Hoosier Energy
Volume III

Appendix K

Board Presentations
2019 Long Range Resource Planning
Hoosier Energy
February 19 BOD Meeting
Charles River Associates

Overview

Founded in 1965
650 consultants
Advisory and Expert Services
Five Primary Industry Verticals

Industries, Services, and Typical Clients

Advisory
Expert

Energy

Industrials

Life Sciences

Financial Services

Metals & Mining

 Clients: Utilities
Midstream
Conglomerate
Gas
Private Equity

 Clients: Heavy
manufacturing
Chemicals

 Clients: Pharma
Hospitals
Private Equity

 Clients: Large Banks
SEC, DOJ

 Clients: Public and
Private
Companies
Private Equity
CRA’s Energy Practice

CRA’s Energy Practice comprises five primary practice areas spanning management consulting to expert services.

**Corporate Strategy**
- Portfolio optimization
- Offering development
- M&A
- Market entry

**Utility Strategy & Investment Planning**
- Grid modernization
- Integrated resource plan
- DSP
- The New Utility
- Infrastructure planning
- Storage
- Regulatory

**Energy Markets**
- Market Rules
- Order 1000
- Fuel Security
- Order 841
- Capacity market design
- Order 744

**Transaction Support**
- Power plant due diligence
- Market power analysis
- Utility due diligence

**Litigation Support**
- Damages analysis
- International arbitration
- Commercial litigation
- Expert testimony
CRA’s Key Project Team Members

Jim McMahon
Officer in Charge
20+ years experience

Specialties
Utility Strategy
Generation Planning
Capital Allocation

Pat Augustine
Modeling and Markets Leader
10+ years experience

Specialties
Market Modeling
Generation Planning
Portfolio Analysis

Andrew Trump
Portfolio Strategy
25+ years experience

Specialties
Utility Strategy
Business Planning
Technology

Robert Kaineg
Project Manager
10+ years experience

Specialties
Market Modeling
Generation Planning
Price Forecasting
CRA’s Recent Resource Planning Activity

CRA has recently worked with a wide range of utilities across the country facing complex resource questions.

Key

<table>
<thead>
<tr>
<th>Coal</th>
<th>Natural Gas</th>
<th>Solar</th>
<th>Nuclear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro</td>
<td>Wind</td>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>#</th>
<th>Utility</th>
<th>Mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Southern</td>
<td><img src="image1" alt="Mix" /></td>
</tr>
<tr>
<td>2</td>
<td>MEAG</td>
<td><img src="image2" alt="Mix" /></td>
</tr>
<tr>
<td>3</td>
<td>NIPSCO</td>
<td><img src="image3" alt="Mix" /></td>
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<tr>
<td>4</td>
<td>DTE Energy</td>
<td><img src="image4" alt="Mix" /></td>
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<tr>
<td>5</td>
<td>Alliant</td>
<td><img src="image5" alt="Mix" /></td>
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<tr>
<td>6</td>
<td>MN Power</td>
<td><img src="image6" alt="Mix" /></td>
</tr>
<tr>
<td>7</td>
<td>Empire</td>
<td><img src="image7" alt="Mix" /></td>
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<td>8</td>
<td>CPS Energy</td>
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</tr>
<tr>
<td>9</td>
<td>Cheyenne</td>
<td><img src="image9" alt="Mix" /></td>
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</tbody>
</table>
CRA’s Recent Resource Planning Activity

While every utility client presents a unique situation and set of questions, several central questions have emerged.

**Central Investment Questions**

- Baseload Plant Retirements
- Renewable v. Fossil Replacement
- Storage Investment
- Ownership v. Power Purchase Agreements (PPA)
- Central v. Distribution System Investments
- Demand-side Investment
MEAG – Support Continued Investment in Vogtle

“We are all pleased to have reached an agreement and to be moving forward with the construction of Vogtle Units 3 & 4 which is critical to Georgia’s energy future” - Vogtle co-owners, Sep 2018

Plant Specifications
2 x 1215 MW, Newest plant design

Plant Cost and Commercial Operation Date
$14 billion original estimate
$27 billion current estimate
Commercial operation dates: 2021/2022

MEAG Ownership / Contracting
MEAG owns 22.7% share or ~500 MW
MEAG sells a portion of its capacity to JEA under a power purchase agreement

Employment Impact
Vogtle 3 & 4 is currently the largest jobs-producing construction project in the state of Georgia employing more than 7,000 workers from across the country, with more than 800 permanent jobs available once the units begin operating.
Southern – Retire Coal, Replace with Gas + Renew + DSM

“Sustained low gas prices combined with reduced energy demand growth continue to place economic pressure on the Company's remaining coal-fired generating units” – GA Power, Feb 2019

<table>
<thead>
<tr>
<th>Announced Coal Retirements</th>
<th>Announced Additions</th>
</tr>
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<tbody>
<tr>
<td><strong>McIntosh Unit 1:</strong></td>
<td>1600 MW of <strong>Demand-Side Management</strong></td>
</tr>
<tr>
<td>143 MW</td>
<td>1000 MW of <strong>Renewables</strong></td>
</tr>
<tr>
<td>• First Year in Service: 1979</td>
<td>Likelihood of <strong>Combined Cycle and Combustion Turbine units</strong></td>
</tr>
<tr>
<td>• Heavily Controlled for Pollutants</td>
<td>amid low gas price environment</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Hammond Units 1-4:</th>
<th>Souther Company</th>
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<tbody>
<tr>
<td>840 MW</td>
<td>CRA Charles River Associates</td>
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<tr>
<td>• First Years in Service: 1954-1970</td>
<td>Source: Georgia Power 2019 Draft IRP</td>
</tr>
<tr>
<td>• Heavily Controlled for Pollutants</td>
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</table>

Source: Georgia Power 2019 Draft IRP
NIPSCO – Retire Coal, Replace with Renewables

*NIPSCO’s Integrated Resource Plan (IRP) calls for the retirement of 1600 MW of coal by 2023 and all coal by 2028, replaced by almost 4000 MW of nameplate renewables.

IRP results supported rollout of “Your Energy, Your Future” reduce emissions 90% by 2028

NIPSCO to add 800 MW wind in first steps to coal-free generation

Source: NIPSCO 2018 IRP

Notes: *Capacity in chart reflects capacity eligible to count as a capacity resource in MISO. This is greater than the maximum potential output of a given resource at a moment in time.
Lower Renewable Costs …

The cost of wind and solar have dropped dramatically in the last decade as a result of larger turbines, scale economies, and innovation.

Source: EIA
Notes: LCOE = Levelized Cost of Electricity. This equals the total investment, maintenance, and operating costs of the asset divided by the output of the asset over its life.
State and federal policies and mandates are becoming important considerations in resource planning decisions.

### State and Federal Energy Policies Impacting Resource Planning and the Timing of The Impact

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<thead>
<tr>
<th>Policy Area</th>
<th>Near Term</th>
<th>Long Term</th>
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<td><strong>Federal Policies</strong></td>
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<td>Investment Tax Credit</td>
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<td>Production Tax Credit</td>
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<tr>
<td>Coal Combustion Residuals, Other</td>
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<td>Carbon Policy</td>
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<td>Energy Efficiency Standards</td>
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<tr>
<td>Renewable Energy Standards</td>
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<tr>
<td><strong>State Policies</strong></td>
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<tr>
<td>Storage Mandates</td>
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<td>🔄</td>
</tr>
<tr>
<td>Off-Shore Wind Mandates</td>
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</tbody>
</table>

- **Federal Policies**
  - Tax credit related to investment of renewable resources
  - Tax credit related to production of renewable resources
  - Federal rules that impact many coal units
  - Potential to move toward a Paris Accord policy, state rules
  - States generally becoming more aggressive
  - Some states increasing targets or focus areas
  - Some states mandating storage (NY, CA, MA, CT)
  - Mandates and incentives for NE and MidAtl states

- **State Policies**
Combined With Persistently Low Gas Prices …

Natural Gas Prices – Historical and Futures

$2018 / MMBtu

Historical

Futures (dotted)

Chicago City Gate
Henry Hub

Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16 Jan-17 Jan-18 Jan-19 Jan-20 Jan-21 Jan-22 Jan-23 Jan-24 Jan-25 Jan-26 Jan-27 Jan-28
Are Leading to Significant Changes to the US Gen Fleet

Coal capacity in MISO has been displaced by natural gas, wind, and to a lesser extent, solar.
Industry Change Raises Important Questions for Hoosier

• How is Merom performing? Should Hoosier consider changes with respect to how it invests in or operates the plant?

• Does Hoosier have the right mix of resources to best meet its objectives around Least Cost? Risk? Sustainability?

• What are Hoosier’s objectives? Have they changed over time?

• Should Hoosier consider resource procurement options that allow customers to better achieve their own objectives?

• How does NIPSCO’s (or other utilities’) move to divest their coal generation fleet impact Hoosier, if at all?
Hoosier’s Generation Strategy Should Be Unique

While Hoosier can learn from other utility experiences, its portfolio decision should be based on factors specific to the company.

How Hoosier Differs from Other IOUs That Recently Made Major Baseload Resource Decisions

<table>
<thead>
<tr>
<th>Utility</th>
<th>Resource Decision</th>
<th>Key Differences to Hoosier</th>
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<tbody>
<tr>
<td>NIPSCO</td>
<td>Retire Coal, Build Renewables</td>
<td>At risk industrial load, enviro costs</td>
</tr>
<tr>
<td>Empire District</td>
<td>Possibly Retire Coal, Build Wind</td>
<td>Small coal plant, high wind region</td>
</tr>
<tr>
<td>Cheyenne (CL&amp;P)</td>
<td>Maintain Coal</td>
<td>Mine mouth coal plant, unique buy out contract</td>
</tr>
<tr>
<td>MEAG Power</td>
<td>Continue Vogtle Nuclear Plant</td>
<td>Non-majority, non-operator of Vogtle</td>
</tr>
<tr>
<td>Southern Company</td>
<td>Retire Coal, Build Gas + Nuclear</td>
<td>Sustainability goals, non-ISO, distinct locations</td>
</tr>
</tbody>
</table>
2019 LRRP Decision Framework

This year we will utilize a decision framework that moves Hoosier methodically toward a decision.

Goals of the 2019 Process
• Collaborative – direct involvement and feedback from Board
• Transparent – process with clear assumptions and decision criteria
• Robust – leading models and analytical capabilities
• Comprehensive – addresses the complete set of strategic questions
• Decisional – provides the Board a decision framework around a set of key questions
Today will focus on discussing the Objectives that will guide the decision-making process.
Objectives Will Manifest in a Scorecard

The Objectives that we define will be incorporated into a Scorecard for purposes of evaluating tradeoffs between different portfolio options.

Sample Scorecard
Purpose and Elements of a Scorecard

**Why Use a Scorecard?**

- Helps validate and rationalize decisions
- Forces structured tradeoff discussion
- Improves speed of decisions
- Supports approval process, no arbitrary decisions

**What Makes a Good Scorecard Factor?**

- Discrete
- Measurable
- Specific
- Collectively exhaustive
- Balanced
- Reflects utility situation
Preliminary List of Scorecard Factors for Discussion

- Rate Predictability & Stability
- Customer Procurement Flexibility
- Resource Location
- Ownership of Power Supply Resources
- Construction of New Resources
- Operation of Portfolio Resources
- Deployment of Emerging Technologies
- Sustainability of the Portfolio
- Development of Demand-Side Resources
- Employee Retention
- Resource Diversity
- Wholesale Rates
Agenda

- Introduction to Scenarios
- Approach to Scenario Design
- Range of Key Uncertainties
- Proposed Scenarios for 2019 LRRP
2019 LRRP Development Process

The LRRP is now in the analysis phase, beginning with scenario development.

Scorecard objectives and metrics were defined in March.
LRRP Modeling Approach

Develop Scenarios “States of the World”

- Multiple scenarios tested
- Drivers of differences – assumptions on technology, policy, economy, customer

Test Hoosier Portfolio Options

Report Outcomes on Scorecard

- Wholesale Rates
- Rate Stability
- Resource Diversity
- Sustainability

<table>
<thead>
<tr>
<th>Objective</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholesale Rates</td>
<td>$$</td>
</tr>
<tr>
<td>Rate Stability</td>
<td>$$ - $$</td>
</tr>
<tr>
<td>Resource Diversity</td>
<td>%</td>
</tr>
<tr>
<td>Sustainability</td>
<td>Good / Bad</td>
</tr>
</tbody>
</table>

CRA Charles River Associates
Agenda

• Introduction to Scenarios
• Approach to Scenario Design
• Range of Key Uncertainties
• Proposed Scenarios for 2019 LRRP
Scenario Design Principles

1. Scenarios should be plausible and internally consistent views of the possible market futures

2. Scenarios should be distinct and result in materially different MISO market conditions for testing Hoosier resource decisions

3. Scenarios should be designed to test risks and concerns prioritized by Hoosier’s Board and management
Developing Scenario Themes

- Scenarios are constructed through combinations of model “drivers”
- Generally, the major drivers of key portfolio value drivers fall within four major categories

**Technology**
- Supply-side resource options (solar, storage, etc.)
- Natural gas extraction

**Policy/ Regulation**
- Renewable tax incentives
- Carbon regulations (national or local)
- Power market design changes

**Economy**
- Macroeconomic growth
- Commodity Prices
- Commercial and industrial power demand

**Customer Behavior**
- Energy efficiency and demand side management
- Distributed energy penetration
- Electric vehicle growth
Developing Scenario Inputs

**Scenario Concept Development**
Each scenario has a primary theme that drives the combined set of fundamental market modeling inputs

<table>
<thead>
<tr>
<th>Primary Drivers</th>
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</thead>
<tbody>
<tr>
<td>Technology</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
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<tr>
<td>C</td>
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<tr>
<td>D</td>
</tr>
</tbody>
</table>

**Scenario Parameterization**
Assumptions are developed across key model inputs and used to forecast energy prices, capacity prices, additions and retirements in the MISO market

**Load Growth**
- Load Shape
- New Resource Capital Cost
- Capacity Mix Changes

**CO2 Price**
- Natural Gas Prices
- Transmission Views
- Reserve Margin Value
## Major Forecast Movers

<table>
<thead>
<tr>
<th>Variable Change</th>
<th>Expected Modeling Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Natural Gas Prices</strong></td>
<td></td>
</tr>
<tr>
<td>High Gas Price</td>
<td>Model chooses <strong>renewable options</strong> and/or <strong>retains coal</strong> generation</td>
</tr>
<tr>
<td>Low Gas Price</td>
<td>Model chooses new <strong>gas-fired gen</strong>, deploys <strong>fewer renewables</strong> and <strong>retires more coal</strong></td>
</tr>
<tr>
<td><strong>Load Forecast</strong></td>
<td></td>
</tr>
<tr>
<td>High Load</td>
<td>Model requires <strong>new capacity</strong> to meet reserve requirements</td>
</tr>
<tr>
<td>Low Load</td>
<td>Lack of demand for new generation <strong>lowers capacity prices</strong> for MISO resources</td>
</tr>
<tr>
<td><strong>CO2 Pressure</strong></td>
<td></td>
</tr>
<tr>
<td>High CO2 Price</td>
<td>Model <strong>accelerates fossil retirements and renewable deployment</strong></td>
</tr>
<tr>
<td>Low CO2 Price</td>
<td>Model <strong>retains existing fossil resources</strong>, <strong>lower</strong> penetration of <strong>renewable</strong> generation</td>
</tr>
</tbody>
</table>
Agenda

- Introduction to Scenarios
- Approach to Scenario Design
- Range of Key Uncertainties
- Proposed Scenarios for 2019 LRRP
Scenario Development for Resource Planning

**Step 1**
Develop “Base Case” scenario that reflects the current expected outlook for key model drivers

**Step 2**
Evaluate range of uncertainty around these drivers

**Step 3**
Develop a manageable set of plausible futures that capture range of uncertainty around key model inputs
Agenda

• Introduction to Scenarios
• Approach to Scenario Design
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Proposed LRRP Scenarios

**Base Case**
- The MISO market continues to evolve based on the current outlook for load growth, commodity prices, technology development, and regulatory pressure.

**Stagnating Economy**
- Decline in economic outlook relieves regulatory pressure and results in a low load growth environment and fewer coal retirements.

**US Economy Decarbonizes**
- A national cap on CO2 emissions affects all sectors of the US economy, negatively affecting fossil generation and changing end-use demand patterns.

**Customers in Control**
- Widespread procurement of renewable energy by large C&I customers reduces demand for central station power and impacts load shape.

**Challenged Gas Economy**
- Restrictions on gas resource and infrastructure expansion result in high commodity prices for natural gas and reduced reliability of gas-fired units.
**Base Case**

- The MISO market continues to evolve based on the current outlook for load growth, commodity prices, technology development, and regulatory pressure.

**Primary Drivers**

- **Natural Gas Prices**
  - Henry Hub

- **CO₂ Price**

- **Load**
  - Avg. Growth rate 0.24%

**Notes**

- Load forecast consistent with MISO’s “Continuing Fleet Change” forecast.
- Gas prices grow modestly over time driven by increased domestic and international demand and resource depletion.
- CO₂ price represents modest level of future emissions pressure, not a specific policy.
Stagnating Economy

- Decline in economic outlook relieves regulatory pressure and results in a low load growth environment and fewer coal retirements

**Natural Gas Prices**

- Henry Hub

**CO₂ Price**

**Load**

Avg. Growth rate 0.00%

**Notes**

Case definition includes stagnation of load growth, consistent with the Limited Fleet Change view

Case definition includes regulatory pull-back, with lower CO₂ pressure than the Base view
US Economy Decarbonizes

- A national cap on CO2 emissions affects all sectors of the US economy, negatively affecting fossil generation and changing end-use demand patterns

Primary Drivers

Natural Gas Prices

CO2 Price

Henry Hub Forecast

Load

Notes

Case contemplates CO2 pressure on US economy, consistent with the Accelerated Fleet Change view.

CO2 pressure drives coal-to-gas switching, resulting in increased demand for natural gas and higher prices.

CO2 pressure is the primary driver of this case, emissions drop 20% from current levels by 2040.
Customers in Control

- Widespread procurement of renewable energy by large C&I customers reduces demand for central station power and impacts load shape.

**Natural Gas Prices**

**CO₂ Price**

**Load**

**Henry Hub Forecast**

**Avg. Growth rate -0.42%**

**Primary Drivers**

- 15% C&I 2030 load & 20% C&I 2040 load met by customer procured resource, reducing demand for central station power.

- Customer preference for renewable generation lowers demand for central station electricity, resulting in lower natural gas prices.

- Case contemplates customer demand for renewables as manifestation of CO₂ pressure on electric sector.

Notes:

- 2018 $/MMBtu
- 2018 $/Ton
Challenged Gas Economy

- Restrictions on gas resource and infrastructure expansion result in high commodity prices for natural gas and reduced reliability of gas-fired units.

**Natural Gas Prices**

Henry Hub Forecast

**CO₂ Price**

**Load**

Avg. Growth rate 0.24%

**Notes**

Restricted access to gas resource raises commodity price of natural gas.

Case contemplates restriction on production and transport of gas as manifestation of CO₂ pressure on electric sector.
## Scenario Details

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Base Case</th>
<th>Stagnating Economy</th>
<th>U.S. Economy Decarbonizes</th>
<th>Customers in Control</th>
<th>Challenged Gas Economy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Core Inputs and drivers</strong></td>
<td>• Low gas prices and decreasing RE costs leading to expected MISO market evolution</td>
<td>• No growth in load</td>
<td>• CO₂ tax on electric sector</td>
<td>• Rapid deployment of customer-driven renewables</td>
<td>• High cost natural gas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lower gas commodity prices</td>
<td>• End-Use Electrification (e.g. EVs)</td>
<td></td>
<td>• Reduced capacity value for gas resource</td>
</tr>
<tr>
<td><strong>Resulting Changes from Current Trends</strong></td>
<td>• Reduced capacity value for PV</td>
<td>• Fewer MISO Coal retirements</td>
<td>• Low PV, wind, and storage costs</td>
<td>• Reserve margin requirements increase</td>
<td>• Reduced capacity value for gas combined cycle resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CO₂ pressure relaxed</td>
<td>• Increase in gas commodity prices</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Reduced capacity value for PV</td>
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<tr>
<td><strong>Key Risks Addressed</strong></td>
<td>Low market price outlook requires careful portfolio management</td>
<td>Market prices don’t support heavy storage or renewable investment</td>
<td>Reduced economic performance of fossil units and exposure to market changes for all units</td>
<td>Demand destruction from customer-driven generation, changes in daily load patterns, and increase need for load-following resource</td>
<td>Restrictions on production and transportation increase gas prices and reduce reliability of gas-fired options</td>
</tr>
</tbody>
</table>
Review: LRRP Analysis Results Reported In The Scorecard

The Scorecard provides a framework for evaluating trade-offs between portfolio alternatives across a set of defined metrics.

<table>
<thead>
<tr>
<th>Low Wholesale Rates</th>
<th>Rate Stability &amp; Predictability</th>
<th>Resource Diversity</th>
<th>Sustainability of Portfolio</th>
</tr>
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<tbody>
<tr>
<td>5 Yr NPV of System Costs</td>
<td>Max NPV Under Edge Scenario</td>
<td>Portfolio Generation by Tech</td>
<td>Total Fleet Emissions</td>
</tr>
<tr>
<td>20 yr NPV of System Costs</td>
<td>Min NPV Under Edge Scenario</td>
<td>Portfolio Capacity by Tech</td>
<td>Fleet Water Consumed</td>
</tr>
<tr>
<td>Growth in Customer Rates</td>
<td>25th &amp; 75th Percentile Range</td>
<td>Ratio Owned to Contracted</td>
<td>Fleet Waste Produced</td>
</tr>
<tr>
<td>20 yr NPV of System Costs</td>
<td>NPV of Costs - 95th Percentile</td>
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<thead>
<tr>
<th>Portfolio</th>
<th>$/MWh</th>
<th>$/MWh</th>
<th>%</th>
<th>$/MWh</th>
<th>%+ and %-</th>
<th>$/MWh</th>
<th>% by Tech</th>
<th>% by Tech</th>
<th>%</th>
<th>Tons CO2e</th>
<th>Gallons</th>
<th>Tons</th>
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<tr>
<td>Portfolio 1</td>
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<td>Portfolio 3</td>
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**Portfolio** design is critical component of the LRRP Scorecard. Portfolios are distinct and reflect Hoosier priorities.

**Scenario** results will drive the “Rate Stability & Predictability” metrics on the Scorecard.
# Recommended Scenario Drivers: Details

<table>
<thead>
<tr>
<th>Category</th>
<th>Driver</th>
<th>Base Case</th>
<th>Customers in Control</th>
<th>Stagnating Economy</th>
<th>Challenged Gas Economy</th>
<th>US Economy Decarbonizes</th>
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<tr>
<td><strong>Fuel Prices</strong></td>
<td>Natural Gas Price</td>
<td>CRA Base</td>
<td>CRA Low</td>
<td>CRA Base</td>
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<td>CRA Base</td>
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<td>CRA Base</td>
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<td>CRA Low</td>
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<td>Battery Costs</td>
<td>CRA Base</td>
<td>CRA Base</td>
<td>CRA High</td>
<td>CRA Base</td>
<td>CRA Low</td>
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<td>Base CO₂ Price</td>
<td>No Carbon Price</td>
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<td>No Carbon Price</td>
<td>High CO₂ Price</td>
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<td>MISO RM</td>
<td>8.9% by 2024</td>
<td>11.4% by 2024</td>
<td>7.9%</td>
<td>8.9% by 2024</td>
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<td>Capacity Credit</td>
<td>PV: 50% → 30%</td>
<td>PV: 50% → 30%</td>
<td>PV: 50% → 50%</td>
<td>PV: 50% → 30% NGCC: -15%</td>
<td>PV: 50% → 20%</td>
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<td><strong>Market Capacity</strong></td>
<td>Planned Additions</td>
<td>Planned / Announced</td>
<td>15% by 2030 &amp; 20% by 2040 C&amp;I load served by customer resource</td>
<td>Planned / Announced</td>
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<td>Planned Retirements</td>
<td>Planned / Announced</td>
<td>Planned / Announced</td>
<td>Fewer Coal Retirements</td>
<td>Planned / Announced</td>
<td>No MISO Nuclear Retirements</td>
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</table>
Long-Range Resource Plan
Planning Scenarios and Portfolio Options

July 8, 2019 Board Meeting
Objectives

• Respond to the LRRP questions raised by the BOD at the May meeting

• Share the overall LRRP timeline and examples of information that the BOD will review at upcoming meetings

• Discuss the outcome of the MISO market simulations for the LRRP scenarios previously shared with the BOD

• Preview the early plant retirement alternatives that will be tested by CRA in the LRRP portfolio modeling
Agenda

May 13 Board Follow Up

LRRP Schedule

Report on MISO Market Simulations

Early Retirement Analysis
LRRP questions from the May BOD Meeting

• Fifty questions received from the May break-out sessions
• Responses prepared in a memo
• Questions generally covered the following categories:
  – Portfolio modeling approach
  – Fuel and CO2 allowance price forecasting
  – Options for Merom
  – Alternative replacement options and considerations
• Today we will provide some additional detail on the fuel and CO2 allowance price forecast questions
Fuel and CO2 allowance price forecast questions

• Gas Forecast Questions
  – Should we use current gas futures for the LRRP forecast, how long are they reliable?
  – Why does the gas forecast rise above current prices in the Base Case when futures are flat?

• Coal Forecast Questions
  – What are the coal price assumptions for each scenario?
  – How are the gas and coal price forecasts related, and are we being consistent in our views?

• CO₂ Price Modeling Questions
  – Why include a CO₂ price in the base case?
CRA fuels, power, and emissions forecast clients

Sample Utility Clients

Southern Company

Produce Southern Company’s natural gas price forecast that is used in IRPs, avoided cost calculations, and other (last 10 years)

CPS Energy

Produce planning scenarios that include long-term natural gas price forecasts used in resource planning decisions

Oglethorpe Power

Produce long-term natural gas, electricity, and emission price forecasts, twice per year

Sample Investor Clients

Sample Investor Clients

Siemens

Evaluated numerous gas-fired power plants, primarily in the Eastern US

Mitsubishi Hitachi Power Systems

Evaluated dozens of natural gas power plants across the US using CRA gas and power price forecasts

Macquarie

Supported numerous utility and power asset transactions across the US
Natural gas price forecast

CRA Gas Price Forecast Compared to Recent EIA Projections (Henry Hub)

Over the long term, prices rise as producers develop more costly resources to meet sustained domestic and international demand.

Prices rise over the short term due to growth in LNG and pipeline exports.

CRA’s natural gas fundamentals model

A fundamental price forecast answers the question: “What gas price is needed to satisfy total demand and make producers whole?”

CRA Natural Gas Fundamentals Model (NGF)

Gas Supply
- Total resource in place, proved and unproven
- Resource growth over time
- Wet / dry product distribution
- Historic wells drilled and ongoing production
- Conventional & associated production
- Existing tight and coal bed methane
- Existing offshore production

Well Performance
- Drilling & completion costs
- Environmental compliance costs
- Royalties & taxes
- Initial production rates
- Changing drilling and production efficiencies over time
- Productivity decline curve
- Well lifetime
- Distribution of performance

Gas Demand
- Electric and non-electric sector demand forecast (domestic)
- International demand (net pipeline & LNG exports)

Other Market Drivers
- Value of natural gas liquids and condensates
- Natural gas storage
CRA’s approach to forecasting natural gas prices

• CRA is using a NG forecast that is higher than the natural gas futures price, which is flat
  – CRA’s NG forecast is “solved” by evaluating the intersection of supply and demand in future periods
  – The NG futures price is a traded contract price for natural gas deliveries out in future time periods

• It is the view of CRA’s experts that the NG futures strip is not a reliable indicator of long-term future actual prices

• CRA’s NG forecast rises gradually from current prices as a result of producer pricing pressures and increasing demand

• CRA’s forecast is consistent with other fundamental forecasts over the long term; we also will run alternative cases for the LRRP
CRA’s approach to forecasting coal prices

- Coal forecasting process assesses the future supply and demand balance for the U.S. coal market:
  - Macroeconomic drivers, including domestic and international demand
  - Microeconomic drivers, including trends in mining costs and production trends
- Includes consideration of electric and gas market feedbacks
Coal price forecast

Source: CRA Analysis

Comments

- Flatter prices reflect reduced demand offset by increased production cost
- Exports grow from current levels, but not enough to offset lost domestic demand for steam coal
Considerations in CO2 allowance price forecasting

- Actions targeting CO2 emissions are emerging at the state, federal, and international level
- The generation sector is a likely target for CO2 reduction requirements

Widespread state renewable requirements

Endangerment finding requires EPA to curb emissions

- EPA has set New Source Performance Standards (NSPS) for new or modified sources under the Clean Air Act
- EPA has recently finalized the Affordable Clean Energy Rule, an emissions standards for existing sources that replaces the Clean Power Plan
CO2 allowance price forecast

The **US Economy Decarbonizes** case is a more aggressive level of CO2 pressure that affects all sectors of the US economy, driving changes to electricity demand as well.

The **Base Case** represents a modest level of regulatory pressure that affects only the electric sector, driving supply-side changes.

Source: CRA Analysis
Agenda

May 13 Board Follow Up

LRRP Schedule

Report on MISO Market Simulations

Early Retirement Analysis
LRRP schedule for upcoming Board meetings

**July Board Meeting**
- Review of long-term power market changes by scenario (modeled results)
- Factors impacting tenure of existing Hoosier resources
- Replacement concepts to be considered (e.g., renewable type and timing, DERs, owned v. PPA)

**August Retreat**
- Analysis of current resource tenure options
- Review of “indicative” replacements analysis
- Discussion of specific replacement options

**October Board Meeting**
- Review of results for full portfolio analysis
- Review of draft scorecard and discussion of tradeoffs

**Meetings Beyond October**
Depending on need for iteration on portfolio options and tradeoff discussion, Board approval of the LRRP could extend into the first quarter of 2020.
Integrated Resource Plan to be filed with the IURC in 4th quarter, 2020.
Agenda

May 13 Board Follow Up

LRRP Schedule

Report on MISO Market Simulations

Early Retirement Analysis
The price forecasts for each scenario that will be used in the Hoosier portfolio simulation

Comparison of portfolios when evaluated against each scenario – includes early retirement analysis, resource additions, etc.
Hoosier market scenarios

**Base Case**
- The MISO market continues to evolve based on the current outlook for load growth, commodity prices, technology development, and regulatory pressure

**Stagnating Economy**
- Decline in economic outlook relieves regulatory pressure and results in a low load growth environment and fewer coal retirements

**US Economy Decarbonizes**
- A national cap on CO2 emissions affects all sectors of the US economy, negatively affecting fossil generation and changing end-use demand patterns

**Customers in Control**
- Widespread procurement of renewable energy by large C&I customers reduces demand for central station power and impacts load shape

**Challenged Gas Economy**
- Restrictions on gas resource and infrastructure expansion result in high commodity prices for natural gas and reduced reliability of gas-fired units
MISO market modeling

CRA ran each scenario through Aurora to simulate how demand would be met by power supply in the MISO market.

**AURORA Electric Forecasting Model**

- Hourly chronological dispatch of supply to meet demand in MISO, and beyond
- Detailed representation of load, generating sources, and transmission constraints across zones
- “Solves” system long term to identify least cost retirements, additions, upgrades
- Key outputs of modeling: energy prices, capacity prices
MISO zone 6 (IN) prices by scenario

The power price forecasts produced for each of the scenarios reflect the differences between the cases.

All-Hours Zone 6 Power Price Forecast by Scenario

- **Comments**
  - Scenarios provide broad spread of power price outcomes around the Base Case.
  - Base Case gradually increases with gas prices until carbon policy emerges in 2028.
  - Customers in Control shows the lowest power prices driven by low gas and high renewable penetration.
  - US Economy Decarbonizes results in highest prices due to high level of CO₂ pressure and high gas price view.

Source: CRA Analysis
Capacity and generation mix – base case

The base case sees a significant shift in the capacity mix

Base Case Capacity Mix 2019 - 2040

- Wind and solar grow significantly over the period
- Natural gas capacity grows as coal and nuclear resources retire

Base Case Generation Mix 2019 - 2040

- Market generation mix mirrors capacity changes
- Lost coal and nuclear generation replaced by renewables, primarily
- Wind & solar comprise 40% of market generation by 2040
Agenda

May 13 Board Follow Up
LRRP Schedule
Report on MISO Market Simulations
Early Retirement Analysis
Rationale for evaluating early retirements

• Other utilities retiring coal and older natural gas-fired resources

• The cost of alternative technologies has fallen significantly

• Short term additions of new efficient gas and renewables may put price pressure on older combined cycle gas units

• Flexibility to take advantage of emerging technologies like storage

• Potential for a more renewable, diverse, and flexible portfolio

Note: The analysis will consider that some plant costs are sunk and will need to be recovered even when the plant is retired
Coal units in MISO – operating and retired

**Location of Coal Units in MISO**
Operating, Retired, Announced Retirement

- Since 2010, approximately 10% of coal-fired capacity has been retired in MISO*
  - 52 units total
  - Smaller units: 210 MW ave.
  - Most due to environmental compliance considerations
- Approximately 15% of remaining capacity has been announced for retirement in the next 10 years
  - 28 units total
  - Unit size: 420 MW ave.

*Greater than >100 MW

Source: Energy Velocity
Recent and planned coal unit retirements

Comparison of MISO Coal Units Retired 2010-2018 and MISO Coal Units Announced for Retirement

By Age and Size of Unit

- Unit Retired Since 2010
- Unit Planned Retirement

Illustrative Position of Merom Units
Merom relative to other units – efficiency and age

**MISO Operating Coal-Fired Plants (Not Announced for Retirement)**

**Heat Rate v Capacity**
- Smaller units include generation for special purpose (e.g., industrial)

**Age v. Capacity**

- Operating Coal Unit
- Merom Units

---

CRA Charles River Associates
Early retirement dates for LRRP modeling

Merom Early Retirement Alternatives

• 2023 is the earliest plausible retirement year
  – Significant work is required to close the units and arrange for replacement capacity

• 2028 market conditions may worsen for Merom
  – By 2028 MISO market conditions (e.g., prices) across the LRRP scenarios have separated meaningfully, which likely impacts Merom economics

• 2033 is the year that Merom will be fully depreciated
  – This is a natural decision point with respect to further operating the facility

Holland Early Retirement Alternative

• Early retirement of Holland will also be considered as part of the “everything on the table” approach to LRRP development
### Early retirement plan combinations

<table>
<thead>
<tr>
<th>Case</th>
<th>Concept</th>
<th>Units</th>
<th>2023</th>
<th>2026</th>
<th>2028</th>
<th>2033</th>
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<td>Merom EoB, Holland Early</td>
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</table>

**Bookend early Merom retirement with and without Holland**

**Test impact of alternate Merom retirement dates**
Replacement options

• The current stage of the LRRP is focused on whether earlier retirement of Merom or Holland makes sense

• We will use an “indicative” set of replacements to test the alternative retirement combinations
  – Indicative replacements reflect lower cost options selected during the MISO market simulation – e.g., what was chosen to replace coal

• A detailed analysis of the type, size, and timing of replacements will follow once potential retirement approaches are identified
  – Examples: sizing of renewables v gas, central v distributed, owned v PPA
Scorecard development

We will develop a scorecard for each of the retirement portfolios options.

<table>
<thead>
<tr>
<th>Scorecard Objectives &gt;&gt;</th>
<th>Low Wholesale Rates</th>
<th>Rate Stability &amp; Predictability</th>
<th>Environmental &amp; Employee Impacts</th>
<th>Resource Diversity</th>
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<tbody>
<tr>
<td>Portfolio 1</td>
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<td>Portfolio 2</td>
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<tr>
<td>Portfolio N</td>
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Present Value of Revenue Requirement (PVRR)
Long Range Resource Plan

Early Retirement Screening

August 19, 2019
Hoosier Energy will actively manage its current and future supply portfolio to provide reliable and affordable energy emphasizing a diversified portfolio, including traditional and alternative resources.

Strategic Considerations

- Emphasis on clear plans and options/contingencies for Merom
- Importance of a diversified portfolio (technologies, fuels, geographies, ownership/PPAs, etc.)
- Understanding of dispatch flexibility in changing markets
- Looking to the future with emerging renewable and other distributed technologies (e.g., battery storage)

Board Oversight – Methods of Monitoring Progress

- Consistent reporting of other G&T portfolios (what, how is it changing, and why)
- Ensure Integrated Resource Plan and Long Range Resource Plan clearly investigate relevant aspects of a diversified portfolio with input from all stakeholders (Board, Managers and Hoosier staff)
Average Electricity Price 2018
($/MWH)

Hoosier Energy

$60

$11

$4

Generation/Supply
Transmission
Distribution
Member Services
LRRP Schedule

Feb Board Meeting
- Introduce CRA Team
- Review LRRP Process & Scorecard
- Survey Member Priorities

Mar Board Meeting
- Report on Member Priorities
- Propose Scorecard Categories for Review
- Propose Scorecard Metrics for Review

Apr

May Board Meeting
- Discuss Market Scenario Design
- Review Range of Key Market Uncertainties
- Propose Scenarios for Market Modeling

June

July

Aug Retreat
- Review Results of Retirement Analysis
- Decide Options to Test in Full Replacement Analysis
- Discuss Framework of Full Replacement Analysis

Sept

Oct

November through March
- Review Outcomes of Full Uncertainty Analysis
- Discuss Scorecard and Portfolio Tradeoffs and
- Iterate on Portfolio Options (as needed)

Nov

Nov...
<table>
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<tr>
<th>Scorecard Factor</th>
<th>Resource Category</th>
<th>Portfolio Category</th>
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<tbody>
<tr>
<td>Rate Predictability and Stability</td>
<td>Construction of New Resources</td>
<td>Operation of Portfolio Resources</td>
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<tr>
<td>Customer Procurement Flexibility</td>
<td>Employee Impact</td>
<td>Deployment of Emerging Technologies</td>
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<td>Resource Location</td>
<td>Resource Diversity</td>
<td>Sustainability of the Portfolio</td>
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<tr>
<td>Ownership of Power Supply Resources</td>
<td>Wholesale Rates</td>
<td>Development of Demand-Side Resources</td>
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</tbody>
</table>
The Full Scorecard Will be Used in our Portfolio Analysis

Alternative resource portfolios will be compared on how well they meet objectives for low and stable rates, resource diversity, and sustainability.

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Low Wholesale Rates</th>
<th>Rate Stability</th>
<th>Predictability</th>
<th>Sustainability of Portfolio</th>
<th>Resource Diversity</th>
<th>Employee Impact</th>
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<tbody>
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<td>$/MWh</td>
<td>$/MWh</td>
<td>$/MWh</td>
<td>$/MWh</td>
<td>25th &amp; 75th Percentile Range</td>
<td>NPV of Costs - 95th Percentile</td>
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<td>NPV of Costs - 95th Percentile</td>
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<td>$/MWh</td>
<td>$/MWh</td>
<td>$/MWh</td>
<td>$/MWh</td>
<td>25th &amp; 75th Percentile Range</td>
<td>NPV of Costs - 95th Percentile</td>
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<td>$/MWh</td>
<td>$/MWh</td>
<td>$/MWh</td>
<td>$/MWh</td>
<td>25th &amp; 75th Percentile Range</td>
<td>NPV of Costs - 95th Percentile</td>
</tr>
</tbody>
</table>

Early Retirement Screening metrics ensure Hoosier captures the most savings possible from any early unit retirements.

The Full Early Retirement / Replacement Analysis will introduce data on the additional objectives affected by more diverse set of new resource choices.
Scenarios Evaluated

**Base Case**
- The MISO market continues to evolve based on the current outlook for load growth, commodity prices, technology development, and regulatory pressure.

**Flat Gas**
- Base case sensitivity where natural gas stays flat according to market futures prices and no carbon policy is enacted.

**Stagnating Economy**
- Decline in economic outlook relieves regulatory pressure and results in a low load growth environment and fewer coal retirements.

**US Economy Decarbonizes**
- A national cap on CO2 emissions affects all sectors of the US economy, negatively affecting fossil generation and changing end-use demand patterns.

**Customers in Control**
- Widespread procurement of renewable energy by large C&I customers reduces demand for central station power and impacts load shape.

**Challenged Gas Economy**
- Restrictions on gas resource and infrastructure expansion result in high commodity prices for natural gas and reduced reliability of gas-fired units.
MISO capacity and generation mix – base case

The base case sees a significant shift in the capacity mix

- Wind and solar grow significantly over the period
- Natural gas capacity grows as coal and nuclear resources retire
- Market generation mix mirrors capacity changes
- Lost coal and nuclear generation replaced by renewables, primarily
- Wind & solar comprise 40% of market generation by 2040
## Portfolio Decisions Evaluated

### Objective

<table>
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<tr>
<th>Concept</th>
<th>Units</th>
<th>2023</th>
<th>2026</th>
<th>2028</th>
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<td>Holland</td>
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<tr>
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<td><strong>Merom 2023-2028</strong></td>
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<td></td>
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</table>

*Units retire on 5/31 of given year, consistent with MISO capacity planning timeline*
Agenda

Objectives

Key Findings of Early Retirement Screening

The Hoosier Portfolio Today

Modeling Approach and Scorecard Template

Early Retirement Screening Results

Conclusions and Next Steps
Forum Objectives

• Summarize indicative portfolio approach to evaluating early retirement options at Merom and Holland

• Share results and insights of early retirement screening of Merom and Holland

• Inform selection of retirement concepts for future analysis
Agenda

Objectives

Key Findings of Early Retirement Screening

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Early Retirement Screening Results

Conclusions and Next Steps
Key Observations and Findings

• Retiring both Merom units in 2023 is likely to provide significant savings versus retaining the units through 2040

• Retiring Merom in 2023 is better than a delayed retirement pathway

• Potential savings associated with a Holland retirement are less significant and are dependent on Hoosier resource generating more energy for market sales than members consume

• Merom can look attractive when at least two of the following three market factors prevail:
  – No carbon regulation or carbon pressure
  – Natural gas prices higher than $4/MMBtu (*in real $*)
  – 30% higher than expected costs for new wind, solar, and storage resources
Agenda

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Conclusions and Next Steps
The Hoosier Portfolio Today

• Merom represents over half of Hoosier’s capacity, and nearly two-thirds of Hoosier’s energy and costs.

• Holland provides very little energy to the portfolio, but is a significant capacity resource and accounts for only 7% of Hoosier’s costs. The gas peakers also provide more capacity value than energy value.

• Contracts and net market purchases provide one-third of the portfolio’s energy and account for a quarter of the cost.

Capacity Mix%
Total 1,915 MW

Energy Mix%
Total 7,965 GWh

Portfolio Cost%
Total Cost $454M

Contracts 9%
Other Owned 19%
Holland 17%
Merom 54%
Contracts 16%
Net Market Purchases 14%
Other Owned 19%
Holland 7%
Merom 60%
Contracts 18%
Other Owned 5%
Holland 7%
Net Market Purchases 6%
Merom 64%
Characteristics of Merom & Holland

Merom

• 100% Ownership
• Owned Capacity: 1,080 MW
• Age: 37 years
• 2019 average MISO offer cost: $26/MWh

Holland

• 50% Ownership
• Owned Capacity: 351 MW
• Age: 17 years
• 2019 average MISO offer cost: $28/MWh
Rationale for Early Retirement Screening

• Other utilities retiring coal and older natural gas resources
• The cost of alternative technologies has fallen significantly
• Potential for future carbon pressure and additional environmental regulation
• Short term additions of new efficient gas and renewables may put price pressure on older NGCCs
• Flexibility to take advantage of emerging technologies like storage
• Potential for a more renewable, diverse, and flexible portfolio that provides savings to current portfolio with less overall risk
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Key Findings of Early Retirement Screening

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Early Retirement Screening Results

Conclusions and Next Steps
Analytical Framework

The Board is not making a decision today about retiring assets early

Focus is on identifying whether an early retirement of Merom or Holland should be considered further based on initial screening results.

Scenarios Concepts

Modeling Assumptions: Load, Fuel Prices, Tech Costs, Etc.

Completed April - July

MISO Market Simulation

Market Prices – energy, capacity, ancillary services

Current Stage

Early Retirement Screening

Hoosier Portfolio Simulation

Rate impact, portfolio attributes, risk analysis

Full Replacement Analysis

Scorecard
Retirements Screening Scorecard: Key Focus Areas

*The Retirement Screening Scorecard includes a subset of objectives from the larger LRRP scorecard that are relevant for this screening stage*

---

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Low Wholesale Rates</th>
<th>Rate Stability &amp; Predictability</th>
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<td>Base 5-Year Rate</td>
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<td>Annual Growth Rate</td>
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<tr>
<td>Merom 2023 - 2028</td>
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</table>

Primary metric for this purpose – we are trying to understand how timing affects cost savings

Illustrates exposure to market conditions of retirement choices – a key decision criteria
## Portfolios Evaluated in the Early Retirements Screening

### Objective

- Establish baseline for comparison
- Test impact of different Merom retirement dates
- Layer in Holland retirement

### Concept

<table>
<thead>
<tr>
<th>Concept</th>
<th>Units</th>
<th>2023</th>
<th>2026</th>
<th>2028</th>
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<td><strong>Merom 2023</strong></td>
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<td><strong>Merom 2023-2028</strong></td>
<td>Merom 1, Merom 2, Holland</td>
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<td>Retired</td>
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<tr>
<td><strong>Merom 2028</strong></td>
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<td><strong>Merom 2028-2033</strong></td>
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</tbody>
</table>

*Units retire on 5/31 of given year, consistent with MISO capacity planning timeline*
Replacement Resources Used in the Retirement Screening

• A set of cost-effective “indicative replacements” were identified for testing the viability of an early retirement at Merom or Holland

• Indicative replacements are a diverse mix of gas CC, solar, storage, and wind based on MISO long-term capacity expansion and recent Indiana IRP filings

• Indicative portfolios rely on short term bilateral capacity purchases and small net energy purchases from MISO to balance portfolios at lowest cost

*Note: Actual ratios vary slightly by portfolio and timing of retirement. This representative view is based on 2030 with Merom retired.

Pricing and costs of new resources are benchmarked to public announcements and unsolicited term sheets received by Hoosier
Recent Plans from MISO Neighbors Show Similar Mix

Recent IRPs in Indiana (and other MISO states) have shown utilities replacing coal with the resources included in the indicative set: gas, solar, and wind.

<table>
<thead>
<tr>
<th>Utility</th>
<th>Resource Mix - 2018</th>
<th>Resource Mix - 2038</th>
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</thead>
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<tr>
<td>Indiana Michigan Power</td>
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<td>Duke Energy Indiana</td>
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<tr>
<td>Wabash Valley*</td>
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<td>![Pie Chart]</td>
</tr>
<tr>
<td>Indianapolis Power &amp; Light</td>
<td>![Pie Chart]</td>
<td>IRP in progress, significant coal retirements expected</td>
</tr>
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</table>

Note - * Wabash Valley’s most recent IRP reflects the 2017 – 2036 planning period
Scenarios Represent a Range of Possible Futures

**Base Case**
- Expected view of the world
- (1) Gas prices rise gradually ($4 in \textit{real}\$ by 2030, close to $5 by 2040)
  (2) Moderate CO\textsubscript{2} policy in 2028

**Flat Gas**
- “Status quo” sensitivity
- (1) Flat gas prices close to current levels (below $3), (2) No carbon price

**Stagnating Economy**
- Decline in economic outlook
- (1) Lower load growth, (2) Lower coal retirements; (3) No CO\textsubscript{2} price; (4) Higher solar, wind, and storage costs

**Decarbonization**
- CO\textsubscript{2} emission cap, more EVs
- (1) Higher CO\textsubscript{2} prices; (2) Higher gas prices; (3) Lower renew and storage costs; (4) No nuclear retirements

**Customers in Control**
- High C&I procurement of renewables
- (1) Lower gas prices; (2) Lower solar costs; (3) No CO\textsubscript{2} price; (4) Higher reserve margin; (5) Lower C&I load

**Challenged Gas**
- Restrictions on gas growth and reliability
- (1) Higher gas prices ($4 in \textit{real}\$ by 2023, close to $6.5 by 2040)
  (2) No carbon price
Full Scorecard Used in Subsequent Stage

Alternative resource portfolios will be compared on how well they meet objectives for low and stable rates, resource diversity, and sustainability.

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Low Wholesale Rates</th>
<th>Rate Stability</th>
<th>Predictability</th>
<th>Sustainability of Portfolio</th>
<th>Resource Diversity</th>
<th>Employee Impact</th>
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<tr>
<td></td>
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<td>25th &amp; 75th Percentile Range</td>
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<td></td>
<td>$/MWh</td>
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<td>Portfolio 3</td>
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Early Retirement Screening metrics ensure Hoosier captures the most savings possible from any early unit retirements.

The Full Replacement Analysis will introduce data on the additional objectives affected by more diverse set of new resource choices.

Charles River Associates
All Portfolio Options Assume Equivalent Reliability

*MISO manages resource adequacy and grid reliability. We don’t believe Hoosier’s portfolio decisions impact future grid reliability.*

All Generating Units in MISO (Includes Hoosier)

Load is served with the most efficient set of resources, regardless of owner

MISO socializes reliability risk for Hoosier to all zonal participants

All Load Serving Entities in MISO (Includes Hoosier Coops)
Agenda

Objectives

Key Findings of Early Retirement Screening

The Hoosier Portfolio Today

Modeling Approach and Scorecard Template

Early Retirement Screening Results

Conclusions and Next Steps
# Portfolio Decisions Evaluated

<table>
<thead>
<tr>
<th>Concept</th>
<th>Units</th>
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<td>Merom 2023</td>
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</table>

*Units retire on 5/31 of given year, consistent with MISO capacity planning timeline*

## Objective

- Establish baseline for comparison
- Test impact of different Merom retirement dates
- Layer in Holland retirement
**Base Case: Annual Revenue Requirement**

- **Revenue requirement includes all portfolio supply costs but not T&D or member service costs**
- **The net present value of revenue requirement (“NPVRR”) is a way to distill all costs into one number to allow for meaningful comparisons**
Base Case: 10-Year NPVRR

- Replacement energy is cheaper than fixed costs at Merom.
- Retiring Holland increases costs prior to carbon policy.

<table>
<thead>
<tr>
<th></th>
<th>Delta ($M)</th>
<th>Delta (%)</th>
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<tr>
<td>Current Portfolio</td>
<td>-</td>
<td>-2.1%</td>
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<td>Merom 2028</td>
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<td>Merom 2033</td>
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<td>Merom 2023, Holland 2026</td>
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</tr>
<tr>
<td>Merom 2033, Holland 2026</td>
<td>+$1</td>
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</table>
Base Case: 20-Year NPVRR

-Retiring Merom lowers portfolio costs in all cases.
-Replacing Holland becomes cheaper long-term.

<table>
<thead>
<tr>
<th></th>
<th>Delta ($M)</th>
<th>Delta (%)</th>
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<td>Merom 2033, Holland 2026</td>
<td>-$373</td>
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</table>
Base Case: Observations

- Early retirement of Merom in 2023 provides substantial savings versus retaining the current portfolio through the study period.

- Staggered retirement of Merom units in 2023/28 also offers significant savings and potentially more operational flexibility, but this option would incur more costs at the coal plant and potentially miss the lowest-cost renewable resource opportunities.

- Retiring Merom after 2028 provides more limited savings versus the current portfolio.

- Early retirement of Holland offers opportunity for additional savings by swapping out low-cost capacity for low-cost energy.
  - Mid-term (10-yr) costs for a Holland retirement are higher prior to projected increases in carbon and gas prices.
  - This option introduces risk due to its reliance on market sales.
Scenario Analysis: 20-Year NPVRR

- Current Portfolio
- Merom 2023
- Merom 2023-2028
- Merom 2028
- Merom 2028-2033
- Merom 2033
- Merom 2023, Holland 2026
- Merom 2033, Holland 2026

Base Case • Flat Gas • Stagnating Economy • US Economy Decarbonizes • Customers in Control • Challenged Gas
## Scenario Analysis
### Customer Supply Costs Table

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Base Case</th>
<th>Flat Gas</th>
<th>Stagnating Economy</th>
<th>US Economy Decarbonizes</th>
<th>Customers in Control</th>
<th>Challenged Gas</th>
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<td>$66.81</td>
<td>$58.86</td>
<td>$60.60</td>
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</table>

*Customer supply costs represent the levelized cost of generation and do not include T&D or member services costs*
Scenario Analysis: Observations

• Early retirement of Merom in 2023 is lower cost than retaining the current portfolio in **4 out of the 6** scenarios
  - Merom looks attractive when at least two of the following market factors prevail: no carbon price, high gas prices, and high replacement resource costs

• Retiring Merom in 2023 is always better than a delayed retirement pathway, due to the ability to avoid capital spending at the plant and the opportunity to take advantage of low-cost renewables with tax credits

• Retiring Holland in 2026 is lower cost in **3 out of the 6** scenarios over the long-term (20-yr) and generally higher cost over the mid-term (10-yr)
  - Scenarios with low power prices make early Holland retirement unattractive (Flat Gas, Customers in Control, Stagnating Economy)
## Scorecard: Early Retirement Screening

<table>
<thead>
<tr>
<th>Portfolio Concept</th>
<th>Supply Cost: Base Case</th>
<th>Annual Growth Rate 2019-2040</th>
<th>Supply Cost: Scenarios</th>
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<td>$57.83</td>
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<td>$63.13</td>
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*Supply costs represent the levelized cost of generation and do not include T&D or member services costs*
Agenda

Objectives

Key Findings of Early Retirement Screening

The Hoosier Portfolio Today

Modeling Approach and Scorecard Template

Early Retirement Screening Results

Conclusions and Next Steps
Conclusions

• Retiring Merom in 2023 is less costly than retaining the plant across 4 out of the 6 scenarios

• Early retirement of Merom is always lower cost than later retirement due to deferred maintenance and capital spending and the opportunity to access renewables with significant federal tax credits

• A staggered retirement in 2023 and 2028 may preserve some optionality at slightly higher cost than retirement of both units in 2023

• Retirement of Holland may provide benefit by swapping out low-cost capacity with resources that generate more energy, but this option introduces risk due to its reliance on market sales
Next Steps

• Selection of best portfolio concepts to study further in full replacement analysis

• Exploration of the tradeoffs associated with different replacement options
  – Resource type – Natural gas, wind, solar, storage, market, re-powering
  – Structure – ownership vs. PPA
  – Scale and location

• More robust risk analysis
  – Deeper evaluation of random market shocks (gas and power prices)
  – Assessment of energy generation risk (intermittent resource output)
  – Opportunity to stress test certain variables that are determined to be highly uncertain, such as resource costs, PPA prices, MISO capacity market changes
# Scorecard: Early Retirement Screening

## Low Wholesale Rates

<table>
<thead>
<tr>
<th>Portfolio Concept</th>
<th>Supply Cost: Base Case</th>
<th>Annual Growth Rate 2019-2040</th>
<th>Rate Stability &amp; Predictability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5-Year</td>
<td>10-Year</td>
<td>20-Year</td>
</tr>
<tr>
<td></td>
<td>$/MWh</td>
<td>$/MWh</td>
<td>$/MWh</td>
</tr>
<tr>
<td>Current Portfolio</td>
<td>$57.86</td>
<td>$58.36</td>
<td>$66.36</td>
</tr>
<tr>
<td>Merom 2023</td>
<td>$57.02</td>
<td>$57.14</td>
<td>$59.20</td>
</tr>
<tr>
<td>Merom 2023-2028</td>
<td>$57.66</td>
<td>$57.34</td>
<td>$60.49</td>
</tr>
<tr>
<td>Merom 2028</td>
<td>$57.84</td>
<td>$57.74</td>
<td>$63.35</td>
</tr>
<tr>
<td>Merom 2028-2033</td>
<td>$57.84</td>
<td>$58.40</td>
<td>$64.33</td>
</tr>
<tr>
<td>Merom 2033</td>
<td>$57.84</td>
<td>$58.23</td>
<td>$64.31</td>
</tr>
<tr>
<td>Merom 2023, Holland 2026</td>
<td>$57.09</td>
<td>$57.30</td>
<td>$58.11</td>
</tr>
<tr>
<td>Merom 2033, Holland 2026</td>
<td>$57.83</td>
<td>$58.38</td>
<td>$63.13</td>
</tr>
</tbody>
</table>

*Supply costs represent the levelized cost of generation and do not include T&D or member services costs.
Breakout Groups—Two Tasks

• Hoosier staff believes the next step of the resource planning process is to “stress test” each of the four portfolio options (Current Portfolio; Merom 2023 Full Retirement; Staggered Merom Retirement 2023/2028; Merom 2023 Full Retirement and Holland 2026 Retirement)

  Do you agree that these are the right group of portfolio options to look at? Why or why not?

• Resource planning is complicated.

  What questions do you have about the process with staff or Charles River? Are we on the right track of further work? What comments or questions do you have about the process?
<table>
<thead>
<tr>
<th>Group 1 – Truman</th>
<th>Group 2 – Kennedy</th>
<th>Group 3 – Eisenhower</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderator: Bob Richhart</td>
<td>Moderator: Chris Blunk</td>
<td>Moderator: Mike Mooney</td>
</tr>
<tr>
<td>David Smith</td>
<td>Jamie Meredith</td>
<td>Steve Dieterlen</td>
</tr>
<tr>
<td>Eugene Roberts</td>
<td>John Trinkle</td>
<td>Jodie Creek</td>
</tr>
<tr>
<td>John Edwards</td>
<td>Jason Barnhorst</td>
<td>Gary Waninger</td>
</tr>
<tr>
<td>Doug Childs</td>
<td>Mary Jo Thomas</td>
<td>Jim Turner</td>
</tr>
<tr>
<td>Shannon Thom</td>
<td>Terry Jobe</td>
<td>Daryl Donjon</td>
</tr>
<tr>
<td>Mark McKinney</td>
<td>Keith Mathews</td>
<td>Bill Schmidt</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 4 – Nixon</th>
<th>Group 5 – Ford</th>
<th>Group 6 – Roosevelt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderator: Robert Kaineg</td>
<td>Moderator: Caleb Steiner</td>
<td>Moderator: Adam Roberts</td>
</tr>
<tr>
<td>Darin Duncan</td>
<td>Janet Anthony</td>
<td>Todd Carpenter</td>
</tr>
<tr>
<td>Don Sloan</td>
<td>Jerry Pheifer</td>
<td>Larry Hosselton</td>
</tr>
<tr>
<td>Rick Wendholt</td>
<td>Bob Stroup</td>
<td>Dan Schuckman</td>
</tr>
<tr>
<td>John Sturm</td>
<td>David Lett</td>
<td>Matt Deaton</td>
</tr>
<tr>
<td>David Vince</td>
<td>Brett Abplanalp</td>
<td>Joe Henson</td>
</tr>
<tr>
<td>Tom Nowaskie</td>
<td>Steve Seibert</td>
<td>James Tanneberger</td>
</tr>
</tbody>
</table>
APPENDIX
### Scenario Details

<table>
<thead>
<tr>
<th>Category</th>
<th>Driver</th>
<th>Base Case</th>
<th>Flat Gas Sensitivity</th>
<th>Stagnating Economy</th>
<th>US Economy Decarbonizes</th>
<th>Customers in Control</th>
<th>Challenged Gas Economy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel Prices</strong></td>
<td>Natural Gas Price</td>
<td>CRA Base</td>
<td>CRA Flat</td>
<td>CRA Base</td>
<td>CRA High</td>
<td>CRA Low</td>
<td>CRA High</td>
</tr>
<tr>
<td></td>
<td>Coal Price</td>
<td>CRA Base</td>
<td>CRA Base</td>
<td>CRA Base</td>
<td>CRA Low</td>
<td>CRA Base</td>
<td>CRA Base</td>
</tr>
<tr>
<td><strong>Load</strong></td>
<td>MISO Load Growth</td>
<td>MTEP CFC</td>
<td>MTEP CFC</td>
<td>MTEP LFC</td>
<td>MTEP AFC</td>
<td>MTEP CFC</td>
<td>MISO CFC</td>
</tr>
<tr>
<td></td>
<td>MISO Load Shape</td>
<td>MTEP Base</td>
<td>MTEP Base</td>
<td>MTEP Base</td>
<td>MTEP DET</td>
<td>MTEP Base</td>
<td>MTEP Base</td>
</tr>
<tr>
<td><strong>Generator Costs</strong></td>
<td>Solar Costs</td>
<td>CRA Base</td>
<td>CRA Base</td>
<td>CRA High</td>
<td>CRA Low</td>
<td>CRA Low</td>
<td>CRA Base</td>
</tr>
<tr>
<td></td>
<td>Wind Costs</td>
<td>CRA Base</td>
<td>CRA Base</td>
<td>CRA High</td>
<td>CRA Low</td>
<td>CRA Base</td>
<td>CRA Base</td>
</tr>
<tr>
<td></td>
<td>Battery Costs</td>
<td>CRA Base</td>
<td>CRA Base</td>
<td>CRA High</td>
<td>CRA Low</td>
<td>CRA Base</td>
<td>CRA Base</td>
</tr>
<tr>
<td><strong>Regulatory</strong></td>
<td>MISO Emissions</td>
<td>Base CO2 Price</td>
<td>No Carbon Price</td>
<td>No Carbon Price</td>
<td>High CO2 Price</td>
<td>No Carbon Price</td>
<td>No Carbon Price</td>
</tr>
<tr>
<td><strong>Market</strong></td>
<td>MISO RM</td>
<td>8.9% by 2024</td>
<td>8.9% by 2024</td>
<td>7.9%</td>
<td>8.9% by 2024</td>
<td>11.4% by 2024</td>
<td>8.9% by 2024</td>
</tr>
<tr>
<td></td>
<td>Capacity Credit</td>
<td>PV: 50% → 30%</td>
<td>PV: 50% → 30%</td>
<td>PV: 50% → 50%</td>
<td>PV: 50% → 20%</td>
<td>PV: 50% → 20%</td>
<td>PV: 50% → 30% NGCC: -15%</td>
</tr>
<tr>
<td><strong>Market Capacity</strong></td>
<td>Planned Additions</td>
<td>Planned / Announced</td>
<td>Planned / Announced</td>
<td>Planned / Announced</td>
<td>Planned / Announced</td>
<td>15% by 2030 &amp; 20% by 2040 C&amp;I load served by customer resource</td>
<td>Planned / Announced</td>
</tr>
<tr>
<td></td>
<td>Planned Retirements</td>
<td>Planned / Announced</td>
<td>Planned / Announced</td>
<td>Fewer Coal Retirements</td>
<td>No MISO Nuclear Retirements</td>
<td>Planned / Announced</td>
<td>Planned / Announced</td>
</tr>
</tbody>
</table>
Indiana Utilities Resource Mix

Drivers for replacement capacity
- Least cost
- Lower carbon emissions
- Greater fuel diversity with lower exposure to market risk

Drivers for replacement capacity
- Least cost
Indiana Utilities Resource Mix

**Indiana Michigan Power Co.**

**Resource Mix**

- 2018
- 2038

**Additional / Replacement Capacity**

- Gas, 2,700MW
- Wind & Solar, 3,600MW
- Storage, 50MW

**Drivers for replacement capacity**

- Least cost
- Greater resource diversity

**Wabash Valley Power Alliance**

- 2017
- 2036

- Gas, 950MW
- Wind, 200MW

**Drivers for replacement capacity**

- Least cost
Indiana Utilities Resource Mix

Indianapolis Power & Light Co.

Resource Mix

Additional / Replacement Capacity

Drivers for replacement capacity

- Currently in the middle of 2019 IRP process
- Scenarios being considered at the moment have different accelerated timelines for Petersburg coal plant retirement
- Different scenarios are driven by considerations on cost and attaining lower carbon emissions
- Replacement options have not been decided on yet and will be dependent on preferred retirement scenario
Other Resource Replacements in MISO

Recent IRPs from utilities across the MISO region also show a shift towards gas and renewable capacity

- **DTE Energy Co.** – 11MW solar plus storage pilot projects, ~700MW wind, 2,500 MW solar, current construction on 1,100MW CC plant recently approved

- **Consumers Energy** – ~55 MW wind, 3,200-5,000 MW solar

- **Wisconsin utilities** – 730 MW of current CC construction
  - *WEC Energy Group* – 650 MW mix of wind and solar
  - *Wisconsin Public Service* – 200 MW solar
  - *Wisconsin Power & Light* – 150 MW wind

- **Xcel Northern States** – 3,000MW of solar, 2,400MW of coal retirements (preserve existing gas and nuclear capacity for now)
Coal units in MISO – operating and retired

**Location of Coal Units in MISO Operating, Retired, Announced Retirement**

- Operating
- Retired after 2010
- Announced Retirement by 2030

### Comments

- Since 2010, approximately 10% of coal-fired capacity has been retired in MISO*
  - 52 units total
  - Smaller units: 210 MW ave.
  - Most due to environmental compliance considerations
- Approximately 15% of remaining capacity has been announced for retirement in the next 10 years
  - 28 units total
  - Unit size: 420 MW ave.

*Greater than >100 MW
Recent and planned coal unit retirements

Comparison of MISO Coal Units Retired 2010-2018 and MISO Coal Units Announced for Retirement

By Age and Size of Unit

Illustrative Position of Merom Units

- Unit Retired Since 2010
- Unit Planned Retirement

Installed Capacity of Unit
Scenarios Evaluated

**Base Case**
- The MISO market continues to evolve based on the current outlook for load growth, commodity prices, technology development, and regulatory pressure.

**Flat Gas**
- Base case sensitivity where natural gas stays flat according to market futures prices and no carbon policy is enacted.

**Stagnating Economy**
- Decline in economic outlook relieves regulatory pressure and results in a low load growth environment and fewer coal retirements.

**US Economy Decarbonizes**
- A national cap on CO2 emissions affects all sectors of the US economy, negatively affecting fossil generation and changing end-use demand patterns.

**Customers in Control**
- Widespread procurement of renewable energy by large C&I customers reduces demand for central station power and impacts load shape.

**Challenged Gas Economy**
- Restrictions on gas resource and infrastructure expansion result in high commodity prices for natural gas and reduced reliability of gas-fired units.
Long Range Resource Plan

Full Replacement Analysis

August 20, 2019
Session Objectives

• Describe the next phase of work: Examining replacement options for any long-term energy and capacity needs

• Identify the key decision elements for replacement options, such as type, timing, location

• Share important considerations for alternative portfolio construction

• Describe how we will evaluate and compare alternative portfolios
Analytical framework

1. Scenario Concepts
   - Modeling Assumptions: Load, Fuel Prices, Tech Costs, Etc.
   - Outputs: Completed April - July

2. MISO Market Simulation
   - Market Prices – energy, capacity, ancillary services

3. Hoosier Portfolio Simulation
   - Rate impact, portfolio attributes, risk analysis
   - Outputs: 3A (Early Retirement Screening), 3B (Full Replacement Analysis)
   - Next Stage

4. Scorecard
Replacement Options – Decision Elements

Many combinations of replacement options may be available for filling an identified resource gap.

<table>
<thead>
<tr>
<th>1- TYPE</th>
<th>2- SIZE</th>
<th>3- LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas combined cycle (CC)</td>
<td>Could range from 50 MW to 500+ MW, depending on resource</td>
<td>• May impact capacity factor, MISO pricing</td>
</tr>
<tr>
<td>Gas turbine</td>
<td></td>
<td>• Also, may refer to central v distributed</td>
</tr>
<tr>
<td>Gas aero</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hybrid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>side mgmt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4- TIMING
• Meet capacity and energy needs
• Practical considerations

5- OWNERSHIP V. CONTRACTED
• Own/ joint venture
• If contracted, questions of duration

6- ASSET OPTIMIZATION
• Repowering
• Repurposing site
Considerations in Portfolio Development

Wind and solar run on an intermittent basis and do not align perfectly with load, but can complement each other to improve portfolio performance.
Considerations in Portfolio Development

While MISO provides a liquid market for purchases and sales, Hoosier may not want to rely on market too heavily due to uncertainty in prices.

While net purchases and sales may be near zero, there is financial risk in prices being low mid-day and very expensive during evening peak.
Considerations in Portfolio Development

Storage may offer a solution to intermittent resource output, but there is an added cost to reducing risk. Gas peakers serve a similar purpose and can reduce exposure to high market prices.

Merom & Holland Retired – Replaced With 1,500 MW Solar and 800 MW Wind
January 2035

Battery storage can be used to shift power from low-value to high-value periods.
Considerations in Portfolio Development

The value of intermittent capacity could change over time based on market changing conditions (e.g., solar peak credit).

MISO Summer Peak

- MISO 2019 expected peak load: 125 GW
- Peak load with 10 GW additional solar
- Peak load with 20 GW additional solar
- Average solar capacity factor at 5pm: 50%
- Average solar capacity factor at 7pm: 10%

Net Peak Hour

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Considerations in Portfolio Development

There are financial and risk tradeoffs in contracting versus ownership of new assets which will be explored.

![Diagram showing cost and debt service over years.]

- **Debt service of owned unit**
- **20-Year PPA**
- **Uncertainty in renewed contract cost or cost of replacement resource**
- **Price certainty with owned asset, but with less flexibility**
Considerations in Portfolio Development

Distributed resources could be cost competitive with central resources depending on costs they can avoid.

Approximate cost of energy if customer pays 11.5¢ per kilowatt-hour.

Energy has more value the closer it is produced to home.
Alternative resource portfolios will be compared on how well they meet objectives for low and stable rates, resource diversity, and sustainability.

The full retirement and replacement analysis will introduce data on the additional objectives.
Replacement Resource Screening

Initial resource options list

Screened list of options

Portfolio themes

Preferred portfolio

Feasibility screen – Identifying candidate resources from MISO market work and peer plans

Screening tests – Quantitative analysis across different scenarios for select resource types

Full Portfolio analysis – Short-list of concepts against all scenarios and risk analyses

10-12 integrated portfolios with different coal retirement schedules and different replacements
LRRP Schedule

Feb Board Meeting
- Introduce CRA Team
- Review LRRP Process & Scorecard
- Survey Member Priorities

Mar Board Meeting
- Report on Member Priorities
- Propose Scorecard Categories for Review
- Propose Scorecard Metrics for Review

Apr

May Board Meeting
- Discuss Market Scenario Design
- Review Range of Key Market Uncertainties
- Propose Scenarios for Market Modeling

June

July Board Meeting
- Review Long-term Power Results for the Market Scenarios
- Describe Early Retirement Analysis and Portfolio Modeling Options for Merom and Holland

Aug

August Retreat
- Review Results of Retirement Analysis
- Decide Options to Test in Full Replacement Analysis
- Discuss Framework of Full Replacement Analysis

Sept

Oct

November through March
- Review Outcomes of Full Uncertainty Analysis
- Discuss Scorecard and Portfolio Tradeoffs and
- Iterate on Portfolio Options (as needed)

Nov

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APPENDIX
## Potential Thematic Portfolio Options

Themes can be developed around resource type and commitment

<table>
<thead>
<tr>
<th>Shorter duration commitments</th>
<th>More natural gas</th>
<th>More renewables</th>
</tr>
</thead>
<tbody>
<tr>
<td>- More 15-20-yr PPAs</td>
<td>Mostly gas (plus some renewable) power purchase agreements (PPAs)</td>
<td>All solar PPAs</td>
</tr>
<tr>
<td>- More short-term capacity purchases</td>
<td></td>
<td>Solar plus wind PPAs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Longer duration commitments</th>
<th>Owned natural gas combined cycle/peakers plus smaller renewables</th>
<th>Solar dominant</th>
<th>Solar plus wind</th>
<th>Renewable and storage PPAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Longer-term PPAs</td>
<td>Re-power Merom to Gas</td>
<td>Demand Side Management Options</td>
<td>Distributed Energy Resource Options - to be evaluated further in subsequent phases</td>
<td>Renewables plus significant storage</td>
</tr>
<tr>
<td>- More owned assets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other key resource options

---

CRA Charles River Associates
Long Range Resource Plan

Portfolio Analysis

November 13, 2019
Outline

• Background

• Alternative Portfolio Development

• Portfolio Analysis and Results

• Key Takeaways and Conclusions
Industry Change and Generation Owner Response

**Are Leading to Significant Changes to the US Gen Fleet**

**MISO Coal Retirements**

**MISO Capacity Additions**

**MISO Capacity Mix**

Coal capacity in MISO has been displaced by natural gas, wind, and to a lesser extent, solar.
### Purpose and Elements of a Scorecard

#### Why Use a Scorecard?
- Helps validate and rationalize decisions
- Forces structured tradeoff discussion
- Improves speed of decisions
- Supports approval process, no arbitrary decisions

#### What Makes a Good Scorecard Factor?
- Discrete
- Measurable
- Specific
- Collectively exhaustive
- Balanced
- Reflects utility situation
### Scorecard Survey Results Review

#### Break-out Group Survey Results Detail

<table>
<thead>
<tr>
<th>Category</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholesale Rates</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>Rate Stability and Predictability</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>Ownership of Power Supply Resources</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>Operation of Portfolio Resources</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>Construction of New Resources</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>Sustainability of the Portfolio</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>Resource Location</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>Development of Demand-Side Resources</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>Deployment of Emerging Technologies</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>Customer Procurement Flexibility</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>Resource Diversity</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>Employee Retention</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
</tbody>
</table>

*Private and Confidential*
Survey results used to generate scorecard objectives

**Proposed LRRP scorecard**

<table>
<thead>
<tr>
<th></th>
<th>Low Wholesale Rates</th>
<th>Rate Stability &amp; Predictability</th>
<th>Sustainability of Portfolio</th>
<th>Resource Diversity</th>
<th>Employee Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Base Case</strong></td>
<td>$MM</td>
<td>Average 2031-2040 Supply Cost</td>
<td>Average 2020-2030 Supply Cost</td>
<td>Lowest Expected 20-Yr NPV of Supply Cost</td>
<td>Highest Expected 20-Yr NPV of Supply Cost</td>
</tr>
<tr>
<td><strong>Lowest Case</strong></td>
<td>$MM</td>
<td>$MM</td>
<td>$MM</td>
<td>$MM</td>
<td>$MM</td>
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<tr>
<td><strong>Average Case</strong></td>
<td>$MM</td>
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<td>$MM</td>
<td>$MM</td>
<td>$MM</td>
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<tr>
<td><strong>Expected Case</strong></td>
<td>$MM</td>
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<td>$MM</td>
<td>$MM</td>
<td>$MM</td>
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<td><strong>Likely Range</strong></td>
<td>$MM +$MM</td>
<td>$MM</td>
<td>$MM</td>
<td>$MM</td>
<td>$MM</td>
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<tr>
<td><strong>Worst Case</strong></td>
<td>$MM</td>
<td>$MM</td>
<td>$MM</td>
<td>$MM</td>
<td>$MM</td>
</tr>
<tr>
<td><strong>2030 Carbon Reduction from Current Portfolio (Base Case)</strong></td>
<td>% reduction</td>
<td>%</td>
<td>MW</td>
<td>Rating</td>
<td></td>
</tr>
<tr>
<td><strong>Max Resource Type as % of Generation Mix</strong></td>
<td>Minimum Unit Size</td>
<td>Criteria Rating (Low, High)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Current Portfolio**

|                      |                     |                                 |                            |                    |                 |
| Alt 1                |                     |                                 |                            |                    |                 |
| Alt 2                |                     |                                 |                            |                    |                 |

Note: Not exact slide from March; current scorecard shown to avoid version confusion.
The ISO Model – an efficient market

Today, as a part of MISO, Hoosier’s generating units are dispatched economically against all other generators to serve all load.

All Generating Units in MISO (Includes Hoosier)

All Load Serving Entities in MISO (Includes Hoosier Coops)

Load is served with the most efficient set of resources, regardless of owner.
Scenarios examine how the future might turn out

Developing Scenario Themes

- Scenarios are constructed through combinations of model “drivers”
- Generally, the major drivers of key portfolio value drivers fall within four major categories

**Technology**
- Supply-side resource options (solar, storage, etc.)
- Natural gas extraction

**Policy/Regulation**
- Renewable tax incentives
- Carbon regulations (national or local)
- Power market design changes

**Economy**
- Macroeconomic growth
- Commodity Prices
- Commercial and industrial power demand

**Customer Behavior**
- Energy efficiency and demand side management
- Distributed energy penetration
- Electric vehicle growth
Initial Set of Planning Scenarios

**Base Case**
- The MISO market continues to evolve based on the current outlook for load growth, commodity prices, technology development, and regulatory pressure.

**Flat Gas**
- Base case sensitivity where natural gas stays flat according to market futures prices and no carbon policy is enacted.

**Stagnating Economy**
- Decline in economic outlook relieves regulatory pressure and results in a low load growth environment and fewer coal retirements.

**US Economy Decarbonizes**
- A national cap on CO2 emissions affects all sectors of the US economy, negatively affecting fossil fuel generation and changing end-use demand patterns.

**Customers in Control**
- Widespread procurement of renewable energy by large C&I customers reduces demand for central station power and impacts load shape.

**Challenged Gas Economy**
- Restrictions on gas resource and infrastructure expansion result in high commodity prices for natural gas and reduced reliability of gas-fired units.

Note: Flat Gas scenario added after May but included to avoid version confusion.
MISO Retirements

Coal units in MISO – operating and retired

Location of Coal Units in MISO
Operating, Retired, Announced Retirement

Comments
- Since 2010, approximately 10% of coal-fired capacity has been retired in MISO*
  - 52 units total
  - Smaller units: 210 MW ave.
  - Most due to environmental compliance considerations
- Approximately 15% of remaining capacity has been announced for retirement in the next 10 years
  - 28 units total
  - Unit size: 420 MW ave.

*Greater than > 100 MW

Source: Energy Velocity

Private and Confidential
## Hoosier Early Retirement Combinations

### Objective

**Establish baseline for comparison**

**Test impact of different Merom retirement dates**

**Layer in Holland retirement**

### Early retirement plan combinations

<table>
<thead>
<tr>
<th>Concept</th>
<th>Units</th>
<th>2023</th>
<th>2025</th>
<th>2026</th>
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Charles River Associates

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**February**

**March**

**April**

**May**

**June**

**July**

**August**

**September**

**October**

**November**
Hoosier Early Retirement Combinations

Base Case: 20-Year NPVRR

- Retiring Merom lowers portfolio costs in all cases.
- Replacing Holland becomes cheaper long-term.

<table>
<thead>
<tr>
<th>Delta (SM)</th>
<th>Delta (%)</th>
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<tr>
<td>-$817</td>
<td>-11.1%</td>
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<tr>
<td>-$672</td>
<td>-9.1%</td>
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<td>-$346</td>
<td>-4.7%</td>
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<td>-$237</td>
<td>-3.2%</td>
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<td>-$942</td>
<td>-12.8%</td>
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<td>-$373</td>
<td>-5.0%</td>
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</table>

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Hoosier Early Retirement Combinations

Scenario Analysis: 20-Year NPVRR

Note: Connector bars added for high and low scenarios
Changes to Retirement Options & Timing

Remove Holland Early Retirement

- Early retirement benefits of Holland don’t begin to accrue until the late 2020s
  - Can revisit as part of 2023 IRP process
- Significant portfolio changeover at the same time with Merom

Alternative to Staggered Option

- Eliminate staggered Merom retirement 2023/2028
- Replace with Merom 2025 full retirement option
- Splits 2023/2028 timeframe
Low wholesale rates reflect Hoosier power supply costs over different time periods

<table>
<thead>
<tr>
<th>Base Case 20-Yr NPV of Supply Cost</th>
<th>Average 2020-2030 Supply Cost</th>
<th>Average 2031-2040 Supply Cost</th>
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<tbody>
<tr>
<td>Portfolio 1</td>
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<td>Portfolio 2</td>
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<tr>
<td>Portfolio 3</td>
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Power Supply Costs
- Fuel Costs
- O&M Costs
- Depreciation on Capital
- Interest on Debt
- Property Taxes
- Stranded/Decommissioning Costs
Rate stability and predictability measure supply cost certainty under varying market conditions

<table>
<thead>
<tr>
<th>Low Wholesale Rates</th>
<th>Rate Stability &amp; Predictability</th>
<th>Sustainability of Portfolio</th>
<th>Resource Diversity</th>
<th>Employee Impact</th>
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<td><strong>Scenario Based</strong></td>
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<td>Min Case 20-Yr NPV of Supply Cost</td>
<td>Max Case 20-Yr NPV of Supply Cost</td>
<td>Likely Range of 20-Year Supply Costs</td>
<td>Worst Case of 20-Year Supply Costs</td>
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<tr>
<td>Portfolio 1</td>
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<td>$MM</td>
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<td>Portfolio 3</td>
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</tbody>
</table>

Scenario-related metrics illustrate how portfolios perform across different states of the world.

Stochastic-related metrics illustrate how portfolio costs respond to market or weather shocks.

[Table]

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Scenarios represent storylines with distinct trajectories

**Base Case**
- Expected view of the world
- (1) Gas prices rise gradually ($4 in real$ by 2030, close to $5 by 2040)
- (2) Moderate CO\textsubscript{2} policy in 2028

**Stagnating Economy**
- Decline in economic outlook
- (1) Lower load growth, (2) Lower coal retirements; (3) No CO\textsubscript{2} price; (4) Higher solar, wind, and storage costs

**Customers in Control**
- High C&I procurement of renewables
- (1) Lower gas prices; (2) Lower solar costs; (3) No CO\textsubscript{2} price; (4) Higher reserve margin; (5) Lower C&I load

**Flat Gas**
- “Status quo” sensitivity
- (1) Flat gas prices close to current levels (below $3), (2) No carbon price

**Decarbonization**
- CO\textsubscript{2} emission cap, more EVs
- (1) Higher CO\textsubscript{2} prices; (2) Higher gas prices; (3) Lower renewable and storage costs; (4) No nuclear retirements

**Challenged Gas**
- Restrictions on gas growth and reliability
- (1) Higher gas prices ($4 in real$ by 2023, close to $6.5 by 2040)
- (2) No carbon price
## Empty Scorecard

<table>
<thead>
<tr>
<th>Low Wholesale Rates</th>
<th>Rate Stability &amp; Predictability</th>
<th>Sustainability of Portfolio</th>
<th>Resource Diversity</th>
<th>Employee Impact</th>
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<tr>
<td>$MM</td>
<td>$ / MWh</td>
<td>$ / MWh</td>
<td>$MM</td>
<td>$MM</td>
</tr>
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</table>

### Current Portfolio

### 2023 Retirement Options

- Alt 1
- Alt 2
- ...

### 2025 Retirement Options

- Alt 1
- Alt 2
- ...
Outline

- Background
- Alternative Portfolio Development
- Portfolio Analysis and Results
- Key Takeaways and Conclusions
Under the Base Case, Hoosier’s long-term supply costs for the current portfolio rise significantly, but are flat near term.

**Current Portfolio – Base Case Forecast**

- Supply cost forecast is similar to August presentation
- Costs are flat through 2027 as Merom benefits from rising gas and power prices
- Mild carbon policy starting in 2028 causes a jump in supply costs

Source: CRA Analysis
Expected supply costs vary widely under different future states of the world

**Comments**

- Current portfolio supply cost is highly uncertain: ranges from flat to rising sharply
- High carbon drives up costs by $10 to $20 per MWh after 2028
- Low gas prices and no carbon policy produce flat cost trajectory
Portfolio alternatives were narrowed down based on detailed assumption review and modeling

- Portfolio concepts were developed based on consideration of all scorecard objectives

- All portfolios developed plan for summer and winter peak needs and to limit market exposure

- A diverse set of resource options were considered to test limits on technology availability (e.g. combined cycle, storage, distributed resources) and varying levels of carbon emission
Three portfolio replacement themes were developed that test a range of gas, renewable, and storage additions.

1. “Small Gas CC”
   - 300 MW Gas CC is added
   - 1,750 MW of renewables added
   - 100 MW of Gas Peaker and 350 MW of Storage added

2. “No Gas CC”
   - 2,450 MW of renewables added
   - 200 MW Gas Peaker and 450 MW of Storage added

3. “No New Fossil”
   - 2,400 MW of renewables added
   - 675 MW of Storage added
The replacement themes were tested with a 2023 and a 2025 Merom retirement, totaling 6 portfolios.

<table>
<thead>
<tr>
<th>Merom Retirement Date</th>
<th>2023</th>
<th>2025</th>
</tr>
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<tbody>
<tr>
<td><strong>Small Gas CC</strong></td>
<td>“2023 Small Gas CC”</td>
<td>“2025 Small Gas CC”</td>
</tr>
<tr>
<td><strong>No Gas CC</strong></td>
<td>“2023 No Gas CC”</td>
<td>“2025 No Gas CC”</td>
</tr>
<tr>
<td><strong>No New Fossil</strong></td>
<td>“2023 No New Fossil”</td>
<td>“2025 No New Fossil”</td>
</tr>
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</table>

Six portfolio replacement concepts
Outline

• Background

• Alternative Portfolio Development

• Portfolio Analysis and Results

• Key Takeaways and Conclusions
The 2023 retirement portfolios yield large long-term cost savings and track near the current portfolio in the early years.

**Current and 2023 Retirement Portfolios - Base Case Forecast ($/MWh)**

- The No New Fossil portfolio provides the lowest supply costs over the long term.
- The Small Gas CC portfolio provides the lowest supply costs in the short term.

**Comments**

Source: CRA Analysis
2023 retirement portfolios lower member supply costs by $700 million to $770 million over 20 years.

Base Case Forecast - PV Revenue Requirement

- All 2023 portfolios provide significant savings in the Base Case.

Cost Savings (M) for 2023 Retirement Portfolios:
- 2023 No Gas CC: $735
- 2023 Small Gas CC: $765
- 2023 No New Fossil: $748
- 2023 Small CC, Low Storage: $704

*In the sensitivity, storage is assumed to be unavailable until 2035 and lost storage capacity is replaced by gas peakers.
Retiring Merom in 2025 also lowers long-term supply costs to Hoosier members.

Comments:

- All 2025 portfolios lower long-term supply costs in the Base Case.
- 2025 portfolios show lower savings than 2023 due to higher renewable costs, as tax credits phase out.

Source: CRA Analysis
2025 retirement portfolios miss out on early renewable pricing, but still provide more than $400 million in savings.

**All Portfolios - Base Case Forecast**

Present Value Revenue Requirement

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Current Portfolio</th>
<th>2023 No Gas CC</th>
<th>2023 Small Gas CC</th>
<th>2023 No New Fossil</th>
<th>2025 No Gas CC</th>
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Source: CRA Analysis
### Scorecard – Low Wholesale Rates

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<td>%</td>
<td>MVW</td>
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<td>$MM</td>
<td>$ / MWh</td>
<td>$ / MWh</td>
<td>$MM</td>
<td>$ / MWh</td>
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<td>% reduction</td>
<td>%</td>
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#### 2023 Retirement Options

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<tr>
<td>No New Fossil</td>
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The 2023 Small Gas CC portfolio reduces the range of expected supply costs under different scenarios.

Comments:

- 2023 Small Gas CC reduces the risk of high rates and high-low spread.
- Fuel diversity in the 2023 replacement portfolios reduces overall risk.

Source: CRA Analysis
Other 2023 concepts also show reduced supply cost range under different scenarios.

Source: CRA Analysis
The 2025 Small Gas CC portfolio also reduces the range of supply cost, but costs are higher than for a 2023 retirement.

Comments

• A 2025 retirement still reduces risk and spread of outcomes significantly.
• Missing tax-advantaged renewable window leads to higher costs than 2023.

Source: CRA Analysis
Other 2025 concepts also show reduced supply cost range under different scenarios.

Source: CRA Analysis
Analysis also was conducted to evaluate how certain shocks that aren’t present in base modeling could impact results

- 500 additional modeling runs were conducted off of the Base Case, where 3 key variables were randomly shocked:
  - Gas prices, Electricity prices, Solar output
  - These three variables can experience intra-day volatility, differing significantly in any one hour from their expected values. For instance,
    - Gas prices can spike with unexpected pipeline capacity shortages
    - Electricity prices can spike when a large generator trips off line
    - Solar output can fall with cloud cover
  - The additional analysis, called stochastics, evaluates whether this volatility presents any significant additional risk to the alternative portfolios
The stochastic analysis indicated that these potential shocks did not present a significant additional risk to supply costs.

**Comparison of Base Case Revenue Requirement to 5% Probability Outcome Based on Stochastics**

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>2023 No Gas CC</th>
<th>2023 Small Gas CC</th>
<th>2023 No New Fossil</th>
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<tbody>
<tr>
<td>Base Case</td>
<td>$7,222 M</td>
<td>$6,487 M</td>
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<tr>
<td>5% Probability</td>
<td>$7,246 M</td>
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<td>$6,504 M</td>
<td>$6,496 M</td>
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<tr>
<td>Difference</td>
<td>+$24 M</td>
<td>+$33 M</td>
<td>+$47 M</td>
<td>+$22 M</td>
</tr>
</tbody>
</table>

- Portfolios were designed to limit energy market exposure, resulting in relatively small stochastic risk compared to the broader scenario uncertainties.

Source: CRA Analysis
## Scorecard – Rate Stability & Predictability

<table>
<thead>
<tr>
<th>Low Wholesale Rates</th>
<th>Rate Stability &amp; Predictability</th>
<th>Sustainability of Portfolio</th>
<th>Resource Diversity</th>
<th>Employee Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$MM</td>
<td>$ / MWh</td>
<td>$ / MWh</td>
<td>$MM</td>
</tr>
<tr>
<td>Current Portfolio</td>
<td>6,109</td>
<td>8,850</td>
<td>-$14 +11</td>
<td>7,246</td>
</tr>
</tbody>
</table>

### 2023 Retirement Options

<p>| | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>No Gas CC</td>
<td>6,144</td>
<td>7,126</td>
<td>-$14 +14</td>
<td>6,520</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Small Gas CC</td>
<td>5,938</td>
<td>7,003</td>
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<td></td>
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<tr>
<td>No New Fossil</td>
<td>6,183</td>
<td>7,214</td>
<td>-$10 +8</td>
<td>6,496</td>
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### 2025 Retirement Options

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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No Gas CC</td>
<td>6,416</td>
<td>7,452</td>
<td>-$15 +16</td>
<td>6,810</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small Gas CC</td>
<td>6,155</td>
<td>7,306</td>
<td>-$22 +22</td>
<td>6,850</td>
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<td></td>
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</tr>
<tr>
<td>No New Fossil</td>
<td>6,463</td>
<td>7,567</td>
<td>-$10 +10</td>
<td>6,834</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
All replacement options significantly improve the sustainability of the supply portfolio.

2030 CO₂ Emissions by Portfolio

Retirement portfolios put Hoosier on track to meet or exceed 2030 targets recently announced by Duke and other Midwest utilities.

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Current Portfolio</th>
<th>2023 No Gas CC</th>
<th>2023 Small Gas CC</th>
<th>2023 No New Fossil</th>
<th>2025 No Gas CC</th>
<th>2025 Small Gas CC</th>
<th>2025 No New Fossil</th>
</tr>
</thead>
<tbody>
<tr>
<td>% CO₂ Reduction</td>
<td>94%</td>
<td>81%</td>
<td>96%</td>
<td>94%</td>
<td>82%</td>
<td>96%</td>
<td></td>
</tr>
</tbody>
</table>

Source: CRA Analysis
Replacement options increase fuel diversity and reduce market purchase reliance relative to the current portfolio.

* DERs opportunity included
All replacement portfolios improve Hoosier’s single unit exposure relative to the current portfolio.

Resource Diversity

- No Gas CC and No New Fossil portfolios rely on resource types with small and modular unit sizes.
- The Small Gas CC portfolio has higher single-unit dependency than other replacement options.

Maximum Unit Size
Excluding Holland

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Portfolio</td>
<td>500</td>
</tr>
<tr>
<td>2023 No Gas CC</td>
<td>200</td>
</tr>
<tr>
<td>2023 Small Gas CC</td>
<td>300</td>
</tr>
<tr>
<td>2023 No New Fossil</td>
<td>200</td>
</tr>
</tbody>
</table>

Source: CRA Analysis
All portfolios that retire Merom have High impact on Hoosier employees

Employee Impact measures level and timing of organizational change driven by resource decisions

- Low: Portfolio requires little or no major change in employees or function
- High: Major change in employees or function required

Comments

- Retaining Merom has the lowest impact on current Hoosier employees
- 2023 and 2025 retirement of Merom impacts timing, not level, of employee impact
## Scorecard – Sustainability, Diversity, Employee Impact

<table>
<thead>
<tr>
<th>Low Wholesale Rates</th>
<th>Rate Stability &amp; Predictability</th>
<th>Sustainability of Portfolio</th>
<th>Resource Diversity</th>
<th>Employee Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>$MM</td>
<td>$ / MWh</td>
<td>$ / MWh</td>
<td>$MM</td>
<td>$MM</td>
</tr>
<tr>
<td>Current Portfolio</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2023 Retirement Options</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>No Gas CC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small Gas CC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No New Fossil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2025 Retirement Options</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>No Gas CC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small Gas CC</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No New Fossil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 2023 Retirement Options

- **No Gas CC**
  - 94% Wind 67%
  - 200 MW
  - High
- **Small Gas CC**
  - 81% Wind 43%
  - 300 MW
  - High
- **No New Fossil**
  - 96% Wind 73%
  - 200 MW
  - High

### 2025 Retirement Options

- **No Gas CC**
  - 94% Wind 69%
  - 200 MW
  - High
- **Small Gas CC**
  - 82% Wind 41%
  - 300 MW
  - High
- **No New Fossil**
  - 96% Wind 68%
  - 200 MW
  - High
Outline

• Background
• Alternative Portfolio Development
• Portfolio Analysis and Results
• Key Takeaways and Conclusions
## Scorecard – Fully Populated

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Portfolio 7,222 $MM</td>
<td>64.1 $/ MWh</td>
<td>82.2 $/ MWh</td>
<td>6,109 $MM</td>
<td>8,850 $MM</td>
<td>-$14 +11 $MM</td>
<td>7,246 $MM</td>
<td>-</td>
<td>Coal 63%</td>
<td>500 MW</td>
<td>Low</td>
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<tr>
<td><strong>2023 Retirement Options</strong></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>No Gas CC 6,487 $MM</td>
<td>63.5 $/ MWh</td>
<td>62.3 $/ MWh</td>
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<td>7,126 $MM</td>
<td>-$14 +14 $MM</td>
<td>6,520 $MM</td>
<td>94%</td>
<td>Wind 67%</td>
<td>200 MW</td>
<td>High</td>
</tr>
<tr>
<td>Small Gas CC 6,457 $MM</td>
<td>62.0 $/ MWh</td>
<td>64.2 $/ MWh</td>
<td>5,938 $MM</td>
<td>7,003 $MM</td>
<td>-$21 +20 $MM</td>
<td>6,504 $MM</td>
<td>81%</td>
<td>Wind 43%</td>
<td>300 MW</td>
<td>High</td>
</tr>
<tr>
<td>No New Fossil 6,474 $MM</td>
<td>63.8 $/ MWh</td>
<td>61.4 $/ MWh</td>
<td>6,183 $MM</td>
<td>7,214 $MM</td>
<td>-$10 +8 $MM</td>
<td>6,496 $MM</td>
<td>96%</td>
<td>Wind 73%</td>
<td>200 MW</td>
<td>High</td>
</tr>
<tr>
<td><strong>2025 Retirement Options</strong></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Gas CC 6,769 $MM</td>
<td>65.3 $/ MWh</td>
<td>67.3 $/ MWh</td>
<td>6,416 $MM</td>
<td>7,452 $MM</td>
<td>-$15 +16 $MM</td>
<td>6,810 $MM</td>
<td>94%</td>
<td>Wind 69%</td>
<td>200 MW</td>
<td>High</td>
</tr>
<tr>
<td>Small Gas CC 6,795 $MM</td>
<td>64.0 $/ MWh</td>
<td>70.2 $/ MWh</td>
<td>6,155 $MM</td>
<td>7,306 $MM</td>
<td>-$22 +22 $MM</td>
<td>6,850 $MM</td>
<td>82%</td>
<td>Wind 41%</td>
<td>300 MW</td>
<td>High</td>
</tr>
<tr>
<td>No New Fossil 6,804 $MM</td>
<td>65.4 $/ MWh</td>
<td>67.9 $/ MWh</td>
<td>6,463 $MM</td>
<td>7,567 $MM</td>
<td>-$10 +10 $MM</td>
<td>6,834 $MM</td>
<td>96%</td>
<td>Wind 68%</td>
<td>200 MW</td>
<td>High</td>
</tr>
</tbody>
</table>
## Key Takeaways

### Low Wholesale Rates

- Keeping current portfolio is more expensive long-term than all alternative portfolios
- 2023 replacement lowers long term member supply costs by $17-$21 per MWh and saves $750 million in 20-year NPV
- 2025 replacement lowers long term member supply costs by $12-14 per MWh and saves $400 million in 20-year NPV

### Rate Stability & Predictability

- Keeping the current portfolio has the greatest cost risk of all the options considered
- 2023 replacement reduces risk across all modeled market futures
- Uncertainty associated with market shocks does not impact the relative cost differences for the portfolios across the scenarios
Key Takeaways (cont.)

**Sustainability of Portfolio**

- Maintaining the current portfolio keeps future emissions in line with current levels
- Replacement options reduce portfolio carbon intensity by 75%-95%, relative to the current portfolio
- Sustainability benefits are similar between 2023 and 2025 concepts

**Resource Diversity**

- Current portfolio remains heavily reliant on coal for energy supply
- Replacement options in the Small Gas CC portfolio are the most fuel diverse
- All replacement options reduce exposure to single site risk when compared to current portfolio

**Employee Impact**

- Retaining Merom is “Low” impact
- All replacement portfolios assume full retirement of Merom and are scored as “High” impact
- Retirement in 2023 or 2025 changes timing but not level of employee impact
Frequently Asked Questions

1. How realistic is 2023 retirement? Can we purchase enough capacity to replace Merom?

2. What are the major drivers/assumptions, and what happens if we are wrong about those assumptions?

3. How does Hoosier’s assumption of the carbon tax year and cost compare to other long range resource plans?

4. Savings are mostly in the second ten years of the plan. Why can’t we just wait and get the savings then?

5. What are the tradeoffs if we were to compare the value of the 2023 renewable credits versus the value of flexibility if we were to wait until 2025?

6. How do the alternative portfolios match up with our load?
1. How realistic is 2023 retirement? Can we purchase enough capacity to replace Merom?

- Hoosier has recently received 15 unsolicited bids for solar, wind and natural gas combined cycle projects with on-line dates between 2020 and 2023 and total capacity of 3.2 GW

- The MISO queue contains 232 proposed projects comprising 36 GW of potential additions. The resources in the queue are the same technology types considered for this analysis.

- NIPSCO and Vectren recently ran RFPs that received nearly 100 responses each
  - NIPSCO received more than 13 GW of proposed capacity
  - Vectren received nearly 10 GW of proposed capacity
Term sheets provided to Hoosier demonstrate resource availability

### Proposals Received

<table>
<thead>
<tr>
<th>State</th>
<th>Capacity</th>
<th>Online Year</th>
<th>Term (Yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maple Flats IL</td>
<td>250</td>
<td>2022</td>
<td>15</td>
</tr>
<tr>
<td>Fairbanks IN</td>
<td>250</td>
<td>2020</td>
<td></td>
</tr>
<tr>
<td>Farmersburg IN</td>
<td>150</td>
<td>2021</td>
<td></td>
</tr>
<tr>
<td>Greensboro IN</td>
<td>100</td>
<td>2021-2023</td>
<td>15-20</td>
</tr>
<tr>
<td>Ratts 1 IN</td>
<td>150</td>
<td>2022</td>
<td>20-25</td>
</tr>
<tr>
<td>New Madrid MO</td>
<td>200</td>
<td>2023</td>
<td>20</td>
</tr>
<tr>
<td>Casey Fork IL</td>
<td>135</td>
<td>2021</td>
<td>20</td>
</tr>
<tr>
<td>Black Diamond IL</td>
<td>200</td>
<td>2022</td>
<td>12</td>
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<tr>
<td>Wheatland I IN</td>
<td>100</td>
<td>2022</td>
<td>20</td>
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<tr>
<td>Wildwood IN</td>
<td>300</td>
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<td>15</td>
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<td>NGCC</td>
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<tr>
<td>St. Joseph EC IN</td>
<td>100-600</td>
<td>2023</td>
<td>20</td>
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<td>Wind</td>
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<td>12</td>
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<td>20</td>
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<td>Clinton IN</td>
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<td>2021</td>
<td>20</td>
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<td>Sugar Creek IN</td>
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<td>20</td>
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<tr>
<td><strong>Total</strong></td>
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</tr>
</tbody>
</table>

Source: Hoosier

### Proposal Capacity (MW)

The graph illustrates the capacity of solar, wind, and NGCC proposals over different years. The bars represent the capacity in megawatts (MW) for each project, with years from 2020 to 2023, showing a significant amount of capacity planned for solar and wind projects in the next few years.
Many utility-scale alternatives are currently proposed and under development in the region

- Over 36,000 MW of new projects are in the MISO interconnection queue
- Over 2,000 MW has been permitted or is under construction in IL and IN

### Projects in the MISO Interconnection Queue

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Project Count</th>
<th>Project Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar</td>
<td>147</td>
<td>21.5 GW</td>
</tr>
<tr>
<td>Solar + Storage</td>
<td>17</td>
<td>2.4 GW</td>
</tr>
<tr>
<td>Wind</td>
<td>39</td>
<td>6.6 GW</td>
</tr>
<tr>
<td>Battery Storage</td>
<td>16</td>
<td>1.1 GW</td>
</tr>
<tr>
<td>Combined Cycle</td>
<td>8</td>
<td>4.2 GW</td>
</tr>
<tr>
<td>Gas Peaking</td>
<td>5</td>
<td>0.5 GW</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>232</strong></td>
<td><strong>36.3 GW</strong></td>
</tr>
</tbody>
</table>

Source: MISO Interconnection Queue; Velocity Suite – EIA, FERC, NRC, SEC, CEMS & other federal regulatory data
The NIPSCO RFP demonstrated significant renewable and gas options available in Indiana

**NIPSCO Overview of Proposals Received**

<table>
<thead>
<tr>
<th>Count</th>
<th>CCGT</th>
<th>CT</th>
<th>Other Fossil</th>
<th>Wind</th>
<th>Wind + Solar + Storage</th>
<th>Solar</th>
<th>Solar + Storage</th>
<th>Storage</th>
<th>Demand Response</th>
<th>Total</th>
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<td>Asset Sale</td>
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<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6</td>
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<td>PPA</td>
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<td>-</td>
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<td>1</td>
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<tr>
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<td>-</td>
<td>7</td>
<td>1</td>
<td>8</td>
<td>4</td>
<td>1</td>
<td>-</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>1</td>
<td>3</td>
<td>14</td>
<td>1</td>
<td>35</td>
<td>11</td>
<td>9</td>
<td>1</td>
<td>90</td>
</tr>
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<table>
<thead>
<tr>
<th>Locations</th>
<th>IN, IL</th>
<th>IN</th>
<th>IN, KY</th>
<th>IA, IN, IL, MN</th>
<th>IN</th>
<th>IL, IN, IA</th>
<th>IN</th>
<th>IN</th>
<th>IN</th>
</tr>
</thead>
</table>

- The RFP generated a tremendous amount of bidder interest
- **90** total proposals were received across a range of deal structures
  - 59 individual projects across five states with ~**13.3 gigawatts** capacity
  - Many of the proposals offer variations on pricing structure and term length
  - Several renewable projects paired with storage

Source: NIPSCO IRP July, 2018 Stakeholder Meeting
The Vectren RFP further validated the large quantity of renewable and gas options available

Preliminary Vectren RFP Statistics

- 100 proposals from 22 respondents (4/5 in Indiana, 2/3 PPA)

Source: Vectren IRP August, 2019 Stakeholder Meeting
2. What are the major drivers/assumptions, and what happens if we are wrong about those assumptions?

- The major drivers of the analysis are carbon policy/prices, natural gas prices, and renewable technology costs/incentives
- The scenarios and the stochastic analyses test the “what if we are wrong” proposition
- The results indicate that the replacement portfolios perform significantly better than the current portfolio in most cases
  - Portfolio diversity creates resiliency in costs, avoiding large swings in costs across scenarios
  - Replacement portfolios provide member benefits across risk, sustainability, and diversity metrics even when costs are similar or slightly higher than the current portfolio
3. How does Hoosier’s assumption of the carbon tax year and cost compare to other long range resource plans?

- **NIPSCO 2018 IRP**
  - Base: 2026 start, $8 increasing to $14 by 2038
  - High: 2026 start, $20 increasing to $35 by 2038

- **IPL 2019 Public Advisory Meeting**
  - Base: no carbon price
  - 3 of 4 alternative cases have carbon starting in 2028

- **Duke Energy Indiana 2018 IRP**
  - Base: 2025 start, $5 increasing to $41 by 2037
  - High Tech: 2025 start, $10 increasing to $47 by 2037

- **I&M 2018-2019 IRP Inputs Update**
  - Base: 2028 start, $14 increasing to $21 by 2037

- **Vectren 2019 Stakeholder Meeting**
  - Base: No carbon price
  - High Tech: 2025 start, $1.20 increasing to $8.50 by 2039
  - 80% Reduction: 2025 start, $3.57 increasing to $20 by 2039

- **Wabash Valley Power 2017 IRP**
  - Used sensitivity range; middle of range has 2030 start, $7.78 rising to $26.30 by 2036
4. Savings are mostly in the second ten years of the plan. Why can’t we just wait and get the savings then?

- Solar, wind, and storage may benefit from large federal tax credits that reduce the construction cost by 30-50% if installed in the early 2020s.

- The cost of renewables and storage is primarily in the upfront capital costs; ongoing capital and O&M costs are usually relatively small.

- Installing renewables later, when limited tax credits are expected to be available, is likely to be much more expensive.
  
  - Expiration of tax credits results in a significant increase in renewable costs – amounts to ~$300 million in NPV increase over time.

- Delay in retirement and replacement would also expose Hoosier members to additional capital required to maintain Merom.
5. What are the tradeoffs if we were to compare the value of the 2023 renewable credits versus the value of flexibility if we were to wait until 2025?

• Based on current assumptions, waiting until 2025 increases supply costs by ~$300 million in 20-year NPV

• Waiting may provide additional clarity on extension of tax credits and timing of CO2 policy that can change the expected value of resource strategies
  • Extension of tax credits has been considered at some level in Congress, but final outcomes are uncertain
  • There may still be considerable uncertainty regarding carbon policy timing and cost to comply two years in the future

• Diversity and sustainability benefits are not compromised between 2023 and 2025 replacement options, though benefits lag by 2-3 years
6. How do the alternative portfolios match up with our load?

- Replacement portfolios are designed to limit market exposure across seasons.
- The current portfolio is exposed to market purchases during winter and spring seasons.
- Replacement portfolios have a more even generation pattern across the year and more diverse generation sources.
Discussion
2025 retirement portfolios miss out on early renewable pricing, but still provide more than $400 million in savings.

All Portfolios - Base Case Forecast
Present Value Revenue Requirement

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Current Portfolio</th>
<th>2023 No Gas CC</th>
<th>2023 Small Gas CC</th>
<th>2023 No New Fossil</th>
<th>2025 No Gas CC</th>
<th>2025 Small Gas CC</th>
<th>2025 No New Fossil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Savings ($M)</td>
<td>$735</td>
<td>$765</td>
<td>$748</td>
<td>$453</td>
<td>$427</td>
<td>$418</td>
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</tbody>
</table>

Source: CRA Analysis
In the Flat Gas scenario with no carbon pressure, the 2023 Small Gas CC portfolio is lowest cost.

**All Portfolios - Flat Gas Forecast**

*Present Value Revenue Requirement*

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Current Portfolio</th>
<th>2023 No Gas CC</th>
<th>2023 Small Gas CC</th>
<th>2023 No New Fossil</th>
<th>2025 No Gas CC</th>
<th>2025 Small Gas CC</th>
<th>2025 No New Fossil</th>
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<tbody>
<tr>
<td><strong>Cost Delta ($M)</strong></td>
<td>+$78</td>
<td>-$311</td>
<td>+$120</td>
<td>+$364</td>
<td>+$9</td>
<td>+$9</td>
<td>+$410</td>
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</table>

Source: CRA Analysis
In the Customers in Control scenario, 2023 Small Gas CC is lower cost than current portfolio.
In the Stagnating Economy scenario, Current Portfolio is lowest cost due to high cost replacements in all portfolios.
In the Challenged Gas scenario, Current Portfolio is lowest cost due to assumptions which favor coal.
In the US Economy Decarbonizes scenario, 2023 No New Fossil portfolios is lowest cost.

All Portfolios – US Economy Decarbonizes Forecast
Present Value Revenue Requirement

Source: CRA Analysis
Resource Plan Recommendation

Retire Merom in 2023 and transition to a more diverse generation mix that includes a combination of low-cost wind, solar, natural gas, market purchases and storage (beginning in 2035)---the “2023 Small CC, Low Storage” portfolio presented in November

• Best meets member-consumer priorities:
  • **Low Wholesale Rates**-Saves members estimated $700 million over 20 years versus current portfolio
  • **Resource Diversity**-Mitigates risk through greater fuel source, unit size, term and location diversity
  • **Rate Stability/Predictability**-Provides clearest opportunity for stable supply costs
  • **Sustainability**-Reduces carbon footprint nearly 80%

• Transform portfolio while maintaining stable or lowering supply costs while competitors raise rates for similar transition
Resource Plan Recommendation (continued)

Assist impacted employees through retraining, reassignment, professional outplacement and early retirement options

Recover decommissioning and stranded costs (included in analysis)

Pursue Merom site opportunities such as:

- Sell as operating plant
- Promote for industrial development
- Transition to energy campus
<table>
<thead>
<tr>
<th>SCORECARD</th>
<th>Low Wholesale Rates</th>
<th>Rate Stability &amp; Predictability</th>
<th>Sustainability of Portfolio</th>
<th>Resource Diversity</th>
<th>Employee Impact</th>
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</thead>
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<tr>
<td></td>
<td>$MM</td>
<td>$ / MWh</td>
<td>$ / MWh</td>
<td>$MM</td>
<td>$MM</td>
</tr>
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### Current Portfolio

- **Base Case 20-Yr NPV of Supply Cost:** $7,222
- **Average 2020-2030 Supply Cost:** $64.1
- **Average 2031-2040 Supply Cost:** $82.2
- **Lowest Expected 20-Yr NPV of Supply Cost:** $6,109
- **Highest Expected 20-Yr NPV of Supply Cost:** $8,850
- ** Likely Range of 20-Year Supply Costs:** -$14 to +11
- **Worst Case of 20-Year Supply Costs:** $7,246
- **2030 Carbon Reduction from Current Portfolio (Base Case):** $-$14
- **Max Resource Type as % of Generation Mix:** Coal 63%
- **Max Unit Size:** 500
- **Criteria Rating:** Low

### 2023 Retirement Options

#### No Gas CC

- **20-Yr NPV of Supply Cost:** $6,487
- **Average 2020-2030 Supply Cost:** $63.5
- **Average 2031-2040 Supply Cost:** $62.3
- **Lowest Expected 20-Yr NPV of Supply Cost:** $6,144
- **Highest Expected 20-Yr NPV of Supply Cost:** $7,126
- **Likely Range of 20-Year Supply Costs:** -$14 to +14
- **Worst Case of 20-Year Supply Costs:** $6,520
- **2030 Carbon Reduction from Current Portfolio (Base Case):** $+$11
- **Max Resource Type as % of Generation Mix:** Wind 67%
- **Max Unit Size:** 200
- **Criteria Rating:** High

#### Small Gas CC

- **20-Yr NPV of Supply Cost:** $6,457
- **Average 2020-2030 Supply Cost:** $62.0
- **Average 2031-2040 Supply Cost:** $64.2
- **Lowest Expected 20-Yr NPV of Supply Cost:** $5,938
- **Highest Expected 20-Yr NPV of Supply Cost:** $7,003
- **Likely Range of 20-Year Supply Costs:** -$21 to +20
- **Worst Case of 20-Year Supply Costs:** $6,504
- **2030 Carbon Reduction from Current Portfolio (Base Case):** $+$4
- **Max Resource Type as % of Generation Mix:** Wind 43%
- **Max Unit Size:** 300
- **Criteria Rating:** High

#### No New Fossil

- **20-Yr NPV of Supply Cost:** $6,474
- **Average 2020-2030 Supply Cost:** $63.8
- **Average 2031-2040 Supply Cost:** $61.4
- **Lowest Expected 20-Yr NPV of Supply Cost:** $6,183
- **Highest Expected 20-Yr NPV of Supply Cost:** $7,214
- **Likely Range of 20-Year Supply Costs:** -$10 to +8
- **Worst Case of 20-Year Supply Costs:** $6,496
- **2030 Carbon Reduction from Current Portfolio (Base Case):** $+$6
- **Max Resource Type as % of Generation Mix:** Wind 73%
- **Max Unit Size:** 200
- **Criteria Rating:** High

#### Small CC, Low Storage

- **20-Yr NPV of Supply Cost:** $6,518
- **Average 2020-2030 Supply Cost:** $62.4
- **Average 2031-2040 Supply Cost:** $65.1
- **Lowest Expected 20-Yr NPV of Supply Cost:** $5,999
- **Highest Expected 20-Yr NPV of Supply Cost:** $7,234
- **Likely Range of 20-Year Supply Costs:** -$21 to +$22
- **Worst Case of 20-Year Supply Costs:** $6,570
- **2030 Carbon Reduction from Current Portfolio (Base Case):** $+$22
- **Max Resource Type as % of Generation Mix:** Wind 43%
- **Max Unit Size:** 300
- **Criteria Rating:** High

### 2025 Retirement Options

#### No Gas CC

- **20-Yr NPV of Supply Cost:** $6,769
- **Average 2020-2030 Supply Cost:** $65.3
- **Average 2031-2040 Supply Cost:** $67.3
- **Lowest Expected 20-Yr NPV of Supply Cost:** $6,416
- **Highest Expected 20-Yr NPV of Supply Cost:** $7,452
- **Likely Range of 20-Year Supply Costs:** -$15 to +16
- **Worst Case of 20-Year Supply Costs:** $6,810
- **2030 Carbon Reduction from Current Portfolio (Base Case):** $+$16
- **Max Resource Type as % of Generation Mix:** Wind 69%
- **Max Unit Size:** 200
- **Criteria Rating:** High

#### Small Gas CC

- **20-Yr NPV of Supply Cost:** $6,795
- **Average 2020-2030 Supply Cost:** $64.0
- **Average 2031-2040 Supply Cost:** $70.2
- **Lowest Expected 20-Yr NPV of Supply Cost:** $6,155
- **Highest Expected 20-Yr NPV of Supply Cost:** $7,306
- **Likely Range of 20-Year Supply Costs:** -$22 to +22
- **Worst Case of 20-Year Supply Costs:** $6,850
- **2030 Carbon Reduction from Current Portfolio (Base Case):** $+$22
- **Max Resource Type as % of Generation Mix:** Wind 41%
- **Max Unit Size:** 300
- **Criteria Rating:** High

#### No New Fossil

- **20-Yr NPV of Supply Cost:** $6,804
- **Average 2020-2030 Supply Cost:** $65.4
- **Average 2031-2040 Supply Cost:** $67.9
- **Lowest Expected 20-Yr NPV of Supply Cost:** $6,463
- **Highest Expected 20-Yr NPV of Supply Cost:** $7,567
- **Likely Range of 20-Year Supply Costs:** -$10 to +10
- **Worst Case of 20-Year Supply Costs:** $6,834
- **2030 Carbon Reduction from Current Portfolio (Base Case):** $+$10
- **Max Resource Type as % of Generation Mix:** Wind 68%
- **Max Unit Size:** 200
- **Criteria Rating:** High
How MISO Views Capacity

- Utilities are required to obtain resources to meet their load plus a reserve margin
- MISO values resources based on performance and availability
- Replacement capacity accreditations not necessarily “one-to-one”:

<table>
<thead>
<tr>
<th>Resource</th>
<th>Today Summer Capacity Credit</th>
<th>Anticipated Winter Capacity Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>96%</td>
<td>92%</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>91%</td>
<td>90%</td>
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<tr>
<td>Wind</td>
<td>15%</td>
<td>13%</td>
</tr>
<tr>
<td>Solar</td>
<td>50%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(anticipated 2033)</td>
<td></td>
</tr>
<tr>
<td>Battery</td>
<td>98%</td>
<td>98%</td>
</tr>
</tbody>
</table>
Planned Replacements for Merom in 2023

<table>
<thead>
<tr>
<th>Resource</th>
<th>Nameplate (MW)</th>
<th>MISO Summer Value</th>
<th>Anticipated MISO Winter Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riverstart Solar (2022)</td>
<td>200</td>
<td>100</td>
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</tr>
<tr>
<td>Merom retired</td>
<td>990</td>
<td>(947)</td>
<td>(911)</td>
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<tr>
<td><strong>Replacements</strong></td>
<td></td>
<td></td>
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<tr>
<td>Wind</td>
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<td>120</td>
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<tr>
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<td>Natural Gas</td>
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<td>Market</td>
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Planned Resource Additions

Annual Additions – Nameplate Capacity

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<tr>
<th>Type</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
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<th>2035</th>
<th>2036</th>
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<th>2038</th>
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<th>2040</th>
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</thead>
<tbody>
<tr>
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<td>300</td>
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<tr>
<td>New Gas CT</td>
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<tr>
<td>New Solar</td>
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<td>25</td>
<td>50</td>
<td>50</td>
<td>75</td>
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</tbody>
</table>
# Planned Portfolio Summary

## Nameplate Capacity

<table>
<thead>
<tr>
<th>Type</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
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<th>2037</th>
<th>2038</th>
<th>2039</th>
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</thead>
<tbody>
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<tr>
<td>Existing Gas CC</td>
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<td>335</td>
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<tr>
<td>Existing Gas CT</td>
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<td>360</td>
<td>360</td>
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<td>360</td>
<td>360</td>
<td>360</td>
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<td></td>
</tr>
<tr>
<td>Existing Solar</td>
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<td>211</td>
<td>211</td>
<td>211</td>
<td>211</td>
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</tr>
<tr>
<td>New Gas CC</td>
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<tr>
<td>New Solar</td>
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<tr>
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<td>0</td>
<td>0</td>
<td>25</td>
<td>25</td>
<td>50</td>
</tr>
</tbody>
</table>

Note: The table and graph above represent the planned portfolio summary for nameplate capacity across different types and years from 2020 to 2040. The key types include Existing Coal, Existing Gas CC, Existing Gas CT, Existing Solar, Existing Wind, Existing Other, New Gas CC, New Gas CT, New Solar, New Wind, and New Storage. The data is presented in megawatts (MW) for each year.
# Planned Market Resources

## Winter Peak Capacity

<table>
<thead>
<tr>
<th>Type</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>2027</th>
<th>2028</th>
<th>2029</th>
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<th>2037</th>
<th>2038</th>
<th>2039</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>(24)</td>
<td>(34)</td>
<td>(65)</td>
<td>519</td>
<td>442</td>
<td>448</td>
<td>507</td>
<td>498</td>
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<td>121</td>
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<td>147</td>
<td>132</td>
<td>118</td>
<td>129</td>
<td>118</td>
<td>136</td>
<td></td>
</tr>
</tbody>
</table>

![Graph showing planned market resources for winter peak capacity](image-url)
Follow Up to December/January Discussions

What if renewable credits are extended? Would that change our retirement timing?

- 2020 Budget Bill became law December 20, 2019
  - Wind production tax credit extended one year
  - No extensions for solar
  - No credits for storage (stand-alone or paired with renewables)
  - CRA perspective indicates that the tax credit extension for wind does not significantly impact the analysis and results
Follow Up to December/January Discussions

What is the value of each additional year that Merom operates?

- Merom is challenged today; 2019 saw Merom in economic reserve roughly 25% of the time

<table>
<thead>
<tr>
<th>2018 Merom Costs</th>
<th>$/MWh Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel &amp; Variable O&amp;M</td>
<td>$23</td>
</tr>
<tr>
<td>Fixed O&amp;M, Property Taxes, Insurance</td>
<td>7</td>
</tr>
<tr>
<td>Labor &amp; Benefits</td>
<td>6</td>
</tr>
<tr>
<td>Depreciation &amp; Interest</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$46</strong></td>
</tr>
</tbody>
</table>

Replacements approximately $30

- There is benefit to retiring even with recovery of stranded costs
Recommended Plan Lowers Member Supply Costs by $700 million*

Base Case Forecast – Present Value Revenue Requirement-20 Years

* Includes decommissioning and stranded cost recovery
Recommended Plan Reduces the Range of Expected Supply Costs Under Different Future Scenarios

Rate Stability & Predictability

- Current Portfolio
- Recommended Plan 2023 Retirement
- 2025 Retirement

$/MWh

2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040

$0 $20 $40 $60 $80 $100 $120
Recommended Plan Puts Hoosier on Track To Meet or Exceed 2030 Targets Recently Announced by Duke and other Midwest Utilities

**2030 CO₂ Emissions**

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Current Portfolio</th>
<th>2023 Retirement</th>
<th>2025 Retirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>% CO₂ Reduction</td>
<td>78%</td>
<td>78%</td>
<td>78%</td>
</tr>
</tbody>
</table>

Sustainability of Portfolio
Recommended Plan Increases Fuel Diversity and Reduces Market Purchase Reliance

Energy Mix - 2030

Current Portfolio

Recommended Plan - 2023 Retirement

* Opportunities for distributed energy resources
Conceptual Ownership vs Purchase
Capacity - 2023

Current Portfolio

- Owned
- Purchased

Recommended Plan

If all replacements are purchases
Other Diversification Strategies

- Unit Size
  - Maximum 300 MW
  - Consider location concentration
- Diversity in size within resource types
- Purchases
  - Consider current portfolio commitments
  - Stagger terms
  - Different contract lengths
  - Use market products to bridge gaps and ensure staggered terms
## Estimated Employees Impacted by the Recommended Plan

<table>
<thead>
<tr>
<th>Category</th>
<th>Estimated Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Operations (today)</td>
<td>165</td>
</tr>
<tr>
<td>Support Staff (today)</td>
<td>20</td>
</tr>
<tr>
<td>Move to other positions within Hoosier</td>
<td>30</td>
</tr>
<tr>
<td>Needed through decommissioning (through 2028)</td>
<td>20</td>
</tr>
<tr>
<td>Needed post decommissioning (ongoing)</td>
<td>5</td>
</tr>
<tr>
<td>Employees requiring assistance</td>
<td>130</td>
</tr>
<tr>
<td>Experience says some employees will leave or retire over the next 3 years/prior to closure</td>
<td>15</td>
</tr>
<tr>
<td>Need assistance once the plant closes</td>
<td>115</td>
</tr>
</tbody>
</table>
Employee Assistance Strategies

Retain - Focus on retention of key personnel to operate the station until the retirement date

Retrain - Identify employees for training programs to replace vacancies in other areas of the company

Retire - Consider early retirement plan for directly impacted employees who are near retirement age at time of closure

Outplacement Assistance - Provide professional outplacement support for remaining employees

Total investment estimated at $13 million or 1-2% of expected savings over 20 years
We Will Actively Pursue Merom Site Opportunities

- Sell Merom As Operating Plant
  - Go to market for potential buyers
- Develop Merom Energy Campus
  - Potential site for solar, storage and gas generation resources
  - Take advantage of existing transmission interconnection
- Promote Site as Attractive Industrial Development Opportunity
  - Site features rail, water and wastewater treatment capabilities
  - Labor availability and opportunity
Property Boundary of Merom Site (7,000+ Acres)
Conceptual Energy Campus & Industrial Development
How We Will Pursue Replacements

• Begin discussions with developers that have already submitted unsolicited term sheets
• Engage CRA to assist us in the request for proposal (RFP) process
• Issue RFP mid-March
• Update board on responses at May board meeting
• Replacement projects to appropriate Board committees and Board beginning in summer 2020 and beyond
Communicating Our Plan

Key Messages

• Saves members estimated $700 million over next 20 years
• Expect to retire Merom in 2023 and transition to more diverse generation portfolio that includes low-cost wind, solar, natural gas and storage
• Sets foundation for supply cost stability
• Reduces carbon footprint by nearly 80%
• Assist impacted employees through retraining, reassignment, professional outplacement and retirement options
• We will work with state and local economic development officials to market portions of the Merom property for industrial development. We will consider renewable energy generation or pursue a sale of the plant
Communicating Our Plan (continued)

Key Stakeholders

• “Who is it that needs to hear first from us?”
  • Hoosier employees
  • Local Directors & co-op communications staff
  • Government officials
Communicating Our Plan (continued)

Timeline

• Day of Board Decision
  • CEOs give heads up to co-op communicators to be available for a 9 am conference call the next day

• Day Following Board Decision
  
  7:15 a.m. Merom employee meeting
  
  7:45 a.m. Email to Merom employees

  8 a.m. Email to all Hoosier employees; email to local Directors and CEOs

  Email to CEOs and co-op communicators of 9 am call
Communicating Our Plan (continued)

Timeline

• Day Following Board Decision (continued)

  9 a.m.   HQ employee meeting
           Conference call with CEOs and co-op communicators
           (Email including news release, talking points, logistics for
            media inquiries)
           News release issued
           Email to key external stakeholders
Communicating Our Plan (continued)

Timeline

• Day Following Board Decision (continued)
  
  1 p.m. Meeting with Ops Center employees
  
  3 p.m. Conference call for local Directors, CEOs and key co-op staff

• Ongoing support beyond initial announcement
## Board Actions Related to the Recommended Plan

<table>
<thead>
<tr>
<th>February 2020 – A long-range resource plan</th>
<th>Future – Measures to carry out the plan that exceed CEO authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retire Merom in 2023 and</td>
<td>Final shut down determination to MISO (November 2022)</td>
</tr>
<tr>
<td>Transition to a more diverse mix that includes wind, solar, natural gas, market purchases and storage</td>
<td>Specific replacement resources</td>
</tr>
<tr>
<td>Assist impacted employees</td>
<td>Special early retirement plan</td>
</tr>
<tr>
<td>Recover decommissioning and stranded costs</td>
<td>Way in which stranded costs will be recovered - over what period, as “transition” charge etc. (November 2020) Method to recover decommissioning costs (closer to final shutdown)</td>
</tr>
<tr>
<td>Pursue Merom site opportunities</td>
<td>Any sale of the plant Industrial development at the site Siting new generation at the site</td>
</tr>
</tbody>
</table>
Board Decision Framework for the Plan

Three portfolio options for consideration

1. Current portfolio to 2040
2. Merom retirement in 2023 (recommended)
3. Merom retirement in 2025
Board Decision Framework (continued)

• **Step 1**: Should the Long Range Resource Plan include retirement of Merom prior to 2040? Yes/No
  • If majority votes “no”, the current portfolio will be included in the plan to 2040
  • If majority votes “yes”, there is a second step

• **Step 2**: The Long Range Resource Plan should include retirement of Merom in
  • 2023 (recommended)
  • 2025
Discussion