Update on the Provincial eDSM Achievable Potential Study

DECEMBER 9, 2025

ieso
Connecting Today. Powering Tomorrow.

Welcome and Introduction

- Today's session will be recorded and available for viewing online
- The recording and presentation for this engagement can be found on the 2026 Provincial eDSM Achievable Potential Study engagement page

Participation

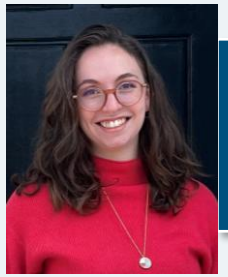
- For questions and comments click on the “raise hand” icon (hand symbol) at the top of the application window. This will indicate to the host you would like to speak.
- To unmute audio, click on the microphone icon at the top of the application window.
- Audio should be muted when not asking a question.

Territory Acknowledgement

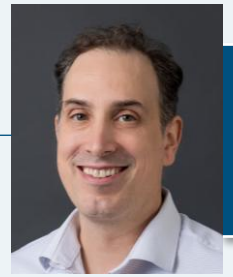
The IESO acknowledges the land we are delivering today's webinar from is the traditional territory of many nations including the Mississaugas of the Credit, the Anishnawbe, the Chippewa, the Haudenosaunee and the Wendat peoples and is now home to many diverse First Nations, Inuit and Métis peoples. We also acknowledge that Toronto is covered by Treaty 13 with the Mississaugas of the Credit First Nation.

As we have attendees from across Ontario, the IESO would also like to acknowledge all of the traditional territories across the province, which includes those of the Algonquin, Anishnawbe, Cree, Oji-Cree, Huron-Wendat, Haudenosaunee and Métis peoples.

Cadmus Project Team

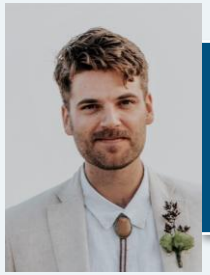


Conner Geery
Project Manager



Aquila Velonis
Principal Investigator

Taylor Bettine
Energy Efficiency and Electrification Lead



Ari Kornelis
Demand Response Lead

Danial McGhie
Behind-the-Meter Solar and Storage Lead

Agenda

- Timeline and Stakeholder Engagement
- Focus Areas and Reporting Metrics
- Methodology Overview
  - Energy Efficiency and Electrification
  - Demand Response
  - Behind-the-Meter Solar, Storage, and Load-Shift
- Appendices
  - Appendix A: IESO Electric Zones
  - Appendix B: Planning Study Priorities and Scope

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Timeline and Stakeholder Engagement

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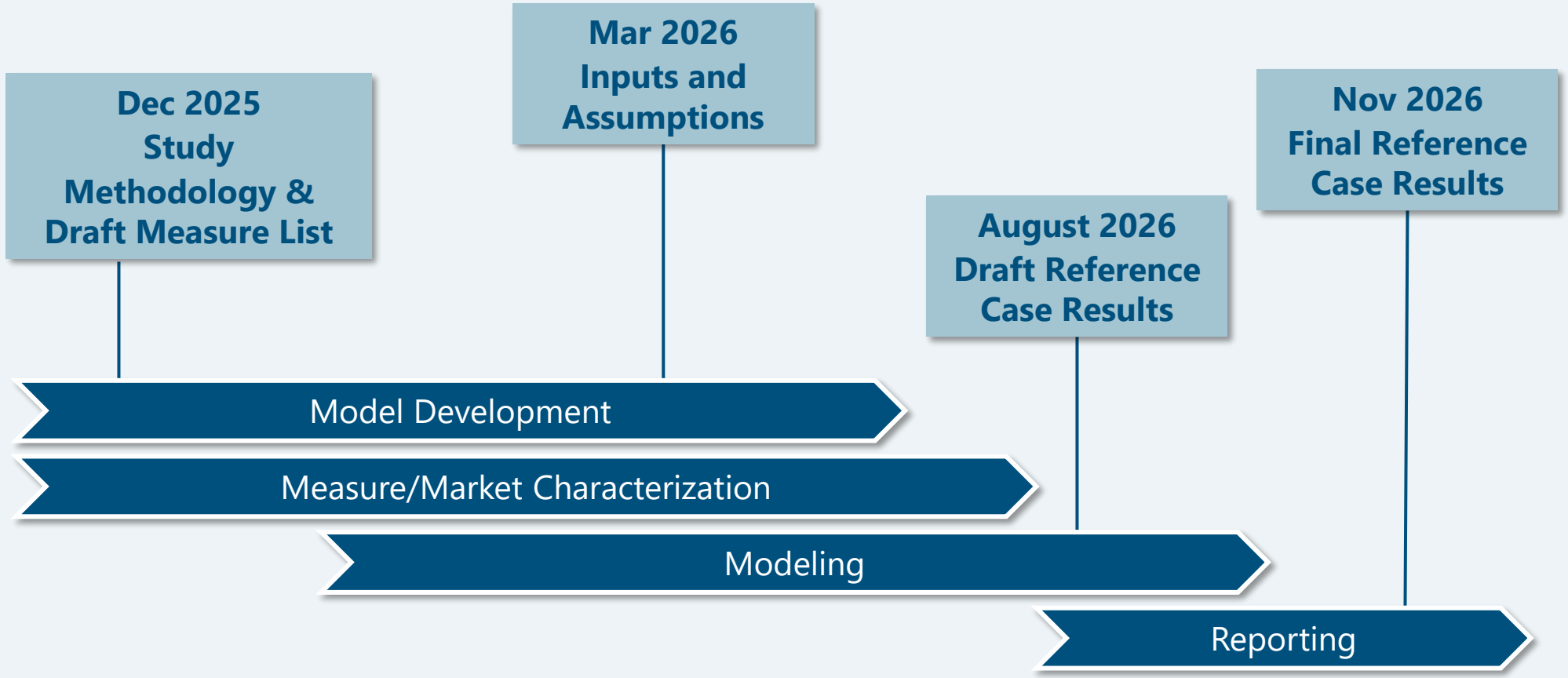
Planning Study Timeline and Key Milestones

Stakeholder Presentation Schedule



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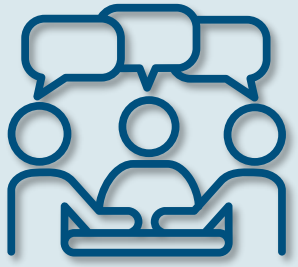
Stakeholder Engagement Process

Stakeholder Meetings

- Four public webinar meetings
  - Study methodology
  - Input assumptions/scenario design
  - Draft results (base scenario)
  - Final results



Stakeholder Feedback

- Feedback forms posted by the IESO for each meeting
- IESO will summarize feedback received
- Cadmus and the IESO will work together to address and incorporate feedback

Focus Areas and Reporting Metrics

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Planning Study Priorities and Scope

Study Priorities	**Estimate the IESO potential impacts on** electric loads and electric peak demand for specific customer segments and contextualize findings to inform decision-making

Study Scope	
Estimates of Potential:	Electric technical, economic, and achievable
DSM Potential Resources:	Energy efficiency, fuel-switching, demand response, and behind-the-meter resources (solar, storage, and load-shifting)
Applicable Sectors:	Residential, commercial, industrial including agriculture
Locational Level:	Overall system and IESO electrical zone level (1 Bruce, 2 East, 3 Essa, 4 Niagara, 5 Northeast, 6 Northwest, 7 Ottawa, 8 Southwest, 9 Toronto, and 10 West)
Study Horizon:	2026 (base year) to 2050
Scenarios:	Reference Scenario (Ref), High Demand Scenario (HDS) and Low Demand Scenario (LDS), and additional scenario (TBD)
Modeling Type:	Hybrid bottom-up / top-down end-use model

Primary Tasks

1

Measure List / Data Gathering

- Develop a comprehensive measure list for each resource
- Gather measure and market data
- Data request

2

Technical Potential

- Market characterization by sector, segment, vintage, end-use, and zone
- Measure characterization of impacts, costs, incentives, lifetime, and technical constraints

3

Economic Potential

- Follow the IESO cost-effectiveness criteria
- Use avoided energy and avoided capacity

4

Achievable Potential

- Assess DSM adoption by modeling customer decisions
- Use customer-facing economics with diffusion of innovation theory

5

Scenario Analysis

- Conduct load scenario analysis to determine levels of potential from low and high IESO system loads

6

Reporting / Findings

- Prepare one report for energy efficiency, beneficial electrification, and behind-the-meter resources
- Prepare one report for demand response

Methodology Overview

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Energy Efficiency and Electrification

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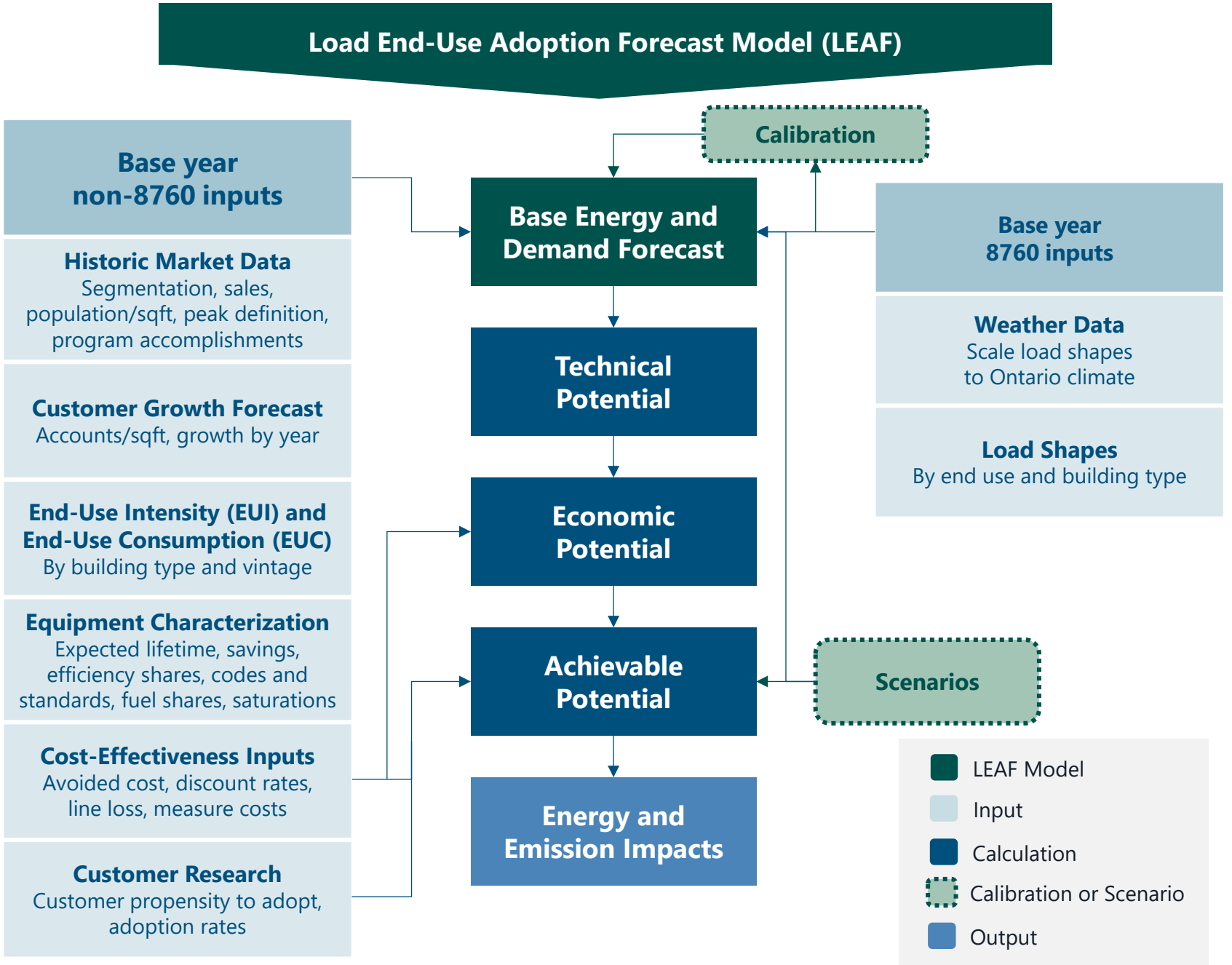
Energy Efficiency and Electrification Methodology Overview

Purpose: Produce estimates of electric technical, economic, and achievable energy efficiency and fuel-switching potential

Sectors: Residential, commercial, and industrial

Period: 2026 base year with potential 2027 to 2050

Location: For each of the 10 IESO electrical zones as well as for the overall system



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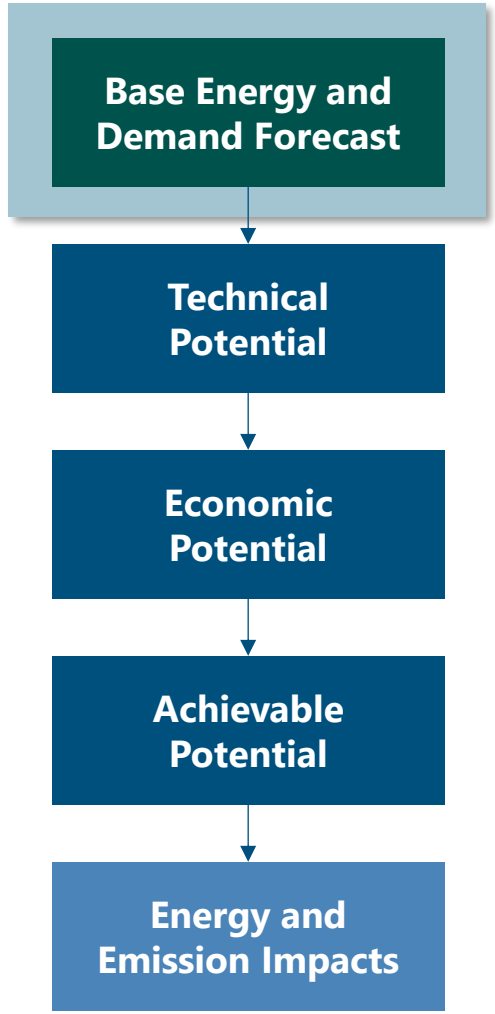
Base Year Energy and Demand Forecast

Characteristics:

- Based on the IESO's Long Term Demand Forecast (LTDF) from LEAF
- Built up from customer accounts, end-use saturations, end-use fuel shares, end-use equipment efficiency shares, and end-use consumption
- Includes new construction and existing construction demolition/major renovation rates by building type
- Includes adjustments from climate forecast
- 8760 level results, built up from equipment load shapes



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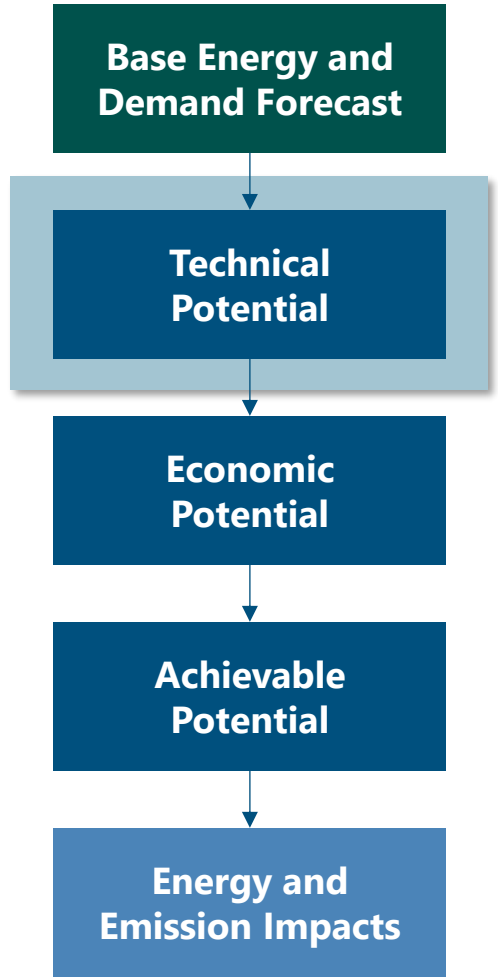
Technical Potential

Characteristics:

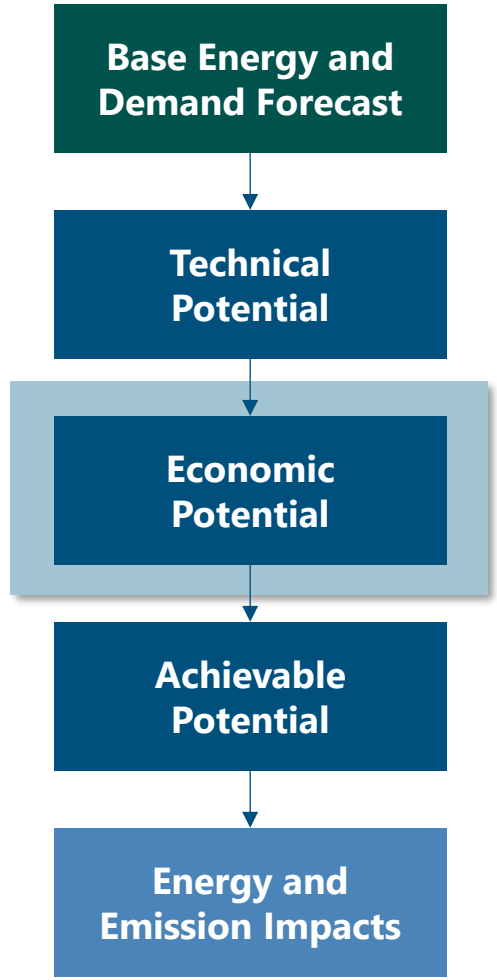
- Represents the maximum energy impact from study measures (technically feasible), regardless of economics or customer choice
- Built up from equipment load shape
- Estimates energy efficiency and electrification impacts separately due to downstream / interactive effects
- Develops database of measure-level impacts
- Incorporates equipment turnover assumptions, technical feasibility, and baseline code assumptions
- Accounts for interactions among measures—a treatment called measure stacking—to avoid overestimating total savings



Economic Potential

Characteristics:

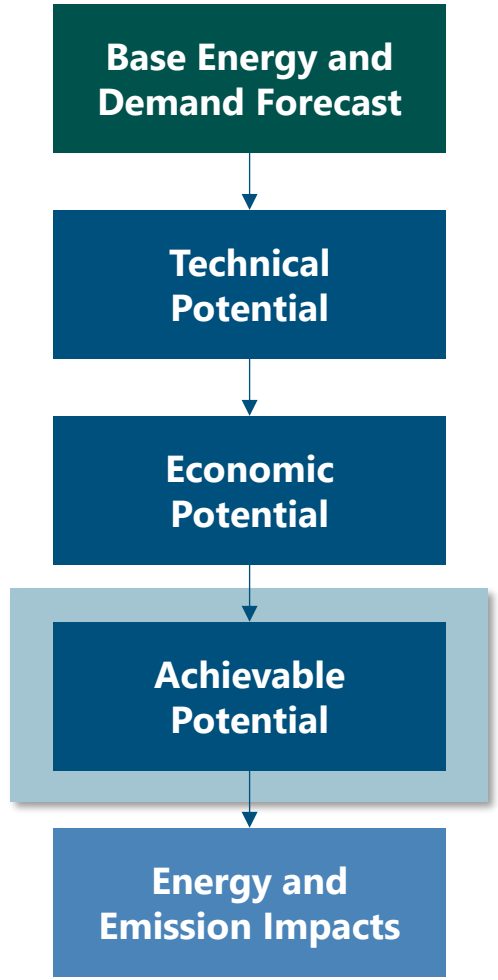
- Subset of technical potential, representing measures in technical potential that pass the IESO cost-effectiveness test
- Competing options weighed by customer decision-makers, the option with the highest energy impact that passed the cost-effectiveness screen is installed, regardless of other barriers
- The difference between technical and economic potential is the number and type of measure units assumed to be installed
- Data includes (but are not limited to) avoided energy, capacity, and transmission costs; discount rate; and forecasted electricity rates



Achievable Potential

Characteristics:

- Subset of economic potential that accounts for real-world market barriers to adoption of efficiency measures
  - Simulates customer decisions based on customer economics and adoption attributes (customer, technology, and market)
- Competing options weighed by the proportional measure market share
  - Allows for most mature and economically appealing options to claim the largest market shares without resorting to a simplistic winner-takes-all assumption
- Does not consider program / portfolio design or delivery mechanisms (this study does not estimate program potential)



Energy Consumer Segments, Modeling Considerations, and Impacts Measured

Customer Segmentation

Building Segments

Residential: Single-Family Attached, Single-Family Detached, Multifamily, Multifamily 5+ stories, Other

Commercial: Large Office, Office, Large Retail, Retail, Schools, Hospitals, etc.

Industrial: Primary Metals, Paper, Wood Products, etc.

Building Vintages
New, Existing

Residential Income Strata
Standard, Income Qualified

Residential Ownership Type
Owner, Renter

Geography
10 IESO Zones

Modeling Considerations


Building energy codes and appliance standards


Climate impacts on weather-sensitive measures


Non-energy impacts (applicable)


Underserved communities and equity


Customer choice adoption


Energy efficiency and electrification interactions

Reporting Metrics / Measures

Electric Energy Efficiency

MWh, MW Winter / Summer Peak, Economic Screen, Units

Electrification

MWh, MW Winter / Summer Peak (increase load), Economic Screen, Units

Data Sources and Inputs

Data hierarchy

- IESO data (forecast, MAL, surveys, and other)
- Utility data (if available)
- Ontario technical reference manuals (TRMs)
- EIA data
- Secondary sources

Base Forecast Data Sources

Data	Primary Source	Secondary Source
Baseline/Forecasted Sales and Customers	• IESO's Long Term Demand Forecast (LTDF) • Stokes Economics forecasts • IESO transmission-connected customer data • Q2 Reliability Outlook forecast of 2026	• Natural Resources Canada's Office of Energy Efficiency databases • Canada Mortgage and Housing Corporation (CMHC) statistics • Natural Resources Canada's Survey of Household Energy Use and SmartDriver and Fuel Management guide • ENERGY STAR unit shipment reports • U.S. DOE data and reports • Other TRMs from U.S. states
Percentage of Sales by Building Type	• 2025 Residential End-Use Survey • Stokes Economics forecasts • IESO industrial customer database	
End-Use Energy Consumption	• 2025 Residential End-Use Survey (REUS) • 2022 Commercial End-Use Survey (CEUS) • IESO's Measure Assumptions List (MAL) • Ontario Energy Board TRMs • Survey of Commercial and Institutional Energy Use (SCIEU) • U.S. Energy Information Administration's (EIA) Residential Energy Consumption Survey (RECS) • EIA's Commercial Building Energy Consumption Survey (CBECS) • EIA's Manufacturing Energy Consumption Survey (MECS) • EnerGuide associated with Canada's energy-efficiency regulations	
Saturations, Fuel, and Efficiency Shares	• REUS, CEUS, SCIEU, RECS, CBECS, MECS	

Data Sources and Inputs

Data hierarchy

- IESO data (MAL, evaluations, program data, research, and other)
- Utility data (if available)
- Ontario TRMs
- Secondary sources

Measure Data Sources

Data	Primary Source	Secondary Source
Energy Savings	• IESO's MAL • Ontario Energy Board TRMs • Ontario evaluation reports • IESO's program data • ENERGY STAR Canada	• Prior Ontario potential study • Incremental cost studies • ENERGY STAR shipments reports • U.S. DOE data and reports • Other TRMs from U.S. states
Equipment and Labor Costs	• IESO's MAL • Ontario Energy Board TRMs • ENERGY STAR Canada • RS Means cost database • Cadmus research	
Measure Life	• IESO's MAL • Ontario Energy Board TRMs • ENERGY STAR Canada • Lifetime studies • Cadmus research	
Measure Applicability (technical feasibility and percentage completed)	• REUS, CEUS, SCIEU, RECS, CBECS, MECS • Program evaluations / program data	

Draft Measure List

Energy Efficiency

Electrification

Equipment + Retrofit Measures

Sources:

- IESO's Measure Assumptions List (MAL)
- IESO and Ontario Energy Board Prior APSs / TRMs
- IESO model electrification measures
- Cadmus research

Measures list contains:

~560 measure permutations by

- Sector
- End-Use
- Measure Name/Efficiency Description
- Baseline Description
- Electrification Flag or List
- Emerging Technologies Flag

Feedback is requested on the spreadsheet via the IESO feedback form

Please review your preferred area by filtering to the desired sector and end-use

Please have responses by January 9th

Demand Response

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Demand Response Methodology Overview

Purpose: Produce estimates of electric demand response technical, economic, and achievable potential

Sectors: Residential, commercial, industrial, and agriculture

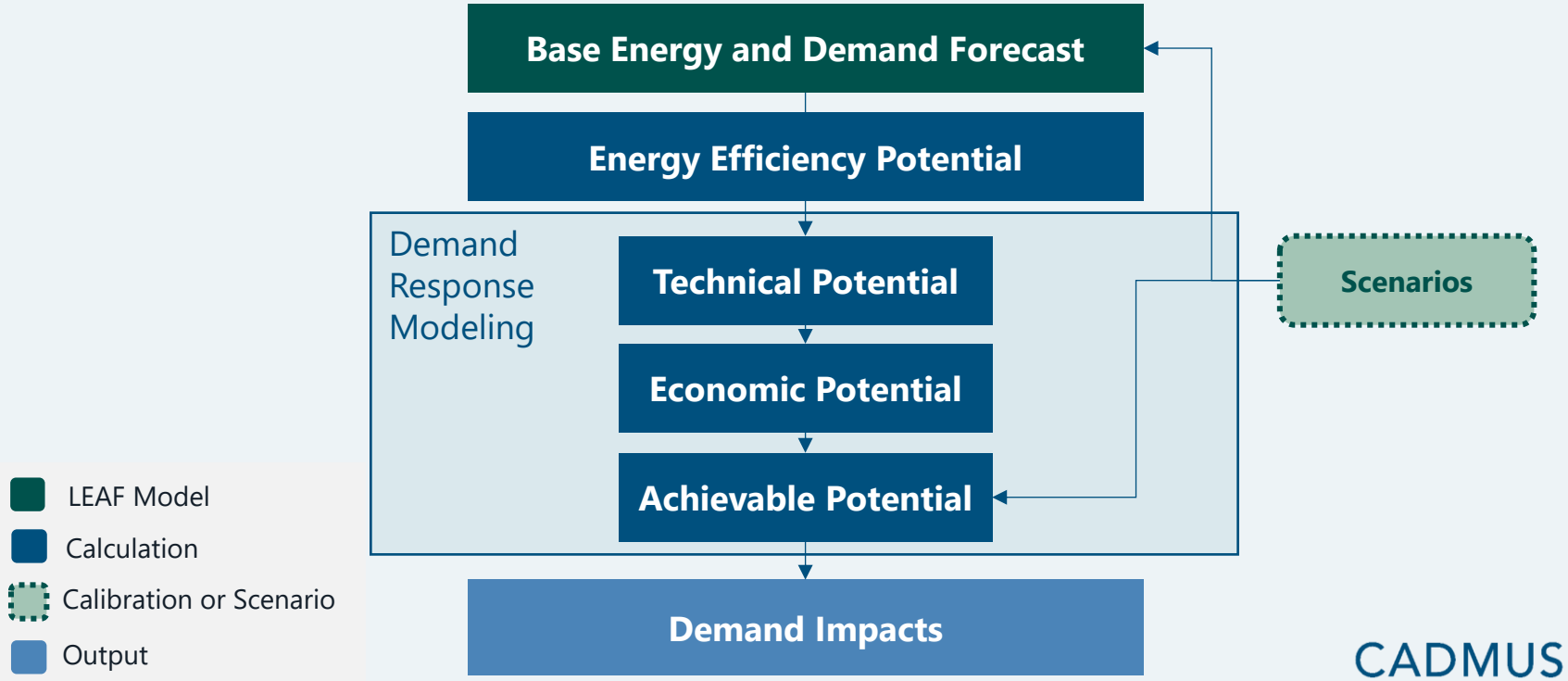
Period: 2026 base year with potential 2027 to 2050

Location: For each of the 10 IESO electrical zones as well as for the overall system

Reporting: Stand-alone report from energy efficiency

General Demand Response Product Categories by Sector

Sector	Product Demand Response Category
Direct Load Control (DLC)	
Residential, Commercial	Electric Vehicle DLC
Residential	Water Heat DLC
Residential	Pool Pump DLC
Residential, Commercial	Heating and Cooling DLC
Commercial, Industrial	Demand Curtailment
Agriculture	Irrigation Demand Response



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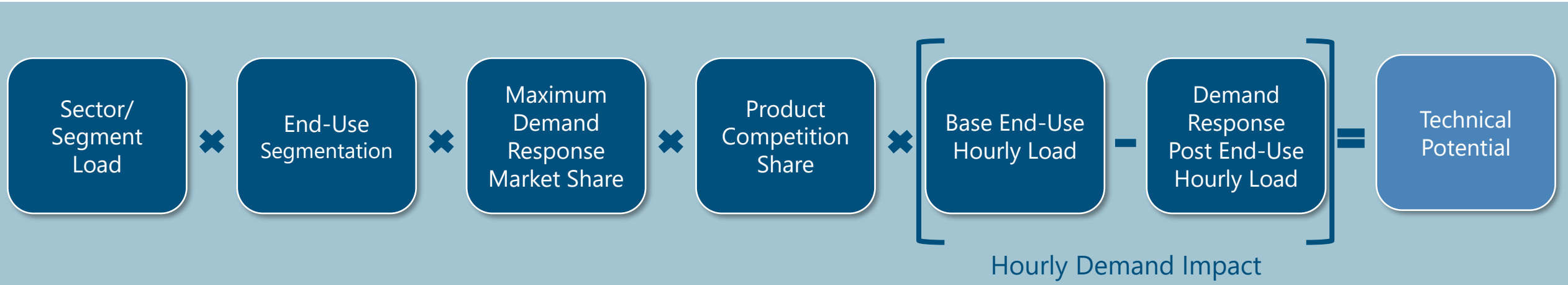
Demand Response Technical Potential

Technical potential assumes 100% participation and represents a theoretical limit for unconstrained potential

Methodology

Each demand response opportunity will be characterized with the following steps:

- Reference load and peak coincidence
- Product design and impact
- Eligible market size
- Product competition



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Demand Response Economic Potential

Economic potential is a subset of technical potential that represents potential from cost-effective measure applications

Methodology

Four key factors affect the cost-effectiveness of demand response programs:

- The expected load reduction (in kW) provided by each participant
- The avoided capacity, transmission, and distribution costs
- Key financial assumptions such as discount rate, T&D line loss, and analysis period
- The fixed and variable costs of each program

The direct program costs of a demand response option can include setup costs, program operation and maintenance costs, equipment cost, marketing cost, and incentives

Demand Response Achievable Potential

Achievable potential is a subset of economic potential that accounts for real-world market barriers to the adoption of demand response opportunities

Methodology

The achievable potential will account for three assumptions:

- The maximum rate of adoption is the market maximum for a given price (incentive)
- The adoption ramp rate is the expected annual rate of incremental product enrollment to reach program maturity (also known as the maximum rate of adoption)
- Event participation represents the percentage of program customers who are expected to participate in an individual event

Data Sources and Inputs

Data hierarchy

- IESO data (evaluations, program data, research, and other)
- Utility data (if available)
- Advisory group input
- Cadmus evaluation and research
- Secondary sources

Data	Primary Source(s)	Secondary Source
Peak Definition (may vary by year)	• IESO Annual Demand Forecast (LEAF model output)	• Benchmarking data from demand response programs in North America • Non-regional evaluations • Peak Load Management Alliance presentations and research
Demand Response Impact Characterization	• Base end-use load shapes from IESO forecasts • IESO/Ontario evaluations • Cadmus evaluations	
Market Size	• IESO/Ontario evaluations • Cadmus' prior research	
Demand Response Competition Factors	• Advisory group input • Cadmus' prior research	
Economic Inputs	• IESO data	
Demand Response Program Costs / Incentives	• IESO/Ontario program data • Cadmus' prior research	
Maximum Rate of Adoption	• Advisory group input • Cadmus' prior research	
Annual Ramp Rate	• Advisory group input • Cadmus' prior research	
Event Participation	• Program evaluations/program data • Advisory group input • Cadmus' prior research	

Draft Measure List

- HVAC DLC
- Water Heat DLC
- Pool Pump DLC
- EV DLC
- Curtailment
- Irrigation

Feedback is requested on the spreadsheet via the IESO feedback form

Sector	Product Name	Product Description
Residential	**Heating and Cooling DLC**	Uses existing Wi-Fi-enabled thermostats to automatically change the setpoint temperature to preheat/precool and reduce demand during peak events.
Commercial		
Residential	**Water Heat DLC**	Wi-Fi integration or a load switch installed on an electric resistance water heater to reduce water heating during summer and winter demand response event periods.
Residential	**Pool Pump DLC**	Wi-Fi integration or a load switch installed on a pool pump to reduce demand during summer demand response event periods.
Residential	**Electric Vehicle DLC (V1G)**	Centralized utility intervention to shift EV charging to off-peak hours through Wi-Fi-enabled charger controls and/or vehicle telematics. This is an event-based resource involving Level 2 chargers.
Commercial		Centralized utility intervention to shift EV charging to off-peak hours through Wi-Fi-enabled charger controls and/or vehicle telematics. This is an event-based resource, including Level 2 and direct current fast chargers (DCFC).
Commercial	**Demand Curtailment (contract)**	Provides incentives for custom load curtailment strategies and event-based technology agnostic energy demand reduction. Customers nominate a certain amount of load (lighting, refrigeration, HVAC, process loads, etc.) to be curtailed during events. Includes both manual and automated voluntary demand curtailment.
Industrial		
Agriculture	**Irrigation Management**	Remote curtailment of agricultural irrigation pumps during summer season peak events.

Behind-the-Meter Solar, Storage, and Load-Shift

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Behind-the-Meter Solar and Storage Methodology Overview

Purpose: Produce hourly estimates of technical, economic, and achievable potential for behind-the-meter solar and storage, rooftop solar with battery, battery without rooftop solar, and thermal storage

Sectors: Residential, commercial, and industrial

Period: 2026 base year with potential 2027 to 2050

Location: For each of the 10 IESO electrical zone as well as for the overall system

Primary Tasks	Solar	Battery Storage	Thermal Storage
Segment building stock	✓	✓	✓
Apply technical resource characteristics to calculate total available roof area and system capacities	✓		
Develop battery size bins by sector		✓	
Determine adjustable load criteria (peak hours, 2- to 4-hour events)		✓	
Apply non-adjustable load shifts to applicable existing building end-uses (consistent with LEAF model)			✓
Calculate cost-effectiveness	✓	✓	✓
Forecast market adoption based on Bass diffusion and project economics (same as LEAF model)	✓	✓	✓
Estimate technical, economic, and achievable potential	✓	✓	✓
Develop hourly results and hourly load shifts	✓	✓	✓
Reporting	Part of energy efficiency report		

Data Sources and Inputs

Data hierarchy

- IESO data (evaluations, program data, research, and other)
- Utility data (if available)
- Advisory group input
- Cadmus evaluation and research
- Secondary sources

Solar Data	Primary Source	Secondary Source
Energy Savings	• DSM MAL	• Benchmarking data from programs in North America • NREL • Lazard levelized cost analysis • IESO Pilot Data
Equipment and Labor Costs	• IESO 2024 APO	
Measure Life	• DSM MAL	
Measure Applicability	• DSM MAL; NREL; Cadmus targeted research of rooftop applicability	

Battery Data	Primary Source	Secondary Source
Energy Savings	• DSM MAL; IESO Pilot Data; Cadmus Analysis	• Benchmarking data from programs in North America • NREL • Lazard levelized cost analysis • IESO pilot programs analysis • IESO Pilot Data
Equipment and Labor Costs	• DSM MAL; IESO APO; IESO Pilot Data	
Measure Life	• DSM MAL;	
Measure Applicability	• DSM MAL; Ontario Electrical Safety Code; Cadmus Research	

Load Shift Data	Primary Source	Secondary Source
Energy Savings	• DSM MAL; IESO Pilot Data; Cadmus Analysis	• Utility studies and forecasts • NREL • IESO Pilot programs
Equipment and Labor Costs	• DSM MAL; IESO APO; IESO Pilot Data	
Measure Life	• DSM MAL; EE IESO data; Cadmus Research	
Measure Applicability	• DSM MAL; IESO Annual Demand Forecast (LEAF model output); Cadmus Research	

Draft Measure List

Solar

Solar + Battery Storage

Battery Storage

Feedback is requested on the spreadsheet via the IESO feedback form

Sector	Type	Product/ Measure Name	Planned kWh/kW Capacity Ranges	
Residential	Solar No Battery	Rooftop solar	**Solar**	5-30 kW DC
	Solar With Battery	Rooftop solar with traditional battery storage	**Solar**	5-30 kW DC
			Battery	Power Capacity: 5-11.5kW Battery Storage Capacity: 5-30kWh Hours of Storage: 1-4 hours
	Battery No Solar	Traditional battery storage	**Battery**	Power Capacity: 5-11.5kW Battery Storage Capacity: 5-30kWh Hours of Storage: 1-4 hours
Commercial	Solar No Battery	Rooftop solar	**Solar**	10 - 2400 kW DC
	Solar With Battery	Rooftop solar with traditional battery storage	**Solar**	10 - 2400kW DC
			Battery	Power capacity: 10-300kW Battery Storage Capacity: 10 - 2400 kWh; Hours of storage range = 1 - 4
	Battery No Solar	Traditional battery storage	**Battery**	Power capacity: 10-300kW Battery Storage Capacity: 10 - 2400 kWh; Hours of storage range = 1 - 4
Industrial	Solar No Battery	Rooftop solar	**Solar**	300 - 2400 kW DC
	Solar With Battery	Rooftop solar with traditional battery storage	**Solar**	300 - 2400 kW DC
			Battery	Power capacity: 300kW Battery Storage: 300 - 2400 kWh; Hours range = 1-4
	Battery No Solar	Traditional battery storage	**Battery**	Power capacity: 300kW Battery Storage: 300 - 2400 kWh; Hours range = 1-4

Draft Measure List

Thermal Storage

- Residential Applications: Low Temperature (<100C)
- Commercial Applications: Low Temperature (<200C)
- Industrial Applications: Low, Medium, and High Heat Temperatures: <500C and >500C

Sector	Type	Product/ Measure Name	Technology Type
Residential	Thermal	Space heating	**Latent/Phase Change Thermal** (PCM) – DHW & Space Heating
Commercial	Thermal	Space heating or cooling	**Sensible** - Liquid Based (water-based systems)
			Latent/PCM – DHW and Space Heating
	Thermal	Process Cooling/Refrigeration	**Sensible** - Liquid Based (water-based systems)
Industrial	Thermal	Space heating or cooling	**Sensible** - Liquid Based (water-based systems)
			Latent/PCM
	Thermal	Process heating/cooling	**Sensible - Solid State** (brick/concrete/silica sand) - ETS
			Sensible - Liquid State (molten salts)
			Thermochemical - (Magnesium/Magnesium oxide)
			Phase Change/Latent Materials - (Miscibility Gap Alloy MGA)

Q & A

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Seeking Feedback 1/2

Topic: Data Inputs and Sources

1. Do you see any gaps in identified data inputs or additional sources we should consider?
2. Do the assumptions behind the measures seem reasonable and aligned with real-world conditions?
3. Do you suggest adding/removing any measures?

Seeking Feedback 2/2

Topic: Methodology

4. Are there any specific comments or suggestions for the methodology?

Topic: Stakeholder Engagement

5. Are there any topic areas of particular interest (inputs, assumptions or methods) to stakeholders for engagement?

6. Would DR and DER developers be interested in a focused meeting to discuss their insights in more detail?

For More Information

- The recording, presentation, and feedback form for this engagement can be found on the 2026 Provincial eDSM Achievable Potential Study page
- If you have any questions on the information shared today, please contact engagement@ieso.ca

Thank You

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Appendix

Appendix A: Planning Study Priorities and Scope

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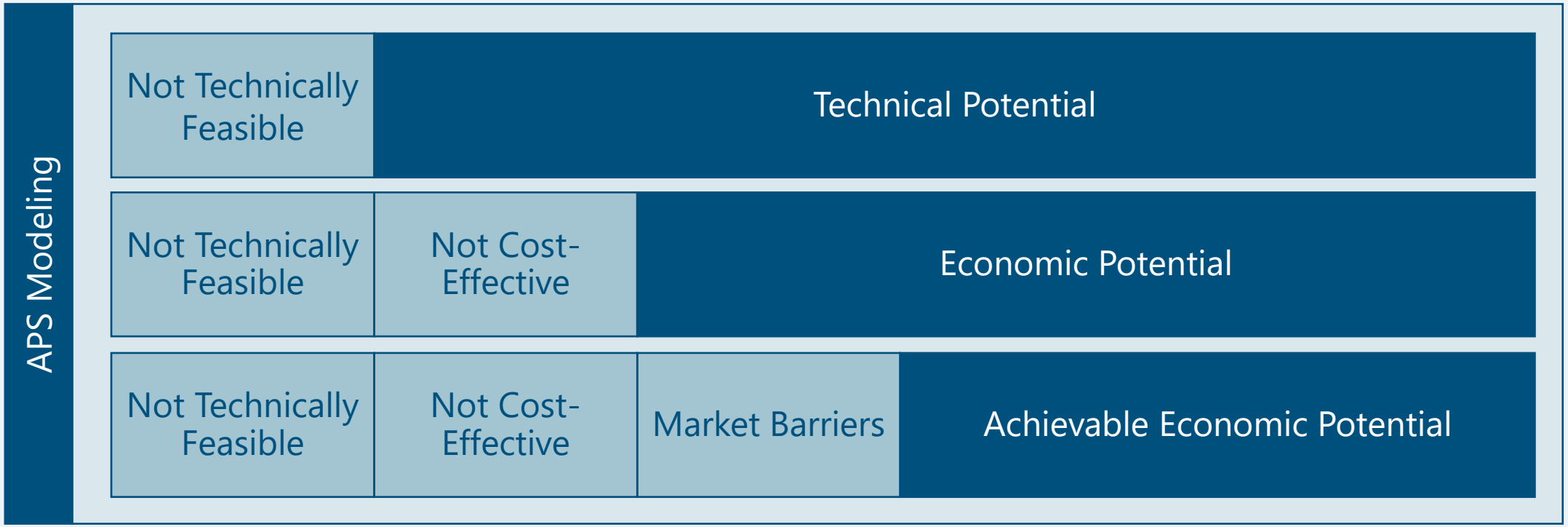
Appendix A: Planning Study Priorities and Scope



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