

# Markham's Municipal Energy Plan

**General Committee  
May 22, 2018**

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Director, Sustainability & Asset Management**

# Agenda

- Climate Change Context
- Markham's Energy Leadership
- MEP Summary
- Implementation
- Recommendations



# Climate Change Context



<https://youtu.be/Ok8rMT2KCyo>

## Energy Leadership – Summary

- The Greenprint, Markham's Community Sustainability Plan endorsed in 2011, was and still is a ground breaking plan that guides much of our work, and includes the Energy & Climate goal of: **net zero energy, water, waste and emissions by 2050**
- Markham Official Plan policies push for new communities that are:
  - Compact, pedestrian supportive and mixed use
  - Served by active transportation and public transportation
  - Promote green infrastructure and resource conservation
  - Promote innovative technology, including electric vehicle infrastructure
- Markham is a leader in energy conservation & efficiency, renewable energy and zero emission vehicles in Ontario,
- Energy conservation and renewable energy projects have reduced emissions from City assets by 20% per capita and have a positive financial impact of \$2M/yr (2012-2017)

## MEP Process

- In 2014 Markham was selected as one of the first eight municipalities in Ontario to receive a \$90,000 matching grant from the Ministry of Energy to develop a Municipal Energy Plan (MEP)
- Over the next three years staff and our consultant (SSG) completed the following:
  1. Stake holder engagement – established and continued to work with the 65 member strong Stakeholder Working Group
  2. Energy Mapping & Study
  3. Energy Plan Development

**Today, more than 30 municipalities have received the same grant and the Province is taking steps to encourage more MEPs**

# Municipal Energy Plan – Net Zero 2050

The City of Markham's Municipal Energy Plan (MEP) has four main components:

1. **Baseline** energy map and resulting Greenhouse Gas (GHG) – our current state
2. **Projection of Business As Usual** into the future – what our energy and emissions would look like if we did nothing new
3. **Future goal** for energy and emissions to Net Zero 2050
4. **Road map to our future goal** – what needs to happen for Markham to achieve Net Zero by 2050

# 1. Baseline Summary (2011)

- \$695,000,000 per year spent on energy in Markham
- \$2,231 per year per person spent on energy
  
- Total energy use in Markham – 8,241,000,000 ekWh (29,670,000 GJ)
- Total energy use per person – 26,500 ekWh (95GJ)
  
- 1,778,000 tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e) per year emitted –
  - To offset, a forest 40 times the total area of Markham would need to be planted (8,475 km<sup>2</sup>) \*
- GHG emissions per person – 5.7 tCO<sub>2</sub>e per year
  - To offset, 148 tree seedlings for each resident would need to be planted every year\*

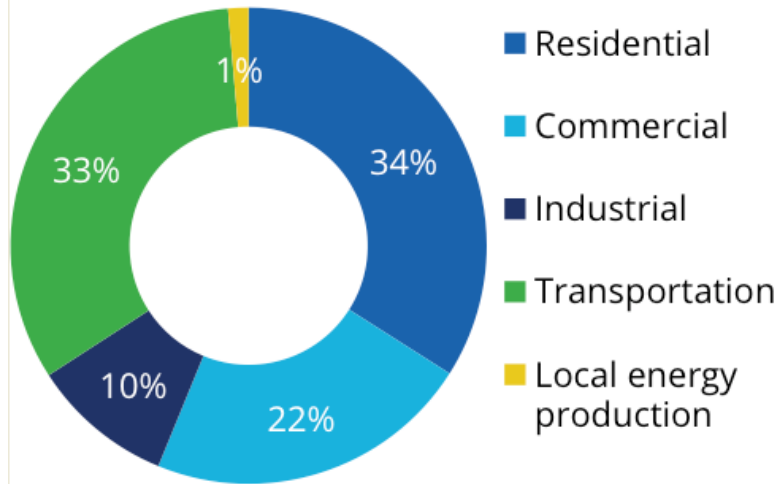
Note – equivalent kilo-watt hour (ekWh), giga-joule (GJ), tonnes equivalent CO<sub>2</sub> (tCO<sub>2</sub>e)

\*per EPA Greenhouse Gas Equivalencies Calculator

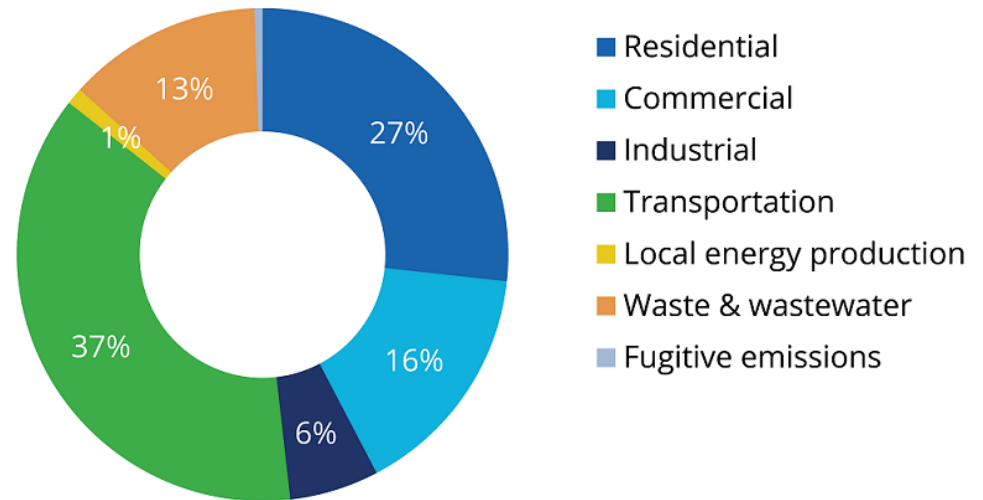


# 2011 Baseline - Energy and Emissions by Sector

ENERGY USE BY SECTOR



EMISSIONS BY SECTOR





# 1. Baseline Comparison

	Markham (2011)	Vaughan (2013)	Newmarket (2013)
Total Energy (PJ)	29.67	36	16.5
Energy per person (GJ/Capita)	95	115	197
Total GHG (Mt CO <sub>2</sub> e)	1.78	1.58	0.503
Emissions per person (t CO <sub>2</sub> e/Capita)	5.7	5.04	6
Population	311,400	312,882	83,833

**Each person in Markham uses energy more efficiently than comparators.  
Markham is 55% below the 2013 Provincial emissions intensity of 12.6 t CO<sub>2</sub>e/capita**



# 1. Baseline - Total Energy by Zone

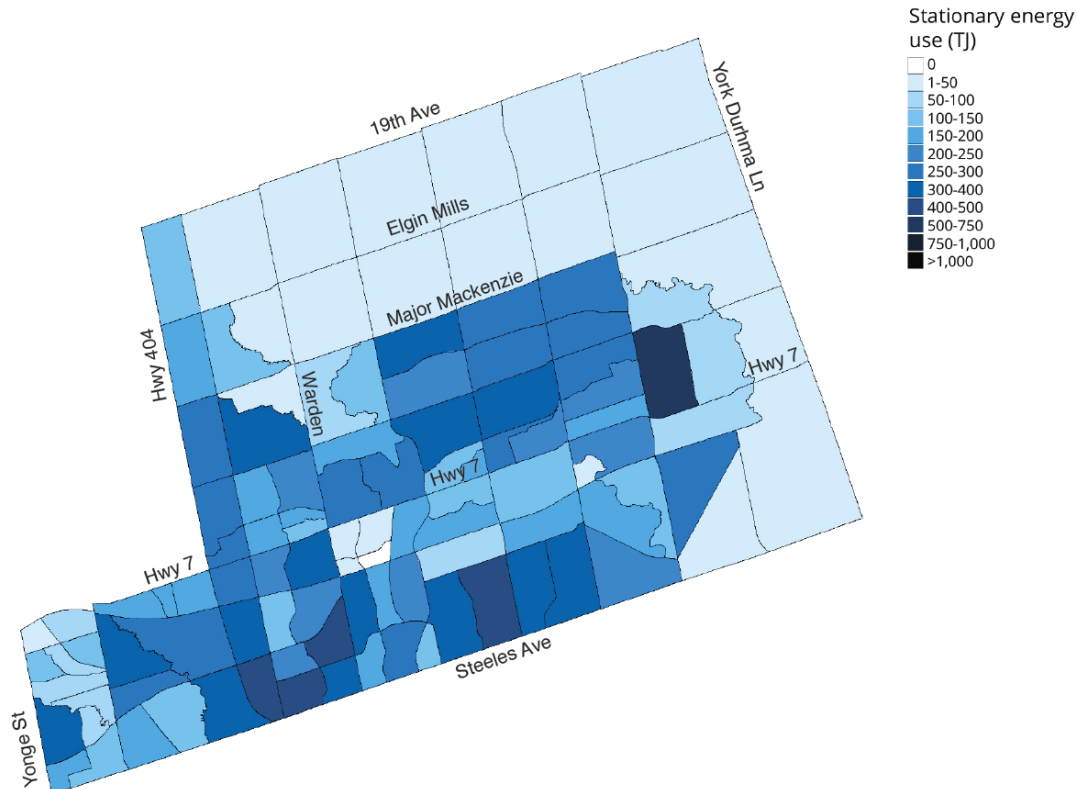


Figure 35. Total energy (TJ) by zone; all buildings, 2011.



# Municipal Energy Plan – Net Zero 2050

1. **Baseline**
2. **Projection of Business As Usual** into the future – what our energy and emissions would look like if we did nothing new
3. **Future goal**
4. **Road map to our future goal**

## 2. Business As Usual 2050 Emissions Projection

EMISSIONS BY FUEL TYPE, 2011-2051, BUSINESS-AS-USUAL SCENARIO

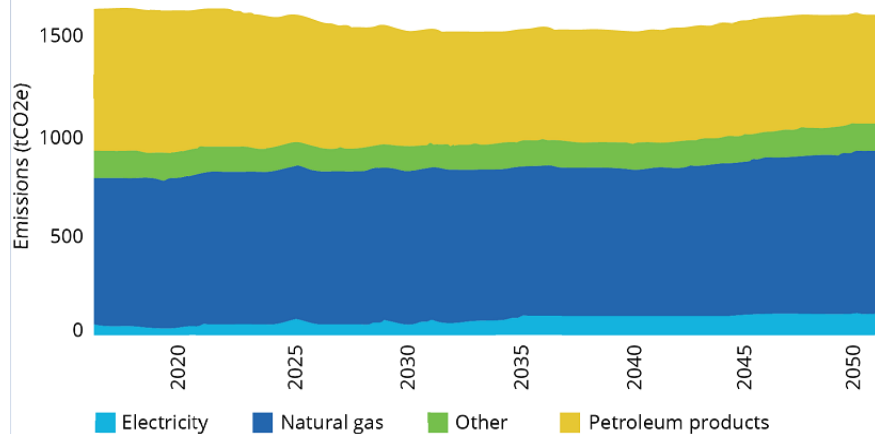


Figure 89. Total GHG emissions by fuel type (2011–2050).

Business As Usual (BAU) - No change to City policies, accounting for known Federal and Provincial policies and planned population growth

- BAU 2050 emissions are projected to be 1.75 MtCO<sub>2</sub>e down slightly from 1.78 MtCO<sub>2</sub>e
- Per capita emissions will be 3 tCO<sub>2</sub>e/capita for the BAU vs 5.7 tCO<sub>2</sub>e/capita 2011 baseline.

**If Markham makes no major changes, our total emissions will not reduce substantially as our population nearly doubles, but each new resident will emit less and less.**

## 2. Business As Usual 2050

Factors that affect BAU:

- Building code improvements
- Existing home retrofits
- Warming climate
- Greener electricity
- More efficient vehicle fuel standards
- More zero emissions vehicles

**These factors become the levers we can use to determine how to achieve our future goal.**

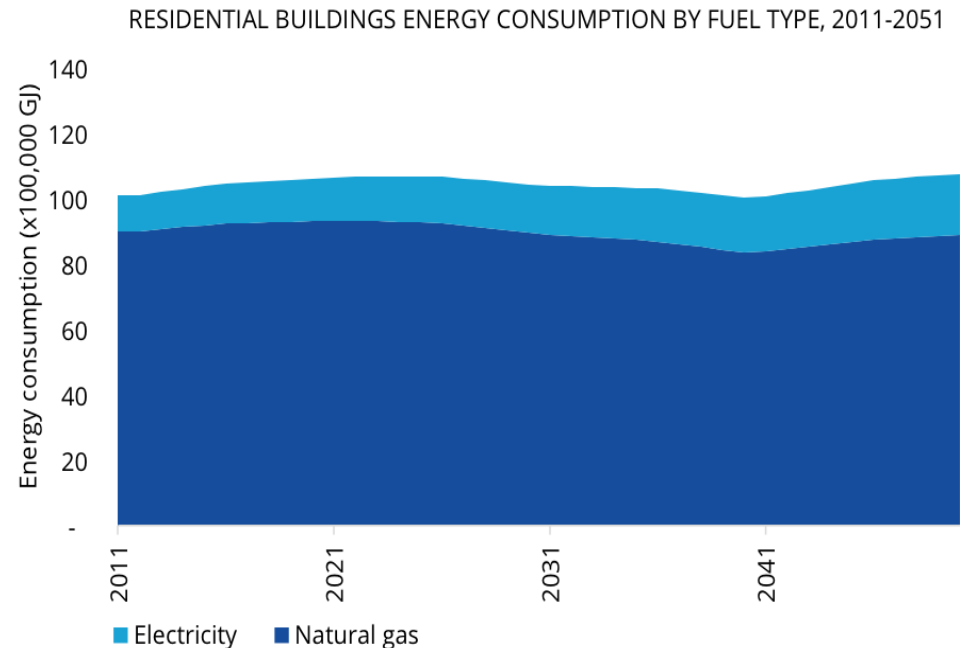


Figure 68. Energy use in residential buildings by fuel type, 2011–2051.

# Municipal Energy Plan – Net Zero 2050

1. **Baseline**
2. **Projection of Business As Usual**
3. **Future goal for energy and emissions to Net Zero 2050**
4. **Road map to our future goal**

## 3. Future Goal - Net Zero 2050

The Municipal Energy Plan defines our future goal:

A **net zero energy emissions Markham** is one that has **greatly reduced energy needs** through efficiency gains and conservation. Annual energy needs for vehicles, thermal and electricity are met by sustainable and **non-fossil fuel sources, carbon offsets** and/or carbon sequestration (where feasible within Markham), resulting in an annual **net zero** balance of **greenhouse gas emissions**.

## 3. Future Goal - Net Zero 2050 (Our Plan)

Net zero emissions 2050 means Markham will:

- Use less energy
- Generate more local renewable energy
- Switch away from fossil fuels
- Offset remaining emissions (preferably locally with tree planting or buying credits)

**By 2050 our annual greenhouse gas emissions should equal zero tonnes of carbon dioxide emitted (0 tCO<sub>2</sub>e).**



# Municipal Energy Plan – Net Zero 2050

1. **Baseline**
2. **Projection of Business As Usual**
3. **Future goal**
4. **Road map to our future goal** – what needs to happen for Markham to achieve Net Zero

## 4. Road Map to Net Zero 2050

The BAU 2050 projection showed the following areas of opportunity:

- New Buildings
- Existing Buildings
- Renewable Energy – building and community scale
- Public Transit
- Active Transportation
- Private/Commercial Vehicles

The MEP includes specific actions to address each area, which were modelled to assess their impact on emissions through to 2050

## 4. Road Map to Net Zero 2050

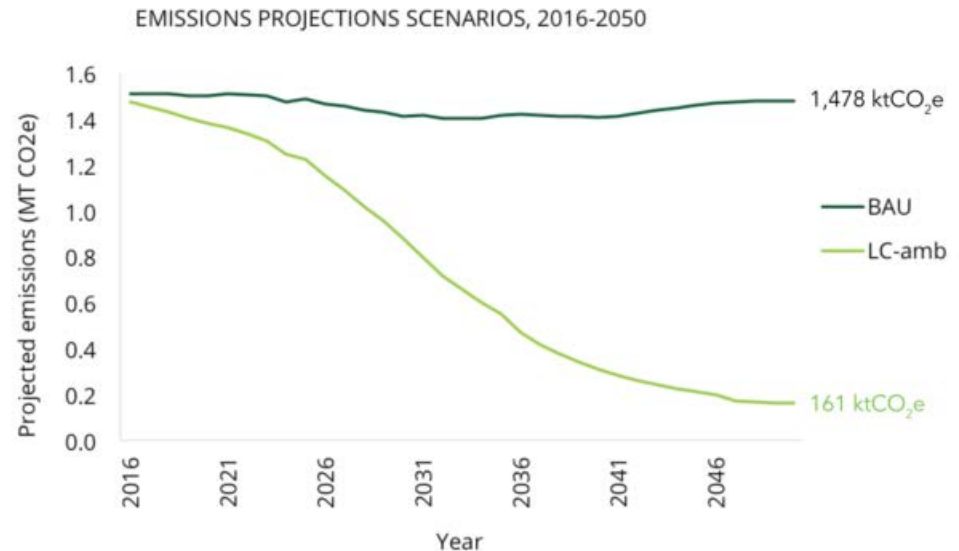
This graph compares:

- Business As Usual (dark green line)
- Low Carbon (light green line)

Between 2020 and 2040, the plan requires significant emission reductions to achieve 90% of our goal.

By 2050, the residual 10% of emissions will relate to fossil fuels remaining in the electricity generation mix.

**Our plan, coupled with a small amount of emission offsets, will get us to Net Zero Emissions by 2050**



## 4. Road Map to Net Zero 2050 – Economic Impact

Expenditure Type	BAU	Low Carbon	Difference
Residential building construction and maintenance	\$23,779,164,018	\$24,704,954,543	\$925,790,525
Residential buildings equipment	\$1,810,143,418	\$5,409,840,057	\$3,599,696,639
Personal vehicles and maintenance	\$46,054,518,211	\$39,271,923,508	-\$6,782,594,703
Household energy costs (buildings and transportation)	\$16,037,804,734	\$12,024,502,369	-\$4,013,302,365
Household carbon costs	\$2,253,122,363	\$721,325,238	-\$1,531,797,125
Commercial building construction and maintenance	\$8,201,180,910	\$8,390,931,712	\$189,750,802
Commercial buildings equipment	\$64,260,235	\$64,260,235	\$0
Commercial vehicles and maintenance	\$6,498,876,633	\$6,011,651,283	-\$487,225,350
Non-residential energy costs	\$11,095,370,145	\$10,417,505,956	-\$677,864,189
Non-residential carbon costs	\$819,044,641	\$341,234,582	-\$477,810,059
Energy generation capital costs	\$48,239,890	\$2,225,940,557	\$2,177,700,667
Energy generation energy costs	\$244,887,012	\$332,832,964	\$87,945,952
Energy generation carbon costs	\$89,433,827	\$29,981,224	-\$59,452,603
Transit capital costs	\$997,098,380	\$896,624,426	-\$100,473,954
Transit fuel costs	\$302,047,463	\$149,368,001	-\$152,679,462
Transit emissions costs	\$46,479,172	\$23,329,541	-\$23,149,631
Energy generation revenues	\$617,032,128	\$1,237,404,328	\$620,372,200
Transit revenues	\$852,737,601	\$792,799,473	-\$59,938,128
<b>Total</b>	<b>\$119,811,440,782</b>	<b>\$113,046,409,998</b>	<b>-\$6,765,030,784</b>

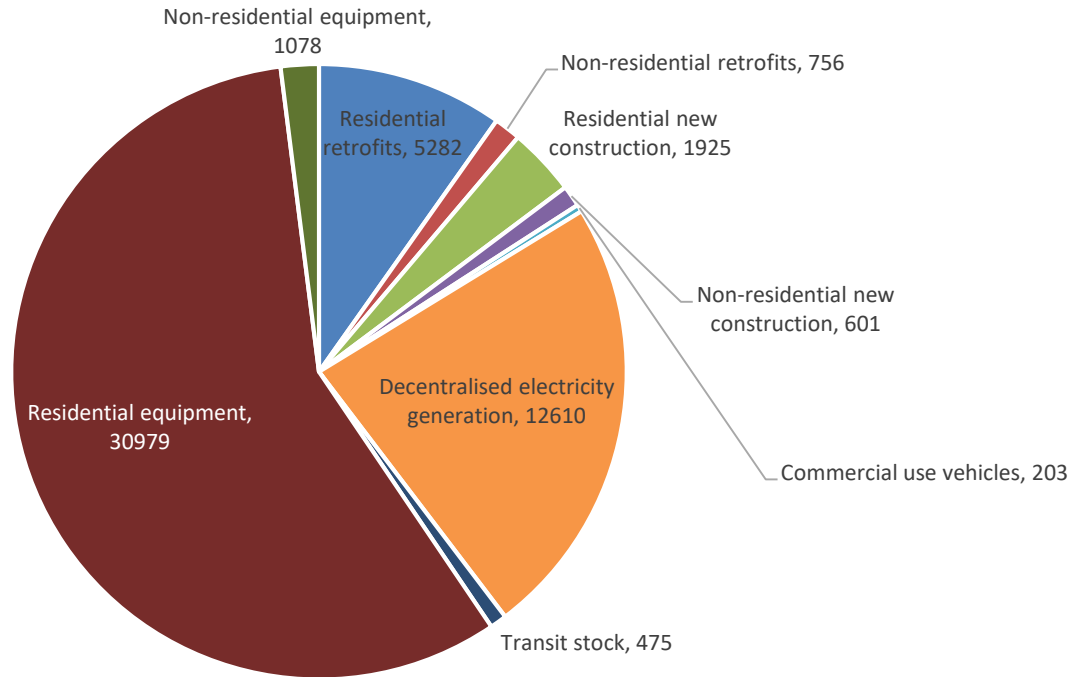
**By 2050 cumulative total expenditures will be \$120B for Business as Usual, \$113B for Net Zero.**

**The \$7B difference is largely driven by:**

- **Increased investments in Residential Buildings and Equipment (\$4.5B) yields significant household energy cost savings (-\$4B).**
- **Less personal vehicles also reduces costs (-\$6.7B)**
- **Investments in local energy generation increase by (\$2.2B)**

## 4. Road Map to Net Zero – Economic Impact

Number (Person Years) and Sector of New Jobs Expected to be Created



**35,700 person years of net additional employment are expected to be created from now until 2050. This includes a reduction of 18,201 person years of employment related to personal vehicles, most of which will be outside Markham.**

## 4. Road Map to Net Zero Targets

TARGETS FOR MARKHAM'S MEP

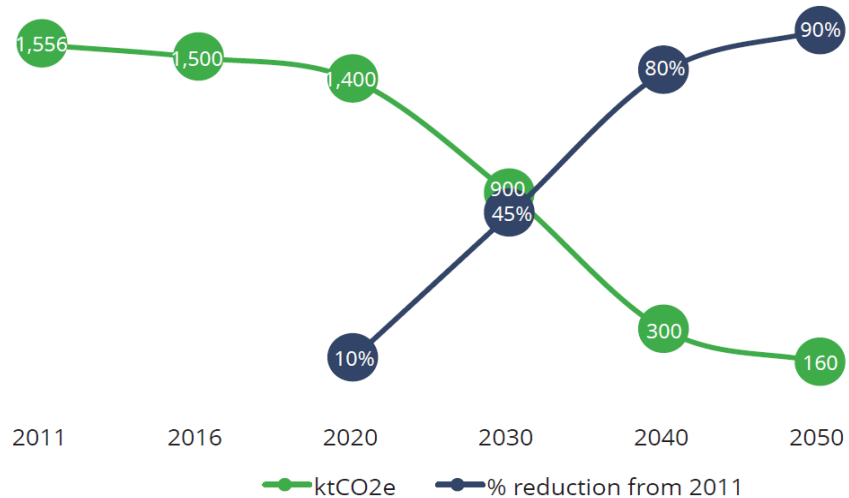


Figure 118. GHG reductions targets for the MEP.

**Net zero emission 2050 target is achievable with some final offsets; it is good for our economy and positions Markham as a leader in the battle against climate change.**

## Implementation - Approach

- We will build on our experience with City assets, which has achieved a 20% emission reduction per capita
- We will enable our community to join us to achieve net zero emissions 2050 as follows:
  - Continue to lead by example
  - Make it easy for the public, and business community to understand why and what changes they need to make
  - Reduce barriers to change – design our programs and advocate for upper level government policy changes that make it pain-free and simple to change
  - Be a platform for innovative pilots and partnerships
  - Leverage existing City resources with external partnerships and funding from Provincial and Federal Governments

## Implementation - Current Activities

- Leading Municipal solar roof top portfolio of 1.83MW and growing
- Leading energy conservation program for City Assets
- Textile diversion – over 8 million pounds diverted to date
- Alectra Drive for the Workplace electric vehicle (EV) charging pilot at the Civic Centre
- Net Zero Energy Emissions Pilot Partnership with Enbridge and Alectra
- Pond Technologies partnership with Markham District Energy
- Near Net Zero Emissions Community Energy Plans for new development
  - Mattamy and Enwave
  - Future Urban Area Land Owner's
- 10 applications for \$27M in funding sought in partnership over the last six months for these projects



## Implementation – Prioritized Actions

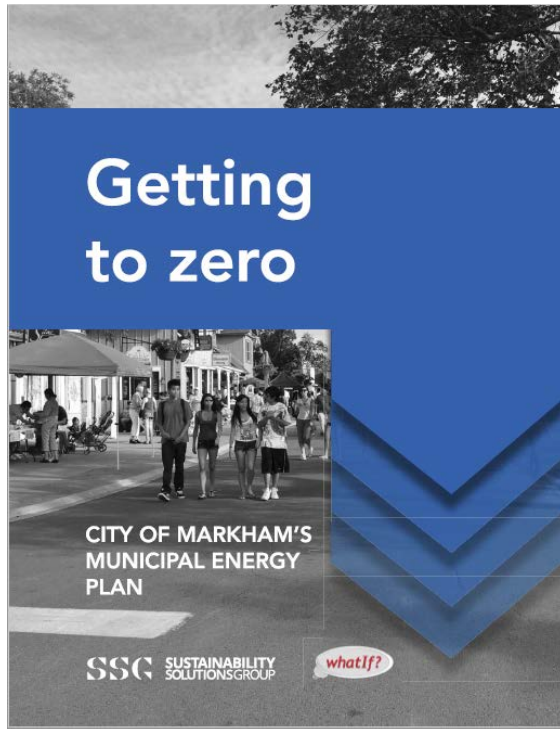
- Better than Building Code new buildings
  - Support Mattamy and Enwave’s net zero emissions community energy system
  - Collaborate with FUA Land Owners to develop a plan to reach net zero emissions as soon as possible
  - Work to have all new homes EV ready as soon as possible
- Achieve Net Zero Emissions City Assets well ahead of 2050:
  - Further advance “greening our fleet”:
    - Develop a plan with the goal to transition cars and light duty fleet vehicles to zero emissions
    - Actively explore opportunities to replace our medium and heavy duty fleet with innovative zero emissions technology vehicles
  - All new City buildings should be net zero emissions. As part of the updated Corporate Energy Management Plan in 2019, a roadmap to retrofit and upgrade existing City buildings to net zero emissions will be developed

## Implementation Priorities

- Future Priority Actions:
  - Reduce barriers to high performance/net zero emissions building retrofits or upgrades to new buildings
  - Encourage zero emissions vehicle adoption in the community
  - Foster opportunities to help businesses reduce their emissions

## Recommendations

1. THAT the presentation “Markham’s Municipal Energy Plan” be received;
2. AND THAT Appendix 1 “Getting to Zero – City of Markham’s Municipal Energy Plan” be received;
3. AND THAT the City wide goal of net zero emissions by 2050 be endorsed in principle, meaning that to achieve this goal Markham will:
  - Use less energy
  - Generate more local renewable energy
  - Switch away from fossil fuels
  - Offset remaining emissions
4. AND THAT Staff report back within 18 months with a progress update;
5. AND THAT Staff be directed and authorized to do all things necessary to give effect to this resolution.



## [Markham Municipal Energy Plan](#) [- Getting to Zero](#)

Click the hyperlink above to open the full appendix document.