



# **Integrated Resource Plan Stakeholder Engagement Meeting Series**

**Stakeholder Meeting # 5 – January 10, 2024**

# Agenda



**Cantrece Jones**  
**Acuity Design Group**

**Integrated Resource Plan**  
Get Connected | A community engagement process.

2023 IRP STAKEHOLDER MEETING SERIES

# IRP Stakeholder Meeting # 5 Agenda

## **GRU Updates**

**Eric Walters, GRU Interim Chief Sustainability Officer**

## **Preliminary IRP Scenario and Sensitivity Modeling Results**

**Brad Kushner, Acuity Design Group Team**

## **Open Discussion & Next Steps**

**Cantrece Jones, Acuity Design Group Team**

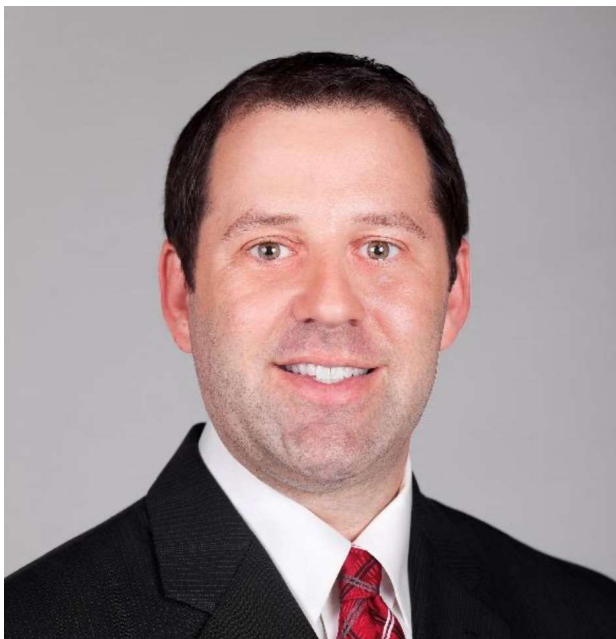
# GRU Updates



**Eric Walters**  
**Interim Chief**  
**Sustainability Officer**

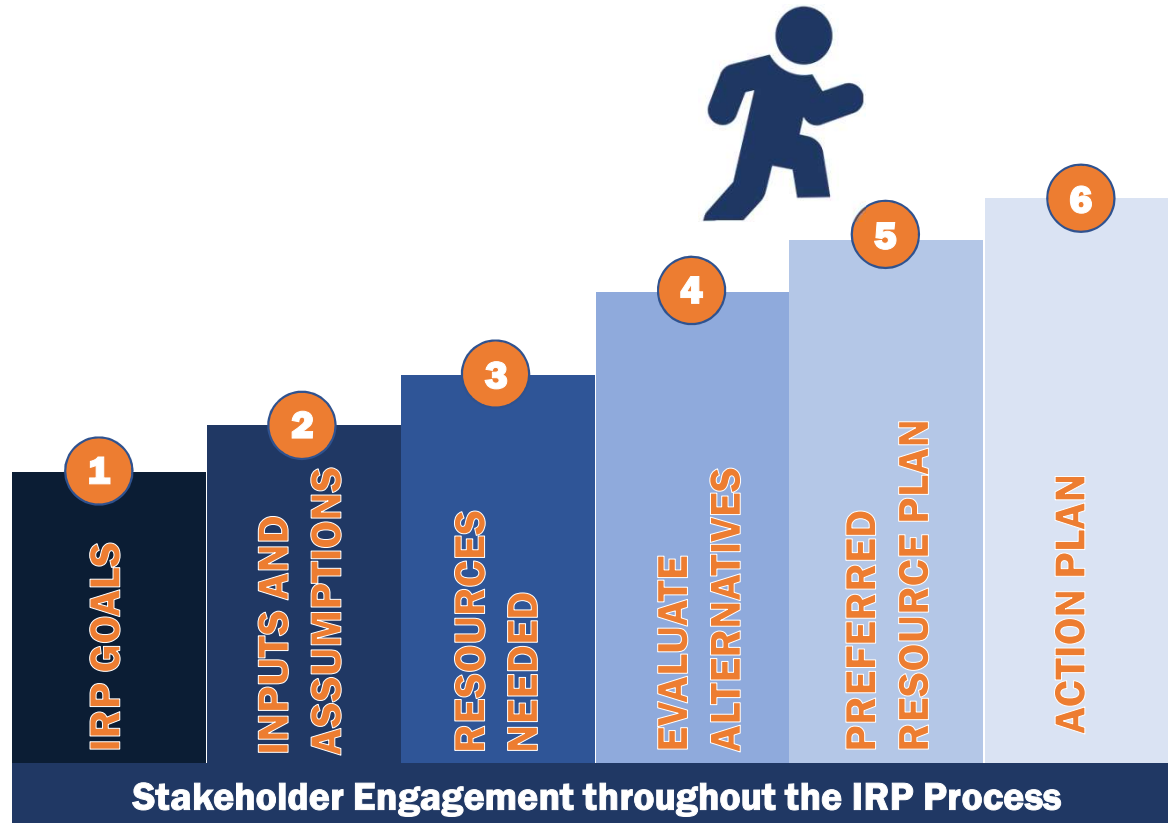
**Integrated Resource Plan**  
Get Connected | A community engagement process.

# Preliminary IRP Modeling Results



**Brad Kushner**  
**Acuity Design Group**

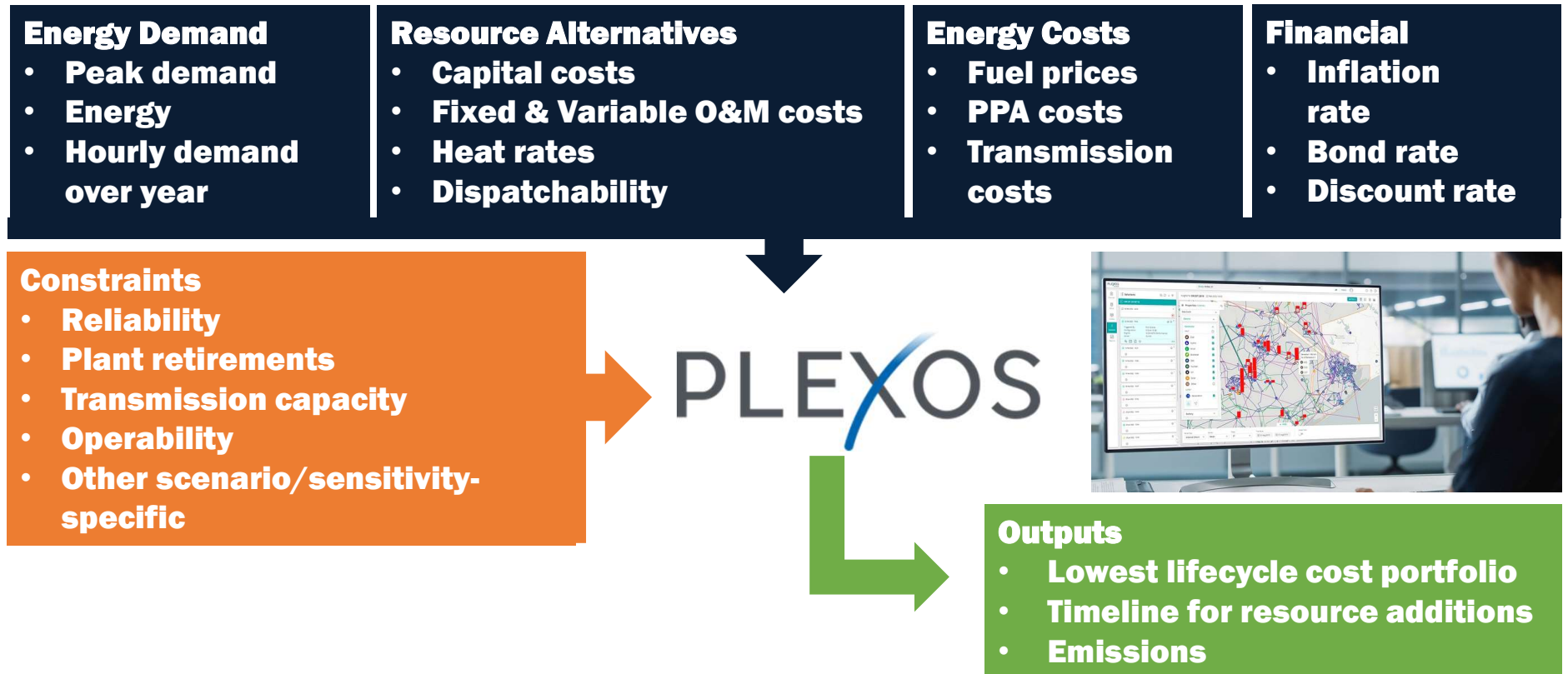
# The IRP Process



# IRP Analysis

- **Used Scenario and Sensitivity analyses 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**
- **Results presented herein are preliminary and subject to change**

# PLEXOS Model





# Transmission Considerations

- **Current Firm Import Capability**
  - 75 MW Summer
  - Up to 200 MW beginning 2028
  - Can be utilized to import solar energy or other purchased power
- **Additional Import Capability requires transmission upgrade**
  - +200 MW
  - Estimated cost of \$131M NPV (2023 dollars)
  - Modeled as an option in all scenarios and sensitivities

## **Solar Integration Considerations**

- **Firm capacity required in conjunction with solar**
  - **1:2 ratio of Firm capacity to Solar PV**
  - **Firm capacity options include thermal generation and batteries**
- **Contribution of Solar PV rated capacity available to meet peak demand**
  - **36% Summer; 0% Winter**
- **Solar PV additions limited to 75MW**
- **Must be at least 4 years apart for Tier 1**
  - **1 year to familiarize use of increasing inverter-based resources (i.e. Solar PV and Battery Storage)**
  - **3 years for ACE study/RFP process/permitting/construction**
- **Must be at least 3 years apart for Tier 2**

# Solar Integration Timeline Capability

Resource Location	Incremental Cost	Year Ranges Solar Can be Added	Maximum Incremental Nameplate Capacity Added (MW)	Maximum Cumulative Nameplate Capacity (MW)
Local (Tier 1)	PPA Cost	2025-2028 (Sand Bluff)	75	75
		2029-2032	75	150
		2033-2036	75	225
		2037+	50	275
External (Tier 2)	PPA Cost + Wheeling Cost	2040-2042	75	350
		2043-2045	75	425
		2046+	50	475
External (Tier 3)	PPA Cost + Wheeling Cost + Transmission Upgrade Cost (\$131M in 2023\$)	2049+	75	550

## Battery Storage Timeline Considerations

- **Battery storage additions limited to 50 MW every 3 years until 2033**
  - **Integration of inverter-based resource**
  - **Battery technology expected to advance in 10-year horizon**

<b>Resource Location</b>	<b>Incremental Cost</b>	<b>Year Ranges</b>	<b>Maximum Incremental Nameplate Capacity Added (MW)</b>	<b>Maximum Cumulative Nameplate Capacity (MW)</b>
<b>Local</b>	<b>PPA Cost</b>	<b>2027-2029</b>	<b>50</b>	<b>50</b>
<b>Local</b>	<b>PPA Cost</b>	<b>2030-2032</b>	<b>50</b>	<b>100</b>
<b>Local</b>	<b>PPA Cost</b>	<b>2033+</b>	<b>No Limit</b>	<b>No Limit</b>

# IRP Scenarios

- **Baseline**
- **High Utility-Scale Renewables in the Southeast US**
- **Rapid Electrification**
- **High Inflation**

Variables	Baseline	High Utility-Scale Renewables in Southeast US	Rapid Electrification	High Inflation
Inflation/Interest/Discount Rates	Base	Base	Base	High
Load Forecast (Peak Demand and Net Energy for Load)	Base	Base	High	No Load Growth
Planning Reserve Margin	Base (15%)	High (20%)	Base (15%)	Base (15%)
Transmission Import	Base	Base	Base	Base
Price of Off-System Power Purchases	Base	High Renewable Penetration	High	High
Natural Gas Prices	Base	Base	High	High
Cost of New NG Resources	Base	Base	High	High
Renewable Prices	Base	High	High	High
CO <sub>2</sub> Emissions Targets	None	None	None	None
Cost for CO <sub>2</sub> Emissions	None	None	None	None

# ORIGINAL SENSITIVITIES

- **Demand-Side Management**
- **No Load Growth**
- **Increased Import Capability**
- **Carbon Tax**
- **2018 City Commission Resolution**
- **Significant CO<sub>2</sub> Reductions**

Variables	Demand-Side Management	No Load Growth	Carbon Tax	2018 Renewable Resolution
Inflation/Interest/Discount Rates	Base	Base	Base	Base
Load Forecast (Peak Demand and Net Energy for Load)	5% Peak/NEL Reduction	No Load Growth	Base	Base
Planning Reserve Margin	Base (15%)	Base (15%)	Base (15%)	Base (15%)
Transmission Import	Base	Base	Base	Base
Price of Off-System Power Purchases	Base	Base	Base	Base
Natural Gas Prices	Base	Base	Base	Base
Cost of New NG Resources	Base	Base	Base	Base
Renewable Prices	Base	Base	Base	Base
CO <sub>2</sub> Emissions Targets	None	None	None	Net Zero CO <sub>2</sub> emissions by 2045
Cost for CO <sub>2</sub> Emissions	None	None	\$62.11/ton beginning 2030	None

# Additional Sensitivities

- **Reliance on Market Imports, No New GRU-Owned Generating Resources**
- **High Natural Gas Price**
- **Low Natural Gas Price**
- **No Solar**
- **Deerhaven ST2 Life Extension**
- **High Solar PPA Price**
- **Low Capacity PPA Price**
- **2% Present Worth Discount Rate**

Variables	Market Reliance	High Natural Gas Price	Low Natural Gas Price	No Solar	Deerhaven ST2 Life Extension	High Solar PPA Price	Low Capacity PPA Price	Reduced Discount Rate
Natural Gas Prices	Base	High	Low	Base	Base	Base	Base	Base
Renewable Prices	Base	Base	Base	Base	Base	Range of High Solar Prices	Base	Base
Capacity PPA Price	Base	Base	Base	Base	Base	Base	\$2.50/kW-mo Capacity Price	Base
Discount Rate	Base	Base	Base	Base	Base	Base	Base	2% Discount Rate
Other	No New GRU Generation	N/A	None	No Solar in GRU Portfolio	5 and 9-Year Life Extension	N/A	N/A	N/A

# N-1 Requirement - Preliminary Results - Baseline Scenario

Planning for a Loss of Largest Unit  
contingency exceeds the requirements of the  
15% Summer Planning Reserve Margin

**Largest Unit:**  
Years 2023-2031      Year 2032  
DHFS2 (150 MW)      Kelly CC (112 MW)

**2025: Sandbluff Solar PPA (+27 MW)**

**2027: New Flexible Gas (+29.5 MW)**

**2028: Battery (+50 MW)**

**DHFS1 Retirement (-76 MW)**

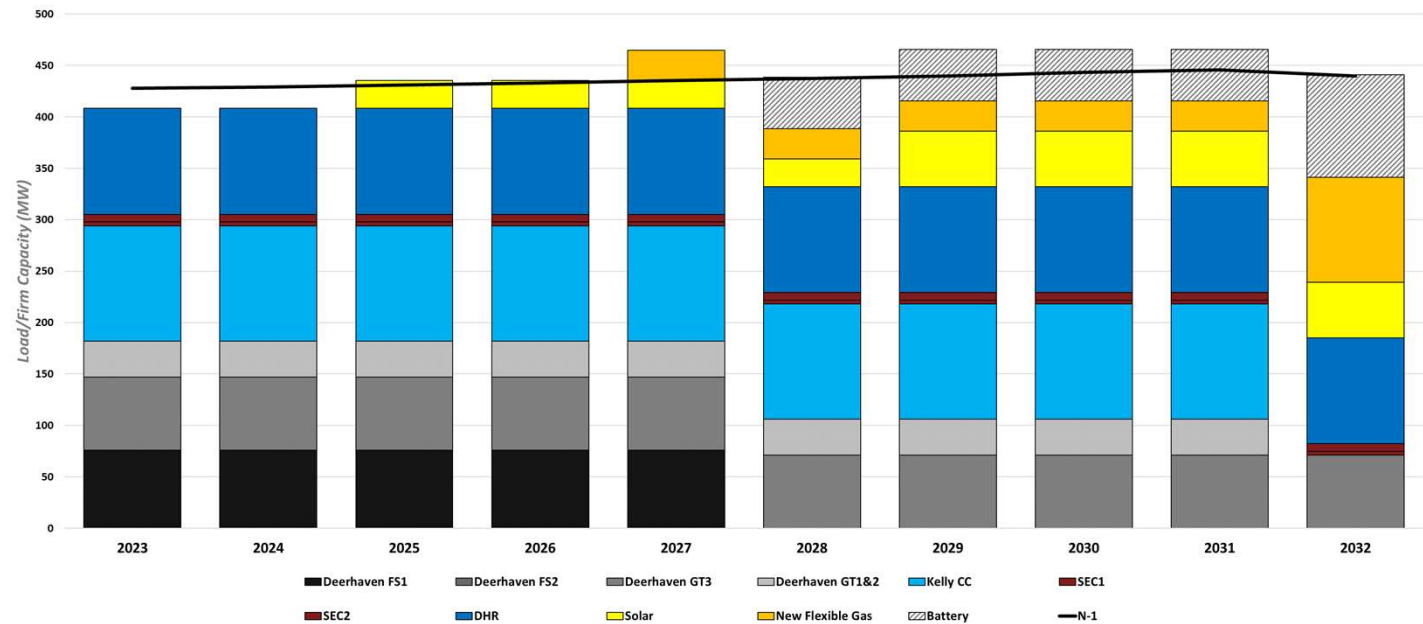
**2029: Solar PPA (+27 MW)**

**2032: New Flexible Gas (+72.4 MW)**

**Battery (+50 MW)**

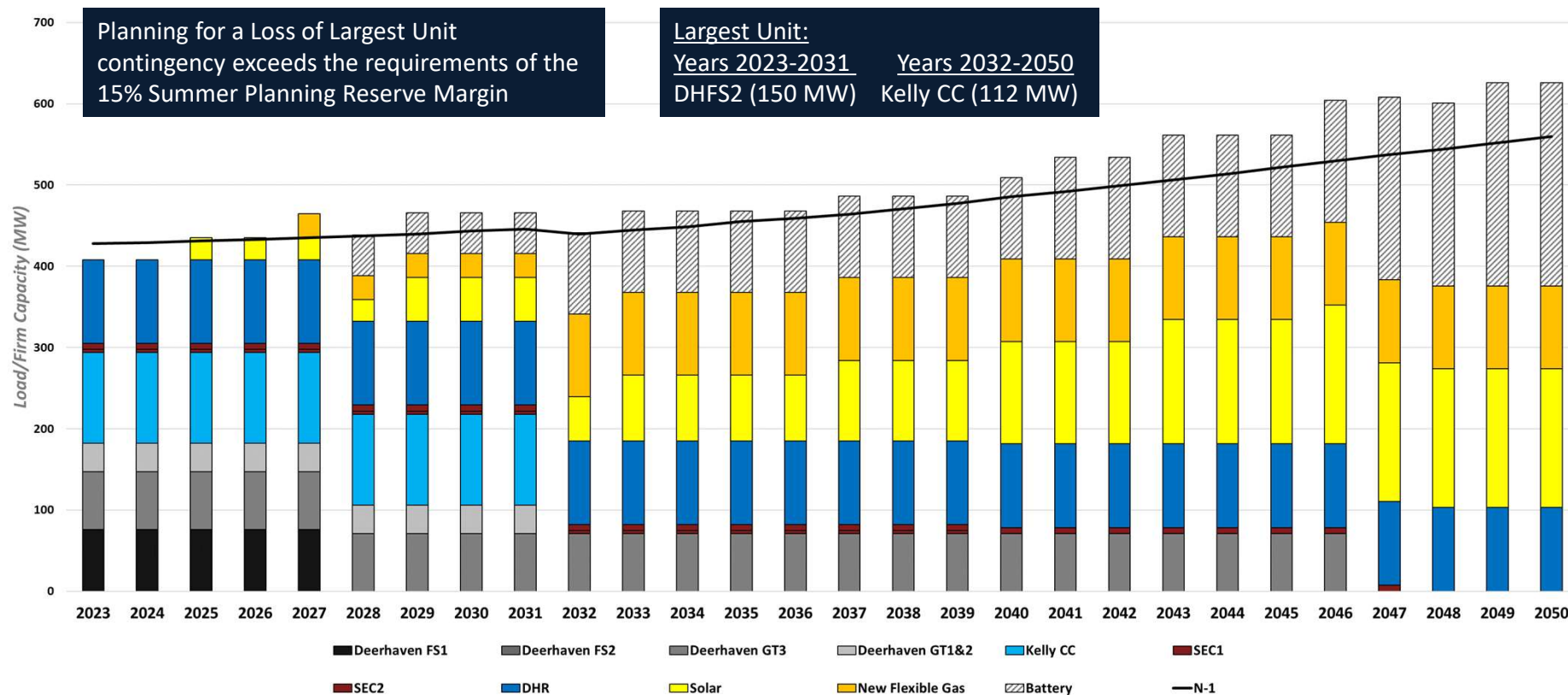
**DHFS2 Retirement (-232 MW)**

**DHGT1-2 Retirement (-35 MW)**

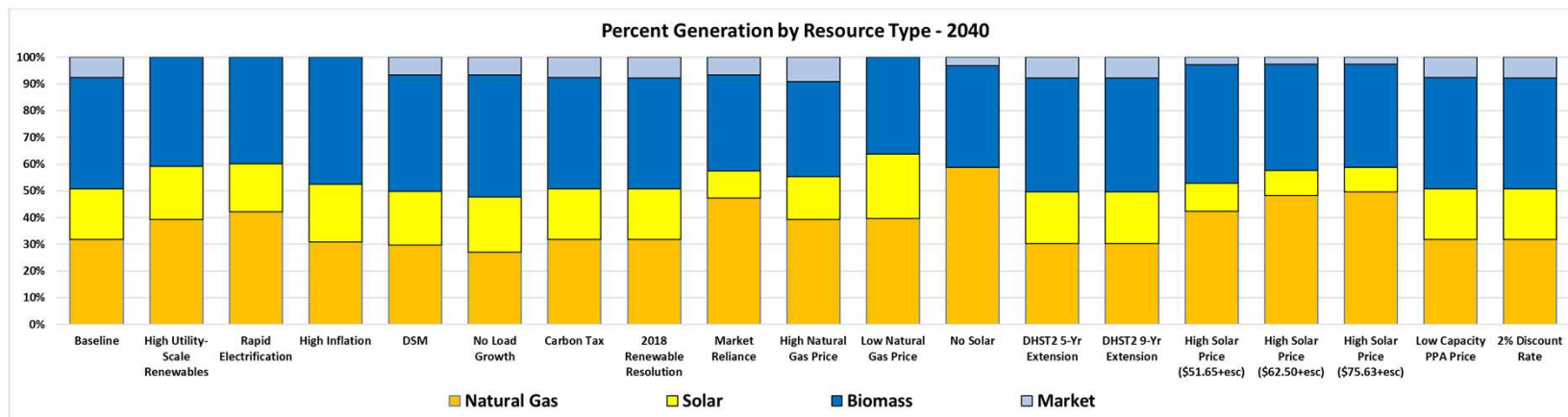
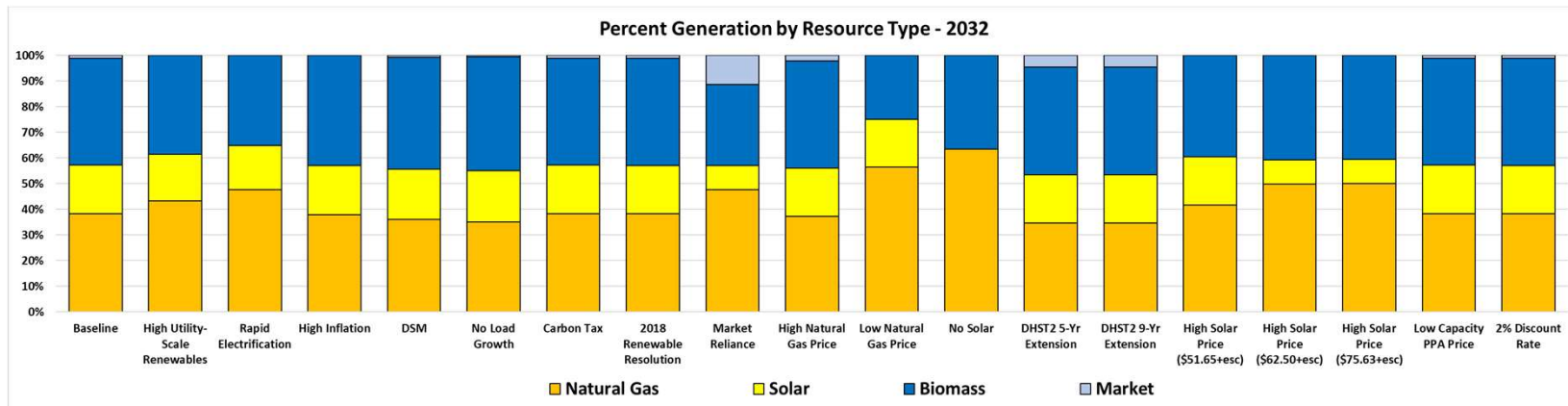




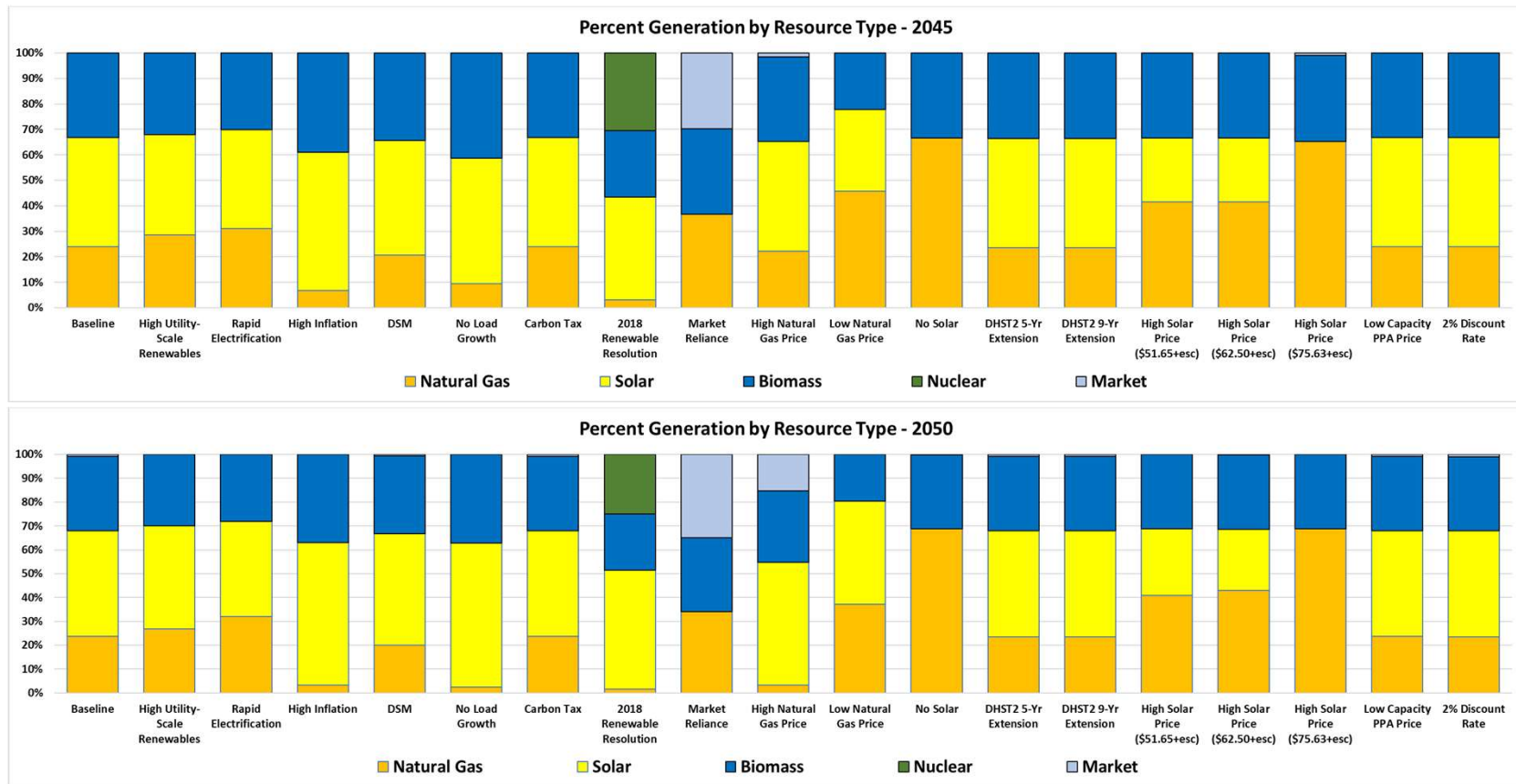
# N-1 Requirement - Preliminary Results - Baseline Scenario



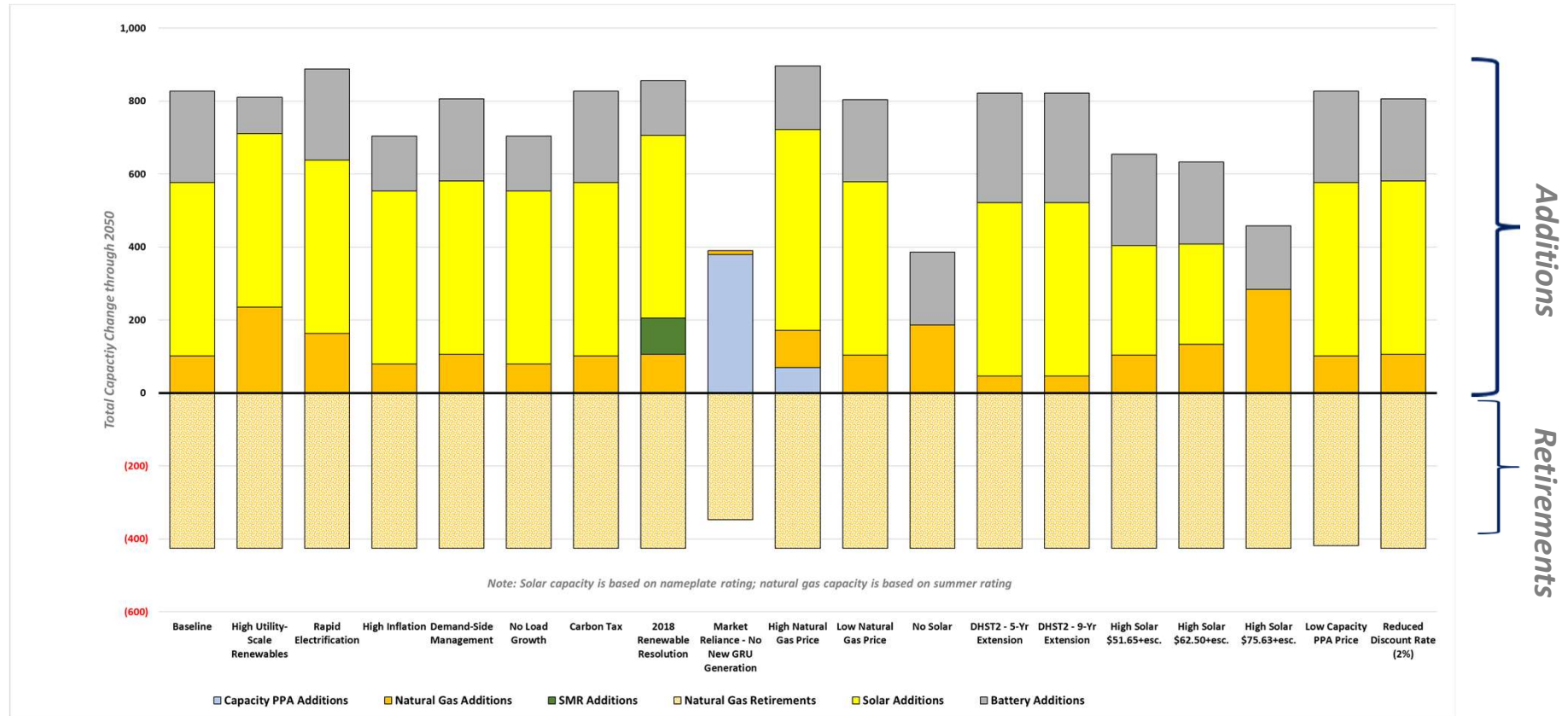
# Preliminary Results – % Generation by Resource Type



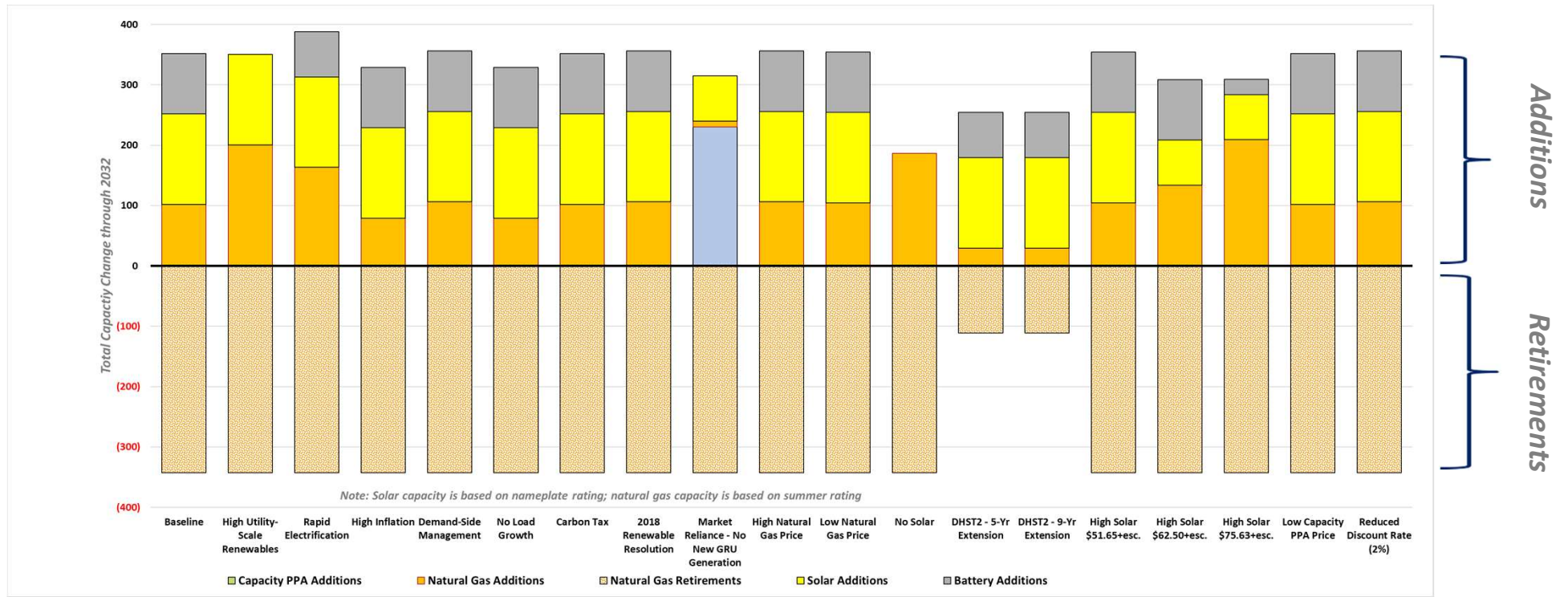
# Preliminary Results – % Generation by Resource Type



# Preliminary Resource Additions (MW) – In 2050

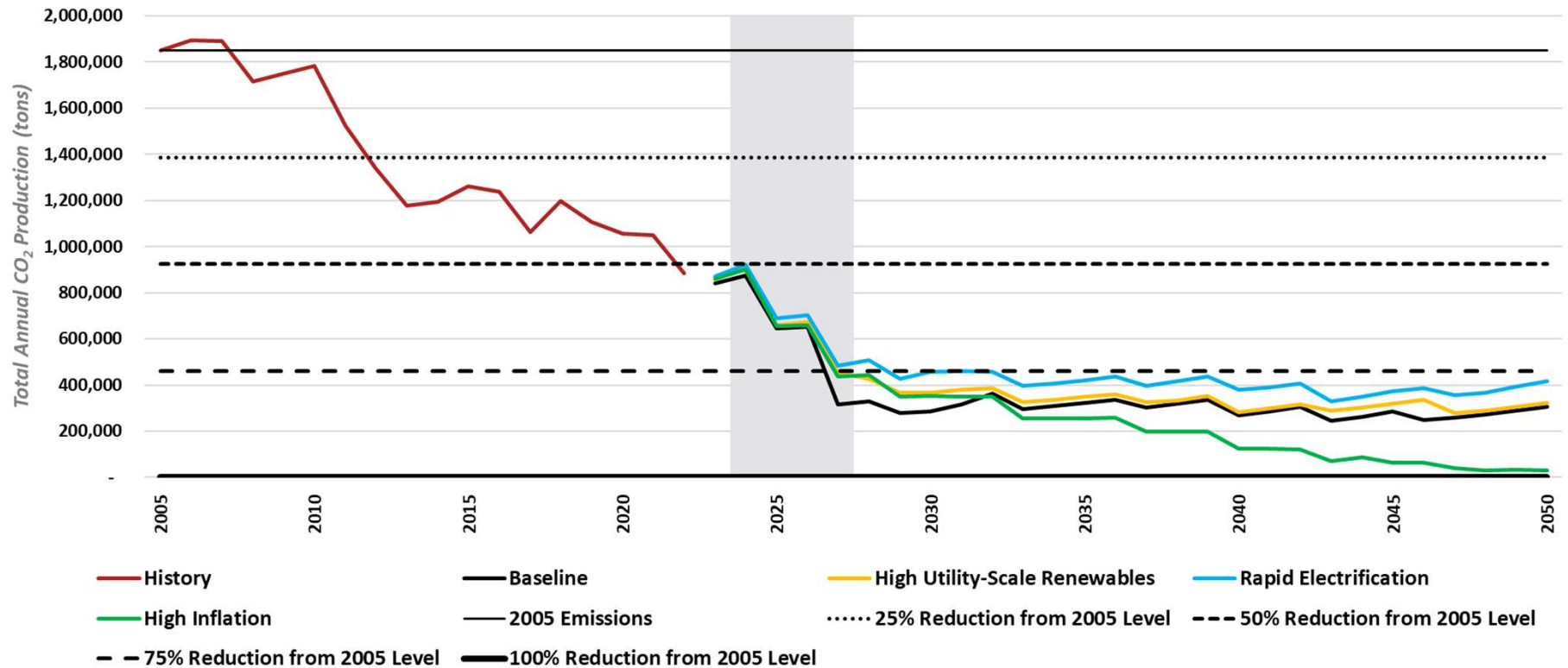


# Preliminary Resource Additions (MW) – In 2032



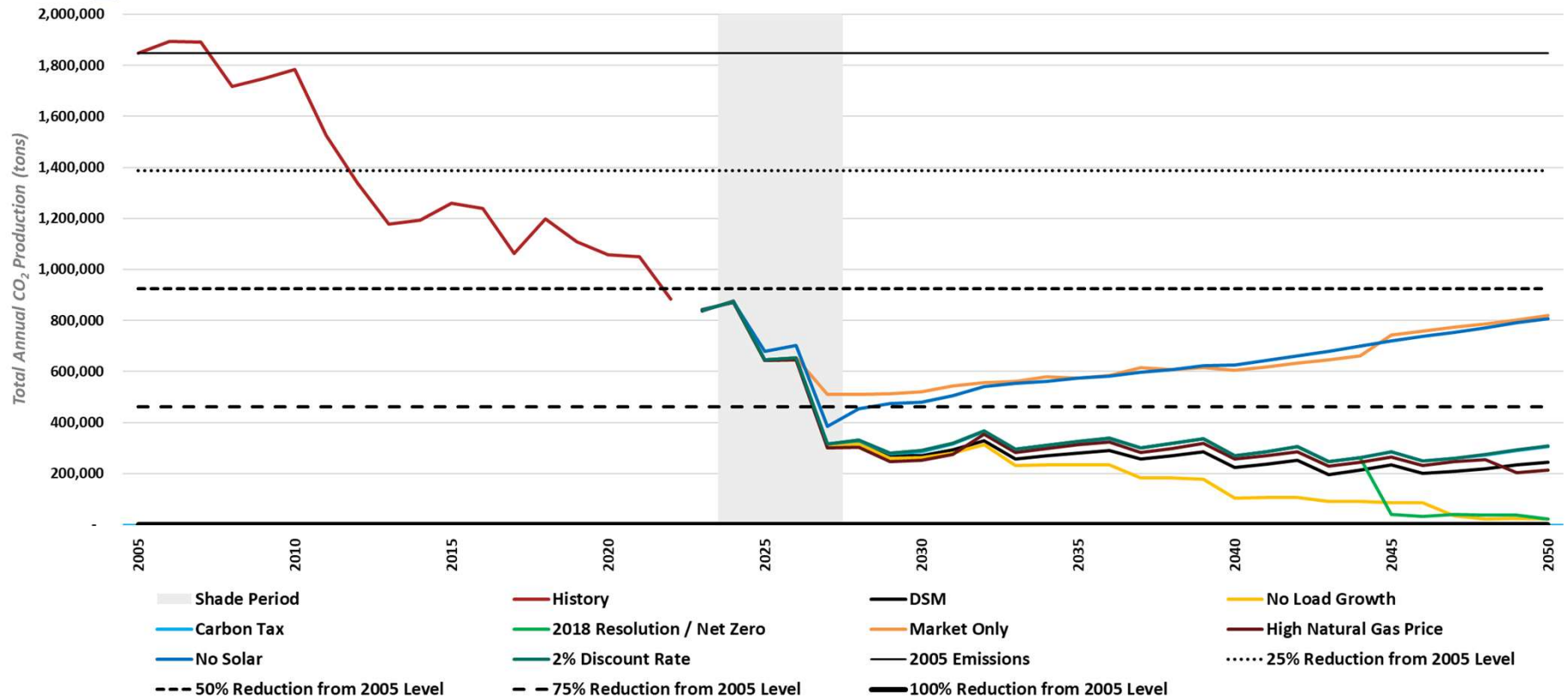


# Preliminary Results – Net CO<sub>2</sub> Emissions – Scenarios



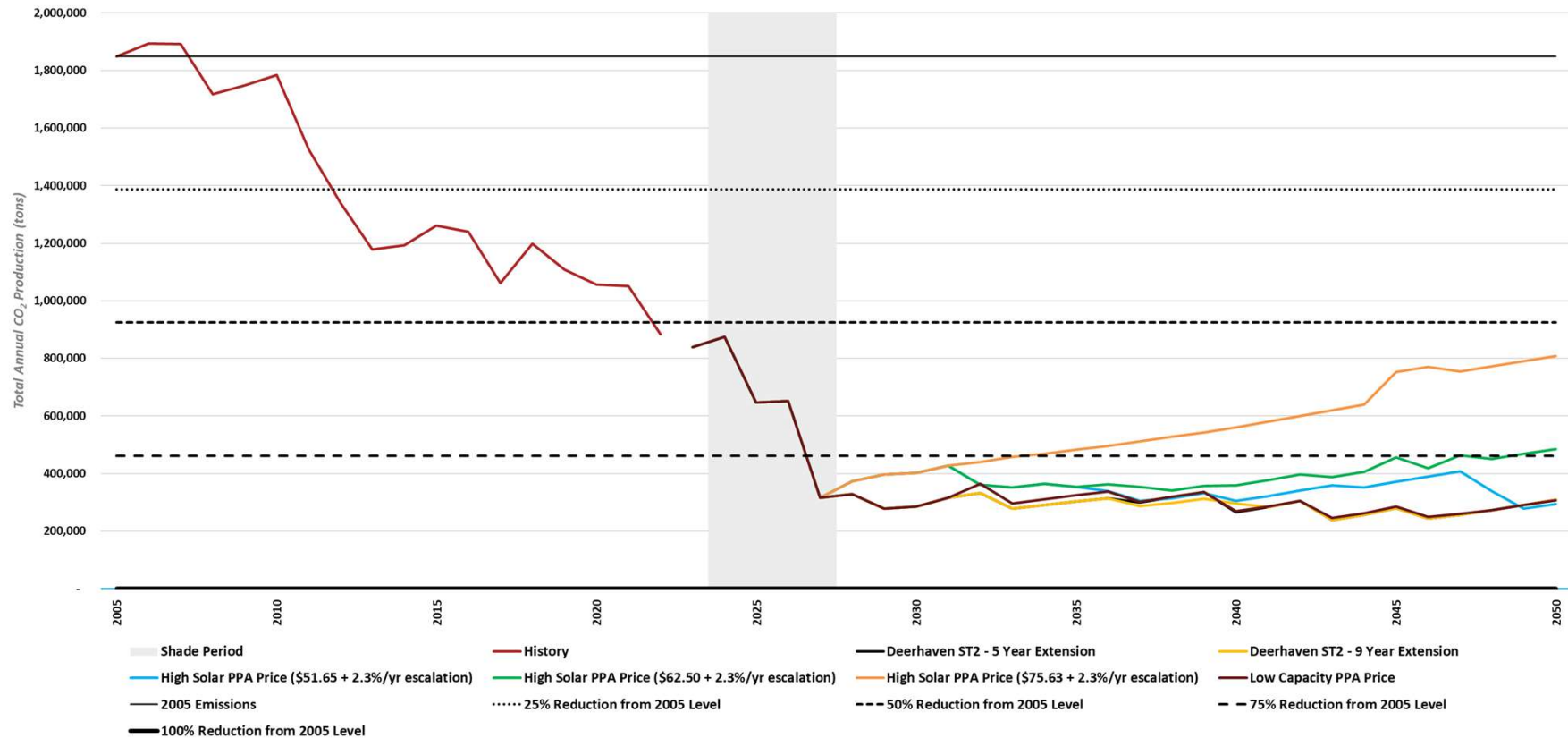
# Preliminary Results – Net CO<sub>2</sub> Emissions

## Original Sensitivities



# Preliminary Results – Net CO<sub>2</sub> Emissions

## Additional Sensitivities

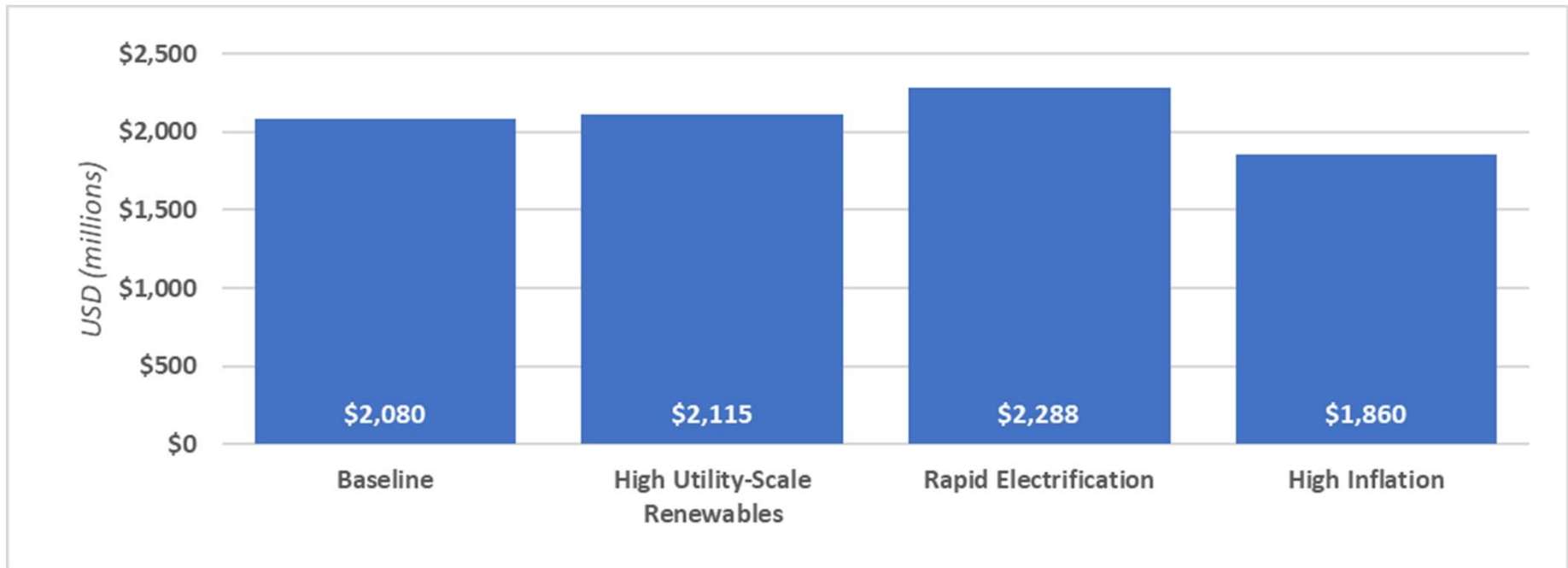




# Comparison of Preliminary Results

Scenario / Sensitivity	Resource Plan Cost			Capacity Added as of 2050 (MW)					
	Net Present Value (Millions \$)	Difference from Baseline (Millions \$)	Difference from Baseline (percent)	Total (MW)	Solar	Natural Gas	Small Modular Reactor	Firm Capacity	Battery Storage
Baseline	\$2,080	\$0	0.0%	827	475	102	0	0	250
High Utility-Scale Renewables	\$2,115	\$35	1.7%	811	475	236	0	0	100
Rapid Electrification	\$2,288	\$208	10.0%	888	475	163	0	0	250
High Inflation	\$1,860	-\$220	-10.6%	704	475	79	0	0	150
Demand-Side Management	\$2,014	-\$65	-3.1%	806	475	106	0	0	225
No Load Growth	\$1,800	-\$280	-13.5%	704	475	79	0	0	150
Carbon Tax	\$2,329	\$250	12.0%	827	475	102	0	0	250
2018 Renewable Resolution	\$2,207	\$127	6.1%	906	550	106	100	0	150
Market Reliance - No New GRU Gen.	\$2,460	\$380	18.3%	390	0	10	0	380	0
High Natural Gas Price	\$2,138	\$58	2.8%	897	550	102	0	70	175
Low Natural Gas Price	\$1,909	-\$170	-8.2%	804	475	104	0	0	225
No Solar	\$2,400	\$321	15.4%	461	0	261	0	0	200
Deerhaven ST2 - 5 Year Extension	\$2,056	-\$23	-1.1%	822	475	47	0	0	300
Deerhaven ST2 - 9 Year Extension	\$2,048	-\$32	-1.5%	822	475	47	0	0	300
High Solar \$51.65+esc.	\$2,270	\$191	9.2%	629	300	104	0	0	225
High Solar \$62.50+esc.	\$2,319	\$239	11.5%	659	275	134	0	0	250
High Solar \$75.63+esc.	\$2,348	\$268	12.9%	459	0	284	0	0	175
Low Firm Capacity Price	\$2,080	\$0	0.0%	827	475	102	0	0	250
Reduced Discount Rate (2%)	\$2,955	\$875	42.1%	806	475	106	0	0	225

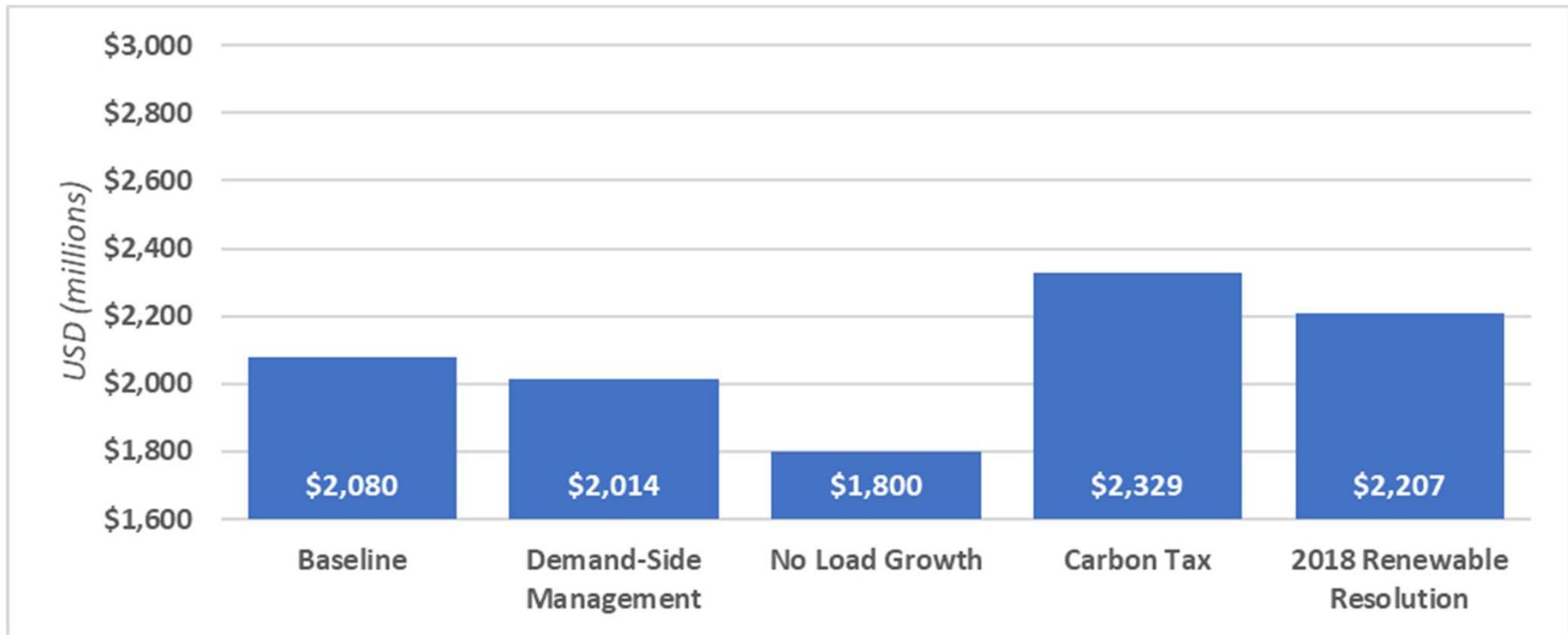
## Preliminary Results - NPV of Revenue Requirements (Scenarios)



# Comparison of Preliminary Scenario Results

	Resource Plan Cost			Capacity Added as of 2050 (MW)					
Scenario	Net Present Value (Millions \$)	Difference from Baseline (Millions \$)	Difference from Baseline (percent)	Total (MW)	Solar	Natural Gas	Small Modular Reactor	Firm Capacity	Battery Storage
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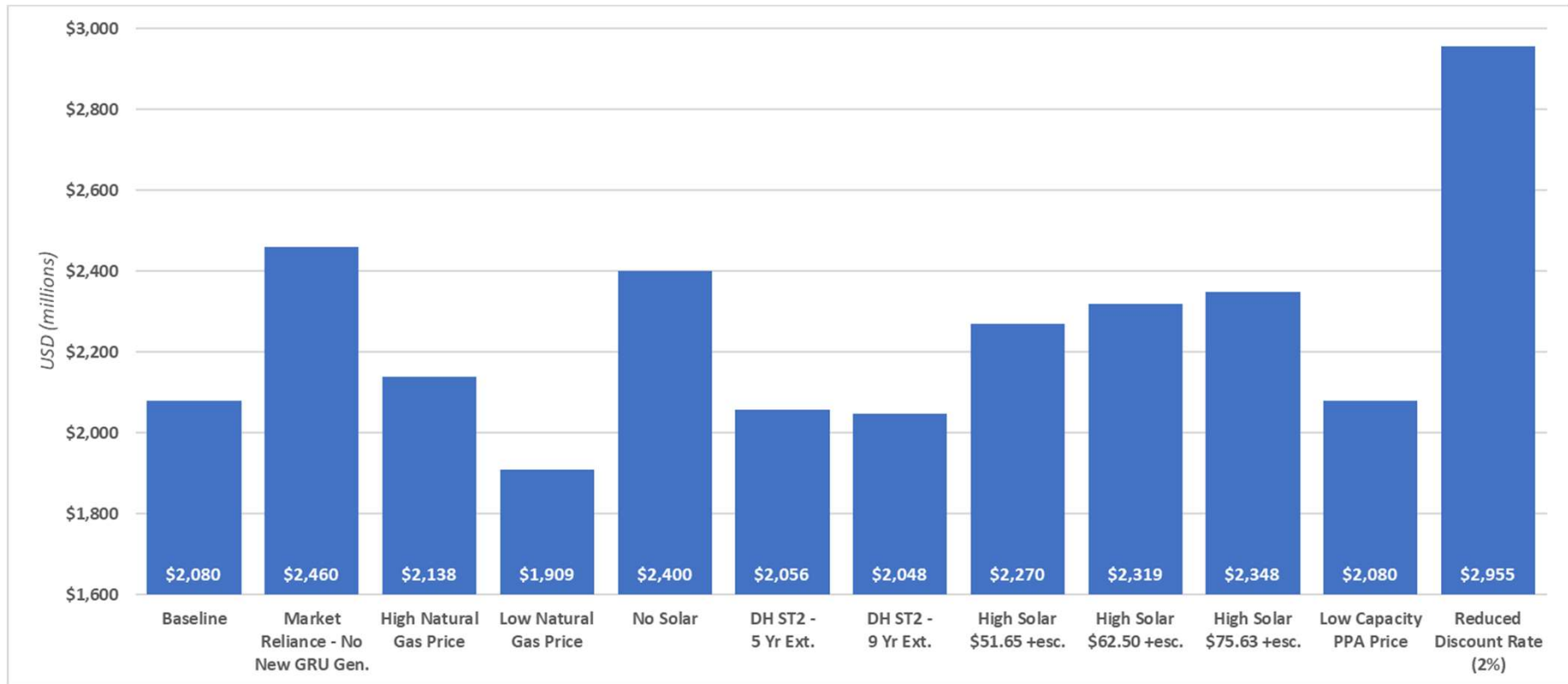
## Preliminary Results - NPV of Revenue Requirements Original Sensitivities



# Comparison of Preliminary Sensitivity Results (Original)

Sensitivity	Resource Plan Cost			Capacity Added as of 2050 (MW)					
	Net Present Value (Millions \$)	Difference from Baseline (Millions \$)	Difference from Baseline (percent)	Total (MW)	Solar	Natural Gas	Small Modular Reactor	Firm Capacity	Battery Storage
Baseline	\$2,080	\$0	0.0%	827	475	102	0	0	250
Demand-Side Management	\$2,014	-\$65	-3.1%	806	475	106	0	0	225
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# Preliminary Results - NPV of Revenue Requirements - Additional Sensitivities

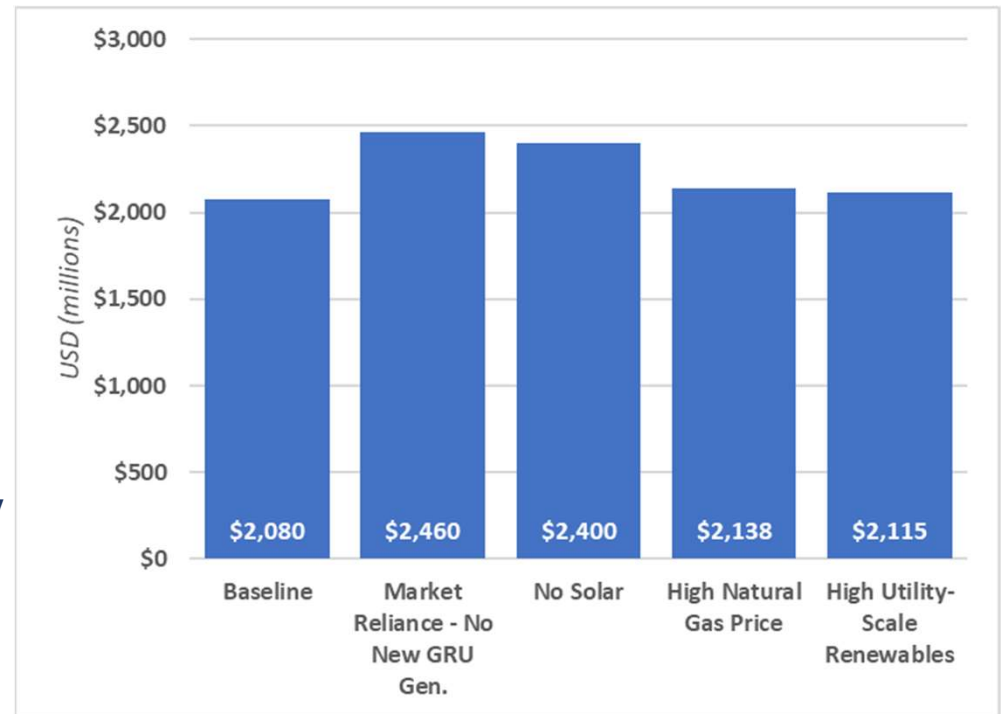


# Comparison of Preliminary Results – Additional Sensitivities

Sensitivity	Resource Plan Cost			Capacity Added as of 2050 (MW)					
	Net Present Value (Millions \$)	Difference from Baseline (Millions \$)	Difference from Baseline (percent)	Total (MW)	Solar	Natural Gas	Small Modular Reactor	Firm Capacity	Battery Storage
Baseline	\$2,080	\$0	0.0%	827	475	102	0	0	250
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# Preliminary Results – Importance of Resource Diversity

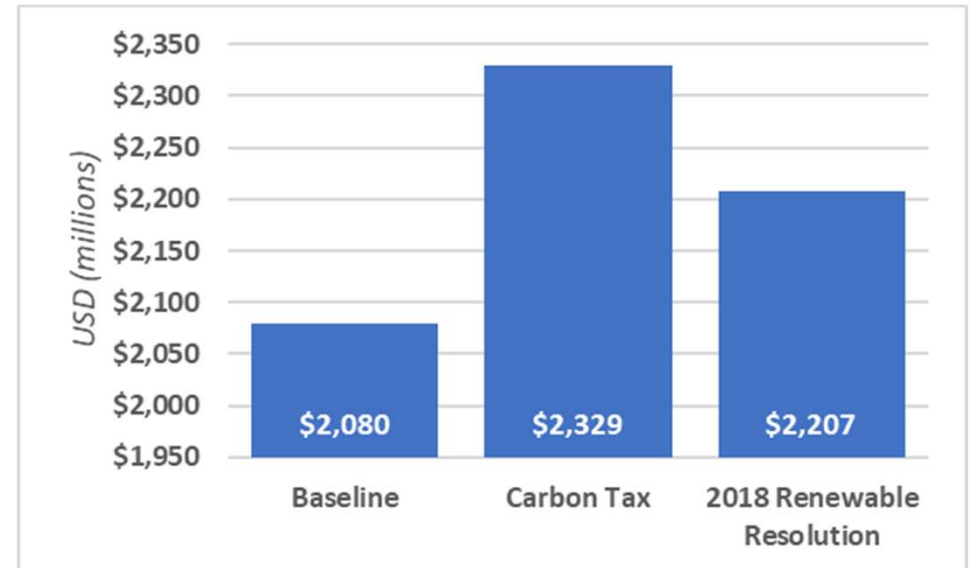
- All plans select a mix of solar and natural gas-fired resources if allowed
- Resource diversity enhances cost effectiveness
  - **Baseline NPV:**
    - **\$380M less than "Market Reliance No New GRU Gen."**
    - **\$321M less than "No Solar"**
- Resource diversity mitigates NPV increases from economic volatility
  - **+\$58M in High Natural Gas Pricing Sensitivity**
  - **+\$35M in High Utility-Scale Renewable Scenario**





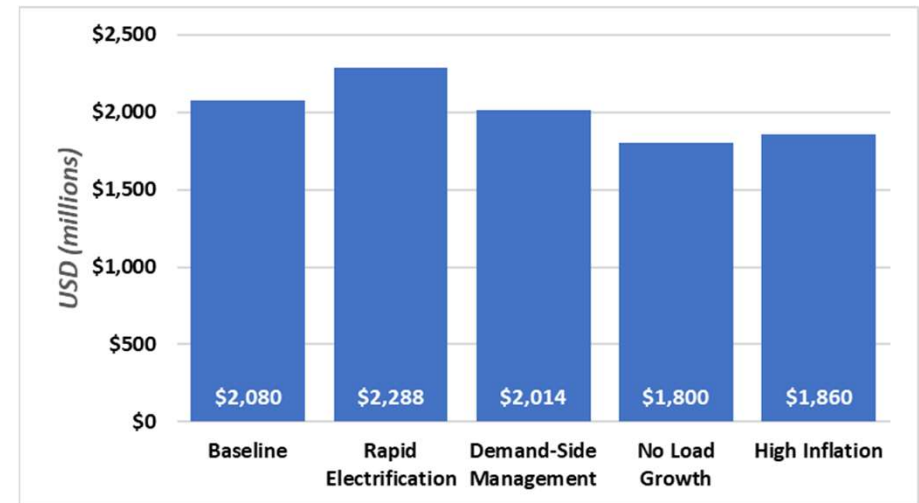
## Preliminary Results – Environmental Observations

- **The addition of a carbon tax in the Carbon Tax Sensitivity increases NPV \$249M but does not change the resource plan from Baseline**
- **Most scenarios/sensitivities reduce CO<sub>2</sub> emissions from 2005 levels by more than 75% (Baseline reduction is 85%)**
- **Reduction of CO<sub>2</sub> emissions to "net zero" by 2045 increases NPV by \$127M**



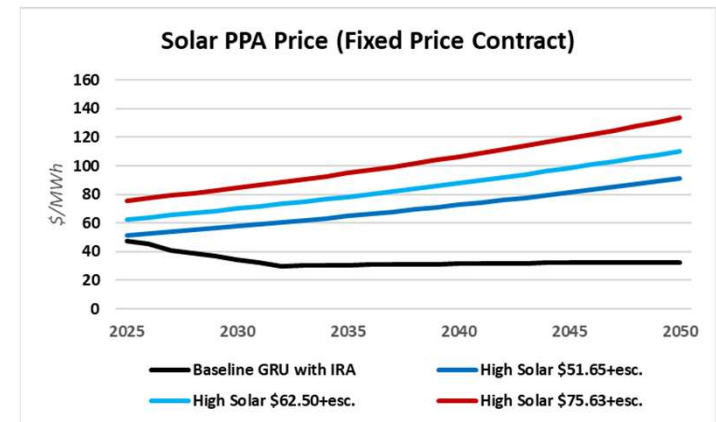
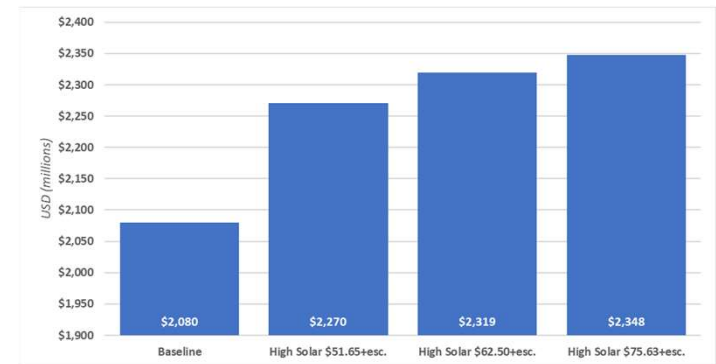
# Preliminary Results – Impact of Demand on NPV

- The following cases are based on demand levels that differ from the Baseline scenario and would alter GRU revenues.
- Higher electric demand and increases in natural gas pricing and resource costs in the Rapid Electrification scenario result in an NPV that is \$208M higher than in the Baseline scenario.
- Lower demand in the DSM sensitivity reduces NPV by \$66M before accounting for DSM program costs.
  - DSM may be beneficial in reducing peak demand
  - Additional study required to evaluate revenue impacts, program risks, and if DSM program peak demand reductions are attainable
  - Risks include demand reduction falling short of 5% and actual program costs exceeding \$66M NPV savings identified in this sensitivity
- No Load Growth and High Inflation sensitivities reduce NPV, but also would reduce revenue compared to baseline



# Preliminary Results – Solar PPA Price Increases Required to Reduce Solar Additions

- **All Scenarios and most Sensitivities add 475 MW of Solar Capacity by 2050**
  - 275 MW Tier 1 (Local)
  - 200 MW Tier 2 (Using existing Transmission)
  - Tier 3 Solar requires Transmission Upgrade and only appears in 2018 City Commission Resolution and High Natural Gas Price Sensitivities (+75 MW)
- **Solar PPA Prices that impact Solar Additions**
  - 2025 price increased from \$47.35 to \$51.65/MWh and escalated at 2.3% inflation rate – Reduces Tier 2 Solar to 25 MW and total Solar to 300 MW
  - 2025 Price increased to \$62.50/MWh – Eliminates Tier 2 Solar and reduces total Solar to 275 MW (all local)
  - 2025 Price increased to \$75.63/MWh – Eliminates all Solar additions from Resource Plan



## **Preliminary Results – Capacity PPA Additions Not Impacted by Change in Capacity PPA Price**

- § **2023 Capacity PPA cost is \$6.50/kW-mo in Baseline**
- **Capacity PPA Option Selected in Only 2 Sensitivities:**
  - **High Natural Gas Price (70 MW)**
  - **Market Reliance – No New GRU Generation (380 MW)**
- **Capacity Option competes with Solar for use of limited Transmission Capacity**
- § **Low Firm Capacity Sensitivity Reduces 2023 Capacity PPA price to \$2.50/kW-mo with no change to Baseline Resource Plan**

## Open Discussion and Next Steps



**Cantrece Jones**  
**Acuity Design Group**

## **Open Discussion and Next Steps**

- **Upcoming IRP Stakeholder Engagement Meeting**
  - **Meeting 6 –GRU’s Path Forward**
    - **Proposed for March 26, 2024**
- **We value YOUR feedback**