Collaborative Non-Profit DER Registry Briefing

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Collaborative UTILITY SOLUTIONS

EMPOWERING THE ENERGY TRANSITION

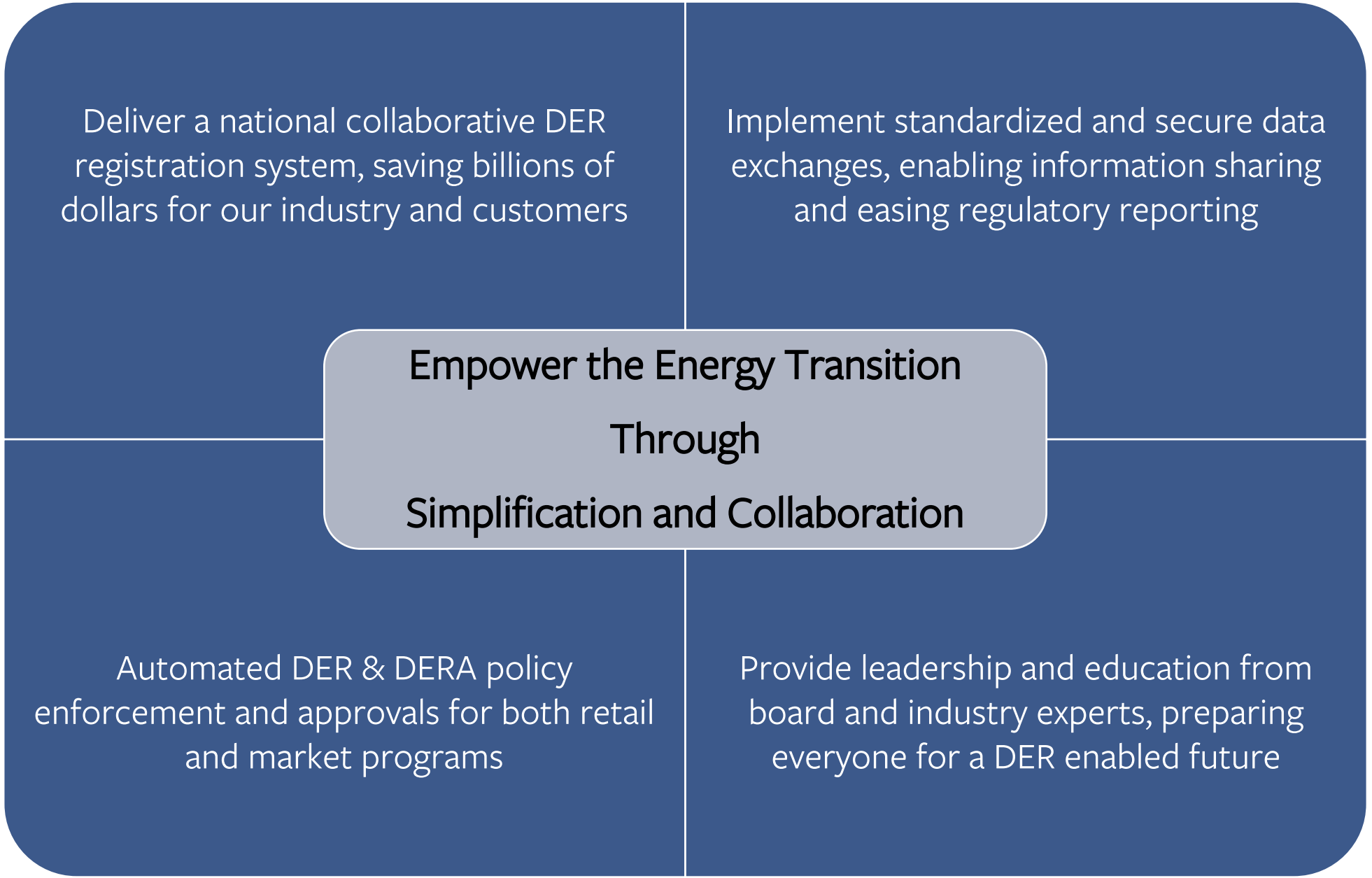
FERC Order 2222

Four primary categories for successful implementation

1. Legislative/Regulatory to enable (On-going for next several years)
   - Includes things like permitting (SolarAPP+), standards adoption (1547-2018) and interconnection process/administration (PowerClerk).
   - Phased/Tiered – MO LBNL report
2. DER Administration, Data Sharing and Retail/Market enrollment for DER Aggregations – DER Registry (Needed now)
3. DER Operational Coordination – NREL PRECISE (Needed in a couple of years for most areas)
4. Settlement (Needed in a couple of years for most areas)

PJM Filing Update

- Effective date February 2, 2026
- Broke 60 day review into 15 day capability review and 45 day reliability review
- If a RERRA has opted out of DR Aggregation, PJM will exclude any DER aggregation that has DR in it
- If you want to do multi-nodal aggregations, you are stuck with energy market only
- Unless you play in energy market only, you are subject to telemetry requirements
- Officially punted dispute resolution in major part to the states – governance a key issue even more than before
- Gave broad latitude to DSO's for 'override' as long as they can explain why they are over riding
- But followed with: …in both the day-ahead and real-time markets, PJM anticipates all communications to flow to and through the DER Aggregator. For example, PJM will make available directly to the DER Aggregator all day-ahead schedules and real-time dispatch instructions. …Although PJM and the Electric Distribution Company will maintain informal communications as necessary, at this time, PJM is not establishing a formal role in the Tariff related to operational coordination between itself and the Electric Distribution Company.



What is our purpose at Collaborative Utility Solutions (CUS) and Creation Energy (CE)?

The very foundation of the entire electricity model is shifting from a central station generation model to a distributed generation model. To successfully transition to this model and benefit customers *and* the grid, we must effectively collaborate across all industry segments and stakeholders. Therefore, our goal for CUS and CE is:

EMPOWERING THE ENERGY TRANSITION

The core of our mission – *to advance and support the electric industry by developing, enhancing access to, and enabling data and technology regarding Distributed Energy Resources to support a clean energy future.*

DERs Are Not Well Understood

- Many view DERs as a problem instead of a potential solution.
- Use Cases for DER applications in grid and markets are limited and inconsistent across the world.
- Standards (IEEE 1547-2018, UL 1741 SA & SB and IEEE 2800) are not being adopted consistently. Therefore, the industry does not have a common frame of reference for Use Case development of these resources, and this leads to 'inadequate' resources continuing to be deployed into our grid systems.
- Terminology not 'standard' – What's a DER (Who's definition? Market, Reliability or other?) NERC U-DER and R-DER not mainstream yet.
- Expected penetration rates for DERs vary widely based on the vendor, utility, ISO, or agency model. This is creating inconsistent 'urgency' to adequately characterize and integrate DERs into the grid and markets.
- Regions like Australia, Germany, Ireland, California and Texas that have high penetrations of DERs/IBRs have experienced cascading outages and have identified a Registry as the key component to help resolve issues.

DER Initiatives Around the World

Immense amount of activity you should be aware of to eliminate redundancy

FERC

- 2222 Ruling and ISO DER Working Groups (Dozens of State Regulatory dockets opened)
- RM22-12 DER Data and Modeling
- First Use Policy
- 719 Removal of Opt-out Discussions

DOE

- Joint Project with NARUC on DER data needs
- DER Services list/matrix
- Grid Codes for DERs

Australia

- Inverter potential replacement
- Implementation of first DER Registry
- Instantaneous Renewable Energy over 90%, moving to 100%, grid implications

EU

- Registry Standard

DER Initiatives Around the World (cont)

Immense amount of activity you should be aware of to eliminate redundancy

NARUC
- Joint Initiative with DOE on DER data
- Joint Initiative with NASEO DER Integration and Compensation (DERIC)**

NAESB
- 2023 WEQ Plan

NERC
- RM22-12 Interaction with existing SAR processes on DER Data needs for reliability
- The *Reliability Guideline: Modeling DER in Dynamic Load Models*, published in December 2016.
- The *Reliability Guideline: Distributed Energy Resource Modeling*, published in September 2017.
- The *Reliability Guideline: Parameterization of the DER_A Model*, published in September 2019.
- Cyber Security for Distributed Energy Resources and DER Aggregators published in December 2022.
- SPIDERWG

IEA
- Unlocking the Potential of Distributed Energy Resources

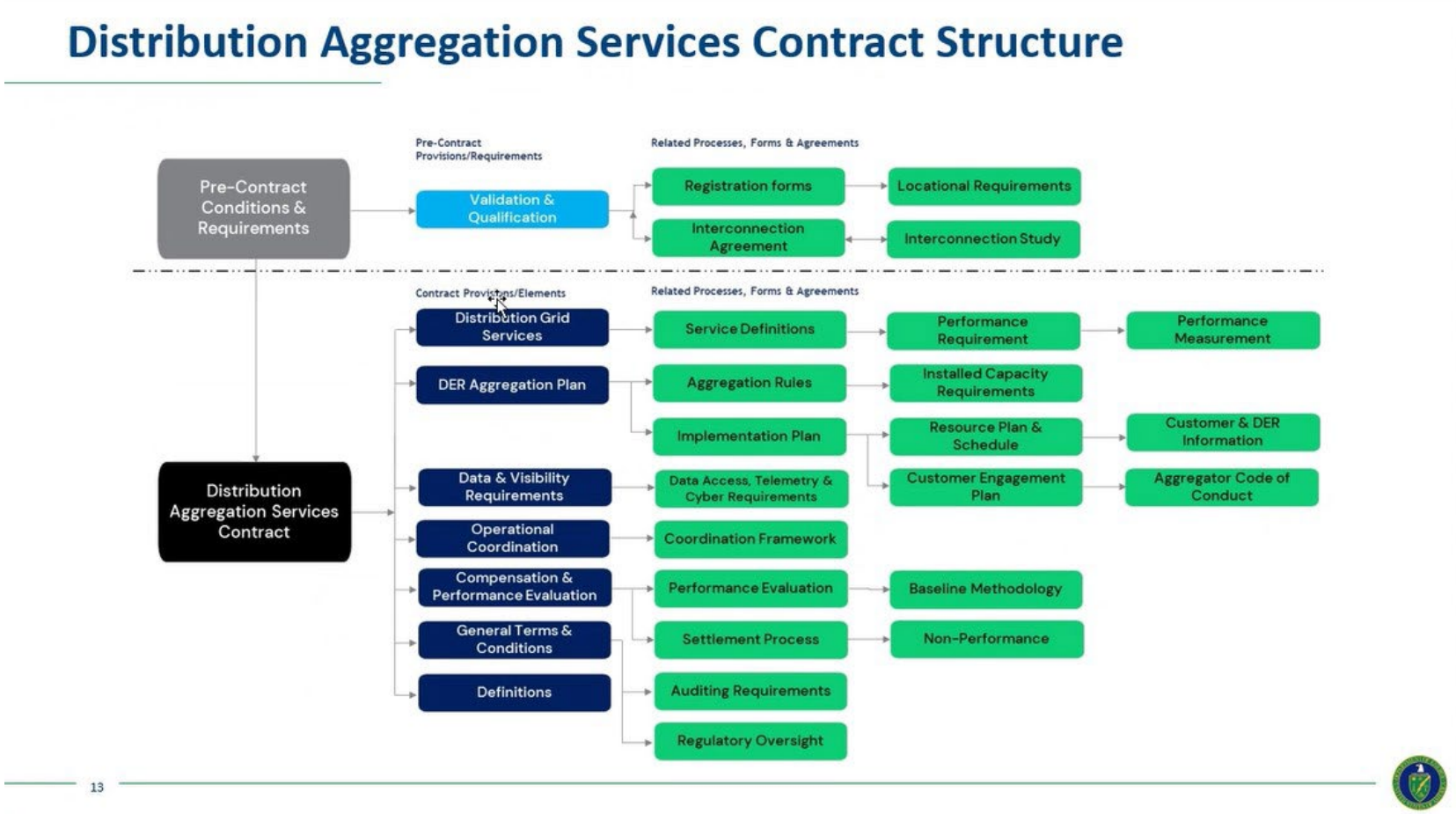
DOE OE – Distribution Transformation Project
- Aggregator Code of Conduct
- Contractual Mechanism to resolve Governance/Oversight Issues without Legislative process

And many more . . .

#1 Issue Discussed: State Governance/Oversight of Aggregator

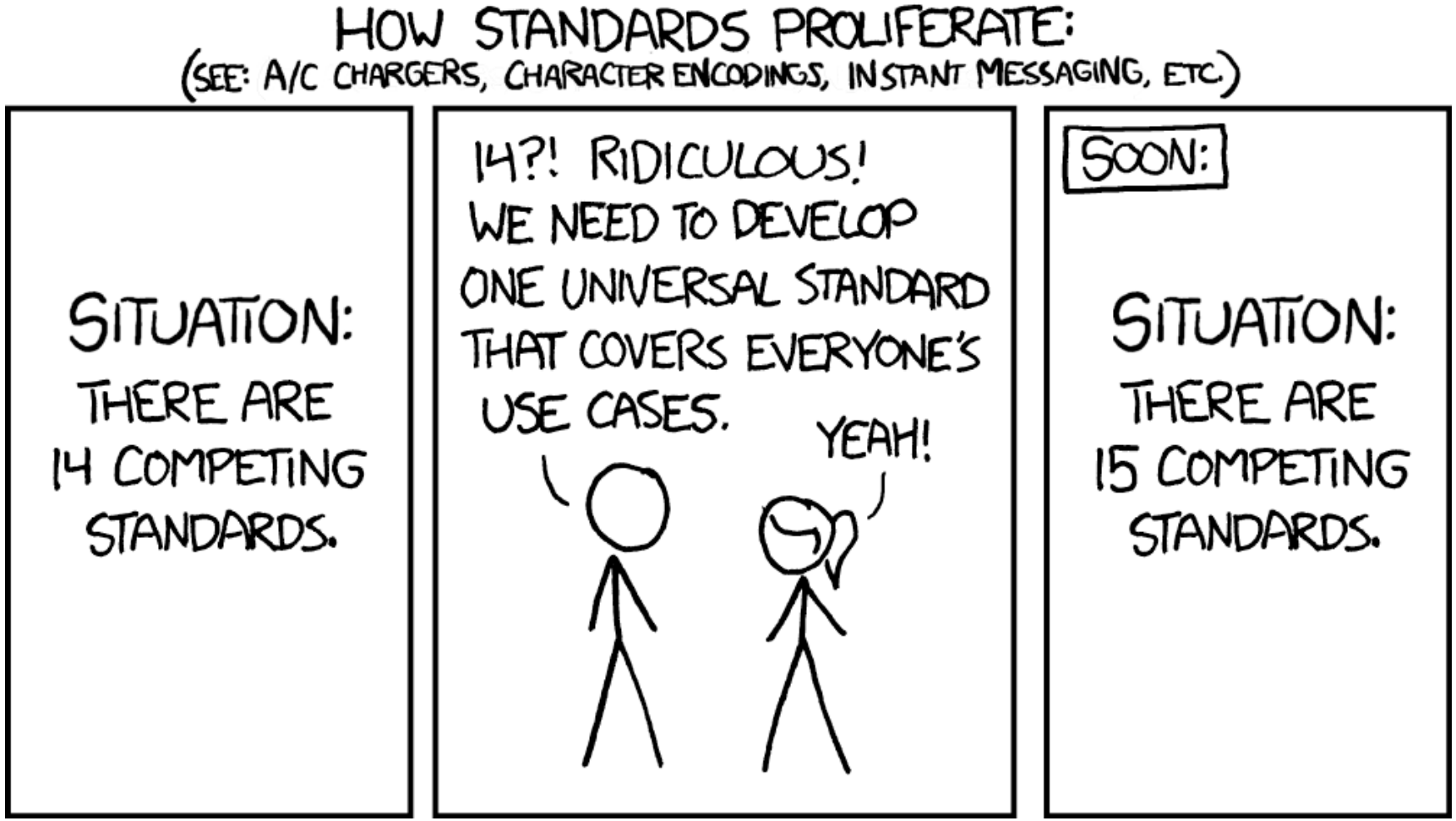
MO LBNL Report 'Tiered Approach'

- Tier 1 – Bi-lateral Contract/Code of Conduct
- Tier 2 – Aggregator as 'public utility' with Commission defined scope of regulation
- Tier 3 – Legislation/Regulation



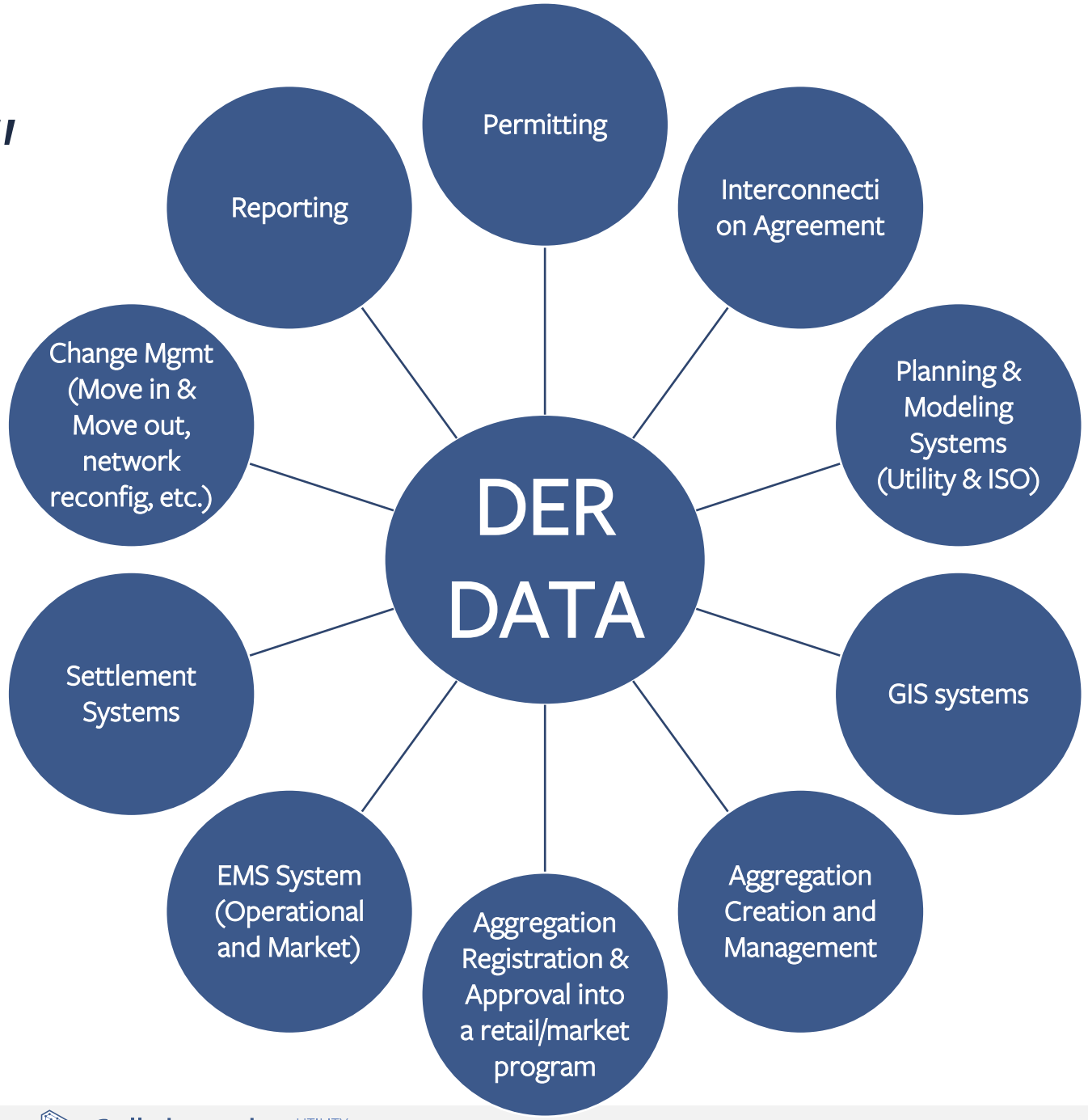
Collaboration Must Increase

We have the opportunity to get in front of this and simplify through collaboration



DER Data "Uses"

Isolated Efforts by any single group or function create barriers to successfully enable DERs



What's in a Registry and Why?

Process must be 'physics based' not 'policy based'. Can't be hung up by naming conventions, market structures, and corporate structures. What is the core data required to enable DERs to make it all work?

Aggregators	Regulator	ISO	Utility	Customer
All ISOs have different approaches but have to operate across them all	Federal vs State	FO 2222 Compliance	Customer Service	Equipment
Systems integration with all	New rules/tariffs/etc	Systems	Distribution	Interconnection
Customer Interaction	Customer protection	Tariffs – Market Products	Transmission	Operation
Business Models	Utility cases	Operations	Generation	Maintenance
Etc	Etc	etc	Regulatory	Cost
			Trading	Programs
			etc	etc

REQUIREMENTS

- Requirements pouring in by the dozens/hundreds
- Each major group and their subgroups have their own concepts

Pre-Competitive DER Registry

The Base Data Set required for all stakeholders.

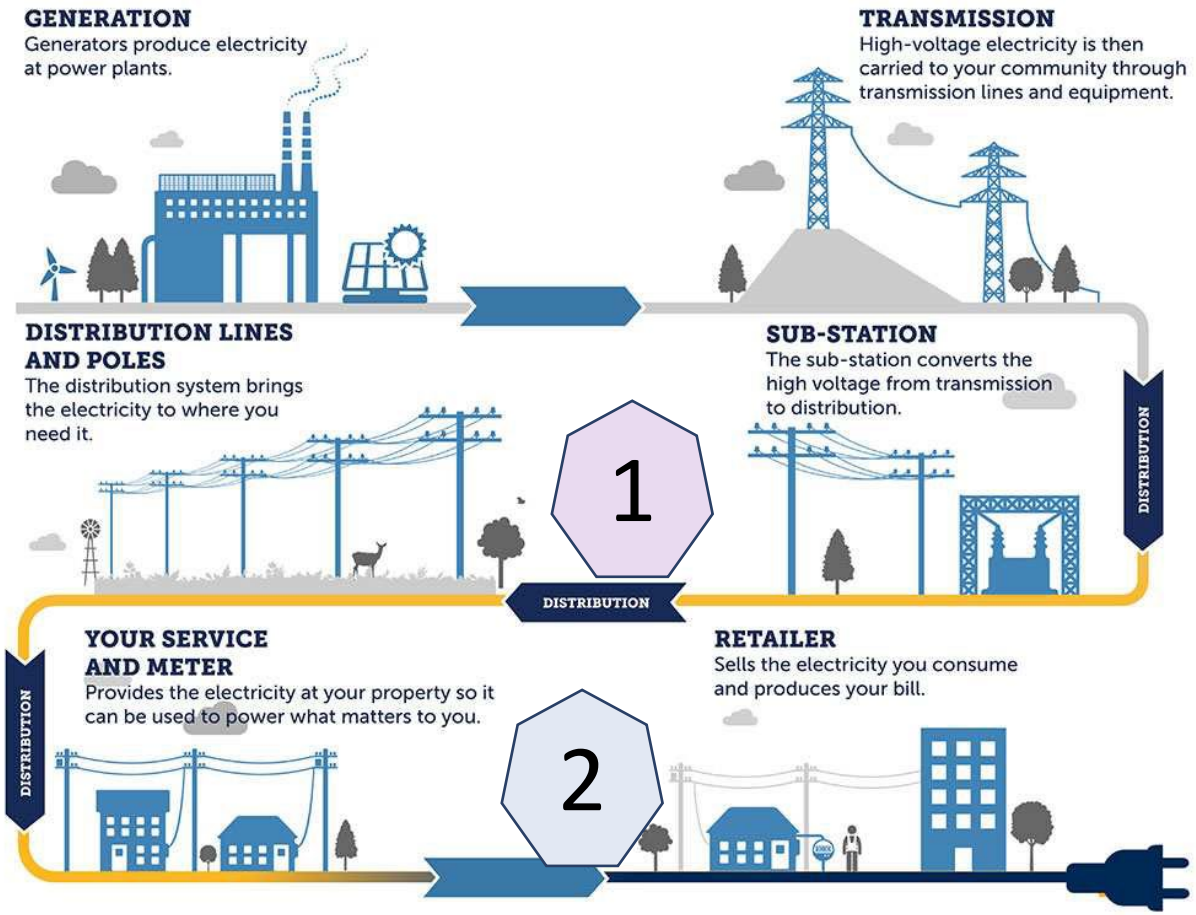
Shared Data: Enabling DERs through Collaboration

To meet the challenges before it, the industry must know:

WHAT IS IT?	•Solar, wind, battery, EV, mix of several, etc.
WHERE IS IT?	•Geospatial coordinates with premise address, utility meter, and Geospatial Interface. Electrical position in the network: Premise-Meter-Transformer-Feeder-Sub-Transmission-ISO Node/Region.
WHAT CAN IT DO?	•Capability and dispatchability.
WHO OWNS IT?	•Who can register and market?

All stakeholders (Utilities, ISOs, Aggregators, Scheduling Coordinators, Competitive Retail Electric providers, etc.) must have fair and equal access to the data they need based on appropriate regulatory authority oversight which determines which data elements in a registry are available to each stakeholder.

Three Key Interfaces of Data Exchange for DER



Interface	System Description	Business Description
1	EHV/Bulk Electric System interface to Distribution System at the Substation	ISO/RTO operations and planning interface to Distribution Utilities at the Substation
2	Distribution System interface to Premise at the Meter	Utility/Retailer interface to Consumer at the meter
3	Market Systems	DER Interface to Market and Utility Programs

Market/Program

The Registry must be built with CIM in mind

"déjà vu all over again"
– Yogi Berra

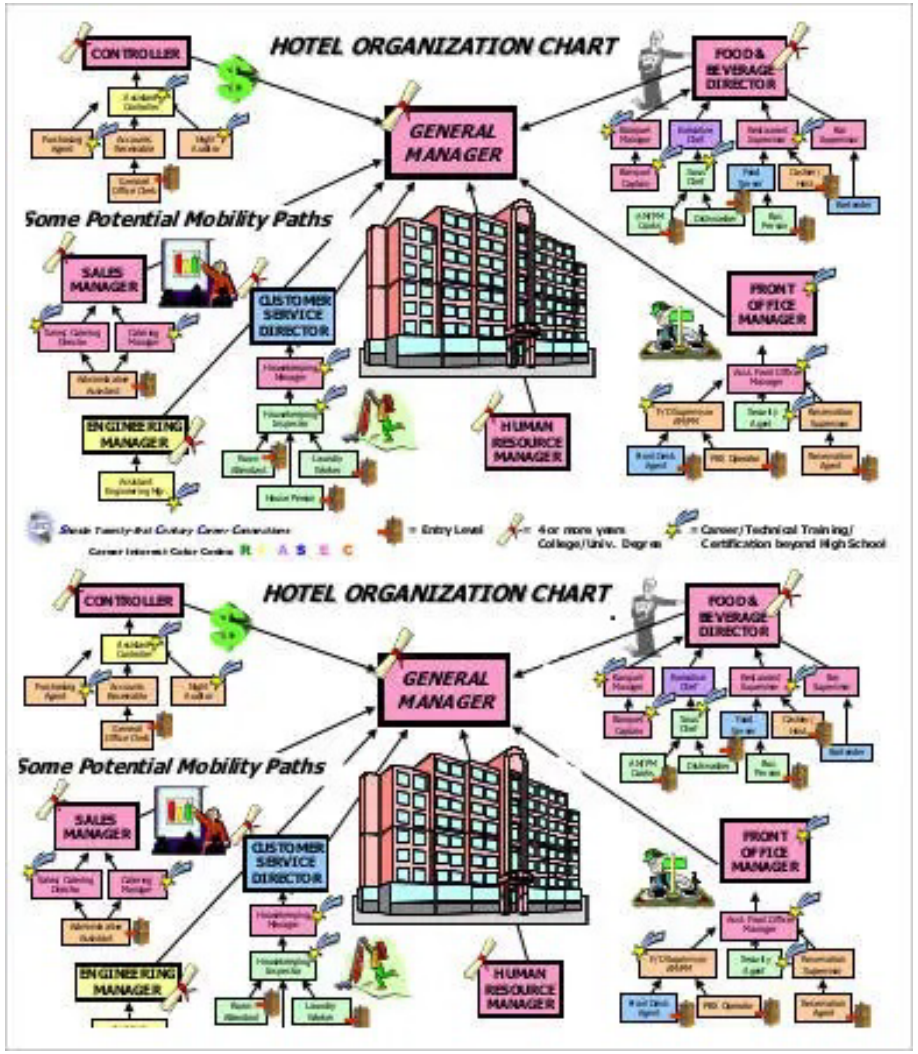
Solving the same exact problem but for millions of generators instead of a few thousand. Will it take us another decade?

The Common Information Model (CIM) was developed as an open standard for representing power system components. CIM was originally developed by EPRI in North America and is now a series of standards under the International Electrotechnical Commission (IEC)

This format has been adopted by the major EMS vendors.

Solving the 'DER Interface' is the exact same issue, just for millions of small generators vs tens of thousands of big generators.

Why Share Data and Who Makes the Call?



- Makes perfect sense to all of us that the General Manager would want to see all of the data from all groups, right?
- Does it make sense that the Hilton CEO would want to see data from all hotels?
- Does it make sense that key suppliers would have access to some of the data?

- Now think of each hotel like a power plant:
  - Anyone here go through the process of getting groups to share data at a plant? Or across all plants?
  - Or getting different silos of your utility to share data or plan for a common system?

- Now think of DERs, not personally from where you sit in a part of an organization, but from the overall grid reliability, safety, affordability and sustainability. If you sit in a DSO, you may not want to share your information, but if you sit at NERC or an ISO, you know that you also need that information for overall grid reliability.

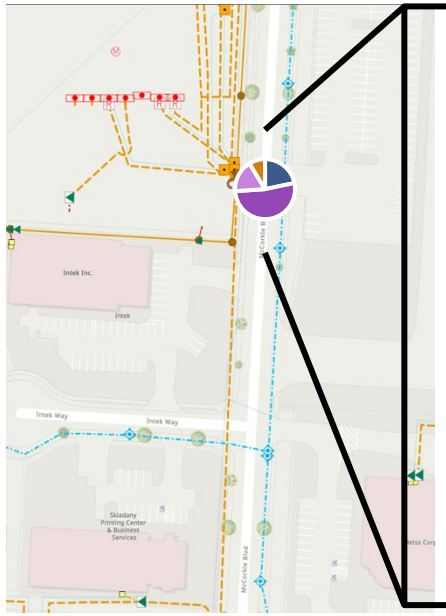
Data Access

Data Access to the information in the DER Record is determined by each appropriate regulatory authority. The Registry allows this dynamic ability for each regulatory authority to define who shall have access to each data element in the Registry.

WHO HAS ACCESS TO THE DATA? (Each Regulatory Authority to define)										DER RESOURCE RECORD CREATION		
										*REQUIRED DATA		DER Registry
Sched Coord	Comp Retail Supplier	Equip Mfg	Aggregator	Regulatory Authority	ISO/RTO	TSO	DSO	Owner Agent	DER Owner	Entered by:		Field Description
										DER OWNER INFO		
	X		X	X			X	X	X	DER Owner*		First Name (As it appears on utility bill)
	X		X	X			X	X	X	DER Owner*		Last Name (As it appears on utility bill)
	X		X	X			X	X	X	DER Owner*		Address 1 (As it appears on utility bill)
	X		X	X			X	X	X	DER Owner*		Address 2 (As it appears on utility bill)
	X		X	X			X	X	X	DER Owner*		City
	X	X	X	X			X	X	X	DER Owner*		State
	X	X	X	X			X	X	X	DER Owner*		Zip
	X		X	X			X	X	X	DER Owner*		Phone Number (premise)
										DER Owner*		Phone Number (mobile)
	X		X	X			X	X	X	DER Owner*		Email
X	X		X	X	X	X	X	X	X	ESRI*		GPS Coordinates
	X		X	X			X		X	DER Owner*		Utility Account Number
X	X	X	X	X	X	X	X	X	X	DER Owner*	pick list	Distribution Utility Service Provider
X	X		X	X	X		X	X	X	DER Owner*	Y/N	Do you have a Competitive Retail Supplier (CRS)?
X	X		X	X	X		X	X	X	DER Owner*	pick list	Pick your CRS
X	X		X	X	X		X	X	X	DER Owner*	Y/N	Do you have an Aggregator?
X	X		X	X	X		X	X	X	DER Owner*	pick list	Pick your Aggregator
				X				X	X	DER Owner*	Y/N	Allow Agent to enter DER Info?
	X			X				X	X	DER Owner*	pick list	Pick your Agent
				X				X	X	DER Owner*	Y/N	Want info from equip mfg?
										DER Owner*	Y/N	Do you have a different aggregator for Demand Response?
										DER Owner*	pick list	Pick your DR Aggregator
X	X		X	X	X		X	X	X	Registry		Premise Unique ID
X	X		X	X	X		X	X	X	Registry		Aggregate DER Unique ID for premise
X	X	X	X	X	X	X	X	X	X	Registry		Date entered into registry
										SOLAR INFO		
X	X	X	X	X	X	X	X	X	X	Registry		Date Entered into Registry
X	X		X	X	X	X	X	X	X	Registry		Solar Unique Identifier
	X	X	X	X			X	X	X	DER Owner or Agent	pick list	Panel Manufacturer Name
	X	X	X	X			X	X	X	DER Owner or Agent	pick list	Panel Model Number
	X	X	X	X			X	X	X	DER Owner or Agent	pick list	Nameplate Capacity of Panel
	X	X	X	X			X	X	X	DER Owner or Agent		Number of Panels

GIS capability is needed for visualization

Different stakeholders will have different views, but this graphical interface allows rapid incorporation into grid planning and operational tools through CIM and Esri tools out of the box without custom interface.



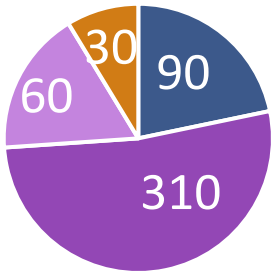
Feeder 11
Phase A: 140
Phase B: 185
Phase C: 110

Feeder 12:
None

Feeder 13
None

Feeder 14
Phase A: 55

Capacity (kW) by Resource
Pearl Street Substation
(115kV/12.47kV)



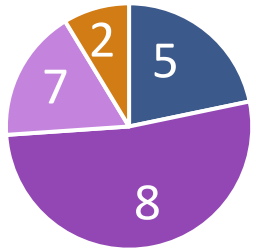
Solar Home Bat EV HEMS

Transmission Line:
Westinghouse
115kV

Transformer POI:
Pearl Street #1

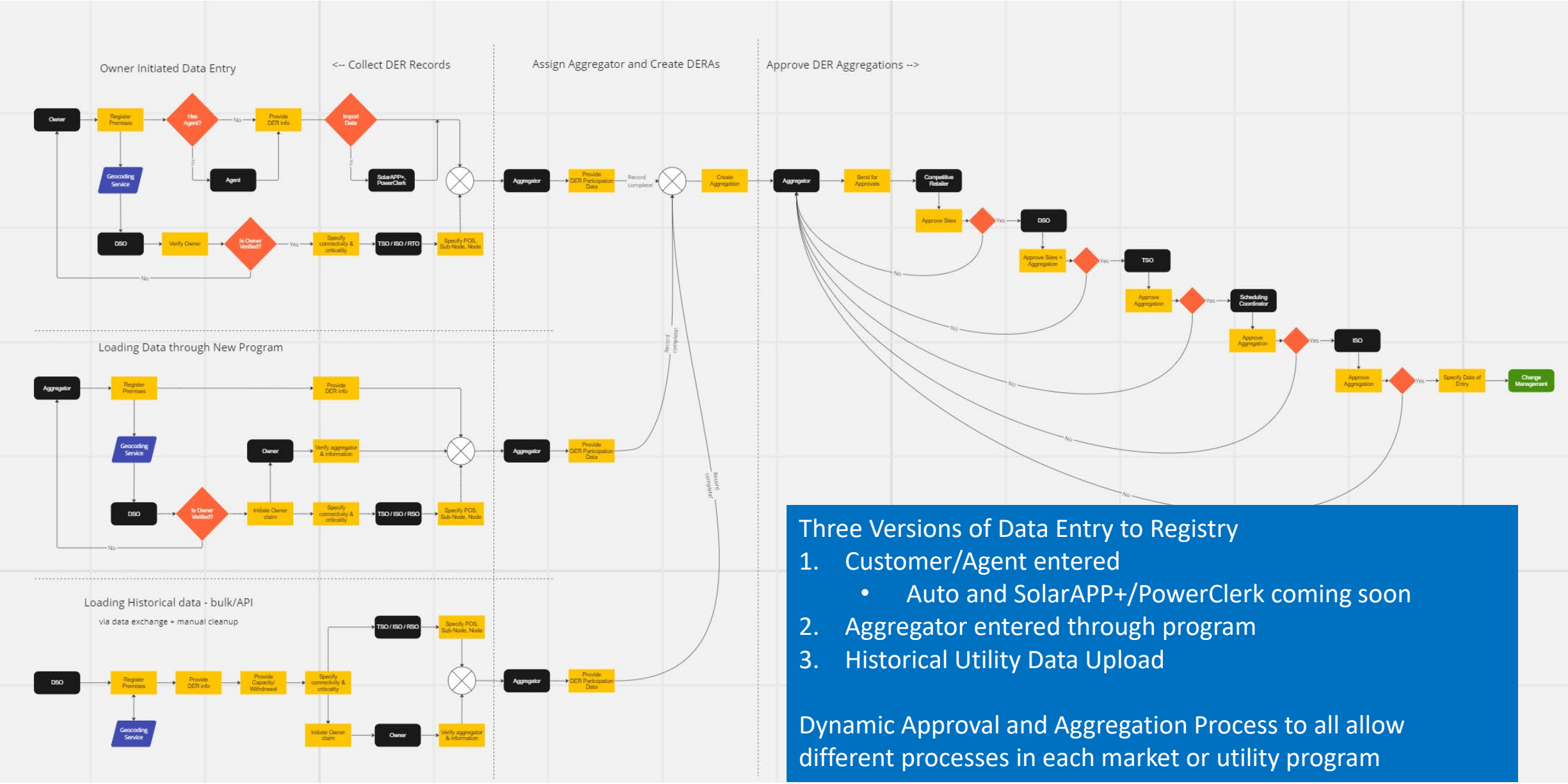
Capacity (kW) by Resource

Phase: A
Feeder: 11
Sub: Pearl Street
#1



Solar Home Bat EV HEMS

DER Data Collection and DER Aggregation Administration

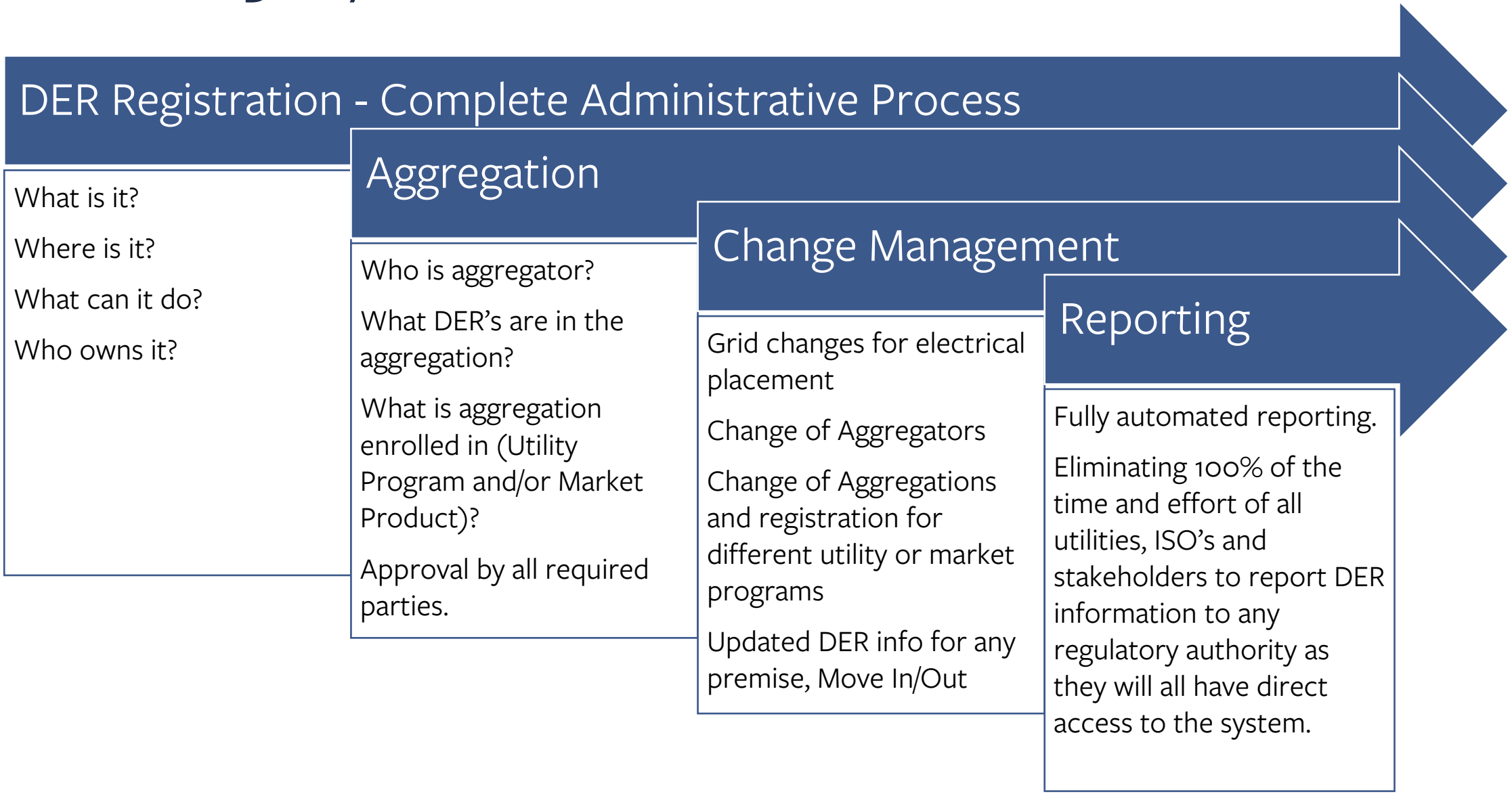


Three Versions of Data Entry to Registry

1. Customer/Agent entered
   - Auto and SolarAPP+/PowerClerk coming soon
2. Aggregator entered through program
3. Historical Utility Data Upload

Dynamic Approval and Aggregation Process to all allow different processes in each market or utility program

DER Registry: End to End Solution



Two ways to develop a DER Registry

Business as Usual – For Profit

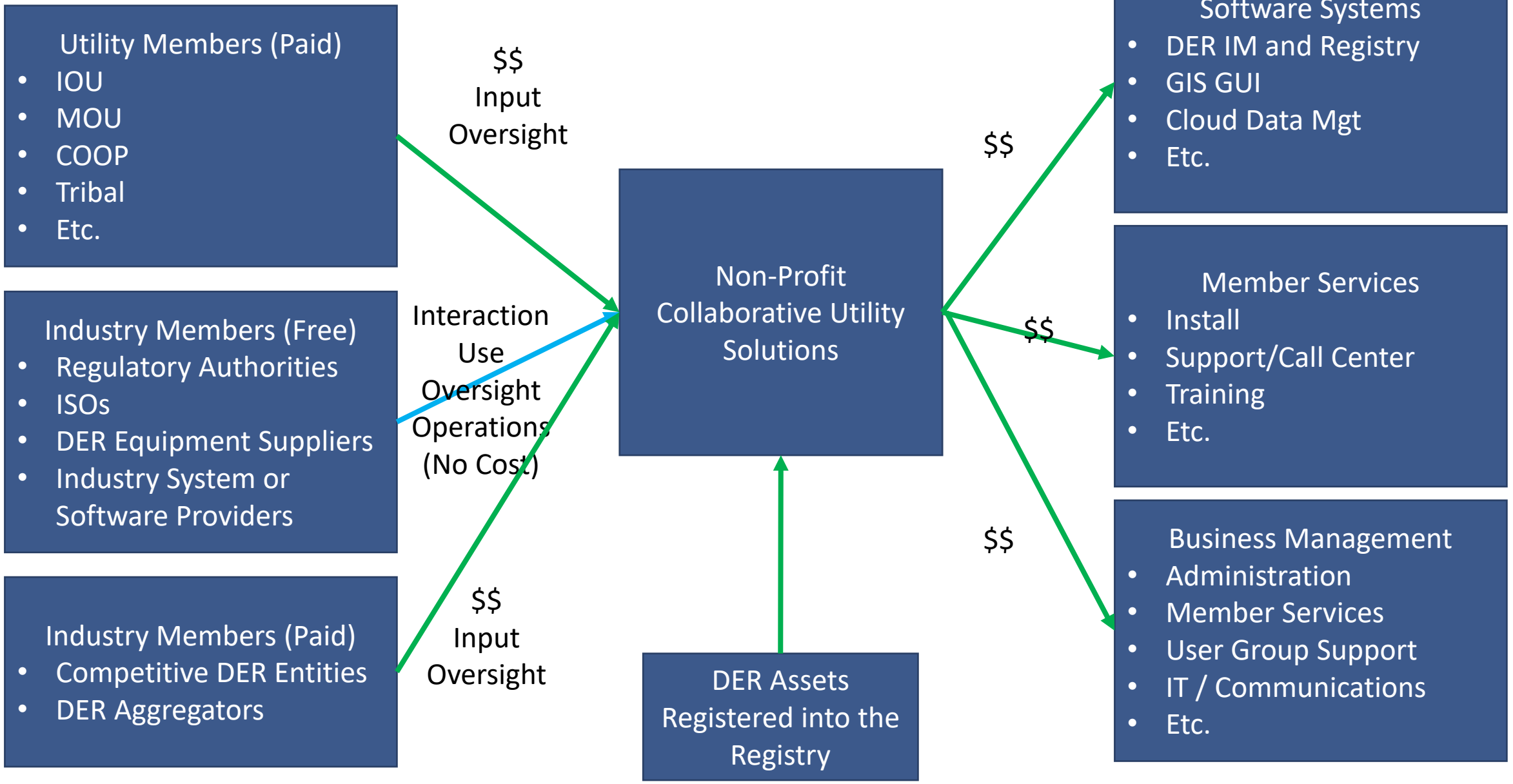
- Multiple Vendors/Platforms with no common requirements or control
- 3000+ Utility/ISO RFP processes, requirements and customizations
- Estimated at $20-$40 Billion in cost over 10+ years for utility adoption and implementation
- Proprietary Data structures requiring integration cost to any other system
- Cost continually escalate over time
- Barrier to entry for customers/aggregators requiring multiple integrations across multiple jurisdictions and organizations

Collaborative Non-Profit

- Single common platform with member defined requirements/control
- Collaborative requirements and developed for consistent use and application
- **<1% of cost** for full deployment to all utilities and ISOs in a few years
- CIM based platform to eliminate software integration to existing utility/ISO systems
- Costs continually decline with scale
- Rapid market entry for any resource as any aggregator or consumer has a single, known interface to the market/utility/ISO

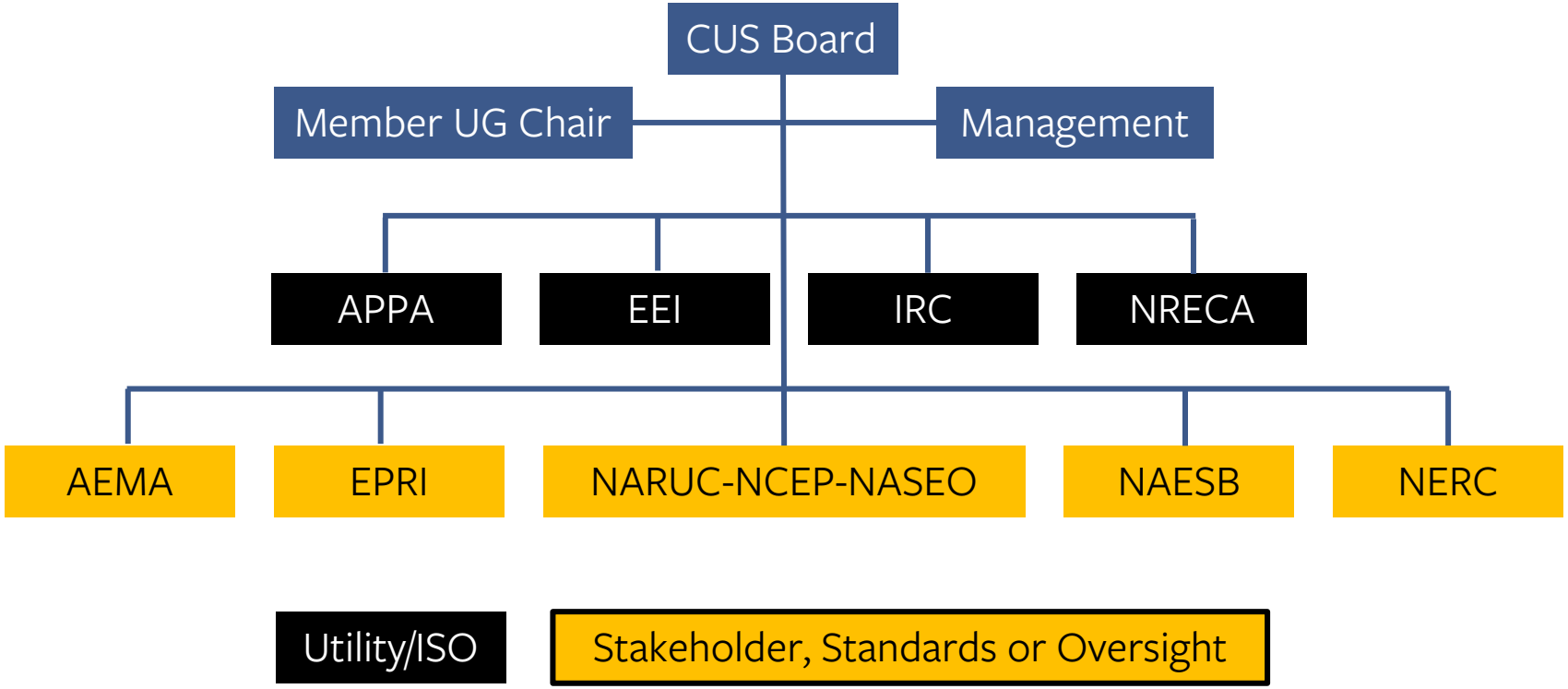
Collaboration is not always possible but enabling DERs through collaborative efforts vs 'business as usual' is possible and has multi-billion-dollar implications for the cost of energy.

Structure for Non-Profit



CUS Board Structure

- The Board of Directors is designed to be comprised of non-profit organizations that represent the segments of the electric industry and set standards for, or have oversight of, the members.
- Through their user group, members will suggest, define, and prioritize changes/enhancements to the Registry. User group chair sits on the Board and will present changes/enhancements to the Board for approval.

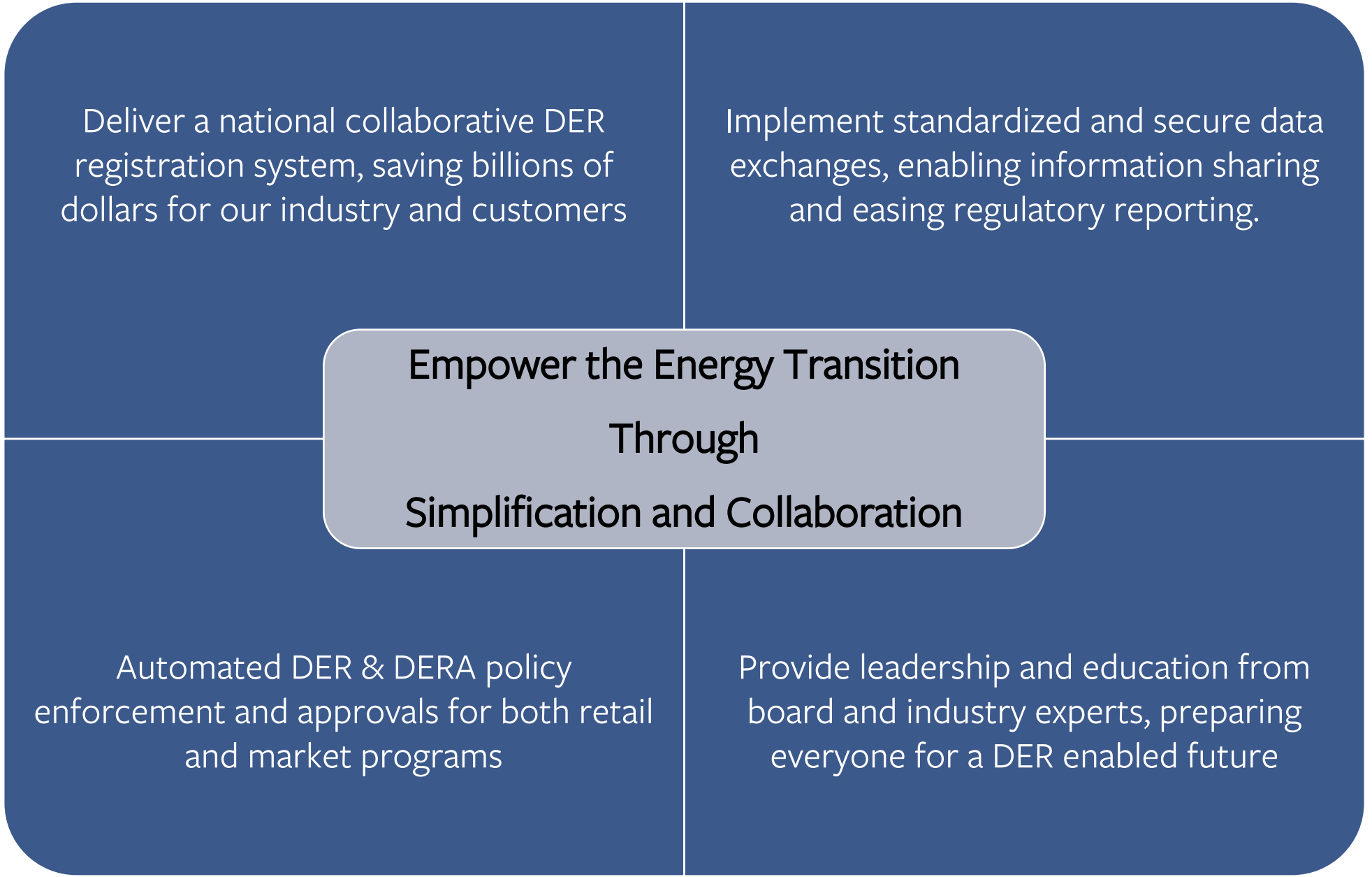


Registry Roll-Out

- Announced November 1, 2022, in partnership with Esri.
- Final Testing with current industry supporters in Q1 2023.
- Product Launch March 2023
  - ISOs/Regulatory Authorities/Equipment vendors have free access to the Registry
  - All U.S. utilities have free access to 'DER data collection' tool as of March 2023 as Limited Utility Members
- Full Members will have access to the complete suite of tools in the Registry
  - Mapping/Analysis
  - API Integration to existing systems
  - Program Coordination/Approval Process for DER enablement
  - Reporting
  - Etc.

What's coming

- API with PowerClerk to support interconnection process management
  - Shared data structure to allow the registry, permitting and the interconnection process to eliminate redundant customer entry
- API with SolarAPP+ for DER data input
  - If SolarAPP+ used to permit the DER, the data is automatically available to the registry (and PowerClerk) so customers do not have to re-enter
- Fully automated discovery and registration of equipment
  - Reduce errors in data entry and simplify process of registration and interconnection. Validation of previously entered data.
- Future API Collaboration with GIS/CIS/ADMS/DERMS/EMS systems
  - UCA Event next year



Thank You!!

- We want to thank the immense number of people and organizations that have given their time and energy to bring this Collaborative, Non-Profit DER Registry to life and serve our industry.

- And Thank You for making the time to be with us today to learn about the Registry and its purpose to serve our industry.

Q&A

- Let’s deal with the first question

  “What’s the catch?”

501(c)6 – Open book financials and Industry run board and user group

Appendix

MANAGEMENT BIOS

CHRIS HICKMAN

Chris has three decades of utility industry experience ranging from power generation to regulation to end-use customer services and technologies. He has helped companies envision the future of the industry and how their company is successful in that future. By leveraging new technologies and a vast network, Chris' career has been focused on creating opportunities to help improve the energy industry.

Chris has been a frequent contributor at a variety of utility industry events and leadership conferences, as well as having spoken before Congress, the Federal Energy Regulatory Commission (FERC), state commissions and other influential policy groups. He has served on the boards of the IEEE Power Engineering Society, the GridWise Alliance, and Avistar (an unregulated subsidiary of PNM), along with several non-profit organizations and as a member of the DOE regulatory assistance project team, helping provide a utility industry perspective to state and federal regulators regarding current policy issues. He has also helped 13 countries around the world to develop their national energy policy to enable Distributed Energy Resources.

EDUCATION

BSEE & MSEE, Electric Utility Management Program, New Mexico State University

MBA in Policy and Planning, University of New Mexico

RICHARD BEESON

Before starting his most recent ventures, Richard was CTO of OSIsoft, where he spent over 30 years creating, developing, and designing enterprise software for process industries resulting in products like the PI System, Asset Framework, and others, that actively serves the worlds power industries. In addition to his executive roles driving strategy, technology and business success, Richard has been active in numerous industry group such as Industrial Internet Consortium and Linux Foundation and has served on panels and presented on a diverse range of technical and strategic topics.

Today Richard is focused on helping realize a more sustainable, equitable and healthy future for all people through companies like Mr. Dewie's Cashew Creamery, through continuing investments in technology and through ongoing research and development driving the realization of the value of operational information.

EDUCATION

Bachelor of Science
Chemical Engineering
University of California
at Berkeley

MICHAEL JEWELL

Licensed by the State Bar of Texas since 1989, Michael has advised and represented telecommunications and energy clients, including companies and organizations focused on solar, wind, energy storage, and transmission issues, as well as large industrial consumers, energy brokers, and retail electric providers, before the Public Utility Commission of Texas, Electric Reliability Council of Texas, and the Texas Legislature. Michael also has been engaged in the Texas legislative arena working both in and out of the Capital for more than 35 years.

Michael is a frequent speaker before the Gulf Coast Power Association and at legal conferences, is a member of the Board of Directors of the Conservative Energy Network and is member of the Advisory Board of Conservative Texans for Energy Innovation.

EDUCATION

B.A. In Plan II
Concentration in ME, German, and Computer Programing
University of Texas Austin

J.D.
University of Texas Law School Austin

Support Slides

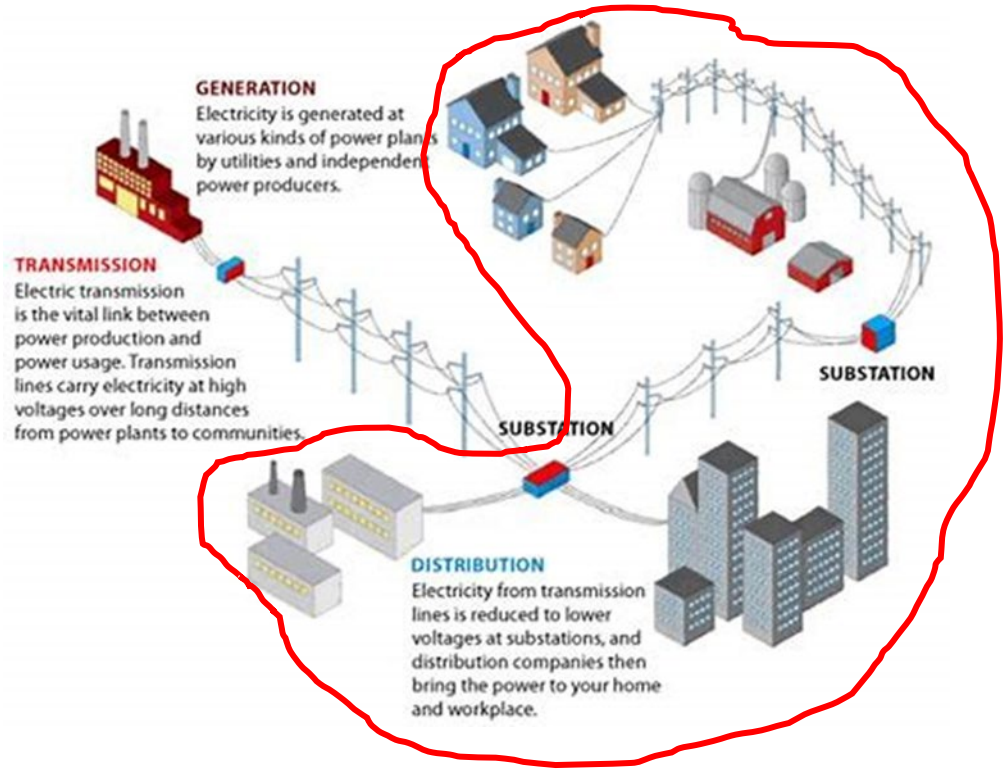
A fundamental 'Gap' has been identified

Collaborations for standards, policy and structure exist, but **we do not have a 'Tools' collaboration** to produce collaborative solutions for the industry.

- The electric industry has fragmented significantly into silos based on utility ownership (IOU/MOU/Co-op/etc.) and structure (G/T/D/ISO/IPP/Competitive/etc.) over the past few decades.
- DERs around the world are being implemented haphazardly without consistent frameworks to optimize their participation in grid and markets.
- Markets around the world have clearly documented the need for a registry (Australia, Ireland, Germany, California, etc.), but each has approached this process without a non-profit collaborative structure. This creates conflicts and 'data hoarding'.
- In all cases, one fundamental need is very clear: There must be a collaborative DER registry as a predicate for all stakeholders to allow effective grid and market adoption for these resources going forward.

Simplified Need Defined

Bulk System grid operators (ISOs/RTOs/Control Area Authorities) are forced to ‘guess’ what is going to happen each day because they have no insight on resources embedded in the distribution system.



Distribution Companies provide “Net Load” to the grid operator. For example, Net Load might be 100MW for the red circle area. However, the actual load might be 130MW with 30MW of solar. With no visibility to these DERs, the grid operator is scrambling for an extra 30MW of supply when the sun goes behind a cloud.

Planning & Operation of a Power System

- It is not possible to plan or operate a power system reliably without this baseline information of what resources are connected to the system.
- We would never allow a 3000 MW nuclear plant to connect without knowing this information and fully integrating their operation and control via CIM to the ISO EMS.
- DERs are ‘sneaking up on us.’ For example, according to ERCOT, there already are about 3500MW of registered and unregistered DERs on the Texas grid now. One California event and the two Odessa, TX outages are pointed out in the NERC reliability reports and are directly tied to IBRs and their performance.
- An ISO or Utility is unable to effectively do its job to plan and operate the grid without this information.

DER Registry Service Security

- Committed to Security (Security Development Lifecycle)
  - Development starts with and maintains clearly defined security and privacy requirements
  - SDL best practices
- Committed to Privacy Rights (CPRA Compliance)
  - California Privacy Rights Act (US based closely aligned to GDPR) compliance
  - Additionally, will follow any requirements for any applicable regulatory authority
- Committed to Government Compliance (FedRAMP Authorization)
  - Best practices for cloud service providers
- Service and Organization Committed to Zero Trust Architecture
  - Every level of service is based on zero trust NIST recommendations and evolving best practices – no assumed rights across any boundary

DERs done 'right' – A few Use Cases

DERs are creating significant issues on the grid worldwide largely due to how they are being incorporated with no operational visibility and control. However, if DERs are incorporated with Utility/ISO visibility and control, they **CAN** solve many different problems like power factor and phase balance. Solving these problems will dramatically reduce planned infrastructure costs for distribution and transmission network upgrades, billions of dollars for future grid investment.

1. Correct Power Factor to Unity on each feeder.
2. Correct Phase Balance
   - DERs can help solve phase balance issues on the distribution grid. This has been proven through actual deployments to reduce feeder and customer losses by more than 40%. This creates significant EE effects and extends the life of every electrical device on the grid.
3. Significantly Reduce Technical Losses on the Grid (EE). With appropriate four-quadrant inverter specification (1547-2018), it is possible to 'dial' watts and vars from each DER. This has been proven through actual deployments to reduce feeder and customer losses by 6-12%. They can also be used to help balance the three phases, another 30%-40% in technical losses on feeders. Correcting Power Factor and Phase Balance creates significant EE effects and extends the life of every electrical device connected to the grid. It also creates 'new' capacity for additional electrification.
4. Mitigate ramps
   - Morning and afternoon ramps with solar are creating significant issues that active DER control can mitigate/eliminate. (Duck Curve)

DERs done 'right ' – A few Use Cases (cont)

5. "Head room capacity" for EVs
   - Through targeted deployment, it is possible to create capacity on each feeder for the electrification of transportation (EVs) without costly feeder reconductors and substation upgrades. Deploy DERs to defer, or eliminate planned feeder or substation upgrades.
6. Wholesale portfolio use (Energy/Capacity/Ancillary Services in Markets and IRP outside)
   - While DERs could be used for distribution purposes 90%-95% of the 8760 hours, they also can be aggregated for 5%-10% of the hours of the year to lower the cost of the wholesale power portfolio each day through net load adjustments and for hedging offsets, reduced reserve margin requirements, 4 CP mitigation, spinning reserves, non-spinning reserves, and grid emergency services like UFLS and UVLS first stage performance.
   - Day of/Day Ahead use for loss of units or other grid anomalies.
   - Utility Scale Renewable Balancing – DER Storage to balance and optimize use of utility scale renewables.
7. Reliability and Resiliency
   - Improve Volt/VAR management on each feeder.
   - Minimize, and eliminate over time, VAR transport on the bulk electric grid. This will dramatically improve stability margins in grid operation and support 'inertia/system strength'.
   - Provision community reliability and resiliency for major weather (ice, tornado, etc.) events for critical care customers, police/fire/emergency response, community centers, etc.
   - If critical care/emergency response are supported with DERs, utility crews can address the larger outages sooner rather than reserving a significant number of crews for these types of customers.

The Importance of Information Sharing

Information sharing has and does work. But it works because the parties see that the benefits (better protection, detection and response) outweigh the risks. History also teaches, however, that information sharing tends to work best when those involved trust each other to respect informal and sometimes formal agreements (e.g., non-disclosure agreements) on information use and disclosure.

-Scott Charney

DER and DER Aggregation Administration

- Approval process by any market or utility program will require sign off by the necessary industry entities for the DER and/or DER Aggregation. In the US, this will include entities such as Competitive Retail Suppliers, DSOs, TSOs, Scheduling Coordinators, and the ISO/RTO for ISO/RTO-based programs.
- These names may be different by market. Competitive Retail Supplier could be a Retail Electric Provider in another market. A Scheduling Coordinator could be a Qualified Scheduling Entity.
- For each market or utility program, the registry must capture the approval/rejection of an individual DER or DER aggregation by the appropriate entities.
- Registry includes a dynamic Administration Engine for DER and DER Aggregation Administration/Approval.

Reporting

- ‘Standard’ DER reports by:
  - Utility
  - ISO
  - Geographic area (city, county, state, country)
  - Aggregator
- ‘Custom’ Reports as defined by Members
  - History, Trending, etc.
- Tools for agencies like EIA to have access to the data for reporting
- Fully automated to eliminate time and cost requirements for all stakeholders (Utilities/ISO’s/Aggregators/Regulators/etc.) to develop and deliver data and reports

The Registry must be built with CIM in mind

- The Common Information Model (CIM) is an abstract information model that provides data understanding through through the identification of common features or attributes for different objects and how those objects are related to each other within a utility enterprise.
- This enhanced data understanding supports the exchange of data models and messages and increases the ability to integrate applications both within the enterprise and with trading partners.
- These trends go beyond exchange or updates of network models to the exchange of specific dynamic data within transactional messages in a real-time environment.
- Using industry CIM eliminates custom and costly interfaces.

CIM Interface Reference Model

For the electric industry to be able to effectively operate millions of pieces of equipment from hundreds of vendors, the CIM reference model must be utilized to be able to exchange key data without custom, costly software interfaces.

CIM is the electric utility industry's version of "Plug-N-Play

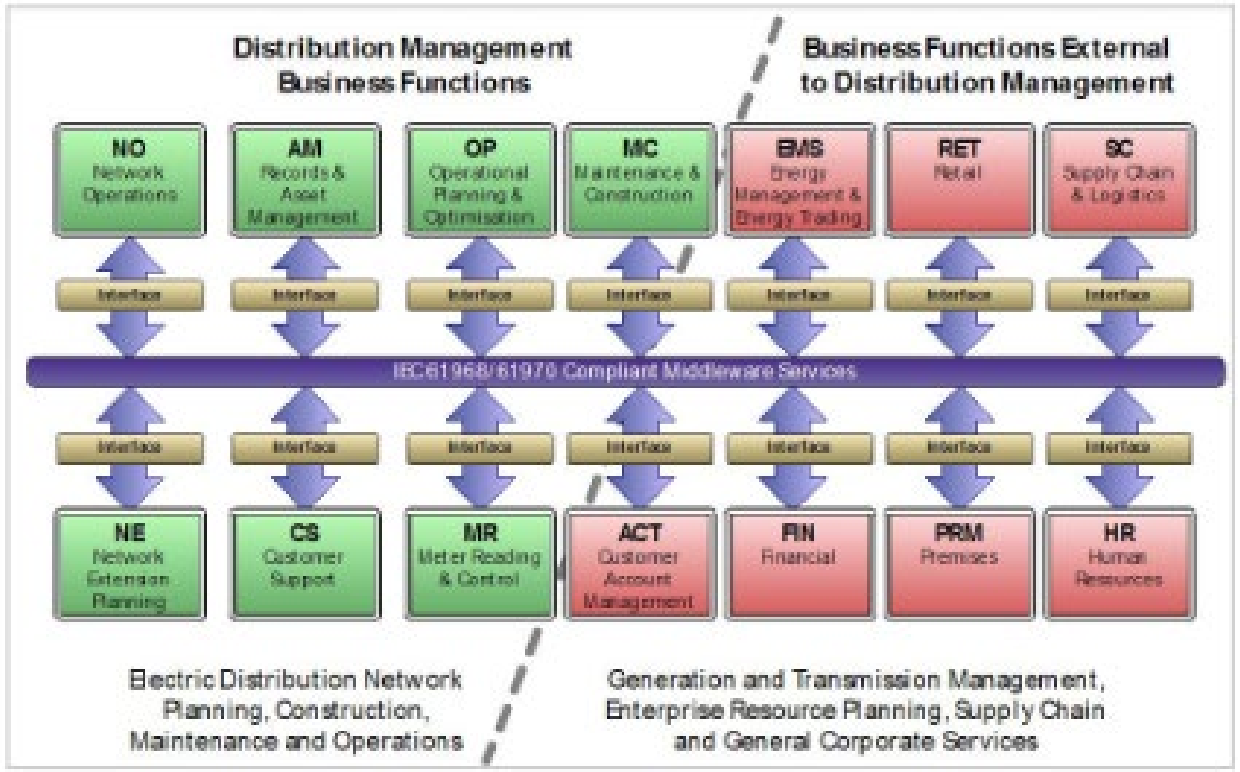
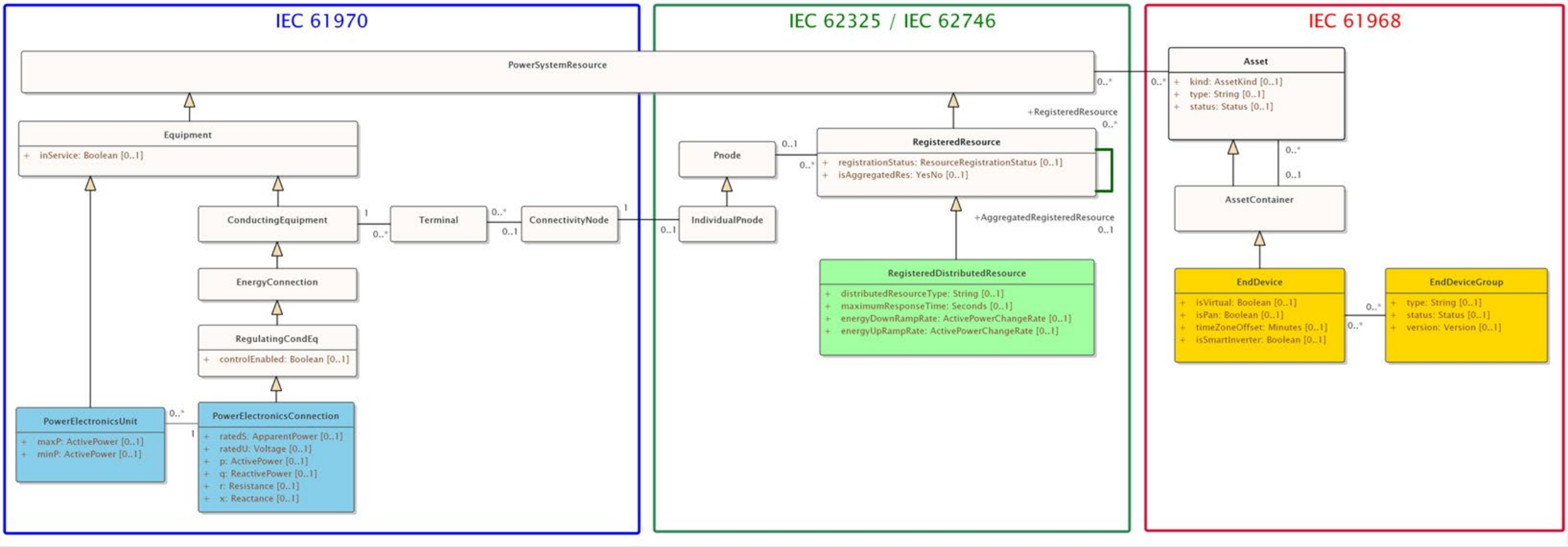


Figure 6-1
IEC61968-1 Interface Reference Model

CIM



Sample Approval

- Aggregation Name
  - Site 1 Name/Info
    - Site DER Record Data
    - Site DER Record Data
    - . . . .

  Approve ☐ Reject ☐

  Reject Reason: (from approved pick list)
  - Site 2 Name/Info
    - Site DER Record Data
    - Site DER Record Data
    - . . . .

  Approve ☐ Reject ☐

  Reject Reason:

Aggregation:

Approve ☐ Reject ☐

Reject Reason:

- A DSO will need the ability to approve or reject on a site-by-site basis as well as approve or reject the entire aggregation.
- An ISO/RTO will only need to approve or reject an aggregation. The individual approval and rejection will not show on their list of sites.
- The registry is designed to allow these different approval requirements by utility or market.

