



**ELECTRICITY
ADVISORY
COMMITTEE**

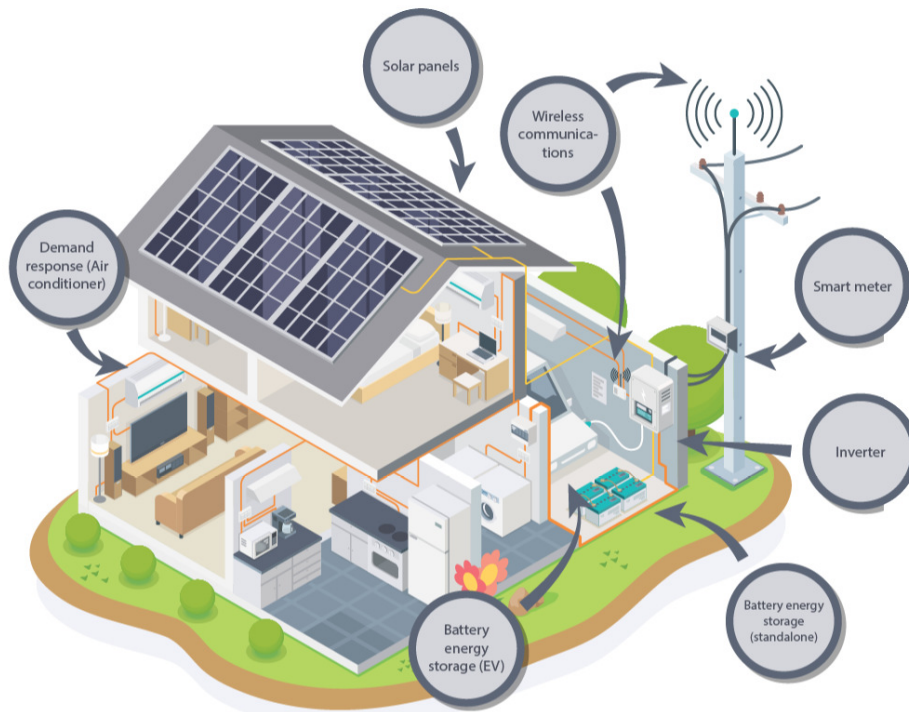
Understanding the Issues Surrounding Distribution Edge Resources

L. Lynne Kiesling

June 8, 2023

What are the implications of digitization and DER around the distribution edge?

Use Case 1: Residential DER



Source: <https://www.cummins.com/news/2021/11/04/what-are-distributed-energy-resources-and-how-do-they-work>



Use Case 2: Commercial fleet vehicle electrification

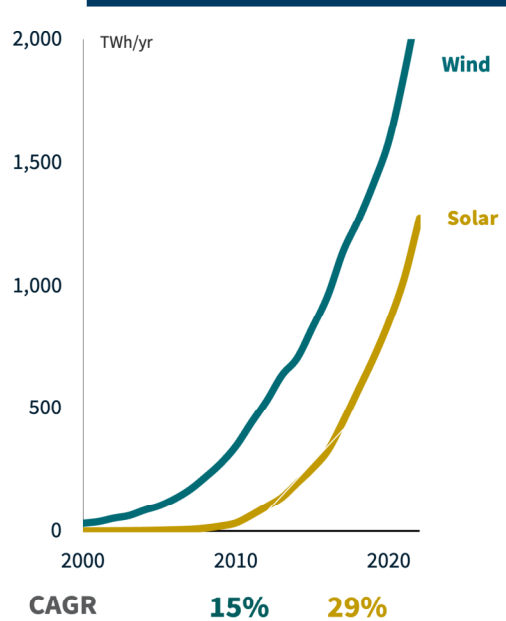


Source: <https://www.popsi.com/technology/fedex-receives-electric-vehicle-fleet/>

The clean energy transition is a technology transition

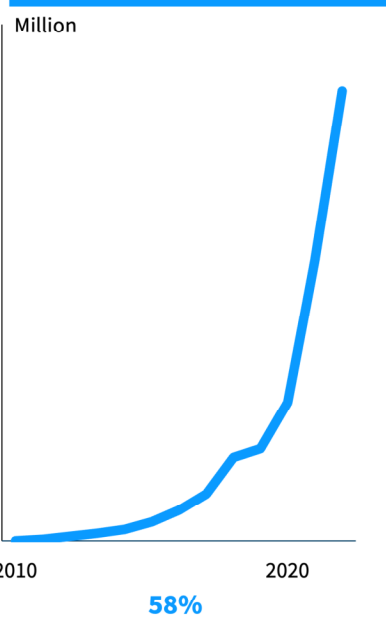
Exponential Energy Change Is All around Us

Annual solar & wind generation

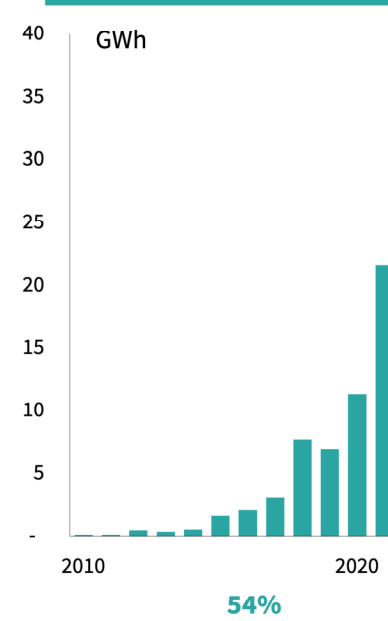


RMI – Energy. Transformed.

Annual EV sales



Annual battery storage sales

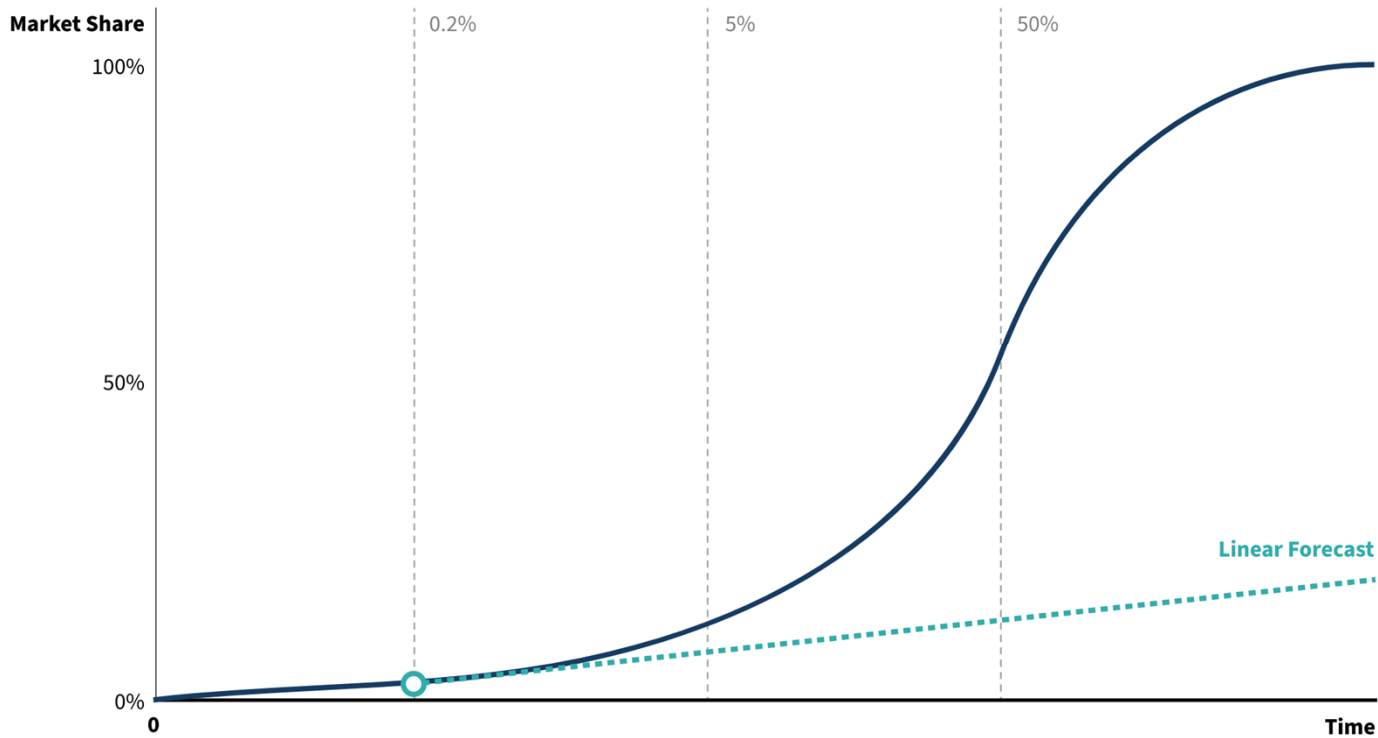


Source: BNEF, BP, Ember; Note: CAGR is the compound annual growth rate between 2012-2022

Source: <https://rmi.org/the-energy-transition-in-five-charts-and-not-too-many-numbers/>

S curves: slow but accelerating growth

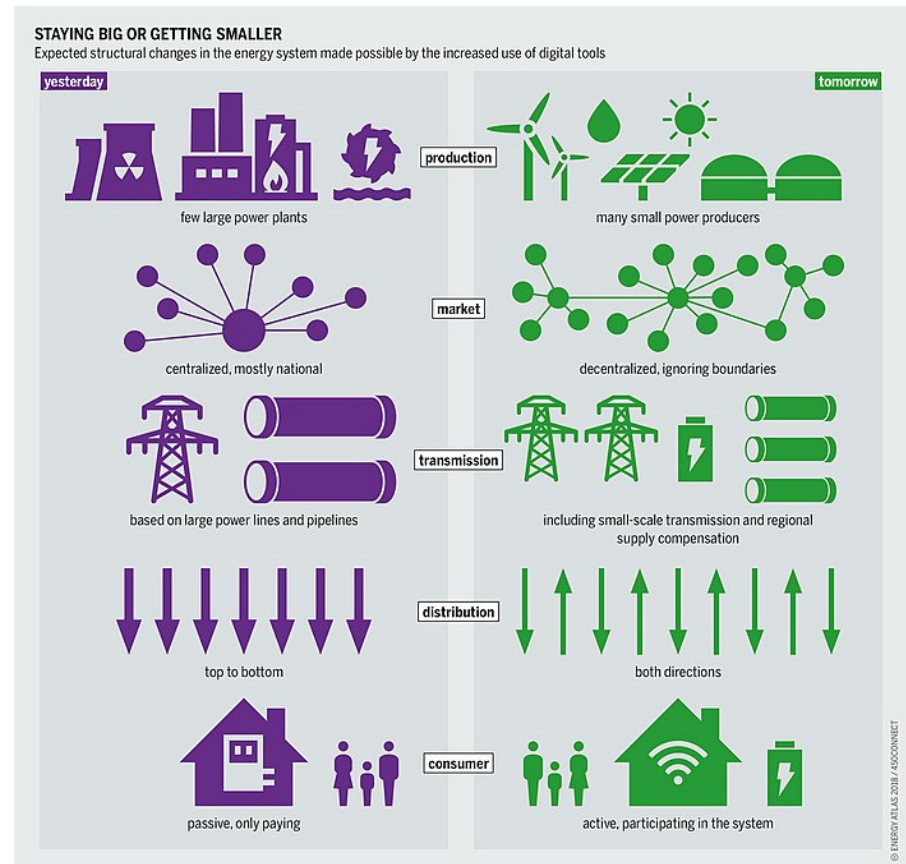
Exhibit 3: Gradual then fast, the first 5% takes about the same time as the next 50%



Source: <https://rmi.org/insight/peaking-a-theory-of-rapid-transition/>

The technological changes of the energy transition create institutional and operational changes, opportunities, and challenges

- Technology characteristics
 - Physical behavior
 - Emissions profiles
- Grid architecture
 - Decentralized
 - Digitized
- Grid operations
- Market boundaries and opportunities
- Risk profiles
- Policy landscapes
 - Decarbonized
 - Democratized, participatory opportunities
 - Distributive justice
- Utility & industry business models



EAC Smart Grid Subcommittee

Can we develop a broader and deeper understanding of the opportunities and challenges of innovation around the distribution edge?

- Interaction of technological changes with other technologies and systems, including communications and data
- Operational implications – device impacts on grid, coordination, control, safety, reliability, resilience
- Institutional implications – consumer behavior, implications for affordability, business models and industry and market structures, regulatory institutions

Can we advise DOE on strategies they can take to facilitate maximizing the potential opportunities and addressing the challenges effectively?

- Identify emerging issues
- Identify interdependent systems and their implications
- Advise on policy issues of concern (e.g., FERC 2222 implementation)
- Advise on coordination with federal, state, tribal, territorial, regional, and private parties on relevant matters

Possible series of panels

- Setting the stage: Distribution edge resource capabilities, data requirements and existing gaps
- Distribution system management, devices
- Distribution grid operations, system controls and grid services
- Possible market structures and business models for distribution edge resources
- Regulatory institutional framework compatibility with distribution edge resources

This panel: Setting the stage

- What are the relevant definitions of demand side and distributed resources (e.g., behind-the-meter, non-utility microgrids, etc.)?
- At a high level, what are the possible benefits and costs of greater demand flexibility and increased distributed resources?
- Are there ways to quantify the benefits and costs?
- What data exist to inform distribution edge-related research, business and policy?
- What are the implications of increased demand and distributed resources for energy systems modeling and modeling used in optimization/control at the grid edge?
- What data challenges exist in distribution edge-related research, business and policy?
- What role will policy, including FERC 2222, play in reducing barriers to distributed resource adoption and grid integration?
- What lessons have innovators learned in entering these markets?

Speakers



David Kathan

President, Kathan Energy Consulting



Johanna Mathieu

Associate Professor, Electrical Engineering & Computer Science, University of Michigan



Robert Tucker

Subject Matter Advisor, TRC Companies



Alex Pratt

VP of Strategic Business Development,
AutoGrid