The Save on Energy Retrofit Program's Impact on Ontario's Greenhouse Sector

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Acknowledgement

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Executive Summary

The Independent Electricity System Operator (IESO) has been supporting the Ontario greenhouse industry since 2018, when it identified a surge in demand from this rapidly growing sector in southwestern Ontario. Through its Save on Energy brand, the IESO has offered solutions to maximize energy savings while preparing the greenhouse sector for demand response (DR), including incentives for LED horticultural lighting through the **Save on Energy Retrofit Program**. The energy savings have translated into reduced costs and increased yields for greenhouses participating in the program, attracting greater investment into the greenhouse sector and strengthening the reliability, affordability, and sustainability of the electricity system.

Energy efficiency was prominent in the Ontario government's **integrated energy plan** to build a more reliable, affordable, and sustainable system. The IESO is helping to advance the province's energy-efficiency efforts through the **2025-2036 Electricity Demand Side Management Framework**, which will also support economic development in Ontario. This report presents an overview of the IESO's Save on Energy Retrofit Program serving the Ontario greenhouse industry and multiple benefits that have been realized since 2018. What follows are the findings of this paper:

Rapid Sector Growth That Outpaced Infrastructure

- Greenhouse development in the Leamington and Kingsville area surged after 2017's natural gas expansion.
- Growth exceeded expectations, overwhelming local electricity transmission capacity.

The IESO's Strategic Response

- A series of transmission reinforcements was initiated (with later stages expected to complete by 2030).
- In the interim, the IESO focused on electricity demand-side management (eDSM) and operational solutions to support continued growth.

Save on Energy Retrofit Program Enabled Energy Efficiency and Sector Growth

- Incentives for LED horticultural lighting helped transform the market, reduce energy use, and increase crop yields.

Significant Energy and Economic Impact

- 101 MW of net verified local peak demand reduction (2021 – 2024).
- 431 GWh of net verified energy savings.
- $67 million in ratepayer spending, garnering more than $155 million in private sector investment.

- Nearly 50 per cent of the Save on Energy Retrofit Program's net energy savings came from greenhouse measures in 2024, averaging 30 per cent less in cost per kilowatt-hour when compared with the Southwest Retrofit region.

Market Transformation Achieved

- Applications for more than 350,000 LED fixtures received incentives from the program.
- Save on Energy Retrofit Program maintained high influence (92.4 per cent net-to-gross ratio in 2024).
- Growers expanded into other efficiency measures (e.g., variable frequency drives, motors, fans).

Future Opportunities

- Market transformation towards dimmable/programmable LED systems and incentives for lighting controls and solar DERs position the sector for future local DR offerings.

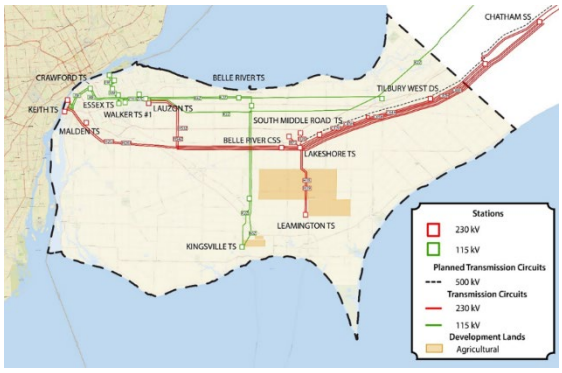
Introduction

In 2018, Ontario's greenhouse sector—particularly in the Southwest region—experienced unprecedented growth, driven by expanding markets for fresh agricultural produce and advancements in growing methods. The **Leamington and Kingsville area**, in particular, became a focal point for greenhouse development. It provided a central region for growers and a temperate climate, with growth mainly catalyzed by the 2017 expansion of natural gas infrastructure in the area. This expansion unlocked new production opportunities for cultivators, but the demand growth that followed—nearly four times the anticipated rate—quickly outpaced existing electricity transmission capacity. By 2018, it was clear that additional transmission infrastructure would be required to support the sector with a reliable supply of electricity.

The IESO responded with a cross-organizational effort, with the Power System Planning and the Demand Side Management teams coming together in collaborative response to the greenhouse sector's need. The goal was to put forward a combined approach to support the sector and mitigate grid constraint in the short term, while long-term solutions were being developed.

For the long-term strategy, a series of transmission recommendations were made, including:

- **Two 230 kV lines south to Leamington by 2019**
- **One switching station in Lakeshore by 2022**
- **Two 230 kV lines from Chatham to Lakeshore by 2024**
- **Two 230 kV lines from Sarnia to Chatham by 2028**
- **One 500 kV line from Strathroy-Caradoc to Lakeshore by 2030**



IESO Integrated Resource Planning Map for Windsor-Essex, Ontario (IESO, 2025)

In addition, the IESO proposed the acquisition of at least 550 MW of new or existing local resources, which were secured through completed procurements and are expected to be in-service prior to 2030. In tandem, the local distribution companies (LDCs) were tasked to build out load connection facilities to individual customers and areas with significant greenhouse development. These upgrades would provide the backbone for future reliability in the region; however, until their completion, short-term solutions were needed to support industry growth. To empower growers to maximize their existing connection capacity, the IESO turned to eDSM efforts and the use of operational measures to manage the electrical system.

Greenhouse Initiatives in the IESO Save on Energy Retrofit Program

eDSM efforts were guided by the **Agriculture-Energy Working Group**, established by the IESO in 2006. This group—comprising the Ontario Ministry of Agriculture, Federation of Agriculture, LDCs, and eDSM-focused sector stakeholders—ensured co-ordinated action and allowed the IESO to respond quickly to the market.

While initial offerings for the greenhouse sector mainly focused on distributed energy resources (DER)—with incentives such as Feed-in Tariff (FIT) and net metering—the 2018 boom in Leamington highlighted the need for more energy and demand reduction efforts.

Greenhouse facilities were becoming more abundant and were more frequently installing horticultural lighting systems to supplement natural lighting. A lit greenhouse used as much as 10 times the electricity as an unlit greenhouse (Posterity Group, 2019) and growers were predominantly using high-pressure sodium (HPS) lighting, which consume up to twice the electricity of LEDs and are non-programmable. The heavy concentration of these lights in a small geographic area only served to exacerbate the grid management issues. While the IESO recognized the importance of fostering growth in the emerging Ontario greenhouse sector, current infrastructure was quickly reaching its limit and upgrade completion was many years away.

The IESO first investigated the plausibility of a local demand response program to help with grid relief. Some growers were open to the concept, but the lack of programmable and dimmable lights meant that they would have to manually operate fixtures during high demand periods, which was seen as impractical.

The IESO then turned to a solution that would maximize energy savings while preparing the sector for DR, offering incentives for LED horticultural lighting through its **Save on Energy Retrofit Program**. LED systems were proven to be up to twice as efficient and were programmable/dimmable, but adoption among growers was slow due to high costs—five times more expensive—and uncertainty about crop impacts (Resource Innovations, 2024).

LED vs HPS Lighting

Lighting Type	Energy Consumption	Controls	Lifespan	Upfront Costs
LED		Dimmable, Programmable	Up to 5x longer than HPS	Up to 5x more than HPS
HPS	Up to 2x more than LED	Limited controls		

In a concerted effort to **de-risk LED adoption and create local success stories**, the Save on Energy Retrofit Program upgraded its offering in 2019 with a limited-time three-fold increase to incentives. The Grid Innovation Fund was released shortly after, in 2020, and both initiatives provided growers with funding to try more efficient lighting.

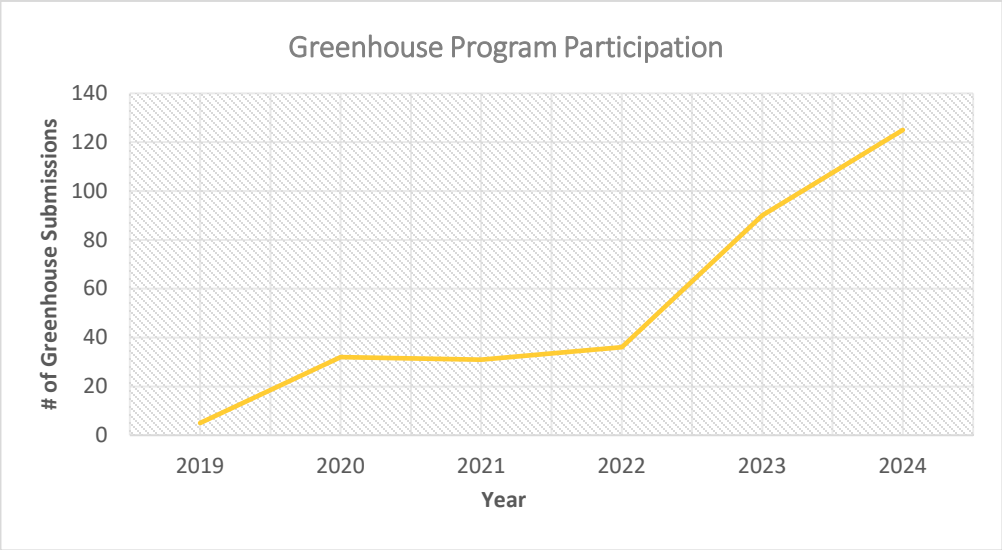
Great Lakes Greenhouses Inc. in Leamington was one of many large growers to take advantage of the expanded Retrofit offer. Starting in 2020, the company was able to leverage the extra incentive to bring two hectares of new grow area online, across 37 greenhouses. After installing LED systems, which were more efficient and had higher efficacy, Great Lakes Greenhouses saved an estimated 57 GWh of electricity while cutting fixture counts by 80 per cent. Even with the lower count, the LED systems allowed for a **higher crop yield using the same acreage**.

Great Lakes Greenhouses notes that the purchase of LED systems would not have been executed without the Save on Energy incentive. The company credits the program for changing their business and Great Lakes Greenhouses Inc. continues to use the Save on Energy Retrofit Program to this day.

Alongside the Retrofit Program, the Grid Innovation Fund also helped growers explore LED technology. The fund incentivized participants to find innovative solutions for energy savings. Growers like Allegro Acres Inc., in Kingsville, used the incentive to experiment with a combination of new lighting sources, colours, and controls.

Allegro Acres Inc. reduced their peak demand by 50 per cent while trialling new lights, controls, and light spectrums (red during the day, blue at night) through the Grid Innovation Fund.

Both initiatives served the purpose of creating local success stories for LEDs and **stimulating market transformation**. Their popularity was demonstrated through increased program submissions for LEDs from the sector, which ballooned to the point of exhausting the Save on Energy Retrofit Program's budget in 2022.



In the IESO's aim to continue to maintain reliability for the area and the province, and to continue fostering economic development, additional funding was provided specifically for greenhouses in locally constrained areas of the Southwest Region through a Ministerial directive issued to the IESO on Sept. 29, 2022. This Ministerial directive was in response to the **IESO's *2021 Annual Planning Outlook***, which indicated a need for additional electricity capacity beginning in 2025, and the IESO's recommendation to offer new and expanded energy-efficiency programs to support meeting the electricity system needs. The directive enabled the IESO to provide additional programming through a $342-million budget increase to deliver an additional 285 MW of peak demand savings and 1.1 TWh of electricity savings, which included—but is not limited to—additional funding to support greenhouse growers in the Southwest Region, as detailed further on **Save on Energy's website**.

This greenhouse stream continues to be a staple in the Save on Energy Retrofit Program and the additional funding has helped support a 250 per cent increase in greenhouse participation.

Benefit to Growers and Economic Impact

Since the introduction of horticulture measures into the Retrofit Program, Save on Energy has played a pivotal role in supporting greenhouse growers in Ontario. The program has enabled:

- Significant market transformation of horticulture lighting from HPS to LED.
    - The program raised awareness of the benefits of LEDs and has processed applications for more than **350,000 lighting fixtures** through the program.[1]
    - The Save on Energy Retrofit Program's 2024 **net-to-gross rating of 92.4 per cent** (Resource Innovations, 2025) for greenhouses shows that while the technology may be more widespread, the program still plays a significant role in a growers' decision to buy LED systems. This is especially true with LED capital costs reported to be up to five times that of HPS lights, with payback periods of more than 10 years—well above the five-year industry norm (Resource Innovations, 2024).
    - Lighting has been a great introduction to energy efficiency and the Save on Energy programs for growers. Aside from lighting, growers have **submitted applications for more than 15 other measures** including variable frequency drives, motors, and fans.
- Significant production growth and greenhouse growth in the Leamington and Kingsville areas.
    - The energy efficiency of the LEDs—up to twice the efficiency of HPS—also allowed for more lights to be installed without exceeding existing capacity. This meant that growers were not only increasing yield on existing acreage but were **able to light new acreage** using the same infrastructure. This helped support an annual 5 per cent growth in Ontario's greenhouse acreage over the last five years (as reported by the Ontario Greenhouse Vegetable Growers Association). The IESO's eDSM activities directly contributed to building Ontario's multi-billion-dollar horticulture market.
- Significant relief on the local transmission grid with energy and local peak demand savings.[2]
    - Net peak demand savings of **101 MW** for the local Southwest Ontario peak from horticultural measures completed between 2021 and 2024.
        - Southwest Ontario was observed to have local winter peaks—November to December between 8 a.m. and 11 a.m. (Resource Innovations, 2025)—which varied from the provincial summer peaks and is a peak profile commonly seen in areas with significant greenhouse loads.
        - The weighted average coincidence factor of 77 per cent for LED grow lights indicates the average percentage of connected demand savings that aligns with the local peak (Resource Innovations, 2025). This highlights the major effect that lighting savings from the Save on Energy Retrofit Program had on local grid relief during the highest local demand periods.

[1] Figure represents fixtures for completed greenhouse projects that have received an incentive from the Retrofit Program.

[2] Numbers represent incentives and net verified savings for completed greenhouse projects from 2021 to 2024. Peak demand savings are applicable to the local winter peak of Southwest Ontario (Resource Innovations, 2025) and not the provincial summer peak.

    - Net energy savings of **431 GWh** from horticultural measures implemented across the province between 2021 and 2024.
        - Almost **50 per cent of the entire Save on Energy Retrofit Program's net energy savings** in 2024 came from greenhouse measures (Resource Innovations, 2025).

- Significant ratepayer spending supporting economic development.
    - Greenhouse incentives worth **$67 million**.
        - While this represents a large investment, the Save on Energy Retrofit **greenhouse measures remain cost-effective**,[3] averaging approximately 30 per cent less in cost per kilowatt-hour than the Southwest Retrofit region.[4]
        - The ratepayer spending was met with more than **$155 million in private sector investment**.
    - Greenhouse projects supported by the Save on Energy Retrofit Program generated **significant employment opportunities**, with nearly **1,900 jobs** generated in 2024.[5]

Aside from achieving profound market success, the IESO's involvement with the greenhouse sector has provided great learnings. Engagement with stakeholders proved to be important, allowing for the early identification and response to grid vulnerabilities. The IESO's integrated approach played a key role in addressing near- and long-term reliability needs and reaching outcomes that fostered economic development. Lastly, the Save on Energy Retrofit Program has helped to foster deeper relationships with the greenhouse sector, which enables the IESO to stay current on market trends and sector activities. Critical feedback from these relationships helps to inform ongoing program evaluation and future market needs for eDSM initiatives and is a model that can be replicated for other large sectors.

[3] The greenhouse measures implemented in constrained areas of Southwest Ontario are cost-effective with a Program Administrator Cost (PAC) ratio of 2.94 as detailed in the 2024 evaluation results for greenhouse projects (Resource Innovations, 2025).

[4] Comparison between average 2025 project cost for greenhouse projects in constrained areas of Southwest Ontario against average 2025 Southwest Region project cost.

[5] The jobs estimate presented represents annual employment generated in the specific year of program activity or investment – both direct and indirect – across Canada. This figure should not be interpreted as ongoing or permanent employment.

Future Opportunities

As LED horticulture lighting has increased in popularity, the Save on Energy Retrofit Program has introduced advanced lighting control measures as a strategic pairing. With programmable and dimmable LED systems in place, advanced control systems could prime the sector for future DR programs. The technology not only enables more energy-efficient operation but can provide growers the capability to dim lights during high peak periods, helping to alleviate demand on the grid **while still supporting their production needs.**

One other area of development is in DERs. The IESO's 2025 reintroduction of a solar DER measure was met with interest by the horticulture market. Solar arrays enable growers to produce their own energy and save money, while supporting grid resiliency. With the possibility to pair DER systems with a future battery energy storage system measure, the sector would be positioned one step closer to **DR readiness**, with batteries allowing growers to store and release energy when needed.

The **Save on Energy Retrofit Program's impact on the greenhouse sector has been notable, and the IESO is dedicated to continuously grow and develop the market, while supporting a reliable, affordable, and sustainable energy future**.

The combination of eDSM and transmission infrastructure investments is sufficient to meet the projected growth of the greenhouse sector in southwestern Ontario. The IESO continues to engage with existing and potential customers as well as the sector to monitor the pace of growth. The IESO will also track transmission developments and changes in generation across the region. Future transmission planning activities will consider the need for additional investments should the growth rate exceed projections, taking into account the progress of transmission developments and changes in generation across the region.

Key Terms

Distributed Energy Resources (DER) - Resources that generate energy, store energy, or control load and that are connected directly to a local distribution system or to a host load facility within a local distribution system.

Demand Response (DR) - When customers reduce their energy use during high demand periods or shift their energy use during high demand periods to different times.

Electricity Demand-Side Management (eDSM) – Strategies such as financial incentives, education, and other programs that modify how and when customers use energy to support grid reliability, affordability, and sustainability.

Local Peak - The period in which a specific region of Ontario has its highest electricity demand in kilowatts which varies from the provincial Summer Peak. The Local Peak of the Southwest Region of Ontario currently takes place from November through December between 8 a.m. and 11 a.m.

Net-to-Gross - An overall comparison between the Energy Savings and/or Peak Demand Savings achieved as a direct result of the Save on Energy Retrofit Program and the Energy Savings and/or Peak Demand Savings that would have occurred even in the absence of the Save on Energy Retrofit Program.

Summer Peak - The period in which Ontario has its highest electricity demand in kilowatts, which currently takes place from June 1 through Sept. 30 between 3 p.m. and 9 p.m. on weekdays.

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