TDWG Meeting #16

B1 Sub-group – Work Package #2 & #3 Update

November 25th, 2024

alectra
Discover the possibilities

TORONTO HYDRO

Agenda

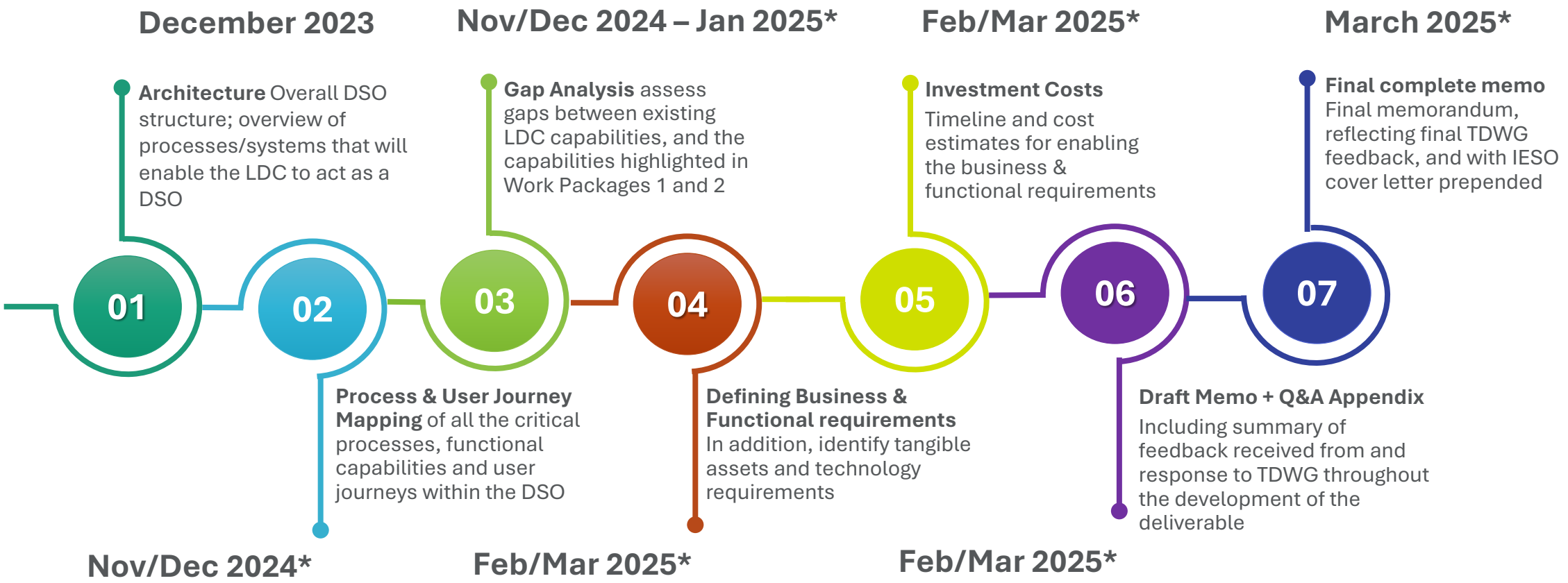
1. B1 Sub-group Deliverables Overview
2. Work Package #2 – Process & User Journey Mapping Summary
3. Work Package #3 – Gap Analysis
4. Next Steps
5. Q&A

01

B1 Sub-group Deliverables Overview

Deliverable B1 Functional Assessment – Overview

The B1 Functional Assessment Deliverables focus 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.



*** Tentative – Dates to be Finalized**

Deliverable B1 Functional Assessment – Work Packages

Work Package #	Name	Description	Output
1	DSO Architecture	Define the overall DSO structure and an overview of the processes/systems that will enable the LDC to act as a DSO	A deck outlining overarching DSO structure (flowchart/map) and required systems for each model (high-level)
2	**Process & User Journey Mapping**	**Mapping of all the critical processes, functional roles and user journeys within the DSO**	**A deck outlining the critical processes and user journeys for each model**
3	**Gap Analysis**	**Gap analysis that will assess the gap between the existing LDC capabilities and the capabilities highlighted in Work Packages 1 and 2**	**A document outlining the gap analysis for each model**
4	Defining Business & Functional Requirements	Defining the business and functional requirements. In addition, identify tangible assets and technology requirements	A spreadsheet outlining the key business and functional requirements for each model
5	Investment Costs	Timeline and cost estimates for enabling the business and functional requirements	A spreadsheet with a costing breakdown for each model

02

Work Package #2 – Process & User Journey Mapping Summary

Overview of DSO Models

DSO Model	Description*
Dual DSO (DP-DSO)	A DSO that facilitates direct participation by DER/As in the wholesale market as well as DER/A provision of distribution services. DER/As participate directly in the wholesale markets and the IESO schedules and dispatches DER/As to meet bulk system needs. The IESO models each DER/A that participates in the wholesale market as though it were connected at the appropriate T-D interface. The DP-DSO assesses the impacts of IESO dispatches of DER/As and applies operational limits on the DER/As if needed for distribution system reliability. The DP-DSO communicates such limits to the DER/As, and the DER/A is responsible for notifying the IESO of its reduced capability or unavailability. Simultaneously, the DSO can schedule and activate DER/As to meet distribution system needs based on their locations on the distribution system.
Total DSO (T-DSO)	A DSO that coordinates all wholesale market and distribution system services provided by DER/As, eliminating their direct participation in the wholesale market. The T-DSO serves as the sole wholesale market participant for its distribution system, and the IESO only needs to interact with a single entity for wholesale services provided by DER/As. The T-DSO submits bids/offers that represent the combined bids/offers of the participating DER/As under each T-D interface node (or multiple nodes, if permitted). The T-DSO receives wholesale market schedules and dispatches from the IESO and then administers its own instructions to DER/As, making any adjustments that may be appropriate based on changing distribution system conditions. Adjustments may include re-optimization of DER/As to prevent a shortfall in meeting the wholesale market dispatch. The T-DSO would be subject to the same market rules that apply to all wholesale market participants. DER/As also provide distribution services to the T-DSO, which schedules and activates DER/As to meet distribution system needs.
Market Facilitator (MF-DSO)	A DSO that facilitates the direct participation of DER/As in the wholesale market through two distinct features. First, the MF-DSO acts as an intermediary between the DER/As and IESO by gathering DER/A bids and offers and providing these to the IESO, and by relaying IESO schedules and dispatches to DER/As. In executing these actions, the MF-DSO assesses the reliability impacts of the bids and IESO dispatches on the distribution system and applies operational limits on the DER/A if needed. The MF-DSO does not otherwise adjust the DER/As' wholesale market bids/offers or schedules/dispatches. Second, the MF-DSO optimizes the distribution system to minimize the curtailment of the DER/As, with the aim of improving the DER/As' ability to participate in the wholesale market (in the context of the MF-DSO, the objective of the DSO's optimization activity is to minimize DER/A curtailment while maintaining distribution system reliability and security of supply). DER/As also provide distribution services to the MF-DSO, which schedules and activates DER/As to meet distribution system needs via a local market.

*From B4 Sub-group "Glossary of Working Terms and Definitions" - TDWG Meeting #14 (May 31st, 2024)

Overview of DSO Processes

Planning

LDC/DSO Planning for both Day-ahead and Real-time Markets

Market Setup and Program Design for both Day-ahead and Real-time Markets

Pre-Market

System Condition

Visibility of all connected assets

Identification of constraints resulting in needs due to updated system conditions or forecast

System Operations & Needs

Needs Communication

Translating system needs to requests

Mechanism where generation, demand or flexibility can state their capacity to respond

Needs Response & Reception

Response Evaluation

Evaluating responses from the participants and selection of best ones

Communication of accepted requests and field optimization

DER Operations

Measurements & Verifications

Field measurements, and verification of compliance with orders

Closing out financial transactions

Settlement

Description of DSO Processes

Process	Description
Planning	This is a pre-operational stage. LDC planning determines long term system needs and defines the types of services for procurement.
Pre-Market	This is a pre-operational stage. System operators upload network models and define boundaries. Market Participants create an account, receive login details, setup their profile, and register their DER asset(s) to participate in an applicable market(s).
System Condition	This is the first operational stage in the process. This stage requires that the LDC SCADA platform receives information about the current and future state of the system. This could include but isn't limited to, electrical measurements on lines and at substations (real power, reactive power, apparent power, current, etc..), existing generation forecasts and commitment from assets, forecasted load, state of charge of large scale batteries, an asset reliability metric, planned work (capital and maintenance) resulting in abnormal circuit configurations etc..
System Operation and Needs	The Whole Distribution System Coordinator (WDSC) ingests the system condition data and identify future system issues that need to be resolved (i.e. supply, demand imbalance, a thermal constraint of a line/cable, a risk of voltage deviating outside of the operational limits).
Needs Communication	These needs are translated into programs or services that are required. The DSO then posts the needs on the Shared Platform or directly to market participants (depending on the user journey) to procure.
Needs Response & Reception	Participants publish their ‘responses’, directly on the Shared Platform or directly to the relevant Market Operator (depending on the user journey), which includes how much power and for what duration participants can increase/decrease generation or load and for what price they are willing to do this for.
Response Evaluation	The WDSC calculates a techno-economic optimal dispatch schedule (utilizing PF and/or OPF) for the system to solve the System Need(s), while risks with non-delivery for System-wide/Market(s)/Market Zone levels and time frames.
DER Operations	The optimal dispatch is communicated with market participants through the DSO via direct connections or APIs for relevant Market(s)/Market Zone(s).
Measurement & Verifications	Post-dispatch metered data is collected to verify actual generation and consumption. The output is posted to the Shared Platform (depending on the user journey).
Settlement	Metered data is compared to contracted volumes and prices to calculate payments and penalties for each participant. The output is posted to the Shared Platform (depending on the user journey).

Overview of DSO User Journeys

User Journey	Description	DSO Model Covered
LDC and IESO Journey (with Shared Platform)	Standard User Journey covering each DSO model with a Shared Platform	Dual Participation DSO (DP-DSO)
		Total DSO (T-DSO)
		Market Facilitator DSO (MF-DSO)
LDC and IESO Journey (without Shared Platform)	Standard User Journey covering each DSO model without a Shared Platform	Dual Participation DSO (DP-DSO)
		Total DSO (T-DSO)
		Market Facilitator DSO (MF-DSO)
Host LDC and Embedded LDC Journey (with Shared Platform)	Embedded and Host LDS User Journey covering each DSO model with a Shared Platform	Dual Participation DSO (DP-DSO)
		Total DSO (T-DSO)
		Market Facilitator DSO (MF-DSO)
Host LDC and Embedded LDC Journey (without Shared Platform)	Embedded and Host LDS User Journey covering each DSO model without a Shared Platform	Dual Participation DSO (DP-DSO)
		Total DSO (T-DSO)
		Market Facilitator DSO (MF-DSO)

- In August, the B1 Sub-group held 2 workshops with the IESO innovation team to address several comments with Work Package #2
- The result of the comments/suggestions provided in the workshops resulted in the expansion of the DRAFT Work Package #2 Deliverable (submitted in May) from ~100 Slides to over ~550 Slides
- The ~5x increase is due to the B1 team working out each of the 4 User Journeys for the 3 different proposed DSO Models (12 User Journeys)
- Remaining work includes:
  - Outline the flow of data/information across actors within each User Journey (in coordination/consultation with Sub-group B2)
  - Providing additional detail with respect to how DSO Processes are carried out in relation to the updated Deliverable A Coordination Protocols (Section 6) and addressing general changes from the latest Deliverable A Draft
  - Potentially holding separate workshops for the sub-groups (collectively or 1 by 1) to go over the User Journeys and Processes if useful

Draft DSO User Journey Process Difference Summary

Process	Total-DSO	Dual Participation DSO	Market Facilitator	Host LDC and Embedded LDC
System Condition	The DSO determines local distribution system needs and potential system limits on any DER/A.	The DSO informs DER/A of operating limits, and DER/A is responsible for communicating any limits to the IESO.	DER/As submit info to DSO. The DSO assesses DER/A limits, optimizes system to enable maximum DER/A participation.	The DSO would collect relevant telemetry and account for limits set by the Host LDC. All communication would require the inclusion of the Host LDC.
System Operation and Needs				
Needs Communication	The DSO would communicate local and wholesale needs through the Market/Shared Platform (depending on the user journey) to DER/As. The DER/As submit their bids for both markets (for both RT and DAM).		The DSO would communicate DER/A limits through the Market/Shared Platform (depending on the user journey) to DER/As.	All communication would require the inclusion of the Host LDC.
Needs Response & Reception		-		
Response Evaluation	The DSO would evaluate the bids for both local and wholesale market and select the bid and aggregate the response back to the IESO.	-	The DSO facilitates and channels DER/A bids into the wholesale market through a singular pathway and point of integration.	-
DER Operations	The DSO would select the bid for both local and wholesale market. The DSO would be required to reoptimize the system and go back to the market to address the shortfall in its IESO aggregated bid. If it is unable to address the shortfall, this would be communicated to the IESO.	The DSO would not dispatch the DER/A for wholesale services, the IESO would dispatch DER/A and would inform the DSO. The DSO does NOT run a time-series (for the appropriate market time frames) security constraint power flow for each of the zones to determine optimal network operations to accommodate maximum DER participation if step 4 identifies system constraints. If a constraint is identified, the limits are communicated to the DER/A and the DER/A is responsible for communicating any limits to the IESO.	The IESO would clears the market and send the corresponding dispatch signals to the DSO. The DSO re-assesses live system conditions and dispatch DER/As accordingly. The DSO may limit DER/A prior to dispatch, if the re-assessment identifies system constraints, or post-dispatch if system conditions change. In either scenario, the DSO informs both the DER/A and IESO.	The DSO would collect relevant telemetry and account for limits set by the Host LDC. All communication would require the inclusion of the Host LDC.
Measurement & Verifications	The DSO would be responsible for submitting the measurements to IESO and would be handling disputes with both the DER/A and IESO.	-	-	The DSO would collect relevant telemetry from the Host LDC and make available to the DER/A. All communication would require the inclusion of the Host LDC

Without a Shared Platform

Process	Total-DSO	Dual Participation DSO	Market Facilitator	Host LDC and Embedded LDC
All Steps	All communication between the IESO, DSO, and DER/A would be managed through point-to-point integration between the parties.			

03

Work Package #3 – Gap Analysis

Gap Analysis Overview

Purpose: The Gap Analysis is meant to assess the gaps between existing LDC capabilities and the DSO capabilities outlined in Work Packages 1 and 2 for all DSO models

Process:

I. Draft survey for utilities participating in TDWG and other potential distribution partners (e.g., EDA, CHEC group etc.)
II. Review and finalize survey questions and distribution partners
III. Send out survey via distribution partners
IV. Analyze results and summarize findings

Example Themes/Question Areas:

1. Control Room
    i. Hours of Operation (e.g., Business Hours, 24/7/365, etc.)
    ii. DMS/OMS/ADMS maturity level
    iii. Level of Telemetry across service territory
        i. Visibility across different voltage levels (e.g., 4.16 kV, 8 kV, 13.8 kV, 27.6 kV, 44 kV etc.)
        ii. Metering data incorporated into system operations (e.g., aggregated secondary voltage loading, last gasp etc.)
        iii. Current LDC asset classes observable/controllable via SCADA (e.g. circuit breaker, switch, recloser, FCI, LTC, etc.)
        iv. Current Customer asset classes observable /controllable via SCADA (e.g., customer plant, DER assets, etc.)
2. Communication
    i. Existing SCADA communication network(s)
    ii. DER Communication requirements (e.g. size, type of system etc.)

Gap Analysis Overview

3. Systems of Record
    i. Types of Systems and availability/capabilities to obtain required data
        a. Geospatial Information System (GIS)
        b. Metering Data Management System (MDMS)
        c. Data Historian
        d. Customer Information System (CIS)
4. Integrations
    i. Integration Maturity Level (e.g., Enterprise Service Bus, Flat File Exchange, automated file transfer etc.)
    ii. Current methods to share real-time data with external parties (e.g. HONI, IESO, Upstream LDC etc.)
5. Records Data Quality
    i. % of digitized Network Models
    ii. Frequency of updates
    iii. Paper or digital records
    iv. Cycle time for records updates
6. Planning
    i. Tools and types of assessments carried out for load forecasting, interconnection analysis,
    ii. Level of detail for assessments (e.g. bottom up-Supply Point or Distribution Transformer or top down-Sub Station or Station Bus)

04

Next Steps

Next Steps

Work Package #2 – Process and User Journey Mapping

1. Incorporate updated coordination protocol diagrams from Deliverable A for DSO processes-coordination protocols alignment – Proposed timeline: By mid-December 2024
2. Work with Sub-group #2 to determine starting points, mediums, and end points of data for each User Journey – Proposed timeline: Early to mid-January 2025
3. If there is interest, hold separate workshop(s) with each sub-group team to walk through the User Journeys for alignment and comments/feedback – Proposed timeline: TBD 2025

Work Package #3 – Gap Analysis

1. Engage EDA to discuss how best to send out survey – Proposed timeline: Last week of Nov/First week of Dec 2024
2. Review and finalize survey questions and distribution partners (e.g. TDEG, EDA, CHEC Group etc.) – Proposed timeline: Second week of December 2024
3. Send out survey via distribution partners – Proposed timeline: By mid-December 2024
4. Analyze results and summarize findings – Proposed timeline: By mid-January 2025
5. Provide Findings Document to TDWG (and potentially EDA) – Proposed timeline: End of January 2025

05

Q&A