DOE Quadrennial Energy Review 1.2, Electricity: Generation to End Use – Stakeholder Meeting #6: Atlanta, Georgia on May 24, 2016

Written Statement of Doug Esamann - Duke Energy

Opening Statement

Duke Energy appreciates the opportunity to participate in the May 24, 2016 Quadrennial Energy Review (QER) 1.2 stakeholder meeting. I am Doug Esamann, Executive Vice President of Duke Energy with responsibility for our regulated utilities in Indiana, Ohio, Kentucky and Florida. In addition, my organization also supports the company's grid solutions and modernization initiatives, many of which are topics of discussion in the QER. I welcome the opportunity to provide Duke Energy's perspective during the May 24th Panel 1 discussion and in these written comments related to: "Bulk Power Generation and Transmission: How Can We Plan, Build, and Operate the Appropriate Amount for Future Needs?"

This written statement expands on the Panel 1 discussion. It also offers suggestions in areas that DOE is addressing in its QER 1.2 effort, such as policy, legislation and research and development areas that we believe would be helpful to an energy industry in transition.

Below is an outline of the written statement:

- Executive Summary
- Duke Energy Corporation Information
- Duke Energy's Road Ahead:
    - Transform the Customer Experience
    - Modernize the Power Grid
    - Generate Cleaner Energy
    - Engage Employees and Stakeholders
        - Duke Energy Examples of Solutions to Address our Challenges
- Duke Energy's Recommendations regarding:
    - Policy
    - Legislation
    - Research and Development
- Attachments:
    - Attachment A - Presentation Slides
    - Attachment B - Duke Energy Storage Projects

Executive Summary

- Duke Energy Corporation is one of the largest electric power holding companies in the United States (U.S.).

- The supply of reliable, affordable electricity is critical to the economic vitality of our communities and states as well as our overall quality of life. For that reason, and because of the grid utilized to deliver our product to customers, the relationship and interactions of utilities and their customers have been highly regulated. In that regulated world, emphasis has been placed on reliability of supply, least cost options, an obligation to serve all customers, the need to treat all customers equally and fairly and the receipt of a fair rate of return by investors. The electric utility industry takes a long term view and utilities are generally not rewarded for risk taking. Policy issues find their way into the business via statutory and administrative requirements, incentives and penalties.

- But the changing expectations of customers, emerging technologies and new energy economics are requiring the electric utility industry to rethink its business after operating under traditional cost-of-service regulation for more than a century.

- Duke Energy has recently formulated a new strategy for our regulated business (e.g. our retail service states), which we call the Road Ahead, that will lead the way to cleaner, smarter energy solutions that customers value. Duke Energy's Road Ahead strategy has four elements: transform the customer experience; modernize the power grid; generate cleaner energy; and engage employees and stakeholders.

- Duke Energy is preparing our generation portfolio for a cleaner energy future and more flexible operations. Duke Energy has retired 40 coal units and invested in cleaner natural gas generation and renewables. These modernization efforts began more than a decade ago and will continue for years to come. As a result, Duke Energy's generation from coal has decreased from about 58% in 2005 to about 35% in 2015 and has reduced overall carbon dioxide emissions by more than 28% in that same time period.

- Diversity of generation sources will continue to play a critical role in meeting the future needs of our customers. While renewables and natural gas will be an increasing part of our generation portfolio, there will also be a need for generation resources and smart grid technologies that can complement the variable nature of renewable resources.

- Duke Energy is ensuring that throughout this transformation, we remain committed to providing value to our customers while maintaining a focus on safety, reliability, affordability and environmental stewardship. Duke Energy is a recognized leader in safety and led the industry in safety in 2015. Duke Energy's rates are lower than the national averages in all six states we serve and we have a reliability rate of 99.98 percent.

- Duke Energy believes that the greatest value we can deliver to our customers in our regulated states results from the vertically integrated utility model which allows Duke Energy to optimize the complete value chain from power generation to delivery and service to our customers. Therefore, federal policies should support regional differences as well as not favor particular business models, but understand the value the different models provide for their customers in the various regions.

About Duke Energy

Duke Energy is one of the largest electric power holding companies in the United States. Its regulated utility operations serve approximately 7.4 million electric customers located in six states in the Southeast and Midwest, representing a population of approximately 24 million people. Its Commercial Portfolio and International business segments own and operate diverse power generation assets in North America and Latin America, including a growing portfolio of renewable energy assets in the United States.

Headquartered in Charlotte, N.C., Duke Energy is a S&P 100 Stock Index company traded on the New York Stock Exchange under the symbol DUK. More information about the company is available at duke-energy.com.

Duke Energy's Road Ahead

Duke Energy has recently formulated a new strategy for our regulated business, which we call the Road Ahead. Duke Energy's Road Ahead vision is to lead the way to cleaner, smarter energy solutions that customers value.

Duke Energy believes that the greatest value we can deliver to our customers in our regulated states results from the vertically integrated utility model which allows Duke Energy to optimize the complete value chain from power generation to delivery and service to our customers. It is critically important that federal policy accommodates the varying business models that are providing value to our customers across the many different environments in the U.S.

Duke Energy's Road Ahead strategy has four elements: transform the customer experience; modernize the power grid; generate cleaner energy; and engage employees and stakeholders. These areas of focus are described at a high level below.

Transform the Customer Experience

At Duke Energy, customers are at the center of everything we do and we are working hard every day to meet our customers' changing expectations. Our customers not only want affordable and reliable power but they also want the following: more ways to manage their accounts and their energy use; more ways to interact/communicate with the company; and more options and value opportunities through innovative program offerings. Some examples of the choice, control and convenience our customers want include the following:

- Large commercial customers increasingly want renewable energy to meet their corporate sustainability goals.
- Cities and towns are requesting customized services such as help with microgrids, smart city services, or renewable energy.
- Some residential customers want rooftop solar to generate their own energy.
- Residential customers increasingly want to manage their energy use through connected devices like iPhones and Nest Learning Thermostats, as well as through web-based platforms.
- Customers also expect Duke Energy to provide service offerings based on their unique needs and individual preferences: frequent updates during outages, bill alerts, as well as the ability to

connect or change their service remotely, alternative rate plans and the ability to choose their own monthly payment date that is convenient for the individual customer.

Duke Energy is continuing to develop solutions that meet these changing expectations. We're communicating with customers in ways they prefer, such as through social media channels, two-way texting for outage reporting and high-usage notifications. Customers want to be able to better manage their energy usage and Duke Energy has responded by offering such programs.

Modernize the Power Grid

Our customers expect their lights to work at the flip of a switch; they expect to be well-informed about power outages when they do occur and the duration of those outages to be minimized. They also seek the ability to readily connect their rooftop solar panels and battery systems to the grid. In order to meet our customers' modern expectations, we are investing to modernize the power grid. We are making targeted investments in technologies that improve our customers' energy experience. We are investing in smart meters to provide more customer access to usage information. We are investing in self-healing and other grid automation technologies to make power outages increasingly rare and enable faster service restoration.

As more renewables are added to the power system, the variable nature of renewable generation places new demands on the grid, including its need to support a two-way flow of energy on a system designed for single directional power flow. Through our power grid modernization efforts, Duke Energy is preparing for the integration and optimization of these clean and distributed energy resources.

Batteries play an important part in overcoming these new challenges and we are working to realize where we can extract the greatest customer value that battery storage has to offer. From a wind farm in Texas to a microgrid in North Carolina, we are investing in battery projects around the country to learn more about how and where battery technology can deliver more value to our customers. [See Attachment B for a summary of Duke Energy's work in the energy storage space.] Based on this previous work, Duke Energy has recently announced its shift away from simply piloting battery technology to the commercial installation of energy storage technology.

As part of our commitment to delivering reliable electric service for our customers through the use of innovation, Duke Energy is committed to the use of distributed intelligence to establish a grid that is simpler and more cost-effective to operate. One of the key enablers of distributed intelligence is interoperability: the idea that devices on the grid are able to automatically and seamlessly communicate and work together in a simpler, more-efficient way. As the interoperability of field devices matures, utilities are shifting from simply interconnecting distributed energy to optimizing and integrating these cleaner resources into the power grid.

Duke Energy participates in a "Coalition of the Willing," with 25 other utilities, vendors, research labs and government agencies to lead the development and commercialization of a framework to ensure field device interoperability. This framework is known as the Open Field Message Bus (OpenFMB™).

This standards-based solution, now adopted by the Smart Grid Interoperability Panel (SGIP) and the North America Energy Standards Board (NAESB), reduces implementation complexity and integration costs typically associated with a multi-manufacturer solution. The OpenFMB standard ensures that devices such as solar generation systems can readily communicate with other devices and equipment, such as energy storage systems, to ensure quick, intelligent and automated actions may be performed.

Our work in the area of interoperability is one of the reasons why Duke Energy has been consistently recognized as an innovative industry leader. In the past two consecutive years, Greentech Media named Duke Energy to the Grid Edge 20, an honor bestowed on the top 20 companies shaping the electrical power sector's transformation.

In addition to smart meters, self-healing, and renewable integration, Duke Energy is moving into an era where the grid can be strategically automated to reduce the amount of customer demand placed on the grid to support emergency load reduction and fuel savings. This grid "optimization" provides fast response capability that would otherwise require fast-ramping generation capability, typically via a combustion turbine. In fact, Duke Energy Progress recently offset the need to build a 322 MW combustion turbine peak-generating plant by instead deploying this volt/VAR optimization technology on the grid. [1]

Generate Cleaner Energy

Duke Energy is providing increasingly clean energy for our customers. Duke Energy has retired 40 coal units and invested in cleaner natural gas generation and renewables. These modernization efforts began more than a decade ago and will continue for years to come. As a result, Duke Energy's generation from coal has decreased from about 58% in 2005 to about 35% in 2015 and has reduced overall carbon dioxide emissions by more than 28% in that same time period.

More than 40 percent of the electricity Duke Energy generated in 2015 came from carbon-free sources. Over the next five years Duke Energy plans to retire more than 1,800 MW of coal generation and invest $3 billion in renewables and $4 billion in natural gas generation.

Duke Energy is also preserving our nuclear generation options. We are evaluating extending the life of our existing nuclear plants and possibly building new ones. Duke Energy's nuclear fleet continues to perform extremely well. In 2015, Duke Energy's nuclear fleet had its best capacity factor in over a decade – 94.2 percent; the 17th consecutive year it's been above 90%. Within the U.S., nuclear generation contributed approximately 33% of our electricity with no carbon emissions.

In our regulated states, Duke Energy continues to evaluate our future generation mix primarily through our state integrated resource planning processes. These resource plans drive our transmission plans. Duke Energy believes that our planning processes address the core of this panel's discussion - planning for bulk power generation and transmission to meet our future needs. This public process includes engagement with regulators and other stakeholders to develop long-term energy plans for each of the states we serve.

Diversity of generation sources will continue to play a critical role in meeting the future needs of our customers. While renewables and natural gas will be an increasing part of our generation portfolio, there will also be a need for generation resources and smart grid technologies that can complement the variable nature of renewable resources. The generation fleet will need to be more flexible - quickly ramping up and down as renewable production fluctuates during the day. The grid must also adapt to optimize bi-directional power flow. Duke Energy manages its resource mix and transmission and distribution investment strategy to ensure renewables fit comfortably within our portfolio – providing a balanced solution.

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[1] Duke Energy's external webpage focused on the development of a smarter grid through grid modernization can be found here: http://www.duke-energy.com/about-us/smart-grid.asp.

Duke Energy has recently revised our renewable goal for combined regulated and commercial generation to be 8,000 MW by 2020. Duke is making progress in this area. As of year-end 2015, Duke Energy owned or had under contract nearly 4,400 MW of wind, solar and biomass, with 1,900 MW of renewable energy in our regulated utilities and 2,500 MW in our commercial portfolio. Solar is already playing a large role in North Carolina. Approximately 1,700 MW of the 1,900 MW of renewables in our regulated utilities are located in North Carolina. North Carolina is third in the nation, behind California and Arizona, for cumulative installed solar capacity and number one in the Southeast. Duke Energy has invested more than $1 billion in new solar projects across North Carolina. Duke Energy is also accelerating our solar power efforts in South Carolina. Duke Energy plans to add up to 500 MW of solar power in Florida by 2024.

Duke Energy also considers our energy efficiency programs as another fuel source. Duke Energy has vibrant energy efficiency programs in all of our retail states. In 2015, Duke Energy's energy efficiency programs had reduced energy consumption by more than 11,000 gigawatt hours. Since 2009, the company has provided more than 80 million deeply discounted energy-efficient lighting products through direct order platforms, participating retailers and Duke Energy's Online Savings Store. The company's "My Home Energy Report" provides residential customers with a comparative view of their energy use compared to that of their neighbors. Over the past six years, this program has saved more than 1 terawatt-hour of electricity, which is enough to fully power 70,000 homes for a year.

DOE acknowledged the importance of central station generation in its QER 1.1 April 2015 report[2]. Duke Energy's central station generation supported by a strong transmission grid will remain the backbone for Duke Energy in the long term and will enable and support the integration of the newer technologies such as renewables, Distributed Energy Resources, and energy storage as their penetration increases on the grid. Due to differences in our retail service states' current generation mixes, economies, renewable policies and other factors, the path taken in one state may be different than another state, and federal policies need to recognize and not disadvantage certain states. DOE should continue to recognize the important role that the concept of regional differences should play within the QER recommendations.

Duke Energy is ensuring that throughout this generation mix transformation, we remain committed to providing value to our customers while maintaining a focus on safety, reliability, affordability and environmental stewardship.

Duke Energy is a recognized industry leader in safety. Duke's Total Incident Case Rate scores, a key safety performance measure, have decreased steadily over the past several years. Two industry groups have ranked Duke Energy No. 1 in safety in 2015. The Edison Electric Institute (EEI) ranked Duke Energy's 2015 employee safety record No. 1 among its members in the "large utility" category. The Southeastern Electric Exchange (SEE), whose members stretch from New England to Texas, ranked Duke Energy's 2015 performance No. 1 among all members, regardless of utility size. In addition, Duke Energy's Transmission department was the top-performing transmission group among

[2] Quadrennial Energy Review: Energy Transmission, Storage, and Distribution Infrastructure – April 2015 – Page 3-24: "Planning for the future grid must recognize the importance of the transmission and distribution systems in linking central station generation—which will remain an essential part of the U.S. energy supply for many years to come—to electricity consumers.";
http://www.energy.gov/sites/prod/files/2015/07/f24/QER%20Full%20Report_TS%26D%20April%202015_0.pdf

all large EEI member utilities, and the Transmission and Delivery Operations teams received top honors among all SEE members.

Engage Employees and Stakeholders

Duke Energy internally embraces a flexible and adaptable culture, and externally works to update regulatory models for the benefit of our customers. Stakeholder outreach and engagement is central to advancing the company's long-term strategy. We are working with regulators, policymakers and other external stakeholders to develop an energy future that benefits all our customers. Some examples of the solutions that Duke Energy is implementing to address the challenges we are facing in the transformation taking place in our company and our industry.

In both of the Powering the Western Carolinas and the Powering the Palmetto State initiatives, Duke Energy effectively worked through the stakeholder process to find solutions. In the Powering the Western Carolinas project, which included portions of western North Carolina and South Carolina, the original plan included retiring the coal plant and adding a new natural gas plant and solar facilities. This plan required a 45-mile transmission line and a substation. When residents raised concerns over the new transmission line, Duke Energy paused, listened and took a closer look at viable alternatives. Duke Energy developed a revised plan that included two smaller natural gas units and solar facilities which resulted in the transmission line no longer being needed. A third natural gas unit may be built in 2023 or later, depending on the success of collaborative efforts with the community to reduce energy use in the area.

In the Powering the Palmetto State effort, Duke Energy worked for over a year in a collaborative effort among representatives from the environmental community, solar industry and other utilities in South Carolina to develop a way forward for the implementation of solar facilities that was beneficial to all stakeholders. This resulted in the Distributed Energy Resource Program Act being signed by Governor Nikki Haley in 2014. These efforts enabled the company to introduce several options for customers to participate in solar, including a solar rebate program for customers who install up to 1MW of solar on their property.

Duke Energy's Policy, Legislation and Research and Development (R&D) Recommendations

One of the tasks of the QER efforts is to develop policy, legislative and R&D recommendations that can help the industry in the energy transformation. Duke Energy is providing specific suggestions in these areas for consideration as the recommendations are formulated.

Policy

- Regional Differences - Federal policy should recognize regional differences and not favor any particular business model or structure. DOE acknowledged the need for regional differences in their QER 1.1 April 2015 report.[3]

[3] Quadrennial Energy Review: Energy Transmission, Storage, and Distribution Infrastructure – April 2015: Page 3-20, report section entitled "Different Industry Structures and Business Models Rule Out "One-Size-Fits-All" Solutions to Challenges";

- Federal versus State Jurisdictions – Policy positions should be mindful of respective federal and state jurisdictional lines in order to make progress on the important issues related to the energy industry transformation. States have jurisdiction and control over many aspects that will be important in this transformation. DOE and the federal government should collaboratively work with the states to support the coordination of the important goals across these jurisdictional lines.

Federal Legislation

- De-risk New Technology Implementation – Duke Energy supports federal policy that de-risks the cost recovery concerns of many state regulatory agencies with the implementation of new technologies. Some of the new technologies, like energy storage, do not have a long operational track record. Therefore, it is difficult to predict the life of the asset for ratemaking purposes. One approach could be to expand the use of existing programs, like the 1703 loan program, to provide federally backed performance warranties or insurance programs for new technology deployment. The current authorization for the 1703 loan program is broadly written enough for the Department of Energy to implement a performance guarantee program without the need for new legislation. An entity could pay a premium into the insurance program assuming the life of an asset but if the asset failed before the full regulatory life of the asset, then the insurance program could make the technology provider whole from a cost recovery of the regulatory asset perspective. This would encourage the industry to move forward with these new technologies without being harmed financially for taking these progressive steps toward grid modernization. The Senate spoke to this problem in its version of the fiscal year 2017 Energy and Water Appropriations bill. As part of the QER 1.2 effort, the Department of Energy should examine this issue and determine if the above approach could be accomplished without legislative changes and support this type of mechanism to de-risk new technology investment. However if the Department of Energy determines through the QER 1.2 effort that alternative approaches should be considered that would require federal legislation, then the Department of Energy should propose such legislative solutions to this issue.

- Opt-out of Normalizing the Solar Federal Investment Tax Credit (FITC) - Currently, regulated utilities like Duke Energy are at a competitive disadvantage when it comes to meeting our customers' needs. For instance, Walmart has indicated they want to go 100% "green." We want to provide them the energy. But, an unregulated company that does not have to normalize the solar FITC over 25 years, like we do, can come in and pocket a portion of the FITC and still undercut our best offer – purely because we have to normalize the solar FITC. We need a level economic playing field and a tax code that does not have a bias for picking winners and losers.

- PURPA Reform – PURPA legislation was originally passed in 1978 and has only been modified slightly since that time.

  PURPA has played an important role in the deployment of new alternative generation technologies. Economic, technological, financing, and market barriers to these alternative

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http://www.energy.gov/sites/prod/files/2015/07/f24/QER%20Full%20Report_TS%26D%20April%202015_0.pdf

generation technologies have been removed. Therefore, Duke Energy believes that it is time to re-visit the basis for PURPA and its avoided cost mandatory purchase construct in the context of the following: (i) focus on achieving actual rather than perceived environmental benefits, (ii) the justness and reasonableness of rates for customers while providing predictable revenue streams and financial returns for generators, (iii) shifting of unneeded power and capacity costs to utilities and their customers, (iv) the negative impact of long term purchased power contracts upon utility credit ratings and, (v) the operational and reliability risks and burdens imposed on utilities with the obligation to purchase energy that cannot be reliably forecasted.

Recommended changes to PURPA and its implementation include the following:

- Terminate the obligation to purchase from cogenerating PURPA facilities – these fossil-fuel powered PURPA (coal, municipal solid waste, fuel oil, natural gas) generators do not provide environmental benefits that equal or are superior to utility owned and dispatched natural gas combined cycle plants.
- Limit purchases to non-fossil fuel alternative generation small power production facilities, return to the founding principles of PURPA that requires purchases (i) only to fulfil system needs and (ii) at competitively established market based rates, terms, and conditions that establish the “avoided cost” for those system needs.
- Base commitments to sell and purchase on system capacity and contribution to peak and base-load native load energy service needs.
- Expand interconnected operations obligations on Qualifying Facilities, including appropriate and balanced generation and operational control and portfolio dispatch rights. As intermittent generation increases, all electrical generators must contribute to and share responsibility for grid operations, generation dispatch, and delivery costs and upgrades.
- When purchases are required, limit the obligation to purchase to generators that interconnect directly with the purchasing utility. The current obligation of a utility to purchase from any generator who is willing to wheel power to such utility that it is not directly interconnected with imposes an undefined uncertainty on utility integration and resource planning.
- Require the implementation of integration and generation imbalance services that are paid for by generators requiring these services – not by utilities and their customers.

Research and Development (R&D)

- Smart Grid - Duke Energy supports continued smart grid research and development to better understand how to optimally interconnect distributed resources as well as optimize and forecast their output, truly integrating them into the system.
- Energy Storage – Duke Energy would prefer that R&D funding would be agnostic to particular technology approaches. For example, Duke Energy would prefer that R&D not focus on flywheel technology since it might have limited commercial applications. Duke Energy would instead support R&D on projects that facilitated commercialization or identification of new applications for existing technologies which are more impactful in the energy marketplace.

- Standards - Interoperability standards and open systems protocols will lead to a simpler and more cost effective grid. Duke Energy believes the industry needs communications protocols that are based on open system standards - not custom interfaces. We encourage the DOE to promote this by awarding projects to those entities that commit to using open systems instead of proprietary features. Duke Energy supports and engages with on-going work at the National Labs, particularly the work that is being done by NREL.

- Cybersecurity

    - Duke Energy supports R&D for cybersecurity. Duke Energy has participated in the Cybersecurity Risk Information Sharing Program (CRISP) and believes that this is a very high value area of DOE R&D. Sharing threat information is very important to keeping our industry protected and secure. Duke Energy believes that DOE should align with the NIST framework rather than pursuing their own framework (e.g. the Cybersecurity Capability Maturity Model). Funding should be redirected to more valuable R&D efforts. Also it is unclear what the path forward would be for the Virtual Energy Sector Advanced Digital Forensics Analysis Platform since the E-ISAC, the FBI and various industry participants have similar efforts and capabilities.

    - Duke Energy has an overall concern with DOE's R&D projects that propose to collect increased amounts and sources of sensitive data regarding critical infrastructure. It is unclear that such data can or will be protected against disclosure by the government. Moreover, if this data was loaded into a nationwide situational awareness tool, this could create an invaluable roadmap for terrorists, if they were to be successful in hacking into the system.

- Hydropower - Duke Energy supports the DOE R&D being performed related to the advanced hydropower technologies. Duke Energy would encourage DOE to work with the permitting agencies so that companies like Duke Energy can eventually implement the technologies being developed.

- Advanced Nuclear Reactors – Duke Energy supports the DOE and Nuclear Regulatory Commission efforts to think differently about licensing reactors and hopes that an efficient, risk informed, technology-neutral framework for advanced reactor licensing is achieved.

- Simplify the criteria for acceptance of DOE funding by states and utilities and allow use of funds within existing operational and rate design parameters.

- R&D Should Not Promote a Particular Business Model - Duke Energy is not supportive of R&D funding being allocated to pursue a particular business model. One example of this would be in the state-distribution level programs that are being pursued by a few states, but not being pursued by the majority of the states.

- Transformer Resilience – Duke Energy would like to see DOE's R&D around transformers focused on long term reliability and life cycle cost, in addition to resilience, interoperability and transportability.

- Make it simpler to Participate in DOE Demonstration Projects - Duke Energy finds the administrative burden to be high in participating in DOE demonstration projects. Finding ways to mitigate these burdens would likely increase participation. In addition, offering opportunities for industry consortiums to provide input/direction on particular research efforts is a way to get meaningful input from industry.

Conclusions

At Duke Energy we take our responsibility to serve our customers seriously. Every day, more than 29,000 Duke Energy employees are committed to ensuring the electricity and the products and services we provide to more than 24 million people are reliable, affordable and increasingly cleaner.

The world and our industry are changing – technology, changing customer expectations, new public policies and the push for greener, cleaner energy all have an impact on the way energy is generated, delivered and used. And while these changes present us with a new set of challenges, they also present us with an opportunity to work together and develop solutions.

Duke Energy has a responsibility and an obligation to provide our customers with reliable electricity on demand. Duke Energy believes that our customers in our regulated states benefit from the vertically integrated utility model. This model allows Duke to optimize the complete value chain from power generation to delivery and service to our customers placing us in a unique position to address the issues of today and to help drive solutions for tomorrow. Every customer is unique and we want to make sure we're providing value to all 24 million that depend on us.

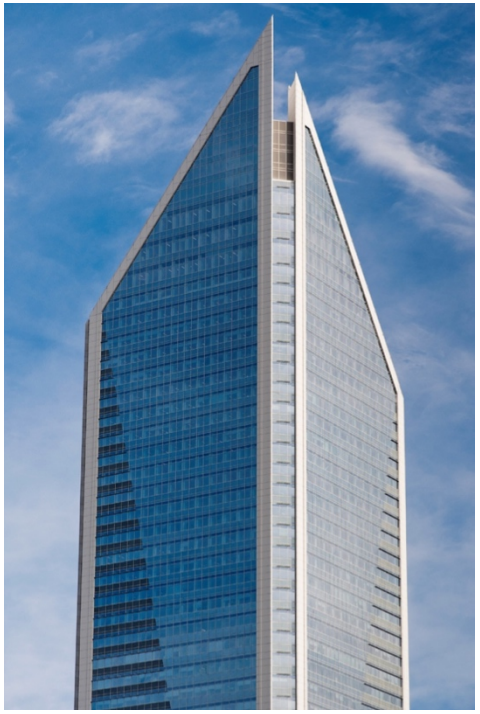
These are exciting times in our industry. As we continue this journey of transformation, working together will be very important to ensure we're all successful.

Quadrennial Energy Review: May 24, 2016 Atlanta, GA Meeting

Doug Esamann

Attachment A



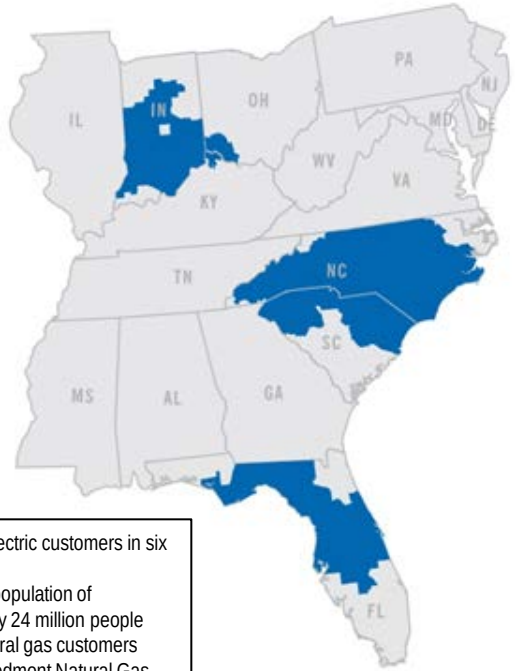





DUKE ENERGY®

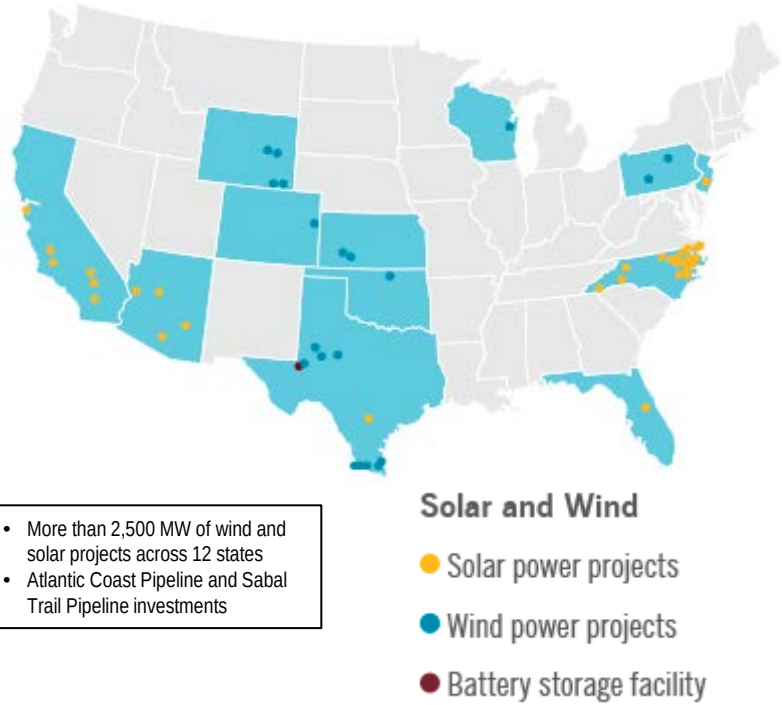
Duke Service Territories

Regulated Utilities



- 7.4 million electric customers in six states
- Represents population of approximately 24 million people
- 525,000 natural gas customers
- Proposed Piedmont Natural Gas acquisition will triple natural gas customers to 1.5 million

Commercial Renewable Portfolio



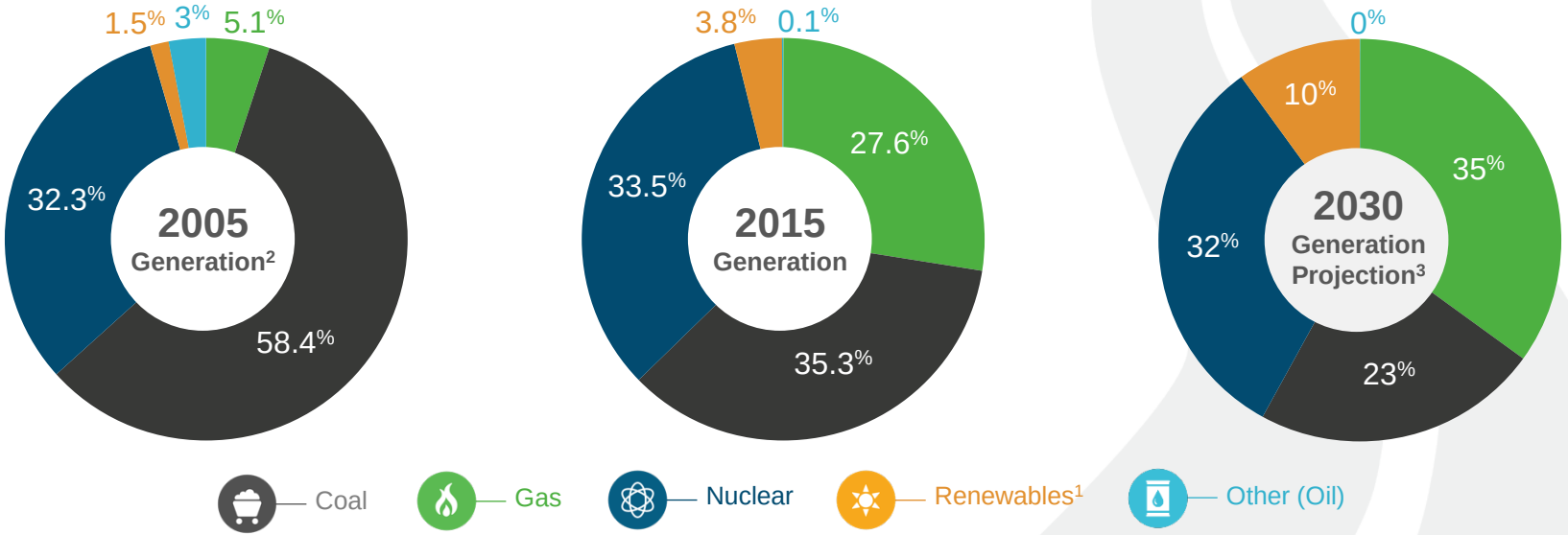
- More than 2,500 MW of wind and solar projects across 12 states
- Atlantic Coast Pipeline and Sabal Trail Pipeline investments

Generate Cleaner Energy

Adapting to a lower-carbon future

**Graph shows one possibility for how an increase in renewables and natural gas will impact the overall fuel mix.*

GENERATION BY FUEL TYPE



[1] Renewables includes hydro, wind and solar. Does not include pumped hydro.
[2] The projections include Commercial, but not International. It is owned, not purchased.
[3] Projections include a carbon price, but not planning for the CPP as our states have not made their plans.

New Solutions to Address Challenges

Powering the Western Carolinas

- Original plan included coal plant retirement and new natural gas plant, solar facility and transmission line
- When residents raised concerns, we paused, listened and took a closer look
- Plan reconfigured with smaller natural gas units
- New transmission line no longer necessary
- Third natural gas unit to be built in 2023 or later, depending on success of collaborative efforts to reduce energy use

Powering the Palmetto State

- Distributed Energy Resource Program Act was signed by Gov. Nikki Haley in 2014
- Resulted from a year of collaboration among representatives from the environmental community, solar industry and electric utilities
- Opened the state for solar leasing with consumer protection regulations, making rooftop solar more accessible
- Allows utilities to build solar and recoup costs – like other power plants; mandates that utilities craft programs for nonprofits & educational facilities to expand solar

Technology Development

- Advancing at unprecedented rate. Innovations in telecom, IT, reliability systems drive further evolution
- Grid Modernizations
- Smart meters
- Self-Healing Equipment
- Voltage Control
- Distributed resources will co-exist with central station generation; will rely on grid for optimization and future growth capabilities


DUKE
ENERGY®

Energy Storage

Duke Energy is a leader in battery energy storage, with projects around the nation. These projects have allowed us to better understand how energy storage fits as grid modernization and distributed energy resources – like wind and solar – become a bigger part of the electric industry.

Commercial Businesses

Texas

Duke Energy's Notrees Battery Storage Project is one of the largest battery installations in North America. It was developed in partnership with the Department of Energy and commissioned in late 2012. Located at the Notrees Wind Power Project in West Texas, the 36-megawatt advanced lead acid battery technology provides frequency regulation for the ERCOT market. The Electric Power Research Institute (EPRI) is collecting and sharing performance data to help assess the potential for broader adoption of energy storage throughout the industry.

Ohio

Duke Energy is using Toshiba's 2-MW battery storage system designed to regulate frequency and increase stability within the power grid. The system, online in 2015, is located at the retired W.C. Beckjord Station in New Richmond, Ohio. The project uses Toshiba's lithium-ion battery, with 2-MW output and 0.8 megawatt-hour capacity.

Duke Energy, LG Chem and Greensmith are teaming up for a 2-MW storage project will assist in regulating electric grid frequency for PJM, the transmission organization that powers much of the eastern U.S. The system will be built at the W.C. Beckjord Station in New Richmond, Ohio. It is expected to be operational by late 2015.

Regulated Businesses

North Carolina

The Rankin Battery Storage Project located at the Rankin Substation in Gaston County, N.C., was commissioned in early 2012. The 402-kilowatt FIAMM sodium nickel battery is linked with a commercial solar installation located 3 miles from the substation. The Rankin Battery Storage Project was named Project of the Year at the 2013 DistribuTECH Conference and Exhibition for integrating renewable energy into the grid. After a successful testing period, the batteries were removed in late 2014. The site is currently being evaluated for a new battery installation with a different chemistry.

North Carolina (continued)

The Marshall Battery Storage Project located at the Marshall Steam Station in Catawba County, N.C., was commissioned in 2012. The 250-kW Kokam superior lithium polymer battery with S&C Electric integration is located next to the 1.2-MW solar installation to which it is linked. The Marshall project uses a solar smoothing and energy shifting application to help integrate the electricity generated from the solar installation into the grid.

The McAlpine Community Energy Storage Project located at a transformer in a residential neighborhood in Charlotte, N.C., was commissioned in 2011. The 24-kW Kokam battery with S&C Electric integration provides voltage support to the transformer to which it is connected. It also provides the capability to maintain power to a customer's home during a grid outage event.

The McAlpine Substation Energy Storage Project located in Charlotte, N.C., was commissioned in late 2012. The 200-kW BYD lithium iron phosphate battery is interconnected with a 50-kW solar facility. The battery provides energy shifting and solar smoothing applications. This project will also be part of a planned microgrid that will be used to maintain power to a fire station during a grid outage event.

Indiana

The Clay Terrace Project combines a solar canopy, battery storage and EV charging at a shopping mall in Carmel, Ind. The project uses Toshiba lithium titinate technology. The battery's output is 75 kW/48 kWh. It was commissioned in 2013.

Other Investments

Florida

A $1 million grant from Duke Energy to the University of South Florida - St. Petersburg helped fund a project that will explore how to store and use energy from the sun. As part of the research grant, a 100-kW solar photovoltaic (PV) system has been installed on the top of the university's 5th Avenue South parking garage. A battery by Tesla will be used to store and discharge energy when needed.

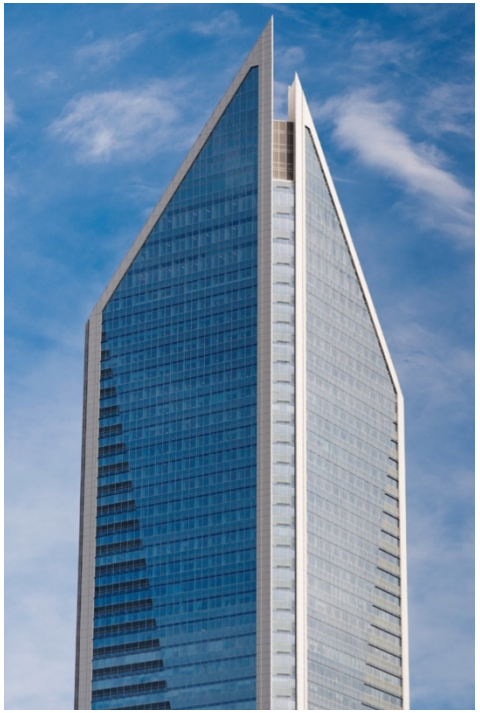
Indiana

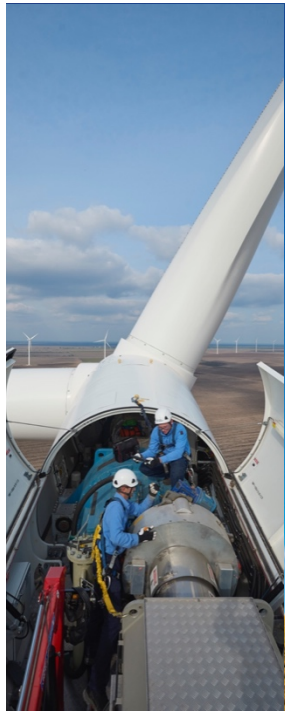
Duke Energy is funding $1 million in research at the Battery Innovation Center to study how battery storage can maximize renewable power sources, such as rooftop solar panels and small wind turbines, and integrate them into the electric grid. Duke Energy and the Indiana Office of Utility Consumer Counselor (OUCC) are partnering with the Battery Innovation Center to advance energy storage research, particularly as it applies to homes and communities.

Quadrennial Energy Review: May 24, 2016 Atlanta, GA Meeting

Doug Esamann



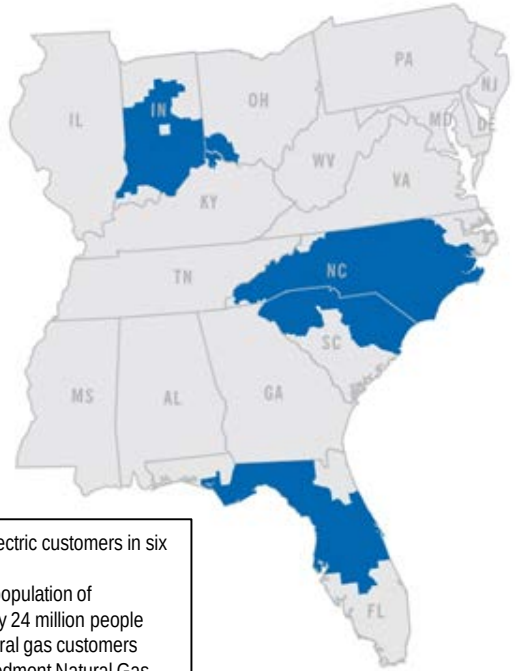





DUKE ENERGY®

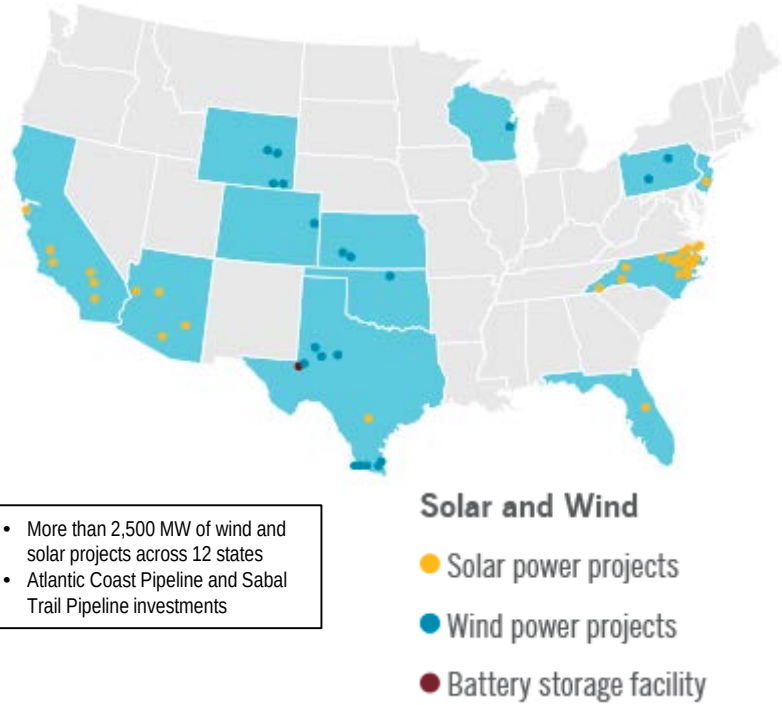
Duke Service Territories

Regulated Utilities



- 7.4 million electric customers in six states
- Represents population of approximately 24 million people
- 525,000 natural gas customers
- Proposed Piedmont Natural Gas acquisition will triple natural gas customers to 1.5 million

Commercial Renewable Portfolio



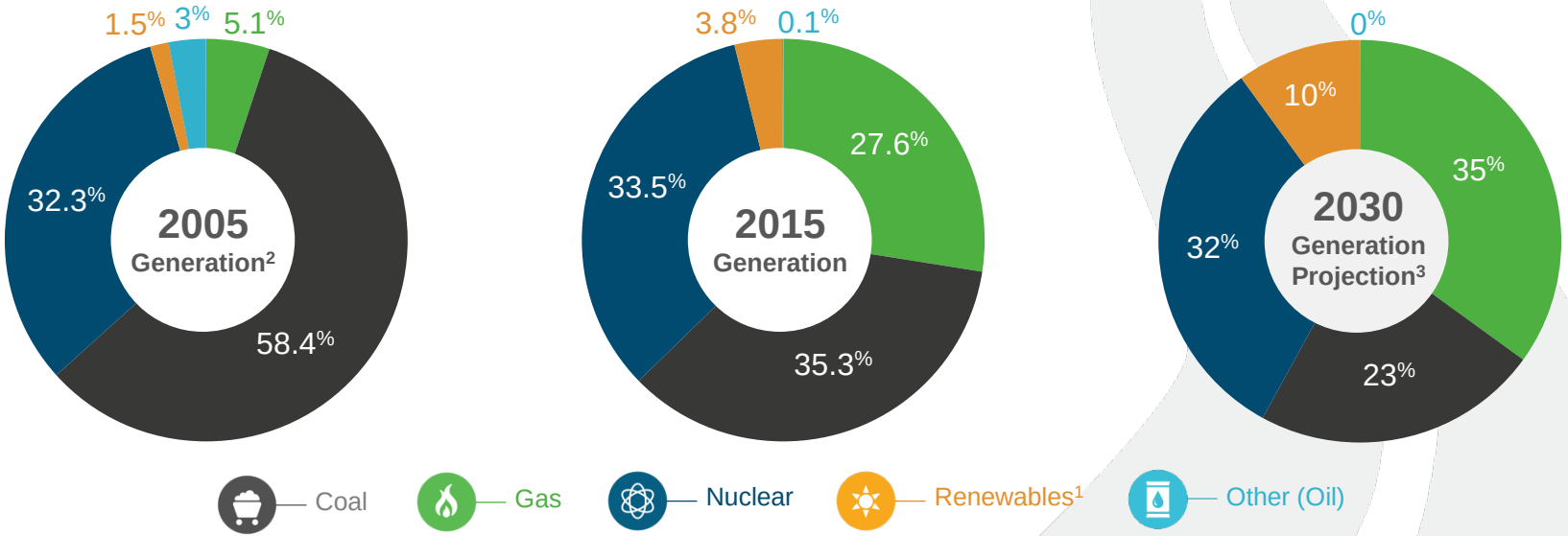
- More than 2,500 MW of wind and solar projects across 12 states
- Atlantic Coast Pipeline and Sabal Trail Pipeline investments

Generate Cleaner Energy

Adapting to a lower-carbon future

**Graph shows one possibility for how an increase in renewables and natural gas will impact the overall fuel mix.*

GENERATION BY FUEL TYPE



[1] Renewables includes hydro, wind and solar. Does not include pumped hydro.
[2] The projections include Commercial, but not International. It is owned, not purchased.
[3] Projections include a carbon price, but not planning for the CPP as our states have not made their plans.

New Solutions to Address Challenges

Powering the Western Carolinas

- Original plan included coal plant retirement and new natural gas plant, solar facility and transmission line
- When residents raised concerns, we paused, listened and took a closer look
- Plan reconfigured with smaller natural gas units
- New transmission line no longer necessary
- Third natural gas unit to be built in 2023 or later, depending on success of collaborative efforts to reduce energy use

Powering the Palmetto State

- Distributed Energy Resource Program Act was signed by Gov. Nikki Haley in 2014
- Resulted from a year of collaboration among representatives from the environmental community, solar industry and electric utilities
- Opened the state for solar leasing with consumer protection regulations, making rooftop solar more accessible
- Allows utilities to build solar and recoup costs – like other power plants; mandates that utilities craft programs for nonprofits & educational facilities to expand solar

Technology Development

- Advancing at unprecedented rate. Innovations in telecom, IT, reliability systems drive further evolution
- Grid Modernizations
- Smart meters
- Self-Healing Equipment
- Voltage Control
- Distributed resources will co-exist with central station generation; will rely on grid for optimization and future growth capabilities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