Regional Planning Process Review

Final Report

February 3, 2021

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1. Executive Summary

Background and Objectives

Through the regional planning process, the IESO works with electricity distributors, transmitters, and other stakeholders to assess the reliability of Ontario's regional electricity system and consider cost-effective energy efficiency, generation, distributed energy resource (DER), and transmission solutions. The regional planning function was previously carried out by the former Ontario Hydro and later by its successor companies. While formalization of the process in 2013 was initiated through the Ontario Energy Board's (OEB) *Renewed Regulatory Framework for Electricity* (RRFE), [1] it is considered an industry-owned process. With the involvement of Indigenous communities, municipalities, and stakeholders, the IESO, transmitters, and distributors have successfully carried out the first cycle of the formalized regional planning process for all 21 regions of the province and the second cycle is underway. As a result, numerous integrated plans have been developed to address forecasted electricity system needs. In 2017, the Ontario government directed the IESO to review and report on the regional planning process, taking into account lessons learned from the first cycle, and provide options and make recommendations for improvement.

Opportunities for Improvement

In response to the 2017 directive, the IESO established the Regional Planning Process Review Advisory Group (RPPRAG) and carried out a public engagement to assist in this review. Through advisory group meetings, public webinars, surveys, discussions with planning participants, and learnings from past planning cycles, the IESO identified three key focus areas:

- Improving the efficiency and flexibility of the regional planning process
- Aligning transmission facility end-of-life (EOL) needs with regional planning needs
- Addressing potential barriers to implementing non-wires alternatives (NWAs) in regional planning

The IESO identified opportunities to improve process efficiency and flexibility by examining the existing scope, timelines, roles, accountabilities, and objectives for each step in the process. Of the eight process areas explored, five resulted in recommendations to improve the efficiency and flexibility.

Consideration of transmission facility EOL replacement needs is integral to planning a transmission system. When assets reach EOL, a decision must be made to either replace the asset (like-for-like or right-size) or, in some cases, decommission the asset to meet safety,

[1] The Renewed Regulatory Framework for Electricity Report is available at the OEB's website

reliability, environmental, and customer requirements. While length of life varies, many transmission assets remain in use for 40 years or more – a period during which the functional requirements of the transmission system may change due to evolving customer needs, system conditions, sector trends, government policy, and other factors. Similar to most other jurisdictions in North America, Ontario is in the early stages of a significant asset renewal phase requiring major reinvestments in its transmission equipment. For this reason, it is important that the transmission planning process incorporate facility end-of-life replacement needs.

In recent years, improvements in the costs and capabilities of DERs and energy efficiency (EE), and increasing public awareness of their advantages, have pointed to the potential to use these resources as NWAs to cost-effectively meet system needs and defer the need for new or reinforced infrastructure. The review identified barriers to implementing NWAs throughout the electricity sector in Ontario. These range from how needs and options are studied in the regional planning process, to NWA funding streams and procurement and operational concerns. The review outlines a high-level direction for the sector at large that contextualizes and provides the framework for more concrete near-term recommendations for the IESO. Regional planning must remain in step with regulatory and market changes so that it can take advantage of NWAs as they continue to become more feasible and cost-effective. As such, this review recommends near-term actions to improve how needs are characterized and options are developed in regional planning studies. This review also summarizes other ongoing IESO initiatives that advance NWAs in line with the high-level direction.

Next Steps

The regional planning process relies on the joint participation of the IESO, transmitters, and distributors. Implementing the recommendations identified in this review will require the continued collaboration of all participants and, in some cases, amendments to the process established in the 2013 RPPAG Report, as well as the Transmission System Code(TSC), the Distribution System Code (DSC) and the IESO's licence with the OEB. The recommendations range in complexity and accountability; some are within the IESO's mandate and others fall under the OEB's jurisdiction. As such, the IESO and OEB have collaborated to identify the organization responsible for the review and implementation, if appropriate, of each recommendation. That collaboration culminated in a document[2] issued by the IESO in July 2020, which sets out the organization taking the lead on each recommendation.

Summary of the IESO's Recommendations

The IESO is committed to implementing the recommendations for which it has responsibility, as described in Section 7. While the Regional Planning Process Review formally concludes with this report, implementation of the recommendations is anticipated to proceed over the next few years as the IESO and other planning participants undertake regional planning activities.

[2] The Implementation Plan Leads Document is available on the IESO website

Table 1 | Summary of Recommendations from RPPR

Recommendations
Process Efficiency and Flexibility
1. Streamline and standardize load forecast development
2. Clarify process stages and final products: Integrated Regional Resource Plan (IRRP) and Regional Infrastructure Plan (RIP)
3. Improve integration and coordination of regional planning with related processes
4. Better consider cost allocation during development of a plan
5. Enhance activities occurring between planning cycles
End-of-Life Transmission Asset Replacement
1. Incorporate end-of-life asset replacement information (long and short lists) as an input to the regional planning process
Barriers to Non-Wires Alternatives
1. & 2. Develop tools and methodologies to support need characterization and options development
3. Formalize the stages of the planning process during which NWAs are developed and evaluated
4. Explore non-wires participation in market mechanisms
5. Explore requirements for the operationalization of NWAs
6. Investigate mechanisms for locally targeted energy efficiency
7. Continue testing non-wires performance through Grid Innovation Fund projects

8. Continue capacity building through Grid Innovation Fund projects

Process changes that require further detailed discussions, and are likely to involve material changes to current practices, may not be implemented immediately. In the near term, the IESO will prioritize the actions expected to provide the greatest incremental value for the work required:

- Defining the coordination required between the regional and bulk planning processes
- Formalizing the NWAs evaluation sub-process within IRRPs[3]
- Conducting annual Technical Working Group meetings to review forecasts, monitor developments, and report on previous recommendations for all regions

Recommendations that are led by the OEB (see Section 7) will be subject to separate timelines. The IESO will participate in the RPPAG to advance and support review and implementation of recommendations, as required. The IESO proposes the following actions as priority items for the RPPAG's consideration:

- Incorporating end-of-life asset replacement information (long and short lists) as an input to the regional planning process
- Clarifying the scope of the IRRP and RIP process stages
- Streamlining and standardizing forecasting activities

The IESO will publically share its progress in implementing these recommendations through future planning-related engagement activities.

[3] Includes the near-term activities described in Section 6.5

2. Purpose of the Regional Planning Process Review

2.1 Background

Through the regional planning process, the IESO works with electricity distributors, transmitters, communities and stakeholders to assess Ontario's regional electricity needs and consider cost-effective energy efficiency, generation, distributed energy resource, and transmission solutions. In May 2018, the IESO launched an engagement to seek feedback from stakeholders and participants on lessons learned and findings from previous regional planning cycles and other regional planning development initiatives, such as pilots and studies, that could inform process improvements.

While the formal review was initiated after completion of the first planning cycle, the process has naturally evolved since its formalization in 2013. These changes were the result of the continuous improvement approach advocated by participants and the Regional Planning Process Advisory Group (RPPAG) established by the Ontario Energy Board (OEB) to monitor implementation on an ongoing basis and make process changes based on lessons learned.

Regional Planning Process Advisory Group

Recognizing the need to continuously monitor the process and to identify opportunities for improvements, the OEB established the Regional Planning Process Advisory Group (RPPAG) to continue the work of the Process Planning Working Group (PPWG) that initially created and documented the existing process. The RPPAG consists of representatives from the IESO, a leading transmitter (i.e. Hydro One), local distributors, local interest groups, and other stakeholders (e.g., municipal representatives). The RPPAG is largely focused on enhancements to the Regional Infrastructure Plan (RIP) process (e.g., wires-only planning), as it is the area where the OEB has the legislative authority to make changes. The other stages in the regional planning process – Needs Assessment and Scoping Assessment – are also within the scope of the RPPAG except the Integrated Regional Resource Plan (IRRP). In 2016, the OEB recognized the need to broaden the RPPAG's mandate to some extent to better take the IRRP process into consideration.[4]

Due to the importance of coordinating improvement efforts between the IESO and the OEB on the regional planning process, the OEB made a decision to temporarily place the OEB's RPPAG on hold during the IESO's review of the process. For the purpose of the OEB's consideration of the IESO's recommendations, the OEB initiated a consultation process on December 10, 2020 through the issuance of a letter on Regional Planning Process Review and participation in

[4] The OEB's response to RPPAG is available on the OEB's website

RPPAG[5]. The first step in that consultation process involves re-establishment of the RPPAG.
Ontario Government Directive

- The *Electricity Act, 1998* was amended in 2016 to include a new framework for energy planning in Ontario. This process includes the development of a technical report (Annual Planning Outlook – formerly Ontario Planning Outlook) by the IESO on the adequacy and reliability of electricity resources after considering anticipated electricity supply, capacity, storage, reliability, and demand. The Ontario government would use this technical information to develop a Long-Term Energy Plan (LTEP), which details the policy direction for the energy sector. Concurrently with the release of the 2017 LTEP, the Ontario government issued directives to the IESO and the OEB to develop related implementation plans. The Ontario Government is postponing the release of the next long-term plan to review and update the process. [6]
- A directive to the IESO, issued on October 25, 2017, states that:
- "With respect to the Government of Ontario's objectives of ensuring a flexible energy system delivering efficiency and value to consumers, enhancing reliability, recognizing regional priorities, and ensuring public engagement in the electricity sector, the IESO shall:
- Review and report on the regional planning process, taking into account lessons learned, and provide options and recommendations. The IESO may use existing processes and working groups in its review and consult stakeholders and experts, and, in addition to other details the IESO considers appropriate, shall:
- identify barriers to the implementation of cost-effective non-wires solutions such as conservation and demand management and distributed energy resources, and provide options to address any such barriers, including potential legislative or regulatory changes, as well as options to address local distribution capacity;
- propose approaches for improving the integration of regional planning with bulk system, distribution and community energy planning, and approaches to ensure alignment with market-based approaches;
- include consideration of improved planning for replacement of transmission assets reaching end of life; and
- propose approaches for streamlining the regional planning process."[7]

The directive to the OEB was also issued on October 25, 2017 and states that:

[5] Letter re: Regional Planning Process Review Consultation

[6] Notice on removing the timing requirements for releasing Ontario's next long-term energy plan

[7] Ontario Government Directive October 26, 2017

"On receipt of recommendations from the IESO regarding its review of the regional planning process … the OEB shall identify steps to implement such changes as may be appropriate to improve utility regional planning processes."

2.2 Scope of the Review

The Regional Planning Process Review examines three key areas of focus to explore opportunities and make recommendations for improvement:

Process Efficiency and Flexibility

- Examine process improvements for greater efficiency and flexibility (involving review of inputs, outputs, activities, timelines, engagements, and roles and responsibilities associated with each process stage)
- Consider process coordination and integration with related processes (e.g., bulk system planning, regulatory filings, community energy planning)
- Evaluate how the process might evolve to better adapt to a changing planning context (including growing interest in non-wires solutions, aging transmission assets, and shifts to market-based solutions)

End-Of-Life Transmission Asset Replacement

- Examine opportunities for process improvements to better consider replacement of transmission assets reaching end of life (EOL)[8]

Barriers to Non-Wires Alternatives

- Identify barriers to the implementation of cost-effective non-wires solutions (such as conservation and demand management, and distributed energy resources) within the regional planning process, and provide options to address any such barriers, including potential legislative or regulatory changes, as well as options to address local distributor capacity

2.3 Activities Completed to Support the Review

To inform needs and develop recommendations, the IESO undertook a number of engagement and data-gathering activities, including:

[8] The examination of EOL transmission asset replacement and any subsequent recommendations will contribute to both the Regional Planning Process Review and the ongoing formalization of the Bulk Planning Process.

- A review of the existing regional planning process and recommendations from the OEB's Regional Planning Process Advisory Group
- Research via questionnaires and in-person interviews with IESO staff, and with distributors and transmitters
- In-person interviews and targeted engagement with industry stakeholders
- Establishment of the Regional Planning Review Advisory Group and facilitated discussion in group meetings
- Establishment of the EOL Working Group and facilitated discussion in group meetings
- The launch of an engagement initiative in Q4 2018 to inform and seek feedback from the public through webinars
- Completion of a jurisdictional scan
- Publication of an interim report to identify key areas of focus
- Publication of a report to identify draft recommendations and request stakeholder feedback

Regional Planning Review Advisory Group

The IESO established the Regional Planning Review Advisory Group (RPRAG) in Q3 2018 to support its work on the Regional Planning Process Review. The advisory group is diverse; membership includes representatives from transmitters, distributors, mining associations, renewable energy associations, municipalities, the Métis Nation of Ontario, and the private sector. All topics explored through this engagement and documented in this report were presented to and discussed with the RPRAG. RPRAG meetings enabled cross-functional discourse in support of identification of lessons learned based on their unique perspectives and experiences, prioritization of recommended improvements to the process, and other valuable input. In addition, RPRAG members advised in support of the following:

- Key regional planning process areas of focus for enhancement
- Potential barriers to implementing non-wires solutions in regional planning
- Opportunities for potential coordination between bulk system planning, community energy planning, regional planning, and market mechanisms
- The development of a coordinated, cost-effective, long-term approach to replacing transmission assets at end of life
- Engagement approaches and materials, where appropriate

Transmission Asset EOL Replacement Working Group

The IESO established the Transmission Asset EOL Working Group in Q4 2018 to identify opportunities to better consider the replacement of transmission assets reaching EOL. This

working group is composed of transmitters, distributors who own transmission assets, and the OEB (observer).

Targeted Engagement on Barriers to Non-Wires Alternatives

In addition to consultation efforts described previously (such as through the RPRAG), the IESO sought input from the Market Renewal Working Group – Non-Emitting Resources Subcommittee (NERSC) and the Energy Storage Advisory Group to help identify barriers and develop recommendations.

2.4 Developing Recommendations

Throughout this review, the IESO has used feedback from the RPRAG, Transmission Asset EOL Replacement Working Group, NERSC, and public webinars to develop recommendations aimed at improving process efficiency and flexibility, better coordinating transmission asset EOL needs in planning, and addressing barriers to non-wires alternatives (NWAs). While formalization of the regional planning process was initiated through the OEB's Renewed Regulatory Framework for Electricity (RRFE), the function itself is considered to be industry owned.[9] For this reason, soliciting input and engaging industry participants was an essential part of developing recommendations for this review. For the same reason, implementation of these recommendations will require the collaboration of various industry participants.

Ontario Energy Board

The OEB did not have a direct role in developing the specific steps of the regional planning process. As indicated in its RRFE Report, the OEB concluded an effective regional planning process would be best achieved by turning to the relevant industry stakeholders to build on their practical experience and therefore convened a stakeholder working group (i.e., PPWG) to prepare a report that set out the details of the process and designed the related outputs. After the PPWG Report was completed it, it was endorsed by the OEB and the OEB then established the RPPAG to continue the work of the PPWG by monitoring implementation and making refinements based on lessons learned. However, the OEB did play a direct role in placing obligations on industry participants in the process to hold them accountable for following the process, meeting timelines and sharing the required information by amending its regulatory instruments (i.e., TSC, DSC, IESO licence). Since implementation of any recommendations resulting from this review would result in changes to process, amendments to the PPWG Report and the OEB's applicable regulatory instruments may be required. As a result, the OEB will also be taking a lead role in implementing the recommendations.

The IESO and OEB have therefore collaborated to identify the organization responsible for the review and implementation, if appropriate, of each recommendation made in this report.

[9] OEB's Renewed Regulatory Framework for Electricity Report

3. Overview of Regional Planning

3.1 Purpose of Regional Planning

Ontario's Formalized Regional Planning Process

The former Ontario Hydro conducted regional supply planning for the province until the restructuring of the electricity industry in 2000, following which the process was conducted on an "as needed" basis by transmitters. The former Ontario Power Authority (OPA)[10] began planning activities in 2005 to address electricity supply adequacy and reliability needs.. In the ensuing years, it initiated a number of integrated regional plans in areas of the province where needs were identified. These plans were conducted on a voluntary basis with technical working groups consisting of the former OPA, LDCs, the transmitter, and the IESO.

In 2012, the Ontario Energy Board (OEB) released its Renewed Regulatory Framework for Electricity (RRFE), [11] a report that included direction for developing a more formalized process for regional planning. To achieve this, the OEB convened a Planning Process Working Group (PPWG) to create a structured and transparent regional planning process. The PPWG released its Working Group Report to the Board in May 2013, detailing this new process. After the OEB endorsed the report, the process was formalized through changes to the Transmission System Code and Distribution System Code in August 2013, and to the former OPA's licence in October 2013.

The formalized regional planning process has two distinct but interconnected components:

- The Regional Infrastructure Plan (RIP), which identifies transmission and distribution infrastructure requirements in a specific area and is led by the lead transmitter
- The Integrated Regional Resource Plan (IRRP), which is led by the IESO (former OPA), and considers a range of integrated solutions (including non-wires options) to maintain reliable supply to a local area
- By the end of 2017, the IESO, transmitter, and LDCs had evaluated all 21 planning regions in Ontario using the formalized approach discussed above, marking the completion of the first cycle of regional planning. The OEB requires this process to be conducted at least once every five years for each planning region.

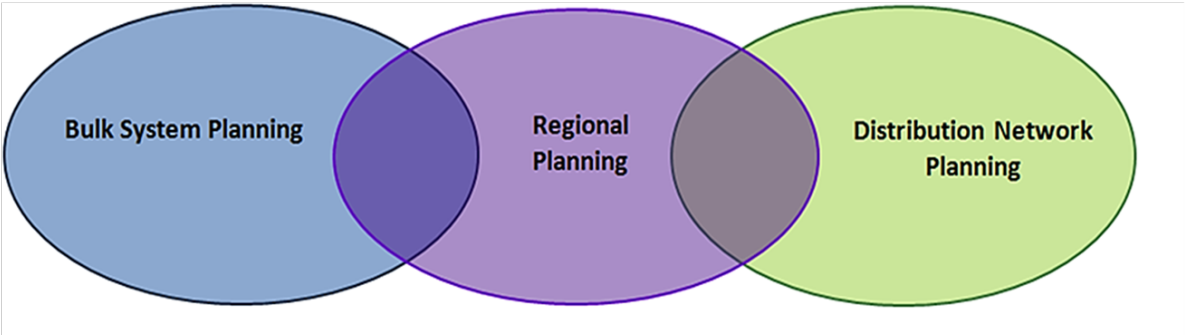
[10] The Independent Electricity System Operator (IESO) and the Ontario Power Authority (OPA) merged on January 2nd, 2015.

[11] OEB's Renewed Regulatory Framework for Electricity Report

As one of three categories of interrelated electricity system planning, regional planning assesses the adequacy and reliability of electricity supply to customers in a local area and develops a long-term plan that:

- Summarizes the electricity needs, and recommends infrastructure investments or near-term actions (e.g., monitoring, initiating pilot) to maintain reliability of supply for a local area
- Supports regulatory (e.g., distribution and transmission rate filing) and any related acquisition processes (e.g., generation or distributed energy resources procurement), if applicable
- Regional planning also serves as a forum for the IESO, LDCs, transmitters, stakeholders and communities to share information and coordinate local electricity priorities with provincial electricity needs and policy direction.

Figure 1 | Types of Electricity System Planning



Bulk system planning typically focuses on the adequacy and reliability of the 500 kV and 230 kV networks, and addresses provincial electricity needs and broader policy direction (such as assessing the impact of nuclear facility refurbishment or renewable energy policies). As regional planning can overlap with bulk system planning, coordination between the two could result in optimal solutions that meet both local and provincial needs. In addition, regional planning provides valuable information on how load is growing within specific areas of the province and potential community-level solutions within those regions that inform planning at the provincial level.

LDCs carry out distribution network planning to address electricity needs and priorities at the community level, such as building distribution infrastructure to connect a new subdivision. Regional planning can also overlap with distribution planning, as solutions could meet needs at multiple levels (bulk and local).

Ontario's 21 Planning Regions

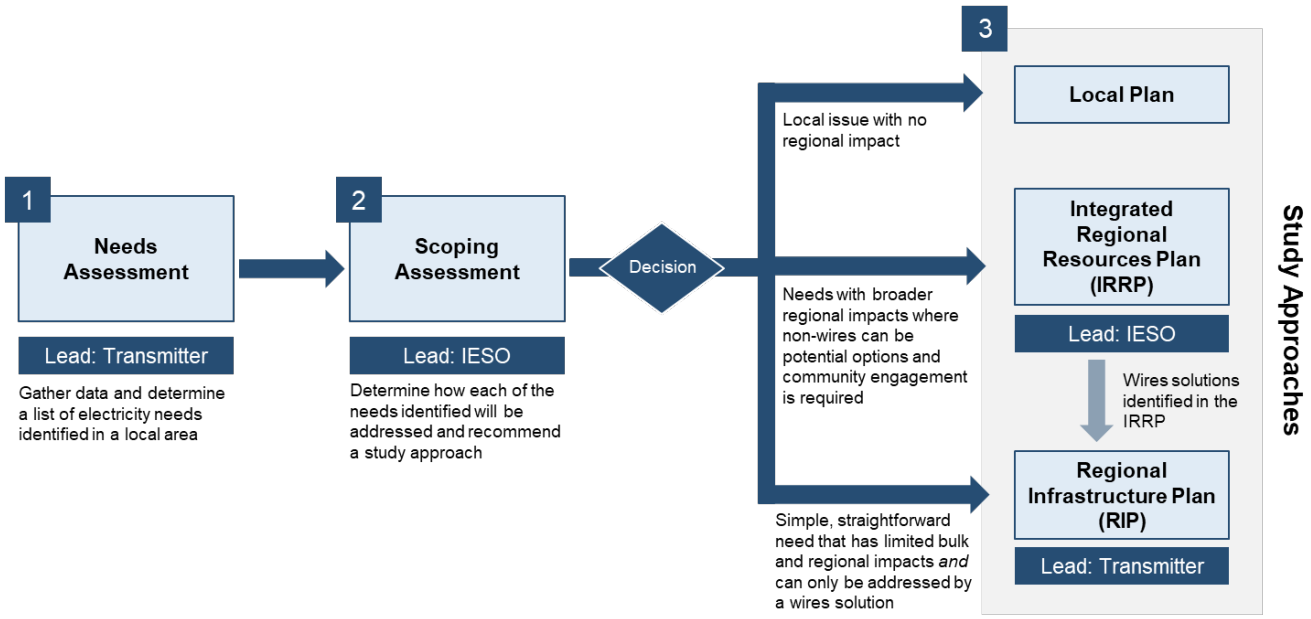
Regional planning looks at the unique needs of each of Ontario's 21 electricity planning regions, and considers energy efficiency, generation, transmission and distribution, and non-traditional resources to meet these needs. The regions are defined by electrical boundaries rather than municipal borders, and planning for each region is carried out at least once every five years (as required by the OEB for licensed electricity distributors, electricity transmitters and the IESO).

Figure 2 | The 21 Planning Regions in Ontario

The regional planning process involves a number of stages: Needs Assessment, Scoping Assessment, IRRP, and RIP. Details regarding the purpose, objectives and scope of each stage are further defined in the PPWG Report to the Board.[12] The IESO, transmitters, and distributors form the Technical Working Group, and are mandated by the OEB to conduct the regional planning process. Communities and public stakeholders (e.g., municipalities, First Nation and Métis communities, members of local advisory committees) are also engaged at select points throughout the process.

[12] Planning Process Working Group Report to the Board

Figure 3 | Stages of the Current Regional Planning Process



4. Process Efficiency and Flexibility

4.1 Background and Motivation

In 2012, when the OEB first established its stakeholder working group for regional planning (later named the Planning Process Working Group, or PPWG), the objective was to provide greater structure and formalize the regional planning process, ensuring regional issues and requirements would be effectively integrated into utility planning. Distributors and transmitters, which were expected to participate in and support this process, could then file evidence in rate and leave-to-construct proceedings to demonstrate that regional issues had been appropriately considered and addressed.

Ultimately, the PPWG report to the OEB helped define the key elements of this regional planning process by:

- Identifying key outputs and assigning lead responsibilities
- Determining regional boundaries according to electrical system boundaries
- Outlining the type and frequency of information to be provided by distributors
- Establishing the criteria to be considered when comparing options
- Describing the circumstances under which the OPA (at the time) should participate

The regional planning process has since been conducted successfully across the province and the second planning cycle is well underway. Naturally, processes evolve as participants have the opportunity to reflect on their experiences and flag opportunities for improving overall efficiency and flexibility. In initiating the Regional Planning Process Review, the IESO formalized these improvement efforts to achieve two objectives:

- Review and report on the regional planning process, taking into account lessons learned, and provide options and recommendations; and
- Propose approaches for streamlining the regional planning process.

The IESO also examined ways to improve the integration of regional planning with bulk system, distribution, and community energy planning, and to ensure alignment with market-based approaches.

Jurisdictional Scan

To support the 2017 directive and this review, the IESO engaged Power Advisory LLC (Power Advisory) to perform a scan of electricity planning processes in other jurisdictions by interviewing six system operators[13].

The jurisdictional scan revealed that, similar to the IESO, most entities use a consistent planning cycle that is repeated at regular intervals or overlaps with previous cycles – to allow inputs and assumptions to be carried forward, and previous conclusions to be re-assessed as appropriate. Stakeholder and community engagement was viewed as integral to all operators' planning processes, pointing to its importance both in ensuring solutions are viable, cost-effective, and supported by market participants and key stakeholders and communities, and in mitigating the risks of delays due to subsequent reassessments.

The report also highlighted the impact of public policy and market mechanisms on planning in all jurisdictions. Public policies, such as those supporting energy efficiency or renewable generation development, directly affect the demand forecasts that inform transmission system planning. Market mechanisms, such as those to procure transmission competitively or to meet resource adequacy needs, impact planning processes by increasing the need for public information (assumptions, models, draft recommendations, and conclusions). Publicly shared information and robust stakeholder and community participation in planning help build market participant confidence in the process, and maintain transparency and fair competition.

Overall, a clear and consistent planning process is required to maintain reliability standards in a cost-effective manner, while also meeting policy objectives during a shift to more market-based mechanisms.

Identifying Areas for Investigation

In addition to the jurisdictional scan, the IESO engaged regional planning participants in identifying both elements of the process that were working well, and opportunities for improvement, through public webinars, RPRAG meetings, surveys, and other targeted meetings with stakeholders (including the transmitter, the OEB, and LDCs). The Regional Planning Process Review considered how to strike a balance between consistency and flexibility, and between thoroughness and effectiveness. For instance, while the current process provides a transparent and structured framework for collaborative planning, it must also be flexible enough to accommodate the unique needs of every region. Simultaneously, there are ways for regional planning to be comprehensive without creating inefficiencies.

To identify areas of improvement, existing timelines, roles, accountabilities, and objectives were examined at each stage of the process. The Regional Planning Process Review also considered where activity scope and accountability expectations were unclear – from the load forecasting activities during which different methodologies may be used, to the selection of a preferred option when there is not yet a common understanding of cost allocation factors. The review

[13] More information about the jurisdictional scan available here

sought to provide options to reduce the duplication of work during the process (such as between planning products) and better facilitate opportunities for meaningful input from stakeholders during public engagement. The differences in accountability between the system operator, transmitter, LDC, and public stakeholders during the regional planning process were considered, as were the coordination points between regional planning and related processes, such as bulk, distribution, and community energy planning.

Eight areas of the regional planning process were investigated – recommendations for improvement have been identified in five of the areas. These areas are summarized in the sections below.

Figure 4 | Five Areas with Opportunities to Improve Process Efficiency and Flexibility

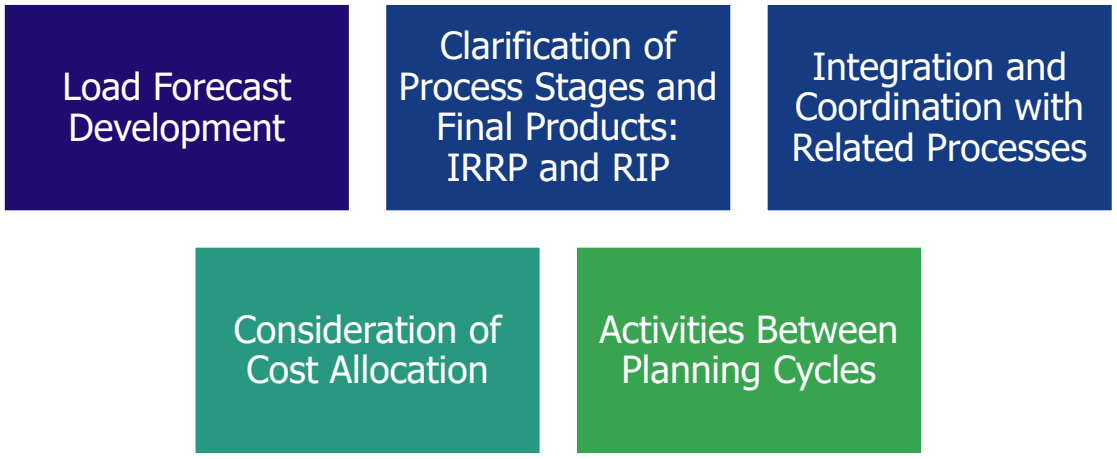
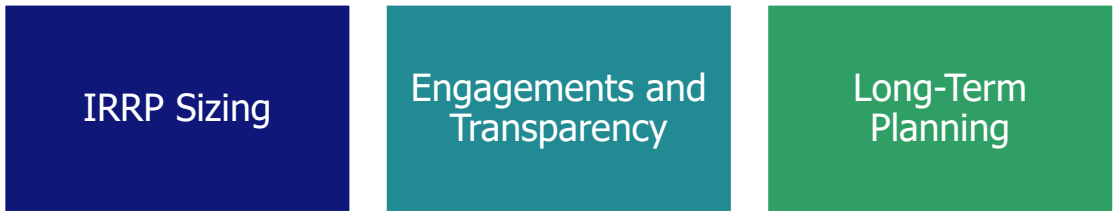


Figure 5 | Areas Not Requiring Further Process Efficiency and Flexibility Improvements



4.2 Areas for Improvement

Load Forecast Development

Objective

As load forecasting is inherently time-intensive, ensuring forecasting methodologies (between different LDCs and between process stages) are consistent and development work is not repeated can prevent unnecessary delays in the overall process.

Forecasting methodologies should also adapt to new trends as the electricity sector evolves, taking into account changing peaks and load behaviour. Load forecast base assumptions and methodologies should be consistent among members of a Technical Working Group.

Context

Forecasting future electricity demand occurs up to three times for a region undergoing the full planning process: during the Needs Assessment, the IRRP, and the RIP. The iterations have different objectives: a less-comprehensive and shorter-term forecast for the Needs Assessment (sufficient for a high-level need identification), followed by a more detailed, longer-term forecast in the IRRP and RIP. The current process allows both the IESO and the transmitter to lead, consolidate, and process the forecast provided by the LDCs. Distributors have the greatest visibility into their own load customers and growth, while other members of the Technical Working Group may have more information on transmission-connected industrial loads (when applicable), as well as better line of sight into energy efficiency, demand response, distributed generation, and other DERs. The IESO, for instance, is best positioned to forecast the impact of energy efficiency.

During the Needs Assessment, the transmitter leads the forecast development, which is intended to identify the region's needs to determine whether comprehensive planning is required. The methodology at this stage involves:

- Establishing historical net peak loads from all distributors in the region
- Gathering the 10-year gross forecast load from each distributor
- Obtaining 10-year forecast for distributed generation, and conservation and demand management from the IESO Correcting from median to extreme weather conditions using Hydro One weather-correction factors

If an IRRP is deemed necessary through the Scoping Assessment, the IESO leads the next load forecast development. During the IRRP, the methodology includes:

- Extending the time horizon to 20 years
- Applying regional coincidence factors to each station's forecast
- Conducting more detailed energy-efficiency and distributed generation estimates

- Applying weather normalization correction factors (methodology differs between IESO and Hydro One, which may lead to slightly different need dates between NA, IRRP and RIP)
- Conducting a survey to better understand distributor forecast assumptions, such as the:
- Power factors at each station
- Load transfer capability between stations
- Seasonality (whether load peaks in the summer or winter)
- Presence of embedded distributors
- Customer type segmentation
- Developments driving new load growth
- Considering different electricity demand sensitivity scenarios

The 20-year forecast in the IRRP is key to assessing adequacy and reliability. Transmission planning criteria are applied to the region's electricity system under future peak demand conditions, and needs are subsequently identified when the current infrastructure is not sufficient. The comprehensive forecast also enables the Technical Working Group to identify the expected timing of needs: near-term (within the next five years), mid-term (five to 10 years), and long-term (10 to 20 years). Near-term needs and forecasts are typically considered with greater certainty.

The forecast is reassessed at the beginning of the RIP stage. Led by the transmitter, this forecast incorporates any changes that may have occurred since the finalization of the IRRP forecast.

Recommendation

While stakeholders generally support the streamlining of assumptions and methodologies to improve load-forecasting efficiency and consistency, preferred approaches differ. Two key recommendations are described below.

Re-Evaluate the Number and Scope of Forecasts

To avoid load forecasting more than once (during the needs assessment, IRRP, and occasionally the RIP) in a single planning cycle, load forecasting may:

- Occur only once, with the same single, comprehensive forecast used throughout each stage of the planning cycle, OR
- Occur twice, with:
    - A 10-year preliminary forecast for the needs assessment (primarily to identify significant changes in growth rates at delivery points and, more broadly, at the regional level)

- The same 20-year detailed, comprehensive forecast used for both the IRRP and RIP (to evaluate options to solve identified needs)

The latter option is largely the status quo. The first option could prevent duplication of work later in the process, but requires more effort during the Needs Assessment stage and earlier collaboration between the transmitter and the IESO. Given the length of time between initiating the process and the plan completion, participants would also review the forecast as appropriate during the process to ensure it is still valid.

Develop Standard Guidelines

To provide more clarity and consistency while accommodating the uniqueness of customers across different regions and LDCs, a set of base assumptions and methodologies for load forecasting should be common to all regions. Key assumptions and elements, such as the calculation of gross vs. net load, the treatment of energy efficiency and distributed generation, the approach to the forecast starting point, or the definition of sensitivity scenarios (i.e., electrification of transportation), should be consistent between planning participants. Any deviations should be specified by Technical Working Group members at the start of the regional planning process.

Clarification of Process Stages and Final Products: IRRP and RIP

Objective

Each stage and its deliverable in the regional planning process should offer incremental value. The scope and accountabilities between the IRRP and the RIP should be clarified to avoid unnecessary work, better set expectations, and increase overall process efficiency. Documentation of the regional planning process should then be updated to reflect recent changes and better define the scope of the different stages.

Context

As described in Section 3, during the Scoping Assessment, the Technical Working Group recommends a regional planning approach after considering needs identified in the Needs Assessment and soliciting stakeholder input. Straightforward needs can be addressed through an RIP only when they do not have a broader bulk system impact, can only be solved by a wires option, and do not require public engagement or broader coordination.

In practice, many regions require coordinated planning and proceed first to an IRRP. Unlike an RIP, an IRRP is conducted to facilitate public engagement and to ensure that integrated solutions consider all options (generation, NWAs, and wires) and are evaluated to ensure identified needs are addressed through the most cost-effective means. The RIP, which requires up to six months to complete, includes many of the same components as an IRRP: data gathering, load forecasting, technical assessments, and the development of (wires) options. While RIPs do not include stakeholder engagement and sometimes have a study period of 10 rather than 20 years, they are also used to support rate filing submissions and distributor rate applications.

Figure 6 | Characteristics of an RIP (Wires-Only Plan)

Both IRRPs and RIPs involve the development and recommendation (if warranted) of wires options. In the case of the IRRP, wires options must be evaluated to permit adequate comparison between all potential options. The final wires recommendations in both planning products should ultimately align, reflecting the collaboration and consensus achieved through the Technical Working Group.

Recommendation

The IESO submits that, as the system operator, it is uniquely well-positioned to conduct integrated planning for needs that require coordination, which include cases where:

- Non-wires options are available
- There is interplay between regional and bulk system planning on the IESO-controlled grid
- There is a need for public engagement
- There is potential for reinforcements that offer both network and local benefits, resulting in costs to all ratepayers

As such, the IESO suggests that an RIP only be conducted for needs where the above circumstances are not applicable. In the event that an RIP must be conducted, it should focus

on advancing the wires recommendations of the IRRP without replicating work. For instance, the RIP should use the IRRP load forecast in the absence of significant changes, and wires recommendations made in the IRRP should be developed in further detail rather than reassessed. The extent of wires solution development between the IRRP and RIP could be further outlined in the Terms of Reference at the Scoping Assessment stage.

Given the need for further consultation on the structuring of the IRRP and RIP stages in the planning process, this area of improvement is best conducted through the original venue for formalizing the regional planning process: the OEB's RPPAG. With input from sector stakeholders, the Regional Planning Process Review documentation should be updated to clarify process steps and capture changes that have occurred since 2013. This includes better defining hand-off points, establishing mechanisms for formal agreement from Technical Working Group members, and further describing the extent of wires planning in the IRRP versus the RIP.

Integration and Coordination with Related Processes

Objective

To ensure effective coordination and integration, the interdependencies (data sharing, coordination, and hand-off points) between regional planning and other related processes should be well-defined.

Context

The regional planning process naturally intersects with many other processes and electricity sector activities that have different timelines, objectives, data and reporting requirements, and stakeholders. Examples include:

- Bulk planning
- End-of-life asset replacement[14]
- Distribution planning
- Connection assessments and approvals
- Community energy planning
- Regulatory proceedings (including distributor/transmitter rate filings)
- Markets or procurement mechanisms (such as for transmission infrastructure, generation resources, or NWAs)
- Energy-efficiency program planning

[14] Refer to Section 5 for more on the proposed EOL information process.

As some related processes, such as bulk planning[15], are also the subject of a formal reviews, recommendations on connections between them may be deferred pending completion of the reviews

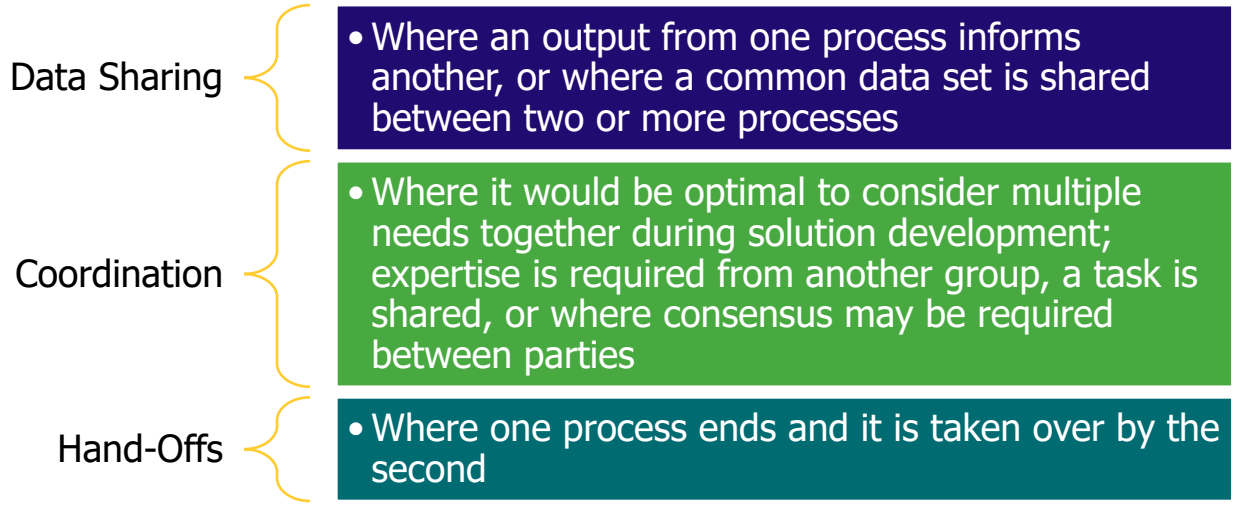
Others, such as competitive procurement mechanisms for NWAs, are not yet be defined and, if introduced, will require further adjustments to the regional planning process. For instance, competitive mechanisms may impact engagement methods and the scope of stakeholder participation, the type of information to describe a need and when it is made public to enable third-party solutions, and whether contingency paths or backup solutions may be required. More discussion around NWA procurement mechanisms is found in Section 6.2.

In contrast, other related processes are already well-established and their interactions with regional planning may either continue in much the same way, or improvements could be made immediately if recommended. For instance, while the OEB does not formally approve regional plans, these products will continue to support distributors and transmitters when filing evidence in rate and leave-to-construct proceedings, ensuring that regional issues and options have been appropriately considered before a specific investment is proposed.

Recommendation

Process integration be improved by defining the key points of interaction between regional planning and related processes. All interactions may generally be defined according to three categories shown in Figure 7.

Figure 7 | Primary Forms of Process Integration



[15] Learn more about the ongoing bulk planning process initiative here.

For each related process, the following will be identified:

- What, when, and how data and information should be shared
- Common stakeholders and strategies for overlapping engagement
- Key decision points that impact or are impacted by regional planning decisions
- Any overlap in accountabilities, scope, and objectives process

Consideration of Cost Allocation

Objective

Members of the Technical Working Group should establish a clearer understanding of cost allocation principles and their potential implications during the regional planning process. This may encompass increased clarity with respect to cost-recovery mechanisms (for both wires and non-wires solutions) to further support informed decision-making and consensus-building for preferred options.

Context

> *"…regional planning will seek to coordinate in a cost-effective manner the planning of transmission-level investments that can provide supply to more than one distributor but it was not meant to coordinate the breadth of distribution planning and investments among distributors."*
>
> *- Planning Process Working Group Report to the Board, May 2013*

Though the most cost-effective reinforcements are recommended through IRRPs and RIPs, cost allocation itself is not quantified in the planning stage. Decisions relating to cost allocation are ultimately part of the OEB's mandate, as it is the TSC and DSC that contain cost responsibility provisions for load customers.

Cost allocation generally depends on a number of factors, including:

- The impacted beneficiaries (taking into account the incremental peak load requirements and expected load forecast from each distributor)
- The benefit to the broader system relative to the local customer being connected

Cost inherently affects decision-making during the regional planning process. IRRPs aim to recommend integrated solutions (wires, NWAs, and/or generation) that meet local reliability needs based on both technical feasibility and the least total cost to ratepayers. Consequently, regional planning products (IRRPs, RIPs) are used to support related regulatory proceedings, such as distributor and transmitter rate applications.

Recommendation

As decisions relating to cost sharing fall within the OEB's jurisdiction, it would be beneficial to specify actions to improve the Technical Working Groups' understanding of the factors that impact cost allocation – this may include informal IRRP discussions after the least-cost solution is developed. These discussions should include cost allocation for transmission solutions, as well as potential cost recovery for cost-effective non-wires options.[16]

Activities Between Planning Cycles

Objective

Between-cycle activities should be enhanced to support an ongoing dialogue among planning participants, help maintain industry working relationships, and further expedite future planning cycles.

Context

As required by the OEB, regional planning is conducted for each of the 21 planning regions (defined by electrical boundaries) at least once every five years. The full planning process (from trigger to Needs Assessment, Scoping Assessment, IRRP, and RIP) can last more than two years as the team gathers data, identifies needs, conducts studies, compares options, and engages stakeholders.

In practice, system changes are continuous and regions evolve between official planning cycles. Feedback from planning participants has indicated a need to more consistently update stakeholders on the progress of recommendations after the planning cycle officially concludes. Improving communication channels for regions that did not require coordinated planning (an IRRP) and public engagement in the previous planning cycle would also be beneficial, as in-between activities and updates for all regions help planners monitor needs and keep abreast of changes that could warrant early triggering of the next cycle.

Recommendation

Activities between planning cycles would improve the process by ensuring that the Technical Working Group is advised of new load connections, demand growth, and the status of implementation plans and recommendations before the next planning cycle is triggered. Additionally, obtaining this information between planning cycles can help inform the connection assessment process of near-term changes to connecting facilities and loads. To enable this, the IESO recommends that the Technical Working Group should meet annually to:

- Review the accuracy of current load forecasts and monitor the status of local supply
- Report on the status of previous planning recommendations and projects

[16] Barriers for the implementation of non-wires options, as they relate to funding streams, are described in Section 6.2.

- Discuss/flag new or ongoing developments that may impact load growth (e.g., community energy plans, load connection requests, sector trends)

To maximize their value, the IESO recommends Technical Working Groups align these activities with existing annual reporting mechanisms required by the OEB (such as the regional planning annual status report), and leverage the work of regional electricity networks, consolidating information, where possible, and taking advantage of existing communication or reporting channels for updates. For instance, annual reviews that have already been conducted could be formally shared with affected planning participants – particularly for regions that are not in an active planning cycle at that time.

4.3 Other Investigated Areas

IRRP Sizing

Objective

The type and scope of an IRRP should be tailored to the complexity and needs of the region or sub-region so that integrated planning is conducted efficiently and in a timely manner.

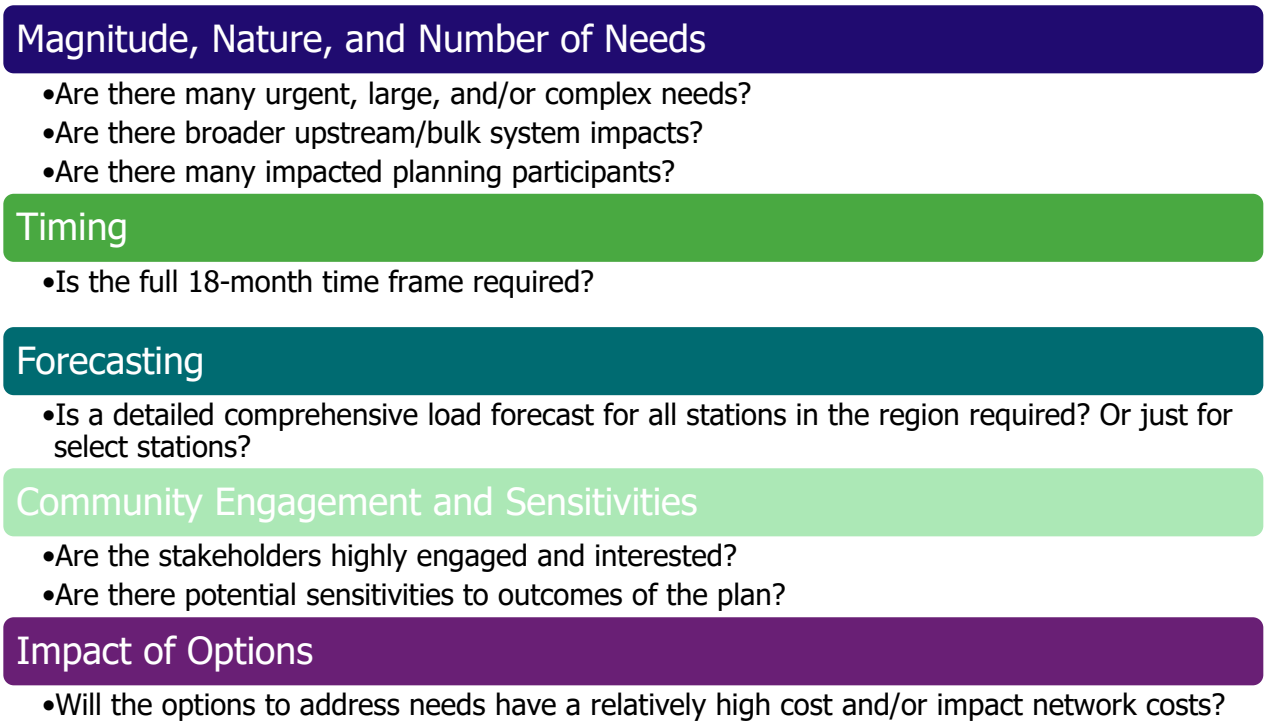
Context

Stakeholders have provided feedback regarding the length of the full regional planning process, which, from Needs Assessment to RIP, typically requires more than two years. Regions (their needs and potential options) inevitably evolve during these time frames.

To conduct regional planning expeditiously, effectively scoping the assessments and studies is crucial. Currently, scoping of IRRPs are established through the Scoping Assessment and its Terms of Reference after adequate discussion and consensus from the Technical Working Group and the existing planning process provides a great deal of flexibility in setting the scope of the IRRP. Qualitative guiding principles when scoping the IRRP and its core activities (e.g., data gathering, load forecasting, engagement) are summarized in Figure 8.

The existing planning process also offers additional flexibility: an IRRP can accommodate urgent needs, if required, through hand-off letters issued by the IESO before finalization of the IRRP. Hand-off letters advance recommendations by notifying the lead transmitter and impacted distributors of the facilities necessary to meet near-term needs so that development work can begin immediately. In combination with a well-scoped IRRP, these features can ensure planning is conducted efficiently. As such, no further changes will be implemented as a result of the of the findings with respect to the type and scope of an IRRP.

Figure 8 | Key Elements Considered When Scoping IRRPs



Engagements and Transparency

Objective

Engagement conducted in the IESO-led stages of regional planning should continue to incorporate the IESO's engagement principles and processes. This includes ensuring that:

- Targeted outreach is conducted to inform individuals within relevant communities and municipalities and enable them to contribute to the ongoing dialogue
- Information is accessible and transparent throughout the process
- Needs, options, and recommendations are clearly articulated and supplemented with educational documents (e.g., glossary of terms, FAQs, summaries of applicable codes and standards) where possible
- Stakeholder feedback on IESO-led engagement activities during regional planning has been considered in the past as part of continuous improvement efforts. The IESO will continue to respond to the needs of stakeholders as it relates to their engagement experience and will consider future enhancements to engagement, as appropriate. As such, this review does not recommend any further enhancements to the IESO engagement process and principles. The following provides additional detail on how the IESO's engagement process evolved over the past several years.

Context

Public engagement is a vital part of the IESO's decision-making process, ensuring that the electricity system is planned with community and stakeholder needs and input in mind. Solicitation of public feedback currently occurs during two IESO-led stages in the regional planning process – the Scoping Assessment and the IRRP. The IESO conducts a variety of engagement and outreach activities for active regions, including:

- Broader public webinars to provide an overview of key planning activities, such as needs identification and draft options development to equip attendees to provide feedback
- Outreach meetings with targeted stakeholders, such as large industrial customers or impacted municipalities to ensure important information is considered
- To facilitate a transparent engagement process, all engagement materials are posted, including:
- Presentations and draft documents for review prior to finalization
- All written feedback, along with the IESO's response to the feedback
- Where appropriate, the materials and discussions of any established Local Advisory Committee to inform specific areas within the development of the IRRP

Feedback received from the first planning cycle and through discussions with the RPRAG has shown that stakeholders continue to seek relevant and meaningful opportunities to contribute to the process. The IESO's regional planning engagement activities should give stakeholders the opportunities and information to engage in a meaningful way, enable them to be involved earlier and more often in the process, and deliver on their expectation for an ongoing dialogue between planning cycles.

In response to feedback, the IESO improved engagement in the scoping assessment and IRRP stages by creating new opportunities for interested parties to participate in these discussions. As well, the IESO has enhanced its community engagement efforts by providing information/education about the electricity sector to prepare interested parties for future planning engagement initiatives.

Integrating Engagement Principles

Following the first regional planning cycle, the IESO's engagement principles and processes were integrated into regional planning activities to enhance transparency and improve the relevance and effectiveness of engagement. Subsequent changes have resulted in:

- Engagements that define and scope the areas for local or regional input, and ensure stakeholders are invited to provide feedback on draft plans
- Engagement plans that reflect unique local or regional characteristics, including methods to incorporate community-level advice into the broader engagement initiative, e.g., the formation of a local advisory committee to discuss specific issues/needs within the broader regional plan

- Outreach to key contributors in each engagement to bring required inputs into the planning process
- Dedicated web pages that host all engagement materials
- Increased transparency by posting all feedback received and the IESO consideration of and response to that feedback on engagement web pages

Broadening Engagement Opportunities

Broadening and enhancing engagement opportunities during the scoping assessment and IRRP help ensure that stakeholders are provided with relevant, accurate and timely information – both early in the process and between regional planning cycles. This will ensure that stakeholders have more context and background during the scoping assessment which, in turn, better prepares them to participate in discussions during the development of an IRRP. Enhancements in the scoping assessment process include:

- Presentations/webinars to provide overview and background and to address stakeholder questions
- Posting online stakeholder feedback submitted at each stage of the planning process along with IESO responses to that feedback

New Regional Electricity Networks

To supplement engagement activities, the IESO has also established regional electricity networks. These provide opportunities for ongoing dialogue on the latest trends and activities in regional planning, including updates on the implementation of projects recommended in past IRRPs. Ongoing discussions between planning cycles also provide the information to help all parties manage local issues as they arise. Members of these networks will receive regular communication from the IESO through dedicated web pages with region-specific information, a newsletter, and face-to-face meetings (including an annual Regional Electricity Forum). In addition, in December 2020, the IESO introduced a new online engagement platform – IESO Connects – to make it easier for members to participate in these discussions.

Long-Term Planning

Objective

Regional planning should maintain a long-term outlook to ensure that recommendations can accommodate potential future needs and do not preclude options to meet them. IRRPs, which consider the full 20-year time horizon, are an effective mechanism to evaluate long-term planning considerations. To support this, the Technical Working Group is currently:

- Evaluating key long-term sensitivity scenarios unique to the region (such as significant load growth driven by local industries or electrification, local generation assumption changes, EOL/expected service life concerns)

- Investigating and communicating the implications of near-term recommendations on long-term options, and staging solutions as required
- The current regional planning process already enables long-term planning. As such, this review does not recommend any further changes.

Context

While IRRPs assess system capability with a 20-year load forecast, the focus is justifiably on urgent and more certain near-term needs. Typically, recommendations for needs arising in the five- to-10--year range are identified but are not yet committed. Comparably, needs anticipated in year 10 and beyond are monitored and re-confirmed in the subsequent planning cycle.

Regional planning participants generally support the emphasis on near- and mid-term needs, as forecast certainty degrades over time, and planning processes must manage the risks of overbuilding and underutilizing assets. However, some participants also advocate for greater development of long-term plans to ensure near-term actions consider long-term needs and potential requirements, and do not eliminate potential future options by taking a short-term view. There are also benefits to identifying options for addressing long-term needs even if facilities are not committed, considering the long lead time required (often more than five years) to build transmission infrastructure or implement non-wires solutions, and the timing of the subsequent planning cycle. With aging transmission assets, the potential for widespread change, such as transportation electrification, the impacts of climate change, and other system-wide developments, greater emphasis on long-term planning may be warranted. However, activities to support this (such as greater use of scenarios, identification and consideration of the expected service life of assets, and triggering of reinforcements earlier if warranted) can occur, as required, within the existing process framework for regional planning.

5. End-of-Life Transmission Asset Replacement

5.1 Background and Motivation

Consideration of end-of-life (EOL) transmission asset replacement needs is an integral part of transmission planning. When an asset reaches EOL, a decision must be made to either replace it (like-for-like or right-size) or, in some cases, decommission it to meet safety, reliability, environmental, and customer requirements. While the length of time varies, many transmission assets remain in use and deliver value for 40 years or more. Over such a long period of time, the functional requirements of the transmission system could change, as customer needs, system conditions, sector trends, and government policy evolve. Coordination of transmission asset replacement needs with other reliability and security needs forecast over the long term is critical to maximizing the benefits and value of investments.

Similar to most other jurisdictions in North America, the transmission system in Ontario is aging, with a significant portion of transmission assets requiring replacement. Approximately $1 billion is forecast to be spent annually on system renewal – representing over 70 per cent of the total spend on transmission capital investments.[17]

End of Life and Expected Service Life

EOL represents the state of having a high likelihood of failure, or loss of an asset's ability to provide the intended functionality, wherein the failure or loss of functionality would cause unacceptable consequences. EOL is determined by the asset owner's risk-based assessments, taking into account such factors as reliability, loss of load, environmental considerations, and safety.

Expected Service Life (ESL) is a general guideline to inform transmission asset owner investment decisions; the ESL is defined as the average duration in years that an asset can be expected to operate under normal system conditions, and is determined by considering factors such as manufacturer guidelines, and historical asset performance, failure and retirement data.

As assets age and begin to approach their ESL, assessments are carried out to determine their overall condition by examining asset-specific health metrics, along with performance history. Based on the results, equipment is scheduled to be replaced when it reaches EOL.

As noted earlier, over an asset's lifespan (which can be 50+ years), a number of variables can affect its overall condition, and timing for replacement: operating conditions (loading, switching, faults), climate and pollution. For this reason, some assets can fail well in advance of their ESL,

[17] Hydro One's 2020-2022 Transmission Revenue Requirement and Rate Application (EB-2019-0082)

while others can remain in good operating condition and continue to be useful well beyond their ESL.

2017 Government Directive and Sub-Initiative Scope

The 2017 Ontario government directive regarding "Delivering a Flexible and Efficient System" includes two key objectives with respect to EOL:

- Develop a bulk system planning process inclusive of a coordinated, cost-effective, long-term approach to replacing transmission assets at end of life, in order to better align investments with power system and market conditions and needs
- Review and report on the regional planning process, including consideration of improved planning for replacement of transmission assets reaching end of life

The examination of EOL transmission asset replacement is not limited to the Regional Planning Process Review. Recommendations made as part of this report will contribute to and subsequently be included in the ongoing formalization of the Bulk Planning Process.

5.2 Current Approach to Transmission Asset End-of-Life Replacements

Since asset EOL needs are determined through condition-based assessments and take into consideration risk (safety, reliability, load security), the time between when an asset is identified as requiring replacement and the date it must be replaced can vary substantially. In some cases, asset replacement can be urgently required depending on the condition and criticality of the equipment.

Asset EOL needs are identified by the transmitter during the Needs Assessment stage of the regional planning process. These needs are evaluated alongside other requirements, such as capacity, reliability, load security and restoration. A Technical Working Group comprising the transmitter, local distributors, and the IESO develop and evaluate options prior to recommending a preferred solution. During this process, the Technical Working Group will examine the current arrangement and load forecast and consider whether:

- The asset is still required or can be removed from service at EOL
- The asset should be "right-sized" (i.e., either replaced with a larger unit to address increasing demand, or with a smaller unit in cases where demand has dropped significantly)
- Cost-effective non-wire alternatives (NWAs) could remove the need to replace the asset at EOL
- The system should be redesigned due to changes in system topology and customer needs

The ad-hoc inclusion of asset EOL needs presents challenges within the regional planning process and to the soon-to-be-formalized Bulk Planning Process, due to varying lead times for replacement. For example:

- Regional planning is conducted once every five years (can be triggered earlier if urgent needs arise), but an EOL need could arise and be addressed between regional planning cycles
- An urgent EOL need may limit the options available for consideration, since the study itself may take a year or more to complete, and options like a new transmission line require five to seven years to design and build

In some instances, ensuring a well-coordinated, cost-effective, long-term approach to replacing transmission assets at EOL, and better aligning investments with system needs and market conditions, will require longer than the typical two-to-five-year lead time.

Jurisdictional Scan

The IESO commissioned a jurisdictional scan, a portion of which was focused on the planning of EOL assets[18]. Three entities were interviewed and a further six were researched, including transmitters, market operators, and regulators from select jurisdictions in Canada, the United States, and Europe.

From the interviews and an assessment of EOL asset processes and barriers, one of the learnings that emerged is planning and optimizing EOL asset replacements requires a detailed outlook of the power system, which is adapting to new electricity sector policies and emerging technologies (e.g., distributed energy resources) that are changing how the system will be used. Future requirements on EOL assets will influence the appropriate replacement plan (e.g., like-for-like, upgrade, retirement). Assessing future system needs requires a detailed system planning outlook and coordination of needs among asset owners, system operators, and other key stakeholders.

5.3 Recommended Approach to Transmission Asset Replacement Needs

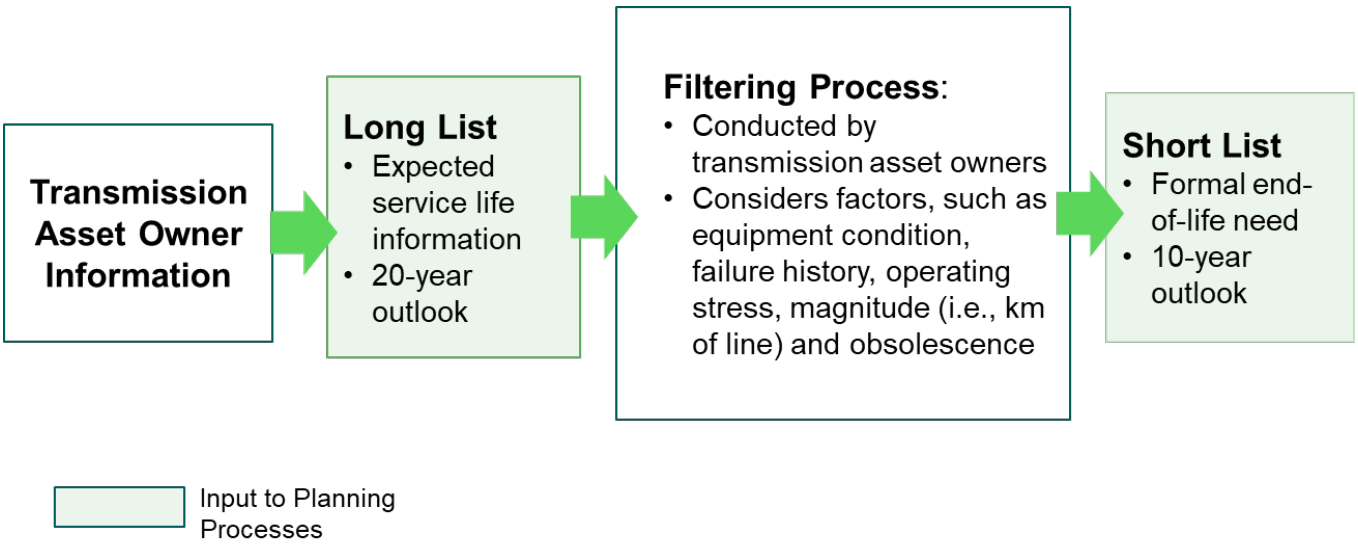
While not always required, planning for select transmission asset replacements should start proactively and prior to the transmitter identifying an EOL need. As input to the transmission planning process, asset owners (including applicable distributors) should produce a "long list" of transmission assets that are nearing or past their ESL. This list will act as a starting point, and enable the development of a "short list" of equipment replacement needs expected over the next 10 years.

Development of the long and short lists will provide better visibility of an area's asset demographics over the mid to long term, improving timing of transmission planning activities,

[18] More information about the jurisdictional scan available here

and enabling opportunities to better align asset replacement needs with other needs, such as capacity, reliability, and load security and restoration, forecasted over the long term. This also provides a longer lead time to study opportunities for non like-for-like replacements, particularly for bulk system planning.

Figure 9 | Proposed Approach to Identifying Transition Asset Replacement Needs



Long List

On an annual basis, transmission asset owners will prepare a long list comprising data for major categories of high-voltage equipment, including transformers, circuit breakers, overhead lines, and underground cables. These categories present the highest-value opportunities for considering non like-for-like replacements. The list will be based on the expected service life of the asset and will act as an input to transmission planning processes.

Short List

- Transmission asset owners will work from the long list to identify the short list, which includes projects:
- That are likely to reach EOL over the next 10 years based on available asset condition information;
- Where typical replacement options may not be possible; and/or
- That have imminent near-term needs that require timely planning decisions.

Similar to the long list, the short list will be prepared on an annual basis and will act as another input to the transmission planning processes.

6. Barriers to Non-Wires Alternatives

6.1 Background and Motivation

Regional planning takes an integrated approach, considering a combination of potential solutions to meet identified needs. Centralized utility-scale generation and traditional infrastructure (commonly referred to as "wires") solutions have dominated the discourse in regional planning. Improvements in cost, capabilities and public awareness continue to increase the relevance of using distributed energy resources (DERs) and energy efficiency (EE) as non-wires alternatives (NWAs) in meeting the reliability needs identified in regional planning.

"A significant shift is taking place in the electric power sector today. Regulators, policy makers, and utilities are beginning to investigate and deploy alternatives to traditional transmission and distribution assets – that is, building power plants and other traditional electric infrastructure as has been done for the past 100 years…However, the growing interest in NWAs has revealed a major gap in current knowledge…"

Non-Wires Alternatives: Case Studies from Leading U.S. Projects, Smart Electric Power Alliance, Peak Load Management Alliance, and E4TheFuture, November 2018

Incorporating NWAs in regional plans can have numerous benefits for local customers, as well as the broader electricity system. The modular and local nature of DERs contributes to the decentralization of electricity systems, giving customers and community stakeholders greater choice in how they meet their energy needs. As technologies and practices mature, both distribution and transmission system operators can choose NWAs to meet local needs in a more targeted manner, and to contribute to provincial capacity and energy needs.

That said, NWAs pose significant challenges to both the planning and operations of electricity grids. Enabling NWAs requires a more granular approach to both needs identification and options analysis. While traditional wires solutions are well established and understood, the technical capabilities of NWAs – and regulatory framework governing their participation – are evolving. Higher uptake will also result in greater variability in the grid while decentralized controls will increase system complexity.

This scope of this section extends well beyond regional planning and the purview of the IESO. As such, addressing barriers to NWAs will require a coordinated effort from multiple entities, including the IESO, transmission and distribution companies, the OEB, and solution providers.

Regional planning operates within the existing regulatory, procurement, and operational frameworks. While improvements can be made to address barriers within the regional planning process, the industry as a whole must evolve to meaningfully enable cost-effective NWAs.

This sub-initiative identifies barriers both within and beyond regional planning, proposes a high-level direction for addressing these barriers, and itemizes near-term actions for the IESO and regional planning in particular.

IESO Innovation Roadmap and Related Initiatives

This Barriers to Non-Wires Alternative sub-initiative contributes to and aligns with the IESO's broader innovation work.

The IESO's Innovation Roadmap[19] was created, in part, to recognize the role of emerging technologies, increased digitization, and changing consumer behaviour and expectations, in disrupting familiar business models – and the potential for the IESO to leverage these changes to create a more reliable and cost-effective electricity system. Addressing barriers to sector evolution requires a pragmatic mindset and strategic collaboration with stakeholders, industry, research partners, and others. The roadmap identifies nine areas of focus for learning, capability building, and enabling the innovation of others. The IESO is also undertaking a DER Roadmap to align near -term and scope longer-term work on enabling DERs in Ontario. The Roadmap will clearly communicate how existing and planned DER work at the IESO fits together and establish a path for enabling DERs to deliver on their potential value to the system.

As part of the 2021-2024 Conservation and Demand Management Framework, the IESO is developing a Local Initiatives Program, which will issue competitive procurements for local energy efficiency (EE) programs or projects that target areas of the province with regional and/or local needs. This framework is further discussed in Section 6.5.

FERC Order 2222

On September 17, 2020, the U.S. Federal Energy Regulatory Commission (FERC) issued Order 2222[20], which promotes competition in electric markets by removing the barriers preventing DERs from competing on a level playing field in capacity, energy and ancillary services markets run by regional grid operators. This order builds on Order 841 – which did the same for energy storage – and a recent ruling from the U.S. Court of Appeals affirming FERC's jurisdiction over the regional wholesale electricity markets and the criteria for participation in those markets.

Regional grid operators in the U.S. must revise their tariffs to establish DERs as a category of market participant. These tariffs will allow DERs to register their resources under one or more participation models that accommodate the physical and operational characteristics of those resources. The order also allows the aggregation of DERs to satisfy the minimum-size and performance requirements that each may not be able to meet individually. Furthermore, tariffs must allow DERs that participate in one or more retail programs to participate in wholesale market as well. Regional transmission organizations/independent system operators (RTO/ISOs), however, are permitted to limit the participation of resources in their markets through DER

[19] To learn more about the roadmap, visit the IESO's website

[20] Federal Energy Regulatory Commission Order 2222

aggregators that are already receiving compensation for the same services as part of another program.

While this order does not directly impact Ontario, in enabling increased DER participation in wholesale markets in the U.S., it highlights the potential for DERs to cost-effectively address local reliability needs in high-value locations.

This report focuses on how NWAs, including DERs, can help meet local reliability needs. This is not necessarily contingent on NWA participation in wholesale markets but, as discussed in the next section, access to system value streams can improve the cost-effectiveness of NWAs.

6.2 Barriers Identified

Barriers to cost-effective NWAs exist across the industry in Ontario. Addressing these barriers is a challenge due to the complexity and interlinkages between processes managed by multiple entities. While the near-term actions of this sub-initiative focus on the regional planning process specifically and other ongoing IESO projects, the first step in this industry-wide task is to systematically catalogue these barriers, regardless of the organization accountable for addressing them.

Data Gathering and Identification Approach

The approach to identifying barriers was balanced and participatory, and took into account lessons learned from past initiatives and the results of engagement with a broad cross-section of industry stakeholders. This section documents the barrier identification process and the sources from which they were compiled.

The approach began with taking inventory of the barriers encountered in the first cycle of regional planning. In addition to internal feedback from across the IESO, surveys, interviews and workshops were conducted with regional planning participants to gather their experiences to date. A number of initiatives since the regional planning process was formalized in 2013 have sought to advance NWAs and were reviewed for lessons learned. In parallel, a jurisdictional scan was performed to identify best practices. Throughout this process, the RPRAG was consulted to identify gaps, provide examples based on the group's experience with NWAs, and comment on the impact and importance of addressing each barrier.

NWAs in the First Regional Planning Cycle

Generally speaking, the following factors were considered when studying NWAs in the first cycle of regional planning:

- Whether supply capacity, load restoration, and load security needs can technically be solved with energy efficiency, demand response, distributed generation or any other NWAs
- The timing and magnitude of incremental peak demand savings required and whether there is sufficient lead time to implement cost-effective NWAs

- Whether and how existing energy-efficiency programs and resources (both local and provincial, including demand response) can be leveraged by targeting areas with regional needs
- Potential implementation hurdles (such as siting in high-density urban areas and lack of experience in implementing NWAs targeted to a local area)

This analysis was limited during the first cycle of regional planning because data was not readily available. While some integrated plans have leveraged provincial procurement programs to strategically locate generation for system needs in regions with local reliability needs (e.g., York Energy Centre), in many cases the focus was limited to transmission-connected facilities. As the temporal and spatial granularity in typical planning studies was insufficient to fully assess the feasibility of NWAs, analysis from the first cycle was typically limited to the following avenues:

Energy Efficiency: Peak demand savings from existing and future committed province-wide energy-efficiency programs and codes and standards were considered in forecasts, reducing electricity consumption overall and potentially deferring capacity needs.

Local Generation: Generation procurement programs were targeted toward areas with local reliability needs. Contracted distributed generation peak demand contributions were built into the planning forecast. These contributions were typically very conservative due to the variability of the renewable generation procured under provincial policies at the time and the inherent uncertainty of peak demand timing. Visibility of local generation was also limited to generators with a commercial relationship with the IESO. In some cases, distributors provided the IESO with information on any known behind-the-meter generation that did not have a contract.

Local Achievable Potential Studies: Some IRRPs recommended local achievable potential studies to determine the potential for NWAs in a local area (e.g., for a particular transformer station service area). These studies typically used local load segmentation data to assess the technologies that can technically and economically address needs.

Review of Past Initiatives

A review of past and ongoing initiatives was undertaken to understand the current context for non-wires alternatives in Ontario. This ensures that the Barriers to Non-Wires Alternative sub-initiative starts from a common understanding of where we are today and the lessons learned to date. A few projects and the barriers they encountered are discussed below.

Power.House Pilot

In 2016, Alectra Utilities, in partnership with the IESO, investigated the benefits and challenges associated with widespread adoption of a DER program, Power.House, with a specific focus on York Region. This was a demonstration pilot, which considered the coordination of multiple residential solar-storage systems to achieve various customer and regional electricity system benefits.

The study had two primary objectives: to assess the feasibility of widespread DER program expansion and to understand the associated costs, benefits and barriers. With respect to the latter, particular emphasis was placed on exploring the various value streams associated with the program and whether it is feasible to use such a program to defer transmission or distribution capital investment.

The Power.House study team evaluated various value streams and conducted a cost-benefit analysis of a large-scale Power.House deployment in York Region. The study team compared the total cost of deployment, including equipment, installation, and enabling software over the life of the program against the total monetary benefits to all Ontario electricity customers, including the value of deferring transmission and distribution infrastructure in York Region, and providing additional energy, capacity, and ancillary services to the electricity system. Increased customer reliability/outage protection and avoided greenhouse gas emissions were identified as potential value streams, but were considered in a qualitative manner.

The working group established "key enablers," which were factors required to enable the large-scale adoption of the Power.House system. The resulting summary consists largely of existing barriers to program enablement. These include:

- The inability to access ancillary services markets, such as for DR, which could be challenging for utilities trying to make a business case for DERs
- Regulatory obstacles, such as the prohibition against third-party ownership of DERs and the absence of a regulatory structure for DERs in Ontario
- The failure of Ontario's smart metering data management systems to accommodate time-of-use pricing for net metered customers
- A lack of locational incentives for DERs and a need to formalize processes to incorporate DERs into traditional utility and regional planning to mitigate local capacity issues
- The need for utilities to develop processes or programs for acquiring resources and policies for allocating capacity by resource
- An absence of clear regulations on cost responsibility for DER options to meet regional needs

Brant Demand Response Pilot

This pilot was intended to help the IESO test the value of demand response as an NWA to help meet local capacity needs and relieve overloading on the 115 kV Brant subsystem, pending transmission reinforcements to provide additional capacity. Given the localized need, the IESO could not rely on the wholesale energy price as the dispatch signal (which was the case with the former Demand Response Auction) and must dispatch based on actual conditions on the sub-system itself.

The Brant Demand Response Pilot resulted in a range of lessons learned, including:

- Pilot's short lead time limited the ability to fully develop the project

- Short agreement term (i.e., one to two years) limited financial incentive to participate
- Procurement model required more upfront development work than a Demand Response Auction
- Pilot targeted a highly localized area, within which few loads have suitable profiles to act as DR
- As custodians for customer load data, LDCs have limited ability to share data with aggregators, resulting in challenging project development
- DR capacity acquired through the pilot would not count toward LDC conservation targets, limiting the incentive for LDCs to encourage customer participation

The project also pointed to the importance of:

- Appropriate criteria (e.g., lead time, term of opportunity, customer load profiles) to assess the suitability of NWA opportunities, including the need for LDCs and the IESO to share data
- Information requirements for NWA service providers, such as capacity, activation triggers, usage frequency, usage duration, and other characteristics
- Demonstrating how NWA opportunities could be linked to wholesale markets (e.g., revenue stacking, interoperability of markets)
- Understanding how the risk profile of NWA opportunities may differ from the IESO's Demand Response Auction and how commercial terms can potentially be structured to allocate risks
- Sufficient stakeholder engagement to fully assess NWA implementation considerations, such as local load as trigger definition, potential for higher number of activation events, and capacity commitment requirement

York Region Non-Wires Alternatives Demonstration Project

The IESO, with support from Natural Resources Canada, is undertaking a demonstration in York Region to explore market-based approaches to secure energy and capacity services from DERs for local needs, while coordinating with broader electricity system needs. A key objective of the IESO York Region Non-Wires Alternatives Demonstration Project is to better understand the potential of using DERs in place of traditional infrastructure by enabling them to operate in real-world applications.

Development of the project is being informed by two IESO-led white papers, one of which describes a framework for assessing how transmission and distribution systems could interact with each other in a high-DER future. The second paper considers different market-based approaches for procuring DERs, explores how these resources can operate to meet local needs and wholesale market needs, and assesses the coordination required to ensure they can do both without adversely impacting reliability.

This project is currently underway and a local capacity auction was held in November 2020[21]. This 10 MW demonstration project is focused on the southernmost part of the region, including Markham, Richmond Hill and Vaughan. If requirements are met, this model could be replicated in other areas of the province experiencing rapid growth and system constraints.

Local Achievable Potential Studies

The primary objective of a Local Achievable Potential (LAP) Study is to better understand the nature of local load by market segment and establish a suite of NWAs that could best be matched with each segment to help manage current and future demand. LAP studies tested a range of methodological approaches and analytical tools, which can be leveraged to evolve how NWAs are considered in planning processes.

The objectives of a LAP Study are achieved through five primary tasks:

- Characterizing load, which involves determining market segmentation, local customer composition, existing building stock, heating type and end-use composition
- Determining technically feasible measures for reducing demand in the local area
- Assessing expected adoption based on existing and enhanced programs
- Analyzing expected adoption based on enhanced programs for conservation and demand management, and demand response
- Evaluating the potential for DERs

The analysis undertaken within a LAP Study would leverage, where available, information provided by an IRRP Technical Working Group, including participating LDCs. LAP studies have been completed for locations within the Barrie, Ottawa, and Parry Sound/Muskoka planning regions.

One of the main issues with the current framework for LAP studies is establishing responsibility for various aspects of the study. LAP studies were contracted via LDCs and employed a different team of LDCs and consultants for each area. Challenges with this approach included the administrative burden created by multiple layers of contracting and the additional time and effort required to develop a new methodology with each LAP study team and consultant. Benefits included testing a range of methodological approaches and analytical tools, which the IESO can learn and borrow from as it evolves its NWA planning work.

[21] More information can be found at the York region non-wires alternative demonstration project website

Jurisdictional Scan

The IESO commissioned a jurisdictional scan focusing on regional planning process design, frameworks for the consideration of NWAs, and roles and responsibilities for implementing non-wires alternatives[22]. Five entities were interviewed and a further two were researched; these included distributors, market operators, and regulators from select jurisdictions in Canada, the United States, and Australia.

Most jurisdictions used similar screening criteria – typically viability, cost and timing – to determine which needs can be addressed by NWAs. The viability test requires planners to determine the exact services that the wires solution would be providing, and whether a non-wires solution can provide that level of service. Some jurisdictions included explicit cost screening metrics, considering NWAs only if the cost of the proposed wires solution exceeded a predetermined threshold. These thresholds varied between jurisdictions but were typically on the scale of a few million dollars. The timing screen consists of identifying exactly when the identified need will materialize, and requiring the utility to determine the feasibility of soliciting and implementing NWA solutions before the forecast need date.

Many jurisdictions use or plan to use a Request for Proposal (RFP) approach over single utility-supplied solutions to take advantage of the best market information regarding technology costs, capabilities, and maturity from providers. This approach also reduces reliance on internal resources by outsourcing implementation. Using an RFP can shift risk from ratepayers to private developers by capping contract payments below the baseline capital and operating/maintenance costs of traditional wires-solutions.

All entities identified significant data requirements to implement non-wires solutions involving considerable time and effort. This included compiling the amount of capacity available for connection of DERs to each part of the utility system and supporting information to determine if and where NWAs may be viable. The supporting information required detailed technical data characterizing historical demand. Additionally, economic indicators such as capacity costs, energy costs, ancillary service costs, and the market price dampening/suppression effect were needed to determine the net benefits of implementing NWAs at a particular location.

Overall, emerging technologies and rapid innovation are causing jurisdictions to be receptive to new products and service offerings to meet changing system needs. Each jurisdiction aimed for technology neutrality to ensure selection of the most cost-effective solution to meet operational requirements.

[22] More information about the jurisdictional scan available here

Regional Planning Review Advisory Group Meetings

Through the data gathering exercises discussed above, the IESO compiled a list of over 30 barriers falling within two broad categories:

- "System barriers" – those that exist in the broader sector and influence NWAs in regional planning, e.g., factors pertaining to the state of technology, system value, industry experience/knowledge, regulatory issues, and resource markets
- "Process barriers," which are part of the regional planning and implementation process, and focus on tools/data used in regional planning, acquisition processes, and operationalization.

Once compiled, this inventory of barriers (found in Appendix X) served as a starting point for the RPRAG to provide its feedback. Over the course of several meetings, RPRAG members identified gaps, gave examples from their experience with NWAs in Ontario, and commented on the impact/importance of addressing each barrier.

An attempt was made to scope these barriers according to their relevance to the IESO's mandate. In-scope barriers referred to those that fall within the IESO's core market administration and independent planning functions. Partially in-scope barriers were those over which the IESO has some influence, but which are outside its mandate. Out-of-scope barriers were beyond the IESO's authority.

Breakout sessions were conducted to more closely examine each of the barriers and to collect feedback on scoping, criticality, and potential solutions. Aside from a few barriers that were either clearly out-of-scope or entirely in-scope, the majority were classified as partially in-scope. Following concerns about how it would treat the latter, the IESO clarified that changes to the regional planning process can result in tangible solutions to in-scope barriers. The IESO recognized that barriers were heavily interdependent and attempting to addressing only a subset of the barriers, limited the breadth of discussions and would not capture linkages both upstream and downstream of IESO processes. As a result, partially in-scope barriers will be examined as part of this sub-initiative so that high level recommendations can be made for other entities and processes that are better suited to address them.

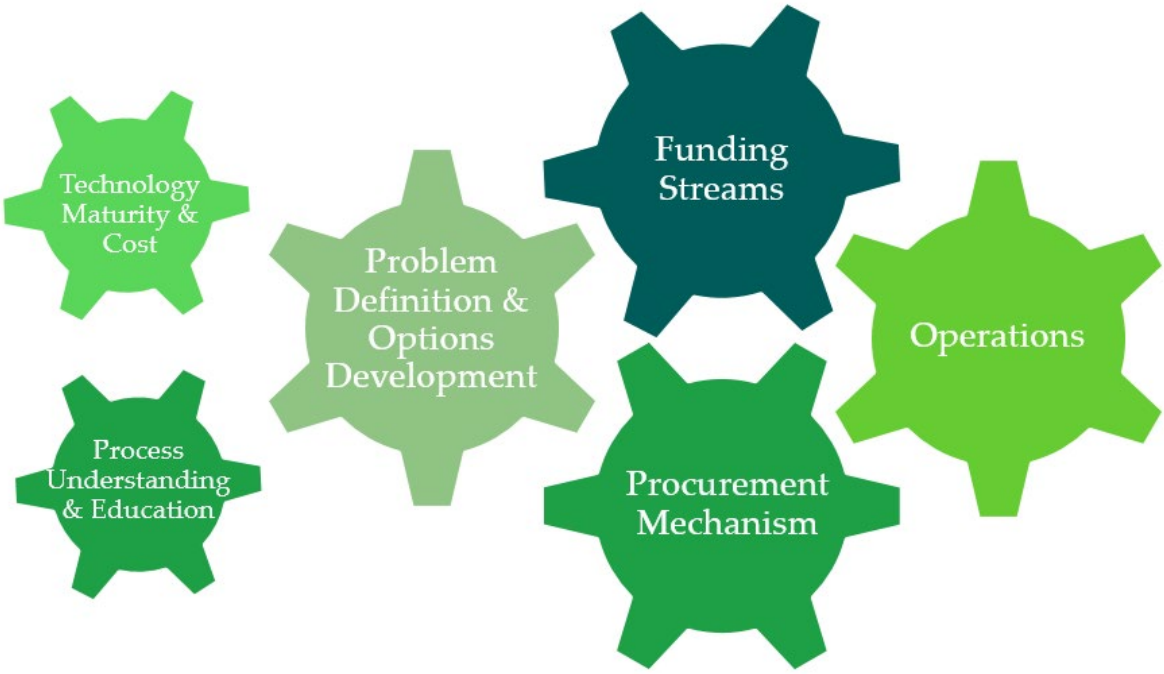
The dialogue with the RPRAG provided breadth and context to the initial inventory of barriers[23]. This knowledge helped shape the final organization of barriers discussed in the next section.

Categories of Barriers

As shown in Figure 10, the barriers identified are grouped into six interdependent categories, reflecting the fact that barriers to NWAs exist across the sector and interact with each other in complex ways. In order to advance cost-effective NWAs, taking a holistic view of these barriers is necessary, regardless of the entities or processes with which they are associated.

[23] Full meeting details can be found at IESO's Regional Planning Process Review Engagement Page

Figure 10 | Six Interdependent Types of Barriers



The following subsections elaborate on each of these categories.

Problem Definition and Options Development

The need definition in regional planning, typically characterized as the local load-meeting capability on an annual basis, caters to wires solutions, implicitly assuming that the broader system is adequate. A more comprehensive needs definition and options evaluation methodology is required to enable NWAs, and comprises three aspects:

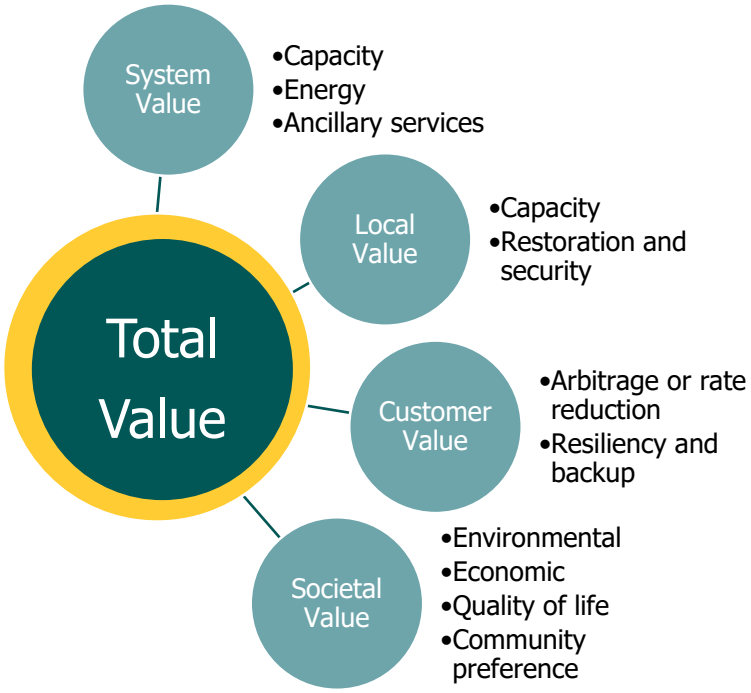
1. *Granularity:* Local needs are not captured with sufficient granularity (time, location, customer type) and do not adequately describe the probabilistic nature of capacity/reliability needs. Further, load characteristics are changing and forecasts are more volatile due to recent trends, such as increased consumer choice, DER proliferation, new energy-intensive loads with short lead times (e.g., data centres, artificial greenhouse lighting, cryptocurrency mining), and electrification.
2. *Scope:* Ancillary services needs are not considered in conjunction with local needs. Consideration of system-level generation/resource value should also be refined.
3. *Options evaluation:* There is a lack of formalized methods for evaluating both the technical and economic feasibility of NWAs given their unique characteristics, capability to provide multiple services, and timing challenges (if multiple individual resources are required).

Funding Streams

Before barriers related to funding streams can be discussed, the concept of multiple value streams and value stacking must be defined. NWAs can potentially provide system, local, customer, and societal value as summarized in Figure 11:

- System value is the ability of NWAs to provide services to the bulk system and is typically acquired through wholesale markets, including capacity, energy, and ancillary services.
- Local value is the ability of NWAs to address needs, including local capacity, restoration and security, in a specific area of the system.
- Customer value is the ability of NWAs to provide services, such as energy arbitrage, rate reduction, resiliency, and other non-energy benefits like improved comfort or productivity, directly to electricity customers.
- Societal value is the ability of NWAs to provide value to the community – through, for example, environmental, economic or quality-of-life benefits – that are not typically recovered through ratepayer.

Figure 11 | Sample Value Streams that Make Up an NWA's Total Value



Wires solutions typically have only a single funding stream: regulated rate recovery from transmission/distribution customers. NWAs must often access multiple revenue streams concurrently to be economically viable. This category has three aspects:

1. *Rules/Regulations for Value Stacking:* No formalized process exists today to access multiple value streams. Guidelines are incomplete regarding when and for what services value stacking is appropriate.
2. *Timing and Coordination of Ancillary Services:* The market for ancillary services that NWAs may provide is not transparent which results in value uncertainty. Additionally, procurement of these services may not align with capacity/energy/local reliability procurement mechanisms for NWAs.
3. *Cost Sharing and Recovery*: The mechanism for having local area beneficiaries (municipalities, customers, or market participants, in addition to LDCs) pay for NWAs is very limited. Where there are multiple beneficiaries, there are no guidelines or mechanisms for cost sharing. There is also no means by which local communities could elect to pay a premium for a solution that better addresses their preferences but is more expensive than the most cost-effective option.

Procurement Mechanism

This category is closely related to funding streams but focuses on the lack of procurement mechanisms for NWAs. Today, there are clear mechanisms for procuring wires solutions depending on whether they pertain to the distribution or transmission system. While conservation and demand management guidelines exist for distributors, no corresponding mechanism exists for NWAs addressing local transmission system needs, which makes recommending them in regional plans impractical for near-term needs. Aspects of this category include:

1. *Roles and responsibility:* In regional planning, no party is clearly responsible for implementing a recommendation for NWAs.
2. *Standardized acquisition process:* No standard process exists for procuring NWAs to address a local/regional system need.
3. *Access to IESO-administered markets:* The minimum-size requirement, resource eligibility, and other connection/registration requirements may be prohibitive for NWAs to access IESO-administered markets. There are also NWA attributes for which there are no readily available markets and participation in existing markets may not provide enough revenue.
4. *Commitment Timelines:* Long lead times associated with wires infrastructure planning/implementation may make a wires backup to NWAs infeasible if required.

Operations

There is no established procedure governing the process, timing, communications, and controls associated with operating dispatchable NWAs (mainly DERs and demand response) and verifying their performance. Barriers include:

1. *Local Dispatch Signals:* Trigger mechanisms or market signals for NWAs to respond to local reliability constraints do not currently exist.
2. *Transmission-Distribution System Interfaces:* Without a robust transmission-distribution system interface (including all hardware, software, protocols, and standards), NWAs to address both transmission and distribution system needs can not be enabled.

Technology Maturity and Cost

The Technology Maturity and Cost category refers to the barriers resulting from the state of NWA technologies and their associated costs. Some technologies may not have demonstrated the reliability and scalability required for mass adoption and commercial deployment. In other cases, NWAs technologies may not be cost competitive compared to other service products and wires infrastructure. This category is mainly included for the sake of completeness; this sub-initiative only focuses on NWAs that are cost-effective, assuming that value stacking, to the extent it is technically possible, is enabled.

Process Understanding and Education

Both potential solution providers and the broader public have gaps in their knowledge regarding system needs and regulations pertaining to NWAs. Several factors contribute to this:

1. *Quality, Timing, and Detail of Information from the IRRP Process:* Information from IRRP studies related to needs definition and options development is inconsistent and generally not sufficient for stakeholders to provide input on potential NWAs.
2. *Communication of Ongoing Work:* Stakeholder knowledge of ongoing work (e.g., initiatives, programs, pilots) related to energy efficiency and DERs is inconsistent and incomplete.
3. *Understanding of Existing Regulations, Procurement Processes, and Value Streams:* Both industry stakeholders and the general public are unclear about both the governance of NWAs within existing regulations and processes, and the full range of their potential benefits.

6.4 High-Level Direction

The barriers identified in the previous section are not limited to IESO processes and span the electricity sector. Addressing barriers related to regional planning in isolation would be a step in the right direction, but the ability to leverage NWAs would still be limited by barriers downstream of the planning process.

This section outlines a high-level direction for the sector at large, providing a framework for contextualizing more concrete near-term recommendations pertaining to the IESO and regional planning in the next section. It also highlights additional measures necessary to unlock the potential of cost-effective NWAs that are outside the purview of the IESO and will require coordinated action between industry entities, including distributors, transmitters, regulators, and government.

The measures below are divided into two categories: those directly related to the regional planning process and those related to implementation processes downstream of regional planning, such as NWA procurement, market integration, value stacking, and operationalization.

Regional Planning Measures

Four measures are directly related to the regional planning process: understanding the need and data gathering, ensuring a fair comparison, enabling market solutions, and empowering community choice.

Understanding the Need and Data Gathering

- Quantify with greater granularity the temporal, locational and end-use characteristics of the need
- Standardize methodologies for evaluating needs between regions

Ensuring a Fair Comparison

- Develop an evaluation framework to capture, to the extent they can be realized, the full range of NWA benefits to ensure a fair comparison between options

Enabling Market Solutions

- Consider early options analysis for future needs to allow additional time for NWA development and implementation
- Communicate relevant information in sufficient detail to enable proponents to design and propose solutions

Empowering Local Community Choice

- Build public knowledge to facilitate meaningful dialogue

Generally speaking, the regional planning process should ensure that planning tools, methodologies, and processes are in place to evaluate NWAs to the extent downstream implementation processes allow. Implementation of the measures above should proceed in step with or slightly ahead of regulatory, procurement, and operationalization measures. Section 6.5 will discuss the steps regional planning can take in the near-term and incremental improvements as downstream barriers are addressed.

Implementation Measures

Three broad measures relate to the implementation of NWAs: standardizing procurement, creating the framework and infrastructure for NWA solutions, and streamlining market integration and enabling value streams.

Standardizing Procurement

- Develop a clear implementation path for NWA recommendations
- Clarify roles and responsibilities among the IESO, transmitters, distributors, third-party providers and any new entities that may be involved in NWA procurement and implementation in future

Creating the Framework and Infrastructure for NWA Solutions

- Enable transmission-distribution system interoperability
- Implement the means for visibility and, where necessary, dispatch of NWAs to ensure system reliability

Streamlining Market Integration and Enabling Value Stacking

- Enable proponents to build economic business cases for NWAs that take into account multiple concurrent value streams including but not limited to IESO-administered markets and centrally delivered programs
- Facilitate monetization of NWA system, local, and customer-level services through competitive services, to the extent NWAs are technically qualified
- Explore interim procurement mechanisms until enduring competitive mechanisms are established

The extent to which regional planning-related measures can be advanced is highly dependent on the progress made on the implementation measures. For example, regional planning can only make full use of NWAs that address both transmission and distribution needs if transmission-distribution interoperability allows for it.

With respect to the monetization of NWAs, regional planning only influences one value stream: deferral of local wires infrastructure. System value streams, such as energy and capacity, are considered in regional planning's financial evaluation, but only to the extent they are accessible through wholesale market mechanisms or another cost recovery mechanism. Customer value streams should be established directly between NWA proponents and customers while societal value streams should only be considered in the electricity planning processes to the extent they are monetized by other entities.

Ongoing OEB Initiatives

The OEB initiated two integrated consultation processes: Utility Remuneration and Responding to Distributed Energy Resources. The purpose of the latter is to develop a more comprehensive regulatory framework that facilitates investment in DERs (on the basis of value to consumers) and supports effective DER integration to realize the benefits of sector evolution. The related initiative will identify how to remunerate distributors without favouring either traditional wires or non-wires solutions, better support the pursuit of least-cost solutions, strengthen the focus on long-term value and require them to reflect the impact of sector evolution in their system planning. These consultations and the resulting policy directions will have a direct impact on many of the measures outlined above.

The IESO has provided input to those consultations, noting many communities have expressed a preference for NWAs to meet growing local demand and defer transmission and distribution infrastructure investments. In particular, the IESO asked the OEB to consider the following questions:

- What approaches should be considered to provide a level playing field between wires and non-wires solutions?
- How should a resource's NWA value be stacked alongside other potential services?
- What mechanism(s) should be considered to procure NWAs?
- Who should plan for, procure and operate NWAs?
- How should the costs of NWAs be allocated?
- Should communities have the option to pay a premium for a non-wires solution if it is a less cost-effective alternative?

At a February 2020 stakeholder meeting, OEB staff set out the organization's current thinking on the objectives, scope, issues, and guiding principles of each initiative.[24] As part of a preliminary scope for the DER initiative, OEB staff committed to address several elements of particular relevance to NWAs and regional planning. These include:

- Developing a common framework for identifying DER costs and benefits in Ontario
- Ensuring signals for investment and operation of DERs promote efficient system use
- Enabling DERs to provide services to the distribution system, as well as the bulk system and directly to consumers
- Establishing roles, responsibilities, rules and requirements for sector participants engaging in DER activities

The IESO will continue to participate in these consultations.

[24] OEB Presentation for Stakeholder Meeting, February 2020.

6.5 IESO Near-Term Actions

This section outlines the IESO's near-term actions to advance cost-effective NWAs consistent with the measures documented in the previous section. Regional planning will focus on three actions related to need characterization, options development, and formalization of the NWA evaluation process to improve how IRRPs consider and make use of NWAs. This section will also point to the IESO's ongoing efforts to advance measures related to processes downstream of regional planning.

Regional Planning Process Improvements

Enabling NWAs will require sector-wide changes and the IESO will coordinate the implementation of improvements to the regional planning process alongside the sector's efforts to address downstream barriers. These improvements will enhance the tools and methodologies employed for studying NWAs and proactively prepare regional planning for the regulatory changes that will enable NWA value stacking and procurement.

Work has begun to implement the improvements below and further updates will be provided in 2021 to inform stakeholders of these actions and how they can expect future regional plans to incorporate them.

Need Characterization Improvements

Load forecasting in regional planning has traditionally focused on the peak hour of every year to ensure the transmission system is designed to meet applicable standards. This approach has been sufficient for studying wires infrastructure that needs to be sized according to the maximum instantaneous demand and is typically available continuously once installed. Unlike traditional wires options, NWAs represent a greater range of technical solutions to address local reliability needs, but their availability in terms of magnitude, duration, and frequency varies. Consequently, information such as the number of hours that forecast load might exceed system capacity, number of need events per year, and maximum duration of a single need event all have an impact on the feasibility and economic viability of NWAs.

Tools and methodologies will be developed to provide more comprehensive and detailed data on the nature of the load and any projected growth, including, but not limited to, capturing the load's temporal granularity, locational distribution, end-use applications, and customer types.

Not all local reliability needs are well suited for NWAs; this is further discussed in the Formalization of NWA Evaluation Process section. For needs that warrant a more detailed look at NWAs, studies will include:

- Developing representative hourly load profiles for each forecast year based on such factors as historical load behavior, weather, calendar variables, economic impacts, end-use applications, existing DER performance and conservation

- Characterizing the need in probabilistic terms where appropriate to quantify the expected frequency, magnitude, and duration of events that NWAs must be able to address

Formalization of NWA Study Process

The treatment of NWAs in past IRRPs has been inconsistent, in part due to incremental improvements to how NWAs are considered as subsequent IRRPs built on the work of and lessons learned from previous IRRPs. Additionally, regions differed in their electrical characteristics and local community priorities, which influenced the scope of NWA considerations.

Nevertheless, a more consistent and predictable approach to study NWAs is needed. The IESO will clarify the framework under which regional planning considers and evaluates non-wires options to provide additional transparency to stakeholders and advance general process understanding. This work will include formalizing the sequence and timing of how NWAs are studied.

Specifically, the IESO will consider:

- The merits of a screening mechanism for NWAs to address needs identified in regional plans and what guiding principles should be used
- The information requirements in regional plans to enable providers to formulate NWA options
- How to implement backstop paths in the regional planning process as non-wires procurement mechanisms evolve

A robust screening mechanism will become increasingly important as consideration of NWAs becomes more widespread. Not all local reliability needs are a good fit for NWAs and not all types of NWAs are equally suited to address specific needs. The incremental work to perform a fulsome needs characterization and options analysis for NWAs can be significant and should be targeted toward areas where NWAs have greater potential than traditional wires solutions.

As with options development, formalizing the study process will necessarily evolve alongside procurement and value-stacking mechanisms.

Options Development Improvements

Developing tools and methodologies to expand how regional planning evaluates and compares non-wires options will enable a level playing field for both wires and non-wires solutions.

NWA development will depend heavily on available procurement mechanisms and operationalization capabilities. The success of using new tools and data to identify and implement cost-effective non-wires solutions may be limited in the near to mid term as the sector continues to evolve. The focus of any proposed economic evaluation method today is currently limited to looking at the deferral value of transmission and system avoided costs. To unlock instances where NWAs are cost-effective, these resources will need better access to existing revenue streams, such as system capacity and energy, as well as customer and societal value streams that are yet to be monetized.

Regional planning will evolve the options development process in step with the outcomes of the OEB's ongoing consultations.

Other Ongoing Initiatives

In addition to improving the regional planning process to pave the way for greater DER participation, the IESO is engaged in several ongoing initiatives to advance NWAs in line with the high-level direction outlined in Section 6.4. These initiatives provide a starting point; efforts to realize this direction must involve regulators, transmitters, distributors, and NWA solution providers.

Explore NWA Participation in Markets

As set out in the its Innovation Roadmap , the IESO is developing and releasing a series of white papers ("Innovation and Sector Evolution White Paper Series").These white papers are intended to support the creation of a shared, fact-based understanding of emerging economic, technical, environmental, and social issues, opportunities and trends with the potential for significant future impact on Ontario's electricity system and broader electricity sector and, in particular, on electricity market efficiency, affordability and reliability.

Three white papers in this series are particularly relevant to NWAs and can help overcome access-to-information barriers that can pose a challenge to participation in electricity markets.

Non-Wires Alternatives Using Energy and Capacity Markets explores why enabling DERs to compete on a more level playing field with traditional generation and network infrastructure has become a priority for the sector, the importance of robust market and operational processes between transmission and distribution system operators, and how using energy/capacity markets to secure DER services could reduce system costs.

The second of a two-part white paper on exploring expanded DER participation in the IESO-administered markets (IAMs)*, Options to Enhance DER Participation* has been posted[25] in draft

[25] To learn more about the white paper series, visit IESO's Innovation and Sector Evolution White Paper Series website

and will inform planning for future work to enable DERs. This paper explores pathways to expand participation of DERs in IAMs with a focus on markets for energy, operating reserve, and capacity. Released in October 2019, Part I of this white paper, *Conceptual Models for DER Participation* explores existing participation models for DERs in wholesale markets and identifies a range of options to expand participation in the future.

A third white paper, *Distributed Energy Resources: Capability to Provide Bulk and Distributed Level Products & Services*, will be initiated later this year.

Explore Operationalization Requirements

Work is proceeding on several fronts to enhance visibility and control of the transmission-distribution interface to advance the successful implementation of NWAs and ensure local and system needs can be met.

A key objective of the IESO York Region Non Wires Alternatives Demonstration Project is to better understand the potential of using DERs in place of traditional infrastructure by enabling them to operate in real-world applications. The IESO will leverage learnings from this demonstration project to further understanding of coordination between IESO wholesale and distribution markets/operations.

In a similar vein, the IESO will further advance the DER agenda by working through the Grid-LDC Interoperability Standing Committee – a forum for engaging on matters relating to the coordination of IESO and LDC-controlled grid resources to enhance the reliability and efficiency of Ontario's electricity grid. DERs present potential risks to essential reliability services, load forecasting and operational planning, voltage and frequency ride-through capability, power flow modelling, market scheduling and coordination, system restoration, protection systems and under frequency load shedding, as well as cybersecurity. This committee's work includes evaluating future scenarios for DER development and performing relevant risk assessments, as well as identifying collaboration and data-sharing opportunities through the Grid-LDC Interoperability and Data Sharing Framework.

The *Development of a Transmission-Distribution Interoperability Framework* white paper examines how roles and responsibilities at the transmission and distribution levels could evolve to meet Ontario's changing needs and objectives for the grid. The paper explores several potential interoperability models along a continuum, looks at the pros and cons of each, and sets out next steps for the province to identify, design, select and implement a preferred transmission-distribution interoperability model.

Implement Targeted Energy Efficiency

On September 30, 2020, the IESO was directed[26] to implement a 2021-2024 Conservation and Demand Management Framework launching the week of January 4, 2021. The new framework will be centrally delivered by the IESO under the Save on Energy brand and will include

[26] To learn more about the CDM framework, visit the IESO website

incentive programs targeted to those who need them most, including opportunities for commercial, industrial, institutional, on-reserve First Nations, and income-eligible electricity consumers.

As part of this Framework, the IESO has been directed to procure, through competitive mechanisms, measures to address regional and/or local electricity system needs, including through local CDM programs, projects or pilots.

In response to this directive, the IESO is developing a Local Initiatives Program to issue competitive procurements for local energy efficiency (EE) programs or projects that target areas of the province with regional and/or local needs identified through the regional planning process. Procurements will be open to different participants, including LDCs, energy service companies, and large customers. The contracts resulting from these procurements are expected to be performance-based (e.g., paying for delivered capacity savings).

The Local Initiative Program will enable the IESO to take another step forward in developing its ability to use EE as an NWA resource that can be targeted geographically to areas with capacity needs and temporally at hours of the day with highest electricity demand. This program aims to maximize the value of CDM programs to ratepayers, increase competition to encourage innovation and demonstrate the ability of the IESO to deploy EE as a reliable regional resource.

NWA Capacity Building and Performance Testing through the Grid Innovation Fund

The Grid Innovation Fund (GIF) advances innovative opportunities to achieve electricity bill savings for Ontario ratepayers by funding projects that either enable customers to better manage their energy consumption or that reduce the costs associated with maintaining reliable operation of the province's grid. It supports projects that validate the performance and business case of promising new technologies, practices, and services, and that identify and mitigate market barriers, or otherwise accelerate the adoption of competitive cost-effective energy solutions.

The GIF invests in projects through two types of calls: periodic at targeted calls for projects addressing a specific challenge or opportunity identified by the IESO; and open calls, which capture the most promising ideas from the market at least once a year.

The IESO will continue to leverage the GIF to implement demonstration projects and programs that help the IESO and non-wires proponents validate technology performance and advance their potential for deployment. The GIF also supports projects focused on research, tools, training, community practice, and information-sharing to help the IESO and the broader electricity sector gain familiarity with and an understanding of NWAs. These endeavours will continue to help close knowledge gaps among solution providers and other stakeholders.

7. Conclusion

With the involvement of Indigenous communities, municipalities, and other stakeholders, the IESO, transmitters and distributors have successfully completed the first planning cycle for all 21 regions of the province. This process has resulted in the development of numerous integrated plans to address forecasted end of life, reliability and load restoration needs arising over the near-, mid- and long-term. Over the past seven years, the Ontario Energy Board's (OEB) Regional Planning Process Advisory Group (RPPAG) and regional planning process participants have actively enhanced the process through continuous improvement.

The IESO, with input from its advisory group (i.e., Regional Planning Review Advisory Group) and other key stakeholders, has made a number of recommendations to improve the efficiency and flexibility of the regional planning process, as well as how replacement of transmission assets reaching end of life are considered during the regional (and bulk) planning processes. As the barriers to non-wires alternatives (NWAs) identified during this review are not limited to regional planning, the ability to fully leverage NWAs will depend on addressing barriers that extend beyond the regional planning process.

With the regional planning process involving the IESO, transmitters and distributors, further assessing and implementing the recommendations identified during this review will require the continued collaboration of all participants and, in some cases, amendments by the OEB to applicable regulatory instruments.

The IESO is committed to its role in the regional planning process and will work toward implementing the IESO-led recommendations outlined in this report, as well as support the OEB's RPPAG in further assessing the other recommendations.

Summary of Recommendations

Options for process improvements have been developed by incorporating feedback throughout the Regional Planning Process Review. The recommendations range in complexity and accountability; the IESO can implement some, while others fall under the OEB's mandate.

As such, the IESO and OEB have collaborated to identify the organization responsible for the review and implementation, if appropriate, of each recommendation (see **Table 2** for the summary of recommendations and associated lead).

Table 2 | Summary of Process Review Recommendations by Implementation Lead

Recommendations	IESO Lead	OEB Lead
Process Efficiency and Flexibility		
1. Streamline and standardize load forecast development		X
Improve the weather correction methodology, seeking better alignment with IESO bulk planning processes	X	
Clarify the number and scope of the forecasts created between different stages of the planning process		X
Formalize annual forecast reviews with Technical Working Groups		X
Develop standard guidelines for base assumptions and methodologies to capture different scenarios (e.g., gross vs. net, electrification, long-term outlook)		X
2. Clarify process stages and final products: Integrated Regional Resource Plan (IRRP) and Regional Infrastructure Plan (RIP)		X
Clarify the difference in scope between the two products X		X
Optimize timelines between the IRRP and RIP stages		X
3. Better integrate and coordinate regional planning with related processes	X[27]	
Bulk planning	X	
Distribution planning		X

[27] The IESO and OEB will share accountability for this recommendation, each taking the lead for aspects of the recommendation that fall within their respective mandates.

Recommendations	IESO Lead	OEB Lead
Connection process[28]	X	
Community energy planning	X	
Regulatory proceedings (including distributor/transmitter rate filings)		X
Markets or procurement mechanisms (such as for transmission infrastructure, generation resources, or NWAs)	X	
Energy-efficiency program planning	X	
4. Better consider cost allocation during development of a plan		X
5. Enhance activities occurring between planning cycles	X	
Conduct annual meetings with Technical Working Groups to obtain updates on previous planning recommendations or new developments	X	
End-of-Life Transmission Asset Replacement		
1. Incorporate a process where transmission asset owners develop a long list of facilities with expected service life		X
2. Include a short list of end-of-life needs as an input to regional planning		X
Barriers to Non-Wires Alternatives		
1. & 2. Develop tools and methodologies to support need characterization and options development	X	

[28] To learn more about the process, visit the IESO Connection Process website

Recommendations	IESO Lead	OEB Lead
Conduct a review of all Local Achievable Potential studies when complete to identify best practices and useful tools	X	
Draft options scoping criteria/screening mechanisms	X	
Formalize and continue development on the Need Characterization Tool to include distributed generation modelling	X	
3. Formalize the stages of the planning process during which NWAs are developed and evaluated	X	
Create and engage stakeholders on a process flow diagram to outline the stages of a non-wires assessment, e.g., hand-off points, timing, accountabilities	X	
Communicate process broadly to the impacted teams	X	
Lead broader engagement with sector stakeholders to achieve consensus on the proposed process	X	
4. Explore non-wires participation in market mechanisms	X	
5. Assess requirements for the operationalization of NWAs	X	
6. Investigate mechanisms for locally targeted energy efficiency	X	
7. Continue testing non-wires performance through Grid Innovation Fund projects	X	
8. Continue capacity building through Grid Innovation Fund projects	X	
•		

IESO Near Term Actions

The IESO is committed to implementing the recommendations under its jurisdiction. While the Regional Planning Process Review formally concludes with this Final Report, implementation of the recommendations is anticipated to proceed over the next few years as the IESO and other planning participants undertake regional planning activities. Process changes that require further detailed discussions, and are likely to involve material changes to current practices, may not be implemented immediately. In the near term, the IESO will prioritize the actions that are expected to provide the greatest incremental value for the work required:

- Defining the process coordination required between the regional and bulk planning processes
- Formalizing the non-wires alternatives evaluation sub-process within IRRPs[29]
- Conducting annual Technical Working Group meetings to review forecasts, monitor developments, and report on previous recommendations for all regions

Recommendations that are led by the OEB will be subject to separate timelines. The IESO will participate in the RPPAG to advance and support review and implementation of these recommendations, as required. The IESO proposes the following actions as priority items for the RPPAG's consideration:

- Incorporating the end-of-life asset replacement information (long and short lists) in regional planning
- Clarifying the scope of the IRRP and RIP process stages
- Streamlining and standardizing forecasting activities

All recommendations will also involve some common implementation activities, such as general IESO staff education and training, updates to existing or creation of new formal documentation, and continued support from and collaboration among planning participants. Planning stakeholders and participants will experience process changes firsthand if they are participating in an upcoming planning cycle. To complement this, the IESO will publicly share its progress on process improvements through future planning-related engagement activities.

[29] Includes the near-term activities described in Section 6.5

Appendix 1 – List of Acronyms

Acronym	Definition
DER	Distributed Energy Resource
EOL	End-of-Life, end of life
ESL	Expected Service Life
GIF	Grid Innovation Fund
IESO	Independent Electricity System Operator
IRRP	Integrated Regional Resource Plan
LAP	Local Achievable Potential
LDC	Local Distribution Company
LTEP	Long-Term Energy Plan
NWA	Non-Wires Alternative
OEB	Ontario Energy Board
OPA	Ontario Power Authority
PPWG	Planning Process Working Group
RFP	Request for Proposal
RIP	Regional Infrastructure Plan
RPPAG	OEB's Regional Planning Process Advisory Group
RPRAG	IESO's Regional Planning Review Advisory Group

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