Planning & Preparing for Smart Grid Investments

Leveraging Data to Support Affordable, Reliable Electricity

June 10th,2025

nrtc

Member driven. Technology focused.

Session Facilitator

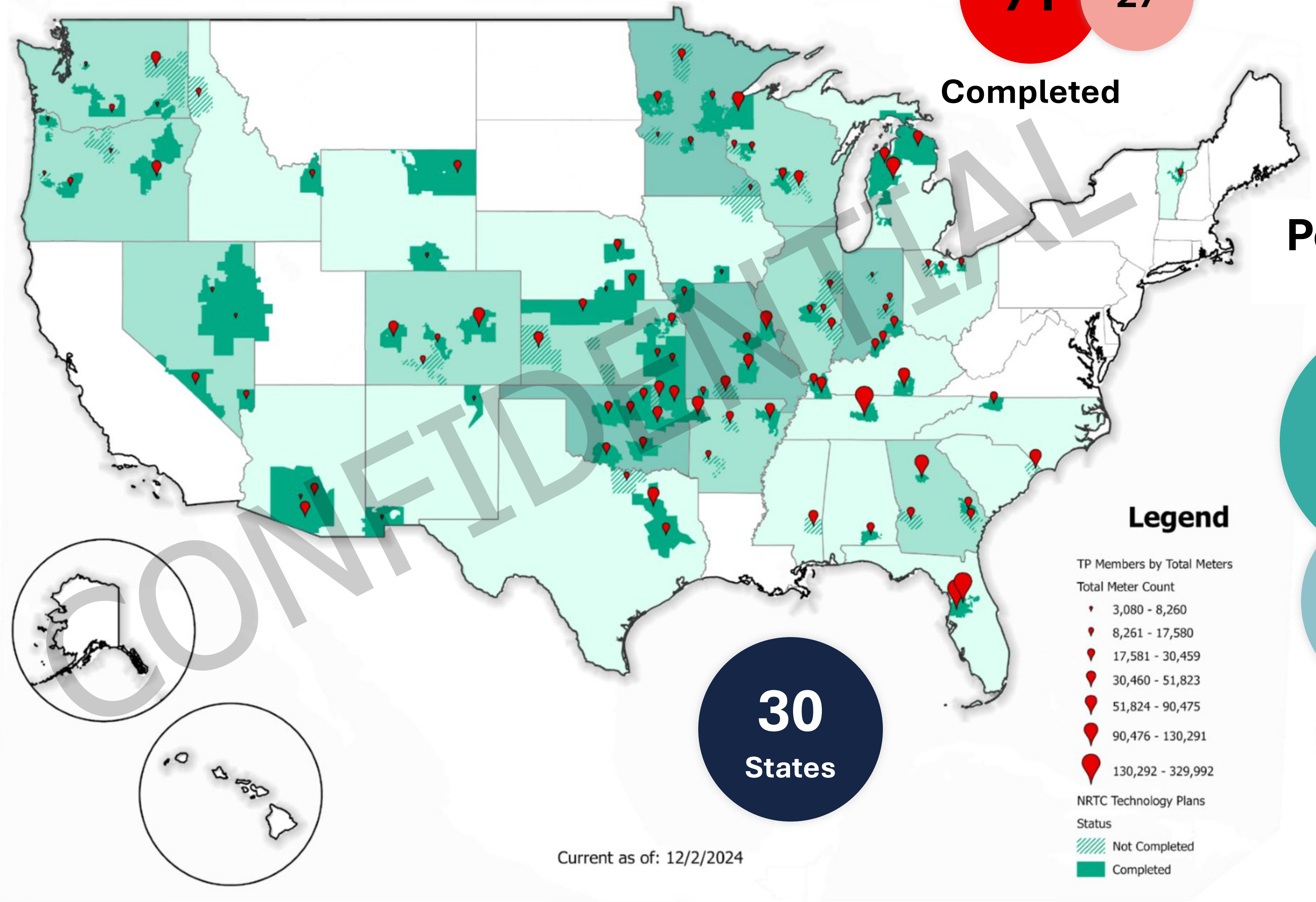
Thomas McCollum, P.E.
Technology Planning Director

- As a Smart Grid Technology Planning Director, Thomas supports the development of NRTC Members' 10-year Smart Grid Technology Plans, especially with respect to Reliability Initiatives.
- Before joining NRTC in 2024, Thomas worked as a system engineer at a distribution cooperative for 6 years, primarily focusing on implementing the coop's SCADA initiatives and deploying its RF AMI system across the territory. He has also served as Director of Distribution Planning at a consulting firm, supporting electric utilities across the country with various engineering studies and analyses.
- Thomas has a BSEE from Mississippi State University, an MBA from Delta State University, and a Professional Engineering License in the states of MS and GA

Technology Planning Engagements Map

71 Completed

27 Planned



30 States

Total Meters
(EIA 2022)

High: **329,992** Meters

Med: **20,875** Meters

Low: **3,080** Meters

Peak Load
(EIA 2022)

High: **2,225** MW

Med: **124** MW

Low: **10** MW

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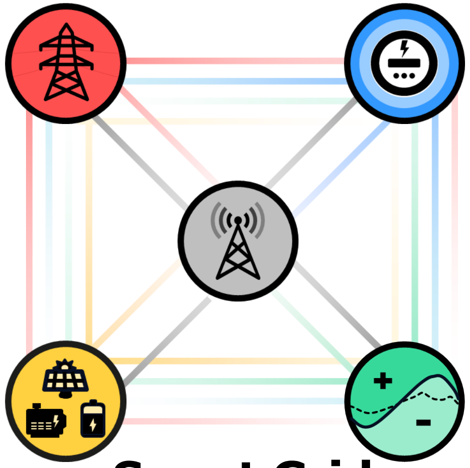
Session Agenda



Smart Grid Planning

- Setting the Stage
- Leveraging the Data at Hand to Define Goals & Objectives
- Migrating to Dynamic Systems
- Conclusion

Objectives For Today

1) Provide overview of how electric industry is changing
2) Demonstrate how data utilization provides foundation for goal formation, decision making, and system investments
3) Outline methodology to create metrics to measure progress & decision points

Setting the Stage

Florida Industry Trends

Seminole Electric Cooperative, Inc.

Florida

This over $1.25 billion New ERA financing through grants and loans will be used for Seminole Electric Cooperative to construct and procure a total of 700 megawatts of energy resources through a combination of utility-scale solar and battery energy storage projects across rural portions of Florida. The initiative is expected to create an estimated 3,400 short- and long-term jobs, provide resource diversity at stable cost, and reduce greenhouse gas emissions by more than 3.5 million tons annually. This proposal will reduce greenhouse gas pollution by the equivalent of 740,000 gasoline-powered cars each year.

As a co-applicant with Seminole, Sumter Electric Cooperative Energy will leverage the New ERA investment to increase energy cost savings, enhance energy efficiency, and reduce dependence on fossil fuels. They will construct three solar microgrids with battery energy storage anticipated to generate approximately 6.6 megawatts total of clean, renewable energy and implement a system-wide high-efficiency LED streetlight replacement program which, collectively, will create an estimated 581 short- and long-term jobs and increase rural access to clean energy.

Florida Power & Light to spend US$3.8 billion on new BESS in 2026-2027, launches LDES pilot

By Matthew Biss

March 13, 2025

Data Center Published on 11/14/2024 by **HostingJournalist Editorial Team**

Florida's Data Center Market Set for Growth Amid U.S. Digital Transformation

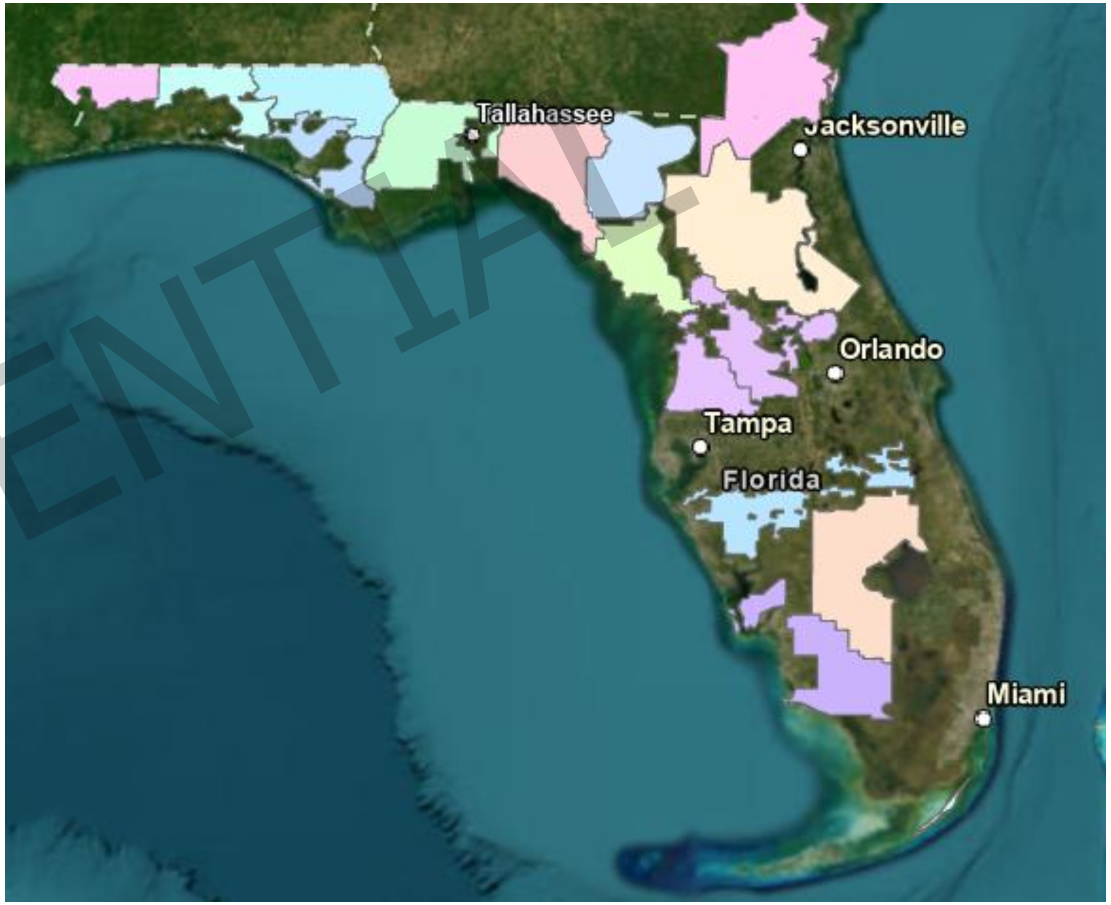
The global data center market is witnessing unprecedented growth, with the United States leading the charge in this digital revolution. As demand surges and infrastructure investments soar, the U.S. is projected to double its data center power capacity by the close of 2029. Within this transformation, Florida has emerged as a key player, ranking among the top five states in the nation for data center market strength.

Recent analysis from LandGate underscores Florida's strategic importance, revealing the state hosts over 100 data centers, encompassing colocation, hyperscale, and enterprise projects. Florida's rapid high-tech employment growth, now the third fastest in the U.S., bolsters its position as a leading force in the data center ecosystem.

Sources: [USDA](); [Energy Storage News](); [Hosting Journalist]()

Florida Utility 2023 Demographics

- **Cooperative Utilities**
  - Summer Peak Demand Range (MW): 70 – 1,078
  - Winter Peak Demand Range (MW): 64 – 1,036
  - Total MWh Sales: 23,323,852
  - Total Meters: 1,324,644
- **Municipal Utilities**
  - Summer Peak Demand Range (MW): 71 – 2,394
  - Winter Peak Demand Range (MW): 54 – 2,816
  - Total MWh Sales: 36,313,612
  - Total Meters: 1,567,918
- **Investor-Owned Utilities**
  - Summer Peak Demand Range (MW): 154 – 28,461
  - Winter Peak Demand Range (MW): 116 – 22,599
  - Total MWh Sales: 189,830,372
  - Total Meters: 8,889,185

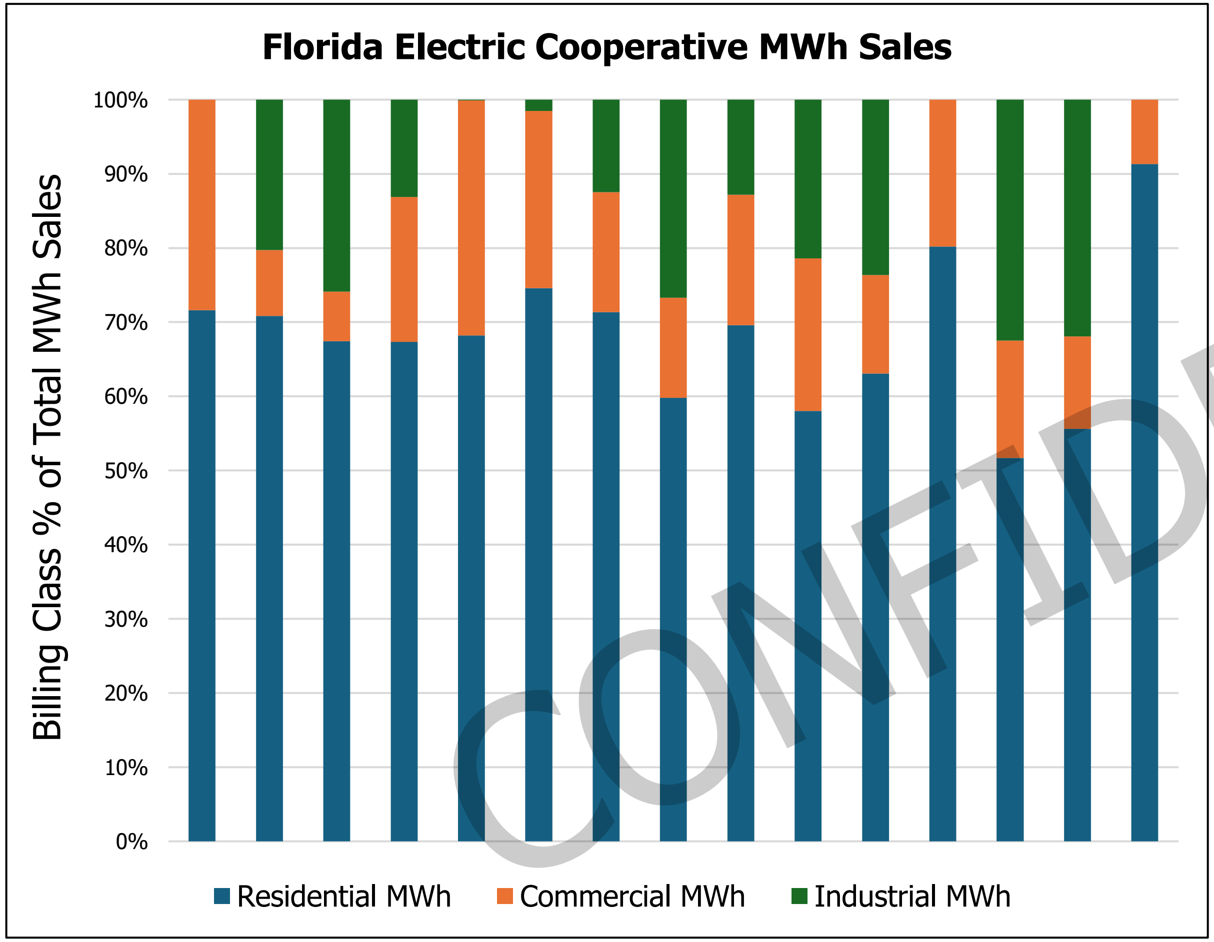


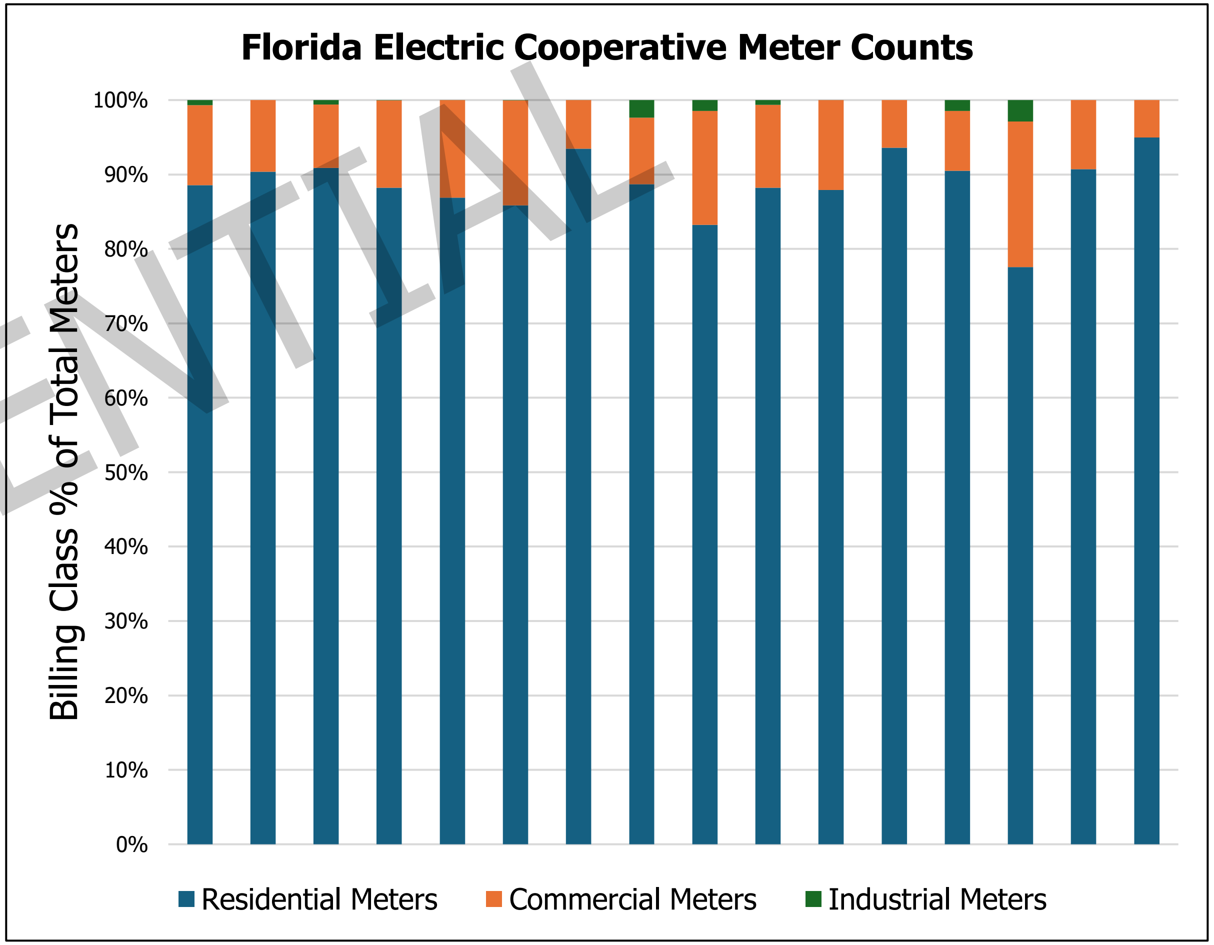
Service Territories of Florida Electric Cooperatives

Source: 2023 EIA Form 860 (NRTC Analysis)

Note: Values are displayed as were reported to the EIA for 2023. Not all Florida cooperatives filed a submission for this year

Florida Utility Load Demographics





Source: EIA Form 860 (NRTC Analysis)

Note: Values are displayed as were reported to the EIA for 2023.

Meters counts and energy sales outside of Florida were excluded from these charts

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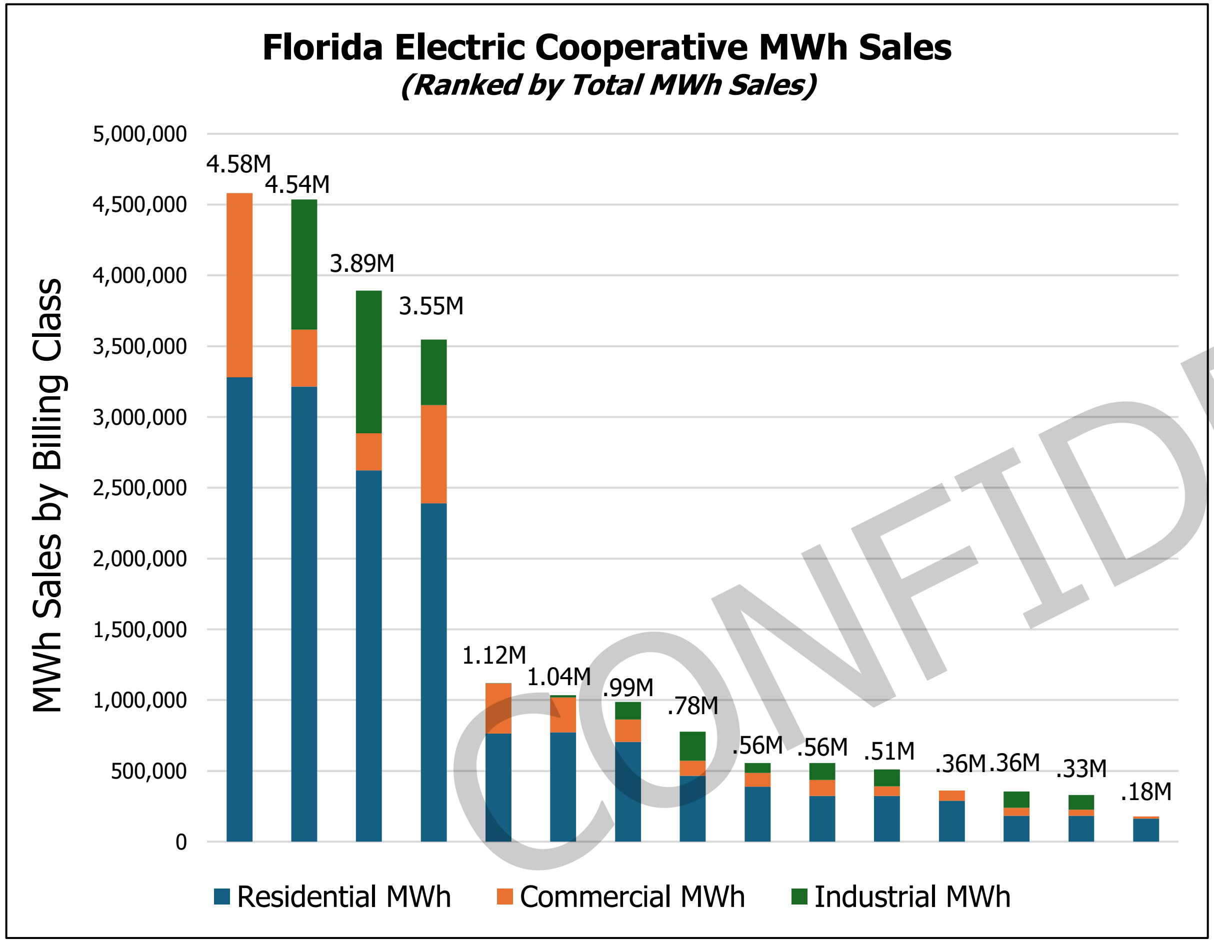
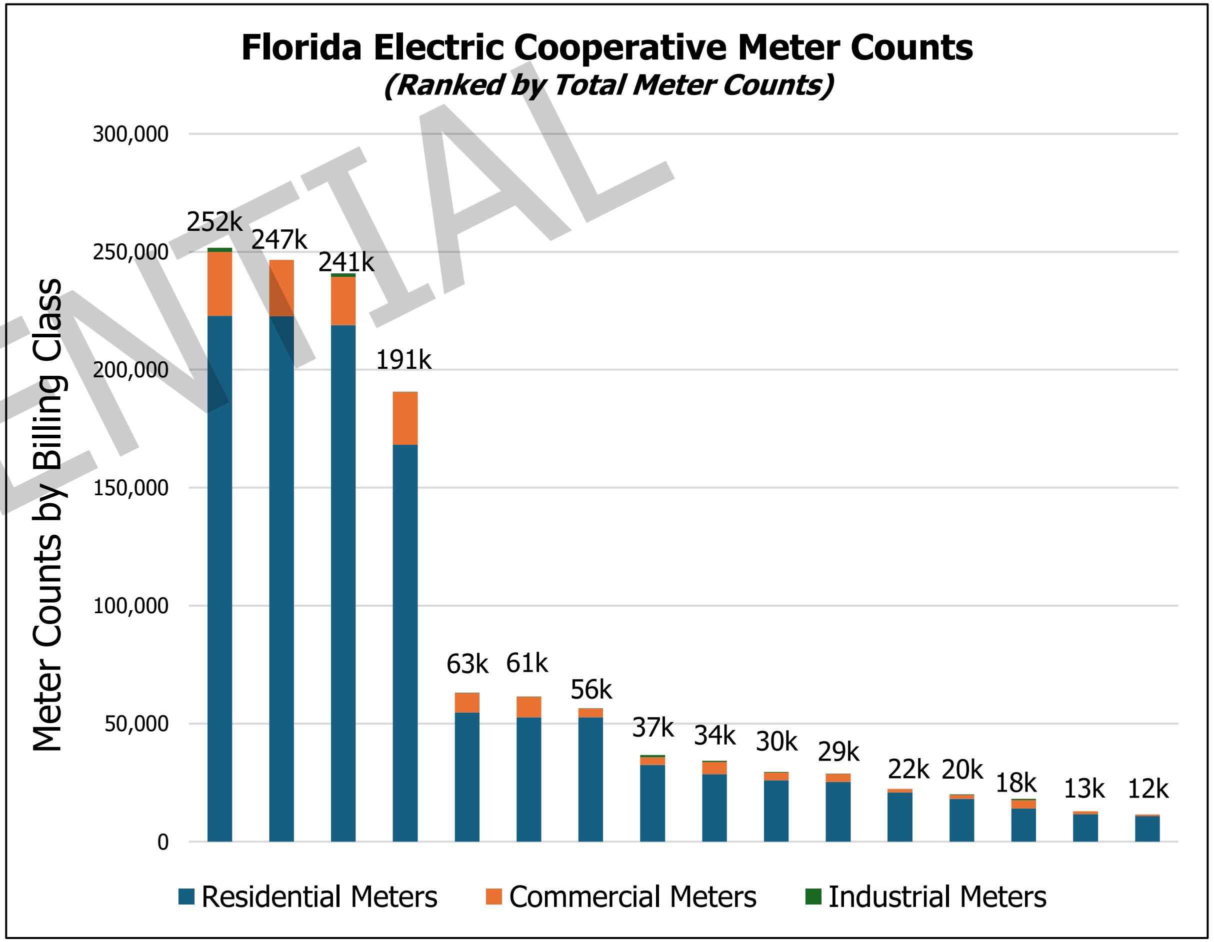
Florida Utility Load Demographics





Source: EIA Form 860 (NRTC Analysis)

Note: Values are displayed as were reported to the EIA for 2023.

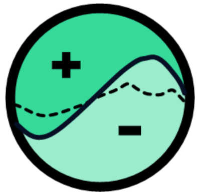
Meters counts and energy sales outside of Florida were excluded from these charts

Different Opportunities to Reach a Common Goal

- No matter the size, <u>all your goals are the same</u>

  To provide safe, affordable, reliable power to your members and communities

- <u>Many opportunities exist</u> to support the goal, but there is no "one size fits all" solution

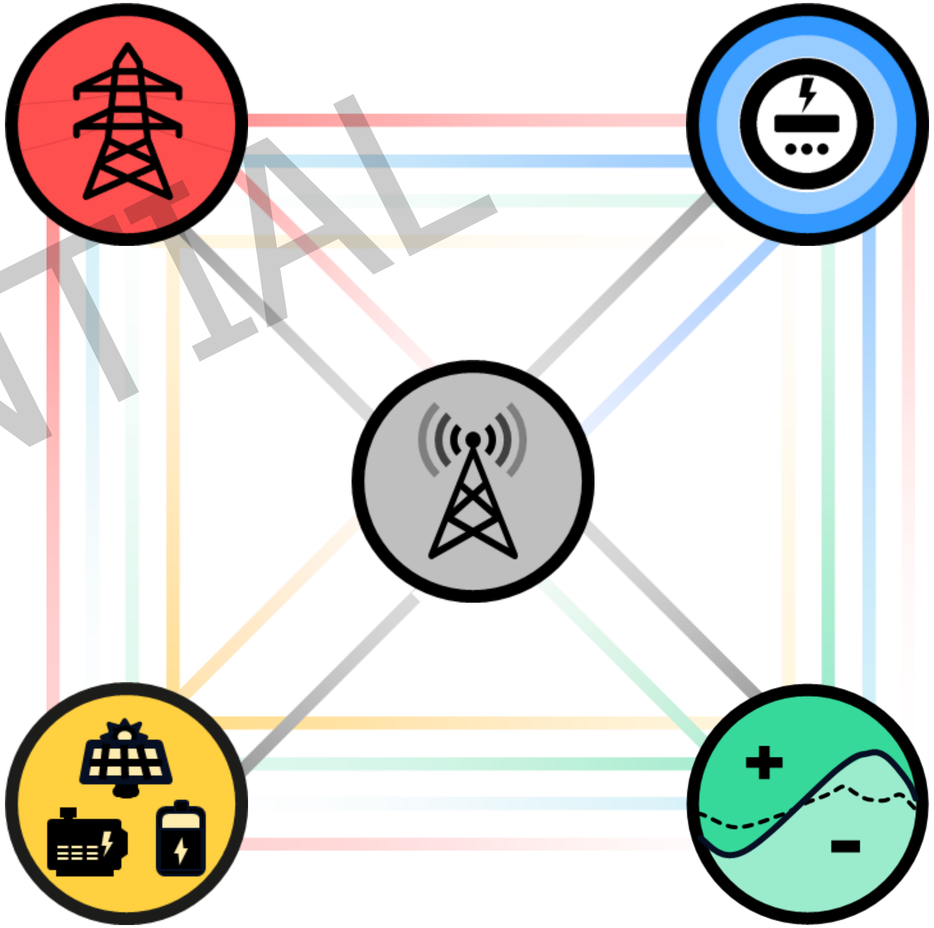


Different Opportunities to Reach a Common Goal

- No matter the size, <u>all your goals are the same</u>

  To provide safe, affordable, reliable power to your members and communities

- <u>Many opportunities exist</u> to support the goal, but there is no "one size fits all" solution
- Determining and optimizing beneficial Smart Grid investments will vary depending on:
  - Member load requirements
  - Wholesale billing structure
  - Local threats to reliability and resiliency
  - Communications coverage
  - Data at hand (SCADA, AMI/MDMS, OMS, wholesale power costs, member surveys, etc.)
- *Defined outcomes are critical for successful smart grid investments!*



Leveraging the Data at Hand to Identify Smart Grid Opportunities

Smart Grid Project Planning Lifecycle

A strong commitment to proper planning and ongoing evaluation is critical to Smart Grid investments

- Planning
  - Documentation of existing facilities and assets
    - Identifies risks of "Garbage in…"
  - Design for long-term operational goals
  - Training and work process development for improved system utilization
  - Development of key performance indicators and benchmarks
- Execution
  - Utilization of resources to achieve defined goals
  - Incremental measurement and documentation
- Evaluation
  - Holistic review of measured results compared to KPIs and benchmarks
  - Refinement of approach and objectives

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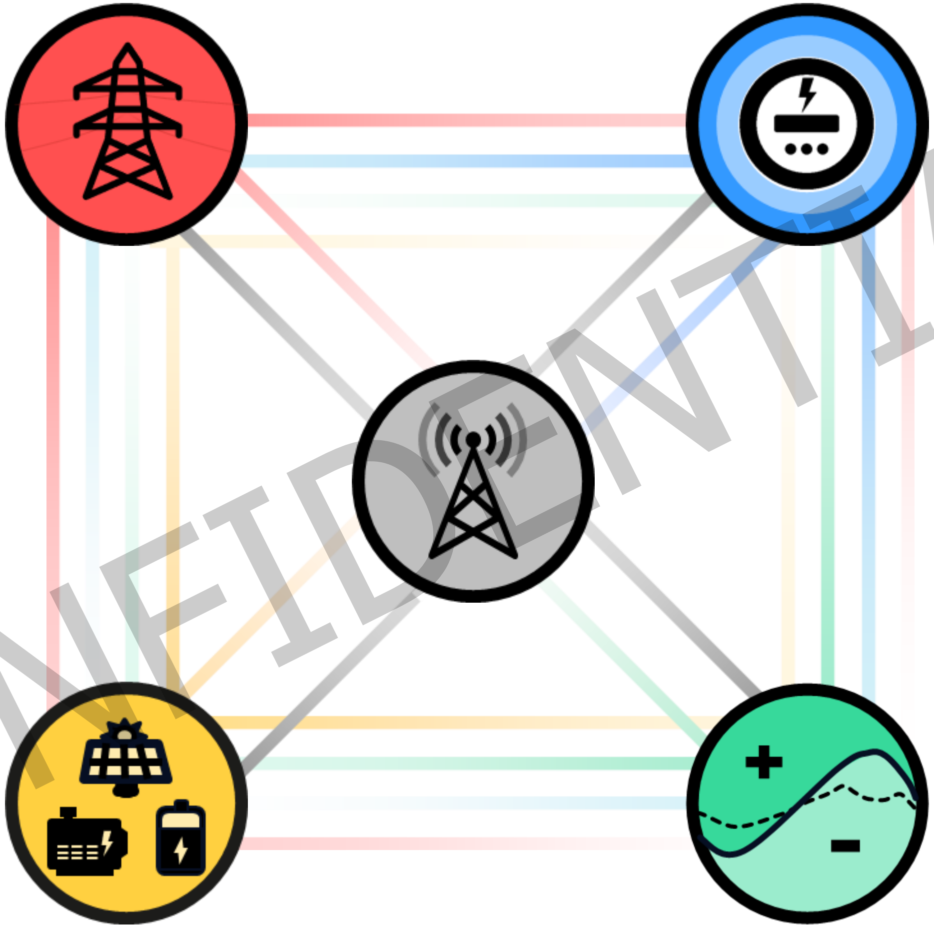
Planning and Preparing for Smart Grid Investments: Sample Strategies



Planning and Preparing for Smart Grid Investments: Sample Strategies

- **Sample Strategy 1:** Developing benchmarks with utility stakeholders to **identify trends and decision points** for meter upgrades, integrations, and replacement schedules

Determining Key Factors for Benchmarking and System Evaluations

Prior to making additional investment into current systems, an assessment should be done by a cross-functional team to document the current state of the system and determine what the decision points are for acceptable performance with respect to the business and operational expectations for system performance.

Each additional investment into the current generation of technology bears a capital cost and impacts the remaining depreciation expense for the assets. Incremental gains in operational capabilities are unlikely to offset these cost in the current system replacement horizon.

Utility Data Access	**Member Data Access**	**Operational Visibility**	**Resource Requirements**	**Usable System Life**	**Vendor Support**

Methodology For Benchmarking and System Evaluation: Metering Example

Performance / Satisfaction Rating	**High**	**Medium**	**Low**
Utility Data Access	Utility can access data in native environments, integrations are well-supported with no custom programing required	Utility can access data as exports or – in limited systems – via additional effort and custom programing	Access to data is limited requiring extensive overheads to view or utilize data
Member Data Access	Members are presented timely, accurate data that allows them to monitor and control usage	Members have access to limited data views in presented data, or data has a lower degree of confidence/fidelity than utility views	Members are not able to access or utilize data without extensive effort or member services support
Operational Visibility	Operational information is fully integrated, trusted and actionable	Operational data can be accessed and utilized in specific instances or by limited users	Operational data is not available or is not trusted to make operational decisions
Resource Requirement	Low FTE resource requirements to support system; largely maintained through native environments with minimal support required	Resources required to verify system operation and to perform manual processes to access or leverage data sets	Extensive resources required for basic system operation and data collection
Usable System Life	System has a continual roadmap for improvements and capability to support current and future use cases. Little to no equipment replacements required	System is currently supported but lacks additional development and support for additional features. Few equipment failures and replacements	System is nearing end of vendor support or lacks a defined pathway for continued expansion. Increasing trend of equipment failures and maintenance requirements
Vendor Support	Vendor proactively responsive to current system requirements and actively pursuing additional features and functionality. Readily available replacement equipment	Vendor responds slowly to current needs, and support for expansion is limited. Replacement equipment is available but requires extensive lead times	Vendor is unresponsive to current needs or lacks development of additional functionality. Equipment has gone end of life or is no longer supported

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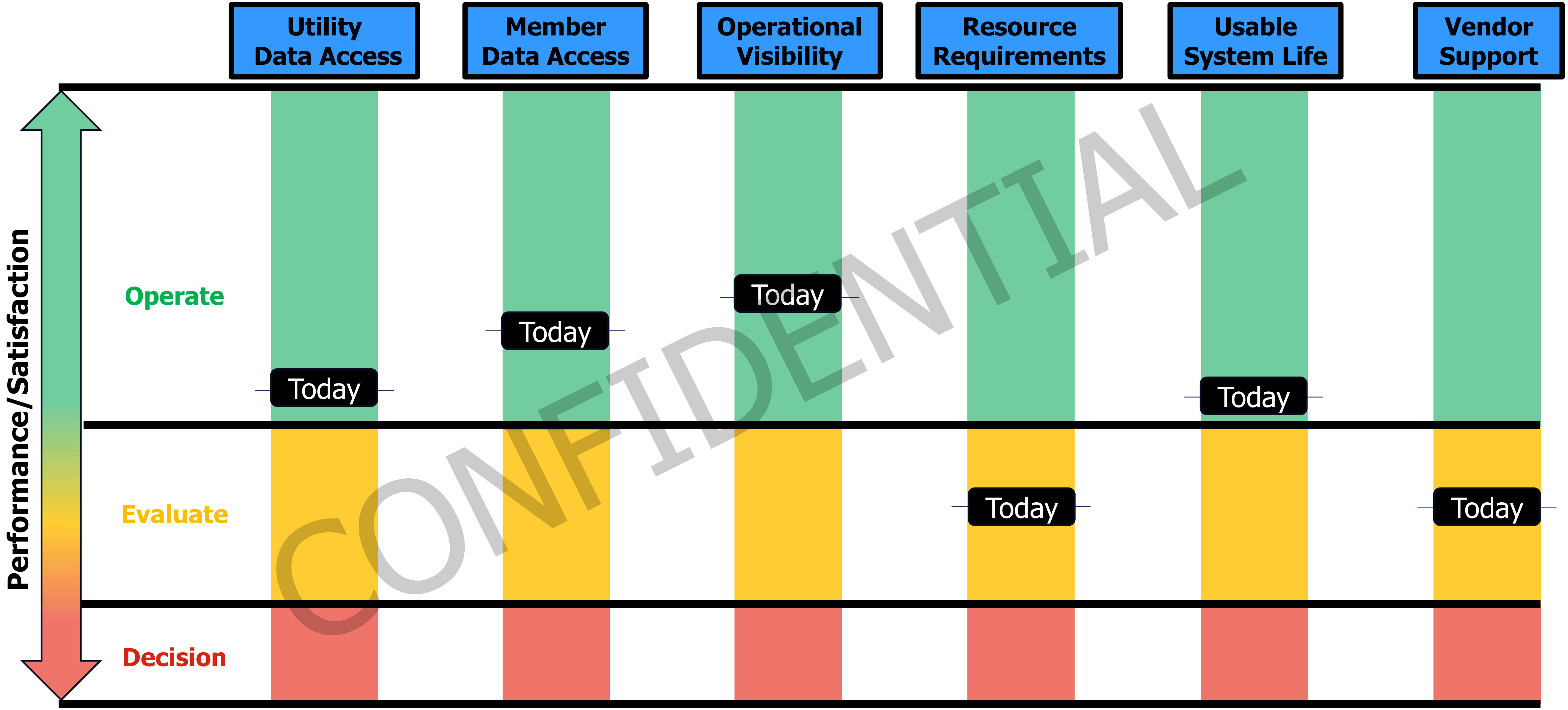
Examples of rating criteria and rationale

Factors for Benchmarking and System Evaluation: Collecting User Input

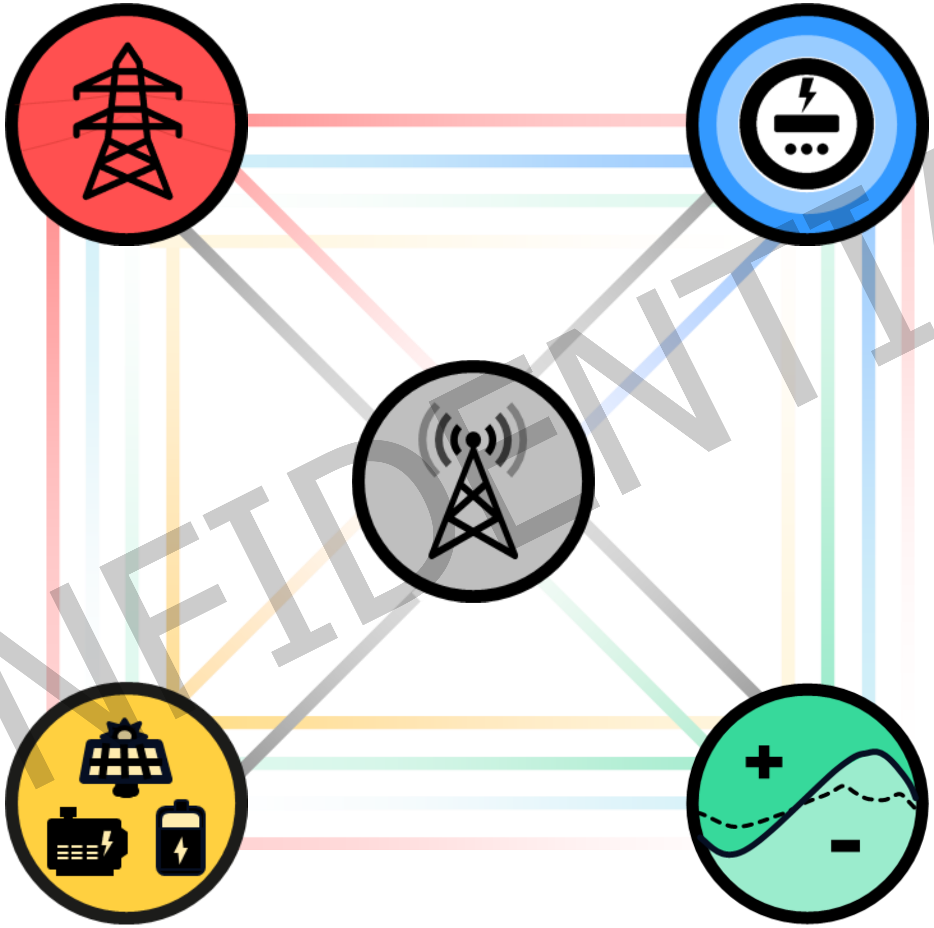
Performance/Satisfaction

Performance Satisfaction Rating	Utility Data Access	Member Data Access	Operational Visibility	Resource Requirement	Usable System Life	Vendor Support
High						
Medium						
Low						

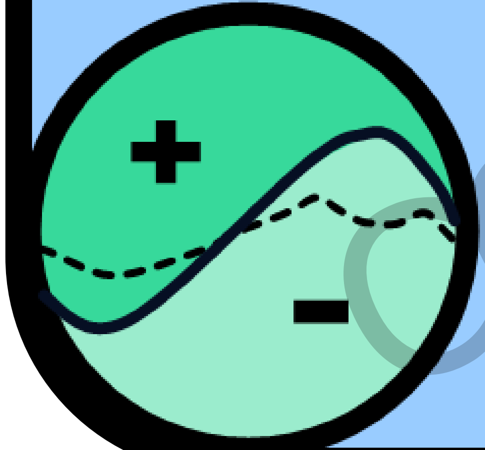
Factors for Benchmarking and System Evaluation: Quantifying the Data



Planning and Preparing for Smart Grid Investments: Sample Strategies

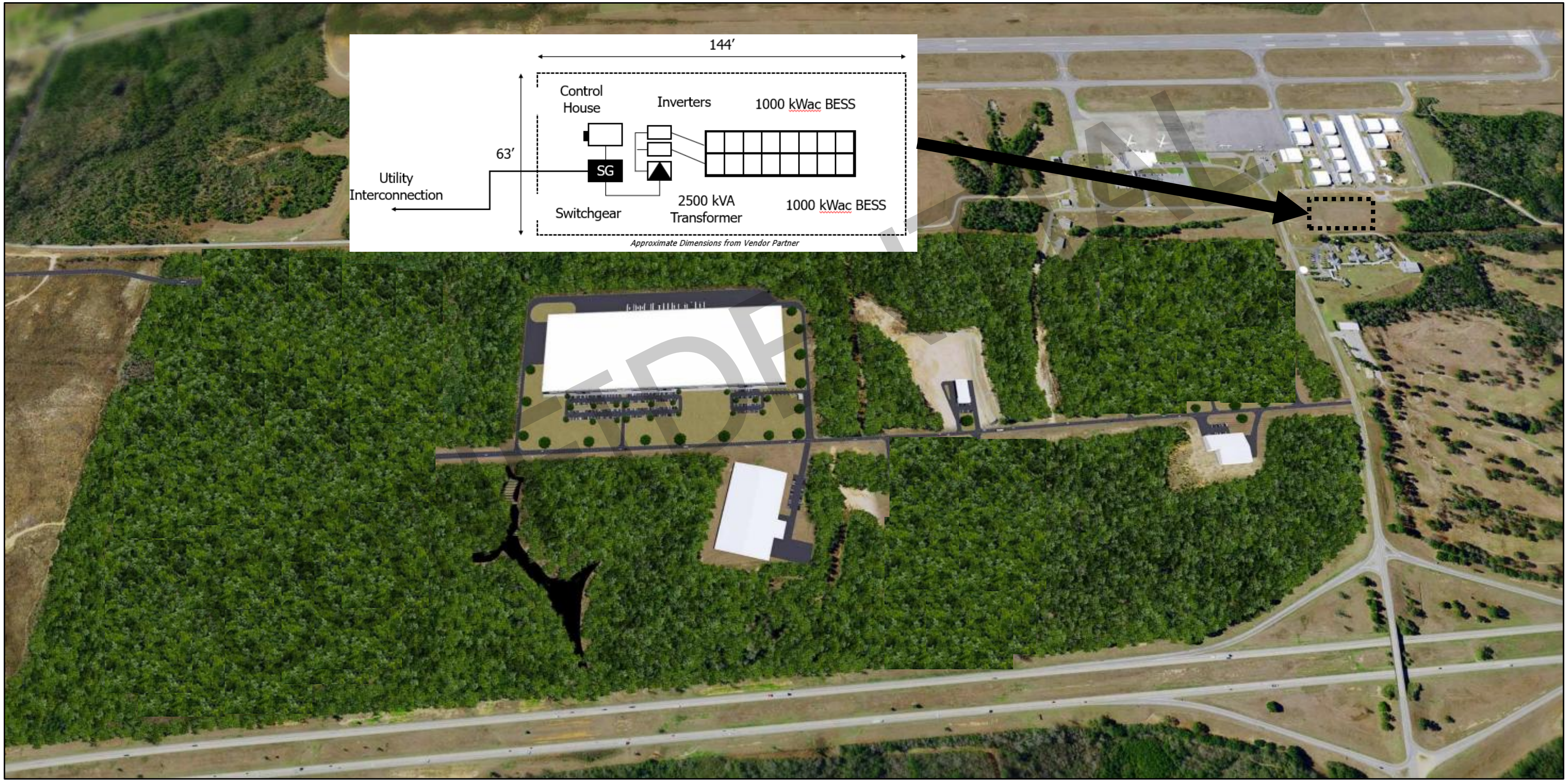


Planning and Preparing for Smart Grid Investments: Sample Strategies



- **Sample Strategy 2:** Evaluating <u>system and local load profiles</u> to **determine viability and availability** of distributed generation and load management partnerships and programs
- **Key Requirements:**
  - System/substation, feeder, and customer site load profiles
  - Wholesale power costs
  - Identification of key account locations
    - Note forecasted load changes
  - Defined resiliency requirements

Sample Microgrid Evaluation: BESS at Key Account Developments



Note: Microgrid example is not set to scale with architectural rendering and is for example purposes only

Sample Microgrid Evaluation: BESS at Key Account Developments

Initial Siting Considerations:

Initial Projected Loading: 1.8 MW

Historical Site Information:

- Substation 2024 NCPs:
  - Summer: 4.7 MW
  - Winter: 6.3 MW
  - Shoulder: 3.6 MW
- Feeder 4 Outage History (4 Years): 25 events
- Longest Outage Duration: 8.11 Hours
- Average Outage Duration: 2.33 Hours

Wholesale Costs (2025):

- Combined CP Demand Charge: $20/kW
- NCP Demand Charge: $1/kW
- Combined Energy Charge: $30/MWh

Initial Design:

- 2 MW, 8 MWh battery with room to grow up to 4 MW in the future
- **Ideal dispatch** will reach full power rating **without backfeeding Substation**

Site-Level BESS Analysis Based on Historical Data

Consumer Site Average Loading on Coincident Peak Event Days (Pre-BESS)																								
Month/Hour Ending	1:00 AM	2:00 AM	3:00 AM	4:00 AM	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
January	224	226	188	138	149	196	293	296	283	283	273	273	138	246	244	236	222	242	238	241	255	229	186	227
February	154	100	109	115	128	170	248	241	230	222	205	225	202	212	182	185	199	203	232	209	189	200	135	213
March	123	121	114	125	134	151	241	327	345	348	353	347	361	351	352	345	369	340	339	342	358	354	269	157
April	154	146	137	127	133	145	218	371	414	405	411	423	430	396	427	405	415	469	413	413	417	407	393	231
May	226	215	194	191	210	230	330	679	728	676	690	706	712	658	683	585	571	574	564	563	591	581	565	392
June	254	240	222	207	207	227	347	590	655	654	649	647	665	608	611	588	573	585	597	588	597	552	546	387
July	257	245	232	225	236	252	348	535	572	607	611	592	593	553	568	516	518	522	520	534	534	470	448	331
August	237	228	213	219	228	242	319	467	506	504	507	464	529	500	494	454	438	428	436	505	445	435	426	381
September	559	554	536	399	263	271	361	654	693	681	734	780	749	730	683	666	711	675	651	647	642	625	583	375
October	449	445	430	329	210	215	288	462	452	426	470	467	494	471	470	439	427	424	431	425	421	411	384	354
November	237	125	181	163	169	227	363	391	373	338	342	364	305	343	368	365	352	363	350	336	298	307	247	250
December	122	128	150	177	184	184	186	151	146	130	124	114	104	105	106	96	96	136	151	156	154	0	108	125

BESS Discharge/Recharge Schedule for Event Days																								
Month/Hour Ending	1:00 AM	2:00 AM	3:00 AM	4:00 AM	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
January	1,467	1,467	1,467	1,467	1,467		-2,000	-2,000	-2,000	-2,000														1,467
February	1,467	1,467	1,467	1,467	1,467		-2,000	-2,000	-2,000	-2,000														1,467
March	1,467	1,467	1,467	1,467	1,467		-2,000	-2,000	-2,000	-2,000														1,467
April	1,467	1,467	1,467	1,467	1,467										-2,000	-2,000	-2,000	-2,000						1,467
May	1,467	1,467	1,467	1,467	1,467										-2,000	-2,000	-2,000	-2,000						1,467
June	1,467	1,467	1,467	1,467	1,467										-2,000	-2,000	-2,000	-2,000						1,467
July	1,467	1,467	1,467	1,467	1,467										-2,000	-2,000	-2,000	-2,000						1,467
August	1,467	1,467	1,467	1,467	1,467										-2,000	-2,000	-2,000	-2,000						1,467
September	1,467	1,467	1,467	1,467	1,467										-2,000	-2,000	-2,000	-2,000						1,467
October	1,467	1,467	1,467	1,467	1,467										-2,000	-2,000	-2,000	-2,000						1,467
November	1,467	1,467	1,467	1,467	1,467		-2,000	-2,000	-2,000	-2,000														1,467
December	1,467	1,467	1,467	1,467	1,467		-2,000	-2,000	-2,000	-2,000														1,467

Consumer Site Average Loading on Coincident Peak Event Days (Post-BESS)																								
Month/Hour Ending	1:00 AM	2:00 AM	3:00 AM	4:00 AM	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
January	1,691	1,693	1,655	1,604	1,615	196	-1,707	-1,704	-1,717	-1,717	273	273	103	246	244	236	222	242	238	241	191	229	186	1,694
February	1,620	1,567	1,576	1,581	1,594	170	-1,752	-1,759	-1,770	-1,778	205	225	202	212	182	185	199	203	232	209	189	200	135	1,679
March	1,590	1,587	1,581	1,556	1,582	151	-1,759	-1,673	-1,655	-1,652	353	347	361	351	352	345	369	340	339	342	358	354	269	1,624
April	1,621	1,613	1,604	1,594	1,600	145	218	371	414	405	411	423	430	396	-1,573	-1,595	-1,585	-1,609	413	413	417	407	393	1,698
May	1,580	1,574	1,564	1,562	1,572	115	165	340	364	338	345	353	356	329	-1,658	-1,854	-1,714	-1,713	282	282	296	290	283	1,663
June	1,721	1,707	1,689	1,674	1,673	227	347	590	655	654	649	647	665	608	-1,389	-1,412	-1,427	-1,415	597	588	597	552	546	1,757
July	1,723	1,711	1,699	1,692	1,703	252	348	535	572	607	611	592	593	553	-1,432	-1,484	-1,482	-1,478	416	534	534	470	448	1,798
August	1,656	1,694	1,680	1,686	1,695	242	319	467	506	504	507	464	529	500	-1,506	-1,546	-1,562	-1,572	436	404	445	435	426	1,848
September	2,025	2,021	2,002	1,866	1,730	271	361	654	693	681	734	780	749	730	-1,317	-1,334	-1,289	-1,325	651	647	642	625	583	1,841
October	1,916	1,911	1,896	1,796	1,677	215	288	404	452	373	470	467	494	471	-1,530	-1,561	-1,573	-1,576	431	425	421	411	384	1,821
November	1,664	1,571	1,648	1,630	1,636	227	-1,637	-1,609	-1,627	-1,662	342	364	305	343	368	365	352	363	350	336	249	307	247	1,716
December	1,589	1,595	1,617	1,643	1,650	184	-1,814	-1,849	-1,854	-1,870	124	114	104	105	106	96	96	136	151	156	154	0	108	1,592

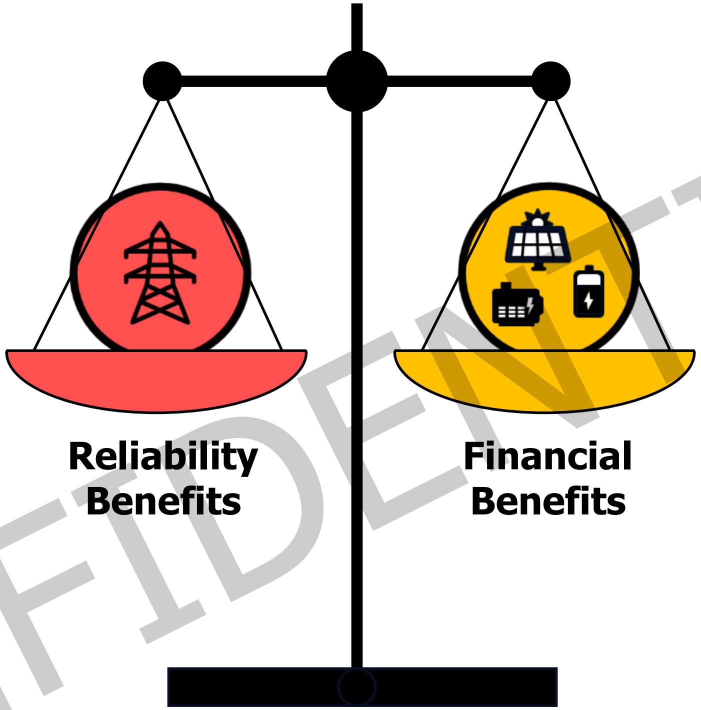
**NRTC recommends that Dixie this analysis based on loading at the Substation and Feeder level as well as the consumer level to determine viability of approach, <u>especially as load and generation grows</u>*

Sample BESS Summary

Analysis performed using consumer loads, OMS, and GIS data provided by the cooperative

<u>Reliability Considerations</u>:

- Under modeled scenario, full capacity of the BESS was available **64.2% of the time**
  - <u>Decreasing charge time</u> from 6 hours to 4 hours increases availability to **68.3%** but may result in NCP shift
- Analysis should consider **station-level interval data** as well as consumer-level
- Hosting capacity evaluation recommended to determine if standalone BESS is feasible or if RICE genset support required



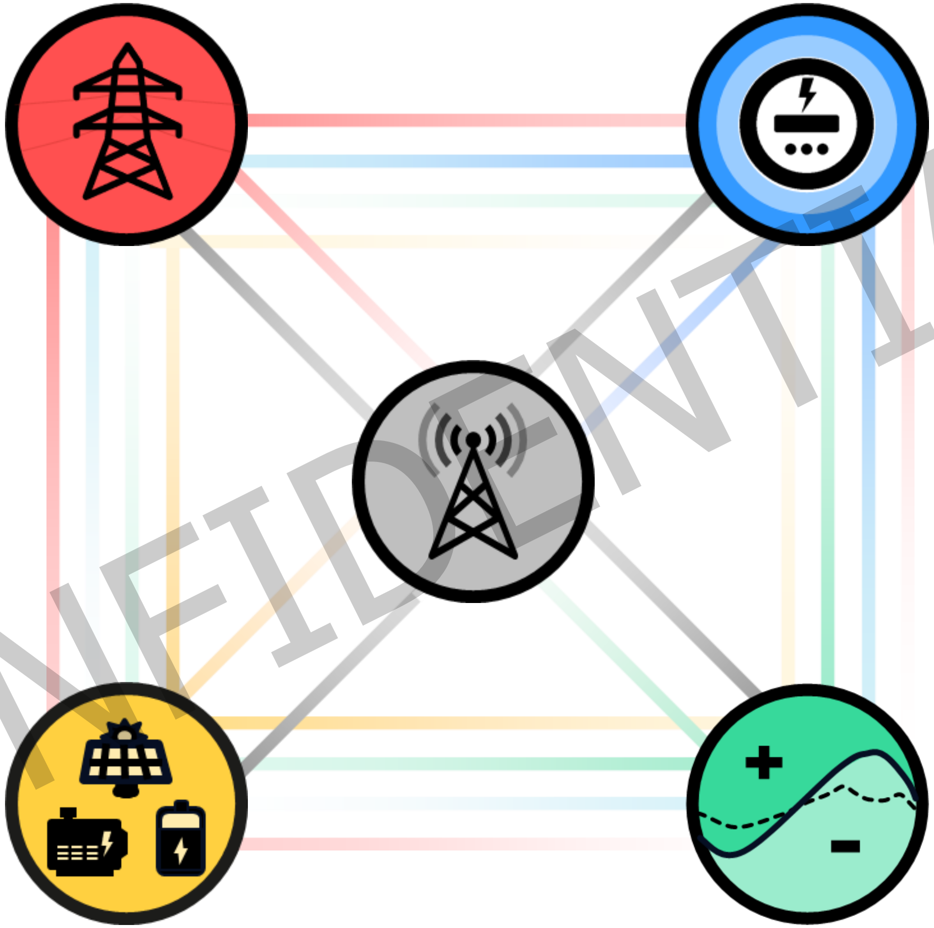
<u>Financial Considerations</u>:

- Potential net benefit assuming **max rated power output is feasible.** Dispatching at less than designed output diminishes ROI
- Assets are typically <u>undersized</u> to reduce costs and maximize benefit <u>at expense of reliability</u>
- Dispatch scenario was modeled to **reduce probability of shifting NCP.** As load and capacity requirements grow, **NCP charges** <u>play a greater role</u> in the cost/benefit equation

Summary:

- Using a BESS as a **Reliability** asset and **Demand Reduction** resource are exclusive operations and have different investment considerations to be balanced.
- With high value of CP demand charges, prioritizing ROI-oriented dispatching allows for increased value, and goals may shift once costs have been recovered and financial goals have been met
- Siting power/energy requirements will dictate if microgrid is required or if asset can stand alone

Planning and Preparing for Smart Grid Investments: Sample Strategies



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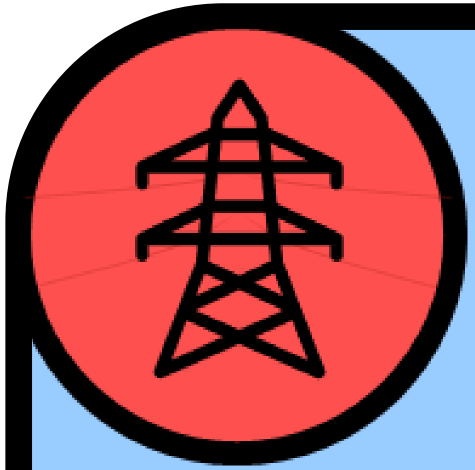


- **Sample Strategy 3:** Analyzing historical outage data to develop protective device placement criteria, prioritize device deployment schedules, & deploy FLISR schemes
- **Key Considerations:**
  - Clean outage data
    - Consider integrity of data collected, including cause codes, equipment codes, type codes,
    - Connectivity model validity significantly impacts analysis
  - Clearly defined reliability baselines, objectives, and metrics enable trending for continued planning and investment
  - Determine if GIS displays facilitate decision-making

Reviewing Historical Data: Reliability Indices

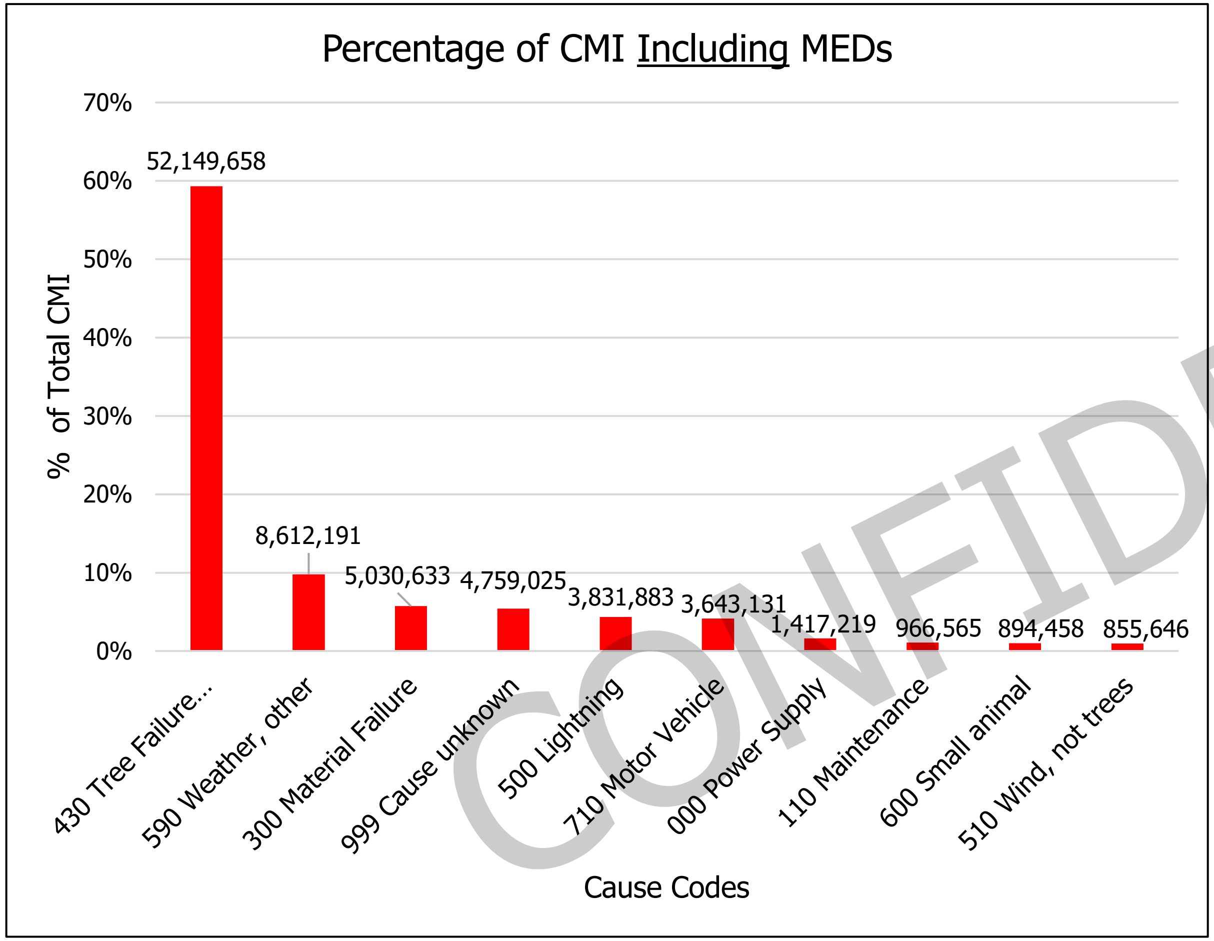
Review system-level outage trends to identify areas of weakness and opportunities for investment

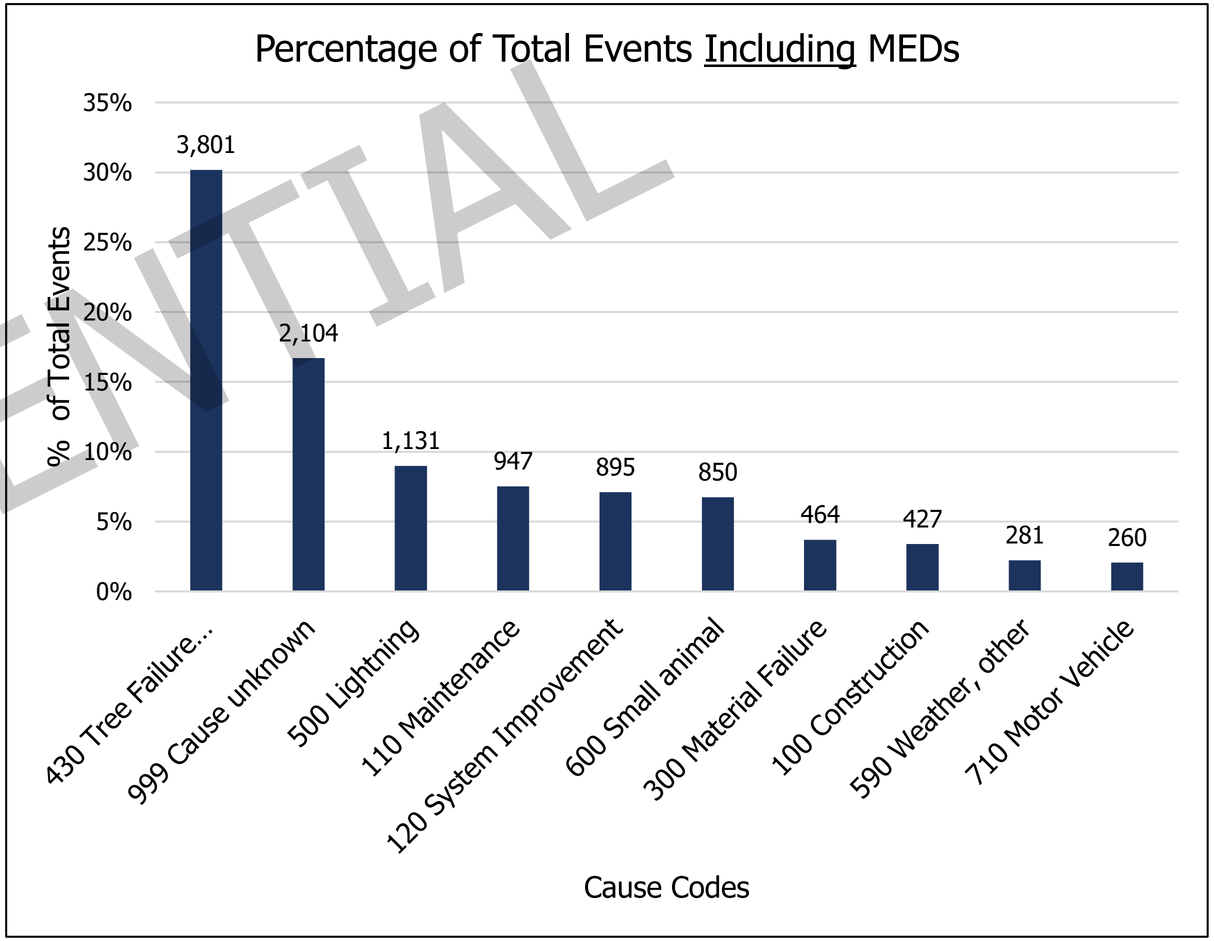
	All Events (With Major Event Days)			Without Major Event Days			Loss of Supply Removed (With Major Event Days)		
Data Year	SAIDI (minutes/year)	SAIFI (events/year)	CAIDI (minutes/consumer)	SAIDI (minutes/year)	SAIFI (events/year)	CAIDI (minutes/consumer)	SAIDI (minutes/year)	SAIFI (events/year)	CAIDI (minutes/consumer)
2024	262.35	2.31	113.67	197.54	2.03	97.13	258.04	2.14	120.73
2023	440.10	2.40	183.38	151.50	1.50	101.00	436.57	2.36	185.23
2022	216.80	1.90	114.11	187.40	1.70	110.24	211.14	1.79	118.02
2021	238.10	1.90	125.32	184.80	1.70	108.71	221.48	1.71	129.84
2020	1,036.70	3.00	345.57	212.90	1.90	112.05	1,027.92	2.89	356.10

- **Outage Trends and Insights**
  - Consider insights from the team on what is driving outages and the reported metrics
  - Delineate existing targeted plans to further improve reliability
  - Review investment requirements against expected returns for reliability improvement

Reviewing Historical Data: Reliability Assessment

Sample: Yearly values pulled from OMS export ranging from 1/1/2020 to 12/31/2024





Non-Outage Events Excluded

**CMI = Consumer Minutes of Interruption = Consumer Count * Outage Duration in Minutes*

MED = Major Event Day

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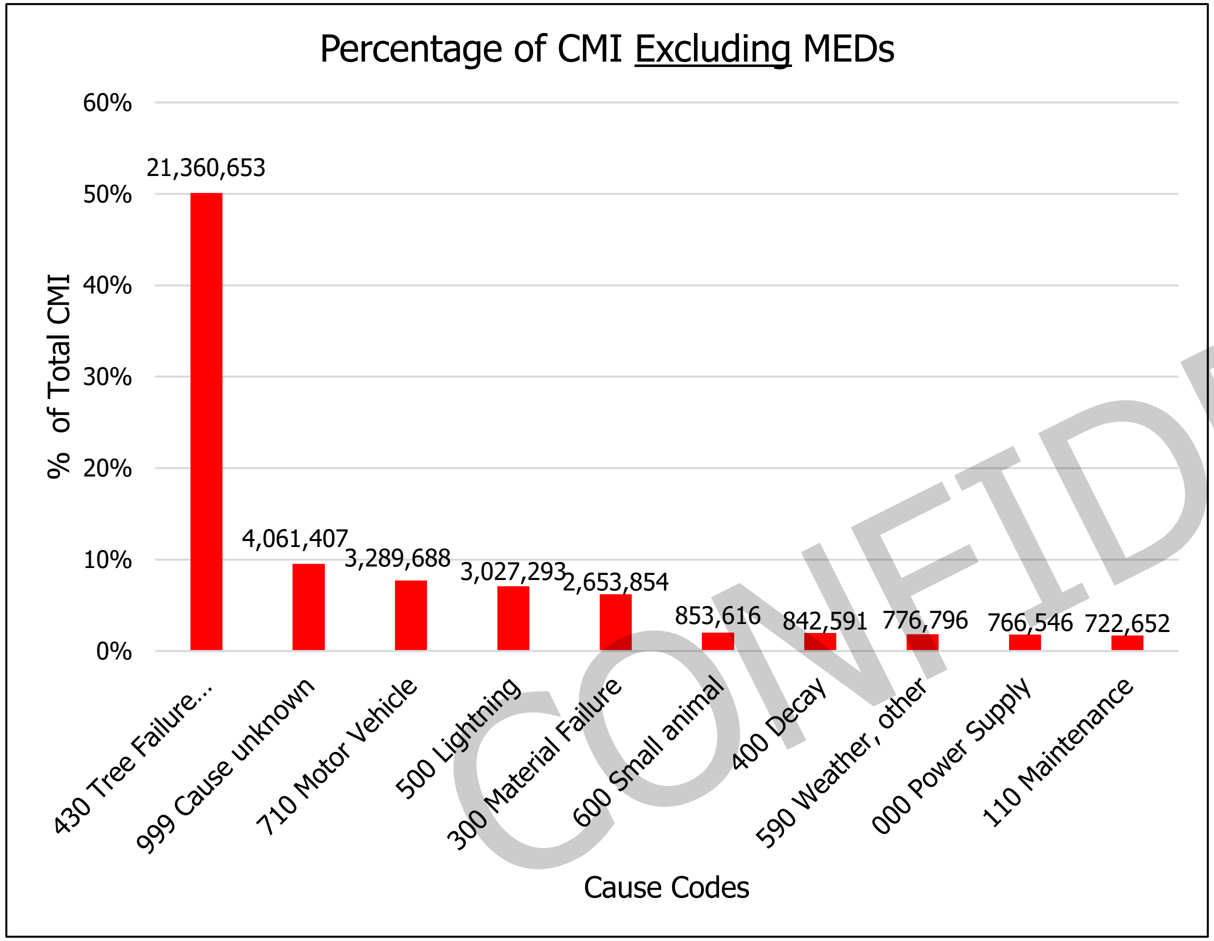
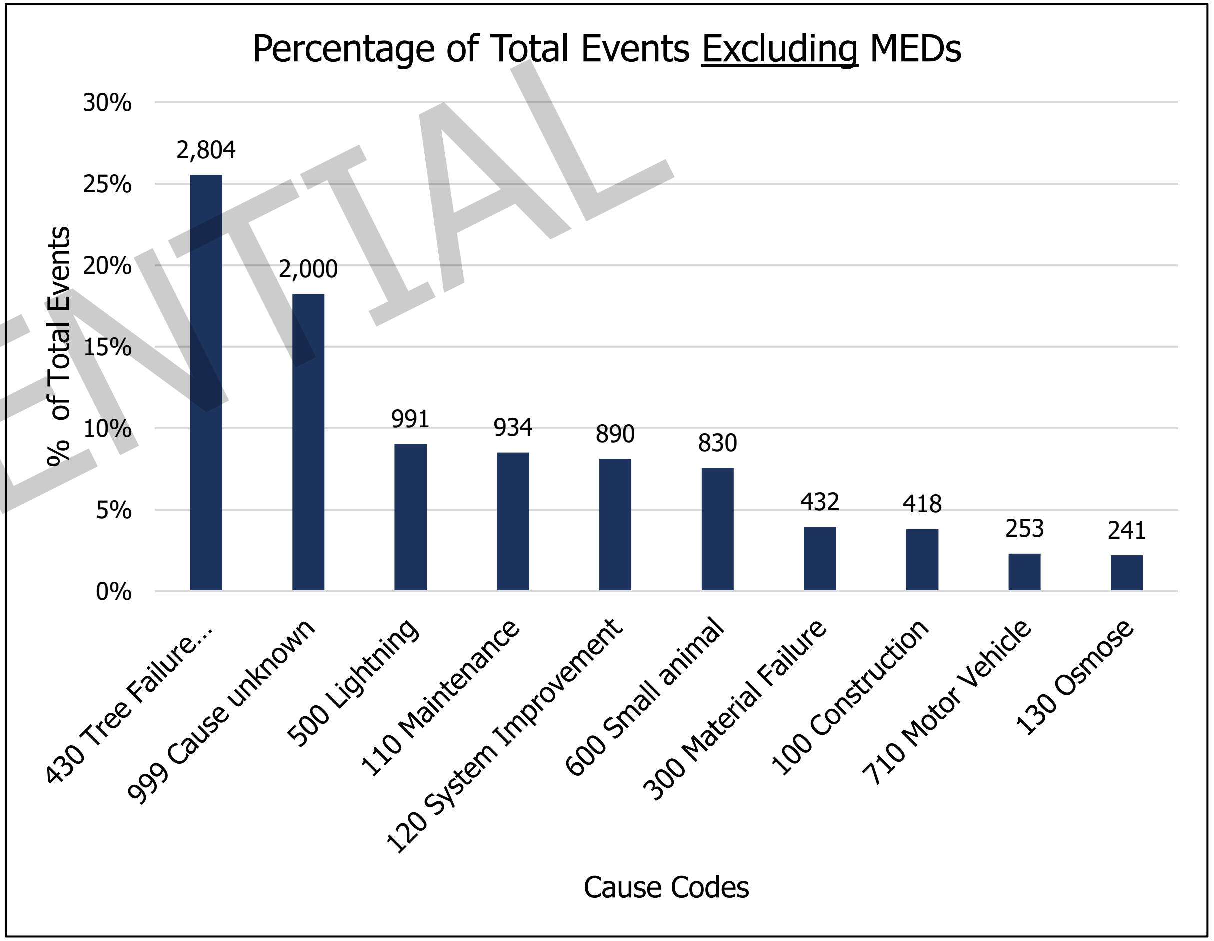
Reviewing Historical Data: Reliability Assessment

Sample: Yearly values pulled from OMS export ranging from 1/1/2020 to 12/31/2024





Non-Outage Events Excluded

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Reviewing Historical Data: Data Integrity

Determining value of smart grid investments depends on the reliability of the data at hand

- Data-driven decision making depends on <u>understanding the limitations of your datasets</u> and **working to improve them**
- Review of historical data often uncovers opportunities for improvement and refinement:
  - <u>Example:</u> What does the outage logging process look like for your utility?
    - How is the outage created and dispatched?
    - Who closes the outage? How frequently are outages reviewed?
    - How are outage records used for subsequent planning?
- Analysis can evolve into something complex, <u>but often starts simply:</u>
  - <u>Sample</u>**:** 12,598 Total Records from 01/01/2020 to 12/31/2024 totaling ~88M CMI. Data cleanup opportunities include:
    - 41 unique cause codes, 40 equipment codes
    - "0XX" level codes typically reserved for generation/transmission assets, but were used 51 times for equipment codes
    - Define difference between "110 Maintenance" and "120 System Improvement?"
    - Of 2,104 "Unknown" Outages, 276 had an Equipment Code besides "No Equipment Failure"
    - Recommend periodic review RUS Bulletin 1730A-119 for OMS Cause and Equipment Codes to ensure additional/revised codes aren't needed for refined analysis

a <u>Cause Codes and Equipment Codes.</u> Two codes have traditionally been associated with interruption reporting: cause codes and equipment codes. Cause codes indicate the initiating condition which would include decay, animals, lightning, tree limbs, etc. while the equipment code indicates what equipment was involved, such as a broken insulator. However, when a protective device such as a fuse operates (as designed) to disconnect a faulted conductor, no equipment has failed or been damaged. Therefore, a "special" equipment code is also needed to indicate that no failure of equipment or material defect occurred. Every interruption has a cause, but not every interruption results in damaged or failed equipment. Therefore, in the case where no equipment was damaged, the corresponding code in Table 3, "999, No Equipment Failure", would be used. Including this special code ensures that every interruption will have a cause code and an equipment code associated with it even when no equipment is at fault. Recommended cause codes are shown in Table 2, and equipment codes are shown in Table 3.

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Sample Outage Data Analysis: Substation/Feeder Outages

Outage data pulled pulled from OMS export ranging from 1/1/2020 to 12/31/2024

Top 10 Feeders
Ranked by Substation/Feeder Outage CMI

Feeder	CMI	Frequency of Event	Consumers Affected*	Avg. CMI/Event
15-03	**1,173,555**	61	2,040	19,239
10-01	**1,038,219**	63	5,880	16,480
14-03	**811,526**	87	4,977	9,328
15-01	**804,984**	55	1,928	14,636
9-04	**683,609**	72	3,205	9,495
19-02	**623,623**	70	2,116	8,909
1-04	**608,856**	63	2,680	9,664
201-02	**550,580**	40	2,771	13,764
17-04	**542,768**	71	3,573	7,645
15-02	**530,203**	58	3,616	9,141

**Consumers Affected refers to the sum of consumers affected by all events rather than the number of consumers on the associated feeder*

Cooperative Outage Analysis Sub/Fdr-Type Freq.

Note: Map reflects results of outage data from cooperative spanning from 01/01/2020 – 12/31/2024

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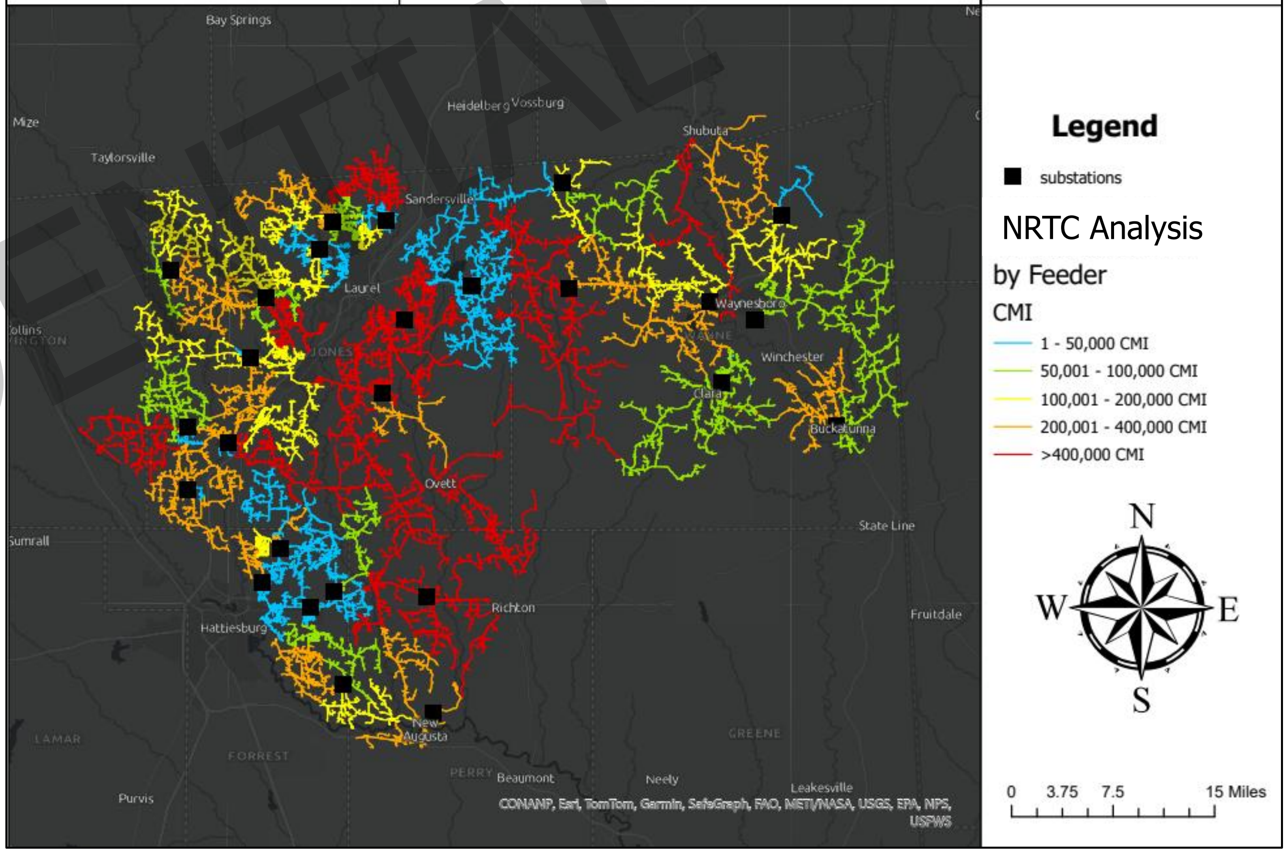

Prioritization Approach

1

Develop reliability goal ranking

- Define which reliability metrics matter most and document why
  - SAIDI? SAIFI? CMI? CEMI? Others?
  - Consider if specific reliability initiatives shifts metric priorities

2

Decide what parameters define a priority location

- Document which accounts are considered priority (key, critical, etc.)
- Determine what additional priority should carry for system improvements or in prioritizing restoration or resiliency schemes

3

Evaluate and score all feeders

- Using historical data, calculate feeder level indices for priority metrics
- Rank feeders by metric & develop composite scores by assigning weight to key metrics

Prioritization Approach

4

Define targets and objectives

- What are the key goals to achieve, and how do I implement them?
  - *Example: To reduce SAIDI on the system by X%, our utility will deploy FLISR-capable devices on feeders with more than Y consumers with Z members within a zone.*

5

Identify limiting factors and required prerequisite construction

- Compare ranks against substation/feeder capacities to determine CWP/comms availability
  - *Example: Though Feeder A is a worse performing feeder, it requires an RUS 300 job for capacity, slated for 2028. Feeder B has capacity for backfeed and has fiber available today*

6

Continually monitor the system and analyze health from various perspectives

- Review outage data and system performance to document successes / failures of plan
- Revise the plan based on lessons learned and best practices
- Respond to emerging threats proactively by analyzing the data from different perspectives

Migrating to Dynamic Systems

Key Systems to Leverage Increasing Grid Capabilities

Meter data management provides the mean to accurately gauge power-flow trends across the system at a granular level. This enables advanced grid management through ADMS and DERMS platforms

- **MDMS:** Measurement and management through utility AMI load data
  - Collection and storage of metering data
  - Verification, estimating and editing of billing data
  - Common platform for integrations into the AMI headend system
  - Grouping and aggregation of data to create groups and subgroups for business or operational interest
  - Simplified advanced data analytics through enterprise software vendors
- **ADMS:** Measurement and management through grid connected equipment
  - SCADA functionality related to data collection, retention, reporting and device control operations
  - Model-based management of power-flows in the system through data collection and execution of predefined automated responses to system states and conditions
  - Integration point for administration and control of DVR/VVO/FLISR/Microgrid programs
- **DERMS:** Measurement and management of distributed resources
  - Measurement and verification of system state, program and event effectiveness
  - Aggregation and presentation of loading data
  - Forecasting and projections to enable decision making
  - Management of DER and DR programs for dispatching
  - Direct load control of DG, EV, and storage assets

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Increasing Capable Systems

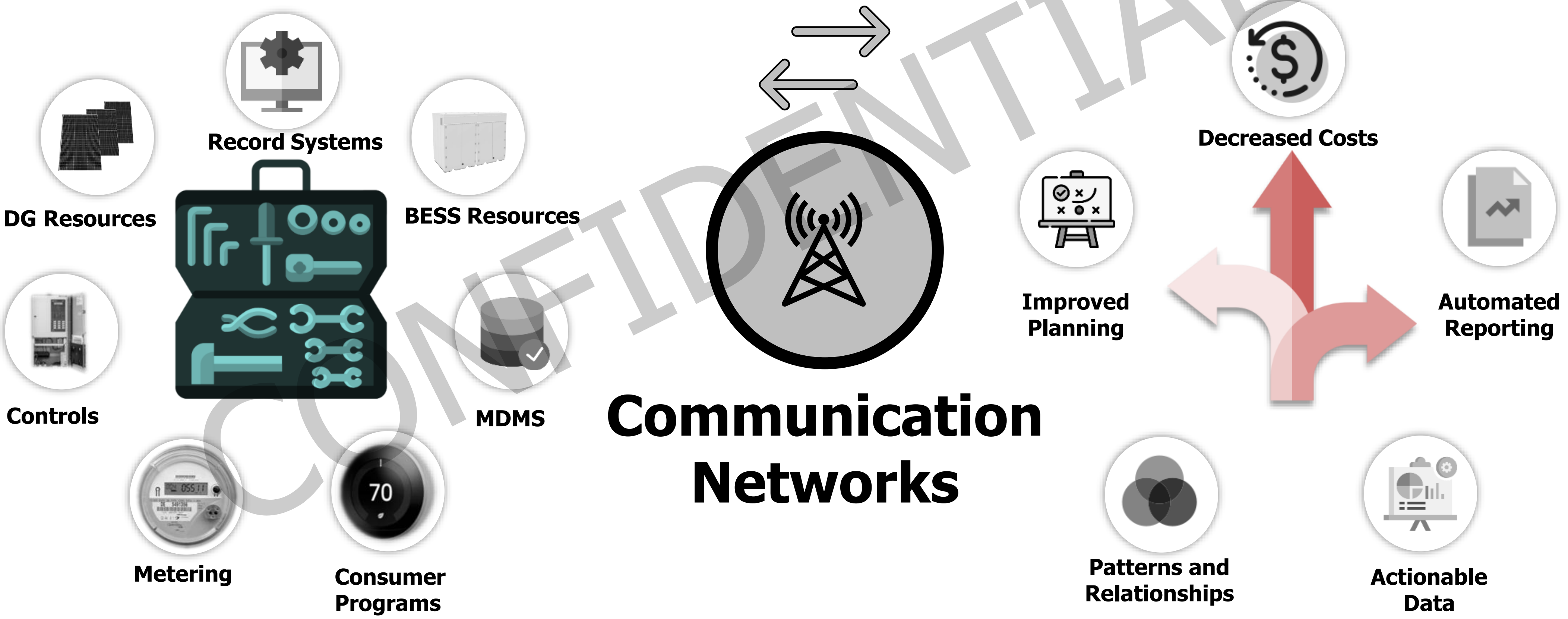
Understanding these concepts helps to inform the reason why we need to invest in Smart Grid Infrastructure

Smart Grid

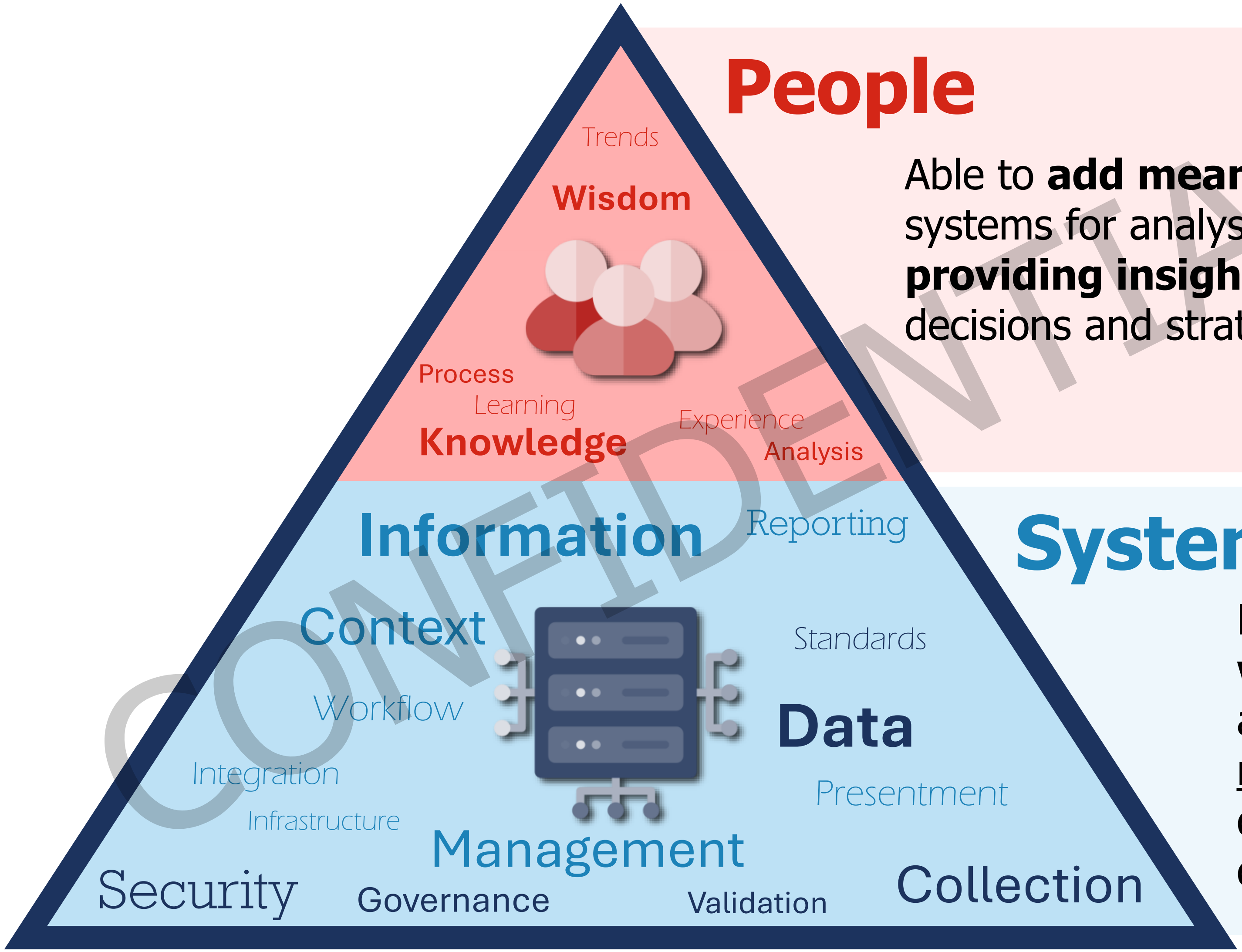
<u>Connected, capable, tools</u> that provide data and ways to **collect, aggregate, analyze, and share data**

Dynamic Operation

<u>Processes</u> enabled by our PEOPLE that **create increased efficiency and effectiveness**



Actionable Decisions Realized From Data Analysis



People

Able to **add meaning** to data using various systems for analysis and presentment **while providing insight** to help enable data driven decisions and strategy development

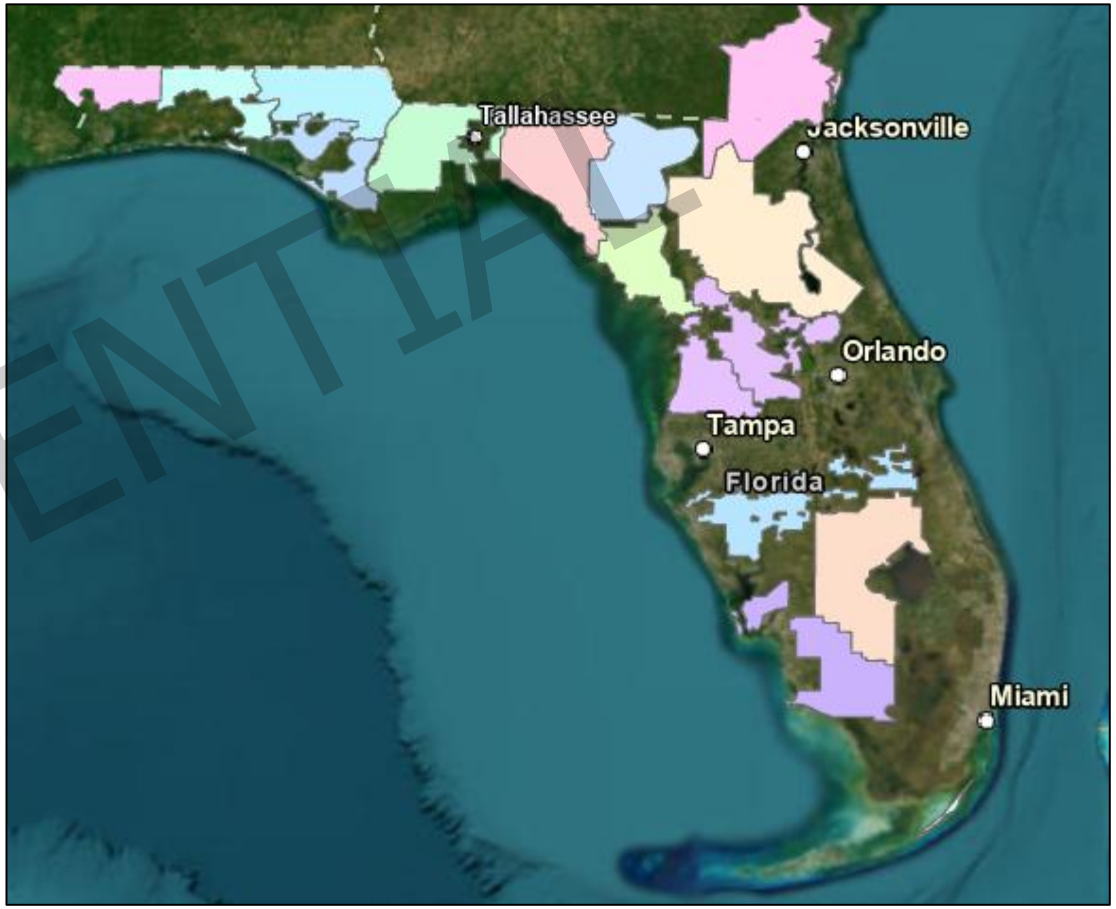
Systems

Helps **standardize data, workflows, and outputs** which allows people to reliably apply meaning to data to enable decision making and strategy development

In Summary

Turning Data into Smart Grid Decisions

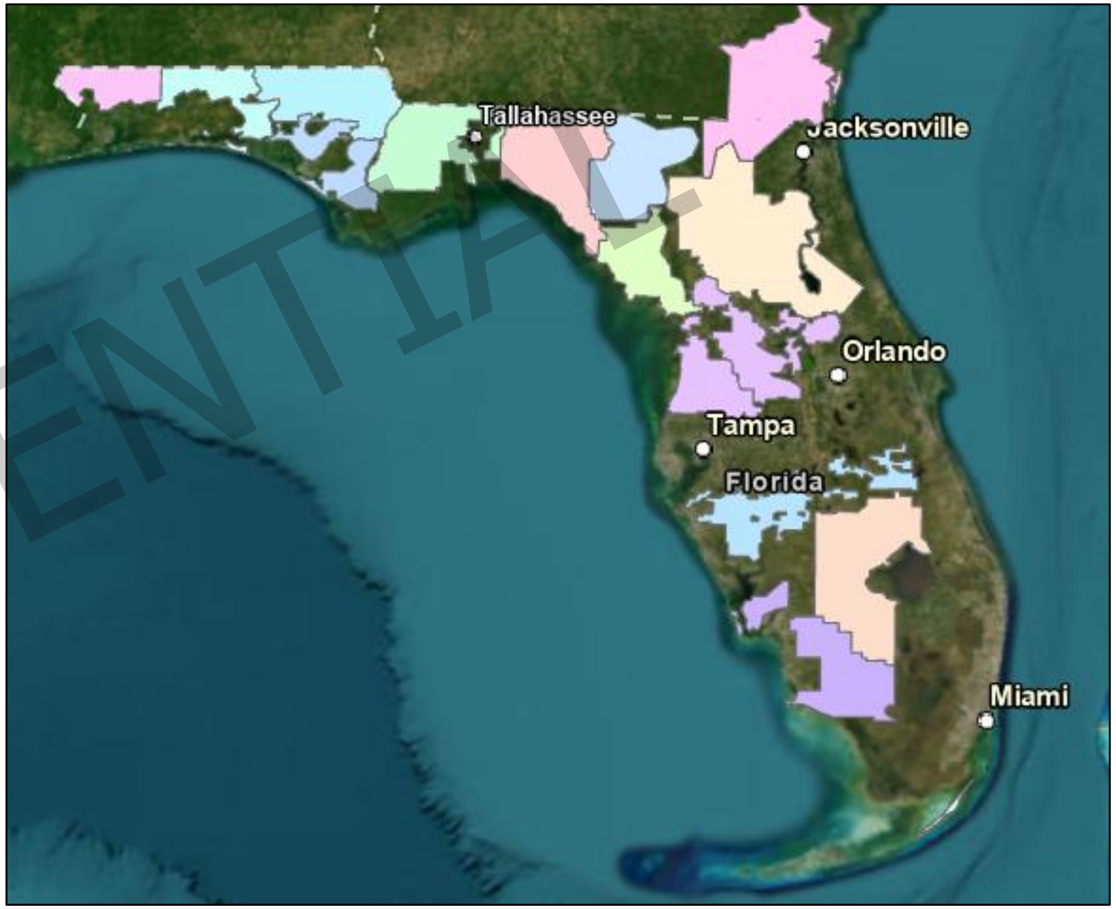
- Identify data at hand
  - AMI, SCADA, OMS, wholesale power bills, etc. provide foundation for analysis
  - Align system- and local-level insights for holistic impact analysis
  - Focus on data quality/accessibility for analytics
  - Create KPIs and benchmarks to enable performance tracking against goals
- Identify the right opportunities
  - Prioritize initiatives that solve known pain points
  - Let data identify the problem, then look at the available solutions
  - Select technologies that provide measurable impact and track progress against goals



Turning Data into Smart Grid Decisions

- Align needs with capabilities
  - Evaluate internal readiness:
    - Staffing
    - Skills
    - Technological maturity
  - Consider potential for partnerships
  - Determine implementation roadmap based on today's abilities and dependencies to reach tomorrow's goals
- Leveraging the data at hand enables you to confidently achieve the cooperative goal:

To provide safe, reliable, affordable power to your members and communities



Questions?

Thank You!

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Member driven. Technology focused.