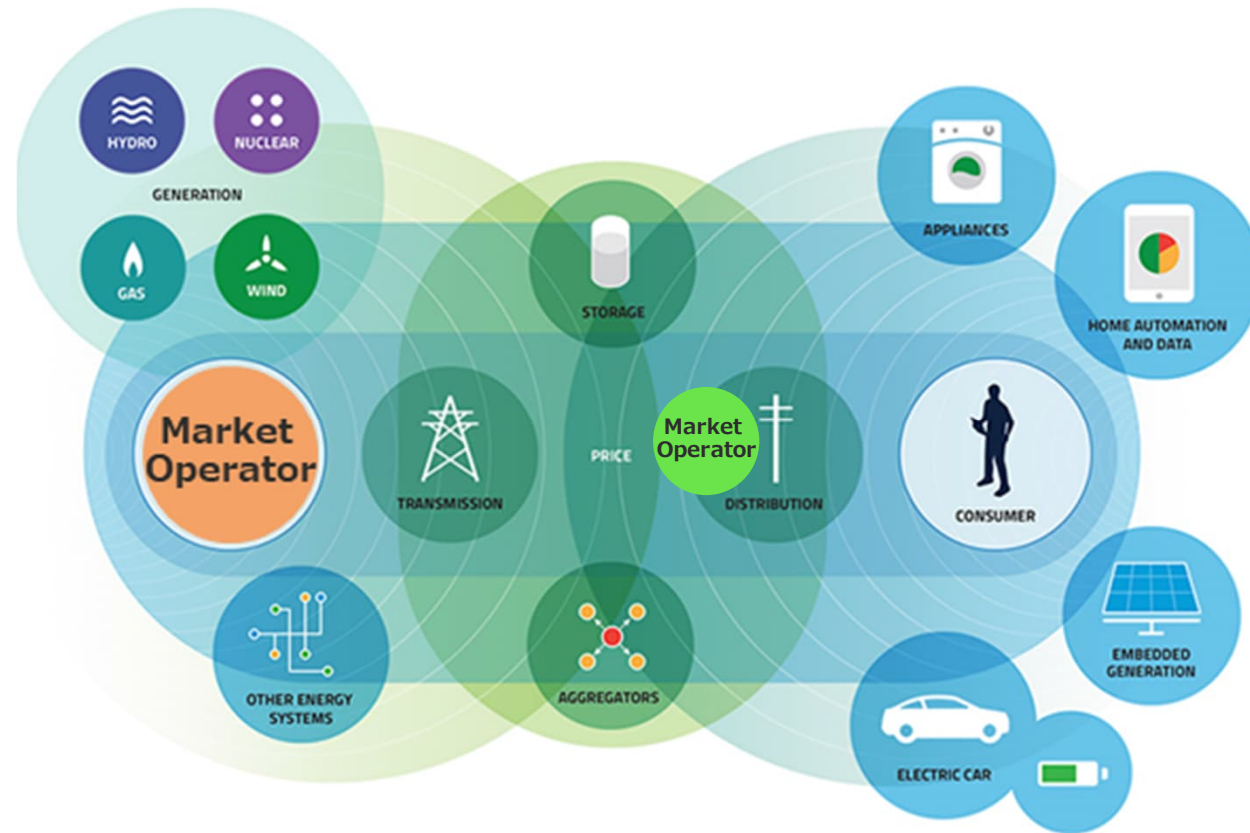


APEX 2022 Dubrovnik Panel 3: New Technologies and Emerging Energy Forms

Enabling new technologies to participate in electricity markets

Mohit Saigal, Hitachi Energy

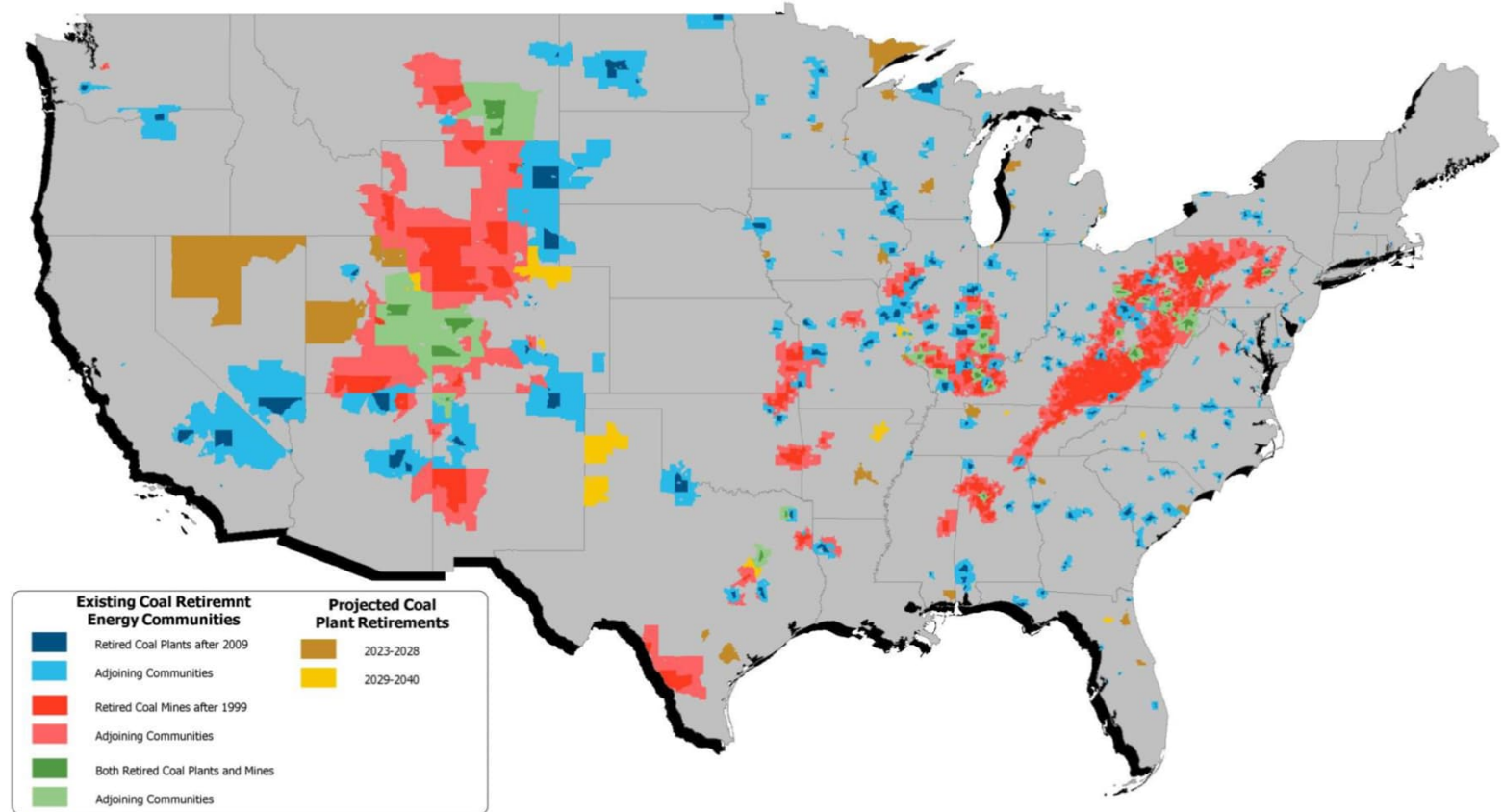


Source: IESO

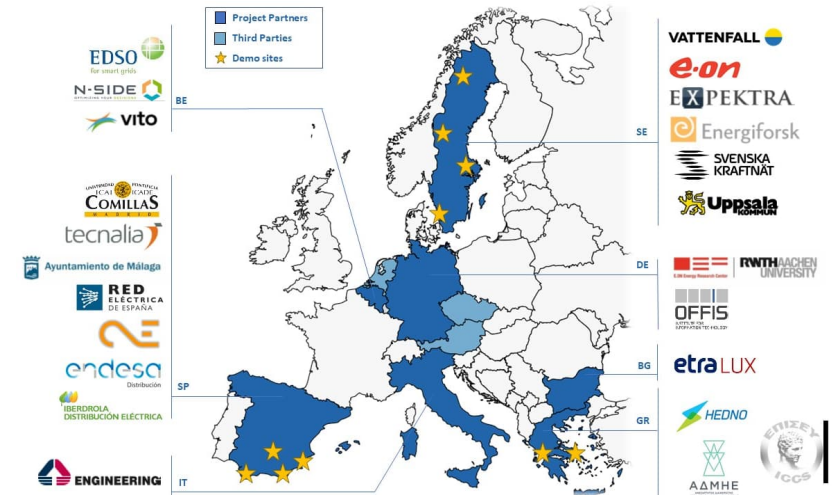
Inflation Reduction Act (IRA)

- Signed into law by U.S. President Biden on August 16, 2022
- The single largest investment in climate and energy in US history
- Delivers policy certainty
- Offers tax credits for low carbon and zero emission resources as well as tax credits for carbon capture
- Availability of bonus credits (e.g. brownfield sites, fossil fuel communities, low-income communities, domestic content)
- Extends tax credits for clean vehicles (electric vehicles, plug-in hybrids, hydrogen fuel cell vehicle) and offers rebates for electrification of buildings and energy efficiency related upgrades

Hitachi Energy Velocity Suite Map



- By 2030: 50 % of new renewable installations in 16 countries of Continental Europe will be connected to the distribution network
- By 2030: Electricity demand across Europe increasing by almost 20% due to EVs and heat pumps, despite energy efficiency.
- Drivers: Self-generation, EVs, heat pumps, storage, electrification of the heat and transport sectors and sector coupling (example: power-to-gas, power-to-heat, power-to-hydrogen)
- Full transposition of Article 32 of the Clean Energy Package (Directive 2019/944) needed for deployment of flexibility markets.
- DSOs will need to actively manage more complex power flows and constraints
- Flexibility resources could deliver better value to resolve a network constraint than investing in traditional network reinforcement
- Need for greater coordination amongst DSOs and between DSOs and TSOs
- resources needed to manage the grid at all voltage levels are shared efficiently across the grid under a “one system approach”.



Source: ENTSO-E

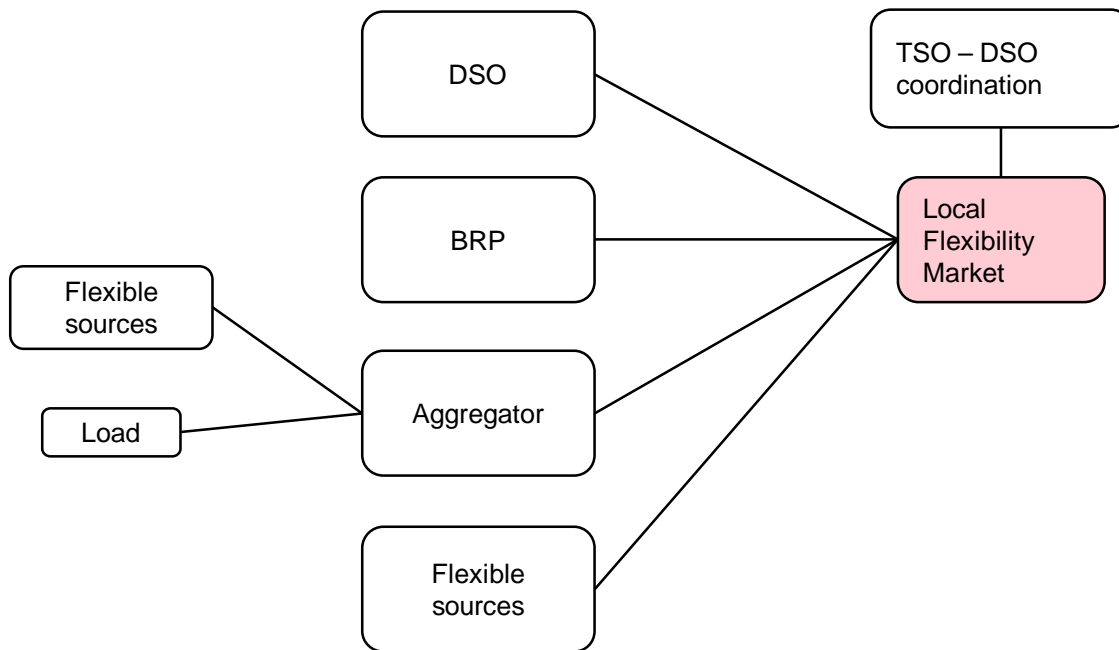
Source:

ENTSO-E. Vision on market design and system operation towards 2030. November 2019. Available at: vision2030.entsoe.eu/wp-content/uploads/2019/11/entsoe_fp_vision_2030_web.pdf

Other studies foresee a sharp increase in electricity demand beyond 2030 and towards 2050: 53 % for the European Commission (A Clean Planet for all, 2018), 60 % for Eurelectric (Decarbonisation pathways for the European economy, 2018).

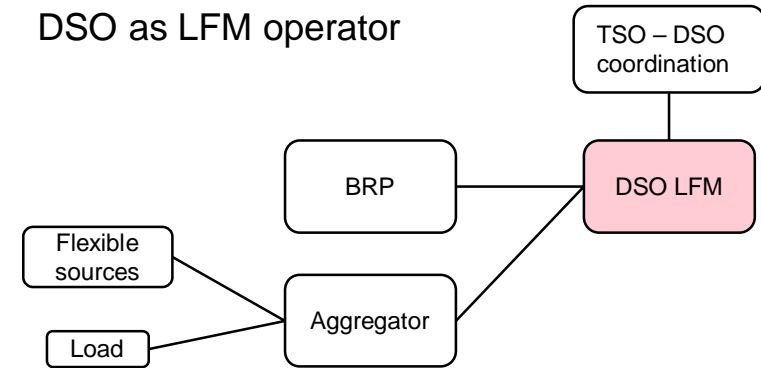
Main model explored

LFM as independent operator

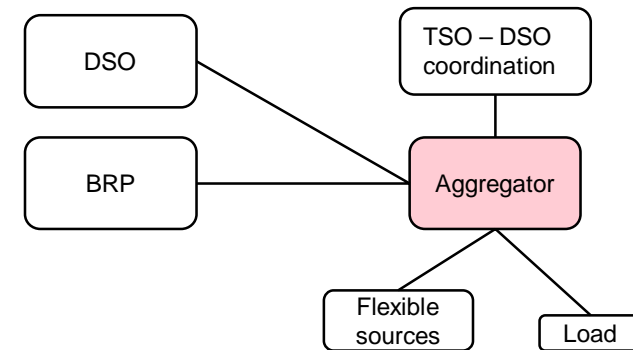


Other models

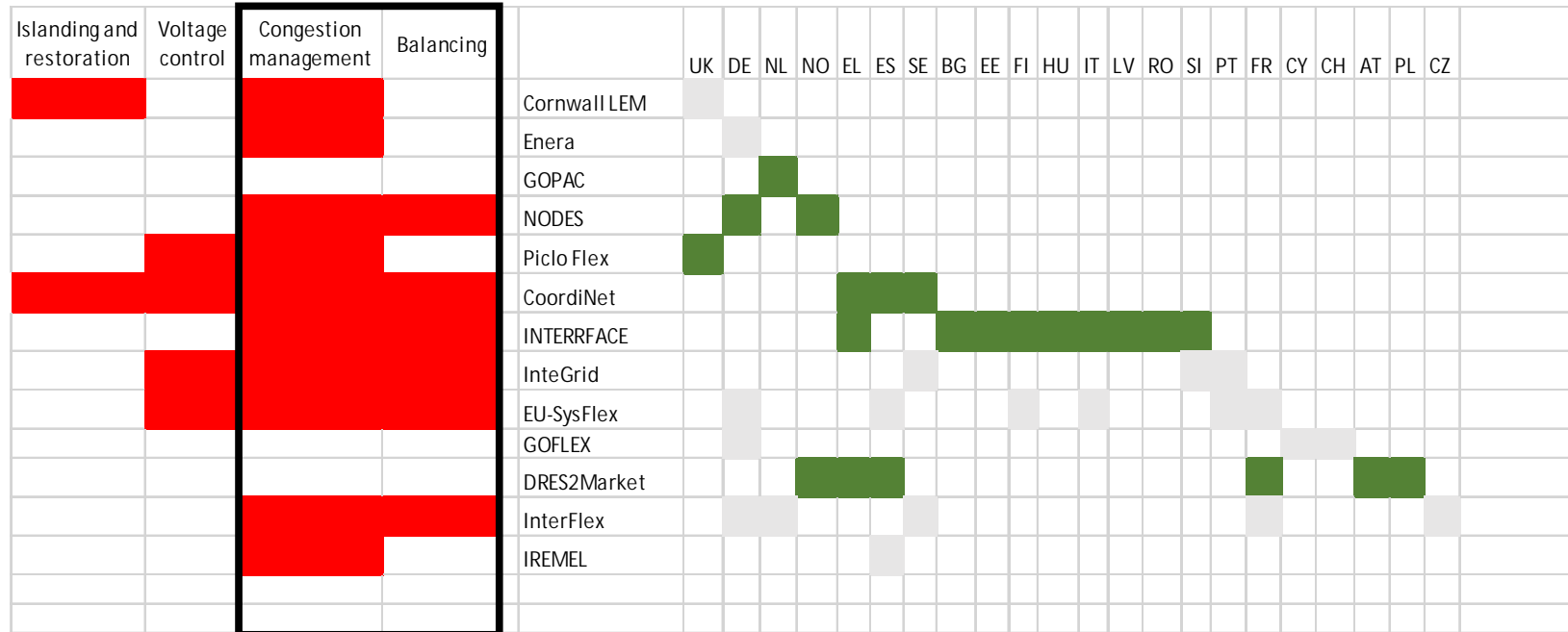
DSO as LFM operator



Aggregator as LFM



Spread of local flexibility platform projects in Europe

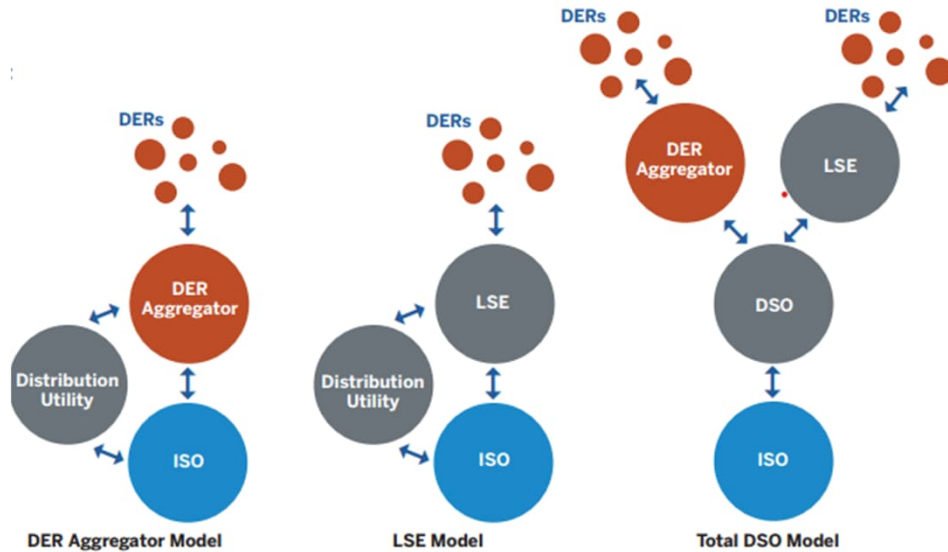


1. Most projects are looking at tackling the issue of congestion and balancing
2. Today, there still exist multiple pilot runs with some countries having multiple project in parallel
3. All projects are operating either as a link between TSO and DSO or working exclusively at a DSO level

Concluded
 Running

Models:

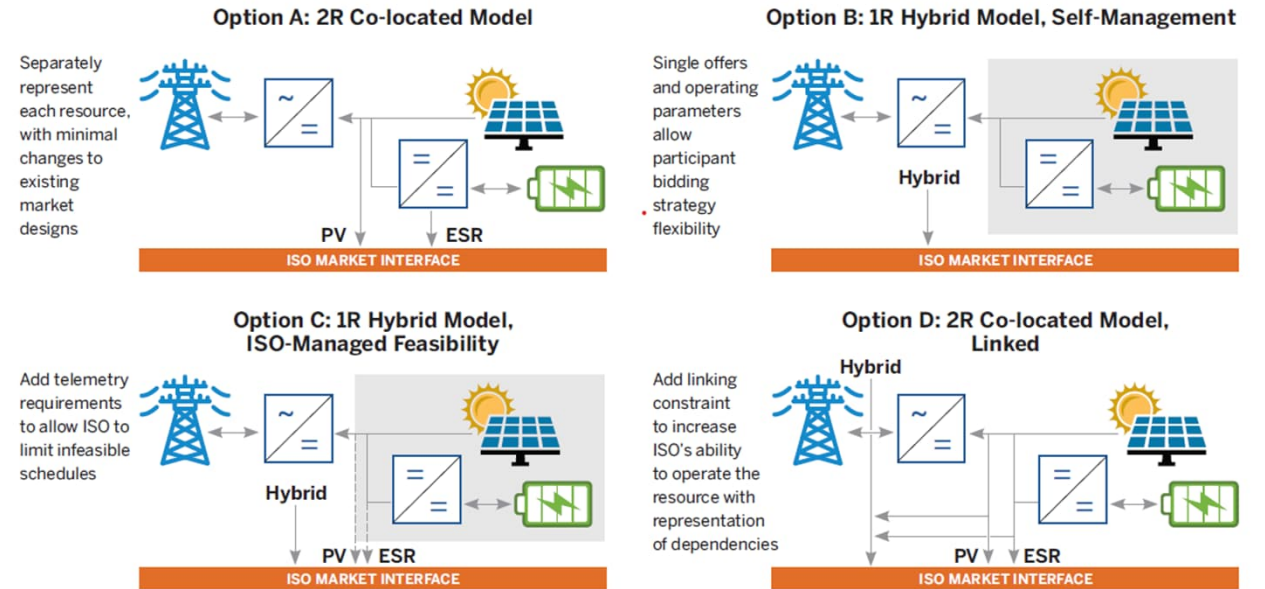
- DER aggregator model
- Load-serving entity (LSE) model
- Total distribution system operator (DSO) model



Source: ESIG

Hybrid Resource Models:

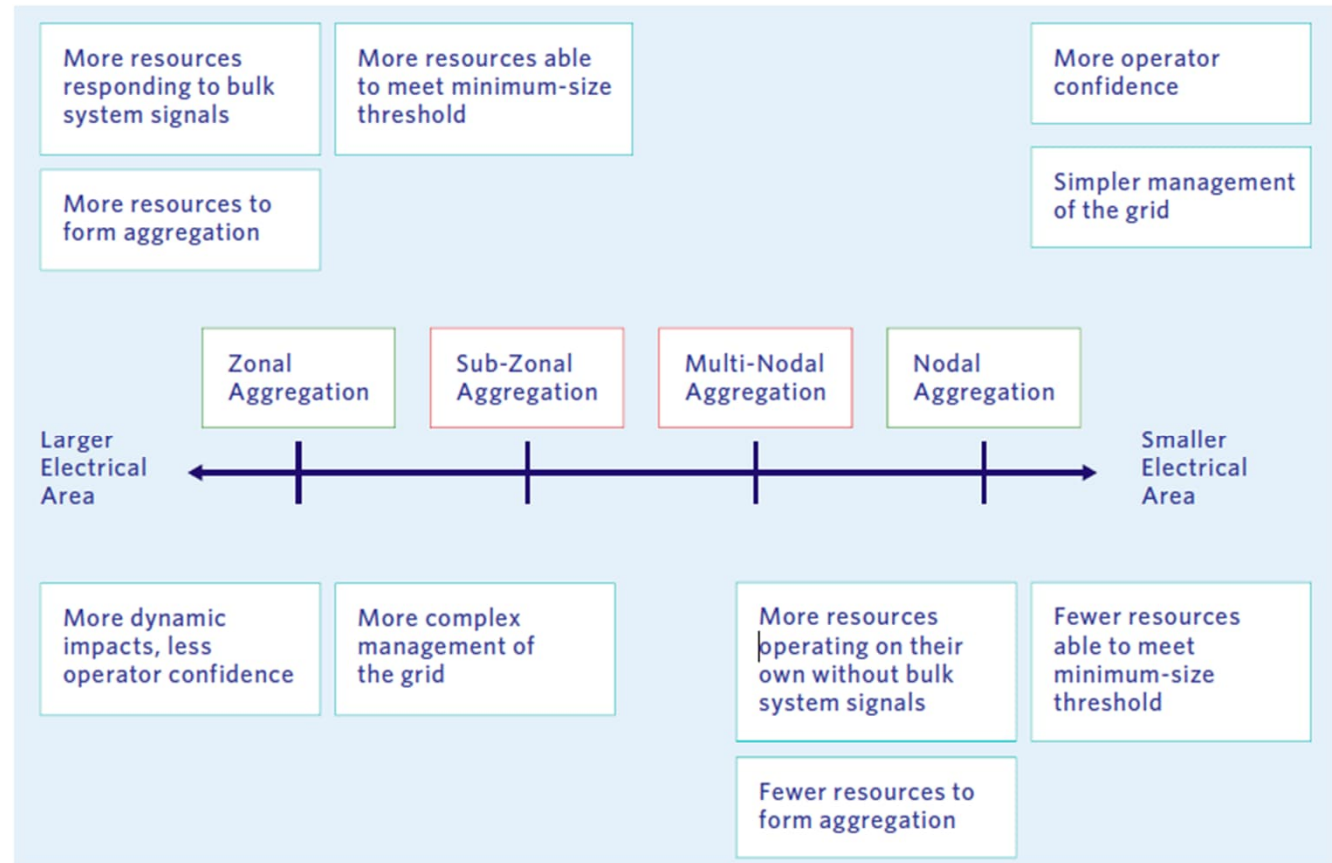
- Co-located options
- Hybrid options



Source: ESIG

Spectrum of Aggregation Boundaries and Outcomes

- Reducing minimum size threshold
- Modifying aggregation boundaries
- Aggregation for non-dispatchable generation
- Permitting alternative sources of telemetry
- Enhancing T-D interoperability
- System capabilities and needs

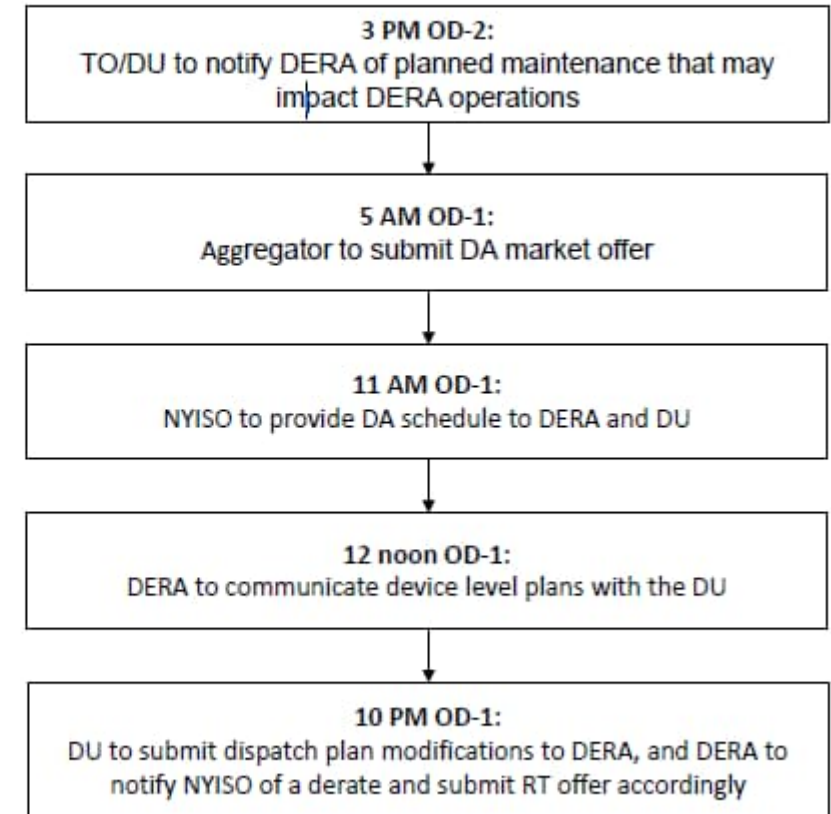


Source: Exploring Expanded DER Participation in the IESO-Administered Markets PART II: OPTIONS TO ENHANCE DER PARTICIPATION

Future needs:

- Transmission and distribution planning coordination
- Distribution interconnection and aggregation review
- Communications and data-sharing
- Distribution operations
- Federal-state market regulation
- ISO market design
- Open access distribution tariffs
- Utility regulation and business models
- Transparency
- Data Visibility
- Value Stacking
- Incentives/renumerations
- - Regulatory framework
 - Article 32, Network Codes for flexibility, IRA, etc

NYISO Model – Operational Coordination



OD: Operating Day, TO: Transmission Owner, DU: Distribution Utility, DERA: Distributed Energy Resource Aggregation, DA: Day-Ahead,

Source: EPRI

Challenges Remain

- DER 24/7 availability (CAISO) restricts services to other markets/programs (utility DRs, etc)
- Real time telemetry and metering (CAISO – over 10 MW aggregations requires this info from every DER device attached to the aggregation)
- Heterogenous aggregations - Measure load reduction and grid injection as a single value (NYISO)
- “Baselining” (ISO-NE/CAISO) - customer’s load profile would have been if an intervention hadn’t taken place.
 - “Baseline erosion” : If DER resource is dispatched multiple times per week, that baseline becomes normalized and becomes relatively useless. Not much or No credit received for DER performance (load reduction ,etc).
 - NYISO trying to tackle this issue by adding adjustments to baseline erosion.
- DERs acting as emergency capacity as of today – “doing little, earning little”
- Single “location pricing node” on its transmission network (NYISO, PJM)
 - CAISO is allowing for multi-node aggregations – increasing geographical area
- Double counting – ISO compensation and Utility retail compensation for the same DER action
- Banning Net Energy Metering DER resources in the retail sector to participate in ISO markets (CAISO)

