TDWG Presentation

B1 – Functional Assessment

December 14, 2023

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Agenda

1. B1 Functional Assessment - Deliverable Overview
2. B1 Deliverable Principles
3. Deliverable 1 - Architecture Scope
4. Proposed DSO Architecture
5. Architecture Definition

B1 Functional Assessment - Deliverable overview

The B1 deliverable focuses on the identification of operational and functional requirements, internal resourcing and capability development, and the associated costs that must be taken on by LDCs as they transition into DSOs

B1 Deliverables Principles

To ensure consistency and objectivity across all the B1 work packages/deliverables, the following core principles will be adhered to:

1. DSO functionality will be treated independently from existing LDC functions to avoid conflating DSO-specific functions with core utility modernization activities.

2. All deliverables will be agnostic of the DSO model (Total or Dual); if a distinction is made, it will be highlighted clearly in the deliverables.

3. Functional assessment will be focused on a framework that delivers the maximum value and considers the impacts on LDCs, rate-payers, the IESO and all participating DER(A)s.

4. LDCs are responsible for the safe and reliable operation of the electricity grid.

5. The deliverables will take a holistic view, and will not be based on the needs of a specific entity or existing system. As such, all deliverables will be generic with a view to define functions required to stand up a fully functioning DSO.

Deliverable 1 – Architecture Scope

In Scope

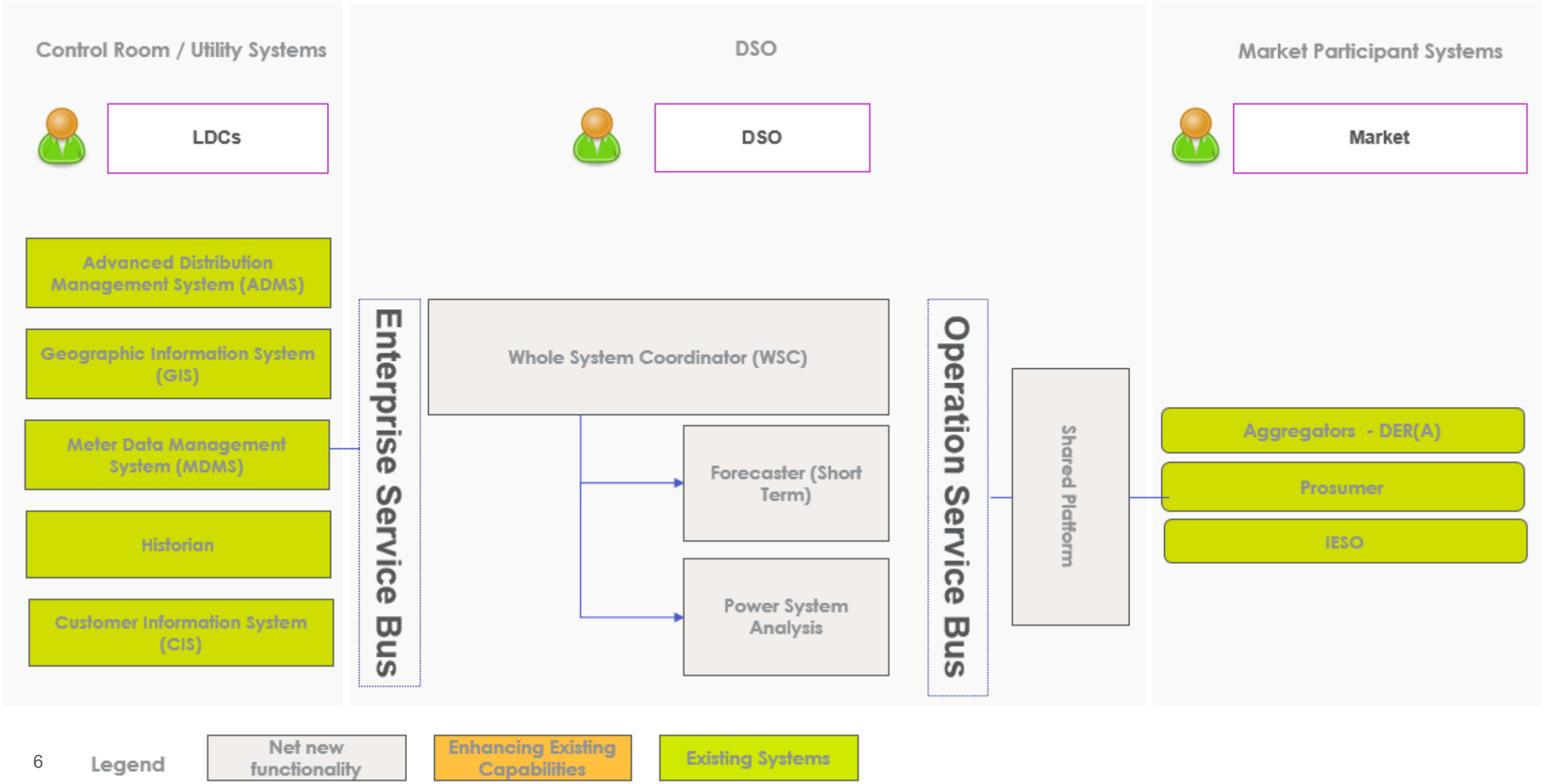
This deliverable provides a high-level overview of the key functions and enhancements required to enable to enable a DSO, as well as the connection between these functions/enhancements and existing LDC and external systems.

Out of Scope

The nature of the interaction between these system, the type of integration, the data exchanges, etc. is out of scope for this deliverable. These items will be captured in future deliverables.

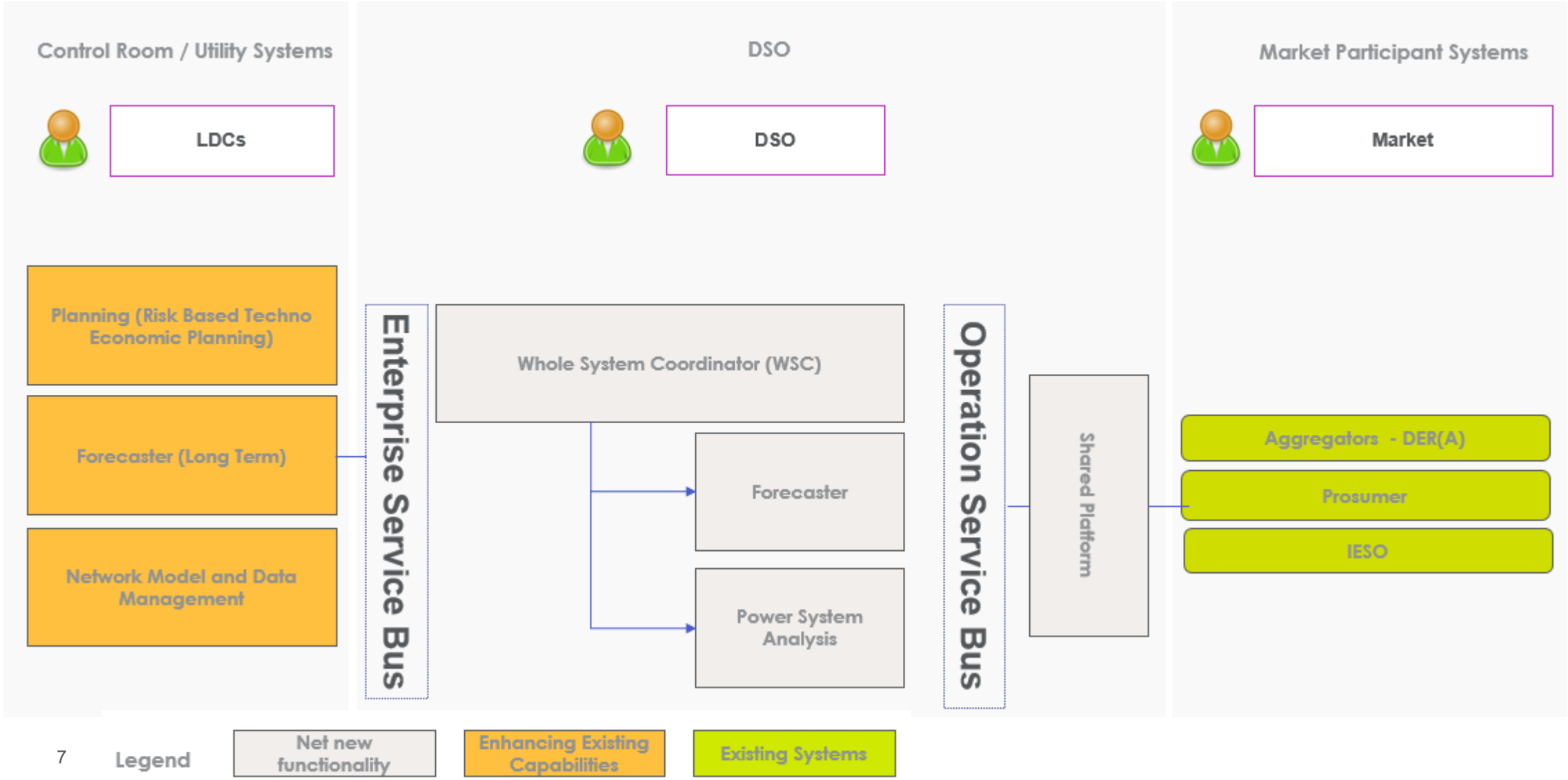
Proposed DSO Architecture – Operational Elements

Elements required for day-to-day DSO operation

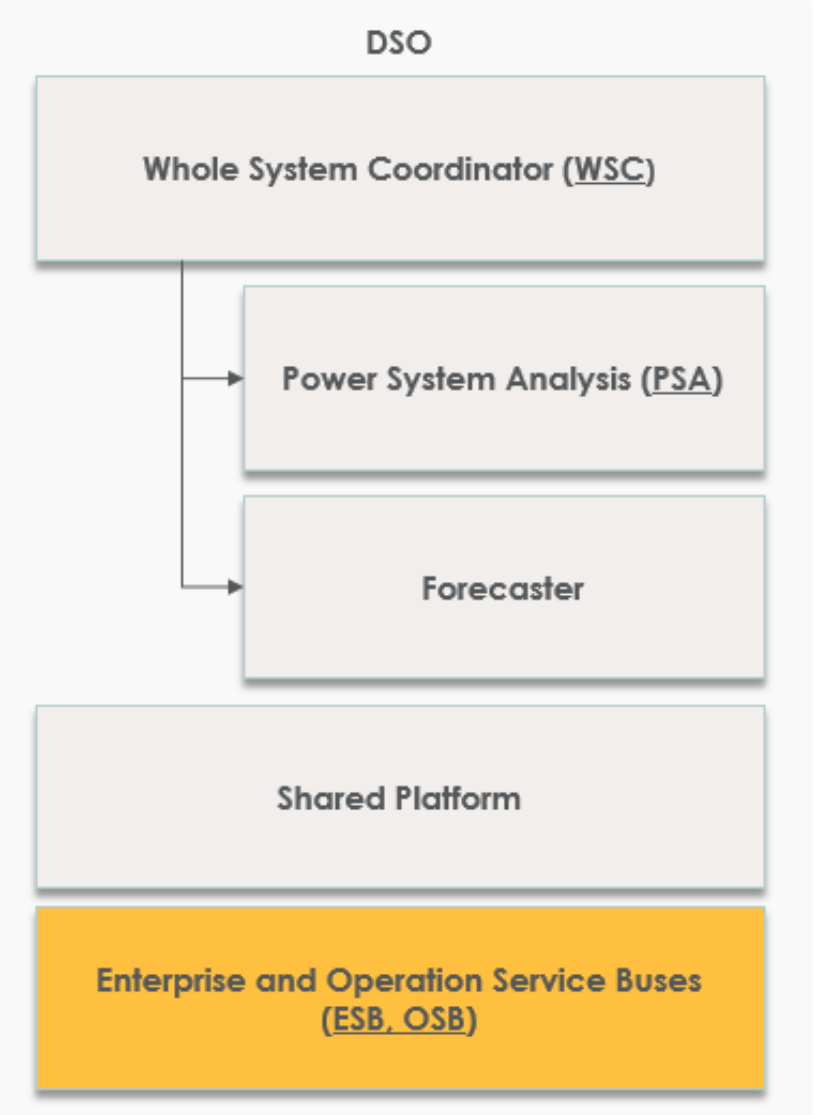


Proposed DSO Architecture – Planning Elements

Elements required for longer-term decision making and coordination



Architecture Definitions (1/3)



Whole System coordinator (WSC) is the "brain" of the DSO's operation (1)

- Responsible for conducting the constant power flow analyses of the network's ever-changing state
- Determines grid needs in terms of physics and electromagnetics, and computes the DER(A) quantities that could address them (e.g. DER-supplied energy additions or reductions, or in future use cases, reactive power or frequency support)

Power System Analysis (PSA) is the DSO's analytical engine

- Determines system conditions/needs and evaluates responses based on the ability to at minimum run a 3 phased unbalanced security constrained power flow or optimal power flow (snapshot and time series) with the inputs being network model, load and generation forecast, and asset demographics.
- The objective functions would be technical (e.g. voltage conservation, loss minimization, cost minimization).
- The PSA must conduct this analysis in relevant market zones (includes all the feeders in that zone at all voltage levels) within a 5-10 minute window.

Forecaster is an engine that can generate a nodal and system wide load and generation forecast at different time granularity levels as needed.

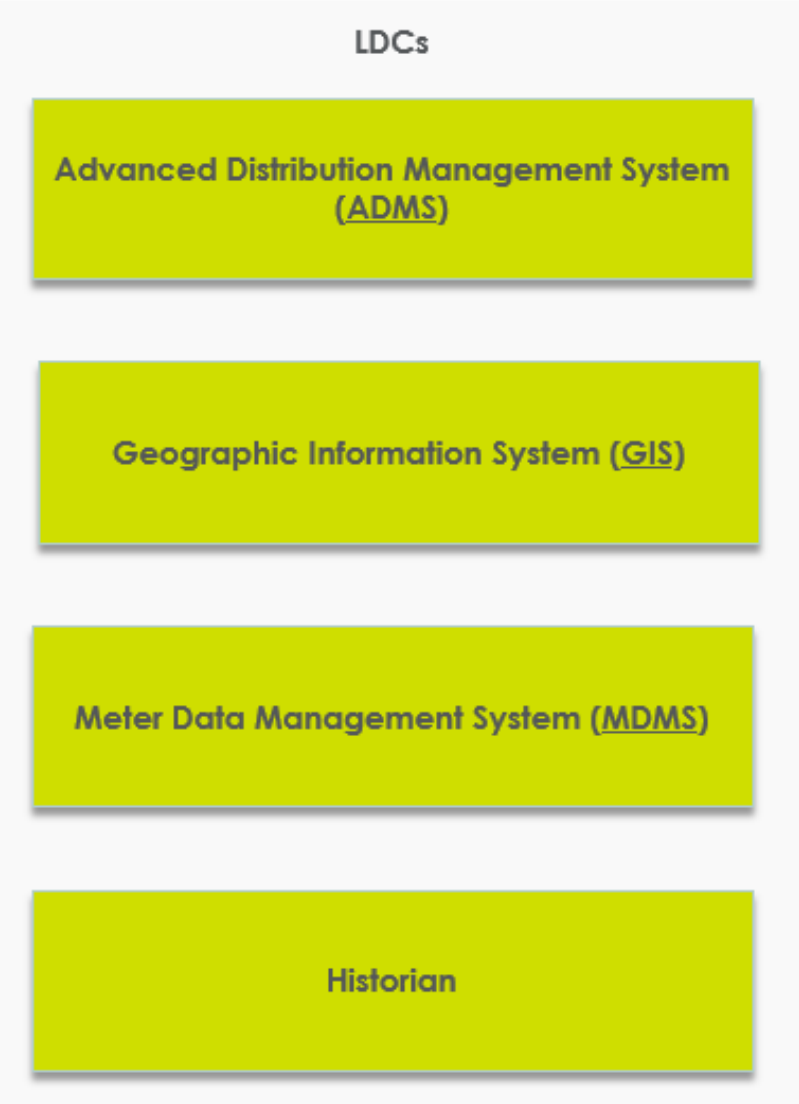
Shared Platform is an exchange platform that helps facilitates transactions, enables information sharing, and supports an ecosystem of market services. It is external to utility's control room infrastructure. (2)

- Communicates grid needs to the market where DER(A)s can make offers
- Enables market-clearing functions, including registering participating DER(A)s, tracking contractual obligations, bids/offers,
- Shares system and dispatch information with market participants and the IESO, enabling each party to make informed decisions

Enterprise and Operation Service Buses – Enterprise Service Bus is an integrated platform that provides fundamental interaction and communication services for complex software applications via an event-driven and standards-based messaging engine, or bus, built with middleware infrastructure product technologies. This is the ideal integration approach, however, LDCs could undertake other approaches that provide system separation and integration.

1. Whole System Coordinator – UK, Scottish and Southern Energy Network's TRANSITION Project
2. Shared Platform – TDWG B3 Deliverable

Architecture Definitions (2/3)



Advanced Distribution Management System (ADMS)

- Combines advanced distribution management system (DMS) analysis to optimize network operations, a field-proven SCADA system to address modern cybersecurity requirements, and an embedded outage management system (OMS) for improved resilience and reliability.

Geographic Information System (GIS)

- Provides a map-centric, intuitive way to model, design, maintain, and manage facility and land-based information. This enables collaboration, network management and analytics to improve performance for utilities.

Meter Data Management System (MDMS)

- Responsible for cleansing, calculating, providing data persistency, and disseminating consumption and event data obtained from meters installed on delivery points.
- The key data being tracked is metered commodity consumption and meter-related events, regardless of the type of commodity metered, type of meter, communication technology or collection device.

Historian

- is an integrated portfolio of software to collect, store, view, analyze, and share operational data with users within and beyond the enterprise.

Architecture Definitions (3/3)

Customer Information System (CIS)

- A CIS application serves as the backbone for the LDC's customer data management with a focus on handling customer data, billing, and consumption information

Planning (Risk Based Techno Economic Planning) (3)

- Planning toolset(s) that will allow planners to pivot away from worst case scenario assessments to an approach that captures the economic and technical details of operational realities within planning
- Planning toolset(s) that would allow planners to quantify and evaluate potential investment scenarios (network reconfiguration, flexibility procurement, expansion strategies, and non-wires alternatives) based on asset benefits by type, capacity, location, and time. This planning tool(s) will be able to determine the different cost components of each potential solution, assess their technical viability at addressing system needs, and compare the solutions to reveal the lowest cost and/or highest customer value options.

Forecaster (Long Term)

- Forecaster is an engine that can generate a nodal and system wide load and generation forecast at different time granularity levels (time series planning granularity)

Network Model and Data Management

- Network model and data management capability focused on continuously maintaining the accuracy and integrity of network models and all associated data that will support the function of all system

3. Planning (Risk Based Techno Economic Planning: UK, Scottish and Southern Energy Network's MERLIN project

Thank You

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