MAY 31, 2023

Draft Service Stacking T-D Protocols

Part of Deliverable A

TDWG Meeting #14

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Purpose & Outline

Purpose: provide an overview of May 2024 Draft of Service Stacking T-D Protocols

Presentation outline:

- Objectives
- Coordination Challenge
- Service Timeframes
- DER/A Resource Plans
- Key Features of Operational Coordination
- Service Stacking Coordination Protocols
- Swim Lane Diagrams
- Walkthrough of MF-DSO
- Next Steps
- Feedback Questions

Objectives

- To enable DER/A* to participate in services across the transmission and distribution grid requires coordination among DER/A participants, DSOs*, and the IESO
- Examines the T-DSO*, DP-DSO*, and the MF-DSO* models
- Draft report considers DER/A provision of services to the DSO and participation in the IESO's wholesale markets, as well as the possibility of "stacking" both
- Details the operational actions that need to be taken and information exchanges that need to occur among the relevant parties
- A key area of focus is the coordination of dispatchable, participating DERs

* DER/A = Distributed Energy Resource (DER) or DER aggregation; DSO = Distribution System Operator; T-DSO = Total DSO; DP-DSO = Dual Participation DSO; MF-DSO = Market Facilitator DSO

Coordination Challenge

- The operational T-D* coordination challenge is to ensure that DSOs and, under certain models, the IESO, maintain visibility into the real-time and expected status of DER/A
- Mutual visibility allows both the IESO and DSOs to understand the operation of DER/A and their availability to provide grid services
- DER/A status is informed by (a) schedules and dispatch instructions in the wholesale market and (b) schedules and activations as DER/A are used as distribution NWA*
- Outage reporting processes are needed to communicate the unavailability of DER/A
- Effective T-D coordination paves the way for DER/A to deliver "stacked" services, offering value to both DSOs and the IESO

* T-D = transmission-distribution; NWA = non-wires alternatives

Service Timeframe – Wholesale Energy Market [1/2]

- Report considered new processes being introduced by IESO's Market Renewal in 2025
- IESO will operate a day-ahead market (DAM) and real-time market (RTM)
- Coordination protocols structured around day-ahead and real-time processes

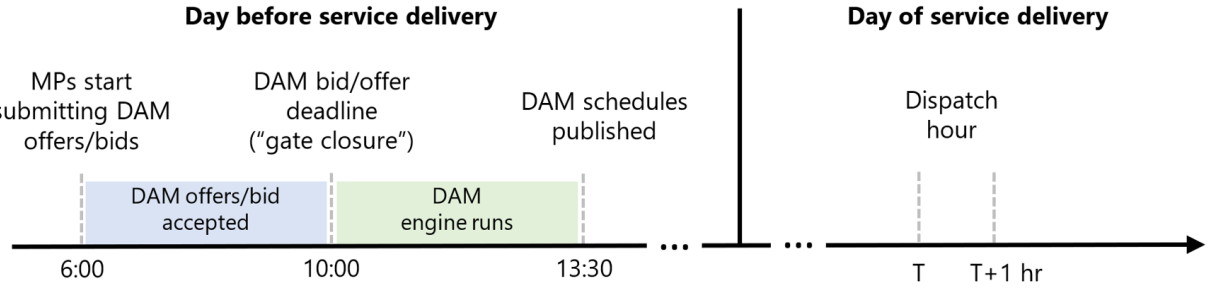


Figure 1: Relevant IESO Day-Ahead Market Timelines

Service Timeframe – Wholesale Energy Market [2/2]

- RTM is run to determine instructions and prices for each 5-minute interval
- The rapid pace of this process is a challenge, where communication latency or delays in execution may impact reliability

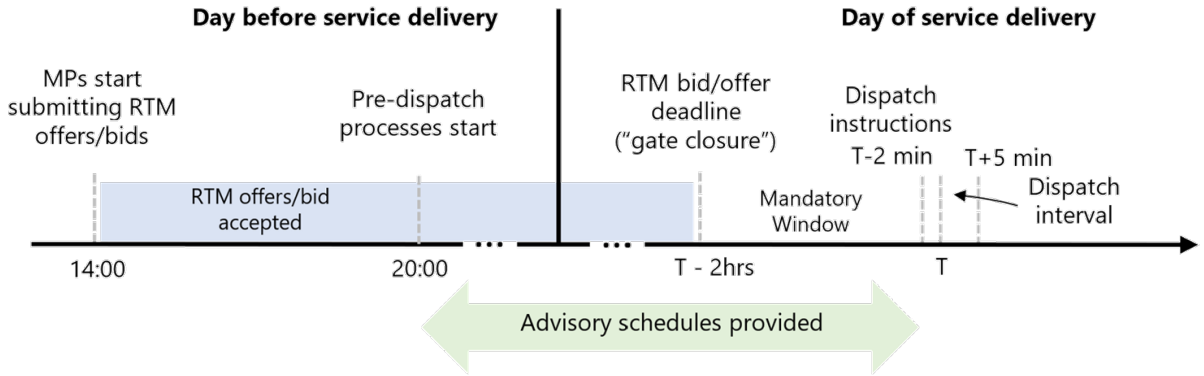


Figure 2: Relevant IESO Real-Time Market Timelines

Service Timeframe – Distribution Non-Wires [1/2]

- Report defines a minimal set of features associated with DER/As offering distribution services, focusing primarily on timing considerations
- Draft report focuses on DER/A providing services as NWA to distribution infrastructure

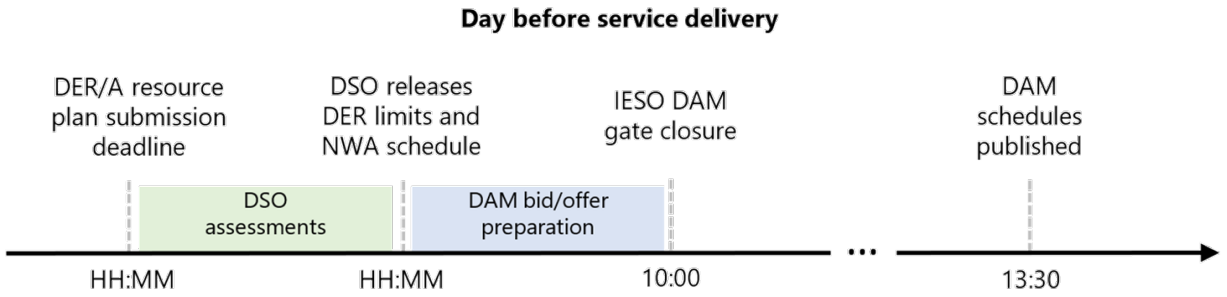


Figure 3: Relevant Day-Ahead DSO and IESO Timelines

Service Timeframe – Distribution Non-Wires [2/2]

- A sequential process is used: the DSO must strategically perform key DER/A-related processes in advance of the IESO's DAM and RTM processes
- DSO assessments determine DER/A operating limits and distribution service instructions
- The deadlines for the DSO service timeframes are not defined in the report

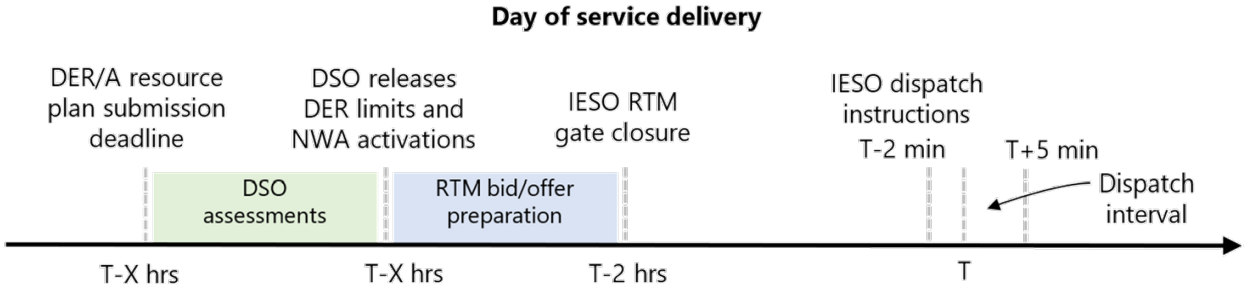


Figure 4: Relevant Real-Time DSO and IESO Timelines

DER/A Resource Plans

- The resource plan is envisioned as a dynamic tool for sharing DER/A data with the DSO, and may include:
  - Availability of DER/A for distribution and/or wholesale services
  - For aggregators, the specific DER contributors planned to operate
  - Pricing information for providing distribution services
  - Wholesale market bids/offers, depending on the DSO model
- Resource plan provides DSOs with data to set DER/A operating limits, issue distribution service instructions, and, if applicable, formulate wholesale market bids/offer
- Data requirements can be targeted/limited initially and expand as DSO needs evolve

Key Features of Operational Coordination

1. DSO Override of DER/A Operation

2. Sequential Coordination of Stacked Grid Services

3. On-Going DSO Limits on DER/A Operation

4. Floor Price Bid/Offer for Distribution Services

For the next iterations, considering adding about *optimization* and *neutrality* as key features

1. DSO Override of DER/A Operation

- In the protocols for all DSO models, DSOs can override DER/A participation in the wholesale market to prevent adverse reliability impacts on the distribution system
- On an on-going basis, when a DSO detects an outage or unexpected conditions posing safety and reliability risks, it can initiate the override process for impacted DER/A
- Depending on the DSO model, the override process may result in an outage or derate notification for the DER/A to the IESO
- Also involves updating DER/A availability to provide services and market bids/offers
- The different DSO models have different lines of communication, which can affect the latency of the override process

2. Sequential Coordination of Stacked Grid Services

- The coordination protocols make use of a sequential process when DER/A provide both distribution and wholesale market services
- DER/A are firstly considered for distribution system needs by the DSO and secondly remaining DER/A availability is considered for wholesale market services by the IESO
- The IESO's wholesale market processes are not designed for iterative adjustments and cannot accommodate after bid/offer submission deadlines ('gate closure')
- Additionally, the RTM's 5-minute dispatch instructions leave limited/insufficient time for additional processes afterward, which is why they should occur beforehand
- Sequential coordination ensures more complete DER/A data is input into IESO processes

3. On-Going DSO Limits on DER/A Operation

- Protocols ensure that up-to-date information is available, including any limits to the operation of DER/A due to current or expected distribution system conditions
- For each of the 3 DSO models explored, the protocols include an on-going process for the DSO to enforce operational limits on the DER/A
- A challenge for DSOs when conducting assessments to identify any DER/A operational limits relates contributor DERs within aggregations
    - Resource plan can enable visibility into specific contributor DERs planned for use
- Different DSO models provide different degrees of flexibility for DSOs to mitigate limits to DER/A operation and minimize the curtailment of DER/A

4. Floor Price Bid/Offer for Distribution Services

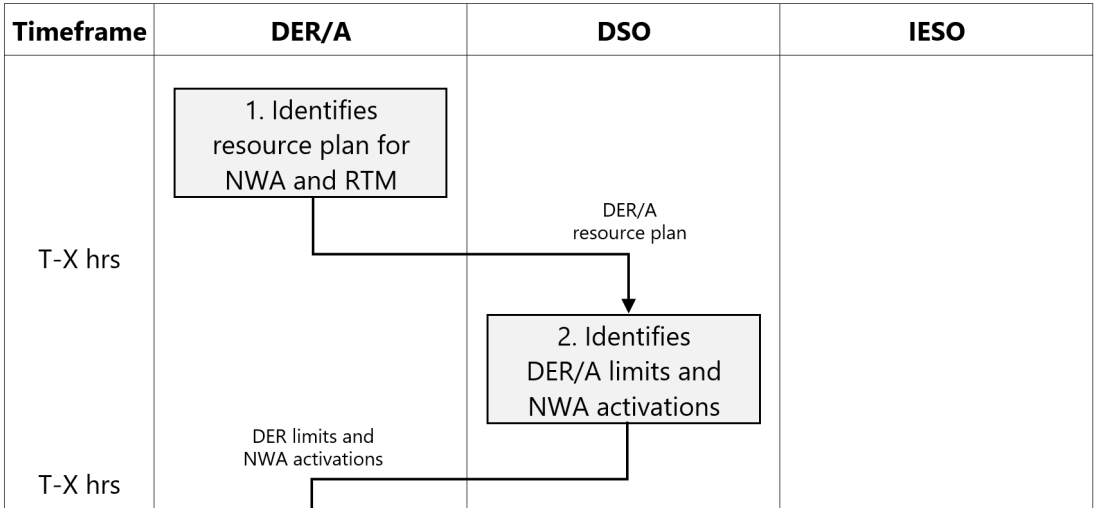
- A key aspect of effective coordination protocols is ensuring DSO and IESO visibility into each other's DER/A instructions for grid services
- The sequential coordination process involves DSOs identifying NWA needs and selecting DER/A for distribution services before IESO's wholesale market processes
- To provide the IESO visibility, DER/A that are committed to operate for distribution services submit wholesale market bids/offers at a floor price
- The floor price, which could be zero or a negative, ensures that DER/A can meet local distribution needs and participate in the IESO market without conflicting instructions
- E.g., a 3 MW DER selected for 2 MW of distribution service (bid at $0/MWh) with 1 MW available to the wholesale market (bid at a higher price set by participant)

Service Stacking Coordination Protocols

- For each of DP-DSO, T-DSO, and MF-DSO models, the report outlines coordination protocols for five processes:
  - Day-Ahead Process
  - Real-Time Process
  - DER/A Outage Process
  - Distribution Override Process
  - DER/A Resource Plan Change Process

Swim Lane Diagrams

- Swim lane diagrams are used in the draft report to illustrate the coordination processes among DER/A, DSOs, and the IESO



[Walkthrough of MF-DSO swim lane diagrams in draft report Word document]

Next Steps

- The next report iteration is expected to:
  - Address cases where DER/A provide wholesale services only, services to the DSO only, or do not explicitly provide grid services
  - Outline a number of pre-operation (or operational planning) requirements
  - Expand on optimization and neutrality as key features of operational coordination

- IESO staff are aiming to provide the next draft of the report in July

Feedback Questions

For Deliverable A: Draft "Service Stacking" Protocols

1. Word document review – We invite detailed review of the draft sections of the report that were shared (this will not be posted publicly).

2. Feedback form – In your review, what are the strengths of the draft report sections, and where do you see opportunities for improvement? Feel free to reference specific questions or provide general feedback.

Thank You

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