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How a County Utility Can Catalyze the 21st Century Economy: Cuyahoga County's Vision to Develop Clean and Resilient Energy Districts to Attract and Retain Commercial Activity

Andrew R. Thomas
Cleveland State University, a.r.thomas99@csuohio.edu

Mike Foley
Cuyahoga County

Mark Henning
Cleveland State University, m.d.henning@csuohio.edu

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Creation and Purpose of the County Utility

The Cuyahoga County Utility (the "County Utility") was created in the fall of 2021 as a division of the County. Its goal is to reduce greenhouse gas emissions within the County, while simultaneously improving energy system resiliency. The County Utility seeks to target for development commercial districts where power uptime is critical to attracting and retaining business.

The best strategy for enabling this transition is the adoption of microgrid technologies, which consists of locally controlled grid edge technologies, such as generation, storage, controls and smart distribution systems. Current regulatory schemes in Ohio, as they do throughout the nation, are impeding this transition. Investor owned utilities cannot readily recover local investments into grid-edge technologies because their costs must be socialized across a large ratepayer base – which strategy public utility commissions resist.[2] That leaves municipal and rural cooperative utilities to lead this transition. The County Utility will function as the equivalent of a municipal utility.

Cuyahoga County is a Charter County under Ohio law, meaning it accedes to the rights held by municipalities under Ohio law (one of only two such counties in Ohio). One of those rights, as

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[1] Prepared jointly by the Cuyahoga County Department of Sustainability and the Energy Policy Center, Levin College of Urban Affairs, Cleveland State University. Mike Foley (mfoley@cuyahogacounty.us) is Director of the Department of Sustainability for Cuyahoga County. That department also manages the County Utility division. *See:* https://www.cuyahogacounty.us/sustainability. Andrew R. Thomas (a.r.thomas99@csuohio.edu) and Mark Henning (m.d.henning@csuohio.edu) conduct research for the Energy Policy Center at Cleveland State University. *See*: http://levin.urban.csuohio.edu/epc/.

[2] In 2016 AEP Ohio was able to get the Public Utility Commission of Ohio to approve limited investments into microgrids, which costs were then socialized across its ratepayer base. This proved to be the exception to the rule: no other proceedings for this purpose have been undertaken by any utility in Ohio since. Many investor owned utilities are actively hostile to 21st century models of the grid. Not only are cost recovery models uncertain, new grid models could potentially undermine the value of the traditional grid, into which they are heavily invested. In the Midwest, where generation has been deregulated, the grid has become the principal asset of many utilities. These assets may have been paid for by ratepayers multiple times, but utilities are still not eager to seem them devalued. The County Utility, on the other hand, has no sunk costs into 20th century models, and no need to prefer the status quo over the interests of the environment or the County constituents.

set forth in the Ohio Constitution, is to create and operate a utility. Its Charter status thus enables the County to take leadership in transforming the local grid. This transformation will not just reduce emissions and improve resiliency: it will also constrain costs, improve comfort, enhance safety and demonstrate new technologies and tariff strategies for adoption by others. And, importantly, it will create and retain jobs. It will do this by attracting business to high-uptime utility districts and by engaging the regional grid-edge development economic cluster in construction.

The Need for the County Utility: Electricity Market Transformation

The national grid is undergoing a transformation from the 20th century command and control model, with centralized power generation, to a new 21st century model, which is marked by distributed generation and local delivery systems that readily respond to load demand. In part this is being driven by the need to deploy more renewable power and energy efficiency measures to mitigate greenhouse gas emissions. This is also being driven in part by the need for improvements in system resiliency and responsiveness. Additional drivers include cost and security – the last having a heightened relevance today, as we deal with an increased threat of cyber-attacks on the grid.

Economic growth in the 21st century will increasingly be a function of system reliability, as manufacturing, financial, medical, insurance, academic and other industries require maximum energy system uptime from a greater diversity and placement of generation sources. The digital economy -- the fastest growing sector of the national economy – demands nearly 100% uptime.[3] Further, advanced manufacturing, which relies heavily on robotics and digitization, has experienced a convergence of its operating and information technologies.[4] This IT/OT convergence has forced manufacturing to reconsider traditional strategies for operating under interruptible power supply agreements. Losses from power outages can no longer be readily accommodated.

State-of-the-art smart grid systems will be critical to maintaining uptime and optimizing comfort and safety. Electricity networks must be flexible enough to include interactive load management at the building, parking lot and campus scales. Further, such systems must be able to optimize complex systems that include district energy, heat, electricity, communication, water and

[3] Companies that are especially sensitive to reliable power are also forecast to experience relatively high employment growth over the next decade. With the Internet of Things poised to impact 11% of gross world output by 2025, companies that are unprepared to maintain consistent information technology capabilities during utility service disruptions will be unable to achieve maximum profitability in the digital economy. *See:* Thomas, Andrew R.; Henning, Mark; Date, Kirby; and Simons, Robert A., "The Economic and Fiscal Impact of a Microgrid in Downtown Cleveland, Ohio" (2018). *Urban Publications*. 0 1 2 3 1560.
https://engagedscholarship.csuohio.edu/urban_facpub/1560

[4] This convergence is part of what has been identified as the "Fourth Industrial Revolution," driving intelligence, automation and optimization. Managing this convergence has been identified as "critical to businesses seeking to obtain competitive advantage." *See, e.g.,* "Managing the Successful Convergence of IT and OT," Deloitte, https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Risk/gx-deloitte-managing-the-successful-convergence-of-it-and-ot.pdf

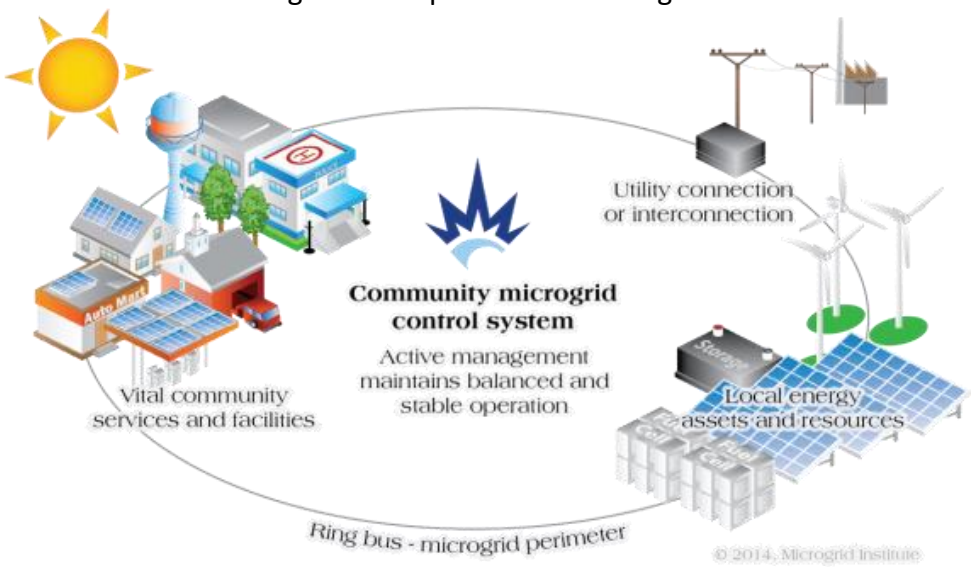
transportation accessibility. In short, future local grid design must account for the convergence of the electric grid, mobility and information technologies.

Adoption of Microgrid Technology

The Utility's principal strategy for developing clean energy, high-uptime districts is through the use an emerging technology known as a microgrid. A microgrid is a contained energy system capable of balancing captive supply and demand resources in a manner to maintain reliability. It is defined by function, not size, and it incorporates multiple distributed "grid-edge" technologies, including generation, storage and smart control systems. The principal goal of the microgrid is to cost-effectively maximize reliability and efficiency. However because most distributed power tends to be cleaner, another goal can be to reduce emissions. Importantly, the microgrid has the capacity to "island" from the main grid during a disturbance. This can be accomplished through state-of-the-art control systems now commercially available that can seamlessly remove the load from the main grid.

The microgrid can, and frequently does, deploy other utilities, including steam, hot water, chilled water and network connectivity. Indeed, the microgrid works best when it can optimize all of these systems, thereby capturing the highest efficiencies and performance possible. For this reason, early adoption of microgrids has been on campuses where natural-gas-fueled Combined Heat and Power systems can operate at 80-90% efficiency, instead of the 30-40% efficiencies normally experienced with gas turbine power generation.

Figure 1. Depiction of a Microgrid



County Utility Vision

Because electrical infrastructure is expensive, the microgrids will be built out modularly, over time, and as the customers are willing to invest. Early adoption will be behind the meter on campuses, with single customers. These early adoptions can, over time, be transitioned into in-front-of-the-meter commercial microgrids. This in-front-of-the-meter adoption is what will make the County Utility microgrids unique in the United States,[5] and will be what drives microgrids from campus-restricted use into general commercial use wherever uptime is valued.

The County Utility's plans will be revised as opportunities are presented, and as the urgency to address climate change and resiliency changes. The follow are steps contemplated by the Utility that are in keeping with its current strategy:

- Step 1 – Lay the initial foundation for a microgrid (generation, storage, smart grid and load management) for identified districts. Two communities (Brooklyn and Euclid) are currently being actively considered. The County Utility anticipates a number of sites will be identified over time.
- Step 2 – Build from these foundations to create and connect a community scale microgrid in each district by constructing distribution infrastructure (wires, substations), and connecting to the transmission system.
- Step 3 – Use early demonstrations as the model to develop community microgrids in other areas in the County that have expressed interest. These include, among others, Solon, Broadview Heights/Brecksville, and the Aerozone District.
- Step 4 – Develop strategies for merging resilient and decarbonized transportation, district energy and electrical grid systems. These will deploy local generation, smart grid technologies, plus hydrogen and battery electric storage/charging stations.
- Step 5 – Transfer technology to municipal utilities and rural cooperatives interested in these models, and, as may be consistent with regulations, to investor owned utilities. Demonstrate technology and tariff strategies for investor owned utilities and public service commissions to pave the way for regulatory alignment with transformation to clean, high uptime grids.
- Step 6 – Disseminate knowledge through County partnerships with universities and through a local microgrid center of excellence. The Center of Excellence will be managed by a collaboration of local universities, national and local laboratories, incubators, economic development entities, and private sector

[5] The best current example of a similar grid that has been developed for business attraction Is the Naval Shipyard in Philadelphia. *See e.g*. E. Wood, "The Remarkable Emergence of an Unintentional Microgrid," December 20, 2019, https://microgridknowledge.com/philadelphia-navy-yard-microgrid/. As of early 2022, and due principally to regulatory roadblocks, there are few other examples of in front of the meter operating microgrids in the U.S.

partners.[6] Work with local economic development agencies to attract research, advanced manufacturing and others that are part of the digital economy.

- Step 7 – Merge electrical grids with mobility through EV charging stations and use of hydrogen storage and refueling infrastructure. Incorporate microgrid districts into communications and broadband systems as may be necessary to support smart city adoption and adaptation.

Cuyahoga County is home to a number of "legacy cities" that have fallen on difficult times over the past 50 years, as manufacturing and other businesses have moved out of the Great Lakes region. Redevelopment of legacy cities begins with infrastructure, and the County Utility will look to leverage federal, state, county and private resources to help modernize the County's infrastructure. Microgrids provide a strategy for the County Utility to merge promising new energy technologies into state-of-art commercial districts that will provide manifest attractions to businesses that can locate within them. The County Utility will also work with local research institutions and economic development agencies to enable cluster and workforce development, and to target low income areas for commercial microgrid development.

[6] Examples of national laboratories includes NASA Glenn, which has a strong interest in establishing microgrid technology for use on moon and other bases. A local incubator is Brite Energy Innovators in Warren, Ohio. Economic development entities in the region include Manufacturing Advocacy and Growth Network (MAGNET), TeamNEO, the Greater Cleveland Partnership and JobsOhio.