SEPTEMBER 22, 2022

# Achievable Potential Study Refresh Results

**Public Engagement Webinar**

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# Purpose

- To inform and summarize findings from the IESO's refresh of the 2019 Achievable Potential Study (APS) modeling, which estimates the amount of Conservation and Demand Management (CDM) savings potential that is cost effective and achievable based on electricity system needs.

# Agenda

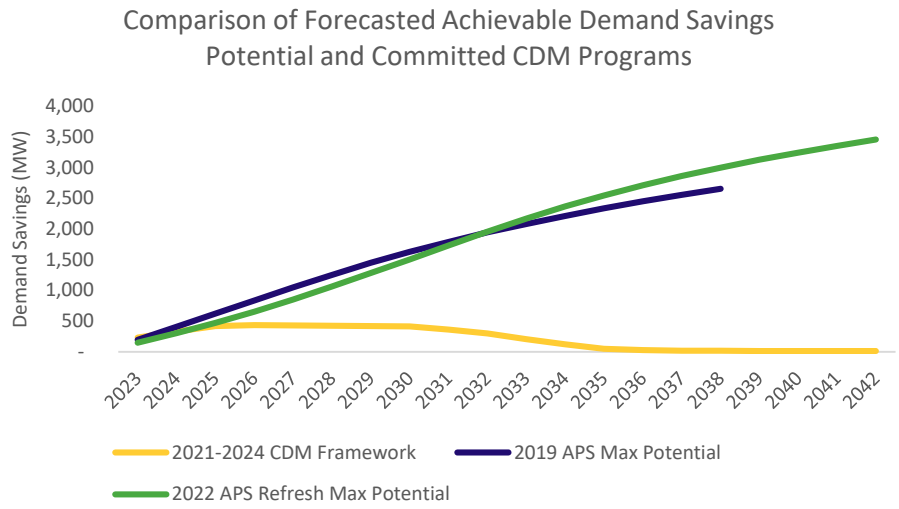
1. Summary and Key Findings
2. Background on 2019 APS
3. Guidehouse APS refresh results
    4. Modeling updates
    5. Findings
6. Next steps

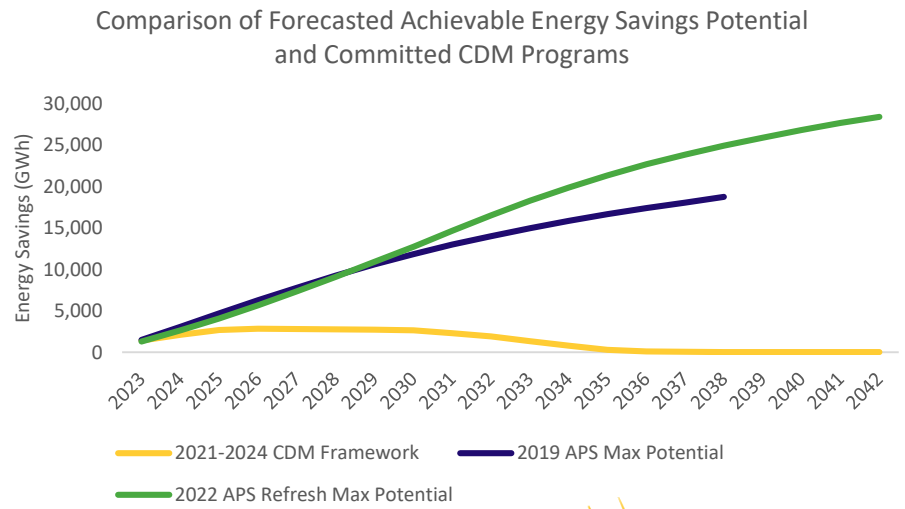
# Summary and Key Findings

- Consultant Guidehouse was retained to refresh the 2019 Achievable Potential Study modelling, specifically the Maximum Achievable scenario, by updating key inputs based on the latest 2021 Annual Planning Outlook (APO) forecasts
- The Refresh will inform the underway Mid-Term Review of the 2021-2024 CDM Framework and other activities
- The 2022 APS Refresh reveals that additional cost-effective, achievable CDM savings is available above and beyond the potential identified in the 2019 study over the study period

# Summary and Key Findings (2)

- While near-term potential is moderately less than the 2019 study, there remains a major opportunity to increase CDM beyond currently committed targets - refreshed forecasted achievable potential is approx. 6,350 GWh and 640 MW higher than CDM savings committed under the 2021-2024 CDM Framework in the year 2028 and 16,930 GWh and 1,970 MW higher in the year 2033 (see next slide)
- Results indicate an opportunity to increase CDM targets to cost-effectively address system needs over the five-year time horizon and beyond



# Background

- The 2019 Achievable Potential Study was the first integrated electricity and natural gas potential study conducted in partnership with the Ontario Energy Board
- The 2019 APS was produced with stakeholder input from:
  - An Advisory Group including government, EE advocacy groups/consultancies, CDM program delivery vendors, LDCs, Enbridge Gas, institutional and business associations
  - The public through an IESO-led public engagement process
  - A technical working group of CDM planning and forecasting experts
- The IESO's 2022 APS refresh leverages Guidehouse's DSMSim potential model that was developed through the IESO stakeholder process to update electricity potential forecasting inputs based on the 2021 Annual Planning Outlook
- 2021 APO inputs have been shared with stakeholders through the APO engagement process

# Historic Applications of APS Data

- The IESO has prepared Achievable Potential Studies every three years since 2013
- In Ontario, Achievable Potential Studies are used to:
  - Estimate the quantity of cost-effective, achievable CDM savings available across the province to inform province-wide program budget and target setting as well as bulk system planning
  - Estimate the quantity of CDM savings available in local areas to inform regional planning and assessments of non-wires alternatives
  - Identify customer segments and zones with high savings potential to inform customer outreach and marketing
  - Identify energy-efficiency measures with high-savings potential to inform CDM program eligibility
  - Understand the relative impact of different forecasted trends on CDM potential (e.g., demand increases, avoided cost updates, retail rate changes, measure cost changes, etc.) to inform program planning

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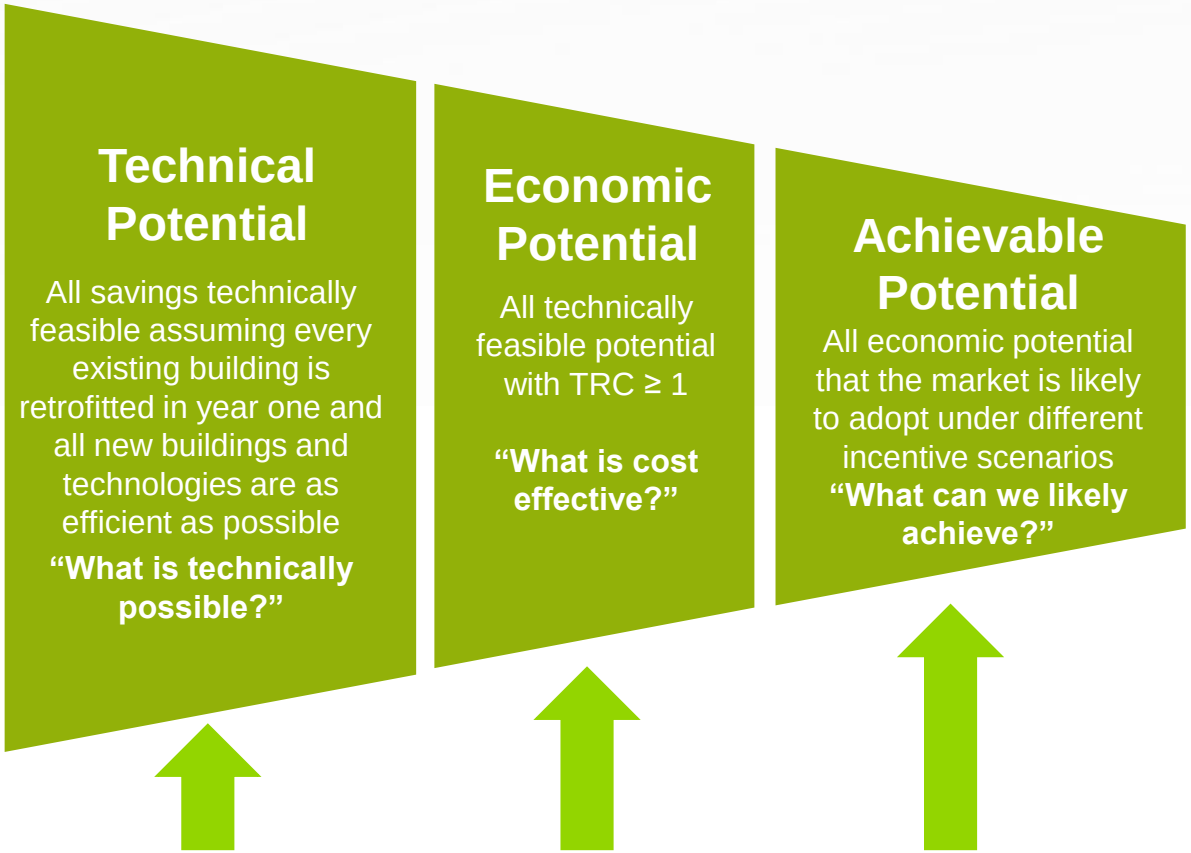
# Conservation Achievable Potential Study Refresh

## Independent Electricity System Operator (IESO)

# Preface to the review of potential

## Context and Background




**Maximum Achievable Scenario (Scenario B).** This scenario represents unconstrained potential, specifically:

- Incentives set at 100% of incremental cost of each measure
- Assumes idealized program design (i.e. fewer market barriers and higher adoption rates

# Preface to the review of potential (2)

## What has changed

- **Reference forecast:** Guidehouse developed an updated reference forecast **based on the 2021 APO net reference forecast**.
- **Updated avoided costs** from the IESO. These updated avoided costs rise significantly compared to the avoided costs used in the original study, particularly in the later years.
- **Updated retail rates** from the IESO. These rates are slightly lower than those used in the original study as a result of policy initiatives to manage customer electricity costs.

# Preface to the review of potential (3)

## What has not changed

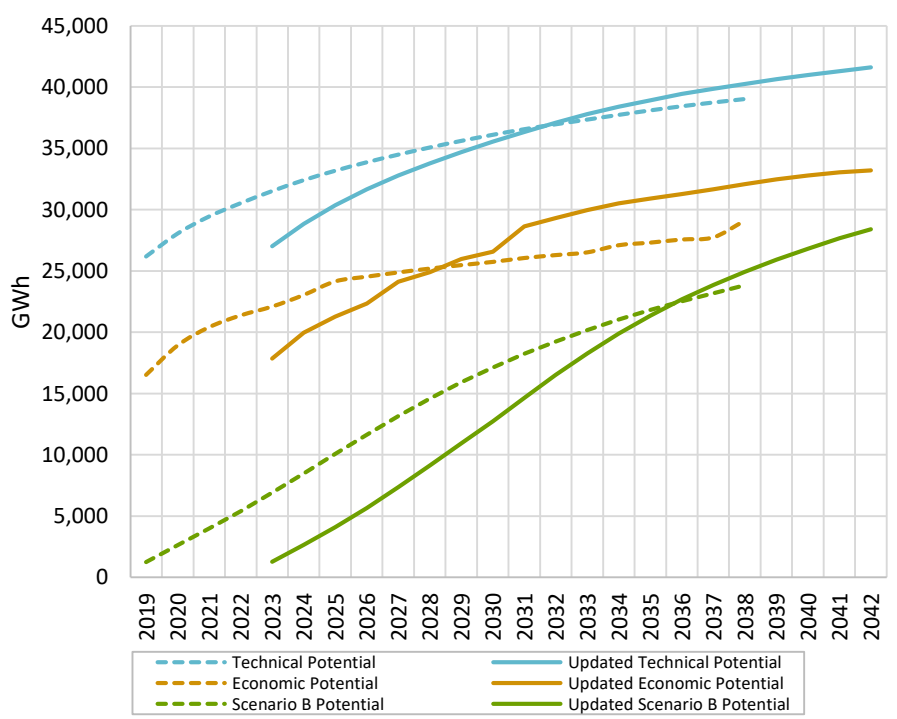
- **Measure level assumptions have not changed** from the original study. This includes measure savings, cost, density, and saturation values.
- **No new technologies** were assessed as part of this update. The original study measure list was retained.
- **Achievable adoption logic has been retained from the original study**. This includes marketing and awareness factors.
    - Based on the results of the 2021 CEUS, the commercial marketing and awareness factors used in the original study were determined to be consistent with the survey findings.

# Projected Potential

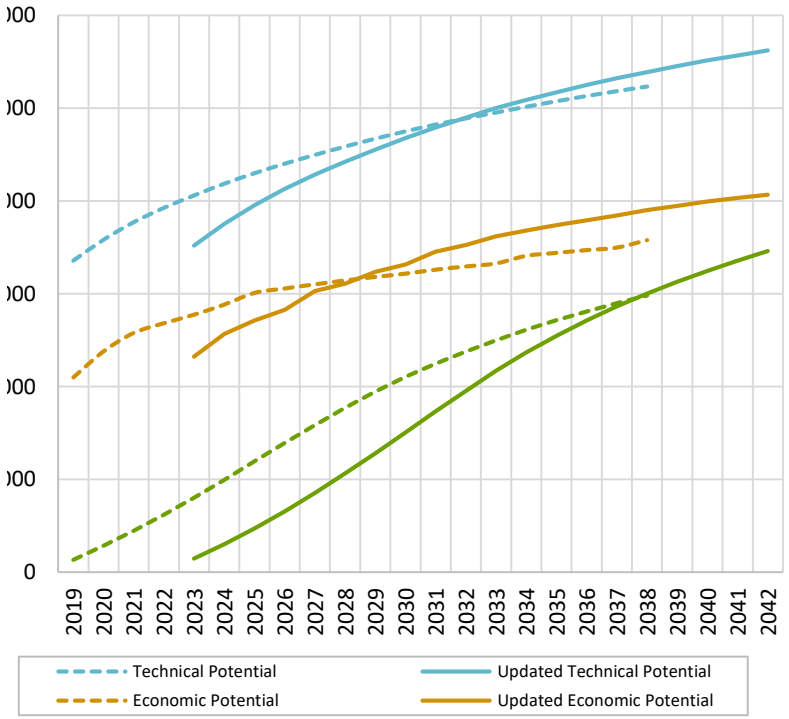
## Technical, Economic and Achievable Savings Potential

Near-term technical, economic and achievable potential is moderately less than the 2019 study driven primarily by decreases in near-term forecasted demand. Potential exceeds the 2019 APS results over the forecast period.

### Energy Savings Potential



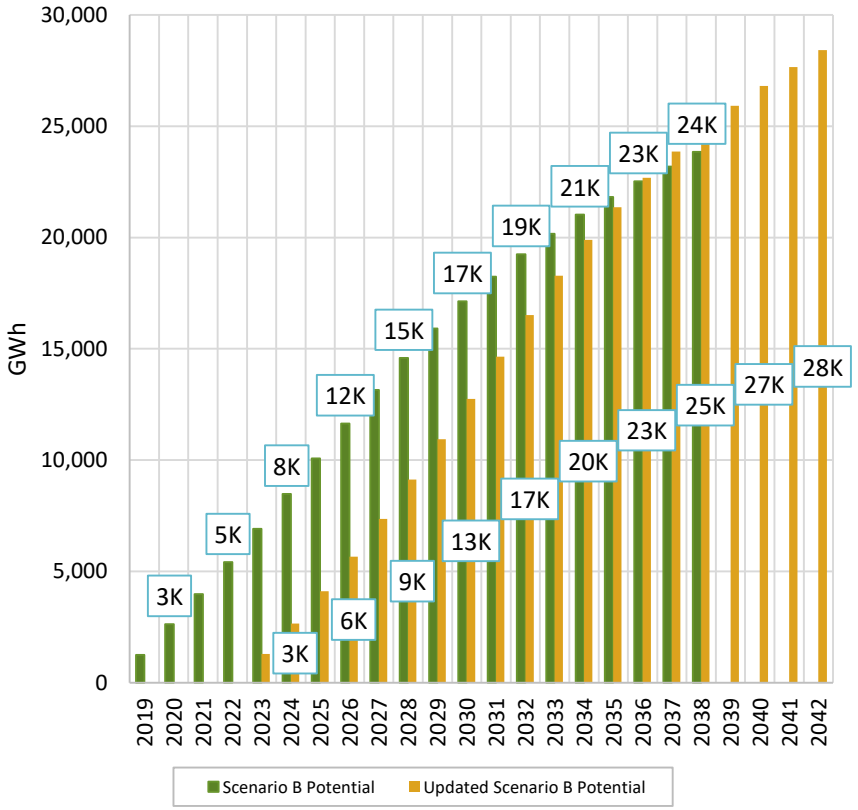

### Demand Savings Potential



# Projected Potential (2)

## Achievable Electric Energy Savings Potential

**Figure 1. Achievable Electric Energy Savings Potential Comparison**



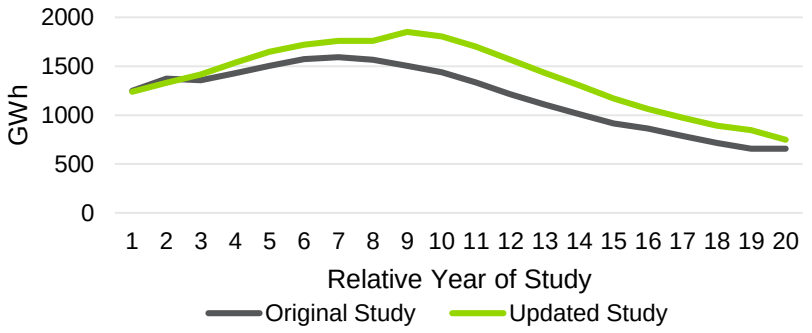

In study year 10, the maximum achievable potential (Scenario B):

- Original Study: 15 TWh
- Updated Study: 17 TWh

In study year 20, the maximum achievable potential (Scenario B): :

- Original Study: 24 TWh
- Updated Study: 28 TWh

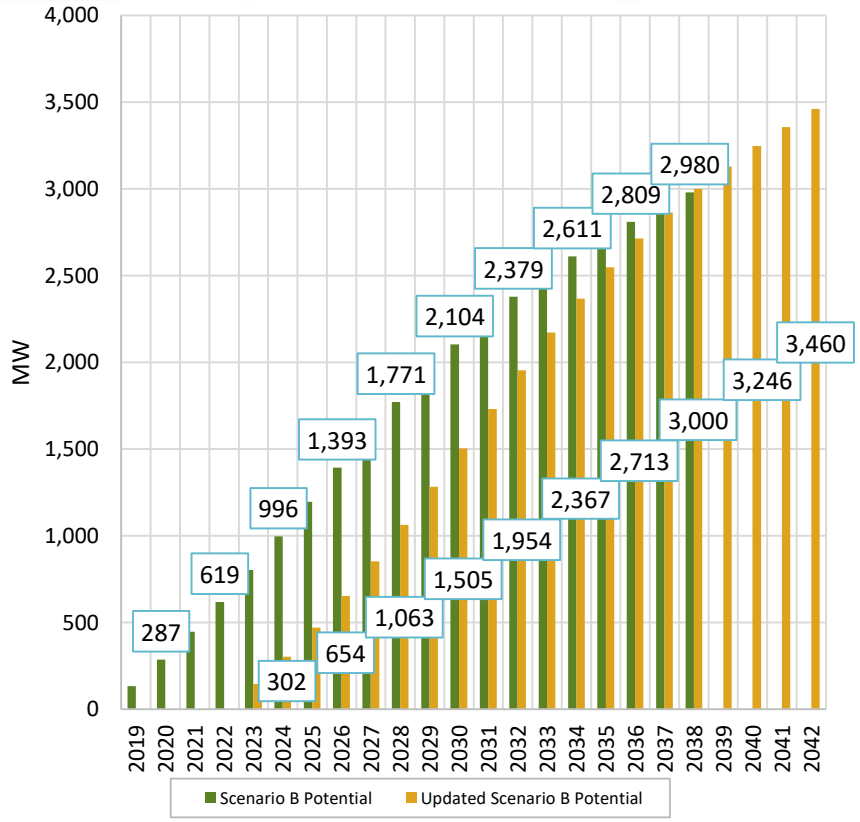
**Figure 2. First Year Energy Savings**



# Projected Potential (3)

## Achievable Electric Demand Savings Potential

**Figure 3. Achievable Electric Demand Savings Potential Comparison**



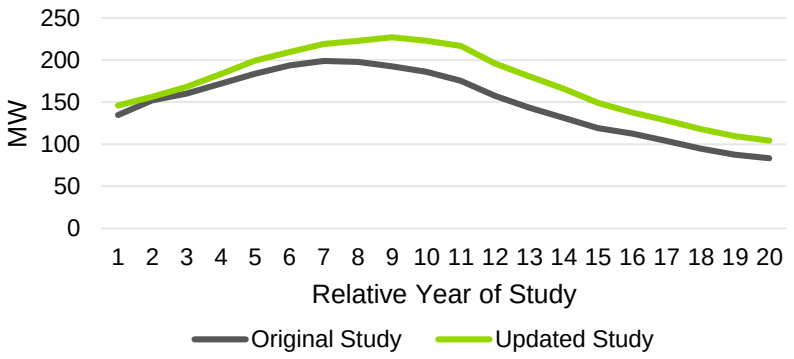

In study year 10, the maximum achievable potential (Scenario B):

- Original Study: 1.8 GW
- Updated Study: 2.0 GW

In study year 20, the maximum achievable potential (Scenario B): :

- Original Study: 3 GW
- Updated Study: 3.5 GW

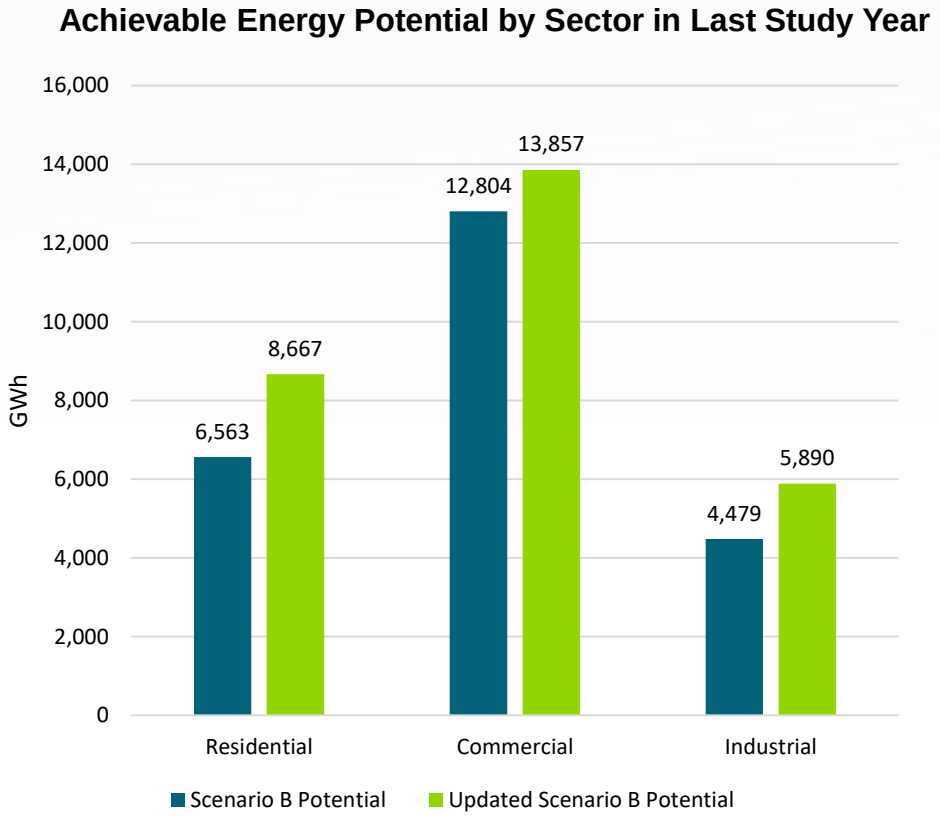
**Figure 4. First Year Demand Savings**



# Sector Findings

## Maximum Achievable Energy Potential by Sector

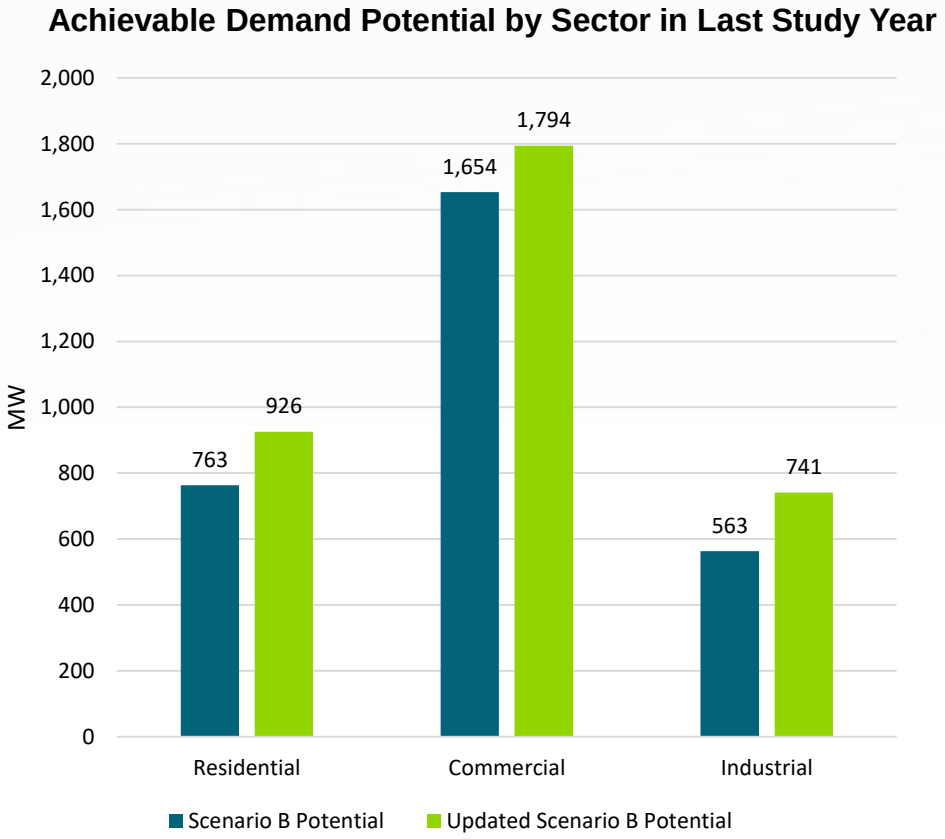
- **Residential and industrial potential increase by 32%** when comparing the terminal years in the original and updated studies.
- For residential, **a 4% increase in housing stock** and **15% increase in energy sales** drive this growth.
- For industrial, a **26% increase in sales** drive this growth in potential.
- **Commercial potential increases by just 8%.** This is expected given that while sales increase modestly, commercial stock has decreased by 3% compared to the original study.



# Sector Findings (2)

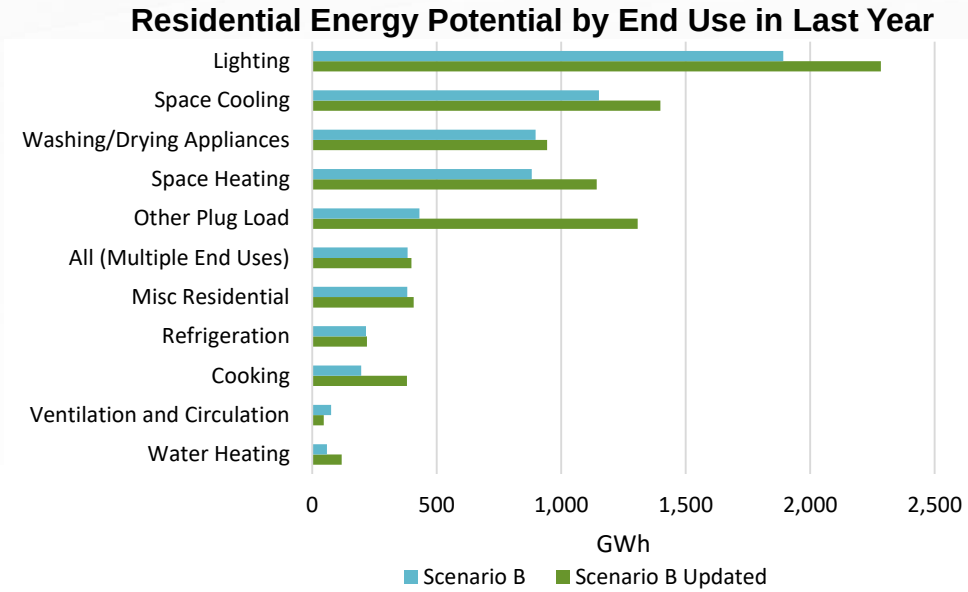
## Maximum Achievable Demand Potential by Sector

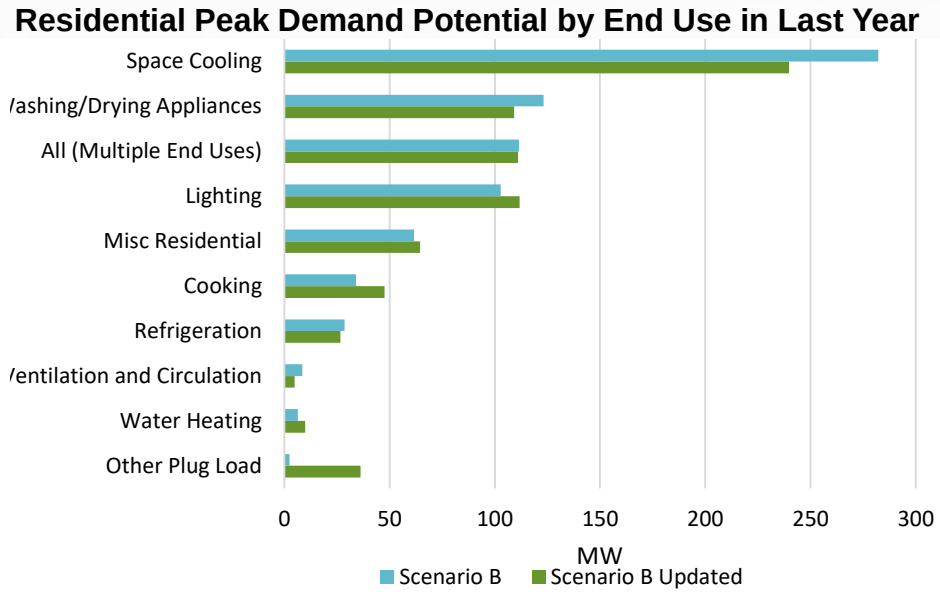
- **Residential potential increases by 21%** when comparing the terminal years in the original and updated studies. **Commercial potential increases by just 8%.**
- For residential and commercial, the **top measures do not differ in the updated study**. The increase in potential is well distributed over all measures, which means that the increases are driven by the increase in sales. For commercial, this increase is limited by the decrease in commercial stock.
- **Industrial demand potential increases by 31%.** This is driven by a large increase in potential from HE lighting and greenhouse grow lights.



# Sector Findings (3)

## Residential Sector



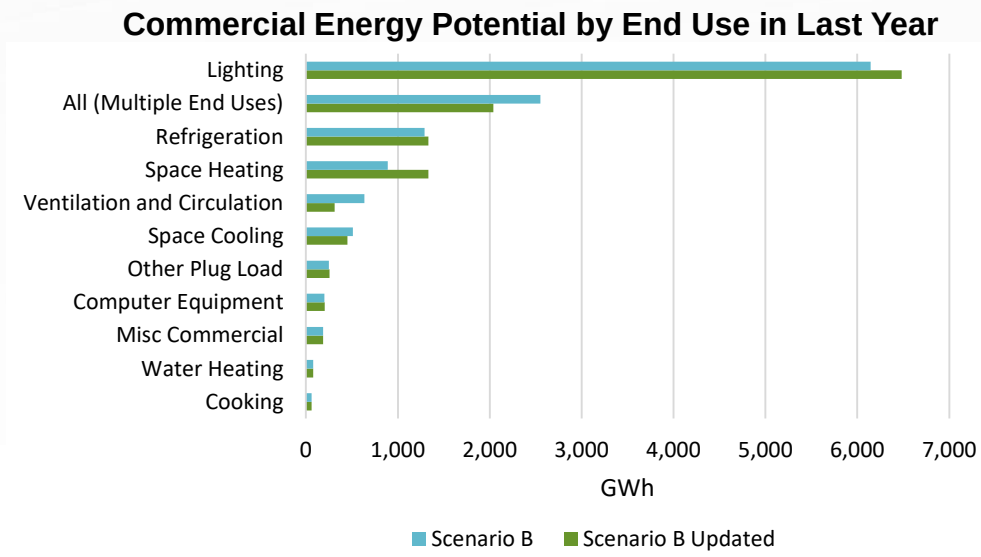



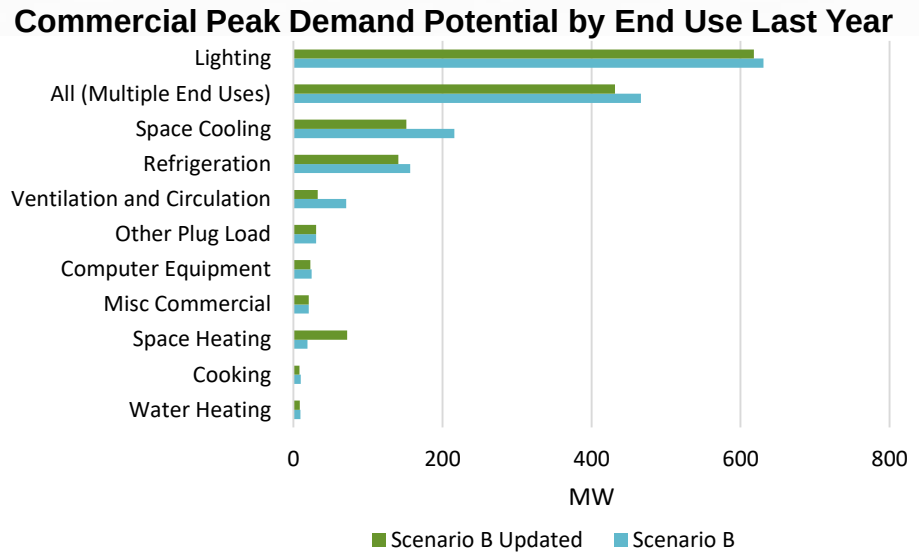

**Key Residential Findings**

- In the original study, the IESO reference forecast predicts a significant fall in water heating and lighting intensity. The updated reference forecast does not predict a significant decrease in either of these end use intensities, and in some cases predicts an increase. Both the original and updated reference forecasts predict an increase in miscellaneous/plug loads over the study period
- Maximum energy saving measures in the fifth study year (2023 and 2027 for the original and updated studies, respectively) include E Star clothes washers, variable speed pool pumps, car block heaters and MURB recommissioning
- Maximum peak demand saving measures in the fifth study year include ductless mini-split heat pumps, adaptive thermostats, clothes washers and MURB recommissioning

# Sector Findings (4)

## Commercial Sector



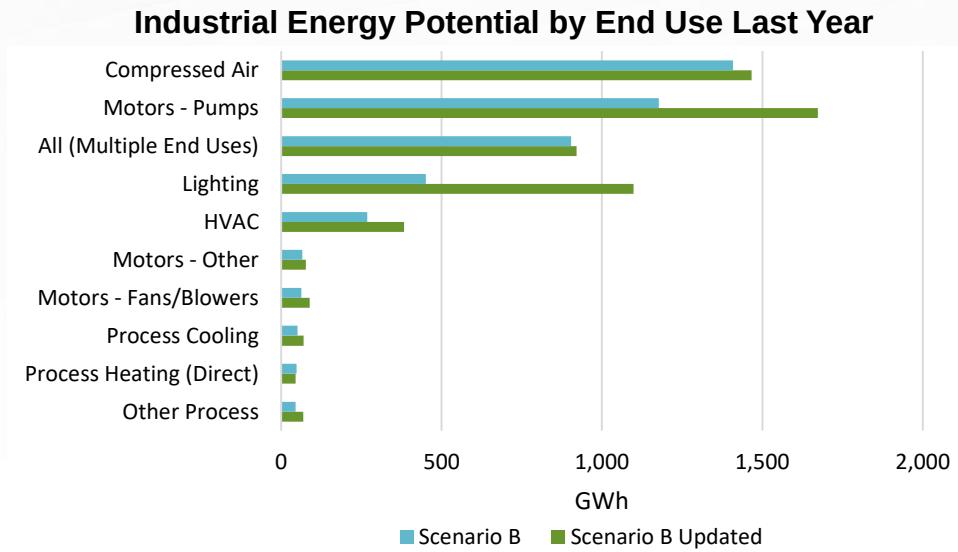



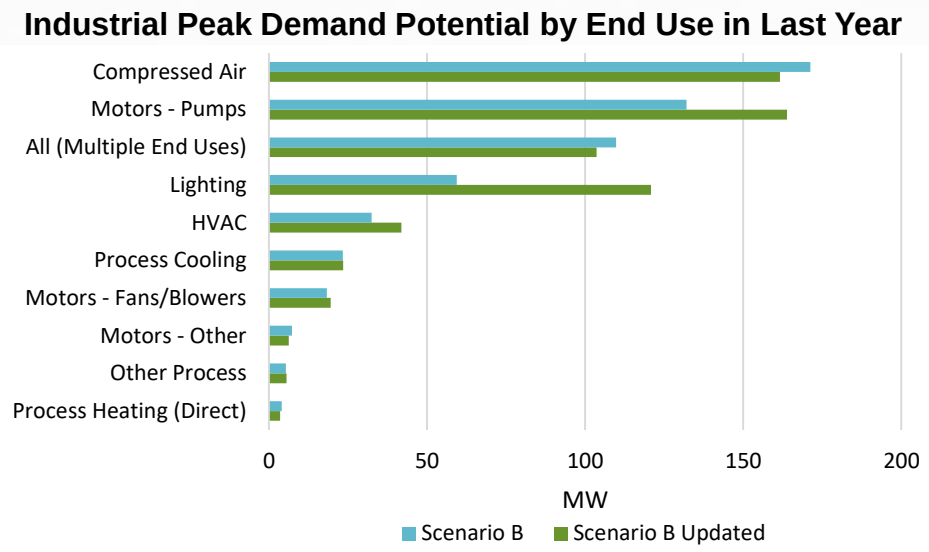

**Key Commercial Findings**

- Consistent with the original study, the IESO reference forecast predicts a more static end use profile in the commercial sector compared to residential, with lighting remaining as the top consuming end use over time
- The top 5 energy measures have not changed with the update to the study. LEDs of different types provide the greatest energy savings across all scenarios over the duration of the study period

# Sector Findings (5)

## Industrial Sector




**Key Industrial Findings**

- In the original study, the top measures are primarily non-lighting and include air leak survey and repair, air compressor optimization, recommissioning, SEM and pump optimization. In the update to the original study, while these measures remain high in priority, HE lighting and greenhouse grow lights rise into the top 5 measures.
- Top measures remain relatively stable over time and are mostly consistent between energy and peak demand savings
- Top segments include mining, quarrying and oil & gas extraction; agriculture and 'other industrial'
- Sector experts advise that while 1-2 year paybacks are generally required, projects related to core business and/or providing significant non-energy benefits (e.g., health and safety) may take priority. Understanding of optimization-type measures is generally lower than equipment measures.

# Summary of Findings

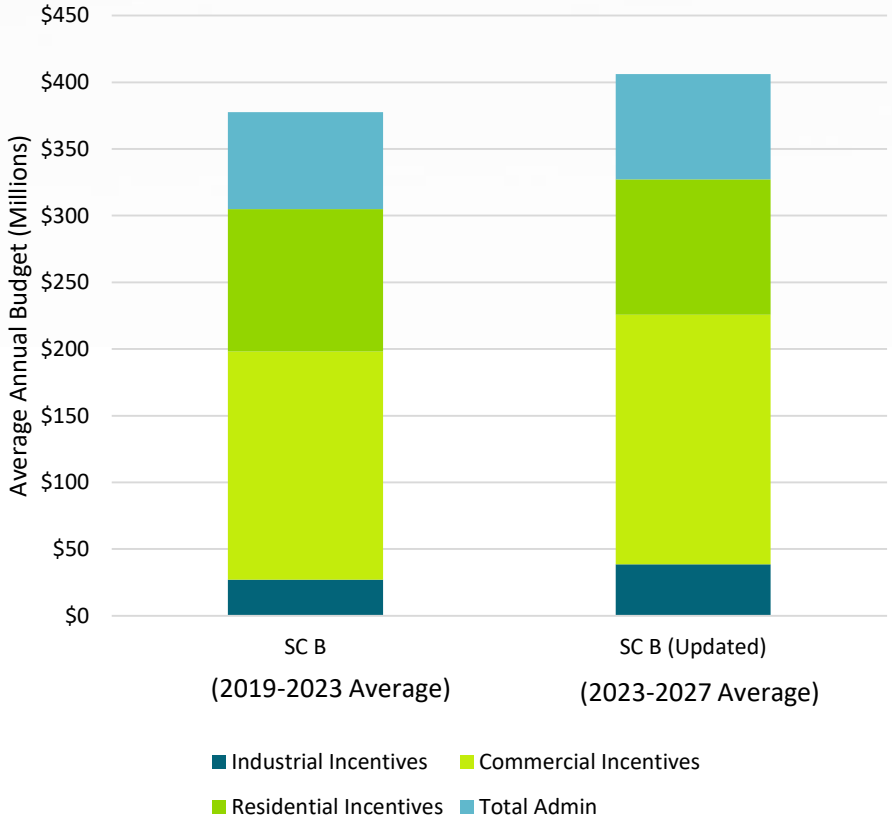
## 2021 APS Update Findings

- **Residential and industrial energy and demand potential increase the most from the original study.** This is largely attributed to a projected rise in energy sales in both these sectors.
- **The increase in commercial energy and demand potential is limited by the decrease in commercial stock.** While sales are projected to be higher than in the original study, the decrease in projected commercial stock limits the growth of potential for this sector.
- **Industrial customers will need to be specifically targeted to capture increase in achievable potential.** The maximum achievable scenarios presented here are only reflective of a market with 100% of incremental costs incentivized. In order to capture the additional potential associated with industrial customers, specific strategies need to be explored given that these customers require faster payback periods.
- **Adjusted avoided cost inputs have relatively less effect on the maximum achievable potential compared to demand changes.** While the avoided costs affect the cost benefit calculations that determine economic potential, a sensitivity analysis from the original study showed that this has less affect than changes in energy demand.
- **In the maximum achievable scenario, adoption is not affected by the retail rates since efficient measures cost the same as baseline equipment from the customer's perspective.** In other scenarios where measures are not incentivized at 100% of incremental costs, retail rates *will* affect adoption.

# Scenario Costs

## Province Wide Costs

**Figure 6. Average Annual Cost for First 5 Years**




- Annual budget under 2019 study: ~$375M average per year for the first five years.
- This increases to ~$400M per year in the first five years of the updated study.
- The largest increase is seen in the industrial sector, which shows an additional $12M in incentives (+43%), due to the increase in industrial sales in the reference forecast.
- Commercial incentives rise by $16M (+9%).
- Residential incentives show a 5% decrease from the original study.
- The total admin rises by $6M (+9%).

# Next Steps

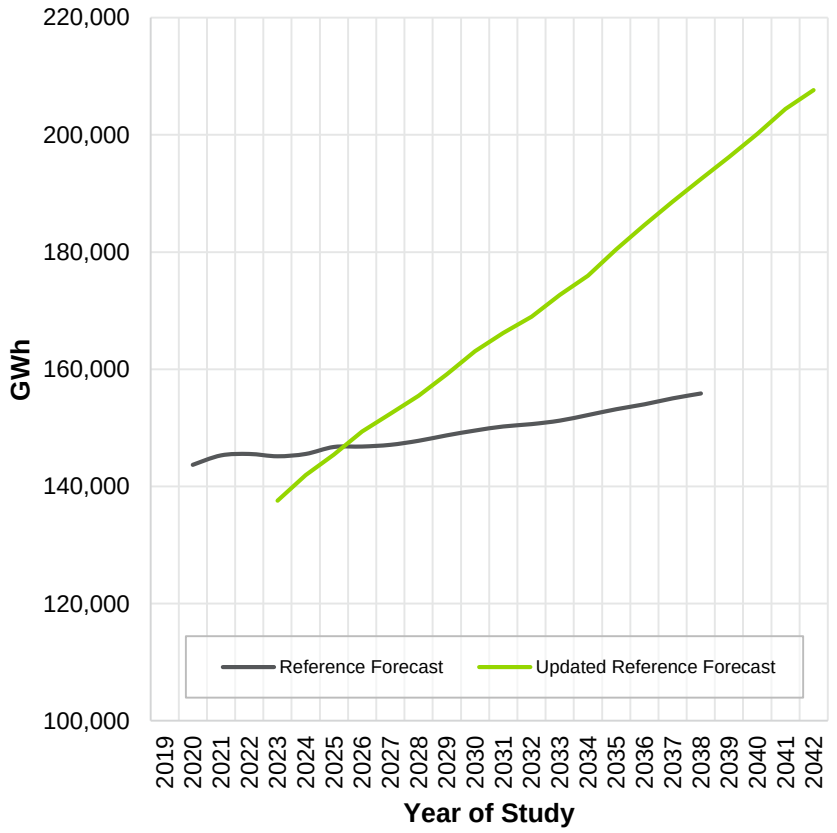
- The APS refresh confirms there is significant opportunity to increase CDM targets and budgets above present levels to cost-effectively meet system needs; findings will be reflected in the 2021-2024 CDM Framework Mid-Term Review
- IESO will use APS Refresh results as input in regional planning CDM non-wires assessment and to inform other activities
- APS refresh results including a forward and updated data appendices have been posted on the IESO's website

# Appendix

## Results, Methodology, and Outputs

# Model Inputs

## Updated Inputs: Reference Forecast



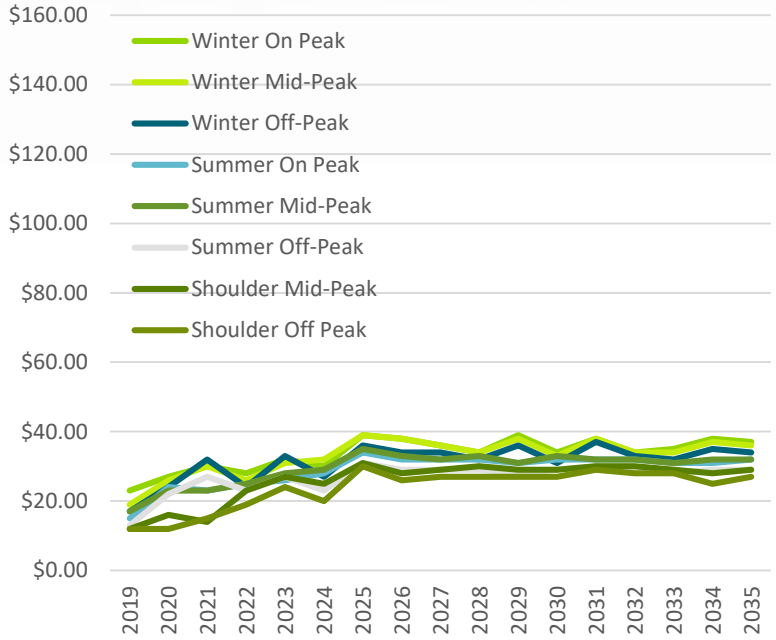

- The updated reference forecast shows an **increased amount of load growth** over time, reaching 181 TWh by 2042.
- This growth in sales is mainly due to **increased industrial sales** which rose by just under 30% compared to the original study.
- In the first half of the study period, commercial sales are lower than in the original study. After 2032, they rise to be 3% higher. **Commercial stock is lower overall**, cumulating in 3% less floorspace than the original study.
- **Residential sales increase** to be 15% higher than the original study. Residential stock also increases by 3M homes (or 4%) in 2038.

# Model Inputs (2)

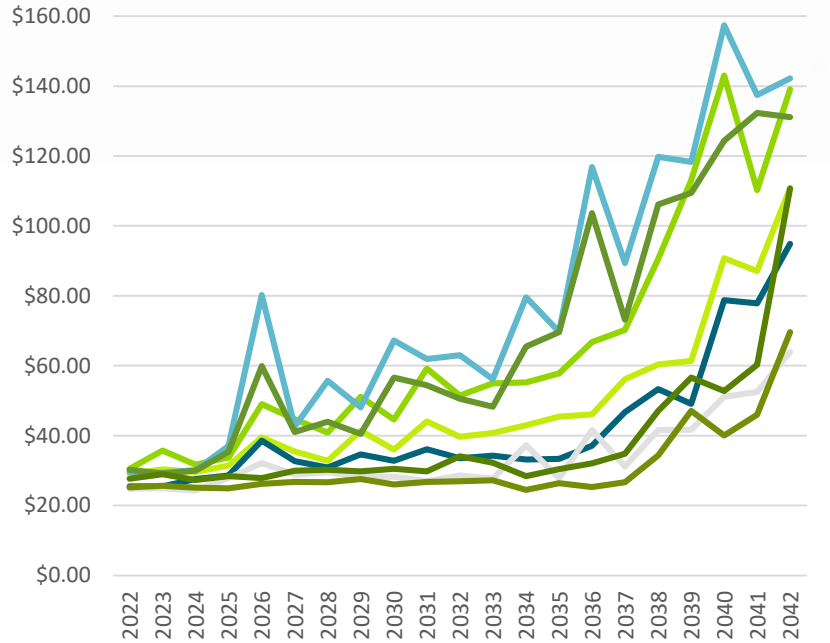
## Updated Inputs: Avoided Energy Costs

The updated avoided energy costs are much larger than in the original study, particularly in the later years. This has the effect of **increasing the economic potential** of measures by increasing the benefits over measure lifetimes.

### Original Avoided Costs (2018$/MWh)




### Updated Avoided Costs (2021$/MWh)

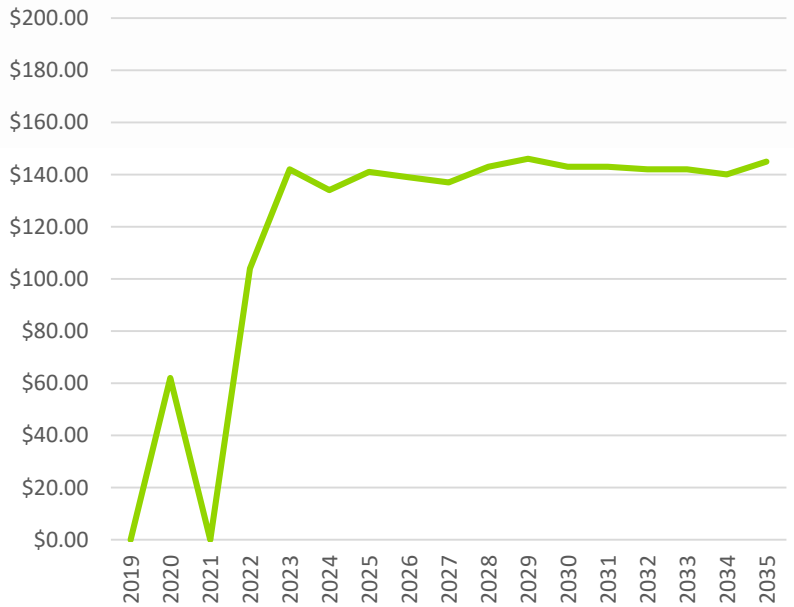


# Model Inputs (3)

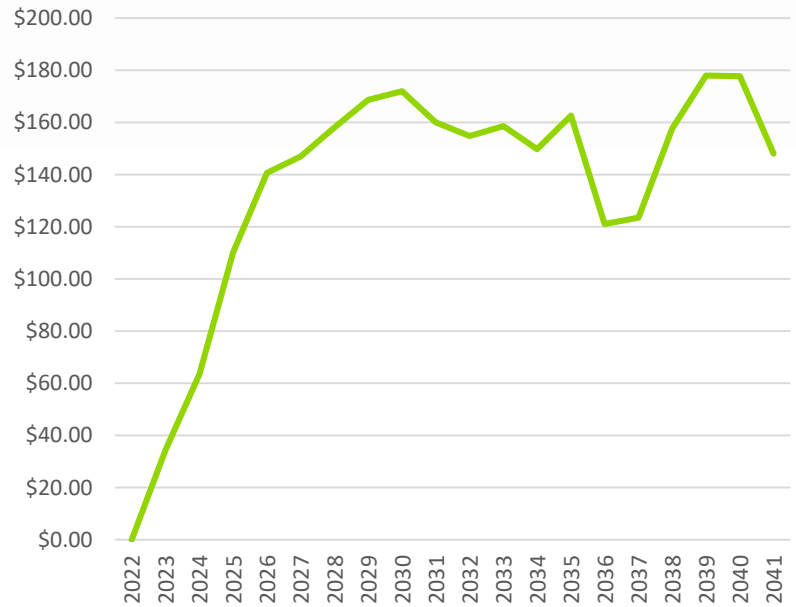
## Updated Inputs: Avoided Capacity Costs

The updated avoided capacity costs exhibit the **same overall trend** as in the original study. They do rise higher, however, to $180/kW-yr in the later years, whereas the original study flatlines at $140/kW-yr.

**Original Avoided Costs (2018$/kW-yr)**




**Updated Avoided Costs (2021$/kW-yr)**

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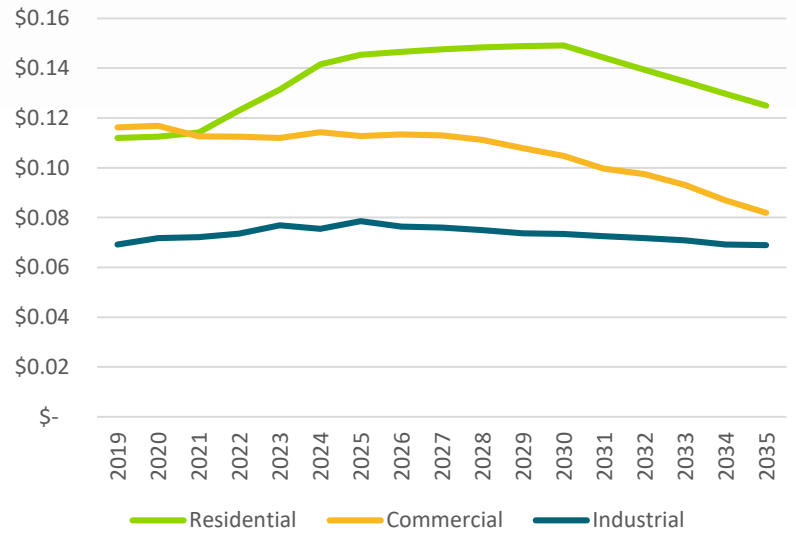
# Model Inputs (4)

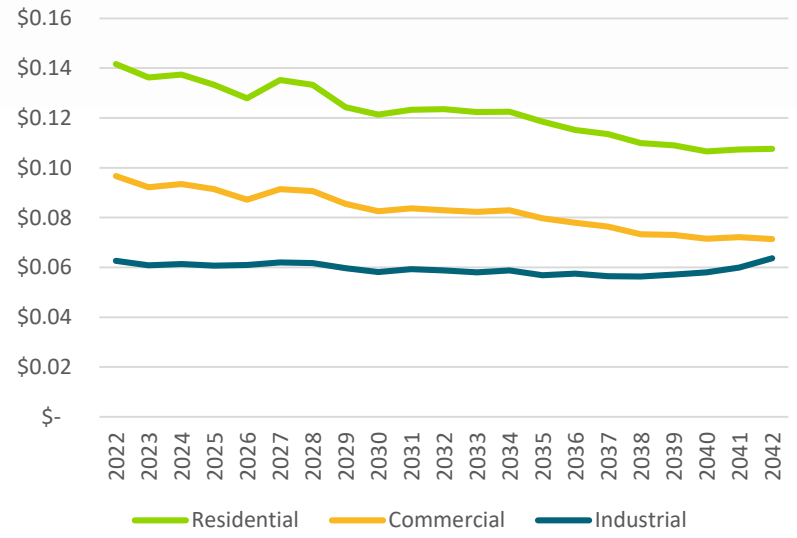
## Updated Inputs: Retail Rates

Retail rates are lower overall than in the original study and exhibit different trends. For example, Residential retail rates do not increase, rather, they decrease over the study period.

**Original Retail Rates (real 2018$/kWh)**




**Updated Retail Rates (real 2022$/kWh)**

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# Model Inputs (5)

## Unchanged Inputs: Marketing and Awareness Factors

In Bass Diffusion modeling, customers need to be aware of a technology before they can determine whether it meets their pay-back criteria and if they want to adopt it; in the DSMSim™ model:

- **Marketing factors:** represent the fraction of customers that become aware of CDM measures in each year, driven primarily by advertising
- **Awareness factor (adopter):** represents the fraction of customers that become aware of CDM measures in each year driven by the word of mouth of customers that have previously adopted that CDM measure
- **Awareness factor (aware customers):** represents the fraction of customers that become aware of CDM measures in each year driven by the word-of-mouth of customers that are aware of a measure but have not yet adopted it
- **Medium-range values have been used for all three factors** in the original 2019 study and carried forward into the 2022 refresh, based on input from the Delphi panel

# Model inputs (6)

## Unchanged Inputs: Marketing and Awareness Factors (Cont'd)

Updating marketing and awareness factors would require calibrating sector models against recent year actual savings. Guidehouse-IESO discussions established that calibrating against 2021-2022 savings would be problematic as these savings are unrepresentative of typical program participation/performance due to the effects of the COVID-19 pandemic and related supply chain issues. Consequently, updated marketing and awareness factors could impact the accuracy of estimated achievable potential over the study period.