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OFFICIAL COPY

Jan 09 2019

January 9, 2019

VIA ELECTRONIC FILING

M. Lynn Jarvis, Chief Clerk
North Carolina Utilities Commission
4325 Mail Service Center
Raleigh, North Carolina 27699-4300

**RE: Duke Energy Progress, LLC and Duke Energy Carolinas, LLC's
Report of Second NC Grid Improvement Technical Workshop
Docket Nos. E-2, Sub 1142 and E-7, Sub 1146**

Dear Ms. Jarvis:

Duke Energy Progress, LLC and Duke Energy Carolinas, LLC held a follow-up Technical Workshop regarding Grid Improvement on November 8, 2018. I enclose the report prepared by Rocky Mountain Institute, the independent organization that facilitated the workshop.

Thank you for your attention to this matter. If you have any questions, please let me know.

Sincerely,

A handwritten signature in black ink, appearing to read 'Law B. Somers', written over a horizontal line.

Lawrence B. Somers

Enclosure

cc: Parties of Record

CERTIFICATE OF SERVICE

I certify that a copy of Duke Energy Carolinas, LLC's Report of Second NC Grid Improvement Technical Workshop, in Docket No. E-7, Sub 1146, has been served by electronic mail, hand delivery or by depositing a copy in the United States mail, postage prepaid to the following parties:

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This the 9th day of January, 2018.

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Summary Report of Duke Energy North Carolina Grid Improvement Workshop

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Prepared by Rocky Mountain Institute
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Executive Summary

Duke Energy hosted a workshop with North Carolina stakeholders on November 8, 2018 to share the company's current thinking and plans for grid improvement and to solicit feedback. Duke Energy contracted Rocky Mountain Institute (RMI) as a 3rd party to conduct needs assessments with stakeholders, design the agenda and facilitate the workshop itself.

The workshop convened 78 stakeholders on November 8, 2018 at the North Carolina State University Club in Raleigh, inclusive of 4 RMI staff and 19 Duke Energy staff. At the workshop, stakeholders heard presentations from Duke Energy, participated in live polling, held discussions at individual tables of 4-6 participants, had questions answered by Duke Energy staff and provided written and verbal feedback to Duke Energy.

In this report, Rocky Mountain Institute summarizes the day's discussions, survey results and outcomes. The report's synthesis does not attribute specific comments to specific parties, to respect the ground rules agreed to by participants at the beginning of the meeting. Specifically, participants agreed that what was discussed at the workshop could be shared publicly, but specific comments could not be attributed to individuals without their permission.

Before the workshop, Duke Energy prepared and sent stakeholders a 103-page pre-read document that contained the company's analysis and current grid improvement plans. The workshop presentations summarized the pre-read material, leaving time to hear stakeholder feedback.

Workshop objectives

The workshop was organized around three objectives, listed below. RMI defined these objectives in consultation with Duke Energy and other participants interviewed in advance of the event.

1. Obtain stakeholder input to Duke Energy's outlook on seven megatrends shaping grid improvement decisions.
2. Describe and get feedback on how Duke Energy has used stakeholder input, the impact of megatrends on grid needs, and a prioritization methodology to develop a grid improvement portfolio.
3. Describe the benefits and risks of the draft program portfolio and hear from stakeholders what changes they propose, and why.



Key Workshop Takeaways

1. Online polling, plenary question and answer sessions, and table discussions all indicated that stakeholders ranged widely in their support for Duke Energy's draft grid improvement plan. In online polling explicitly asking for the extent that stakeholders supported the plan (Figure 1 below):
 - Stakeholders indicated a wide range of level of support from ~0% to ~80%
 - 14 stakeholders indicated support well below 50%; 13 stakeholders were near 50%; and 8 stakeholders were well above 50%.
2. The following major perspectives were expressed by stakeholders throughout the day. These perspectives do not represent consensus of the entire stakeholder group:
 - Many stakeholders **requested further details on how Duke's conducted its analysis**. Specifically, stakeholders asked for the underlying assumptions, data, and formulas used to assess 1) the costs and benefits and 2) how the plan would increase in the amount of distributed energy resources (DER) that could be added to the grid. These requests were made in several sessions and was detailed in the 'Sharing Data' portion of the workshop's final session.
 - Many of the stakeholders were supportive of aspects of the grid improvement plan but were hesitant to provide official support until they understood **the specifics of cost recovery and rate changes**.
 - Several stakeholders asked Duke Energy to **explicitly include Climate Change in its megatrends** and show how the plan would help reduce emissions.
 - Stakeholders wanted to know how much DER the grid could support today and **how much additional DER the grid could support with the plan's improvements**.
 - Industrial or 'transmission line' customers wanted to understand **how the plan would improve transmission service** and whether their rates would fairly reflect those benefits (or lack thereof).

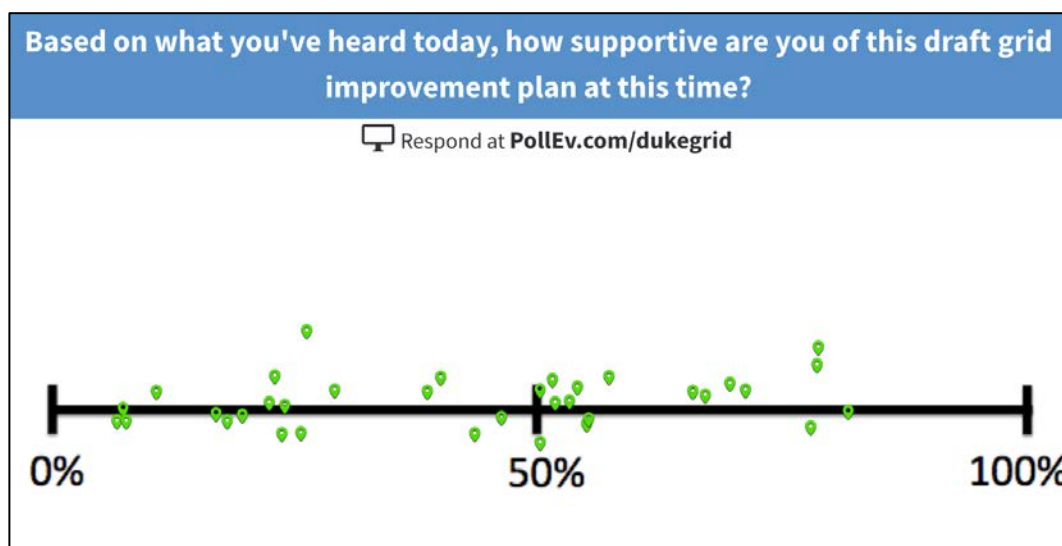


Figure 1. Online polling showed a wide distribution of support for the plan, varying from ~0% to ~80%.

- A number of stakeholders wanted to consider grid improvement together with other Duke Energy activities including resource planning, cost recovery and implementation plans.
3. Stakeholders generally acknowledged and appreciated Duke Energy's improved preparation and transparency (both in the pre-read and in the presentations), as compared to information provided in the original Power/Forward plan and previous grid improvement workshop.
 4. Stakeholders generally appreciated the chance to provide feedback to Duke Energy on the grid improvement plans and felt the workshop provided an effective platform to provide that feedback. In the end-of-workshop survey question asking whether the workshop was an effective forum for giving Duke Energy feedback, most stakeholders respond with a 7 or higher (out of 10). The vast majority of stakeholders expressed a willingness to continue grid improvement conversations with Duke Energy. In the end-of-workshop survey question asking whether they would like to continue working with Duke Energy on grid improvement, most stakeholders responded with a 9 or higher (out of 10).

This Report

This report documents the feedback that stakeholders provided throughout the workshop in the form of online polling, table discussions and plenary question and answer sessions. We also summarize common themes that emerged in the workshop conversations, table conversations and the post-event survey. [The Appendix](#) documents detailed notes from all of the workshop conversations.



Workshop Agenda and Attendee List

The Workshop agenda was designed by RMI, in consultation with Duke Energy, to meet the workshop objectives. The agenda included dedicated sessions to discuss the megatrends and their implications (Objective #1), Duke Energy's portfolio prioritization method (Objective #2) and Duke Energy's current grid improvement plan (Objective #3). At the end of the workshop, stakeholders were invited to provide additional input to Duke on topics related to Grid Improvement.

Table 1: Workshop Agenda

Time	Activity	Objectives addressed
9:00	Welcome, Safety Briefing, Agenda and Ground Rules	
9:15	Introductions and Check-in	
9:35	Overview of Duke Energy's Grid Improvement Analysis	#1, #2, #3
9:50	Activity: Polling, Feedback and Questions	#1, #2, #3
10:30	Presentation on Megatrends and Implications	#1
10:40	Activity: Questions, Polling and Feedback	#1
11:40	Lunch	
12:25	Presentation on Portfolio Prioritization Method	#2
12:40	Activity: Discussion, Questions	#2
1:15	Presentation: Current Draft Grid Improvement Plan	#3
1:30	Activity: Questions, Polling and Discussions	#3
2:35	Activity: Coaching Questions, Data Dump, and Q&A	#1, #2, #3
3:30	Closing Remarks and Adjournment	#1, #2, #3



Table 2: Attendee List

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Bowman	Kendal	Duke Energy
Bragg	Scott	Evergreen Packaging
Brooks	Jeff	Duke Energy
Brookshire	Daniel	NC Sustainable Energy Association
Brown	Justin	Duke Energy
Burnett	John	Duke Energy
Chan	Coreina	Rocky Mountain Institute
Cherry	Troy	Varentec
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Delli-Gatti	Dionne	Environmental Defense Fund
DeMay	Stephen	Duke Energy
Downey	Diana	Public Staff - NC Utilities Commission
Doyle	Ned	Energy Innovation Task Force - Asheville
Dyson	Mark	Rocky Mountain Institute
Edge	Chris	Duke Energy
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Finnigan	John	Environmental Defense Fund
Floyd	Jack	Public Staff - NC Utilities Commission
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Holder	Nathan	Advanced Energy
Howard	Preston	North Carolina Manufacturers Alliance
Hughes	Mike	Duke Energy
Jacob	Bryan	Southern Alliance for Clean Energy
Jenkins	Alan	Jenkins at Law
Kalland	Stephen	NCSU - NC Clean Energy Technology Center
Klein	PJ	Corning Incorporated
Kruse	Susan	Duke Energy
Ledford	Peter	NC Sustainable Energy Association
Maley	Dan	Duke Energy
Masemore	Sushma	North Carolina Department of Environmental Quality
McIlmoil	Rory	Appalachian Voices
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Musilek	Jim	North Carolina Electric Cooperatives
Neal	David	Southern Environmental Law Center
Ohms	Cindy	Carolina Utility Customers Association
Oliver	Jay	Duke Energy
Palmer	Miko	Duke Energy
Parkhurst	Daniel	Clean Air Carolina
Powell	Claudia	Advanced Energy
Quinn	Matthew	NC WARN
Ralph	Karen	Duke Energy
Ripley	Al	NC Justice Center
Rogers	David	Sierra Club
Rountree	Grace Trilling	Duke Energy
Rouse	Jay	North Carolina Electric Cooperatives
Scheier	Eric	NC Interfaith Power & Light
Schull	Matthew	ElectriCities of North Carolina
Sides	James	United States Marine Corps - Regional Energy Program
Simpson	Bobby	Duke Energy
Sipes	Robert	Duke Energy
Smith	Ben	NC Sustainable Energy Association
Teplin	Chaz	Rocky Mountain Institute
Trathen	Marcus	Brooks Pierce - Tech Customers
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Weiss	Jennifer	Nicholas Institute for Environmental Policy Solutions
Williamson	David	Public Staff - NC Utilities Commission
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Workshop Outcomes

Objective 1

Obtain stakeholder input to Duke Energy's outlook on seven megatrends shaping grid improvement decisions.

Supporting Activities

The following activities allowed stakeholders to provide input to Duke Energy on the seven megatrends:

- Pre-Read: In the pre-read sent to participants, Duke Energy identified seven megatrends shaping near and long-term grid improvement needs, and the potential implications of these megatrends on customer service under a business-as-usual scenario (no grid improvement). Duke Energy compared the outlook for grid performance under business-as-usual vs. grid improvement plan scenarios, using the following qualitative summary slide:
- Workshop presentations and discussions: A presentation by Duke Energy staff summarized the megatrends and how they shaped the company's approach to grid improvement. Following the presentation, several feedback activities collected input from stakeholders including: a Q&A session, table discussions, online polling, and additional discussion at the end of the day. Please see Appendix 2, for detailed notes from the Q&A, table discussions, and plenary comments.

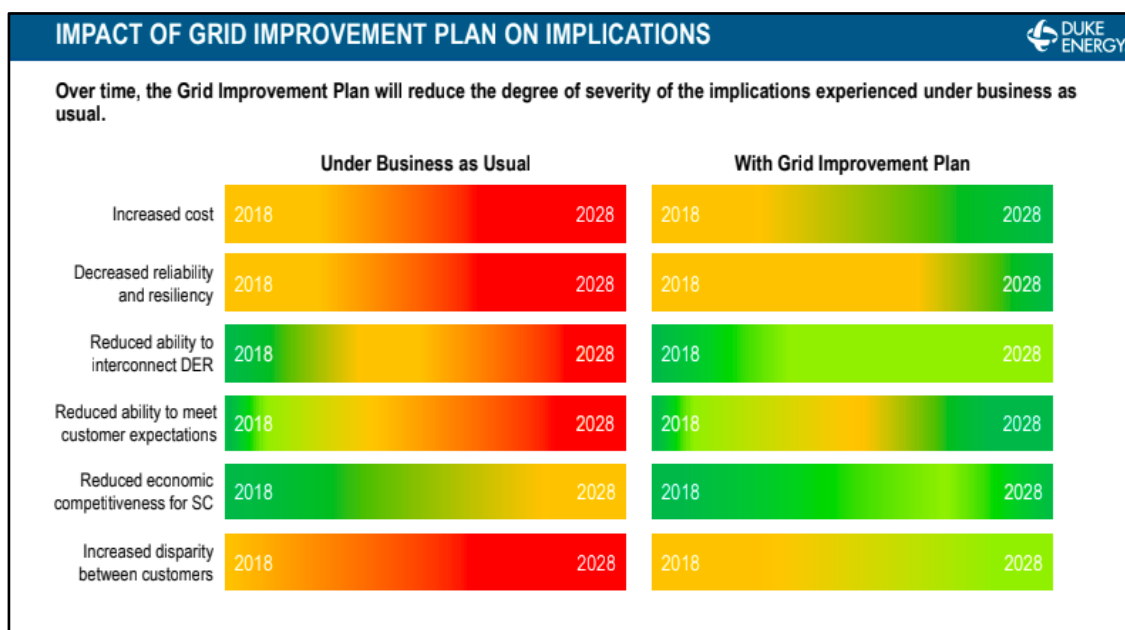


Figure 2. This heat map from the workshop pre-read summarized the Duke's analysis of the implications of the seven megatrends.

Summary of stakeholder feedback on the Megatrends

- Quantitative analysis: Many stakeholders requested more quantitative analysis, better descriptions of the methodology, and the underlying data and details on the assumptions used. In particular, stakeholders wanted to better understand quantitatively how Duke Energy formulated the implications resulting from the trends.
- Impact of clean and renewable technologies: Many stakeholders shared their belief that distributed energy resources (DERs) represent an opportunity to lower costs, in contrast to Duke Energy's heat map. Similarly, many stakeholders said that the analysis should have increased its emphasis of the lowering cost and increasing competitiveness of new, clean energy technologies.
- Climate change: A number of stakeholders said that climate change and sustainability needed to be addressed explicitly in the megatrends and their implications.
- Evolving utility business model: Many stakeholders said that changing utility business models was missing from the megatrend list.
- Underserved and at-risk communities: A number of stakeholders were concerned that the needs of low income and rural customers were not adequately accounted for in the trends.
- Changing customer expectations: Some stakeholders found the description of 'changing customer expectations' confusing and asked Duke Energy how interpreted these changes and what could reasonably be done in response.
- Outlook on load growth: A number of stakeholders questioned how load growth was addressed in Duke Energy's analysis. They shared their perspective that load growth is fairly flat today across the nation but could increase with increased electrification and electric vehicles.

Gauging stakeholder alignment on the Megatrends

Real-time polling indicated that stakeholders had mixed reactions to Duke Energy's megatrends and implications analysis. When asked "How aligned are you with how Duke Energy views these 7 megatrends?" (see Figure 3 below), stakeholder responses were fairly evenly distributed from 0% alignment to ~80% alignment.

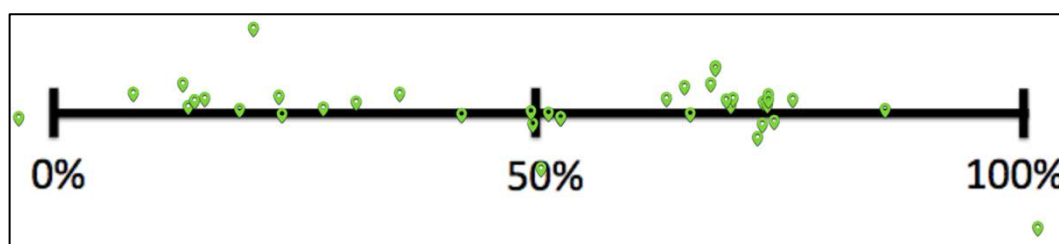


Figure 3. Results of online polling to the question: How aligned are you with how Duke Energy views these megatrends and implications?"

Objective 2

Describe and get feedback on how Duke has used stakeholder input, the impact of megatrends on grid needs, and a prioritization methodology to develop a grid improvement portfolio.

Supporting Activities

The following activities supported the second objective:

- Workshop pre-read: Duke Energy described the cost-benefit and cost-effectiveness analysis that they used to create the draft grid improvement plan. The key graphic describing Duke Energy's process is shown in Figure 4 below.
- Dedicated workshop session on Duke Energy's Methodology: Duke Energy summarized the process they used to create the draft grid improvement plan. After the presentation, stakeholders were given the chance to ask questions in plenary. This Q&A is documented in [Appendix 3](#).
- **Question and Answer Summary**

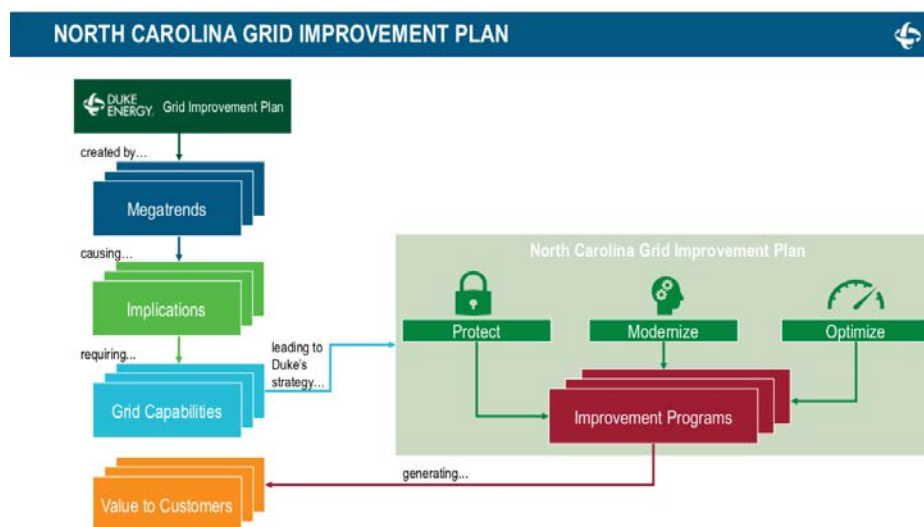


Figure 4. Duke's methodology for creating the draft grid improvement plan, reproduced from the workshop pre-read.

During the Q&A and subsequent sessions, stakeholders provided feedback that included the following recurring concerns:

- Cost and benefit balance among customers: Stakeholders asked how each customer and income class would benefit from the plan's programs and whether cost recovery would reflect that balance. Duke Energy described benefits for low income and industrial (transmission-level) customers, explained how service interruptions were monetized, and gave their rationale for including a number of programs in the draft grid improvement plan.

- Technical clarifications: Duke Energy staff explained the workings of the “ICE” model that was used to monetize interruptions, described undergrounding benefits for transmission customers, and detailed how line losses were taken into account.



Objective 3

Describe the benefits and risks of the draft program portfolio and hear from stakeholders what changes they propose and why.

Supporting Activities

Workshop Pre-Read: Duke Energy's workshop pre-read detailed the draft grid improvement plan budget (Figure 5). The pre-read also contained detailed descriptions of each program in the plan.

Workshop Presentations and Q&A:

During the workshop, a dedicated Duke Energy presentation summarized the plan and its benefits for customers. After the presentation, Duke Energy answered stakeholder questions in plenary.

Online Polling: Following the Q&A, stakeholders responded to an anonymous online poll to assess their support of the plan (Figure 6). In plenary, some stakeholders indicated why they responded the way that they did.

Table Discussions on the Plan's Strengths and Changes

Stakeholders Would Like to See:

After the poll, at their tables, participants discussed 'What are the strengths of the plan' and 'What changes would you like to see to this plan?' Duke Energy staff documented stakeholder answers on post-it notes. In plenary, Duke Energy representatives summarized the discussions at each table.

In [Appendix 4](#), we include detailed notes of the Q&A, table summaries and post-it note comments.

Summary of stakeholder feedback and common discussion themes

Below, we summarize common stakeholder feedback and themes from the Q&A, table discussions and post-it note comments.

Program	3 Year Range
Compliance: Cost Effectiveness Justified	\$164 - 266M
Physical Security	\$113 - 184M
Cyber Security	\$51 - 83M
Cost Benefit & Cost Effectiveness Justified	\$973 - 1580M
SOG	\$412 - 670M
Distribution H&R	\$111 - 180M
IVC DEC	\$123 - 200M
Transmission H&R	\$98 - 159M
TUG	\$57 - 93M
Energy Storage	\$103 - 167M
Transmission Bank Replacement	\$36 - 58M
D-OIL Breaker Replacements	\$10 - 15M
T-OIL Breaker Replacements	\$15 - 24M
DSDR peak shaving to CVR in DEP	\$8 - 13M
Rapid Technology Advancement: Cost-Effectiveness Justified	\$418 - 680M
T&D Communications	\$163 - 264M
Distribution System Automation	\$92 - 150M
Transmission System Automation	\$71 - 115M
T&D Enterprise Systems	\$16 - 26M
ISOP	\$30 - 48M
DER Dispatch Tool	\$12 - 20M
Electric Vehicle Charging	\$27 - 45M
Power Electronics for volt/var control	\$6 - 10M
Customer Data Access	\$2 - 3M
Total	\$1,600 - 2,500M

Figure 5. The draft grid improvement plan budget, as communicated to stakeholders in the Workshop pre-read.

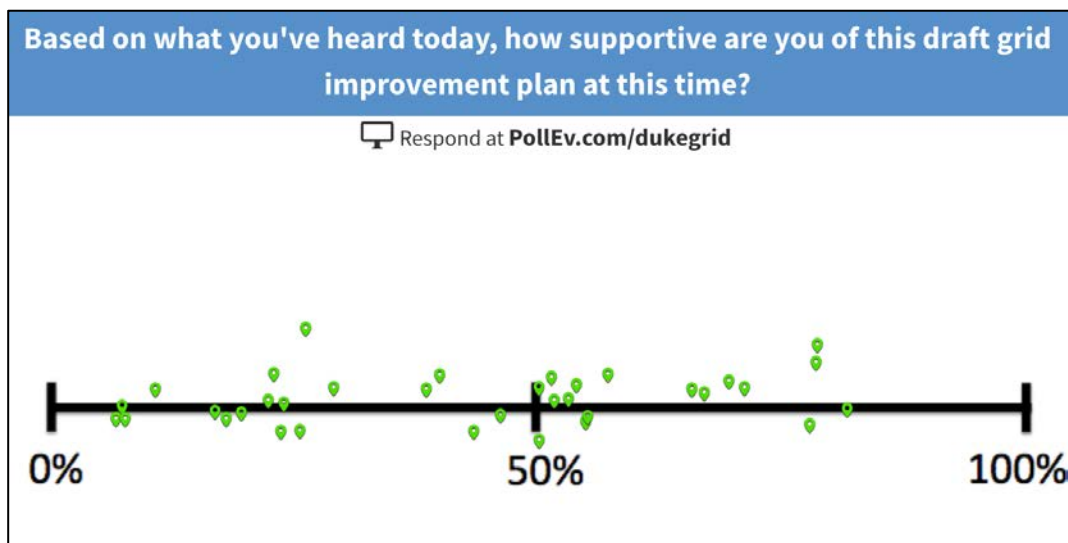


Figure 6. Online polling showed a wide distribution of support for the plan, varying from ~0% to ~80%.

- Improved transparency: Many stakeholders appreciated the additional details and transparency that Duke Energy provided in the pre-read and at the workshop, especially in comparison to previous grid mod plan descriptions from Duke Energy.
- Incorporation of feedback: Many stakeholders appreciated how the plan has been pared down and changed in response to stakeholder feedback to the original Power/Forward plan.
- Cost recovery details: Many stakeholders were unwilling to support the plan without cost recovery details. Additionally, stakeholders wanted to know whether the plan's costs would be distributed equitably among customers.
- Business model reform: Many stakeholders felt that it was difficult to assess the plan without also addressing the issue of utility business model reform and how it would affect Duke Energy and North Carolina.
- Quantify DER improvements: Stakeholders repeatedly asked for a quantitative assessment of how much additional distributed energy resources (DER) could be accommodated with the help of the draft grid improvement plan.
- Supporting data for costs and benefits: Stakeholders repeatedly asked for additional details regarding the assumptions and data used to calculate the benefits and cost of the plan.
- Plans for implementation: A number of stakeholders wanted to know if Duke Energy had plans or commitments to deploy customer programs that would take advantage of the technology improvements in the plan.
- Program cost-benefit choice: Some stakeholders wanted to know the justification for why some programs were put in the 'cost-effectiveness' category and not the 'cost-benefit' category.
- More DER support: Many stakeholders wanted to see more aggressive support for renewable energy and DER in the grid improvement plan.

Gauging stakeholder understanding and support of the draft grid improvement plan

In online polling after the Q&A session (Figure 6), there was a large variation in stakeholder support of the draft grid improvement plan, from being largely unsupportive (13 responses

at 25% or lower) to mixed support (19 responses between 25% and 75%) to supportive (4 responses at about 75% supportive).

Participants also had the chance to indicate how well the workshop enhanced their understanding of the plan and provide feedback in the end-of-workshop survey questions. As shown in Figure 7, **most stakeholders indicated that the workshop enhanced their understanding of the plan**, scoring the first end-of-survey question 7 or higher. In their [comments to this question](#), stakeholders indicated they would like to have seen more supporting details and justification for the cost-benefit analysis.

In the second end-of-workshop survey question (Figure 8), **stakeholders indicated overwhelming that they had a satisfactory ability to provide feedback** to Duke Energy. All but one respondent scored this question a 7 or higher.

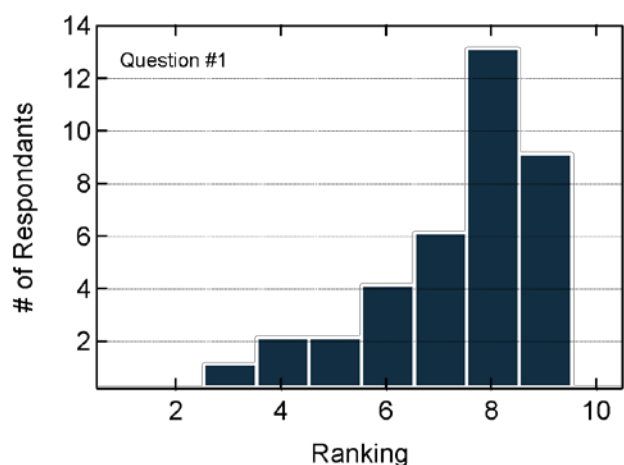


Figure 7: Responses to Survey Question #1: "On a scale of 1-10, how well did this workshop enhance your understanding of the draft grid improvement plan?"

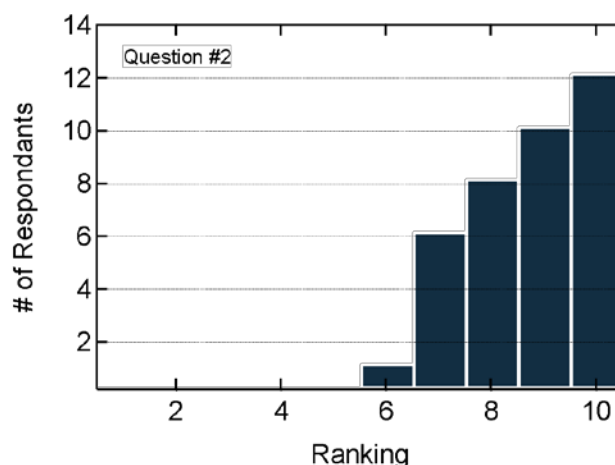


Figure 8. Responses to survey questions #2: "On a scale of 1-10, how satisfied are you with the opportunity to provide feedback to Duke Energy at this workshop?"

Additional Feedback to Duke Energy

The workshop's final session was organized into three sessions:

1. Coaching questions: Stakeholders were asked to provide input in the form of 'coaching questions' to Duke Energy staff, to help identify additional opportunities and issues important to stakeholders.
2. Requests for Duke Energy to share more underlying data and assumptions: Stakeholders were asked to provide specific requests for information and data from Duke Energy.
3. Final Q&A: Stakeholders were given a final opportunity to ask Duke Energy any questions relevant to Grid Improvement.

Coaching Questions for Duke

The following coaching questions were posed to Duke Energy.

- Is it possible for Duke Energy to elevate/advance the ISOP ahead of some of the other parts of the plan?
- Is it possible that Duke Energy could coordinate with the five or so other groups that are also creating visions of North Carolina's energy future?
- Can Duke Energy staff envision a completely different paradigm of how the energy business can be run in the future? (Changes to the utility business model could be a part of that.)
- If not directly addressing climate change, can Duke Energy consider the social cost of carbon?
- Is it possible for Duke Energy to show how their projections with the IRP match up with the new grid capabilities in this plan?
- How can the social cost of carbon be considered in the plan?
- Could Duke Energy consider exchanging more assurance for future cost recovery with a lower rate of return?
- Can Duke Energy explain the regulatory cost recovery options that NC needs, and that SC and some other states already have?
- Would Duke Energy consider rolling out the parts of this plan that pencil out as cost-effective without a requirement for additional cost recovery?
- Would Duke consider working with Co-op groups to get their perspective on what is needed for grid improvement?
- Can Duke Energy indicate how this plan will impact opportunities for Muni's and Co-ops to do their own grid improvement projects? For example, will those utilities be able to add their own storage?
- Will this plan improve interconnection speed?
- Can Duke Energy work with the municipalities with 100% clean energy plans to develop a plan that would help them meet their goals?
- Is it possible for Duke Energy to draft documents that address stakeholder questions about DERs, customer control, customer choice, and reliability?
- Can Duke Energy maximize the number of NC businesses it uses as vendors?

Sharing Data

In this session, stakeholders asked Duke Energy to provide further information about the data they used to create the plan and to conduct cost-benefit analysis. Stakeholders asked for:



- Underlying data to be provided in machine readable format (not as a PDF). When Duke noted that this is a very large amount of data, stakeholders indicated their understanding, and remained very interested.
- In places where specific assumptions had to be made, indicate the model's sensitivity to those assumptions and ranges for the outputs
- Include all calculation formulas so others can repeat the calculations
- Please clearly indicate alternative pathways for accomplishing the same goals, and why the current plan is the preferred option.
- Please provide the climate assessments that were used to create the plan, and the risks/uncertainties of that data
- More specific rate impact data — explain how costs and benefits are allocated to each rate classes.
- Indicate whether costs will be integrated into fixed and/or volumetric charges.

Final, Open Q&A with Duke Energy Staff

The following summary highlights the final Q&A. A detailed transcript is in [Appendix 5](#).

- When asked about the amount of renewable energy the draft grid improvement plan would enable at the distribution grid, Duke Energy described how IVVC and SOG will help support behind-the-meter DERs and electric vehicles. Duke has not yet quantified how much DER capacity will be enabled by IVVC and SOG.
- When asked about Duke Energy's plans for customer programs that will fully leverage the capabilities of the technologies in the draft grid improvement plan, Duke Energy said that it has already started developing plans and working with 3rd parties.
- When asked about whether they will go to the General Assembly with this grid mod plan, Duke Energy said that they much preferred to first obtain general agreement with stakeholders and then work through either the legislature or a rate case. Duke Energy did not think a rate case was likely before the middle of 2019. In a follow-up question about what consensus looked like, Duke Energy stated that when most stakeholders indicate overlapping agreement, they will feel comfortable moving forward.
- Duke Energy indicated that they believed ISOP would indicate that the Plan's technologies would be good investments into the future.
- When asked about whether Duke Energy should state publicly a commitment to renewable generation, Duke Energy noted that they currently have carbon reduction and sustainability goals which tie directly to increasing levels of renewable generation. Increasing these goals needs to align with direction set by policy makers and the priorities and interests of our customers.
- When asked how stakeholders should support this grid plan if Duke Energy is planning to use natural gas for the next 50 years, Duke Energy noted there are a range of opinions among customers, policy makers and regulators about the role of natural gas going forward.
- When asked how the current plan compares to the original Power/Forward plan, Duke Energy noted that they both added and removed items from the original plan based on Stakeholder feedback, and that the value proposition has improved as a result.



Appendix 1: Feedback from Executive Summary

After Duke Energy presented an initial executive summary of their view on the future of the grid, their process for creating an improvement plan and their draft filing plan, participants were asked “Based on what you just heard, what are the most urgent questions you have for Duke Energy?” Participants wrote their questions on post-it notes and RMI staff grouped the questions into categories. Below, we document each question (modified slightly for clarity).

Cost of the Plan and Rate Impacts

- How will these investments, if approved, impact customer bills? How much customer expense will be saved per dollar spent?
- How does the 2-billion-dollar cost cause rates to rise only 1% per year?
- How will this plan lower costs overall for residential customers and utilize clean technologies to do so?
- Rate increases are used to recover costs. What about revenue recovery for savings obtained with IVVC/CVR, energy efficiency and DER?
- If the grid is more efficient, will the savings impact rates?
- The original Power Forward plan was ~\$13.8B. What are Duke’s plans (and schedule) to address the elements in the P/F plan that we don’t see in the Grid Improvement plan?
- Is the upper bound of the plan cost-effective, and how will the plan variances be handled?
- Is there really no Phase II in the works that would bring this plan closer to the original P/F proposal of approximately \$13.8B?
- Show us the money* (*Value proposition – what will it do for us?)
- What is the definition of ‘value’?

Duke Energy’s Methodology

- What cost/benefit analysis has been done on each component of the plan and on the entire plan? Is it available to us?
- What is the methodology for “cost-effectiveness” justification – especially as differences between customers, shareholders, citizens, and society are addressed?
- Why is Duke still prioritizing marginal reliability improvements over cost-effective modernization that could pay for itself?
- What baseline will these improvements be compared to?
- Can you envision making the plan a 5-year plan and making the cost-effectiveness methodology clear, transparent, and inclusive of stakeholder participation?
- I still have questions about Grid Modernization vs Grid Improvement.
- How do you separate routine maintenance from Grid Improvement/Modification?
- Does ‘grid mod’ and ‘grid improvement’ need to be evaluated separately?
- Why can’t the ‘old grid’ handle the new demands?
- Why is grid improvement distinct from regular and customary work that Duke Energy performs as part of its normal mandate (as opposed to grid modernization that includes distinct, new upgrades)?

Large Customer Impacts

- What is the value/payback to transmission level customers?
- What improvements directly impact industrial/transmission?
- Are transmission-related costs going to be recovered through the transmission formula rate?



Distributed Energy Resources (DER) Capability

- If the plan is approved, will Duke Energy remove barriers to more customer-owned DERs?
- What level of DER (capacity/saturation) and pace of DER integration will the current plan facilitate? Related, why would a second plan be necessary?
- Given the lower cost of renewables, could Duke set a target for renewable generation percent that exceeds requirements?
- How will this plan help integrate renewable energy DERs and reduce carbon emissions?
- How does this plan lay a solid proactive foundation for expanding solar/DER?
- Which aspects/elements of the plan will drive/enable higher DER and energy efficiency adoption?
- Why is expansion/investment in solar/wind (DER) a lower priority?
- How much more renewable energy will this plan enable in North Carolina?
- How robust will the grid be to integrate and scale up energy generated from a) customers on the distributed system b) utility-scale battery storage, on-shore/offshore wind, and EV infrastructure?

Cost Allocation

- Why is Duke planning to recover the bulk of the costs for this plan from residential customers who receive the fewest tangible benefits?
- How are the costs of the proposed projects split between: wholesale/retail and transmission/distribution production?
- How will the financial pie be split up? What are the allocation factors?
- What is the per year cost allocation to industrial classes in years 1 to 5?
- How do you ensure that grid improvement investment is distributed equitably (both the costs and the benefits)?

Broader Context

- Will customers truly get a bigger role in managing their own usage and costs and will programs that enable those savings be integrated into grid improvement plans (i.e., designed to have some impact on customer costs)?
- How will 'beyond the meter,' customer facing solutions provide grid benefits while working in concert with a non-regulated, competitive market?
- How is this draft grid improvement plan informing the company's IRP – is there a way that these investments defer the need for new generation?
- How does cost recovery interact with larger business model reforms?
- What new regulatory recovery mechanisms will enable the grid modernization objectives?

Technology Composition

- Which technology is possibly too new and may change too much in 5 years?
- Is AMI (Smart Meter) roll out contingent on this plan getting approved?
- How does future flexibility factor into prioritization of projects — (e.g. fuel cells make certain investments obsolete or stranded)
- What role will TUG play in 'new' draft grid improvement plan? (Didn't hear it discussed in presentation.)
- Ability to work with large customers to place EV facilities at customer locations.
- What determines the 'bucket' that certain tools/measures line up in?



Other Questions

- Why do all these measures have to be approved in one package?
- How would the best interest of customers be presented if Duke was to pursue the South Carolina 'rate step up' model?
- What tool does Duke Energy need to give the NCUC authority to approve the implementation of Grid Modernization?
- Define what consensus means to Duke Energy?
- What assurances can you give us that customers will receive all available benefits from these investments?
- Have you already started implementing any of these grid improvements?

Online Polling on Topics of Interest

During the welcome session, using online polling, stakeholders were asked to describe what two grid improvement topics they most interested in discussing. The results are in Figure 9.

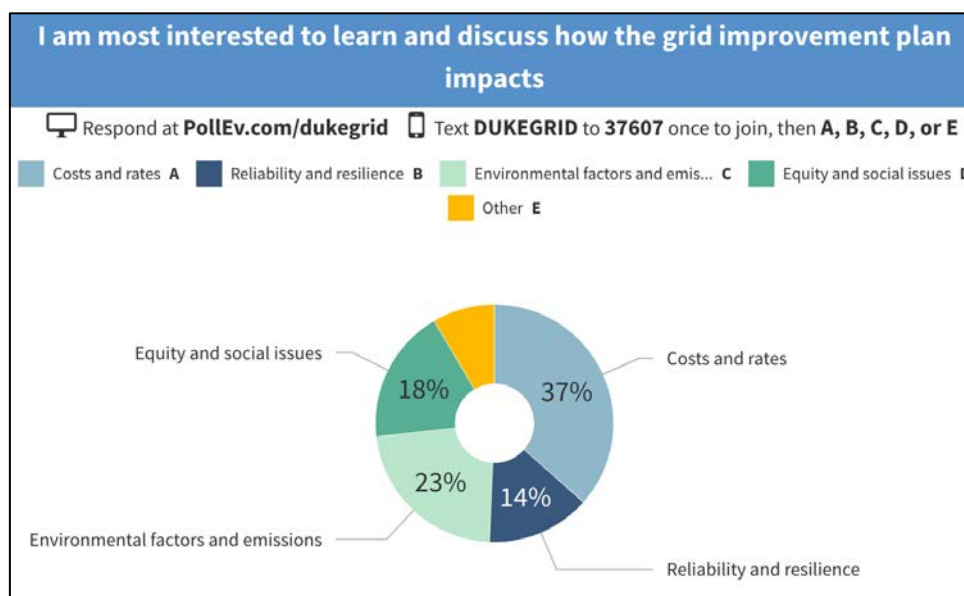


Figure 9. Initial online poll asking stakeholders what grid improvement impacts they would most like to discuss.

Appendix 2: Megatrends and Implications

Question and answer in plenary

After hearing Duke Energy's description of the megatrends and their implications for North Carolina's grid, stakeholders asked questions in plenary that were answered in real-time by Duke Energy representatives. Here, we summarize the questions posed by stakeholders and notes from the responses of Duke Energy staff.

- Q: On Cyber security, Duke only offer proxies for the trend but does not really provide supporting data. This section needs more substance.

- It is a challenge to provide the level of detail for cyber threats as compared to physical threats. By their nature, cyber threats are not visibly apparent unless they are successful. Also, many details of cyber threats are kept confidential to prevent proliferation of information that can be exploited by cyber terrorists.
- We don't want to overdo the cyber investment, but also want to make sure we are being responsible.
- Q: There are absent megatrends including stark economic inequality and increasing numbers of your customers in poverty. This is a trend worth including.
 - Duke Energy considered including low-income economic issues as its own trend. We struggled with paring down the total number from 30-40 initial trends.
 - We find that implementing the projects with the best benefit-to-cost ratios can help low-income customers in the long run through cost savings.
- Q: Why isn't climate change named specifically? I know it is captured a bit in weather.
 - Duke Energy did its best to pare down the megatrends. Climate change is a lightning rod topic for some. We thought we could more universally engage with stakeholders by citing undisputed facts we can state as part of trends, including that some cities and companies are making clean energy goals.
- Q: The given implications are qualitative — how are the color-coded charts in pre-read created?
 - Implications are more quantitative in the near-term and more qualitative in the mid-to-long term.
 - Duke Energy is happy to share how we created them. The process was similar to the cost-benefit analysis.
- Q: How will the grid plan relate to Executive Order 80? Will you modify the plan given the Executive Order?
 - Duke Energy will treat the Executive Order as key stakeholder input.
- Q: Can Duke be more transparent about the types of weather-related events you are expecting?
 - We use weather predictions from professional forecasters, such as those who define the 100-year flood zones. Then, we internally prioritize projects.
- Q: How impactful are these megatrends to other utilities, including non-electric utilities?
 - There are a lot of common trends we face, but we focus on trends most important to North Carolina.
- Q: On geographic and demographic trends, you glaze over the impact on rural areas. Can you explain your justification that how rural areas will be impacted even more if you don't do the plan?
 - It is difficult to address rural areas because improving service to a small number of customers can be very expensive, whereas urban projects have more impact per dollar.
 - We look for opportunities where new technologies provide cost-effective solutions for rural customers (e.g. potentially batteries).

- Q: The connection between a lower carbon future and increased cost [in your color charts] is hard to understand given that the clean, future technologies are the lowest cost generation.
 - Generation resources and the Infrastructure required to support delivery to customers have to be considered holistically. Duke Energy looks for opportunities to address many trends, problems, and/or opportunities at once. IVVC/SOG is an example of a program that can meet many goals at a lower cost.
- Q: Regarding increased costs, there are many people who may experience decreased costs. Depending on the conversation, some customers may benefit more than others. Did you give any thought to that with regards to the first implication 'Increased Cost'?
 - Duke Energy sees increased costs as the reality.
 - We need to structure programs to ensure that we are optimizing the cost/benefits for all of our customers appropriately.
- Q: One trend we have seen is large cost over-runs in many places, not necessarily in Duke Energy territory. Are you having internal conversations about how to prevent that from happening?
 - Duke Energy has a natural incentive to manage our costs because it is part of the cost-benefit analysis.
 - In South Carolina, our filing includes 'not-to-exceed' costs.
 - Duke has been good at managing costs historically. The ranges of costs in the draft plan indicate possible variations in the cost of each program.
- Q: Regarding economic megatrends, my take is that the pre-read seems to presume more or less steady-state economic trajectory. But we have stock markets, trade wars ... it is hard to believe things are going to be hunky dory for another 10 years. How does that scramble the equation?
 - Duke Energy would handle any X factor, war stock market crashes, etc. with real-time program triage.

Poll Everywhere

After the question and answer, stakeholders were asked to respond to an anonymous online poll (Figure 3 above) that assessed stakeholder agreement with Duke Energy's megatrends.

In plenary, some stakeholders offered explanations for their responses

- Closer to 100%: This stakeholder noted that Duke has significantly modified the plan from Power/Forward and has worked with stakeholders, held workshops using RMI as a facilitator, and included analysis from Navigant. This stakeholder's organizations wants to continue working with Duke Energy with to ensure technological benefits will serve customers.
- 50%: This stakeholder noted that Duke Energy has modified the plan based on stakeholder feedback. The stakeholder still wants to see more underlying data and transparency.



- 75%: This stakeholder supported much of the plan but was concerned about whether the workshop's feedback will be incorporated. If the feedback does make it into the plan, the stakeholder said they would be closer to 100%.
- Less than 50%: This stakeholder felt that if analysis showed that projects would quickly save money, then they should not require a new plan with special, dedicated funding.
- Less than 50%: The stakeholder felt that if the net present value of the self-optimized grid (SOG) was so dramatic, the project should be started, and the savings used to fund the remainder of the plan.
- <50%: This stakeholder was unwilling to score the program highly without cost recovery information.

Table Discussions

Table discussions were focused on two questions, 'Where do you share common ground?' and 'What's missing?'. Stakeholders wrote their thoughts on post-it notes. After the conversations, Duke Energy staff reported what they heard at their table:

Table A: In their conversations, stakeholders mostly agreed that the trends seem right. However, they would like to see more details and specificity and comparison to other states. For the concentrated growth trend (and customer expectations), stakeholders asked, as services grow, why can't Duke Energy simply add modern technologies? For weather, improvements may not benefit from technology as much as from process improvement. Stakeholders asked for Climate Change to be addressed specifically.

Table B: There was general agreement on the trends and implications, but the list was missing some things. Some stakeholders expressed that the growing rate of technology obsolescence is a megatrend in itself. This could affect the ability to implement the plan effectively. Also, the table surfaced a lack of interest in working for utilities – the lack of workers could inhibit implementation.

Table C: Stakeholders felt that flat load growth was buried and that the load implications of EV's and electrification may have large load implications that were not addressed. Similarly, stakeholders indicated that the list is too cautious in how it addresses climate change. There should be more emphasis on electric vehicles, social factors, and health. Stakeholders asked how one would define customer expectations and how one would know what customers are asking for. Stakeholders asked about what Duke Energy is doing proactively with Integrated Resource Planning, customer interactions, and urban/rural differences.

Table D: This table's discussions did not achieve consensus. Considering expectations for renewable DER, the table agreed that was on point. They had good discussions on cyber security and weather but differed on cyber: Some said that this is something Duke should already do; there were already dollars set aside for that. Also, funds were already allocated for billing with Customer Connect. Some at the table noted that customer expectations are different for each customer classes, and within different age groups.

Table E: At this table, there was concurrence on weather, physical and cyber threats. There was a lot of interest from industrial/manufacturing where a number of stakeholders had similar concerns – especially about costs. There is a lot of manufacturing in North Carolina and a lot of competitiveness – higher costs could cause lost businesses. The table agreed hurricanes and weather are causing recovery costs. The table indicated that quantitative analysis of avoided costs and how could they be passed on to customers was missing from the plan's justification. For example, storm costs were \$0.9B – could those saved costs be shared?



Another comment from the discussions: The megatrends were missing utility business model reforms. Until Duke Energy really recognizes the changing utility landscape, it will be hard to comprehensively address many issues, including grid improvements.

Written Stakeholder Input

Below, we report the comments that stakeholders wrote on post-it notes. When necessary, we lightly edited the content to be understandable by readers who did not attend the workshop.

Where do we share common ground?

- Technology advancements → There will be significant growth in beyond-the-meter load from new technologies (e.g., electric vehicles). How can we integrate these while retaining reliability?
- Most agreed generally with the megatrends, but we would like more substantiation and a comparison to other states
- Agree, but need more detail on technology advancement and lower carbon future.
- Agree on DER/Renewables, customer expectations, and lower carbon future.
- Agree: Technology advancements, concentrated population growth, and the impact of weather.
- Agree: Most of the megatrends are good. However, the details of how to address them are the key.
- Common ground: New and emerging threats, e.g. cybersecurity
- Agree: The grid may have a reduced ability to manage and integrate DER.
- Agree: Overall, the trends are real and need to be addressed
- Common ground: Cyber security 'megatrends'
- Impact of weather events (climate change)
- Aligned: The trends are real
- We agree some measures for grid modernization are needed
- Aligned: Technology improvements, grid improvements, and reliability (weather, security)
- Weather
- Aligned: Customer expectation i.e. 'mission'
- Aligned: Threats to infrastructure
- Aligned: Weather
- Agree there is a growing number and scope of true threats to grid infrastructure
- Reduced reliability during extreme weather events, 500-year storms (common)
- Threats
- Customer expectations
- Increased costs are a reality today — whether through grid improvement or response to storms. For examples, the \$900M cost in 2018
- Agree with lower carbon future environmental trends and integrating DER's
- Agree with need to integrate customer-sited DER, but utility-scale DER is much more prominent in North Carolina
- Agree with general trends. However, the biggest question is how different programs fit in the 'Maintain' vs 'Grid Modernization' investment categories.
- Share common ground: Need to accommodate new clean power system solutions at large scale without hindering growth and cost competitiveness
- I agree that there have been improvements in renewable energy
- Customer expectations are changing — customers expect and want more DER's, specifically solar.



- Agree that cyber threats need to be addressed. Believe physical threats are more related to weather events and power plants.
- General concern for new justifiable technology investments when balanced by costs and the impact on low-income customers.
- Overall price tag more reasonable (possibly even too low)

What's Missing? Where Do You Differ?

- Disagree: Total lack of climate change
- Disagree: No specific mention of sustainability
- Disagree: Trends show a comfort in dealing with physical/cyber violence and a discomfort in dealing with climate change.
- Cyber and physical security — Duke is supposed to address these with their existing mandate. Money has been set aside for addressing these threats already for some time.
- Customer Connect and Billing System upgrades should be part of Duke's usual business, not a special program.
- Missing: The regulatory model needs to change to effectively accommodate DER.
- Customer expectations — Not all customers want the same thing.
- Disagree: What evidence is there that physical threats to grid infrastructure are a significant problem?
- Weather impacts — We need new and better forecasts than those shown.
- There is a lack of proactive DER planning and goals from Duke Energy.
- Missing: Connection for business model and every-day/residential customers.
- Missing: The technology trends should include more investments in EVs and efficient electrification.
- Weather – New technologies may not prevent increases in outage events and duration. Process improvements could help.
- Concentrated growth — In new areas where growth and infrastructure are installed, Duke should be installing new technologies as part of its normal work to add service for these customers.
- Climate Change — Duke Energy should address climate change directly.
- Differ: These are not the only trends — changing electric utility business models should be an added trend.
- Missing: How does this plan enhance the mission of the military in NC?
- Customer Expectations — As existing infrastructure is replaced; the baseline practice should be to use new technologies during replacements.
- Differ: Low carbon and environmental (kind of differ) (due to policy)
- Differ: The implications are not logically consistent.
- How do you balance economically attractiveness vs economic concerns
- In terms of competitiveness for North Carolina – we must balance having a modern grid with higher energy costs.
- Economic Competitiveness – increasing costs harm North Carolina as some industrial customers may leave causing loss of electric load.
- What is grid modernization vs normal operations and maintenance?
- Is it time to consider a new regulatory model?
- Is this the right direction?
- What are the checks and balances on Duke Energy if this plan is passed?

- Missing: There is no strategic prioritization of the trends. There is no policy leadership perspective for health and innovation.
- Critical items should already be in progress as required by Duke Energy's existing mandates.
- There is no mention of cost avoidance.
- What are critical needs vs. wants? As an example: security vs smart meters.
- The trend of non-utility technologies supplanting utility functions needs to be taken into account in projections.
- Missing: There is no mention of changing electric utility business models.
- These are supposed to be trends in Duke's territory, but grid improvement is all about national actions. If you considering national trends, then why is there no consideration of business model reforms.
- Missing: Trends specific to North Carolina are missing (larger scale renewables, Governor's climate executive order).
- Missing: There is no quantitative data supporting the heatmaps that describe the implications.
- Need more details, and specific information is needed on all of the megatrends.
- Missing: Analysis specific to North Carolina
- Missing: Polling data by various entities on what consumers want. This needs to include polls not contracted by Duke.
- Duke Energy needs to show who will incur increased costs, not just that costs will increase. Duke Energy needs to note that new resources acquired by the utility usually cost more than those created by other parties.
- Missing: There are megatrends in the power sector regarding grid modernization, utility business models, and utility platform business models. Resource cost trends need to include who will incur the cost.
- The Macro trends beg the question of what is an appropriate regulatory structure? How do we know we are best addressing the trends?
- Missing: The plan is like driving a round peg into a square hole. A fundamental review and recognition of new business and/or regulatory models may be needed.
- What's missing: The trends and implications are missing how the implementation of clean technology can tangibly lower customer bills.
- In Navigant's benchmarking, there is no apparent correspondence between grid modernization activities and the percent of DER in use.
- Inequality and poverty help drive population changes and how people use energy. This needs to be addressed directly.
- Need to include the growing obsolescence of fossil fuel infrastructure, specifically coal.
- Missing: Inequality and aging populations
- Differ: I don't think the DER/Renewables discussion is being adequately identified for its value and potential.
- Surprised to see projected load growth in North Carolina (nationwide, the trend is declining or flat load growth)
- The implications include an unwarranted reliance on unlikely events that are used to justify the plan. As an example: the threat of an electromagnetic pulse.
- Missing: Electrification and Health

- I would like to see a concretely stated goal for modernization. Is it related to resilience or DER deployment?
- I would like to see Duke Energy take on direct ownership of greenhouse gas issues.
- The transparency in the methodology used is low.
- Missing: Flat load growth, not mentioning climate change by name, and any prioritization or weighting of the trends
- Differ: Do we know customer expectations?
- Differ: Duke Energy should be proactively acting to counter trends with negative implications on customers. For example, climate change and encouraging behaviors that lower costs and reduce impacts.
- Differ: The details and approach are the key, i.e. for technology advancements, why is Duke focused on non-utility DER? How is 'customer expectations' a trend?
- How much is this going to cost? How much am I going to benefit? Need to include information for retail and wholesale customers.

Appendix 3: Program Prioritization Methodology

Question and Answer

- Q: Why are you using non-asset benefits and how will you ensure that costs will be adequately distributed?
 - A: Duke Energy includes costs and benefits related to non-asset issues like momentary interruptions. This reflects the actual value of electricity to customers.
- Q: Outage costs and benefits are different for different customer classes — does the ICE model take that into account?
 - A: Yes, the ICE model does value the costs and benefits according to customer class. The costs associated for <50 kWh and >50 kWh customers are handled differently, to reflect the fact that outages to residential customers are less costly.
- Q: There is some disagreement on how effective the ICE tool is for accurate cost-benefit analysis. How many projects are cost-benefit justified without incorporating values from ICE?
 - A: The answer depends on the project. Some projects, such as targeted undergrounding, are cost-benefit justified without incorporating ICE values. The ICE tool offers a method to assign monetary value to low-probability / high-impact events. Some programs like IVVC don't require use of the ICE tool for cost-benefit analysis. IVVC benefits come primarily from efficiency savings.
- Q: For targeted undergrounding, your analysis shows that the costs are less than the operational savings. If this is the case, why wouldn't you do this project as part of normal operations rather than under the grid improvement plan?
 - A: Targeted undergrounding programs represent an opportunity to save money if the company carefully targets the right projects. Within the normal utility 'least-cost' paradigm that we operate in, we cannot accelerate projects based on longer term savings. Because the current paradigm prevents us from accelerating these kinds of projects, we have included them in the draft grid improvement plan. Also, these programs address several megatrends including increasingly severe storms



- Q: Can you give us examples of projects that directly benefit transmission customers?
 - A: The plan includes transmission programs including hardening the transmission system, transmission line rebuilds, bank replacements, upgrading mechanical equipment to electronic equipment, and substation system intelligence projects that will give us warning before failures occur. In addition, for some of the distribution-size substations, there are potential projects we could include to address power quality.
- Q: The largest benefits for commercial and industrial customers appear to be from the targeted underground programs. Are there any other examples in the grid improvement plan of projects with strong benefits for this customer class?
 - A: Several programs in the plan focus on circuits with large commercial customers and will reduce momentary interruptions. We also believe conductor upgrades will benefit these customers, though the benefits from conductor upgrades may be smaller than those from undergrounding.
- Follow up question: Did you consider a cut-out mounted recloser instead?
 - A: Yes, we are considering those and we're currently evaluating that technology so we can accurately determine its effectiveness in mitigating voltage sags and momentary interruptions that would otherwise be eliminated by TUG.
- Q: Has the analysis considered that transmission and distribution wires have 5-7% losses themselves?
 - A: Yes, that is taken into account in the IVVC case. With self-optimizing grid investments, we do not go to that level of detail; we will be upgrading wires for SOG programs and it is difficult to estimate reduced losses from those types of upgrades. If we do obtain significantly lower wire losses, the environmental benefits would increase.
- Q: In a recent rate case, it was noted that Duke Energy was behind in vegetation management and additional funding was approved. What comparisons have you made with that approved vegetation management program and this grid improvement plan?
 - A: This cost-benefit analysis would be somewhat complex, but for a specific tree-trimming project, we assume a '5-year trim cycle' in the calculations, including the costs of climbing poles in certain neighborhoods. We calculate benefits using a 10-year history, and account for major storms in a distinct way, so we would have to make different calculations depending on whether we were on or off the trim cycle. This type of comparison is an area we could focus on for each case going forward.

Appendix 4: Draft Grid Improvement Plan

Q&A following Draft Grid Improvement Plan Presentation

After Duke Energy presented a summary of their draft grid improvement plan, stakeholders were given the opportunity to have their questions answered in plenary by members of the Duke Energy team. The following transcript has been edited lightly for clarity.



- Q: In the heat maps depicting the ability for DERs to connect to the system, where do you get the 10-year period with 300% expansion in rooftop solar. Your numbers are very conservative – it seems the ‘red’ in the heat map should be closer to 2022 than 2028.”
 - A: Our estimate is conservative. We are trying to better quantify that estimate going forward.
 - A: We faced something similar with the Clean Power Plan. Often with these projections, there is a wide range of predictions. We use the median prediction in those situations.
- Q: Before a rate case, will there be an opportunity to see the plan in more granular detail? There are a lot of things in the plan that we support but we would need to see more detail.
 - A: The short answer is ‘Yes.’ We are not sure what the best way is to provide you with this data. It could be a data dump, or a more focused workshop where we went into greater detail.
- Q: Are the heat maps just for the current plan, or for the entire 10-year investment?”
 - A: The heat maps assume the completion of IVVC and SOG
 - A: The heart of those programs is in urban areas. It is going to take some time to complete those programs. The heat maps assume the full 10-year plan.
- Q: Assuming this plan moves forward, is there going to be a commitment from Duke Energy not to throttle rooftop solar and other DERs? What assurance can we get from Duke Energy?
 - A: We cannot commit 100% to anything, unfortunately. However, we absolutely do not want to justify a program with benefits and then not allow customers to take advantage of them.
- Q: With respect to who gets to benefit from these programs: Are we building a bridge that only leads to ‘Duke’s front gate?’ Or this is a benefit to everyone? Will others be able to own connected resources?
 - A: This plan is designed to do no harm and to provide flexibility. Reasonable minds may differ with each other on what programs make sense.
- Q: What investments will reduce economic disparity?
 - A: When programs benefit every customer, either directly or indirectly, that is when we turn the heat map ‘green.’ Yellow indicates that only some customers experience benefits. When targeted cost-benefit analysis shows benefits primarily to small groups of customers, there may be social justice reasons for those investments that go beyond economic justifications. Often, a lot of social justice issues require policy responses beyond our scope.
- Q: Why is it ‘improvement,’ not ‘modernization’?
 - A: We have chosen to use the word ‘Grid Improvement’ because some people get hung up on the precise definition of ‘Grid Modernization.’ As we think back to the programs in the original Power Forward plan, there were some programs that were not appropriate. We have learned from that and changed the plan accordingly. However, there were some investments that were not modernization but also represented a more forward-thinking approach to grid investments. We changed the name to ‘Grid Improvement’ because we want people to think more broadly about grid investments than just new technologies.
- Q: There are a lot of assumptions made that are not described in the slides. We really need to better understand those underlying assumptions.
 - A: This goes back to an earlier question — we would love to get that information into stakeholders’ hands early and not have it come up during a rate case.
 - A: We need to define that process.

Discussion following Online Polling

After the stakeholders responded to online polling that assessed their support of the draft grid improvement plan, some stakeholders explained why they put their cursor where they did.

- Closer to 75%: This stakeholder indicated they could have placed their cursor closer to 100%. They stated that it was evident that Duke had come a long way in modifying the original Power/Forward plan. Duke Energy had reached out to them, had hired RMI, and had hired Navigant. The plan they presented was much different from what was presented in May. They found these changes very encouraging. From their perspective, they wanted to work with Duke Energy to make sure that all of the benefits of this technology can be there for customers. They are looking forward to working with Duke Energy and are grateful that Duke Energy has changed their approach so dramatically.
- Close to 50%: Duke has taken feedback and modified their plan accordingly. This stakeholder was interested in seeing more of the underlying data and more transparency.
- Close to 75%: This stakeholder was behind the plan for the most part but wanted to see the workshop feedback incorporated into the plan. If the feedback is incorporated, the stakeholder would be closer to 100%.
- Lower Score: This stakeholder said that the cost analysis on targeted undergrounding (TUG) did not make sense. They wanted to know why, if the Net Present Value (NPV) is so much greater than the costs, the work isn't already underway.
- Lower Score: This stakeholder didn't understand why, if the value is so obvious, there needs to be a special plan. Why is this work not part of regular operations? As an example, If the NPV of the Self Optimizing Grid (SOG) is real, it should fund the rest of the program. The stakeholder was not sure what programs in the plan were different from activities conducted in regular operations.
- A Lower Score: This stakeholder didn't give the plan a high score because they still wanted to know the cost recovery mechanism.

Table Discussions

After the plenary discussions, stakeholders were asked to discuss at their tables two questions: "What are the strengths of this plan?" and "What changes would you like to see to this plan?" After the discussion, Duke Energy staff summarized the conversations in plenary:

- Table A: Stakeholders indicated that they appreciated that the cost-benefit analysis was available and that the Duke Energy team included subject matter experts. However, stakeholders still needed to know how costs will be allocated. In addition, stakeholders wanted more details regarding customer expectations, distributed energy resources, and reliability.
- Table B: Stakeholders appreciated having a third party facilitate the workshop. They noted that there are multiple projects and solutions that could resolve the same issues and the stakeholders were not sure the plan was the least-cost way. They also thought it was important to include conversation about utility regulatory structure reform, as the current business model is a barrier to more rapid adaptation and technology adoption.
- Table C: Stakeholders appreciated the greater level of specificity and acknowledged that there the plan includes more than hardening and resiliency benefits. However, they wanted to see more behind-the-meter benefits for large industrial customers and to include rate design and other policies as part of the discussion.



- Table D: Stakeholders were excited to see integrated system operating plan (ISOP) and the distributed energy resources dispatch tool in the plan. They appreciated that the plan reflected stakeholder input. However, the stakeholders wanted to see the rates for each customer class. Also, they said that it would be hard to adequately quantify benefits with the ISOP tool in place. Finally, stakeholders wanted to know, with the SOG, how much distributed energy resources could be incorporated on each circuit.
- Table E: Stakeholders appreciated the detailed plan, and that the plan had more benefits than were in the original Power Forward plan. However, they wanted to better understand rate changes and to see defined costs and rates. They did not want to agree to plan and find out the cost later. Additionally, they wanted to understand why projects are placed in the 'cost-benefit' or 'cost-effective' bucket. They wanted to see a more compelling economic benefit.
- Table F: Stakeholders agreed with the megatrends and scope of the plan. However, stakeholders wanted the costs in the plan to be broken out by customer type, especially for transmission customers. They also wanted the plan to more explicitly include the concerns of customers who inject power on to the grid, as well as take power from it
- Table G: These stakeholders gave Duke credit with moving ahead without a state mandate.

Written notes from table discussions

Below, we document the post-it note comments from the draft grid improvement plan discussions.

Strengths of the plan

- Consideration and visibility of stakeholder input
- More incremental plan that allows changes if needed
- New plan is more focused in terms of scope and includes more details on itemized costs
- Appreciated having a 3rd party facilitator...RMI is respected by the clean energy industry
- More detailed and focused information than last time (comparatively speaking)
- Appreciate the effort to educate stakeholders and public on the individual programs
- Duke appears to be looking holistically at stacked benefits. However, we need more transparency about the methodology to feel confident in the plan.
- Seems like a much better cost-benefit analysis but still need more information
- Plan is an effort at comprehensive planning
- Plan is more discreet and focused than Power/Forward
- Background research and positioning
- Appreciate efforts to show cost-benefit analysis
- Cost-benefit analysis
- Shared subject matter expertise
- More forward thinking than previous plan
- Plan reflects stakeholder feedback
- Directionally like the roadmap
- The plan is a good start for a conversation
- Duke is beginning to embrace cost-benefit analysis — this is the opposite to 5 years ago
- More focused than last plan but there is still much work to do
- Customer data access, green button
- ISOP



- Like DER enabling projects (Storage)
- Plan reflected stakeholder input
- Great thought went into the plan
- DER dispatch tool
- Megatrends are appropriate and will serve customers well, if we do those things
- Broad scope and impressive
- It is clear that many of the proposed investments are necessary, beneficial and could facilitate a cleaner energy grid and future
- The new plan is right-sized – the previous \$13 billion plan was too much to swallow
- Shifted money to more grid modernization
- More targeted TUG
- Appreciate greater level of specificity
- Duke acknowledged that there's more to it than hardening and resilience

Changes you would like to see to the plan

- Missing: Is the plan flexible to take into account different scenarios?
- Is there a proxy for the ICE tool that is used to value outages?
- Rate impacts of the plan by customer class
- Needs to include utility business model change (NY-REV, Performance based rate-making)
- The benefits of the plan seem hard to quantify without ISOP being in place
- Needs to include more quantification of how the plan helps integrate DER
- A number of the improvements should be in base work
- Duke Energy Progress did IVVC without special programs
- Needs a breakdown of the benefits to transmission customers and how programs like transformer replacement benefit transmission customers
- The cost-benefit analysis needs to show how transmission customers benefit, or those customers shouldn't have to pay for it.
- More transparency and information on cost recovery
- What are the cost-effective criteria? And is it different for the various options?
- The plan is not grounded without a state energy vision
- Need detailed listing of design parameters, key assumptions, forecasting scenarios, cost/benefit assumptions
- Need more workshops on each megatrend to dig into the details and make corrections
- Need cost-benefit analysis by rate class
- SETP and IPR – Historical penetration of DER is too conservative. 50% is possible.
- Need an accurate set of assumptions — value is not real
- More transparency on data and analysis used to justify the plan
- More info on impacts for each class and the plan's recovery mechanism
- Need Duke to commit to what customer programs it will offer. It is not enough to just improve grid technologies. What programs will Duke commit to?
- Need a data dump
- Duke should shift away from marginal reliability improvements and place a bigger focus on energy efficiency and demand side management.
- Need to know the plan's cost allocations to each customer group



- “Customer expectations” is too general a term - no info is provided on reliability expectations
- More details on cost-benefits for each customer segment
- Need more details on transmission investments and specific benefits for large industrial customers
- Many of the “improvements” still do not justify a return on equity and are instead basic operations
- Duke Energy needs to define reasonable costs and rates as these terms are used repeatedly
- Revisit plan more frequently to consider emerging trends and tech
- Will megatrends still be applicable with unexpected events and landscape
- Show how solutions address multiple problems
- Regulatory barriers
- Further certainty of program/project costs
- Far more effort to support, advance and integrated DER
- Define guiding principles for all work efforts behind the meter
- Climate change should be a megatrend and the \$\$ should be focused on the investments that help to mitigate and adapt and at least do no harm
- Better integrate the specific customer programs, rate design benefits, etc.
- Opportunity for more flexibility — are we missing other areas by focusing on grid only?
- Transparently reveal how projects are bucketed
- Create compelling value proposition using hard economics
- Risk of agreeing to the plan and then figuring out how to pay for it
- Residential battery storage offering like the Green Mountain Power program
- Can Duke incent battery storage in rural areas to help reliability for [customers like] John’s mom? Cost could be split between Duke and the customer
- Would like to see a renewable energy target: how much will you enable?
- Microgrids for critical infrastructure
- How much will it cost and recovery mechanism

Appendix 5: Transcript of final Q&A with Duke Energy Staff

- Q: The draft grid improvement plan includes interconnection improvements. Lower interconnection charges would be a significant benefit. How will the plan affect interconnection charges?
 - A: The grid improvement plan will increase the number and total capacity of interconnections that the grid can accommodate. This benefit does not include any reduction in interconnection charges.
- Q: You mentioned there would be a deferred counting mechanism. What guard rails would there be on the amount that Duke Energy spends?
 - A: The scope of the improvements is limited by the resources we have to actually do the work. I don’t think we could implement improvements faster than what is in the plan given current resources. In addition, provisions would be put in place for any program we implement to ensure that scope and cost commitments are met.
- Q: Are the different numbers in the plan for each program ranges for possible costs?
 - A: Yes — those are class 3 ranges, meaning we add 30% to be conservative. You should feel comfortable with the estimates.



- Q: The company, on a recent call, brought up legislative and regulatory options. We are now about 2 months away from legislative sessions and we haven't started to discuss cost recovery options. What is the expected planning?
 - A: Given the legislative schedule, the timing for discussions would be now. But, as of now, we do not have a legislative plan. I am happy to talk about what the plan in SC has — they have the option for a multi-year rate plan. Duke Energy does not wish to go to the legislature without stakeholder input.
- Q: I still don't have a feel for how the plan scales renewable energy connection. Does it match the integrated resource plan?
 - A: IVVC has conservation voltage reduction. This would allow us to tighten the voltage band and operate in the middle of the band. This allows us to add more renewable energy without the variation in generation causing the line voltages to vary outside of allowed limits. That is one example. The plan also includes power components that allows us to make settings changes more quickly. The self-optimized grid (SOG) helps us with power flow — it allows us to make changes to the grid to support behind-the-meter solar and electric vehicles (EVs). The plan also allows us to prepare for advanced EV support.
 - A: We have modestly valued the addition of DER in our analysis.
- Q: Ideally all of these programs will allow lots of new customer programs such as efficiency and demand response. Have you started developing those programs and/or working with 3rd parties to do so?
 - A: Yes, and yes. With some of the customer programs, we have been careful not to get too far ahead of the available grid technology. For example, for time-of-use pricing, we have been thinking about foundational projects like AMI that enable these new programs.
 - A: We are talking about key foundational pieces that would allow us to implement customer programs, but actual programs require the grid being ready.
- Q: I am feeling the stress of timing. This is a work in progress, there may be future meetings, and then we may eventually get to consensus. But the General Assembly meets in January. I am concerned about how we bridge those time constraints, so we don't end up in an epic battle.
 - A: Everything is easier if there is general agreement. As for the rate case, no one has said we need to do that now. Given the time required, the earliest we could begin a rate case would be mid-2019.
 - Q: But you just filed a rate case in South Carolina. Will you not do that in North Carolina at the same time?
 - A: Ideally yes – but it may be difficult if there are issues.
- Q: You have talked about getting to consensus. What does that look like? When do we turn the other away?
 - A: I see it as a Venn diagram – if there is a core with overlapping agreement, then you can judge there is agreement. In a sense, 'you know it when you see it,' and then you move forward. There will always be some stakeholders on the edges [of the Venn diagram] that do not agree.
 - A: At my table, when we were able to unpack things, perspectives changed. At some point, we will reach diminishing returns with further discussions and it will time to move forward with the proposal (or not).

- A: Our experience was very different in South Carolina. There, we had closer to 80% agreement at the workshop. When North Carolina has a similar level of agreement, we will see that as consensus.
- As you go down the Integrated System Operation Planning (ISOP) path, are you confident that the interim measures will not be obsolete?
 - A: With 85% certainty, yes. The plan designers have been asked to make sure that is the case.
- Is there a grid in the US or elsewhere that you would point to as the gold standard for a modern grid?
 - A: I don't think so yet. Navigant has some utilities that they benchmark off of.
 - A: We are not the first utility to move toward SOG or conservation voltage reduction (CVR). Some of these are tried and true – we think now is the appropriate time for these improvements in North Carolina.
- To justify SOG and other programs, why not have a Climate Change related goal of getting to some percentage, say 80%, of clean energy by some year. It seems like an opportunity to get ahead of carbon taxes. Instead, you are simply projecting that there will be some amount of DERs and trying to improve the grid to accommodate it. Why not take a leadership goal and strive towards a certain percent of clean energy?
 - A: I think about that in 3 prongs: Policy makers, customers and us. Our policy makers are ahead of us. We have corporate goals and we have our coal fleet. Is there consensus on that? I think we are where we should be in North Carolina. Our customers are leading that without having to have us drive it.
 - A: If you think about the draft grid improvement plan, we don't have a renewables goal in it. But we have corporate level goals and grid improvement will support those goals.
- Q: When you sell this to the public, folks will ask, 'Why improve the grid if you are just going to use natural gas for the next 50 years?'
 - A: We are going to have customers, regulators and policy makers with a range of opinions.
- Q: Given Duke's corporate goals and grid modernization goals, if we pass the draft grid improvement plan, will you say that the corporate goals achieve some percent clean energy?
 - A: Yes, to the degree that grid improvement enables clean energy and/or carbon reduction goals we will make that connection.

Appendix 6: End-of-Workshop Survey Comments

Below, we directly transcribe all comments that participants provided in writing in addition to their numerical responses to the end-of-workshop survey. We also provide a summary of the numerical responses to survey questions #3 and #4.

Question 1: On a scale of 1-10, how well did this workshop enhance your understanding of the grid improvement plan?

- Much clearer on inputs, elements of plan, approach to valuation, not just cost (rated 8)
- Pre-meeting material was helpful, but it did not have enough detail to understand fully (rated 6)
- Need more details about assumptions (rated 8)
- Not a very deep dive (rated 7)
- Still need some additional data and details, but it was informative. Thanks (rated 8)
- Would appreciate more transparency to DER planning and cost-benefit analysis (rated 4)



- PDF before handout was very helpful! (rated 8)
- Still need to see more 'under the hood' (rated 7)
- Details for transmission Improvements / added value (rated 4)
- Need to get 'data dump' and independently evaluate (rated 8)
- Dial in a little more on specific technologies and what they do (rated 6)
- I've been a part of the South Carolina process, so I got some advanced notice. (Rated 6)
- I still don't follow how chosen investments address megatrends; nothing about alternatives considered or rejected (graded 6)
- We need specific information about how this plan will benefit and what it will cost large load customers (rated 3)

Question 2: On a scale of 1-10, how satisfied are you with the opportunity to provide feedback to Duke Energy at this workshop?

- Were taken seriously, but the new plan looks like the old plan in better packaging (rated 7)
- Technical question needs (rated 7)
- Great Job! (rated 9)
- Lots of opportunity throughout day (rated 10)

Question 3: On a scale of 1-10, how well did this workshop enhance your understanding about other stakeholders' point of view?

The responses to question #3 are shown in Figure 10, at right. Below, we list the comments to this question:

- Great 'segments' at table (rated 8)
- I'd like to hear more from commercial and industrial customers (rated 4)
- Lots of people in the room I don't think we heard from in the big group discussions (rated 7)

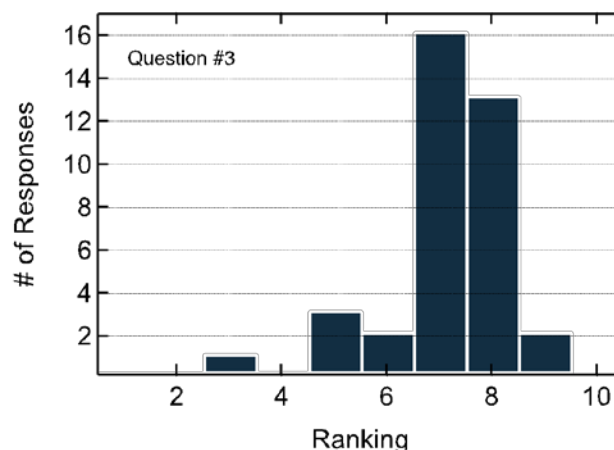


Figure 10. In their responses to survey questions #3, stakeholders indicated that they generally learned more about other stakeholders' points of view.

Question 4: On a scale of 1-10, how willing are you to engage in potential future follow-up conversations with Duke around the grid improvement plan?

The results to question #4 are shown in Figure 11, at right.

The two written stakeholder comments on this question are listed below:

- I'm always happy to engage (rated 10)
- Any way we can help (rated 10)

Question 5: What did you find most useful about this day? Why?

- Information and dialogue
- Opportunity to ask questions and engage in discussions
- More details on plan
- Opportunity to explore enhancements that enable DER penetration
- In-depth details provided by subject matter experts; helpful in understanding plan
- Great Q&A sessions
- More interaction about details
- Seeing other groups' concerns and needs
- Opportunity to discuss strengths and weaknesses was helpful to talk through
- Viewpoints of other stakeholders
- Q&A, discussions at tables
- Interactive, facilitated structure
- Stakeholder engagement
- Issues identified and what plan is lacking in scope (not including regulatory and business model reforms).
- Lots of viewpoints, strong disconnect between Duke Energy and stakeholder expectations, Duke Energy wants to listen to others concerns but not sure they are ready to hear what they are asked to change.
- Example of the project/program differences
- Candid conversation
- Great explanation of new plan and underlying rationale
- Hearing others
- The briefing materials were excellent. Rocky Mountain Institute was good.
- Last session: Coaching questions, Data dump, Q&A
- Open question period for Duke Energy.
- Meeting the new Director
- Flow and breaking up presentations with discussion

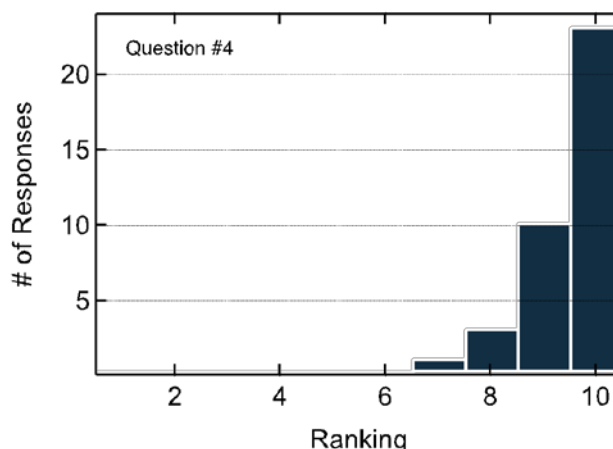


Figure 11. The responses to question #4 indicate that stakeholders are overwhelmingly willing to continue conversations with Duke about grid improvement.

Question 6: What changes would you suggest for future meetings?

- Please continue to have these meetings!



- Encourage more people to speak up and offer diverse viewpoints and make an effort to increase racial diversity of stakeholders (and include more voices of low-income /fixed-income customers)
- More discussion on rate impacts
- Do the data dump before the next meeting
- Shorter meetings
- This was good
- More inter-group/table interaction. May meeting did this well.
- Smaller breakout with various viewpoints
- Mixing up groups to get additional perspectives
- Expand scope to regulatory reform
- Accompanying technical analysis, summary reports and white papers & summary of key assumptions
- Say the page # of a slide you are showing
- Get someone to talk about cost recovery aspects of grid improvements, particularly if different from traditional cost recovery of transmission and distribution investments, operations and maintenance.
- More of the same.
- Not much — well done
- Perhaps working groups for more technical issues and/or specific constituencies (break out by subject matter interests)

Question 7: Please use this space to provide any additional written comments to Duke Energy about their grid improvement plan?

- I remain very concerned that there is a big mismatch between projected/perceived benefits and costs to residential customers.
- Thank you!
- Show us the (rate) money
- I'd like the focus on clean energy to focus on how to integrate and save customers' money. Also, storage should be more explored and used to full potential.
- Would be good to engage stakeholders before pushing any legislation
- Need more detail on what is being proposed and the support for making an extraordinary expenditure
- Step in the right direction toward greater transparency. Long way still to go!
- Thanks.
- Overall, great – but needs more focus on private DER
- Draw a distinction between how it benefits and costs shareholders and customers
- This is a multi-billion-dollar plan. I can't support it until I see the data dump.
- Overall, need a better idea of what Duke sees as the utility of the future and how this plan gets us there, with specific breakdown of costs.