

JULY 15, 2021

Electricity Planning in the West of London Area

Today's Webinar

Purpose:

- To provide an overview of the ongoing planning studies underway in southwestern Ontario
 - Bulk planning: West of London Bulk Study
 - Regional planning: Windsor-Essex Integrated Regional Resource Plan (IRRP) Addendum Study
- To seek input on the potential options and key considerations

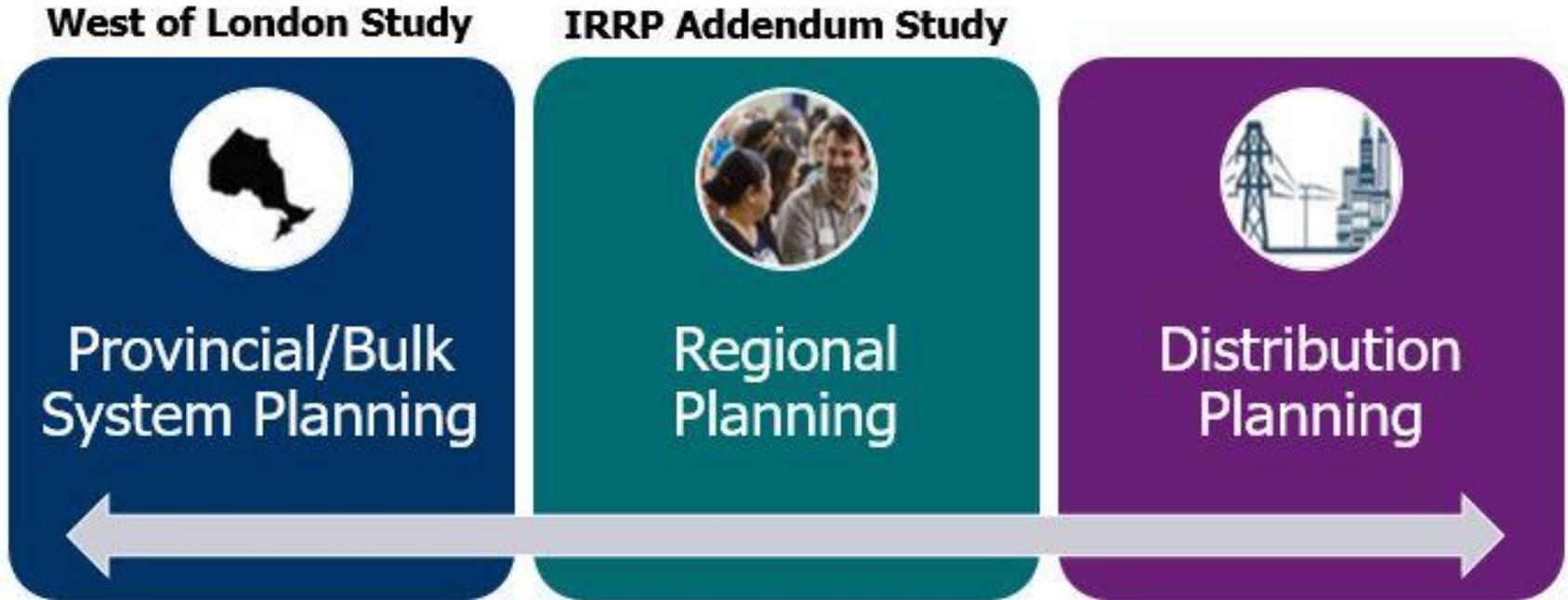
Agenda

1. Introduction and overview of planning activities
2. West of London Bulk Plan
 - i. Near-term recommendations
 - ii. Long-term options & proposed recommendations
3. Windsor-Essex Regional Plan options & proposed recommendations
4. Interdependencies with other system needs
5. Upcoming regional planning cycles



Overview of Planning Activities in the West of London Area

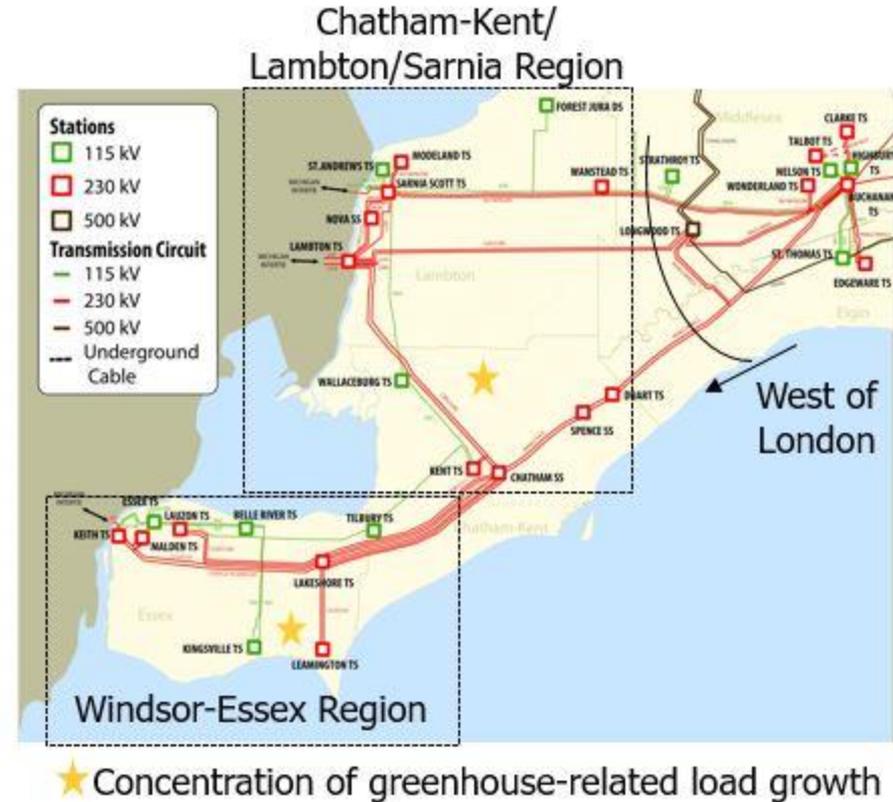
Different Levels of Electricity Planning in Ontario



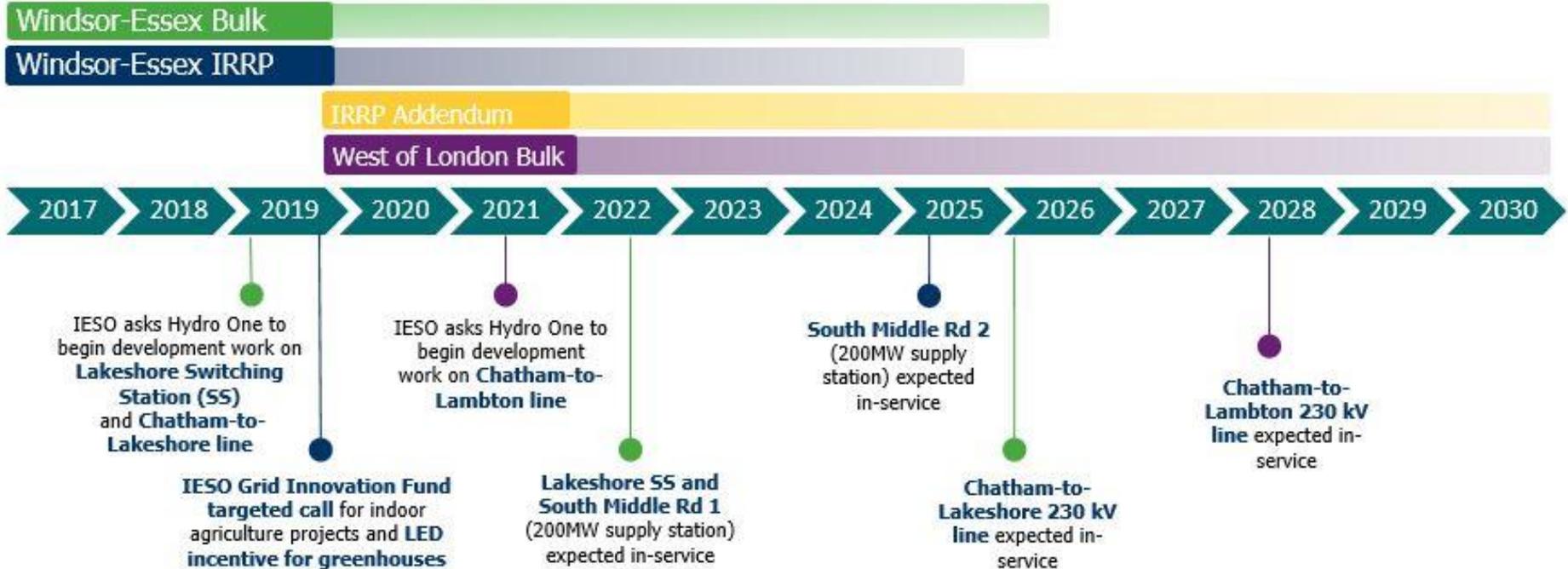
Background

- High electricity demand growth* due to greenhouse expansions near Kingsville, Leamington, and Dresden have exceeded both regional and bulk supply capabilities
- The 2019 Windsor-Essex IRRP and bulk study recommended reinforcements to enable customer connections
 - Lakeshore switching station (in service 2022)
 - Chatham-to-Lakeshore line (in service 2026)
 - Targeted energy efficiency and indoor agriculture call for proposals (in effect 2019-)

*Refer to Appendix for greenhouse load forecast



Timeline of Planning Recommendations, To Date



Overlapping Bulk and Regional Electricity System Needs

West of London Bulk Plan

Addresses broader adequacy needs to Windsor-Essex and Chatham areas (“focus area”)

- Transfer capability needs into the focus area
- Transfer capability needs into the broader west of London area
- Inter-zonal transfer capability needs

Windsor-Essex IRRP Addendum

Addresses local Windsor-Essex electricity supply needs

- Supply capacity needs
- Load restoration needs

Recap: Engagement Activities to Date

- November 2019, ongoing – outreach/meetings with local communities and stakeholders to discuss Windsor-Essex IRRP Addendum
- April 2020, ongoing – outreach/meetings with local communities and stakeholders to discuss West of London Bulk Study
- November 26, 2020 – public webinar to provide an overview of the electricity planning initiatives and seek input on key considerations for the demand forecast, needs and potential options
- March 31, 2021 – Southwest Network meeting to provide an overview of a new transmission line Lambton-to-Chatham and address questions

What we've heard so far...(1)

- Significant economic growth expected to continue, particularly in greenhouses in Kingsville-Leamington and Dresden
 - Potential for greenhouse expansion eastwards into Sarnia-Lambton and Elgin County
 - Potential for other major industrial developments in Sarnia-Lambton
 - Concern around land use impacts of electricity infrastructure
- Strong interest in the potential for non-wires alternatives/distributed energy resources (DERs) to meet needs

What we've heard so far...(2)

- Increased interest/expectation from Indigenous communities in the area to participate in project development
- Access to additional data is important to enable the development of solutions
- A process and mechanism for acquiring generation solutions is needed

Evaluating Options

Potential solutions are evaluated based on the following key considerations:

Technical Feasibility

- Can the option actually be executed? i.e., proximity to customers, routing and spacing considerations, operations

Ability to Address Needs

- Are the number, magnitude, and diversity of needs adequately addressed?

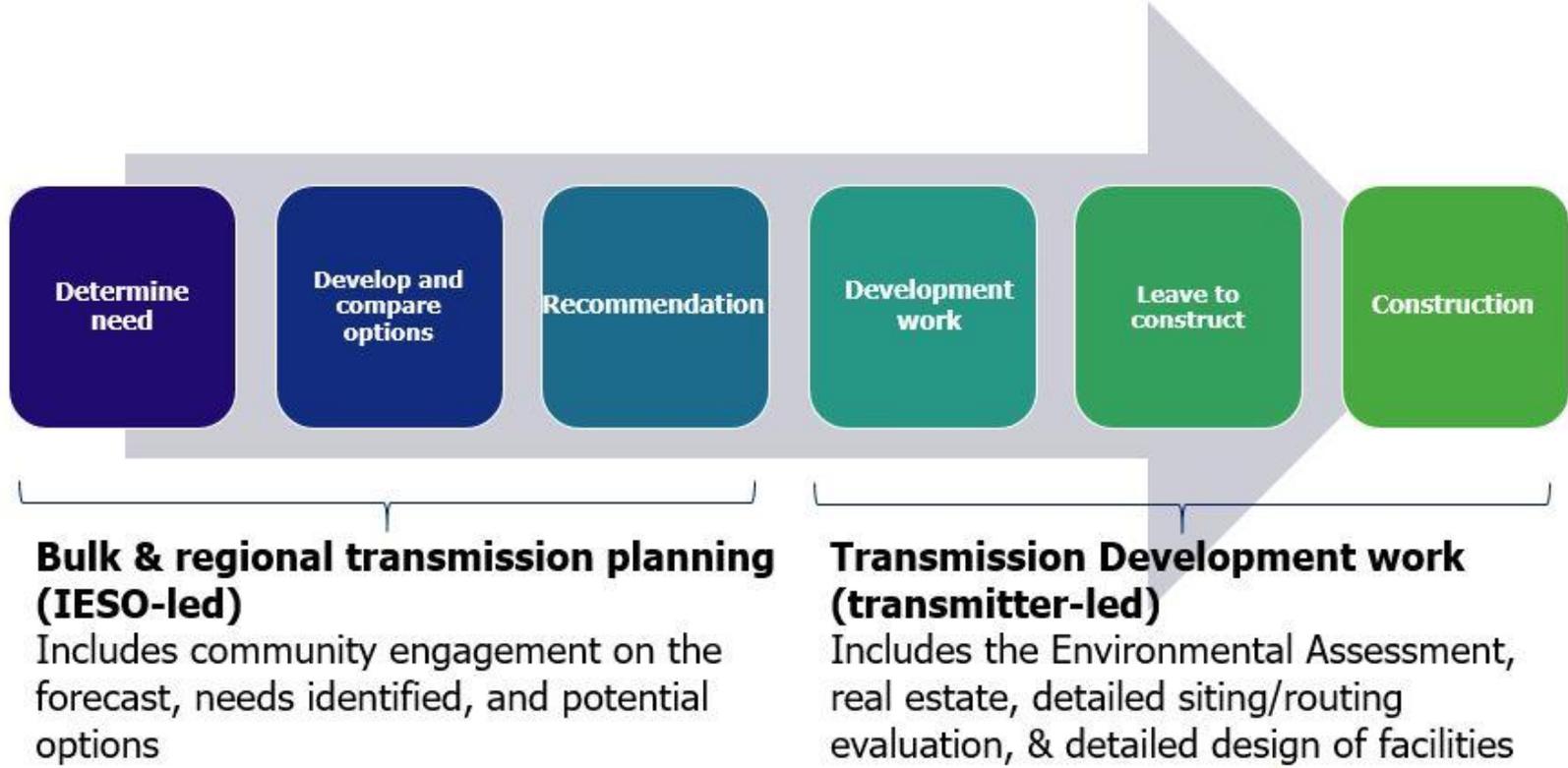
Integration & Cost-Effectiveness

- What is the lowest cost solution considering the possibility that one option may be able to address multiple needs simultaneously?
- Would a combination of option types be most effective?

Lead Time

- New transmission infrastructure or resource procurement/development could take 4-10 years – how does this compare to the timing of needs?

Typical Transmission Development Process

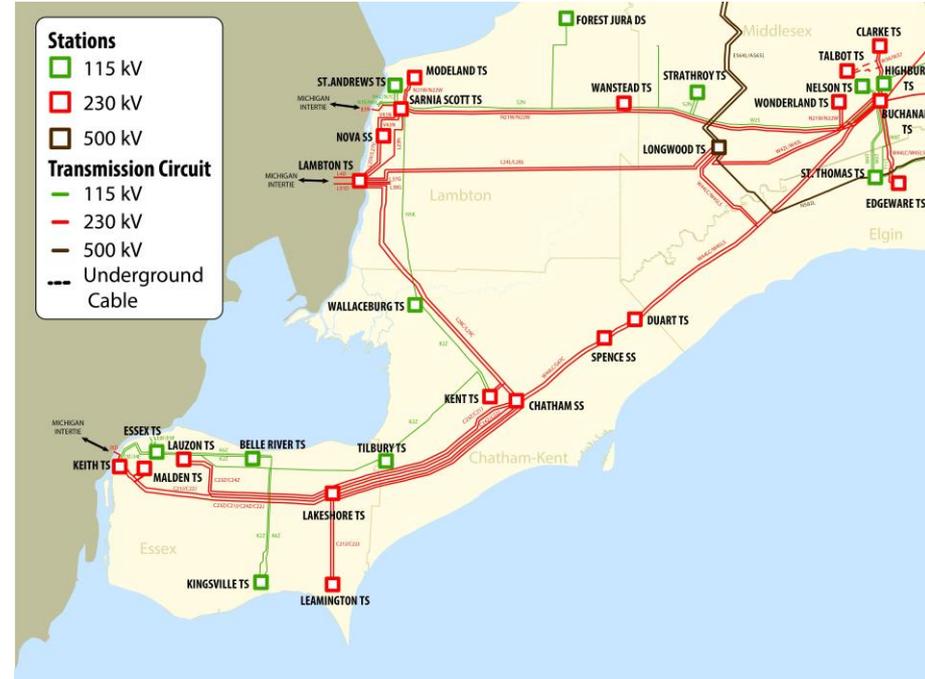




West of London Bulk Plan

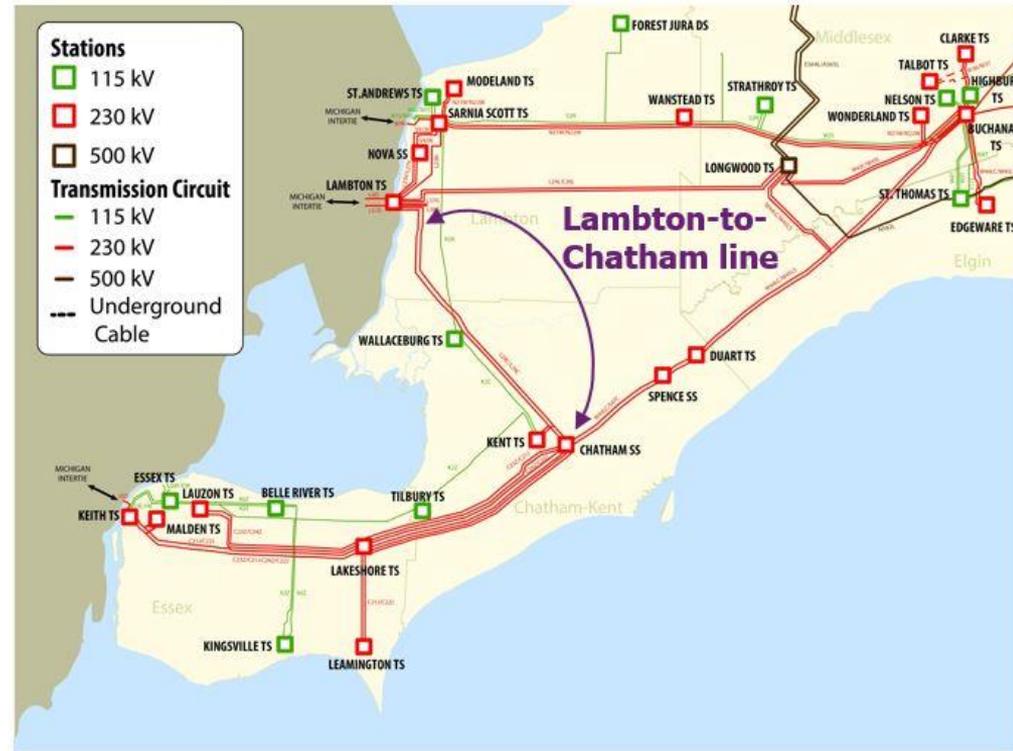
West of London Bulk – Needs

- Bulk transfer into Windsor-Essex and Chatham, from 2028
 - Limited by flow south from Lambton
- Bulk transfer into West of London, from 2030
 - Limited by flow west from London
- Bulk transfer into Windsor-Essex, from 2030
 - Limited by flow and voltage constraints into Lakeshore



West of London Bulk – Near-Term Recommendations (1)

- To supply demand until 2030 and address reliability needs, a letter was issued to Hydro One in March 2021 to initiate development work for a new:
 - Lambton-to-Chatham 230 kV double-circuit transmission line, with a target in-service date of 2028



West of London Bulk – Near-Term Recommendations (2)

- The near-term transmission recommendation and 2028 need date was based on the Reference load forecast, assuming all existing facilities remain in-service, and excluding import/export requirements
 - To ensure reliability can be maintained between 2024-2028, the IESO is developing a plan to acquire the necessary resources in the area, this will be detailed in the upcoming Annual Acquisition Report
 - Existing local generation and operational actions, such as arming a Special Protection Scheme (SPS) for load or generation rejection, will be required until the line comes into service

West of London Bulk – Long-term Needs

- Between 2030 to 2035, there remains a 1,100 MW capacity need, when accounting for the following:
 - Reference load forecast,
 - Resources which remain under contract within Windsor-Essex , and
 - Ontario-Michigan imports/exports

West of London Bulk – Long-Term Options (1)

- Given the magnitude of load growth, additional capacity is needed to enable the reference forecast beyond 2030
- Long-term options being considered are:
 1. A combination of transmission reinforcements in the Lakeshore-to-(Chatham-to)-Longwood corridor, **and** approximately 500 MW of incremental local generation/storage located west of Chatham
 2. A full generation/storage solution



West of London Bulk – Long-Term Options (2)

Option	Description of Option	Total Costs (\$M)
1a	New double-circuit 230 kV line from Longwood to Chatham to Lakeshore + 400 MW generation	500 – 950
1b	New single circuit 500 kV line from Longwood to Lakeshore + 550 MW generation	750 – 1,150
2	1,100 MW generation (no transmission enhancement)	1,500 – 1,600

- Values are the net present value (2020 \$CAD) of capital, O&M, production costs and carbon costs, as applicable, over a 70-year period. It considers provincial capacity value and uses a 4% social discount rate
- Includes a range of generation costs for different resource types (storage and SCGT*), and different assumptions for how existing resources are re-acquired or new resources are acquired

Specific Considerations for Transmission Options

- Cost, operability, and supply capability of:
 - Path from Lakeshore-to-Chatham-to-Longwood, vs direct from Lakeshore-to-Longwood;
 - Double 230 kV vs single 500 kV line;
- Minimizing footprint and long-term flexibility for future reinforcements if load trends toward the High forecast scenario
 - 500 kV has larger tower design and clearance requirements
 - 230 kV requires expansion of Chatham SS, if it is not by-passed and expansion of Lakeshore SS if load increases

Specific Considerations for Resource Options

- Community preferences for type and location of resources
- Coordination with provincial resource capacity needs
- Utilizing existing resources with contracts expiring in the study timeframe (by 2035), and/or acquiring new resources
 - Note, the market will determine the ultimate mix of resources
- Resource siting and preferred locations

Factors When Refining Option 1 Recommendation

	Enhanced with 230 kV	Enhanced with 500 kV	Neutral
Cost	X		
Ability to meet future demand		X	
Land use – Transmission corridor	X		
Land use – Stations		X	
Resiliency		X	
Deliverability of existing resources			X
Reliability during outages	X		
Operational flexibility		X	
Interchange with Michigan			
Transmission losses		X	
Community preferences	?	?	?
Other Factors?	?	?	?

Preferred West of London Bulk Long-Term Option

- Relying on benchmark costs, Option 1 is preferred – the combination of new transmission from Longwood TS (near the City of London) to Lakeshore TS (within the Municipality of Lakeshore) and local generation
- Although the 230 kV variation of Option 1 is a lower cost option compared to the 500 kV variation, the 500 kV variation is not being ruled out yet because it provides operational flexibility and long-term flexibility if load continues to grow post-2035 or trends toward the High forecast scenario
- IESO is requesting feedback on the options and additional factors to consider
- This input will be incorporated into the ongoing study of long-term options, prior to a recommendation in the West of London bulk report, anticipated by August

Seeking Input

- What feedback do you have regarding the preferred option of a combination of new transmission line from Longwood TS to Lakeshore TS and local generation?
- What feedback do you have regarding a 230 kV versus 500 kV line?
- What other information should be considered in finalizing the recommended solution and final report?

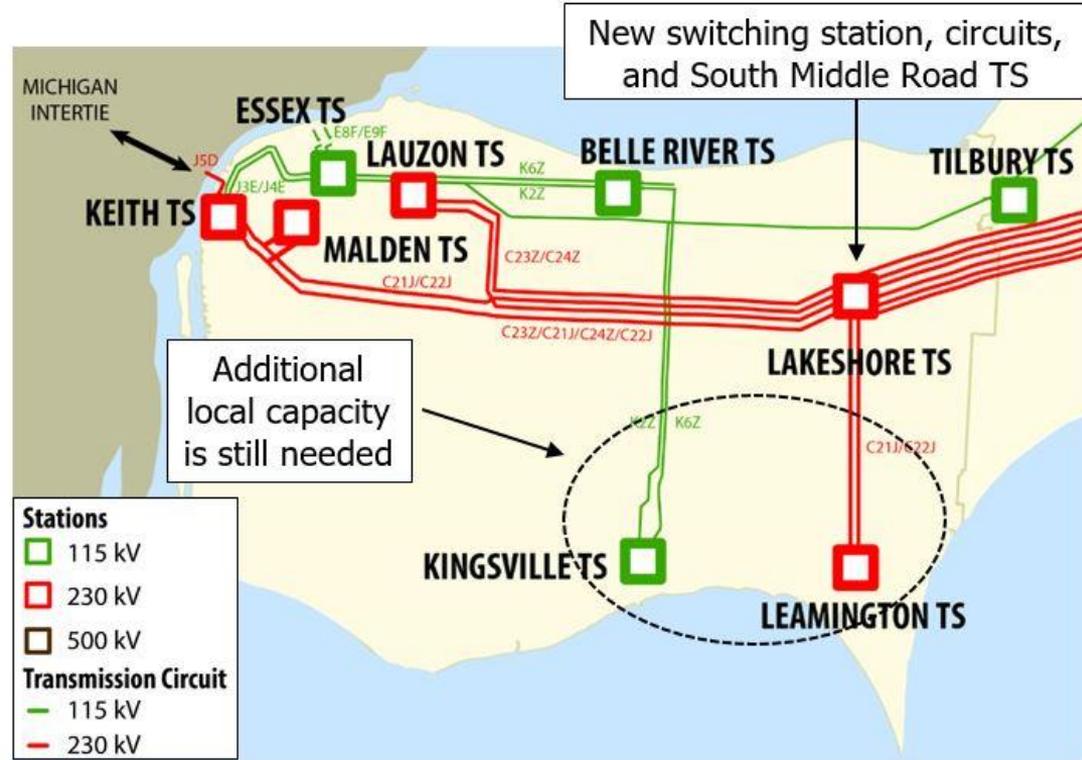
Please submit your written comments by email to engagement@ieso.ca by August 6



Windsor-Essex IRRP Addendum Study

IRRP Addendum – Capacity Needs

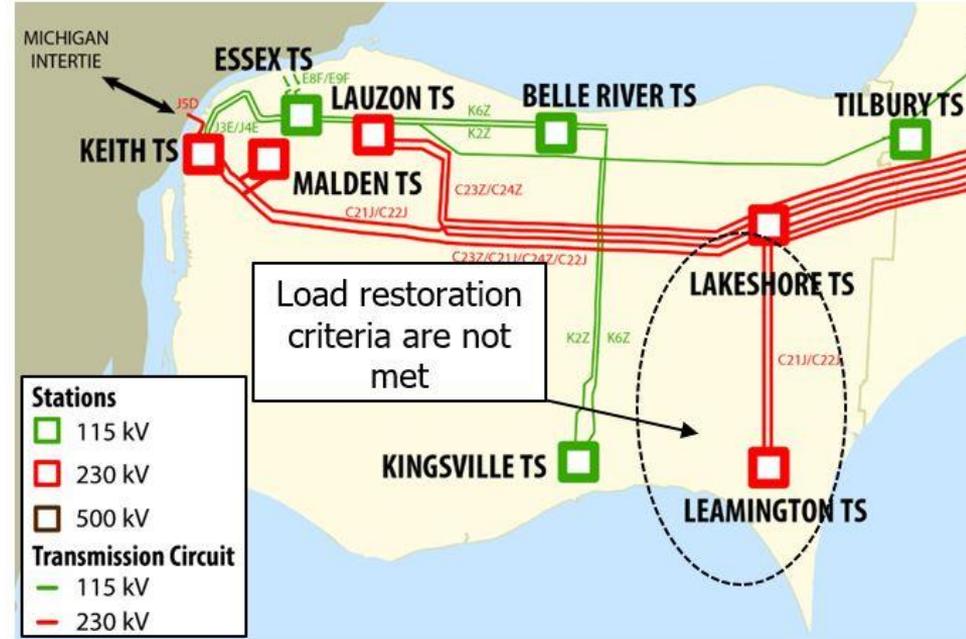
- The IRRP identified existing capacity needs at Kingsville TS
- Forecast greenhouse demand growth in the Kingsville-Leamington area also exceeds the new capacity provided by the expanded Leamington TS and South Middle Road TS



IRRP Addendum – Load Restoration Needs

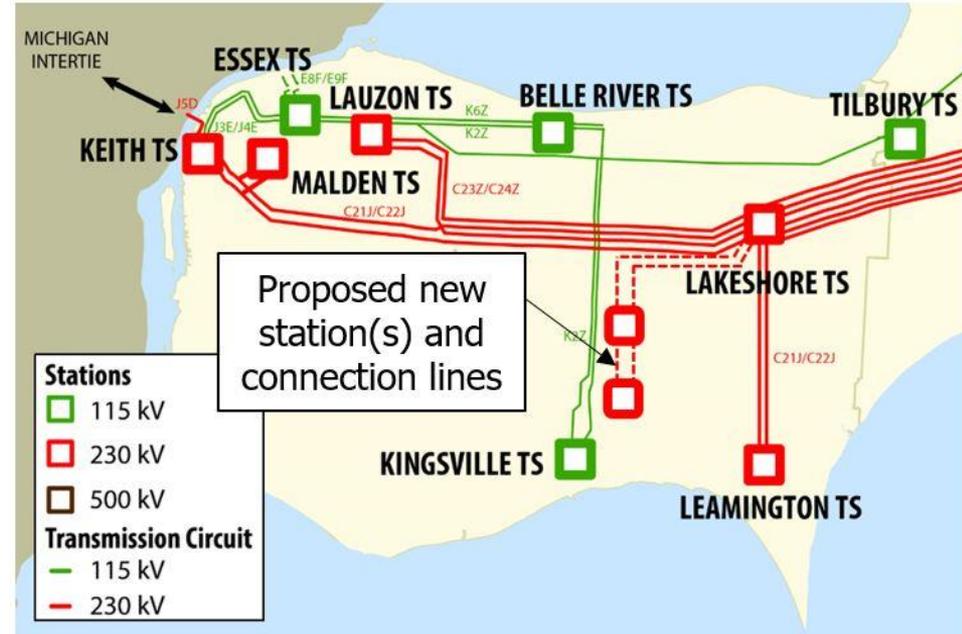
- The IRRP also identified load restoration needs
- For contingencies on the 230 kV circuits supplying Leamington TS, up to 520 MW of load would be interrupted with limited restoration capability
- Load restoration criteria:

Time After Contingency	Load to be Restored
Within 30 min	270 MW
Within 4 h	100 MW
Within 8 h	150 MW



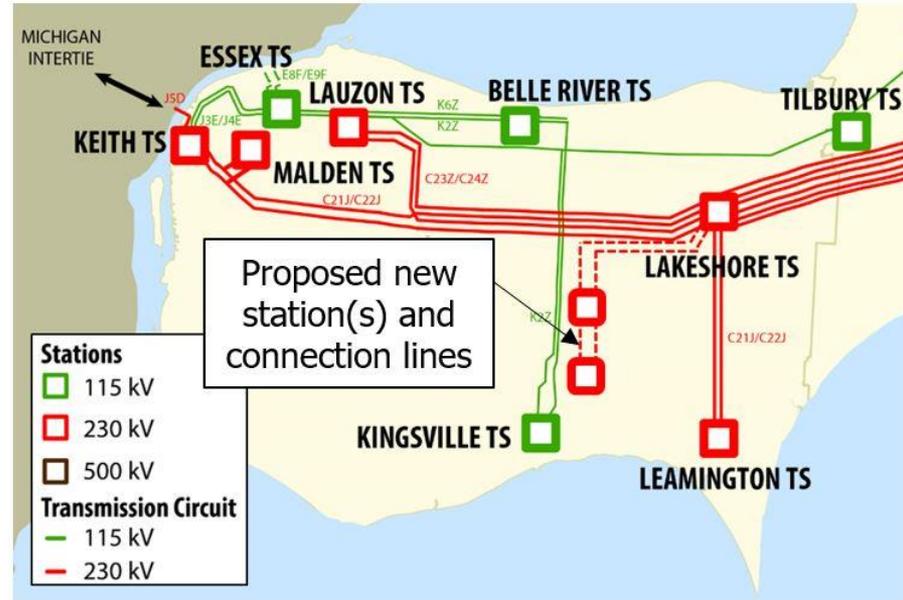
IRRP Addendum – Near-/Mid-Term Options (1)

- Additional local load supply stations and connection lines to the Kingsville area can proceed in parallel with near-term bulk reinforcements
- Two supply stations (beyond those already under development) are needed for the 400+ MW of distribution-connected customers currently waiting for capacity
 - This queue is included as part of the overall Reference load forecast for West of London



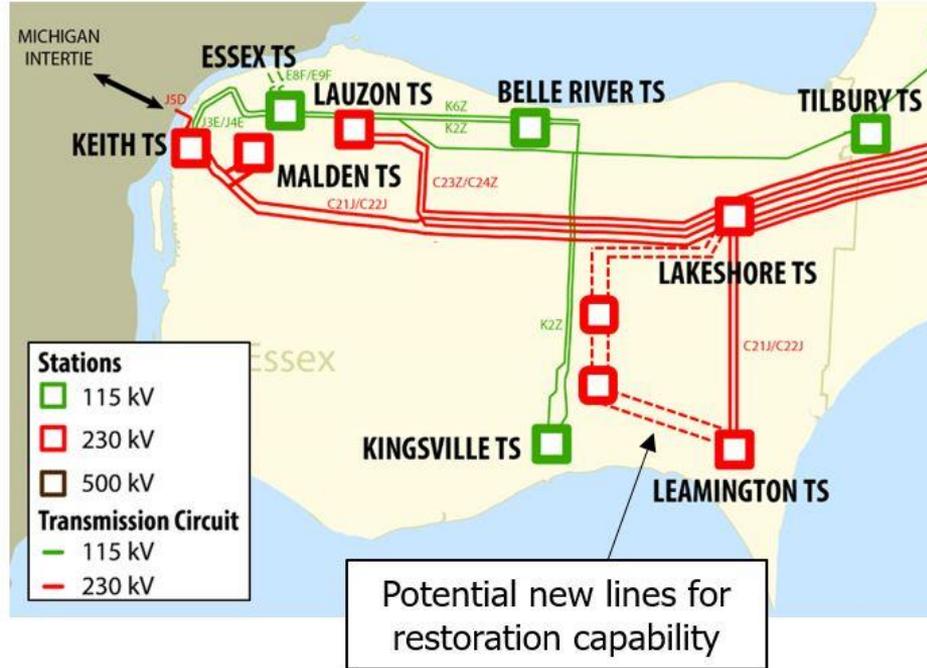
IRRP Addendum – Near-/Mid-Term Options (2)

- Existing and planned local capacity (at Leamington TS, Kingsville TS, and South Middle Road TS) is already allocated
- New connection lines are required because:
 - The new stations should be located close to waiting customers farther south (close to the existing Kingsville and Leamington stations)
 - The 115 kV circuits supplying Kingsville TS and 230 kV circuits supplying Leamington TS cannot accommodate 400+ MW of new load



IRRP Addendum – Near-/Mid-Term Options (3)

- A new 230 kV double-circuit line between Leamington TS and the new station is also being considered
- This transmission reinforcement is likely necessary to meet load restoration criteria
 - i.e., how much and how quickly load at these Kingsville-Leamington stations can be restored during an outage
- Estimated lead time for new stations and 230 kV double-circuit lines: 4-5 years



Exploring Alternatives for Load Restoration Needs

- A new line between Leamington TS and the new stations in Kingsville would provide significant (300+ MW) of restoration capability to the area, for approximately \$40M
- However, other alternatives are being considered for this redundancy:
 - Load transfer capability on the distribution system
 - Distributed generation (DG) (such as combined heat and power or energy storage facilities)
- Beyond cost-effectiveness and amount of restoration capability possible, the Working Group is considering other aspects of these alternatives, such as the:
 - Technical challenges with relying on DG for restoration (i.e., short circuit limitations, restrictions on islanding operations)
 - Final distribution feeder buildout & transmission-level supply capability
 - Alignment with community energy targets and any planned uptake of DG

Seeking Input

- What feedback do you have regarding the potential solutions being examined:
 - Additional local load supply stations and connection lines to the Kingsville area
 - A potential new 230 kV double-circuit line between Leamington TS and the new stations
- What other information should be considered in finalizing the recommended solution and final report?

Please submit your written comments by email to engagement@ieso.ca by August 6



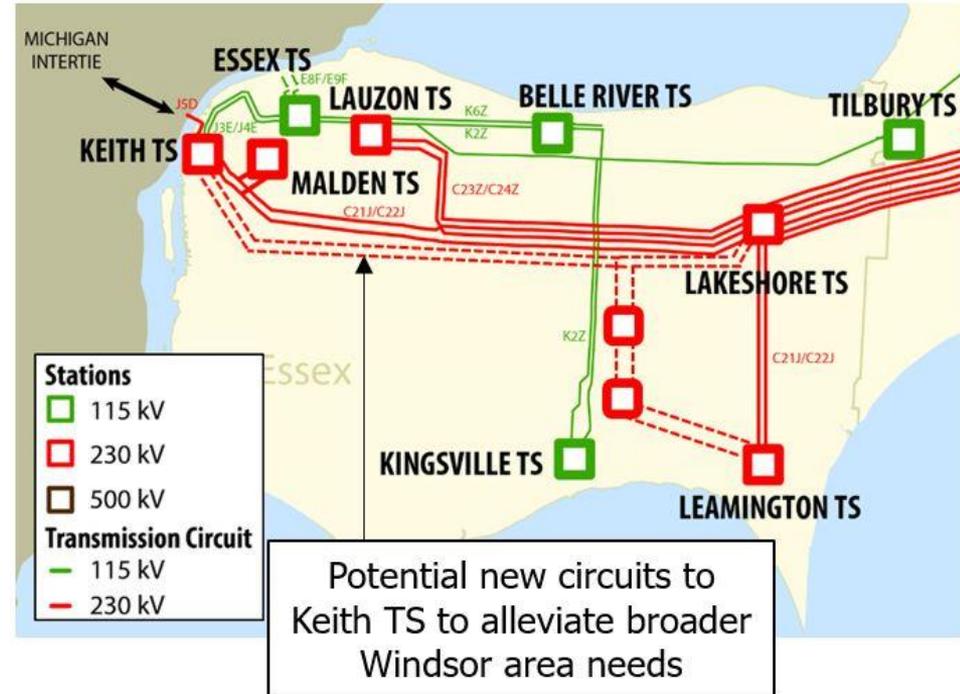
Interdependencies with Other System Needs

Interdependencies between Bulk and Local Needs

- As local supply stations enable more load connections in Kingsville and Leamington, existing reliability issues near Windsor are exacerbated
 - Thermal overloads on the 115 kV path east from Windsor, following the loss of a 115 kV or 230 kV path between Windsor and Lakeshore during high Windsor generation output
- Options explored in the IRRP Addendum provide long-term flexibility
 - If more than 400 MW of generation is sited within Windsor in the long-term, a new 230 kV transmission line between Windsor and Lakeshore (~\$200M) may be required

Interdependencies between Bulk and Local Needs (2)

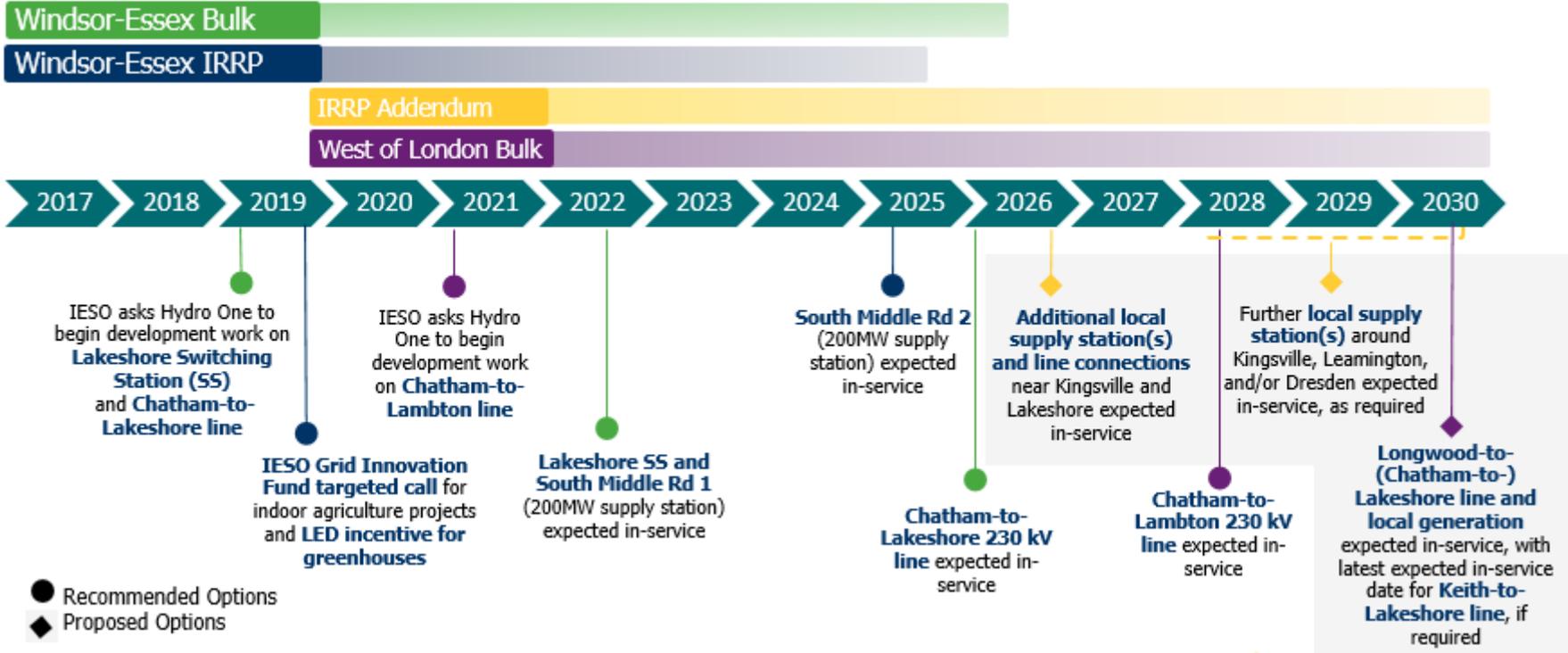
- The benefit of new transmission to Keith TS depends on the location and amount of local generation in the long-term
 - This option does not need to be triggered now
- The long-term picture of local generation will be shaped by the resource component of the long-term West of London bulk plan and community preferences/trends
 - This cost was considered when evaluating the long-term bulk options



Interdependencies with Provincial Adequacy Needs

- There is a growing provincial need for capacity, exceeding 6,000 MW in 2026 and, as such, local generation could contribute to meeting that need. This was considered in the bulk study cost analysis
- There are minimum requirements for supply capacity in the West zone emerging in the late 2020s (these requirements assume that current generation contracts are not renewed once they expire); local generation could help meet this need
- Solutions will be outlined in the upcoming/future Annual Acquisition Report
- Bulk and zonal resource needs will be addressed using the Resource Adequacy framework

Timeline with New Proposed Options



Map of West of London with All Proposed Options

- Includes regional and bulk near-term recommendations, long-term options, as well as projects previously recommended which are under-development



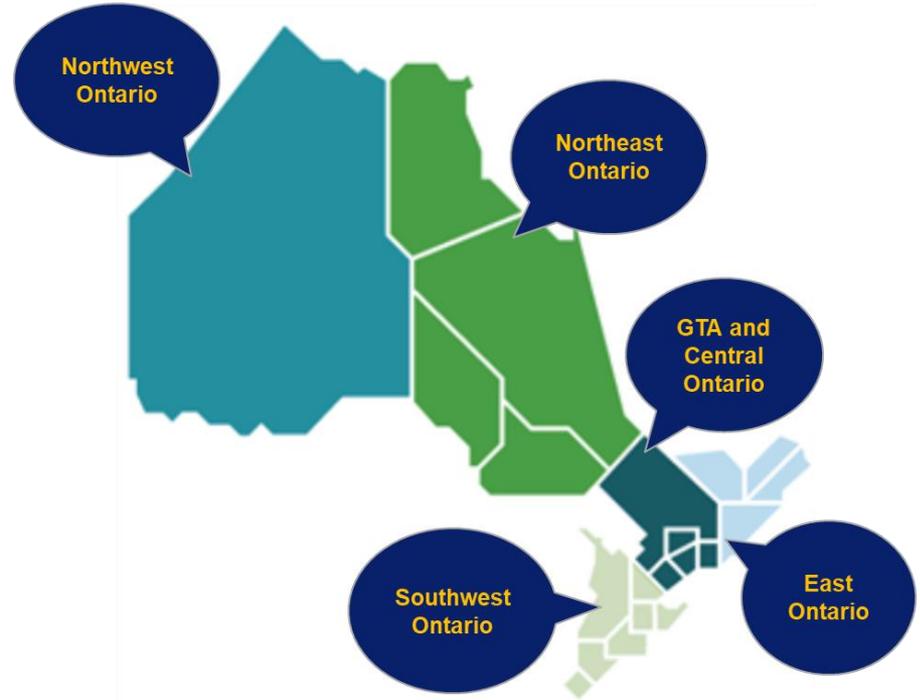
*Diagram provided for illustrative purposes; location will be determined through the EA process



Upcoming Regional Planning Cycles

Electricity Regional Planning

- The regional planning process ensures that each of Ontario's 21 regions are scheduled to start a new planning cycle at least once every five years
- This allows regional planning to continue with the transmitter, local distributor, and other stakeholders in a structured and timely manner



Chatham-Kent/Lambton/Sarnia Regional Planning

- A new cycle of regional planning has begun
 - Hydro One currently conducting their Needs Assessment
- Unlike the previous cycle in 2016, further regional coordination is anticipated
 - Projected greenhouse loads in Dresden
 - Large industrial customer base in Sarnia
 - Coordination with West of London bulk recommendations



Windsor-Essex Regional Planning

- Next cycle of regional planning will start with a transmitter-led Needs Assessment in fall 2022
- Given the quickly-evolving load, multiple new transmission reinforcements, and known needs, the IESO will continue to monitor and work with proponents developing facilities in this region
- Next cycle will ensure updated information from stakeholders can continue to be incorporated (i.e., forecasts, community energy plan implementation)





Next Steps

Upcoming Milestones

- Written feedback due – July 30
- Publish West of London bulk plan report – Summer 2021
- Publish Windsor-Essex IRRP Addendum report – Fall 2021

Information-Sharing

- In response to feedback received from our last webinar, detailed information will be made available upon publication of the West of London bulk report
- To ensure that the information being provided and the proposed format is valuable to stakeholders, the list of data and format (e.g. pdf, excel) will be posted following this presentation for comment
- Data to be provided with the bulk report:
 - Load data (forecast methodology and sensitivities, modelled hourly load profiles, historical hourly load)
 - Needs identification (transmission interfaces limits and forecast flows, planning criteria, capacity methodology)
 - Options development and analysis (resource sizing approach, cost and timing assumptions)
 - Solutions/principles for decision-making

Thank You

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Appendix

Addressing Rapid Growth in Indoor Agriculture

- Electricity demand in Windsor-Essex and Chatham areas is increasing rapidly as a result of growth in the agricultural sector
 - Vegetable greenhouse expansion is the primary driver, to provide year-round local produce
 - Intensification of greenhouses through of indoor lighting also a factor
- Agricultural demand expected to grow from 500 MW to 2,300 MW by 2035 – equivalent to adding a city the size of Ottawa

Agricultural Demand Forecast

