Data Center Grid Integration & the Case of Ireland

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EPRI Europe
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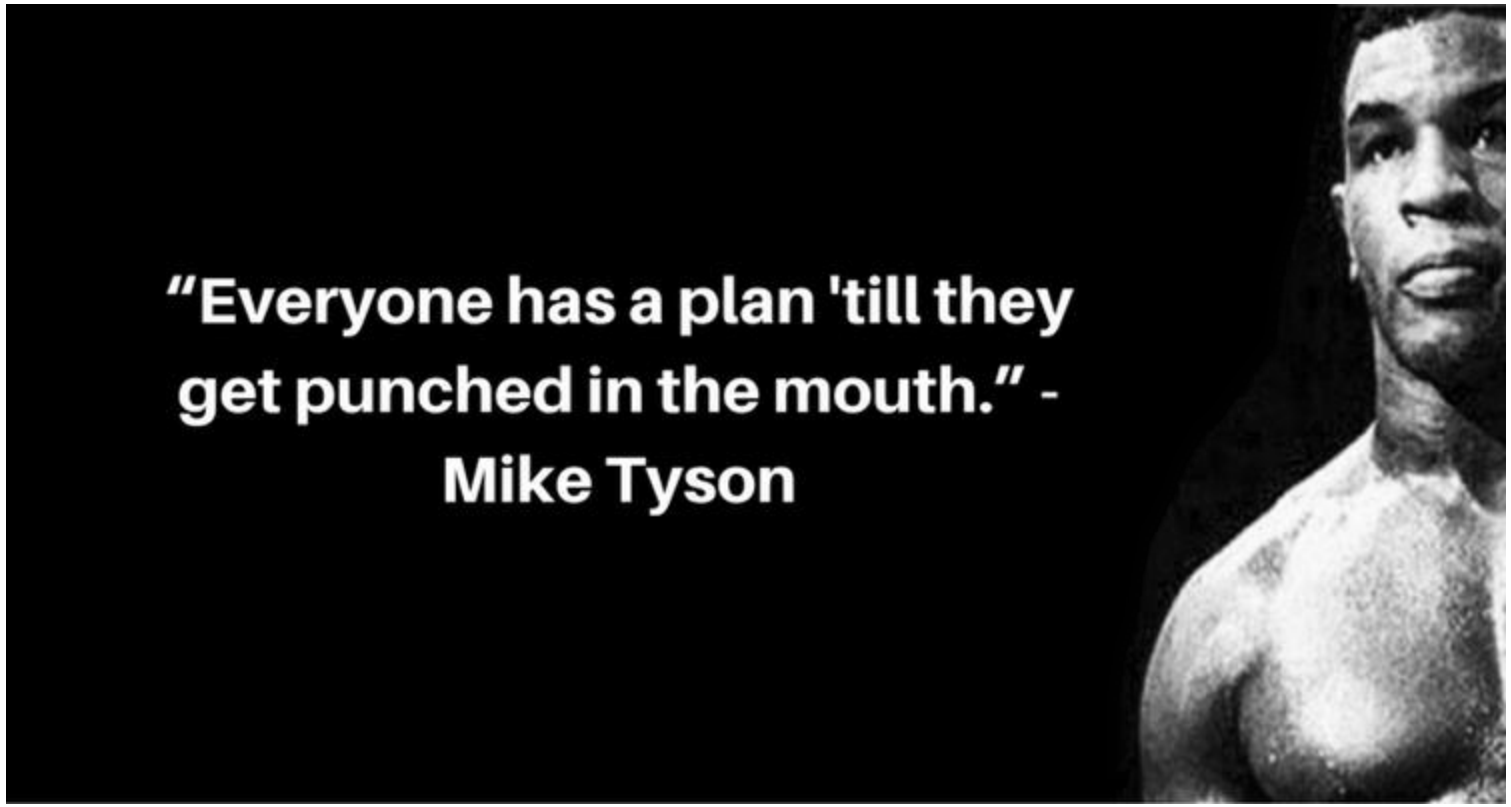
Snapshot

- 49 Committed Members & continued interest…
  - + Across 4 regions & 5 industry sectors
- Foundational Deliverables & ongoing engagement
  - + 5 published, 2 in final review, many on the way
  - + 3 Regulatory, Policy, and Technology Trends Digests released
  - + Launched WS4: Data Center Informed Energy Supply
- Continued External Presence

DCD Aug 26 | YTTA 2025 Sep 10 | Sep 19 | Iltricity Network Sep 29 – Oct 1 | ESIG Energy Systems Integration Group Oct 30

Materiality

Immaterial | **Material** | **Highly Material**



Hard Fought New Tech Playbook

Adequacy

Congestion

~~**D**~~ispatch

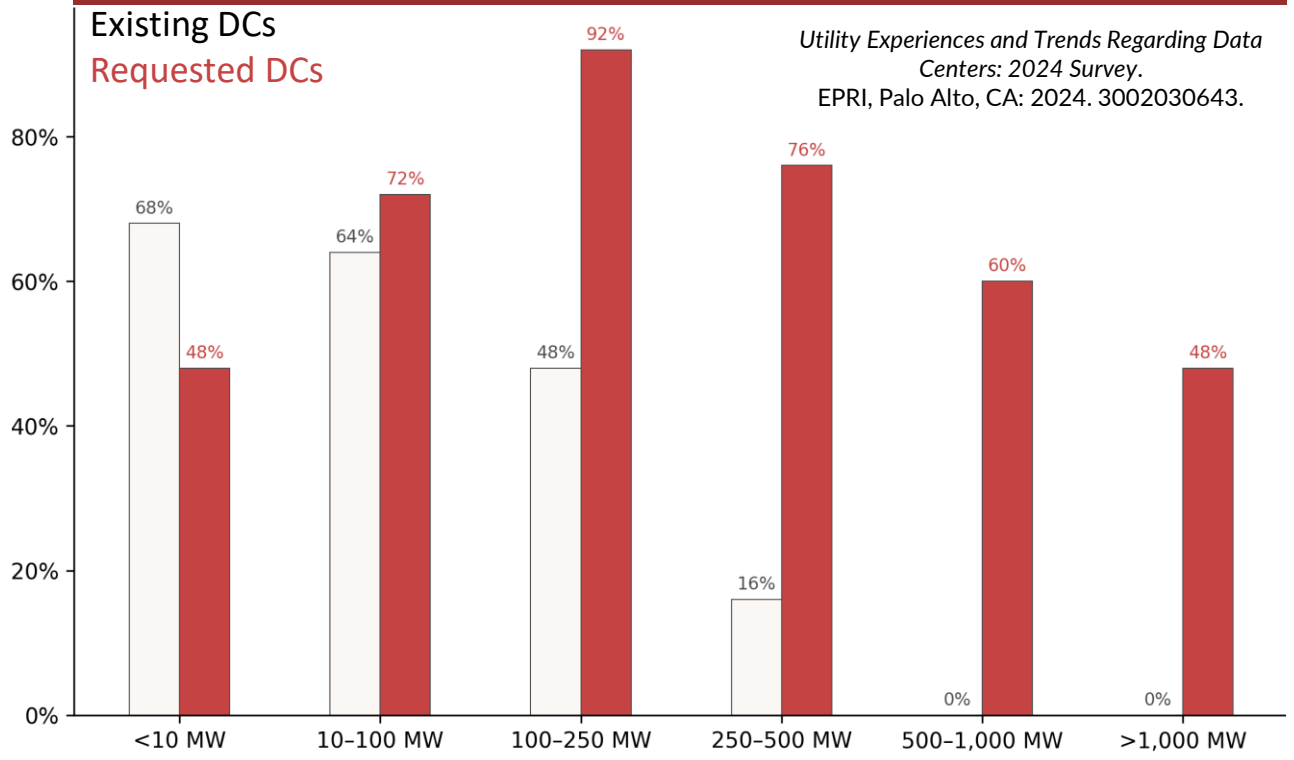
Code compliance

After being relatively flat for decades, electricity use is growing again

Selected Recent Utility and ISO/RTO Load Forecast Projections

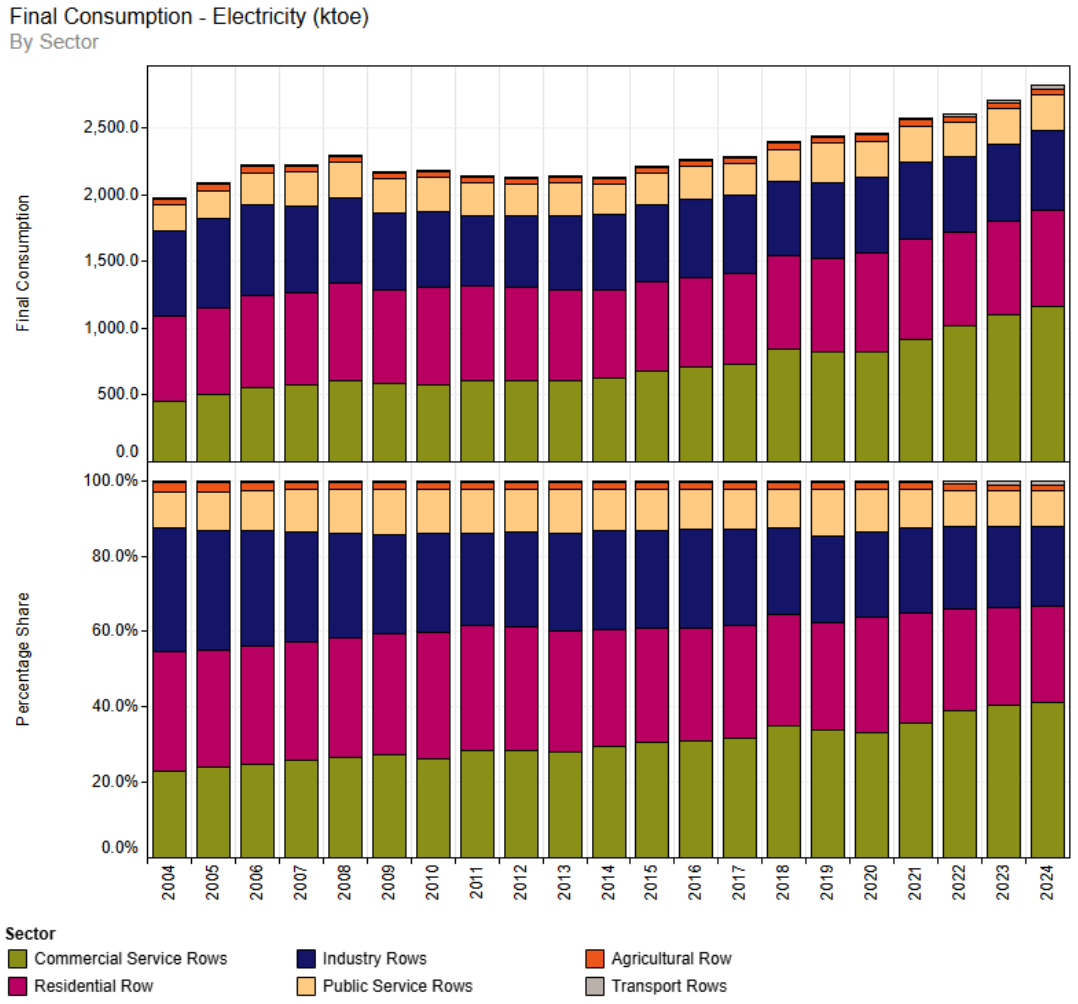
Company	Current Peak	Future Peak	% Increase	Forecast Source
ERCOT	85 GW	152 GW (2028)	79%	April 2024 Legislation
Dominion	22 GW	33.5 GW (2030)	53%	PJM 2024 Load Forecast
Georgia Power	15 GW	21.6 GW (2030)	44%	2023 IRP Revision
APS	8 GW	9.8GW (2030)	23%	2023 IRP
Duke	31.7 GW	36 GW (2030)	14%	2023 IRP

Size of Data Centers Served and New Service Requests (% of 25 Utilities Surveyed)

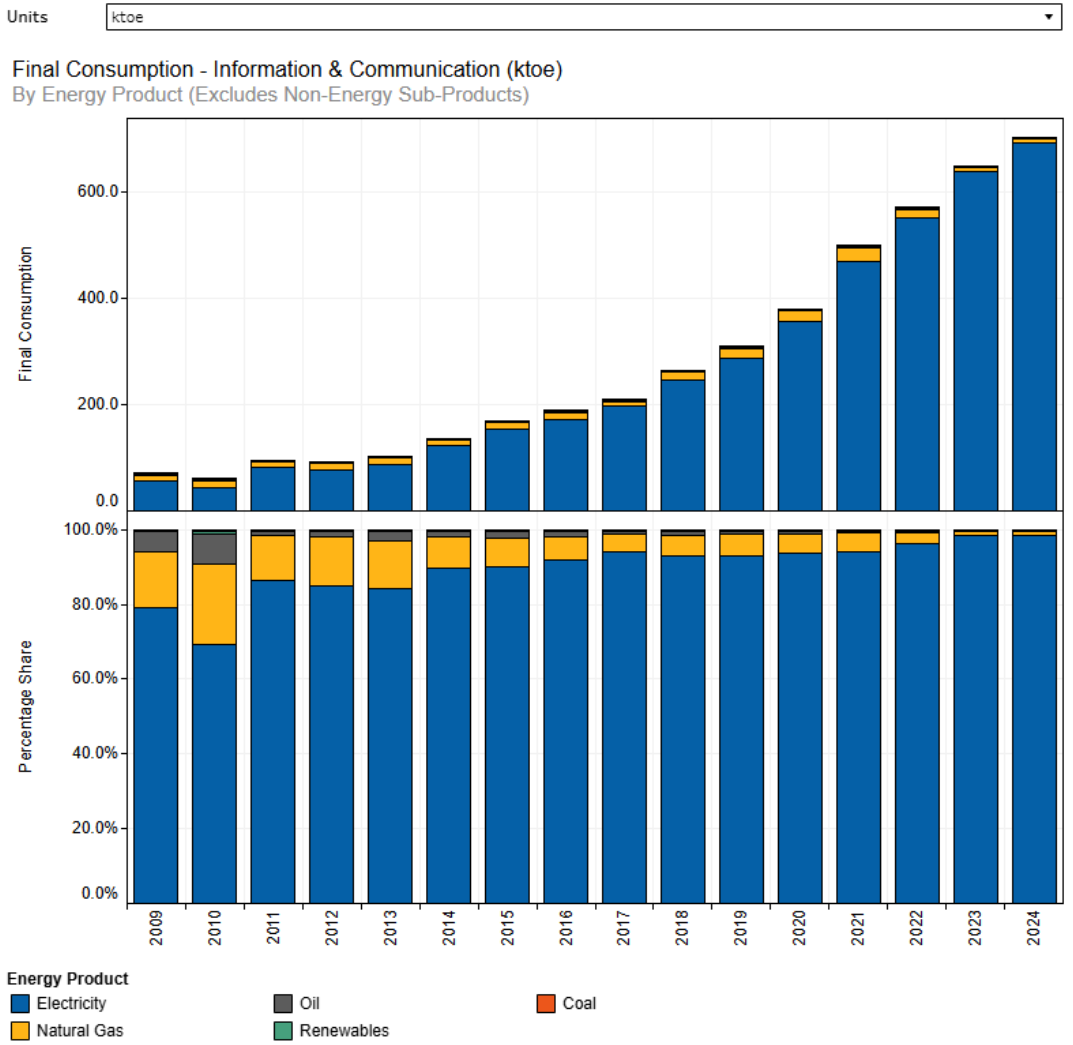


Data Center and industry growth faster than supply and delivery buildout, requiring new strategies

Load Composition Ireland
~21% electricity demand by DCs



C&I
~64%



Adequacy

Materiality

Material:
would require new capacity investment, combined with other load growth

Highly Material:
would require capacity investment alone

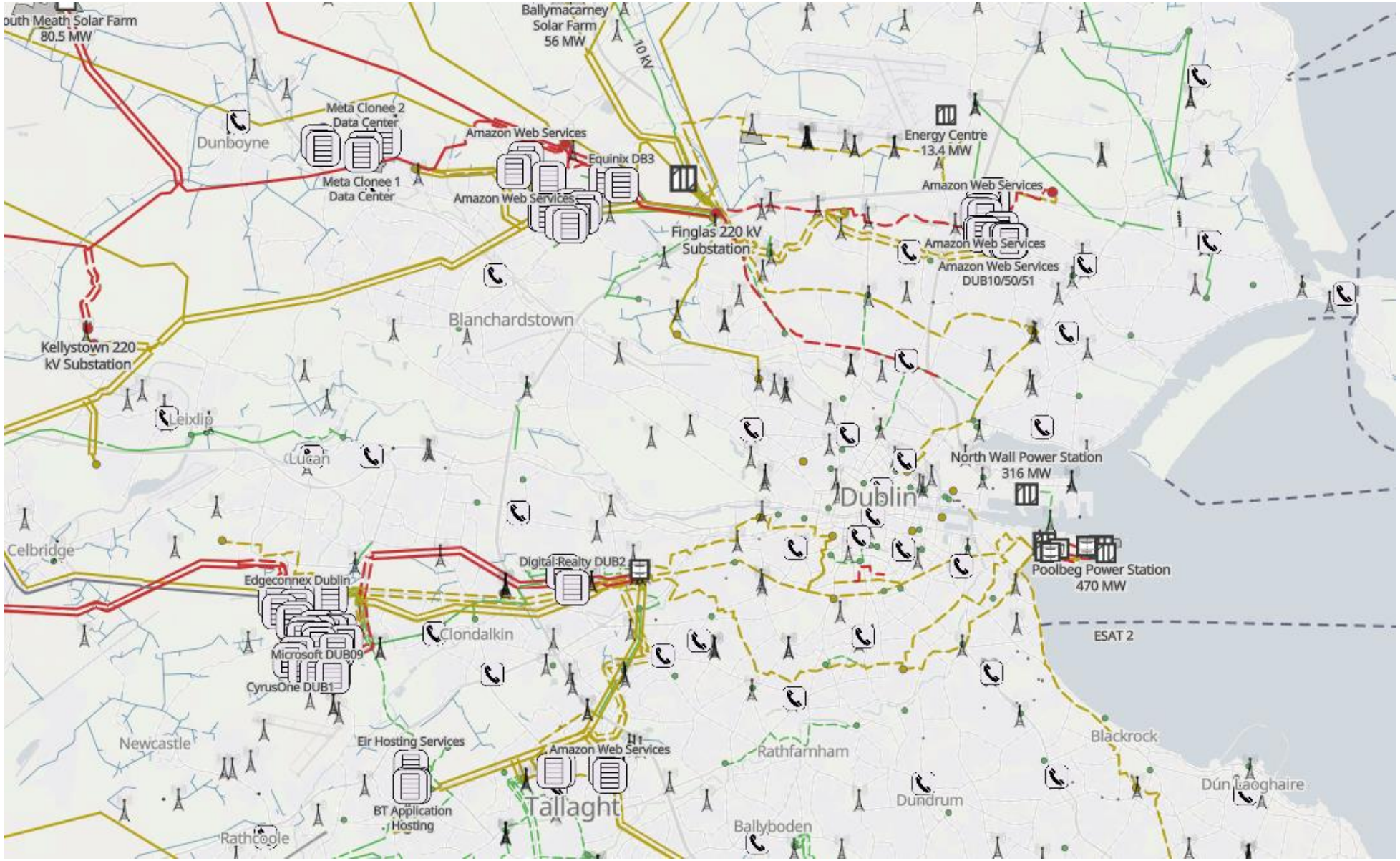
Irish Experience

- 20%+ load served
- Moratorium on new connections
- Capacity auctions binding

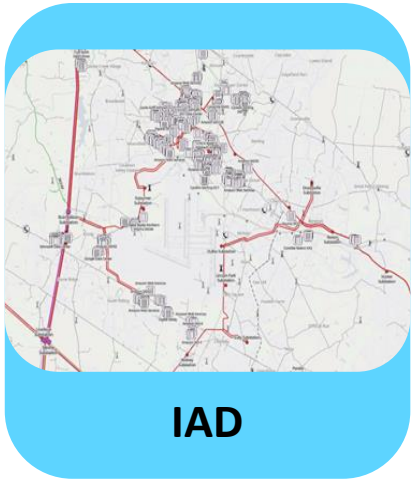
DCFlex Research

- How to anticipate the load profile
- Flexibility to address stress events
- Improved understanding of adequacy
- Energy supply resource delivery

Location Clusters



Global Clusters examples



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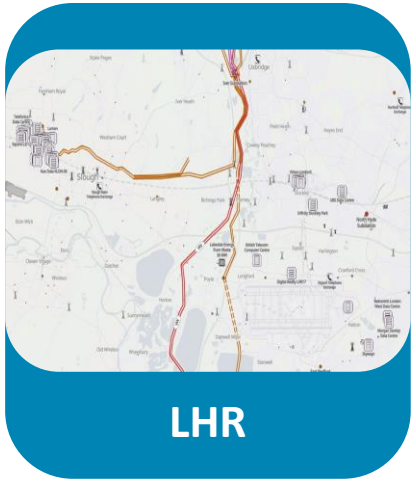
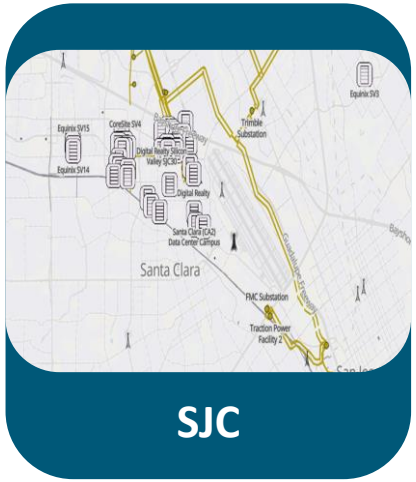


LHR



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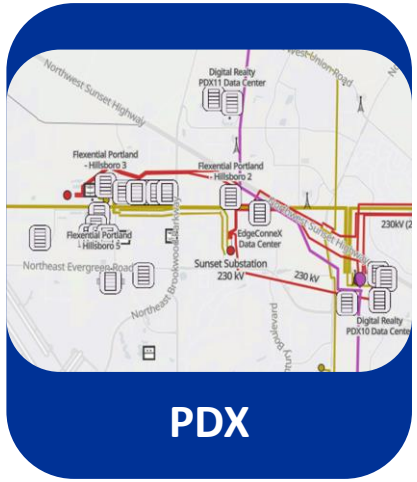


PDX

Congestion

Materiality

Material:

Requires shallow grid reinforcement

Highly Material:

Requires deep grid reinforcement

Irish Experience

- Data centers located in T50 belt outside Dublin (national load center)
- Redispatch handled by EirGrid though redispatch actions
- Deep grid reinforcement required to grow load in East
- Limited ability to refer load west

DCFlex Research

- Flexibility for congestion relief
- Co-location models & designs
- Transmission hosting capacity study processes

Conceptual Proposal

DC Design & Constraints

StarFlex

Grid Flexibility Tests

- FREQUENCY EXCURSION
- TRANSMISSION LOSS
- HIGH CONGESTION ALLEVIATION
- PROLONGED DARK DOLRUM
- DUCK CURVE
- INTRA-DAY BALANCING

Dispatch

Materiality

Material:

Technology engages actively in the market, sets price

Highly Material:

Technology sets stress prices, requires specific representation

Irish Experience

- Prices high relative to Europe
- Negative pricing lower than otherwise would have been
- PPA market influenced by DC customers
- BTM resources used as demand response and for system services

DCFlex Research

- Load participation program & tariff design
- Demonstrations of behind the meter resource usage
- Flexibility to provide system services

Demonstration Selection Update

8 projects proposed, 3 confirmed

	Load Flexibility (AI)	Load Flexibility	Power Quality
Location:	Phoenix, AZ	Lenoir, NC	Paris, France
Demo:	IT Workload Flexibility	IT Workload Flexibility	PQ Fault Ride-Through
Utility:	APS, SRP	Duke Energy	RTE
Partners:	Emerald AI, NVIDIA, Oracle	Google	Schneider Electric, Data 4

Codes

Materiality

Material:

Impact requiring settings based intervention

Highly Material:

Significant risk requiring operational intervention

Irish Experience

- Issues noted with respect to fault ride through during close in faults
- Consequential loss secured against in operations
- Grid code modification proposal under development

DCFlex Research

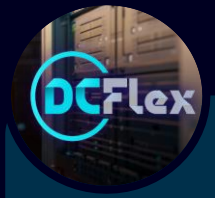
- Modeling for DCs
- Fault ride through strategies for DCs
- Demonstrations of FRT capability
- Power quality monitoring and interventions

TOGETHER…SHAPING THE FUTURE OF ENERGY®

Powering Intelligence: Analyzing Artificial Intelligence and Data Center Energy Consumption

Utility Experiences and Trends Regarding Data Centers

Powering Data Centers: U.S. Energy System and Emissions Impacts of Growing Loads



Data Center Flexible Load Initiative