



Direct Testimony Presentation

PUBLIC SESSION

Export Pricing and Revenues Review

PREPARED BY: DAYMARK ENERGY ADVISORS
PREPARED FOR: MANITOBA PUBLIC UTILITIES BOARD
DATE: JANUARY 2018



Presentation Objectives and Agenda

Presentation Objectives

- Understanding the objective of the export forecast
- Understanding the source of future Manitoba Hydro export opportunities

Agenda

1. Daymark Scope of Work
2. Context of Review
3. Key Concepts
4. Factors Influencing the MISO Market
5. Factors Influencing the Bilateral Market
6. Public Overview, Export Revenues Forecast
7. Key Findings

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1. Daymark Scope of Work

Daymark Scope of Work

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Objective:

- Determine the **accuracy and reasonableness** of the export revenues assumptions included in MH's request for rate increases

Specific Review Requirements:

- **Market price** forecasts for exports to MISO*
- **Exportable surplus energy** forecast
- **Net extraprovincial revenues**
- Changes in **market price forecasting methodology**
- Factors influencing the **MISO market**

* "MISO" stands for "Midcontinent Independent System Operator."

Daymark Activities and Deliverables

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Daymark Approach

- Reviewed MH and third-party CSI materials
- Reviewed publicly available materials related to potential markets and counterparties
- Performed additional (limited) analysis, as needed
- Reviewed relevant portions of the GRA*, IRs, MFRs*, and oral and written testimony

Daymark Materials Relevant to this Presentation

- Produced public and CSI reports (*already on record*)
- Responded to Information Requests (IR) related to reports (*already on record*)

* “GRA” stands for “General Rate Application;” “MFR” stands for “Minimum Filing Requirements.”

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2. Context of Review

MH Stated GRA Objectives

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Financial Goal, per MH

*“Establishing the time frame for the **achievement of its minimum equity target at 10 years** strikes an **appropriate balance** between what is reasonable for customers and what is necessary to ensure the long-term financial health of Manitoba Hydro.” – MH¹*

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Probabilistic Goal, per MH

*“By the end of the 10-year forecast period, there is a **50% chance** that Manitoba Hydro will achieve the **minimum 25% equity ratio target.**” – MH²*

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¹ GRA Submission, Tab 2, p. 3, lines 22-24. [*emphasis added*]

² GRA Submission, Tab 4, p. 24. [*emphasis added*]

MH Probabilistic Forecast of Export Revenues -20 year

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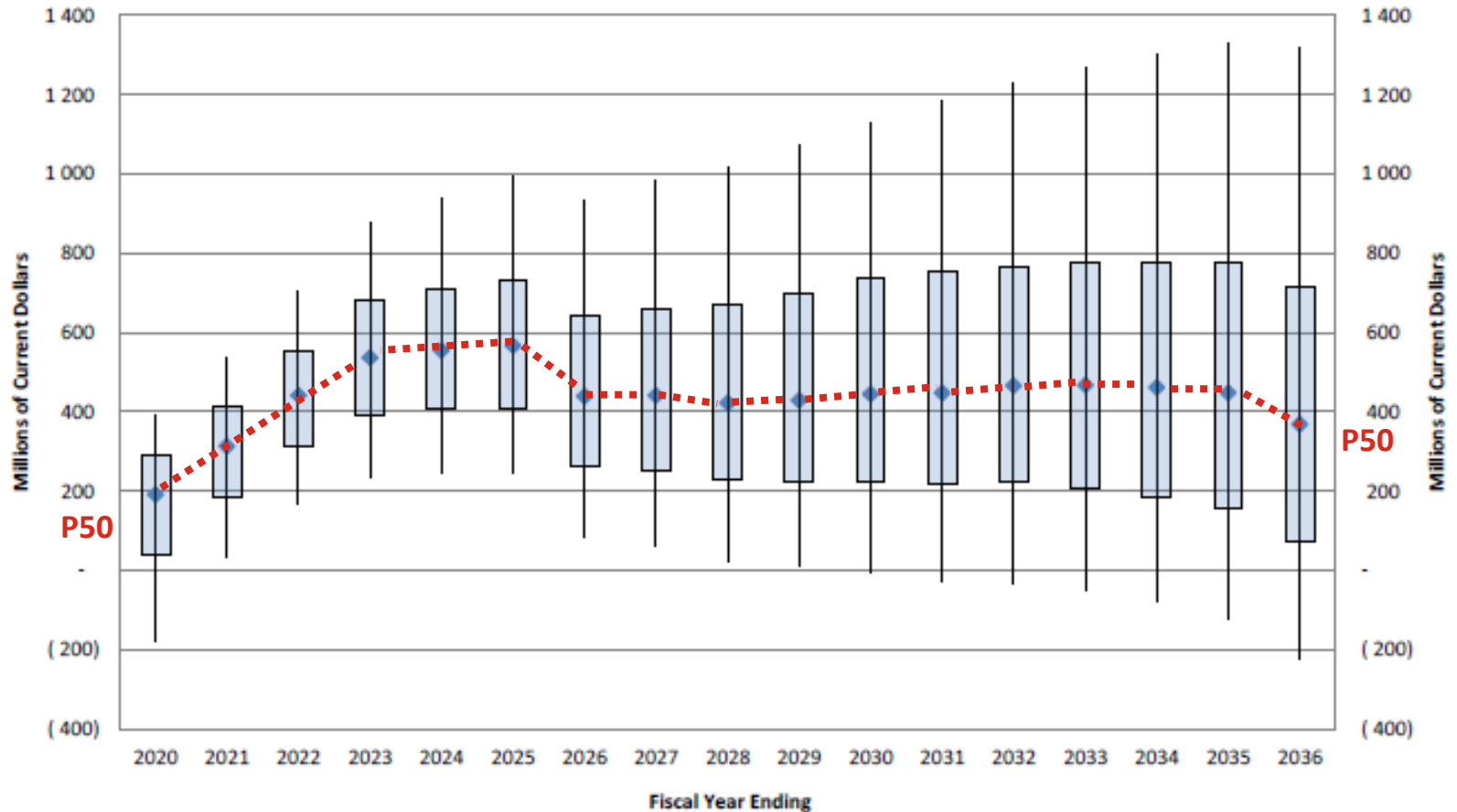


Figure Source: PUB/MH II-41a-b, p. 4, Figure 4.10. *[emphasis added]*

Chart title, "Net Export Revenue (P05 P20 P80 P95 Values), MH16 – 102 Flow Records 1912 To 2013, 3 Export Price Scenarios – Reference, High and Low, 102 x 3 = 306 Financial Runs"

MH Proposed Change in Path to Equity Ratio Goal

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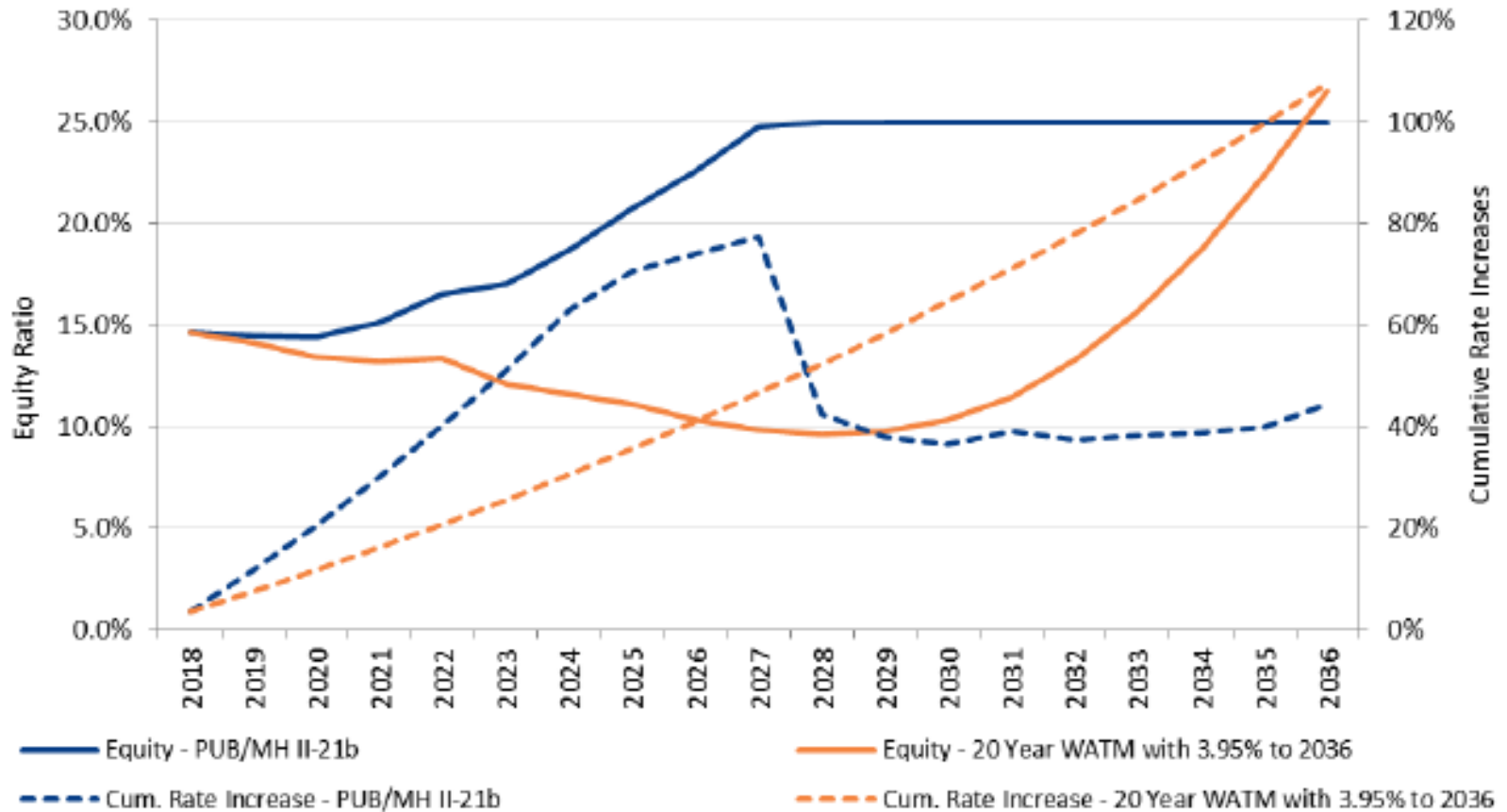


Figure Source: Manitoba Hydro, 2017/18 & 2018/19 Electric General Rate Application, December 4, 2017, presentation of Kelvin Shepherd, P.Eng, President and Chief Executive Officer, and Jamie McCallum, Chief Finance & Strategy Officer, p. 30.

“WATM” stands for “Weighted Average Term to Maturity.”

Daymark Approach to Scope of Work

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- Is the MH approach **balanced**?
 - “...an appropriate balance between what is reasonable for customers and what is necessary to ensure the long-term financial health of Manitoba Hydro” – MH¹
- Does the MH forecast comport with a **50% chance** of reaching the MH equity target?
- What are the **changes from the prior financial plan** (MH15) and the **reasons** for the changes?²
- Are the 10- and 20-year forecasts reasonable?

¹ GRA Submission, Tab 2, p. 3, lines 22-24.

² GRA Submission, Tab 2, Section 2.1.2, p. 5.

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3. Key Concepts

A Few Key Terms

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- **P50** – Probability of actual > forecast value = 50%
 - **MISO Markets** – DA/RT Energy, 1-yr Capacity
 - **LMP** – locational market price of energy
 - **Third-Party Forecasts** – forecasts of MISO market prices purchased by MH
 - **Bilateral Market** – contracts with specific buyer(s)
 - **IRP** – utility Integrated Resource Plan
 - **Reference Forecast** – export revenues based on a baseline set of inputs (e.g., flows, load, prices)

MH Product Offerings and Counterparties

Primary Products MH Can Sell:

- Opportunity energy and capacity
- Dependable energy and capacity

Counterparties for MH in MISO footprint:

- **MISO Energy Market** – day ahead exchange for opportunity energy
- **MISO Capacity Market** – forward-year exchange for opportunity capacity
- **Utilities in MISO Market** – all products longer term

MH Opportunities for Premiums in Bilateral Market

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Why a potential premium in long term contracts?*

- MISO markets are short term
- MISO markets do not incorporate state policy

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How do premiums factor into buyer decisions?

- Most MISO utilities are vertically integrated
- Long-term resource commitments are state-regulated
- IRP processes determine long-term choices

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* Manitoba Hydro's premium considerations are detailed in the Commercially Sensitive Information presentation.

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4. Factors Influencing the MISO Market

A Few Key Terms

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- **Resource Adequacy** – ensuring enough generating capacity to serve load at all times
 - **Planning Reserve Margin (PRM)** – generation capacity reserves in excess of system peak demand
 - **Planning Reserve Auction (PRA)** – MISO-administered auction for capacity to meet next year's PRM
 - **Low Certainty Resources** – resources that are identified in the MISO interconnection queue but do not have any firm commitments to proceed (interconnection agreements)¹

¹ Term used in the MISO MTEP17 on p. 122; concept discussed further in the 2017 OMS survey, p. 8.

Understanding MISO Resource Adequacy

MISO's Role

- Sets planning reserve margin targets
- Ensures qualification of potential resources
- Operates short-term capacity auctions (PRA) to price any annual balancing capacity needed

Participants' Role

- Procures needed capacity
 - Owned
 - Bilateral agreements
 - MISO auctions
- Meets applicable federal and state policies

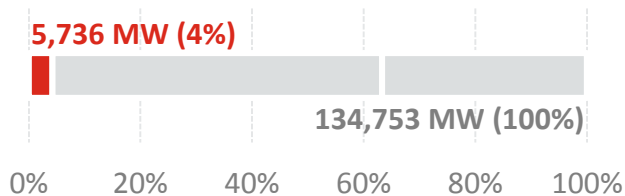
Meeting MISO Resource Adequacy

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2017/18 Auction 134,753 MW total committed capacity

MISO-administered Auction

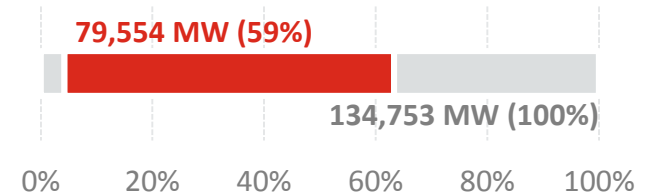
- 4% of cleared capacity was cleared through the auction mechanism



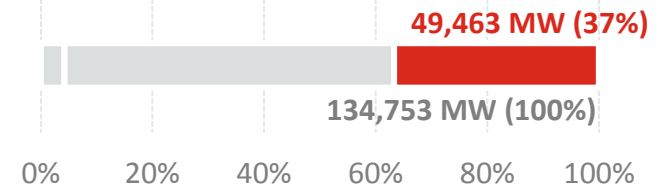
Load Serving Entities

- 96% of cleared capacity was identified before most-recent auction

- Self-scheduled capacity



- Fixed Resource Adequacy Plan (FRAP)



Source: Daymark, based on data available in MISO "2017/18 Planning Resource Auction Results," April 14, 2017, p. 9.

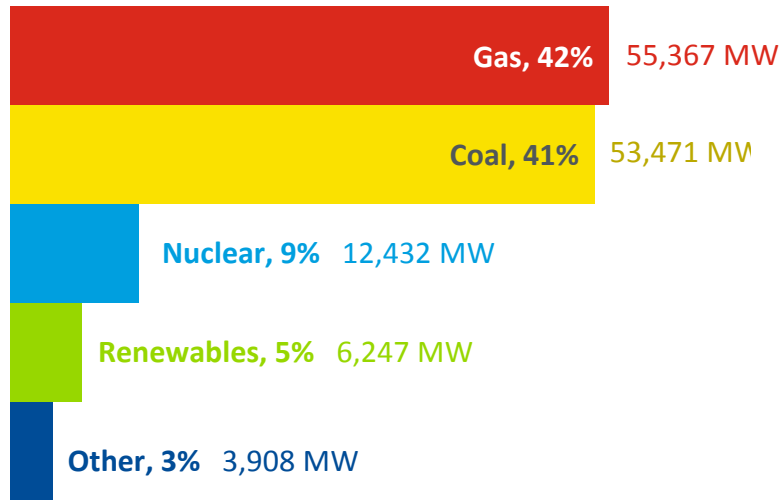
Why are the MISO markets important?

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 - MISO markets are **liquid markets** for selling energy and capacity in excess of dependable amounts (short-term sales)
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 - Certain MISO participants are key existing and potential future counterparties for bilateral sales with MH
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 - The MISO markets and associated requirements are important inputs to resource planning conducted by MISO participants
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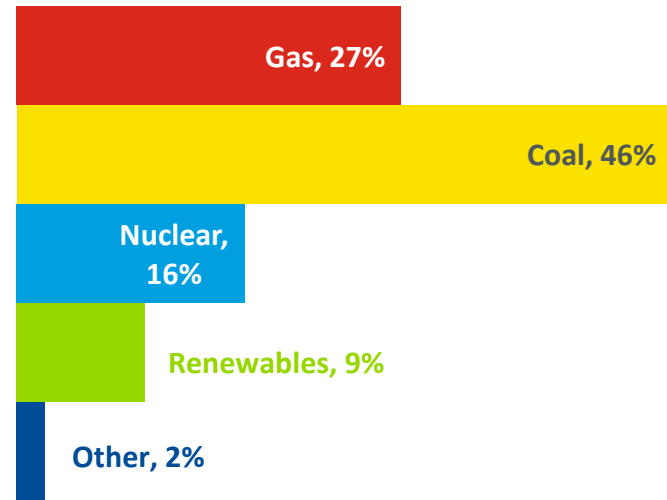
Existing MISO Capacity and Generation Mix

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2016 Unforced Capacity Share



2016 Energy Output Share



Source: Daymark, based on data available in Independent Market Monitor for the Midcontinent ISO, "2016 State of the Market Report for the MISO Electricity Markets," June 2017, Table 1, p. 4.

Aging Units in MISO a key factor in retirements

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Age Distribution of Operating Coal Capacity and Gas & Oil Capacity in MISO

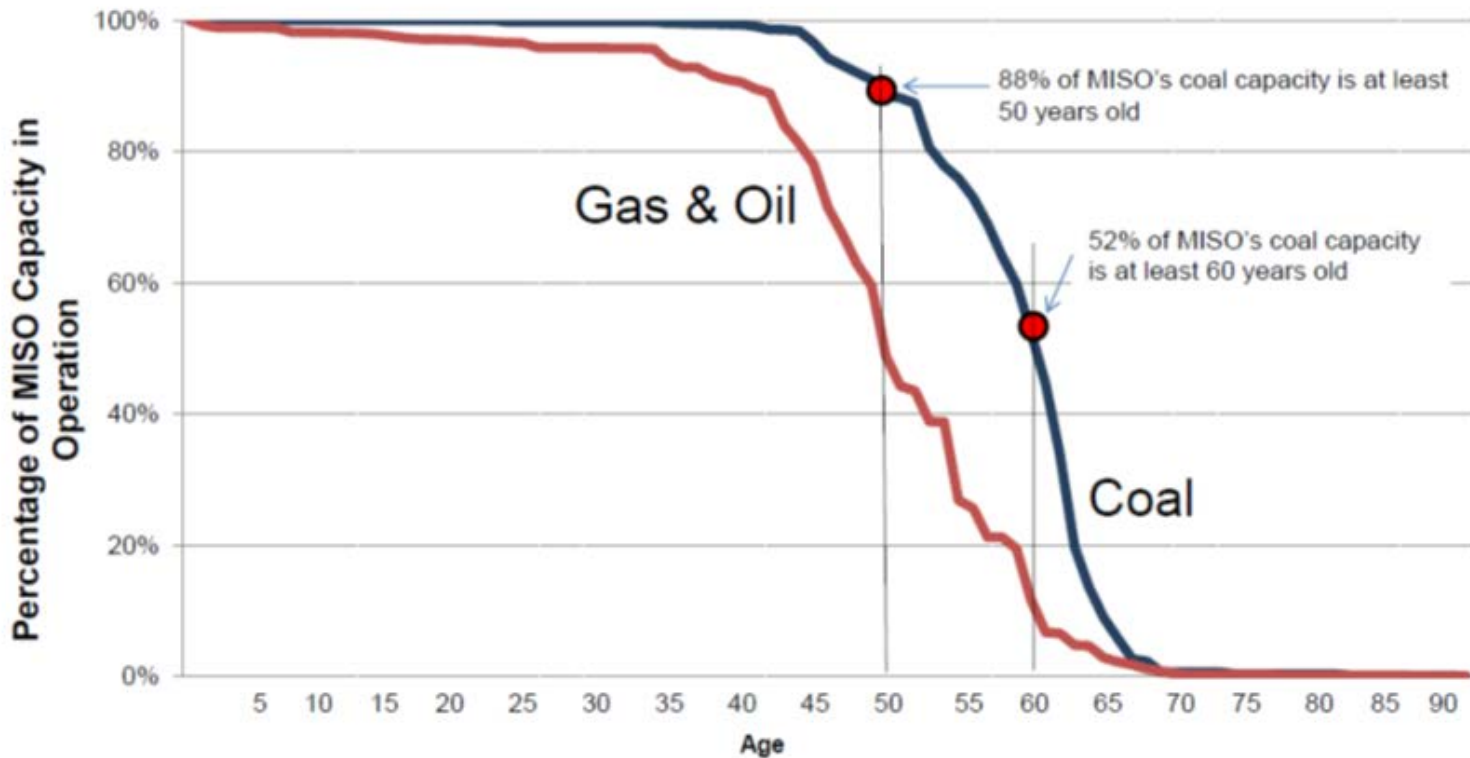


Figure Source: MISO Fleet Changes – slide 9.

MISO Retirements forecast through 2031

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“Policy Regulations Future”

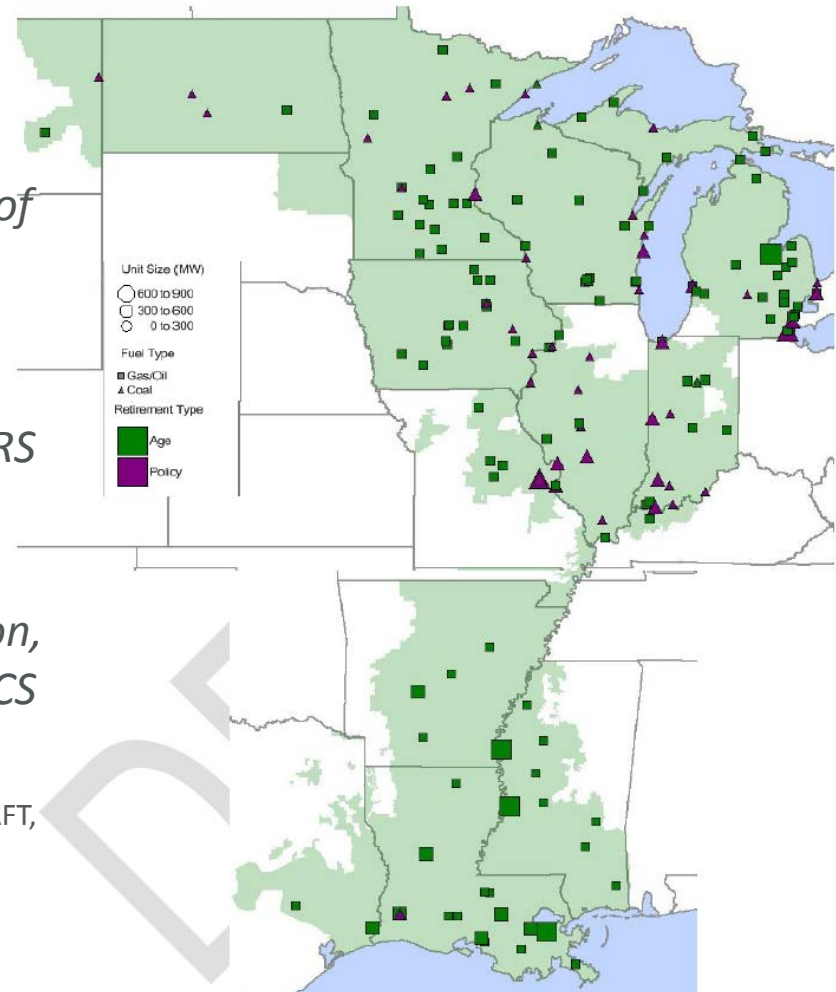
- MISO “middle of the road” future
- “...designed to capture the effects of current economic growth with average energy costs and medium gas prices.”¹
- “All current state-level RPS and EERS mandates are modeled.”²
- “All existing EPA regulations governing electric power generation, transmission and distribution (NAICS 2211) are incorporated.”³

¹ MISO, “MTEP17 MISO Transmission Expansion Plan,” DRAFT, October 2017, p. 83.

² Ibid.

³ Ibid.

Image Source: MTEP17, Appendix E.2, p. 19, Figure 15.



MISO MTEP17 Need for New Capacity

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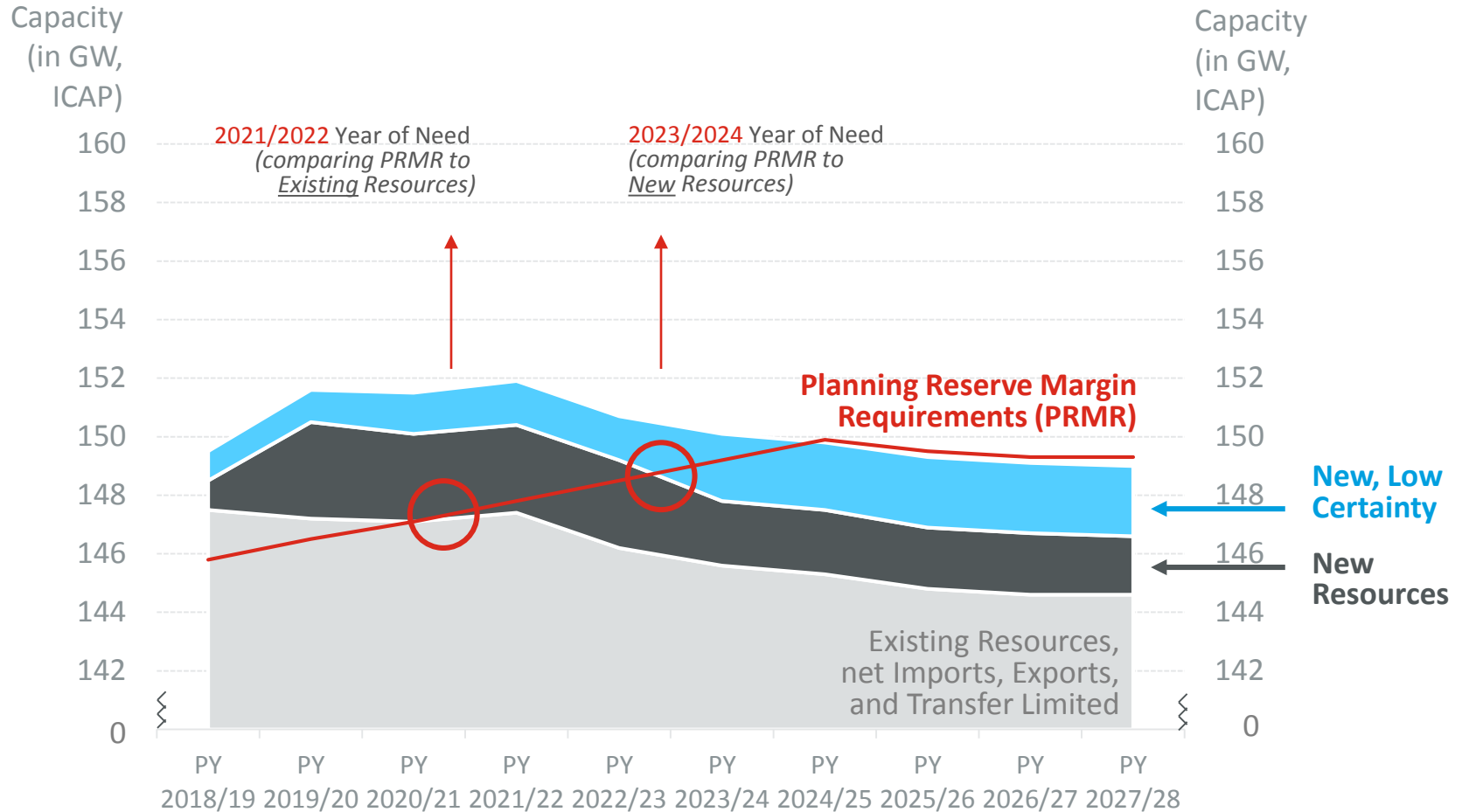


Figure Source: Daymark, based on data provided in MISO MTEP17 draft, Table 6.2-1, "MISO projected PRMP details (cumulative)", p. 122.

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5. Factors Influencing Bilateral Markets

Federal and State Policies

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Federal Policies

- Clean Power Plan & alternative GHG regulations
- Production Tax Credits phasing out (short-term boost in wind and solar proposals)
- Tax law changes
- Grid Resiliency Pricing

State Policies

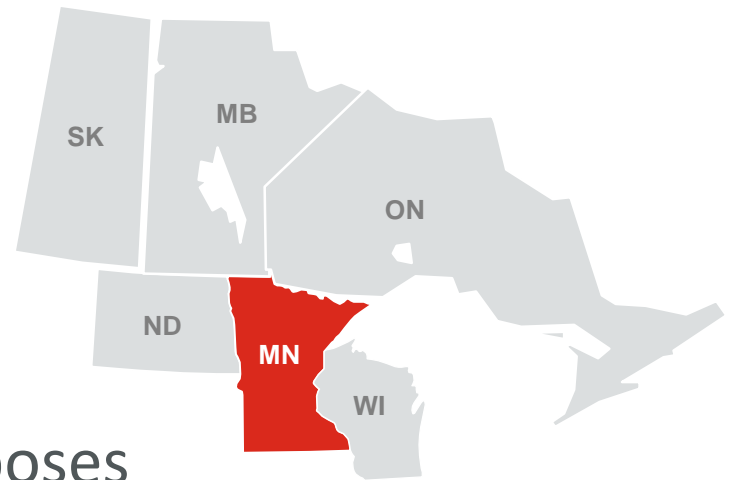
- Resource Planning requirements
- Minnesota moving forward with strong environmental policies
- Wisconsin has met its short-term goals

Key Potential Counterparties in Minnesota

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- Based on the current state of environmental policy-making, **Minnesota** counterparties are most likely to value MH power attributes highly
 - Minnesota Power (MP)
 - Northern States Power (NSP)

Minnesota

- GHG reduction targets
- Renewable targets
- Social cost of carbon increased for planning purposes



Factors Influencing Minnesota Power

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 - 44% renewable energy by 2025
 - Long-term goal of 66% renewable energy and natural gas
 - Existing contracts extend over most of modeling period
 - Currently planning a 525-550 MW natural gas combined cycle plant to be online in 2024 (no regulatory approval yet)
 - Per MP, this project is needed for
 - Increased reliability in support of wind and solar
 - Energy hedge benefits
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Factors Influencing Northern States Power

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- Contracts with MH expiring soon
- Hydro an important part of NSP IRP
- 2024/25 represents an opportunity for both NSP/MH
- Lack of certainty (risk) applies to both sides
- Assuming no sale is the most conservative assumption possible
- Aging of coal and nuclear facilities will require planning to address loss of 75% of energy-producing resources in next IRP

Northern States Power's Integrated Resource Plan

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- NSP's IRP states:
 - *"We will continue to evaluate the potential and value of hydro resource options **including the potential for hydro resources from Manitoba Hydro** beyond the current contracts that expire in the mid-2020s."*
 - Minnesota Public Utilities Commission's January 2017 order approving the NSP IRP includes the following modification:
 - *"Xcel's resource plan is modified ... to change Xcel's planned CT additions in the 2025-2030 timeframe to provide instead for adding the most cost effective combination of resources consistent with state energy policies, including but not limited to the following resource options: **large hydropower**, short-term life extensions of Xcel-owned peaking units, natural gas combustion turbines, demand response, utility-scale solar generation, energy storage, and combined heat and power. "*

¹ Daymark IR response to PUB/Daymark-3, Attachment 2, p. 59. [*emphasis added*]

² Daymark IR response to PUB/Daymark-3, Attachment 3, p. 11. [*emphasis added*]

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6. Public Overview

Export Revenues Forecast

Overview

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- Many elements of the export revenues forecast rely on commercially-sensitive information
- In this **public presentation** we discuss:
 - Our review process
 - Manitoba Hydro's approach to developing the forecast
 - Our public observations and findings
- In our **CSI presentation** we discuss:
 - Details of Manitoba Hydro's forecast
 - Our confidential observations and findings

Overview

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- We will discuss each of the elements, building up:
 - Firm contracts revenues
 - Surplus energy and capacity
 - Changes in forecast methodology
 - Export market prices
 - Export revenues forecast

Firm Contracts Revenues: Our Review Process

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- **Our charge:** Assess reasonableness of the forecast of revenues to be derived from existing export contracts.
 - **Documents we reviewed:**
 - PUB MFR-84-CSI (contract revenues workpapers)
 - Export contracts
 - LCA-CSI-34 Supp Att-LCA Comparison to MH CSI 36.xlsx (our NFAT review of contract revenues)
 - **Other information relied upon:**
 - Discussions with MH regarding the materials above

Firm Contracts Revenues: MH's Approach

- Manitoba Hydro's forecast is a contract-by-contract analysis of the terms of each contract

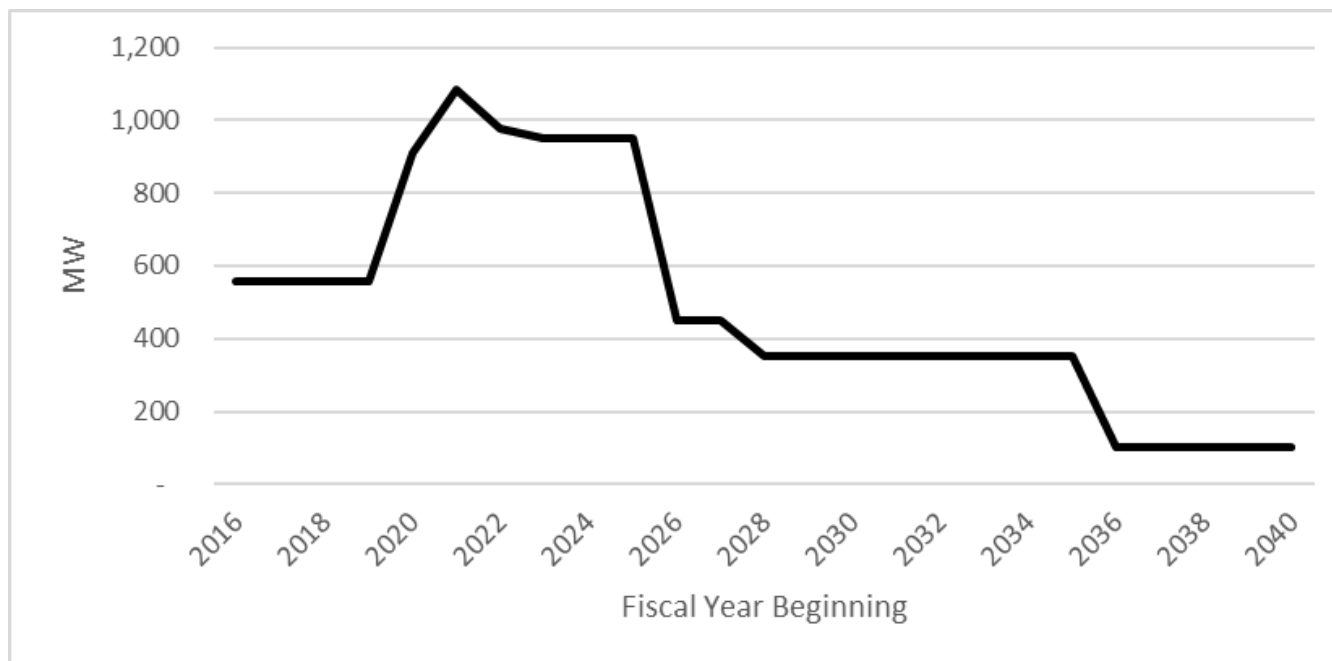


Figure Source: Daymark, "Independent Expert Consultant Report: Export Pricing and Revenues Review," November 16, 2017, Figure 29, p. 62.

Firm Contracts Revenues: Our Public Findings

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- Manitoba Hydro's revenues forecast from existing export contracts is reasonable
 - The treatment of those contracts is consistent with the analysis of those contracts in NFAT
 - The treatment of the new contracts is consistent and the resultant revenues forecast is reasonable

Surplus Energy and Capacity: Our Review Process

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- **Our charge:** Assess reasonableness of the forecast of surplus energy and capacity available for export
 - **Documents we reviewed:**
 - MH documentation of modeling analysis
 - Third-party documents pertaining to hydrology and MH modeling reviews
 - Relevant IR responses
 - Outputs from modeling runs
 - **Other information relied upon:**
 - Discussions with MH regarding the materials above

Surplus Energy and Capacity: MH's Approach

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- Short-term Methodology

- Utilizes their operating planning tool (the EMMA portion of HERMES) to forecast the first two years
- Year one considers actual hydrology to date
- Year two is the average of 104 simulations using historical data

- Long-term Methodology

- Utilizes SPLASH
- Each year's results is the average of 102 simulations using historical data
- No changes in methodology

Surplus Energy and Capacity: Our Public Findings

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- MH's forecasting methods are consistent with past practices
 - The forecast reasonably represents the average supply considering the range of hydrologic uncertainty

Changes in Forecast Methodology: Our Review Process

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- **Our charge:** Assess reasonableness of changes that eliminate premiums for surplus dependable energy and capacity
 - **Documents we reviewed:**
 - PUB MFR-79U-CONF
 - MH Electricity Export Price Forecasts (EPPF) for 2013-2015 (used in NFAT and MH annual planning)
 - MH EPPF for 2016 – used in the GRA
 - **Other information relied upon:**
 - Market information reviewed for other report sections
 - Daymark (then La Capra Asso.) review in the NFAT

Changes in Forecast Methodology: MH's Approach

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2013-2015 Method

- Surplus Dependable Energy
 - MISO market energy prices
 - MISO market capacity prices
 - Long-term contract premium
- Surplus Opportunity Energy
 - MISO market energy prices

Current Method

- Surplus Dependable Energy
 - MISO market energy prices
 - **No capacity**
 - **No premium**
- Surplus Opportunity Energy
 - MISO market energy prices
- Reasons for the change
 - Change in MH long-term market outlook
 - Softness in near-term capacity prices

Changes in Forecast Methodology: Our Public Findings

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- New method is more conservative
 - Capacity and Premium at zero is not a P50 value
 - It is reasonable for use in the near-term
 - It is not reasonable for use in the long-term
 - Not consistent with third-party forecasts
 - Not consistent with needs in MISO and Minnesota
 - MH forecasts significant surplus dependable energy for most of the 20-year forecast period

Export Market Prices: Our Review Process

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- **Our charge:** Assess reasonableness of MH's MISO market price forecasts – reference, high, and low
 - **Documents we reviewed:**
 - Third-party consultant forecast documents
 - MH workpapers and supporting documents
 - **Other information relied upon:**
 - Market information reviewed for other report sections
 - Discussions with MH regarding the materials above

Export Market Prices: MH's Approach, Reference Case

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- Four third-party forecasts purchased
 - Annual energy and capacity values
 - Minnesota Hub prices
 - Limited documentation
 - Initial step was to average the four forecasts for the following price strips:
 - On-peak energy
 - Off-peak energy
 - Capacity value
 - Energy prices were then adjusted to be priced at the border (MHEB)

Export Market Prices: MHs' Approach, High/Low Cases

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- High and low energy price cases prepared in-house
 - Imputes values using a “market heat rate” method
 - Reference gas prices calibrated to US EIA AEO 2017 reference/high/low gas forecasts
 - Reference case market heat rate used with high and low gas cases to derive energy price cases
 - No high or low cases prepared for capacity prices

Export Market Prices: Our Public Findings

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- Public findings summary
 - Third-party forecasts
 - Lacked information on probability or range
 - Lacked information on “reference” definition, as used by Manitoba Hydro
 - Manitoba Hydro did not use the consensus capacity price forecast
 - Confidential findings
 - Most of our observations are commercially-sensitive information

Export Revenues Forecast: Our Review Process

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- **Our charge:** Assess reasonableness of MH's forecast of net export revenues (20 years)
- **Documents we reviewed:**
 - All documents described in prior sections
 - Uncertainty analysis in GRA Tab 4
- **Other information relied upon:**
 - Discussions with MH regarding the materials above

Export Revenues Forecast: MH's Approach

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- Reference Forecast, summing
 - Forecasted revenues from existing firm contracts
 - Surplus energy valued at forecasted MISO energy prices

 - Uncertainty Analysis
 - Reference/High/Low market price forecasts
 - 102 flow records
 - Assigned probabilities to the revenue outcomes

Export Revenues Forecast: MH's Approach, Reference Case

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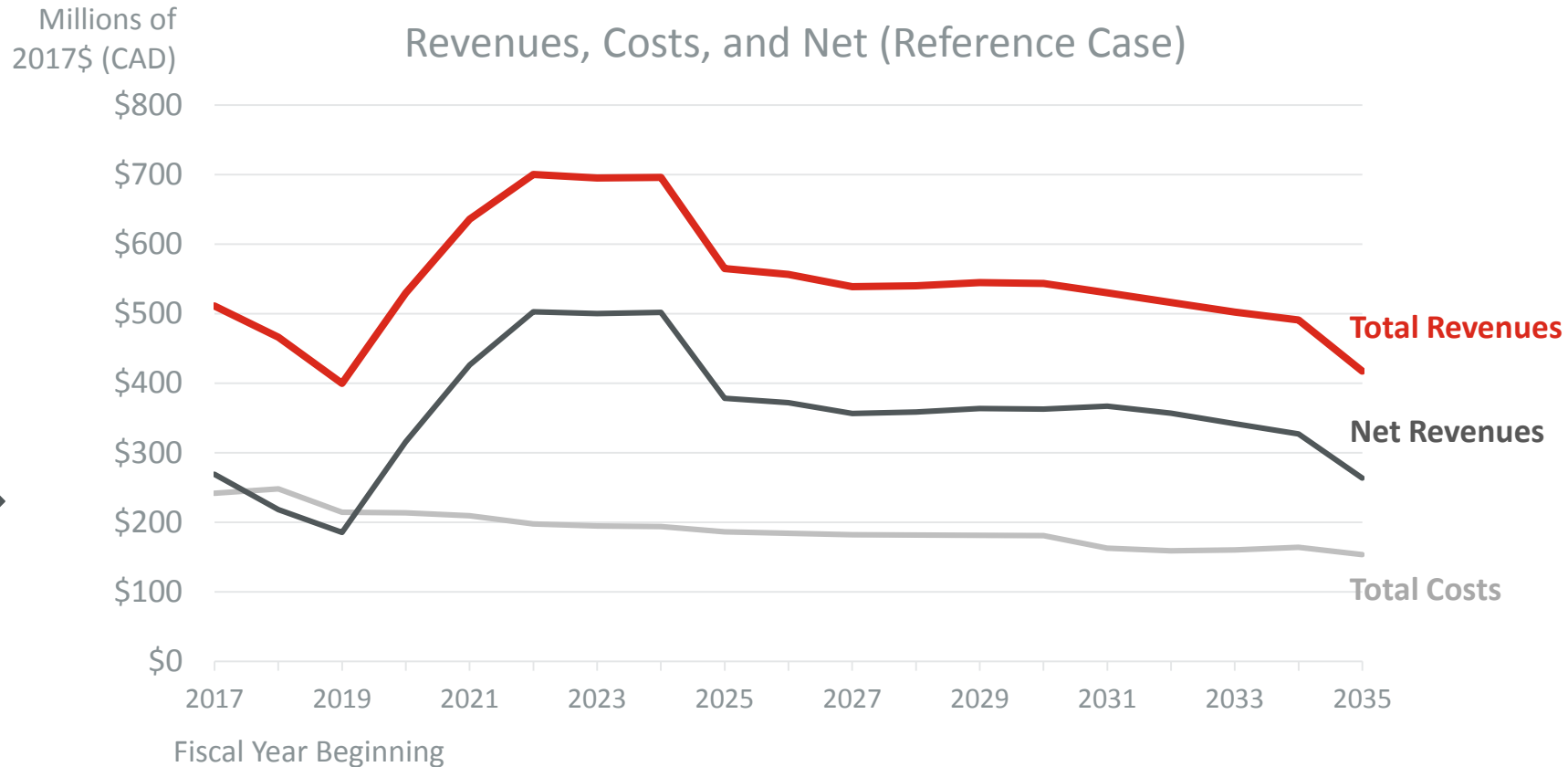


Figure Source: Daymark, "Independent Expert Consultant Report: Export Pricing and Revenues Review," November 16, 2017, Figure 32, p. 69.

Export Revenues Forecast: MH's Approach, Uncertainty

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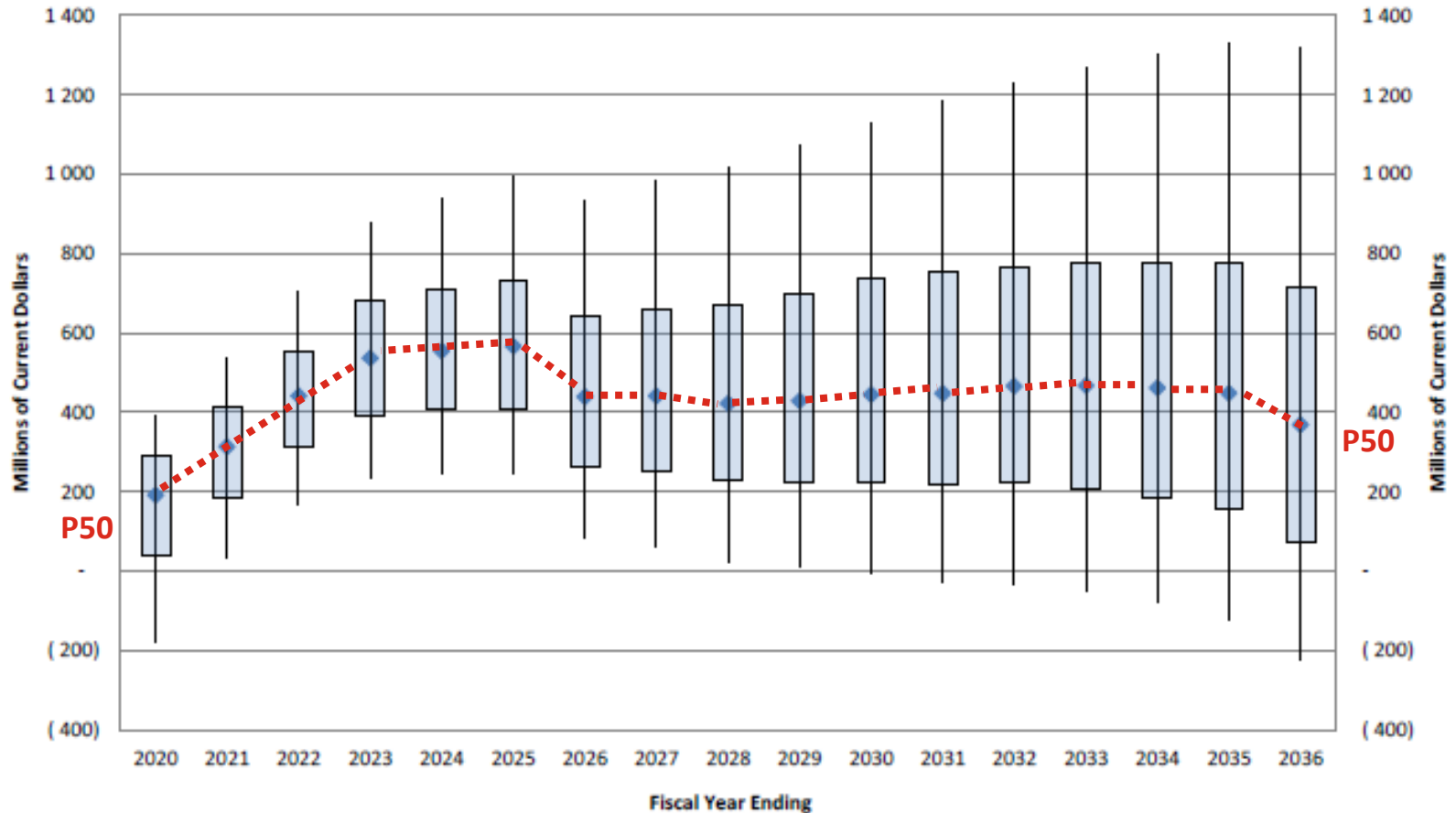


Figure Source: PUB/MH II-41a-b, Figure 4.10, p. 4. *[emphasis added]*

Chart title, "Net Export Revenue (P05 P20 P80 P95 Values), MH16 – 102 Flow Records 1912 To 2013, 3 Export Price Scenarios – Reference, High and Low, 102 x 3 = 306 Financial Runs"

Export Revenues Forecast: Our Public Findings, Reference Case

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- The Reference Case is not a P50 case
 - The energy market price forecast is conservative
 - No representation from vendors of P50 objective
 - No new firm energy contracts for 20 years
 - MH forecast shows high levels of surplus dependable energy through most of the 20 years
 - Zero capacity revenue for 20 years (~P100)
 - Zero premium revenue for 20 years (~P100)

Export Revenues Forecast: Our Public Findings, Uncertainty

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- Risks are not symmetric, as shown in MH chart
 - Natural Gas – skewed distribution
 - Carbon prices – limited values in market prices
 - Capacity and Premium – zero is lowest value possible
 - Risk allocation between MH and customers
 - Asymmetrical risk – expected value may be higher
 - All risks exogenous to customers
 - MH has some control over the marketing of surplus

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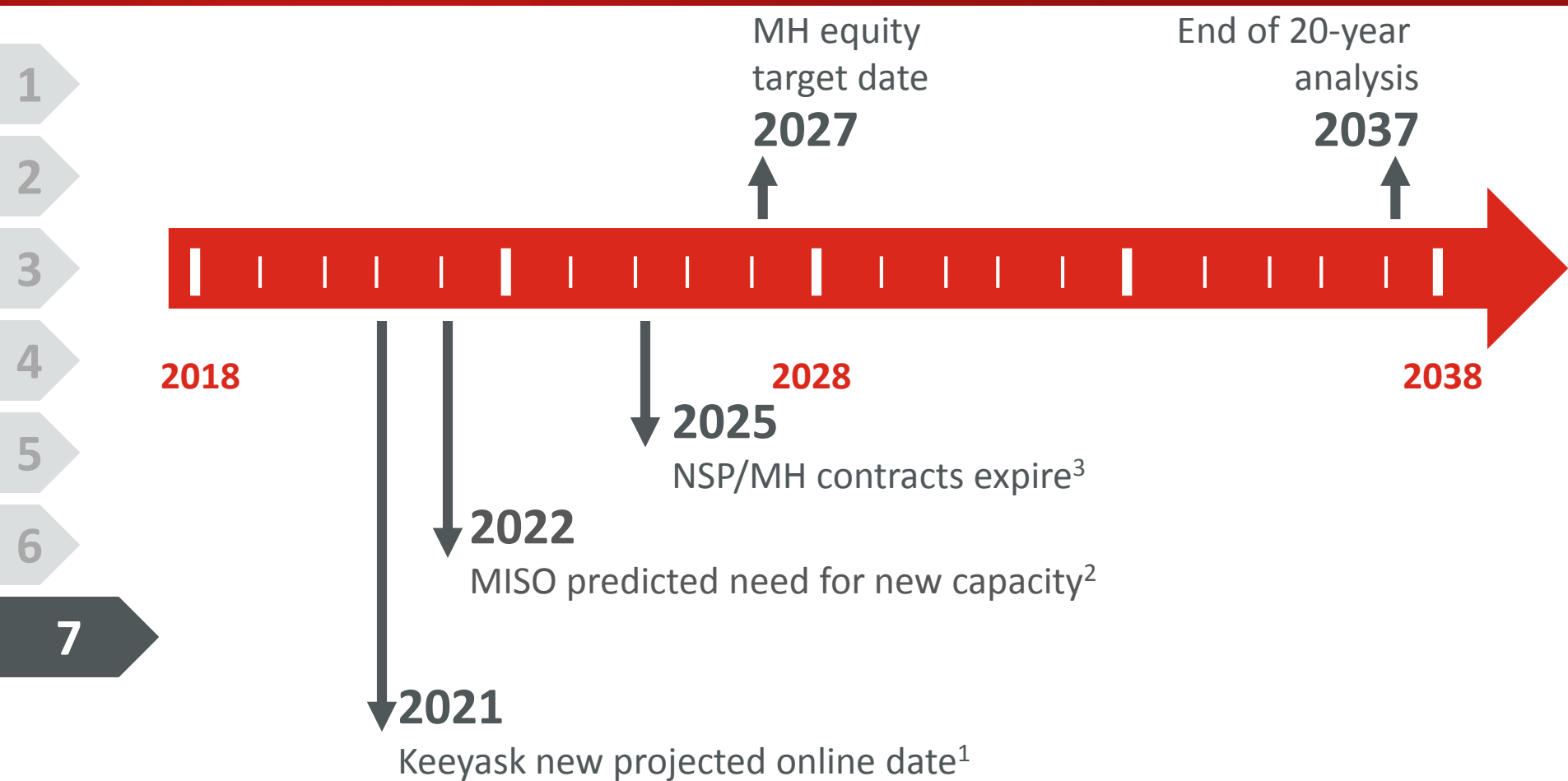
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7. Key Findings

Key Timeline Elements



¹ GRA, Tab 2, Section 2.1.2

² MISO MTEP17 draft, Table 6.2-1, "MISO projected PRMP details (cumulative)", p. 122.

³ Tab 7, Section 7.6, pp. 22-23.

Reasonableness of the Export Revenue Forecast

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- MH's export revenue forecast is **conservative/low** relative to MH's stated goal of having a **50% chance** of achieving its equity ratio target within 10 years
- Key issues:
 - Reference case energy market price forecast and energy revenues are **susceptible to be biased low**
 - MH assumes that **no revenue will be received for capacity or any other premium values** from the substantial surplus dependable energy in the forecast (no new firm contracts assumed)
 - The energy price risk is skewed toward higher values, where the **expected value of the forecast will be higher than the reference case value**

* The basis for these finding are detailed in the Commercially Sensitive Information presentation.

Resource Needs Outlook in the MISO Market

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- Most MH export sales are made to U.S. entities operating in the markets administered by MISO*
- Our review of the outlook for resource needs in the MISO marketplace found the following:
 - 61 GW of coal generation is likely to decline significantly over the next decade
 - Existing and committed resources will leave MISO short in capacity by 2022
 - MISO needs assessment indicates current system surplus capacity is expected to erode within 5 years, with the need for new resources of about 24 GW occurring by 2031
 - State policies have significant influence on resource choices

Elements of the Forecast We Found to be Reasonable

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- We found the following components of the export revenue forecast **to be reasonable**:*
 - Surplus dependable energy forecast
 - Total surplus energy
 - Revenue forecast derived from existing firm contracts

* The basis for these finding are detailed in the Commercially Sensitive Information presentation.

End of Presentation

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