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Ottawa Area Regional Planning – Initiating Study or Development Work on Near and Mid-Term Transmission Solutions

Dear Bing,

The purpose of this letter is to:

- Hand off from the Ontario Power Authority (OPA) the lead responsibility for the planning process associated with the near-term transmission components of the Ottawa Region Integrated Regional Resource Planning (IRRP) process to Hydro One, and
- Request Hydro One Networks to initiate the development of wires solutions or implement the near-term transmission component of the integrated plan to meet the near- and medium-term reliability needs of the Ottawa Area.

This is consistent with the regional planning process endorsed by the Ontario Energy Board (OEB) as part of its Renewed Regulator Framework for Electricity.

The Ottawa Area Working Group (Working Group), consisting of staff from the OPA, the Independent Electricity System Operator (IESO), Hydro One and Hydro Ottawa, has been conducting an Integrated Regional Resource Planning (IRRP) process for the Ottawa Area since 2011. The IRRP process develops and analyzes forecasts of demand growth for a 20-year time frame, determines supply adequacy in accordance with the Ontario Resource and Transmission Assessment Criteria (ORTAC) and develops integrated solutions to address any needs that are identified.

While the IRRP process is not yet complete, a number of supply capacity and reliability issues in the near (within 5 year) and mid (5 to 10 years) term have been identified as not meeting the ORTAC planning standards in the Ottawa area. Furthermore, because of feasibility and the nature of the identified reliability issues, it has also been determined that wires solutions are the only reasonable means of addressing the identified needs. In such a situation, the Ontario Energy Board's (OEB) endorsed regional planning process provides for a "hand off" letter from the OPA to the lead transmitter, in this case Hydro One Networks, to initiate the development of wires

solutions. This will permit Hydro One to develop and implement wires solutions to address the near-term needs in a timely fashion and commence early work associated with these solutions for their Regional Infrastructure Plan for the Ottawa area in advance of the completion of the IRRP.

Summarized below are four near-term needs along with proposed wires solutions identified for the Ottawa area by the Working Group for implementation by Hydro One.

1. Improve the reliability performance of Almonte TS and Terry Fox MTS by installing an in-line circuit breaker at Almonte TS on 230 kV circuit M29C between Cherrywood TS and Merivale TS. This work was identified early in the IRRP and is currently underway with a scheduled in-service date of Q2 2015.
2. Provide additional 230/115 kV autotransformation capacity at Hawthorne TS so as to relieve overloading of the existing autotransformers T5 and T6 there. The preferred alternative is to replace these lower rated units with standard 250 MVA units. The increased capacity is required now.
3. Provide increased supply capability for the downtown Ottawa 115 kV network to relieve overloading of the 115 kV circuit A4K from increased demand on this system. The preferred alternative is to rebuild the existing 115 kV single-circuit A6R to a double-circuit and extend it to Overbrooke TS. The need date is 2017.
4. Upgrade a section of 115 kV circuit S7M (the tap to Fallowfield TS) to increase its supply capability in order to supply a large customer load connecting to this circuit in the south Nepean area. The need date is 2019 or earlier.

In addition to the above, Hydro One has advised that the transformers and protection facilities at Bilberry Creek TS are approaching their end of life. Based on a 2020 end of life date for these facilities, a transmission and distribution development plan is required to supply the load served by Bilberry Creek TS either by refurbishing the station or alternately decommissioning the station and serving the load from other stations in the area.

The Working Group has identified these projects to address near- and mid-term needs. However, more detailed study and development work is required before these projects can be implemented. Continued development of these projects is best accomplished by Hydro One leading this effort as a lead transmitter and working with any relevant LDCs, guided by the information and requirements provided below from the IRRP process.

To facilitate the development of the wires solution, the OPA will provide Hydro One with the following information:

- Relevant system base cases
- Demand forecasts
- Conservation and distributed generation forecasts
- Any other relevant information

We look forward to receiving information, results, recommendations and deliverables related to these four near and mid-term projects for the Ottawa area, as part of the Ottawa Working Group activities and continue to work with and support Hydro One on the implementation of these projects.

Best Regards,



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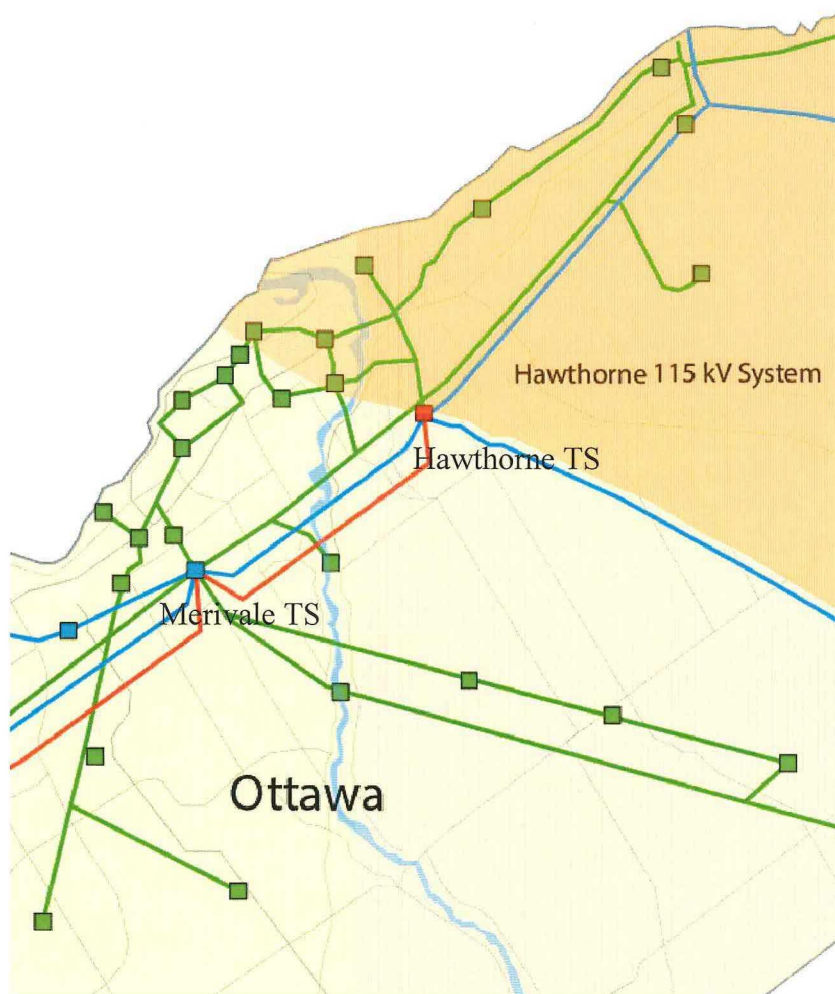
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Attachment 1 – Project Objectives and Scope

Project 1: Hawthorne 115 kV System Autotransformer Upgrade

The 115 kV network in Ottawa area is connected to the 230 kV system through two autotransformer stations, Hawthorne TS, which serves the east half of the Ottawa area and Merivale TS, which serves the west half. The purpose of this project is to increase the 230/115 kV transfer capability at Hawthorne TS in order to meet the forecast load demand in the area while providing a level of reliability consistent with the IESO's ORTAC reliability standards.



There are currently four 230/115 kV autotransformers at Hawthorne TS. They supply about 630 MW of demand in east Ottawa. The 230/115 kV transformation capability at Hawthorne TS is limited by two of the existing autotransformers, T5 and T6. These two autotransformers are smaller in size, each with a rating of 225 MVA, while the other two autotransformers are rated at 250 MVA. Even at today's load level, planning studies done for this IRRP indicate that, following an outage of one of the autotransformers at Hawthorne TS, overload would result on the remaining T5 or T6 transformer under peak demand conditions. Orleans TS, which comes in

service in 2015 and transfer some load from the 115 kV to the 230 kV system, does not provide enough relief for the overloaded autotransformers. After that, continued load growth on the Hawthorne 115 kV system will worsen the overload.

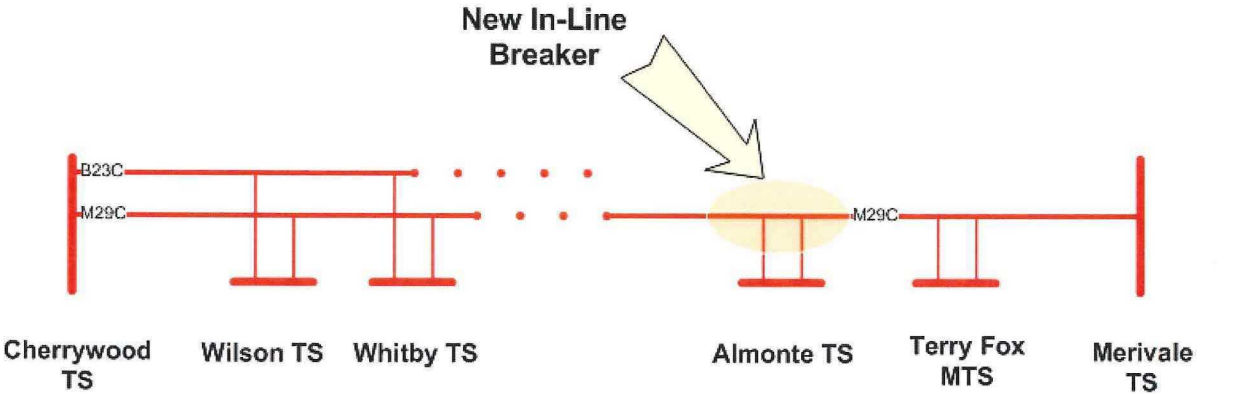
Since the overloading problem exists with today’s load level, local generation option, which requires longer lead time, is not considered viable to address this need. Options of additional CDM were considered. However, significant demand reduction on the 115 kV system in the area will be required to provide sufficient relief for the overloaded autotransformers. 200 MW demand reduction can only provide roughly 10-year of relief on T5 and T6. On the other hand, both T5 and T6 are approaching 60-year-old in next few years. Replacement of these equipments is likely necessary in the near-term. Therefore, with support from the Working Group, the OPA recommends replacing the T5 and T6 autotransformers with 250 MVA units, with an estimated cost of \$14 million. The estimated in-service date is 2017.

Project 2: Almonte in-line Breaker

Circuit M29C is a 320km long line that links Merivale TS in Ottawa to Cherrywood TS in Pickering. The line supplies two DESNs in the GTA, Wilson TS and Whitby TS; and two in Eastern Ontario, Almonte TS and Terry Fox MTS.

While Whitby TS and Wilson TS have a second 230kV supply from circuit B23C, both Almonte and Terry Fox MTS are on single line supply from circuit M29C. Any outage on the circuit - occurring about 7-10 times per year - means a complete interruption of supply to load customers at these two stations.

The Working Group identified the need for a breaker at Almonte early in the IRRP study and Hydro One is currently proceeding with the installation of a 230 kV breaker. This project will improve the reliability of the transmission supply to Terry Fox MTS and Almonte TS by eliminating the exposure of these stations to lightning related outages west of Almonte TS and is expected to reduce the probability of transmission-line related outages at these stations by about 80%.



The Working Group noted that the breaker option does not protect against outages occurring on M29C on the Merivale side of the breaker. However, it does provide substantial improvement in reliability that can be achieved relatively quickly. It does not preclude development of other options that may be considered in the context of a long-term plan for the Nepean/Kanata area.

The reliability problem is due to the system configuration in this area, and is not driven by load growth. Therefore, additional CDM and local generation were not considered viable options to meet this need. This project is scheduled to be in service by Q2-2015, with an estimated cost of under \$5 million.

Project 3: Downtown Transmission Line Rebuild

Downtown Ottawa is supplied by two 115 kV systems as shown in the figure below:

- from Merivale TS in the west through M4G and M5G
- from Hawthorne TS in the east through A4K, A5RK, A6R and A3RM



With forecasted load growth in the downtown area, the main section of A4K, from Hawthorne TS to Blackburn JCT, will exceed planning criteria starting 2017. Upon the contingency of losing the companion circuit A5RK, A4K will experience thermal overload.

This transmission line refurbishment project involves rebuilding a section of A5RK, between Overbrook TS and the junction with A6R, from a single circuit to a double-circuit line, and reconfiguring the supply to Overbrook TS to relieve the A4K circuit.

The Working Group also discussed upgrading the main section of A4K to increase the supply capability of this circuit. However, this would involve upgrading a section that is proximately 8 km in length. In addition, due to the ampacity rating of the existing main section of A4K, upgrading may not provide significant incremental supply capacity to the area. For these reasons, the Working Group did not pursue the option of upgrading A4K.

Other non-wire options were considered. A 29 MW new hydroelectric facility was recently contracted through the OPA's Hydroelectric Standard Offer Program (HESOP). This is a run-of-the-river facility and hence based on planning assumption for run-of-the-river hydroelectric, very little capacity of the facility will be available during peak load condition. In addition, this HESOP facility has the milestone date for commercial operation of 2022. As the overload on A4K starts to arise in 2017, local generation option with this HESOP facility is not considered viable.

Additional CDM, such as Demand Response (DR) was also considered. However, to entirely address this need, over 30 MW of demand reduction will be required in the next 10 years and over 40 MW will be needed by 2032. Since the transmission option involves only refurbishing a short section of an existing line (less than 2 km in length), it would have a lower cost as compare to CDM options.

Therefore, with the support from the Working Group, the OPA recommends that Hydro One initiate work on the project. The cost of this project is currently estimated between \$5 million and \$6 million. Detailed project costs and in-service date will be determined as part of this work.

Project 4: S7M Upgrade

S7M is a 115 kV single circuit originated from Merivale TS. It supplies the Nepean / Kanata area in the west Ottawa. With forecasted load growth in the Nepean south area, the S7M tap to Fallowfield DS is expected to exceed its thermal capacity by 2019. This includes a large customer of Hydro Ottawa with bulk load of 20 MW who has recently requested connection at Richmond DS which is also supplied by the S7M tap, south of Fallowfield DS.

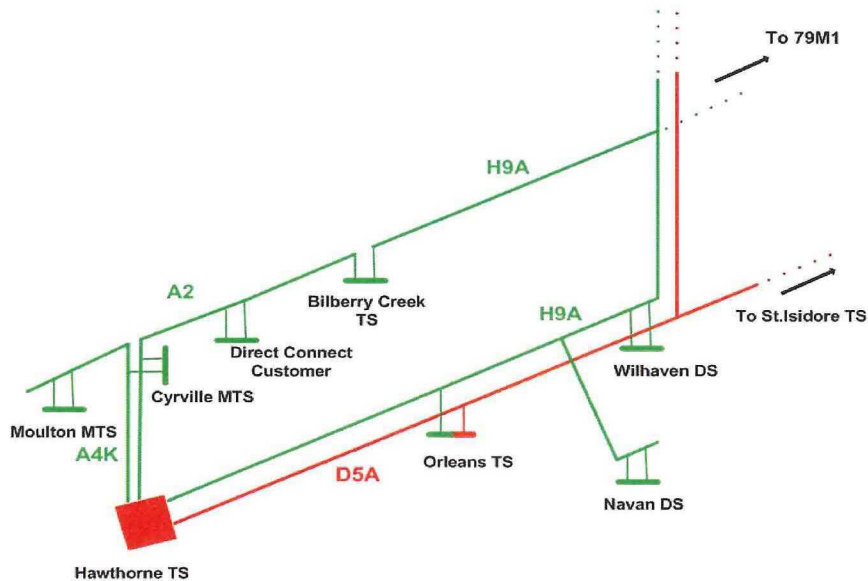
While the Working Group continues to develop options for additional supply to the Nepean south area for the longer-term, upgrading the existing S7M tap to Fallowfield DS is needed in the near-term in order to accommodate the connection of the bulk load customer. With the support from the Working Group, the OPA recommends that Hydro One work with Hydro Ottawa to determine the optimal upgrade configuration and proceed with the development work to upgrade the S7M circuit between STR 673 N JCT and Fallowfield DS.

Development of Transmission Options for Addressing the End-of-Life at Bilberry Creek TS

Bilberry Creek TS is a medium size 115 kV stepdown station located in East Ottawa. It was built in 1964 and is currently supplying about 80 MW of Hydro One Distribution and Hydro Ottawa customer load. Hydro One Transmission, who owns the station, informed the Working Group

that the two transformers and the associated protection system at this station are near their end-of-life. For planning purpose, the end-of-life date is 2020. A decision is needed now to either refurbish the station and maintain the 115 kV system in the area, or decommission the station and transfer its load to other stations in the area by 2020.

Below is a figure showing the current supply arrangement for the East Ottawa / Orleans area.



The primary issue is to replace an end-of-life facility and is not related to load growth. Therefore, other options such as CDM and local generation are not viable to address this need. However, these other options will be considered as part of the integrated solutions for the area in the long-term, after the decision on addressing Bilberry Creek TS end-of-life is made. At this time, more detailed cost and technical information is required by the Working Group in order to make that decision. The Working Group agrees that the study work be handed-off to Hydro One at this time so that more detailed studies can be carried out by Hydro One.