DETAILED DESIGN

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Market Renewal Program: Energy

Reference Levels and Reference Quantities

Responses to Stakeholder Feedback

February 2021

This document details the IESO responses to comments received from stakeholders during the reference levels and reference quantities engagement.

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Responses to Stakeholder Comments

ID	Stakeholder	Comment	Draft Total Response
1	Northland Power	Cell A3 and B3 on tab "CostComponentsCT" - Reference Conditions for the Heat Rate curves & Ambient Correction Curves Can the IESO explain what granularity it expects resources to provide this information. The variables that would impact heat rate is not only temperature but also humidity. A hot summer day of 30C with low humidity vs. high humidity will have different effects on overall capability. Similar to form 1230, I would suggest the IESO limit the granularity to every 5-10 Celsius chunks. Getting too granular will only create more problems than benefit.	Market participants will provide incremental heat rate curves at specified conditions. Market participants must provide historical data and compute the fuel consumption based on the incremental heat rate curves to calculate the theoretical fuel consumption during the same period and conditions as the historical data. The ratio between the actual fuel quantity divided by the theoretical fuel consumption will determine the seasonal performance factor, which will take into account degradation and ambient conditions. Humidity is accounted for in the reference level via performance factors. Section 2.4.3 has been edited to clarify the relationship between ambient conditions and the performance factor. The historical study period for performance factors has also been extended to 5 years so that reference levels more accurately account for the impact of ambient conditions on reference levels.

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2	Northland Power	Cell G3 on tab "CostComponentsCT" - Start-Up Emission Costs (hot, cold and warm start) Will the IESO be applying the same methodology as the RT-GCG Framework team has recently proposed in dealing with emission costs during start-up?	The RT-GCG start-up emissions determination is based on the liabilities that arise pursuant to the applicable legislation that will apply for emission pricing based on actual fuel consumed. Start-up emissions costs in the reference level calculation will use the estimated fuel quantities for start-up fuel to estimate the marginal costs per start.

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3	Northland Power	Cell G4 on tab "DefnCostComponentCT" - Start-up Operating and Maintenance Cost It states that "Costs associated with operating and maintenance of the resource during start-up of the resource from start initiation up until MLP as submitted in in Section E" If the intent is to capture costs incurred as a result of starting, then the IESO needs to look at the period of a cycle and not just the period from initiation to MLP which applies to the RT-GCG program. I don't see the relevance to identifying only costs from initiation to MLP when considering the incremental O&M costs incurred during a cycle. Part of this would be answered if the IESO could point to the section where generators are able to get cost recovery for the costs outside of the period from "initiation to MLP". However, I don't see where that is captured. For e.g. the period from the end of MGBRT to shutting down completely. Prior to the RT-GCG Framework where costs were pre-approved, generators would typically submit their per start cost as defined in their respective CSA/LTSA's. However in the RT-GCG Framework the IESO determined that not all of those costs are incurred during the period from initiation to MLP. Instead only a portion of those costs are. I don't think it was ever disputed that there were costs greater than what the IESO was pre-approving because generators could demonstrate that they were getting billed for those costs and were paying those costs, however it was that some of the "wear and tear" was occurring outside of the eligible period. Here you have an example of where a generator needs to get cost recovery for all variable O&M during their entire operation – known as cycling costs, however there isn't really a place to get this costs validated if not in the start-up cost section. So while the section could stay named start-up costs, I believe the costs that should be permissible in this section are the variable O&M costs during the cycling period.	As discussed in section 2.5.1.6, allocation of eligible operating and maintenance costs between energy, speed no-load and start-up reference levels can vary from resource to resource. A defined point for start-up costs is necessary for establishing fuel quantities associated with a start. The list of eligible costs in the written guide is not exhaustive. MPs can submit any eligible costs to IESO with supporting information. The IESO will evaluate the eligibility of these costs on a case-by-case basis. The IESO notes that there are fundamental differences between the RT-GCG program and MPM reference levels. RT-GCG is a cost-guarantee program whereas reference levels are based on short-run marginal costs of the resource.
4	Energy Storage Canada	Clarification on Detailed Design and Implementation Phase for Energy Storage Resources The Interim Storage Design is expected to be implemented in Q1 2021 per the IESO's now concluded Storage Design Project (SDP). While the draft Detailed Design documents have been provided for stakeholder review and commentary over the course of the past year, none of the Detailed Designs specifically account for energy storage market participants directly. Throughout the Detailed Design phase, several stakeholders have sought clarification from the IESO regarding the coordination of the MRP and the Interim Storage Design. While the IESO has suggested that there continues to be coordination between the SDP and MRP, details of such coordination have yet to be shared with industry stakeholders for input. As such, there are questions about whether aspects of the MRP Detailed Design need to be clearly linked, coordinated, or clarified given the Interim Storage Design. Given the IESO has yet to clarify its approach for aligning the Interim Storage Design and the MRP, we find consultation on reference levels and reference quantities to be premature.	The IESO will update the reference level design to account for changes resulting from the Interim Storage Design as part of a later batch of work.

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5	Energy Storage Canada	Consideration of Non-Pumped Storage Aside from pumped storage, there are very few energy storage resources participating in the IESO-administered Markets (IAM). While we anticipate greater participation of energy storage resources in the IAM over time, it is not clear how much energy storage, and of which technologies, will come online and register to participate in IAM in the future, and whether those storage resources will be of sufficient scale to be subject to the Market Power Mitigation framework. We therefore consider it to be premature to define the cost components for multiple technologies within this framework. In the future, if there is a non-pumped storage facility that is ready to be commissioned and registered in the IAM, it would be appropriate to establish reference levels and reference quantities at that time.	All dispatchable resources that supply energy or operating reserve are subject to market power mitigation for economic withholding, regardless of size.
6	Ontario Power Generation	The IESO indicated in its response to the Grid & Market Operation Integration Detailed Design Document comments that many of the hydroelectric parameters available to the Pre-dispatch and Day Ahead calculation engines could not feasibly be included in the Real Time calculation engine. The IESO stated that instead, "Market participants can manage the opportunity cost of balancing real-time deviations from DAM schedules by adjusting their offer prices in the hours that starts are scheduled. Submitting higher opportunity costs to reflect the additional use of starts, in effect, provides a way for the real-time calculation engine to consider whether additional starts should be used now or saved for subsequent hours." OPG agrees that if the new hydroelectric parameters cannot be integrated into the RT Calculation Engine, the additional costs required to manage operational constraints will by necessity need to be reflected as an opportunity cost in the reference levels. While the opportunity cost calculation as outlined by the IESO addresses some technical restrictions, it does not fully address all opportunity costs. For example: a. Good utility practice dictates that hydroelectric resources reserve at least one hour of energy for use in system contingencies and OR activations. The IESO should consider the system value of such contingency energy in reference levels. Such energy needs to be either offered as a different category or at a high enough price to reflect its value and avoid dispatch outside of contingencies. b. If a resource has only one unit hour of energy available, the energy could be scheduled as one hour of energy, or as many hours of OR (extending for the entire duration of its storage horizon). The opportunity cost for that quantum of energy should reflect the total OR revenue that an energy dispatch would cause it to forego. c. Similarly, resources with a Maximum Number of Starts Per Day (MNSPD) incur energy and OR opportunity costs. For example, if a resource exhausts its MNSPD by HE6, it will be unable to provide OR for the remaining hours of the day. The reference level will need to capture a higher offer price that reflects both lost opportunity costs for OR as well as any energy costs. d. Cascade resources incur an opportunity cost for all stations in the cascade. When an energy dispatch at one generating station requires the other stations to generate or spill due to SEAL restrictions, all stations on the cascade incur an opportunity cost. These multiple opportunity costs will need to be included in the reference levels at each station.	The IESO is considering the opportunity costs described. Any method for calculating additional opportunity costs will need to target the underlying concern in a manner that can be feasibly implemented.

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7	Ontario Power Generation	The IESO should present worked examples of both the Storage Horizon and Intra-day Opportunity Cost calculations to assist MPs in understanding the workbook. The sample table of LMPs provided in section 2.4.6.2 was helpful, but OPG believes that a fully worked example in the implementation phase would allow MPs to provide more insightful feedback.	Examples of the calculation of opportunity costs have been added to sections 2.4.6.2 and 2.4.6.3 of the written guide.
8	Ontario Power Generation	Section 2.4.6 Opportunity Costs Volatility OPG recommends that the Opportunity Cost adders include a real time volatility index based on individual interval prices. Each interval's dispatch can require a hydroelectric resource to synch or de-synch, generate water reserved for later in the day, or cause additional cascade impacts. The resource incurs an opportunity cost in all of these situations, and the IESO's current calculation does not consider that interval prices can be higher than the average hourly price. For example, an interval priced at $60 / MWh may drive dispatches at a hydroelectric resource, but the hourly price that is used by the opportunity cost calculation may be much lower. The opportunity cost adder needs to consider this real time volatility if it is to accurately represent costs for generators.	The opportunity cost that is created in the event that hydro resources are dispatched up in the real-time market is only positive when the Daily Energy Limit is binding and using fuel in an earlier hour prevents supplying energy later in the day. This opportunity cost is addressed via the intraday opportunity cost, based on day-ahead pricing.
9	Ontario Power Generation	Section 2.4.6 Opportunity Costs Storage Horizon Opportunity Cost (Clarity Required) Please provide clarity on the definition and registration process for the storage horizon. OPG interprets this term to describe the maximum length of time in days that a resource can store energy before operational restrictions require it to generate that energy. For a hydroelectric resource, such a value varies substantially with water conditions, discharge from upstream stations, and regulatory requirements - all of which may change hourly. Requiring this value to be updated regularly by market participants seems overly complex and of little benefit. For simplicity, OPG recommends that the storage horizon value included in the workbooks reflects the maximum storage horizon (i.e., under low-flow conditions).	The IESO has updated Section 2.4.6, "Opportunity Costs", with the definition of storage horizon which will be used to determine opportunity costs for eligible resources.
10	Ontario Power Generation	Section 2.4.6 Opportunity Costs Storage Horizon Opportunity Cost (Seasonality) OPG appreciates the IESO's work to update the Opportunity Cost calculation to include the Storage Horizon opportunity cost and Intra-day Opportunity Cost. By using the previous 28 days' LMPs as an input to the calculation, the new formula will likely correlate better with market prices. However, the look back period results in inaccurate opportunity costs during any period where market prices are significantly higher than they were in the historical study period. For example, at the beginning of summer or winter, prices are higher than in the shoulder seasons preceding them. This results in low opportunity cost adders that do not capture the higher market prices that historically occur during summer and winter. To partially mitigate this issue, OPG is recommending that the IESO considers: I. a 90 day look back period, and / or II. a multiplier that accounts for seasonal price variations.	Using a 90-day look-back period would make the delay between step changes in prices and the matching change to the opportunity cost calculation longer. A shorter, 28-day look-back period results in determining the opportunity cost using more current prices. In regards to a multiplier that accounts for seasonal price variations, the use of the price forecast in the opportunity cost calculation is intended to capture these seasonal price variations.

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11	Ontario Power Generation	2.4.6 Opportunity Costs Storage Horizon Opportunity Cost (Use of NY Zone A) The storage horizon opportunity cost calculation uses the ratio of NYZA forward DAM prices to settled DAM prices to calculate the On-Peak and Off-Peak multipliers. OPG assumes the intention of this factor is to adjust for differences between forecasted LBMPs and settled LBMPs in Ontario. OPG agrees that a basis to account for forecast errors is necessary. However, the structural differences between Ontario and New York's markets may cause the chosen measure to be inaccurate. For example: I. Differences between each market's generation fuel mix may lead to differences between forward/settled bases. II. Ontario is currently a net exporter, while Zone A receives imports from Ontario and flows directionally eastward to Zones G, J, and K. III. The Ontario DAM timeline is not aligned with NYISO DAM timelines (which closes at 05:00 EPT). This is significant because the NY DAM is solved prior to Next Day Gas trading later in the morning which ultimately determines the physical gas price. Every market has dynamics that may not reflect those in Ontario and relying on a single zone's price might lead to inaccurate opportunity costs. OPG suggests that a better approach would be to also include price data from Ontario, MISO Indiana Hub and PJM West Hub. A broader selection of data might resolve the issues with using a single zone in the calculation.	The IESO will include MISO Michigan Hub prices and NY Zone A prices in the opportunity cost calculation as both the Michigan-Ontario and NY-Ontario interties are Global Market Power Interties. As such, they are: (i) connected to another wholesale electricity market; and (ii) are able to provide an effective competitive discipline for market participant behaviour. The IESO will not include PJM West Hub prices as that hub is not directly related to Global Market Power Interties.
12	Ontario Power Generation	2.4.6 Opportunity Costs Storage Horizon Opportunity Cost (On- & Off-Peak Multipliers) OPG suggests that the use of unique multipliers for On- and Off-Peak hours may not reflect current dynamics in Ontario. Penetration of variable generation has led to a more complex price profile, often leading to a midafternoon "drop out" period caused by embedded solar. OPG understands that there may be practical factors that make On- and Off- Peak multipliers easier to implement, but the IESO should review the efficacy of such measures on a regular basis and adjust accordingly.	The IESO will continue to use "peak" and "off-peak" delineations as those are consistent with current practice. The IESO will monitor the performance of this approach on an ongoing basis and will make changes as appropriate.
13	Ontario Power Generation	3.4.1.6 MGBDT (Thermal) Clarity on Acceptable forms of Documentation In the IESO's response to stakeholder feedback on the August 27 Reference Level Guide, the IESO states: "Market participants must provide minimum generation block down time and supporting documentation with recommendations from the OEM on minimum time required for the resource. This documentation that shall include the resource shutdown curve and relevant limitations on the equipment recommended by the OEM before the resource can be restarted after a shutdown." This requirement seems inconsistent with the IESO's statement that they would in general accept: "...documentation developed by the relevant market participant, evaluated on a case by case basis by the IESO." Please clarify for which cost categories the IESO will require OEM documentation and / or recommendations.	Market participants should provide supporting documents from an OEM where possible. Where such documentation does not exist, market participants may submit internal documentation that will be evaluated per section 2.3 of the written guide. The written guide will be updated to reflect this language.

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14	Ontario Power Generation	4.2.4 Energy Reference Quantity for Hydroelectric Resources Registration of minimum headbase capability OPG appreciates the IESO's work updating the Energy Reference Quantity calculation to align with the minimum head-based capability of the resource. This value is more accurate and simpler than the DEL-based proposal in the August 27 pre-reading document. Please explain how the minimum head-based capability will be registered and the process for updating this value. Will this term be strictly limited to use in MPM or will it be used by the calculation engines?	The minimum head-based capability for each dispatchable hydro resource will be determined during the reference quantity registration process. The value of head-based capability will impact the registered reference quantity and will not be used directly by the calculation engines.
15	Ontario Power Generation	4.2.4 OR Reference Quantity for Hydroelectric Resources OR Reference Quantities should ben based on minimum head-based capability The proposed OR reference quantity calculation is based on four different (winter/summer on-peak/off-peak) OR ramp rates. Most hydroelectric units, however, are limited by energy capability, not ramp rates. To simplify the calculation, OPG proposes the use of a single OR reference quantity based on a resource's minimum headbased capability and adjusted for operational restrictions that might limit OR capability. This is similar to the energy reference quantity, and better reflects the changing capabilities of hydroelectric resources. De-rates to a resource's OR capability could be communicated to the IESO via Ancillary Service or Protection Out of Service (ASPOOS) slips. The IESO indicated they were open to the use of ASPOOS slips for OR de-rates in Comment #212 of their response to feedback on the MPM detailed design document.	The IESO will use the minimum head-based capability for each dispatchable hydro resource as the reference quantity for operating reserve for hydro resources.
16	Ontario Power Generation	4.2.4 OR Reference Quantity for Hydroelectric Resources 10S and 10N Operating Reserve Quantities should be credited for other categories In the current market, participants offering 10S operating reserve can be scheduled for 10N and 30R operating reserve. If the IESO continues to make use of this flexibility after Market Renewal, it should be reflected in the operating reserve reference quantities. This would simplify calculations, as a resource offering 10S OR in excess of its 10S OR reference quantity could be credited as offering 10N and 30R categories. Similarly, 10N offers above the 10N reference quantity should be credited for 30R.	When the IESO carries out the conduct test for physical withholding for operating reserve, the cascading nature of 10S, 10N and 30R operating reserve will be reflected. 10S offers will be credited as offers of all three operating reserve products and 10N offers will be credited as offers of both 10N and 30 operating reserve. This approach will be reflected in the Market Power Mitigation Framework Market Manual.
17	Capital Power	Economic terms and principles used to guide the development of market rules should be defined with an appropriate amount of detail to provide meaningful guidance for all stakeholders. For example, terms such as "unrestricted competition" should be defined in the context of the IESO Administered Market ("IAM").	The conditions that make a resource eligible for testing for market power mitigation represent the IESO's view of how competition is potentially restricted in the IESO-administered markets. Unrestricted competition means the counterfactual market condition absent the relevant condition. The IESO will update the terms that are defined under the Market Rules as part of Market Renewal.

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18	Capital Power	Design decisions and resultant market rules must provide a reasonable opportunity to earn a competitive return, which includes the opportunity to recover costs.	Reference levels are based on the short-run marginal costs of a resource. Costs that vary as a result of incremental supply of energy or operating reserves are eligible to be included in reference levels. Reference levels are not part of a cost-recovery program such as the RT-GCG.
19	Capital Power	Materials provided to stakeholders should explain how changes to the IAM are expected to impact or interact with design decisions being considered under what is now the Resource Adequacy engagement. This detail is necessary so that all stakeholders may understand the overall impact of market rule changes to fleet operations and economics (i.e. available mechanisms and opportunities to earn a return of and on capital).	The IESO's Resource Adequacy stakeholder engagement provides the opportunity for dialogue regarding Ontario's future resource needs and procurement. The IESO is co-ordinating between Market Renewal and the Resource Adequacy engagement and will align design on an ongoing basis as appropriate.
20	Capital Power	The continued advancement of sound market design requires ongoing efforts by both the IESO and stakeholders to openly consider the economic function of the IAM under MRP, the effect of future changes on commercial operations, the need for a Resource Adequacy framework capable of incentivizing efficient and competitive investment, and a commitment to transparent planning and forecasting activities.	The IESO is co-ordinating between Market Renewal and the Resource Adequacy engagement and will align design on an ongoing basis as appropriate.
21	Capital Power	The process for updating the effect of ambient conditions on performance factors should be automated. Given the wide variations that will occur in heat rates and output based on ambient conditions, the performance factors in section B.3 should be automatically updated to reflect known changes deemed to affect output. Capital Power also suggests the IESO consider setting a seasonal reference level for Summer and Winter, and allowing for a sufficient tolerance band to reduce unnecessary administrative burden on both the IESO and the market participant.	The IESO will not automate data input of ambient conditions as the market power mitigation framework already accounts for ambient conditions in a number of ways, such as performance factors, seasonal reference levels and broad conduct thresholds that allow for variances in ambient conditions. Section 2.4.3 has been edited to clarify the relationship between ambient conditions and the performance factor. The historical study period for performance factors has also been extended to 5 years so that reference levels more accurately account for the impact of ambient conditions on reference levels.
22	Capital Power	The Market Power Mitigation ("MPM") threshold of $25 dollars should be automatically updated where there is a change to the cost inputs used to derive the threshold. The $25 threshold appears to be set based on offer behavior from thermal resources in recent history. This level may be appropriate given recent natural gas prices, foreign exchange, and carbon prices but these variables are expected to fluctuate over time. Capital power recommends the threshold be designed to reflect durable trends reflecting changes in the prices for natural gas, carbon, and currency.	The $25 no-look threshold is consistent with practice in other jurisdictions and is consistent with historical prices in Ontario. The IESO will observe the performance of the market power mitigation framework on an ongoing basis and the framework may be modified via the Market Rule amendment process where appropriate.

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23	Capital Power	Incremental heat rate curves need should not limit a resource's ability to reflect its economics through its offer laminations, which, are required to be monotonically increasing. For a thermal Generator, the heat rate curve will indicate the least efficient point on the curve is at minimum load. A generator may become more efficient as the output rises to their maximum output (up to duct burner) but price quantity pairs must be monotonically increasing. It's not understood how the IESO will apply reference levels for output above MLP given the limits on offer structures and a participant's inability to know ahead of time what output level they will be scheduled at Capital power recommends that the only a MLP reference level should be established.	Reference levels, similar to offers, will be monotonically increasing in quantity offered. Where the short-run marginal costs for a range of MWs are not monotonically increasing in quantity, the reference level will be set based on the highest cost for a given quantity range. For example, for a 100 MW thermal facility, if the short-run marginal costs for 0 - 50 MW is $100/MW and the short-run marginal costs for 51 - 100 MW is $40/MW, the energy reference level for 0 - 100 MW will be set to $100/MW (the highest cost for the MW range 0 - 100 MW). The IESO will not only approve a reference level for MLP energy. The IESO will approve a reference level for the range from 0 to the maximum generation capacity for a resource, as market participants could otherwise exercise market power via incremental energy offers above MLP.
24	Capital Power	Fuel commodity cost for Quick Start Thermal Units must reflect real-time fuel pricing. Quick start units will not be committed in the DAM timeframe and these units receive schedules in real-time, under short notice. More flexibility is required around establishing a reference index where fuel must be procured intra-day as these units are not able to estimate their fuel usage in the day ahead time frame.	As discussed in section 2.5.1.5 of the written guide, market participants may request use of either a different fuel index, or a modification to use the Dawn hub price to account for distance from the Dawn hub. These modifications will be evaluated on a case-by-case basis. Where a methodology is supported by relevant documentation and appropriately reflects the relationship between the Dawn (or other) trading hub and the resource, it will be eligible for use.
25	Capital Power	Foreign Exchange Certain costs used in establishing reference levels may be denominated in USD. It is unclear from the design documents if the reference levels will be adjusted daily based on foreign exchange rates.	For the purposes of reference level cost submissions, conversion to CAD from another currency will be based upon the applicable end of day foreign exchange rate as posted by the Bank of Canada on the day of synchronization. This clarification will be added in the written guide.
26	Capital Power	Independent Review Process A number of questions remain outstanding regarding the Independent Review Process ("IRP"). Capital Power expects that answers to these questions will need to be reviewed and discussed further as part of future engagements. Outstanding issues and questions include: • On what basis has the IESO concluded that the costs of the IRP should be shared? From the detailed design itself, it is not clear why market participants would be required to contribute to the costs of independent review.	Allocation of the cost associated with carrying out the independent review process is an issue that is yet to be determined. This issue will among the issues that will be discussed in future stakeholder engagement on the independent review process.
27	Capital Power	• Will market participants have input into selecting the roster of approved consultants? As proposed, there are readily apparent governance concerns with an independent review process that would limit the appointment of an independent reviewer to those firms pre-selected by the IESO.	This issue will be among the issues that will be discussed in future stakeholder engagement on the independent review process.
28	Capital Power	• What is the process for determining the assignment of an independent reviewer to a market participant's submission?	This issue will be among the issues that will be discussed in future stakeholder engagement on the independent review process.
29	Capital Power	• Does the market participant bear the risk that an independent reviewer may recommend more restrictive parameters than agreed to prior to initiation of the IRP?	This issue will be among the issues that will be discussed in future stakeholder engagement on the independent review process.

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30	Capital Power	• Can the IESO confirm that the details of the IRP will be set out through an amendment to the market rules?	The IESO confirms that the Independent Review Process will be set out through the Market Rules and Market Manuals.
31	Atura Power	Section 2.2 • Says to refer to section 2.5 for historical study period length. Section 2.5 for thermal states that for Major Maintenance it is one major maintenance interval and for Scheduled Maintenance, Unscheduled Maintenance, and Operating Consumables it is 5 years. For Unscheduled Maintenance it could be difficult to find representative costs.	For an eligible cost to contribute to a reference level, market participants must provide supporting documents. Where a market participant does not have any supporting documents, that cost will not contribute to a reference level. NTD: Given recent design discussions, this response should be updated to read as follows: This issue will be among the issues that will be discussed in future stakeholder engagement on the independent review process.
32	Atura Power	Section 2.4.4 • "Only portion of O&M costs incurred as a result of providing incremental supply of energy or operating reserve is eligible". Why aren't fixed costs eligible?	Reference levels are intended to support efficient energy market outcomes. Such outcomes are achieved from offers representing costs that vary with incremental production (short-run marginal costs), not costs that are considered fixed. The IESO's Resource Adequacy stakeholder engagement can provide the opportunity for dialog regarding Ontario's future resource needs and procurement.
33	Atura Power	Section 2.4.4.3 • "If the system or equipment is needed to remain in-service when the resource is not in operation, expenses related to such system or equipment cannot be included." This statement seems too broad – what about switchyard costs, DCS costs, etc. There are many systems that should be included in O&M costs that are in-service when the plant is not producing power.	Costs that are still incurred at the same rate when the facility is offline do not vary with supply of energy or operating reserve. Only short-run marginal costs, those costs that vary with incremental supply of energy or operating reserve, are eligible to be included in reference levels.
34	Atura Power	Section 2.5.1.5 Total Fuel Related Costs • Performance factors are the calculated ratio of actual fuel burn to either theoretical fuel use (design heat input) or the most recent heat rate performance test i. What is the IESO looking for here? Actual fuel burned during past operation? At what load? What about degradation? ii. What ambient temperatures are assumed for summer and winter?	i) Market participants must provide historical data and compute the fuel consumption based on the incremental heat rate curves to calculate the theoretical fuel consumption during the same period and conditions as the historical data. The ratio between the actual fuel quantity divided by the theoretical fuel consumption will determine the seasonal performance factor that will take into account the degradation and ambient conditions. ii) Market participants will provide an incremental heat rate curve at specified conditions that they indicate for summer and winter.
35	Atura Power	Section 2.5.1.6 Operating & Maintenance Costs • Major Maintenance seems fine, but where are BOP, water treatment, switchyard, etc. costs included? Or is that just part of scheduled maintenance?	The information in the written guide is not an exhaustive list of eligible costs. Balance of plant costs that vary with supply of energy or operating reserve can be submitted as the of Scheduled Maintenance adder. Where balance of plant costs do not vary with incremental supply of energy or operating reserves, they are not eligible to contribute to reference levels.

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36	Atura Power	Section 2.5.1.8 • What about maintenance costs? A gas turbine running at FSNL still incurs either start costs or hours cost (depending on which triggers the maintenance interval).	The speed no load cost in Section 2.5.1.8 refers to fuel consumption that are potentially fixed on an hourly basis. Depending on the resource, heat rate curves may show that there is some level of fuel consumption that is not attributable to incremental production. For example, if a resource had the following heat rate curve and incremental heat rate curve, some fuel cost is fixed and not attributable to incremental production: HR(MWh) = (5*MWh^2) + (2*MWh) + 5 Incremental HR(MWh)= 10MWh + 2 For this resource, the speed-no-load cost of fuel is 5. Another way of explaining the speed-no-load cost in section 2.5.1.8 is that it is the y-intercept of the heat rate curve. The presence of speed-no-load costs in reference levels does not signify that the IESO will model NQS resources in this operating state (synchronized but not injecting). Rather, it is a method to allow reference levels to more accurately match the shape of cost curves, where appropriate.
37	Atura Power	Section 2.5.1.9 • Why wouldn't IESO use actual fuel consumption at FSNL instead of doing a hypothetical calculation?	The presence of speed-no-load costs in reference levels does not signify that the IESO will model NQS resources in this operating state (synchronized but not injecting). Rather, it is a method to allow reference levels to more accurately match the shape of cost curves, where appropriate.
38	Atura Power	Section 3.4.1 • Can the IESO please clarify this paragraph.	***Updated February 18, 2021*** The IESO has updated the text in this section. The new text reads "To determine reference levels that are affected by thermal states, market participants determine the ambient conditions associated with hot, warm and cold thermal state reference levels. These ambient conditions will be used to determine all thermal state-affected reference levels."