

# Financing Community & Campus Energy & Climate Master Plans



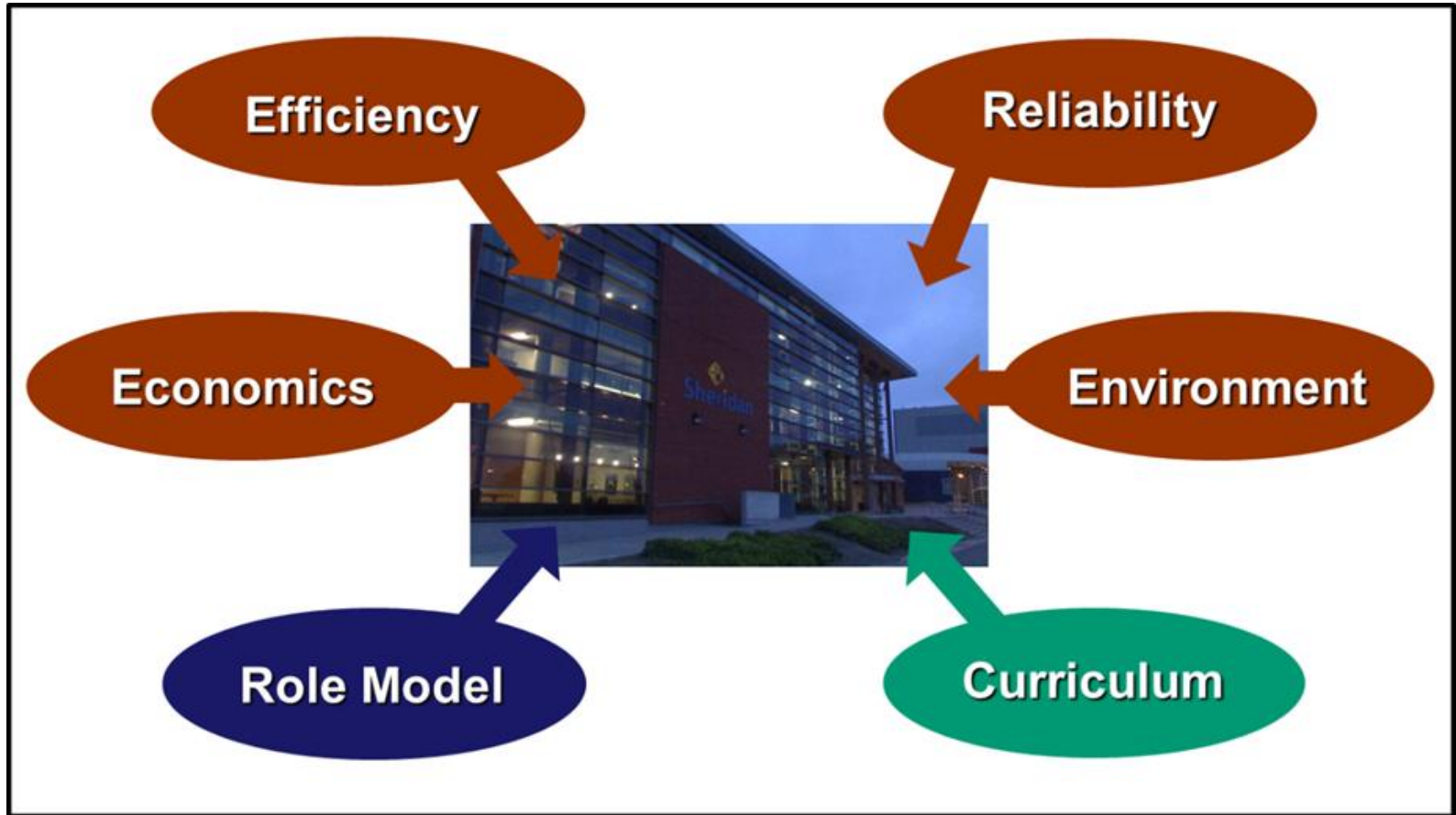
## *Steps to Breakthrough Performance*

Community Energy Financing  
24<sup>th</sup> Clean Air Council Meeting  
Toronto, Ontario, November 24th, 2017

# Recognized Energy Uncertainties *Risks & Opportunities*

- Unpredictable rising energy prices
- Impacts of climate change legislation
- Inefficient campus infrastructure
- College growth
- Reliability, weather events...
- Energy innovation & competitive advantage
- New educational needs
- No energy and climate management culture
- ...

# Sheridan College Integrated Energy & Climate Master Plan



# College IECMP

## World-class Performance Goals

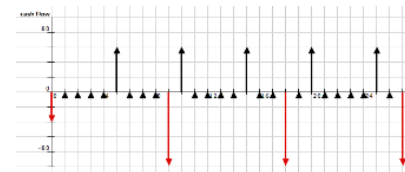
- Source Energy Efficiency Gain
  - *At least 50% by 2030 below 2010*



- Greenhouse gas emissions reduction
  - *At least 40% by 2030*



- Internal Rate of Return
  - *At least 7%*



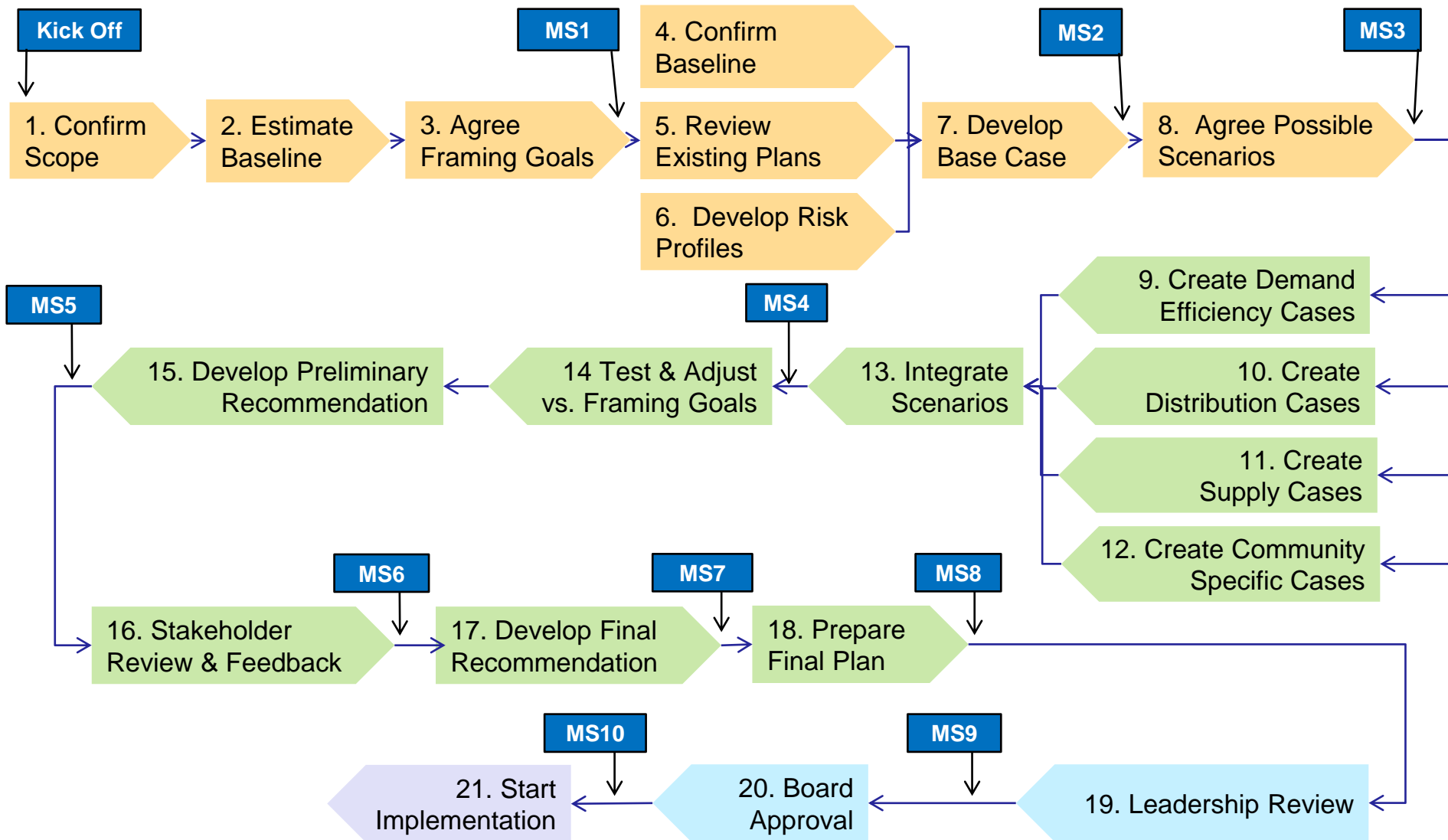
- Ensure energy supply reliability

# College IECMP

## Ambitious Institutional Goals

- Create a campus-wide energy culture
- Be a National and Community Role Model
- Be a platform for new energy technologies
- Offer relevant energy and climate curricula

# Systematic Process with Clear Milestones *Accountabilities and Decisions*



# Sheridan College Integrated Recommendation

- \$35M investment plan from 2013 to 2020
- Comprehensive upgrade of controls and metering
- Efficiency retrofit of all existing buildings
- Energy performance requirements for all new constructions
- Upgraded District Heating at Davis and Trafalgar
- Selective District Cooling upgrades
- On-site CHP and Solar PV
- Encourage college-wide energy culture
- Create world-class energy & climate curricula

# Sheridan College IECMP

## *From Strategy to Action*

- IECMP approved in 2013
- Implementing over \$30M investments
- Results exceeding Plan expectations
- Assessing expanding IECMP benefits to neighbouring communities
- Recognized need to expand national capacity
- Basis for Centre of Applied Research
  - *Community energy and climate planning*
  - *Successful implementation approaches*
  - *Build on world-class teaming*



# Pressure to Deliver Lofty Goals

## *Environmental – Economic - Social*



Cities



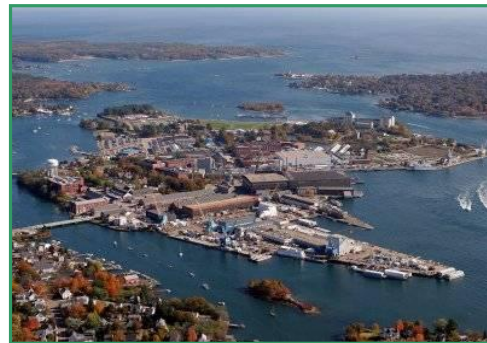
Neighbourhoods



Industrial Areas



Colleges



Military Bases



Buildings

# Successful CEP

## Balanced Benefits

### Competitiveness

1. Energy cost
2. Employment
3. Investment



### Security

4. Supply security
5. Supply quality
6. Flexibility

### Environment

7. Greenhouse Gas Reduction

Breakthrough Targets

# Community Energy Plan Targets

## “World Class Performance”



- ❑ Create at least 3,000 jobs by 2025 implementing the core CEP sub-strategies
- ❑ Energy use per capita by 2041 will be at today's global best practices
  - ❑ *Plan Target: 40% below 2014 levels by 2041*
- ❑ Energy-related investments by the community will be at least as attractive a 20 year public bonds
- ❑ Emissions reduction will support global efforts reverse climate change and meet 2016 Ontario Climate Action Plan
  - ❑ *Plan Target: 40% below 2014 levels by 2041*
  - ❑ *Strategic Trajectory: 80% below 2005 levels by 2050*

**Retain Most Energy Value in City**

# City of Windsor CEP Energy Demand Mapping

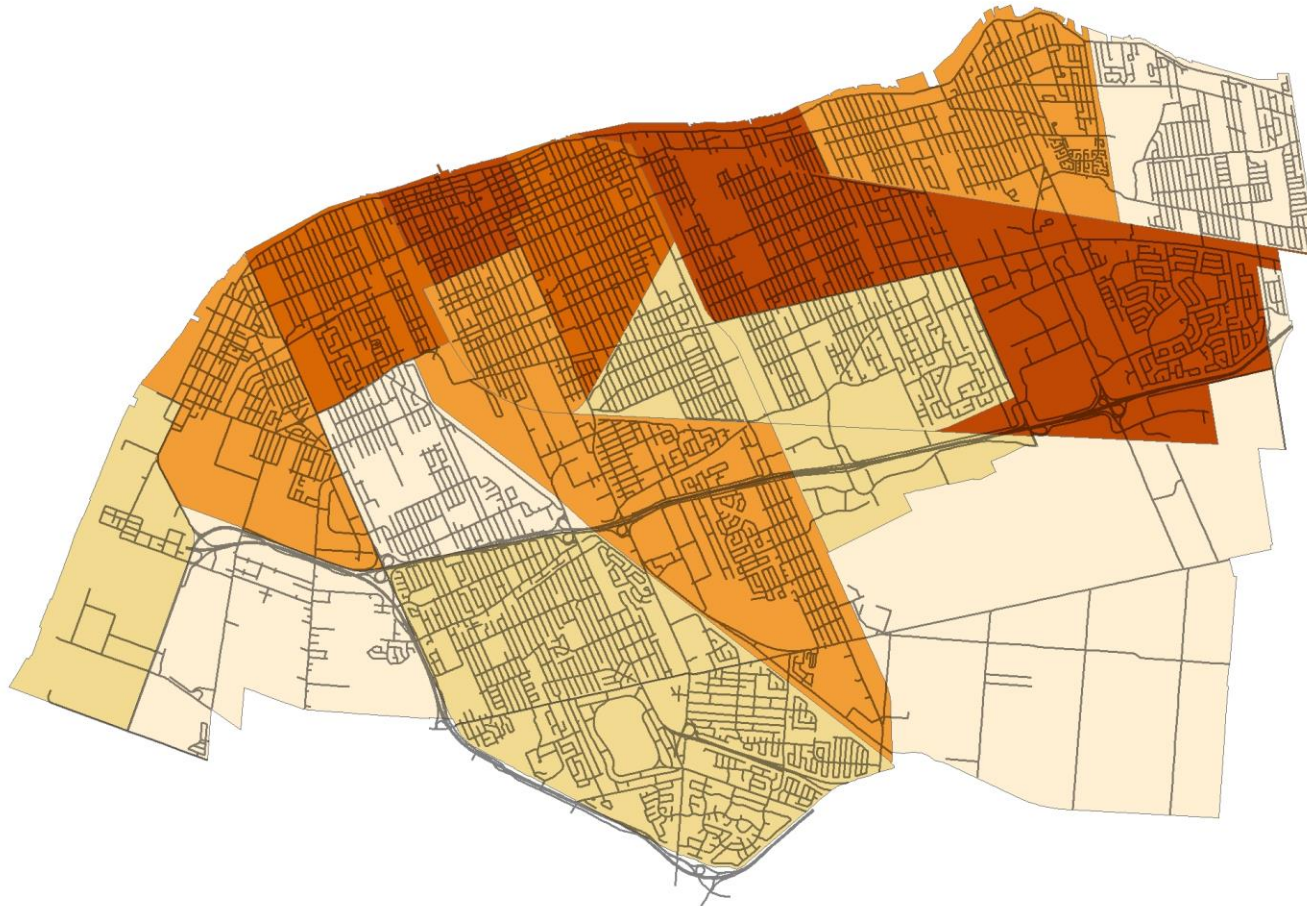


## 20 Energy Planning Districts

- ❑ 76,000 parcels assessed for 2014
- ❑ Matched to Utility Meters
- ❑ Evolution to 2041 developed
  - ❑ *City development plans*
  - ❑ *Provincial outlooks*
  - ❑ *Efficiency changes*
- ❑ Building types and sizes
  - ❑ *Existing*
  - ❑ *Renovation & demolition*
  - ❑ *New construction*
- ❑ End-use requirements
  - ❑ *Heating, Cooling, Lighting, Other*
- ❑ Year-by-year models
- ❑ Aggregated to defined boundaries
  - ❑ *20 Energy Planning Districts*

Aligned with City Official Plan

# 2014 Baseline Total Energy Use

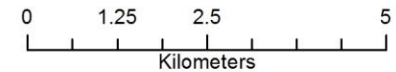


## WINDSOR COMMUNITY ENERGY PLAN

Total Energy Consumption  
(GJ)

### Total Energy Consumption (GJ)

121,000 - 700,000
700,001 - 1,300,000
1,300,001 - 1,900,000
1,900,001 - 2,500,000
2,500,001 - 3,100,000



**Need Neighbourhood Perspective**



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Energy Productivity Solutions

Homes & Buildings Only

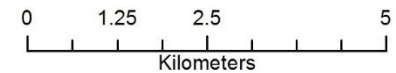
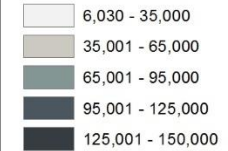
# 2014 Baseline Total Greenhouse Gas Emissions



## WINDSOR COMMUNITY ENERGY PLAN

Total GHG Emissions  
(tCO<sub>2</sub>e)

### Total GHG Emissions (tCO<sub>2</sub>e)



**Need for Differentiated Measures**



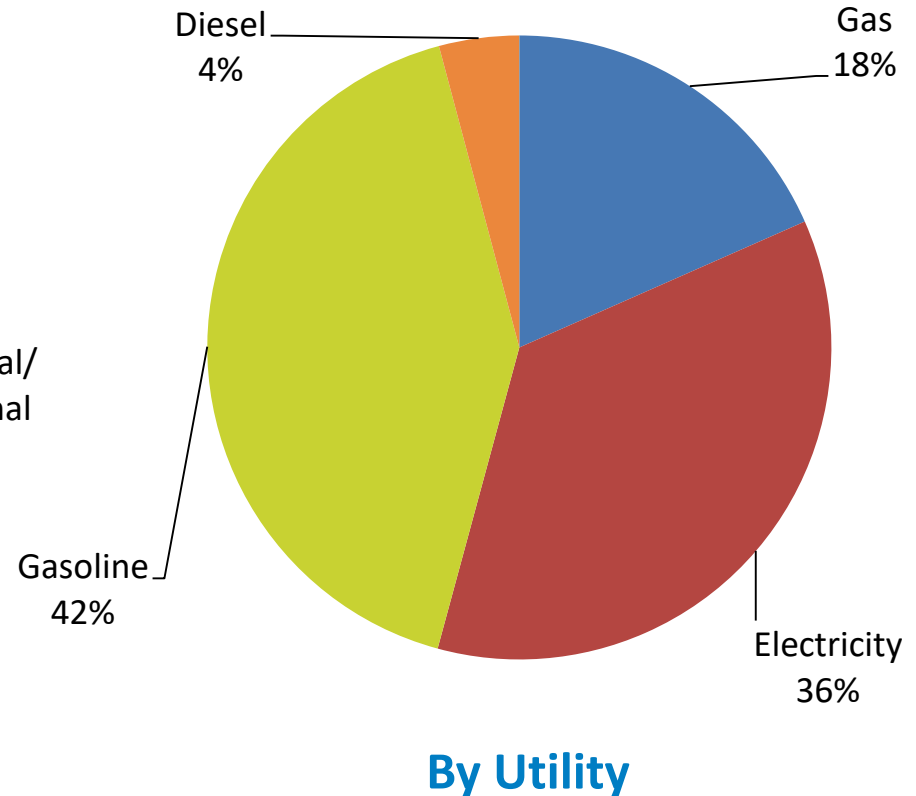
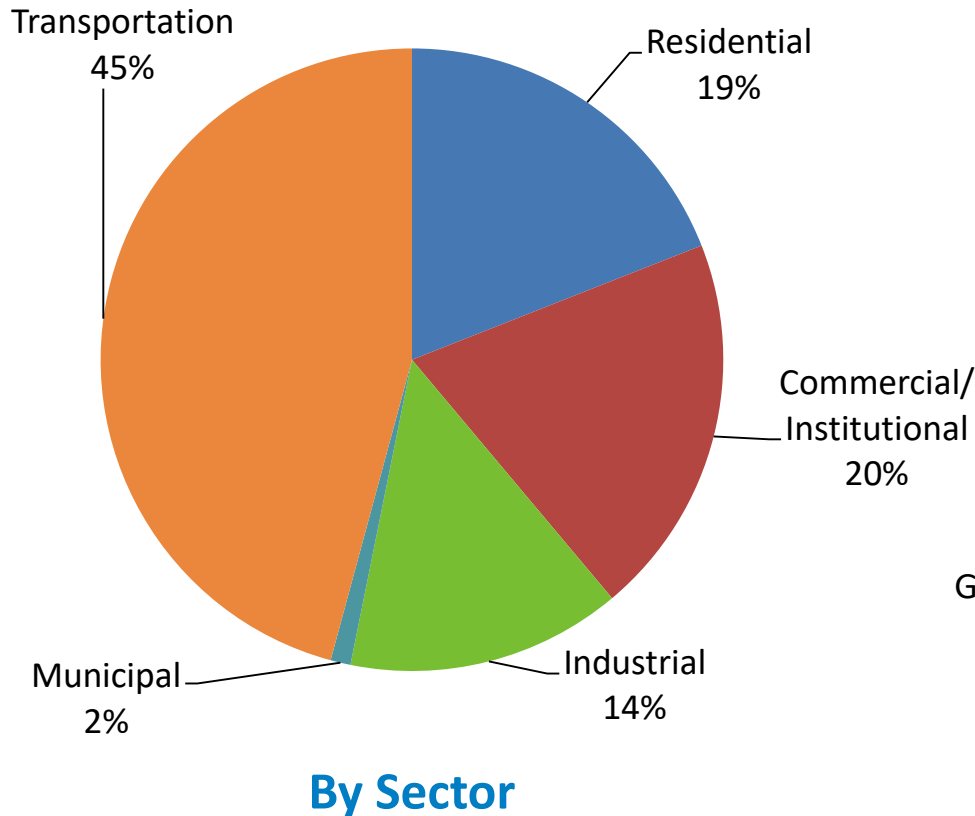
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Energy Productivity Solutions

Homes & Buildings Only

# Understand Baseline Cost

## Energy Cost ~ \$842 Million

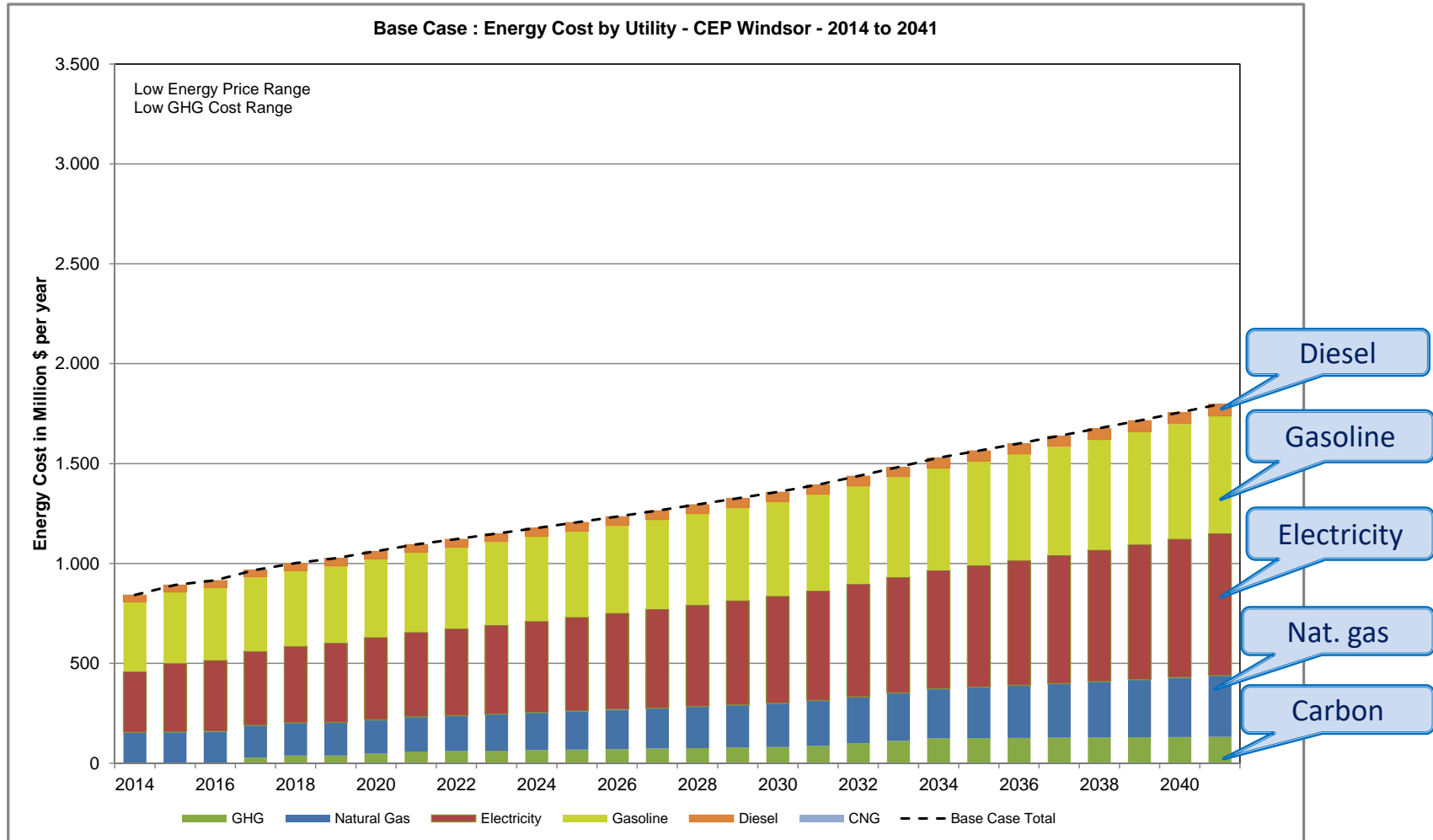
### 2014 Energy Cost



**80% of Value Leaves the City**

# Understand Cost Risk

## Energy Costs 2041 - Lower Range

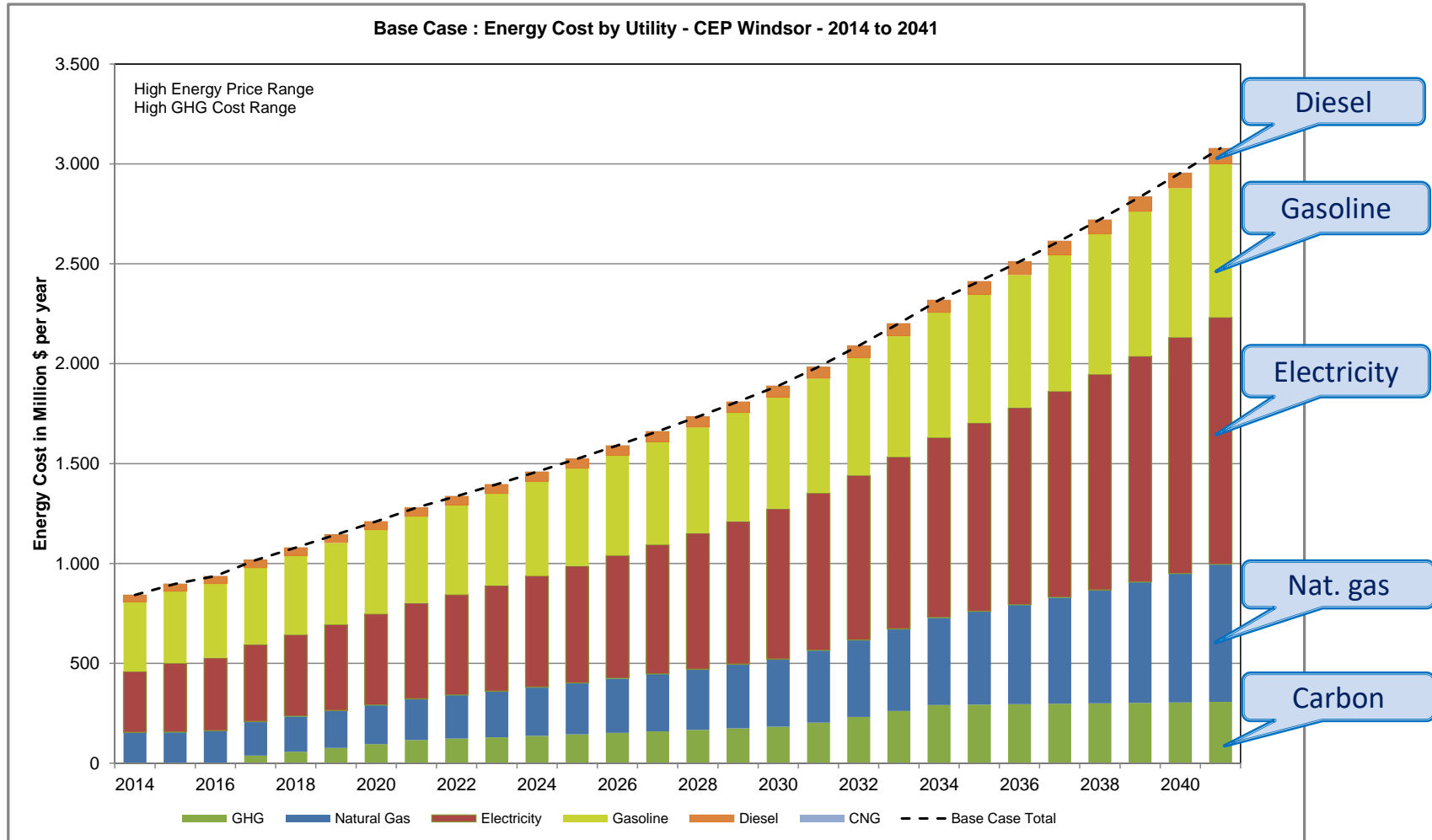


**120% Annual Cost Increase to \$1.8Bn**



# Understand Cost Risk

## Energy Costs 2041 - Higher Range

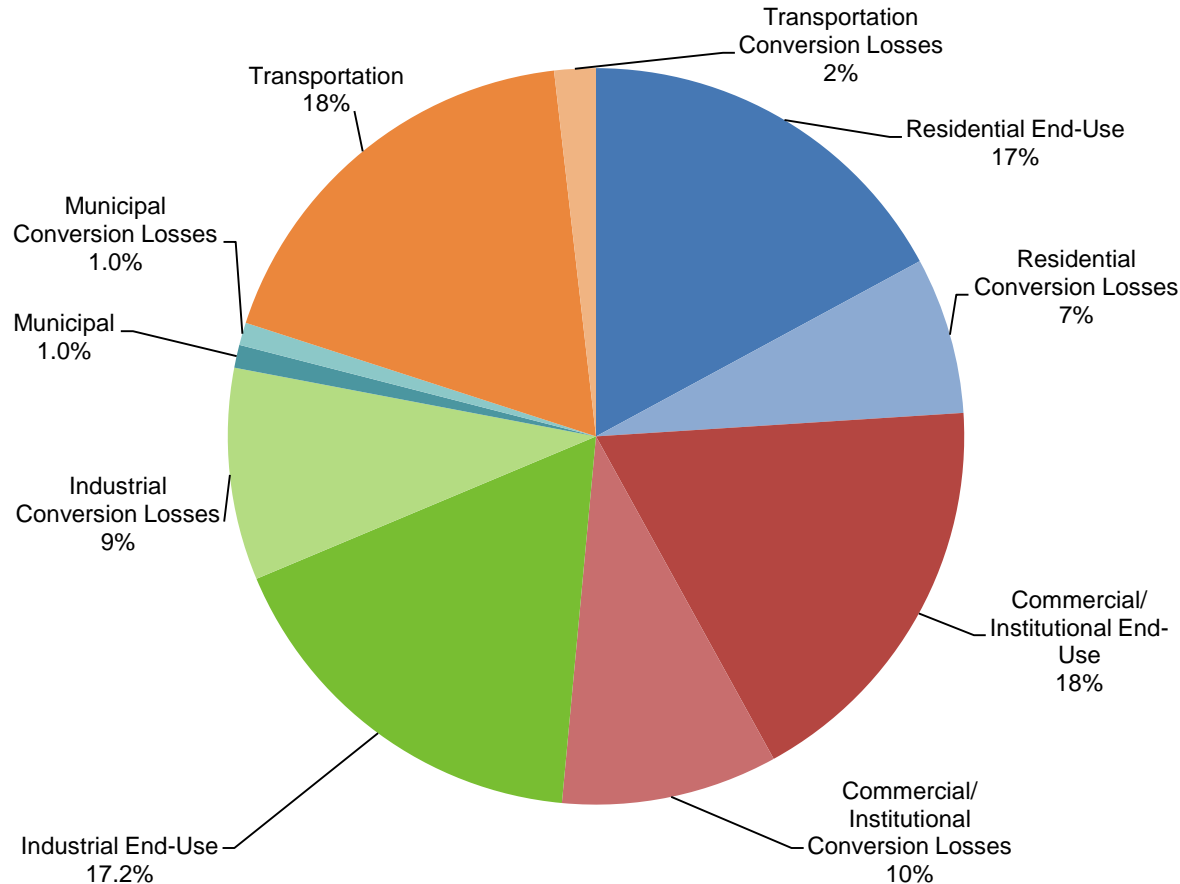


**280 % Annual Cost Increase to \$3.2Bn**

# Understand Use & Losses

## Customer Energy Use – 54M GJ

### 2014 Energy Use by Sector

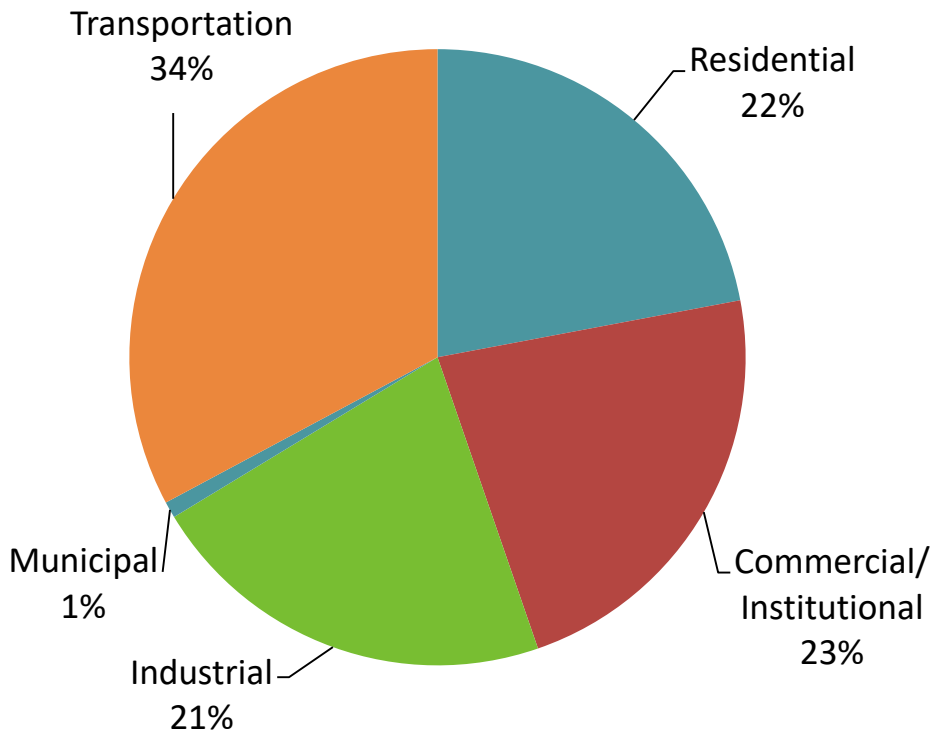


**About 30% Conversion Loss**

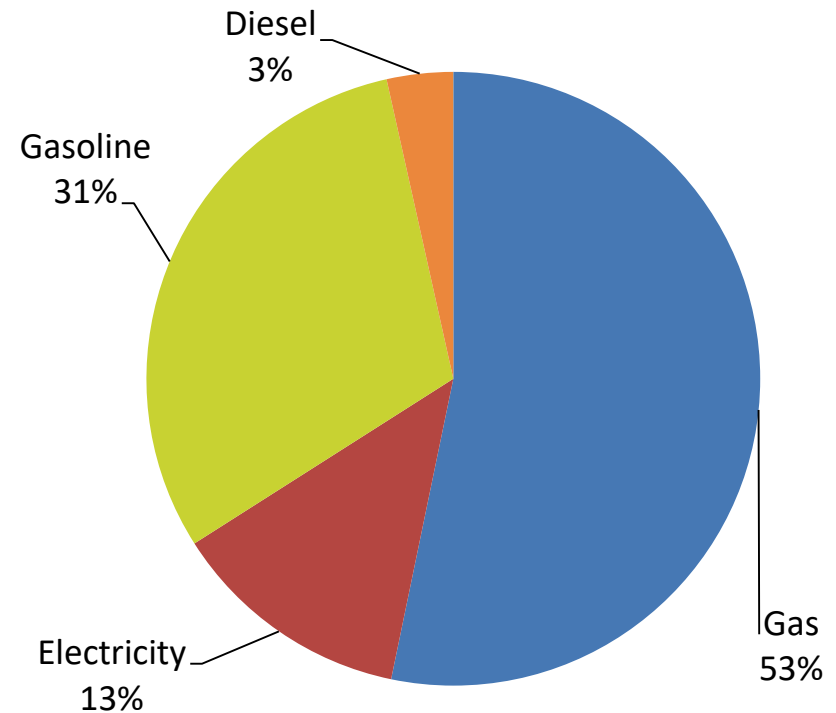
# Understand Baseline Emissions

## GHG Emissions 2.0 Million mt

### 2014 Greenhouse Gas Emissions



**By Sector**



**By Utility**

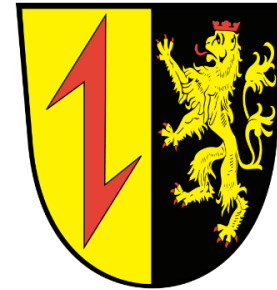
**8.8 tonnes CO<sub>2e</sub> for every resident**

# Benchmark Performance

## Sister City Mannheim



Energy 186 GJ/capita  
*Target -40% by 2041*



Energy 89 GJ/capita  
*Target -20% by 2020*

**Global & Local Benchmarking**

# Build Integrated Data and Scenario Assessment Tools



**Basis for Ongoing Reporting & Detailed Design Plans**

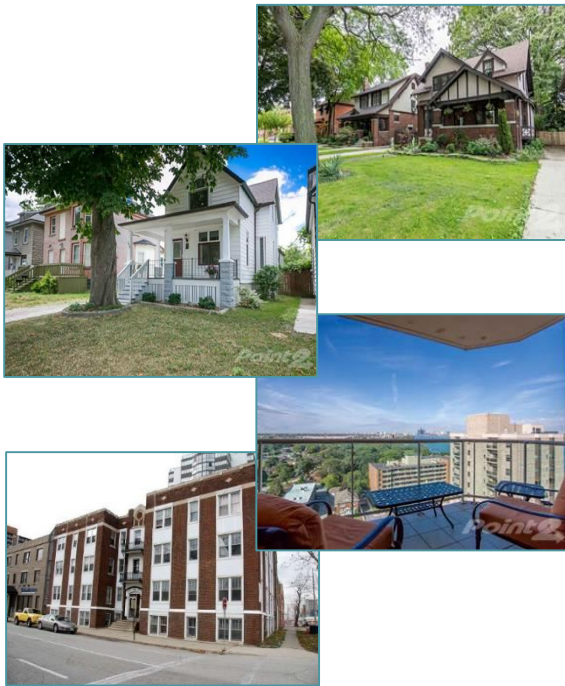
# Increase End-Use Efficiency Existing Homes Strategy

24% of Energy  
22% of GHG

Retrofit 80% of homes by 2041

CEP Strategy

- Create local entity*
- Public/private partnership*
- Quality controlled standardized retrofits*
- Standardized pricing*
- Efficiency gain 30 to 50%*
- Payments using LIC*



Focus on Simplicity, Quality *and* Scale

# Increased End-Use Efficiency Existing Buildings Strategy

**28% of Energy  
23% of GHG**

**Retrofit 60% of buildings by 2041**

**CEP Strategy**

- Extend role of local entity*
- Commercial, Institutional & Municipal*
- Quality controlled standard and tailored retrofits*
- Simplified pricing*
- Efficiency gain 20% to 50%*
- Payments using LIC*



**Focus on Quality and Scale**

# Increase End-Use Efficiency New Homes & Buildings Strategy

<5% of 2041 Energy  
<5% of 2041 GHG



- ❑ Ontario Building Code
  - ❑ *Most energy efficient in North America*
  - ❑ *Typically updated every 3 to 5 years*
  - ❑ *Still far from “Net Zero” or “Passive”*
  
- ❑ CEP Strategy
  - ❑ *Create market transparency through performance labelling as part of rental/purchase*
  - ❑ *Possible permitting incentives for above-code construction*
  - ❑ *Consider “Net Zero Planning Overlays”*

**Focus on Transparency, Compliance & Performance**



# Increased Thermal Efficiency

## District Energy Strategy

- Heating + Cooling ~25% of Primary Energy / ~45% of GHG**
  
- Expand & Modernize existing DE System to global performance
  - Expand Downtown customer base*
  - Integrate University District Energy and link to City Nodes*
  - Expand into Industrial Corridor*
  - Use DE and Economic Development offering for new investors*
  - Explore near-zero carbon DE services in new development areas*
  - Implement Efficient Supply Mix*
  - Maximize Combined Heat & Power*
  - Facilitate industrial heat recovery*
  - Facilitate possible future use of bio-fuel to accelerate GHG reductions*

**Focus on Scale-up of Existing Assets**

# Increase Supply Efficiency

## District Energy Strategy - Areas



**Build on Existing Assets**

# Increase End-Use Efficiency Industrial Strategy

26% of Energy  
21% of GHG

## □ CEP Strategy

- *Achieve average 1% per year efficiency improvement*
- *Industry networking to proliferate best practices*
- *Industry expertise as community resource*
- *Explore District Energy integration*

## □ Typical Best Practices

- *Corporate Energy and Climate plans*
- *Global benchmarking*
- *Continuous improvement 0.5% to 1.5% per year*



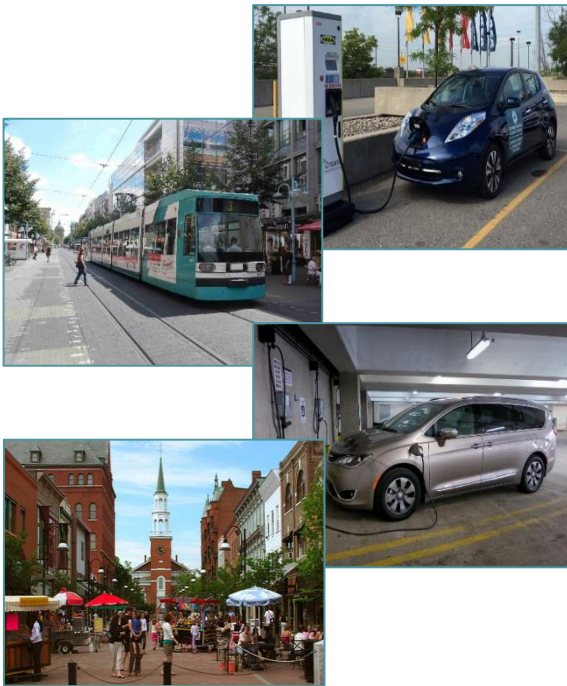
**Focus on Community Teaming & Transparency**

# Increase Efficiency

## Transportation Strategy

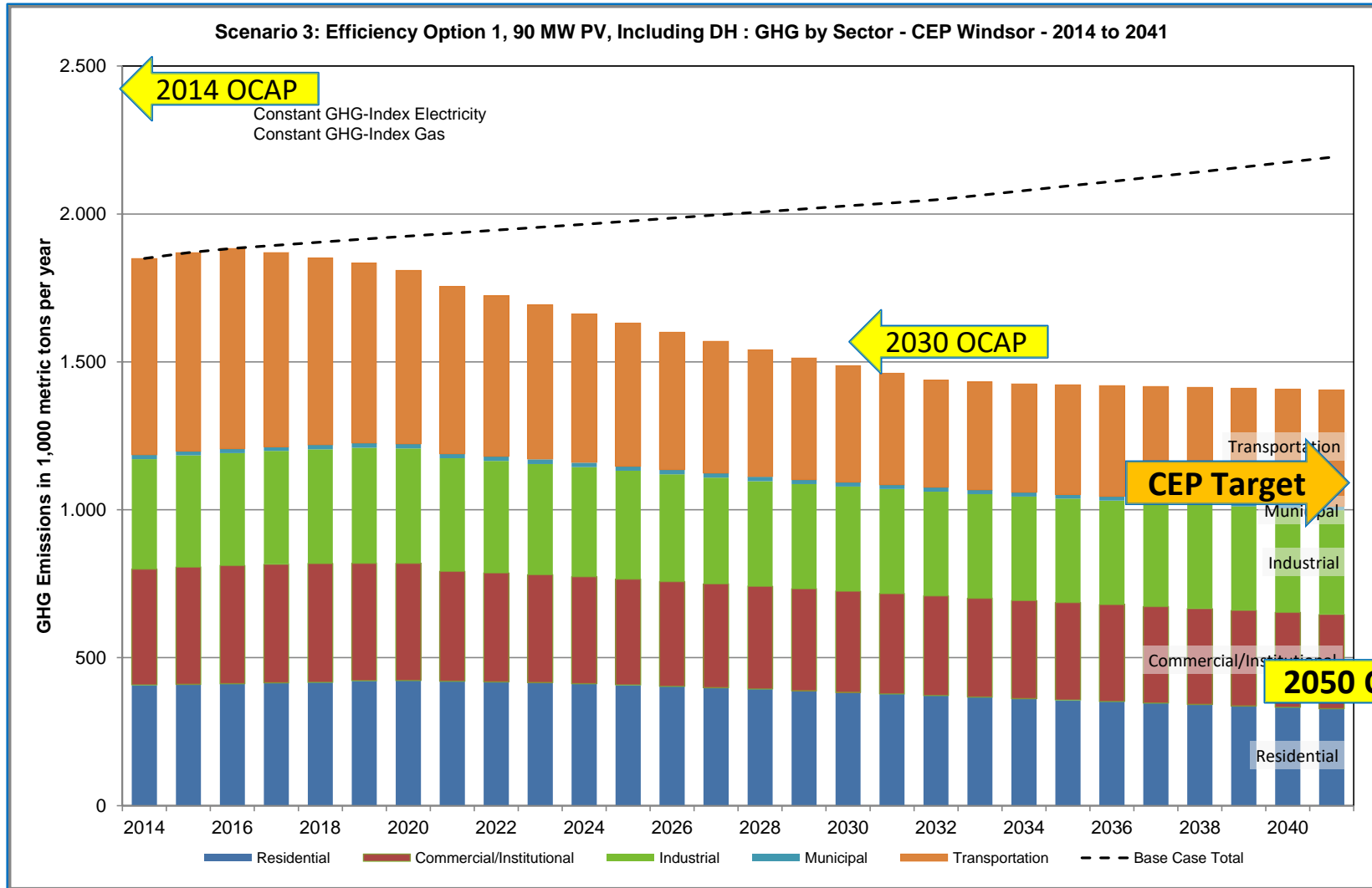
20% of Energy  
34% of GHG  
3.4 mt GHG / capita

- ❑ Market Factors affecting emissions
  - ❑ *Transition to hybrid and electric*
  - ❑ *Reducing vehicle weight*
  - ❑ *Efficient drive trains*
  - ❑ *Biofuels*
- ❑ Regional and City Influences
  - ❑ *Compact urban design*
  - ❑ *Mixed-use zoning*
  - ❑ *Shared and mass transit*
  - ❑ *Charging, Parking and Access privileges*
- ❑ CEP Strategy
  - ❑ *Integrate “all of the above” to be current world-class\* by 2041*

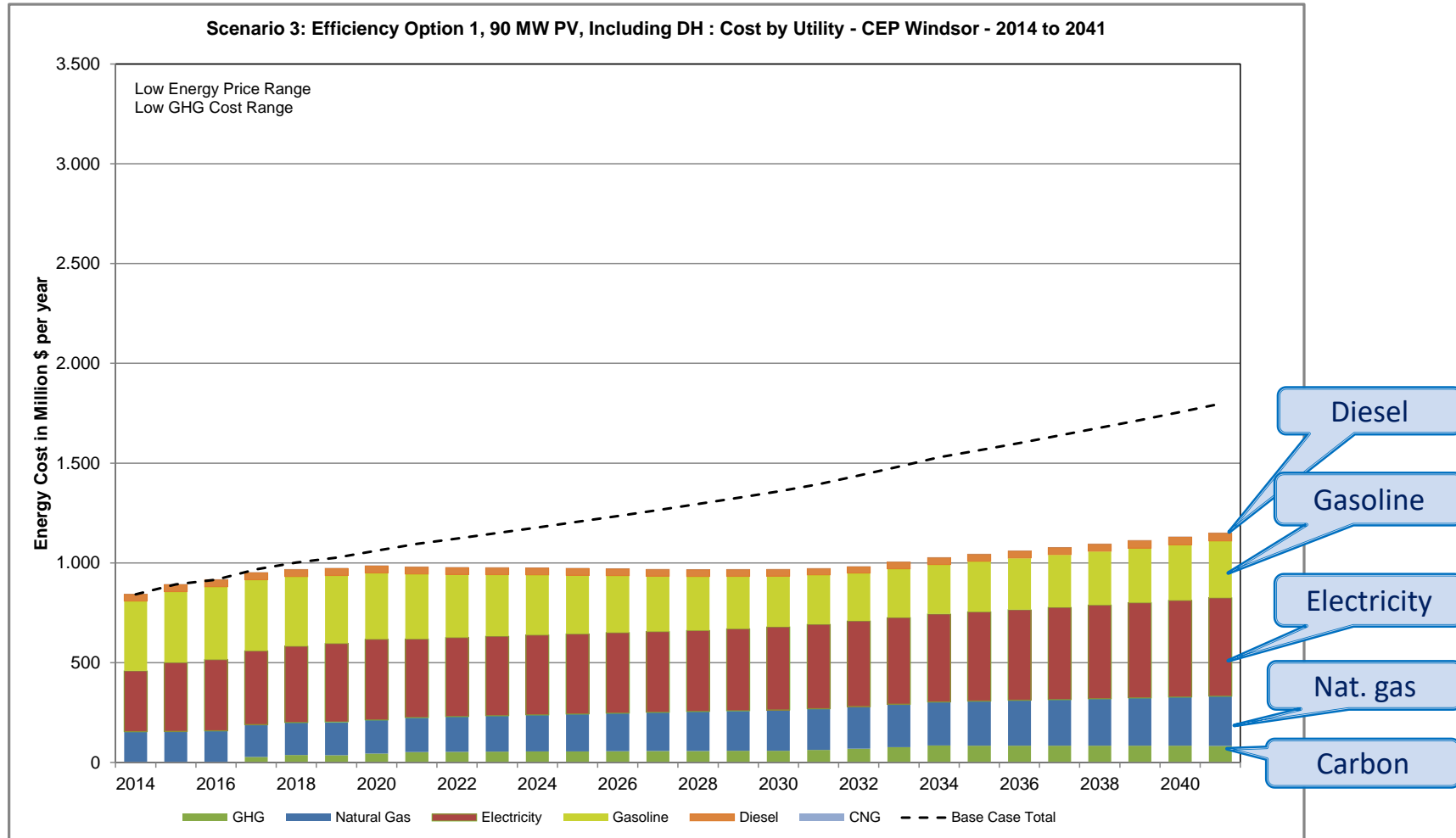


**Focus on Areas of Maximum City Influence**

# Results – GHG Emissions/Capita Gap to City & Provincial Targets

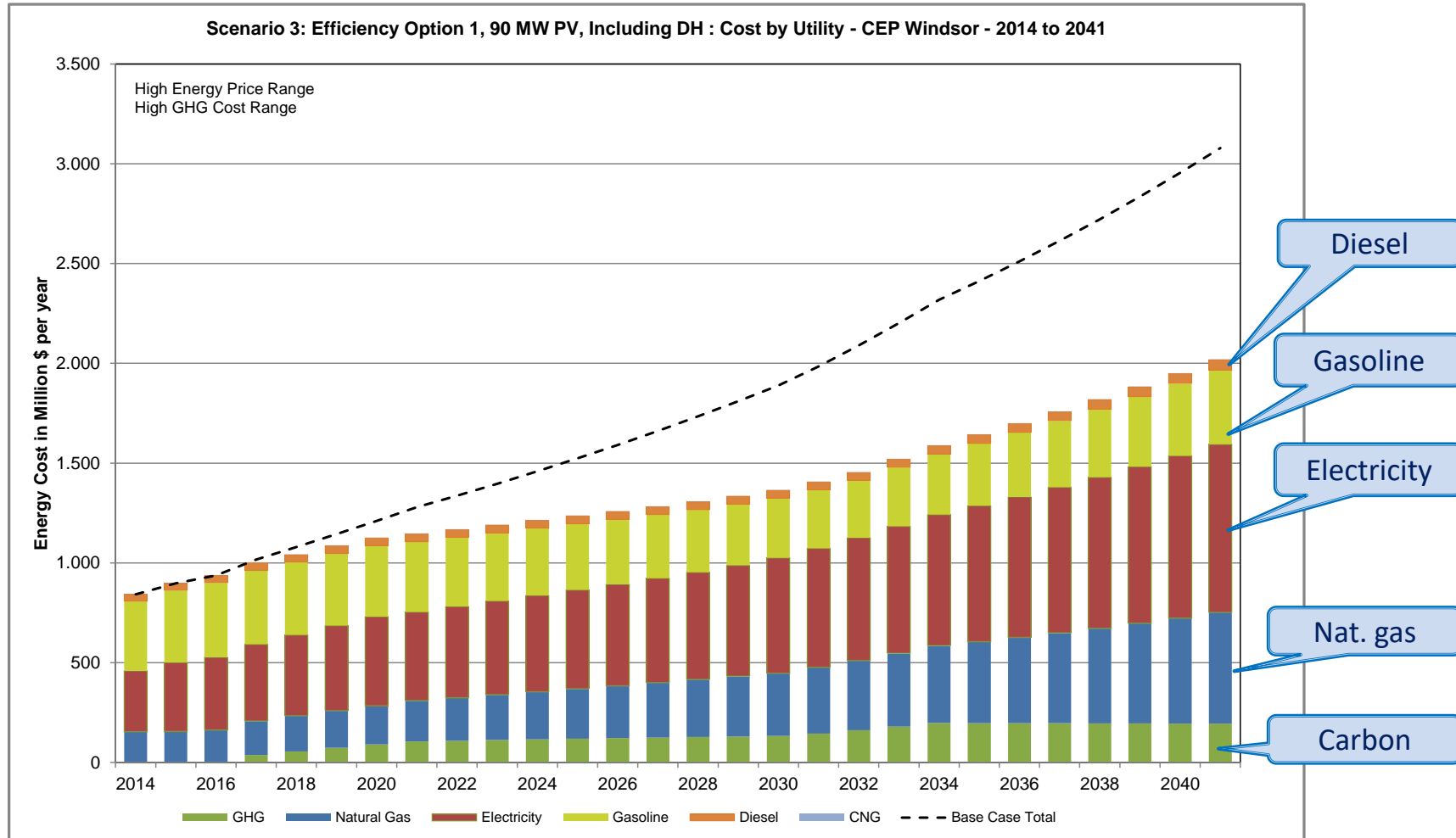


# Results – Utility Cost Lower Range



**\$8.6 Billion Total Savings**

# Results – Utility Cost Higher Range



**\$12.4 Billion Total Savings**

# What Does This Mean?

- Aggressive implementation is essential to even approach climate goals
- Commitment to scale implementation creates:
  - *Attractive investment opportunities*
  - *Local employment*
  - *Reduced risks*
  - *Livable communities and neighbourhoods*
- Universities and colleges have key role:
  - *Community Energy Nodes*
  - *Implementation exemplars*
  - *Source of training and expertise*



# Transformational vs Standard Plans

Standard Energy Plan	Transformational Energy Plan
Delivers average performance built from past experience	Drives exceptional performance based on strategic needs and best-practices
Uses a forecasting approach	Uses a backcasting approach
Builds technical case, then financial, then environmental	Builds all three cases simultaneously
Uses simple financial models	Uses integrated, risk-adjusted financial models
Energy & GHG savings <20%	Energy & GHG savings >50%
	Inspires Community
	Enhances Community leadership
<b>MINOR SHORT-TERM FINANCIAL RETURN</b>	<b>SUSTAINED ECONOMIC VALUE</b>

# Thank You

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