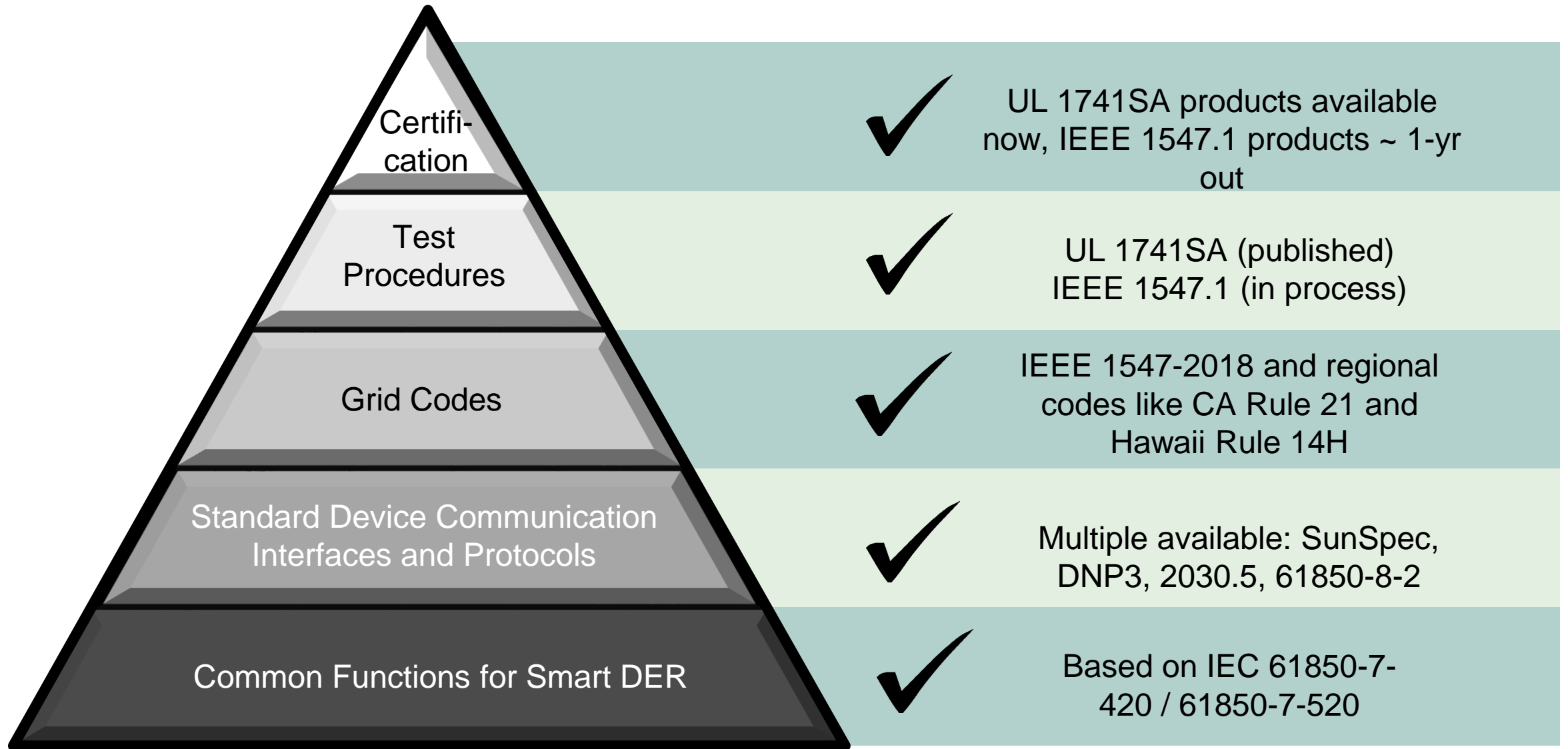


Understanding DER Management Systems (DERMS)

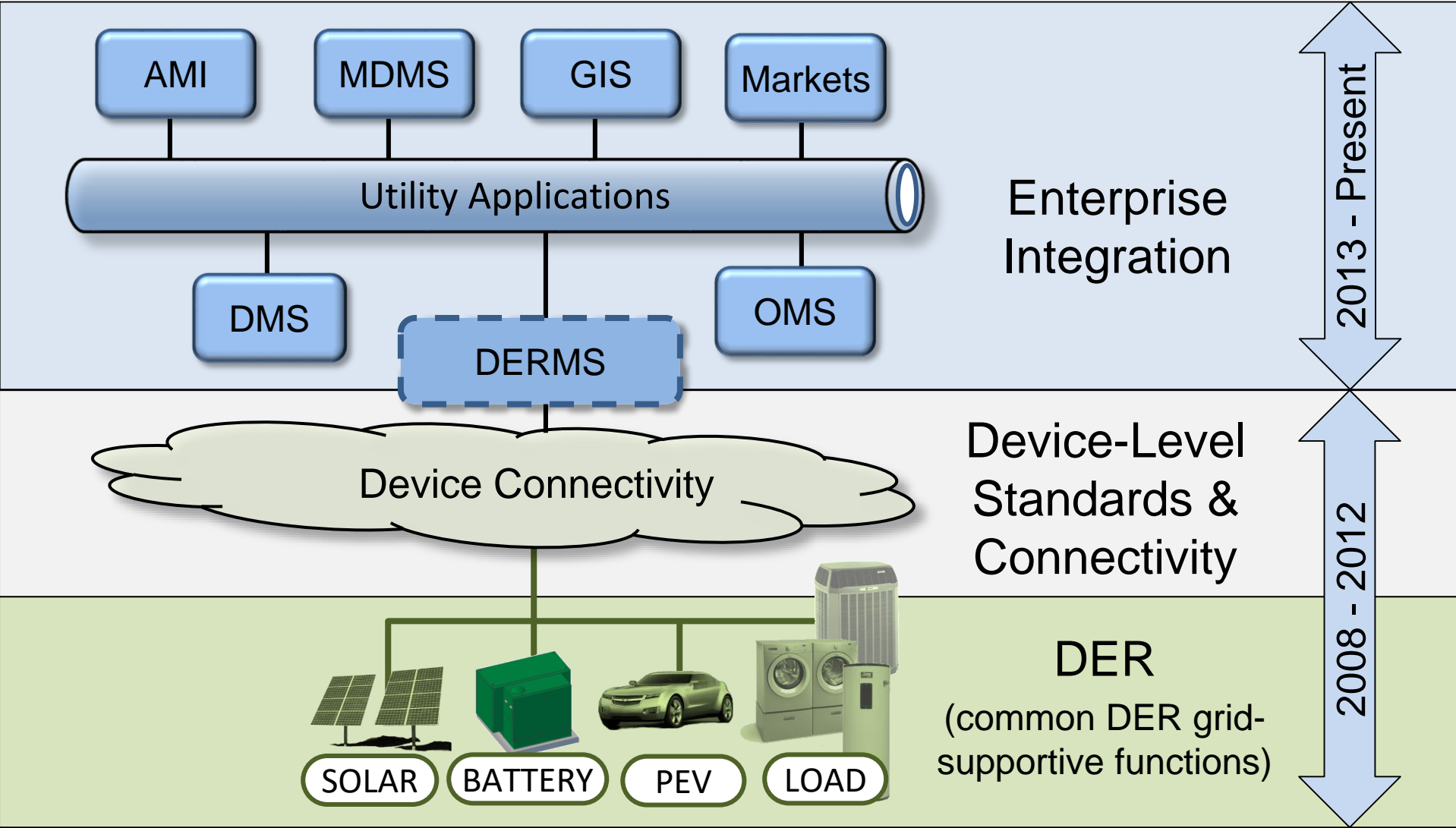
Dr. Ajit Renjit
Sr. Project Manager,
Electric Power Research Institute



Framing the discussion: DER Devices are Ready

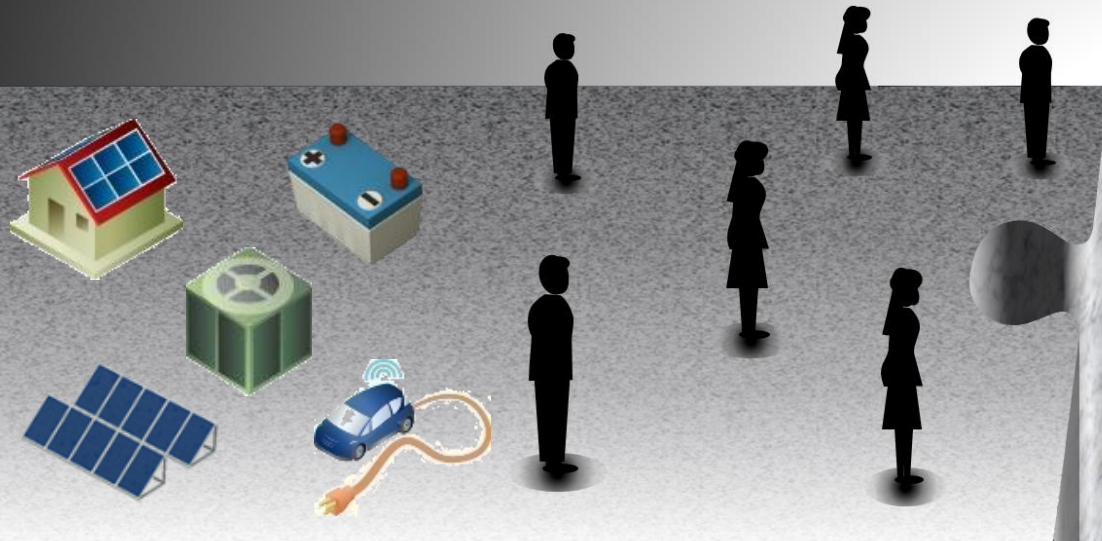


What is a DERMS?



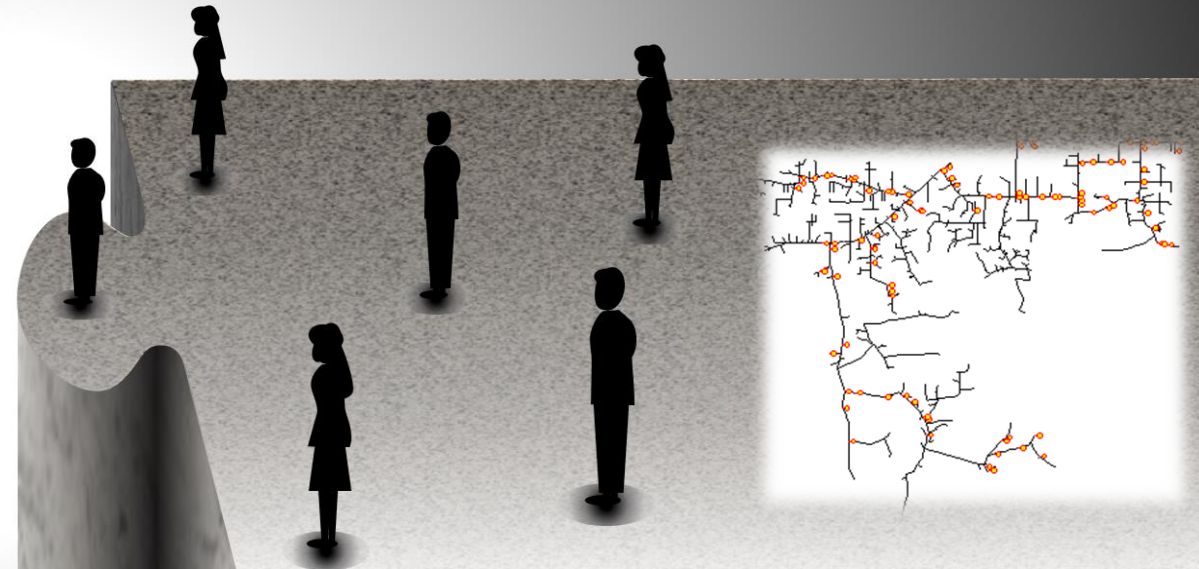
Need for DER Group Management Functions

Device-Oriented Functions are Ready



- Many individual devices
- Complex settings
- DER-type-specific interactions

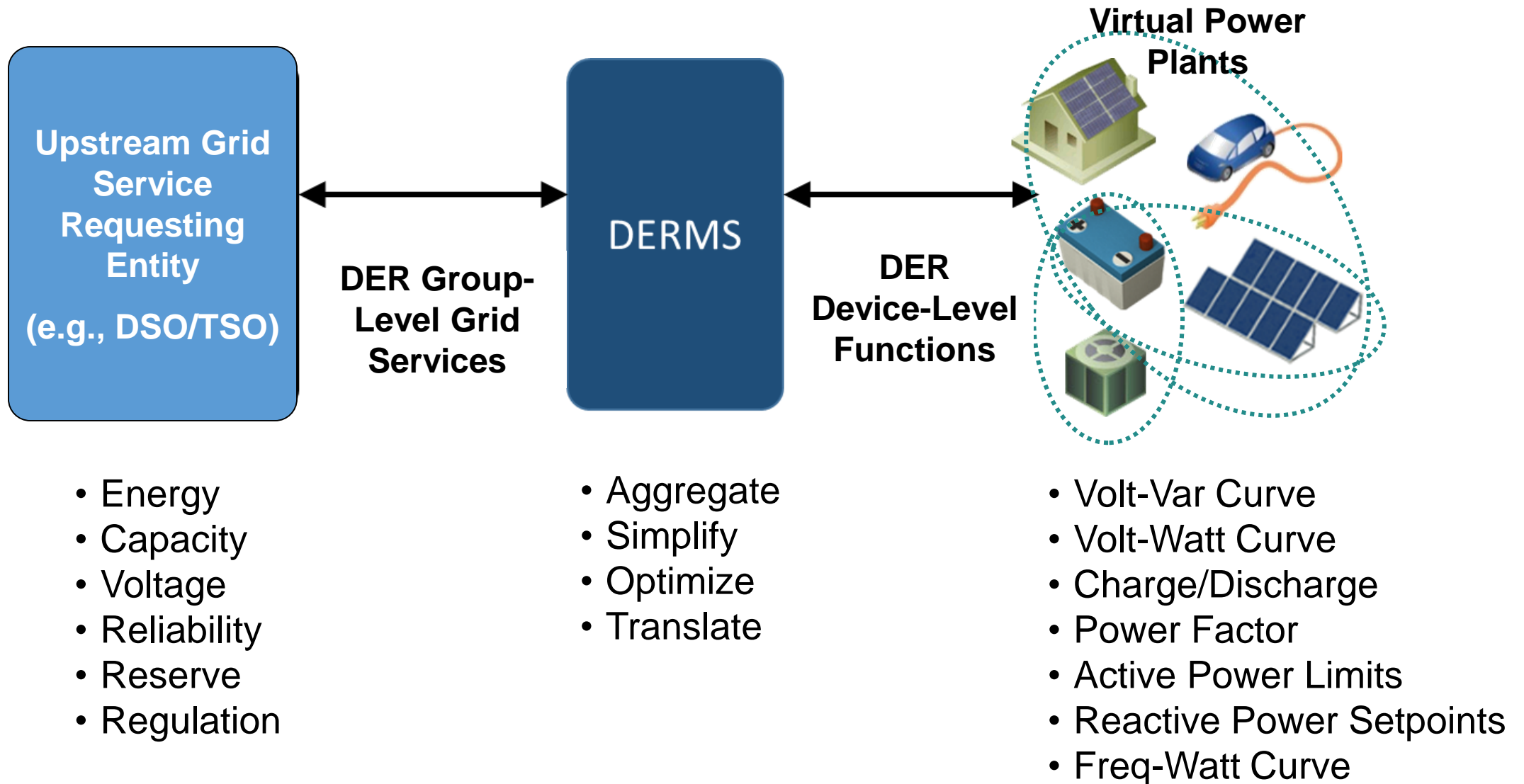
Grid-Oriented Services are Needed



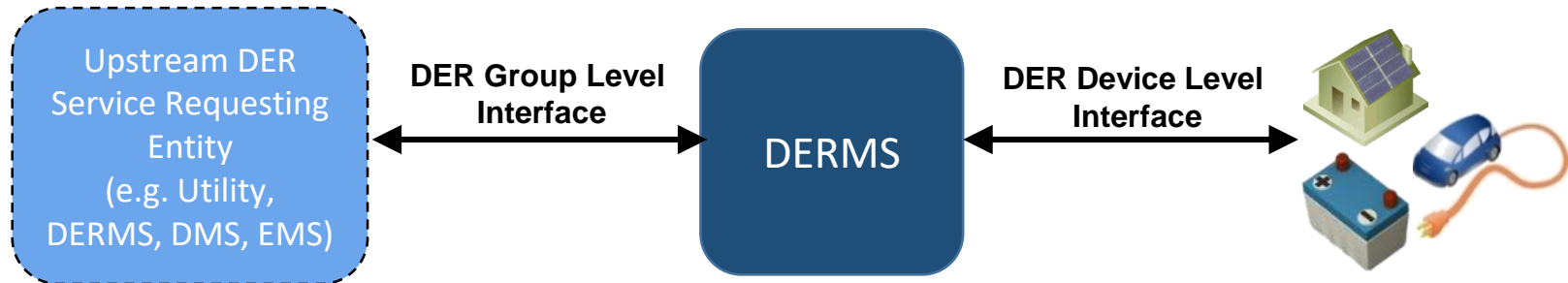
- Grid-aligned DER services
- Simple control actions
- Energy-centric interactions

DERMS

“Services” from DER Groups



DER Group Management Functions



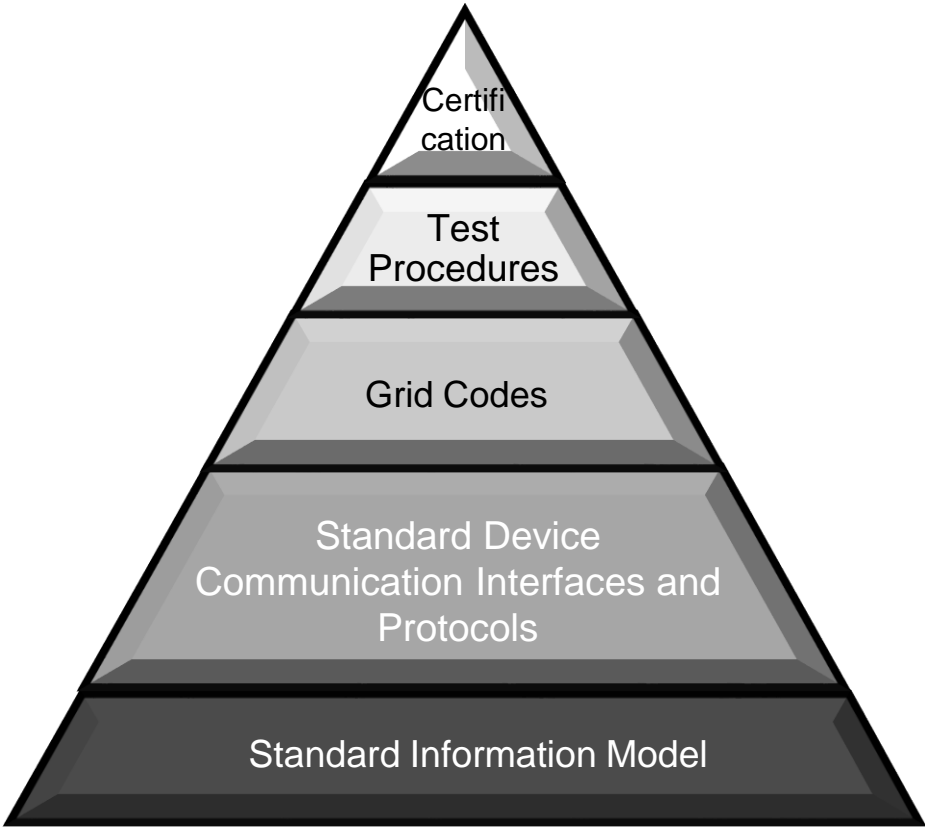
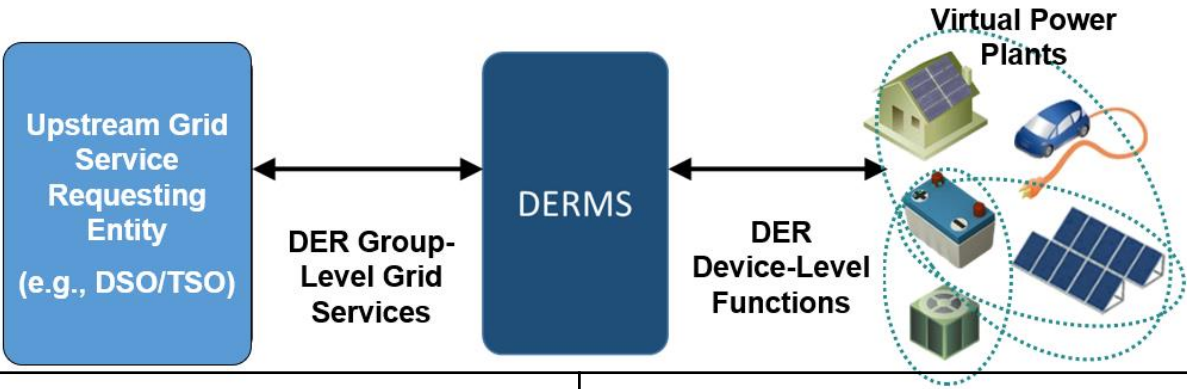
DER Group Level

- DER Group Status Monitoring
- DER Group Real Power Dispatch
- DER Group Reactive Power Dispatch
- DER Group Voltage Regulation Function
- DER Group Maximum Real Power Limiting
- DER Group Ramp Rate Limit Control
- DER Group Phase Balance Limiting
- Set DER Group Curve Functions
- Provide Price to DER Group
- Manage Power at a Point of Reference
- Connect/Disconnect DER Group

DER Device Level

- Status Monitoring Points
- Limit DER Power Output Function
- Fixed Power Factor Function
- Volt-Var Function
- Watt-Var Function
- Volt-Watt Function
- Frequency-Watt Function
- Low/High Voltage Ride-Through Function
- Low/High Frequency Ride-Through Function
- Connect/Disconnect Function

Communication Protocol



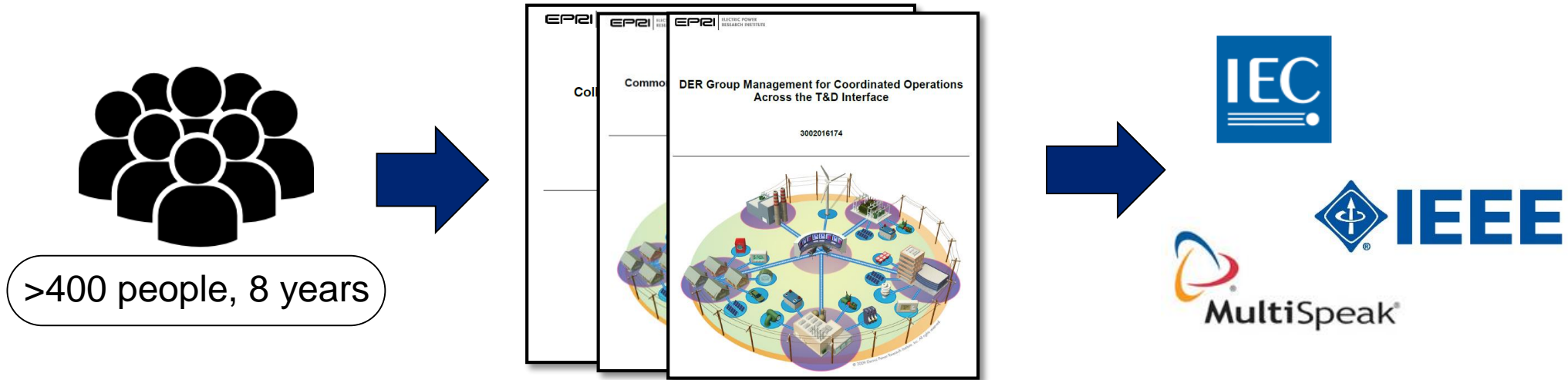
UCAI Users Group, CIM for DER certification and listing.	SunSpec Alliance
UCAI Users Group, CIM for DER compliance testing	<ul style="list-style-type: none"> • IEEE 1547.1 • UL1741SA • SunSpec Alliance
Not Applicable	<ul style="list-style-type: none"> • Multiple worldwide, unique by region • IEEE 1547-2018 (specific set) • CA Rule 21 (specific set)
<ul style="list-style-type: none"> • IEC 61968-100-2013 • Multispeak 5.0 • OpenFMB • OpenADR (mapping considered) • IEEE 2030.5 (mapping considered) 	<ul style="list-style-type: none"> • SunSpec Modbus • DNP3 AN2013-001, AN2018-001 • IEEE 2030.5 • IEC 61850-8-2
IEC 61968-5 (CIM for DER)	IEC 61850-7-420

Recent Motivation – Address FERC O2222 Requirements

- DSO
 - Requirements for operational control systems e.g., DMS/DERMS/SCADA
 - Evolving interconnection challenges
 - Coordination frameworks
- ISO
 - DER participation models
 - Telemetry requirements for performance verification and settlement
- DER owner (DER aggregator)
 - Enabling DER control and communication systems to meet ISO/DSO requirements



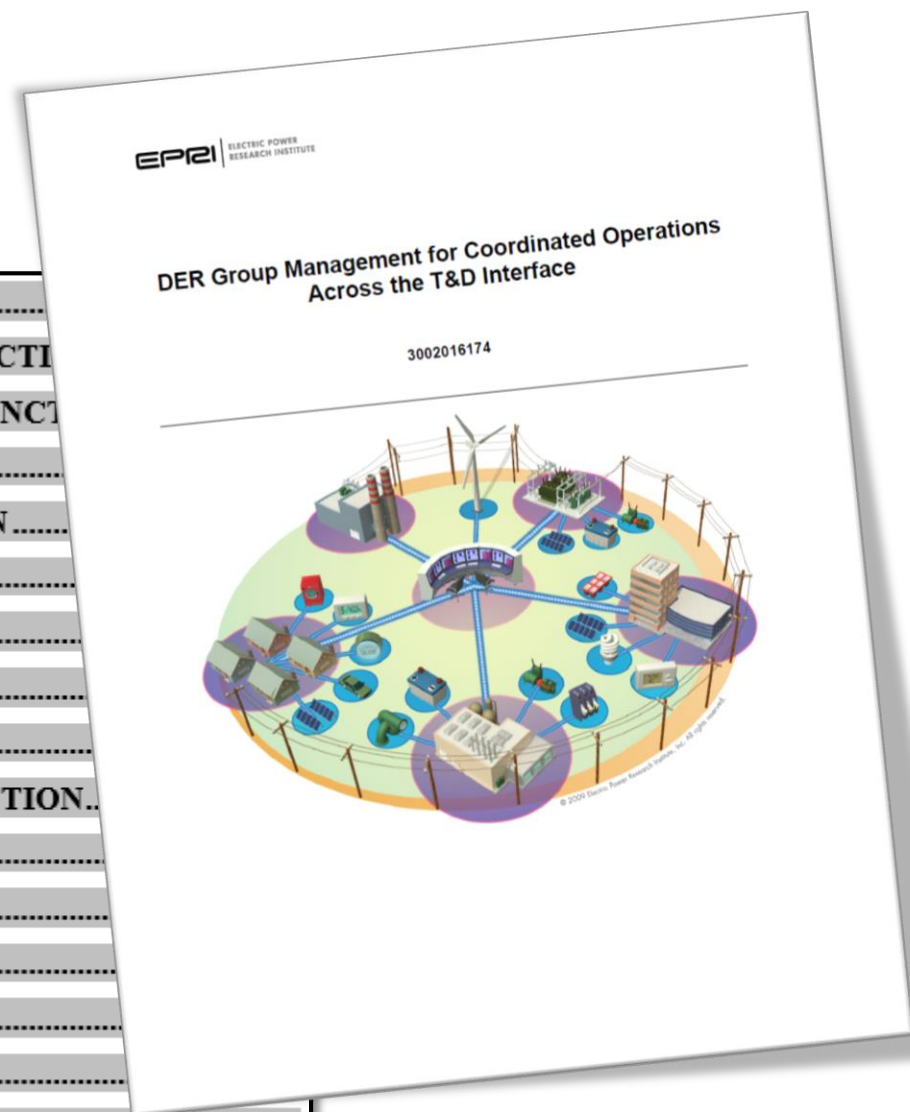
Goal of the Initiative



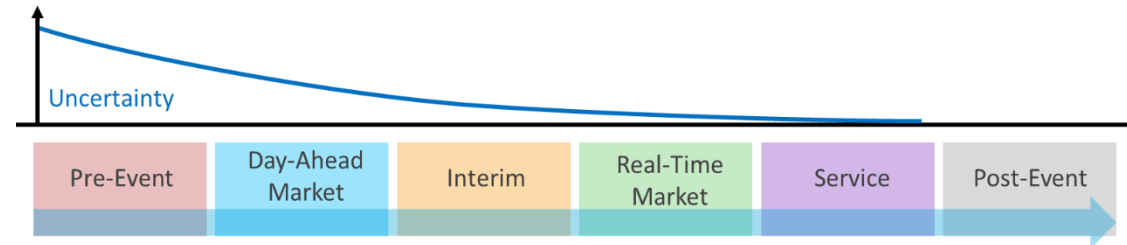
- Address fundamental needs for ISO/DSO coordination through a menu of well-defined technical functions/interactions
- Inform functional requirements of operational control systems e.g., DMS/DERMS/SCADA to address O2222
- Streamline ISO/DSO integration through standardization
- Support reference implementations for planning studies

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Timeframes of Applicability by TSO/DSO Function



FUNCTION	TIMEFRAME						TYPICAL ROLES
	Pre-Event	Day-Ahead Market	Interim	Real-Time Market	Service Period	Post-Event	
Device-Level Service Plan (DLSP) Notification			X				AGG→DSO
Device-Level Constraint Notification			X		X		DSO→AGG
DSO Device-Level Limiting and Notification					X		DSO→DER DSO→AGG
DER Group De-rate Notification			X		X		AGG→ISO
DER Group Service Point(s) Discovery/Notification	X		X		X		DSO→ISO, DSO→AGG

Addressing FERC O2222 Requirements

section, clause no. and the associated description of each interaction from FERC order 2222

Timeframe, associated parties interacting and the information exchanged

status (not addressed/indirectly addressed/addressed) of the interaction & the relevant chapter in the report

FERC Order 2222 Section	Clause	Ref	Description	Timeframe	Implications		Treatment in the TSO/DSO Coordination Document	
					Parties Interacting	Information Exchanged	Status	Relevant Chapters
	310	(2)	(2) require the distributed energy resource aggregator to report to the RTO/ISO any changes to its offered quantity and related distribution factors that result from distribution line faults or outages	Day-Ahead through Service Performance	DSO to DERA DERA to ISO	De-rates, updated DX factors	Addressed?	18 DER GROUP SERVICE POINT(S) DISCOVERY/NOTIFICATION FUNCTION 30 DER TO SERVICE-POINT ASSOCIATION 28 DER GROUP DISTRIBUTION LOSS FACTORS 24 DER GROUP DE-RATE NOTIFICATION FUNCTION
	310		we require each RTO/ISO to revise its tariff to include coordination protocols and processes for the operating day that allow distribution utilities to override RTO/ISO dispatch of a distributed energy resource aggregation in circumstances where such override is needed to maintain the reliable and safe operation of the distribution system.	Day-Ahead through Service Performance	ISO to DSO DSO to ISO DSO to DERA	Dispatch override	Indirectly Addressed	21 DEVICE-LEVEL SERVICE PLAN (DLSP) NOTIFICATION FUNCTION 22 DEVICE-LEVEL CONSTRAINT NOTIFICATION FUNCTION 24 DER GROUP DE-RATE NOTIFICATION FUNCTION
	312		We also require each RTO/ISO to revise its tariff to apply any existing resource non-performance penalties to a distributed energy resource aggregation when the aggregation does not perform because a distribution utility overrides the RTO's/ISO's dispatch . We find that this requirement will ensure that distributed energy resource aggregations are subject to non-performance penalties similarly to other resources participating in RTO/ISO markets. We note that this requirement will incent distributed energy resource aggregators to register individual distributed energy resources on less-constrained portions of distribution networks in order to minimize the likelihood of incurring non-performance penalties from the RTO/ISO.	Day-Ahead through Service Performance	DSO to ISO?	Override Notification	Addressed?	23 DSO DEVICE-LEVEL LIMITING AND NOTIFICATION
IV.I Modifications to List of Resources in Aggregation	336	N/A	We require each RTO/ISO to revise its tariff to specify that distributed energy resource aggregators must update their lists of distributed energy resources in each aggregation (i.e., reflect additions and subtractions from the list) and any associated information and data, but that, when doing so, distributed energy resource aggregators will not be required to re-register or re-qualify the entire distributed energy resource aggregation.	All Timeframes, Ongoing	DERA to ISO DERA to DSO	Changes to DER group makeup	Addressed?	8 DER GROUP MAINTENANCE (ADDING, UPDATING AND DELETING MEMBERS)



Together...Shaping the Future of Electricity