Manitoba Hydro 2025 Integrated Resource Plan

Technical Advisory Committee Meeting #6 Summary Notes

Purpose of Notes:

Meeting notes summarize the discussion and feedback from the Technical Advisory Committee without attributing feedback to specific individuals or groups. How Manitoba Hydro takes action on this feedback, is considered along with input from other engagement conversations throughout the 2025 Integrated Resource Plan process. The outcomes of engagement and any actions taken are published following each engagement round in a "What We Heard" document and the Engagement Report with publication of the 2025 Integrated Resource Plan.

Meeting Details:

Meeting Date: April 7, 2025 – 1:00pm-3:30pm

Location: Manitoba Hydro Place - 360 Portage Avenue, Winnipeg, MB

Attendees:

Committee attendees (members & alternates):	Manitoba Hydro – Committee Chair– Lindsay Hunter Academic (University of Winnipeg) – Patricia Fitzpatrick Association of Manitoba Municipalities – Duane Nicol City of Winnipeg – Becky Raddatz Climate Change Connection – Curt Hull Consumers Council of Canada – Peggy Barker Daymark Energy Advisors – Jeff Bower Eco-West/Éco-Ouest Canada – Shane Pelletier Efficiency Manitoba – Colleen Kuruluk Government of Manitoba – David Scammel Manitoba Chamber of Commerce – Green Advantage – Christa Rust Manitoba Industrial Power Users Group – Dale Friesen Manitoba Métis Federation – Christian Goulet Manitoba Métis Federation – Reed Forrest Manitoba Sustainable Energy Association – Wayne Clayton Public Utilities Board – Brady Ryall Sustainable Building Manitoba – Laura Tyler University of Manitoba – Cameron Whitton
Supporting attendees:	Manitoba Hydro – Adam Marcynuk Manitoba Hydro – Andrew Greaves Manitoba Hydro – Diana Mager Manitoba Hydro – Kathy Allard

	Manitoba Hydro – Lindsay Melvin Manitoba Hydro – Shoni Madden Consultant – Urban Systems – Ryan Segal Consultant – Urban Systems - Kayla Dawson Consultant – Urban Systems - Hannah Patton
Regrets:	Government of Manitoba – Teody Leano Manitoba Keewatinowi Okimakanak Inc. – Anita Murdock Red River College – Jose (Jojo) Delos Reyes
Meeting Materials:	Round 1 What We Heard Report Meeting Agenda (Distributed via email prior to meeting) Copy of Meeting Presentation

Meeting Agenda:

1. Introductions and Setting the Stage
2. How We Are Incorporating Feedback
3. Load Projection Sensitivity Planning Assumptions
4. Preliminary Modelling & Analysis Results
5. Closing and Next Steps

Introductions and Setting the Stage

Slides: 1 - 12

- **Meeting Overview and Purpose:** An overview of the meeting agenda and purpose was provided. The chair noted that all information presented is proposed and open for discussion and feedback. The information may evolve as it is finalized to incorporate feedback heard through engagement. The facilitator noted that the focus of meeting #6 is to share the key feedback heard through Round 1 engagement and resulting updates made to the key inputs, scenarios and evaluation metrics; to share preliminary modelling and analysis results and observations; and to continue to support openness and transparency throughout the development of the 2025 IRP.
- **Committee Updates:** The chair provided an update on the public posting of meeting summary notes (which are not detailed minutes) and membership list and introduced a new member, an Independent Expert Consultant hired by the Public Utilities Board. The Independent Expert Consultant will fully participate in the Technical Advisory Committee to observe engagement and to hear the feedback shared by members and how it has been incorporated. A drafted membership list was circulated for attendees to review and note any edits needed. A member asked if feedback could be shared on the posted notes, and the chair confirmed the team is always open to feedback on the summary notes.
- **Process Updates:** The chair provided an update on the 2025 IRP development process including work completed since December 2024. The project is currently in the modelling & analysis and evaluations step of the process. The focus of meeting #6

is to share the preliminary modelling and analysis results. Next steps include completing modelling and analysis, development of potential development plans which will be evaluated and undergo more detailed financial and risk analysis. The next meeting will focus on sharing the draft road map including draft recommended and alternative development plans, learnings, near-term actions and signposts.

How We Are Incorporating Feedback

Slides: 13 - 29

- **What We Heard Overview:** The chair presented a summary of what was heard through external engagement and how it informed the process to date. This was supported through the What We Heard summary and detailed slides highlighting key changes where feedback informed the key inputs, scenarios, and evaluation metrics.
- **Changes Based on Engagement Feedback:** Members asked for more information on any substantive changes that were made based on engagement feedback, with some noting that they were expecting to see more significant changes to the modelling assumptions and reconciliation value theme. It was noted that discussions around economic reconciliation are ongoing with interested parties to support the development of metrics for economic reconciliation. Engagement feedback also led to the development of a load sensitivity that would be presented in the next section.
- **Costs:** A member noted that the Cost evaluation metric includes net system cost and customer costs, but not customer benefits. The member noted that cost is not always the primary motive for customers to initiate a change, and that is it also important to recognize the benefits of costs the customers and rate payers would not incur. The member also noted the importance of ensuring the net system costs do not discriminate against a focus on energy efficiency and customer driven solutions. Manitoba Hydro noted that the intention throughout the process is to have energy efficiency on a level playing field with other resource options, and it was noted that this would be seen throughout the preliminary results presented. The customer costs are intended to consider an all of the Manitoba perspective, including where costs may be transferred to the customer. This feedback will be considered to make sure no adverse impacts occur through consideration of customer costs and benefits.

Load Projection Sensitivity

- **Objective:** Manitoba Hydro shared an overview of the sensitivity objective, developed based on engagement feedback heard from Round 1 engagement, including from the TAC. The load sensitivity explored what future energy demand would be in 2050 with a transition to absolute zero greenhouse gas emissions from space heating and ground transportation sectors.
- **Changes to Guiding Principles:** Manitoba Hydro shared how the development of the sensitivity required moving away from the guiding principles used to develop the

three load projections for the 2025 IRP, which itself creates execution risks that would need to be addressed. Key changes included:
    - Replacement of heating systems and vehicles before they reach end of life;
    - Removal of natural gas equipment for customers when they replace space heating systems; including smaller industrial and commercial applications; and
    - Significantly increasing market demand for heating systems & vehicles which then end abruptly in 2049/50.
- **Assumptions:** Manitoba Hydro provided an overview of the sensitivity assumptions.
    - **Ground Transportation Assumptions:** Manitoba market demand for vehicles may exceed supply and reaching absolute zero will be a challenge for medium and heavy-duty vehicle classes where limited options are available.
    - **Space Heating Assumptions:** Customers would be replacing over 110,000 gas space heating systems before they reach end of life. These would be replaced using alternatives such as air source heat pumps, cold climate air source heat pumps or ground source heat pumps. It was noted that increased market demand could lead to price increases, and that the heating and cooling industry required to ramp up and meet market demand would see an abrupt reduction in demand by over 50% after 2050.
- **Impact on Demand:** Manitoba Hydro shared the impacts the load sensitivity had on future electricity and natural gas demand to 2050.
    - The sensitivity significantly increases peak demand, requiring an additional 3,000 MW of capacity by 2050 as compared to the high load projection.
    - The sensitivity cuts natural gas consumption in half by 2050 as compared to the high load projection. This still includes some consumption of natural gas, recognizing the difficulty in replacing some industrial processes, and leveraging renewable natural gas. Industrial carbon capture and storage technology is assumed beyond 2050.
- **Net-Zero Assumptions:** Members expressed concerns about the assumptions used to achieve a net-zero economy by 2050 and the assumption of Direct Air Capture technology in 2049. Members expressed a desire to see assumptions that considered earlier emission reductions and consideration for alternate emission reduction solutions. It was noted by Manitoba Hydro that Direct Air Capture is being used as a proxy for negative emissions technology in this iteration of the 2025 IRP to understand energy demand needed to serve a net-zero economy. Future updates to the IRP may incorporate changes to this technology as it matures, as well as more information on the energy transitions occurring across individual sectors.
- **Carbon Tax:** A member noted that carbon tax policies have changed since the beginning of the process and asked how these changes are being considered in the scenarios and modelling. Manitoba Hydro noted that the sensitivity analysis is intended to explore the bounds of these types of changes.

- **Demand Side Management:** A member expressed concern with the energy efficiency assumptions in 2034-35 and how they impact the load curve. The member noted it is unclear what is driving the changes, as well as asked how the costs are determined for installation of alternative heating systems. The member asked if these costs are considered within the costs for energy efficiency programs.
- **Mode Shift:** A member asked why transportation mode shift was not being considered in the sensitivity assumptions. Manitoba Hydro noted that for the purpose of the analysis, a conservative approach was used assuming a shift to electric vehicles but no mode shift.
- **Public Communication:** A member expressed a concern that while the inputs and assumptions are iterative and will change in each IRP cycle, this might not translate to the public. It will be important to communicate the iterative planning cycle as the assumptions in the IRP could be used to drive others planning and decision-making.

Preliminary Results

Setting the Context

Slides: 30 – 39

- **Planning Horizon:** Preliminary modelling results and observations were shared for two key timeframes in the planning horizon. The mid-term point in 2035 aligns with the 10-year focus for the development plan timeframe, while the long-term point in 2050 aligns with the broader long-term planning horizon for the 2025 IRP.
- **Preliminary Model Outputs:** An overview was provided that the information shared are preliminary outputs of the model before analysis and evaluation metrics have been applied. The outputs include the portfolio of resources, net system costs and greenhouse gas emissions. The results are initial observations intended to share the trends and commonalities being seen, and to highlight unique observations that may be explored further in the analysis and evaluations.
- **Portfolios of Resources:** The portfolio outputs from the 8 scenarios were shown as an example to highlight that the results will show each portfolio which will include different combinations of resources that are available to be installed by 2035.
- **Clarifying Capacity & Energy:** An overview was presented to help remind members of the different planning criteria related to capacity and energy. The distinction was noted as important because a diverse resource portfolio can ensure reliability through capacity while optimizing energy use efficiently. Capacity planning and energy use are not always the same, just because a resource is available doesn't mean it frequently used. Therefore, it is important to recognize the context when the results show capacity or energy, and if it is capacity, whether that is installed or accredited capacity.
- **Load Factor:** A member asked for clarification on how the load factor is impacted as more processes become electrified throughout the planning horizon to 2050. The load factor is the relationship between peak load and average energy use.

- **Drought and Water Levels:** Members inquired about whether the model can solve for optimal resources for drought vs. high water years and if the model can consider costs for resources at different water levels. A member asked about whether the model can consider the use of solar and wind for maintaining water levels, and if in a low water year, the model could select more solar and wind. Manitoba Hydro clarified that the model is solving for both energy and capacity, which includes planning based on the worst drought on record. Extreme cases do not happen very frequently but need to be planned for to ensure reliability. Manitoba Hydro shared that the model does optimize water storage, but it is complex to model as hydro generation decisions need to be made in advance.
- **Resources:** Members asked other questions about how different resources in the portfolios are utilized, including some suggestions on communication. A member suggested changing the term battery storage to energy storage.
- **Economic Optimization:** A member asked if the economic analysis includes a climate cost analysis such as the social cost of carbon. Manitoba Hydro confirmed it does.

Mid-Term Portfolio of Resources (2035)

Slides: 40 - 49

- **Results and Observation Summary:** An overview of observations of the mid-term resource portfolios were presented with an emphasis on the existing system's role in meeting future energy needs. The load projections based on a net-zero economy by 2050 require early and significant load growth, accelerating need dates for both capacity and energy. Increasing restrictions on resource options lead to a higher total installed capacity and a greater variety of resource options required, which diverges from the focus on affordable energy. The range of available resource options in this timeframe is limited, with few expected to be available before 2035 due to long lead times, environmental licensing, technology maturity, and regulatory challenges. As a result, new resources in this timeframe will need to be added more closely to follow load growth. Effective policy decisions will be critical, as the current regulatory environment does not accommodate rapid load growth nor does it allow supply to be added ahead of demand. A few key observations were highlighted:
    - Customer-side solutions play a significant role the in mid-term, helping to manage load growth. These solutions would be in place of building new resources, which is why they are included in the portfolios.
    - Combustion turbines and wind are key scalable resources, unlike new hydropower. Combustion turbines are dispatchable and can be used when needed, while wind is variable and is not always available to meet demand.
        - Natural gas is consistently selected as a primary fuel source for combustion turbines as it is low cost and has a reliable supply.
        - Wind is selected by the model in scenarios with higher energy needs, especially when natural gas combustion turbines are restricted. Wind

becomes more cost-effective with higher export prices due to increased opportunities and revenue from selling excess to export markets.
    - Supply side enhancements require a generating unit to be taken offline. This means that excess capacity is needed to balance the loss of this generating unit. This specific planning on the optimal time to complete the supply side enhancements will happen outside of the 2025 IRP analysis.
- **Load Projection Assumptions:** A member asked for further detail on the load projection assumptions to better understand where efficiency programs are considered by different customer sectors including industrial, commercial, and residential demand. Manitoba Hydro shared that Efficiency Manitoba's three-year plan has been extended to 2050 and has already been taken off the each of the load projections as it reduces demand. Demand response is also maximized in each of the load projections. There are also additional selectable efficiency programs beyond the three-year plan that the model can select.
- **Resource Characteristics:** A member asked if any changes have been made to the resource characteristics that were shared with members since meeting #4, and if characteristics such as social acceptability and technology readiness were added. Manitoba Hydro noted that the characteristics have not changed since they were last shared, but that these considerations will be part of the evaluation of the potential development plans. It was noted that the model is quantitative, and that the evaluation step will be used to consider the more qualitative aspects, and that there is always interest in evolving the resource characteristics in future iterations of the IRP.
- **Resources Not Selected:** Members asked about the resources not being selected in the mid-term portfolio, including small modular reactors and solar. Manitoba Hydro noted that the model does not select some resources in the mid-term due to lead times beyond a ten-year horizon. The model also considers time of day and the shape of the load curve and is finding solar cannot provide energy when needed.

Long-Term Portfolio of Resources (2050)

Slides: 50 - 55

- **Results and Observation Summary:** Observations about the long-term portfolio of resources were shared. There is a significant difference in the total installed capacity and number of resource options in the portfolios of resources in 2050 as compared to 2035. Serving energy needs for a net-zero economy by 2050 requires significant new resources, driven by load growth assumptions and projections. Natural gas combustion turbines continue to be selected in modelling (even in scenarios meeting a net-zero economy) as it is an affordable dispatchable resource. Longer lead-time resources, such as new hydropower and small modular reactors (SMRs) are observed.
- **Resource Sequencing:** The sequencing of resources helps to inform when decisions need to be made – and more importantly, if those decisions that need to be made in this IRP or in future IRPs. Steps need to be taken to plan for longer lead-time

resources, like new hydropower or small modular reactors long before they are needed. These longer lead-time resources only appear at the end of the analysis planning horizon, which means that decision would only be expected in future IRPs.

- **Combustion Turbines:** Members expressed concerns about combustion turbines and asked if cost decisions are being optimized over other considerations such as environmental impact. It was noted that combustion turbines have a relatively low cost to operate for capacity and high cost for energy, while a resource such as wind has a high cost to operate for capacity but a low cost for energy – the model optimizes the combination of these resources in to achieve the lowest cost operation. The next steps on evaluation will consider other factors. Members expressed concerns about capital costs driving decision making.
- **Future Decision Making:** Some members expressed concerns about future decision making, noting that resources selected for capacity, such as combustion turbines, could be used more than intended by other decision makers in the future rather than building more costly resources that do not have greenhouse gas emissions.
- **Solar and Battery:** A member noted that while peak demand is often in the dark in winter, solar resources pair well with battery resources and should be explored further. It was noted that the current duration of utility scale battery does not currently meet peak needs, but that this technology will continue to be monitored.

Net System Costs, GHG Emissions, Sensitivity Analysis and Observations

Slides: 56 - 63

- **Net System Costs:** Net system costs include all costs for electricity and natural gas service including capital, maintenance and operating costs, natural gas costs, transmission and distribution infrastructure costs, fuel costs, import costs, and energy efficiency program costs, as well as export revenue. Net system costs results are not a financial analysis. Financial analysis, including potential customer's rate impacts and energy wallet, will occur for the recommended and alternative development plans.
- **Observation Summary:** An overview of net system costs, greenhouse gas emissions and sensitivity analysis observations were shared. Different portfolios of resources result in different net system costs. When there are restrictions on use of natural gas combustion turbines, there is a corresponding increase in net system costs. Mid-term portfolio costs are very similar, however there is a much wider range of net-system costs between long-term portfolios. This difference highlights the importance of considering the long-term costs when committing to assumptions in a scenario.
- **Greenhouse Gas Emissions:** It was observed that Manitoba's greenhouse gas emissions can be reduced by approximately 10 megatonnes through decarbonization. Supporting reductions for a net-zero economy by 2050 will require the use of negative emissions technology for any remaining emissions, including non-combustion emissions – this is a similar strategy included in other net-zero economy studies. The portfolios include the resources needed to serve the load of this negative

emissions technology. However, the 2025 IRP will not make any recommendations regarding their implementation; this will be deferred to future IRPs. It was shared that potential new generation resources will have minimal impact on overall provincial emissions reductions, as most emissions are driven by customer energy choices outside of Manitoba Hydro's control – such as those related to transportation and industry. Currently, emissions from Manitoba Hydro's electricity generation are already low, and the scenarios project negative emissions by 2050 due to strategies aimed at achieving a net-zero electricity grid by 2035.

- **Sensitivity Observations:** The majority of the sensitivities did not impact the amount of resources included in the portfolios of resources – what it did impact was the timing of when resources would be needed. The inclusion of negative emission technology does not impact the near-term decisions that need to be made regarding the recommended development plan in the 2025 IRP. Other resources that showed promise through the sensitivity analysis were selectable energy efficiency programs, utility scale batteries, hydrogen fuel combustion turbines, and market purchases. these will be tested further as analysis continues.
- **Energy Balance:** A member suggested that it would be beneficial to share more information about energy balance. The member noted that emission reductions are often motivated by efficiency savings and that changes to the energy profile are not always due climate change considerations.
- **Greenhouse Gas Emissions:** A member expressed concerns about including non-combustion emissions and the impact this may have on net-zero solutions. Some members suggested that emissions reduction efforts need to occur earlier in the planning horizon than 2049/50. A member suggested that committee representation from the agricultural sector would be beneficial. Manitoba Hydro noted the agricultural sector does participate in other engagement activities.
- **Energy Storage:** A member noted that energy storage solutions are more advanced than carbon capture. Additional research was suggested on energy storage solutions.
- **Policy Influence:** A member noted that the IRP analysis responds to energy transition policy and government decision-making. They acknowledged that Manitoba Hydro is trying to explore investments that are as effective and affordable as possible but can only work within the context of current policy direction.

Next Steps

Slides: 64 – 67

- The chair shared an overview of the methodology being used to move towards a draft recommended development plan. The draft 2025 IRP road map will be shared at the next meeting scheduled for May 15, 2025.
- Members expressed appreciation for the opportunity to ask challenging questions and for the IRP team's willingness to engage and provide answers.