sub-Domain *
Select
Published Datasets *
Select
Define Endpoints
URL
Enter URL
Method
Select
Publishing Settings
Point to Point
Data Brokering
Messaging (Pub/Sub)
Frequency of Sharing
Daily
Sharing Type
Discrete Messages (Changes to Dataset)
Streaming
Back
Test

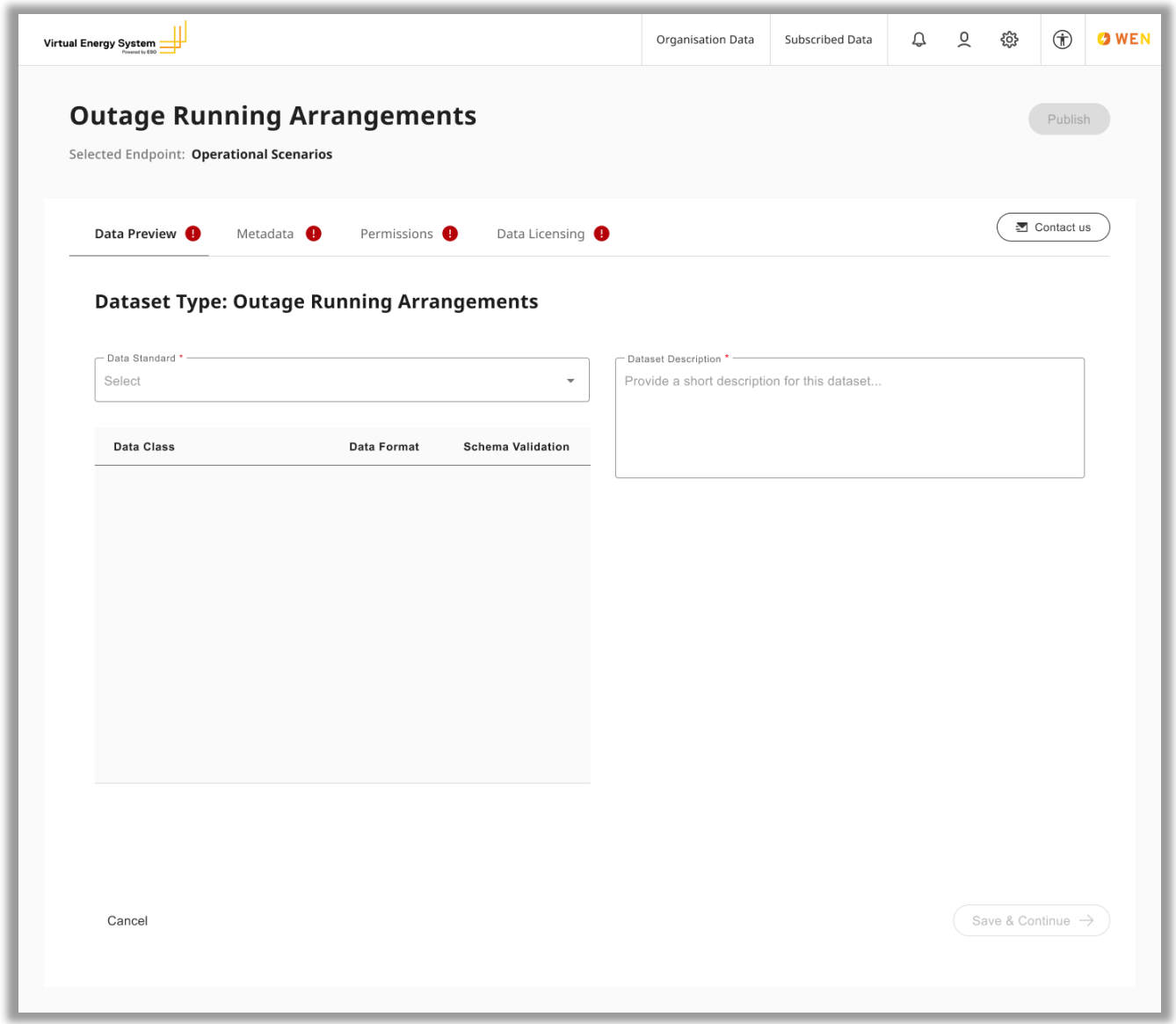
ARUP


Virtual Energy System
Organisation Data
Subscribed Data
WEN
Create New Endpoint
Save
General Settings
Name *
Operational Scenarios
Description *
This API endpoint provides access to operational scenario data owned by Western Electrics Network
Data Domain *
System
Data Sub-Domain *
Operational Scenarios
Published Datasets *
Select or search from list
Search for dataset
Outage Running Arrangements
Week Ahead Running Arrangements
Save
Define Endpoints
URL
https://data.westernelectricnetworks.com/api/repos/operationalscenarios
Publishing Settings
Point to Point
Data Brokering
Messaging (Pub/Sub)
Frequency of Sharing
Daily
Sharing Type
Discrete Messages (Changes to Dataset)
Streaming
Continuous
Specify Time Frame
Select
Back
Test

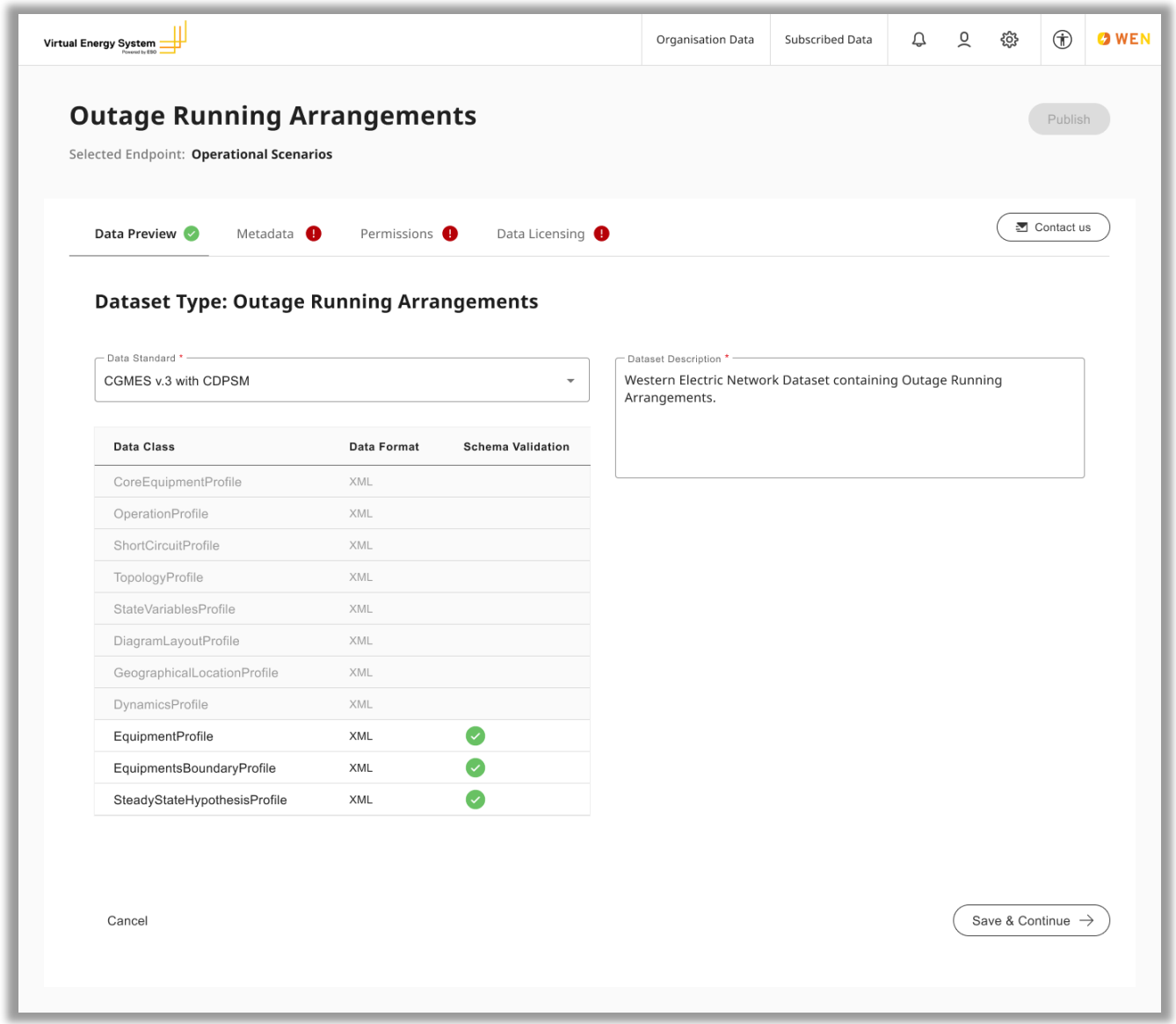
ARUP


Virtual Energy System
Organisation Data
Subscribed Data
WEN
Organisation Data
Sort by
Group by: Data Sub-Domain
View: All
Search for data...
Operational Scenarios
Network Data
Carbon Intensity
Generation Data
Demand Data
Operational Scenarios
Dataset Title
File
Metadata
Permission
Published
Outage Running Arrangements
New
xml
Owner: Western Electric Networks
Updated:
Week Ahead Running Arrangements
New
xml
Owner: Western Electric Networks
Updated:
Network Data
Dataset Title
File
Metadata
Permission
Published
WEN Base Model - Winter Peak
Winter Peak Base Network Model for WEN
xml
Owner: Western Electric Networks
Updated: 2023/05/05
Winter peak
Week 24
Distribution network
WEN Base Model - Summer Peak
Summer Peak Base Network Model for WEN
xml
Owner: Western Electric Networks
Updated: 2023/05/05
WEN Base Modsel - Network Only
Network Only Base Network Model for WEN
xml
Owner: Western Electric Networks
Updated: 2023/05/05
Carbon Intensity
Generation Data
Demand Data

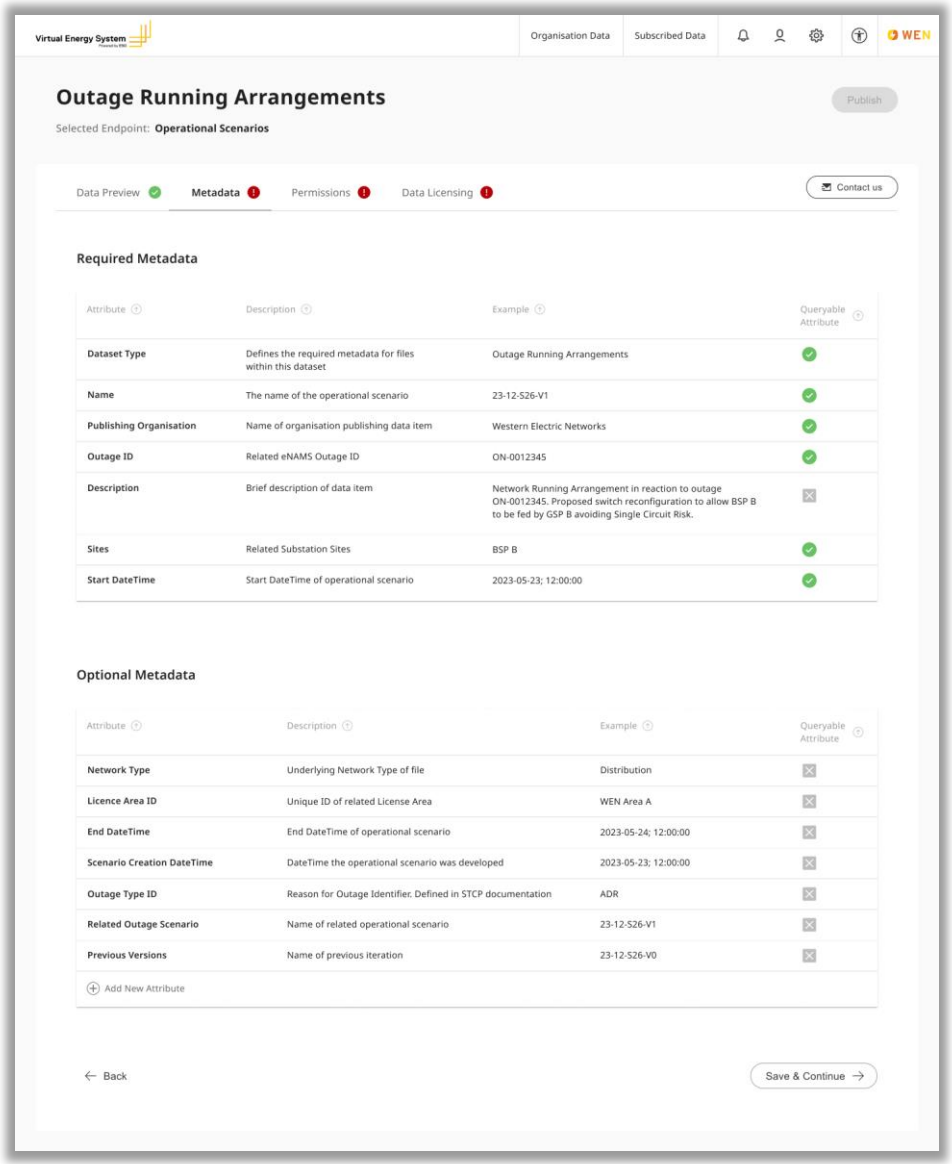
ARUP


Virtual Energy System
Organisation Data
Subscribed Data
WEN
Outage Running Arrangements
Publish
Selected Endpoint: Operational Scenarios
Data Preview
Metadata
Permissions
Data Licensing
Contact us
Dataset Type: Outage Running Arrangements
Data Standard *
Select
Dataset Description *
Provide a short description for this dataset...
Data Class
Data Format
Schema Validation
Cancel
Save & Continue

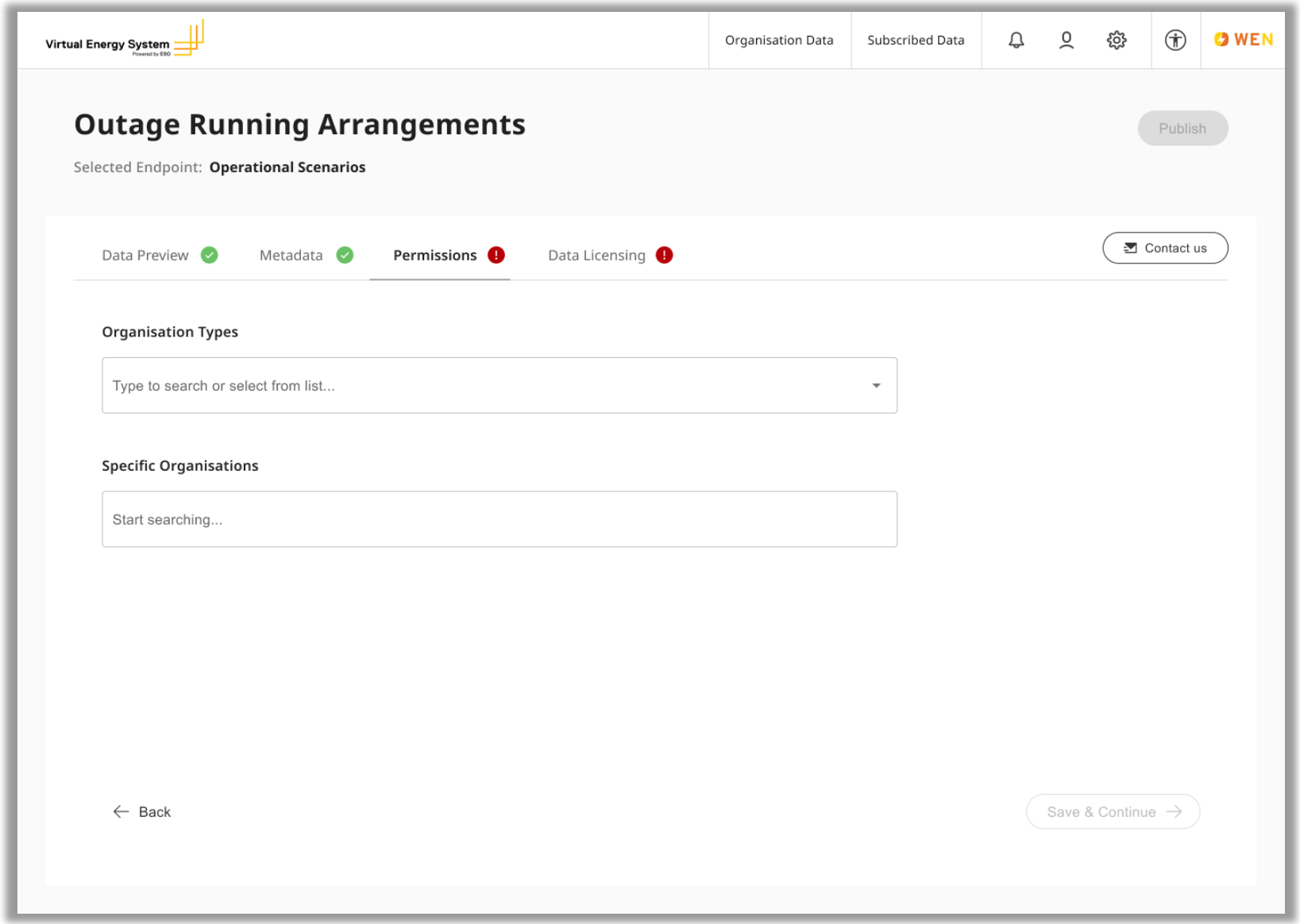
ARUP


Virtual Energy System
Organisation Data
Subscribed Data
WEN
Outage Running Arrangements
Publish
Selected Endpoint: Operational Scenarios
Data Preview
Metadata
Permissions
Data Licensing
Contact us
Dataset Type: Outage Running Arrangements
Data Standard *
CGMES v.3 with CDPSM
Dataset Description *
Western Electric Network Dataset containing Outage Running Arrangements.
Data Class
Data Format
Schema Validation
CoreEquipmentProfile XML
OperationProfile XML
ShortCircuitProfile XML
TopologyProfile XML
StateVariablesProfile XML
DiagramLayoutProfile XML
GeographicalLocationProfile XML
DynamicsProfile XML
EquipmentProfile XML
EquipmentsBoundaryProfile XML
SteadyStateHypothesisProfile XML
Cancel
Save & Continue

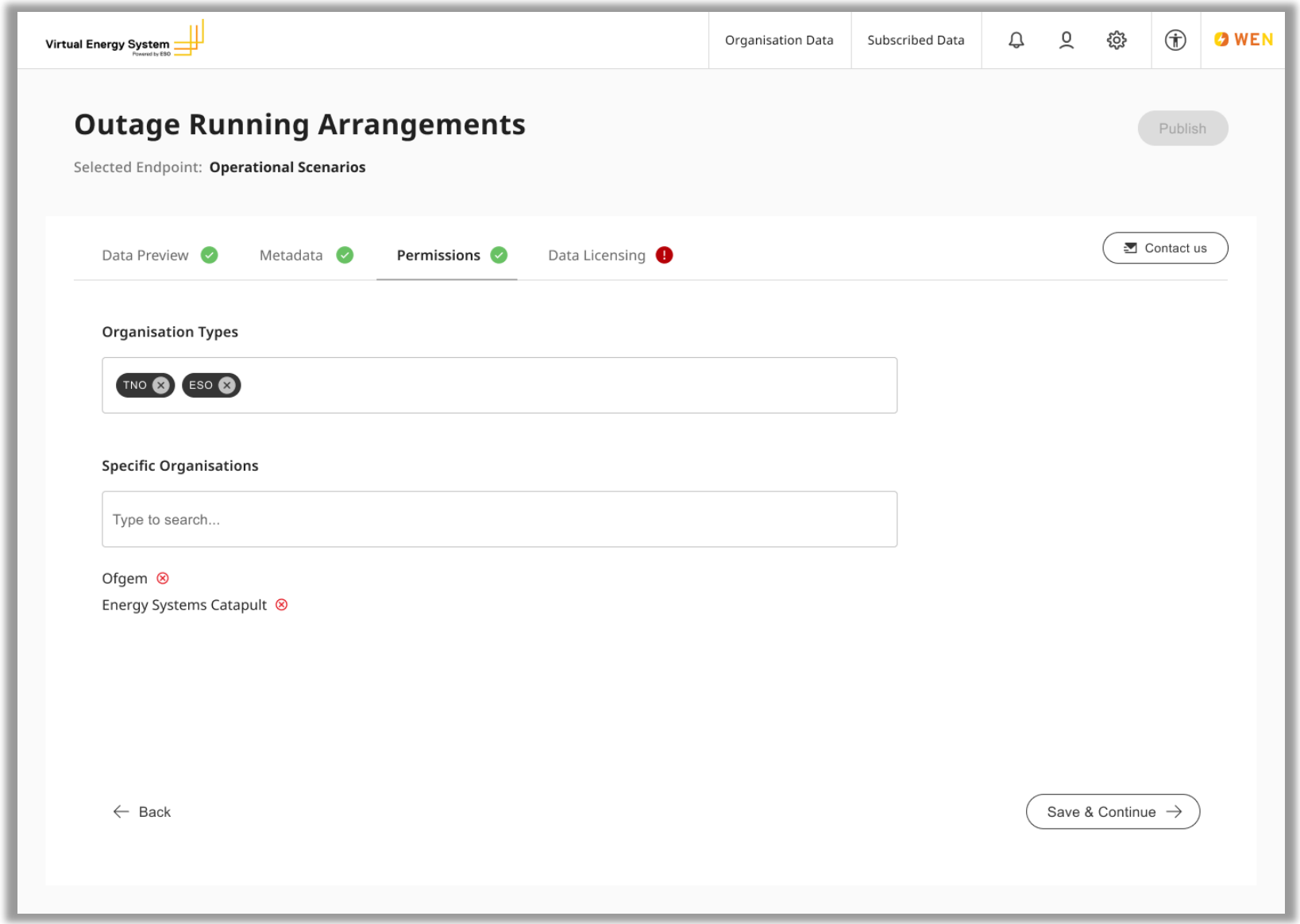
ARUP


Virtual Energy System
Organisation Data
Subscribed Data
WEN
Outage Running Arrangements
Publish
Selected Endpoint: Operational Scenarios
Data Preview
Metadata
Permissions
Data Licensing
Contact us
Required Metadata
Attribute
Description
Example
Queryable Attribute
Dataset Type
Defines the required metadata for files within this dataset
Outage Running Arrangements
Name
The name of the operational scenario
23-12-S26-V1
Publishing Organisation
Name of organisation publishing data item
Western Electric Networks
Outage ID
Related eNAMS Outage ID
ON-0012345
Description
Brief description of data item
Network Running Arrangement in reaction to outage ON-0012345. Proposed switch reconfiguration to allow BSP B to be fed by GSP B avoiding Single Circuit Risk.
Sites
Related Substation Sites
BSP B
Start DateTime
Start DateTime of operational scenario
2023-05-23; 12:00:00
Optional Metadata
Attribute
Description
Example
Queryable Attribute
Network Type
Underlying Network Type of file
Distribution
Licence Area ID
Unique ID of related License Area
WEN Area A
End DateTime
End DateTime of operational scenario
2023-05-24; 12:00:00
Scenario Creation DateTime
DateTime the operational scenario was developed
2023-05-23; 12:00:00
Outage Type ID
Reason for Outage Identifier. Defined in STCP documentation
ADR
Related Outage Scenario
Name of related operational scenario
23-12-S26-V1
Previous Versions
Name of previous iteration
23-12-S26-V0
Add New Attribute
Back
Save & Continue

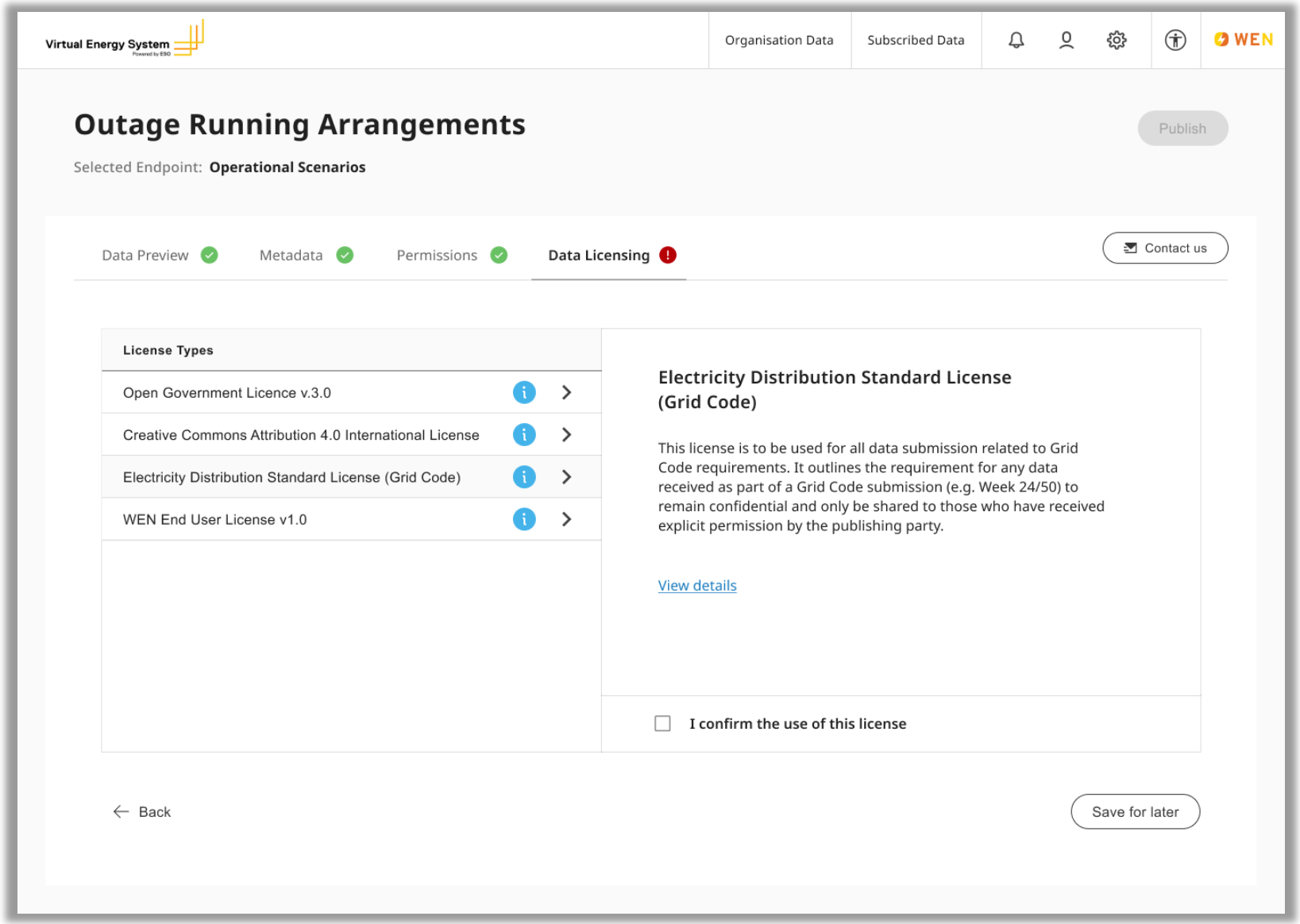
ARUP


Virtual Energy System
Organisation Data
Subscribed Data
WEN
Outage Running Arrangements
Publish
Selected Endpoint: Operational Scenarios
Data Preview
Metadata
Permissions
Data Licensing
Contact us
Organisation Types
Type to search or select from list...
Specific Organisations
Start searching...
Back
Save & Continue

ARUP


Virtual Energy System
Organisation Data
Subscribed Data
WEN
Outage Running Arrangements
Publish
Selected Endpoint: Operational Scenarios
Data Preview
Metadata
Permissions
Data Licensing
Contact us
Organisation Types
TNO
ESO
Specific Organisations
Type to search...
Ofgem
Energy Systems Catapult
Back
Save & Continue

ARUP


Virtual Energy System
Organisation Data
Subscribed Data
WEN
Outage Running Arrangements
Publish
Selected Endpoint: Operational Scenarios
Data Preview
Metadata
Permissions
Data Licensing
Contact us
License Types
Open Government Licence v.3.0
Creative Commons Attribution 4.0 International License
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WEN End User License v1.0
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Save for later

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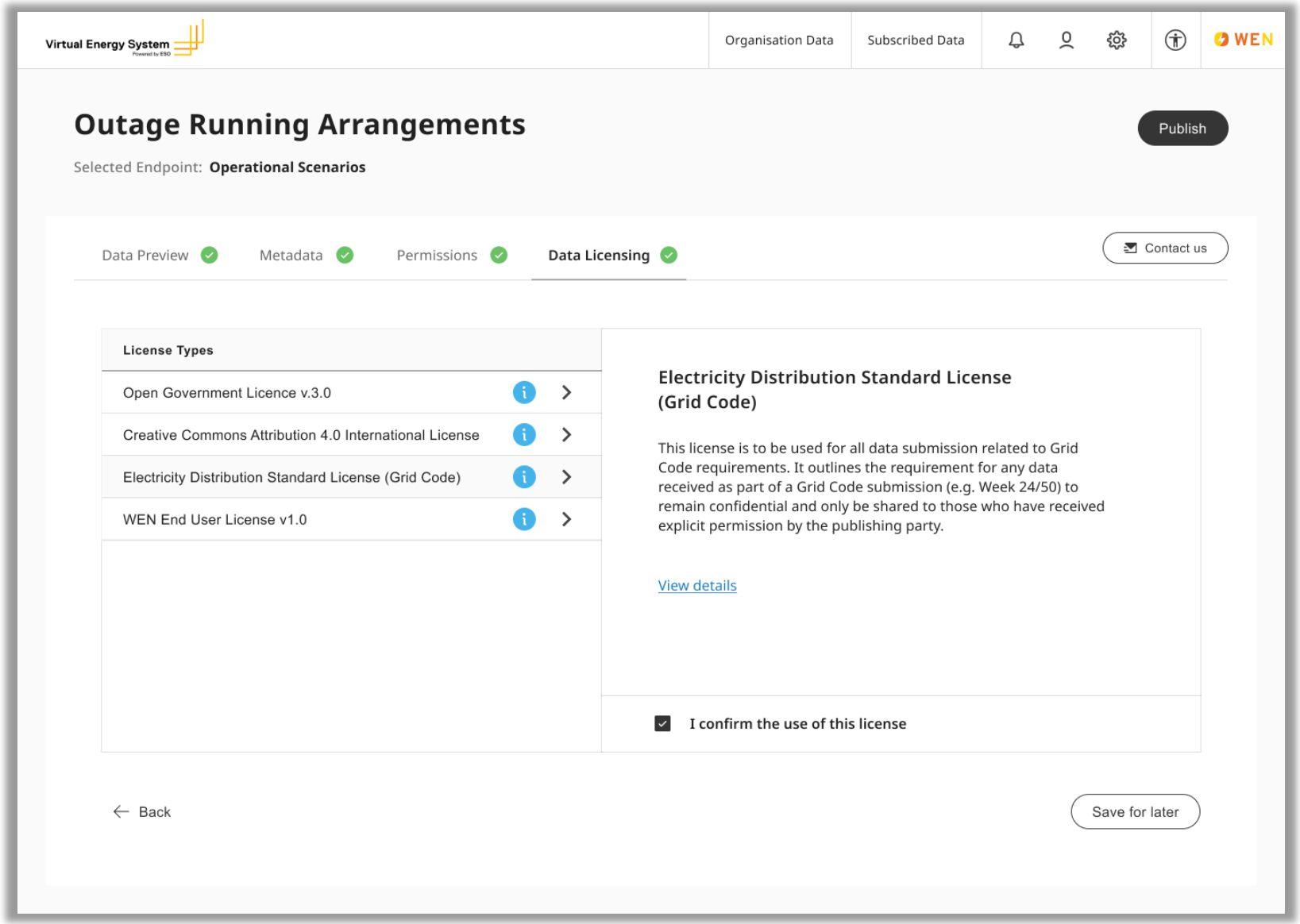
Virtual Energy System
Organisation Data
Subscribed Data
WEN
Outage Running Arrangements
Publish
Selected Endpoint: Operational Scenarios
Data Preview
Metadata
Permissions
Data Licensing
Contact us
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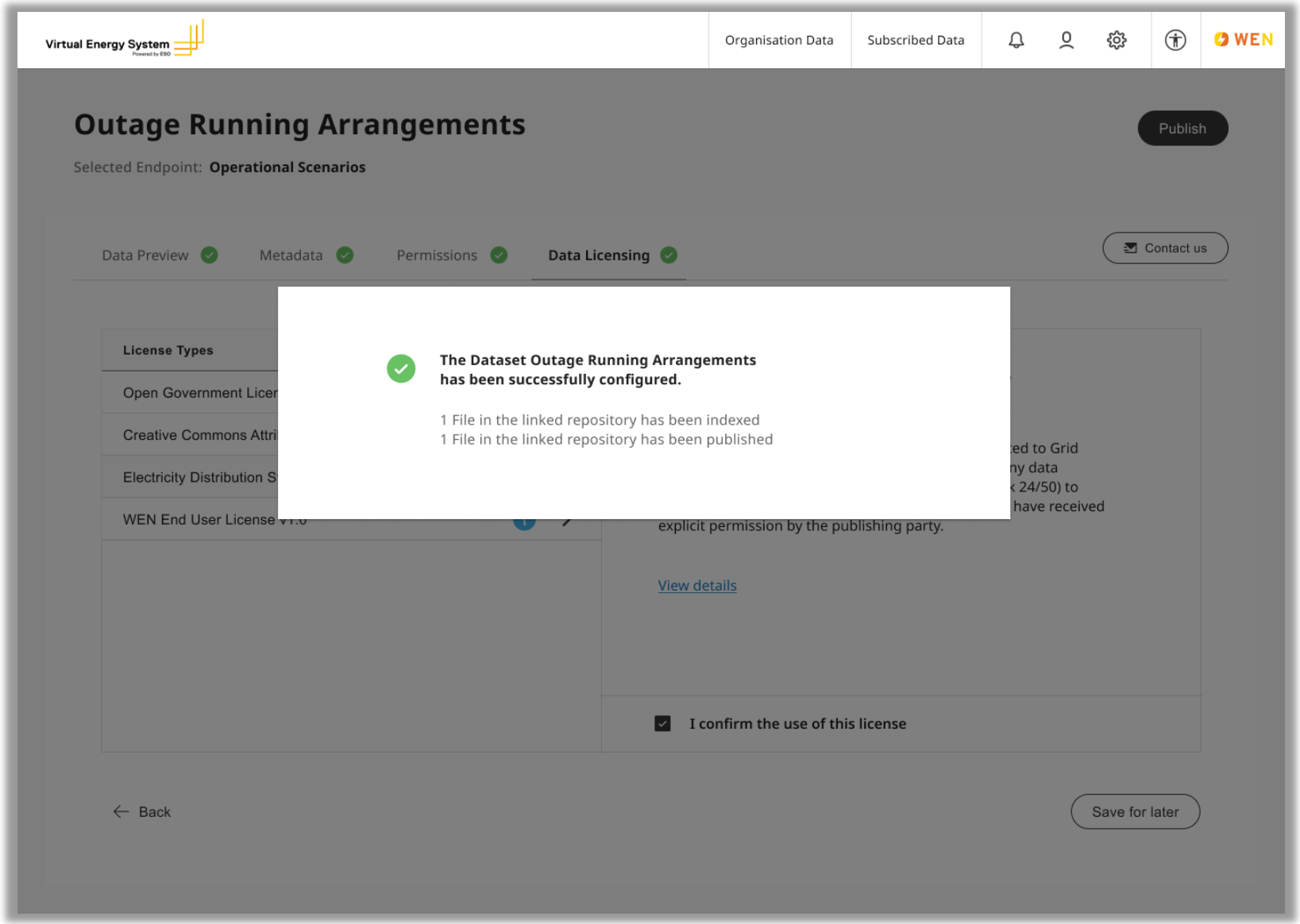
Virtual Energy System
Organisation Data
Subscribed Data
WEN
Outage Running Arrangements
Publish
Selected Endpoint: Operational Scenarios
Data Preview
Metadata
Permissions
Data Licensing
Contact us
License Types
Open Government Licer
Creative Commons Attri
Electricity Distribution S
WEN End User License V1.0
The Dataset Outage Running Arrangements has been successfully configured.
1 File in the linked repository has been indexed
1 File in the linked repository has been published
ed to Grid
ny data
k 24/50) to
have received
explicit permission by the publishing party.
View details
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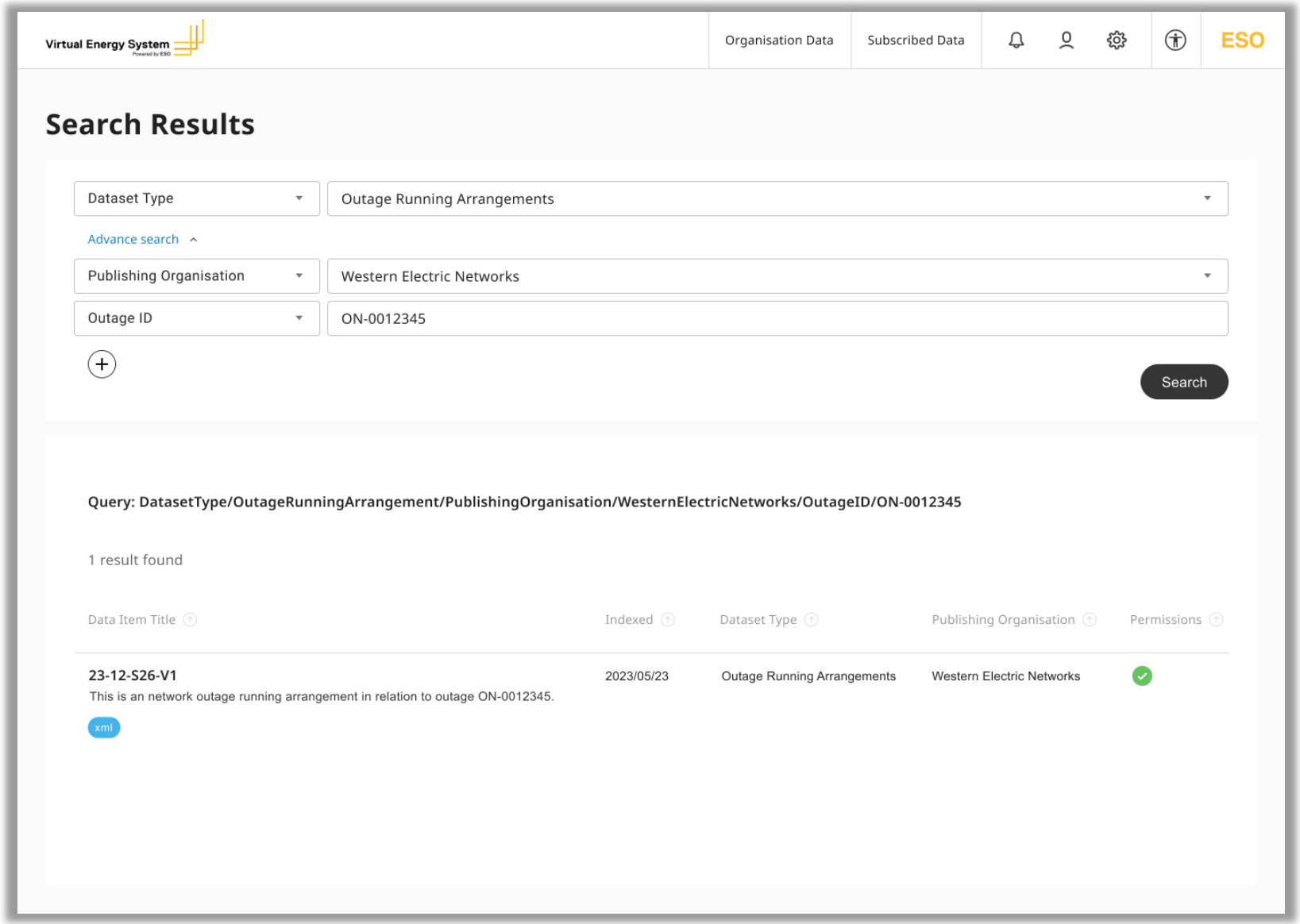
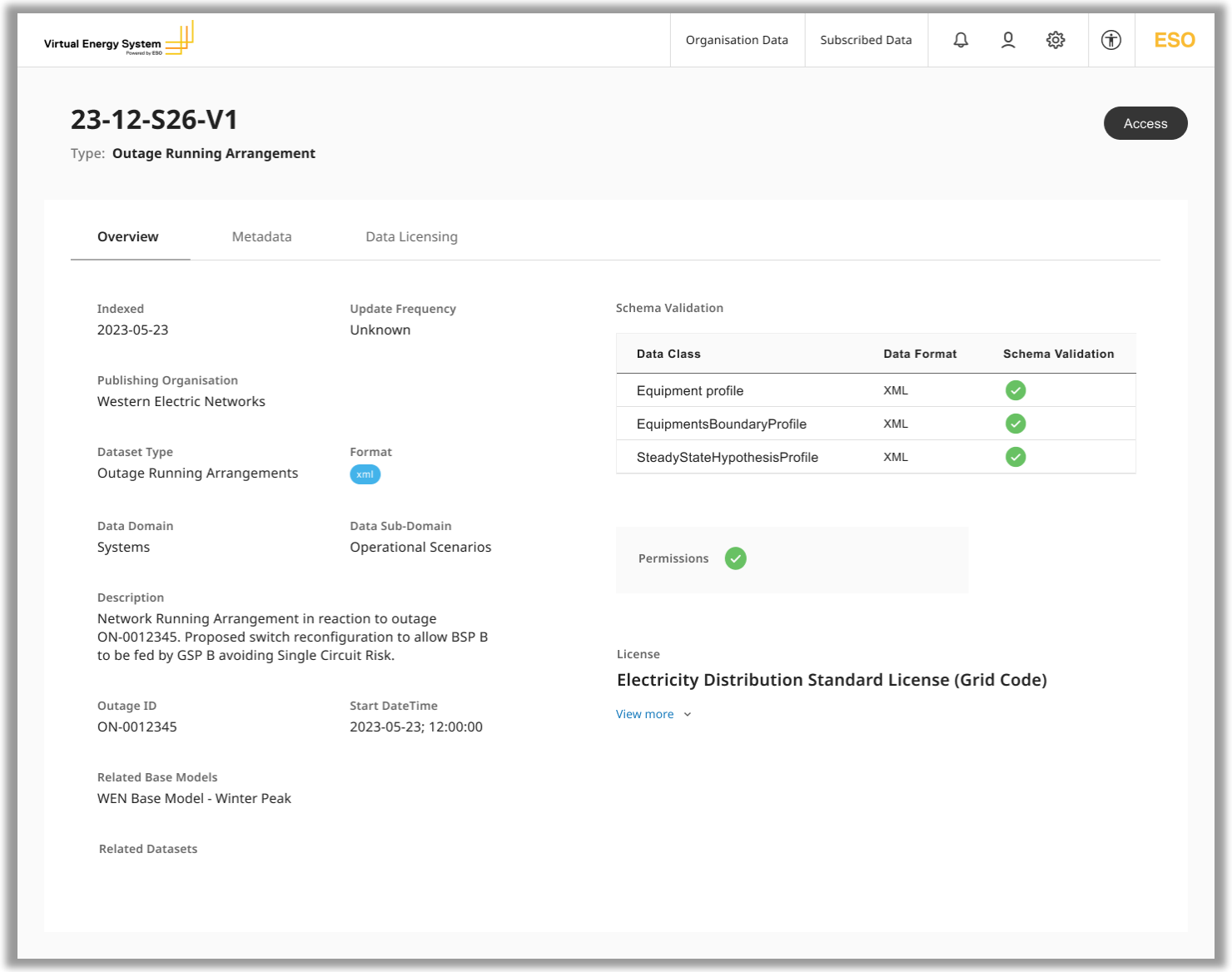
Back
Save for later

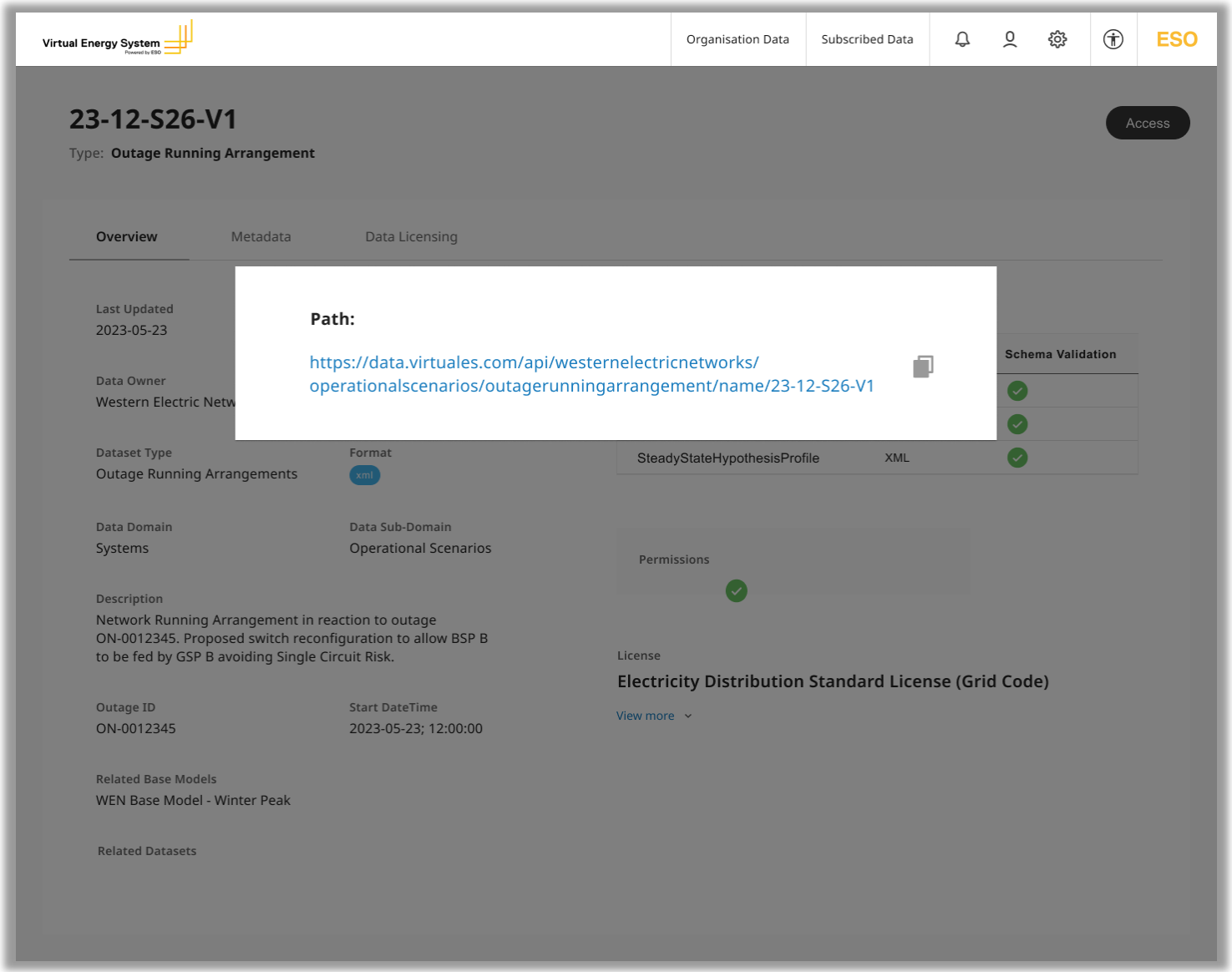
ARUP


Virtual Energy System
Organisation Data
Subscribed Data
ESO
Search Results
Dataset Type
Outage Running Arrangements
Advance search
Publishing Organisation
Western Electric Networks
Outage ID
ON-0012345
Search
Query: DatasetType/OutageRunningArrangement/PublishingOrganisation/WesternElectricNetworks/OutageID/ON-0012345
1 result found
Data Item Title
Indexed
Dataset Type
Publishing Organisation
Permissions
23-12-S26-V1
This is an network outage running arrangement in relation to outage ON-0012345.
xml
2023/05/23
Outage Running Arrangements
Western Electric Networks

ARUP


Virtual Energy System
Organisation Data
Subscribed Data
ESO
23-12-S26-V1
Type: Outage Running Arrangement
Access
Overview
Metadata
Data Licensing
Indexed
2023-05-23
Update Frequency
Unknown
Publishing Organisation
Western Electric Networks
Dataset Type
Outage Running Arrangements
Format
xml
Data Domain
Systems
Data Sub-Domain
Operational Scenarios
Description
Network Running Arrangement in reaction to outage ON-0012345. Proposed switch reconfiguration to allow BSP B to be fed by GSP B avoiding Single Circuit Risk.
Outage ID
ON-0012345
Start DateTime
2023-05-23; 12:00:00
Related Base Models
WEN Base Model - Winter Peak
Related Datasets
Schema Validation
Data Class
Data Format
Schema Validation
Equipment profile
XML
EquipmentsBoundaryProfile
XML
SteadyStateHypothesisProfile
XML
Permissions
License
Electricity Distribution Standard License (Grid Code)
View more

ARUP


Virtual Energy System
Organisation Data
Subscribed Data
ESO
23-12-S26-V1
Type: Outage Running Arrangement
Access
Overview
Metadata
Data Licensing
Path:
https://data.virtuales.com/api/westernelectricnetworks/operationalscenarios/outagerunningarrangement/name/23-12-S26-V1
Last Updated
2023-05-23
Data Owner
Western Electric Netw
Dataset Type
Outage Running Arrangements
Format
xml
Data Domain
Systems
Data Sub-Domain
Operational Scenarios
Description
Network Running Arrangement in reaction to outage ON-0012345. Proposed switch reconfiguration to allow BSP B to be fed by GSP B avoiding Single Circuit Risk.
Outage ID
ON-0012345
Start DateTime
2023-05-23; 12:00:00
Related Base Models
WEN Base Model - Winter Peak
Related Datasets
Schema Validation
SteadyStateHypothesisProfile
XML
Permissions
License
Electricity Distribution Standard License (Grid Code)
View more

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Virtual Energy System

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