



Energy & GHG Management Sustainable Campus Panel Session

SHECA 2019
May 14, 2019

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Energy Management and Sustainable Operations

Outline



- UAlberta + EMSO Intro
- GHG Inventory
- Energy Management Program
- Project Highlights

University of Alberta

- Public university, est. 1908
- ~14,500 staff & faculty
- 39,000+ students
- 5 urban campuses
- Numerous research stations
- Mix of new and heritage buildings



North Campus



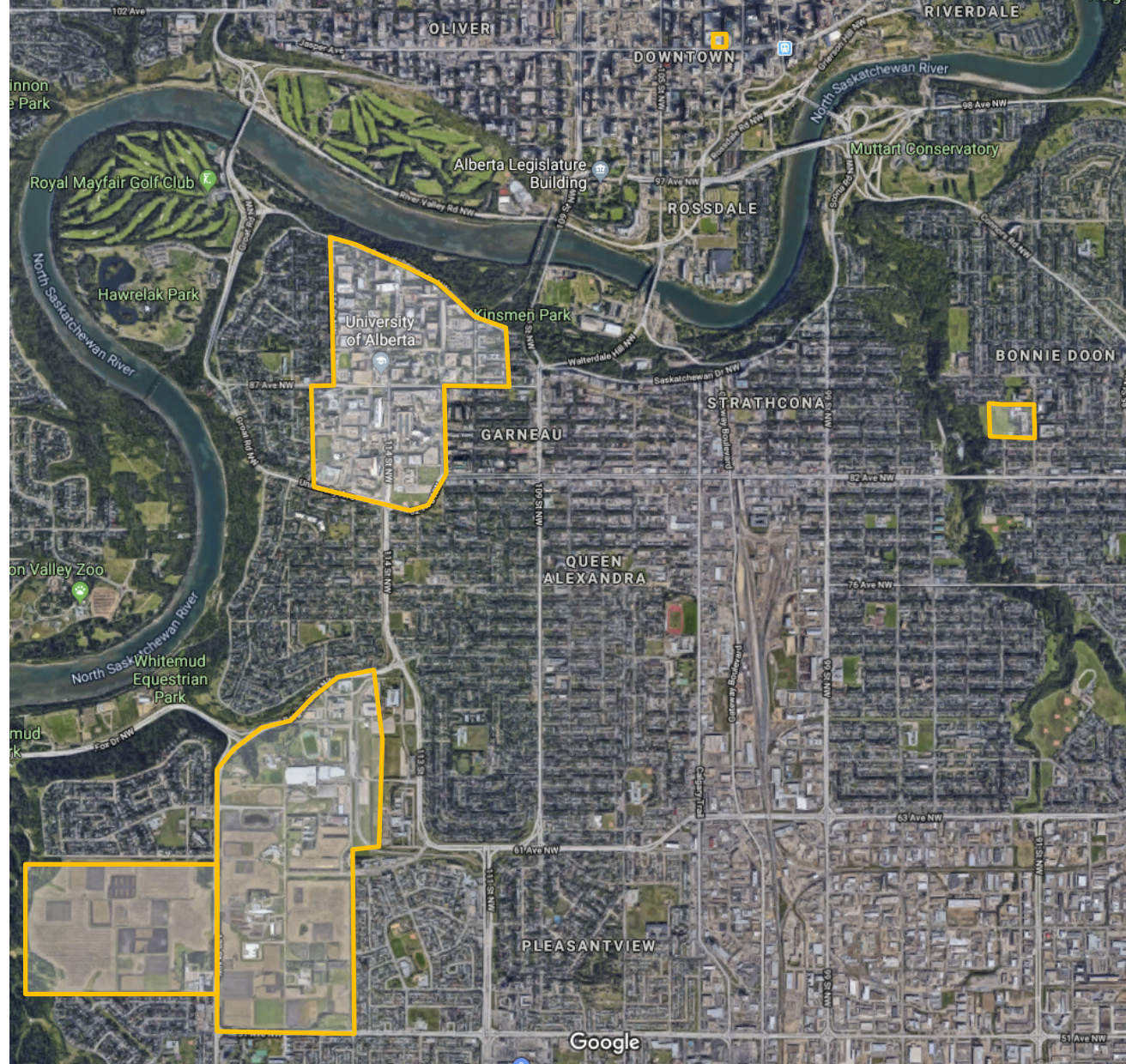
Edmonton Campuses

North Campus

South Campus

Campus Saint-Jean

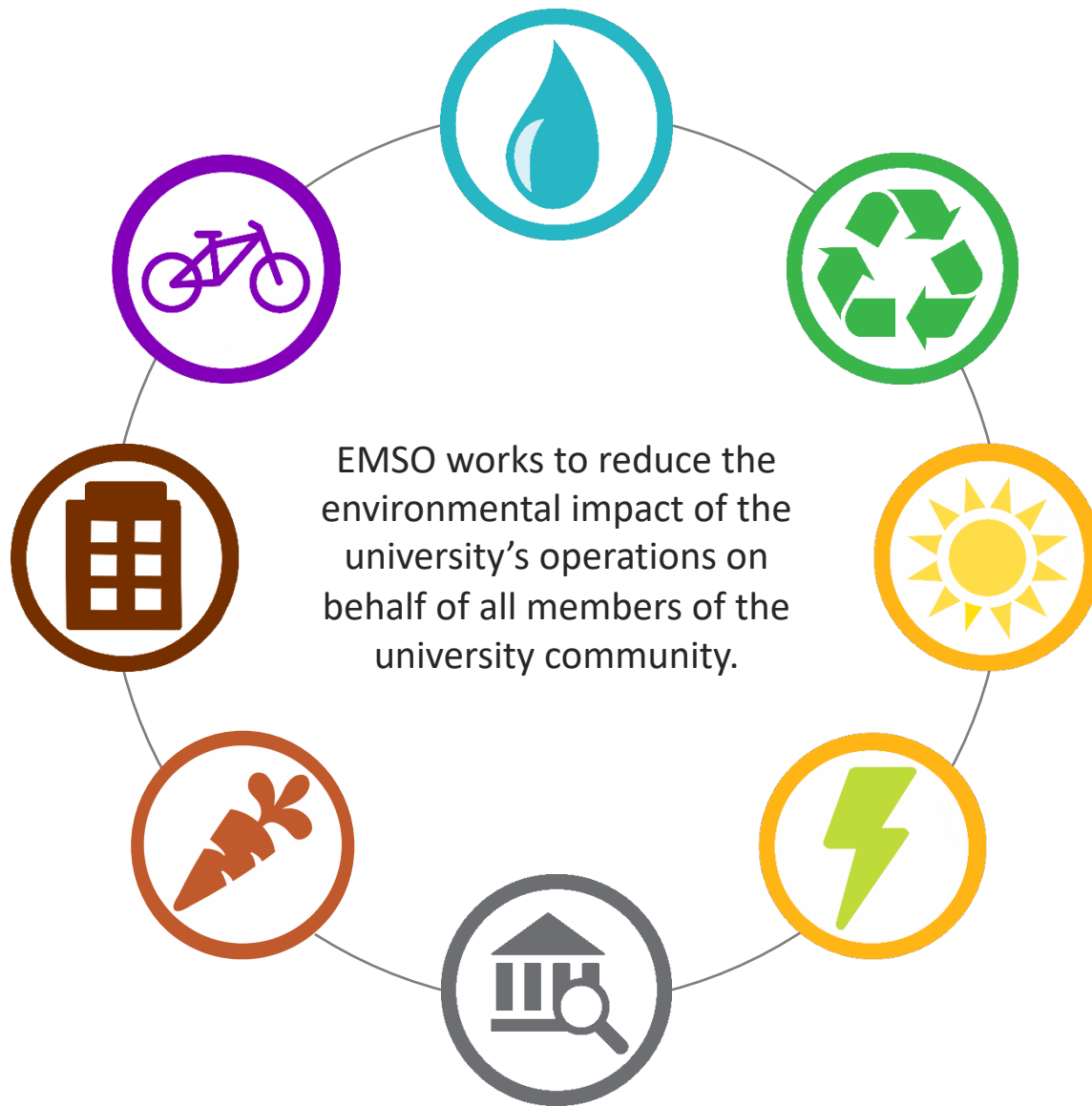
Enterprise Square



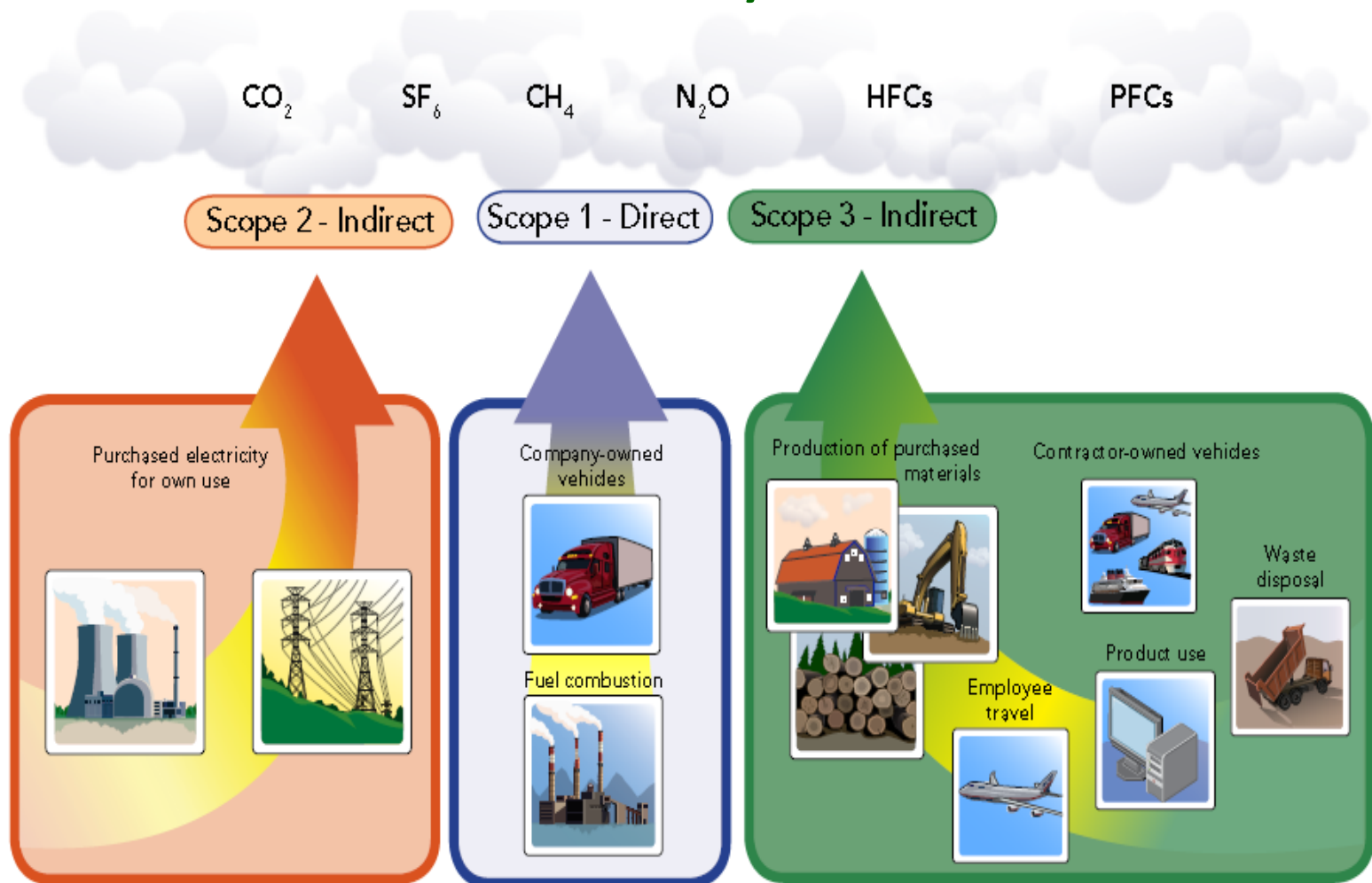


District Energy System

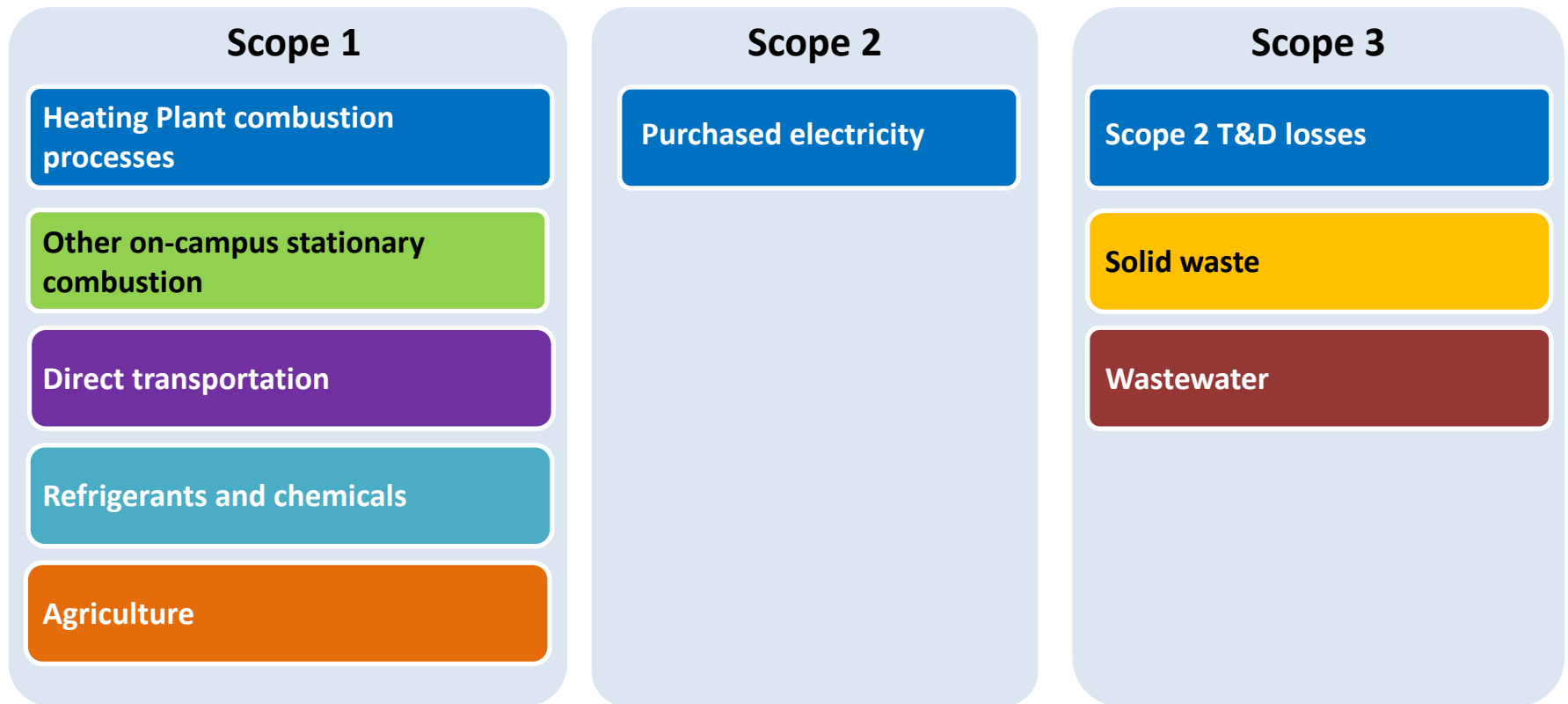
- One of the largest campus DES in North America
- Produces ~25% of North Campus electricity
- Supplies ~100% of North Campus heating and cooling
- Natural gas powered
- Incorporates cogeneration



GHG Inventory Overview

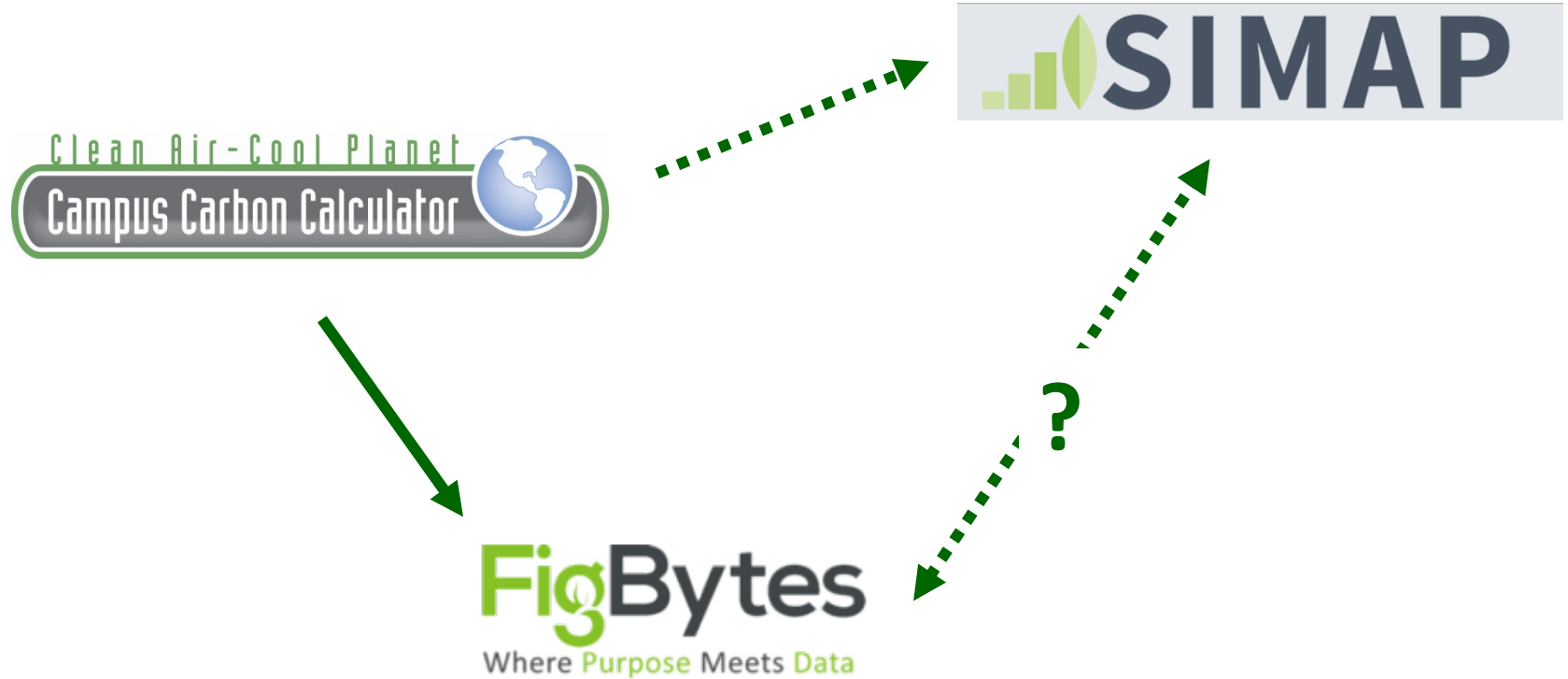


GHG Emission Sources

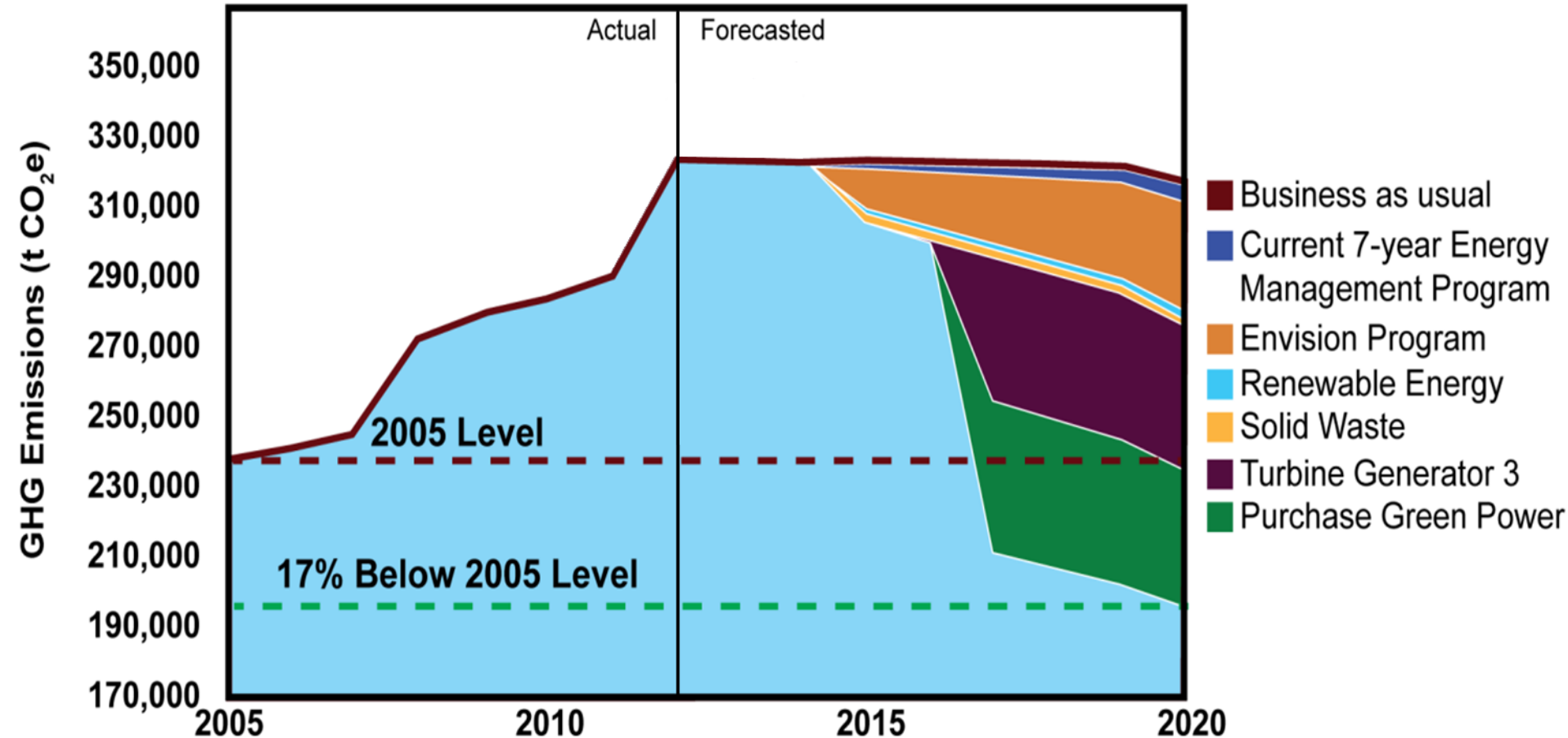


- Working to include more Scope 3 emissions:
 - Air travel, student and staff commuting, paper use

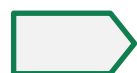
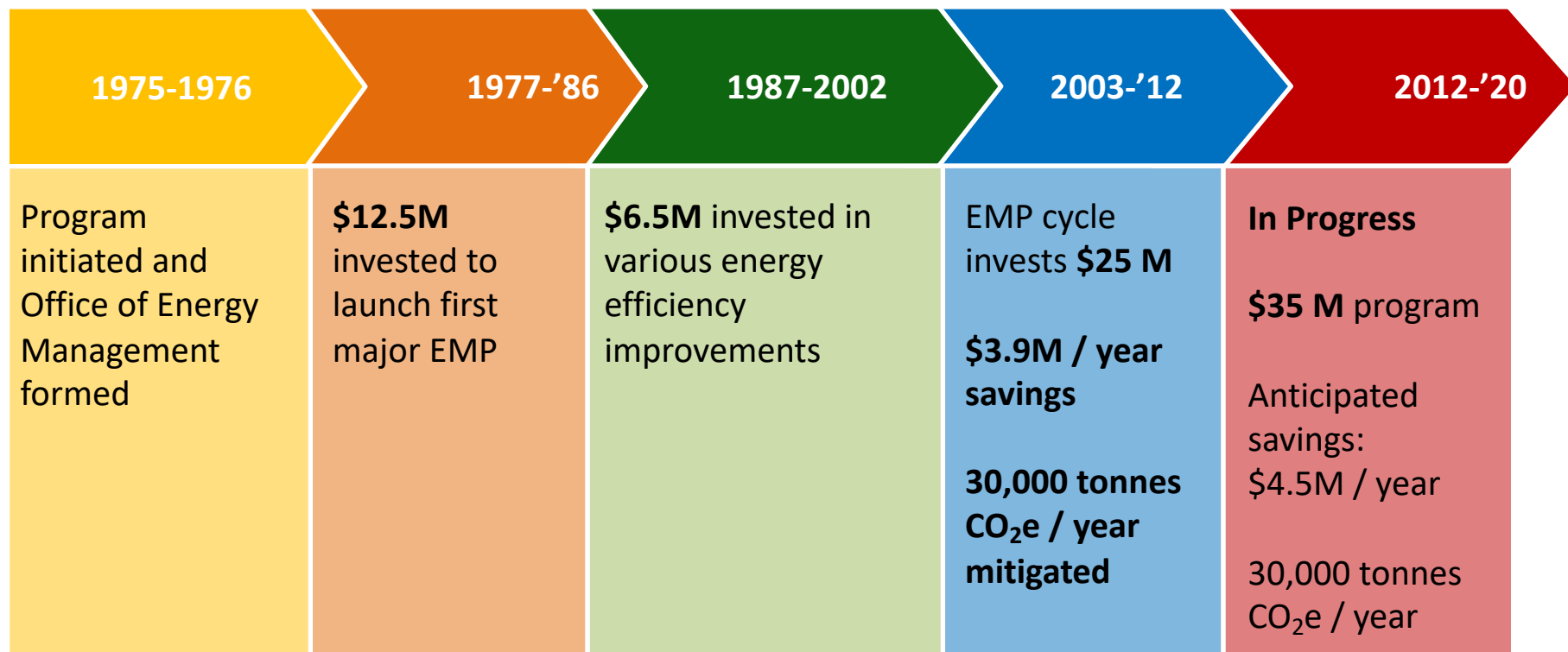
A note about tracking tools



GHG Emissions Reduction Target



Energy Management Program



Over \$80 million invested

Since 1975, the EMP has...



Mitigated
2.3 million
tonnes CO₂e



Reduced building
energy use
intensity (EUI) by
25%



Avoided
>\$350 million
in utility costs

Traditional Types of EMP Projects

Lighting
retrofits

VSD
conversion

Waste heat
recovery

Glazing
upgrades &
tinting

Fumehood
controls

Occupancy
sensors

New Approach to EMP Projects

5-Phase \$35M Program (About to start phase 4)

Demand Reduction

- Building renewals
- Lab demand ventilation
- Envelope upgrades
- Traditional measures
- Design guidelines

Optimization & Behaviour Change

- Enterprise energy analytics
- Occupant sensors & counters
- Campus as a Living Lab
- Performance Visualization

Greening the Supply

- Renewable energy
- Alternative energy
- Smart grid
- Greening the E-grid

Combined Heat & Power

- Facilities not tied to DES
- Reduce reliance on external utility
- GHG reduction
- Increased efficiency



Proposed ECM	MWh / year	Util Savings (\$/Year)	MT CO2e
Devonian Greenhouse CHP (30kW)	282	\$ 46,462	325
Swine Research CHP (50kW)	434	\$ 68,283	475
Agri-Foods CHP (80kW)	631	\$ 92,256	634
Saville CHP (100kW)	781	\$ 114,988	788
Total	2128	\$ 321,989	2217

Renewable Energy Overview

Solar PV Projects Completed

23 kW Medical Isotope and Cyclotron Facility
122 kW Jeanne and Peter Lougheed Performing Arts Centre
(Augustana) theatre fly tower
23 kW Physical Activity and Wellness (PAW) Centre
10 kW Agriculture Forestry Building Atrium
60 kW Chemical/Materials Engineering Building
90 kW Forum Building (Augustana)
35 kW Jeanne and Peter Lougheed Performing Arts Centre
(Augustana) rooftop system
90 kW Donadeo Innovation Centre for Engineering
3.5 kW Miquelon Lake Research Station
90 kW Nîpisîy House

Solar Thermal Projects Completed

13 kW Forum Building (Augustana)
133 kW Physical Activity and Wellness (PAW) Centre

Solar PV Projects in Progress

15 kW R. E. Phillips Building
50 kW Electrical and Computer Engineering Research Facility
and Engineering Teaching and Learning Complex
(ECERF/ETLC)
90 kW Dairy Research Facility (South Campus)
TBD (50-250 kW) Universiade Pavilion

Solar Thermal Projects in Progress

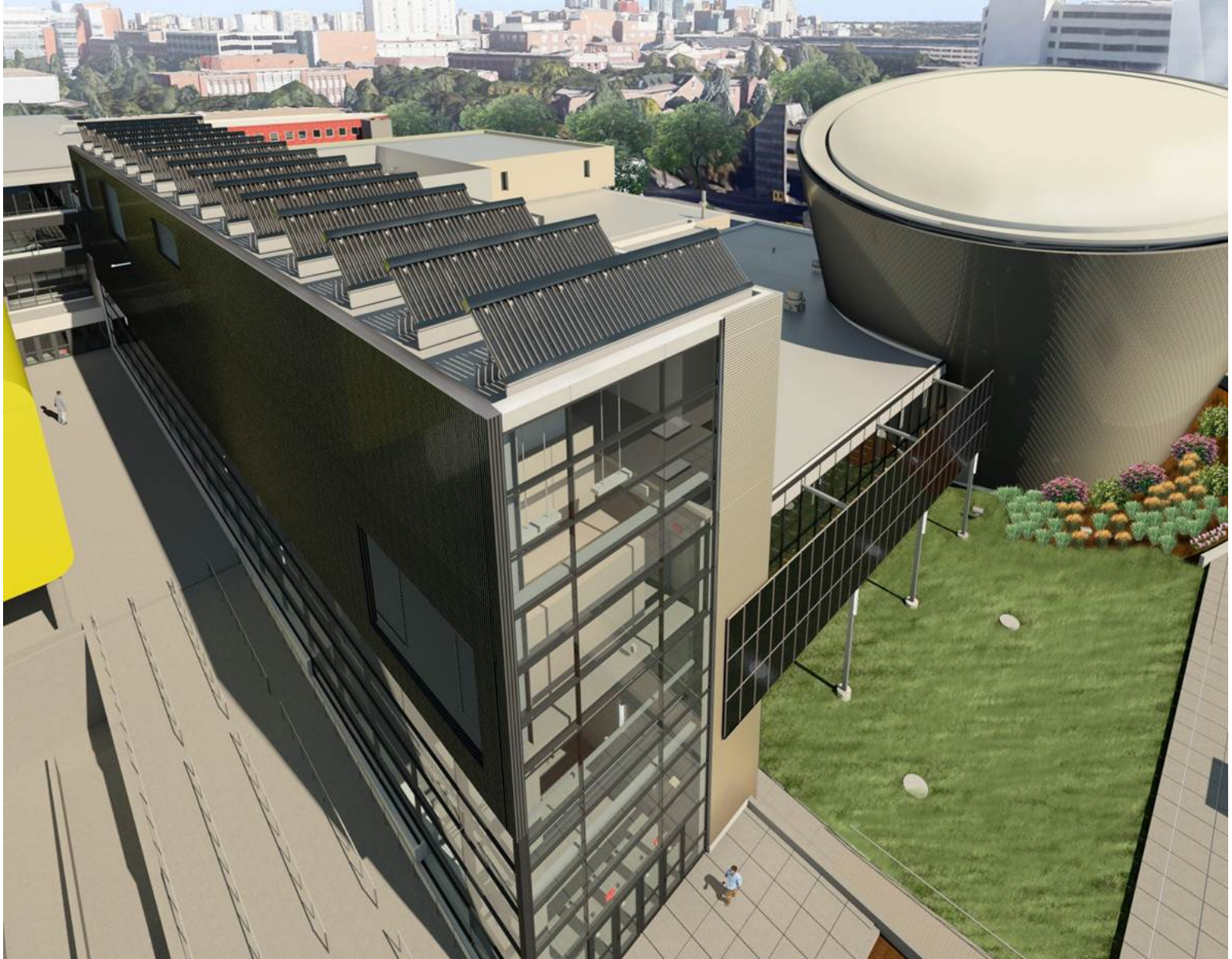
10 kW Forum Building (Augustana) (expands existing)

**~770 kW of renewable energy capacity
complete or in progress**





UNIVERSITY OF
ALBERTA



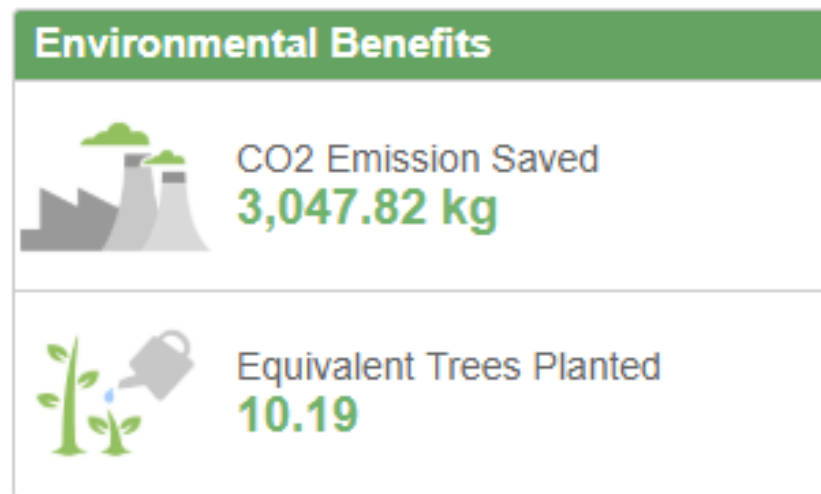
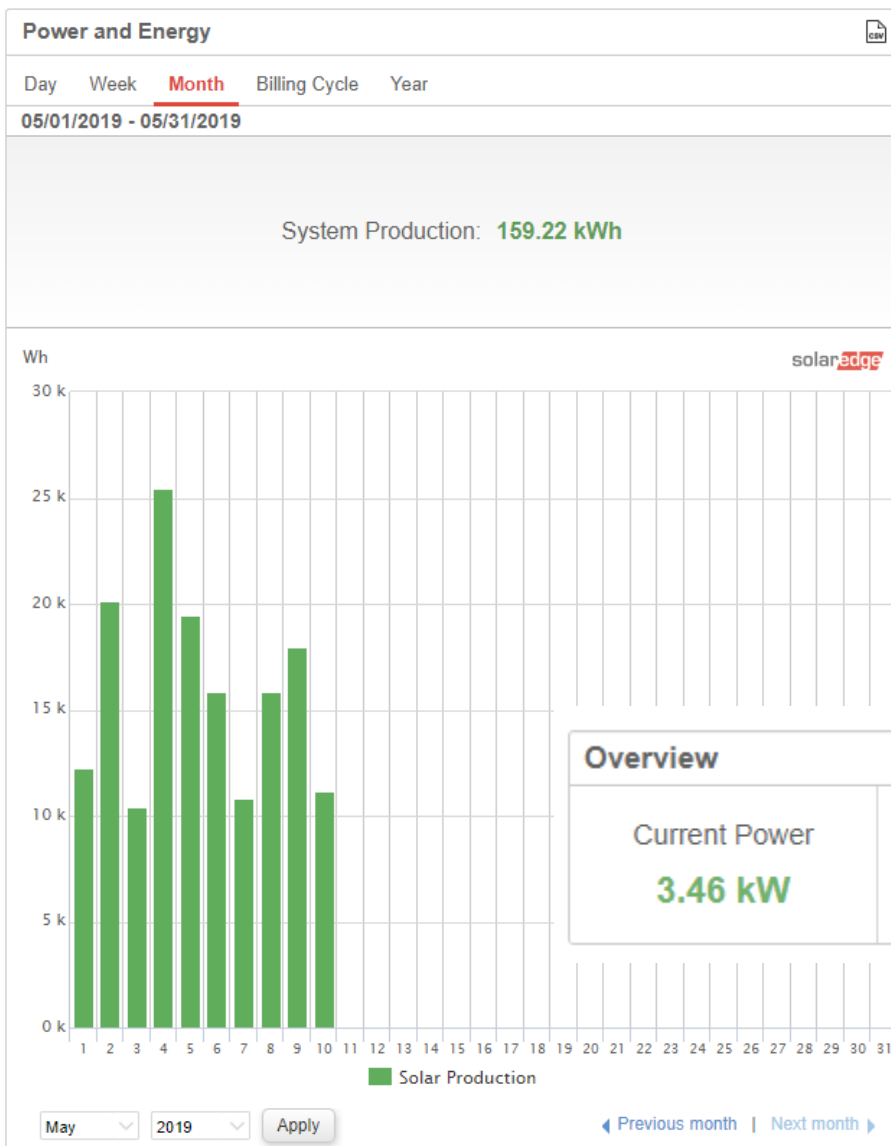












Overview			
Current Power 3.46 kW	Energy today 11.13 kWh	Energy this month 159.22 kWh	Lifetime energy 7.78 MWh

North Campus

South Campus

Campus Saint-Jean

Augustana Campus

Remote Locations



LEGEND

Alternative Energy Installations



Renewable Energy Installations



Zero Waste



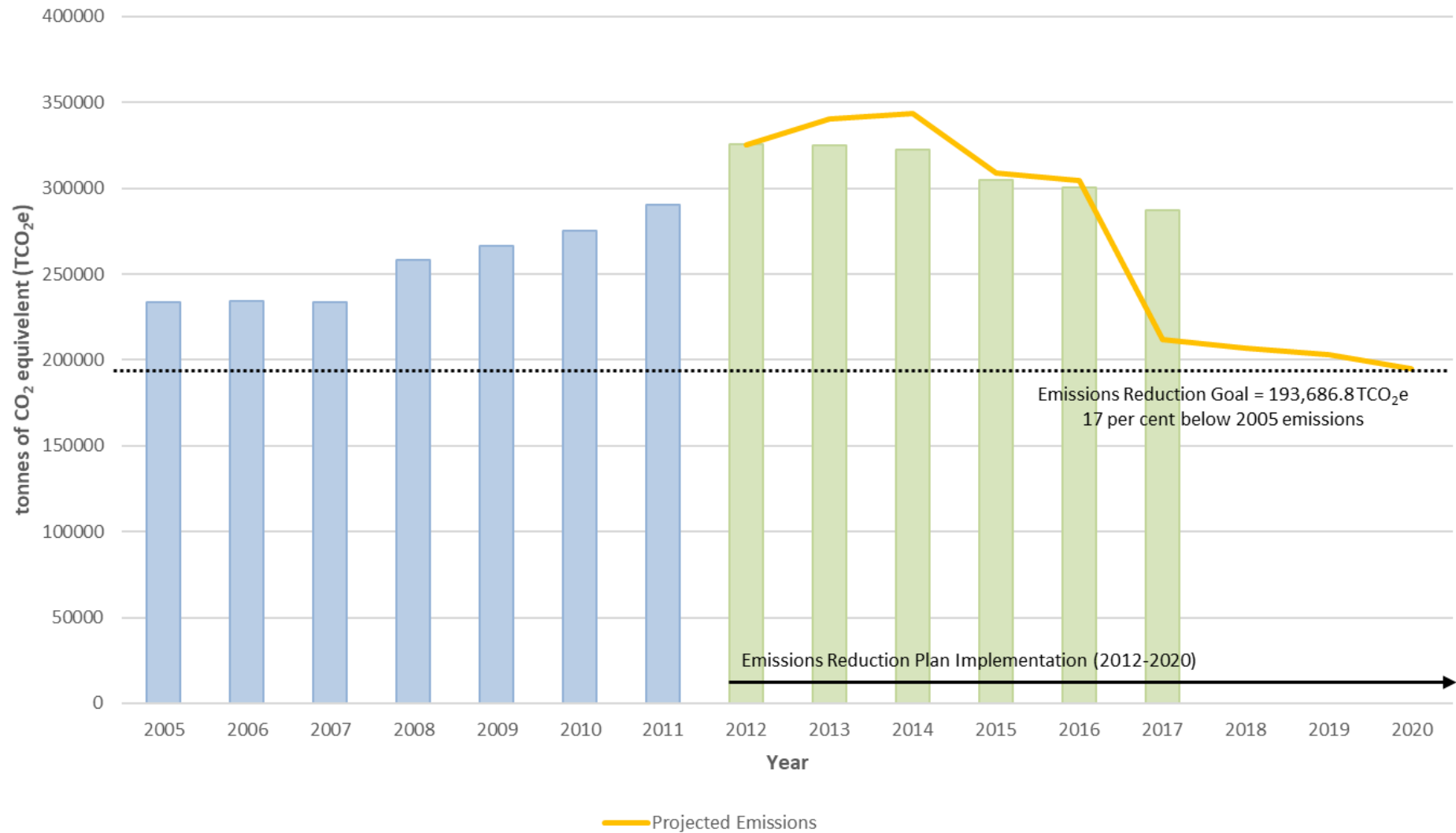
Special Initiatives



OVERVIEW MAP



Overall GHG Emissions (2005 – 2017)





Questions?

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