Advancing to a Clean Energy Future



Duke University, September 26, 2016



Generation Diversity – Regulated Utilities



Natural Gas/Oil





Nuclear



Hydro and Solar





Integrating Comprehensive Solutions for a Clean Energy Future



Duke Energy's Current Distributed Energy Footprint



@2025 Duke Energy Corporation 252632 \$725

Normal Summer Substation Flows without Solar PV



Typical Summer Substation Flows with 10 MWs of Solar PV



measured at distribution bus, 48 hour period

Combined Heat and Power Structure and Value

CHP Business Concept

- Regulated Asset: Duke builds, owns and operates, leases 1 acre site from Host
- Gas fired, Capacity factor = 95% fully loaded 24x7, recover waste heat in HRSG to make steam
- Duke supplies steam to host
- Each asset is ~\$50-60 MM investment
- Host Benefits
 - Receives economically priced steam <u>Improves health and load retention of industrials</u>
 - <u>Avoids capital expenditure and O&M cost for host</u> while lowering combined emissions (ie, CO₂ down ~30%)
 - Operational security potential to island during a grid outage
- Customers
 - Receive economic energy and capacity <u>economically comparable to a large Combined Cycle</u>
- Duke Energy
 - Receives regulated return on rate-based asset
 - Retains industrial load and ability to grow load Potential to make industrials more cost effective

Perspectives on Combined Heat and Power

"Energy use is one of the biggest expenses for steel, chemical, paper, food-processing, and other industries, as well as large institutions like universities and hospitals. By using the same facilities to generate both thermal energy (heat) and electricity, factories can improve their efficiency by a staggering 80 percent. Combined Heat and Power protects these big energy users from volatile energy prices and helps us clean up the grid." – **Sierra** *Club;* Beyond Coal Campaign

"In addition to the efficiency and emissions reduction benefits, utilities and customers are increasingly recognizing the reliability benefits of CHP and viewing it as critical infrastructure for staying online." - **ACEEE;** Blog; "Why Utilities are Investing in this technology as a way to boost resiliency and reduce costs." *"Implementing CHP as a distributed resource more widely across the state would make the biggest energy users more efficient" - NC WARN; Report, "Combined Heat and Power in NC"*

"CHP offers a variety of benefits. It improves business competitiveness by utilizing energy that would otherwise be wasted, it ensures that critical systems remain powered in the event of disruptions to grid power, it helps meets greenhouse reduction and sustainability goals, and it provides educational opportunities for the academic community ." – **Nicholas Institute;** Case Study, "CHP in the Southeast"

Transitioning to a Distributed and Clean Energy Future



