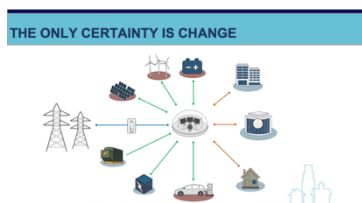




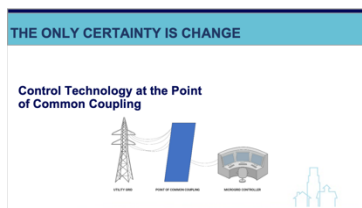
Slide 1: Hello. This is Marc Pfeiffer with the sixth in our Developing Town Center Microgrid webinar series. All the webinars, their accompanying Fact Sheets, and the full report can be found at www.microgrids.io.

This session discusses the technology behind developing and managing microgrids and the implications of change. Specifically, we will discuss how the interface with offtakers and EDCs are evolving at a rate where technology is moving ahead of the regulatory community's capacity to absorb and integrate them into policies and regulations.

By the end of it, I think you'll agree that the speed of change is amplifying complexity.

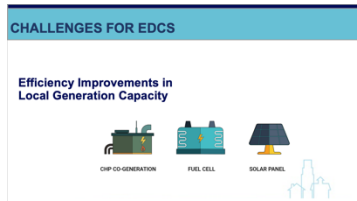


Slide 2: These changes also affect the larger energy generation, transmission, and distribution ecosystem. This ecosystem includes wholesale and retail markets, regional supply generation, data management, distribution grid management, climate policy, energy efficiency, and the physics, technical, and engineering aspects of managing electricity.



Slide 3: Once a microgrid is installed and operating, technology-driven disruption can affect its operation, cost structure, and energy supply contract. These changes include:

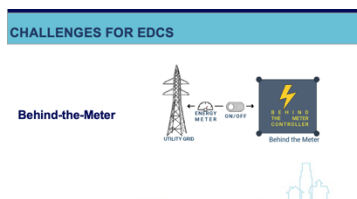
Control technology at the point of common coupling of the microgrid and the EDC must continue to work seamlessly, even as other smart grid enhancements take place around it.



Slide 4: Efficiency improvements in local distributed generation capacity like combined heat and power, cogeneration, fuel cells, and solar panels may change the relative economics of microgrid alternatives.



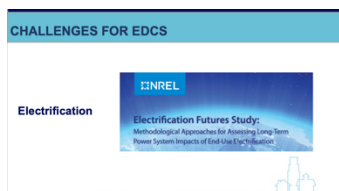
Slide 5: As microgrids and DER use expand, they require new technical and digital tools to integrate and regulate supply on the EDC distribution grid. We've discussed this in the past when it comes to frequency regulation and voltage supply.



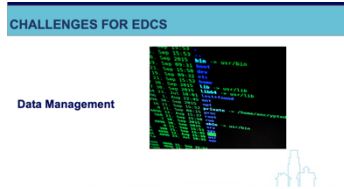
Slide 6: Our next item is constantly improving behind-the-meter microgrid and building management controls that manage electricity use in facilities can improve efficiency and reduce demand.



Slide 7: We find that lower battery storage costs, charging characteristics, and improved battery efficiency can also disrupt cost projections and operational and upgrade plans.



Slide 8: The trend toward increasing electrification of buildings and transportation along with improved energy efficiency practices adds uncertainty to transmission and distribution grid capacity and distribution planning.



Slide 9: Then there is data. Collecting, securing, storing, managing, and using the massive quantities of data that are generated by digital technology has technology management implications, it drives market decisions, and raises related social policy issues, such as equity and personal privacy concerns. Books have been written on this subject at this point.

Finally, let's talk about innovative microgrid designs and innovation generally. These designs may include components that have not yet been widely used in commercial settings. They may include combinations of resources for which risk understanding is still limited. We are finding that equipment suppliers may assume some of that risk with longer-term equipment warranties. When taken together, these elements can have the effect of reducing energy supply needs and costs to the offtaker. They can also result in increased supply that may affect ongoing maintenance and refurbishment costs.

Finally, risks and thus costs may be lower if individual use cases require proven, off-the-shelf technology; on the other hand, that can sacrifice improved efficiency and cost savings. As we've said from the beginning of this series, risk plays a large role. And, as noted earlier, this is all complicated and constantly moving.

