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ASE Inc Response - DER Orchestration Research - Request for Information (RFI)

Additional submitted attachment is included below.

Response to Docket: 23-ERDD-01

RFI Response from

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I. Use Cases that Require Validation through Demonstration:

1. As California transitions away from traditional centralized fossil-gas generation and approaches a high penetration of intermittent renewables and inverter-based resources, what are the most needed grid service functions that aggregated DERs should be able to dispatch and that require validation in the near-term?

   Following Grid Service Functions are recommended.

- Distribution Congestion Management: Utilizing Dynamic Operating Envelopes (DOEs), based on real-time hosting capacity and thermal limits (at transformer, feeder, or substation levels), to dynamically manage DER import/export (via load control, BESS/V2G dispatch, or PV curtailment) and prevent grid constraint violations.
- Distribution-Level Voltage Regulation: Coordinated dispatch of DER reactive power (e.g., using Volt-Var curve settings and mode switching) to maintain voltage within acceptable limits on low-voltage (LV) distribution circuits, especially those with high DER penetration.
- Disaggregation of Load and embedded generation for improving load and generation forecast which will improve the effectiveness and accuracy of Dynamic Operating Envelopes.

2. What performance metrics should a research demonstration achieve to assure confidence in resource dispatchability?

   Proposing the following KPIs for each Grid Service Functions

Gird Service Function	**KPIs**
Distribution congestion management (enabled by - Dynamic Operating Envelops (DOE))	Resource Response KPIs • Accuracy of DER Response to DOE Signal (% deviation from import/export setpoint) • DER Response time to DOE Signal Update Service Outcome KPIs • Magnitude of Congestion Relief Provided (kW / kVAR) • Frequency / Duration of Constraint Violations Avoided DOE Framework KPIs • Tracking of thermal limits • Accuracy of hosting capacity calculation • Revisions per control event or per day • % capacity utilization (energization capacity as well as hosting capacity)
Distribution-Level Voltage Regulation	• Reduction in Voltage Deviation (before/after) • Percentage of Time Voltage within Defined Limits

	• • Number of avoided Gen limiting due to Volt-Watt curves
Disaggregation	• % improvement in forecasting accuracy at distribution level.
General	Operational Resilience System Availability & Reliability • VPP System Uptime (%) • Dispatch Completion Rate (%) • System Performance Under Load Security • Utility requirements • Relevant parts of IEEE 1547.3

3. What role would Investor-Owned Utilities (IOUs) play in potential field demonstrations?

With load growth and intermittent PV generation, IOUs' grid support requirements are expected to increase significantly in the future, one of the fastest and cost-effective mechanism to procure grid support service is by enabling dispatch of IBRs. IOUs need to define VPP programs to incentivize IBR owners to participate for offering grid support services. These VPP programs could leverage connected DERs to participate in local support as well as for ISO's systemwide grid support requirements. There need to be clearly defined strategy for stacking of the DER support functions. This means, local constraints and support requirements need to be considered while committing asset availability in ISO market participation as per FERC2222. While enabling DERs to participate in these value stacking opportunities for local support as well as system support, customers should have option to choose a VPP. With Meter collars and AMI2.0 Meters capable of integrating DERs, IOUs are the right stakeholders to ensure the maximum value realisation of dispatchable DER.

For field demonstration IOUs critical role would be:

a) Facilitate demonstration site.
b) Providing Essential Data & Constraints – Network model, Asset details (DT)
c) Defining the value stacking - coordinating with the VPP and CAISO to manage potential conflicts and ensure distribution reliability is maintained during wholesale market participation.
d) Validating the performance metrics and assessing the scalability and potential grid impact.

- Would IOUs need to develop new programs for grant recipients to bid into, or could projects use existing agreement structures?

New programs for grant recipients are preferred for demonstrations since grid support service IBR based VPP functions like voltage control, ramping support do not fit into existing programs. OpFlex Pilot programs conducted by CA IOUs can be extended to lower capacity assets to manage grid constraints.

- What role could dynamic hosting capacity have in expanding the depth of services that inverter-based DERs could provide to the grid?
  Dynamic hosting capacity is a critical input for grid edge controls used for dispatching and/or limiting inverter-based DERs. It allows for increased amount of flexible generation to be utilized safely and helps in procuring reserves (such as BESS capacity) by providing clear operational boundaries. Furthermore, DHC enables optimization that increases the volume of dispatchable grid support functions. It also helps size energy storage appropriately by clarifying trade-off between energy market participation and local constraint management requirements, thereby improving the ROI for BESS investments made by consumers.

- Should a Letter of Support from an IOU be a minimum requirement?
  Yes.

- Could utilities be potential technical reviewers during the application scoring phase as a means of providing insightful input to Evaluation Committee scorers?
  Yes.

- Are there additional considerations for utility's role in project demonstrations?
  IOU approved DER aggregator can provide standards-based interface to IOU for local constraint management services proposed as well as offering a standards-based data services to VPPs participating via schedule coordinators or other market participants in CAISO Market. Key requirement in IEEE1547 and UL1741 SB enable consumer DERs the ability to connect to Utility backend using IEEE2030.5 CSIP based interface. This same communication infrastructure can then be utilized both by VPPs to dispatch assets for CAISO market participation and by the utility for local grid service functions, promoting efficiency. This approach enables consumers who own DERs the choice of VPP providers and the ability to switch VPPs, avoiding vendor lock-in. Simultaneously, it enables utilities to better verify that assets are not violating grid constraints while participating in various market functions. IEEE2030.5 CSIP features defined for primacy handling can ensure that IOU constraints management controls (for grid reliability) are not violated by VPP despatch.

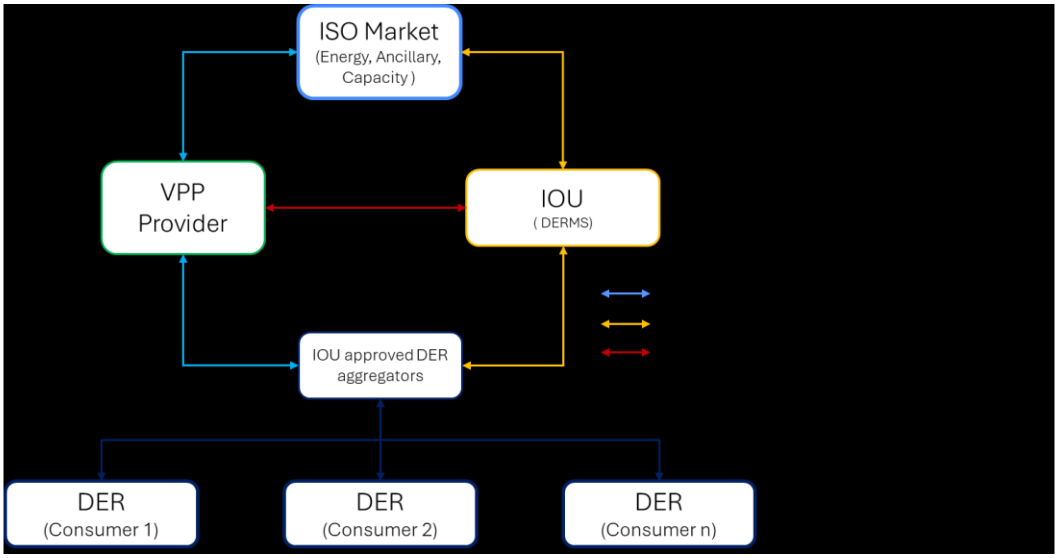

Figure 1 :Proposed Architecture with IOU approved DER aggregator providing data exchange interface to VPPs for ISO Market and Local Constraint management, DER connected to IOU approved aggregators with standard interface like IEEE2030.5 CSIP.

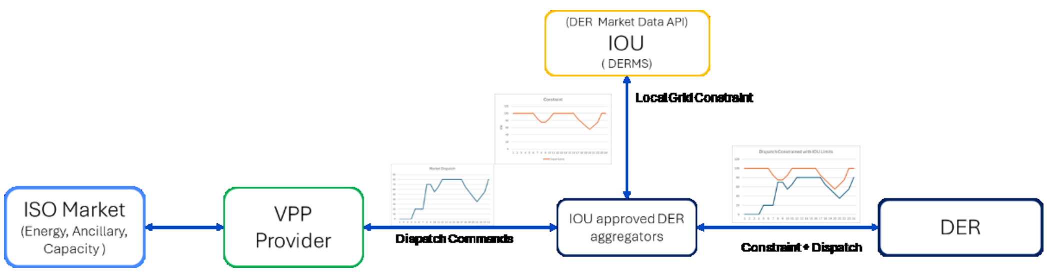

Figure 2 :VPP dispatches for ISO market and local Grid support merged by IOU system

The VPP dispatch gets validated through the IOU system and the dispatch commands get delivered to DER using the IEEE2030.5 CSIP interface from the IOU to the DER.

The VPP dispatch gets validated through the IOU system, and the dispatch commands get delivered to DER using the IEEE 2030.5 CSIP interface from the IOU to the DER. The architecture shown in Figure 1 is already deployed in CA in certain utility programs where BESS assets are dispatched based on commands from a market Optimization & Integration service provider (an actor similar to a VPP provider) for the CAISO's energy market and energy arbitrage functions, as well as based on grid service functions from the IOU's DERMS for constraint management (such as for Non-Wires Alternatives or local capacity requirements). The DERs in this case are integrated at the DER site using a utility-certified aggregator using IEEE 2030.5 CSIP, and the aggregator has interfaces to both these actors. The aggregator stacks the congestion-based constraints onto the market/

arbitrage-based dispatch functions. This ensures local grid support prioritization over arbitrage and system-wide functions.

Typically the data integration model followed by VPPs is as shown in Figure 3 below where each VPP has proprietary interfaces with depend on OEM provided platforms where consumer would find difficult to switch providers because on non-standard interfaces.

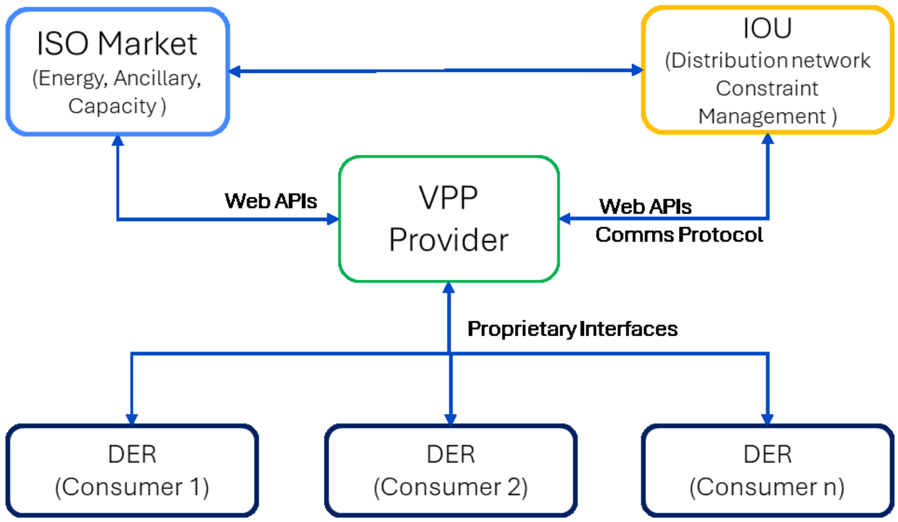

Figure 3 : Existing Architecture with DERs connected directly to VPPs.

Limitation of the existing VPP architecture show in Figure 3 above a listed in response to query 9 below.

II. Gateway Conformance Testing for Dispatchable DERs:

4. What is the industry need for dedicated testing and certification of DER gateway functionalities and conformance independent of the inverter or DER they are paired with?

   Presently Utilities are certifying based on IEEE2030.5 CSIP & CSIP AUS (for import export control) and their cybersecurity requirements. However, the need for more standardized, dedicated testing is recognized industry wide. Testing of DER gateway functionalities and conformance is getting addressed as part of IEEE1547 -part 10, which is work in progress. Therefore, aligning future gateway conformance testing with the requirements of IEEE 1547.10 upon its release is recommended.

- Would there be interest in a unified, open testing procedure that verifies DER gateways' functionality and adherence to utility-mandated communication requirements?

  Ideally, a unified, open testing procedure will be desirable. However utility requirements are expected to be different, it is difficult to manage a common testing which can be used by all utilities. Work undertaken by IEEE1547-Part 10 attempts to address this.

5. Which requirements should this testing tool cover in its scope? These requirements may include:
    - IEEE 2030.5-2023 "Standard for Smart Energy Profile Application Protocol" *ASE*
    - IEEE 1547-2018 "Standard for Interconnection and Interoperability of DERs with Associated Electric Power Systems Interfaces"
    - IEEE 1547.1-2020 "Standard Conformance Test Procedures for Equipment Interconnecting DERs with Electric Power Systems and Associated Interfaces"
    - IEEE 1547.3-2023 "Guide for Cybersecurity of DERs Interconnected with Electric Power Systems"
    - Common Smart Inverter Profile (CSIP)
    - Others that are not listed here

    Pending the completion of IEEE P1547.10, the test procedures already established and utilized by leading utilities within California could serve as a suitable reference framework.

6. What should be the baseline performance requirements of DER gateways for the following functions?
    - Performance in DER communication
    - Interoperability of communication between DER devices from various manufacturers
    - Responsiveness in DER dispatch

    Performance of DER gateway is being defined by IEEE 1547 – part 10, it is work in progress. The performance requirements for different category of gateway must be differentiated based on the capacity of the assets. For e.g., DERs with larger MW rating such as > 1MW shall require higher performance needs as compared to a small C&I gateway connecting 50KW, vs a residential gateway.

7. Should this research scope (gateway conformance testing) be under a separate funding group to be conducted independent of the VPP demonstrations, or should this scope be incorporated as a phase of a larger VPP field deployment demonstration?

    This scope of gateway conformance testing need not be taken up as part of this research since CA IOUs have already defined a formalized program for gateway conformance testing based on IEEE2030.5 CSIP and associated security guidelines.

III. Valuation of Aggregated DER Services:

8. How could technology demonstrations be designed to increase confidence in the efficacy of market signals?
    Large scale DER data simulator with a data integration architecture model given in Figure 1 can be used to validate grid services functions.

9. Identify existing market mechanisms that enable DER aggregators and VPP platforms to provide each of the grid services identified in Question 3. How effective are these market mechanisms in facilitating that service, and what barriers must be overcome for these market mechanisms to be more effective than they are now?

   Existing VPP integration as shown in Figure 3 uses proprietary interface supplied by DER OEMs which creates vendor lock in, lack of direct visibility and control for IOUs in market participation of DER connected through VPPs, duplication of communication with VPP and utility from DER, higher cost on account of consumers not having feasibility to switch VPP providers and over dependency on OEM platforms creating integration and maintenance issues. Most OEM platforms that provide measurement/telemetry data integration does not provide options to control that are required for grid services functions such as frequency-watt curves, Volt-Watt curves, Volt-Var settings, generation limiting etc. These limitations can be overcome with using IEEE2030.5 CSIP based integration as detailed in Figure 1 above.

10. Are there existing market mechanisms for dispatching inverter-based resources to provide voltage regulation and transformer overload prevention at the secondary distribution level?

    There are research projects undertaken by various entities such as ENTSO-E for voltage regulation, however no market mechanisms exist in operation. Non-Wires Alternatives with a tendering process to procure dispatchable DER capacity is initiated in New York with integration architecture using utility owned gateways.

- Which ancillary markets (e.g., fast frequency response, spinning/non-spinning reserves) would DER aggregations be best suited for? Note that these services may vary depending on a third-party aggregator's particular composition of DERs (e.g., energy storage, solar and hybrid smart inverters, Electric Vehicle chargers)
  DER can participate in Frequency Response based on Freq-Watt settings defined as per IEEE1547 with appropriate orchestration capabilities to coordinate participate in frequency support ancillary market. Spinning reserves management and dispatch on target watt in near real time presents various challenges for distributed DER. Services that can rely on "Scheduled controls" based on forecasted constraints would be more suitable for DER.

- What consumer protections measures must be put in place for DER aggregation? This is especially important for projects to be designed with an equitable focus. For example, solicitation requirements could require including protections that ensure DER enrollees are fairly compensated by aggregators for the value they provide to the DER portfolio being dispatched. What are some examples of best practices?

Avoid VPP vendor lock-in, use standards-based interface (such as IEEE2030.5 CSIP) to a common communication infrastructure managed by IOUs, this would be necessary for consumers to switch between VPP providers.

Such an IOU approved aggregation platform can provide a unified standards telemetry/command interface to VPPs providers to ensure level playing field to promote competition.

Utilities can also introduce distribution service operation as an additional procurement function to bring in transparency of how grid services are procured and dispatched. This procurement/bid functions for procuring local grid services can be exposed over a set of APIs for VPPs to access.