While waiting for the workshop to start…

Get ready to participate!

- Turn on your camera
- Find the unmute button and say "Hi" to check your audio

- Find the "raise hand" button

Answer our opening question!

What are you hoping to get from today's session?

Answer in chat or raise hand and unmute

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JUNE 26TH 2025

A practical guide to carbon accounting for commercial sector businesses in Ontario: Scope 1 and 2 emissions

Kyle Aben, MA, BBA, GHG-IQ
Principal consultant, Carbon Realities Consulting

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Agenda

1. Save on Energy update
2. Upcoming survey
3. Training

eDSM Framework for 2025 to 2036

- **$10.9 billion**, **12-year** funding commitment from the Ontario government beginning January 2025
- Moving away from the existing **time-bound**, start-stop demand-side management program model via four three-year program plans
- Offering all of the programs from previous framework
- **New programming:**
  - Home Renovation Savings program
  - Peak Perks for Small Businesses
  - Solar PV systems for businesses
  - *Commercial HVAC Demand Response – to launch June 2026*
- **Funding to LDCs** on an opt-in basis

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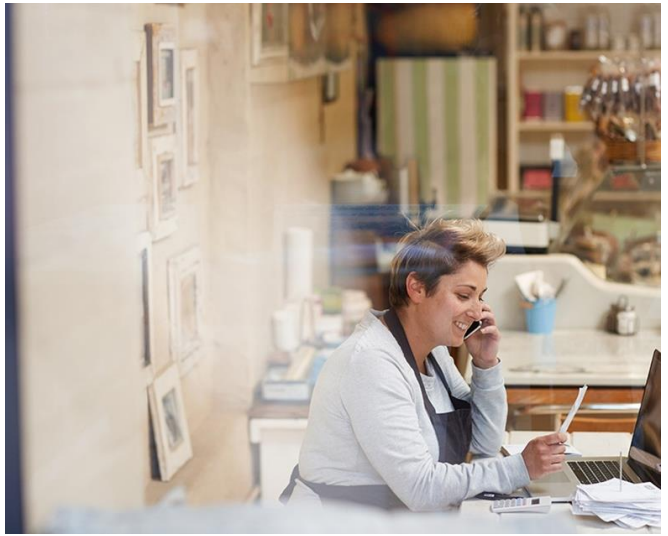
Save on Energy programs for business

Save on Energy's business programs provide incentives to help Ontario businesses of all sizes implement retrofits and other energy-efficiency projects to lower their energy costs, including:

- Retrofit Program
- Instant Discounts Program
- Small Business Program
- Local Initiatives
- Enhanced Energy Management Program
- Existing Building Commissioning Program
- Energy Performance Program
- Training and Support



Sign up for our quarterly business newsletter at https://www.saveonenergy.ca/en/Manage-your-subscriptions

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Retrofit Spring 2025 Enhancements

Enhancements Effective June 30, 2025	Description
Increased incentive rates for Custom projects by ~50%	New incentives at greater of $1,800/kW or $0.20/kWh for electricity savings achieved*
Updates to areas qualifying for regional adders and Custom adders	Adders offer double the standard incentive for facilities located in constrained areas up*
New computer room measures (In addition to existing computer room air conditioning measure)	ENERGY STAR certified computer servers, computer virtualization, ENERGY STAR certified uninterruptible power supply

Learn more: SaveONenergy.ca/News-and-Updates

The next Retrofit program enhancements are expected for Fall 2025.

*Incentives are capped up to 50% of project costs

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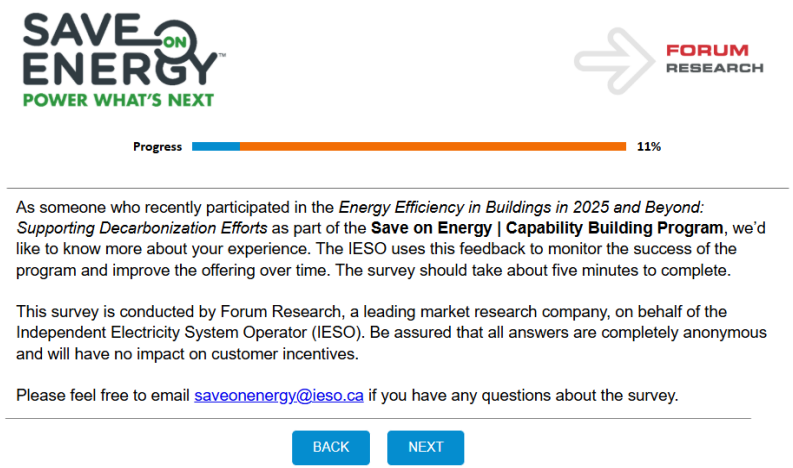
Upcoming survey: We want your feedback!



- Check your email! A survey is coming your way soon.
- Why? Help us improve our training programs.
- Who? Conducted by Forum Research on behalf of the IESO.
- Time? Takes only 5 minutes to complete.
- Confidentiality: Your responses are anonymous and won't impact participation or incentives.

The survey will be sent from:
surveyinfo@forumresearch.com

Objectives for today's training

- Provide an intermediate-level understanding of Scope 1 and 2 emissions in commercial operations
- Review key calculation methods and common emissions sources
- Discuss how to build a greenhouse gas (GHG) inventory using the GHG protocol and ISO 14064-1
- Help companies prepare to set emissions reduction targets aligned with best practices

Why carbon footprints matter in the commercial sector

Carbon footprints support:

1. Compliance with climate regulations
2. Corporate environmental and social governance (ESG) disclosures
3. Internal sustainability goal-setting

Commercial organizations also face increasing expectations from investors, clients, and employees for credible climate action

Greenhouse gas emissions overview

Seven Kyoto gasses measured in carbon dioxide equivalent (CO_2e) using global warming potential (GWP):

- GWP values are regularly updated
- Many governments still use the fifth assessment report (AR5) from the Intergovernmental Panel on Climate Change (IPCC). AR6 now is available.

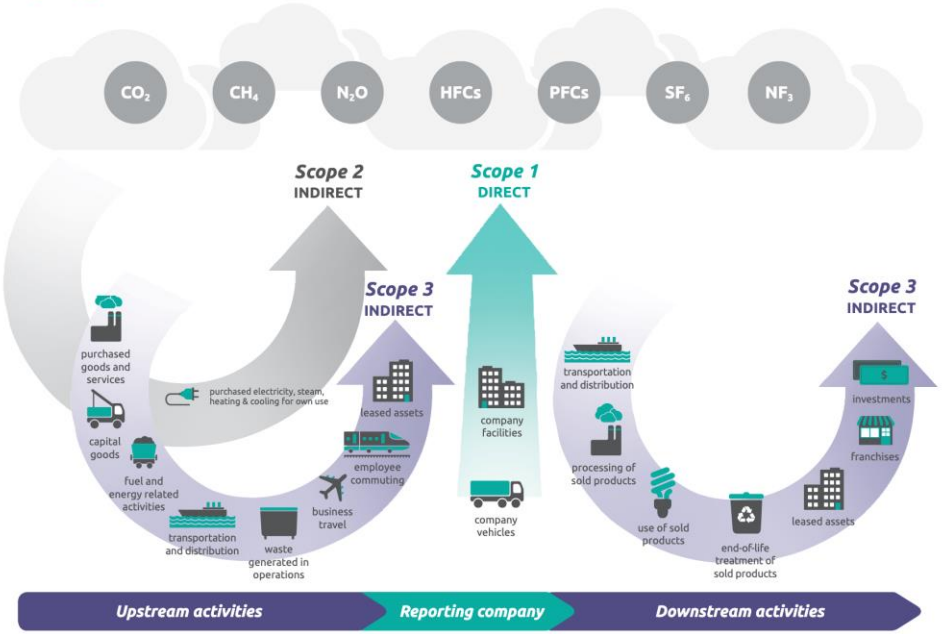
The GHG Protocol guidance groups emissions into:

- Scope 1: Direct emissions
- Scope 2: Indirect emissions
- Scope 3: Other indirect (not covered in this training)

GREENHOUSE GAS PROTOCOL

GHG Protocol Scopes and emissions

Figure [I] Overview of GHG Protocol scopes and emissions across the value chain



Source: Figure 1.1 of *Scope 3 Standard*.

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Organizational boundaries

Operational control approach:

- Alignment with operational realities
- Includes facilities where policies can be implemented
- Only report emissions from operations you can influence (excludes operations without decision-making authority)

Recommended for commercial reporting per ISO 14064 and GHG Protocol

ISO 14064

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Inclusions and exclusions - commercial sector footprint

Included	Excluded
Company-operated buildings	Uncontrolled leased properties
Commercial fleets	Franchised/outsourced operations
On-site energy	Shared spaces with unclear control

Leased assets: operational control-tenant

Control approach	Finance/Capital Lease	Operating Lease
Equity share or financial control approach used	Lessee does have ownership and financial control, therefore emissions associated with fuel combustion are Scope 1 and with use of purchased electricity are Scope 2.	Lessee does not have ownership or financial control, therefore emissions associated with fuel combustion are Scope 3 and with use of purchased electricity are Scope 3.
Operational control approach used	Lessee does have operational control, therefore emissions associated with fuel combustion are Scope 1 and with use of purchased electricity are Scope 2.	Lessee does have operational control, therefore emissions associated with fuel combustion are Scope 1 and with use of purchased electricity are Scope 2.

Leased Assets: operational control-landlord

Control approach	Finance/Capital Lease	Operating Lease
Equity share or financial control approach used	Lessor does not have ownership or financial control, therefore emissions associated with fuel combustion are Scope 3 and with use of purchased electricity are Scope 3.	Lessor does have ownership and financial control, therefore emissions associated with fuel combustion are Scope 1 and with use of purchased electricity are Scope 2.
Operational control approach used	Lessor does not have operational control, therefore emissions associated with fuel combustion are Scope 3 and with use of purchased electricity are Scope 3.	Lessor does not have operational control, therefore emissions associated with fuel combustion are Scope 3 and with use of purchased electricity are Scope 3.

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Leased assets: operational control

Role	Lease type	Fuel combustion emissions	Purchased electricity emissions	Direct or indirect emissions
Lessee	Finance/capital Lease	Scope 1	Scope 2	Direct and indirect (owned and controlled asset)
Lessee	Operating lease	Scope 1	Scope 2	Direct and Indirect (operated but not owned)
Lessor	Finance/capital Lease	Scope 3	Scope 3	Indirect (control transferred to lessee)
Lessor	Operating lease	Scope 3	Scope 3	Indirect (lessor owns but doesn't operate)

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Leased assets: operational control

- **The central reason why the commercial sector uses the operational control approach** is that it simplifies greenhouse gas accounting under different lease structures**.** The tenant takes responsibility for Scope 1 and 2 emissions and the landlord reports emissions as Scope 3 regardless of lease type!

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Scope emissions

Scope 1: Direct GHG emissions from sources owned or controlled by the organization

Scope 2: Indirect GHG emissions from the generation of purchased energy consumed by the organization

Scope 1 emissions sources – stationary fuel combustion

🔥 Stationary fuel combustion

Uses: building heating, hot water, or backup power:

- Natural gas (boilers, furnaces, water heaters)
- Propane (common in rural or temporary buildings)
- Fuel oil (#2 or #6 oil for older heating systems)
- Diesel (for generators or heating)
- Biomass or wood combustion (less common for commercial)

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Scope 1 emissions sources – mobile fuel combustion

🚙 Mobile fuel combustion

Emissions from fuels burned in vehicles or equipment owned or controlled by the organization:

- Gasoline or diesel from cars, vans, trucks, shuttles
- Propane used in forklifts or other warehouse equipment
- Natural gas (CNG) vehicles
- Refrigerated delivery trucks (auxiliary engines)

Scope 1 emissions sources – refrigerant leaks

❄ Refrigerant leaks

High-GWP emissions from refrigerants uses:

- HVAC systems (air conditioners, heat pumps)
- Refrigerated display cases (grocery, pharmacy)
- Cold storage or walk-in freezers
- Ice machines or commercial chillers
- Common refrigerants: R-410A, R-134a, R-404A, R-507A, R-22 (phased out, but still in use)

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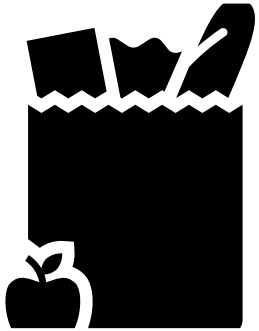
Scope 1 emissions sources – process emissions

🧪 **Process emissions**

- Less common in commercial sector
- Still relevant for some specialized buildings or activities, such as:
  - On-site CO_2 from compressed gas use (labs, beverage carbonation)
  - Emissions from dry ice sublimation (used in biotech or cold chain logistics)

Scope 1 example: natural gas consumption

Combustion of natural gas produces carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O)



Grocery store using 250,000 cubic meters of natural gas per year

Emissions factors:

CO_2: 1.966 kg CO_2/m^3

CH_4: 0.000037 kg CH_4/m^3 (GWP = 28)

N_2O: 0.000033 kg N_2O/m^3 (GWP = 265)

Calculations:

CO_2: 250,000 m^3 × 1.966 kgCO_2/m^3 = 491,500 kg CO_2

CH_4: 250,000 m^3 × 0.000037 kg CH_4/m^3 = 9.25 kg

➡ CH_4 → 9.25 kg CH_4 × 28 GWP = 259 kg CO_2e

N_2O: 250,000 m^3 × 0.000033 kg N_2O/m^3 = 8.25 kg

➡ N_2O → 8.25 kg N_2O × 265 GWP = 2,186.25 kg CO_2e

Total gasses:

491,500 kg CO_2 + 259 kg CO_2e + 2,186.25 kg CO_2e

= 493,945 kg CO_2e OR 493.9 tonnes CO_2e

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Scope 1 example: mobile fuel use

Gasoline combustion emits CO_2, CH_4, and N_2O

Emissions factors:
CO_2: 2.307 kg CO_2/L
CH_4: 0.00006 kg CH_4/L (GWP = 28)
N_2O: 0.00039 kg N_2O/L (GWP = 265)

Calculations:
CO_2: 30,000 L × 2.307 kg/L = 69,210 kg CO_2
CH_4: 30,000 L × 0.00006 kg CH_4/L = 1.8 kg
⇨ CH_4 → 1.8 kg CH_4 × 28 GWP = 50.4 kg CO_2e
N_2O: 30,000 L × 0.00039 kg N_2O/L = 11.7 kg
⇨ N_2O → 11.7 kg N_2O × 265 GWP = 3,100.5 kg CO_2e
Total = 69,210 kg CO_2 + 50.4 kg CO_2e + 3,100.5 kg CO_2e **= 72,361 kg CO_2e OR 72.4 tonnes CO_2e**

Corporate fleet using 30,000 Liters of gasoline per year

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Scope 1 example: refrigerant use

- Unlike fuel combustion, refrigerant leaks do not emit CO_2, CH_4, or N_2O. Instead, they release hydrofluorocarbons (HFCs) that have very high global warming potential (GWPs).
- When refrigerants leak from HVAC or cooling systems, the total emissions are calculated by multiplying the mass of refrigerant leaked (in kg) by its GWP to express the result in CO_2e (carbon dioxide equivalent).

Mall losing 10 kg of R-410A refrigerant per year

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Scope 1 example: refrigerant use

Emissions factors:
R-410A is a blend of:
50% R-32 (GWP = 675)
50% R-125 (GWP = 3,500)
The weighted average GWP = 2,088 kg CO_2e/kg R-410A

Calculation:
Total = 10 kg R-410A released × 2,088 GWP
= 20,880 kg CO_2e or 20.88 tonnes CO_2e

Mall losing 10 kg of R-410A refrigerant per year

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Scope 2 emissions sources

Purchased electricity

- Used in offices, retail, warehouses, hotels, schools, hospitals, data centers
- Ontario grid is low-carbon (hydro, nuclear, some gas)
- Location-based: average provincial grid factor (~0.030–0.040 kg CO_2e/kWh)
- Market-based: green power, Renewable Energy Certificates (RECs), supplier-specific contracts

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Scope 2 emissions sources continued

🔥 **Purchased Steam, Hot/Chilled Water**

- Used in buildings connected to district energy systems
- Common in urban cores (e.g., Toronto), institutional campuses
- Emissions depend on source fuel (natural gas, biomass, electricity)

🏢 **Other Scope 2 Cases**

- Electricity for common areas in leased buildings
- Lighting for shared parking lots and signage

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Scope 2 example: grid electricity use

Ontario's electricity grid remains relatively low-carbon

Emissions factors:

Ontario Grid Electricity (per kWh):

CO_2: 0.03782 kg

CH_4: 0.0000016 kg (GWP = 28)

N_2O: 0.0000009 kg (GWP = 265)

Calculations:

CO_2: 1,000,000 kWh × 0.03782 kg CO_2/kWh = 37,820 kg CO_2

CH_4: 1,000,000 kWh × 0.0000016 kg CH_4/kWh = 1.6 kg CH_4

⇨1.6 kg CH_4 × 28 GWP = 44.8 kg CO_2e

N_2O: 1,000,000 kWh × 0.0000009 kg N_2O/kWh = 0.9 kg N_2O

⇨0.9 kg N_2O × 265 GWP = 238.5 kg CO_2e

Total = 37,820 kg CO_2+ 44.8 kg CO_2e + 238.5 kg CO_2e

= 38,103.3 kg CO_2e OR 38.1 tonnes CO_2e

Office tower using 1 million kWh of Electricity

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Scope 2 example: district energy heating

Assuming a typical natural gas-based district energy system

Warehouse using 8,000 GJ of district heating

Emissions factors:

56.1 kg CO_2e/GJ, inclusive of all gases.

Breakdown of GHGs (typical combustion ratios):

CO_2: ~98.8%

CH_4: ~0.5%

N_2O: ~0.7%

Calculations:

Aggregated CO_2e: 8,000 GJ × 56.1 kg CO_2e/GJ = 448,800 kg CO_2e

Disaggregated CO_2e:

CO_2: 448,800 kg CO_2 × 0.988 = 443,414 kg CO_2

CH_4: 448,800 kg CH_4 × 0.005 = 2,244 kg CO_2e

N_2O: 448,800 kg N_2O × 0.007 = 3,142 kg CO_2e

Total = 443,774 kg CO_2 + 2,244 kg CO_2e + 3,142 kg CO_2e **=448,800 kg CO_2e**

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Scope 2 example: market based green energy

Market-based approach to green energy purchases in Ontario

Assuming the electricity is backed by Renewable Energy Certificates (RECs) with a market-based emissions factor of 0, then:

Emissions factors:
kg CO_2/kWh = 0
kg CH_4/kWh = 0
kg N_2O/kWh = 0

Calculations:
Total = 0 t CO_2e

Store chain purchasing 500,000 kWh of green electricity

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Data collection challenges

Fragmented utility data

- Energy data may come from multiple vendors or systems (e.g., Enbridge, Hydro One, sub-metered tenants)
- Different formats (PDF bills, Excel, web portals) make consolidation time-consuming
- Lack of centralized data tracking across departments (e.g., energy vs. facilities vs. finance)

Data collection challenges

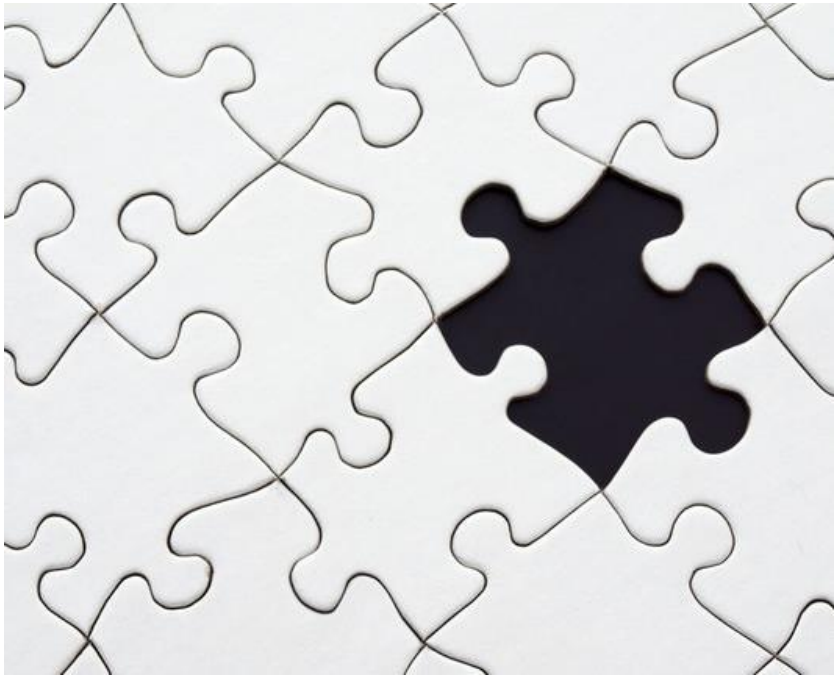
Unmetered or shared leased buildings

- Commercial tenants may not have access to whole-building utility data
- Leases may not specify energy usage responsibilities
- Landlord-controlled utilities complicate boundary setting (Scope 1 vs. Scope 3)

Data collection challenges

Missing historical records

- Previous years' bills may not be archived or easily retrieved
- Building ownership changes can result in data loss
- Without 12-months of data, annual baseline calculations and benchmarking (e.g., ENERGY STAR) becomes difficult



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Improving data quality

Use ENERGY STAR Portfolio Manager® or Excel templates

- ENERGY STAR enables standardized energy and emissions tracking
- Use Excel for custom GHG inventory tools when more flexibility is needed
- Be consistent with units (kWh, m^3, L, etc.) and timestamps (calendar year, fiscal year)

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Improving data quality

Request full utility histories

- Contact utility providers for 12+ months of historical data
- This supports year-over-year comparisons and accurate baseline development
- Useful for newly acquired buildings or those with historical reporting gaps

Improving data quality

Engage facilities teams and centralize tracking

- Facilities and maintenance staff are often key sources of usage data
- Centralized data collection (via shared drives or dashboards) improves consistency
- Appoint one GHG "data custodian" to maintain and verify updates

GHG inventory examples in Ontario

Office: electricity, gas

Example: A multi-tenant downtown office tower in Toronto

- Scope 1: natural gas used for space heating, boilers
- Scope 2: purchased electricity for lighting, HVAC, and plug loads
- Notes: common to use ENERGY STAR Portfolio Manager for tracking

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GHG inventory examples in Ontario

Supermarket: refrigerants, backup power

Example: A grocery store in Mississauga

- Scope 1: refrigerant leaks (e.g., R-404A, R-507A) from display cases and cold storage
- Scope 1: diesel generator for backup power (may also use natural gas)
- Scope 2: electricity use is significant (lighting, refrigeration, HVAC)

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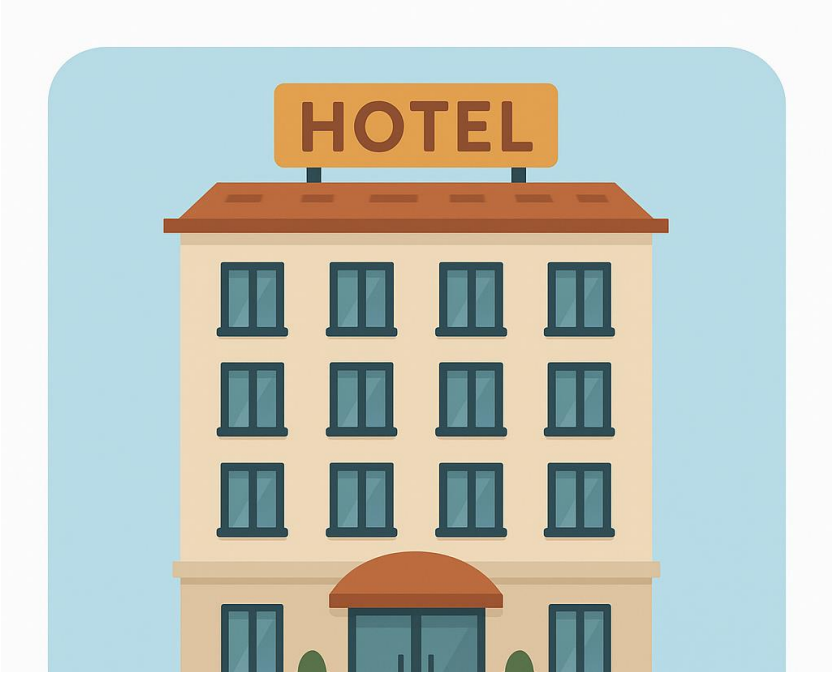
GHG inventory examples in Ontario

Hotel: District heat, refrigerants

Example: Full-service hotel in downtown Toronto connected to a district energy provider

- Scope 1: Refrigerant leaks from room HVAC and walk-in fridges
- Scope 2: District steam or hot water (for heating and domestic hot water)
- Scope 2: Significant electricity use (HVAC, elevators, lighting, commercial laundry)



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Lessons learned from practice, example #1

Refrigerant tracking is often missing

- Many commercial buildings lack proper systems to log refrigerant purchases, leaks, and top-ups. This leads to underreported Scope 1 emissions from high-GWP gases like HFCs.
- **Solution**: Implement standardized tracking logs or automated sensors to monitor refrigerant levels and losses.

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Lessons learned from practice, example #2

Property managers need support

- Property managers are key stakeholders but often lack training in GHG accounting, data collection, and emissions reduction strategies.
- **Solution**: Provide accessible training, templates, and guidance documents tailored to their operational responsibilities.

Lessons learned from practice, example #3

Benchmarking helps target emissions

- Organizations that benchmark energy and emissions data across sites can better identify inefficiencies and prioritize interventions.
- **Solution**: Use ENERGY STAR Portfolio Manager or equivalent tools to benchmark building performance, then focus efforts on underperforming sites.

ENERGY STAR® Portfolio Manager® Building Emissions Calculator

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Tools in use

- **ENERGY STAR Portfolio Manager**
  Tracks and benchmarks building energy use and emissions intensity across portfolios, helping identify high-emitting sites.

- **GHG Protocol templates**
  Standardized Excel and PDF tools that guide users through Scope 1 and 2 calculations and organizational boundary setting.

Tools in use continued

- **RETScreen Expert**
  Developed by NRCan, this free software supports energy analysis, feasibility assessments, and Scope 1 and 2 GHG calculations. Frequently used in Ontario for retrofit evaluations.

- **Energy Management Information Systems (EMIS)**
  Some Ontario businesses implement real-time Energy Management Information Systems to monitor and manage energy consumption. Save On Energy offers rebates for these systems.

From measurement to action: setting reduction targets

Once emissions are measured, targets guide prioritization and accountability

- Align with best practices, builds credibility (e.g., with investors, boards, or regulators)

Common target setting frameworks:

- Science Based Targets initiative (SBTi): Align with 1.5°C or well-below 2°C pathways
  - Requires Scope 3 estimation (if over 40% of total footprint, must include)
  - Validation process to ensure target aligns with science-based goals

SCIENCE BASED TARGETS

DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

From measurement to action: Setting reduction targets

Other common target setting frameworks:

- Federal Net-Zero Challenge: For larger companies and institutions
  - Requires setting net-zero targets with clear interim milestones and transition plans
  - Participation includes public disclosure and alignment with Canada's 2050 climate goals

- Internal carbon budgeting: Track and set limits by building or department
  - Encourages ownership of emissions and enables decentralized planning

Examples of emissions reduction targets (Scope 1 and 2)

Target Type	Example	Best practice reference
Absolute target	Reduce Scope 1 and 2 emissions 50% by 2030 (from 2020 baseline)	SBTi (1.5°C pathway)
Intensity target	Reduce emissions per m² by 30% by 2028	ENERGY STAR, ISO 50001
Equipment switch	Electrify all gas-fired HVAC by 2035	Net-zero challenge
Procurement goal	Purchase 100% renewable electricity by 2026	RE100 / IESO green button

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Key takeaways

- **Scope 1 and 2 = Foundation for Net Zero**
  Direct (Scope 1) and purchased energy (Scope 2) emissions are typically the most controllable and verifiable, making them the logical starting point for any net-zero strategy.

- **Use operational control to simplify**
  Adopting the operational control approach (per GHG Protocol and ISO 14064-1) provides clarity on what facilities and emissions to include, especially in leased or complex ownership structures.

- **Reliable Data + Tools = Success**
  Success depends on accurate data collection and using the right tools, such as benchmarking software, GHG templates, and national emission factors, to ensure consistency and transparency.

Key takeaways

- **Start with big emissions sources, iterate over time**
  Focus first on the largest emissions contributors (e.g., natural gas use, electricity) and improve granularity over time. Don't let perfection delay progress.

- **Move forward with confidence**
  Define next steps clearly: who collects what data, when updates occur, and how results will be used, so stakeholders feel empowered to act and improve performance.

Questions and answers

- Any questions?
- Training and support webpage: visit this page to access all training and support materials

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Stay connected with tools and resources

- Virtual one-on-one coaching: post-webinar support intake form for tailored support for organizations to manage energy resources effectively
- Monthly bulletin: sign up to receive monthly training updates on all Save on Energy training and support new tools and resources
- Live training calendar: visit this page to easily register for upcoming events and workshops
- Training and support webpage: visit this page to access all training and support materials

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Thank you!

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