2021 NIPSCO Integrated Resource Plan

Stakeholder Advisory Meeting #5

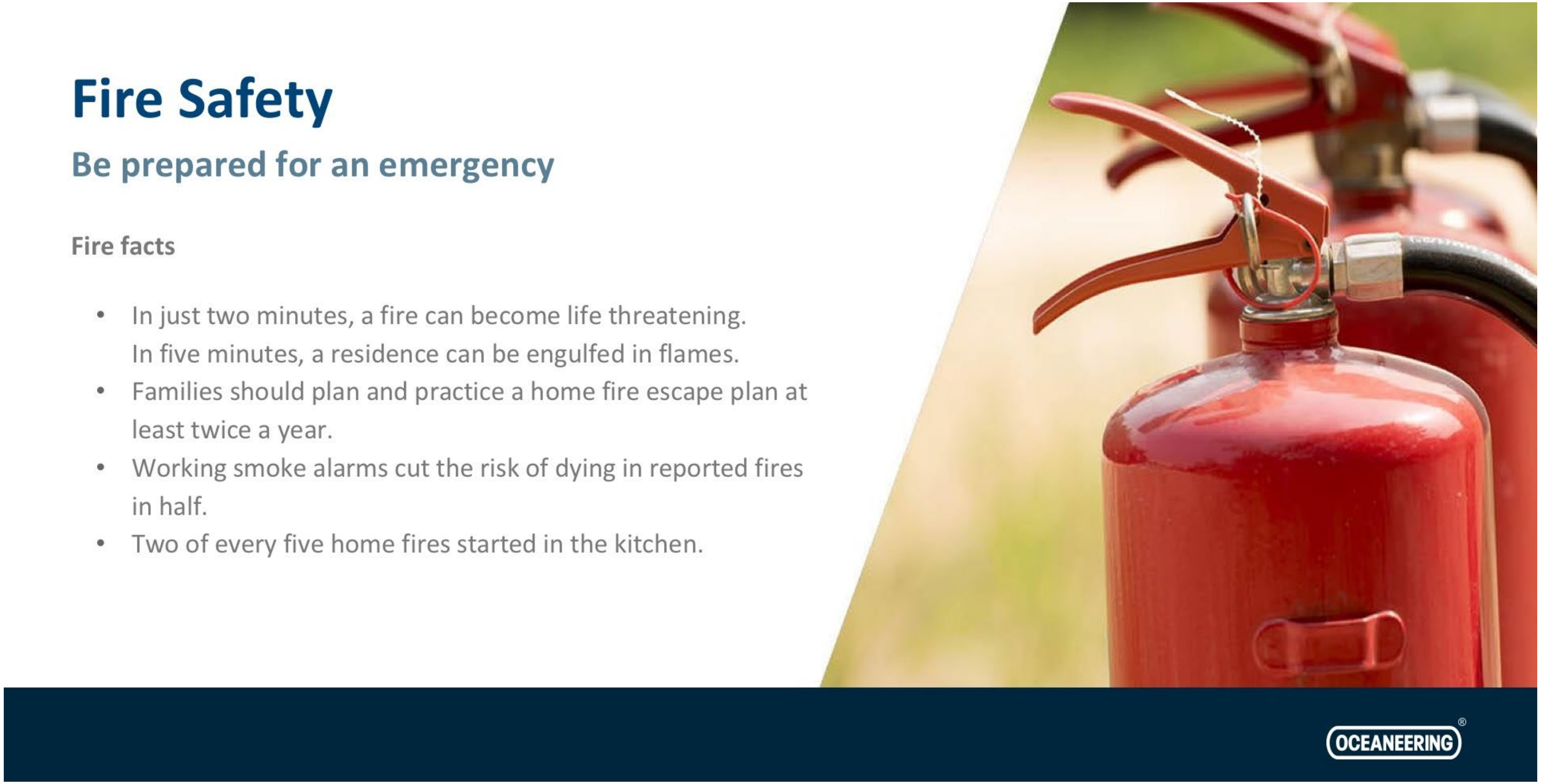
October 21st, 2021
9:00AM-2:00PM CT








SAFETY MOMENT



Fire Safety

Be prepared for an emergency

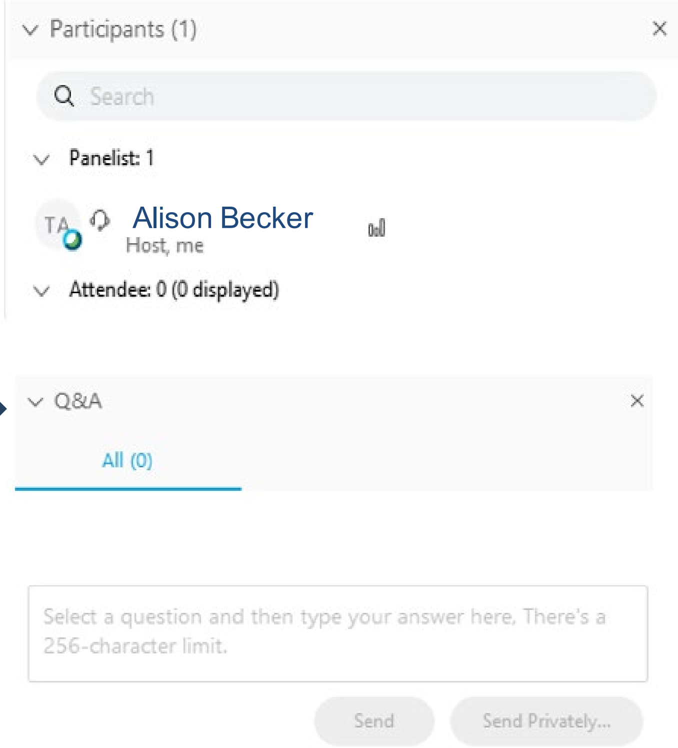
Fire facts

- In just two minutes, a fire can become life threatening. In five minutes, a residence can be engulfed in flames.
- Families should plan and practice a home fire escape plan at least twice a year.
- Working smoke alarms cut the risk of dying in reported fires in half.
- Two of every five home fires started in the kitchen.

OCEANEERING®

STAKEHOLDER ADVISORY MEETING PROTOCOLS

- Your input and feedback is critical to NIPSCO's Integrated Resource Plan ("IRP") Process
- The Public Advisory Process provides NIPSCO with feedback on its assumptions and sources of data. This helps inform the modeling process and overall IRP
- We set aside time at the end of each section to ask questions
- Your candid and ongoing feedback is key:
  - Please ask questions and make comments on the content presented
  - Please provide feedback on the process itself
- While we will mostly utilize the chat feature in WebEx to facilitate comments, we will gladly unmute you if you would like to speak. Please identify yourself by name prior to speaking. This will help keep track of comments and follow up actions
- If you wish to make a presentation during a meeting, please reach out to Alison Becker (abecker@nisource.com)



AGENDA

Time *Central Time	Topic	Speaker
9:00-9:05AM	Webinar Introduction, Safety Moment, Meeting Protocols, Agenda	Alison Becker, Manager Regulatory Policy, NIPSCO
9:05-9:15AM	Welcome	Mike Hooper, President & COO, NIPSCO
9:15-9:30AM	NIPSCO's Public Advisory Process and Resource Planning Activity Review	Fred Gomos, Director Strategy & Risk Integration, NiSource
9:30-10:00AM	Existing Fleet Analysis Review	Pat Augustine, Vice President, CRA
10:00-10:15AM	Break	
10:15-11:00AM	Replacement Analysis Review	Pat Augustine, Vice President, CRA Hisham Othman, VP, Transmission and Regulatory Consulting, Quanta Technology, LLC
11:00-11:30AM	Responses to Stakeholder Feedback	Pat Augustine, Vice President, CRA
11:30AM-12:00PM	Lunch	
12:00-1:00PM	Preferred Resource Plan and Action Plan	Fred Gomos, Director Strategy & Risk Integration, NiSource Pat Augustine, Vice President, CRA
1:00-1:55PM	Stakeholder Presentations	TBD
1:55-2:00PM	Wrap Up & Next Steps	Erin Whitehead, Vice President Regulatory & Major Accounts, NIPSCO

WELCOME

Mike Hooper, President & COO, NIPSCO

PILLARS OF OUR ONGOING GENERATION TRANSITION PLAN

This plan creates a vision for the future that is better for our customers and it’s consistent with our goal to transition to the best cost, cleanest electric supply mix available while maintaining reliability, diversity and flexibility for the technology and market changes on the horizon.

Reliable and sustainable

Flexibility for the future

Local and statewide economic benefits

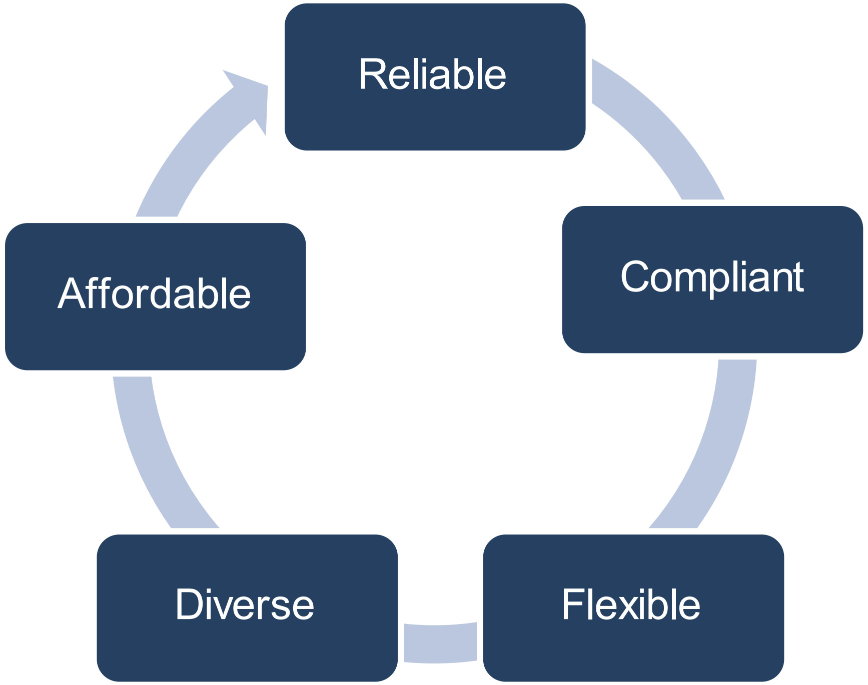
Best plan for customers and the company

NIPSCO'S PUBLIC ADVISORY PROCESS AND RESOURCE PLANNING ACTIVITY REVIEW

Fred Gomos, Director Strategy & Risk Integration, NiSource

HOW DOES NIPSCO PLAN FOR THE FUTURE?

- At least every three years, NIPSCO outlines its long-term plan to supply electricity to customers over the next 20 years
- This study – known as an IRP – is required of all electric utilities in Indiana
- The IRP process includes extensive analysis of a range of generation scenarios, with criteria such as reliable, affordable, compliant, diverse and flexible



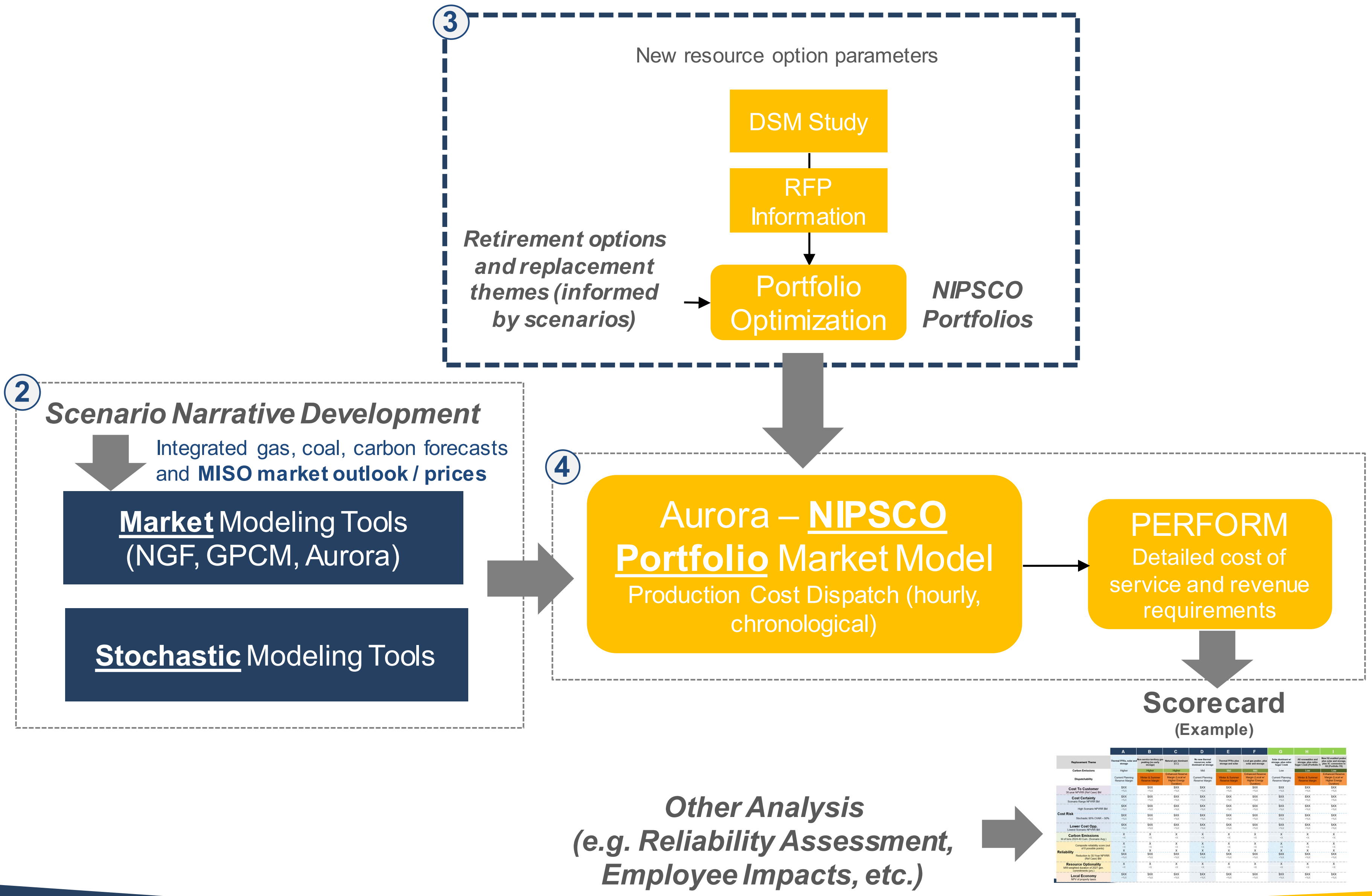
Requires Careful Planning and Consideration for:
- NIPSCO's employees
- Environmental regulations
- Changes in the local economy (property tax, supplier spending, employee base)

2021 STAKEHOLDER ADVISORY MEETING ROADMAP

Meeting	Meeting 1 (March)	Meeting 2 (May)	Meeting 3 (July)	Meeting 4 (September)	Technical Webinar	Meeting 5 (October)
Date	3/19/2021	5/20/2021	7/13/2021	9/21/2021	10/12/2021	10/21/2021
Location	Virtual	Virtual	Virtual	Virtual	Virtual	Virtual
Key Questions	• How has NIPSCO progressed in the 2018 Short Term Action Plan? • What has changed since the 2018 IRP? • How are energy and demand expected change over time? • What is the high level plan for stakeholder communication and feedback for the 2021 IRP?	• How do regulatory developments and initiatives at the MISO level impact NIPSCO's 2021 IRP planning framework? • How has environmental policy changed since 2018? • What scenario themes and stochastics will NIPSCO explore in 2021?	• How are DSM resources considered in the IRP? • How will NIPSCO evaluate potential DER options? • What are the preliminary RFP results?	• What are the preliminary findings from the modeling?	• What are the results of the Reliability Assessment?	• What is NIPSCO's preferred plan? • What is the short-term action plan?
Content	• 2018 Short Term Action Plan Update (Retirements, Replacement projects) • Resource Planning and 2021 Continuous Improvements • Update on Key Inputs/Assumptions (commodity prices, demand forecast) • Scenario Themes – Introduction • 2021 Public Advisory Process	• MISO Regulatory Developments and Initiatives • 2021 Environmental Policy Update • Scenarios and Stochastic Analysis	• DSM Modeling and Methodology • DER Inputs • Preliminary RFP Results	• Existing Fleet Review Modeling Results, Scorecard • Replacement Modeling Results, Scorecard	• Reliability Assessment	• Preferred replacement path and logic relative to alternatives • 2021 NIPSCO Short Term Action Plan
Meeting Goals	• Communicate what has changed since the 2018 IRP • Communicate NIPSCO's focus on reliability • Communicate updates to key inputs/assumptions • Communicate the 2021 public advisory process, timing, and input sought from stakeholders	• Common understanding of MISO regulatory updates • Communicate environmental policy considerations • Communicate scenario themes and stochastic analysis approach, along with major input details and assumptions	• Common understanding of DSM modeling methodology • Communicate preliminary RFP results • Explain next steps for portfolio modeling	• Communicate the Existing Fleet Portfolios and the Replacement Portfolios • Develop a shared understanding of economic modeling outcomes and preliminary results to facilitate stakeholder feedback	• Common understanding of Reliability Assessment methodology • Communicate Reliability Assessment results	• Respond to key stakeholder comments and requests • Communicate NIPSCO's preferred resource plan and short-term action plan • Obtain feedback from stakeholders on preferred plan

RESOURCE PLANNING APPROACH

	Activity		Timing
1	Identify key planning questions and themes	✓	Mar
2	Develop market perspectives (planning reference case and scenarios / stochastic inputs)	✓	Mar-May
3	Develop integrated resource strategies for NIPSCO (portfolios)	✓	Jun-Jul
4	Portfolio modeling ▪ Detailed scenario dispatch ▪ Stochastic simulations	✓	Aug-Sep
5	Evaluate trade-offs and produce recommendation		Sep-Oct



3

New resource option parameters

DSM Study

RFP Information

Retirement options and replacement themes (informed by scenarios)

Portfolio Optimization

NIPSCO Portfolios

2

Scenario Narrative Development

Integrated gas, coal, carbon forecasts and **MISO market outlook / prices**

Market Modeling Tools (NGF, GPCM, Aurora)

Stochastic Modeling Tools

4

Aurora – **NIPSCO Portfolio** Market Model

Production Cost Dispatch (hourly, chronological)

PERFORM

Detailed cost of service and revenue requirements

Scorecard

(Example)

Other Analysis (e.g. Reliability Assessment, Employee Impacts, etc.)

1 IDENTIFY KEY PLANNING QUESTIONS AND THEMES

- The ongoing fleet transition in MISO makes it critical for NIPSCO's IRP to capture several changing dynamics to allow NIPSCO to remain flexible
- Over the course of the 2021 IRP, NIPSCO has discussed these topics:

Topic	
Retirement Timing for Existing Coal and Gas Units	Assessing the retirement timing of the remaining generating fleet after the Schahfer coal units retire, which includes Michigan City Unit 12, Schahfer Units 16A and 16B, and Sugar Creek
Flexibility & Adaptability of The Portfolio	Incorporating evolving capacity credit expectations for resources and an imminent seasonal resource adequacy requirement
Carbon Emissions & Regulation/Incentives	Assessing diverse portfolio options in the context of increased policy conversations that push for 100% decarbonization of the power sector by the middle of the next decade
Long-Term Planning With Intermittent Resources	Understanding system reliability implications of a portfolio that will have significant intermittent resources, in light of the MISO market evolution and NIPSCO's operational responsibilities

① LONG TERM SYSTEM PLANNING WITH INTERMITTENT RESOURCES

	2021 IRP Approach To Evaluate	Action Implemented In IRP Modeling
Ensure Consistency with MISO Rules Evolution	▪ Seasonal resource adequacy ▪ Future effective load carrying capability (ELCC) accounting	▪ Both summer and winter reserve margins tracked and implemented as constraints ▪ ELCC accounting by season with a range of expected solar declines over time
Expand Uncertainty Analysis	▪ Incorporation of renewable output uncertainty ▪ Broadening risk analysis to incorporate granular views of tail risk	▪ Stochastic analysis evaluated the relationship between hourly renewable output and power prices to estimate the impact at different levels of penetration and across the commodity price distribution ▪ Examined tail outcomes to understand the conditions and portfolios that expose customers to low probability, high consequence (price) events
Incorporate New Metrics	▪ Incorporating new scorecard metrics informed by stochastic analysis and capabilities of portfolio resources	▪ Performed ancillary services analysis (regulation, spinning reserves) with sub-hourly granularity and conducted qualitative reliability assessment with several new metrics

1 IDENTIFY KEY PLANNING QUESTIONS AND THEMES

As in the 2018 IRP, multiple objectives and indicators are summarized across portfolios in an integrated scorecard framework against which to test portfolios and evaluate the major planning questions

Objective	Indicator
Affordability	**Cost to Customer**
Rate Stability	**Cost Certainty**
	Cost Risk
	Lower Cost Opportunity
Environmental Sustainability	**Carbon Emissions**
Reliable, Flexible, and Resilient Supply	**Reliability**
	Resource Optionality
Positive Social & Economic Impacts	**Employees**
	Local Economy

- The scorecard is a means of reporting key metrics for different portfolio options to transparently review tradeoffs and relative performance; it does not produce a single score or ranking of portfolios, but serves as a tool to facilitate decision-making
- NIPSCO has identified **5 major planning objectives** and multiple metrics within **9 key indicator categories**
- The Existing Fleet Analysis scorecard focuses on scenario costs, carbon emissions, and impact on NIPSCO employees and the local economy
- The Replacement Analysis scorecard incorporates broader perspectives on risk (stochastic analysis) and reliability than the Existing Fleet Analysis scorecard

2 DEVELOP MARKET PERSPECTIVES (REF CASE, SCENARIOS / STOCHASTIC INPUTS)

- NIPSCO developed four integrated market scenarios or future “states of the world”
  - Scenarios incorporate a range of future outcomes for load, commodity prices, technology, and policy
  - The 2021 IRP includes two distinct policy frameworks for achieving net-zero emission trajectories for the broader power market
- Stochastic inputs have been developed for key components of quantifiable stochastic risk
  - For the 2021 IRP, the stochastic analysis has been expanded to include hourly renewable availability in addition to commodity price volatility

Reference Case

- The MISO market continues to evolve based on current expectations for load growth, commodity price trajectories, technology development, and policy change (some carbon regulation and MISO rules evolution)

Status Quo Extended (“SQE”)

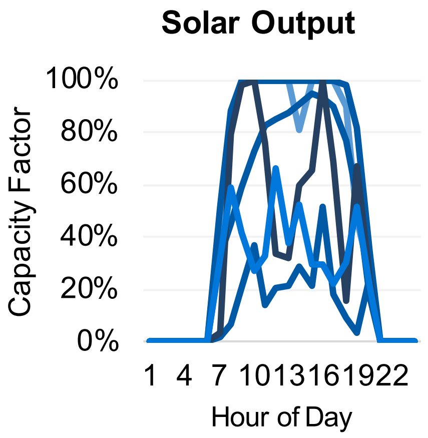
- Binding federal limits on carbon emissions are not implemented; natural gas prices remain low and result in new gas additions remaining competitive versus renewables, as coal capacity more gradually fades from the MISO market

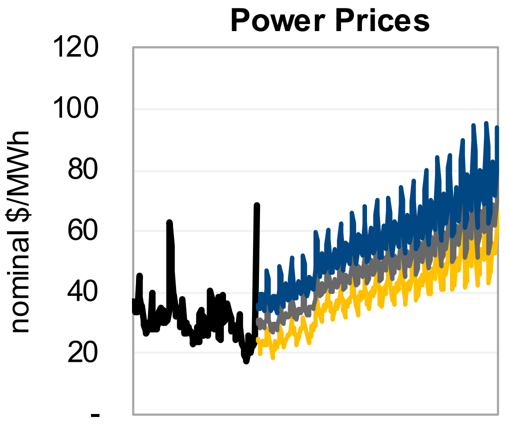
Aggressive Environmental Regulation (“AER”)

- Carbon emissions from the power sector are regulated through a mix of incentives and a federal tax/cap-and-trade program that results in a significant CO2 price and net-zero emission targets for the power sector by 2040; restrictions on natural gas production increase gas prices

Economy-Wide Decarbonization (“EWD”)

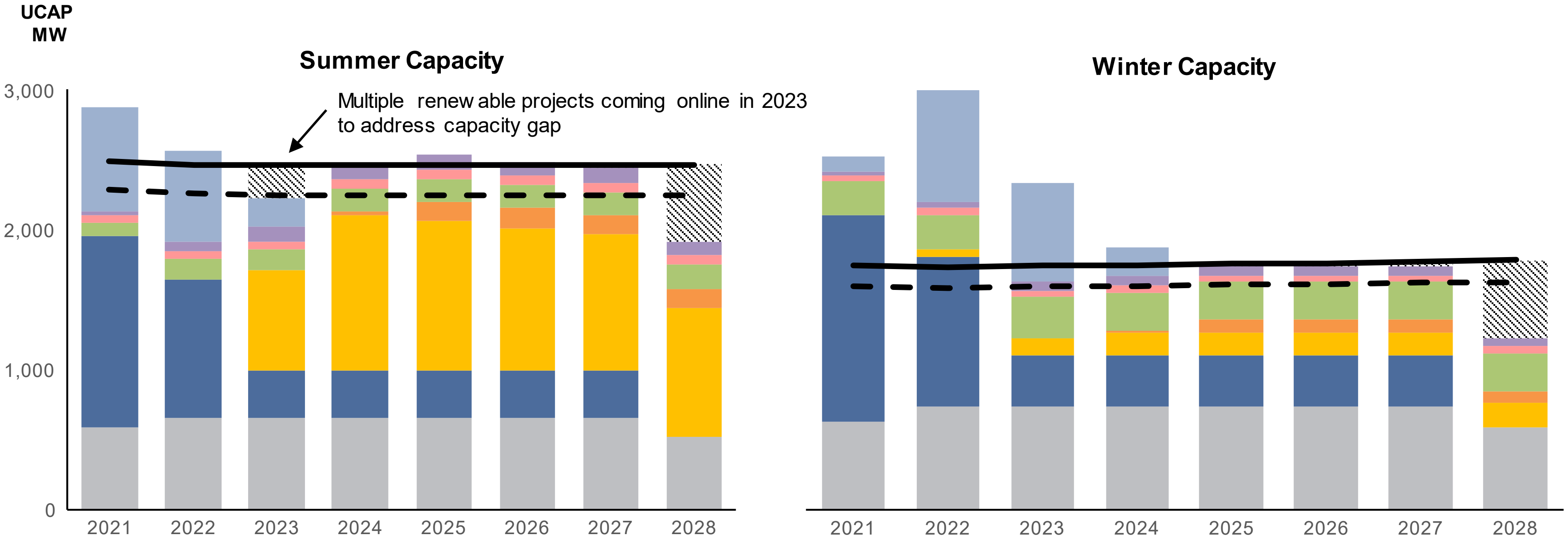
- Technology development and federal incentives push towards a decarbonized economy, including through a power sector Clean Energy Standard (supporting renewables and other non-emitting technologies) and large-scale electrification in other sectors (EVs, heating, processes, etc.)





3 STARTING NEAR-TERM CAPACITY AND ENERGY BALANCE

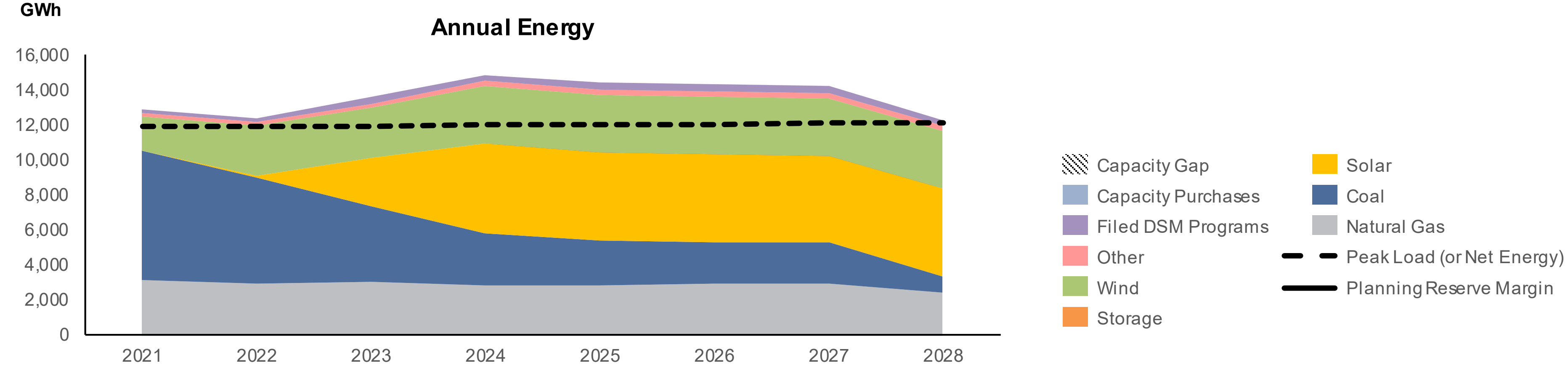
NIPSCO is now monitoring summer and winter reserve margins, plus the annual energy balance



Summer Capacity

Multiple renewable projects coming online in 2023 to address capacity gap

Winter Capacity



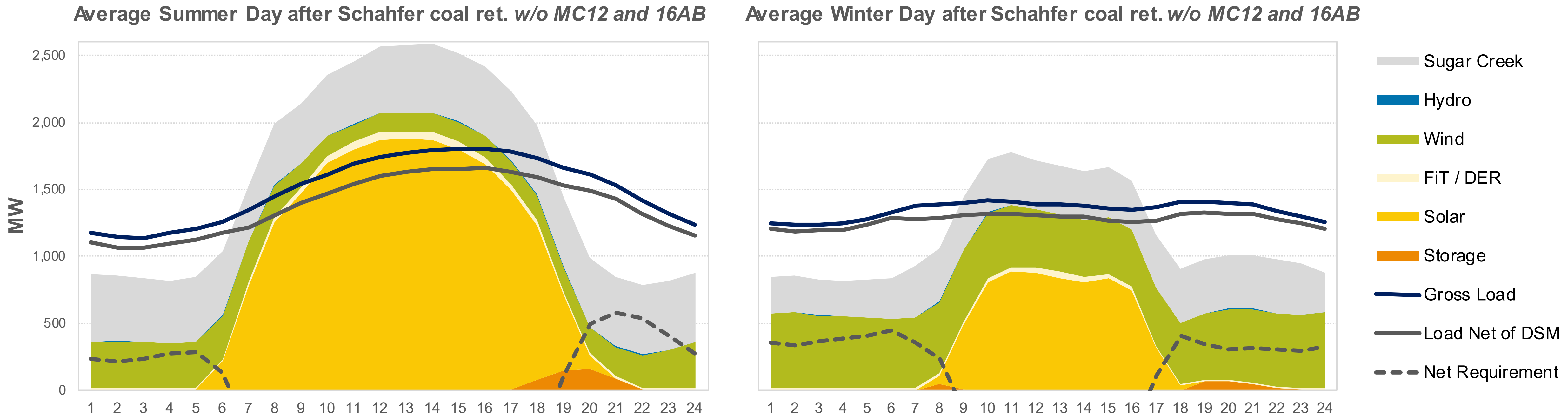
Annual Energy

Key Points

- The capacity credit for some of the 2023 projects is not reflected until 2024 due to in-service date timing
- Capacity credit for some storage resources is not reflected until 2025 (after a full year of operations) due to plant configuration
- While winter loads are lower, the lower capacity credit in the winter for solar resources results in a similar reserve margin
- On an annual basis, the net energy position for the portfolio is long, driven by the energy value and economic dispatch advantage of wind and solar resources. However, the tight capacity position may create hourly gaps, particularly in the winter mornings and evenings when solar resources ramp down (next slide)

3 STARTING ENERGY BALANCE VARIES ON AN HOURLY BASIS

- There are hours of the day where renewable resources are not available (ex: overnight for solar). Furthermore, solar resources may experience steep production declines in the evening hours
- Currently, Sugar Creek (natural gas CC), Schahfer 16AB (natural gas peaker), and Michigan City 12 (coal) are part of the portfolio, and when economic, NIPSCO can purchase from the MISO market
- As 16AB and MC12 retire, the portfolio will require new resources to be available to mitigate against specific hourly energy exposure


Average Summer Day after Schahfer coal ret. ***w/o MC12 and 16AB***

Average Winter Day after Schahfer coal ret. ***w/o MC12 and 16AB***

EXISTING FLEET ANALYSIS REVIEW

Pat Augustine, Vice President, CRA

RECAP: ANALYTICAL FRAMEWORK

- The IRP analysis is performed in two phases; the first phase examines current and future resource additions to evaluate timing of retirement for existing units
- Insight and conclusions from existing fleet analysis inform replacement concepts to evaluate. Once a preferred existing portfolio is established, future replacements are evaluated across a range of objectives

	Existing Fleet Analysis	**Replacement Analysis**
Core Questions	*How does the cost to keep a unit compare to the cost to replace with economically optimized resources?* *Is the portfolio flexible and adaptable to address changes in market rules and energy policy?*	*What are the replacement resource portfolio options?* *How do different replacement themes compare with regard to cost, risk, environmental sustainability, and reliability?*
All-Source RFP	**Actual projects available to NIPSCO**	**Actual projects available to NIPSCO**
Key Decision	What units should retire, and when?	What new resources should be added to meet customers' needs?

RECAP: CONSTRUCTED RETIREMENT PORTFOLIOS TO COVER THE RANGE OF TIMING POSSIBILITIES FOR REMAINING FOSSIL UNITS

	1	2	3	4	5	6	7	7H
Portfolio Transition Target:	**15% Coal through 2032**	**15% Coal through 2028**	**15% Coal through 2026**	**15% Coal through 2024**	**15% Coal through 2028**	**15% Coal through 2026**	**15% Coal through 2028 Fossil Free by 2032**	**15% Coal through 2028 Option for Fossil Free by 2032**
	MC 12 Through Book life	2018 IRP Preferred Plan	Early Retirement of MC 12	Early Retirement of MC 12	2018 IRP Preferred Plan + 2025 16AB retirement	Early Retirement of MC 12 + 2025 16AB retirement	2018 IRP Preferred Plan + 2025 16AB ret. + 2032 SC ret.	2018 IRP Preferred Plan + 2025 16AB ret. + 2032 SC conv.
Retain beyond 2032	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	None	Sugar Creek converts to H2 (2032)
Michigan City 12	**Retire** **2032**	**Retire** **2028**	**Retire** **2026**	**Retire** **2024**	**Retire** **2028**	**Retire** **2026**	**Retire** **2028**	→
Schahfer 16AB	**Retire** **2028**	→	→	→	**Retire** **2025**	→	→	→
Sugar Creek	**Retain**	→	→	→	→	→	**Retire** **2032**	**Convert to H2** **2032**

Short term: 1–6

Longer term: 7–7H

▨ Not a viable pathway due to implementation timing

Key Points

- Portfolio construction is necessarily broad to fully address tradeoffs
- Portfolios 1-4 focus on the timing of the Michigan City retirement
- Portfolios 5 and 6 focus on the replacement timing for Schahfer 16AB. Units are not retained beyond 2028 in any portfolio given current condition and age
- Portfolio 7 and 7H are assessing implications of carbon free portfolio pathways

RECAP: EXISTING FLEET ANALYSIS SELECTIONS ARE DRIVEN BY ECONOMIC OPTIMIZATION

Resource options include RFP tranches, DSM bundles, DER options, and an opportunity to uprate capacity at Sugar Creek

- Driven by a binding winter reserve margin and the energy resources already obtained from the 2018 IRP Preferred Plan, the indicative ordering of model selection preference favors resources that offer greater levels of firm capacity
- This is not NIPSCO's final replacement resource selection or preferred plan, but an optimized set of additions to facilitate evaluation of the various existing fleet strategies

More

COST-EFECTIVENESS

Less

Portfolio 1

MC12 Through Book Life

Technology	ICAP MW	Year
NIPSCO DER	10	2026
Sugar Creek Uprate	53	2027
DSM*	68	2027*
Thermal Contract	50	2024
Thermal Contract	100	2026
Gas Peaker	300	2032
Storage	135	2027
Total	**693**	

Portfolios 2 | 3 | 4

2018 IRP (MC 2028) | MC 2026 | MC 2028

Technology	ICAP MW	Year P2	Year P3	Year P4
NIPSCO DER	10	2026	2026	2026
Sugar Creek Uprate	53	2027	2027	2027
DSM*	68	2027*	2027*	2027*
Thermal Contract	50	2024	2024	2024
Thermal Contract	100	2026	2026	2026
Gas Peaker	300	2028	2026	2024
Storage	135	2027	2027	2025
Solar	100 / 200^	2026	2026	2026
Total	**793 / 893^**			

^ P2/3 have 100 MW of solar; P4 has 200 MW

Portfolios 5 | 6

Portfolio 2 w/ 16AB 2025 | Portfolio 3 w/ 16AB 2025

Technology	ICAP MW	Year P5	Year P6
NIPSCO DER	10	2026	2026
Sugar Creek Uprate	53	2027	2027
DSM*	68	2027*	2027*
Thermal Contract	50	2024	2024
Thermal Contract	100	2026	2026
Gas Peaker	300	2028	2026
Storage	135	2025	2025
Solar	100	2026	2026
Wind	200	N/A	2026
Total	**993**		

Portfolio 7

Fossil Free By 2032

Technology	ICAP MW	Year
NIPSCO DER	10	2026
DSM*	68	2027*
Storage	235	2025
Storage	100	2026
Storage	235	2027
Solar	250	2026
Wind	200	2026
Total	**1,020**	

Portfolio 7H

Fossil Free Option by 2032 w/ SC Conversion (incl. capital costs)

Technology	ICAP MW	Year
NIPSCO DER	10	2026
Sugar Creek Uprate	53	2027
DSM*	68	2027*
Storage	235	2025
Storage	135	2027
Solar	250	2026
Wind	200	2026
Hydrogen-Enabled Gas Peaker	193	2025
SC Electrolyzer Pilot	20	2026
Total	**1,131**	

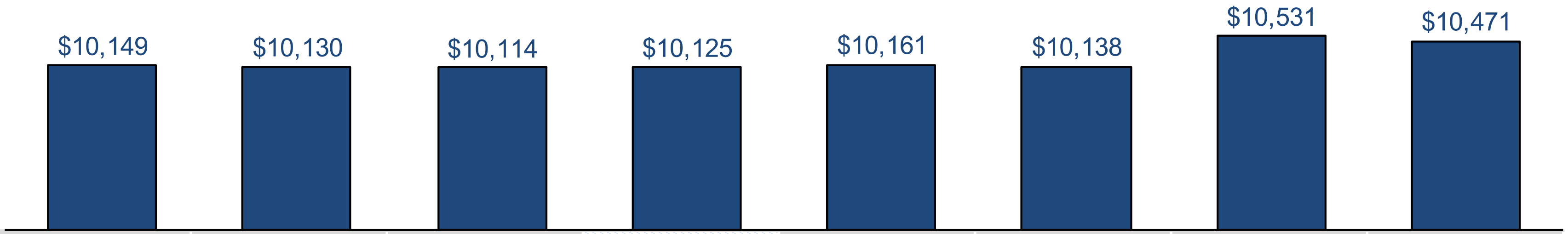
*DSM includes the cumulative impact of both Residential and Commercial programs by 2027, with Commercial being most cost effective. DSM is reported on a summer peak basis. Note that the winter impact is ~46MW.

Notes: Portfolios were optimized against winter reserve margin constraints (9.4%), followed by summer to ensure compliance with both.
A maximum net energy sales limit of 30% during the fleet transition (2023-2026), falling to 25% in 2030+, was also enforced.
Wind outside LRZ6 was not included in optimization analysis, given lack of capacity deliverability to LRZ6 and significant congestion risk.

RECAP: EXISTING FLEET ANALYSIS - DETERMINISTIC COST TO CUSTOMERS RESULTS

Net Present Value of Revenue Requirement

(2021-2050, $M)



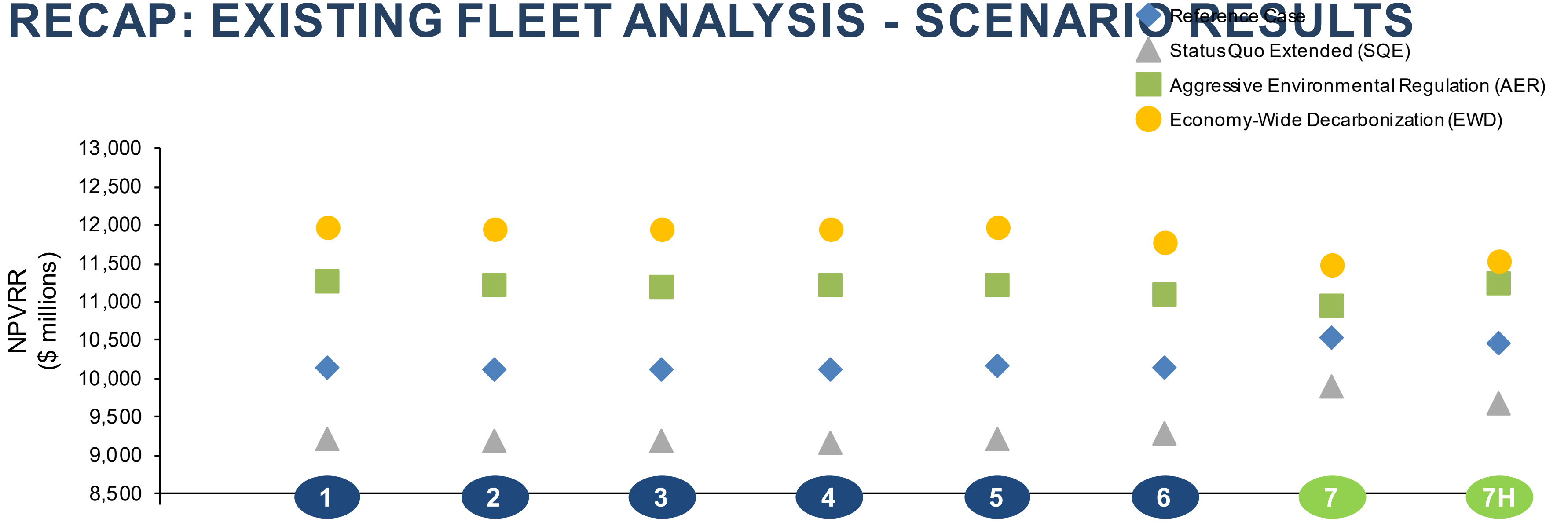
Portfolio Transition Target:	15% Coal through 2032	15% Coal through 2028	15% Coal through 2026	15% Coal through 2024	15% Coal through 2028	15% Coal through 2026	15% Coal through 2028 Fossil Free by 2032	15% Coal through 2028 Option for Fossil Free by 2032
	1	2	3	4	5	6	7	7H
Retire:	MC: 12 (2032) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16AB (2028)	MC: 12 (2026) Schfr: 16AB (2028)	MC: 12 (2024) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16 AB (2025)	MC: 12 (2026) Schfr: 16AB (2025)	MC: 12 (2028) Schfr: 16AB (2025) SC: (2032)	MC: 12 (2028) Schfr: 16AB (2025) SC to H2: (2032)
Retain beyond 2032:	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	None	Sugar Creek converts to H2 (2032)
Rank (1=Least Cost)	5	3	1	2	6	4	8	7
Delta from Least Cost	$35M 0.3%	$16M 0.2%	-	$10M 0.1%	$47M 0.5%	$24M 0.2%	$417M 4.1%	$357M 3.5%

▨ Not a viable pathway due to implementation timing

Observations

- The difference in NPVRR from the highest cost to lowest cost portfolio is approximately $430 million
- Consistent with NIPSCO's prior IRP findings, early retirement of coal is generally cost effective for customers, although the difference in cost across several portfolios is small, since much of the remaining portfolio is fixed and small changes in retirement dates are now being assessed
- Retaining Units 16A/B until 2028 may be cost effective, given the portfolio's capacity needs. However, this is contingent on the operational condition of these older vintage units, and the cost impacts of earlier retirement are less than 1% in NPVRR

RECAP: EXISTING FLEET ANALYSIS - SCENARIO RESULTS



	Portfolio Transition Target:	15% Coal through 2032	15% Coal through 2028	15% Coal through 2026	15% Coal through 2024	15% Coal through 2028	15% Coal through 2026	15% Coal through 2028 Fossil Free by 2032	15% Coal through 2028; Option for Fossil Free by 2032
	Retire:	MC: 12 (2032) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16AB (2028)	MC: 12 (2026) Schfr: 16AB (2028)	MC: 12 (2024) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16 AB (2025)	MC: 12 (2026) Schfr: 16AB (2025)	MC: 12 (2028) Schfr: 16AB (2025) SC: (2032)	MC: 12 (2028) Schfr: 16AB (2025) SC to H2: (2032)
	Retain beyond 2032:	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	None	Sugar Creek converts to H2 (2032)
Reference Case	**Delta from Lowest Cost to Customer**	$35 0.3%	$16 0.2%	- -	$10 0.1%	$47 0.5%	$24 0.2%	$417 4.1%	$357 3.5%
Status Quo Extended	**Delta from Lowest Cost to Customer**	$36 0.4%	$18 0.2%	$2 0.0%	- -	$49 0.5%	$108 1.2%	$720 7.8%	$492 5.4%
Aggressive Env. Reg.	**Delta from Lowest Cost to Customer**	$336 3.1%	$269 2.5%	$259 2.4%	$277 2.5%	$292 2.7%	$157 1.4%	- -	$303 2.8%
Econ-Wide Decarbonization	**Delta from Lowest Cost to Customer**	$477 4.1%	$454 3.9%	$449 3.9%	$459 4.0%	$478 4.2%	$276 2.4%	- -	$29 0.3%

▨ Not a viable pathway due to implementation timing

*Note that a $0.50/kg H2 subsidy is assumed in AER and EWD

Observations

- MC12 retirement in 2026 has a small cost benefit (<$20M) relative to retirement in 2028 across all scenarios
- MC 12 retirement in 2032 is always higher cost than earlier retirement, with the largest difference in the AER scenario (high carbon price)
- Portfolio 2 is slightly lower cost than Portfolio 5, although additional renewable additions with early 16AB retirement (Portfolio 6) lower costs under high carbon regulation scenarios
- Portfolios 7 and 7H have the smallest range, as their future renewable, hydrogen, and storage investments hedge against high-cost power market outcomes

RECAP: EXISTING FLEET ANALYSIS SCORECARD

Objective	Indicator	Description and Metrics
Affordability	**Cost to Customer**	• Impact to customer bills • Metric: 30-year NPV of revenue requirement (Reference Case scenario deterministic results)
Rate Stability	**Cost Certainty**	• Certainty that revenue requirement within the most likely range of outcomes • Metric: Scenario range NPVRR
	Cost Risk	• Risk of unacceptable, high-cost outcomes • Metric: Highest scenario NPVRR
	Lower Cost Opportunity	• Potential for lower cost outcomes • Metric: Lowest scenario NPVRR
Environmental Sustainability	**Carbon Emissions**	• Carbon intensity of portfolio • Metric: Cumulative carbon emissions (2024-40 short tons of CO_2) from the generation portfolio
Reliable, Flexible, and Resilient Supply	**Reliability**	• *To be addressed in Replacement Analysis stage*
	Resource Optionality	
Positive Social & Economic Impacts	**Employees**	• Net impact on NiSource jobs • Metric: Approx. number of permanent NiSource jobs associated with generation
	Local Economy	• Net effect on the local economy (relative to 2018 IRP) from new projects and ongoing property taxes • Metric: NPV of existing fleet property tax relative to 2018 IRP

Additional risk metrics will be included in the Replacement Analysis, when broader set of resource types are evaluated

Key Points

- Two closely related, but distinct scorecards are used for the Existing Fleet Analysis and the Replacement Analysis
- The Existing Fleet Analysis focuses on scenario costs, carbon emissions, and impact on NIPSCO employees and the local economy
- The Replacement Analysis expands the risk assessment to include a stochastic assessment and introduces reliability metrics to assess a broader range of future resource options

RECAP: EXISTING FLEET ANALYSIS SCORECARD

	1	2	3	4	5	6	7	7H
Portfolio Transition Target:	**15% Coal through 2032**	**15% Coal through 2028**	**15% Coal through 2026**	**15% Coal through 2024**	**15% Coal through 2028**	**15% Coal through 2026**	**15% Coal through 2028 Fossil Free by 2032**	**15% Coal through 2028 Fossil Free by 2032**
Retire:	MC: 12 (2032) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16AB (2028)	MC: 12 (2026) Schfr: 16AB (2028)	MC: 12 (2024) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16 AB (2025)	MC: 12 (2026) Schfr: 16AB (2025)	MC: 12 (2028) Schfr: 16AB (2025) SC: (2032)	MC: 12 (2028) Schfr: 16AB (2025) SC to H2: (2032)
Retain beyond 2032:	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	None	Sugar Creek converts to H2 (2032)
Cost To Customer 30-year NPV of revenue requirement (Ref Case)	$10,149 +$35 0.3%	$10,130 +$16 0.2%	$10,114 - -	$10,125 $10 0.1%	$10,161 +$47 0.5%	$10,138 +$24 0.2%	$10,531 +$417 4.1%	$10,471 +$357 3.5%
Cost Certainty Scenario Range (NPVRR)	$2,759 +$1,161 72.6%	$2,754 +$1,156 72.3%	$2,766 +$1,167 73.0%	$2,777 +$1,179 73.8%	$2,747 +$1,149 71.9%	$2,487 +$889 55.6%	$1,598 - -	$1,855 +$257 16.1%
Cost Risk Highest Scenario NPVRR	$11,974 +$477 4.1%	$11,951 $454 3.9%	$11,947 +$449 3.9%	$11,957 +$459 4.0%	$11,976 +$478 4.2%	$11,773 +$276 2.4%	$11,498 - -	$11,527 +$29 0.3%
Lower Cost Opportunity Lowest Scenario NPVRR	$9,215 +$36 0.4%	$9,197 +$18 0.2%	$9,181 +$2 0.0%	$9,179 - -	$9,229 +$49 0.5%	$9,287 +$108 1.2%	$9,899 +$720 7.8%	$9,671 +$492 5.3%
Carbon Emissions M of tons 2024-40 Cum. (Scenario Avg.)	43.3 +22 102%	33.7 +12 57%	28.5 +7 33%	23.0 +2 8%	33.7 +12 57%	28.5 +7 33%	21.4 - -	30.9 +9 44%
Employees Approx. existing gen. jobs compared to 2018 IRP*	+127	0	-127	-127	-4	-131	-34	-4
Local Economy NPV of existing fleet property tax relative to 2018 IRP	+$13	$0	-$10	-$23	$0	-$10	-$16	+$13

*Adding replacement projects could have an impact on net jobs

▨ Not a viable pathway due to implementation timing

BREAK

REPLACEMENT ANALYSIS REVIEW

Pat Augustine, Vice President, CRA
Hisham Othman, VP, Transmission and Regulatory Consulting, Quanta Technology, LLC

RECAP: ANALYTICAL FRAMEWORK

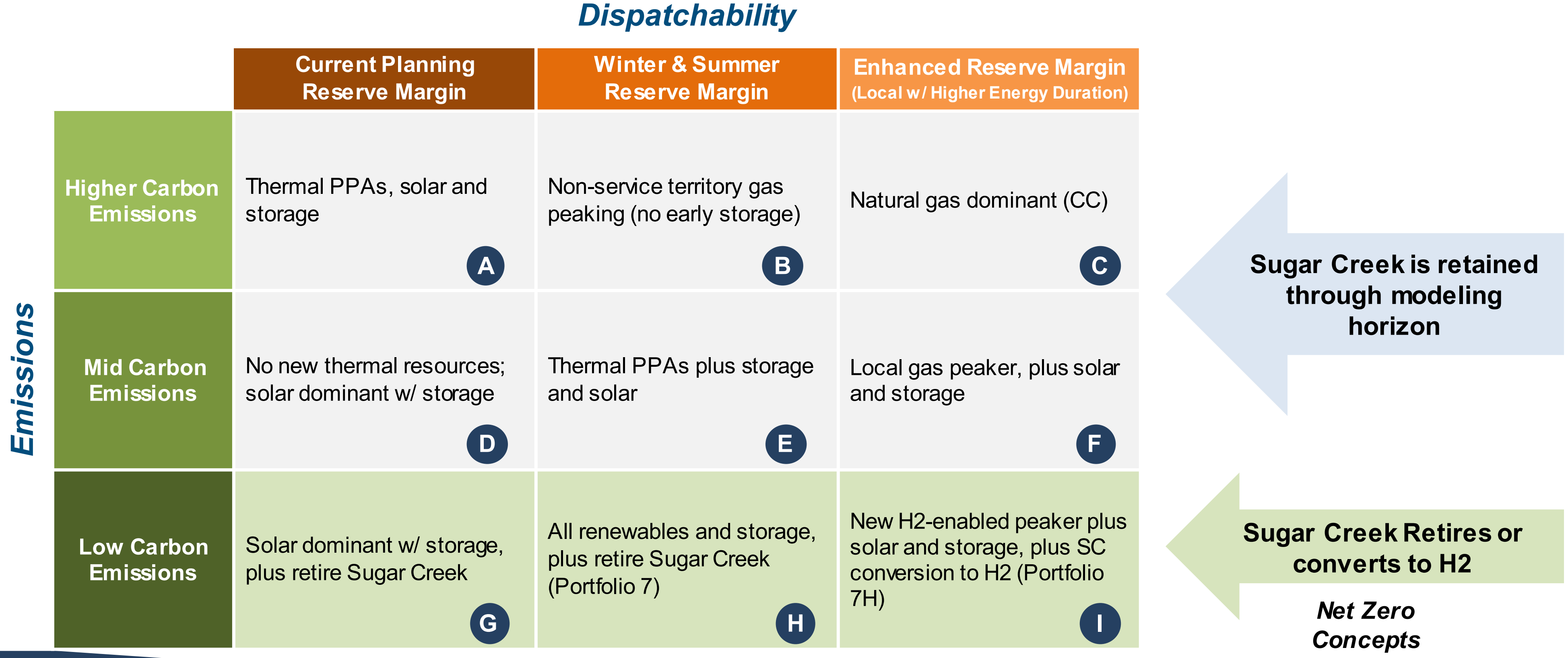
- The IRP analysis is performed in two phases; the first phase examines current and future resource additions to evaluate timing of retirement for existing units
- Insight and conclusions from existing fleet analysis inform replacement concepts to evaluate. Once a preferred existing portfolio is established, future replacements are evaluated across a range of objectives

	Existing Fleet Analysis	Replacement Analysis
Core Questions	*How does the cost to keep a unit compare to the cost to replace with economically optimized resources?* *Is the portfolio flexible and adaptable to address changes in market rules and energy policy?*	*What are the replacement resource portfolio options?* *How do different replacement themes compare with regard to cost, risk, environmental sustainability, and reliability?*
All-Source RFP	**Actual projects available to NIPSCO**	**Actual projects available to NIPSCO**
Key Decision	What units should retire, and when?	What new resources should be added to meet customers' needs?

RECAP: REPLACEMENT ANALYSIS PORTFOLIOS HAVE BEEN DEVELOPED ACROSS NINE CONCEPTS

The concepts are informed by the IRP themes, findings from the Existing Fleet Analysis, and additional optimization testing

- For the Replacement Analysis, **Portfolio 3** from the Existing Fleet analysis has been used to assess portfolio selection under the earliest possible retirement of MC12. Note that Portfolio 2 would have similar results, with small changes in resource addition timing. This approach does not imply that NIPSCO has determined a specific MC12 retirement date
- Resource combinations are constructed based on RFP projects (tranches) and other opportunities to explore a range of emissions profiles and dispatchability under current and proposed market rules



Dispatchability

Emissions

	Current Planning Reserve Margin	**Winter & Summer Reserve Margin**	**Enhanced Reserve Margin (Local w/ Higher Energy Duration)**
Higher Carbon Emissions	Thermal PPAs, solar and storage A	Non-service territory gas peaking (no early storage) B	Natural gas dominant (CC) C
Mid Carbon Emissions	No new thermal resources; solar dominant w/ storage D	Thermal PPAs plus storage and solar E	Local gas peaker, plus solar and storage F
Low Carbon Emissions	Solar dominant w/ storage, plus retire Sugar Creek G	All renewables and storage, plus retire Sugar Creek (Portfolio 7) H	New H2-enabled peaker plus solar and storage, plus SC conversion to H2 (Portfolio 7H) I

Sugar Creek is retained through modeling horizon

Sugar Creek Retires or converts to H2

Net Zero Concepts

RECAP: ICAP ADDITIONS– RFP PROJECTS AND OTHER NEAR-TERM OPPORTUNITIES

- Several resource additions are common across all themes, *when allowed*: **R&C DSM programs**, **Thermal PPAs, attractive NIPSCO DER, SC uprate**
- A range of solar, storage, gas, wind, and hydrogen-enabled resources are incorporated across portfolios

Dispatchability

ICAP Additions through 2027 Planning Year

Emissions

	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)
Higher Carbon Emissions	**A** NIPSCO DER 10MW SC Uprate 53MW Thermal PPA 150MW Storage 135MW Solar+Storage 450MW* Solar 250MW	**B** NIPSCO DER 10MW SC Uprate 53MW Gas Peaker** 443MW Thermal PPA 150MW Solar 250MW	**C** NIPSCO DER 10MW SC Uprate 53MW Gas CC 650MW *Portfolio violates normal net long energy sales constraints enforced in optimization*
Mid Carbon Emissions	**D** NIPSCO DER 10MW SC Uprate 53MW Storage 135MW Solar+Storage 450MW* Solar 400MW	**E** NIPSCO DER 10MW SC Uprate 53MW Thermal PPA 150MW Storage 470MW Solar 250MW	**F** NIPSCO DER 10MW SC Uprate 53MW Gas Peaker** 300MW Thermal PPA 150MW Storage 135MW Solar 100MW
Low Carbon Emissions	**G** NIPSCO DER 10MW Storage 135MW Solar+Storage 450MW* Solar 450MW	**H** NIPSCO DER 10MW Wind 200MW Storage 570MW Solar 250MW	**I** NIPSCO DER 10MW SC H2 Electrolyzer 20MW SC Uprate 53MW H2 Enabled Peaker 193MW Wind 200MW Storage 370MW Solar 250MW

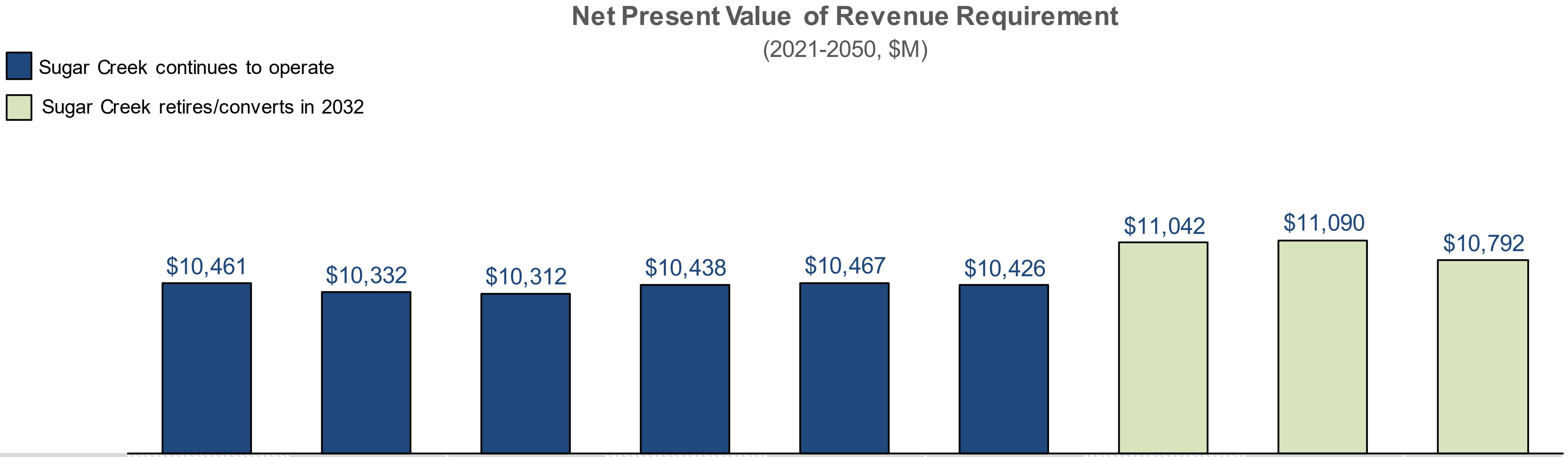
Sugar Creek is retained through modeling horizon

Sugar Creek Retires or converts to H2

Net Zero Concepts

Note: Residential/Commercial DSM universally selected across portfolios
**Represents 300 MW of solar and 150 MW of storage*
***Gas peaker in Portfolio B represents an out-of-service territory PPA; Gas peaker in Portfolio F represents asset sale proposal*

RECAP: RESULTS - COST TO CUSTOMER REFERENCE CASE



Net Present Value of Revenue Requirement

(2021-2050, $M)

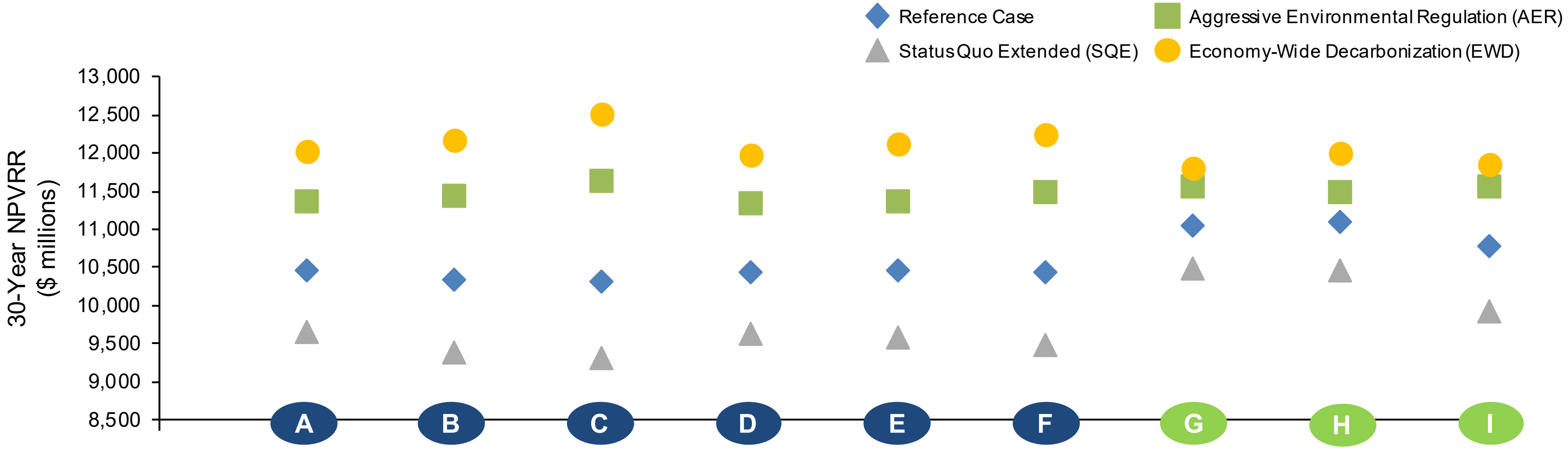
Replacement Theme	Thermal PPAs, solar and storage	Non-service territory gas peaking (no early storage)	Natural gas dominant (CC)	No new thermal resources; solar dominant w/ storage	Thermal PPAs plus storage and solar	Local gas peaker, plus solar and storage	Solar dominant w/ storage, plus retire Sugar Creek	All renewables and storage, plus retire Sugar Creek (Portfolio 7)	New H2-enabled peaker plus solar and storage, plus SC conversion to H2 (Portfolio 7H)
	A ▨	B	C	D ▨	E	F	G ▨	H	I
Carbon Emissions	Higher	Higher	Higher	Mid	Mid	Mid	Low	Low	Low
Dispatchability	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)
Rank (1=Least Cost)	5	2	1	4	6	3	8	9	7
Delta from Least Cost	$149 1.4%	$20 0.2%	-	$126 1.2%	$155 1.5%	$114 1.1%	$730 7.1%	$778 7.5%	$480 4.7%

▨ Not a viable pathway due to not meeting winter planning reserve margins

Observations

- Portfolios A through F are all within ~$150 million NVPRR
- Portfolios A and D (solar dominant that only meet summer RM) are not tenable options given potential market rule changes
- Portfolio C develops a very net long position and is higher cost than several alternatives over a 20-year period, as economics are driven by long-term "merchant" margins
- Portfolios with significant storage (E in particular) have potential value in ancillary services markets
- Portfolios G, H, and I (net zero concepts) are higher cost, with Portfolio I retaining the optionality to burn natural gas at Sugar Creek under Reference Case conditions

RECAP: REPLACEMENT ANALYSIS SCENARIO RESULTS



		A	B	C	D	E	F	G	H	I
	Carbon Emissions:	Higher	Higher	Higher	Mid	Mid	Mid	Low	Low	Low
	Dispatchability:	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)
Reference Case	**Delta from Lowest Cost to Customer**	$149 1.4%	$20 0.2%	- -	$126 1.2%	$155 1.5%	$114 1.1%	$730 7.1%	$778 7.5%	$480 4.7%
Status Quo Extended	**Delta from Lowest Cost to Customer**	$347 3.7%	$91 1.0%	- -	$334 3.6%	$278 3.0%	$186 2.0%	$1,176 12.6%	$1,149 12.3%	$624 6.7%
Aggressive Env. Reg.	**Delta from Lowest Cost to Customer**	$18 0.2%	$106 0.9%	$299 2.6%	- -	$35 0.3%	$151 1.3%	$235 2.1%	$144 1.3%	$212 1.9%
Econ-Wide Decarb.	**Delta from Lowest Cost to Customer**	$207 1.7%	$373 3.2%	$709 6.0%	$156 1.3%	$317 2.7%	$434 3.7%	- -	$202 1.7%	$39 0.3%

▨ Not a viable pathway due to not meeting winter planning reserve margins

*Note that a $0.50/kg H2 subsidy is assumed in AER and EWD

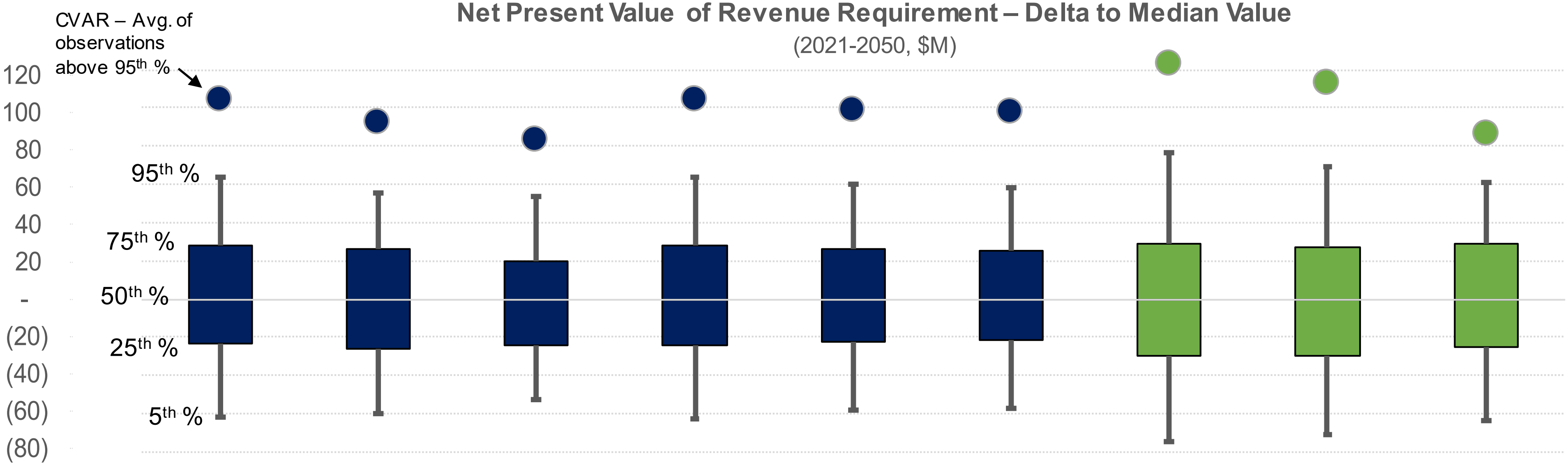
Observations

- Portfolios B, C, and F have lowest costs among viable options under the Reference and SQE scenarios
- Portfolio E has the lowest cost among viable portfolios under the AER scenario, with C highest cost and H/I more competitive
- Emission free resources (clean energy) have the most value in the EWD scenario, with Portfolio I (assuming a future H2 subsidy) having the lowest cost among viable portfolios

RECAP: RESULTS - STOCHASTIC ANALYSIS

Net Present Value of Revenue Requirement – Delta to Median Value

(2021-2050, $M)



	A	B	C	D	E	F	G	H	I
Replacement Theme	**Thermal PPAs, solar and storage**	**Non-service territory gas peaking (no early storage)**	**Natural gas dominant (CC)**	**No new thermal resources; solar dominant w/ storage**	**Thermal PPAs plus storage and solar**	**Local gas peaker, plus solar and storage**	**Solar dominant w/ storage, plus retire Sugar Creek**	**All renewables and storage, plus retire Sugar Creek (Portfolio 7)**	**New H2-enabled peaker plus solar and storage, plus SC conversion to H2 (Portfolio 7H)**
Carbon Emissions	Higher	Higher	Higher	Mid	Mid	Mid	Low	Low	Low
Dispatchability	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)
95th % CVAR Delta from Low	21	9	-	21	15	14	40	31	4
75th % Delta from Low	8	6	-	8	6	6	9	7	9
5th % Delta from Low	13	15	22	12	17	18	-	4	11

Observations

- The stochastic analysis evaluates short-term volatility in commodity prices (natural gas and power) and hourly renewable (solar and wind) output
- The overall magnitude of cost distributions across portfolios is narrower than the scenario range, suggesting that stochastic risk for these portfolio options is less impactful than the major policy or market shifts evaluated across scenarios
- Over the 30-year time horizon, dispatchability serves to mitigate tail risk, as portfolios that retain SC or add gas (including with hydrogen enablement) or storage capacity perform best at minimizing upside risk
- The lowest downside range is observed in renewable-dominant portfolios

RECAP: IN PREVIOUS SCORECARD RELIABILITY INDICATORS WERE UNDER DEVELOPMENT

Objective	Indicator	Description and Metrics
Affordability	**Cost to Customer**	• Impact to customer bills • Metric: 30-year NPV of revenue requirement (Reference Case scenario deterministic results)
Rate Stability	**Cost Certainty**	• Certainty that revenue requirement within the most likely range of outcomes • Metric: Scenario range NPVRR and 75th % range vs. median
	Cost Risk	• Risk of unacceptable, high-cost outcomes • Metric: Highest scenario NPVRR and 95th % conditional value at risk (average of all outcomes above 95th % vs. median)
	Lower Cost Opportunity	• Potential for lower cost outcomes • Metric: Lowest scenario NPVRR and 5th % range vs. median
Environmental Sustainability	**Carbon Emissions**	• Carbon intensity of portfolio • Metric: Cumulative carbon emissions (2024-40 short tons of CO_2) from the generation portfolio
Reliable, Flexible, and Resilient Supply	**Reliability**	• The ability of the portfolio to provide reliable and flexible supply for NIPSCO in light of evolving market conditions and rules • Metric: *Sub-hourly A/S value impact and additional scoring (under development)*
	Resource Optionality	• The ability of the portfolio to flexibly respond to changes in NIPSCO load, technology, or market rules over time • Metric: MW weighted duration of generation commitments (UCAP – 2027)
Positive Social & Economic Impacts	**Employees**	• *Addressed in Existing Fleet Analysis for existing generation assets; employee numbers will be dependent on specific asset replacements*
	Local Economy	• Effect on the local economy from new projects and ongoing property taxes • Metric: NPV of property taxes from the entire portfolio

Key Points

- The Replacement Analysis scorecard incorporates broader perspectives on risk (stochastic analysis) and reliability than the Existing Fleet Analysis scorecard
- NIPSCO has completed the qualitative assessment of reliability and has now defined the reliability metrics which will be used in the scorecard (discussed further on following slides)

COMPLETED ANALYSES TO INFORM RELIABILITY INDICATORS

- The results presented in September did not include additional reliability considerations that were previously under development
  - Certain portfolio attributes were evaluated through additional economic analysis
  - Ohers required a technical, but non-economic review
- NIPSCO held a Technical Webinar on October 12th to review the approach, analyses, and key outcomes of the additional reliability assessment to provide an open forum for questions and discussion

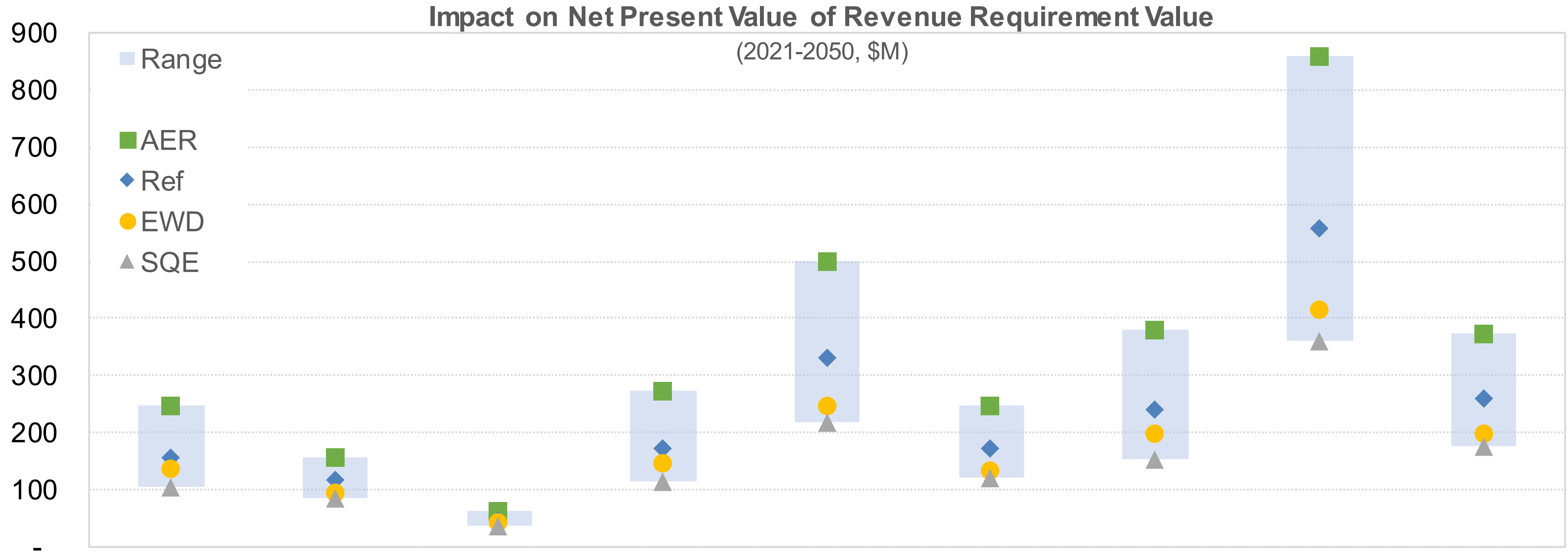
	Economic Assessment	Non-Economic Assessment
Analysis Performed	Ancillary services analysis (regulation and spinning reserves), with sub-hourly granularity	Qualitative reliability assessment performed by third-party expert Quanta Technology
Scorecard Metric	Sub-hourly energy and ancillary services value impact	Composite Reliability Assessment Score

SUB-HOURLY ENERGY AND ANCILLARY SERVICES EVALUATION

- While most of NIPSCO's existing portfolio (including new renewables) realize nearly all value from energy and capacity contributions, highly flexible resources that do not provide a lot of energy to the portfolio may still provide value in the form of ancillary services and in their ability to respond to changing market conditions in real time at sub-hourly granularity:
  - The MISO market currently operates markets for spinning reserves and regulation
  - FERC Order 841 also requires ISOs to redesign markets to accommodate energy storage

- Long-term market developments are uncertain, and fundamental evaluation of sub-hourly ancillary services markets is challenging, but the 2021 IRP has performed an analysis, incorporating:
  - 5-minute granularity for energy and ancillary services based on historical data observations and future energy market scenario projections
  - Operational parameters for various storage and gas peaking options
  - ***Incremental value, above and beyond what is picked up in the Aurora-based hourly energy dispatch, is assessed and summarized on a portfolio level***

RANGE OF ADDITIONAL VALUE OPPORTUNITY (NPVRR COST REDUCTION) BY PORTFOLIO



	A	B	C	D	E	F	G	H	I
Replacement Theme	Thermal PPAs, solar and storage	Non-service territory gas peaking (no early storage)	Natural gas dominant (CC)	No new thermal resources; solar dominant w/ storage	Thermal PPAs plus storage and solar	Local gas peaker, plus solar and storage	Solar dominant w/ storage, plus retire Sugar Creek	All renewables and storage, plus retire Sugar Creek (Portfolio 7)	New H2-enabled peaker plus solar and storage, plus SC conversion to H2 (Portfolio 7H)
Carbon Emissions	Higher	Higher	Higher	Mid	Mid	Mid	Low	Low	Low
Dispatchability	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)

Observations

- *Additional value is uncertain and dependent on market rules evolution, MISO generation mix changes, and market participant behavior*
- Portfolios with the largest amounts of storage (E and H) have the greatest potential to lower NPVRR by capturing flexibility value that may manifest in the sub-hourly energy and ancillary services markets
- A wide range of value is possible, with higher prices and price spreads in the AER scenario driving higher estimates
- Results are incorporated into the final replacement analysis scorecard

RELIABILITY ASSESSMENT GUIDING PRINCIPLES

Resources Modeled	▪ The resources modeled are based on the portfolios constructed for the Replacement Analysis
Transmission Upgrades	▪ Analysis incorporates planned transmission projects
Time Period	▪ Resources are evaluated in 2030 after the Michigan City Unit 12 retirement
Evaluation	▪ The analysis is conducted at a planning level and, therefore, further evaluation and granular studies will be required in the future ▪ Individual resources from the 9 replacement portfolios are assessed based on the established reliability criteria. The score of the individual resources drive the portfolio score

Goal

- **Understand potential reliability implications of potential resource additions to the NIPSCO portfolio**
- **Understand the range of potential mitigations required associated with different replacement portfolio strategies**

TECHNICAL WEBINAR STAKEHOLDER FEEDBACK

Stakeholders offered several comments and questions during the Technical Webinar on 10/12.

Stakeholder	Feedback Summary	NIPSCO Response
Indiana Office of Utility Consumer Counselor (OUCC)	• Consider evaluating "energy inflows and outflows" by hour rather than constraining NIPSCO's system to be islanded.	• This has been evaluated as part of the core IRP economic modeling and analysis, including stochastic analysis: ◦ Under normal operating conditions, NIPSCO is constantly selling and buying energy to and from the market, so this exposure is economic and less about physical transmission limitations. ◦ The analysis concluded that over the long-term, portfolios with more dispatchable gas or storage are less susceptible to market risk than those dominated by renewables. • The reliability assessment has focused separately on energy adequacy risks under emergency conditions.
Citizens Action Coalition of Indiana (CAC)	• Consider portfolio evaluation under more representative emergency conditions rather than full islanded conditions. This might include simulation of severe weather events (which may be getting more frequent due to climate change) and associated resource availability, including renewables and other resources that may be impacted by forced outage or fuel supply unavailability.	• NIPSCO's assessment was intended to evaluate a "worst case" week and not imply islanded operations for the year. • We have not simulated weather, load, or forced outage events within the reliability assessment, but there may be an opportunity to tie elements of the stochastic analysis that was performed to additional reliability metrics in the future. Of particular focus are those that examine tail risk, as measured by CVAR in the economic analysis. • There is an industry trend towards greater focus on generation and transmission resiliency studies that aim to better quantify extreme event risk, and we will consider analysis enhancements for future IRPs and further reliability assessment.

Note NIPSCO has received other comments from stakeholders and is in the process of reviewing. We will strive to incorporate feedback received into the final report.

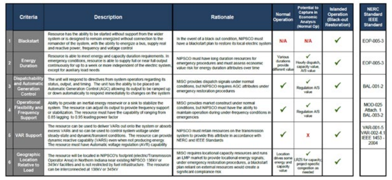
RELIABILITY ASSESSMENT AND RANKING

QUANTA TECHNOLOGY

Assess NIPSCO's Reliability Needs

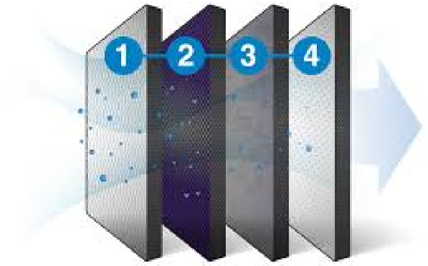
- Power Ramping
- Frequency Response
- Short Circuit Strength
- Flicker
- Black Start

Review & Update Reliability Metrics



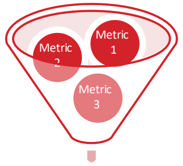
	Criteria	Description	Rationale	Normal Operation	Potential to Capture in Economic Analysis (Normal Op)	Islanded Operation (Black-out Restoration)	NERC Standard IEEE Standard
1	Blackstart	Resource has the ability to be started without support from the wider system or is designed to remain energized without connection to the remainder of the system, with the ability to energize a bus, supply real and reactive power, frequency and voltage control	In the event of a black out condition, NIPSCO must have a blackstart plan to restore its local electric system	N/A	N/A	✓	EOP-005-3
2	Energy Duration	Resource is able to meet energy and capacity duration requirements. In emergency conditions, resource is able to supply full or near full output continuously for up to a week or more independent of the electric system, except for auxiliary load needs	NIPSCO must have long duration resources for emergency procedures and must assess economic value risk for energy duration attributes over time	Various durations provide different value	✓ Hourly dispatch, capacity value, A/S value	✓	EOP-005-3
3	Dispatchability and Automatic Generation Control	The unit will respond to directives from system operators regarding its status, output, and timing. The unit has the ability to be placed on Automatic Generation Control (AGC) allowing its output to be ramped up or down automatically to respond immediately to changes on the system	MISO provides dispatch signals under normal conditions, but NIPSCO requires AGC attributes under emergency restoration procedures	✓	✓ Regulation A/S value	✓	BAL-001-2
4	Operational Flexibility and Frequency Support	Ability to provide an inertial energy reservoir or a sink to stabilize the system. The resource can adjust its output to provide frequency support or stabilization. The resource must have the capability of ranging from 0.85 lagging to 0.95 leading power factor	MISO provides market construct under normal conditions, but NIPSCO must have the ability to maintain operation during under-frequency conditions in emergencies	✓	✓ Regulation A/S value	✓	MOD-025 Attach. 1 BAL-003-2
5	VAR Support	The resource can be used to deliver VARs out onto the system or absorb excess VARs and so can be used to control system voltage under steady-state and dynamic/transient conditions. The resource can provide dynamic reactive capability (VARS) even when not producing energy. The resource must have Automatic voltage regulation (AVR) capability	NIPSCO must retain resources on the transmission system to provide this attribute in accordance with NERC and IEEE Standards	✓	X	✓	VAR-001-5 VAR-002-4.1 IEEE 1453 - 2004
6	Geographic Location Relative to Load	The resource will be located in NIPSCO's footprint (electric/Transmission Operator Area) in Northern Indiana near existing NIPSCO 138kV or 345kV facilities and is not restricted by fuel infrastructure. The resource can be interconnected at 138kV or 345kV	MISO requires locational capacity resources and runs an LMP market to provide locational energy signals; under emergency restoration procedures, a blackstart plan reliant on external resources would create a significant compliance risk	Location drives some energy and capacity value	✓ LRZ6 for capacity; project-specific congestion as needed	✓	

Apply a Series of Reliability Filters to IRP Portfolios



Scoring Criteria

Ranking Portfolios



Preferred Portfolio

RELIABILITY CRITERIA

	Criteria	Description	Rationale
1	**Blackstart**	Resource has the ability to be started without support from the wider system or is designed to remain energized without connection to the remainder of the system, with the ability to energize a bus, supply real and reactive power, frequency and voltage control	In the event of a black out condition, NIPSCO must have a blackstart plan to restore its local electric system. The plan can either rely on MISO to energize a cranking path or on internal resources within the NIPSCO service territory.
2	**Energy Duration**	Resources are able to meet the energy and capacity duration requirements. Portfolio resources are able to supply the energy demand of customers during MISO's emergency max gen events, and also to supply the energy needs of critical loads during islanded operation events.	NIPSCO must have long duration resources to serve the needs of its customers during emergency and islanded operation events.
3	**Dispatchability and Automatic Generation Control**	The unit will respond to directives from system operators regarding its status, output, and timing. The unit has the ability to be placed on Automatic Generation Control (AGC) allowing its output to be ramped up or down automatically to respond immediately to changes on the system.	MISO provides dispatch signals under normal conditions, but NIPSCO requires AGC attributes under emergency restoration procedures or other operational considerations
4	**Operational Flexibility and Frequency Support**	Ability to provide inertial energy reservoir or a sink to stabilize the system. The resource can adjust its output to provide frequency support or stabilization in response to frequency deviations with a droop of 5% or better	MISO provides market construct under normal conditions, but preferable that NIPSCO possess the ability to maintain operation during under-frequency conditions in emergencies
5	**VAR Support**	The resource can be used to deliver VARs out onto the system or absorb excess VARs and so can be used to control system voltage under steady-state and dynamic/transient conditions. The resource can provide dynamic reactive capability (VARs) even when not producing energy. The resource must have Automatic voltage regulation (AVR) capability. The resource must have the capability ranging from 0.85 lagging to 0.95 leading power factor	NIPSCO must retain resources electrically close to load centers to provide this attribute in accordance with NERC and IEEE Standards
6	**Geographic Location Relative to Load**	The resource will be located in NIPSCO's footprint (electric Transmission Operator Area) in Northern Indiana near existing NIPSCO 138kV pr 345kV facilities and is not restricted by fuel infrastructure. The resource can be interconnected at 138kV or 345kV. Preferred locations are ones that have multiple power evacuation/deliverability paths and are close to major load centers.	MISO requires location capacity resources and runs an LMP market to provide locational energy signals; under emergency restoration procedures, a blackstart plan reliant on external resources would create a significant risk. Location provides economic value in the form of reduced losses, congestion, curtailment risk, and address local capacity requirements. Additionally, from a reliability perspective, resources that are interconnected to buses with multiple power evacuation paths and those close to load centers are more resilient to transmission system outages and provide better assistance in the blackstart restoration process.
7	**Predictability and Firmness of Supply**	Ability to predict/forecast the output of resources and to counteract forecast errors.	Energy is scheduled with MISO in the day-ahead hourly market and in the real-time 5-minute market. Deviations from these schedules have financial consequences and thus the ability to accurately forecast the output of a resource up to 38 hours ahead of time for the day-ahead market and 30 minutes for the real time market is advantageous.
8	**Short Circuit Strength Requirement**	Ensure the strength of the system to enable the stable integration of all inverter-based resources (IBRs) within a portfolio.	The retirement of synchronous generators within NIPSCO footprint and also within MISO and replacements with increasing levels of inverter-based resources will lower the short circuit strength of the system. Resources than can operate at lower levels of SCR and those that provide higher short circuit current provide a better future proofing without the need for expensive mitigation measures.

RELIABILITY METRICS

	Criteria	Potential Measurement Approaches Considered	Included in Minimum Interconnection Requirements	Quanta Analysis to Develop Metric
1	**Blackstart**	• MWs with black start capability	NO	• Blackstart Analysis
2	**Energy Duration**	• Percentage of NIPSCO's critical load (MW and Time) that can be supplied during emergencies	NO	• Energy Adequacy Analysis
3	**Dispatchability and Automatic Generation Control**	• MWs on AGC • Up Range / Down Range • Ability for Fast Regulation • Duration of Up / Down Regulation	NO (except being on SCADA for monitoring and control)	• Increase of Regulation Requirements due to IBRs in each Portfolio • 10-min Ramp Capability of Portfolio
4	**Operational Flexibility and Frequency Support**	• Inertial Response Gap/Surplus • Primary Frequency Response Gap/Surplus	NO	• Inertial Repose • Primary Response
5	**VAR Support**	• Continuous VAR output range that can be delivered to load centers	YES	• Dynamic VAR deliverability
6	**Geographic Location Relative to Load**	• MWs or % within NIPSCO footprint • Firmness of fuel supplies • MWs with POIs with multiple (2 or higher) secure power evacuation paths	NO	• Topology analysis
7	**Predictability and Firmness of Supply**	• Ability to mitigate Forecast Error of intermittent resources using fast ramping capability	NO	• Power Ramping and Forecast Errors
8	**Short Circuit Strength Requirement**	• MWs of IBRs potentially impacted by lack of short circuit strength • Need for synchronous condensers and/or grid forming inverters to ensure stable system integration	NO, 1547 and P2800 do not address	• Short Circuit Strength Analysis

PORTFOLIO RELIABILITY METRICS

Preliminary

	Year 2030	Metric	A	B	C	D	E	F	G	H	I
1	**Blackstart**	Qualitative Assessment of Risk of not Starting	0	0	1	0	1	1	0	1	1
2	**Energy Adequacy**	Energy Not Served when Islanded (Worst 1-week) %	76%	78%	32%	75%	78%	56%	74%	73%	58%
3	**Dispatchability and Automatic Generation Control**	Dispatchable (%CAP, unavoidable VER Penetration)	28%	16%	55%	27%	44%	45%	26%	47%	47%
			58%	50%	42%	63%	50%	45%	65%	51%	51%
		Increased Freq Regulation Requirements (MW)	54	41	34	58	41	37	59	46	46
		1-min Ramp Capability (MW)	331	196	261	331	666	382	326	761	599
		10-min Ramp Capability (MW)	574	439	764	574	909	784	548	983	944
4	**Operational Flexibility and Frequency Support**	Inertia MVA-s	3,218	3,218	6,729	3,218	3,218	5,116	2,931	2,931	4,397
		Inertial Gap FFR MW	155	283	157	160	0	79	171	0	0
		Primary Gap PFR MW	259	388	380	260	0	249	261	0	19
5	**VAR Support**	Dynamic VAR to load Center Capability (MVAr)	658	471	457	704	630	555	725	731	719
6	**Location**	Average Number of Evacuation Paths	5	3	N/A	5	5	5	5	6	5
7	**Predictability and Firmness**	Ramping Capability to Mitigate Forecast Errors (+Excess/-Deficit) MW	-228	134	-262	-257	161	154	-266	245	238
8	**Short Circuit Strength**	Required Additional Synch Condensers MVA	580	388	0	763	341	0	802	488	257

CAP: the capacity value of the portfolio including the existing and planned resources
Solar capacity credit: 50% of installed capacity; Wind capacity credit : 16.3% (based on MISO published data on system wide capacity credits)

PORTFOLIO RELIABILITY METRICS (NORMALIZED)

Preliminary

	Year 2030	Metric	A	B	C	D	E	F	G	H	I
1	**Blackstart**	Qualitative Assessment of Risk of not Starting	25%	0%	75%	25%	50%	100%	25%	50%	100%
2	**Energy Adequacy**	Energy Not Served when Islanded (Worst 1-week) %	76%	78%	32%	75%	78%	56%	74%	73%	58%
3	**Dispatchability and Automatic Generation Control**	Dispatchable (%CAP, unavoidable VER penetration%)	28%	16%	55%	27%	44%	45%	26%	47%	47%
			58%	50%	42%	63%	50%	45%	65%	51%	51%
		Increased Freq Regulation Requirement (% Peak Load)	2.30%	1.80%	1.50%	2.50%	1.80%	1.60%	2.60%	2.00%	2.00%
		1-min Ramp Capability (%CAP)	24.00%	20.80%	17.80%	22.80%	47.20%	29.40%	22.10%	49.30%	39.00%
		10-min Ramp Capability (%CAP)	41.70%	46.70%	52.10%	39.60%	64.40%	60.30%	37.10%	63.70%	61.50%
4	**Operational Flexibility and Frequency Support**	Inertia (seconds)	2.13	3.11	4.17	2.02	2.07	3.58	1.81	1.73	2.6
		Inertial Gap FFR (%CAP)	11.20%	30.10%	10.70%	11.00%	0.00%	6.10%	11.60%	0.00%	0.00%
		Primary Gap PFR (%CAP)	18.80%	41.30%	25.90%	17.90%	0.00%	19.10%	17.70%	0.00%	1.30%
5	**VAR Support**	Dynamic VAR to load Center Capability (%CAP)	47.80%	50.00%	31.20%	48.50%	44.70%	42.70%	49.10%	47.40%	46.80%
6	**Location**	Average Number of Evacuation Paths	5	2.5	N/A	4.6	4.7	4.7	4.8	5.6	5.1
7	**Predictability and Firmness**	Ramping Capability to Mitigate Forecast Errors (+Excess/-Deficit) (%VER MW)	-10.00%	6.70%	-15.10%	-10.60%	8.10%	8.40%	-10.70%	11.20%	10.90%
8	**Short Circuit Strength**	Required Additional Synch Condensers (%Peak Load)	25%	17%	0%	33%	15%	0%	35%	21%	11%

VER: Variable Energy Resources (e.g., solar, wind)
CAP: Capacity credit of all resources including existing, planned, and portfolio

SCORING CRITERIA THRESHOLDS

Preliminary

	Year 2030	Metric	1 (Pass)	1/2 (Caution)	0 (Potential Issue)	Rationale
1	**Blackstart**	Ability to blackstart using Storage & SC	>50%	25-50%	<25%	System requires real and reactive power sources with sufficient rating to start other resources. Higher rated resources lower the risk
2	**Energy Adequacy**	Energy Not Served when Islanded (Worst 1-week) %	<70%	70-85%	>85%	Ability of Resource to serve critical part load for 1 week, estimated at 15% of total load. Adding other important loads brings the total to 30%
3	**Dispatchability**	Dispatchable (VER Penetration %)	<50%	50-60%	>60%	Intermittent Power Penetration above 60% is problematic when islanded
		Increased Freq Regulation Requirements	<2% of peak load	2-3% of Peak Load	>3% of peak load	Regulation of Conventional Systems ≈1%
		1-min Ramp Capability	>15% of CAP	10-15% of CAP	<10% of CAP	10% per minute was the norm for conventional systems. Renewable portfolios require more ramping capability
		10-min Ramp Capability	>65% of CAP	50-65% of CAP	<50% of CAP	10% per minute was the norm for conventional systems. But with 50% min loading, that will be 50% in 10 min. Renewable portfolios require more ramping capability
4	**Operational Flexibility and Frequency Support**	Inertia (seconds)	>3xMVA rating	2-3xMVA rating	<2xMVA rating	Synchronous machine has inertia of 2-5xMVA rating.
		Inertial Gap FFR (assuming storage systems will have GFM inverters)	0	0-10% of CAP	>10% of CAP	System should have enough inertial response, so gap should be 0. Inertial response of synch machine ≈ 10% of CAP
		Primary Gap PFR MW	0	0 - 2% of CAP	2% of CAP	System should have enough primary response, so gap should be 0. Primary response of synch machine ≈ 3.3%of CAP/0.1Hz (Droop 5%)
5	**VAR Support**	VAR Capability	≥41% of ICAP	31-41% of ICAP	<31% of ICAP	Power factor higher than 95% (or VAR less than 31%) not acceptable. Less than 0.91 (or VAR greater than 41.5%) is good
6	**Location**	Average Number of Evacuation Paths	>3	2-3	<2	More power evacuation paths increases system resilience
7	**Predictability and Firmness**	Ramping Capability to Mitigate Forecast Errors (+Excess/-Deficit) MW	≥ 0	-10% - 0% of CAP	<-10% of CAP	Excess ramping capability to offset higher levels of intermittent resource output variability is desired
8	**Short Circuit Strength**	Required Additional Synch Condensers MVA	0	0-21.9% of CAP	>21.9% of CAP	Portfolio should not require additional synchronous condensers. 500MVAr is a threshold (same size as one at Babcock)

PORTFOLIO RELIABILITY RANKING

Preliminary

	Year 2030	Metric	A	B	C	D	E	F	G	H	I
1	Blackstart	Qualitative assessment of risk of not starting	1/2	0	1	1/2	1/2	1	1/2	1/2	1
2	Energy Adequacy	Energy not served when islanded	1/2	1/2	1	1/2	1/2	1	1/2	1/2	1
3	Dispatchability	Dispatchable %	1/2	1/2	1	0	1/2	1	0	1/2	1/2
		Increased Freq Regulation Requirements	1/2	1	1	1/2	1	1	1/2	1/2	1/2
		1-min Ramp Capability	1	1	1	1	1	1	1	1	1
		10-Min Ramp Capability	0	0	1/2	0	1/2	1/2	0	1/2	12
4	Operational Flexibility and Frequency Support	Inertia	1/2	1	1	1/2	1/2	1	0	0	1/2
		Inertial Gap FFR	0	0	0	0	1	1/2	0	1	1
		Primary Gap PFR	0	0	0	0	1	0	0	1	1/2
5	VAR Support	VAR Capability	1	1	0	1	1	1	1	1	1
6	Location	Average Number of Evacuation Paths	1	1/2	1	1	1	1	1	1	1
7	Predictability and Firmness	Ramping Capability to Mitigate Forecast Errors (+Excess/-Deficit)	0	1	0	0	1	1	0	1	1
8	Short Circuit Strength	Required Additional Synch Condenser	0	1/2	1	0	1/2	1	0	1/2	1/2

1	Blackstart	0.50	-	1.00	0.50	0.50	1.00	0.50	0.50	1.00
2	Energy Adequacy	0.50	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.00
3	Dispatchability	0.50	0.63	0.88	0.38	0.75	0.88	0.38	0.63	0.63
4	Operational Flexibility and Frequency Support	0.17	0.33	0.33	0.17	0.83	0.50	-	0.67	0.67
5	VAR Support	1.00	1.00	-	1.00	1.00	1.00	1.00	1.00	1.00
6	Location	1.00	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00
7	Predictability and Firmness	-	1.00	-	-	1.00	1.00	-	1.00	1.00
8	Short Circuit Strength	-	0.50	1.00	-	0.50	1.00	-	0.50	0.50

Cumulative Score	3.67	4.46	5.21	3.54	6.08	7.38	3.38	5.79	6.79
Percent Score (out of 8 possible points)	46%	56%	65%	44%	76%	92%	42%	72%	85%

1	Portfolio passes the screening test
½	Portfolio requires minor to moderate mitigation measures
0	Portfolio requires significant mitigation measures

1. Every metric is scored based on the criteria in the legend at the top of the page

2. Then, for criteria where there is more than one metric, the scores are averaged to create a single score for each criteria

3. All criteria scores are added to get a final portfolio score out of 8 possible points

QUALITATIVE RELIABILITY ASSESSMENT RESULTS

	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Duration)
Higher Carbon Emissions	A ⑦ NIPSCO DER 10MW SC Uprate 53MW Thermal PPA 150MW Storage 135MW Solar+Storage 450MW* Solar 250MW	B ⑥ NIPSCO DER 10MW SC Uprate 53MW Gas Peaker** 443MW Thermal PPA 150MW Solar 250MW	C ⑤ NIPSCO DER 10MW SC Uprate 53MW Gas CC 650MW
Mid Carbon Emissions	D ⑧ NIPSCO DER 10MW SC Uprate 53MW Storage 135MW Solar+Storage 450MW* Solar 400MW	E ③ NIPSCO DER 10MW SC Uprate 53MW Thermal PPA 150MW Storage 470MW Solar 250MW	F ① NIPSCO DER 10MW SC Uprate 53MW Gas Peaker** 300MW Thermal PPA 150MW Storage 135MW Solar 100MW
Low Carbon Emissions	G ⑨ NIPSCO DER 10MW Storage 135MW Solar+Storage 450MW* Solar 450MW	H ④ NIPSCO DER 10MW Wind 200MW Storage 570MW Solar 250MW	I ② NIPSCO DER 10MW SC H2 Electrolyzer 20MW SC Uprate 53MW H2 Enabled Peaker 193MW Wind 200MW Storage 370MW Solar 250MW

**Gas Peaker: Local to Service Territory in Portfolio F, while outside of territory in Portfolio B

Observations

- Portfolios F and I scored the highest across the eight defined reliability criteria
- Reliability Assessment results are then incorporated into the replacement scorecard as the non-economic component of the Reliability metric

REPLACEMENT ANALYSIS SCORECARD

Objective	Indicator	Description and Metrics
Affordability	**Cost to Customer**	- Impact to customer bills - Metric: 30-year NPV of revenue requirement (Reference Case scenario deterministic results)
Rate Stability	**Cost Certainty**	- Certainty that revenue requirement within the most likely range of outcomes - Metric: Scenario range NPVRR and 75th % range vs. median
	Cost Risk	- Risk of unacceptable, high-cost outcomes - Metric: Highest scenario NPVRR and 95th % conditional value at risk (average of all outcomes above 95th % vs. median)
	Lower Cost Opportunity	- Potential for lower cost outcomes - Metric: Lowest scenario NPVRR and 5th % range vs. median
Environmental Sustainability	**Carbon Emissions**	- Carbon intensity of portfolio - Metric: Cumulative carbon emissions (2024-40 short tons of CO_2) from the generation portfolio
Reliable, Flexible, and Resilient Supply	**Reliability**	- The ability of the portfolio to provide reliable and flexible supply for NIPSCO in light of evolving market conditions and rules - Metric: *Composite Reliability Assessment Score and Sub-hourly A/S value impact*
	Resource Optionality	- The ability of the portfolio to flexibly respond to changes in NIPSCO load, technology, or market rules over time - Metric: MW weighted duration of generation commitments (UCAP – 2027)
Positive Social & Economic Impacts	**Employees**	- *Addressed in Existing Fleet Analysis for existing generation assets; employee numbers will be dependent on specific asset replacements*
	Local Economy	- Effect on the local economy from new projects and ongoing property taxes - Metric: NPV of property taxes from the entire portfolio

REPLACEMENT ANALYSIS RESULTS

		A	B	C	D	E	F	G	H	I
Replacement Theme		Thermal PPAs, solar and storage	Non-service territory gas peaking (no early storage)	Natural gas dominant (CC)	No new thermal resources; solar dominant w/ storage	Thermal PPAs plus storage and solar	Local gas peaker, plus solar and storage	Solar dominant w/ storage, plus retire Sugar Creek	All renewables and storage, plus retire Sugar Creek (Portfolio 7)	New H2-enabled peaker plus solar and storage, plus SC conversion to H2 (Portfolio 7H)
Carbon Emissions		Higher	Higher	Higher	Mid	Mid	Mid	Low	Low	Low
Dispatchability		Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)
Cost To Customer 30-year NPVRR (Ref Case) $M		$10,461 +$149	$10,332 +$20	$10,312 -	$10,438 +$126	$10,467 +$155	$10,426 +$114	$11,042 +$730	$11,090 +$778	$10,792 +$480
Cost Certainty Scenario Range NPVRR $M		$2,359 +$1,035	$2,782 +$1,458	$3,208 +1,884	$2,322 +$998	$2,538 +$1,214	$2,748 +$1,424	$1,324 -	$1,553 +$229	$1,855 +$531
Cost Risk	High Scenario NPVRR $M	$12,015 +$206	$12,182 +$373	$12,518 +$709	$11,965 +$156	$12,126 +$317	$12,243 +$434	$11,809 -	$12,011 +$202	$11,848 +$39
	Stochastic 95% CVAR – 50%	$104 +$21	$92 +$9	$83 -	$104 +$21	$98 +$15	$97 +$14	$123 +$40	$114 +$31	$87 +$4
Lower Cost Opp. Lowest Scenario NPVRR $M		$9,657 +$348	$9,400 +$91	$9,309 -	$9,644 +$335	$9,588 +$279	$9,495 +$186	$10,485 +$1,176	$10,458 +$1,149	$9,933 +$684
Carbon Emissions M of tons 2024-40 Cum. (Scenario Avg.)		27.3 +11.2	30.4 +14.3	47.2 +31.1	27.3 +11.2	27.3 +11.2	28.5 +12.4	16.1 -	16.1 -	25.2 +9.1
Reliability	Composite reliability score (out of 8 possible points)	3.67 -3.71	4.46 -2.92	5.21 -2.17	3.54 -3.84	6.08 -1.30	7.38 -	3.38 -4.00	5.79 -1.59	6.79 -0.59
	Reduction to 30-Year NPVRR (Ref Case) $M	($158) +$400	($117) +$441	($48) +$510	($173) +$385	($332) +$226	($173) +$385	($240) +$318	($558) -	($259) +$299
Resource Optionality MW-weighted duration of 2027 gen. commitments (yrs.)		20.01 +3.01	20.53 +3.53	23.55 +6.55	20.37 +3.37	21.15 +4.15	22.12 +5.12	17.00 -	18.19 +1.19	21.46 +4.46
Local Economy NPV of property taxes		$420 -$66	$388 -$98	$451 -$35	$417 -$69	$413 -$73	$416 -$70	$486 -	$477 -$9	$421 -$65

▨ Not a viable pathway due to not meeting winter reserve margins

*Note: Appendix contains more detailed scorecard data

REPLACEMENT ANALYSIS SCORECARD FOR VIABLE PORTFOLIOS

		B	C	E	F	H	I
Replacement Theme		Non-service territory gas peaking (no early storage)	Natural gas dominant (CC)	Thermal PPAs plus storage and solar	Local gas peaker, plus solar and storage	All renewables and storage, plus retire Sugar Creek (Portfolio 7)	New H2-enabled peaker plus solar and storage, plus SC conversion to H2 (Portfolio 7H)
Carbon Emissions		Higher	Higher	Mid	Mid	Low	Low
Dispatchability		Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w / Higher Energy Duration)	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w / Higher Energy Duration)	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w / Higher Energy Duration)
Cost To Customer 30-year NPVRR (Ref Case) $M		$10,332 +$20	$10,312 -	$10,467 +$155	$10,426 +$114	$11,090 +$778	$10,792 +$480
Cost Certainty Scenario Range NPVRR $M		$2,782 +$1,229	$3,208 +$1,655	$2,538 +$985	$2,748 +$1,195	$1,553 -	$1,855 +$302
Cost Risk	High Scenario NPVRR $M	$12,182 +$334	$12,518 +$670	$12,126 +$278	$12,243 +$395	$12,011 +$163	$11,848 -
	Stochastic 95% CVAR – 50%	$92 3	$83 1	$98 5	$97 4	$114 6	$87 2
Lower Cost Opp. Lowest Scenario NPVRR $M		$9,400 +$91	$9,309 -	$9,588 +$279	$9,495 +$186	$10,458 +$1,149	$9,933 +$684
Carbon Emissions M of tons 2024-40 Cum. (Scenario Avg.)		30.4 +14.3	47.2 +31.1	27.3 +11.2	28.5 +12.4	16.1 -	25.2 +9.1
Reliability	Composite reliability score (out of 8 possible points)	4.46 6	5.21 5	6.08 3	7.38 1	5.79 4	6.79 2
	Reduction to 30-Year NPVRR (Ref Case) $M	($117) +$441	($48) +$510	($332) +$226	($173) +$385	($558) -	($259) +$299
Resource Optionality MW-weighted duration of 2027 gen. commitments (yrs.)		20.53 +2.34	23.55 +5.36	21.15 +2.96	22.12 +3.93	18.19 -	21.46 +3.27
Local Economy NPV of property taxes		$388 -$89	$451 -$26	$413 -$64	$416 -$61	$477 -	$421 -$56

▨	Delta calculated vs. lowest cost option
■	Metric is ranked from highest to lowest

*Note: Appendix contains more detailed scorecard data

RESPONSES TO STAKEHOLDER FEEDBACK

Pat Augustine, Vice President, CRA

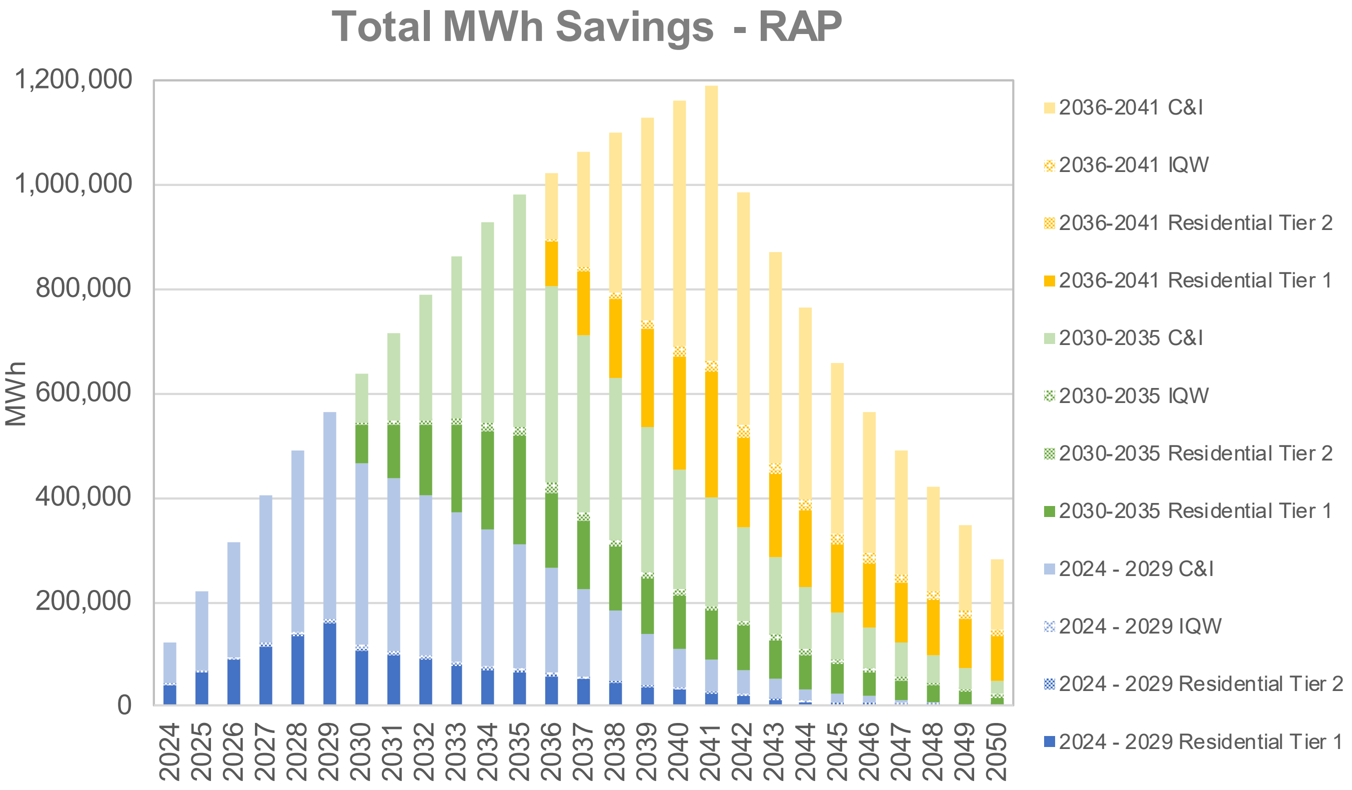
STAKEHOLDER FEEDBACK

- As part of the 2021 IRP public advisory process, NIPSCO has received some questions and requests for supplementary analysis in addition to the core portfolio results we just reviewed
- Today, we'll briefly review two follow-up topics: DSM impacts and different customer cost summaries

Stakeholder	Questions, Comments, and Requested Analysis
Citizens Action Coalition of Indiana (CAC)	• Additional Demand Side Management (DSM) evaluation to assess RAP vs. MAP impacts
Reliable Energy	• Review of 20-year NPVRRs and annual generation revenue requirements

RECAP OF KEY DSM PORTFOLIO FINDINGS

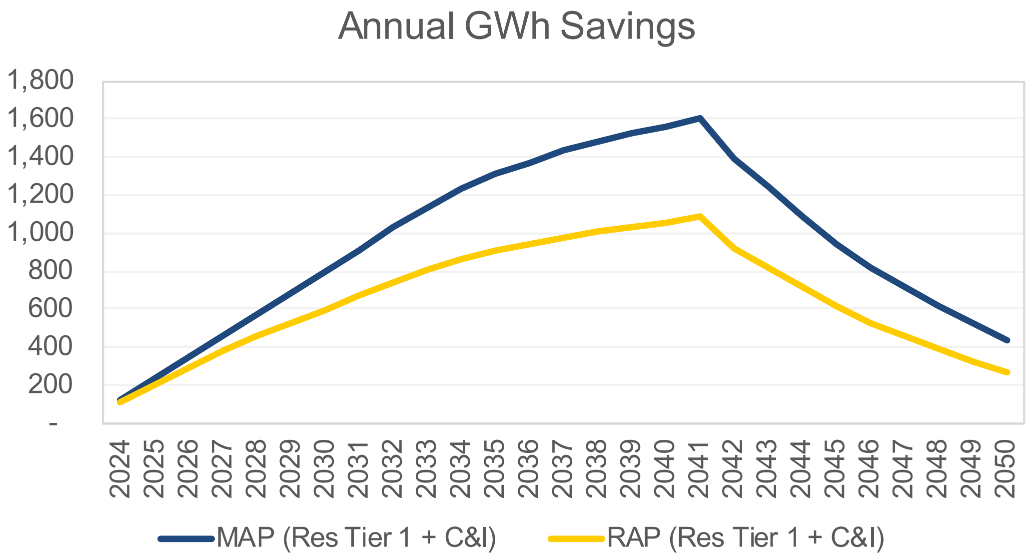
- NIPSCO's portfolio optimization analysis found DSM measures to be cost-effective throughout the entire planning horizon, with the following bundles selected:
  - Tier 1 residential energy efficiency for 2024-2029, 2030-2035, and 2036-2041
  - Commercial & industrial energy efficiency for 2024-2029, 2030-2035, and 2036-2041
  - The residential demand response rates programs after 2030
- Core portfolio analysis was performed for Realistic Achievable Potential (RAP) levels, with Maximum Achievable Potential (MAP) reserved for additional testing



IQW = Income Qualified Weatherization

MAP VS. RAP: KEY INPUTS AND PORTFOLIO DEVELOPMENT

- MAP portfolio testing is most impactful for energy efficiency measures, with additional savings available at higher costs
- NIPSCO tested the impact of DSM at MAP for two candidate Replacement Portfolios (E and F)
  - Residential and commercial/industrial MAP energy efficiency programs “hard coded” into the portfolio model
  - Small long-term capacity adjustments (100 MW of storage in the 2030s) were made to each portfolio to reflect lower capacity requirements (winter reserve margin being more binding over the long-term)



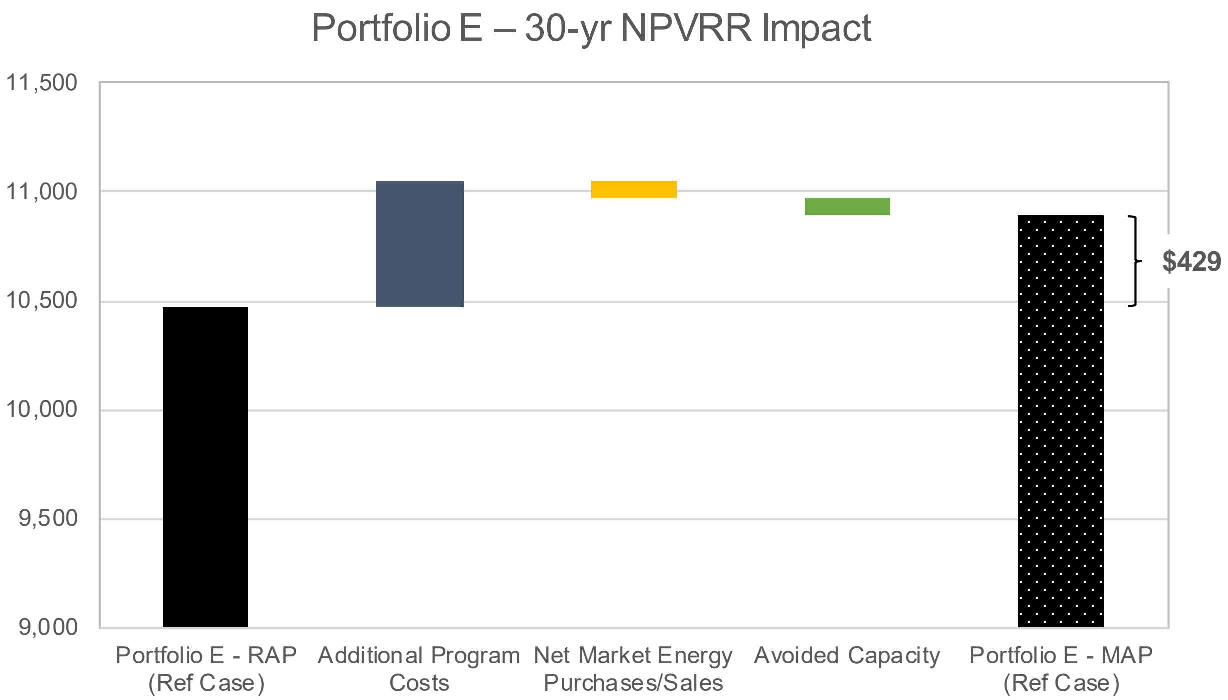
Levelized Cost ($/MWh)

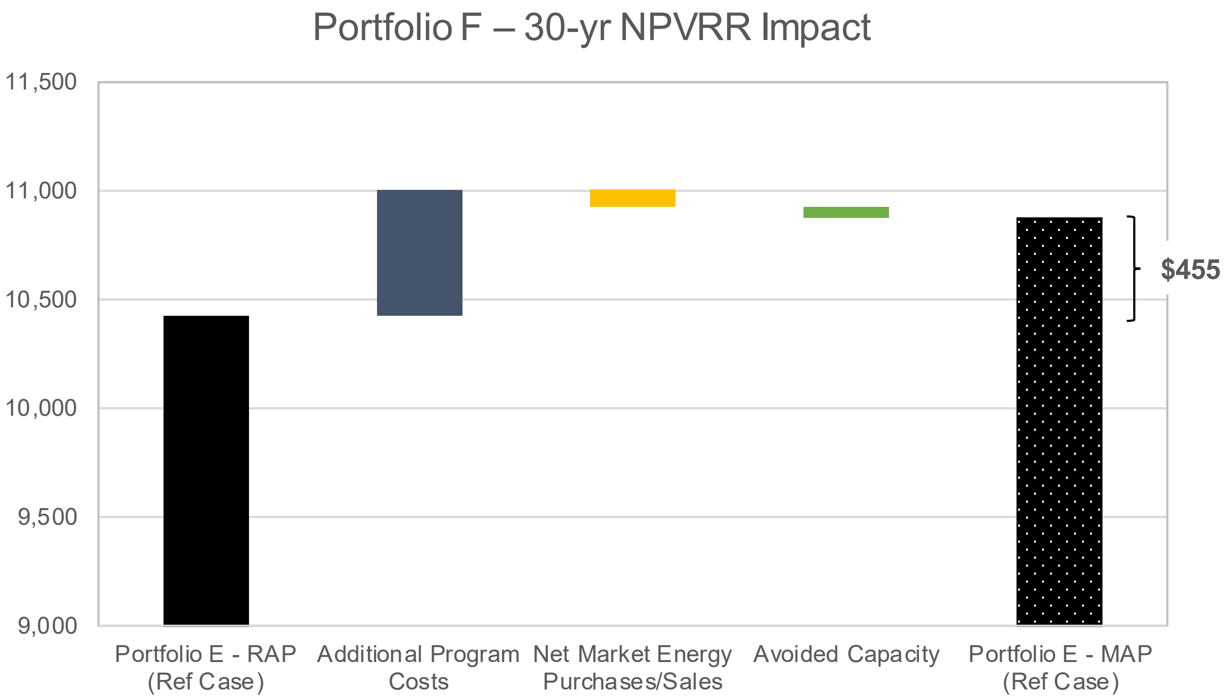
		RAP	MAP
2024-2029	Res Tier 1	53	140
	C&I	26	86
2030-2035	Res Tier 1	60	160
	C&I	30	90
2036-2041	Res Tier 1	65	165
	C&I	32	91

Note that levelized costs are presented prior to cost adjustments for avoided T&D investment

MAP VS. RAP: PORTFOLIO COST IMPLICATIONS

- Under Reference Case conditions, moving to MAP would increase the 30-year NPVRR by $429 million for Portfolio E and $455 million for Portfolio F.
- Alternative scenarios would change the impact of net market energy purchases/sales, but even under the highest scenario price conditions (AER), these savings would not offset additional program costs





20-YEAR NPV REVIEW: EXISTING FLEET ANALYSIS: SCENARIO RESULTS

	Portfolio Transition Target:	15% Coal through 2032	15% Coal through 2028	15% Coal through 2026	15% Coal through 2024	15% Coal through 2028	15% Coal through 2026	15% Coal through 2028 Fossil Free by 2032	15% Coal through 2028; Option for Fossil Free by 2032
	Retire:	MC: 12 (2032) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16AB (2028)	MC: 12 (2026) Schfr: 16AB (2028)	MC: 12 (2024) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16 AB (2025)	MC: 12 (2026) Schfr: 16AB (2025)	MC: 12 (2028) Schfr: 16AB (2025) SC: (2032)	MC: 12 (2028) Schfr: 16AB (2025) SC to H2: (2032)
	Retain beyond 2032:	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	None	Sugar Creek converts to H2 (2032)
Reference Case	**Delta from Lowest Cost to Customer**	$30 0.3%	$12 0.1%	- -	$3 0.0%	$41 0.5%	$33 0.4%	$276 3.1%	$280 3.2%
Status Quo Extended	**Delta from Lowest Cost to Customer**	$20 0.2%	$13 0.2%	$1 0.0%	- -	$43 0.5%	$98 1.2%	$491 6.0%	$389 4.7%
Aggressive Env. Reg.	**Delta from Lowest Cost to Customer**	$233 2.5%	$160 1.7%	$154 1.7%	$152 1.7%	$182 2.0%	$91 1.0%	- -	$221 2.4%
Econ-Wide Decarbonization	**Delta from Lowest Cost to Customer**	$431 4.6%	$395 4.2%	$394 4.2%	$386 4.1%	$418 4.5%	$264 2.8%	$24 0.3%	- -

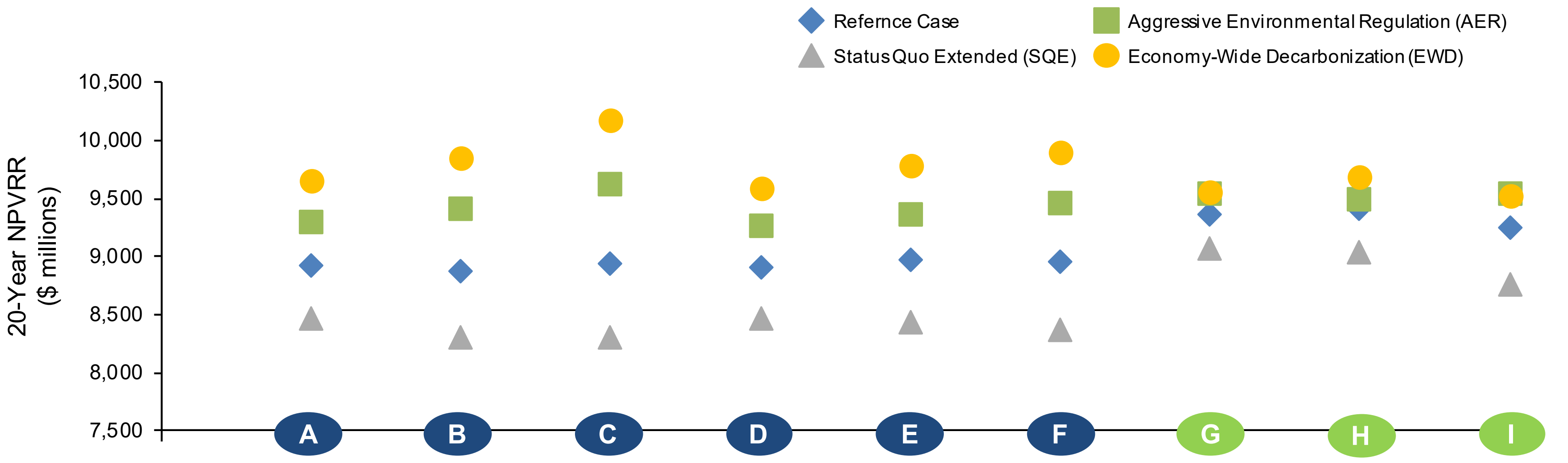
▨ Not a viable pathway due to implementation timing

*Note that a $0.50/kg H2 subsidy is assumed in AER and EWD

Observations

- Observations from the 20-year NPVRR view are very similar to the 30-year view
- MC 12 retirement in 2026 is always slightly lower cost than retirement in 2028
- MC 12 retirement in 2032 is always higher cost than earlier retirement, with the largest difference in the AER scenario (high carbon price)
- Portfolio 2 is slightly lower cost than Portfolio 5, although additional renewable additions with early 16AB retirement (Portfolio 6) lower costs under high carbon regulation scenarios
- Portfolios 7 and 7H have the smallest range

20-YEAR NPV REVIEW: REPLACEMENT ANALYSIS: SCENARIO RESULTS



		A	B	C	D	E	F	G	H	I
	Carbon Emissions:	▨ Higher	Higher	Higher	▨ Mid	Mid	Mid	▨ Low	Low	Low
	Dispatchability:	▨ Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	▨ Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	▨ Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)
Reference Case	**Delta from Lowest Cost to Customer**	$49 0.6%	- -	$66 0.7%	$28 0.3%	$95 1.1%	$76 0.9%	$489 5.5%	$531 6.0%	$365 4.1%
Status Quo Extended	**Delta from Lowest Cost to Customer**	$167 2.0%	- -	$5 0.1%	$169 2.0%	$138 1.7%	$74 0.9%	$773 9.3%	$743 9.0%	$471 5.7%
Aggressive Env. Reg.	**Delta from Lowest Cost to Customer**	$36 0.4%	$150 1.6%	$351 3.8%	- -	$96 1.0%	$201 2.2%	$269 2.9%	$226 2.4%	$278 3.0%
Econ-Wide Decarb.	**Delta from Lowest Cost to Customer**	$128 1.3%	$335 3.5%	$653 6.9%	$62 0.7%	$256 2.7%	$377 4.0%	$32 0.3%	$167 1.8%	- -

▨ Not a viable pathway due to not meeting winter planning reserve margins

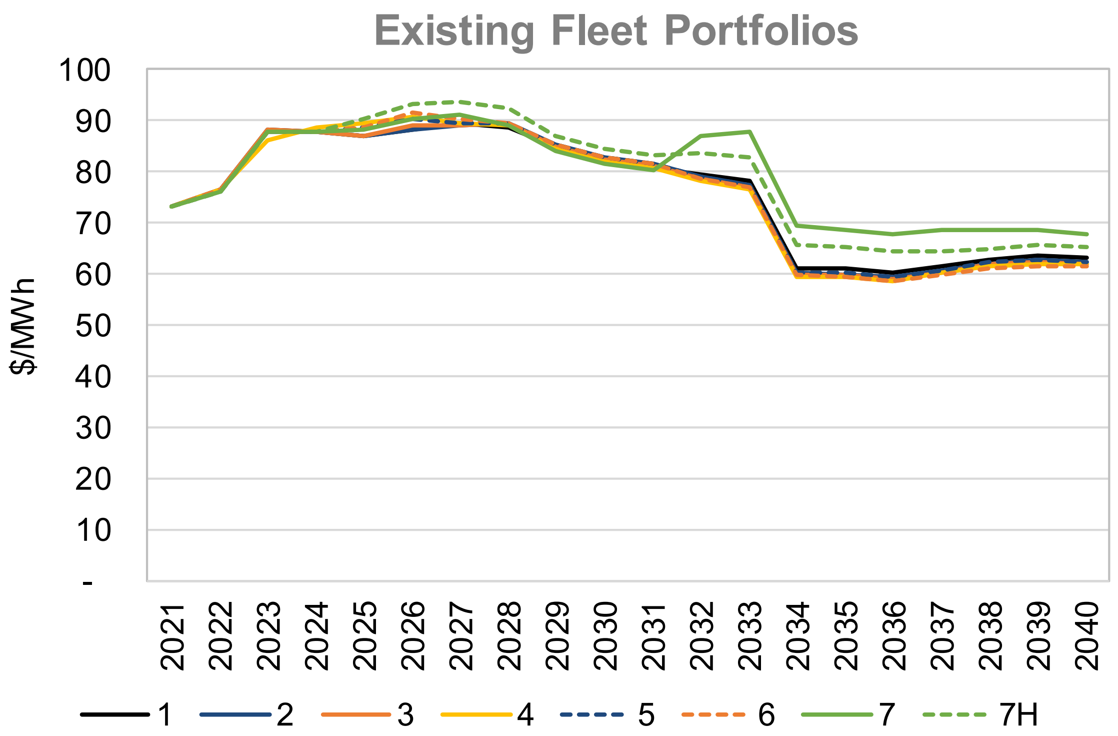
*Note that a $0.50/kg H2 subsidy is assumed in AER and EWD

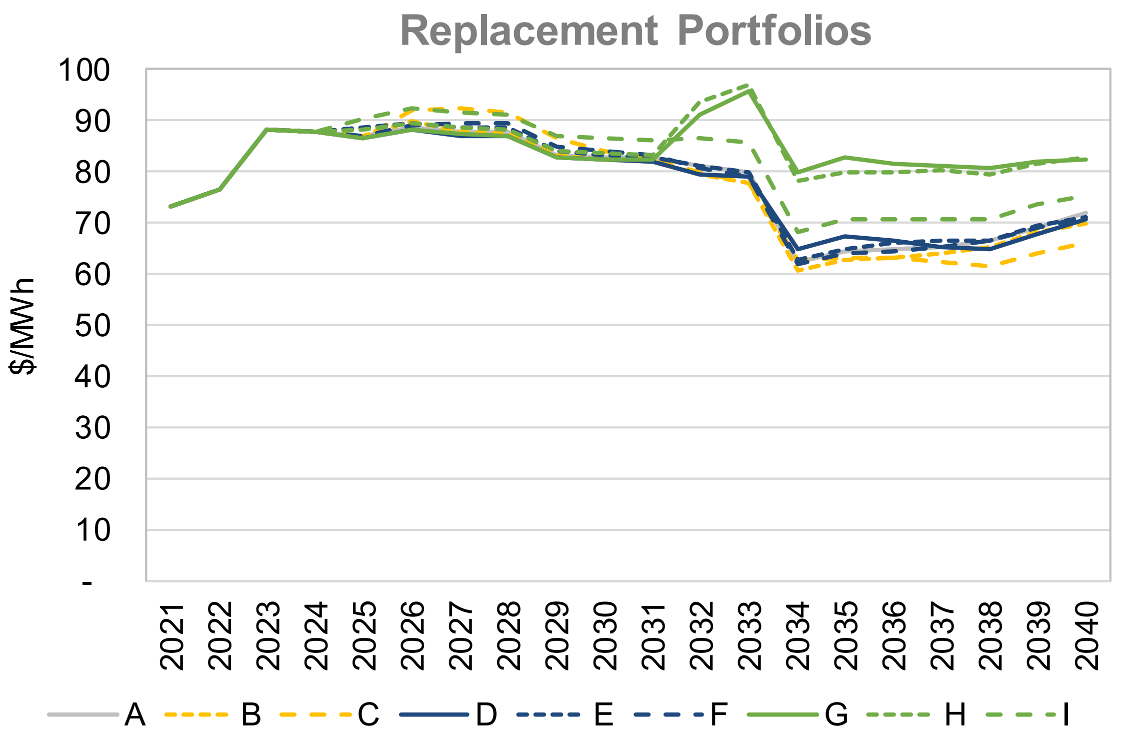
Observations

- Observations from the 20-year NPVRR view are similar to the 30-year view, with a major exception being the performance of Portfolio C (as identified by NIPSCO in the September meeting)
- Portfolios B, C, and F have lowest costs among viable options under the Reference and SQE scenarios
- Portfolio E has the lowest cost among viable portfolios under the AER scenario, with C highest cost and H/I more competitive
- Clean energy has the most value in the EWD scenario, with Portfolio I (assuming a future H2 subsidy) having the lowest cost among viable portfolios

ANNUAL GENERATION COSTS PER MWH – REFERENCE CASE

- Annual "generation rate" review confirms no significant short vs. long-term rate impact differences across portfolios that are not already evident in the NPV summaries
- Different scenarios drive different relative cost trajectories, as also evident in NPV summaries





- Portfolios 1 through 4 are within $2.50/MWh of each over the study period, and Portfolios 1 through 6 are within $3.50/MWh of each other

- All portfolios are within $5/MWh of each other through 2030
- Portfolio C is higher cost in the mid-2020s, but lowest cost over the long-term

LUNCH

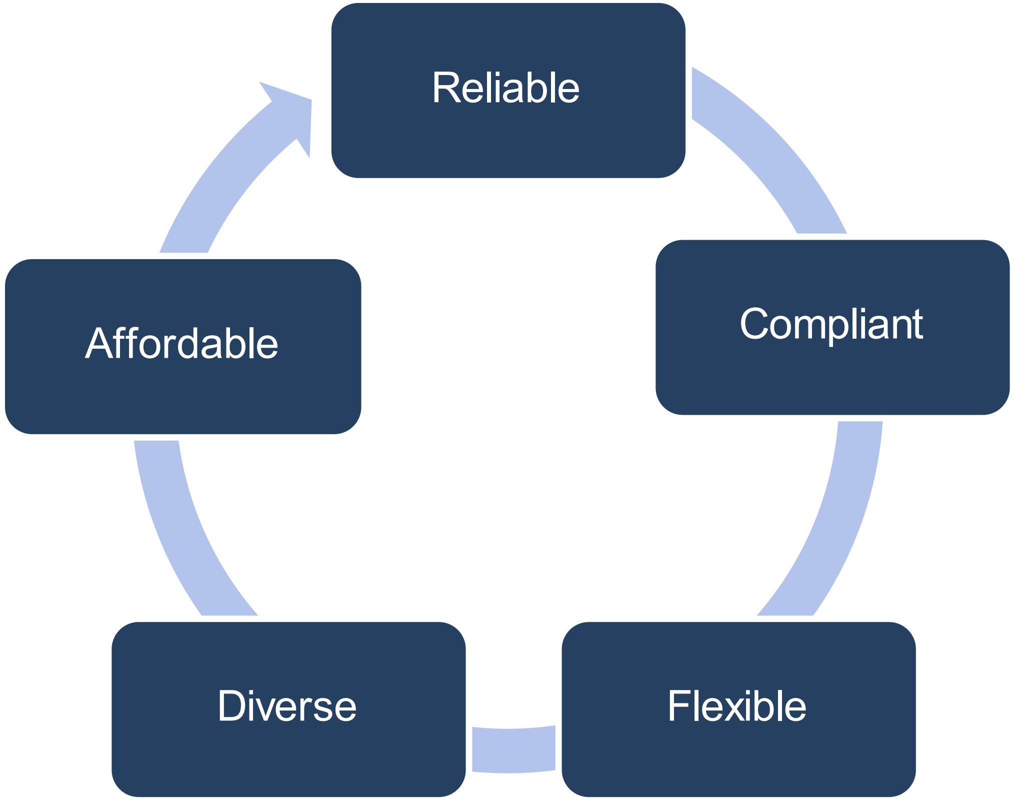
PREFERRED RESOURCE PLAN AND ACTION PLAN

Fred Gomos, Director Strategy & Risk Integration, NiSource

Pat Augustine, Vice President, CRA

NIPSCO PREFERRED SUPPLY PORTFOLIO CRITERIA

- Requires careful planning and consideration for all of NIPSCO's stakeholders, including the communities we serve and our employees
- The IRP is an informative submission to the IURC; NIPSCO intends to remain engaged with interested stakeholders



Reliable

Compliant

Flexible

Diverse

Affordable

EXISTING FLEET ANALYSIS SCORECARD

Preferred Pathways

	1	2	3	4	5	6	7	7H
Portfolio Transition Target:	**15% Coal through 2032**	**15% Coal through 2028**	**15% Coal through 2026**	**15% Coal through 2024**	**15% Coal through 2028**	**15% Coal through 2026**	**15% Coal through 2028 Fossil Free by 2032**	**15% Coal through 2028 Fossil Free by 2032**
Retire:	MC: 12 (2032) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16AB (2028)	MC: 12 (2026) Schfr: 16AB (2028)	MC: 12 (2024) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16 AB (2025)	MC: 12 (2026) Schfr: 16AB (2025)	MC: 12 (2028) Schfr: 16AB (2025) SC: (2032)	MC: 12 (2028) Schfr: 16AB (2025) SC to H2: (2032)
Retain beyond 2032:	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	None	Sugar Creek converts to H2 (2032)
Cost To Customer 30-year NPV of revenue requirement (Ref Case)	$10,149 +$35 0.3%	$10,130 +$16 0.2%	$10,114 - -	$10,125 $10 0.1%	$10,161 +$47 0.5%	$10,138 +$24 0.2%	$10,531 +$417 4.1%	$10,471 +$357 3.5%
Cost Certainty Scenario Range (NPVRR)	$2,759 +$1,161 72.6%	$2,754 +$1,156 72.3%	$2,766 +$1,167 73.0%	$2,777 +$1,179 73.8%	$2,747 +$1,149 71.9%	$2,487 +$889 55.6%	$1,598 - -	$1,855 +$257 16.1%
Cost Risk Highest Scenario NPVRR	$11,974 +$477 4.1%	$11,951 $454 3.9%	$11,947 +$449 3.9%	$11,957 +$459 4.0%	$11,976 +$478 4.2%	$11,773 +$276 2.4%	$11,498 - -	$11,527 +$29 0.3%
Lower Cost Opportunity Lowest Scenario NPVRR	$9,215 +$36 0.4%	$9,197 +$18 0.2%	$9,181 +$2 0.0%	$9,179 - -	$9,229 +$49 0.5%	$9,287 +$108 1.2%	$9,899 +$720 7.8%	$9,671 +$492 5.3%
Carbon Emissions M of tons 2024-40 Cum. (Scenario Avg.)	43.3 +22 102%	33.7 +12 57%	28.5 +7 33%	23.0 +2 8%	33.7 +12 57%	28.5 +7 33%	21.4 - -	30.9 +9 44%
Employees Approx. existing gen. jobs compared to 2018 IRP*	+127	0	-127	-127	-4	-131	-34	-4
Local Economy NPV of existing fleet property tax relative to 2018 IRP	+$13	$0	-$10	-$23	$0	-$10	-$16	+$13

*Adding replacement projects could have an impact on net jobs

▨ Not a viable pathway due to implementation timing

PORTFOLIOS 3 AND 5 ARE THE PREFERRED EXISTING FLEET PORTFOLIOS

Preferred Pathways

	3	5
Portfolio Transition Target:	**15% Coal through 2026**	**15% Coal through 2028**
Retire:	MC: 12 (2026) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16 AB (2025)
Retain beyond 2032:	Sugar Creek	Sugar Creek
Cost To Customer 30-year NPV of revenue requirement (Ref Case)	$10,114	$10,161
Cost Certainty Scenario Range (NPVRR)	$2,766	$2,747
Cost Risk Highest Scenario NPVRR	$11,947	$11,976
Lower Cost Opportunity Lowest Scenario NPVRR	$9,181	$9,229
Carbon Emissions M of tons 2024-40 Cum. (Scenario Avg.)	28.5	33.7
Employees Approx. existing gen. jobs compared to 2018 IRP*	-127	-4
Local Economy NPV of existing fleet property tax relative to 2018 IRP	-$10	$0

- The two portfolios **represent book ends** of Michigan City Unit 12 and Schahfer 16AB retirement dates
- Selecting two portfolios as preferred existing fleet pathways **preserves flexibility for customers,** given ongoing MISO rules evolution, active federal policy deliberations, and required monitoring of Schahfer 16AB's operations over the next few years
- Both portfolios provide **ample timing for transmission upgrades** needed prior to Michigan City Unit 12 retirement
- **Portfolio 3 is lowest cost to customer,** but both portfolios are within 0.5% on an NPVRR basis

REPLACEMENT ANALYSIS SCORECARD

Preferred Pathway F with flexibility to pivot to I over the long term

		B	C	E	F	H	I
Replacement Theme		Non-service territory gas peaking (no early storage)	Natural gas dominant (CC)	Thermal PPAs plus storage and solar	Local gas peaker, plus solar and storage	All renewables and storage, plus retire Sugar Creek (Portfolio 7)	New H2-enabled peaker plus solar and storage, plus SC conversion to H2 (Portfolio 7H)
Carbon Emissions		Higher	Higher	Mid	Mid	Low	Low
Dispatchability		Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w / Higher Energy Duration)	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w / Higher Energy Duration)	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w / Higher Energy Duration)
Cost To Customer 30-year NPVRR (Ref Case) $M		$10,332 +$20	$10,312 -	$10,467 +$155	$10,426 +$114	$11,090 +$778	$10,792 +$480
Cost Certainty Scenario Range NPVRR $M		$2,782 +$1,229	$3,208 +$1,655	$2,538 +$985	$2,748 +$1,195	$1,553 -	$1,855 +$302
Cost Risk	High Scenario NPVRR $M	$12,182 +$334	$12,518 +$670	$12,126 +$278	$12,243 +$395	$12,011 +$163	$11,848 -
	Stochastic 95% CVAR – 50%	$92 3	$83 1	$98 5	$97 4	$114 6	$87 2
Lower Cost Opp. Lowest Scenario NPVRR $M		$9,400 +$91	$9,309 -	$9,588 +$279	$9,495 +$186	$10,458 +$1,149	$9,933 +$684
Carbon Emissions M of tons 2024-40 Cum. (Scenario Avg.)		30.4 +14.3	47.2 +31.1	27.3 +11.2	28.5 +12.4	16.1 -	25.2 +9.1
Reliability	Composite reliability score (out of 8 possible points)	4.46 6	5.21 5	6.08 3	7.38 1	5.79 4	6.79 2
	Reduction to 30-Year NPVRR (Ref Case) $M	($117) +$441	($48) +$510	($332) +$226	($173) +$385	($558) -	($259) +$299
Resource Optionality MW-weighted duration of 2027 gen. commitments (yrs.)		20.53 +2.34	23.55 +5.36	21.15 +2.96	22.12 +3.93	18.19 -	21.46 +3.27
Local Economy NPV of property taxes		$388 -$89	$451 -$26	$413 -$64	$416 -$61	$477 -	$421 -$56

▨	Delta calculated vs. lowest cost option
■	Metric is ranked from highest to lowest

*Note: Appendix contains more detailed scorecard data

PORTFOLIOS F AND I ARE THE PREFERRED REPLACEMENT ANALYSIS PORTFOLIOS

Preferred Portfolio F with flexibility to pivot to I over the long term

		F	I
Replacement Theme		Local gas peaker, plus solar and storage	New H2-enabled peaker plus solar and storage, plus SC conversion to H2 (Portfolio 7H)
Carbon Emissions		Mid	Low
Dispatchability		Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Enhanced Reserve Margin (Local w/ Higher Energy Duration)
Cost To Customer 30-year NPVRR (Ref Case) $M		$10,426	$10,792
Cost Certainty Scenario Range NPVRR $M		$2,748	$1,855
Cost Risk	High Scenario NPVRR $M	$12,243	$11,848
	Stochastic 95% CVAR – 50%	$97	$87
Lower Cost Opp. Lowest Scenario NPVRR $M		$9,495	$9,933
Carbon Emissions M of tons 2024-40 Cum. (Scenario Avg.)		28.5	25.2
Reliability	Composite reliability score (out of 8 possible points)	7.38	6.79
	Reduction to 30-Year NPVRR (Ref Case) $M	($173)	($259)
Resource Optionality MW-weighted duration of 2027 gen. commitments (yrs.)		22.12	21.46
Local Economy NPV of property taxes		$416	$421

- **Portfolio F** is the **preferred near-term** replacement portfolio that balances all of NIPSCO's major planning objectives
- **Both Portfolio F and Portfolio I** include near-term additions of cost-effective DSM, new DER, and an uprate at Sugar Creek
- The potential to pivot to **Portfolio I over the near-term *and* longer-term preserves flexibility** in an environment of market, policy, and technology uncertainty:
  - Additional solar (and wind) capacity may be added if environmental policy makes it more economic
  - Additional storage capacity may be added as further technology and reliability diligence is performed
  - New peaking capacity may be hydrogen-enabled as options are explored further
  - Hydrogen pilot projects and long-term hydrogen conversion pathways may be explored for Sugar Creek as policy and technology evolves

IRP PREFERRED PLAN POINTS TO NEED TO MAINTAIN FLEXIBILITY ON RETIREMENT TIMING AND REPLACEMENT RESOURCES

Evolving MISO Market rules changes and federal policy on emissions regulations are key drivers

Retirement Of Michigan City 12 and Schahfer 16AB

- Refine retirement timing of Michigan City Unit 12 to be between 2026 and 2028
- Establish retirement date for vintage peaking units at Schahfer (16A/B) to between 2025 and 2028
- The exact retirement dates will be informed by:
  - System reliability impacts
  - Policy and regulatory considerations
  - Securing replacement resources
- Flexibility in timing allows NIPSCO to optimize retirement timing of vintage peaking units (along with Michigan City 12). NIPSCO can pursue cost-effective resources that cover capacity needs for both assets
- Michigan City Unit 12 and Schahfer 16AB do not have to retire at the same time

Replacement Resources

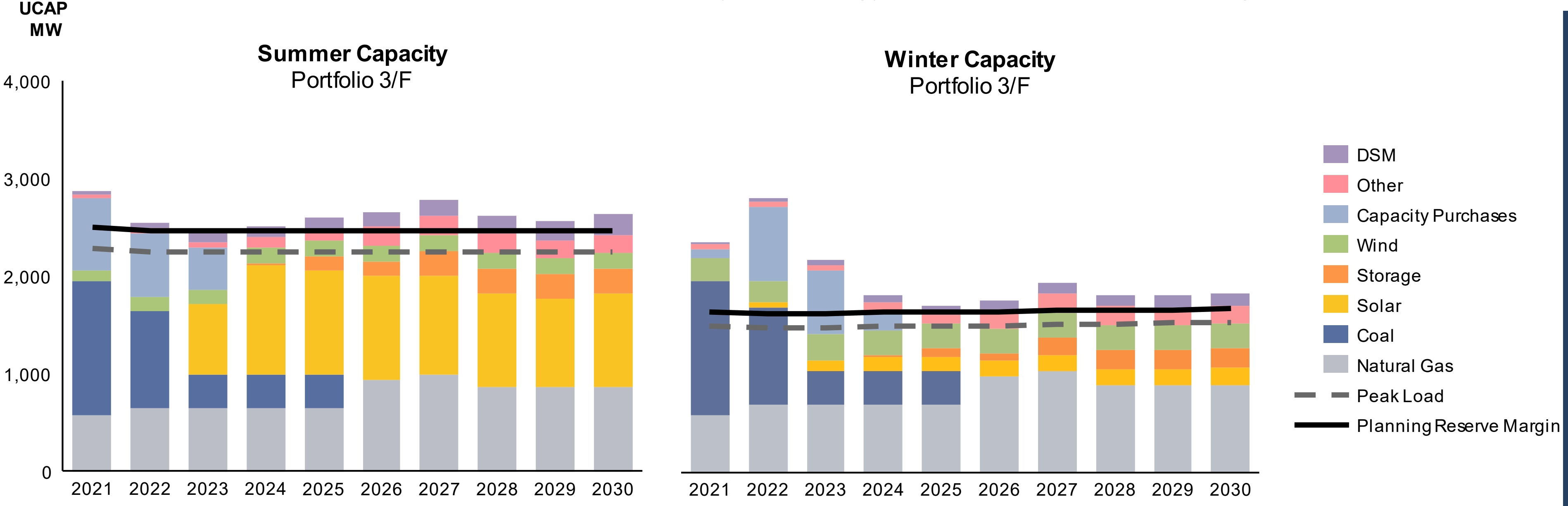
- Preferred Plan contains a diverse, flexible and scalable mix of incremental resources to add to the NIPSCO portfolio
- Large energy storage and gas peaking resources are attractive replacement options, supplemented by continued DSM expansion, new DER opportunities, and contract options to firm up the capacity position in the short term

Summary MW (ICAP) Range Of Portfolio Additions by 2028	
Sugar Creek Uprate	30 – 53 MW ICAP
Short-Term Capacity Contracts	150 MW ICAP
DSM	~68 MW at summer peak
New Solar	100 – 250* MW ICAP
New Storage	135 – 370 MW ICAP
New Gas Peaking**	Up to 300 MW ICAP

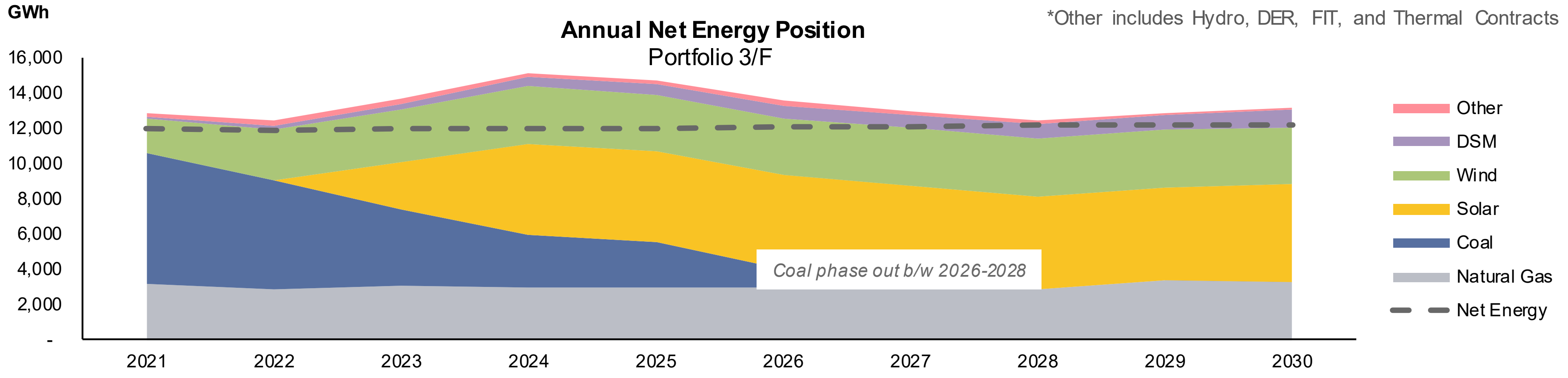
* Top end of range dependent on project sizing
**Potentially H2 enabled

PREFERRED PLAN CAPACITY AND ENERGY BALANCE

Renewable resources balance summer capacity and energy mix, with thermal and storage required for winter reserve margin compliance



*Other includes Hydro, DER, FIT, and Thermal Contracts



*Other includes Storage, Hydro, DER, FIT, and Thermal Contracts

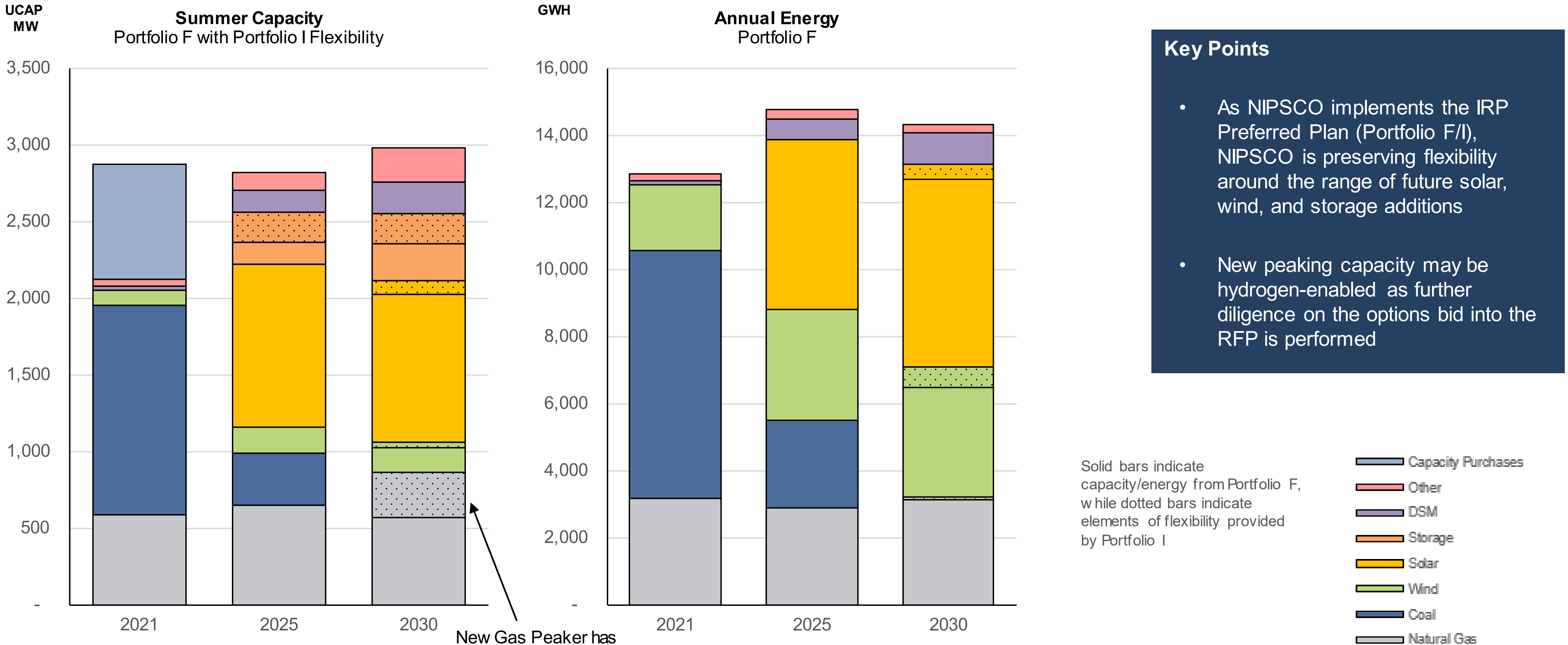
Note that storage has a net negative contribution to annual energy and reduces the size of the "Other" area in the net energy graphic

Key Points

- NIPSCO's preferred plan anticipates new capacity-advantaged resources entering into service by the middle of the decade, including storage, natural gas (SC uprate and peaking), and thermal capacity contracts
- Additional solar and new DSM programs provide additional capacity and energy benefit
- Energy from the portfolio is projected to be roughly in balance with load requirements, with flexibility around the ultimate timing of the Michigan City 12 retirement
- New storage and gas peaking resources provide limited net energy contribution on an annual basis, but support the portfolio's energy adequacy when intermittent resources are unavailable

PREFERRED PLAN PROVIDES FLEXIBILITY TO PIVOT OVER TIME

As NIPSCO implements the IRP preferred plan, there is flexibility to adjust to different resource types as market/technology/policy evolve



New Gas Peaker has potential to be hydrogen-enabled

Solid bars indicate capacity/energy from Portfolio F, while dotted bars indicate elements of flexibility provided by Portfolio I

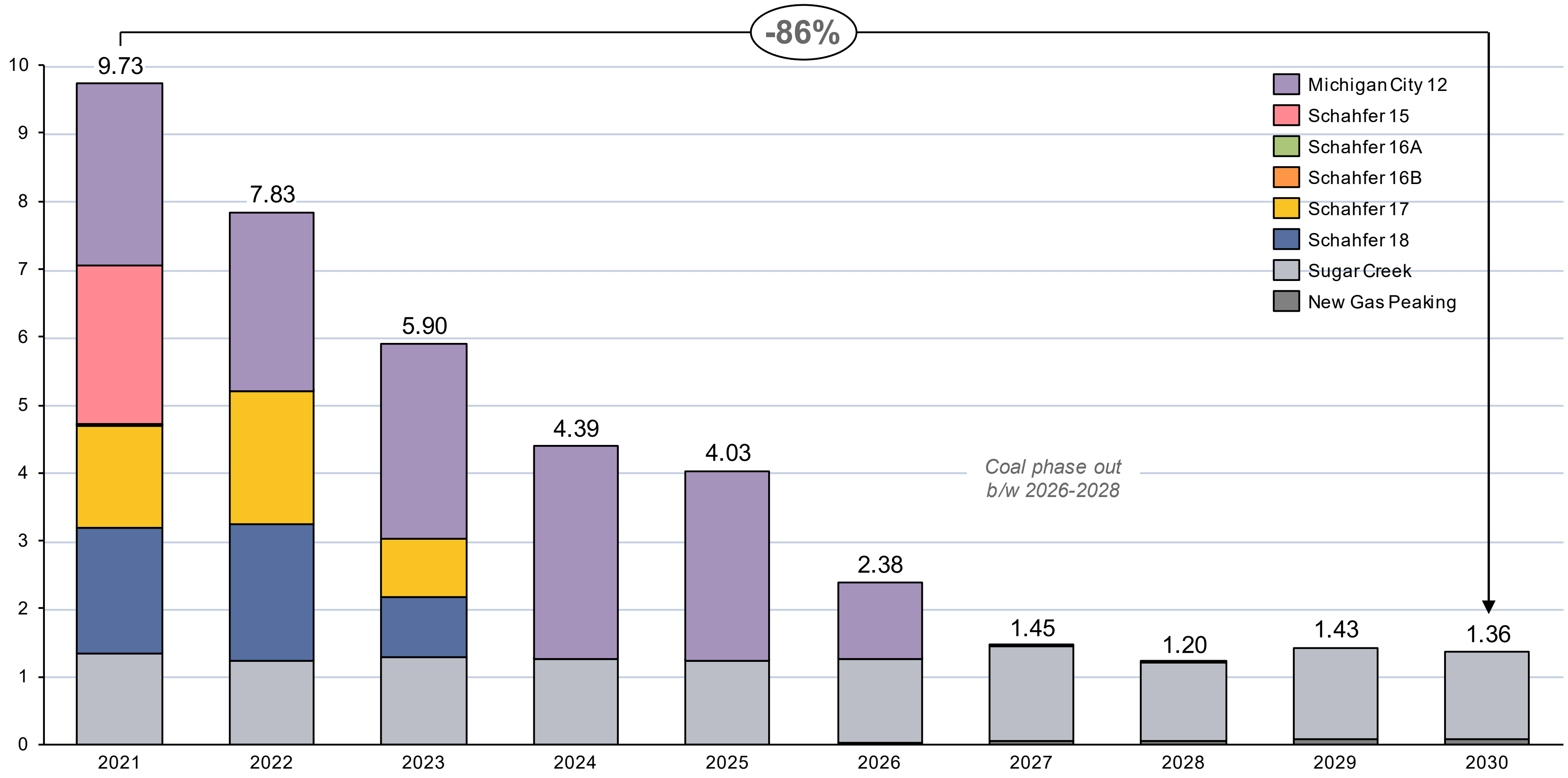
Key Points

- As NIPSCO implements the IRP Preferred Plan (Portfolio F/I), NIPSCO is preserving flexibility around the range of future solar, wind, and storage additions
- New peaking capacity may be hydrogen-enabled as further diligence on the options bid into the RFP is performed

PREFERRED PLAN CO2 EMISSIONS PROFILE

Significant emission reductions are projected by 2030, in line with NiSource overall emissions targets

Portfolio 3/F CO2 Emissions – Reference Case
Million Short Tons of CO2



Key Points

- NIPSCO's preferred plan remains on the CO2 emission reduction pathway identified in the 2018 IRP
- Emissions from coal will be phased out by the 2026-2028 time period based on the ultimate retirement date for Michigan City 12
- New gas peaking additions (modeled at 300 MW in Portfolio F) are likely to contribute emissions of around 0.05 M tons per year from 2026-2030
- The long-term emission profile is dependent on dispatch of Sugar Creek and any new peaking capacity (a product of fuel prices, environmental policy incentives, and the broader MISO market composition), as well as future potential conversion or retrofit opportunities

NIPSCO SUPPLY RESOURCE PLAN AND TIMING

	Near Term	Mid Term	Long Term
Timing	2022-2025	2026-2028	2028 & Beyond
NIPSCO Activity Description	• Complete and place in-service 12 remaining renewables projects filed with the IURC • Complete retirement and shutdown of remaining Schahfer coal units (17, 18) • Begin implementation of MC12-related transmission projects • Actively monitor changing federal/state policy, MISO market rules, and technology advancements • Optimize exact quantities and resource types of portfolio additions	• Full implementation of transmission projects • Retire Schahfer Units 16A/B and Michigan City Unit 12 • Secure approvals for replacement projects • Actively monitor changing federal/state policy, MISO market rules, and technology advancements • Optimize exact quantities and resource types of portfolio additions	• Identify long term pathway for future NIPSCO portfolio to achieve net-zero targets in line with current policy momentum • Monitor market and industry evolution and refine future IRP plans
Retirements	• Schahfer Units 17, 18 (by 2023)	• Schahfer Units 16A/B • Michigan City Unit 12	• N/A
Expected Capacity Additions	• ~2,845 MW*	• ~600-800 MW (ICAP)	
NIPSCO's Preferred Replacement Plan	• Demand Side Management (DSM) • NIPSCO Owned DER (up to 10 MW) • Thermal Contracts (150 MW) • Storage (135-370MW)**	• Sugar Creek Uprate (30-53 MW) • Solar (100-250 MW) • Storage (135-370MW)** • Gas Peaking (up to 300 MW) • Hydrogen Electrolyzer Pilot (20 MW)	• Solar (TBD MW) • Storage (TBD MW) • Sugar Creek Conversion • Other potential resource opportunities
Expected Regulatory Filings	• Approvals for replacement capacity contracts and pilot projects as needed • DSM Plan	• Approvals for replacement capacity resources and pilot projects as needed	• Approvals for replacement capacity projects • Future DSM Plans

*Additions also include replacement ICAP MW for approved renewables projects filed with the IURC

** Exact Storage ICAP MW to be optimized

STAKEHOLDER PRESENTATIONS

TBD

WRAP UP & NEXT STEPS

Erin Whitehead, Vice President Regulatory & Major Accounts, NIPSCO

NEXT STEPS

Seeking Feedback

- Seeking feedback regarding the plan presented today
- Reach out to Alison Becker (abecker@nisource.com) for 1x1 meetings
- NIPSCO IRP Email: nipsco_irp@nisource.com

IRP Submission

- NIPSCO will submit their 2021 IRP report to the IURC by **November 15th**
- IRP Website: www.nipsco.com/irp

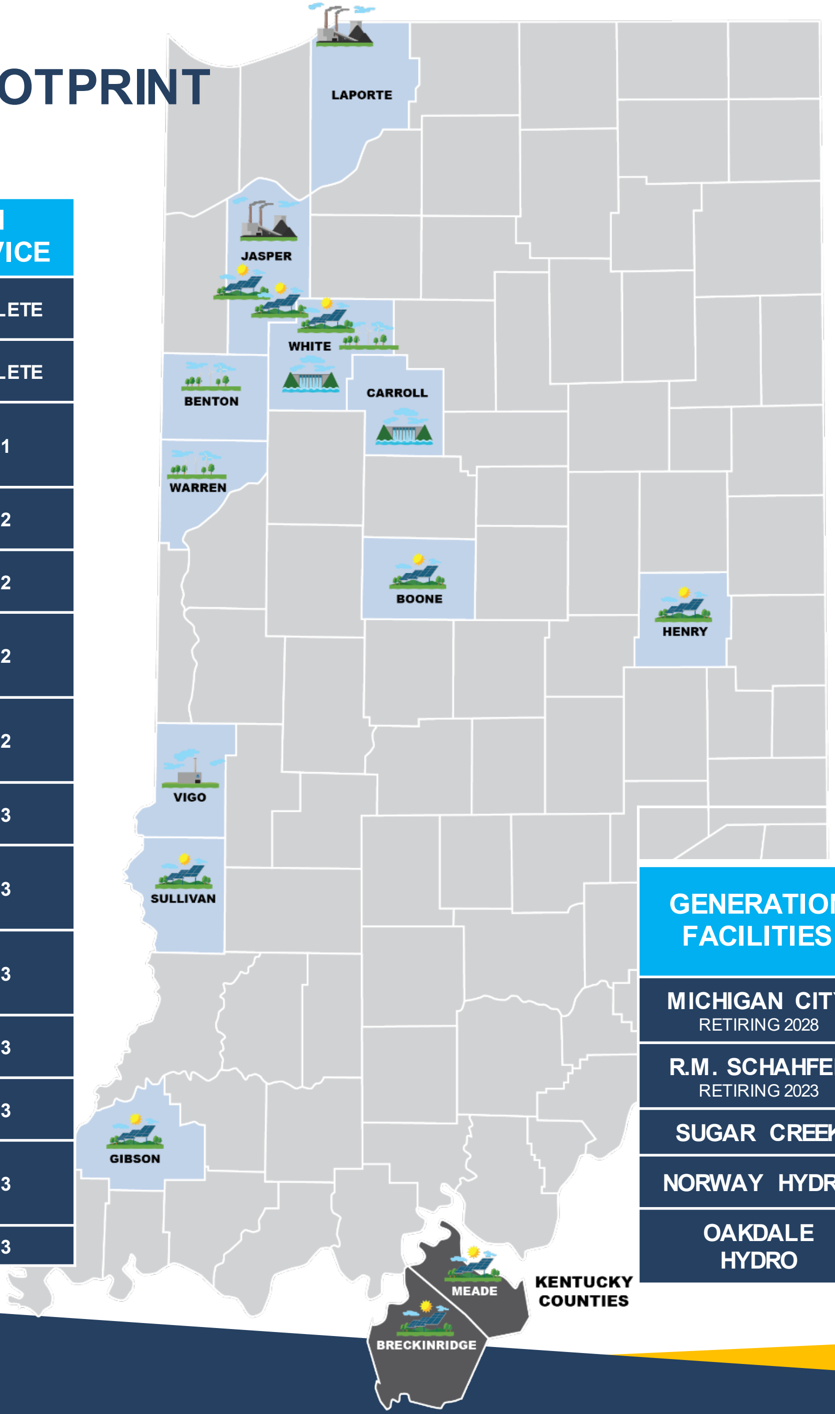
Stakeholder engagement is a critical part of the IRP process

APPENDIX

2023 ANTICIPATED GENERATION FOOTPRINT

New Generation Facilities

PROJECT	INSTALLED CAPACITY (MW)	COUNTY	IN SERVICE
ROSEWATER WIND	102MW	WHITE	COMPLETE
JORDAN CREEK WIND	400MW	BENTON WARREN	COMPLETE
INDIANA CROSSROADS WIND	300MW	WHITE	2021
DUNNS BRIDGE SOLAR I	265MW	JASPER	2022
BRICKYARD SOLAR	200MW	BOONE	2022
GREENSBORO SOLAR	100MW +30MW BATTERY	HENRY	2022
INDIANA CROSSROADS SOLAR	200MW	WHITE	2022
GREEN RIVER SOLAR	200MW	BRECKINRIDGE & MEADE (KENTUCKY)	2023
DUNNS BRIDGE SOLAR II	435MW +75MW BATTERY	JASPER	2023
CAVALRY SOLAR	200MW +60MW BATTERY	WHITE	2023
GIBSON SOLAR	280MW	GIBSON	2023
FAIRBANKS SOLAR	250MW	SULLIVAN	2023
INDIANA CROSSROADS II WIND	204MW	WHITE	2023
ELLIOT SOLAR	200MW	GIBSON	2023



- Planned renewable resources expected to add 3,330MW installed capacity
- Additional $5 billion capital investments, much of which stays in the Indiana economy
- Generation transition plan generates more than $4 billion in cost-savings for our customers with industry-leading emissions reductions

Current Facilities

GENERATION FACILITIES	INSTALLED CAPACITY (MW)	FUEL	COUNTY
MICHIGAN CITY RETIRING 2028	469MW	COAL	LAPORTE
R.M. SCHAHFER RETIRING 2023	1,780MW	COAL	JASPER
SUGAR CREEK	535MW	NATURAL GAS	VIGO
NORWAY HYDRO	7.2MW	WATER	WHITE
OAKDALE HYDRO	9.2MW	WATER	CARROLL

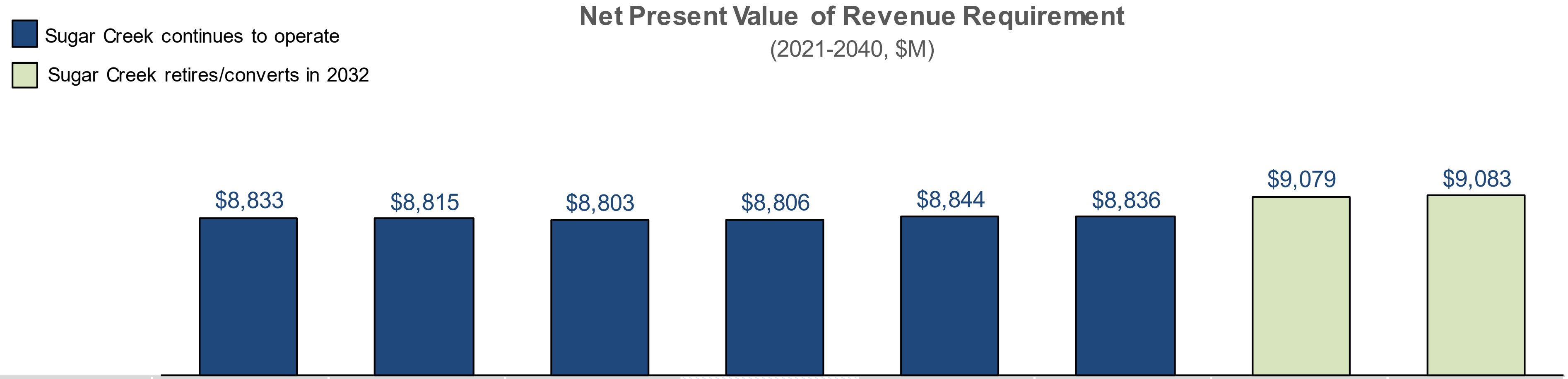
NISOURCE REMAINS COMMITTED TO MEET ENVIRONMENTAL IMPACT TARGETS

NiSource projects significant emissions reductions: By 2030 – compared with a base year of 2005 – expected 90 percent reduction of greenhouse gas emissions, 100 percent reduction of coal ash generated, and 99 percent reduction of water withdrawal, wastewater discharge, nitrogen oxides, sulfur dioxide, and mercury air emissions

	PROGRESS THROUGH 2020 % REDUCTIONS FROM 2005 LEVELS	TARGET 2025 % REDUCTIONS FROM 2005 LEVELS	TARGET 2030 % REDUCTIONS FROM 2005 LEVELS
METHANE FROM MAINS AND SERVICES	39%	50% ON TARGET	50%+
GREENHOUSE GAS (NISOURCE)	63%	50%	90%
NITROGEN OXIDES (NOX)	89%	90% ON TARGET	99%
SULFUR DIOXIDE (SO2)	98%	90%	99%
MERCURY	96%	90%	99%
WATER WITHDRAWAL	91%	90%	99%
WATER DISCHARGE	95%	90%	99%
COAL ASH GENERATED	71%	60%	100%

On Target

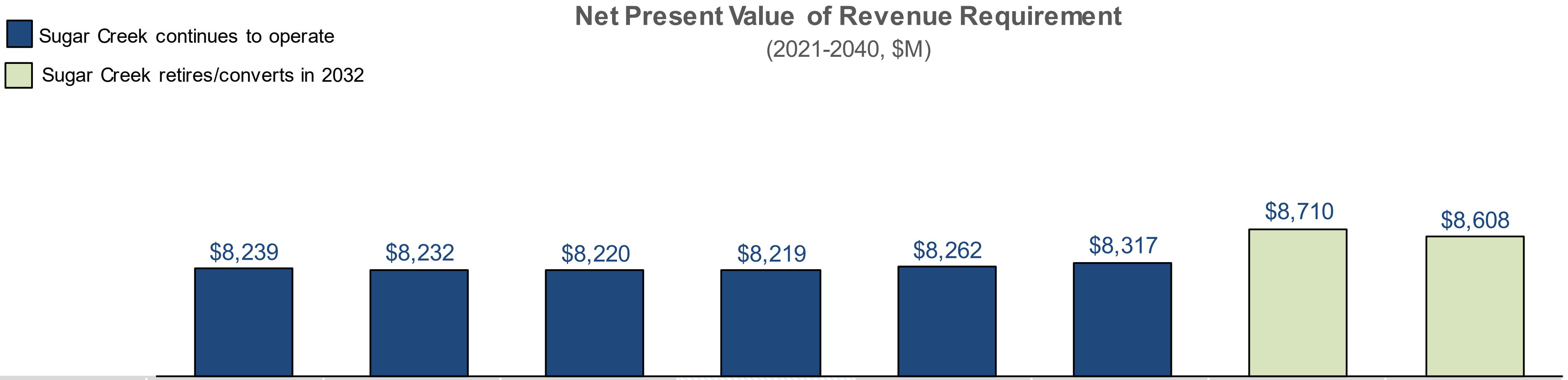
20-YEAR NPV REVIEW: EXISTING FLEET ANALYSIS: REFERENCE CASE


Net Present Value of Revenue Requirement
(2021-2040, $M)

Portfolio Transition Target:	**15% Coal through 2032** ①	**15% Coal through 2028** ②	**15% Coal through 2026** ③	**15% Coal through 2024** ④	**15% Coal through 2028** ⑤	**15% Coal through 2026** ⑥	**15% Coal through 2028 Fossil Free by 2032** ⑦	**15% Coal through 2028 Option for Fossil Free by 2032** 7H
Retire:	MC: 12 (2032) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16AB (2028)	MC: 12 (2026) Schfr: 16AB (2028)	MC: 12 (2024) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16 AB (2025)	MC: 12 (2026) Schfr: 16AB (2025)	MC: 12 (2028) Schfr: 16AB (2025) SC: (2032)	MC: 12 (2028) Schfr: 16AB (2025) SC to H2: (2032)
Retain beyond 2032:	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	None	Sugar Creek converts to H2 (2032)
Rank (1=Least Cost)	4	3	1	2	6	5	7	8
Delta from Least Cost	$30M 0.3%	$12M 0.1%	-	$3M 0.0%	$41M 0.5%	$33M 0.4%	$276M 3.1%	$280M 3.2%

▨ Not a viable pathway due to implementation timing

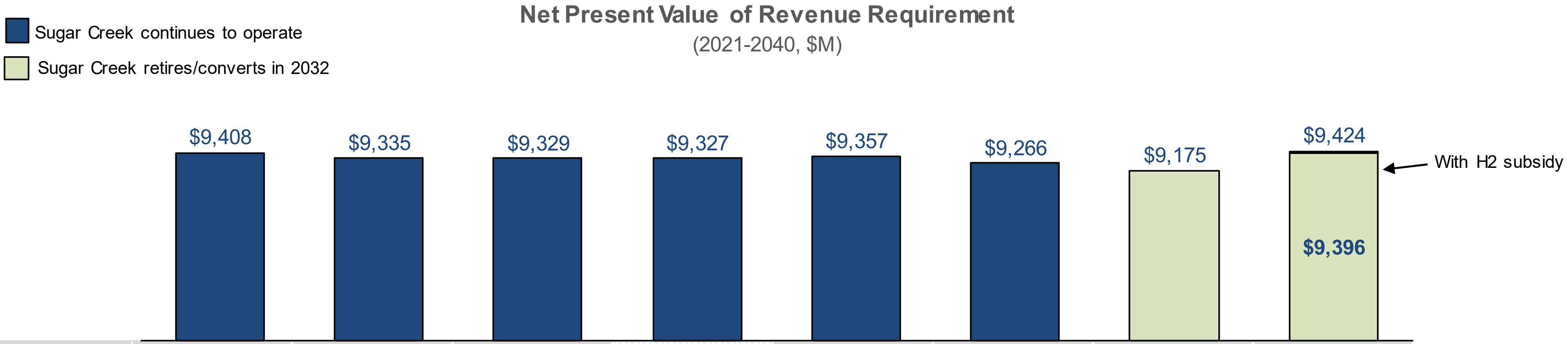
20-YEAR NPV REVIEW: EXISTING FLEET ANALYSIS: STATUS QUO EXTENDED (SQE)


Net Present Value of Revenue Requirement
(2021-2040, $M)

	1	2	3	4	5	6	7	7H
Portfolio Transition Target:	**15% Coal through 2032**	**15% Coal through 2028**	**15% Coal through 2026**	**15% Coal through 2024**	**15% Coal through 2028**	**15% Coal through 2026**	**15% Coal through 2028 Fossil Free by 2032**	**15% Coal through 2028 Option for Fossil Free by 2032**
Retire:	MC: 12 (2032) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16AB (2028)	MC: 12 (2026) Schfr: 16AB (2028)	MC: 12 (2024) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16 AB (2025)	MC: 12 (2026) Schfr: 16AB (2025)	MC: 12 (2028) Schfr: 16AB (2025) SC: (2032)	MC: 12 (2028) Schfr: 16AB (2025) SC to H2: (2032)
Retain beyond 2032:	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	None	Sugar Creek converts to H2 (2032)
Rank (1=Least Cost)	4	3	2	1	5	6	8	7
Delta from Least Cost	$20M 0.2%	$13M 0.2%	$1M 0.0%	-	$43M 0.5%	$98M 1.2%	$491M 6.0%	$389M 4.7%

▨ Not a viable pathway due to implementation timing

20-YEAR NPV REVIEW: EXISTING FLEET ANALYSIS: AGGRESSIVE ENVIRONMENTAL REGULATION (AER)


Net Present Value of Revenue Requirement

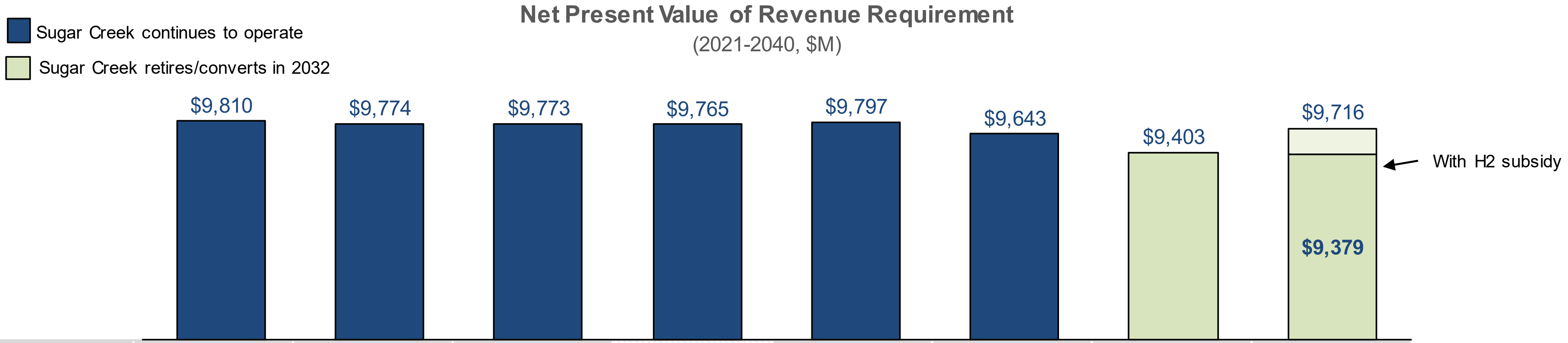
(2021-2040, $M)

Portfolio Transition Target:	15% Coal through 2032 1	15% Coal through 2028 2	15% Coal through 2026 3	15% Coal through 2024 4	15% Coal through 2028 5	15% Coal through 2026 6	15% Coal through 2028 Fossil Free by 2032 7	15% Coal through 2028 Option for Fossil Free by 2032 7H
Retire:	MC: 12 (2032) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16AB (2028)	MC: 12 (2026) Schfr: 16AB (2028)	MC: 12 (2024) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16 AB (2025)	MC: 12 (2026) Schfr: 16AB (2025)	MC: 12 (2028) Schfr: 16AB (2025) SC: (2032)	MC: 12 (2028) Schfr: 16AB (2025) SC to H2: (2032)
Retain beyond 2032:	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	None	Sugar Creek converts to H2 (2032)
Rank (1=Least Cost)	8	5	4	3	6	2	1	7
Delta from Least Cost	$233M 2.5%	$160M 1.7%	$154M 1.7%	$152M 1.7%	$182M 2.0%	$91M 1.0%	-	$221M 2.4%

▨ Not a viable pathway due to implementation timing

*Note: Rank and Delta from Least Cost utilize 3I **with** the H2 subsidy at $0.50/kg.

20-YEAR NPV REVIEW: EXISTING FLEET ANALYSIS: ECONOMY-WIDE DECARBONIZATION (EWD)



Net Present Value of Revenue Requirement

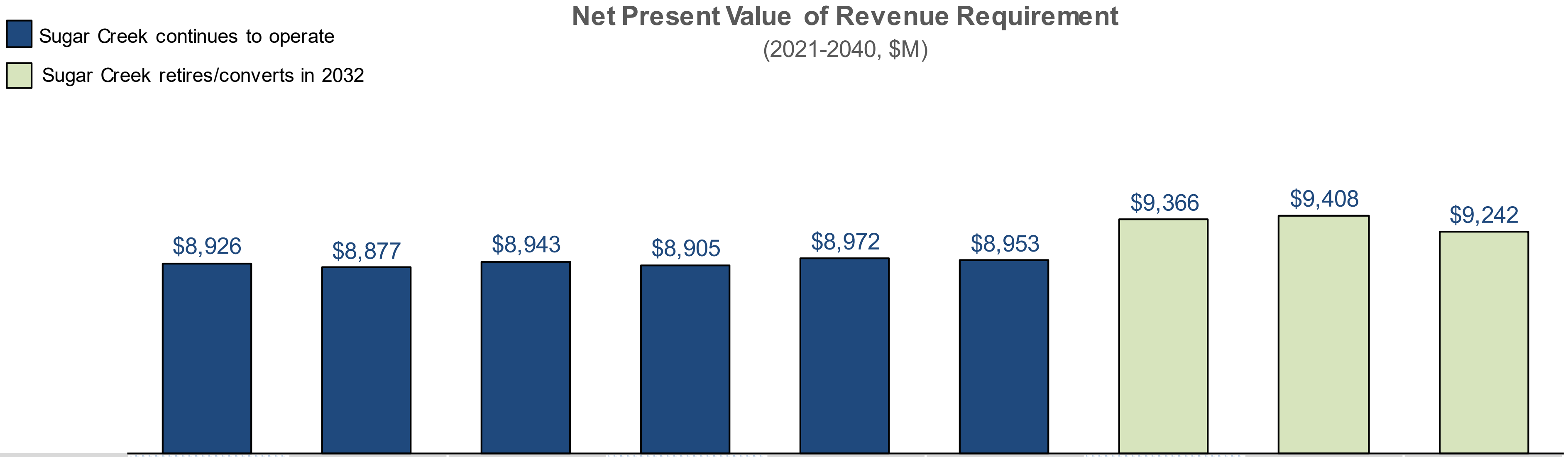
(2021-2040, $M)

Portfolio Transition Target:	15% Coal through 2032 ①	15% Coal through 2028 ②	15% Coal through 2026 ③	15% Coal through 2024 ④	15% Coal through 2028 ⑤	15% Coal through 2026 ⑥	15% Coal through 2028 Fossil Free by 2032 ⑦	15% Coal through 2028 Option for Fossil Free by 2032 7H
Retire:	MC: 12 (2032) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16AB (2028)	MC: 12 (2026) Schfr: 16AB (2028)	MC: 12 (2024) Schfr: 16AB (2028)	MC: 12 (2028) Schfr: 16 AB (2025)	MC: 12 (2026) Schfr: 16AB (2025)	MC: 12 (2028) Schfr: 16AB (2025) SC: (2032)	MC: 12 (2028) Schfr: 16AB (2025) SC to H2: (2032)
Retain beyond 2032:	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	Sugar Creek	None	Sugar Creek converts to H2 (2032)
Rank (1=Least Cost)	8	6	5	4	7	3	2	1
Delta from Least Cost	$431M 4.6%	$395M 4.2%	$394 4.2%	$386M 4.1%%	$418M 4.5%%	$264M 2.8%%	$24M 0.3%%	-

▨ Not a viable pathway due to implementation timing

*Note: Rank and Delta from Least Cost utilize 3I **with** the H2 subsidy at $0.50/kg.

20-YEAR NPV REVIEW: REPLACEMENT ANALYSIS: REFERENCE CASE


Net Present Value of Revenue Requirement
(2021-2040, $M)

Replacement Theme	Thermal PPAs, solar and storage	Non-service territory gas peaking (no early storage)	Natural gas dominant (CC)	No new thermal resources; solar dominant w/ storage	Thermal PPAs plus storage and solar	Local gas peaker, plus solar and storage	Solar dominant w/ storage, plus retire Sugar Creek	All renewables and storage, plus retire Sugar Creek (Portfolio 7)	New H2-enabled peaker plus solar and storage, plus SC conversion to H2 (Portfolio 7H)
	A ▨	B	C	D ▨	E	F	G ▨	H	I
Carbon Emissions	Higher	Higher	Higher	Mid	Mid	Mid	Low	Low	Low
Dispatchability	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)
Rank (1=Least Cost)	3	1	4	2	6	5	8	9	7
Delta from Least Cost	$49 0.6%	-	$66 0.7%	$28 0.3%	$95 1.1%	$76 0.9%	$489 5.5%	$531 6.0%	$365 4.1%

▨ Not a viable pathway due to not meeting winter planning reserve margins

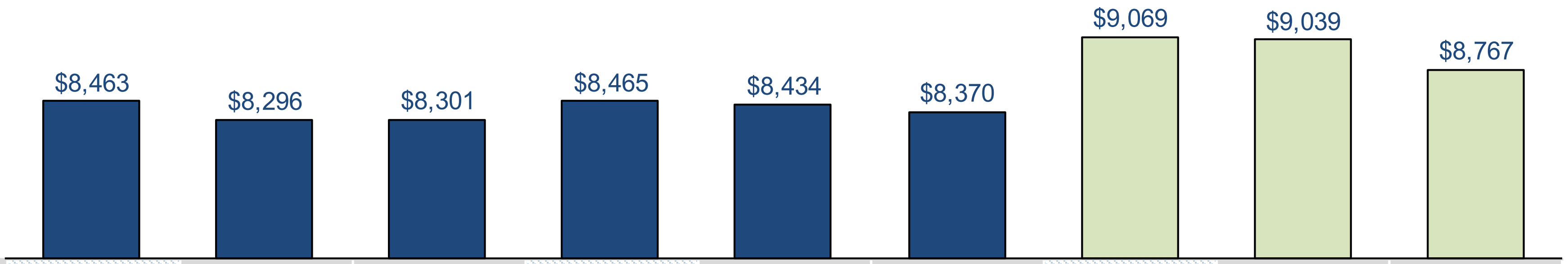
20-YEAR NPV REVIEW: REPLACEMENT ANALYSIS: STATUS QUO EXTENDED (SQE)

■ Sugar Creek continues to operate

□ Sugar Creek retires/converts in 2032

Net Present Value of Revenue Requirement

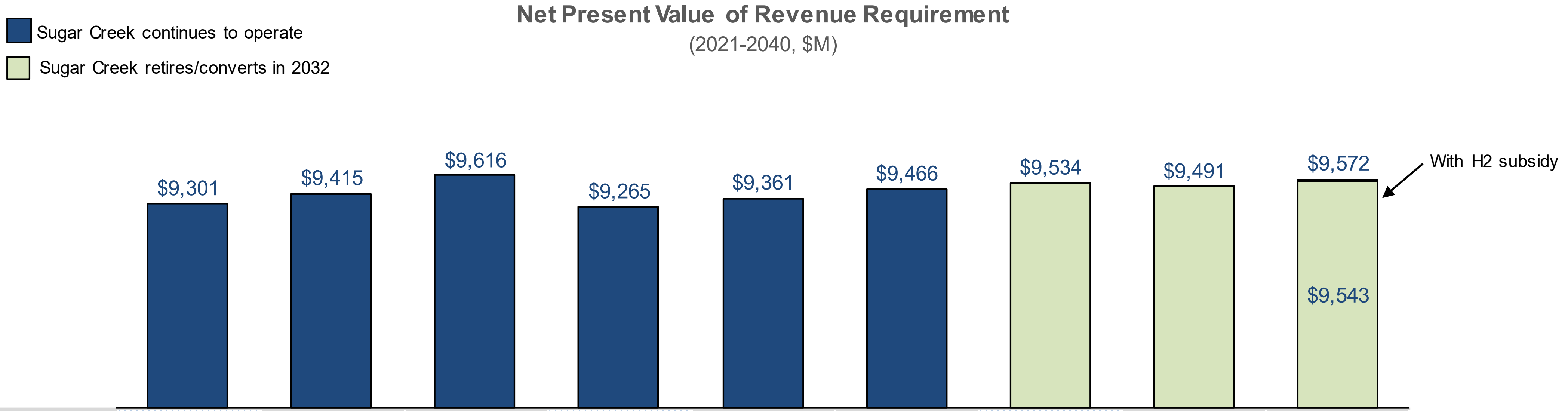
(2021-2040, $M)



Replacement Theme	Thermal PPAs, solar and storage A ▨	Non-service territory gas peaking (no early storage) B	Natural gas dominant (CC) C	No new thermal resources; solar dominant w/ storage D ▨	Thermal PPAs plus storage and solar E	Local gas peaker, plus solar and storage F	Solar dominant w/ storage, plus retire Sugar Creek G ▨	All renewables and storage, plus retire Sugar Creek (Portfolio 7) H	New H2-enabled peaker plus solar and storage, plus SC conversion to H2 (Portfolio 7H) I
Carbon Emissions	Higher	Higher	Higher	Mid	Mid	Mid	Low	Low	Low
Dispatchability	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)
Rank (1=Least Cost)	5	1	2	6	4	3	9	8	7
Delta from Least Cost	$167 2.0%	-	$5 0.1%	$169 2.0%	$138 1.7%	$74 0.9%	$773 9.3%	$743 9.0%	$471 5.7%

▨ Not a viable pathway due to not meeting winter planning reserve margins

20-YEAR NPV REVIEW: REPLACEMENT ANALYSIS: AGGRESSIVE ENVIRONMENTAL REGULATION (AER)

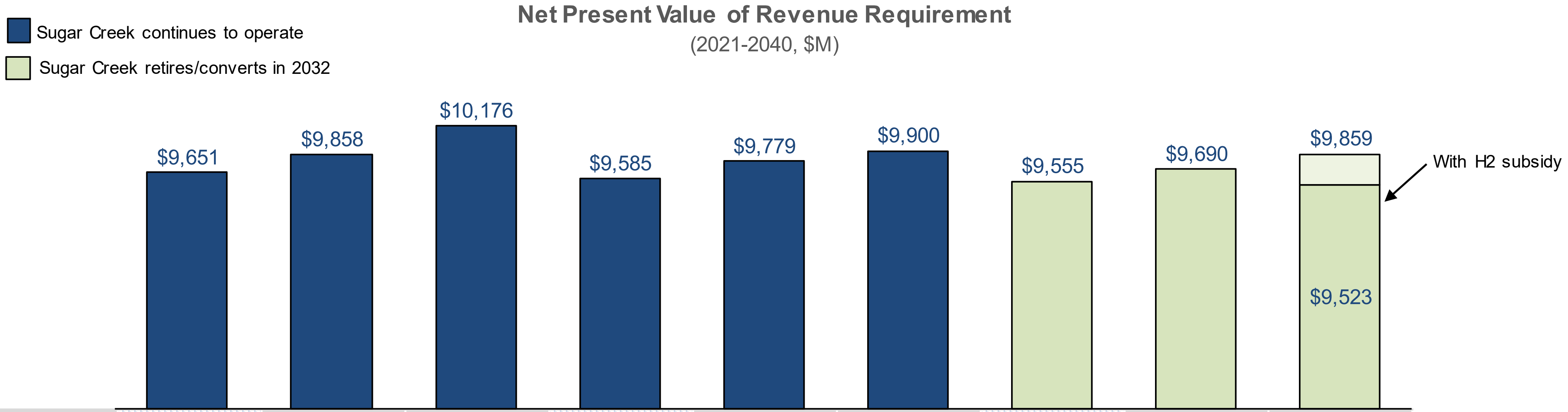


Replacement Theme	**Thermal PPAs, solar and storage**	**Non-service territory gas peaking (no early storage)**	**Natural gas dominant (CC)**	**No new thermal resources; solar dominant w/ storage**	**Thermal PPAs plus storage and solar**	**Local gas peaker, plus solar and storage**	**Solar dominant w/ storage, plus retire Sugar Creek**	**All renewables and storage, plus retire Sugar Creek (Portfolio 7)**	**New H2-enabled peaker plus solar and storage, plus SC conversion to H2 (Portfolio 7H)**
	A ▨	B	C	D ▨	E	F	G ▨	H	I
Carbon Emissions	Higher	Higher	Higher	Mid	Mid	Mid	Low	Low	Low
Dispatchability	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)
Rank (1=Least Cost)	2	4	9	1	3	5	7	6	8
Delta from Least Cost	$36 0.4%	$150 1.6%	$351 3.8%	-	$96 1.0%	$201 2.2%	$269 2.9%	$226 2.4%	$278 3.0%

▨ Not a viable pathway due to not meeting winter planning reserve margins

*Note: Rank and Delta from Least Cost utilize 3I **with** the H2 subsidy at $0.50/kg.

20-YEAR NPV REVIEW: REPLACEMENT ANALYSIS: ECONOMY-WIDE DECARBONIZATION (EWD)



Replacement Theme	Thermal PPAs, solar and storage	Non-service territory gas peaking (no early storage)	Natural gas dominant (CC)	No new thermal resources; solar dominant w/ storage	Thermal PPAs plus storage and solar	Local gas peaker, plus solar and storage	Solar dominant w/ storage, plus retire Sugar Creek	All renewables and storage, plus retire Sugar Creek (Portfolio 7)	New H2-enabled peaker plus solar and storage, plus SC conversion to H2 (Portfolio 7H)
	A	B	C	D	E	F	G	H	I
Carbon Emissions	Higher	Higher	Higher	Mid	Mid	Mid	Low	Low	Low
Dispatchability	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)	Current Planning Reserve Margin	Winter & Summer Reserve Margin	Enhanced Reserve Margin (Local w/ Higher Energy Duration)
Rank (1=Least Cost)	4	7	9	3	6	8	2	5	1
Delta from Least Cost	$128 1.3%	$335 3.5%	$653 6.9%	$62 0.7%	$256 2.7%	$377 4.0%	$32 0.3%	$167 1.8%	-

▨ Not a viable pathway due to not meeting winter planning reserve margins

*Note: Rank and Delta from Least Cost utilize 3I **with** the H2 subsidy at $0.50/kg.

SETTING THE CONTEXT FOR ASSESSING RELIABILITY IN THE IRP

Previous Reliability Assessments

- In the 2018 IRP, NIPSCO began including reliability risk metric in the scorecard used to evaluate the performance of various resource portfolios

2018 Retirement Scorecard

Criteria	Description
Cost to Customer	• Impact to customer bills • Metric: 30-year NPV of revenue requirement (Base scenario deterministic results)
Cost Certainty	• Certainty that revenue requirement falls within the most likely range of distribution of outcomes (75% certainty that cost will be at or below this level) • Metric: 75th percentile of cost to customer
Cost Risk	• Risk of extreme, high-cost outcomes • Metric: 95th percentile of cost to customer
Reliability Risk	• Assess the ability to confidently transition the resources and maintain customer and system reliability • Metric: Qualitative assessment of orderly transition
Employees	• Net impact on NiSource jobs by 2023 • Metric: Approximate number of permanent NiSource jobs affected
Local Economy	• Property tax amount relative to NIPSCO's 2016 IRP • Metric: Difference in NPV of estimated modeled property taxes on existing assets relative to the 2016 IRP

- As part of the 2020 Portfolio Analysis to support NIPSCO renewable filings, the reliability criteria were further expanded to consider operational flexibility

2020 Portfolio Analysis

Criteria	Description
Cost to Customer	• Impact to customer bills • Metric: 34 year NPV of revenue requirement (Base scenario deterministic results)
Long term Optionality	• Flexibility resulting from combinations of ownership, duration, and diversity • Metric: MW weighted duration of generation commitments
Capital Requirement	• Estimated amount of capital investment required by portfolio • Metric: 2020 -2023 capital needs
Fuel Security	• Power plants with reduced exposure to short-term fuel supply and/or deliverability issues (e.g., ability to store fuel on-site and/or requires no fuel) • Metric: Percentage of capacity sourced from resources other than natural gas (2025 UCAP MW sourced from non-gas resources)
Environmental	• Carbon intensity of portfolio / Total carbon emissions • Metric: Total annual carbon emissions (2030 short tons of CO_2) from the generation portfolio
Operational Flexibility	• The ability of the portfolio to be controlled in manner to respond to changes in load (dispatchable) • Metric: % of 2025 Controllable MW in gen. portfolio

2021 IRP Approach

1 Ensure consistency with MISO rules evolution

- Seasonal resource adequacy
- Future effective load carrying capability (ELCC) accounting

2 Expand Uncertainty Analysis

- Incorporation of renewable output uncertainty
- Broadening risk analysis to incorporate granular views of tail risk

3 Incorporate New Metrics

- Incorporating new scorecard metrics informed by stochastic analysis and capabilities of portfolio resources

CORE ECONOMIC MODELING CAPTURES SOME ELEMENTS OF RELIABILITY

Additional analysis and assessment is required for a fuller perspective

Focus of NIPSCO's IRP (Resource Adequacy, Energy Adequacy)

NIPSCO coordinates with MISO (Operating Reliability)

	Resource Adequacy	Energy Adequacy	Operating Reliability
Definition:	Having sufficient resources to reliably serve demand	Ability to provide energy in all operating hours continuously throughout the year	Ability to withstand unanticipated component losses or disturbances
Forward Planning Horizon:	Year-ahead	Day-ahead	Real-time or Emergency
Reliability Factors:	Reserve margin, ELCC and energy duration	Dispatchability, energy market risk exposure	Real Time Balancing System
IRP Modeling Approach:	Portfolio development constraints, with ELCC and seasonal accounting	Hourly dispatch analysis, including stochastic risk	**Ancillary services analysis (regulation, reserves), with sub-hourly granularity**

ECONOMIC ANALYSIS ALONE DO NOT CAPTURE THE FULL VALUE OF RESOURCES

- NIPSCO participates in the Midcontinent Independent System Operator (MISO) in a variety of roles with various compliance standards and responsibilities
- These responsibilities and standards are met in part by existing resources

Role	Definition
Energy, Capacity, and Ancillary Services Market Participant	Offers resources into markets and procures services on behalf of load to ensure adequate provision of energy, capacity, and ancillary services to support system reliability
Transmission Owner (TO)	Owns and maintains transmission facilities
Transmission Operator (TOP)	Responsible for the reliability of its local transmission system, and that operates or directs the operations of the transmission facilities

- As a TOP, NIPSCO is <u>required</u> to comply with a variety of NERC standards, particularly those that govern the reliable operation of the Bulk Electric System
  - For example, EOP-005-3 governs system restoration from Black Start Resources. Part of NIPSCO's compliance plan relies on resources that currently exist within the portfolio and the NIPSCO TOP area
- Any resource decisions (retirement or replacement) will need to consider the implications for NIPSCO's ability to comply with NERC and MISO standards and procedures now and into future

An expanded scoring criteria can account for these additional considerations

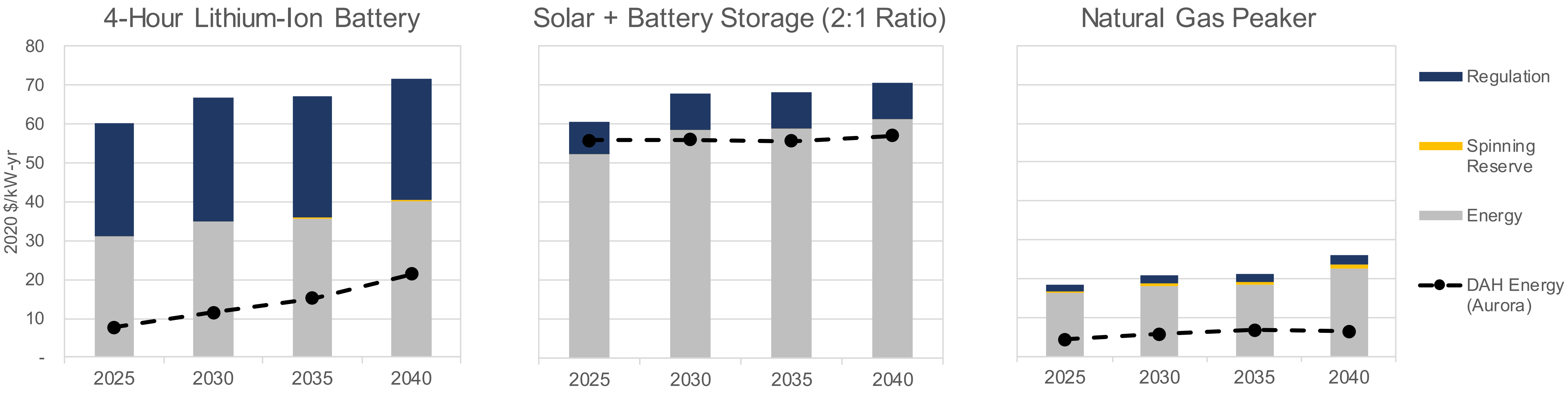
ECONOMIC ANALYSIS OF REAL-TIME MARKET DYNAMICS + ANCILLARY SERVICES

- CRA's Energy Storage Operations (ESOP) model is an optimization program that estimates the value of storage and other flexible resources in the sub-hourly energy and ancillary services (A/S) markets, offering an estimate of the incremental value such resources offer beyond what can be estimated in the day-ahead hourly production cost framework of Aurora

Category	Aurora Portfolio Tool	ESOP
Market Coverage	Day-ahead energy	Energy plus ancillary services ("A/S") (frequency regulation and spinning reserves)
Time Granularity	Hourly, chronological	5-minute intervals, chronological
Time Horizon	20 years	Sample years (ie, 2025, 2030, 2035, 2040)
Pricing Inputs	MISO-wide fundamental analyses feed NIPSCO-specific portfolio dispatch	Historical data drives real-time and A/S pricing; specific asset types dispatched against price
Asset Parameters Used	Hourly ramp rate, storage cycle and depth of dispatch limits, storage efficiency	Sub-hourly ramp rate, storage cycle and depth of discharge limits, storage efficiency
Outputs	Portfolio-wide cost of service	Incremental value for specific asset type

SUB-HOURLY ANALYSIS INDICATES POTENTIAL UPSIDE FOR STORAGE ASSETS

Reference Case



- Highly flexible battery able to respond in real time to changing price signals
- Can participate regularly in the regulation market (providing up and down service, given charging and discharging capabilities)

- Solar component provides significant energy value, which is also captured in fundamental modeling
- Investment tax credit rules limit the battery's flexibility and ability to take advantage of the regulation market (must charge predominantly from the solar)

- Real-time volatility is greater than day ahead hourly dispatch value, providing value upside compared to Aurora modeling
- Regulation opportunities are only available when the unit is already operating for energy