IEEE Education- ISUW 2023 MASTER CLASS

Current State – A Global and Indian Perspective

Dr. Mani Vadari

President, Modern Grid Solutions
Affiliate Professor, University of Washington
Adjunct Professor, Washington State University

28th February 2023

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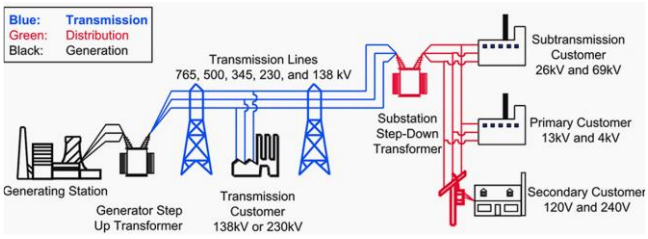
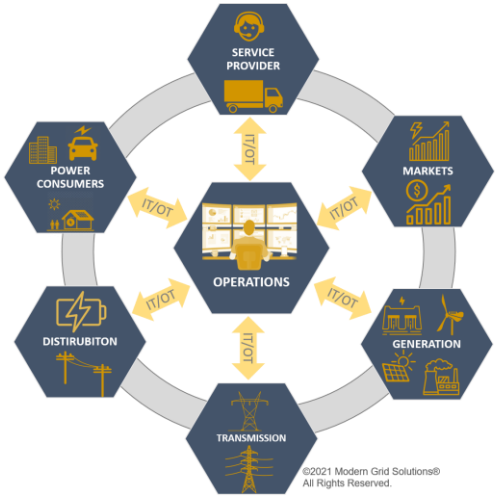
Power Delivery Mechanism is changing





From **To**

2

Changes are Afoot

- DERs: more viable cost, performance, reliability and increased dispatchability.
- Storage: Price coming down and when combined with DERs, allows customers, aggregators or incumbent utility to deliver energy where and when needed.
- Distribution Automation: Supported by decision support mechanisms allows stakeholders a full suite of situational awareness tools.
- Microgrids: Semi-independent entities and interacting with utility during steady-state, emergency situations or never.
- Electric transportation: Moving towards mass penetration requiring a network of charging stations paralleling the gas station network.
- Homes and buildings: Smart with controls, increased automation, cloud connected and reduced need for customer involvement.

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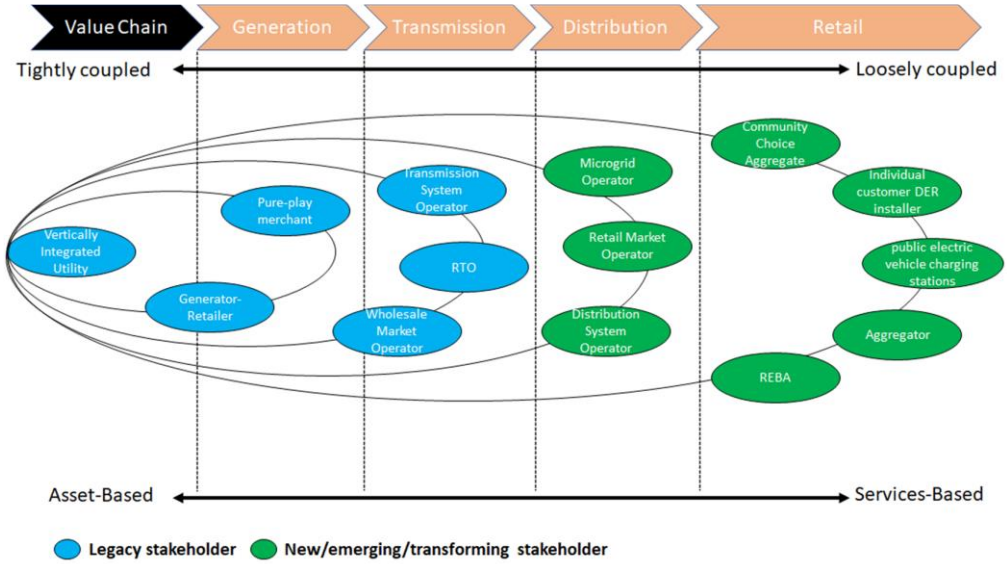
Changes along the energy value chain

New participants, new business models, new interactions, and new impacts to the system operations



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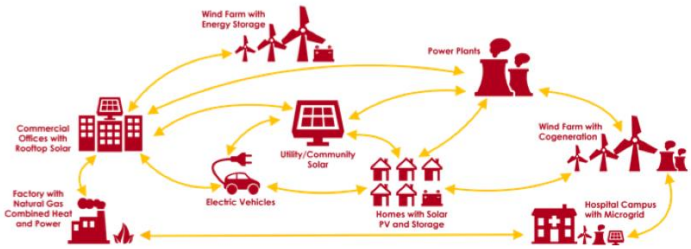
So, What

For the electric utility, this is a tough place because everything under them is shifting

- Distributed energy allows the customer to produce energy and either use it for themselves or sell it back to the utility
- Storage allows anyone to store energy when it is plentiful and cheap and release it when it is not
- Microgrids allow a group of homes, offices or industries to ring-fence themselves and manage their own electric needs whether still connected to the electric grid or not
- Electric vehicles are becoming more relevant bringing a completely new type of load to the electric grid; a life-saver to the declining power consumption faced by most utilities
- Homes and buildings are becoming smarter thereby allowing for the control of their consumption and generation if available
- And lastly, a new genre of automaton is becoming available enabling improved sensing and control of everything in the grid and beyond-the-meter.

Will we need a utility in the future??

Traditional Utility	Generation	Transmission and Distribution	Retail	
Generation + Transmission and Distribution + Retail	Commodity Supplier	Grid Manager	Product Innovator	Value-Added Provider
	"Gentailer"	Grid Developer	Services Bundler	Virtual Utility
ASSET BASED — More Integrated				SERVICE BASED — Less Integrated



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A Lesson in History – AT&T and Ma-Bell

- The history of AT&T dates to the invention of the telephone itself. This company maintained a monopoly on telephone service in the US until anti-trust regulators split the company in January 8, 1982 into seven independent Regional Bell Operating Companies.
- There were three other events happening in parallel - Internet, cellular service, and cable all emerged
  - Internet: Arpanet, the precursor to the Internet adopted TCP/IP as its operating protocol, which in turn became the foundation for general purpose data networks, taking over most every network: voice, local, long-distance, and others.
  - Cellular: In Oct. 1983, Ameritech launched its cellular wireless network - technologies and networks that were originally not as ubiquitous, reliable, or even as cheap as traditional telecom, and certainly not directly competitive.
  - Cable TV: Cable TV, was a young, flourishing industry competitor with phones, mobile, or the Internet. Cable has built a broadband platform that has adopted the digital internet and is now challenging the telecom industry in nearly every way.
- AT&T's primary competition did not come from other telephone companies – It came from innovative new-wave companies bringing new technologies, new platforms, and new business models from both outside and inside the telecom world.

Utilities cannot expect to stay the course as they have over the last 100+ years. They need to assess the competition that will try to enter this marketplace with competing technologies and new/innovative business models and chip away at the utilities' customer base.

Utilities must transform to stay relevant.

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Case for Utility Transformation

"I just returned from Houston and my friend got a message on her cell phone that the power was out at their house, but that it would be back on in two hours, so we kept playing tennis. When she checked the app, she also showed me her car was only charged 80% and because of solar PV on her roof, the storage at her house was fully charged and providing power to her refrigerator and the critical appliances in her house. She smiled and said she sold $75 worth of power last month back to her retailer and it paid for lunch today. She said her electricity bill now only includes a connection charge unless she does her clothes washing and baking on the same day.

I am calling my retail energy provider to see what they can provide."

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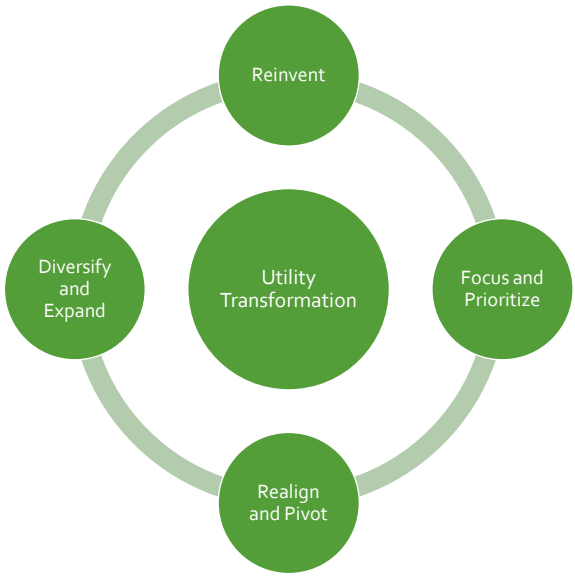
Characteristics of a Transformed Utility

- ❑ Have a flexible operating model
- ❑ Wires, pipes, and service centric, not energy centric
- ❑ Focus on the customer and their desires
- ❑ Manage DERs. They are coming, like it or not
- ❑ Redefine planning and asset management
- ❑ Data and digital insights driven
- ❑ Embrace change, innovate to turn threats into opportunities



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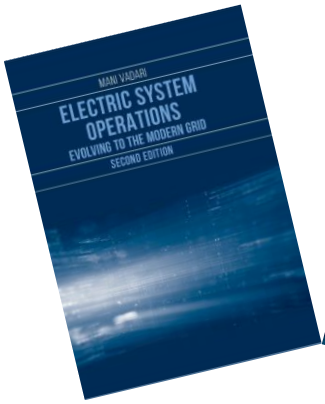
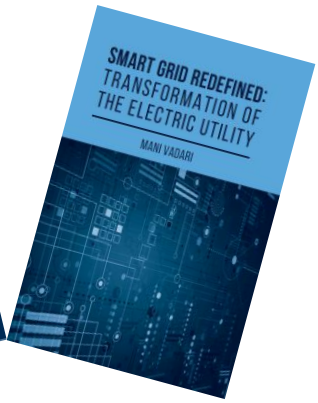
Dr. Mani Vadari is an electric industry leader and visionary, with over 30 years of experience delivering business and technical solutions for transmission, distribution, and generation operations, wholesale markets, Smart Grid, and Smart Cities. Mani has a multi-year track record of delivering value on a wide range of technology and business solutions.

Dr. Mani Vadari leads a team of experts to deliver complex and innovative technology, business, regulatory, and finance solutions. Mani brings over 35 years of experience delivering business and technical solutions. Mani is also an Affiliate Professor at the University of Washington, and an Adjunct Professor at Washington State University. Mani has published two popular books, "Smart Grid Redefined: Transformation of the Electric Utility" and "Electric System Operations – Evolving to the Modern Grid, 2nd edition", and has authored over 100 industry papers, articles and blogs.



Check out the book at www.amazon.com



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mani.vadari@moderngridsolutions.com