Integrated Resource Plan
Stakeholder Engagement Meeting Series

Stakeholder Meeting # 3 – July 26, 2023

Welcome and Update

Tony Cunningham
General Manager

Agenda

Cantrece Jones
Acuity Design Group

IRP Stakeholder Meeting # 3 Agenda

GRU Updates

Eric Walters, GRU Interim Chief Sustainability Officer

Review of Stakeholder Meeting # 2

Cantrece Jones, Acuity Design Group Team

IRP Scenarios and Sensitivities

Brad Kushner, Acuity Design Group Team

Open Discussion & Next Steps

Cantrece Jones, Acuity Design Group Team

GRU Updates

Eric Walters
Interim Chief
Sustainability Officer

IRP Purpose

What will we accomplish during this process?

The purpose of this IRP is to create an actionable resource plan to meet the community's future energy needs that is:

- **Reliable**
- **Sustainable**
  - **People**
  - **Economic**
  - **Environmental**

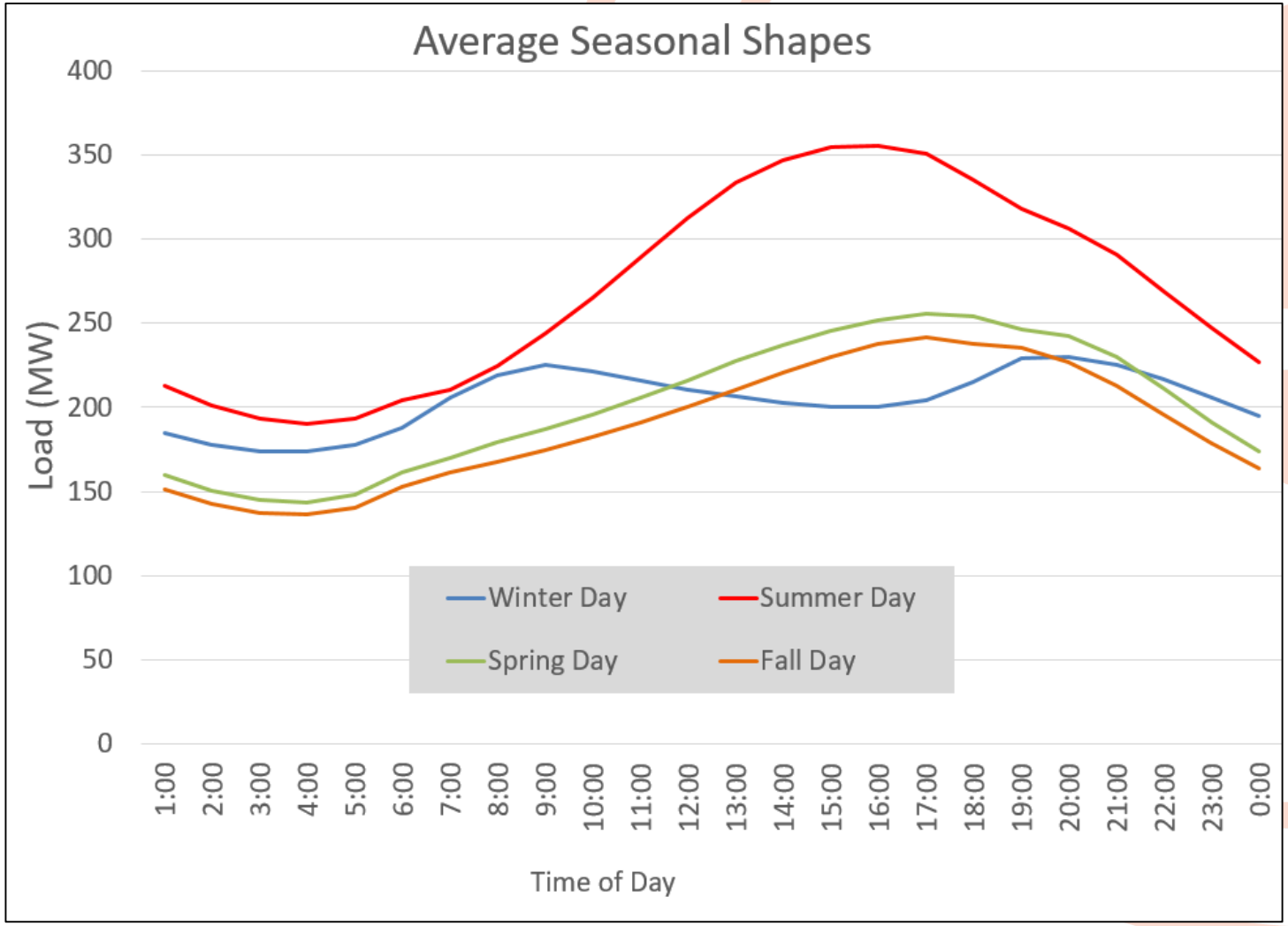
Welcome

Cantrece Jones
Acuity Design Group

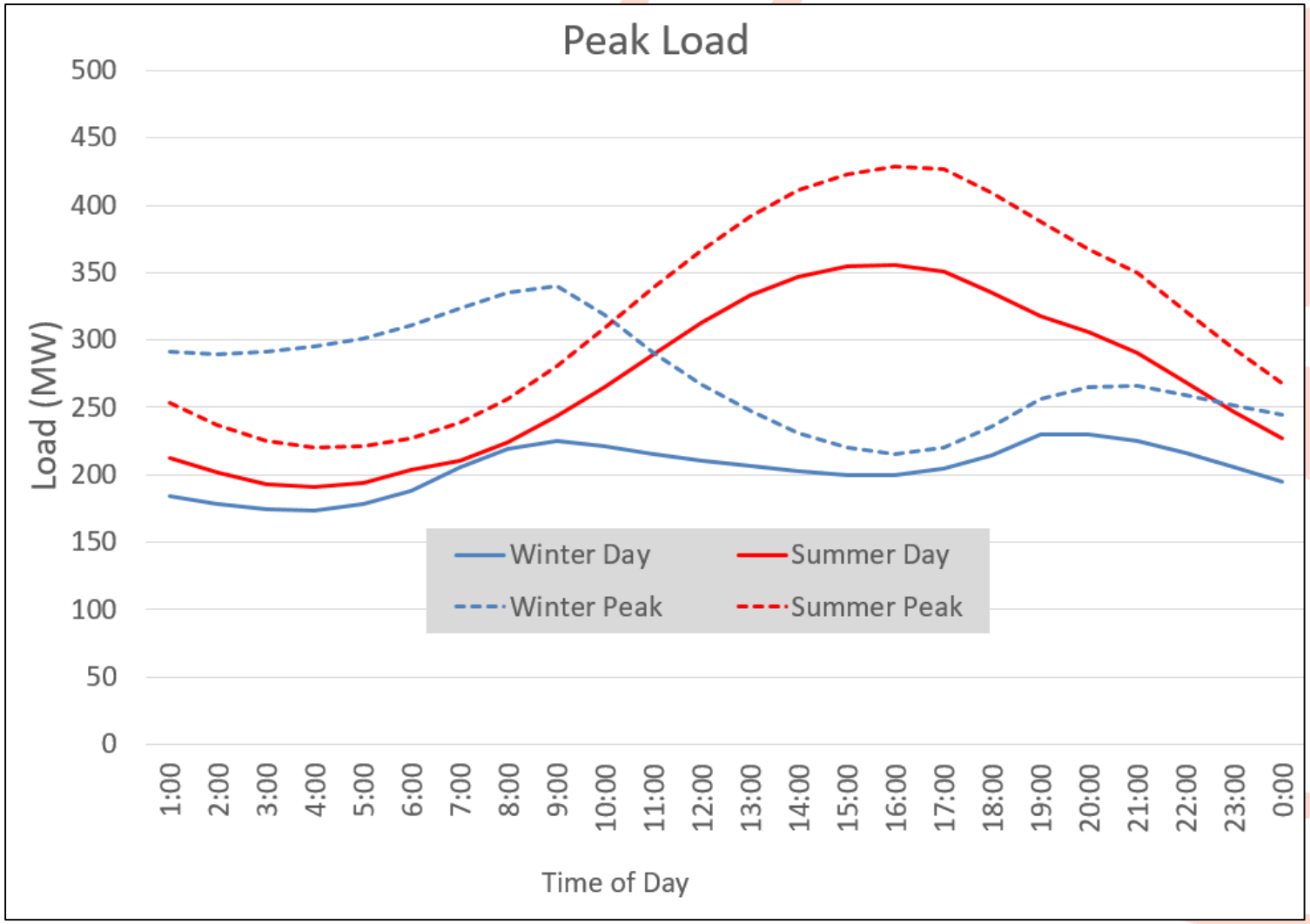
Stakeholder Meeting # 2 Recap

- Feedback from Stakeholder Meeting #2
- Stakeholder Survey
- Questions/Comments

Typical GRU Seasonal Hourly Demand



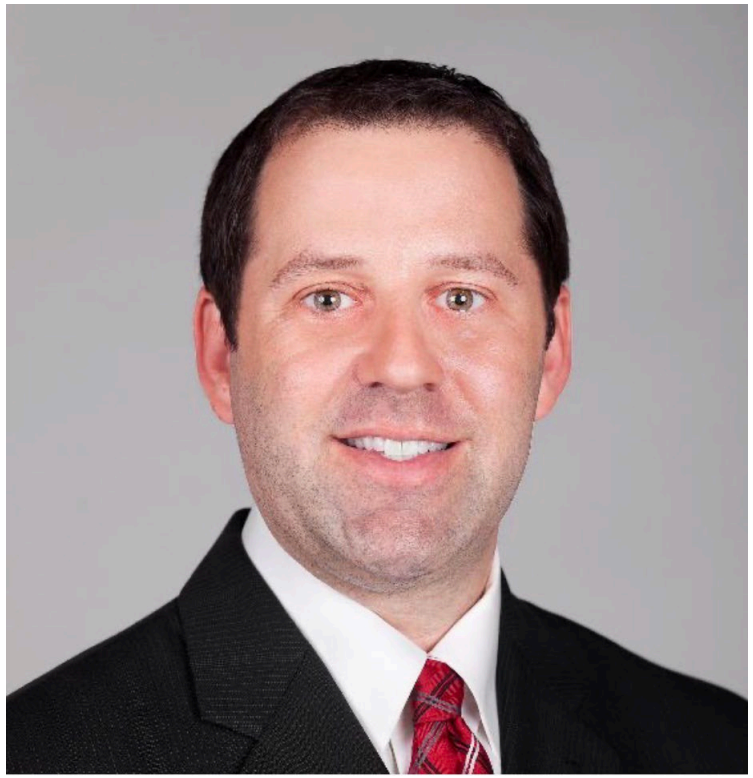
GRU Peak Hourly Demand



Other Comments from Stakeholder Meeting #2

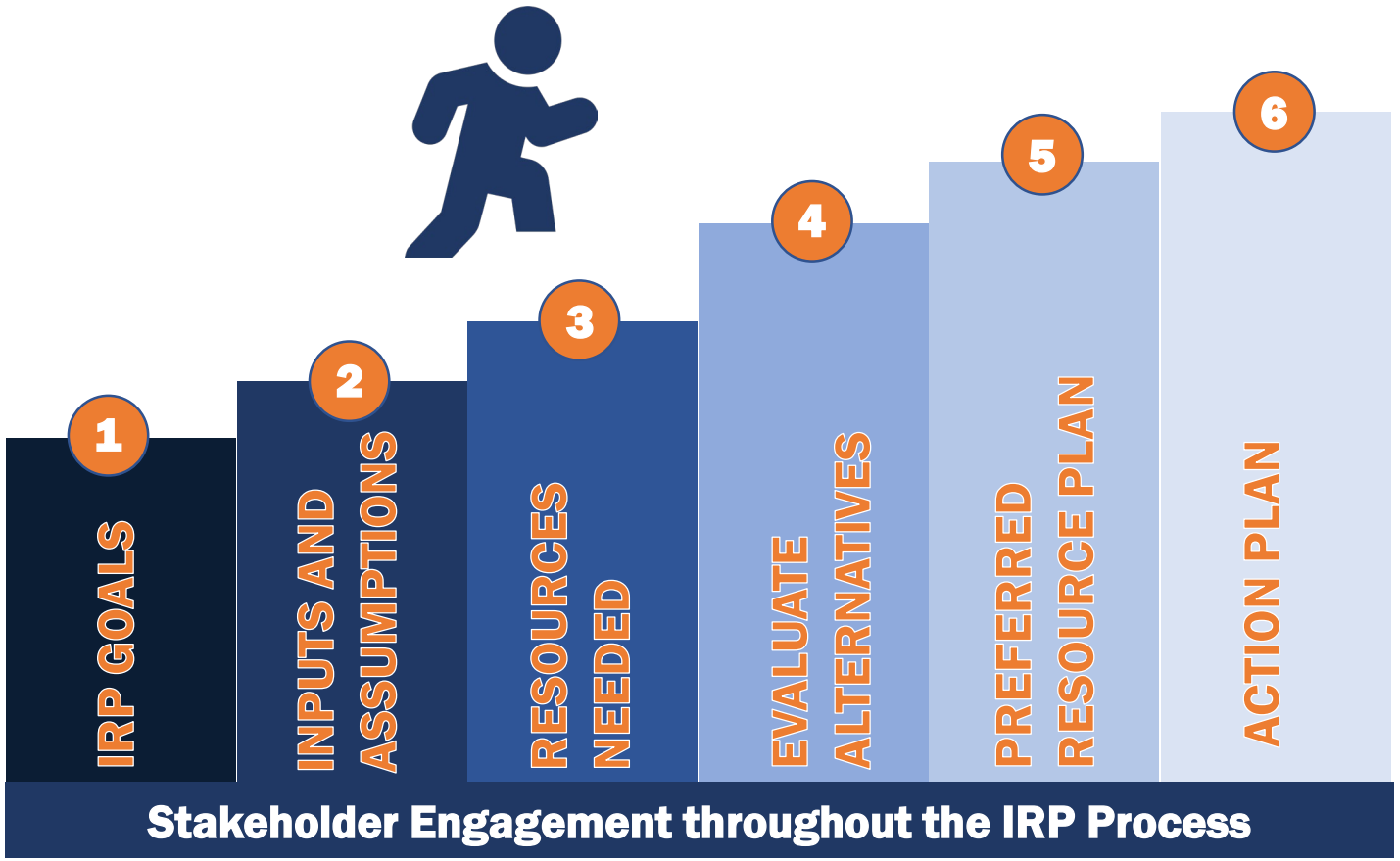
- **Demand-Side Management**
  - **Will be addressed in discussion of Scenarios and Sensitivities**
- **Social Cost of Carbon**
  - **Will be addressed in discussion of Scenarios and Sensitivities**
- **Discount Rates**
  - **For discussion during July 26, 2023 Stakeholder Meeting #3**
- **Retirement Dates for Existing Generating Units**
  - **Retirement dates outlined in previous Stakeholder Meetings and being evaluated in IRP are reasonable for planning purposes**
  - **Retirement dates may be adjusted as part of GRU's ongoing resource planning process**

IRP Scenarios and Sensitivities



Brad Kushner
Acuity Design Group

The IRP Process



IRP Scenarios and Sensitivities

- **Used to identify robust resource plan across a range of potential futures**
- **Scenario**
  - **Consideration of changes to multiple IRP Variables simultaneously to analyze a potential future**
- **Sensitivity**
  - **Consideration of changes to one of the IRP Variables at a time within a given potential future**

IRP Scenarios and Sensitivities

- **Examples of IRP Variables**
  - **Economic Parameters**
  - **Load Forecast**
  - **Existing and Planned Resources**
  - **Need for Capacity**
  - **Fuel Prices**
  - **New Supply-Side Resources**

IRP Scenarios

- **IRP to Consider the Following Scenarios**
  - **Baseline Scenario**
  - **High Utility-Scale Renewables in Southeast US**
  - **Rapid Electrification**
  - **High Inflation**

IRP Scenarios

- **Baseline Scenario reflects current expected future conditions:**
  - **Inflation and discount rates**
  - **Load forecast**
  - **15% reserve margin**
  - **Electrification/electric vehicles and distributed generation**
  - **Power import capability**
  - **Prices for off-system/market power purchases**
  - **Fuel prices**
  - **Solar photovoltaic (PV), battery storage, and natural gas-fired resource prices**
  - **No carbon dioxide (CO_2) emissions regulations**

IRP Scenarios

- **High Utility-Scale Renewables in Southeast US**
  - **20% reserve margin**
  - **Higher prices for off-system/market power purchases**
  - **Higher prices for new solar PV and battery storage**

IRP Scenarios

- **Rapid Electrification**
  - **Load forecast reflects:**
    - **Increased electrification**
    - **Increased adoption of electric vehicles**
    - **Increased distributed generation**
  - **Higher prices for off-system/market power purchases**
  - **Higher natural gas prices**
  - **Higher prices for new solar PV, battery storage, and natural gas-fired resources**

IRP Scenarios

- **High Inflation**
  - **Higher inflation and discount rates**
  - **No load growth**
  - **Higher prices for off-system/market power purchases**
  - **Higher natural gas prices**
  - **Higher prices for new solar PV, battery storage, and natural gas-fired resources**

IRP Sensitivities

- **Demand-Side Management**
  - Reduce peak demand and net energy for load by 5% by 2034
- **No Load Growth**
  - Constant loads for entire IRP study period
- **Increased Import Capability**
  - Increased off-system/market purchase capability

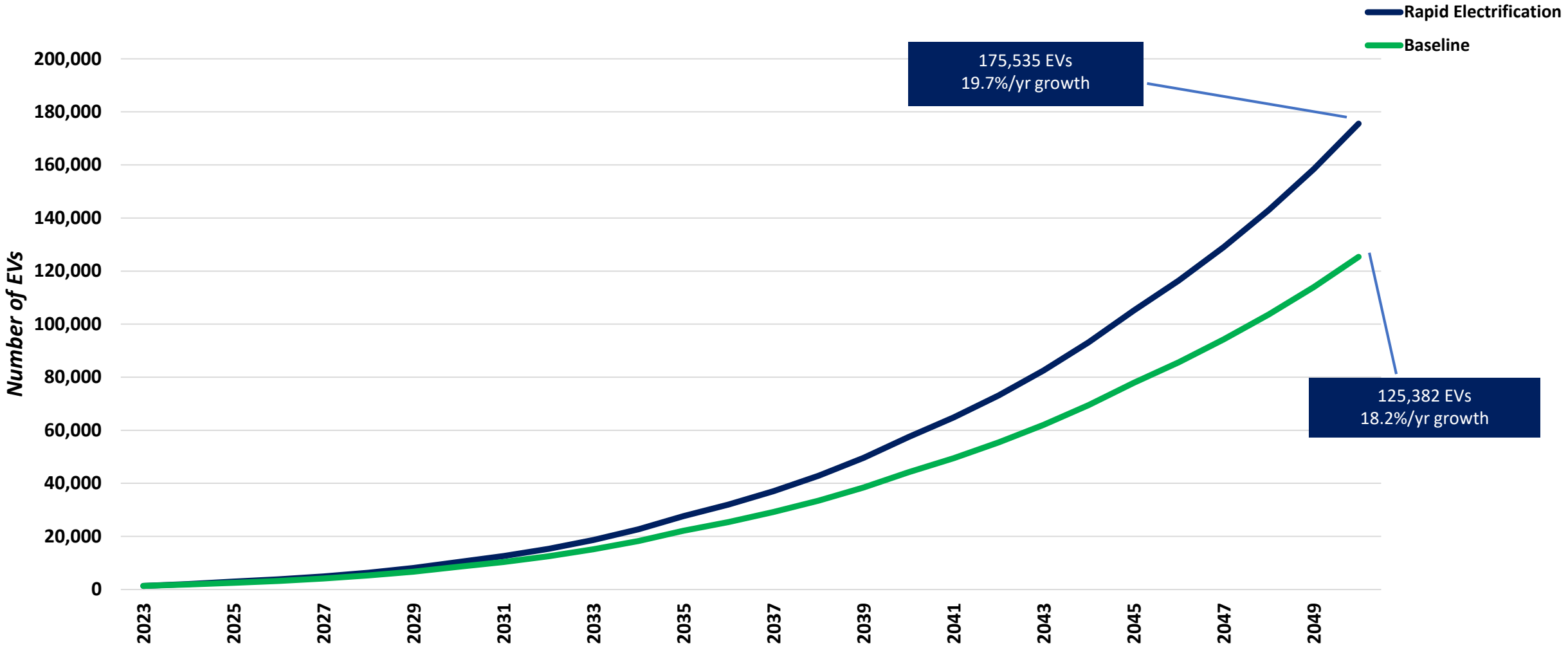
IRP Sensitivities

- **Carbon Tax**
  - Costs for emissions of carbon dioxide (CO_2)
- **2018 City Commission Resolution**
  - Net-zero CO_2 emissions by 2045
- **Significant CO_2 Reductions**
  - 75% reduction of 2005 actual CO_2 emissions by 2045

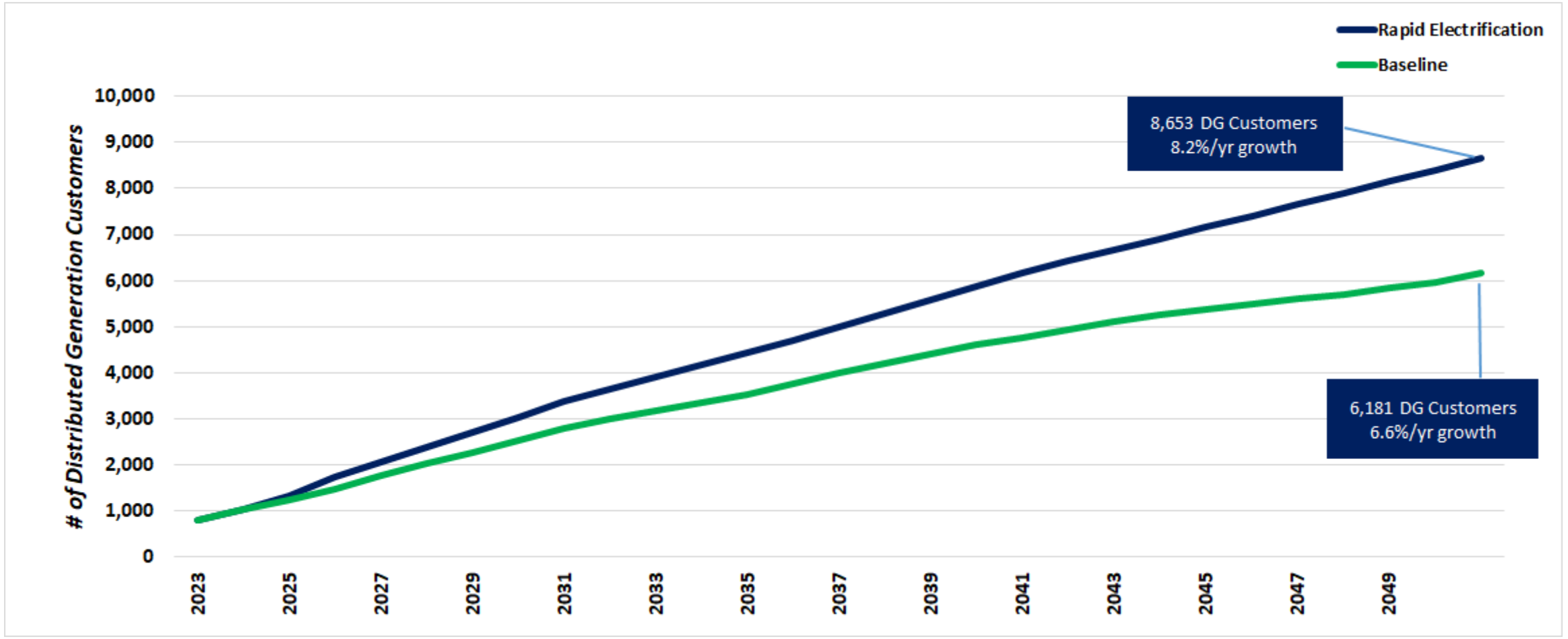
IRP Scenarios and Sensitivities

Variables	Scenarios				Sensitivities (Single Variable Change to Baseline Scenario)					
	Baseline	High Utility-Scale Renewables in Southeast US	Rapid Electrification	High Inflation	Demand-Side Management	No Load Growth	Increased Import Capability	Carbon Tax	2018 Renewable Resolution	Significant CO_2 Reductions
Inflation/Discount Rates	Base	Base	Base	High	Base	Base	Base	Base	Base	Base
Load Forecast (Peak Demand and Net Energy for Load)	Base	Base	High	No Load Growth	5% Peak/NEL Reduction	No Load Growth	Base	Base	Base	Base
Planning Reserve Margin	Base (15%)	High (20%)	Base (15%)	Base (15%)	Base (15%)	Base (15%)	Base (15%)	Base (15%)	Base (15%)	Base (15%)
Transmission Import	Base	Base	Base	Base	Base	Base	High	Base	Base	Base
Price of Off-System Power Purchases	Base	High	High	High	Base	Base	Base	Base	Base	Base
Natural Gas Prices	Base	Base	High	High	Base	Base	Base	Base	Base	Base
Cost of New NG Resources	Base	Base	High	High	Base	Base	Base	Base	Base	Base
Renewable Prices	Base	High	High	High	Base	Base	Base	Base	Base	Base
CO_2 Emissions Targets	None	None	None	None	None	None	None	None	Net Zero CO2 emissions by 2045	75% CO2 reduction from 2005 baseline by 2045
Cost for CO_2 Emissions	None	None	None	None	None	None	None	$62/ton starting 2030	None	None

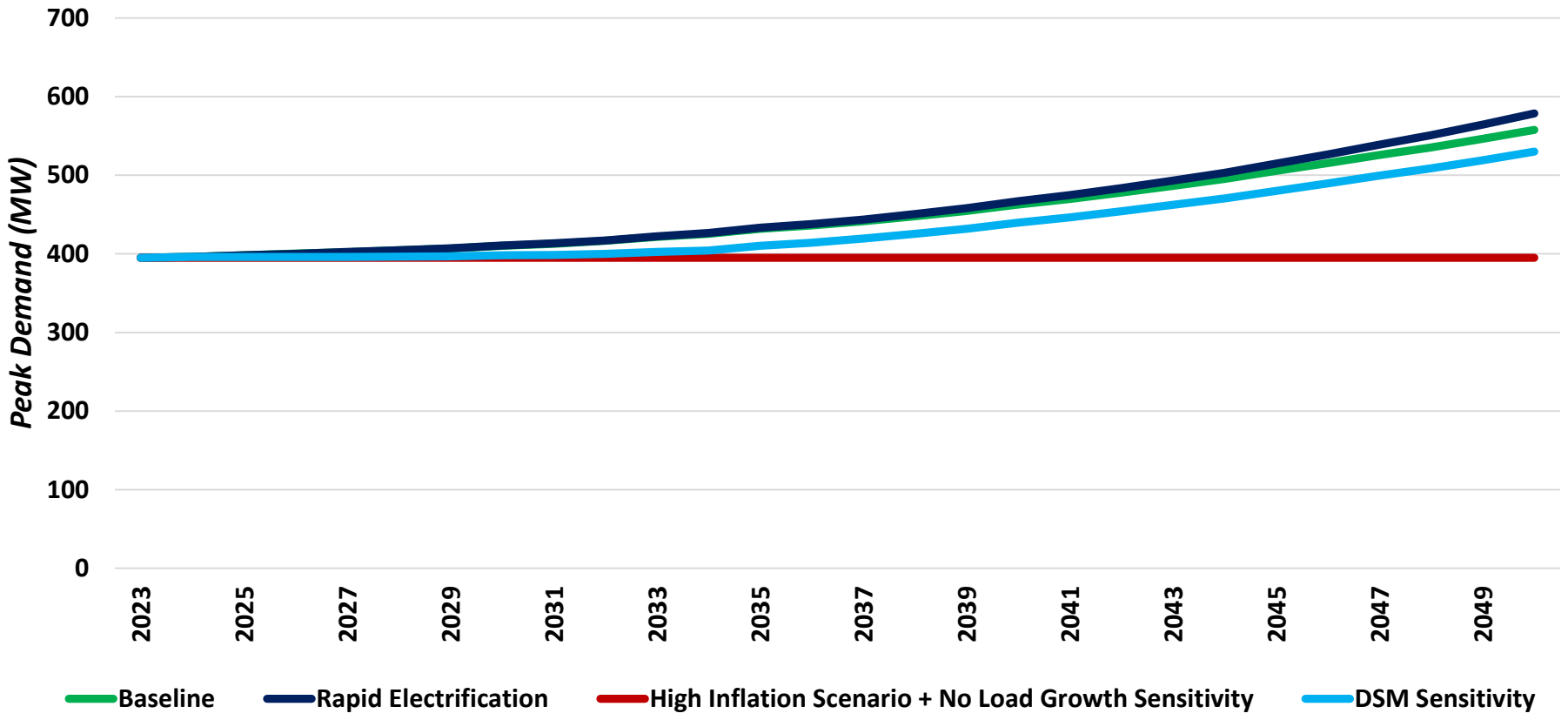
Projected Electric Vehicles



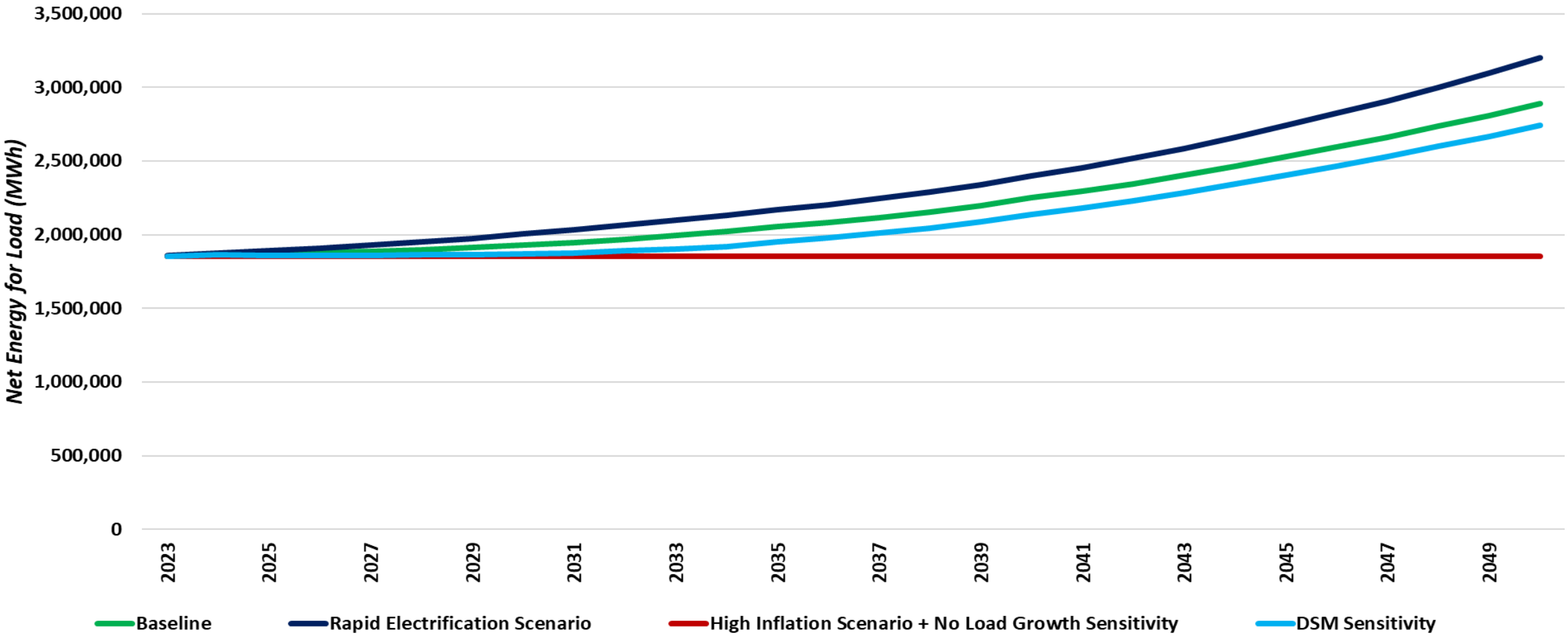
Projected Distributed Generation Customers



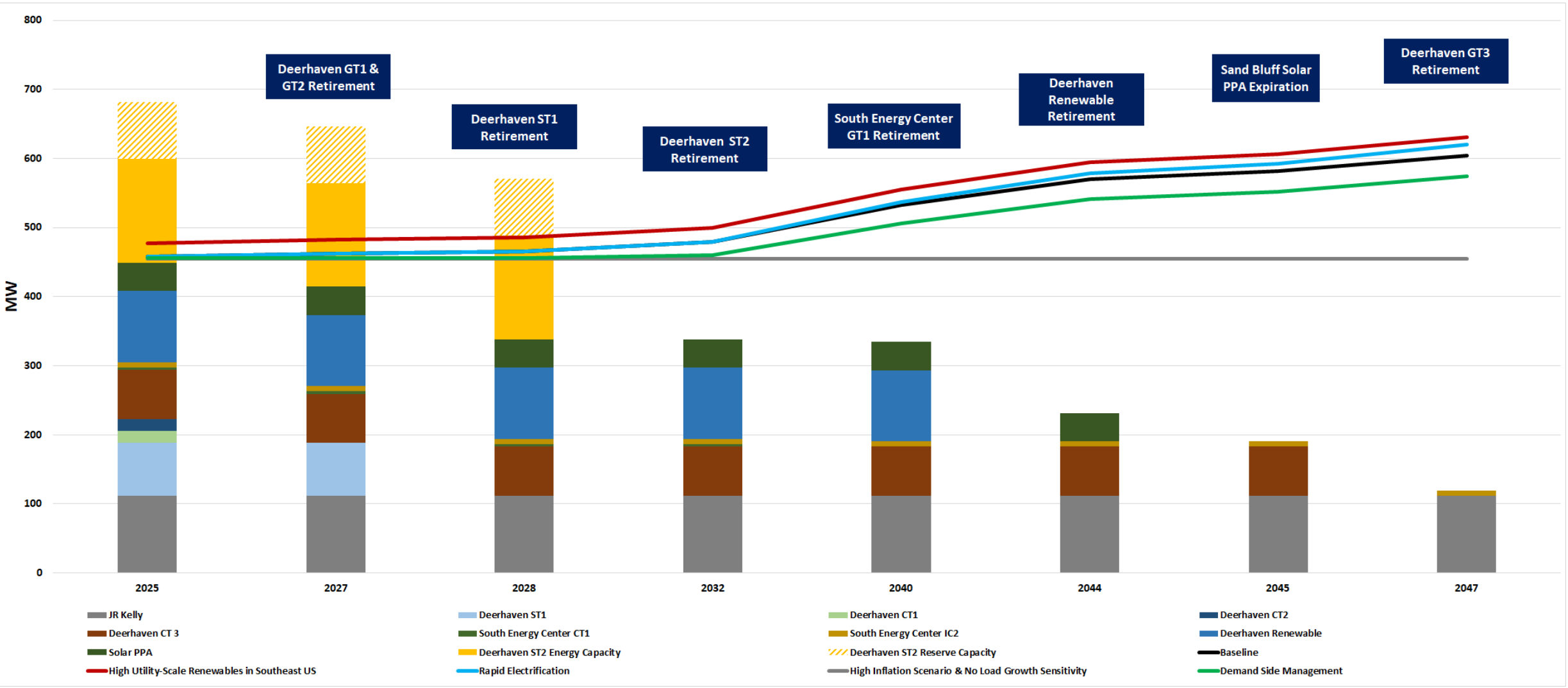
Peak Demand


700
600
500
400
300
200
100
0
Peak Demand (MW)
2023
2025
2027
2029
2031
2033
2035
2037
2039
2041
2043
2045
2047
2049
Baseline
Rapid Electrification
High Inflation Scenario + No Load Growth Sensitivity
DSM Sensitivity

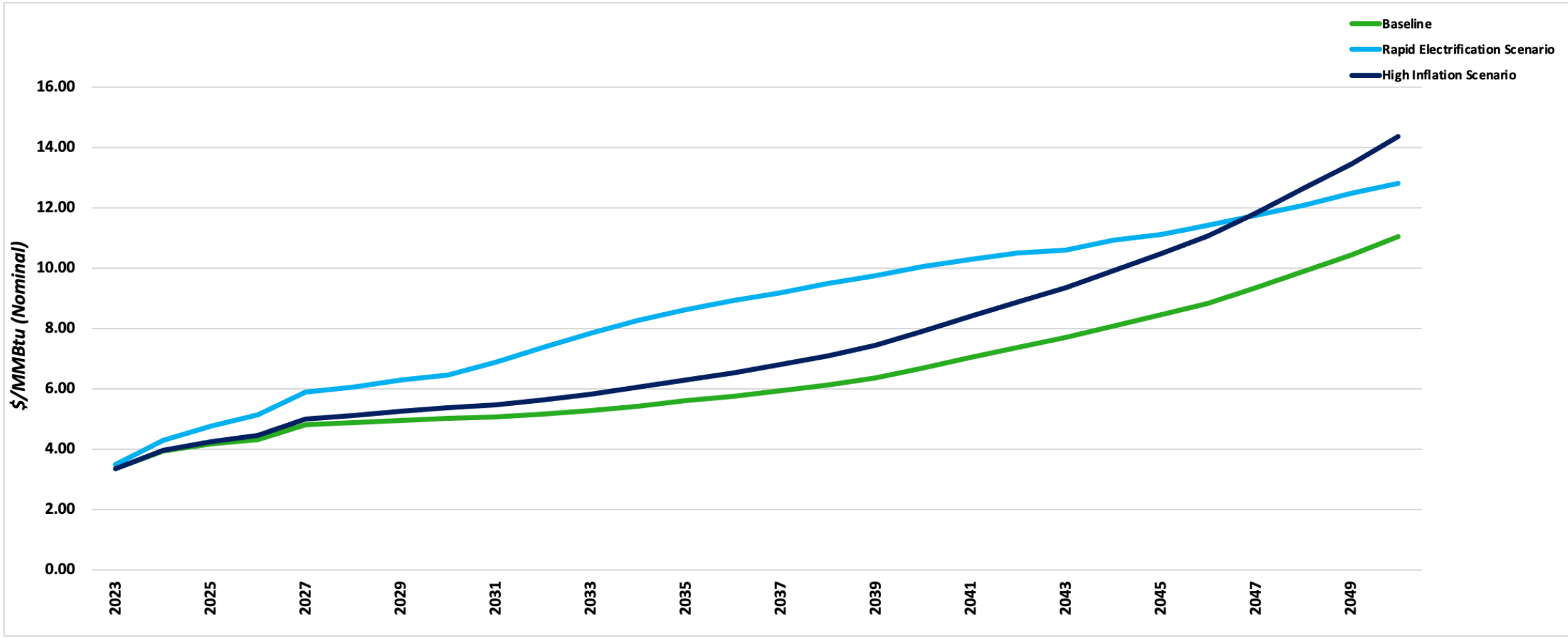
Net Energy for Load



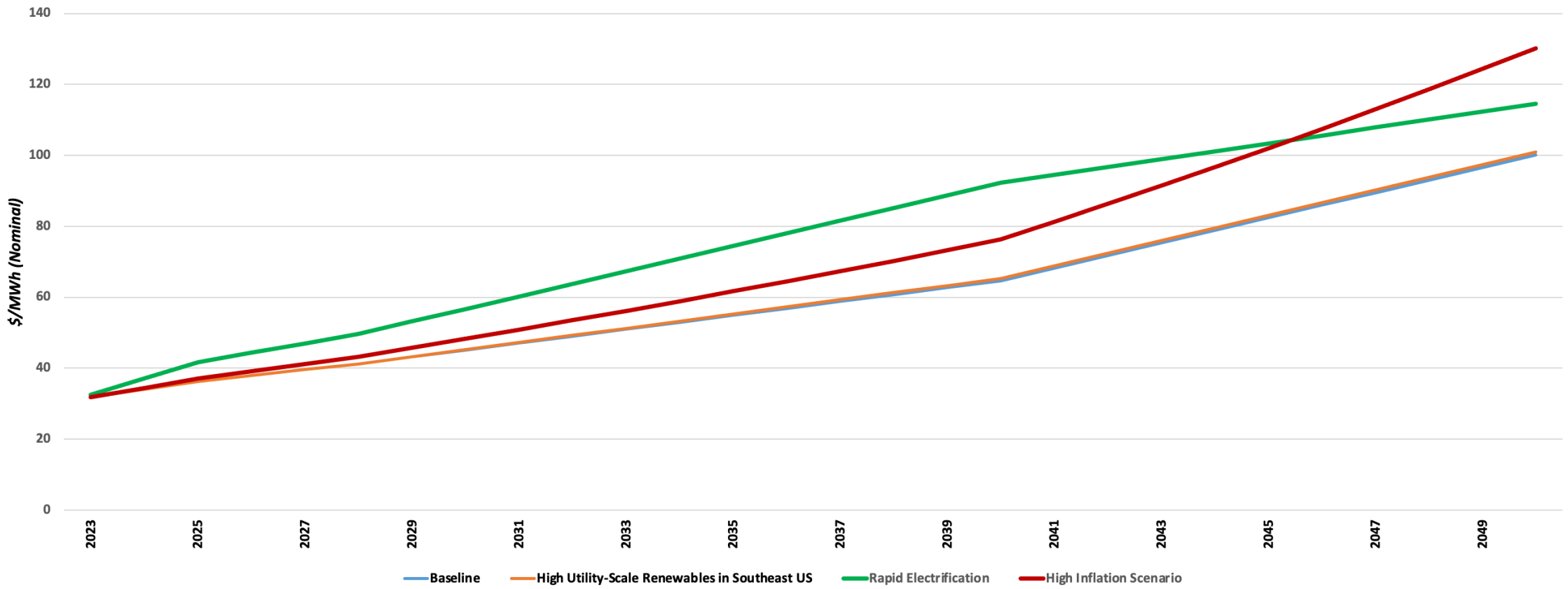
Need for Capacity



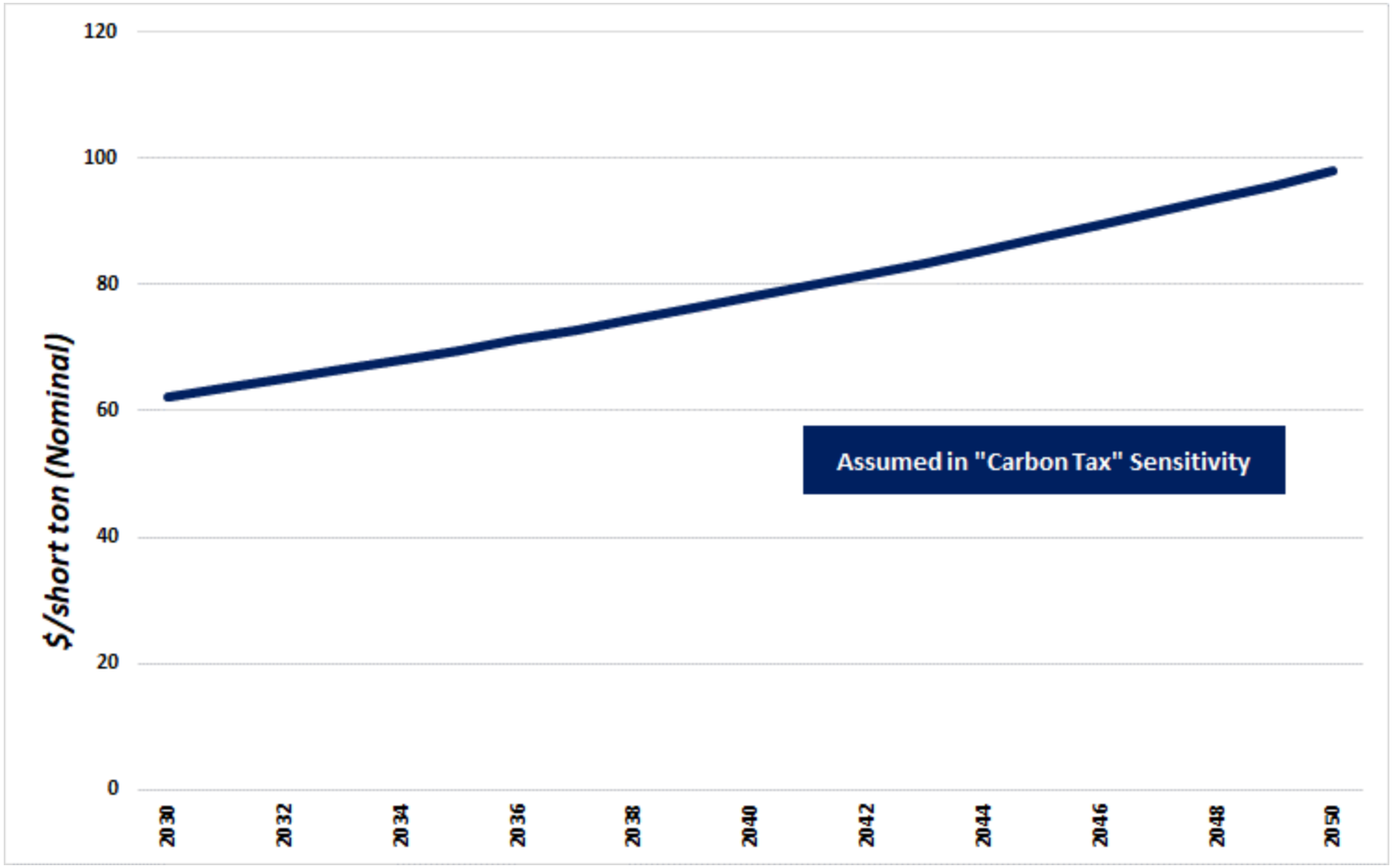
Price of Natural Gas Delivered to GRU



Price of Non-Firm Off-System Power Purchases



Carbon Tax

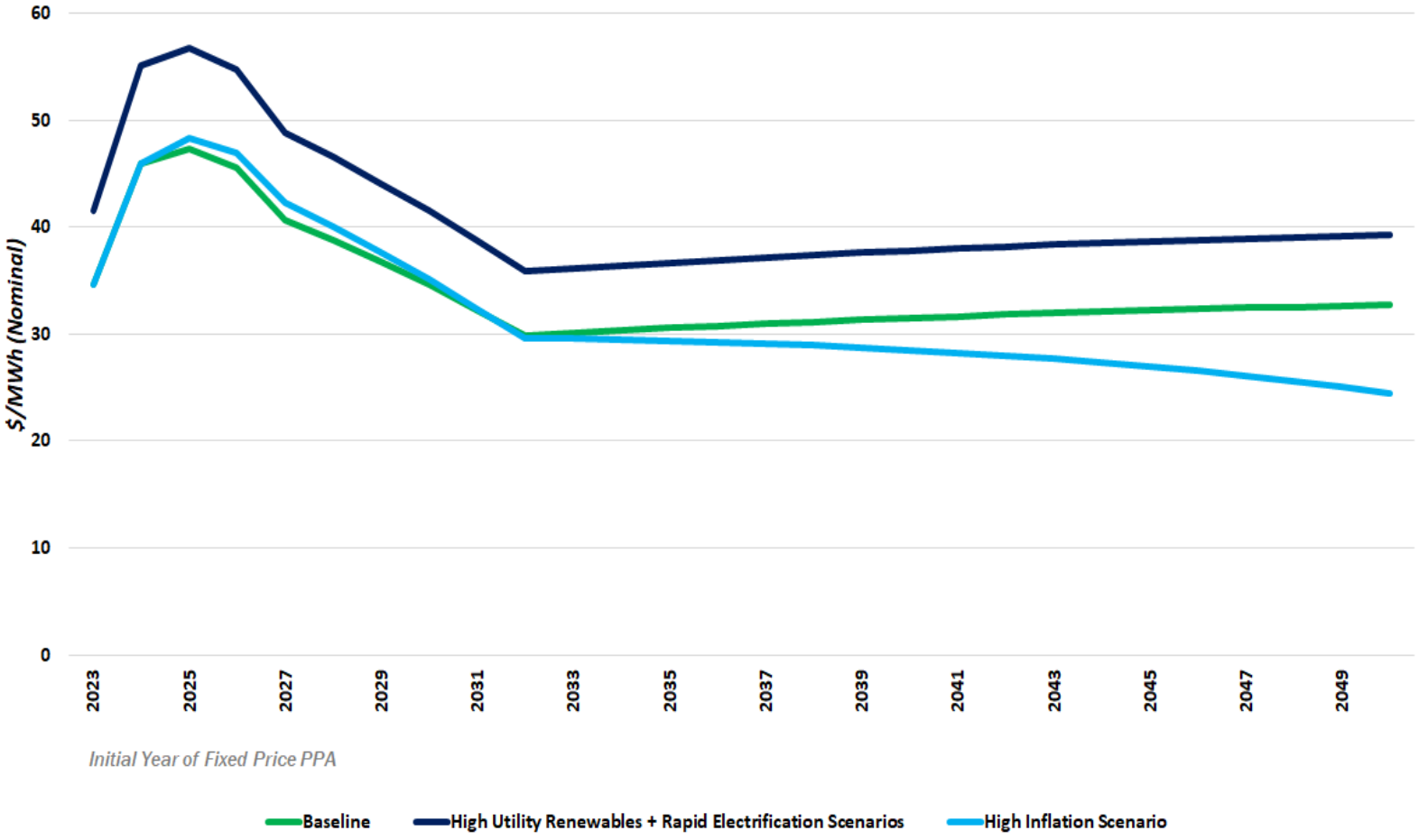


- Carbon tax assumed to begin in 2030
- Based on Feb-21 Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990
- Estimated 2020 cost of carbon of $51/MT ($46.27/short ton)
- Future values adjusted for inflation

Supply-Side Resources

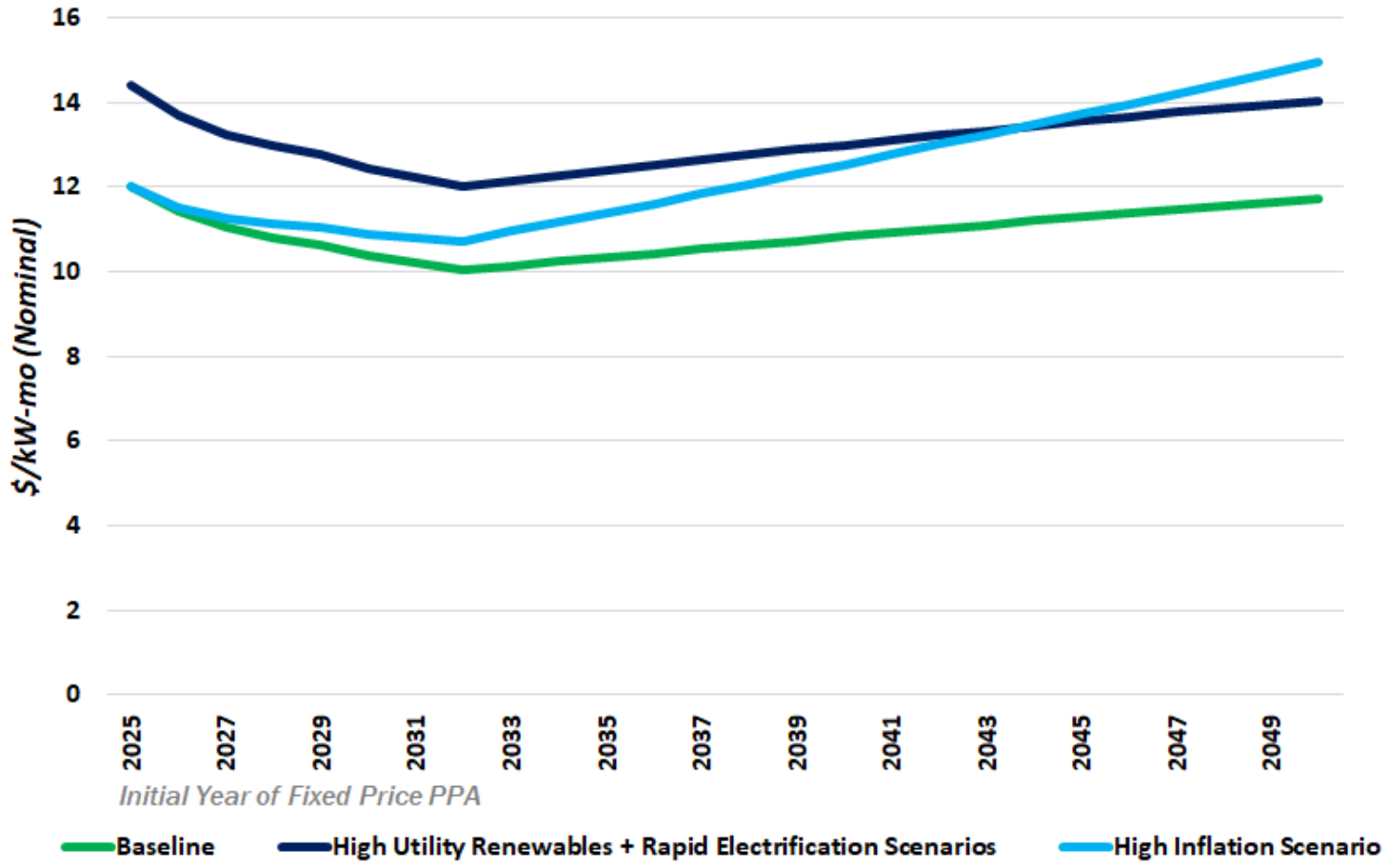
				Base Case		High Case (+20%)	
	Supply-Side Resource	Description	Max. Capacity Summer Net MW	Capital Costs 2023 $, Millions	Capital Costs per kW 2023 $, Summer	Capital Costs 2023 $, Millions	Capital Costs per kW 2023 $, Summer
GRU Owned	Combined Cycle Combstion Turbine	Siemens SGT-800 1x1	74.7	$162.3	$2,173	$194.7	$2,608
		Siemens SGT-800 2x1	143.5	$320.9	$2,236	$385.1	$2,683
		Siemens SGT-800 3x1	224.0	$471.7	$2,106	$566.0	$2,527
	Simple Cycle Combustion Turbine	Siemens SGT-800	52.4	$83.9	$1,601	$100.7	$1,921
		2 x Solar Titan 250	52.6	$97.2	$1,849	$116.6	$2,219
		2 x General Electric LM2500+G4	55.9	$123.7	$2,213	$148.5	$2,655
	Reciprocating Internal Combustion Engine	RICE - MAN 3x20 MW	59.0	$94.7	$1,605	$113.7	$1,926
	Nuclear[(Small Modular Reactors (SMR)]	Participant in 600 MW SMR project	100.0	$865.3	$8,653	$1,038.4	$10,384
	Biomass	Steam Turbine Fueled with Urban Waste Wood	30.0	$155.4	$5,180	$186.5	$6,216

Solar PV PPA Pricing



- **Based on utility scale solar PV (w/o energy storage) capital cost estimates in the 2022 Annual Technology Baseline produced by the National Renewable Energy Laboratory (NREL)**
- **Reflects benefits of Inflation Reduction Act incentives.**
- **20 Year PPA price is fixed for the entire contract period.**

Battery Storage PPA Pricing



- Based on battery energy storage overnight capital cost estimates in the 2022 Annual Technology Baseline produced by the National Renewable Energy Laboratory (NREL).
- 10 Year PPA price is fixed for the entire contract period.
- 4 Hour storage duration

Open Discussion and Next Steps

Cantrece Jones
Acuity Design Group

Open Discussion and Next Steps

- **Upcoming IRP Stakeholder Engagement Meetings**
  - **Meeting 4 – Preliminary Modeling Results 10/19/23**
  - **Meeting 5 – Refined Modeling Results and GRU's Path Forward 1/10/24**
- **We value YOUR feedback**