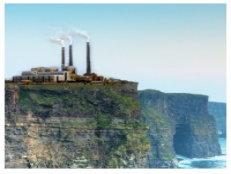
U.S. DEPARTMENT OF ENERGY | Office of ELECTRICITY

Growing Asset Stress		New operating paradigms Lower system inertia Aging infrastructure Fewer power engineers
Increased Variable Generation		More dynamic behavior More stochastic Multi-level coordination
More Dynamic Markets		Broader markets & more services Greater complexity More frequent clearing
New Controllable Assets		Demand response Energy storage / electric vehicles Dynamic T&D assets
Increased Activity at the Grid Edge		Load growth Distributed energy resources Internet of (energy) things
Massive Data & Computational Advances		AI & machine learning New control paradigms Fast computation Cloud computing Probabilistic methods

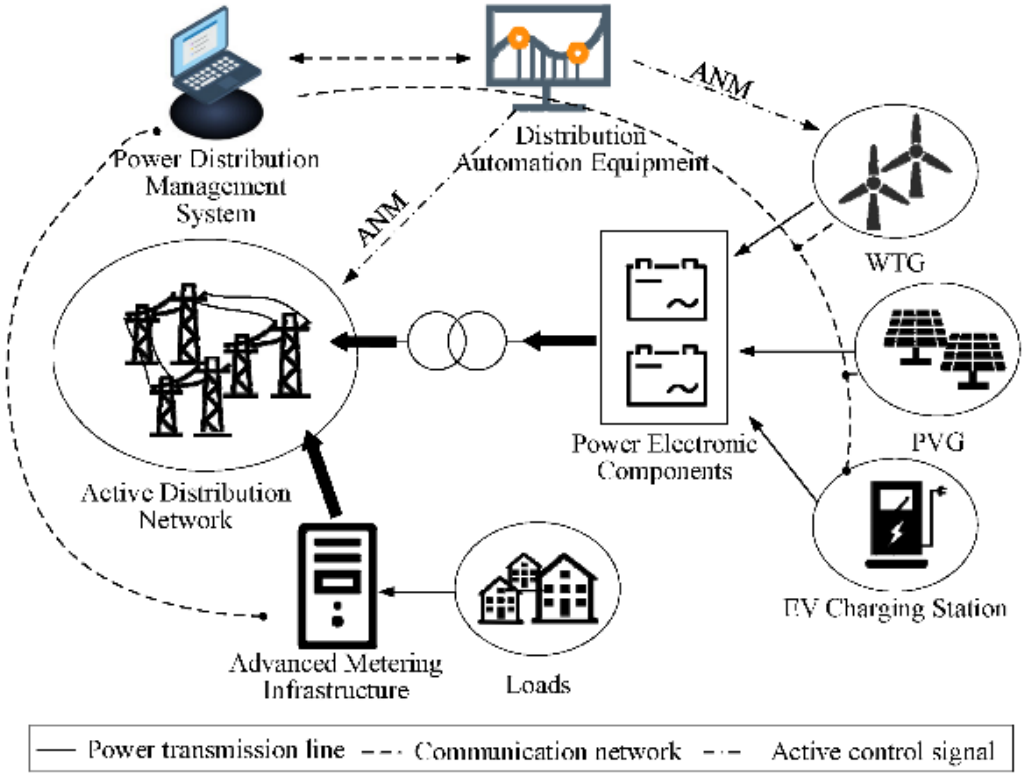
Thesis

The next-generation power grid will be an information network as much as it is an energy network.

Vision

Data and information essential to reliable, resilient grid operations are delivered accurately to the right place, at the right time, without interference.

Different applications require different comms solutions.



Communications requirements

- No one size fits all.
- Future-focused.
- Not ad-hoc; designed in from the beginning.
- Requirements → architecture.

Key challenges

Grid ←→ Comms Interdependencies

- DER use cases
- Restoration use cases
- *Challenge:* Prioritization & coordination

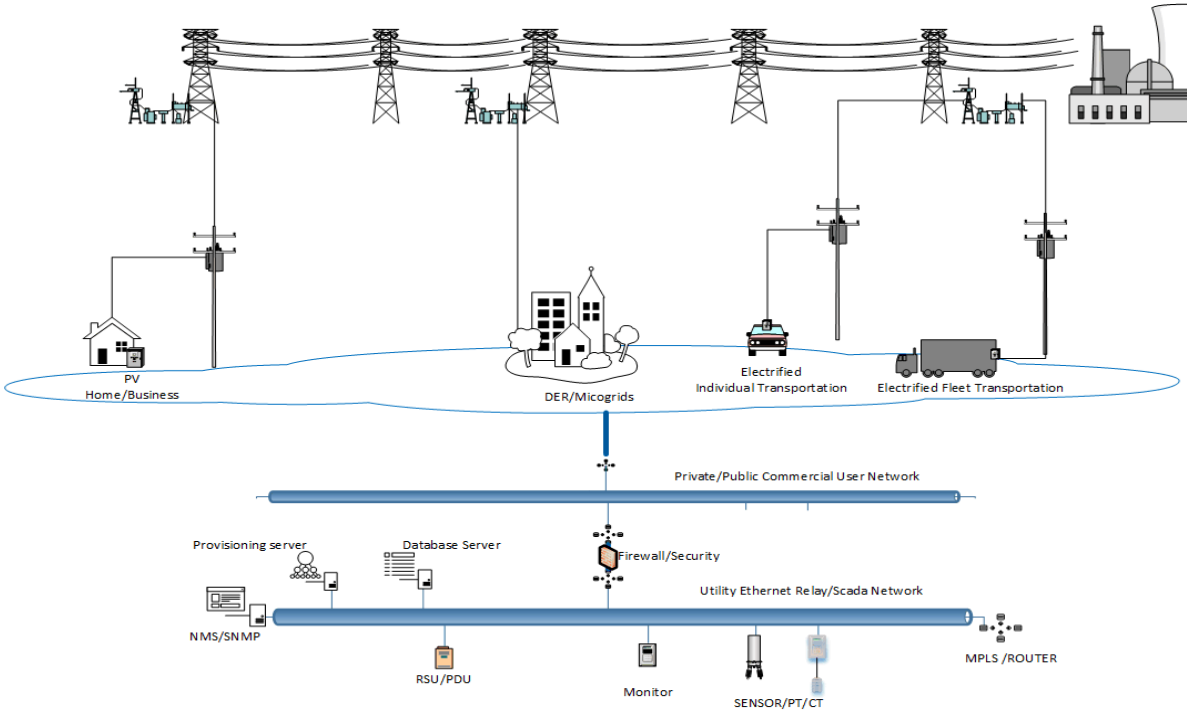
Grid Edge Integration

- Rapid transformation at the edge
- *Challenge:* Operational coordination & orchestration

Secure Communications Interoperability

- Heterogeneous industry & regulatory landscape
- Disparate technology generations
- *Challenge:* End-to-end information security

The key challenge: edge-distribution interface



Edge/customer/third-party networks

Comms platform to integrate DER info and existing utility SCADA systems

Utility comms networks