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March 5, 2021

**VIA ELECTRONIC FILING**

Ms. Kimberley A. Campbell  
Chief Clerk  
North Carolina Utilities Commission  
4325 Mail Service Center  
Raleigh, North Carolina 27699-4300

**RE: Duke Energy Carolinas, LLC and Duke Energy Progress, LLC's  
Presentation for ISOP Technical Conference  
Docket No. E-100, Sub 165**

Dear Ms. Campbell:

As requested by Commission Staff, I enclose for filing presentation materials that Duke Energy Carolinas, LLC and Duke Energy Progress, LLC plan to use in the March 9, 2021 ISOP Technical Conference scheduled by the Commission in connection with the referenced matter.

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 "Lawrence B. Somers", written in a cursive style.

Lawrence B. Somers

Enclosure

cc: Parties of record

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Mar 05 2021

# Presentation to NCUC Technical Conference on Comprehensive Electricity Planning

*An Overview of Duke Energy's Integrated System & Operations Planning Development Efforts*

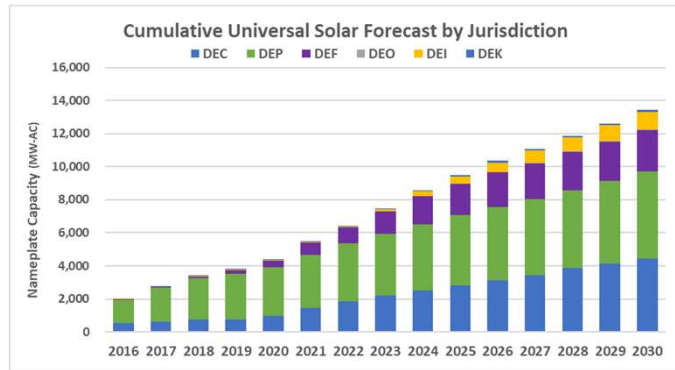
March 9, 2021



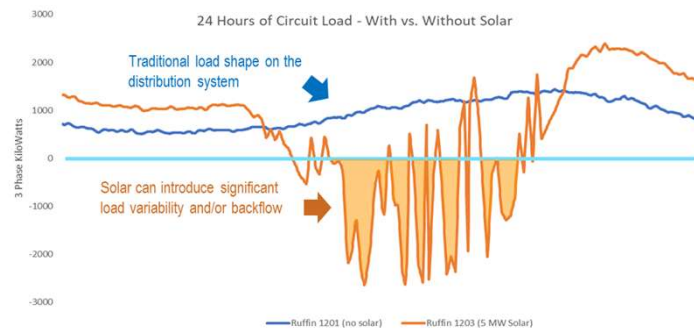
# What are some of the challenges that we are addressing?



## Rapid growth of renewables in our regions ...

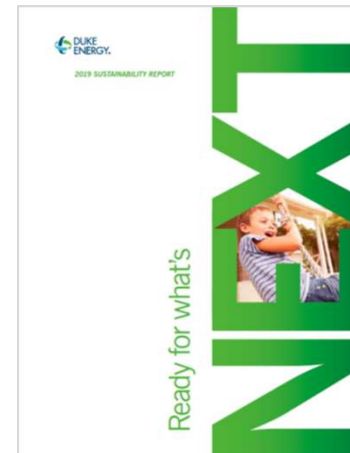


## Addressing dynamic loading on the grid ...



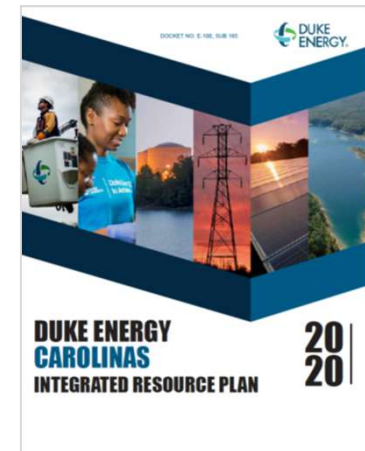
## ISOP is leveraging IRP, ESG and sustainability efforts to frame the future for integrated planners ...

➡ Vision Statement ...  
Net Zero Carbon by 2050



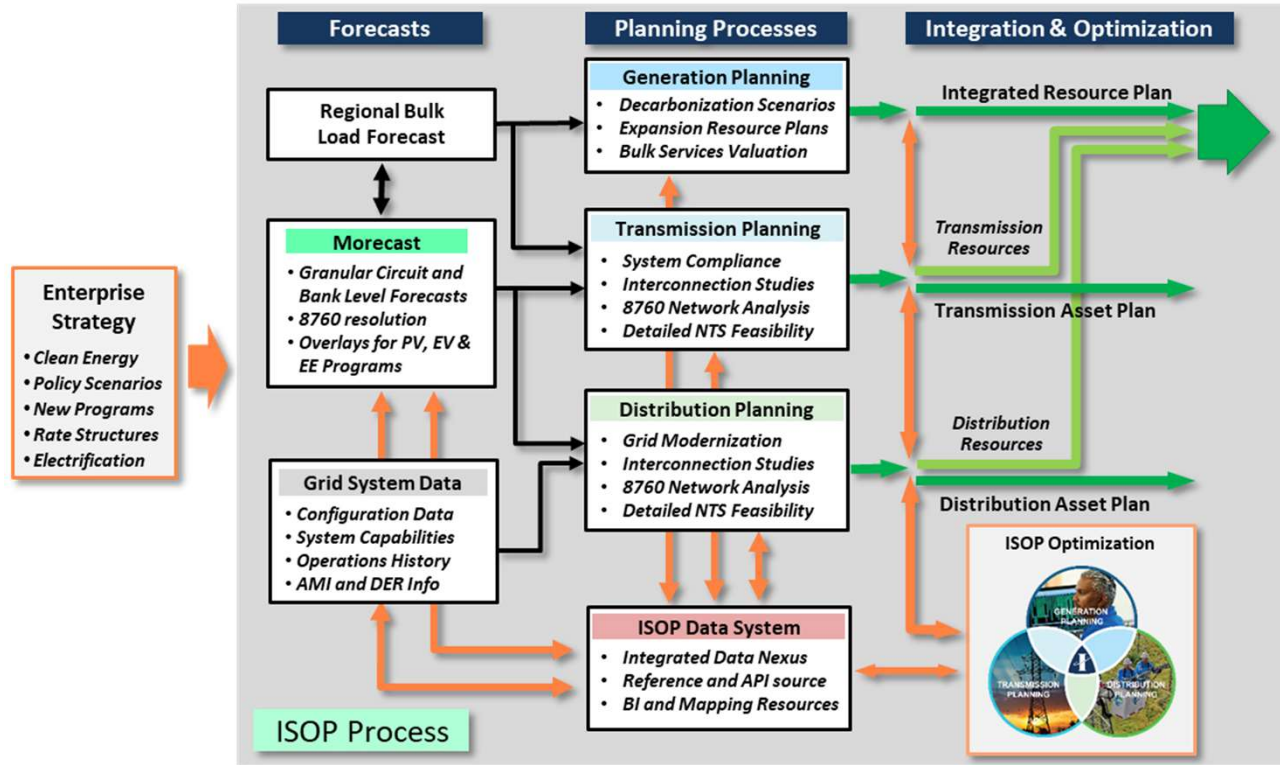
2019 Sustainability Report

➡ Integrated Planning ...  
Pathways to Net Zero



2020 Integrated Resource Plan

# Developing the ISOP integrated electricity planning process



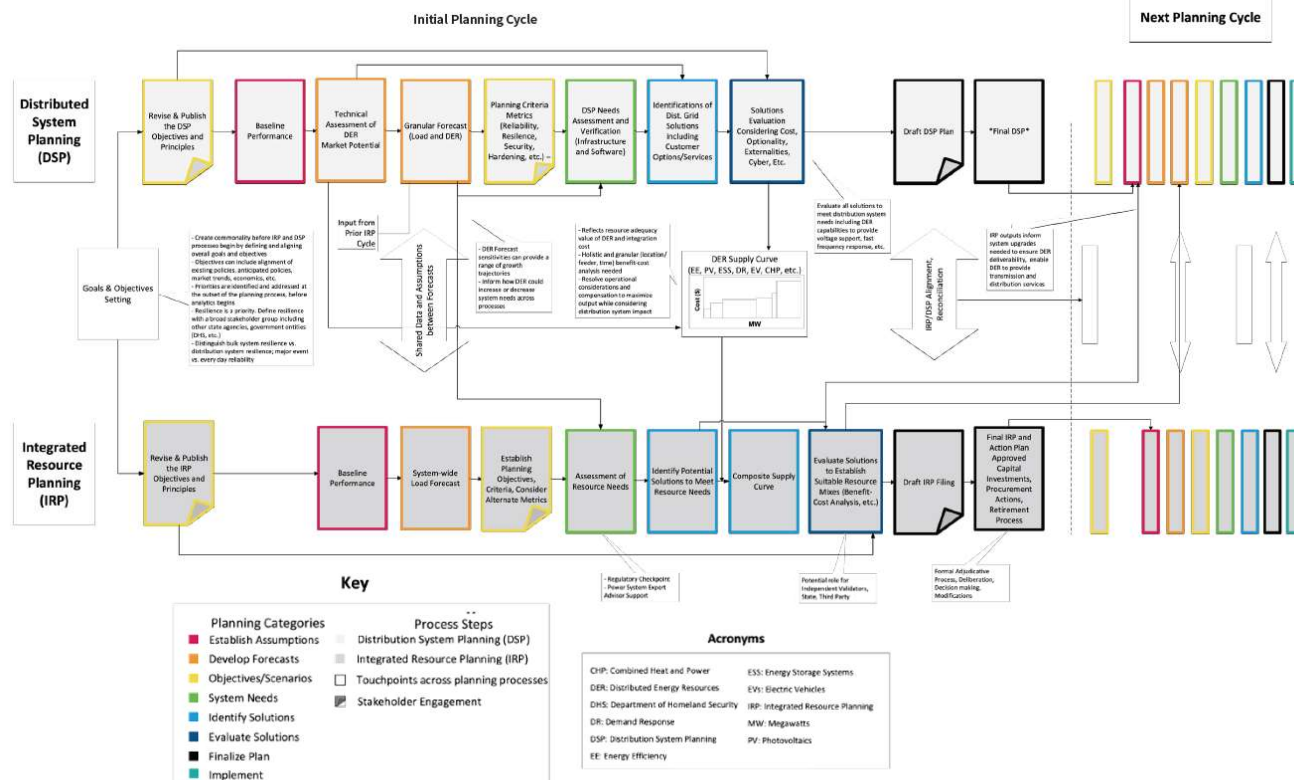
*ISOP is supporting the development and integration of these new processes and methods in each of these planning areas.*





# Perspectives from the NARUC NASEO Task Force

## Silver Cohort Flowchart of Idealized Comprehensive Electricity Planning Process (Feb'21)



## Alignment of ISOP elements

- Stakeholder engagement in the planning process
- Granular forecasting of load and DER
- Integrated needs analysis across D, T and G planning
- Integrating alternatives in the IRP process

## Utility Collaboration

- Coordination on load and DER forecasting with NCEMC, Electricities
- Investigating additional opportunities ...



## ISOP Development - Granular Load Forecasting



### 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

**Morecast:** New internal tool being developed to provide 10-year hourly (8760) forecasts at the circuit level

- *Morecast is a critical input to the advanced distribution planning tools being developed*
- Bottom-up feeder-level forecasts inclusive of DERs, EVs and customer programs (gross and net load)
- Load forecasters and distribution planners collaborating to produce informed forecasts
- Increasing availability of AMI data will influence and enhance the process

### Morecast – Carolinas System



# ISOP Development – Advanced Distribution Planning (ADP)



## Integrating sophisticated granular load forecasts

- Current 3-5 year window evolving to 10 years
- New capabilities for multiple planning scenarios

## New power flow resolution

- From peak hour assessment to 8760 assessment

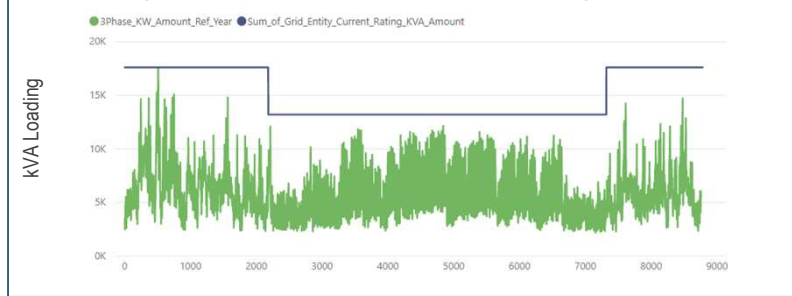
## Assessment of new solutions

- DERs including battery storage systems
- Capture benefits of D-sited options for G and T

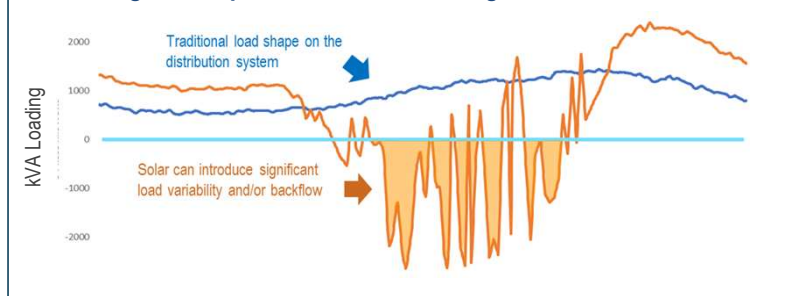
## Integration and automation of new tools and data

- New server based power flow models and integration
- Supports more complex planning for a dynamic grid
- Tools and processes will evolve as planning needs change

### Addressing Future Forecasted Feeder 8760 Loading



### Assessing DER Impacts on Circuit Loading



## ISOP Development – Advanced Distribution Planning (ADP)



### Hybrid Solution

- Combines power flow software with advanced analytics capabilities
- Capable of engineering DERs as a Load Violation Solutions (non-wires alternative)

### Introducing Automation

- Reduced engineering time spent resolving modeling issues and performing circuit analyses
- Time-saving analytics for identifying mitigation solutions to accommodate higher levels of DER
- Reduced engineering time when evaluating DER as a non-wires alternative
- Analysis of more solution alternatives and consistency in investment decisions

### ADP Toolset – Carolinas System

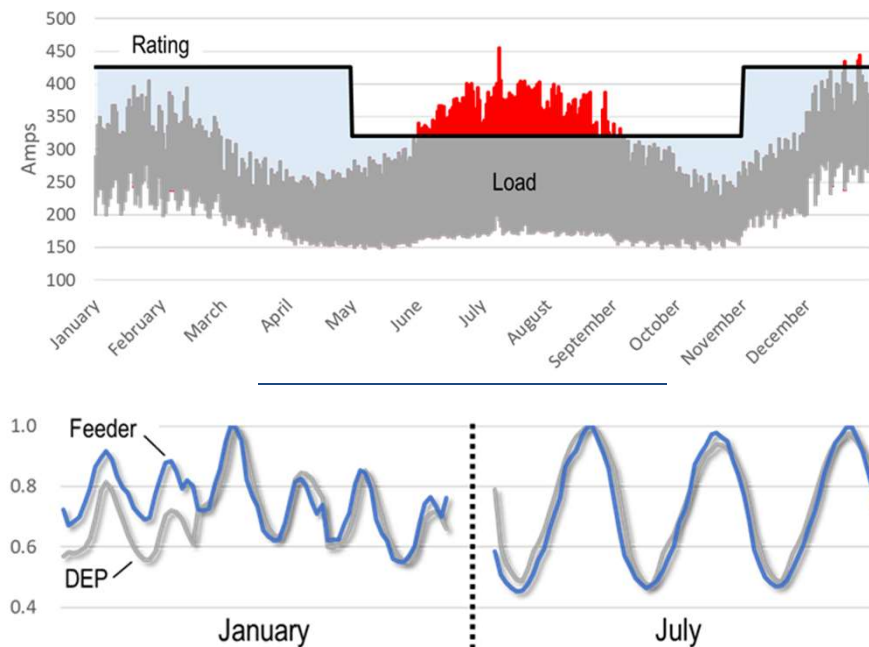




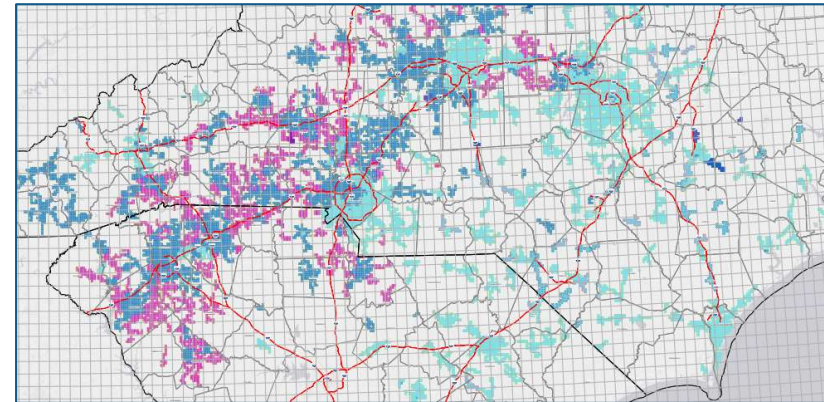
# New Advanced Distribution System Planning Applications



## ISOP Data System Application: NTS Screening



## Distributed Generation (DG) Guidance Map



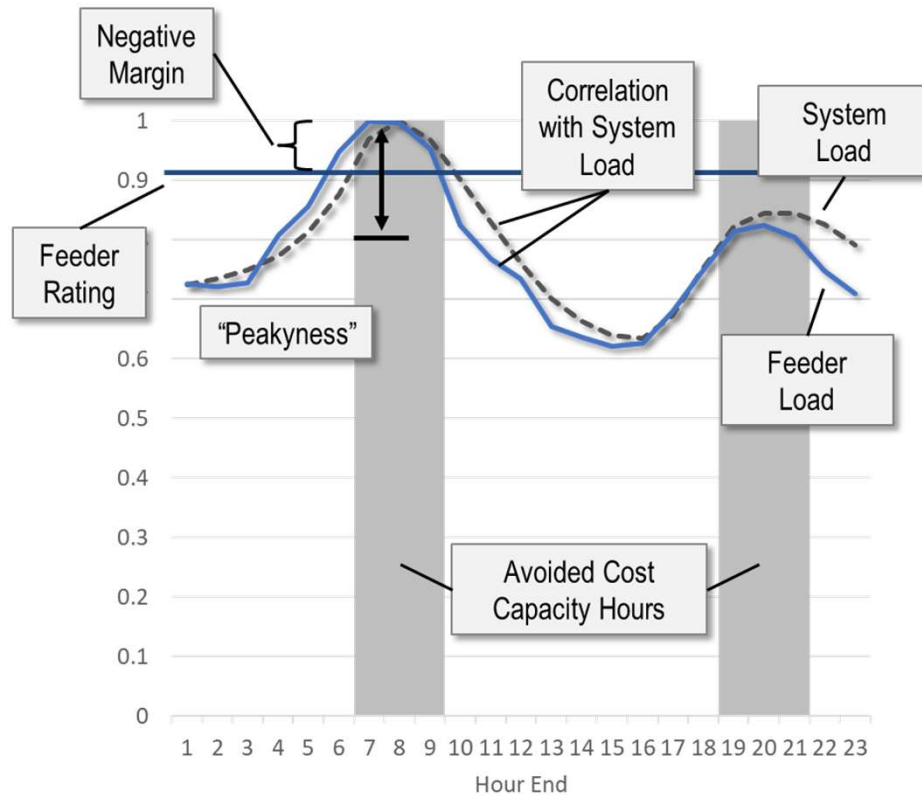
Map provides a geographical visualization of the distribution system in a manner consistent with the "Method of Service Guidelines" to inform siting of future distributed generation.

**Advanced tools to assess non-traditional solution (NTS) deployment opportunities and increasing DER saturation**



# Top Down Screening for NTS Deployment Opportunities

## Sample Normalized System and Feeder Load Shapes



### Additional Screening Criteria

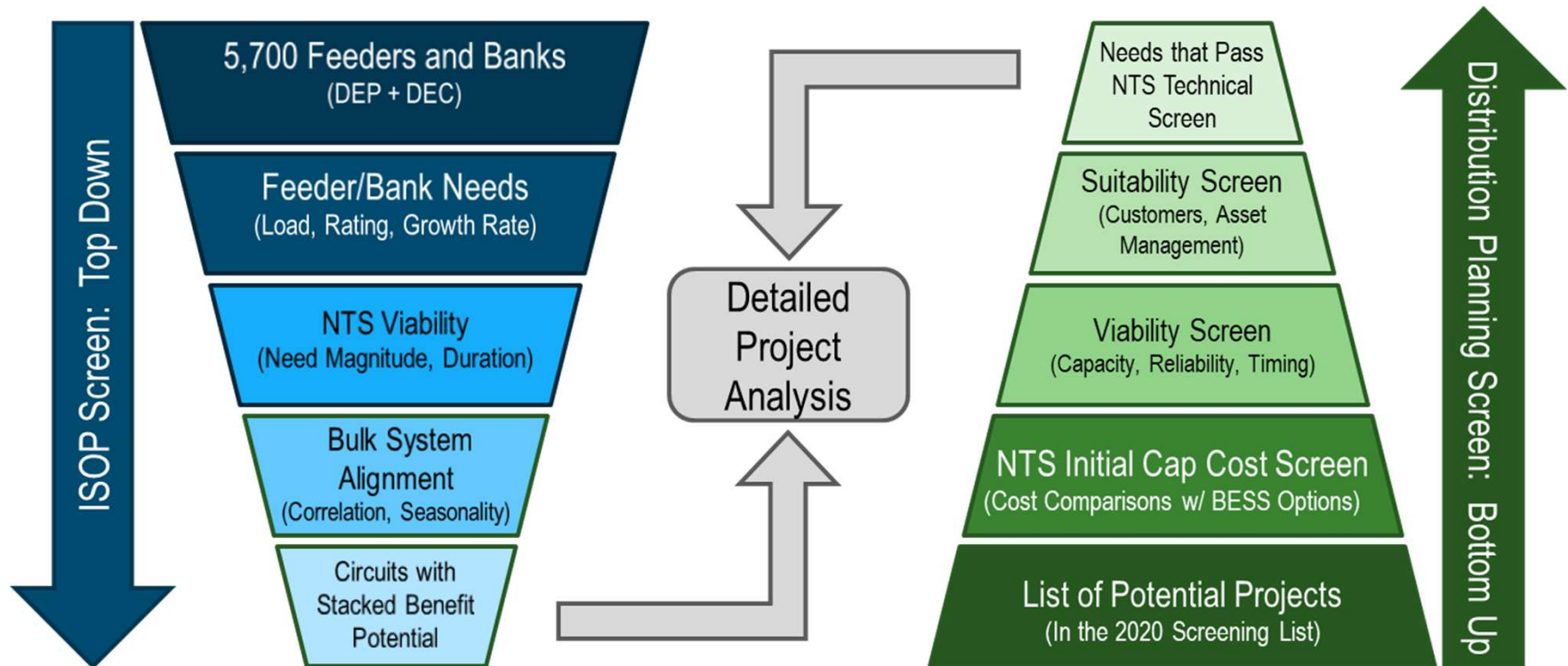
- Load Growth
- Paired Feeder + Bank Overloads
- Connected PV

### Initial Screening Results Using Straw-man Criteria

- 43 DEP feeders (~3%) at or close to overload in 2024
  - Load within 10% of rating, or
  - Load exceeds rating by not more than 5%
- Scored by:
  - Load "peakyness" (ratio of 99<sup>th</sup> percentile to mean)
  - Correlation with system load (hourly)
  - Alignment with capacity need (peaks during LOLE hours)
  - Load growth rate (magnitude of overload in 2028)

Duke Energy - General Information for Illustration and Discussion

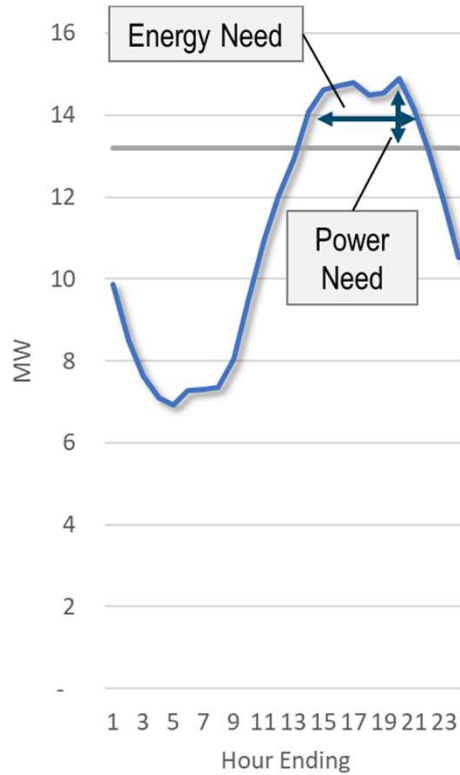
## NTS Screening: Integrated Process



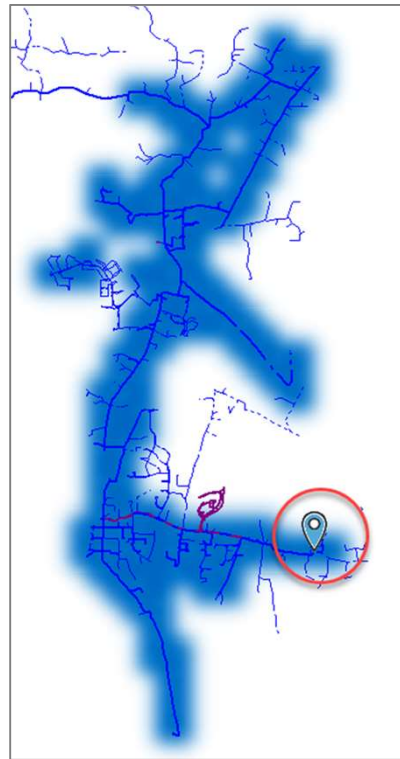
# Case Study: Battery Sizing for Distribution Project Deferral



## 2028 Summer Peak



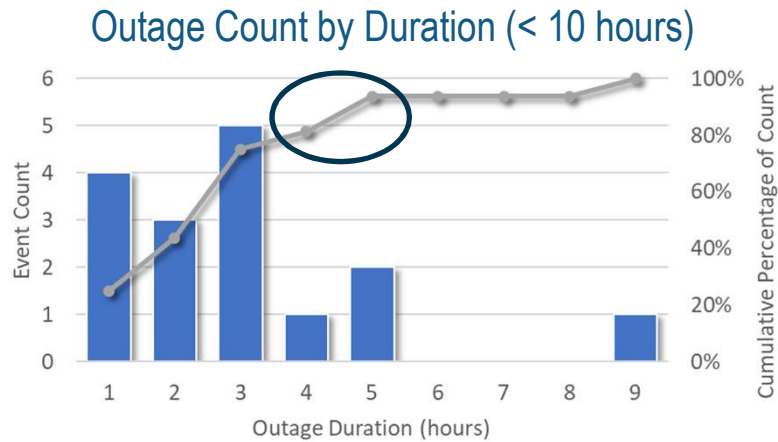
## Location Analysis



## Battery Characteristics

	Units	
Primary Use Case		6-year Deferral
In-Service Year		2023
Useful Life	Years	12
Base Power Need	MW	5.4
Power Upsize		1x
Total Power	MW	5.4
Energy Need (usable energy)	MWh	44.4
Depth of Discharge	%	90%
Annual Degradation	%	3.25%
Installed Energy	MWh	59.8

## Case Study: Battery Sizing for Customer Reliability



### Estimated Energy Need by Outage Duration

	3 Hours	4 Hours	5 Hours
99 <sup>th</sup> Percentile MWh	3.9	5.2	6.5
90 <sup>th</sup> Percentile MWh	3.1	4.1	5.0
75 <sup>th</sup> Percentile MWh	2.3	3.1	3.8

### Battery Characteristics

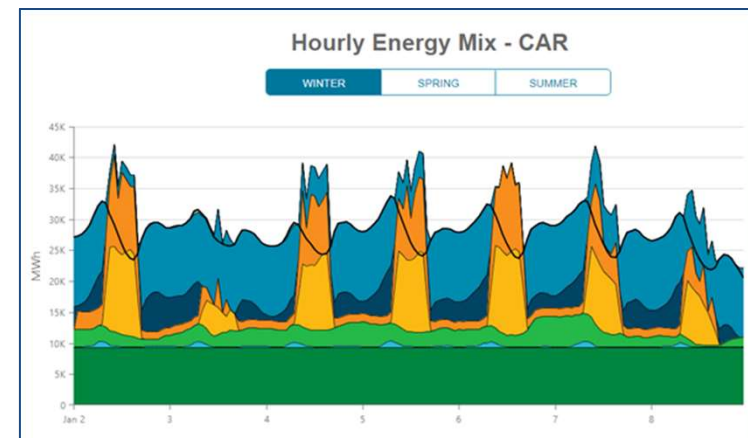
	Units	
Primary Use Case		Reliability
In-Service Year		2023
Useful Life	Years	12
Base Power Need	MW	1.9
Power Upsize		1.8x
Total Power	MW	3.4
Energy Need (usable energy)	MWh	4.1
Depth of Discharge	%	90%
Annual Degradation	%	3.25%
Installed Energy	MWh	6.7



## ISOP Development – Integrating Generation and Grid Planning



- Aligning and integrating generation resource planning with related planning functions
- Developing new tools for strategic transmission analysis to:
  - Reflect a system with significantly more distributed resources
  - Provide a more holistic view of future grid requirements associated with net-zero carbon operations
- Refinement of modeling to quantify ancillary services requirements associated with increasingly dynamic resource mix
- Transitioning to the EnCompass generation capacity expansion and system production cost modeling toolset
- Enhanced stakeholder engagement around generation resource planning, including the introduction of new tools like the Portfolio Screening Tool

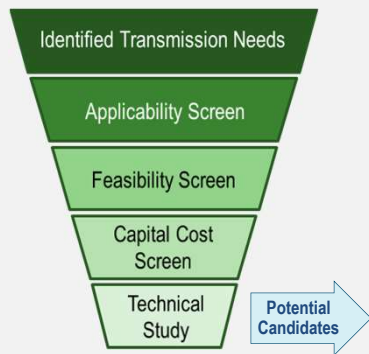




# ISOP Development – Transmission NTS Evaluation

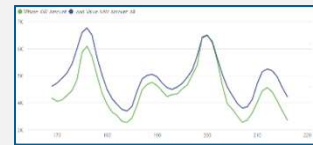
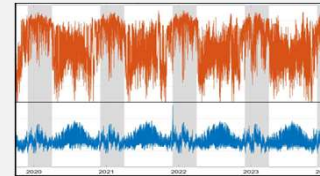
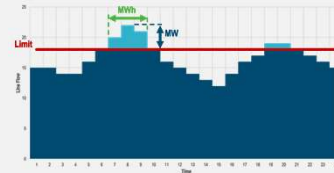
## ① NTS Screening

Screen for potential NTS alternatives to traditional projects being considered



## ② Technical Feasibility (Phase 1)

- Model power flows to identify alternatives, BESS requirements and potential locations
- Evaluate BESS opportunity for potential additional energy and ancillary service value
- Evaluate BESS application for system capacity value



## ③ Economics (Phase 1)

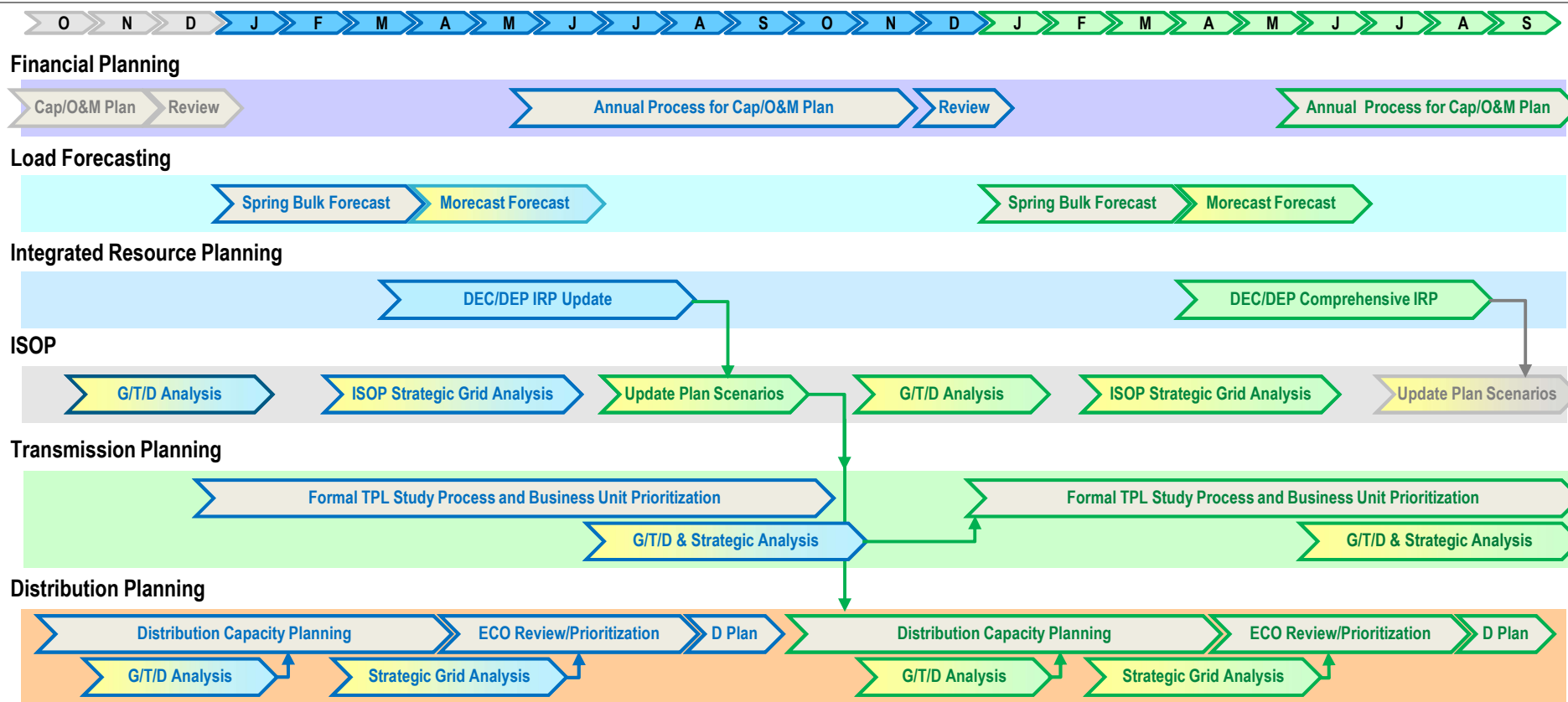
- Preliminary economic analysis of alternatives
- Transmission planning review of system needs and priorities

## ④ Next Steps (Phase 2)

- Detailed feasibility review

*Advanced applications for Transmission Planning to assess dynamic grid operations and storage potential*

# ISOP Integration and Timeline Development



# ISOP Timeline for the Carolinas

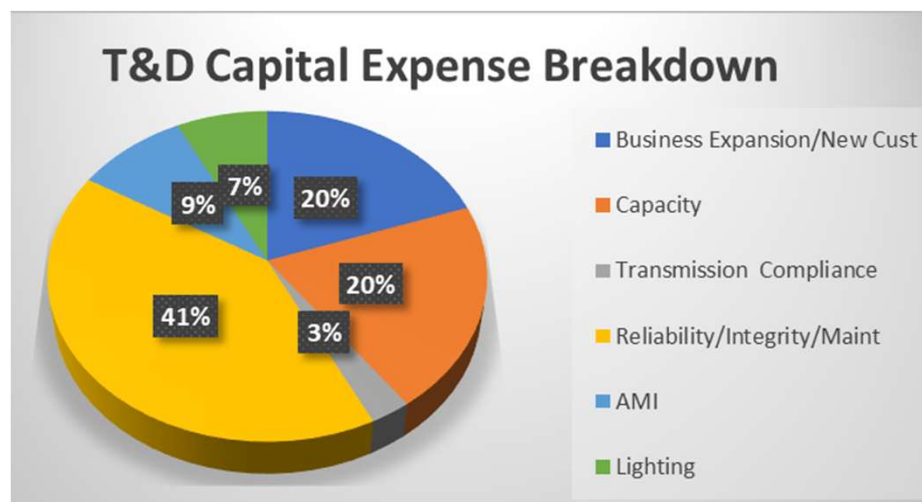


ISOP Development Efforts		2020				2021				2022			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Data	Data Governance & Platform	Develop ISOP Data System		Add additional data and visualizations				Production Support and Refinement					
		ADP integration											
	Data Quality Initiatives	Data Quality Improvement Projects – DERs, T&D Connectivity, Distribution Backbone, CME											
Forecast	Morecast & Related Work	Pre-Scale with Dist Planning Validation				Full-scale DEC/DEP validation and rollout				Forecast System Upgrades			
	Generation Modeling (EnCompass)	Transition to EnCompass Model											
Tools	Transmission Modeling (PROMOD, PSSE)	Rollout PROMOD for CAR				Incorporation of NTS Screening		Business Integration & Process Refinement					
	Distribution Modeling (ADP)			Phase II Pre-Scale		Phase II Prod Deployment (CAR)				Phase III System Upgrades			
Optimization	Integrated Planning Optimization	Integrated Process Development.				Integrated Process Testing				Integrated Process Execution			
		T&D BESS Screening		Demo III <ul style="list-style-type: none"><li>• D NTS Case Studies</li><li>• T NTS Screening</li></ul>		Integrated TS/NTS Screening							
External ISOP Communication		DG Guidance Map		Complete ISOP Stakeholder Process with 2 <sup>nd</sup> Workshop				IRP Update w/ initial ISOP Screening				2022 Full IRP	

## Observations from ISOP and activity in other states



- Importance of “right-sized” approach:
  - Opportunities for capacity deferral are a relatively small part of T&D capital expense
  - Screening results show a small percentage of these projects are candidates for detailed study in next ~3-5 years
  - Only 16% of 321 potential NWA projects in the United States have come into operation, and 59% of potential NWAs were ultimately not pursued
  - Demand side resources serving reliability functions involve more complexity and risk
- Approach should respect utilities’ obligation to serve
- Walk → Jog → Run approach
- Protect customer data and grid security





## Notes on ISOP's path forward



- ❖ Introduce ISOP elements to complement the 2022 IRP process in the Carolinas
- ❖ Continue to engage stakeholders in the Carolinas on development progress (<https://www.duke-energy.com/our-company/isop>)
- ❖ Continue to engage with industry peers and SMEs and benchmark against new practices in other regions
- ❖ Implement new components of the planning framework as capabilities mature
- ❖ Support regulatory policy initiatives





## CERTIFICATE OF SERVICE

I certify that Duke Energy Carolinas, LLC and Duke Energy Progress, LLC's Presentation for ISOP Technical Conference, in Docket No. E-100, Sub 165, has been served by electronic mail, hand delivery or by depositing a copy in the United States mail, postage prepaid to the following parties of record

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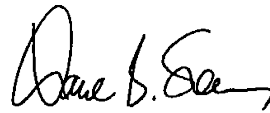
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This the 5<sup>th</sup> day of March, 2021.



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