Blair Mukanik: Hello. My name is Blair Mukanik and I'm leading the technical collaboration on the IRP. I'll present information here on our sensitivities. As mentioned in the beginning of the previous segment of this session, some of the feedback we heard in our last round of engagement was that there needed to be different combinations of inputs between the bookends of the scenarios to properly model potential energy futures, and we do this through our sensitivity analysis. We also used your feedback to prioritize some sensitivities for this discussion so that we could share how your feedback is influencing the initial modeling results.

In sensitivity analysis, we make a change to an assumption or input in a scenario to understand how it might affect the model's outputs or results. We use sensitivity analysis or what-if analysis to understand how individual inputs or constraints are driving output of the model. Understanding this additional layer of information may help to develop our roadmap and near term actions. So let's take a look at some of the examples of these sensitivities.

We've selected three sensitivities that we're going to present today. They are centered around costs and greenhouse gas emissions, because these were key themes in the feedback from our prior engagement. There are other sensitivities we plan to investigate as well, and we'll summarize those later. For the purposes of this discussion, we'll focus the sensitivity work around scenario four, since it represents the greatest degree of change and provides the greatest opportunity to explore costs and greenhouse gas emissions' impacts further.

The first sensitivity we'll discuss is on dual fuel for heating. This sensitivity explores a potential means of reducing the impact of electrification of space heating. Dual fuel heating systems use electric air source heat pumps to heat and cool buildings when above a certain temperature and use natural gas for heating when below a certain temperature. In our case, we've assumed minus 10 degrees Celsius. This is something that's also being explored in other jurisdictions. In our analysis, we assume that customers with gas heating replace their air conditioners with an air source heat pump when they reach end of life.

The second sensitivity we'll be discussing is on restricted gas generation usage. This sensitivity explores reducing the contribution natural gas generation could make to meeting planning criteria. Specifically, it assumes natural gas generation is not included as a resource to satisfy dependable energy planning criteria. Rather, it can only be used to satisfy capacity planning criteria. In practice, this should mean natural gas generation is run less often than in scenario four.

The third sensitivity we'll discuss is on carbon capture required for gas generation. This sensitivity explores potential future requirement to capture and store carbon emissions from natural gas plants. This has been talked about in early proposals for federal clean electricity regulations. This graph is a repeat of the peak demand curves shown earlier in the presentation, but here the dash line is added to show the impact of the dual fuel sensitivity on demand in scenario four. If customers chose to use dual fuel heating systems, there would be much lower winter peak electric demand than in scenario four where we assume that natural gas heating systems would be converted to electric heating systems at their end of life.

The other two sensitivities don't impact demand rather only resource options, and that is why they don't show up as separate lines in this graph. These charts provide similar information to what was shown earlier for scenarios one through four, but focus instead on scenario four and the three sensitivities just discussed. This shows how the supply of energy on the left and capacity on the right could look in 2042 for each of the three sensitivities when compared to scenario four and to 2022.

Starting with capacity on the right, we see a lot less new capacity is required under the dual fuel heating sensitivity than in scenario four. When looking at energy on the left, we see that less thermal generation is used, which should result in lower emissions from electricity generation. The resulting total emissions will be looked at shortly, including those from both electricity and natural gas use.

Moving next to the restricted gas generation usage sensitivity, we see less difference between it and scenario four. Generally a bit more wind would be built in order to provide energy and gas generation would be run less often. Lastly, the carbon capture and storage sensitivity reflects a significant change compared to scenario four. Here we see that the yellow segment represents natural gas generation with carbon capture and storage, and the purple is hydrogen generation. These two resources largely meet future capacity and energy needs with carbon capture and storage providing both capacity and energy and hydrogen primarily providing capacity.

The purple bar for hydrogen in the energy graph, which is below the zero line, shows that hydrogen takes more energy to produce than it would actually provide in terms of electricity. As well, we see that once an investment is made in carbon capture and storage, it is more economic to run that resource in order to produce energy rather than to build additional wind for energy. Once again, to emphasize, these results are based upon a lowest net system cost resource selection.

In this chart, we compare emissions amongst the three sensitivities to scenario four in 2042 and to 2022. We see again that scenario four represents a significant reduction in emissions across the three sectors presented versus today with the sensitivities showing the impact of a change in assumption. An interesting finding is that there is little difference in emissions due to dual fuel heating as compared to scenario four. Rather, there's a trade-off between emissions from natural gas for space heating, which is part of the purple segment, and emissions from electric generation to electrify that space heating, which is shown in pink.

The other two sensitivities show that an impact can be made to total emissions by changing assumptions around future natural gas generation options. We can also see that in 2042 at the end of the IRP study period, greenhouse gas emissions remain. In order to achieve net zero emissions by 2050 within the sectors shown for scenario four and its sensitivities, customers would need to make further changes to the energy they use for heating and transportation in those remaining eight years. As well, emissions from electricity generation would also need to be reduced. It is possible that in the future, clean fuels like renewable natural gas and hydrogen, as well as other emerging technologies, may be available as additional tools to reduce emissions.

This chart shows the present value of net system costs to provide electricity and natural gas service over the 20 year IRP study period. Once again, these are considered very high level indicative estimates and are intended to allow for comparison between scenario four and the three sensitivities. It should also be noted that these are utility costs and don't factor in costs or benefits to customers related to their future energy choices such as cost to customers of equipment they may need to purchase.

This chart shows similar information to what was presented for the four scenarios previously. Focusing first on the left two columns for each scenario, we've shown total capacity and annual costs for 2042 and compared them to 2022. Here we see a similar relationship as we did when looking at the four scenarios, that electric capacity and total cost are closely tied. This is particularly evident when comparing scenario four with the dual fuel sensitivity where both capacity and costs are significantly reduced.

The second two columns for each scenario show energy supplied, including electricity and natural gas, as well as cost per unit energy. Here we see the cost per unit energy for the dual fuel sensitivity is substantially lower while the unit energy costs for the two sensitivities related to natural gas generation result in increased cost. Once again, these percent increases do not include the impact of inflation.

One last graph for sensitivities. This one shows the general relationship between emissions and cost when comparing the three sensitivities with scenario four in 2042 versus 2022. Of note with this chart is that there is a significant difference in cost between the dual fuel sensitivity and scenario four with little difference in overall emissions. This analysis suggests that dual fuel heating may be a cost-effective means of reducing Manitoba's emissions because it can avoid costs associated with new electricity resources in order to provide capacity. This is consistent with findings and other jurisdictions.

Emissions could be further reduced through restricted gas generation usage or the use of carbon capture and storage technology, but it would cost more to achieve these lower emissions. In summary, first, dual fuel programs have the potential to reduce emissions at a lower overall cost, avoid the level of investment associated with scenario four, make better use of existing grid infrastructure and allow for future investment and availability of alternative fuels or the application of other space heating technologies to facilitate further emission reductions.

Second, emissions from electricity generation can be reduced by limiting thermal usage for energy or by using carbon capture. However, this would increase net system cost. Third, the economics of carbon capture result in the increased use of natural gas thermal generation rather than building wind resulting in increased net system costs.

So as I mentioned earlier in our discussion, there are other sensitivities we plan to investigate as well beyond those for which we presented information today. The first of these is demand response. Demand response measures are being explored to assess the cost effectiveness of reducing electricity use during peak demand hours in the winter. Examples of demand response measures include managing EV charging loads, time varying rates, and controlled thermostats for electric heat. Further analysis of energy efficiency measures is also planned using different assumptions about costs, for example.

Examining the impact of market price projections will help to understand impacts to exports and imports as well as gas commodity costs. We're also planning to look at different levels of solar customer self-generation, as well as select climate change impacts on the physical environment like warming temperatures and changes to water flows. The impact of not building any new natural gas generation is also of interest and something we're looking into.

We'll now review our initial modeling results with a summary of observations. We've summarized the information presented on the initial modeling results into four high level points. One, electrification is a means of decarbonization results in customers needing significantly more electricity, and this was shown in the electric and natural gas load projections for each scenario, particularly scenario four. Two, all scenarios resulted in increased winter peak demand, new generation capacity resources, as well as impacts on transmission and distribution requirements, and this was shown in the initial results for resources and cost.

Three, there are many options to reliably meet long-term needs and future choices will have significant impact on cost. This was shown through our sensitivities around future resource options and customer choice on dual fuel. Four, strategic use of natural gas can reduce overall greenhouse gas emissions and mitigate cost impacts. This was shown through investigation of the sensitivities.

On behalf of our IRP team, we'd like to thank you for your participation in our process. Before we close out this presentation, we want to share the next steps in our process with you. As we move on to our next step of developing our roadmap and near term actions, we first need to finish our current step of modeling and analysis. We will be taking your input and feedback to help shape any additional sensitivities to model. We will also complete our post modeling analysis. We will then use this information to develop our roadmap and near term actions.

The next round of engagement is planned for the spring of 2023. We are expecting to have our preliminary outcomes by that time ahead of publishing the final IRP report in the summer of 2023. The development of an IRP is a repeatable process. It is not a one-time occurrence and is expected to be completed on a recurring basis. The 2023 IRP, Manitoba Hydro's first comprehensive IRP, is a foundational step towards planning for the future energy needs of our customers. It will not provide all answers.

It will be critical that the IRP roadmap has the flexibility to adapt as the future unfolds so that we can continue to leverage new technologies and solutions. When specific investments are needed to meet future energy needs, these will be brought into the analysis of future IRPs. Existing processes to review and approve investment decisions and actions will still be followed. Thank you again for your participation today and if you have any questions following this session, please send them to us at irp@hydro.mb.ca.