## Agenda

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Ground Rules for Today’s Workshop

• One person speak at a time; be respectful of others.
• Be succinct so that everyone has the opportunity to speak.
• Try to offer alternatives that accommodate your interests and the interests of others.

In scope:
• Integration of Generation, Transmission, & Distribution Planning
• IRP Analysis Processes
• Non-Traditional Solutions
• Circuit Load Forecasting

Other forums:
• Grid Improvement Plan
• Interconnection Queue Reform
• Regulatory Reform
• Rate Design
• Market Design
Safety Briefing and Opening Comments

Cari Boyce, Duke Energy
• Thank you for participating!
  • We’re in this together – with many opportunities and challenges ahead.

• ISOP will enhance our planning tools and processes across generation, transmission, and distribution disciplines.
  • ISOP objective: cost-effectively integrate new technologies and customer programs as technology and policy continue to evolve.

• Today is part of a multi-stage process
  • Opportunities for voices from diverse perspectives to be heard
  • 2nd ISOP Stakeholder Session (SC) – planned for March 2020
  • Final public report by ICF following second workshop
The path forward for the Carolinas’ energy future will continue to evolve iteratively through dialogues with diverse stakeholders, and state-mandated clean energy requirements.

Duke Energy’s 2020 Carolinas IRP will reflect the company’s updated climate goals.

Future IRPs will continue to evolve, reflecting changes in market dynamics and state policies, including any next steps from NC’s Clean Energy Plan and SC’s Act 62.

Duke Energy’s goal is to implement the basic elements of ISOP in the 2022 Carolinas IRP.

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Q4 2019</th>
<th>Q1 2020</th>
<th>Q2 2020</th>
<th>Q3 2020</th>
<th>Q4 2020</th>
<th>2021</th>
<th>2022</th>
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<tbody>
<tr>
<td>Integrated Resource Plan</td>
<td></td>
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<td>2020 IRP Listening Sessions</td>
<td>Prepare &amp; Submit 2020 Full IRP 9/1</td>
<td>IRP Update</td>
<td>Full IRP with Basic ISOP Elements*</td>
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<tr>
<td>Integrated System &amp; Operations Planning</td>
<td>1st session</td>
<td>2nd session</td>
<td>Final Report</td>
<td></td>
<td>Stakeholder Engagement</td>
<td>Develop and Refine ISOP Tools and Processes</td>
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*Goal

**A-1 directs NC DEQ to develop a report on potential carbon reduction policies.
SETTING THE NATIONAL CONTEXT

Current Status and Best Practices for Utility System Planning

Presented by: Thomas Mimnagh, ICF
A shifting electricity generation landscape

Annual electricity generating capacity additions and retirement (GW)

Electricity generation from selected fuels (Billion kWh)

States with IRP or similar requirements

Independent System Operator (ISO) / Regional Transmission Organization (RTO) Activities

- FERC Order 841: ISOs/RTOs required to develop energy storage participation models
- FERC DER Aggregation Technical Conference: Reviewed key issues and requirements for DER aggregation participation in wholesale markets
- FERC staff report on DER technical considerations for the bulk power system
- DERs currently participate in wholesale markets to varying degrees

Source: Sustainable FERC Project
U.S. Transmission Planning Regions

The colored areas are intended to approximate the scope and location of the transmission planning region, but are for illustrative purposes only.

Overview of National IDP Regulatory Activity

Evolution of Distribution Planning

Traditional Distribution Planning

- Single Load & DER Forecast
- Current Distribution Assessment
- Annual Long Term Distribution Planning
- Distribution Investment Roadmap
- Transmission Planning

Integrated Distribution Planning

- Multiple Scenario Forecasts
- Resource & Transmission Planning
- Current Distribution Assessment
- Annual Long Term Distribution Planning
- Hosting Capacity
- Interconnection Studies
- Interconnection Process

Source: ICF International
Integrated Distribution Planning Elements

- **Load and DER Forecasting**: Shift toward scenario-based forecasting
- **Interconnection**: Efficient and more transparent DER interconnection
- **Hosting Capacity Analysis**: Improved understanding of system constraints
- **Locational Value Assessment**: Improved accuracy of locational value measures and assessment of NWA vs. capex
Evolution of Forecasting

Today: Load Forecasting

- Ensure customer growth is accounted for
- Capacity and reliability planning is for peak loading conditions

New: Load and DER Forecasting

- Integrate the presence and availability of Distributed Energy Resources (DER) into forecasts and planning processes
- Capacity and reliability planning extends beyond peak load periods
Hosting Capacity

- Hosting Capacity is the amount of DER that can be accommodated without adversely impacting power quality or reliability under current configurations and without requiring infrastructure upgrades.
- Hosting Capacity is location dependent (interconnection point on the distribution network), feeder-specific (A feeder’s hosting capacity is not a single value, but a range of value) and time-varying (change in distribution and operation configurations).
- Hosting capacity evaluations require precise models of entire distribution system.
NWA Today

- Growing numbers of state regulators and utilities seeing non-wires alternatives as a way to deliver value, drive innovation, reduce costs.

- **Why:** push from developers, regulators, environmental advocacy groups, regulators

- Some interveners / policy makers recommending very aggressive NWA approaches

Source: ICF
Harder in Practice Than in Theory: Need DSM

Case study spotlight:

<table>
<thead>
<tr>
<th>NWA Opportunities Listed</th>
<th>Listed and Successful</th>
<th>Successful, Using Targeted DSM</th>
<th>No Resolution Listed</th>
<th>Average Size Load Reduction</th>
</tr>
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<tbody>
<tr>
<td>47</td>
<td>6</td>
<td>6</td>
<td>39</td>
<td>5-10 MW</td>
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Case study spotlight:

<table>
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<tr>
<th>NWA Case Studies</th>
<th>Using EE</th>
<th>Using DR</th>
<th>Using Storage</th>
<th>Average Size Load Reduction</th>
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<tbody>
<tr>
<td>10</td>
<td>4</td>
<td>7</td>
<td>5</td>
<td>1-85 MW</td>
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Key takeaway: procurements need ample lead time, lots of work on contracting process
The Purpose of ISOP

Mark Oliver, Duke Energy
Why is Duke Pursuing ISOP in the Carolinas?

- Rapid growth of distributed energy resources (DERs) inspired our vision for ISOP.
- Over longer term (5-15 years), declining technology costs are likely to make non-traditional resources/solutions increasingly competitive relative to traditional resources/solutions.
- Delivering carbon reductions at the lowest total cost will require improvements to planning tools to better evaluate non-traditional solutions.
- The overarching motivation to invest in ISOP is that our customers will benefit from it.
  - Ensure operational feasibility while enabling additional renewable / DER adoption
  - Lower total costs while enabling carbon reductions over the long term
ISOP Development

ISOP Integration Objectives

• Broad strategic view
• Facilitate collaboration
• Drive development

ISOP Benefits

• Comparisons across segments
• Assess the pace of technology evolution and adoption
• Improved visibility for grid needs

*ISOP drives optimization through collaboration and integration*
ISOP Development Timeline

- **Bulk Load Forecast**
- **Morecast** (Initial Rollout Q2 2020)
- **Generation Planning:** Expansion Plans, Production Costs
- **Transmission Planning:** PSSE + PROMOD (Initial Rollout 2021)
- **Distribution Planning:** ADP-8760 (Initial Rollout 2021)

MW Asset Benefit Analysis

ISOP Incorporated in 2022 DEC & DEP IRPs
What’s in it for you to engage in this stakeholder process?

• Prime objective of ISOP is to benefit our customers with reliable and affordable energy by being positioned to integrate new technologies and resources cost-effectively.

• You have an opportunity to influence the development process and outcomes.
  • A balance of customer, environmental, and developer input will help ensure balanced outcomes.
  • Constructive dialog across stakeholder groups is key.

• Future IRP inputs and outcomes: By letting us know what is most important to you, we can be better positioned to address your interests and concerns.

• The ISOP train has not left the station!
  • Most parts of ISOP are still in the formative stage, with opportunity to influence the direction.
Presentations and group discussion on:

- Enhanced forecasting
- Advanced distribution planning
- Non-traditional solutions
- Generation-transmission-distribution coordination
- Feed-in to Integrated Resource Plan
Enhanced Forecasting

Rudy Bombien, Duke Energy
Load Forecasting Components

Jurisdictional Forecast:

- 30-year hourly forecast broken down by state, class (residential, commercial, industrial)
- Includes utility energy efficiency, demand reduction, electric vehicle, and net-metered (rooftop) solar “load modifiers”
- Critical input into financial and production cost models, IRP
Morecast – Increased Granularity

• Morecast: New internal tool being developed to produce hourly mid-term (10-year) forecast at the circuit level

• Bottom-up compilation of distribution feeder-level forecasts inclusive of DERs and EVs (gross and net load)

• Increased availability of AMI data will influence the process

• Morecast will be a critical input to advanced distribution planning tools being developed

Morecast Model Development

Weather
Historical and "normal" temperatures

Economic Variables
GDP, Business GDP, Population, Housing, Income, Employment

Load History
Metered Circuit data with adjustments for impacts from DR, EV & PV

Customer Demographics
Types of customers, number of customers, etc.

Energy Dynamics Segments
Customer's attitude towards energy from Acxiom

Key takeaway: Morecast tool will produce granular 8760 forecasts and serve as a key input to multiple planning processes that will support investment decisions.
Advanced Distribution Planning

Clif Cates, Duke Energy
Evolution of Distribution Planning

Traditional Distribution Planning

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Integrated Distribution Planning

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- ISOP Locational Benefits Analysis
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- Interconnection Process

Source: ICF International
Advanced Distribution Planning (ADP)

• Incorporate more sophisticated load forecasting inputs
  • 3-5 year distribution planning window expanded to 10 year window
  • Forecasting effort moving from individual planners to dedicated forecaster group collaborating with distribution planners
  • Single planning scenario → multiple planning scenarios

• New “power flow” demands
  • Single peak hour assessment → multiple-hour assessment (“8760”)

• New solution assessments
  • Traditional solution assessment (“wires”) → non-traditional solutions such as DERs and batteries
  • Integrate distribution asset benefits across transmission & generation

• Automation of toolsets
  • Allows for planning a dynamic grid
Non-Traditional Solutions

Mike Rib, Duke Energy
Exploring Non-Traditional Solutions

Non-Traditional Solutions (NTS):

- Alternatives to traditional infrastructure upgrades to address contingencies, overloads and capacity.
- T&D Non-traditional solutions are sometimes referred to as non-wires alternatives (NWAs).
Non-Traditional Solutions

Duke’s Existing DR and EE Portfolio

• Large and well-established
• Will evolve as new technologies become viable
• Current regulatory construct limits new approaches that might be needed for NTS considerations

Future Possibilities

• Improved forecast granularity could help enable targeted programs
• Explore smart home/building technologies for potential to support new programs
• ISOP can help assess locational need
Energy Storage

- Potential for multiple use cases
- Complex implications for planning
- Rapid development occurring in the industry
- Significant regulatory issues to address

ISOP Benefits

- Addressing battery planning challenges
- Helping to open up new reliability options for utilities and customers
- Helping address future DERs and regional carbon reduction potential
Generation-Transmission-Distribution Coordination

Mike Rib, Duke Energy
ISOP Development

ISOP Integration Objectives
• Broad strategic view
• Facilitate collaboration
• Drive development

ISOP Benefits
• Comparisons across segments
• Assess the pace of technology evolution and adoption
• Improved visibility for grid needs

ISOP drives optimization through collaboration and integration
Feed-In to Integrated Resource Plan

Mike Rib, Duke Energy
How ISOP will feed into the Integrated Resource Plan

As Duke plans for a carbon-free future:

• The NC and SC Commissions continue to stress the importance of evaluating multiple alternatives for future generation needs, including emerging non-traditional solutions
• The implementation of tools and learnings from ISOP is becoming increasingly important.

Integration of ISOP into the IRP process will evolve over the next several years

• By 2022 … improved methodologies for comparing utility-scale storage and other non-traditional solutions to traditional generation alternatives.
• Beyond 2022 … leverage ISOP for enhanced evaluation of emerging technologies and demand-side trends to improve scenario planning for a broader set of potential futures.
• The timing of ISOP aligns well with indications of energy storage becoming increasingly competitive with traditional resources in the mid- to late-2020’s.
Key Elements of ISOP

- Enhanced forecasting
- Advanced distribution planning
- Non-traditional solutions
- Generation-transmission-distribution coordination
- Feed-in to Integrated Resource Plan
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Please return to the Session room by 12:55 PM for a prompt start to the stakeholder panels.
Stakeholder Panel 1: Customer & Advocate Perspectives

David Beard, Pacolet Milliken

Charlie Bayless, North Carolina Electric Membership Corporation

Teresa Arnold, AARP South Carolina

Dustin Metz, NCUC Public Staff
Stakeholder Panel 1: Customer & Advocate Perspectives

David Beard, Director of Energy Development, Pacolet Milliken

- Pacolet Milliken is a Family-owned Private Equity office that invests the Family’s funds in real assets in the Energy & Infrastructure and Real Estate spaces

- David is responsible for locating, analyzing, and developing potential projects, including energy (typically renewables), water/wastewater, infrastructure, or joint ventures in these fields. He is also the office’s liaison with regulatory agencies
Charlie Bayless, Vice President and Senior Regulatory Counsel, North Carolina Electric Membership Corporation (NCEMC)

- NCEMC is one of the largest generation and transmission electric cooperatives in the nation, providing reliable, affordable electricity to its 26 distinct member-owned, not-for-profit cooperatives. NCEMC serves 2.5 million people and 1 million households and businesses throughout 93 counties in North Carolina.

- Charlie works on renewable projects (both NCEMC- and 3rd party-owned), federal and state regulatory issues, wholesale contracts, markets, and interconnection requests.
Stakeholder Panel 1: Customer & Advocate Perspectives

Teresa Arnold, State Director, AARP South Carolina

• AARP South Carolina is here to help people 50+ live their best life. We are a nonprofit, nonpartisan social mission organization with a membership of more than 600,000 in SC. People value AARP in different ways—from information and products to advocacy and education.

• Teresa is the State Director of AARP SC. She has 30 years of experience advocating for positive change in South Carolina. She received her Master's in Social Work from the University of South Carolina.
Dustin Metz, Electric Division Utilities Engineer, North Carolina Utilities Commission (NCUC) Public Staff

- The Electric Division represents the public in matters brought before the NCUC involving electric providers, including rates and tariffs, energy efficiency program approval and performance, generation plant siting, transmission line siting, power plant operations, fuel procurement, quality of service, and mergers and acquisitions.

- Dustin works on rate and fuel cases, applications for certificates of public convenience and necessity, service and power quality, customer complaints, NERC Reliability Standards, nuclear decommissioning, avoided costs and PURPA, interconnection procedures, integrated resource planning, and power plant performance evaluations, among other issues.
Stakeholder Panel 2: Environmental & Developer Perspectives

Dave Rogers, Sierra Club

Mike Wallace, Ecoplexus

Isaac Panzarella, North Carolina Clean Energy Technology Center
Dave Rogers, Southeast Regional Deputy Director, The Sierra Club

- The Sierra Club is the nation's oldest and largest grassroots environmental group. Its mission is to explore, enjoy, and protect the wild places of the earth; to practice and promote the responsible use of the earth's ecosystems and resources; to educate and enlist humanity to protect and restore the quality of the natural and human environment; and to use all lawful means to carry out these objectives.

- Dave is the Southeast Deputy Regional Director for the Sierra Club's Beyond Coal campaign, which focuses on eliminating the use of coal by 2030 and achieving a 100% clean energy future by 2050. He manages and supports the Sierra Club's work focused on the electricity sector across the Southeast, including in both North and South Carolinas.
Mike Wallace, Vice President of Development Southeast, Ecoplexus

- Ecoplexus is a leading global developer of solar photovoltaic, wind, and battery storage generation facilities for the municipal and utility markets. The company has developed over eighty solar facilities worldwide and closed financing transactions in excess of $600 million to date, and is currently developing a pipeline of more than 6 GW of utility-scale projects across the U.S., Mexico, and Asia.

- Mike represents Ecoplexus as Vice President of Southeast Development and has successfully developed over 1 GW of utility scale solar on 120+ sites in the United States. His development experience includes local permitting, utility interconnection, environmental permitting, title, surveying, wetland delineation, regulatory compliance, land acquisition, PPA negotiations, and energy modeling.
Isaac Panzarella, Assistant Director, North Carolina Clean Energy Technology Center

- The Clean Energy Technology Center, at N.C. State University, advances a sustainable energy economy by educating, demonstrating and providing support for clean energy technologies, practices, and policies. For over 30 years, the Center has worked closely with partners in government, industry, academia and the non-profit community.

- Isaac oversees research and technical services around solar PV and other renewable energy, combined heat and power (CHP), microgrids, energy storage, and energy efficiency. He is also the Director of the U.S. Department of Energy Southeast CHP Technical Assistance Partnership.
Open Q&A and Discussion
Wrap Up & Next Steps

• Workshop Survey – please provide feedback!
• Interim ISOP webinar planned for January based on today’s feedback
• Information Portal Development
• 2nd ISOP Stakeholder Session (SC) – Planned for March 12, 2020
• Final public report by ICF following second Stakeholder Engagement workshop