



Digital Utility Evolution

Supporting the DER Ecosystem

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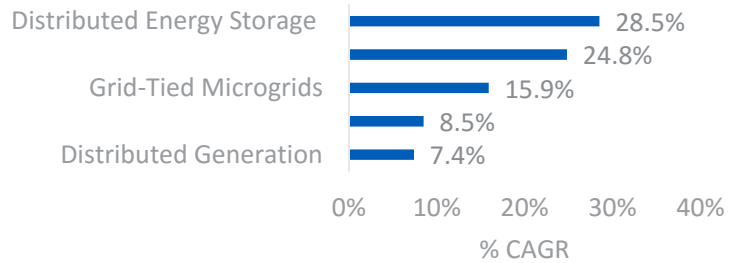
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DER Market Insights

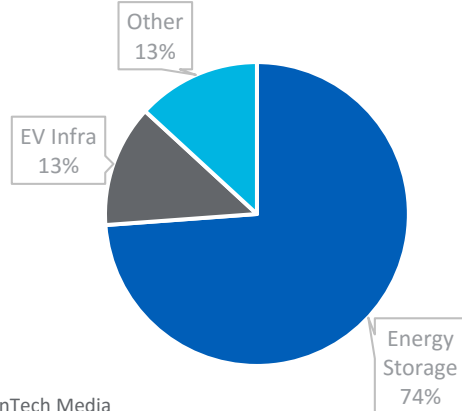
DER Growth

Estimated CAGR, 2016-2025



Source: Navigant

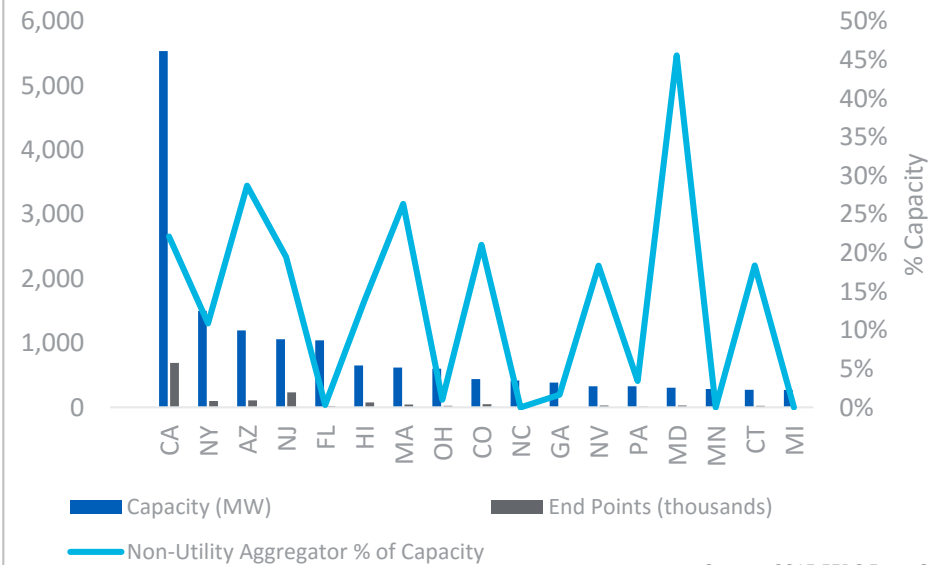
VC & Private Equity Investments at Grid Edge, 2017 YTD



Source: GreenTech Media

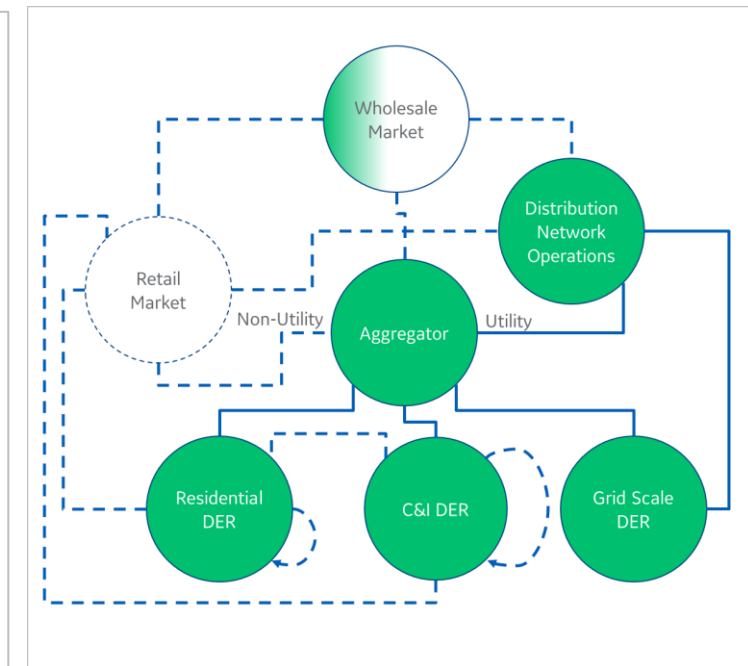
Operational Challenges

US States with > 250MW Penetration



Source: 2015 FERC Form 861

Markets



- Storage growth driven by EV charging and promise of markets
- EV charging will bring significant demand growth and new peak loads
- Operational complexity on the rise, scalability & coordination challenges
- Market structures uncertain, likely to evolve differently in different regions



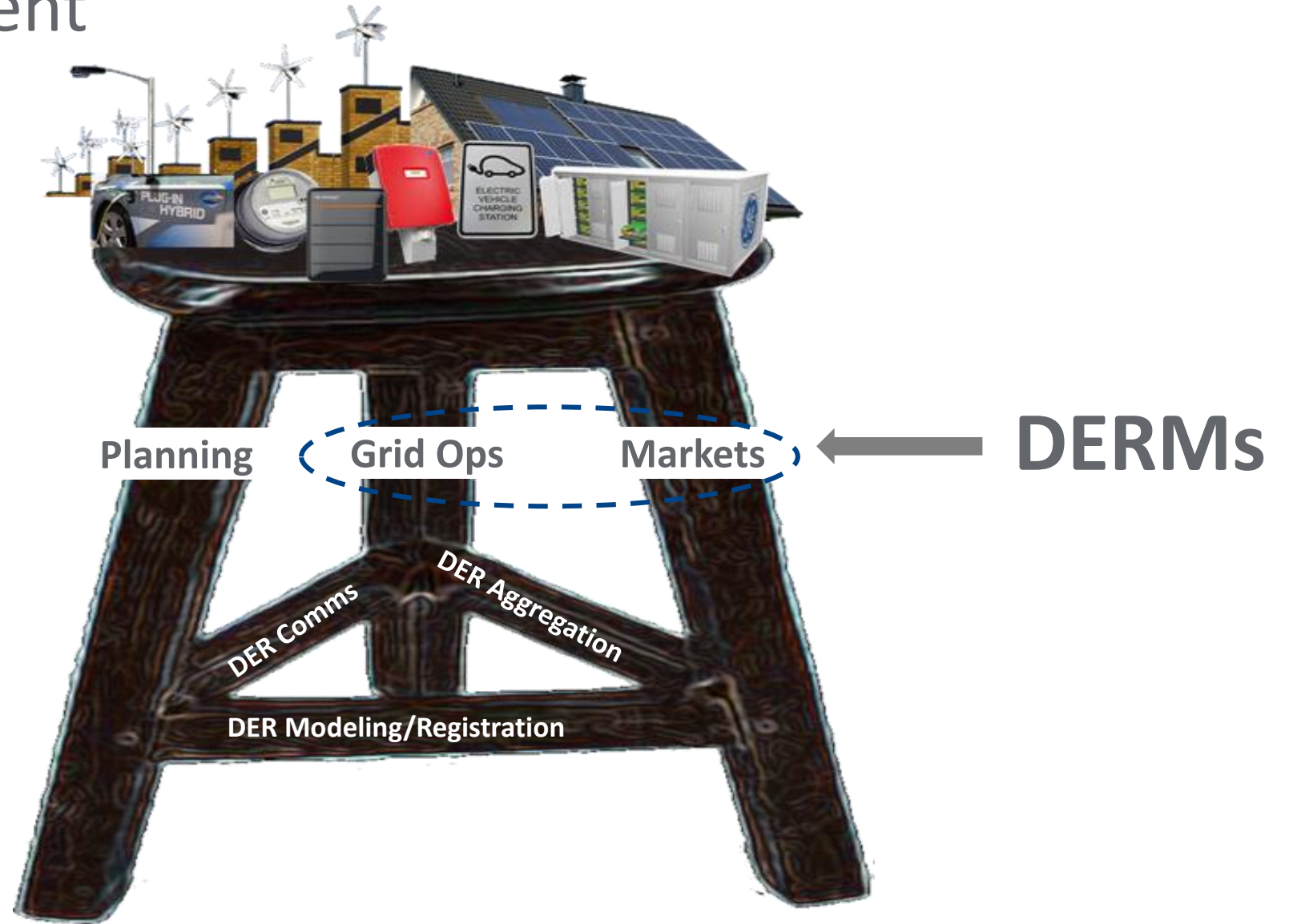
Typical T&D Processes

- Planning/Expansion (IRP)
- Planned Outages
- Outage Restoration
- Switching Management
- Model Management
- TX Grid Management (Contingency Analysis, State Estimation, Forecasting)
- DX Grid Management (Power Quality, CVR, State Estimation, Forecasting)
- Telecommunications
- Ancillary Services
- Customer Notification
- Customer Billing
- Reliability Reporting

HUMAN SAFETY



DER Management

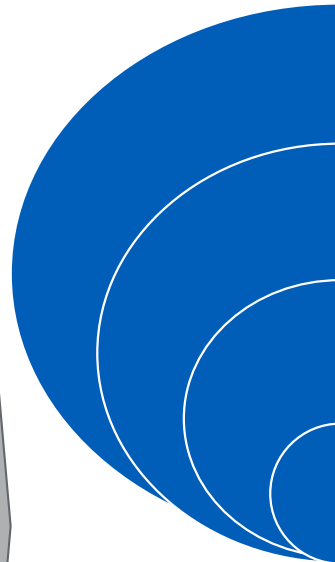


DERMs Focus Areas

DER has emerged as a great disruptor, for both operations and all business models

DERM's value proposition:

- Harness & orchestrate DER's own flexibility along and that of other network assets
- Maintain reliable operation, improve OPEX, defer / eliminate CAPEX & unlock new revenue streams



DER-Enabled ADMS

- Foundational (we need to see the entire DX network)

Flexibility Optimization

- What DER is available and when for diff use cases

DER & Load Forecasting

- What's behind the "meter" – is it load, DG, Flex ?

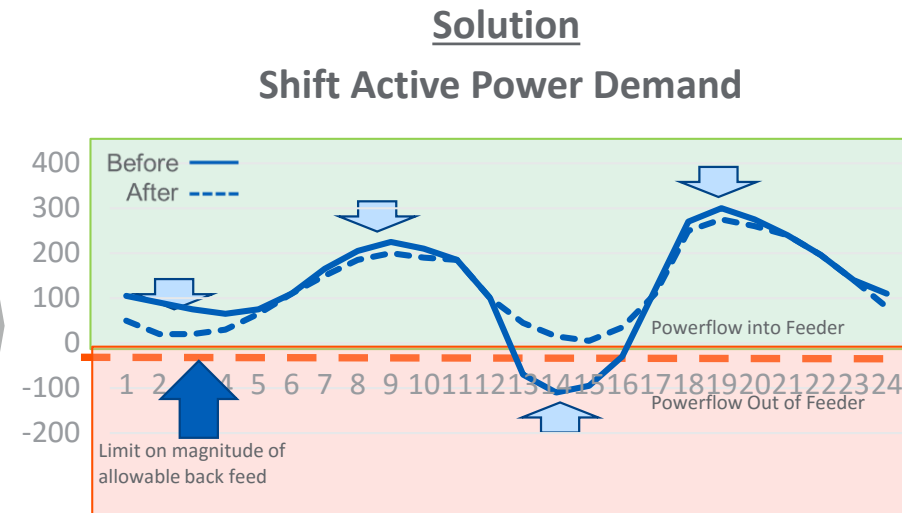
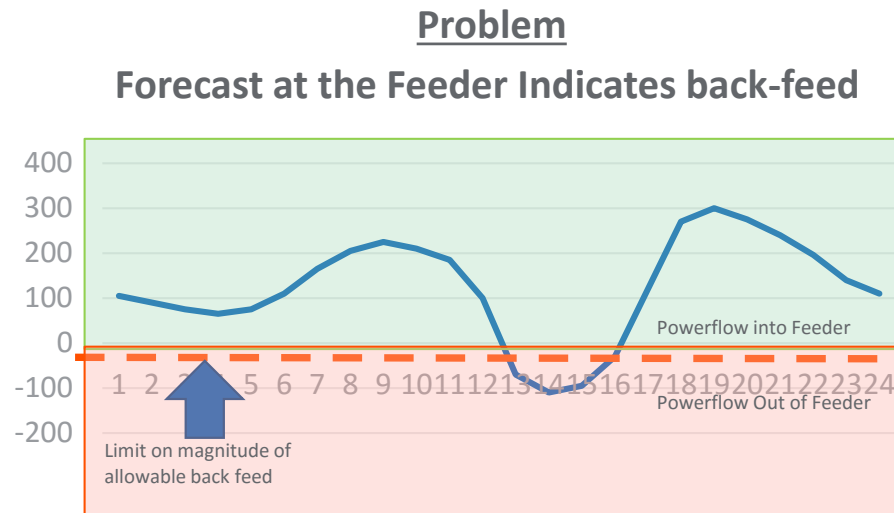
Distributed Intelligence

- How much analysis (sensors) can be done on the edge ?



DER & Managing Grid Reliability Through Flexibility

- Low load, high PV output can result in back-feed, high system voltages
- Load and PV generation forecasts are used to predict such situations
- ***Solution: Avoid PV curtailment, shift loads & charge Batteries to absorb excess PV***



GE DERM: Flexibility Markets/Exchange

