ESO Architecture – Data & Analytics Platform

Data Engagement & Unified Models - Introduction

May 2021

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Contributors (these slides) – Hall of Fame

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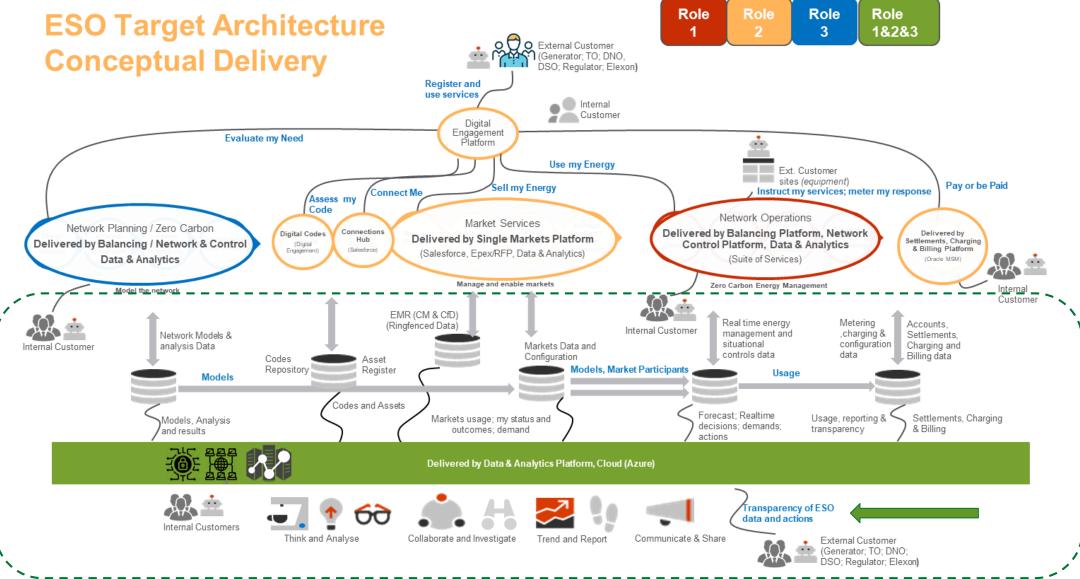
Gary White – ESO Enterprise Architecture
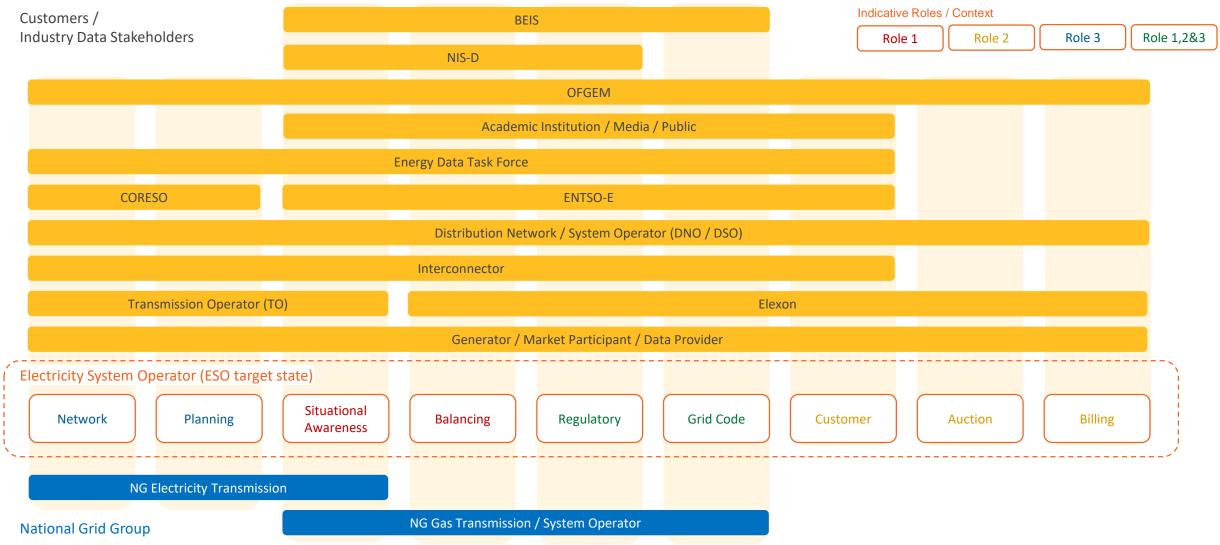
Richard Salmon – ESO Enterprise/Domain Architecture

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Context – the "What"

ESO Target Architecture Conceptual Delivery

Role 1 | Role 2 | Role 3 | Role 1&2&3

External Customer (Generator; TO; DNO, DSO; Regulator; Elexon)

Register and use services

Digital Engagement Platform

Internal Customer

Evaluate my Need

Use my Energy

Ext. Customer sites (equipment)

Instruct my services; meter my response

Pay or be Paid

Assess my Code

Connect Me

Sell my Energy

Network Planning / Zero Carbon
Delivered by Balancing / Network & Control Data & Analytics

Digital Codes (Digital Engagement)

Connections Hub (Salesforce)

Market Services
Delivered by Single Markets Platform
(Salesforce, Epex/RFP, Data & Analytics)

Network Operations
Delivered by Balancing Platform, Network Control Platform, Data & Analytics
(Suite of Services)

Delivered by Settlements, Charging & Billing Platform
(Oracle MSM)

Internal Customer

Model the network

Manage and enable markets

Zero Carbon Energy Management

Internal Customer

Network Models & analysis Data

EMR (CM & CfD) (Ringfenced Data)

Markets Data and Configuration

Internal Customer

Real time energy management and situational controls data

Metering, charging & configuration data

Accounts, Settlements, Charging and Billing data

Codes Repository

Asset Register

Models

Models, Market Participants

Usage

Models, Analysis and results

Codes and Assets

Markets usage; my status and outcomes; demand

Forecast; Realtime decisions; demands; actions

Usage, reporting & transparency

Settlements, Charging & Billing

Delivered by Data & Analytics Platform, Cloud (Azure)

Internal Customers

Think and Analyse

Collaborate and Investigate

Trend and Report

Communicate & Share

Transparency of ESO data and actions

External Customer (Generator; TO; DNO; DSO; Regulator; Elexon)

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ESO T2 Data Landscape – Presumed Open context – the "Why"

Customers / Industry Data Stakeholders

Indicative Roles / Context

| Role 1 | Role 2 | Role 3 | Role 1,2&3 |

BEIS

NIS-D

OFGEM

Academic Institution / Media / Public

Energy Data Task Force

CORESO | ENTSO-E

Distribution Network / System Operator (DNO / DSO)

Interconnector

Transmission Operator (TO) | Elexon

Generator / Market Participant / Data Provider

Electricity System Operator (ESO target state)

| Network | Planning | Situational Awareness | Balancing | Regulatory | Grid Code | Customer | Auction | Billing |

NG Electricity Transmission

National Grid Group

NG Gas Transmission / System Operator

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The journey … the "Why"

DAP Solution design and development over time

'Systems' thinking

100% Legacy	Transition	100% End State
Old ways of working		New ways of working

- Iterate …..
- Enhanced Products
- Data Lifecycle in place
- Core Products – integrated with DAP
- Foundation Data Model – Presumed Open
- DAP Core Services

Today

Tomorrow

'Data' thinking

Application Silos

Operating the business today …

whilst designing DAP for tomorrow.

- System-based discussions
- Inconsistent data and language
- Point to point integration
- Silo data and process
- No single authoritative source
- Unresponsive / not scalable

- Data domain- and requirements-based discussions
- Common data and business vocabulary
- Collaboration and reuse
- Dynamic and responsive

Product

Product

Product

DAP

Role 1 Role 2 Role 3

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Principles – the "How"

ESO Target Architecture Data and API Principles

When I specify new architecture scope / product features, I include the delivery of APIs for all new data I am creating

My product is only ready for UAT/Release when I have seen DAP update/publish the Data/API catalogue including my new data

Solution Functionality

Product Architect

Open APIs

Product Data Set

My product functionality

Product Owner

Gaps in other Products

Data I Need
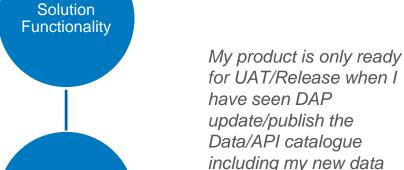
If my product scope highlights data gaps in other products, I expect to work with those product owners to resolve

My first route to data I need is APIs that have already been published via the Data/API catalogue. If data I need is not published yet, I go to the relevant product owner to request publication.

"Example backlog reminder"

Register API's delivered from Sprint 13 into API catalogue
Register new data items from Sprint 13 into Data catalogue
Update processes and share with linked product owners

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What does DAP engagement look like ? – the "How"

Takeaway – DAP is more than just a technology platform – move away from applications-centric and towards data conversations

Example DAP % assistance levels shown for as-is to interim to target architecture - TBD

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DAP Engagement – the "How"
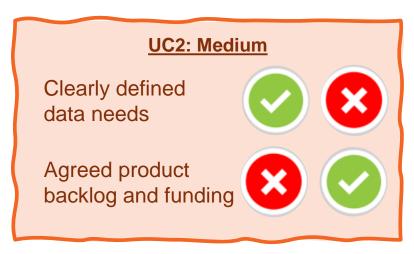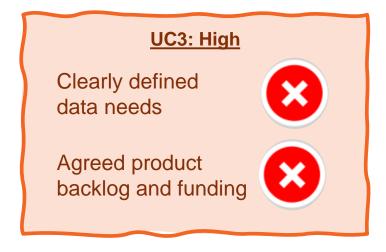
DAP engagements / requirements are expected to fall into three broad categories:

Based on the anticipated levels of support required …
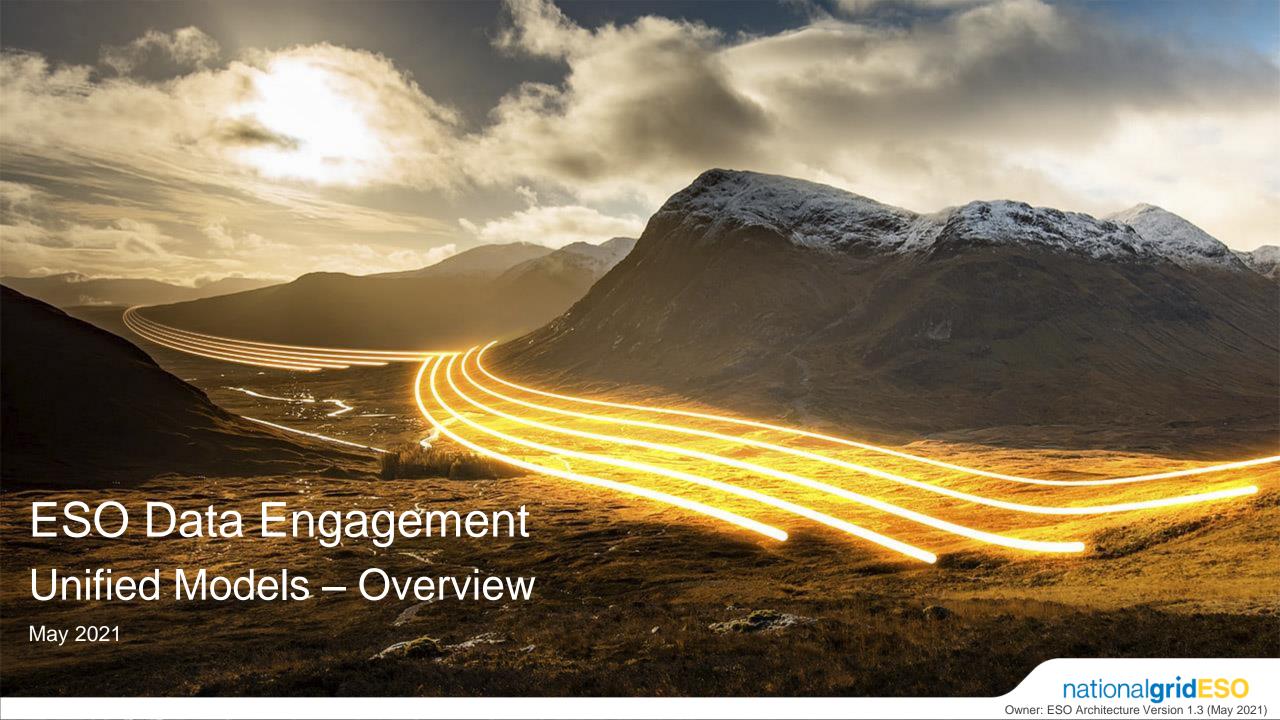
UC1: Low	UC2: Medium	UC3: High
Clearly defined data needs ✅	Clearly defined data needs ✅ ❌	Clearly defined data needs ❌
Agreed product backlog and funding ✅	Agreed product backlog and funding ❌ ✅	Agreed product backlog and funding ❌
Prioritisation	*Prioritisation & Advisory*	*Advisory*

Takeaway – how to reflect in Mandate / INVP / Value Stream / Backlog ?

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ESO Data Engagement
Unified Models – Overview

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- variability in data structure between systems/datastores
- inconsistencies in data values
- multiple instances of same reference data
- variability in resolution/granularity

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Unified Network Model Methodology Applied to ESO
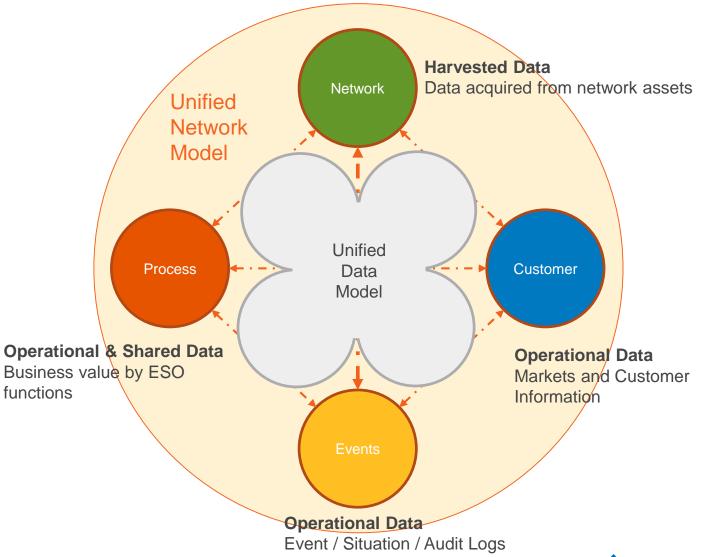
The diagram illustrates the relationships between a Unified Network Model (UNM) and Unified Data Model (UDM).

- **Unified Network Model** – This model focusses on four pillars where data is typically originated
- **Unified Data Model** – This model focusses on relationships between the four pillars

ESO Relationship with Assets
From the network view ESO gathers raw data from non-ESO operated assets, performs process functions and instructs non-ESO operated assets to balance the Electricity network. Increasingly the asset mix is changing with new data sets and renewable energy modelling challenges – driving the need to represent data in a consistent way.

Unified Network Model

Harvested Data
Data acquired from network assets

Network

Unified Data Model

Process

Customer

Events

Operational & Shared Data
Business value by ESO functions

Operational Data
Markets and Customer Information

Operational Data
Event / Situation / Audit Logs

This model is used across multiple industries, and in effect is derivation from People, Process, Technology. Public Services use a similar model called "POLE"

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Consistent Unified Network & Data Model – creates the ESO Information Model

ESO Pillars	L1	Network	Events	Customer	Process	
ESO Data Assets – BMS/DML	L2	e.g. Asset, Location, Data Acquisition & Control, Network Equipment, Network Model, Outage / Contingency, Inventory	Alarm, Situational Awareness Event, Balancing Action	Market, Customer, Organisation, Vendor, Data Provider	Energy Balancing, Energy Scenario Model, Energy Production, Legal & Regulation, Charging and Billing, Forecast	+ Core Processes
ESO Data Model – Presumed Open Data	Unified Data Model					

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ESO Data Lifecycle principles

The framework is intended to define data retention policies and lifecycle of data movement across the architecture.

The intention is that long term retention and consolidated views will be in the Zone 2 landing zone.

It is anticipated that Products will have storage needs in Zone 1 and 2

Data Partitions		Zone 1 (CNI)			Zone 2 (Enterprise)		
Landing Zone	Data Tier	Future	Current	Contingency	Future	Current	Archive
Primary Storage	Partitions / Spaces	-T	30 Days (Ops Window)	30 Days - T+	-T	365 Days (Financial Year)	365 Days Aged
		When data is equal to the current zone 1 time window those data items are moved into the Current window to enable a rolling window and manage retention	Rolling 30 day window of Critical Operational Data, data is synchonrised with the current data in zone 2. Data Aged 30 days is removed to manage retention	Data in excess of 30 days is retained to manage Blackstart retention requirements. Data that has changed and is aged 30 days is synchronised with current in zone 2	When data is equal to the current zone 2 time window those data items are moved into the Current window to enable a rolling window and manage retention	Rolling 365 day window, typically covering the current financial year, data aged 365 days is moved in the zone 2 long term retention archive	All Data aged 365 days is retained in the data lake long term archive data storage pricing tier
Shared Operational Data	Regulatory						
	Published						
	Cache						
Historical Data	Operational History						
	Cache						
Harvested Data	Information (Structured)						
	DEEP Data (Unstructered)						
	Cache						

Above is example / draft – Work in progress

Takeaway – Once we have a Data-driven approach, we can simplify our data lifecycle

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ESO Architecture - DAP
Norma's team – Takeaways

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Key takeaways

- Consider how to engage with DAP on scope, maturity, funding and resourcing
  - DAP cannot resource 100% of your data scope
  - Programme / Product teams have to carve out funds to supplement for ALL ROLES

- Product teams have an obligation to define, implement and then share their Data/API deliverables into DAP
  - Does your INVP consider the maturity of data backlog/funding to engage correctly with DAP ?
  - Add consistent items into your backlogs – Register Processes, Update Data catalogue, Update API catalogue etc
  - Don't accept "someone else will do it" from your teams
  - Audit your backlogs and review with DAP core team

- Ask yourselves and your teams –
  - Have I negotiated a resource split between my Products funding pot and DAP core team ?
  - What am I doing to promote data visibility, re-use and sharing ?
  - Am I following the principles or am I in a silo ?
  - What evidence can I show that I am owning my data requirements and sharing into DAP ?
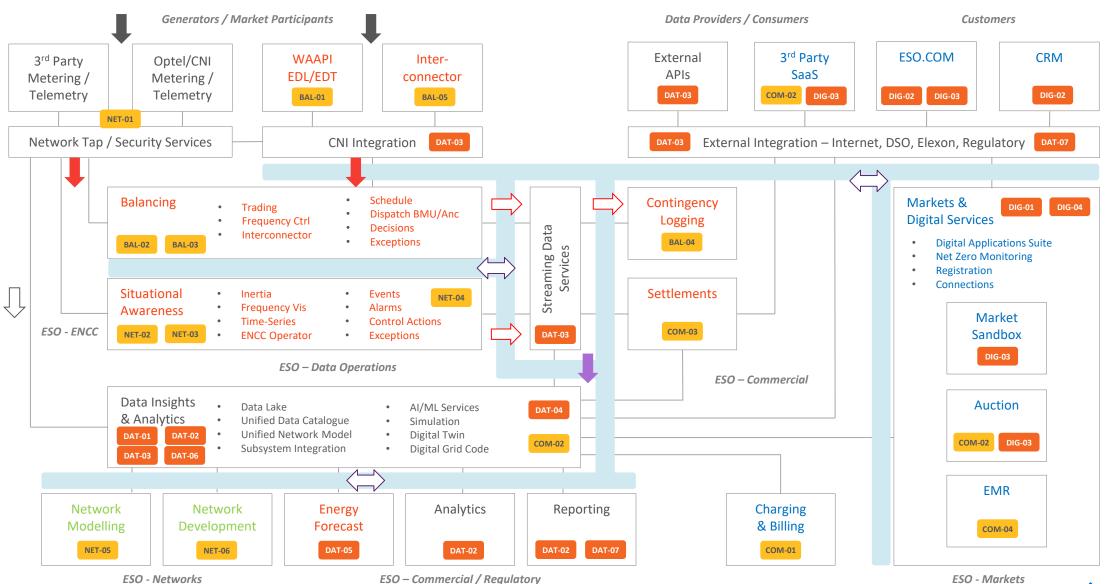 - How is my backlog delivering against Presumed Open Data regulatory commitments ?

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ESO Architecture - DAP
Architecture Reference

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ESO target architecture – logical system view

T2 Platform architecture – Subsystem data landscape

Digital Engagement

Digital Services — DIG-01
- Digital Applications CMDB

Customer — DIG-02
- Connection
- Registration
- Market Participant CMDB
- Auction
- CRM ESO Org

Market Facilitation — DIG-03
- ESO.com CMDB
- Tender / Auction
- Market Sandbox

Situational Awareness — DIG-04
- Net Zero dashboard

Commercial & Markets

Charging and Billing — COM-01
- Charging and Billing

Market Operations — COM-02
- Grid Code Repository
- Ancillary Services CRM/Workflow

Settlements — COM-03
- Settlement

Electricity Market Reform — COM-04
- EMR Capacity Market
- EMR Reporting

Data & Analytics

Knowledge Management — DAT-01
- Metadata Repository
- Records Library
- BMS/DML

Modelling — DAT-06
- Unified Network Model
- Energy Model
- EMR Model

Analytics and Insight — DAT-02
- Time Series / Metering
- Operational Data Store x multiple
- Audit / System of Record
- 3rd Party / Proprietary
- Data Lake

Consistent Data Services — DAT-03
- Data Exchange Catalogue
- Integration Workflow
- Business Rules Engine
- Data Transformation CMDB

Digital Twin — DAT-04
- Digital Shadow/Copy
- Simulation

Regulatory Reporting — DAT-07
- Reporting Catalogue

Forecasting — DAT-05
- Energy Forecast
- Machine Learning Model
- Communication Content Management

Networks

Network Development — NET-05
- Network Plan
- Planning & outage submission

Network Modelling — NET-06
- Visualisation / Configuration

Network Operations & Control

Control Communication — NET-01
- Communication CMDB

Control Room Planning — NET-02
- CRM Workforce Management

Control Support — NET-03
- Mimic
- ENCC Operator CMDB

Situational Awareness — NET-04
- Alarm / Notification
- Operational Metering
- Frequency Visibility
- Restoration CMDB
- Situation Log

Balancing

Balancing Communication — BAL-01
- Communication CMDB

Energy Balancing — BAL-03
- Scheduling
- Dispatch
- Frequency
- Balancing Action Log

Energy Trading — BAL-02
- Trade
- Auction

Contingency Energy Balancing — BAL-04
- Contingency system of record

Interconnector — BAL-05
- Interconnector Package

Legend
- ESO Data Store (BMS Data Compliance)
- Enabling/Supplementary Data Store
- Primary ESO Data Store (BMS + Time-Critical ENCC)
- CNI Ops Configuration
- Data Lake partition

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Data & Analytics

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T1 Applications + New Capabilities	Rationalise to T2 Component	T2 Subsystem	T2 Target Platform
NEW - Advanced Search	**NEW - Advanced Search**	**Knowledge Management**	
NEW – Records Management	**NEW – Records Management**		
Crystal Reports Tableau	**Internal Reporting**	**Analytics and Insight**	
NED	**NEW - Data Lake**		
NEW – Time Series Insights	**NEW – Time Series Insights**		
NEW - Predictive Analytics	**NEW - Predictive Analytics**		
NEW - Predictive Analytics CNI	**NEW - Predictive Analytics CNI**		
NEW - Commercial Simulation	**NEW - Simulation**	**Digital Twin**	
NEW - Market Simulation			
NEW - Training Simulator	**NEW - Training Simulator**		
Email Incentives	**Communication**	**Forecasting**	
EFS (becoming PEF)	**Energy Forecasting**		Data & Analytics
NEW – Innovation Labs	**NEW - Innovation**		
CNI-CDSA	**CNI Integration**	**Consistent Data Services**	
FAME	**Interpolate-Extrapolate**		
NEW - Workflow Automation	**NEW - Workflow Automation**		
CDSA MPSI Talend	**Non-CNI Integration**		
Generator Uncertainty Model OFSA OLTA OSA Plexos	**Power Systems Modelling**	**Modelling**	
BID3	**Economic Modelling**		
EMR Modelling	**EMR Modelling**		
CIMDESK	**NEW – Unified Network Model**		
BMRS Elexon Modis / ETR Trading Reporting and Notification System (TRNS)	**External Reporting**	**Regulatory Reporting**	
LIMS	**Information Provision**		

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