

# Modeling Update

**SOUTH CAROLINA ELECTRICITY MARKET REFORM  
MEASURES ADVISORY BOARD**

**PRESENTED BY**

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**11/17/2022**

**PRESENTED FOR**

South Carolina EMMR  
Advisory Board



# Agenda

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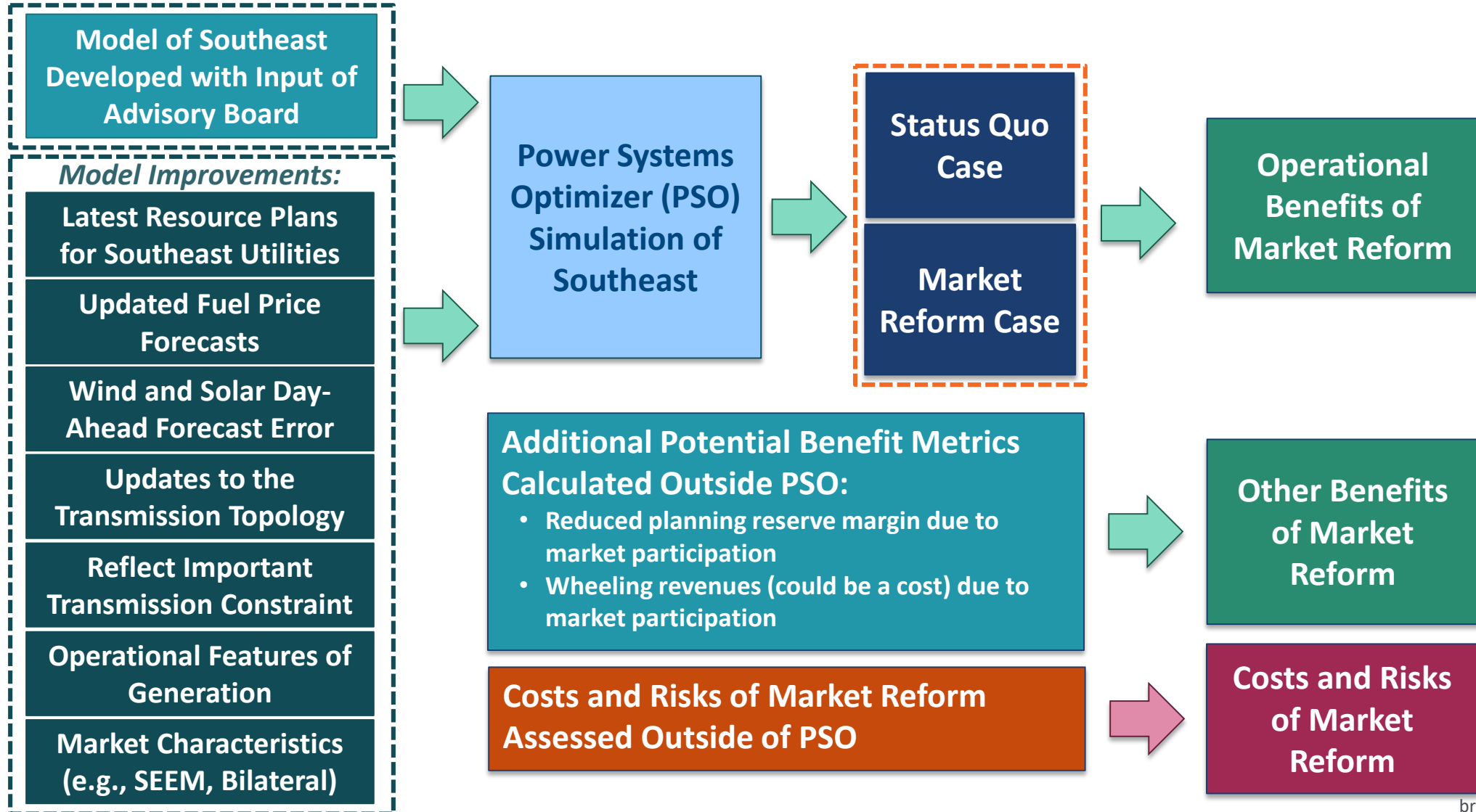
Next Steps

# Objectives for this Meeting

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- **Summarize ongoing data collection and model buildup efforts**
- **Discuss market reform modeling assumptions**
- **Share next steps**

# Review of Study Framework and Benefits Calculation



# Simulated Market Reform Options

We are planning to simulate four different market reform options that represent part of the spectrum of possible reform options

## Market Reform Options

Joint Dispatch Agreement in the Carolinas

Energy Imbalance Market in the Southeast

Southeast RTO  
(w/ Vertically Integrated Utility)

Carolinas in PJM RTO  
(w/ Vertically Integrated Utility)

*The analysis will need to start with an assessment of the Status Quo, including the SEEM*

- We model the entire Southeast, incorporating Advisory Board members' data
- We will simulate one 2030 scenario for each option and compare against the Status Quo

# Proposed Market Reform Options to Analyze

**Proposed Market Reform Options to Assess Qualitatively and Based on Experience in Other Jurisdictions**

**For market options not explicitly modeled, we would assess them based on the negative/positive experiences in other jurisdictions, and other credible analyses of costs, benefits, and risks that are applicable to South Carolina**

**Partial Retail Choice**

**Full Retail Choice**

**Additional Reforms of IRP Process**

**Generation Divestiture**

**Securitization of Retiring Thermal Assets**

**Retail Rate Re-Design**

**Community Choice Aggregation**

**Creation of Distribution System Operators**

# Modeling Steps And Progress Since Last Time

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## **Step 1 – Benchmark and Calibrate the Model (In Progress)**

- Simulate the Southeast using 2020 inputs to verify system dynamics
- Ensure that SEEM member entities and PJM are correctly represented

## **Step 2 – Create 2030 Status Quo Case (In Progress)**

- Model SEEM market
- Get input from the Advisory Board
- Update inputs to forecasted 2030 values

## **Step 3 – Test Market Reform Options**

- Model study market constructs
- Compare benefit metrics against status quo case



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# Carolinas Capacity Mix Evolution

Future resource mix tends to replace coal with gas and renewables

## Santee Cooper Changes:

- Winyah coal plant replaced mostly by gas CC and solar (~1.3 GW of new solar)

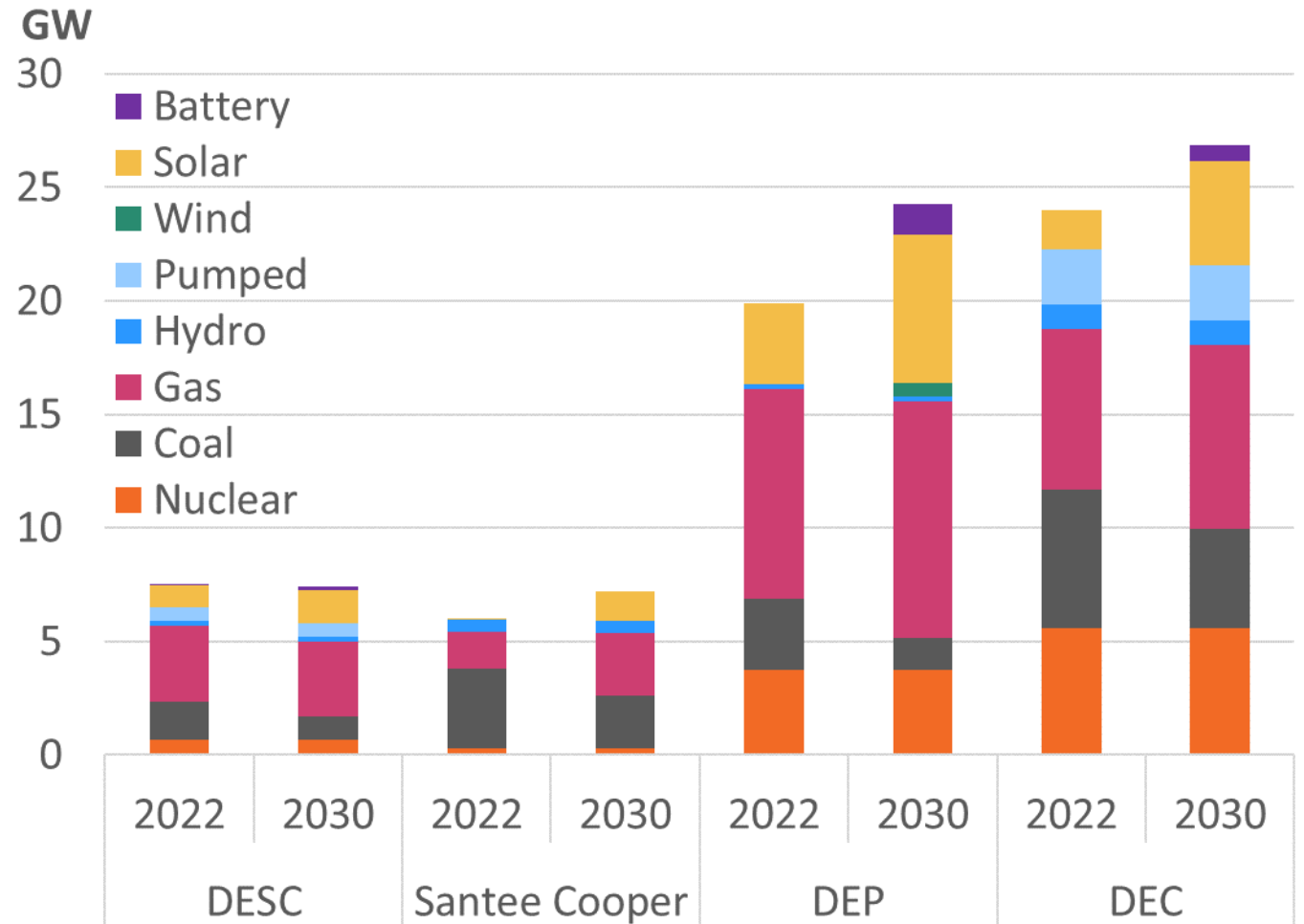
## Dominion Changes:

- Replace Wateree coal ST
- Add 472 MW solar, 140 MW storage

## Duke Changes:

- Marshall, Rogers, Roxboro, and Mayo coal replaced by gas and RE
- ~6 GW new solar, 2.1 GW new storage, and 600 MW new wind

Modeled Capacity Mix 2020 vs. 2030



# Resource Mix Assumption – Special Issues

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- **Winyah coal plant replacement**
  - We’ve discussed resource plans with Santee and Central
  - Proposed assumption: given uncertainty of resource plans, we assume Santee builds a smaller CC to replace its need from Winyah’s retirement; Central’s procurement will also be mostly new gas CC
- **Uncertainty related to PMPA member future resource supply**
  - Our assumption: PMPA will continue to own share of Catawba; with a mix of gas, solar, and storage filling remaining supply need from Santee Cooper
- **Impact of IRA tax credits**
  - IRP processes are continuing to evaluate the impact of these tax credits; we are still working with utilities to see how that will impact resources plans
- **Duke plans to consolidate its two BAs, subject to approval**
  - Our assumption: model Duke as a single BA in 2030

# Fuel Prices

Henry Hub gas price forecasts provided by the utilities are within 20% of each other

- All are slightly lower than Chicago Mercantile Exchange (CME) futures

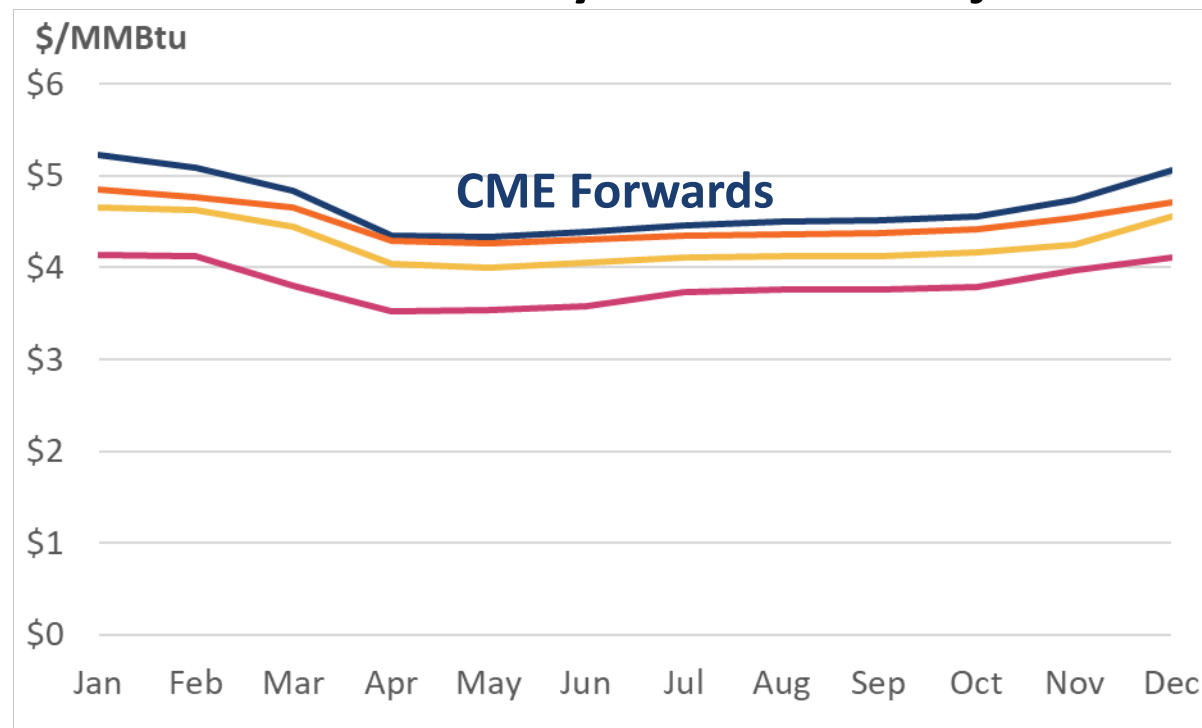
We intend to use the Henry Hub forecast that is in the middle of the range (orange line on chart)

- **Basis differentials** and **delivery adders** for each unit provided by the utilities

Other fuel costs provided by utilities:

- Plant-specific coal prices
- Fuel oil price forecasts above \$20/MMBtu

## Nominal 2030 Henry Hub Price Projections



Source: [CME Group](#) Henry Hub Natural Gas Option Quotes as of Oct 28, 2022

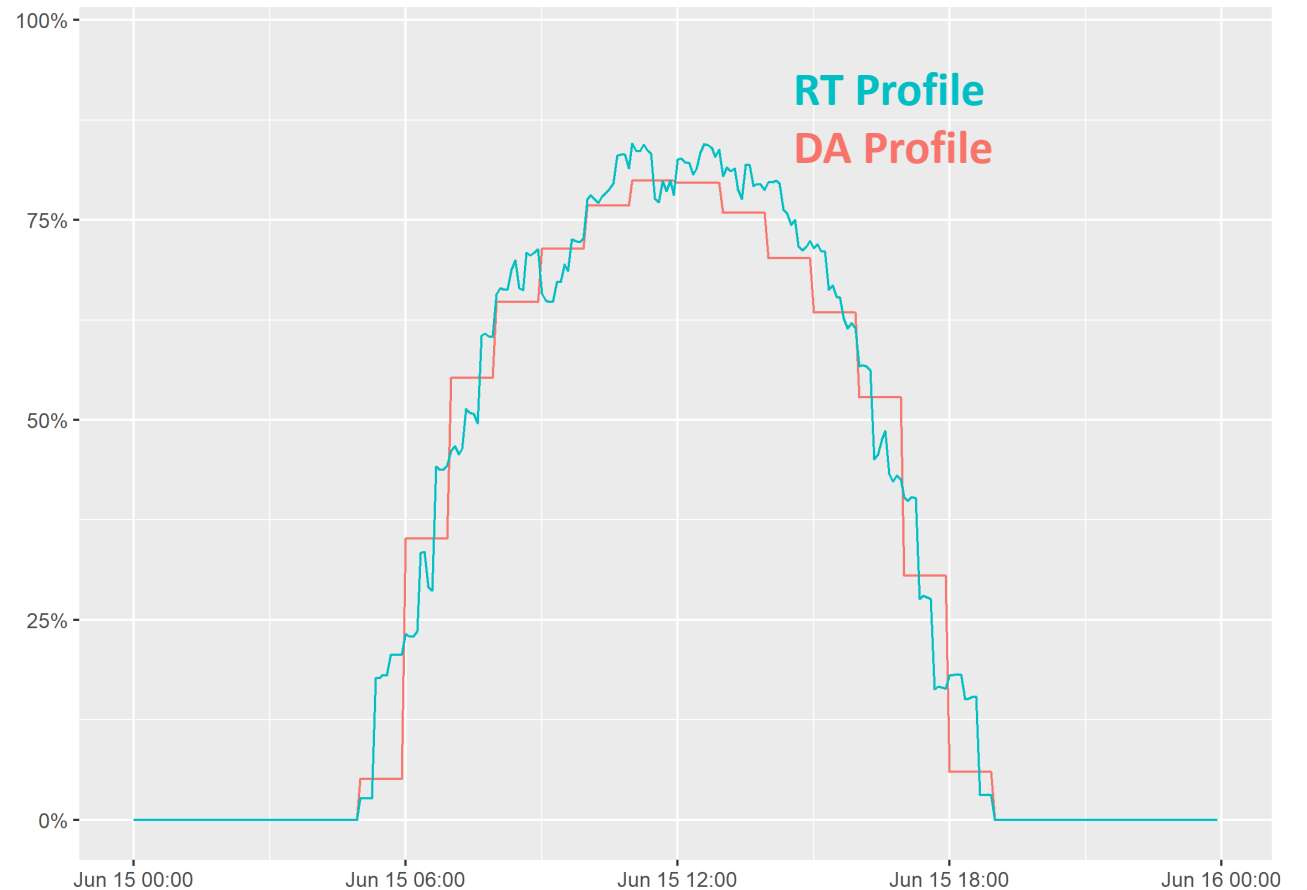
# Day Ahead Forecast Uncertainty

Duke provided mean absolute percentage errors (MAPEs) for two years of load and solar forecasts in both of its BAs.

We will use these MAPEs to apply forecast uncertainty across all time horizons modeled:

- Renewables will vary between the day-ahead, SEEM, and real-time solution cycles in the model

## Illustrative Synthesized RT Solar Output Profile



# Other Data Collected

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Additional model enhancements include:

- **Demand Forecasts**
- **Transmission** inputs
  - Historical transfer capabilities and transfers
  - GA/SC border constraints
  - Expected new facilities
- **Operating reserve** requirements and sharing groups
- **Hydrological modeling assumptions**
- Discussions on, trading, market participation, and operational strategy inform our modeling assumptions

# Data Collection Matrix

## Data collection is largely finished.











- We have a few remaining questions as we sort through data collected
- We are now implementing it into the model

 = Data collected and implemented in model

 = Data collected and being implemented

 = Some outstanding items/questions

## Data Collection Status

Generation Operational	
Future Generation Resource Mix	
Fuel Price Forecasts	
Transfer Capabilities	
Demand Forecasts	
Forecast Uncertainty	
Transmission Upgrades	
SEPA Hydro Budgets	
Market Participation Parameters	
System Operation Discussions	

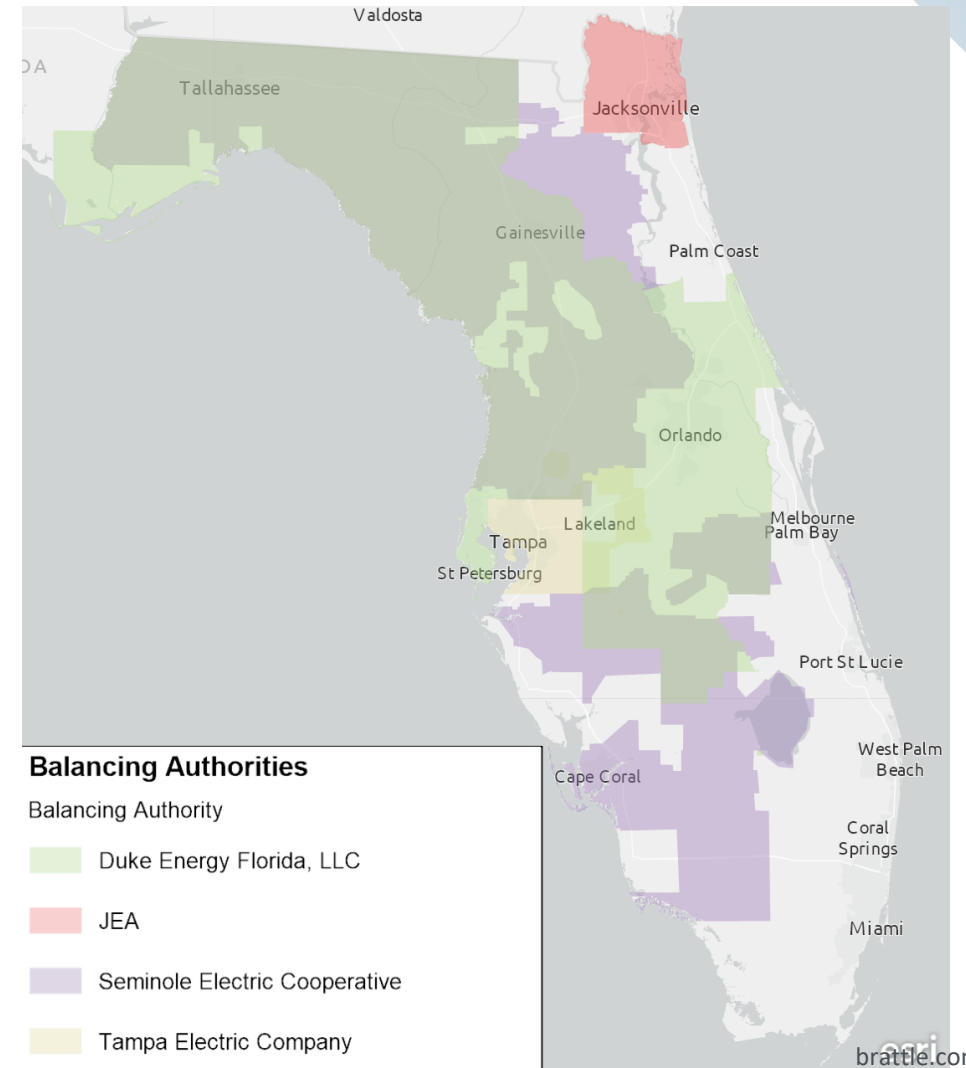
# Expanded SEEM Footprint

On October 11, 2022, four Florida utilities expressed their intent to join the SEEM by Mid-2023

We are currently adding these entities to the model

- Dataset licensed from Enelytix
- Ten-Year Site Plans will inform assumptions
- Non-SEEM entities grouped into “FL-Other” area

## Florida SEEM Participants





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**Market Modeling Assumptions**

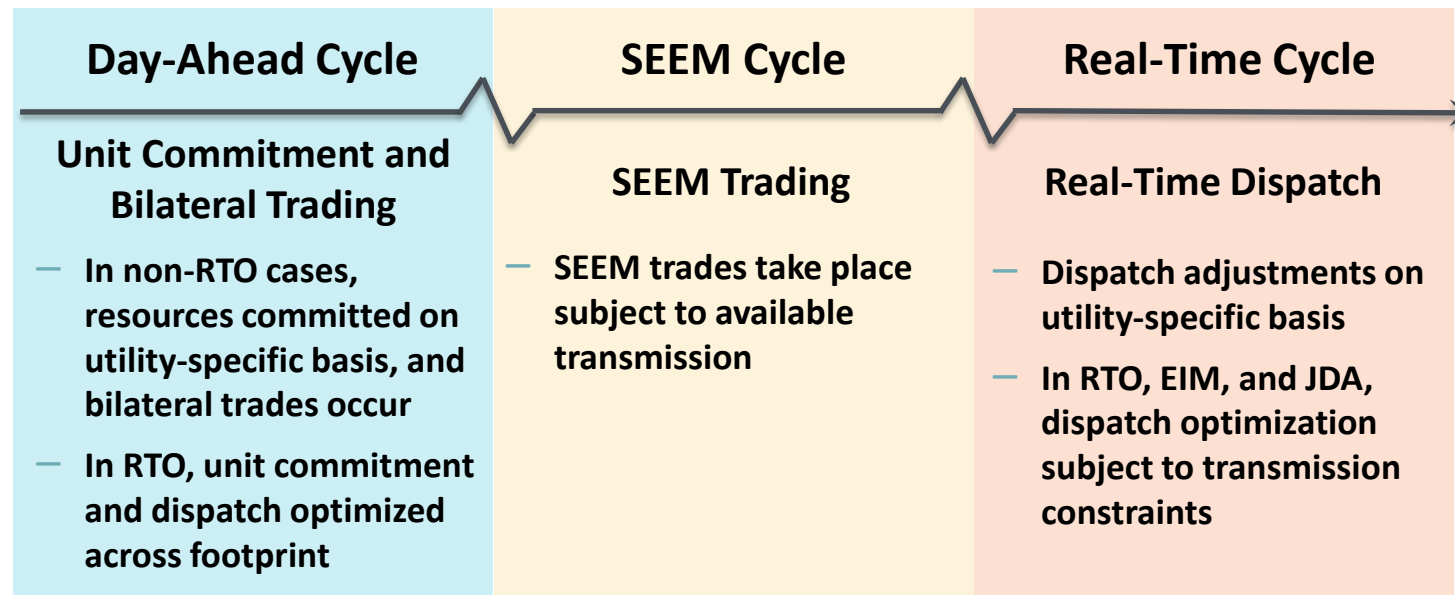
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Next Steps

# Simulating Wholesale Markets

We model sequential decision cycles to capture operational decisions under different market structures (e.g., bilateral, SEEM, EIM, RTO, etc.)

- Market structures are differentiated in our model through the following assumptions:
  - Wheeling fees and hurdle rates between utilities
  - Transmission availability for market transactions
  - Pooled (or not pooled) unit commitment and dispatch decisions
  - Reserve requirements



# Market Reform Assumptions

Cycle	Status Quo	Carolinas JDA	EIM	Southeast RTO	Carolinas in PJM
<b>Commitment</b>					
DA	Utility-Specific	Utility-Specific	Utility-Specific	Market-Wide	Market-Wide
SEEM	Hold DA Commitment	Hold DA Commitment	-	-	-
RT	Fast Start Commitment	Fast Start Commitment	Fast Start Commitment	Fast Start Commitment	Fast Start Commitment
<b>BA to BA Hurdles</b>					
DA	OATT rate + \$4 ED/\$8 UC	OATT rate + \$4 ED/\$8 UC	OATT rate + \$4 ED/\$8 UC	No Hurdle	No Hurdle
SEEM	\$2 hurdle	\$2 hurdle*	-	-	-
RT	High Hurdle To Limit Trades	\$0.50 hurdle	No Hurdle	No Hurdle	No Hurdle
<b>Transmission Capability</b>					
DA	Based on Historical Usage	Based on Historical Usage	Based on Historical Usage	Physical Limits Only	Physical Limits Only
SEEM	Historical - DA trades**	Historical - DA trades**	-	-	-
RT	Historical - DA - SEEM	Historical - DA - SEEM	Physical Limits - DA Trades	Physical Limits Only	Physical Limits Only
<b>Reserves</b>					
	Utility-specific (w/ sharing groups)	Utility-specific (w/ sharing groups)	Utility-specific (w/ sharing grps); spin diversity benefit	Market-wide sharing	Market-wide sharing
<b>Look-Ahead (Hours)</b>					
DA	48	48	48	48	48
SEEM	1	1	-	-	-
RT	2	2	2	2	2

\* We intend to model CAR as a single, joint entity in SEEM

\*\* To be calibrated based on initial data from SEEM and further discussion of model results

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Implement data gathered from Advisors into model

- Historical transmission availability
- Transmission upgrades
- DA/RT uncertainty
- Reserves

Model change cases for each market reform options

Evaluate benefits of market reform

Calculate costs and risk of market participation

Share preliminary results with Advisory Board