



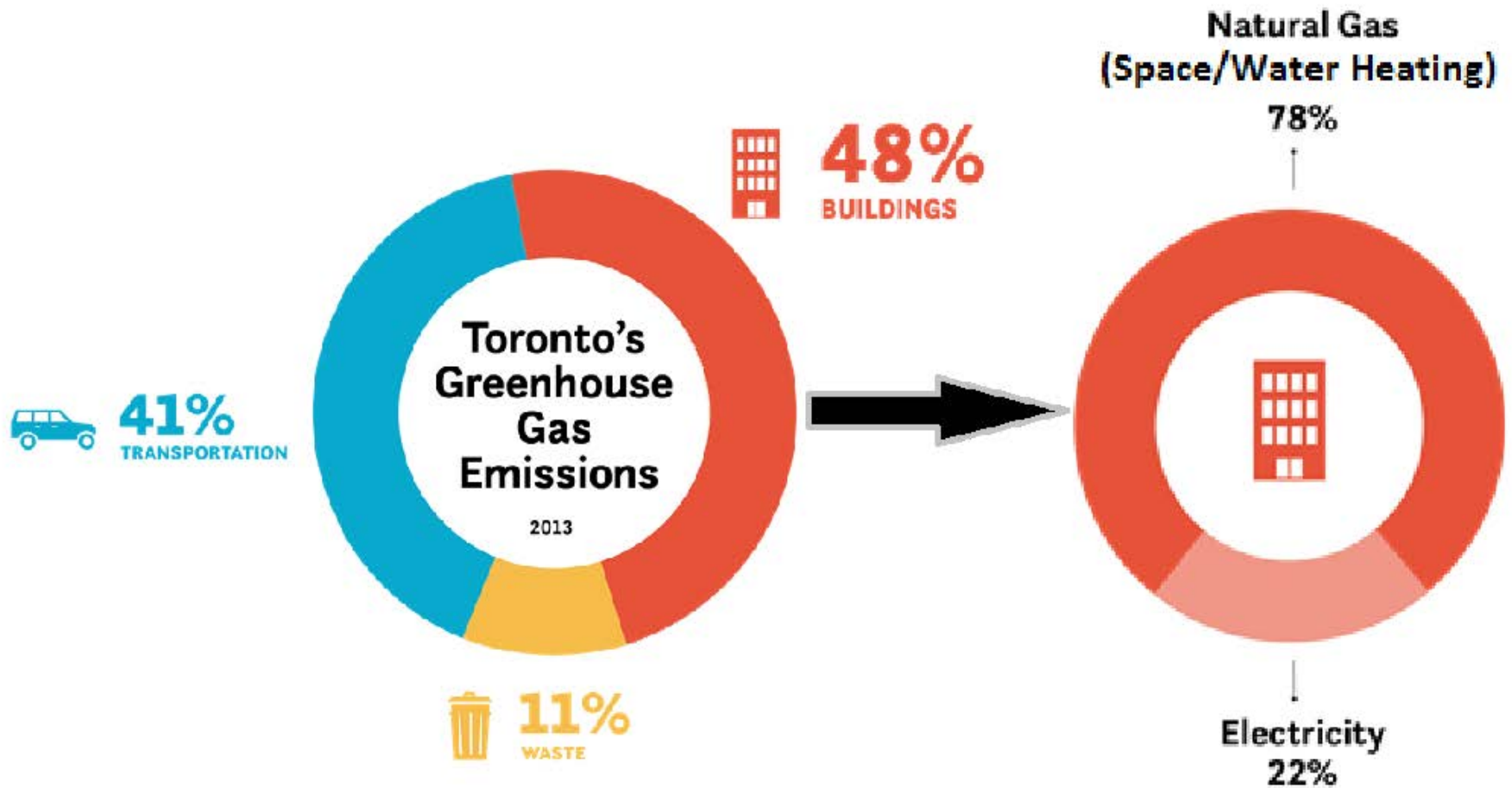
Heat Pumps

A key technology for
low-carbon cities

July 6th, 2016



CONTEXT

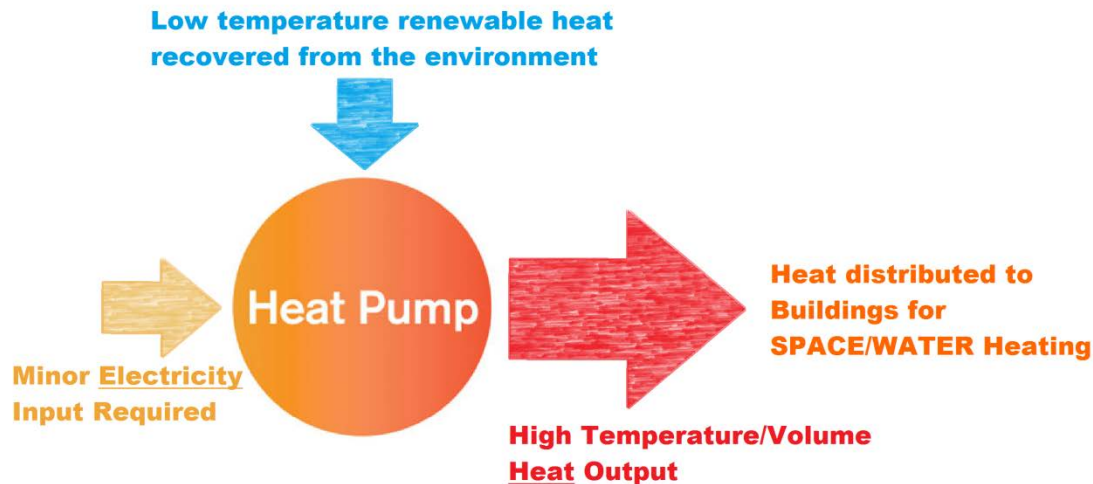


Reduction Strategies

- **Deep Efficiency (first)**
- **Tap Renewable Heat/Cool Sources**
 - **Air**
 - **Ground**
 - **Sewer**
 - **Solar**
 - **Waste Heat** (e.g. industrial)
 - **Water**

WHAT is a HEAT PUMP?

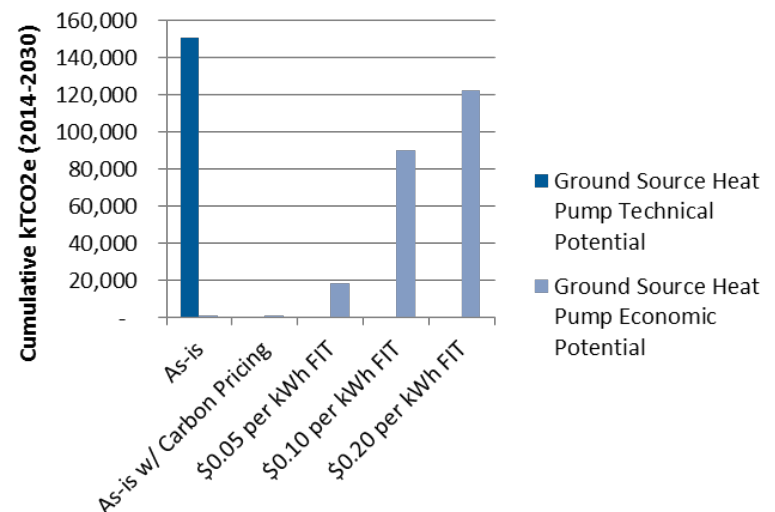
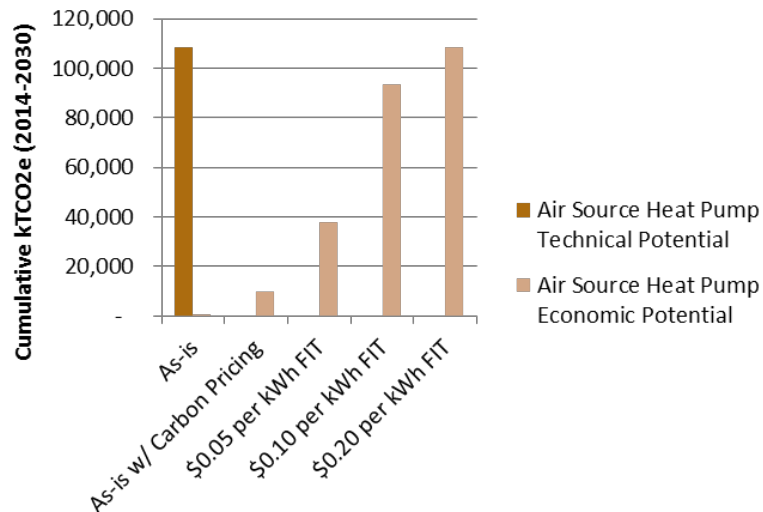
- Mechanical device
- Harvests low-temperature thermal energy
- Concentrates and transfers for heating (winter) and cooling (summer)
- Super-efficient...300% on average



HEAT PUMPS AS A LOW-CARBON SOLUTION

Overall strategy: replace fossil fuels with low/zero carbon electricity

Tactic: use small amount of electricity to 'mine' renewable heat/cool



TAF ACTIVITIES TO ADVANCE HEAT PUMPS

Exploration (2010-2014)

- Technology assessment – Western team
- Stakeholder engagement
- Understand regulatory framework
- Technical Potential – Ernst & Young, ICFI
- Grants – Ryerson (3 projects), TRCA
- Dan Leckie Forum 2012

Demonstration & De-risking (current)

- Pumping Energy Savings
- TowerWise (gas-absorption heat pump)

TAF ACTIVITIES TO ADVANCE HEAT PUMPS

Advocacy for deep carbon reductions from existing buildings:

- Efficiency first, to reduce energy demand
- Heat Pumps to displace natural gas

Climate Change **Action Plan**

Actions and investments in the plan

Action Area: Buildings and Homes

	Action	Intended GGRA Funding	Est. GHG Reduction In 2020*	Est. Cost Per Tonne	Timetable: Action Start
4	Help homeowners reduce their carbon footprints by supporting additional choice				
4.1	Boost low-carbon technology in homes: Ontario will help homeowners purchase and install low-carbon energy technologies such as geothermal heat pumps and air-source heat pumps, solar thermal and solar energy generation systems that reduce reliance on fossil fuels for space and water heating.	\$500,000,000 to \$600,000,000			2017/18

Toronto Atmospheric Fund

TAF ACTIVITIES TO ADVANCE HEAT PUMPS

Pumping Energy Savings

- **Electrically-heated Multi-unit buildings (EMURBs)** = strongest business case for heat pumps

Objectives:

- Demonstrate technical potential & business case
- Develop strategic programs to advance adoption



PUMPING ENERGY SAVINGS: Activities & Accomplishments

PUMPING ENERGY SAVINGS:

Ontario EMURB Market Characterization Study
Advancing the conservation opportunities of air and ground source heat pumps in the Ontario Electrically-Heated Multi-unit Residential Building (EMURB) sector.



Ontario EMURB Market Characterization Study (MCS)

COMPLETED



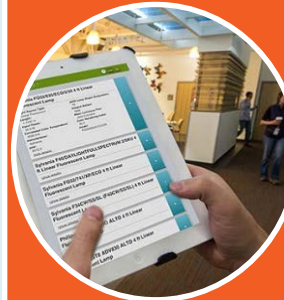
EMURB Retrofit Feasibility Study

**SUMMER/
WINTER
2016**



GHG Reduction & Energy Savings Assessment

**WINTER/
SPRING
2017**



Retrofit Guidelines & Business Case Assessment Tool

SPRING 2017



Conservation Programming Recommendations

SPRING 2017



Final Report

SUMMER 2017

WHAT'S NEXT



CHALLENGES	OPPORTUNITIES
Gas is CHEAP!	Ontario climate change action plan → electrification
Perceived as risky & costly	New technology (e.g. cold climate heat pumps, underground garage drilling rigs)
Lack of professional capacity & familiarity	LDC growth
Increase electric load	Provides cooling in a warming world

WHAT'S NEXT

1. Complete Pumping Savings

2. Demonstration projects:

- Gas conversion
- Mini-districts
- Deep Retrofits

3. Policy reform:

- Utility capacity for fuel switching
- Thermal FIT

4. Specialized Financing:

- Ownership models
- Insurance

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