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MEMORANDUM

FROM: Jason M. Ryan, ADER Task Force Chair
Arushi Sharma Frank, ADER Task Force Vice-Chair

RE: Project No. 53911, *Aggregate Distributed Energy Resource (ADER) ERCOT Pilot Project*

DATE: November 18, 2022

A replay of the November 15, 2022 workshop regarding ADER Registry is available at https://youtu.be/AlnahkjlpX0 and the presentation reviewed during the workshop is attached.


EMPOWERING THE ENERGY TRANSITION
Texas ADER Briefing
Non-Profit DER Registry
November 2022

Agenda

Who we are and why we exist

The Importance of Data Sharing

DERs use in the grid and markets

Fundamental 'Gap' identified for successful DER integration to grid and markets

Overview of Collaborative Utility Solutions Non-Profit DER Registry and savings for Texas

Industry availability and "Roll-out" for Non-Profit DER Registry

The Importance of Data Sharing

- Richard's example of a power plant
  - Where you are in the management chain, the overall plant, the overall industry, all affects how you view things.
  - We ask that today you pull back from whatever your personal position is and listen as if you were responsible for a fully synchronous grid and its overall reliability and resiliency.
- What we KNOW about data sharing
  - It always improve the quality of thought/operation/control when shared
- What we have seen around the world
  - Political Structures and Policies make us forget about the physics and our primary objective of keeping the light on
- ERCOT is next
  - In the right geography (sunny/windy) with the right drivers (recent significant outages and price spikes) – uncertainty.

What is our purpose at CUS & 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

This is 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.*

Why we have CE and CUS

- The rules surrounding a non-profit 501(c)(6) trade association are specific about what can and cannot be done in the non-profit entity. For example, technical support for a specific entity generally is not allowed, while broad education and support is. So, CE would have to support an activity from a specific member to upload historical electronic DER data while all new registrations can be supported by CUS.
- These specific requirements led us first to form Creation Energy to do the foundational work/research and to have an entity that can provide necessary implementation and support services going forward that a non-profit is not allowed to provide.
- By establishing this framework, we can put all the pieces together to EMPOWER THE ENERGY TRANSITION for the industry in the most cost-effective manner possible and speed up the incorporation of DERs for a cleaner energy economy.

DERs Are Not Well Understood

- Many view DERs as a problem instead of a potential solution
- Use Cases for DER application in grid and markets are limited and inconsistent across the world
- Standards (IEEE 1547-2018 and UL 1741 SA & SB) are not being adopted consistently. Therefore, the industry does not have a common frame of reference for Use Case development of these resources and ‘inadequate’ resources continue to be deployed into our grid systems because of this fact.
- 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 them into grid and markets

A fundamental 'Gap' has been identified

- Our industry has fragmented significantly into silos based on utility ownership (IOU/MOU/Co-op/etc.) and structure (G/T/D/IPP/etc.) over the past few decades.
- Collaborations for standards, policy and structure exist but we have a fundamental gap int that we do not have a 'Tools' collaboration to produce collaborative solutions for the industry.
- DERs around the world are being implemented haphazardly without consistent frameworks to optimize their participation in grid and markets.
- In all cases, one need has been identified. There must be a DER registry for all stakeholders to allow effective grid and market adoption for these resources.

Enabling DERs through Collaboration

To meet the challenges before it, the industry must:

- Know where DERs are, what they are, and how they can operate or participate.
  - WHERE IS IT? Geospatial coordinates with premise address, utility meter, and Geospatial Interface for data access/reporting/management and electrical location.
  - WHAT IS IT? Solar? Battery? EV? DR? Wind? DG? All? Some?
  - WHAT CAN IT DO? Capacity and dispatchability of each resource.
  - WHO OWNS IT?
- Establish a shared DER Information Model (IM) - analogous to establishing the "language" of DERs and how to store and share this information.
- Implement a common DER Registry in shared cost, non-profit structure that members control the direction of the solution

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

What's in a Registry and Why?

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

Process must be 'physics based' not 'policy based'. Can't be hung up by naming conventions, market structures, corporate structures. Where are the interfaces of data exchange required to enable DERs to make it all work?

- 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.

What's in a Registry and Why?

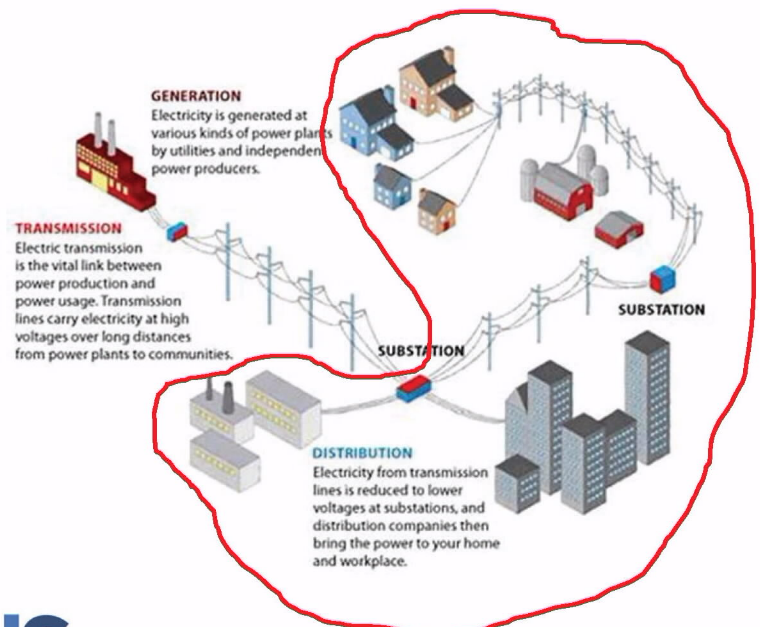
Two Fundamental Issues to address in this process of scrubbing out requirements to get what is included in the registry.

1. Reliability/Operations – What do the reliability organizations need to effectively collaborate on planning and operation of the grid at the DSO/TSO/ISO level.

2. DER Enablement – What are the common administrative needs/functions that a collaborative registry can provide to simplify enablement of DERs to utility programs and market programs.

Reliability/Operational Need Defined

Bulk System grid operators (ISOs/TransCos/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.

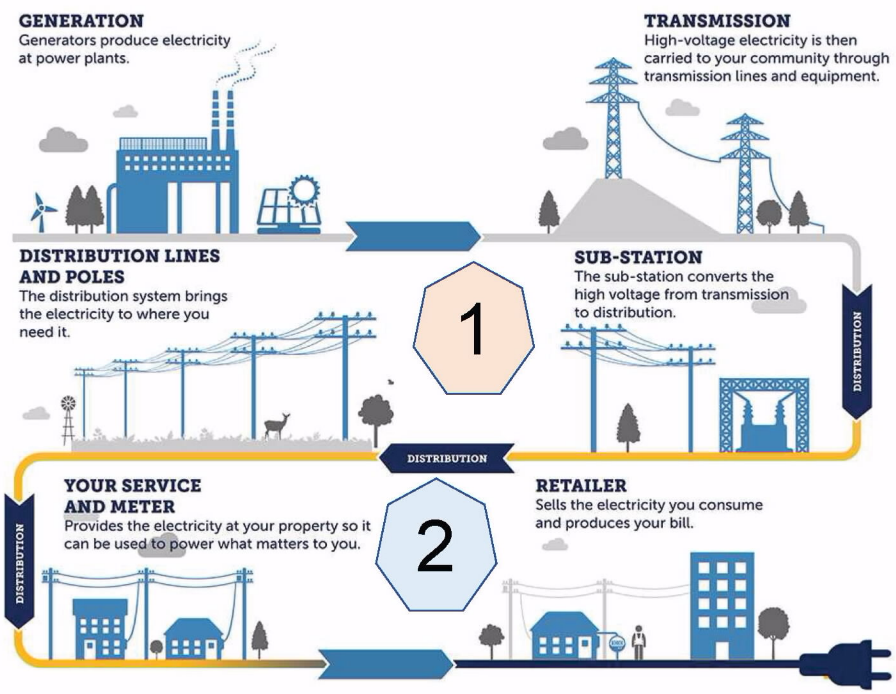


Distribution Companies provide “Net Load” to the grid operator. For example, Net Load might be 100MW for the red circle area. However, the actual load might be 130MW with 30MW of solar. With no visibility to these DERs, the grid operator is scrambling for an extra 30MW of supply when the sun goes behind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

Planning and 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 3000MW 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.’ According to ERCOT, there already are about 3500MW of registered and unregistered DERs on the Texas grid now.
- ERCOT is unable to effectively do its job without this information and is considering how to address this need going forward.

Two 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/Markets interface to Distribution Utilities at the Substation
2	Distribution System interface to Premise at the Meter	Utility/Retailer interface to Consumer at the meter

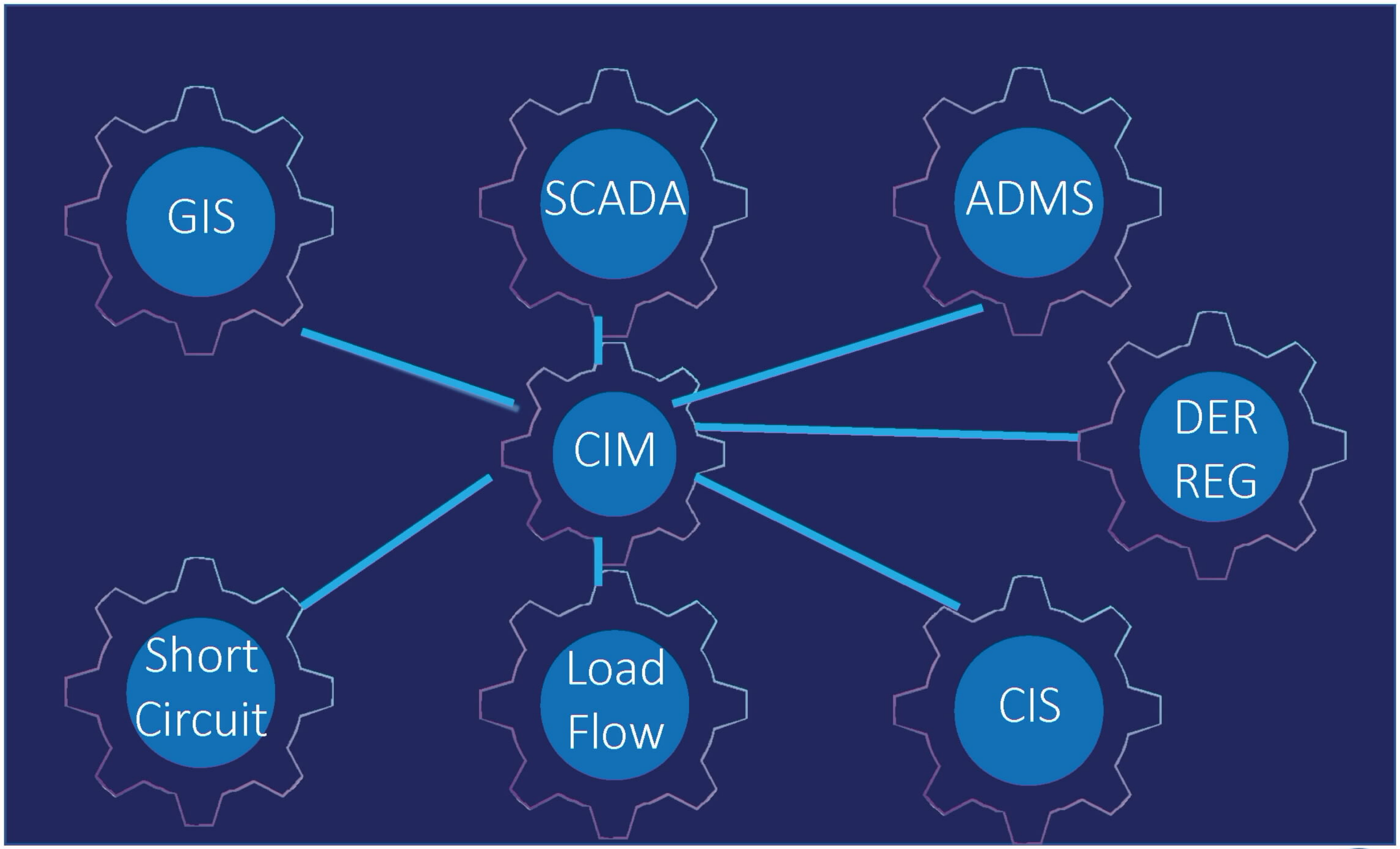
The Registry must be built with CIM in mind

- The Common Information Model (CIM) is an abstract information model that provides data understanding through the identification of the relationships and associations of the data within a utility enterprise.
  - A Canonical Model with 1:1 Relationships
- 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.

Lingua Franca (CIM)–1:1 Canonical–The translator

Data Location

Data Location is based on member utility need. They may have an existing application with all data already acquired and it can stay there with a dynamic CIM link. Or all can be managed by Registry in 'containers' by members.



History of CIM

- Started by EPRI
- Solve EMS interoperability Problem with generators and other utilities
- Control Center Applications Program Interface (CCAPI)
- Eventually became and IEC Standard (61970-301)

Origins of the Utility CIM

Exchanging power systems data between utility companies has been problematic when proprietary formats are used. In the past a company would traditionally use a single software system, whether a custom in-house solution or whether purchased from a large software company, and there would be a single proprietary data standard and format used. With the deregulation of the power industry, the emergence of smarter grids, and the integration of consumer or third-party distributed energy resources (DERs), there is now a greater need to enable interoperability across a wide diversity of companies and systems.

The increase in choice provided by the number of power system software vendors and the different software packages and architectures available add to the challenge of data exchange. These issues point to a requirement for a single, open standard for describing electric utility data and to aid the interoperability between software packages and exchange of information both within one company and between companies.

The Common Information Model (CIM) was developed as an open standard for representing power system components. CIM was originally developed by the Electric Power Research Institute (EPRI) in North America and is now a series of standards under the auspices of the International Electrotechnical Commission (IEC). The standard was started as part of the Control Center Application Programming Interface (CCAPI) project at EPRI with the aim of defining a common definition for the components in power systems for use the Energy Management System (EMS) Application Programming Interface (API), now maintained by IEC Technical Committee 57 Working Group 13 as IEC 61970-301. The format has been adopted by the major EMS vendors to allow the exchange of data between their applications, independent of their internal software architecture or operating platform.

Deriving Profiles

The CIM is by definition intended to be a single, “common” model. One of the key goals of the CIM is to prevent duplication of data definitions but still define all the data exchanged between the systems within organizations supporting electric grid systems. The IEC 61968 standard includes an Interface Reference Model (IRM, shown in Figure 6-1). This diagram illustrates the breadth of the model itself. The CIM has grown from an initial core set of less than 100 classes to describe a balanced electrical model for EMS, to a model with over 1,000 classes and thousands of associations and attributes

CIM Interface Reference Model

For our 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.

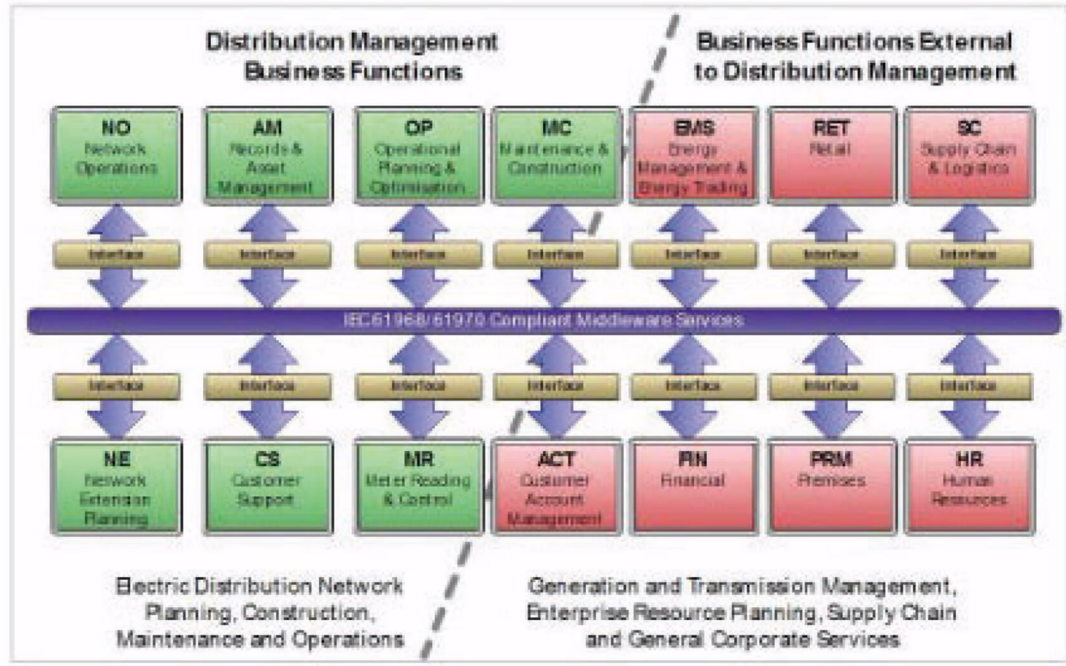


Figure 6-1
IEC61968-1 Interface Reference Model

CIM is our industry's version of "Plug-N-Play

A DER registry solves many problems

- By knowing where a DER is, what it is, and what it can do, distribution companies and grid operators can better plan and operate their networks.
- Creating a shared data source to collect standard data for DERs and their interconnection allows both distribution companies and grid operators to have a single point of truth to work from for optimal results.
- A common registry based on IEC CIMs removes the need for baseline DER data system interfaces between all distribution companies, ISOs/Control Area Authorities and Aggregators (saving billions of software costs for the industry) to access DER data.
- A registry allows broad information availability for every resource to become part of the collective solution to grid and market issues instead of an invisible problem to chase and guess about in daily operations.
- A registry will eliminate consumer barriers and complexity. For example, Aggregators will have one interface – Not 3000+.
- All these functions are pre-competitive and efficiently enable DER's to participate in grid and market activities at the lowest cost and much more quickly.

The Non-Profit Collaborative Registry

- Cannot boil the ocean and meet everyone's use case for their specific application or be a competitive operation platform
- Needs to enable a CIM based data exchange for the basic information and single point of truth for all stakeholders to be able to effectively participate. Must be built correctly to enable data transfer to existing systems without 'software interface', only CIM data exchange and be highly secure
- Will save the industry billions of dollars moving forward
- Will not be perfect in version one – it will grow and adapt over time as members make choices for what is added.
- Will cost LESS over time not more. For example, at 150 Members, membership costs reduced by more than 50%.
- Members are in full control of the evolution of the product functions, features and services. They are never 'stuck' with a vendor, they are in full control of their future with this system.

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
- <$100 Million in 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 market/utility/ISO

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

Texas Numbers

Business as Usual – For Profit

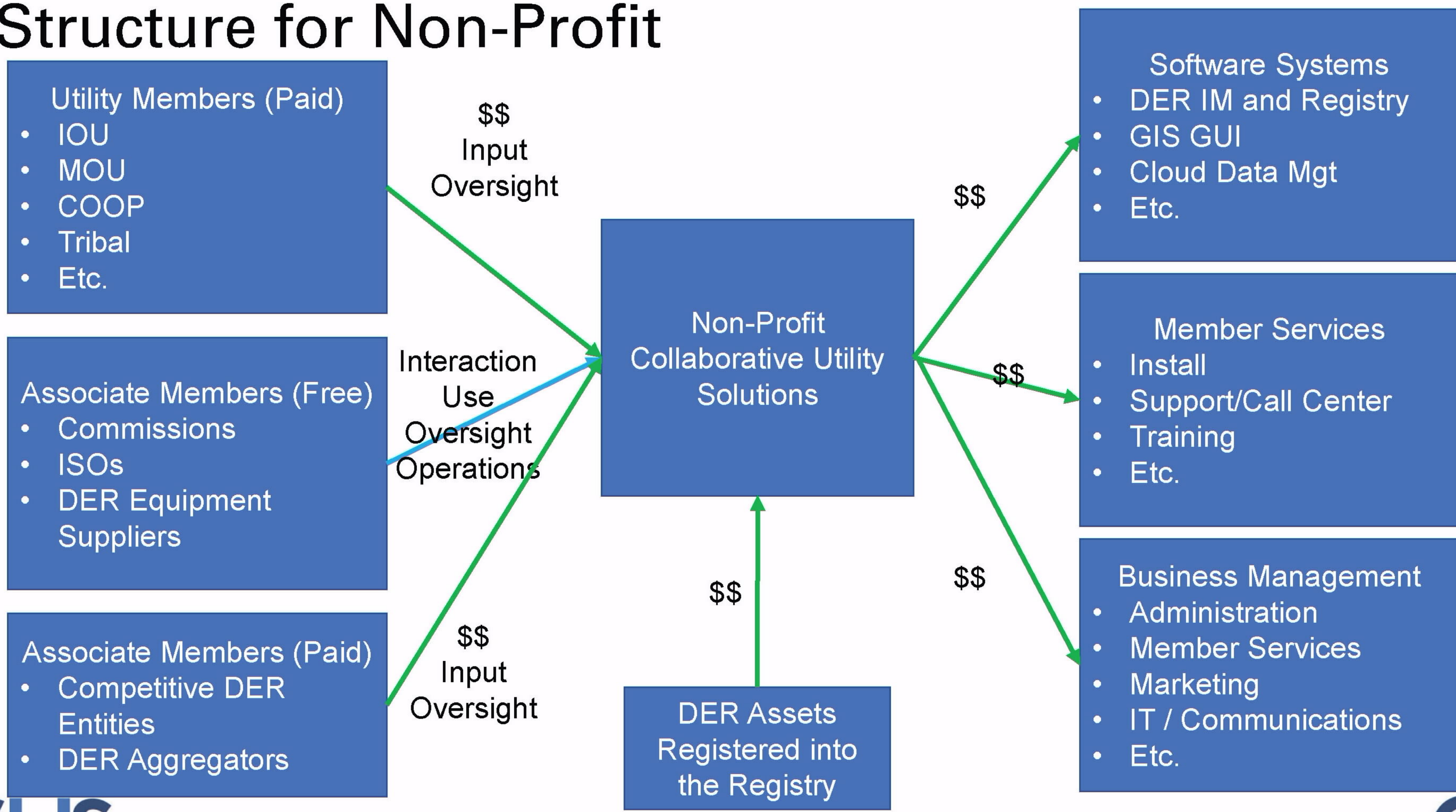
- $1.5M per utility to bid/develop/deploy: At least $50M
- Cost of interface between ERCOT and different registries: $20M
- Cost for Aggregators to Interface to disparate systems: $30M
- Cost for ERCOT and Utilities to Interface to existing Systems: $30M
- Annual Maintenance/Upgrade/Changes: At least $10M annually
- Severely inhibits competition in the Aggregator space

Collaborative Non-Profit

- Annual Membership Fees for Utilities and Aggregators less than $3M. ERCOT gets system for no cost
- Zero interface costs between all market participants
- Zero interface costs to existing ERCOT and utility systems (CIM data exchange)
- No other costs for annual Maintenance/Upgrade/Changes
- Enables broad competition in the Aggregator space

Texas saves $130M upfront and at least $7M annually with Non-Profit Registry

Structure for Non-Profit

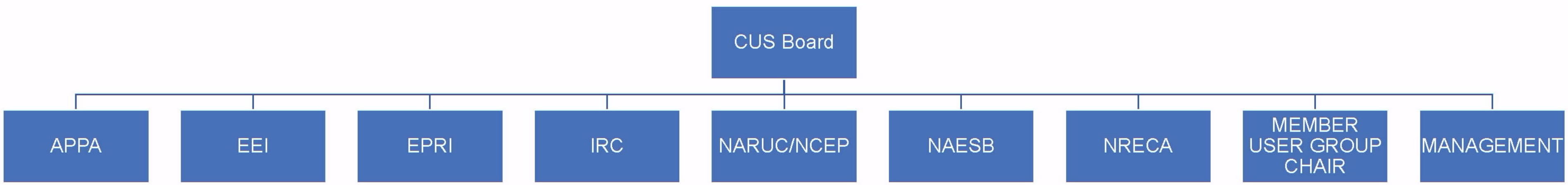


Structure for Non-Profit

- The members (utilities) are in the top left of the graphic on the previous slide and pay ‘member dues’ each year.
- Members have votes as well as a voice in the user group to determine next steps, enhancements, process, etc. The user group will develop and prioritize any recommendations.
- Associate members (Free) do not pay dues but are a necessary part of the ecosystem to make all this work. State Commissions, ISO’s, equipment vendors, etc. If we charged them, they would just have to find a way to bill utilities (members) or consumers through their mechanisms, and fees would effectively ‘double charged’ to the utilities and consumers.
- Associate member (Paid) are competitive businesses that must pay to participate.
- CUS non-profit coordinates all activities to achieve what the members want. The activities and outputs on the right are the ‘services’ that CUS will manage to accomplish its mission. In the event any of these activities or outputs need to be outside of CUS non-profit, we will determine appropriate service provider.
- DER assets will pay to register their assets to make information available for use by the grid and the market.
- Costs for all members will go **DOWN** over time, not up. Open book finances in non-profit manages to lowest cost and costs go down with scale.

Desired Board Structure

- The Board of Directors is desired to be established so it is comprised of the non-profit organizations that represent factions of our industry that represent, set standards for, or have oversight of, the members.
- The members suggest and define changes/enhancements and vote to prioritize and present to the Board through their chair who also sits on the board.



A Complete DER Data Record

- Owner Personal Information (DSO Validates)
- DER Info (Solar/Battery/EV/etc. with capacity ratings)
  - Input by Owner or Owner Authorized Agent (Installer/Aggregator/etc)
- DSO
  - Electrical Connectivity (Meter to Transmission Point of Service) 'Where it is electrically' by providing connectivity between meter and transmission point of interconnection
  - Determine if the customer is critical care/critical load
  - How customer is affected by the automated load shed schemes – This data is important because it may affect how different markets allow the DER to bid into the market
- TSO, ISO/RTO
  - Transmission POS, Market Sub-Node and Node
- Aggregator
  - 'Smart' info for capacity/withdrawal for kW's to register for site
  - Aggregation Coordination/Registration

Approval process for DERs and Aggregations

- Approval Process by any market or utility program will require sign off by the necessary market entities for the DER and/or DER Aggregation. In the US, this will encompass entities such as Competitive Retails Suppliers, DSO's, TSO's, Scheduling Coordinators and finally by 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 one market. A Scheduling Coordinator could be a Qualified Scheduling Entity.
- For each market or utility program, the registry must capture the approval/rejection of a DER or DER aggregation by the appropriate entities.

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 so the approve and reject will not show on their list of sites
- The registry is designed to allow these different approval requirements

Data Access

Data Access to the information in the DER Record will be determined by each appropriate regulatory authority. The registry allows this dynamic ability for each regulatory authority.

WHO HAS ACCESS TO THE DATA? (Each Regulatory Authority to define, this is just a start)										DER RESOURCE RECORD CREATION		
										Entered by:		DER Registry Field Description
SC	CRS	Equipment Mfg	Aggregator	Regulatory Authority	ISO/RTO	TSO	DSO	Owner Agent	DER Owner	DER OWNER INFO		
	X		X	X			X	X	X	DER Owner*		First Name
	X		X	X			X	X	X	DER Owner*		Last Name
	X		X	X			X	X	X	DER Owner*		Address 1
	X		X	X			X	X	X	DER Owner*		Address 2
	X		X	X			X	X	X	DER Owner*		City
	X		X	X			X	X	X	DER Owner*		State
	X		X	X			X	X	X	DER Owner*		Zip
	X		X	X			X	X	X	DER Owner*		Phone Number
	X		X	X			X	X	X	DER Owner*		Email
	X		X	X			X	X	X	ESRI*		GPS Coordinates
	X		X	X	X	X	X	X	X	DER Owner*		Meter ID1
	X		X	X	X	X	X	X	X	DER Owner*		Meter ID2
X	X		X	X	X	X	X	X	X	DER Owner*	pick list	Distribution Utility Service Provider
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	DER Owner*	pick list	Pick your CRS
X	X		X	X						DER Owner*	Y/N	Do you have an Aggregator?
X	X		X	X	X	X	X	X	X	DER Owner*	pick list	Pick your Aggregator
	X		X	X	X	X	X	X	X	DER Owner*	Y/N	Allow Agent to enter DER Info?
	X		X	X	X	X	X	X	X	DER Owner*	pick list	Pick your Agent
X	X		X	X	X	X	X	X	X	Registry		Premise Unique ID
X	X		X	X	X	X	X	X	X	Registry		DER Unique ID
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
X	X		X	X			X	X	X	Aggregator*		Total Capacity of Solar Array (kW)
	X	X	X	X			X	X	X	DER Owner or Agent*	pick list	Inverter Manufacturer Name
	X	X	X	X			X	X	X	DER Owner or Agent*	pick list	Inverter Model Number

Mapping to a Specific Market

DER RESOURCE RECORD CREATION								
Step 2	Step 1		*REQUIRED DATA		DER Registry		ERCOT Spreadsheet	
Data Validated by:	Data Validated by:	Data comes from:	Entered by:		Field Description	Gap	Field Description	Attribute Info
DER OWNER INFO								
DSO	None	DER Owner	DER Owner*		First Name	E		
DSO	None	DER Owner	DER Owner*		Last Name	E		
DSO	ESRI	DER Owner	DER Owner*		Address 1	N	Address	Max 64 Characters
DSO	ESRI	DER Owner	DER Owner*		Address 2	E		
DSO	ESRI	DER Owner	DER Owner*		City	N	City	Max 64 Characters
DSO	ESRI	DER Owner	DER Owner*		State	E		
DSO	ESRI	DER Owner	DER Owner*		Zip	N	Zip	Max 64 Characters
DSO	None	DER Owner	DER Owner*		Phone Number	E		
DSO	None	DER Owner	DER Owner*		Email	E		
	ESRI	ESRI	ESRI*		GPS Coordinates	E		
DSO		DER Owner	DER Owner*		Meter ID1	N	ESIID or For NOIE: Unique Meter ID	Max 64 Characters
DSO		DER Owner	DER Owner*		Meter ID2	E		
DSO	ESRI	Registry	DER Owner*	pick list	Distribution Utility Service Provider	N	Distribution Service Provider (DSP)	Max 64 Characters
		DER Owner	DER Owner*	**Y/N**	Do you have a Competitive Retail Supplier (CRS)?	N	Retail Electric Provider (REP	
		Registry	DER Owner*	pick list	Pick your CRS	N	REP	
		Registry	DER Owner*	**Y/N**	Do you have an Aggregator?	N		
		Registry	DER Owner*	pick list	Pick your Aggregator	N		
	None	DER Owner	DER Owner*	**Y/N**	Allow Agent to enter DER Info?	E		
	Registry	Registry	DER Owner*	pick list	Pick your Agent	E		
	Registry	Registry	Registry		Premise Unique ID	N	Premise Unique ID	Max 64 Characters
	Registry	Registry	Registry		DER Unique ID	E		
	Registry	Registry	Registry		Date entered into registry	E		
SOLAR INFO								
	Registry	Registry	Registry		Date Entered into Registry	E		
	Registry	Registry	Registry		Solar Unique Identifier	E		
		Equip Mfg	DER Owner or Agent	pick list	Panel Manufacturer Name	E		
		Equip Mfg	DER Owner or Agent	pick list	Panel Model Number	E		
		Equip Mfg	DER Owner or Agent	pick list	Nameplate Capacity of Panel	E		
		Equip Mfg	DER Owner or Agent		Number of Panels	E		
			Aggregator*		Total Capacity of Solar Array (kW)	N	Total controllable capacity of Device in	Numeric to 0.1 kW precision
			Aggregator**	pick list		Y	Type of Controllable Device (PV)	pick list
		Equip Mfg	DER Owner or Agent*	pick list	Inverter Manufacturer Name	E		

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

- What we are not here for
- What we are here for

Registry Roll-Out

- Announced November 1, 2022 in partnership with ESRI
- Final Testing with current industry supporters in Nov/Dec
- Product Launch January 2023
  - ISO's/Commissions/Equipment vendors have free access to the Registry in January
  - All U.S. utilities will have free access to 'DER data collection' tool in January
- Members are signing up now for full access to the complete suite of tools in the registry
  - Mapping/Analysis
  - API Integration to existing systems via CIM
  - Program Coordination for DER enablement
  - Reporting
  - Etc.

Thank You!!

- We want to thank the immense number of people and organizations that have given their time and energy freely 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

A Great Read

The Transition to a High-DER Electricity System: Creating a National Initiative on DER Integration for the United States

https://www.esig.energy/der-integration-series-us-initiative/

Appendix I

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

Eamonn McCormick

Eamonn has over three decades of technology architecture and utility experience. Eamonn has been instrumental in architecting and implementing very large utility industry systems at both ISOs and major Utilities across the US. Eamonn's experience includes IT, OT and IoT as well as cloud and SaaS. In recent years Eamonn has been focused on grid architecture and utility transformation, with an emphasis more on the convergence of IT and OT.

In 2021 Eamonn was recognized by the industry as a winner of the 2021 Cleanie Gold Award for community contribution. Eamonn's passion is leading technology aspects of transformational "big bet" initiatives that are focused on sustainability and enabling the energy transition.

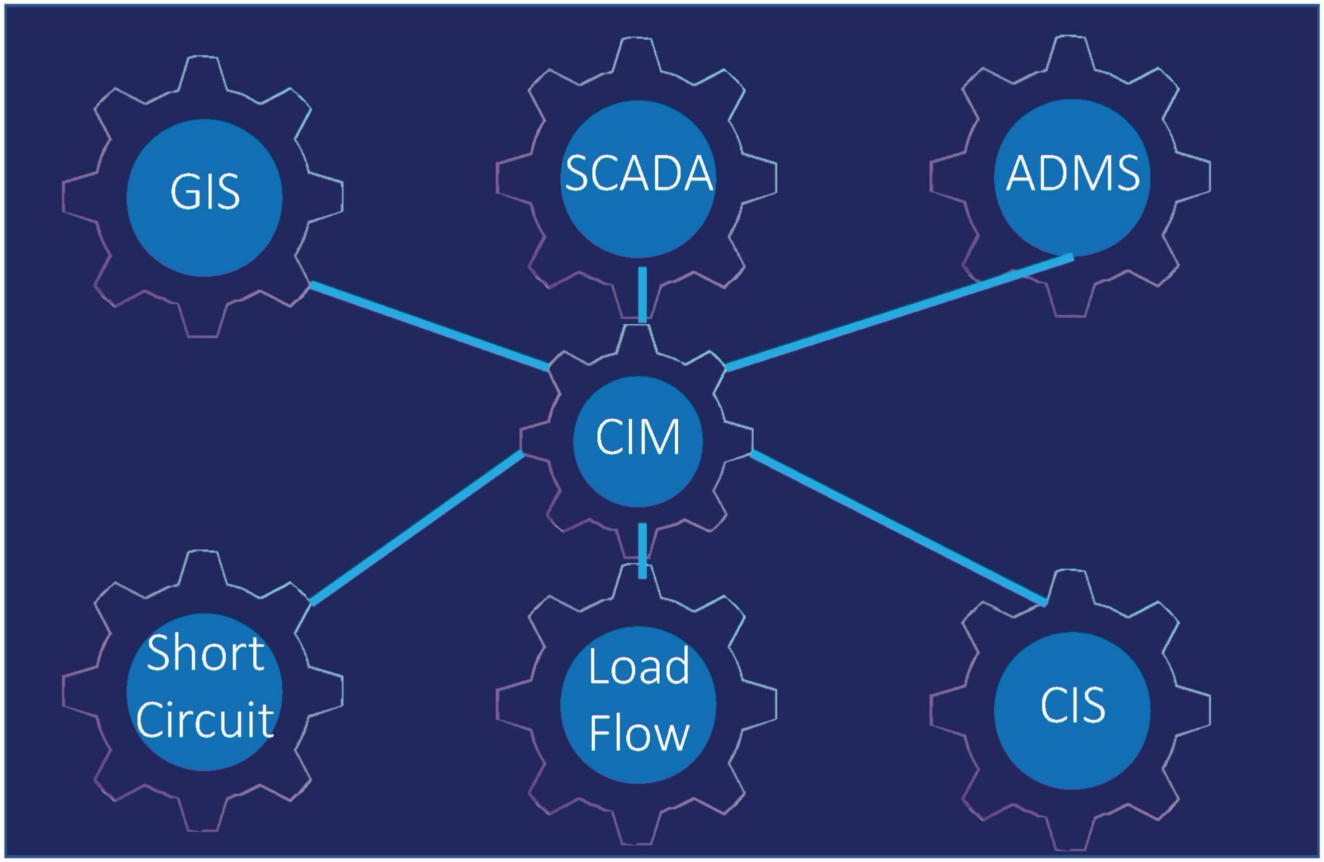
Eamonn passionately believes that this is the most exciting and transformative period for the electricity energy industry since the early 1900s. Eamonn enjoys collaboration, teamwork and trust-based relationship with his professional colleagues and is committed to positive, tangible customer focused outcomes.

EDUCATION

Bachelor Engineering - Mechanical,
University College Dublin

Masters in Management Science,
University College Dublin

CIM is a 'Translator'



System Effects – DERs done 'right' – A few Use Cases

DERs are currently creating significant issues on the grid worldwide largely 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 provides head room on feeders for electrification and dramatically reduces the infrastructure costs for distribution and transmission network upgrades.

1. Correct Power Factor to Unity on each feeder
   a. With appropriate four-quadrant inverter specification in interconnection agreements, you can 'dial' watts and vars from each DER. This has been proven through actual deployments to reduce feeder and customer losses by 6-12%. This creates significant EE effects and extends the life of every electrical device connected to the grid.
2. Correct Phase Balance
   a. 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 connected to the grid.
3. Mitigate ramps
   a. Morning and afternoon ramps with solar are creating significant issues that active DER control can mitigate and even eliminate. (Duck Curve)
4. "Head room capacity" for EVs
   a. Through targeted deployment, you can create capacity on each feeder for the electrification of transportation (EVs) without costly feeder reconductors and substation upgrades.

System Effects – DERs done ‘right ’ – A few Use Cases

6. Wholesale portfolio use (Energy/Capacity/Ancillary Services in Markets and IRP outside)
   a. While DERs could be used for distribution purposes 90%-95% of the 8760 hours, they also can be aggregated to lower the cost of the wholesale power portfolio each day through net load adjustments and for the 5%-10% of the hours of the year 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.
   b. Day of/Day Ahead use for loss of units or other grid anomalies.
   c. Utility Scale Renewable Balancing – Storage to balance and optimize use of utility scale renewables.
7. Reliability and Resiliency
   a. Improve Volt/VAR management on each feeder.
   b. 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’.
   c. Provision community reliability and resiliency for major weather (ice, tornado, etc.) events for crucial care customers, police/fire/emergency response, community centers, etc.
   d. If critical care/emergency response are supported with DER, utilities can address the larger outages first with crews rather than reserving a significant group for these types of customers.
8. DER enablement – IEEE 1547-2018, UL 1741 and FERC Order 2222 have laid the foundation to enable and structure DER transactions to the grid and markets. The policy and standard work is complete, now we must collaborate to effectively enable DERs to grid and markets.
   a. A standard data collection tool for interconnections must be enabled. While it is not possible to ask 3000+ utilities in the US to have a standard legal document for interconnection, they could have a standard data collection and management tool to characterize the DERs appropriately. With this structure in place, a common registry becomes an even more effective tool that incorporates all DERs, not just those participating in a program/market