



Greenhouse Energy Profile Study

Dramatic greenhouse sector growth, increasing electricity use and potential solutions: a forecast of energy use and energy-efficiency opportunities from 2019 to 2024

The greenhouse sector is flourishing in southern Ontario, and becoming a major electricity draw with implications for the province's electricity grid. In partnership with Enbridge Gas and the Ontario Greenhouse Vegetable Growers, the Independent Electricity System Operator (IESO) commissioned the Greenhouse Energy Profile Study to develop a clear picture of the scale of Ontario's indoor agricultural sector in 2018. The report forecasts growth over the next five years, and quantifies the potential of energy-efficiency strategies to meet local and provincial needs.

Overview

The Kingsville-Leamington area is experiencing increasing electricity demand from greenhouses. There are approximately 1,300 megawatts of customer requests to connect to the grid by 2025, well beyond the current demand of 300 megawatts. Transmission upgrades and a new line from Chatham to Leamington will increase supply to the area to about 1,000 megawatts by 2026. However, this growing demand signifies an emerging challenge in planning for the future electricity needs of the region, and the province.

Ontario's greenhouse electricity consumption is forecast to increase 180% to 3.9 TWh by 2024, up from 1.4 TWh in 2018, driven by expansion in the prime growing regions of Essex, Chatham-Kent, Norfolk and Niagara.

With the vegetable greenhouse sector expanding at a record rate and an increasing number of greenhouses adding grow lights to sustain year-round operations, greater demands are being placed on the system. At the same time, following the legalization of recreational cannabis in Canada in 2018, more greenhouses and indoor facilities are coming online to serve the emerging cannabis sector, exerting further pressure on the system.

The research suggests great potential for energy-efficiency strategies to help greenhouses and indoor facilities improve their operations and save on energy, while reducing the need for new supply infrastructure and enabling new businesses to connect.

Working with an advisory group, the study gathered data in collaboration with industry organizations and businesses, and through surveys and focus groups with growers, in order to provide an inside view on the sector.

Snapshot: Ontario's Booming Greenhouse Sector

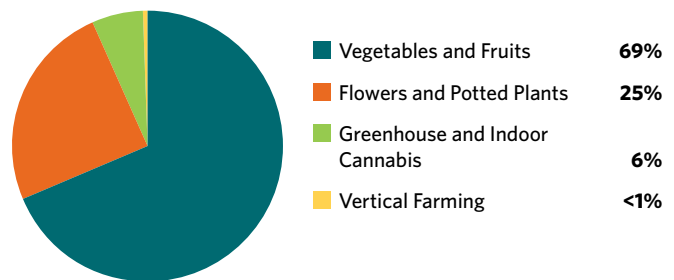
In 2017, Ontario represented 60 per cent of the total national greenhouse area.

Ontario's greenhouses use almost 1.4 terawatt-hours of electricity per year – or the equivalent of powering nearly 155,000 homes.

- In 2018, Ontario had 111.9 million sq. ft. of greenhouses for vegetables and fruit, the largest category within the greenhouse sector.
- Essex County is home to the largest concentration of vegetable greenhouses in Canada and the U.S.
- Vegetables and fruits are only part of the greenhouse demand equation: Ontario is the largest cannabis production market in the country, and the third-largest producer of flower products in North America, with 39.6 million sq. ft. of greenhouses.



Proportion of floor area by type of greenhouse in 2018



Key Drivers of Greenhouse Growth

Energy consumption is expected to increase in all major Ontario greenhouse categories over the next five years: vegetables and fruits, flowers and potted plants, and cannabis.

Vegetable and fruit greenhouses are the largest driver of growth, not cannabis

Vegetable and fruit greenhouses are the largest and fastest-growing category of greenhouses, in terms of both energy use and total area. Electricity consumption in the vegetable sector is forecast to jump by 282 per cent to 1,808,000 megawatt-hours in 2024, from 473,000 megawatt-hours in 2018.

Growth in electricity consumption in vegetable and fruit greenhouses reflects the increase in lighting – and in overall greenhouse area.

An increasing number of vegetable and fruit growers are using supplemental, horticultural grow-lighting in their greenhouses to create a year-round growing season. The square footage of vegetable and fruit greenhouses with lighting is projected to double from four per cent in 2018 to eight per cent by 2020, in all regions except Essex, where it soars to 29 per cent by 2024.

Cannabis greenhouse and indoor facilities are ramping up

With new greenhouses and indoor facilities ramping up to serve the developing cannabis sector, electricity consumption related to cannabis growth is projected to increase 1,253 per cent over the next five years to 1,258,000 megawatt-hours in 2024, up from 93,000 megawatt-hours in 2018.

This large increase in consumption reflects the fact that only 10 per cent of cannabis greenhouse and facility space was being used to produce cannabis as of 2018 – by 2023, these facilities are expected to be fully operational.

Greenhouse lighting is the largest electricity draw

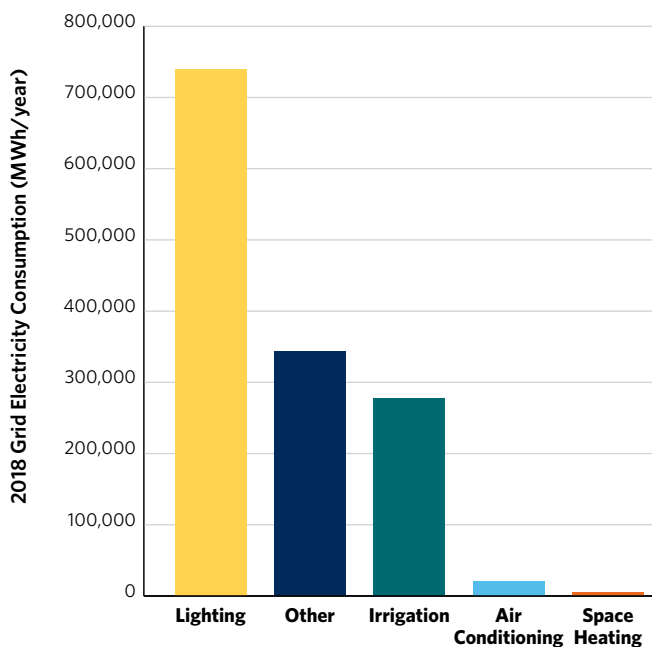
More electricity was consumed for lighting greenhouses in 2018 – a total of 752,000 megawatt-hours – than for all other greenhouse electricity uses combined (637,000 megawatt-hours).

A vegetable greenhouse with lighting consumes 10 times as much electricity as an unlit vegetable greenhouse.

High-intensity discharge lighting, with double-ended high-pressure sodium (DE-HPS) grow lights, continues to be the technology of choice for Ontario's greenhouse sector. Currently, consumption is primarily driven by supplemental lighting in vegetable and flower greenhouses.

Increased demand for locally grown vegetables and fruits is another key factor behind the greenhouse boom.

Lighting accounts for the majority of greenhouse electricity consumption



Vegetable and fruit greenhouses place peak demand on the electricity grid on winter weekdays between 5 a.m. and 9 a.m.

The Energy Efficiency Opportunity

Great potential exists for energy efficiency to improve greenhouse operations and save on energy, while reducing the need for new electricity supply. At two cents per kilowatt-hour, energy efficiency is the province's most cost-effective energy resource.

1) Implementing LED lighting could save as much as 550 gigawatt-hours a year

As the cost of installing more energy-efficient light-emitting diode (LED) grow lights falls and performance improves, uptake by Ontario greenhouses is expected to increase.

If Ontario greenhouses opt for more energy-efficient LED lighting, electricity savings could range from almost 230 gigawatt-hours to over 550 gigawatt-hours per year by 2024.

The IESO, through Save on Energy, provides Retrofit incentives for grow lights to help defray the capital costs as well as longer term operational costs.

2) Optimizing heating, ventilation and air-conditioning for cannabis growth offers the most economic electricity savings potential, other than lighting solutions

Cannabis growers rely on heating, ventilation and air-conditioning (HVAC) systems to dehumidify their facilities and greenhouses. Improving the design and optimizing these systems specifically for the needs of cannabis plants, presents an opportunity for considerable energy savings.

3) Reduce the load during peak periods

Demand-response tactics aimed at lightening the load on the electricity grid could have a measurable impact on reducing use at peak times in the greenhouse sector. These include:

- Turning off the lighting or reducing lighting levels at times when the local grid is projected to peak in December, January and February on weekdays from 5 a.m. to 9 a.m.
- Staggering light cycles so not all greenhouses are lit at the same time
- Leveraging other technologies to reduce the demand in peak hours, e.g., storing electricity from non-peak hours on batteries for use in peak times or using behind-the-meter generation produced on-site

Ontario greenhouses have invested more than \$88 million in energy efficiency initiatives since 2011. These investments have contributed to more than 325 gigawatt-hours of electricity savings for the province.



Next Steps

Participate in the regional planning process

Local input provides a strong foundation for regional electricity planning, ensuring the unique needs of an area are taken into consideration as the IESO plans for the future. Find out about the IESO's engagement initiatives on the Regional Planning and Community Engagement section of the IESO website.

The IESO to provide up \$2.5 million funding for innovation in the agriculture sector

The IESO is committed to supporting business in the sector and is looking for innovative energy solutions that reduce both demand and costs. Through the Grid Innovation Fund, the IESO is offering grants for projects that find innovative solutions that facilitate the growth of indoor agriculture across the province. Proposals will be accepted from November 18, 2019 to February 14, 2020. Learn more by visiting the Innovation section of the IESO website.

Save on Energy Retrofit program for business and industry

The IESO offers Save on Energy programs to businesses so they can benefit from newer, more energy-efficient equipment. Incentives are available for a range of upgrades from high-efficiency lighting, ventilation, chillers, motors, fans and more. Visit the Save on Energy website to find out more: SaveOnEnergy.ca or call Retrofit at: 844-303-5542.

Read the full report online at ieso.ca/GHstudy

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Save on Energy

Retrofit program contact:

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