Track 5D: Business Models, Contracting & Financing

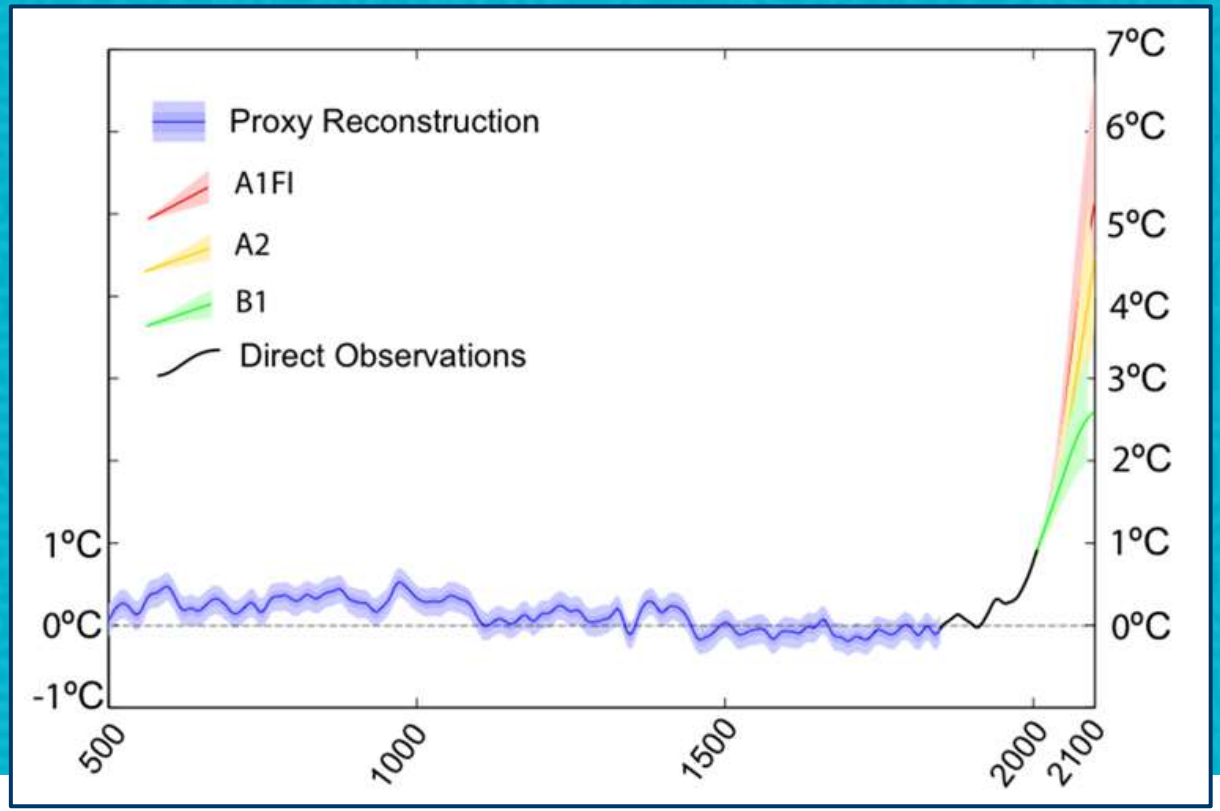
Partnering Across Boundaries: Bringing Global Leadership to Academic-Municipal Collaboration on District Energy

Herbert Sinnock & Katherine Rinas, Sheridan College

February 28, 2019

Can a campus be a catalyst for energy and environmental transformation in its community?

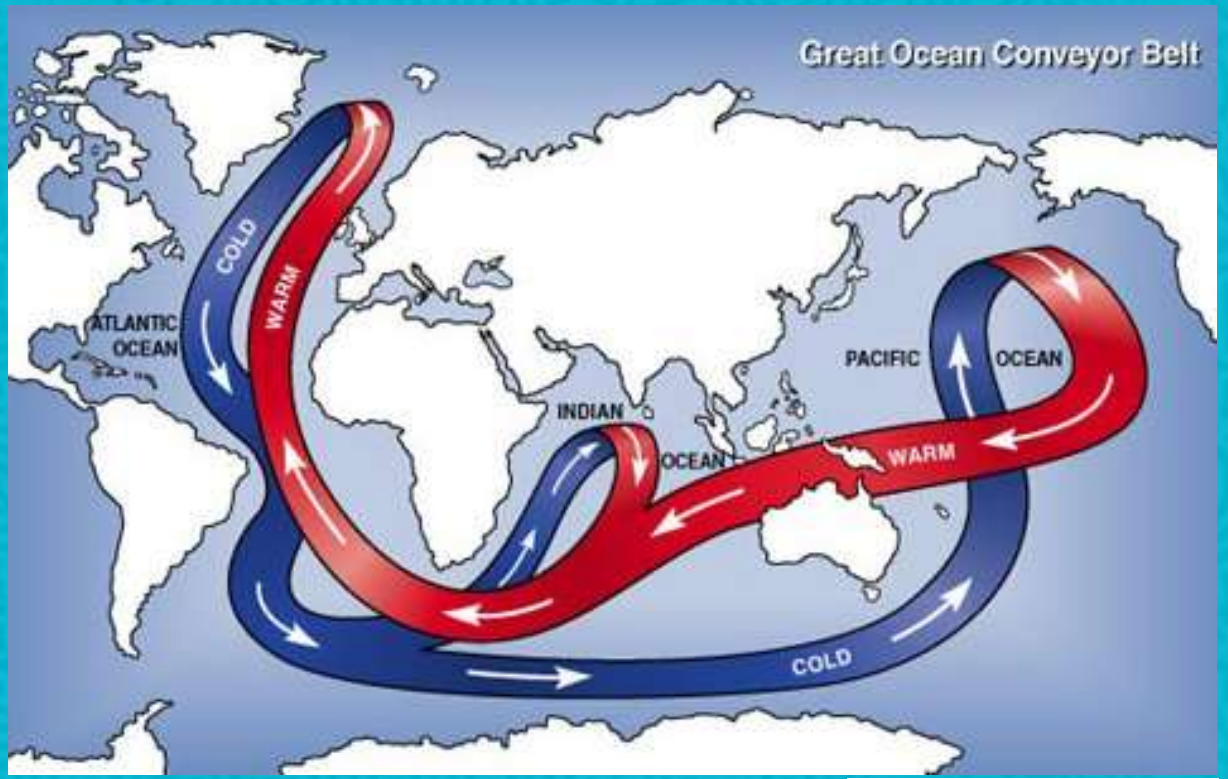
Is there a transformation imperative?



The Copenhagen Diagnosis
www.copenhagendiagnosis.com

When the AMOC Runs Amok

Fortune Magazine
February 9, 2004



Courtesy: National Science Foundation

Besides all known impacts of a shifting climate …

Ice-albedo feedback
Soil carbon feedback
Loss of native habitat to climate shift

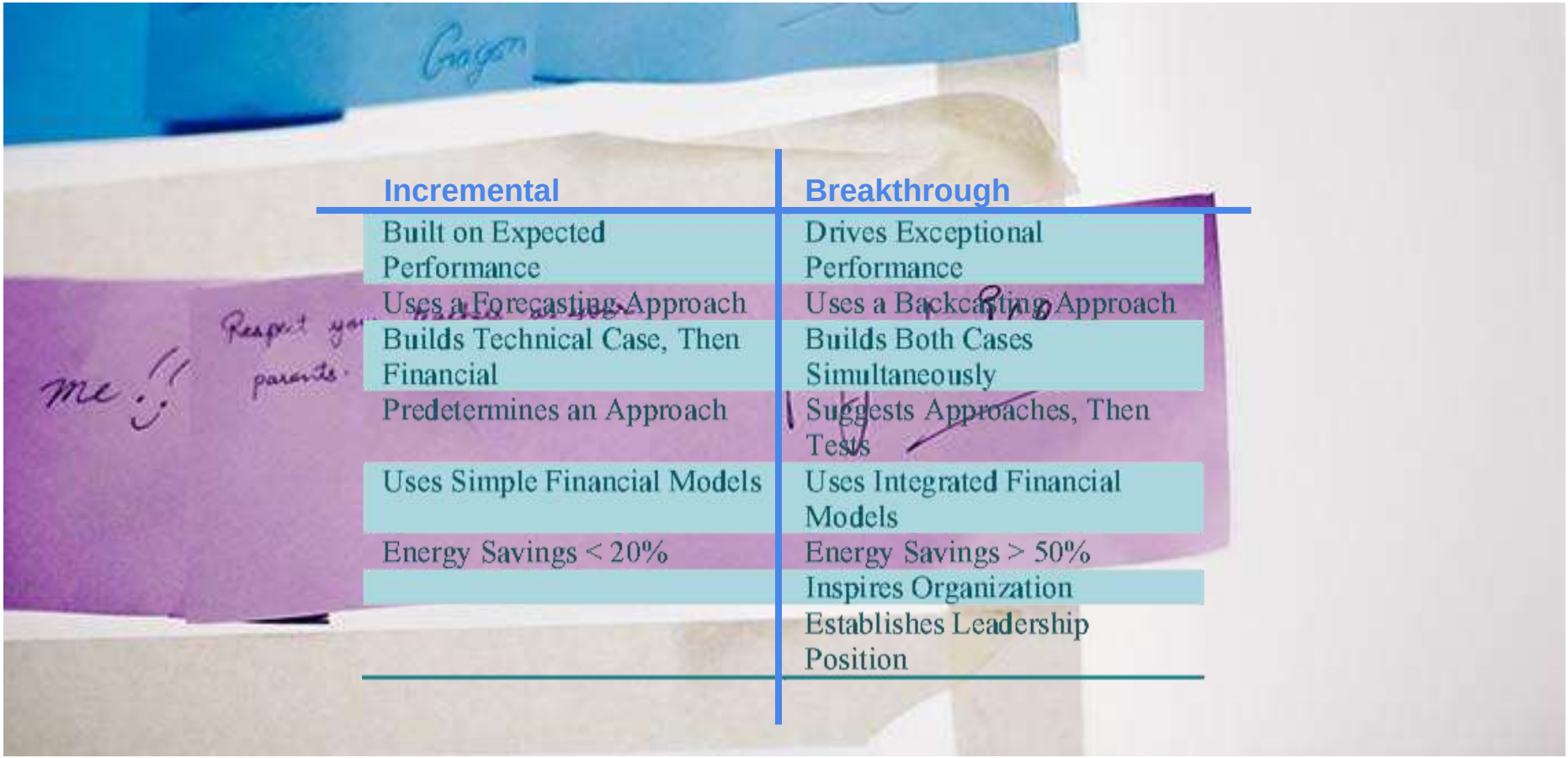
If scientific evidence is signaling transformative climate shift ...

Why do our planning and execution fail to show the same level of transformative effect?

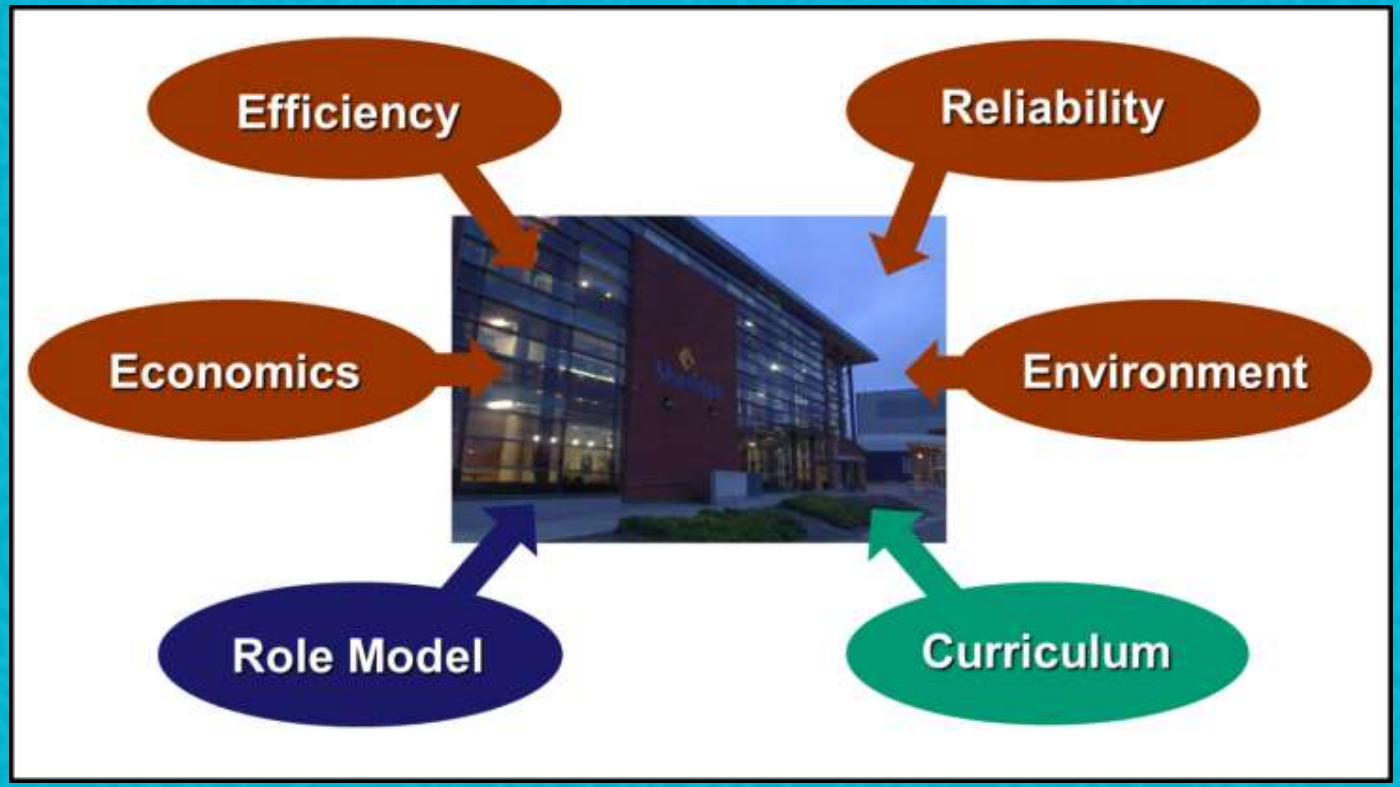
Policy Driven | Policy Compliant | Self-Directed | Policy Driver

Incremental | Stretch | Breakthrough | Transformational

Reactive | Managing | Proactive | Revolutionary



Incremental	Breakthrough
Built on Expected Performance	Drives Exceptional Performance
Uses a Forecasting Approach	Uses a Backcasting Approach
Builds Technical Case, Then Financial	Builds Both Cases Simultaneously
Predetermines an Approach	Suggests Approaches, Then Tests
Uses Simple Financial Models	Uses Integrated Financial Models
Energy Savings < 20%	Energy Savings > 50%
	Inspires Organization
	Establishes Leadership Position

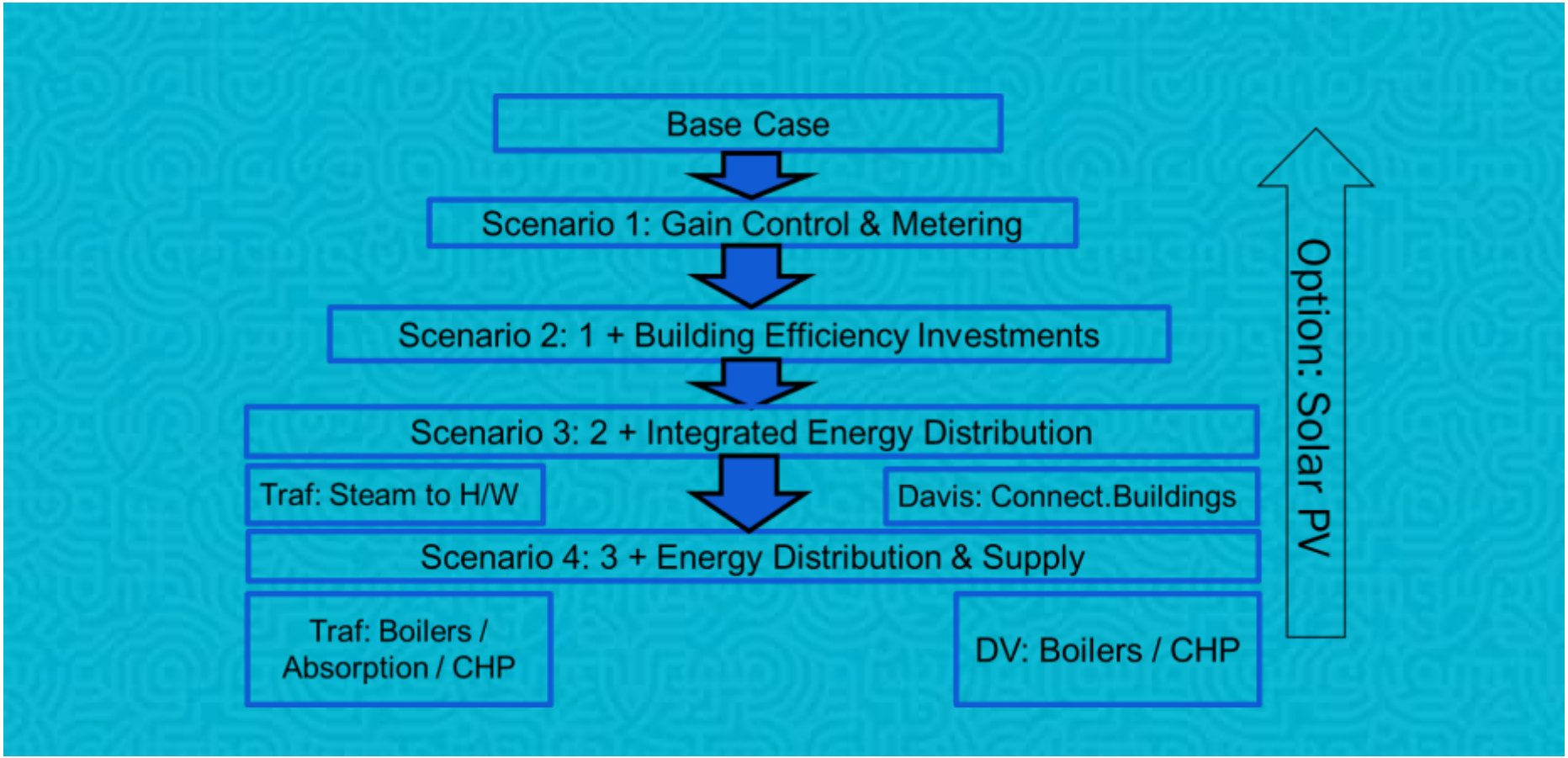

Efficiency
Reliability
Economics
Environment
Role Model
Curriculum

Breakthrough Goals

7% Internal Rate of Return

40% Reduction in
Carbon Emissions

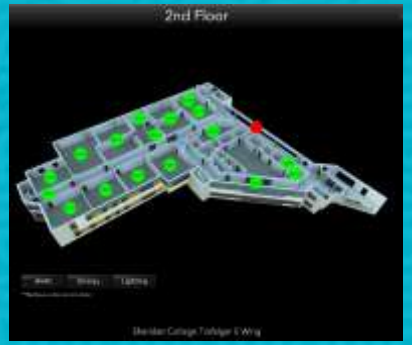
50% Reduction in Source
Energy Consumption


Base Case
Scenario 1: Gain Control & Metering
Scenario 2: 1 + Building Efficiency Investments
Scenario 3: 2 + Integrated Energy Distribution
Traf: Steam to H/W
Davis: Connect.Buildings
Scenario 4: 3 + Energy Distribution & Supply
Traf: Boilers / Absorption / CHP
DV: Boilers / CHP
Option: Solar PV



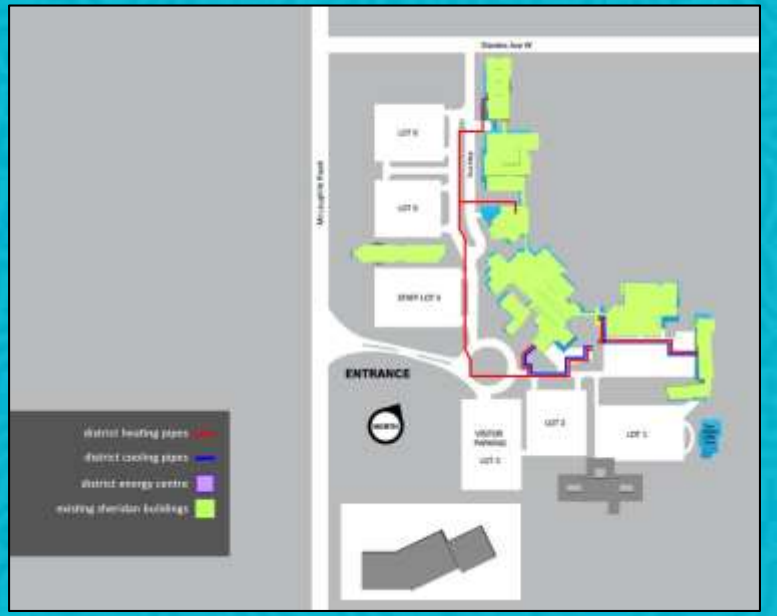



20.3



2nd Floor


Standards for New Buildings

Campus District Energy Infrastructure

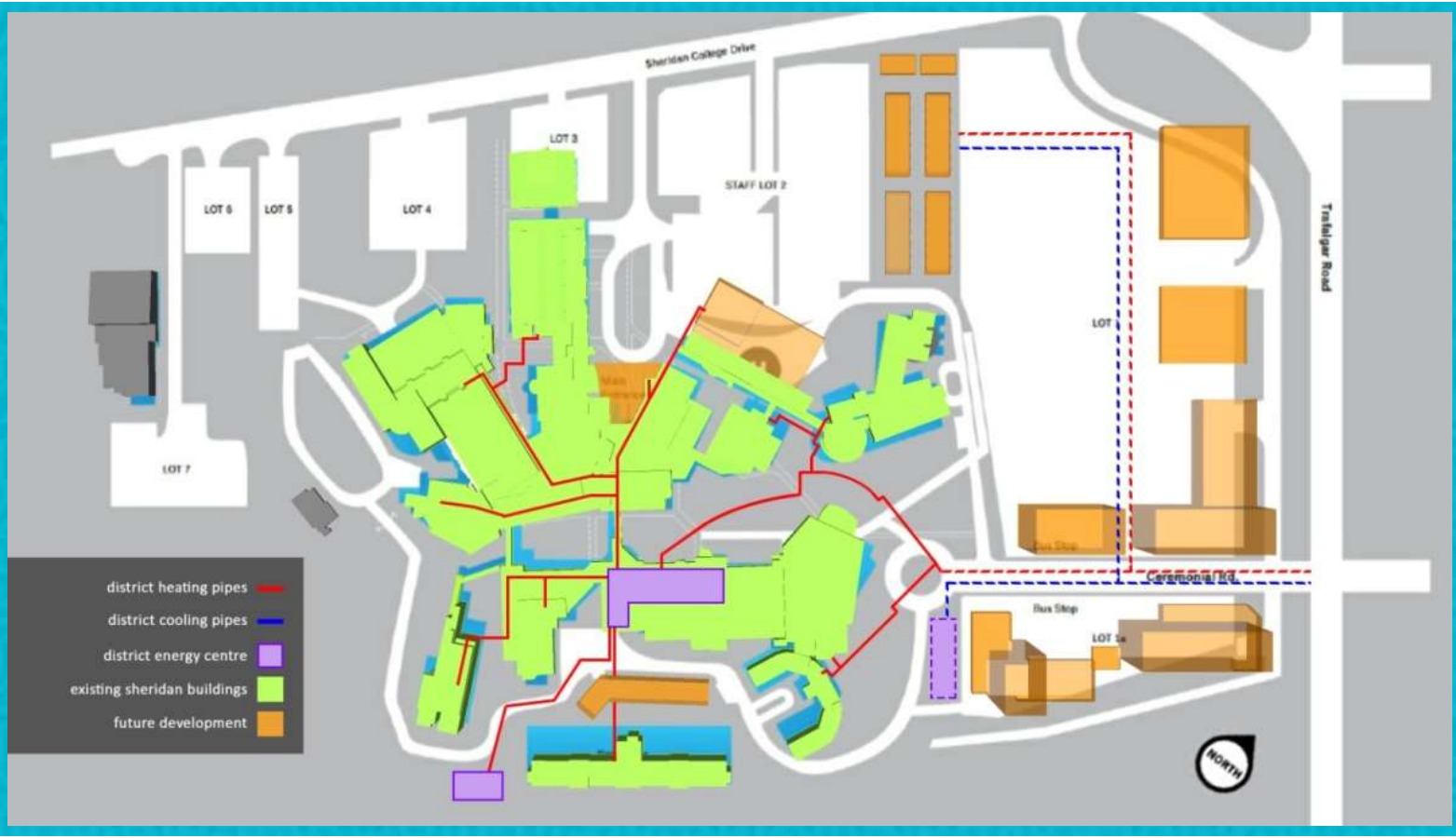



Canada
Shipping & Receiving


KUBOTA
KUBOTA

Davis Energy Centre (Brampton, ON)

Sportsplex & Sheridan		
Investment	**Group**	**Measure**
	Efficiency	Envelope and window upgrades
		Reevaluate thermal load after lighting upgrade
		Existing building retrocommissioning and new equipment commissioning
		Sub-metering
		Finish lighting retrofit
		Replace & Upgrade outdated equipment
		Add heat recovery from ice rinks to HW
		Add heat recovery for swimming pool discharge
	Supply	DH Network (Sheridan) Heating Substations (Sportsplex) CW Network CHP Engines Absorption Chiller Boilers (Sheridan)
	Solar PV	



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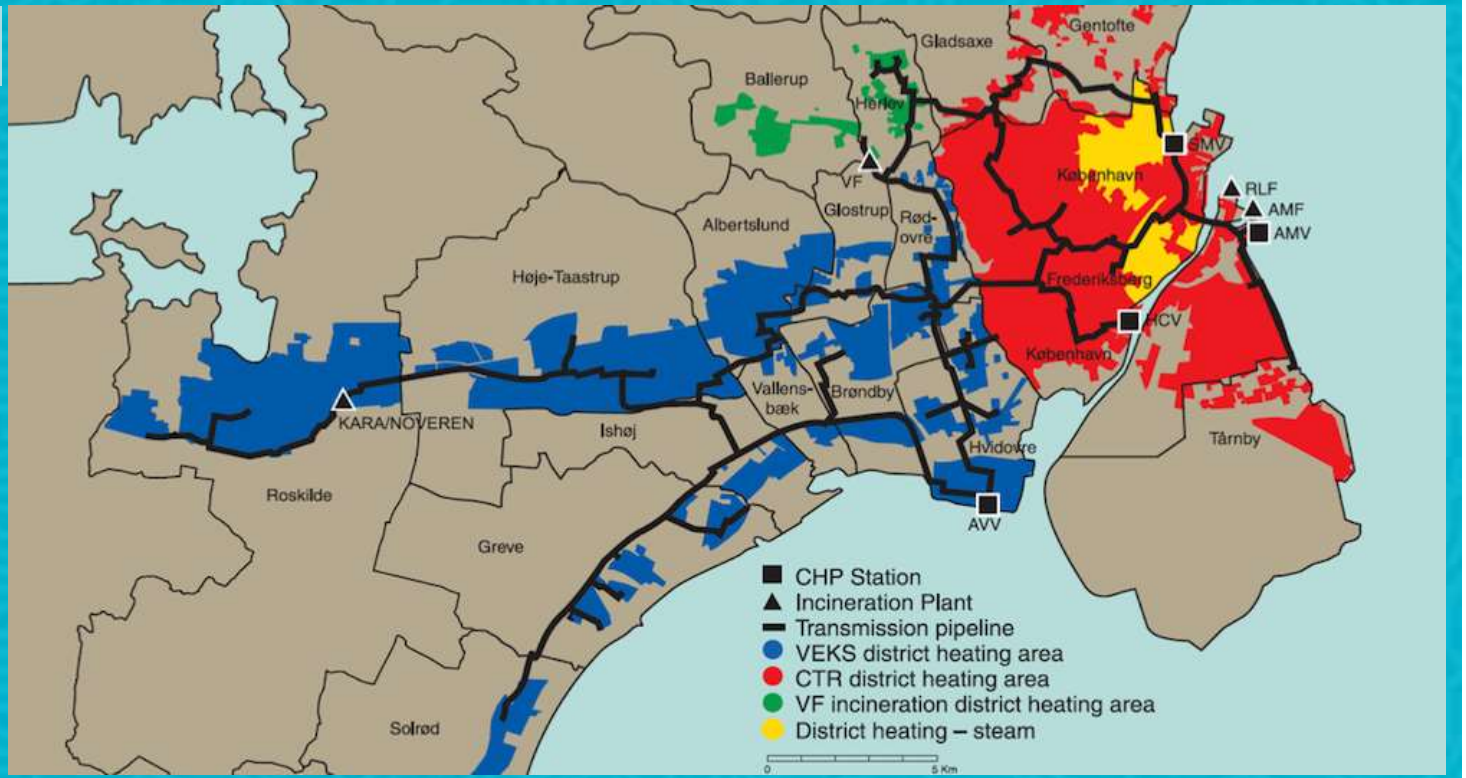
How do we start the conversation in our communities?

Can the tail wag the dog?

Copenhagen District Heating Area Map

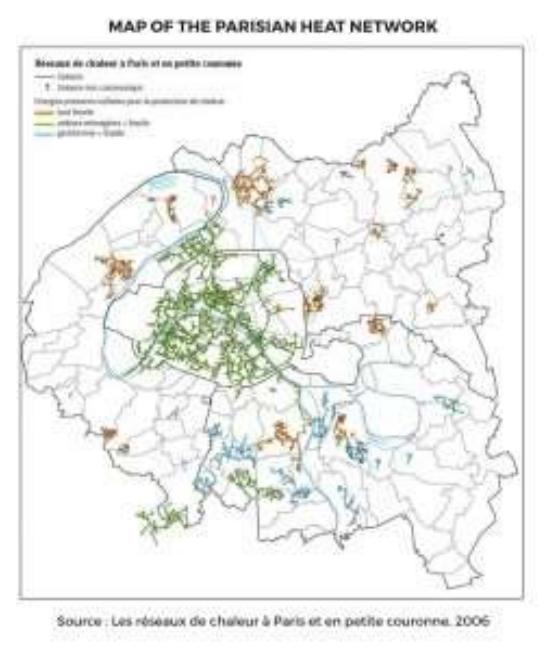


worldcitiesnetwork.org

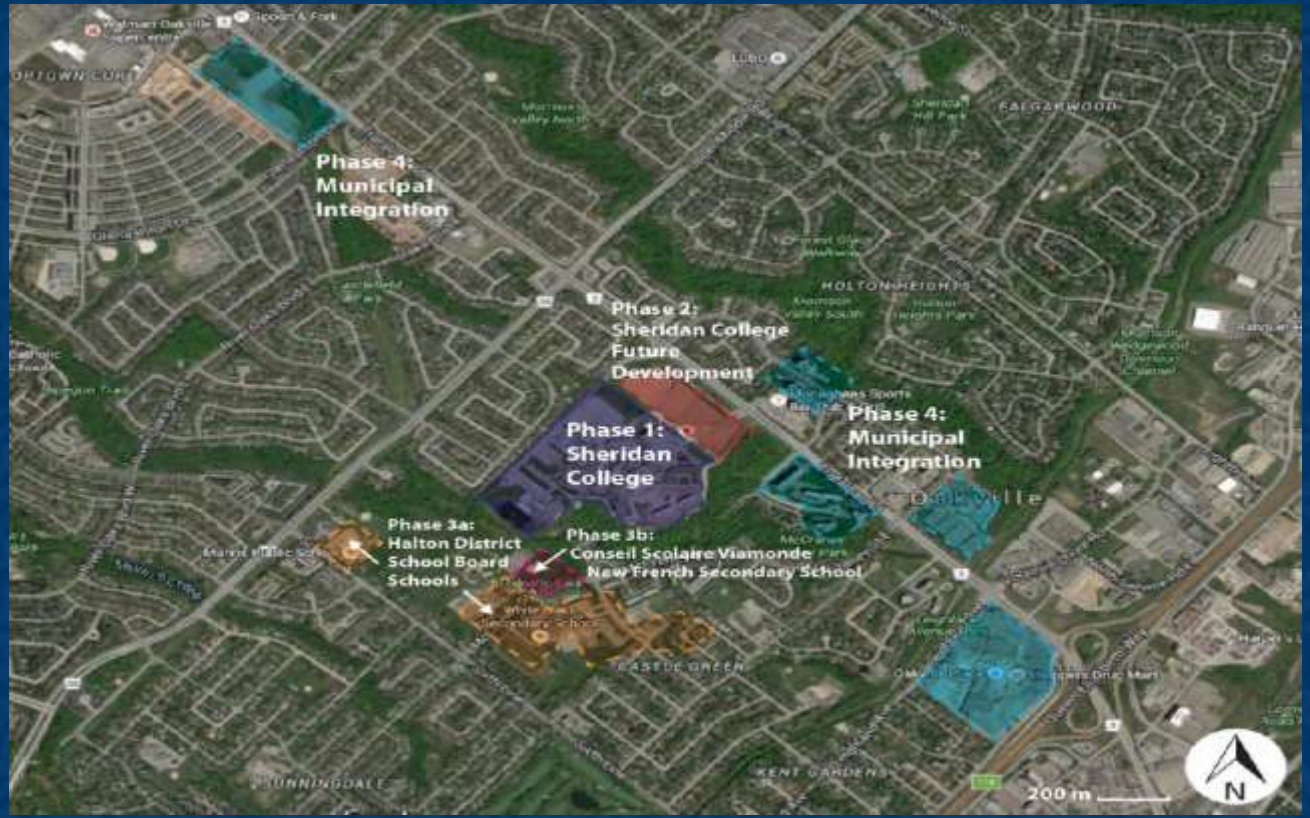
Gothenburg, Sweden
District Heating Area Map

Göteborg Energi

Paris, France District
Heating Area Map



Proposed Oakville District Energy Phasing



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Proposed Brampton District Energy Phasing

Starting the Community Energy Conversation

Initial Scope (Limited Scale)

- *Can this be viable without Community context?*
- *Can this be a planning example for community?*

Community Energy Plan

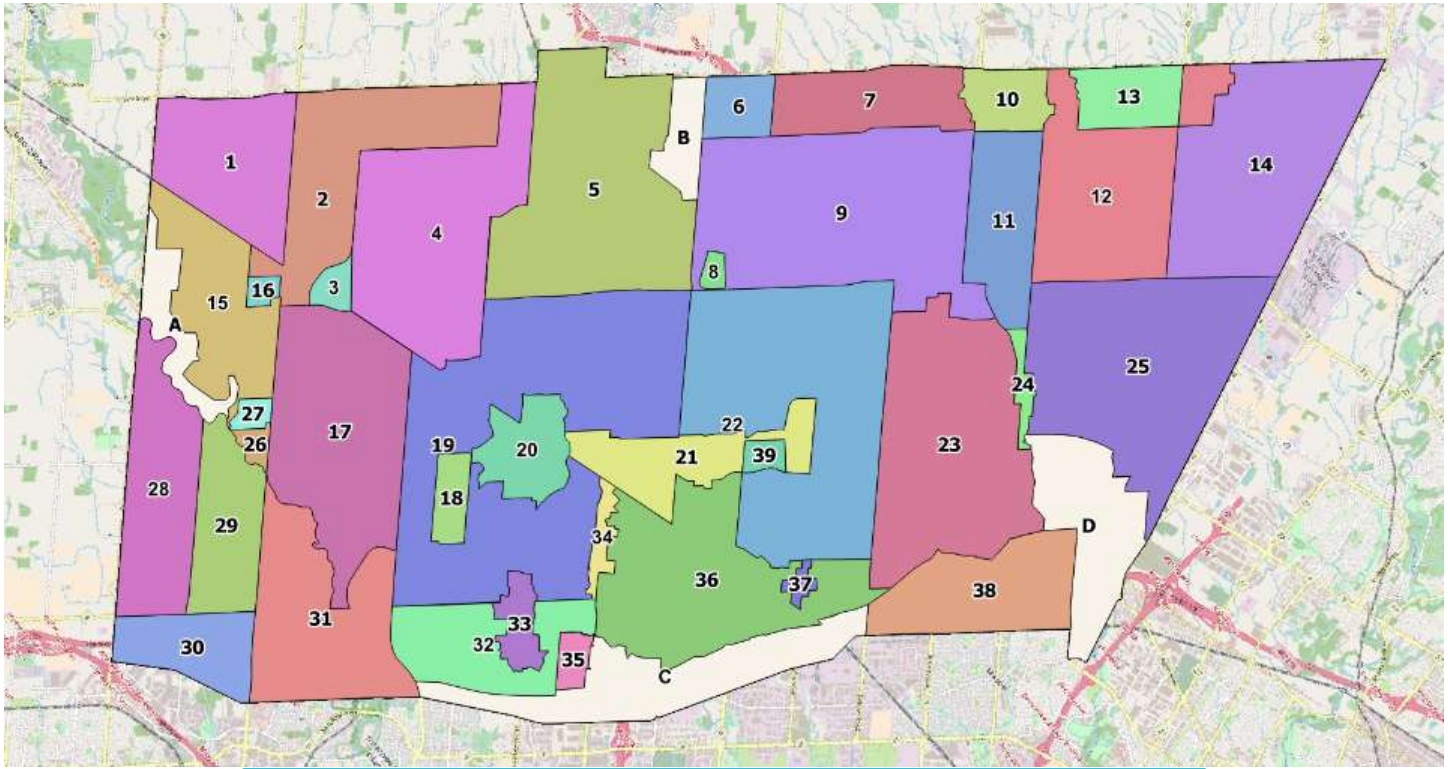
Brampton 2040 Vision
"*Living the Mosaic*"

Community Energy Plan Will Add Energy Layer

Community Energy Plan
Goals

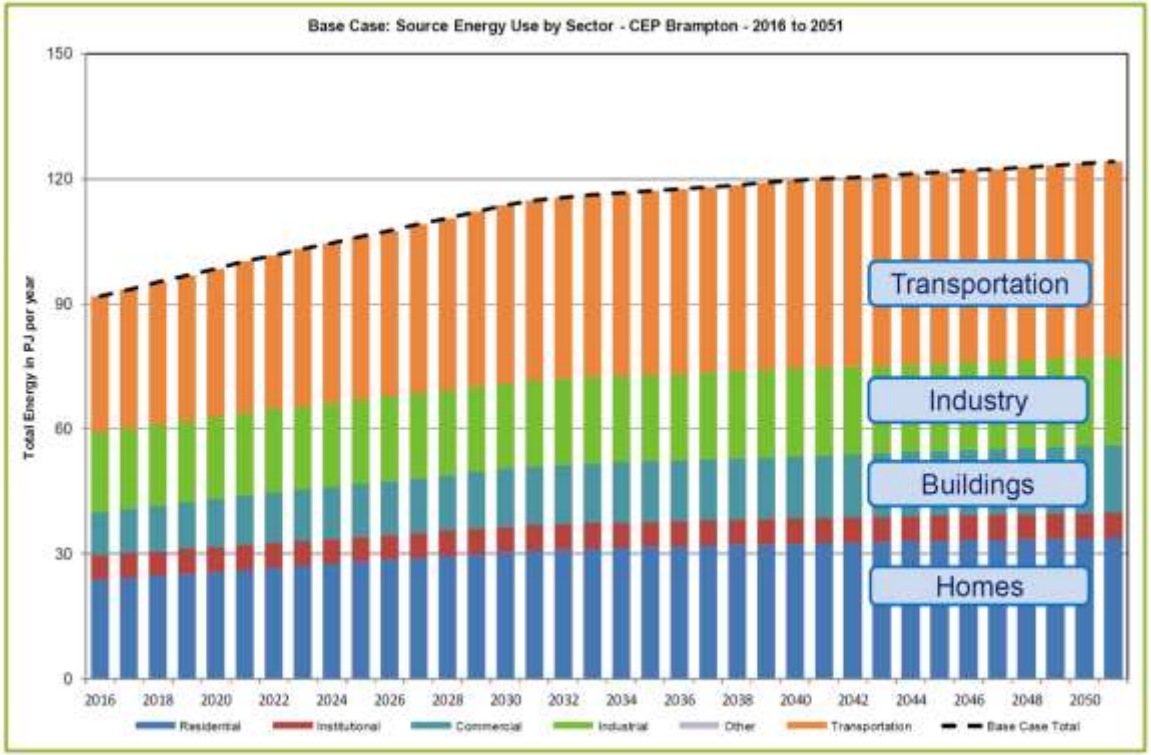
- Support “Brampton 2040 Vision”
- Environment – Support Federal Climate Goals
  - *Cut GHG emissions by 50% by 2041*
  - *Be on track to cut GHG by 80% from 1990 levels*
- Economic – Positive Economic Development
  - *Energy investments meet acceptable risk-adjusted returns*
  - *Energy costs will be competitive compared to comparable Canadian and US communities*
  - *Generate incremental high-quality employment*
- Energy Efficiency – Global Best Practice
  - *50% below 2016 level by 2041*
- Energy Reliability / Resilience / Flexibility
  - *Energy systems will meet the challenges of changing user expectations, climate uncertainty and new technologies*

Community Energy Plan
Energy Planning Districts

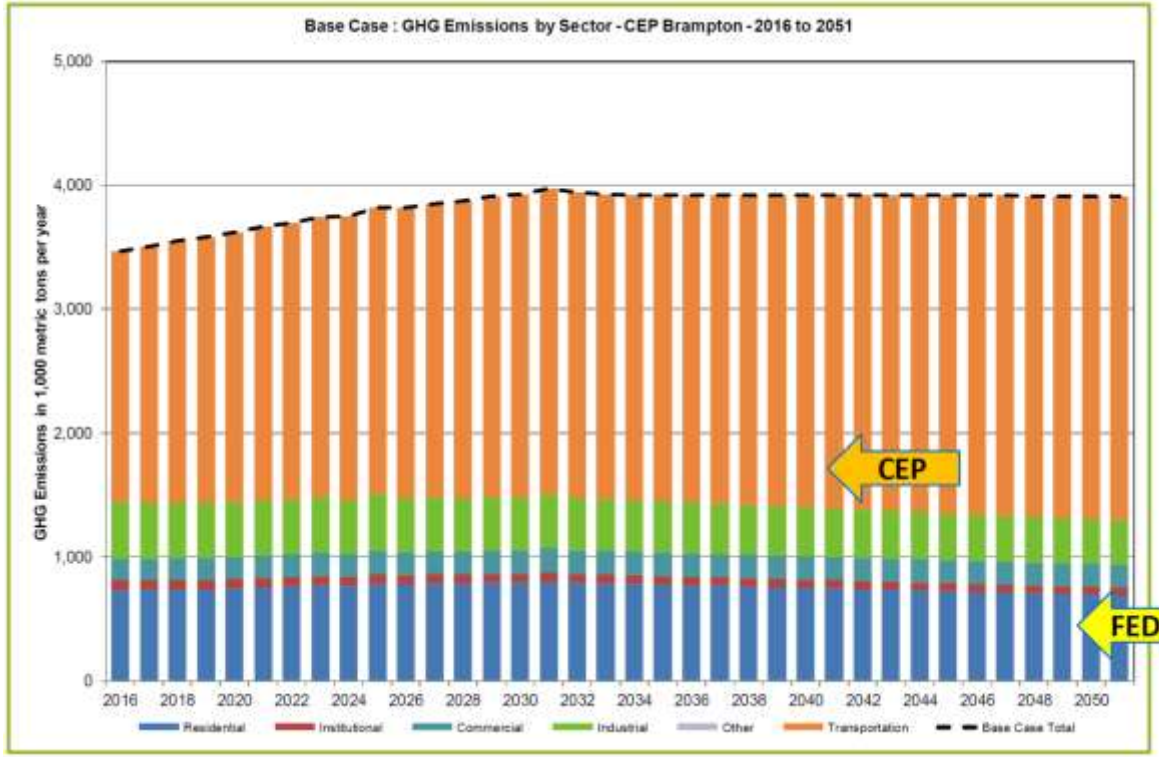


Aligned with Planning

Base Case to 2051
Source Energy Use by Sector



Base Case to 2051
Emissions Goals - CEP & Federal-OCAP

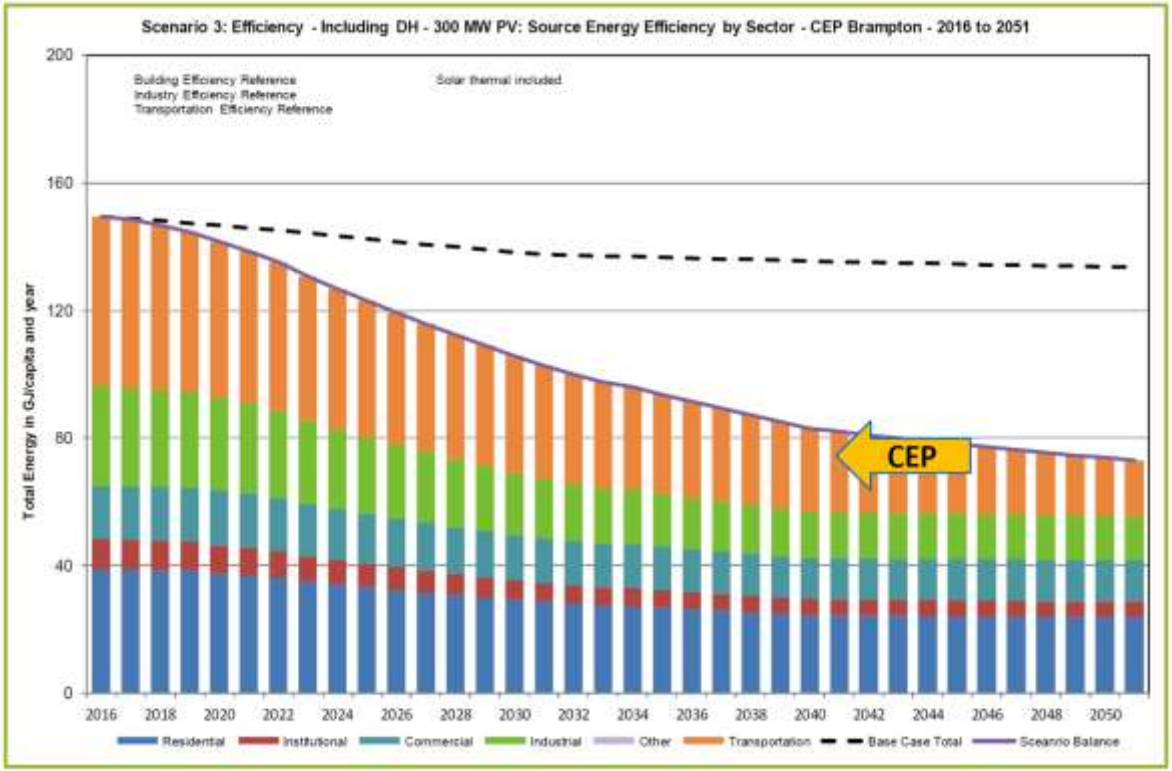


Goals Demand Deep Transformation

Developing Integrated CEP Scenarios
Simulation Elements

- Efficiency of new homes
- Efficiency of new C&I buildings
- Efficiency of existing homes
- Efficiency of existing C&I buildings
- Efficiency of industry
- District Energy Areas - Densification
- District Energy Areas – Greenfield Neighbourhoods
- Renewable solar heat generation
- Renewable electricity generation
- Transportation mix and efficiency
- Ontario grid generating mix
- Natural gas network source mix

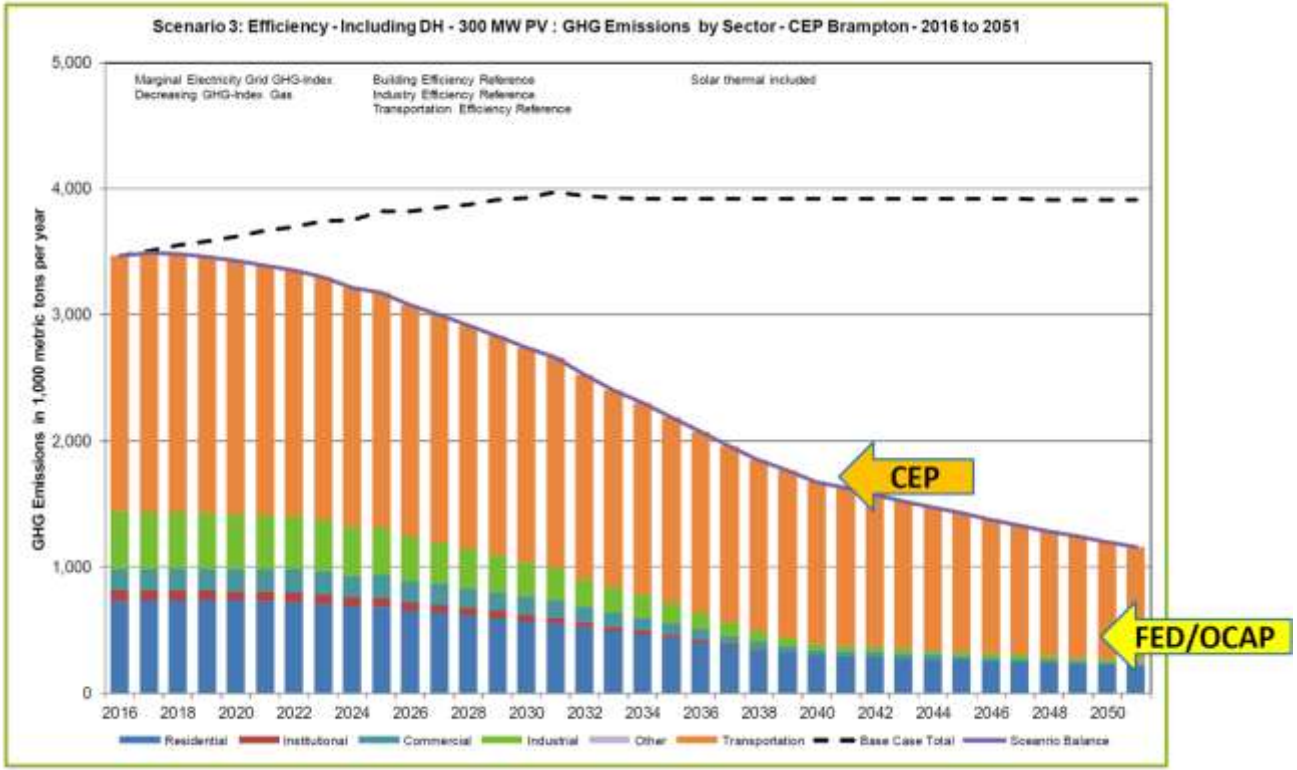
Brampton Simulation – Reference Case
Source Energy Efficiency by Sector



Falls Short of CEP Goal

**Updated 2018-09-11*

Brampton Simulation – Reference Case
GHG Emissions by Sector



Garforth International llc
Energy Productivity Solutions

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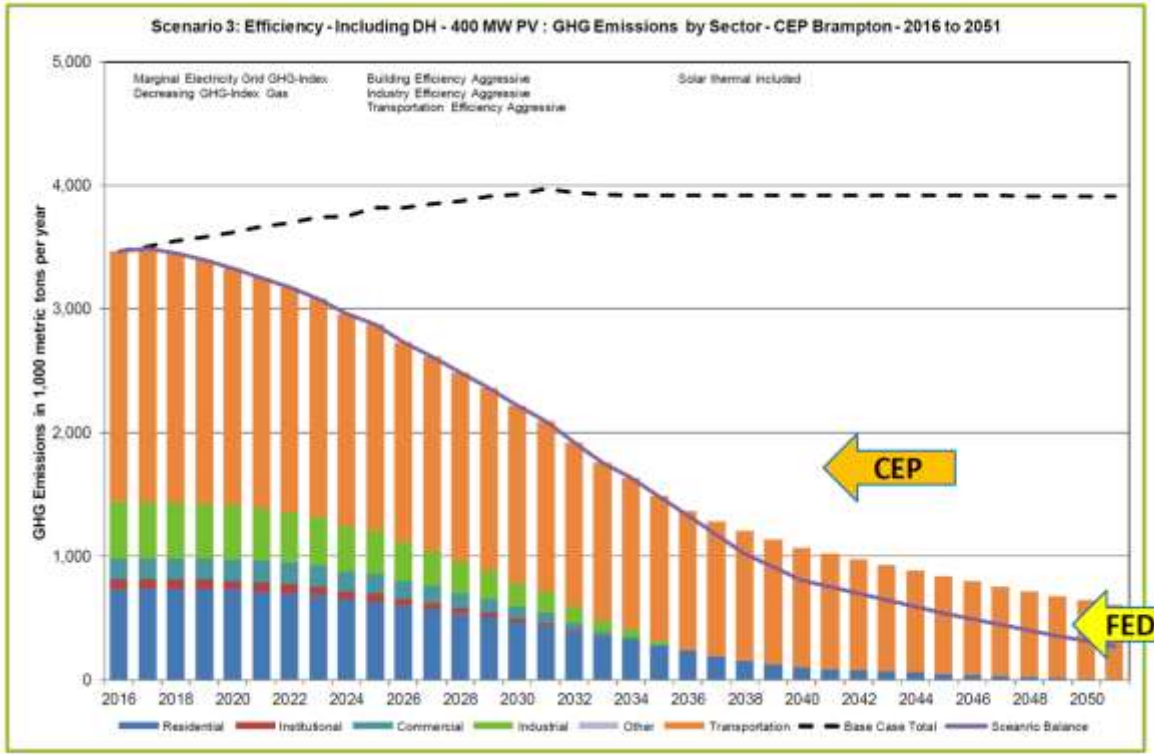
**Updated 2018-09-11*

Brampton Simulation
Aggressive Case

- Existing Home & Building Efficiency
  - *Increase share of retrofits to 90% with 20% more efficient packages*
- New Home & Building Efficiency
  - *Encourage 5% efficiency above code*
- Industrial Efficiency
  - *Encourage all industry meet global-best practice of 1.5% per year*
- District Heating
  - *Increase market shares to near 100% and accelerate use of latest CHP technologies*
- Solar Thermal
  - *Double targeted share to 20%*
- Solar PV
  - *Increase total installed capacity to 400 MW*
- Transportation Energy
  - *Encourage double use of electric vehicles and mass transit*
  - *Design neighbourhoods and policy even more intensively to encourage walking cycling and LEVs*

Is This What is Needed to Meet 2050?

Brampton Simulation – Aggressive Case
GHG Emissions by Sector



Built Environment Is Net-Zero GHG

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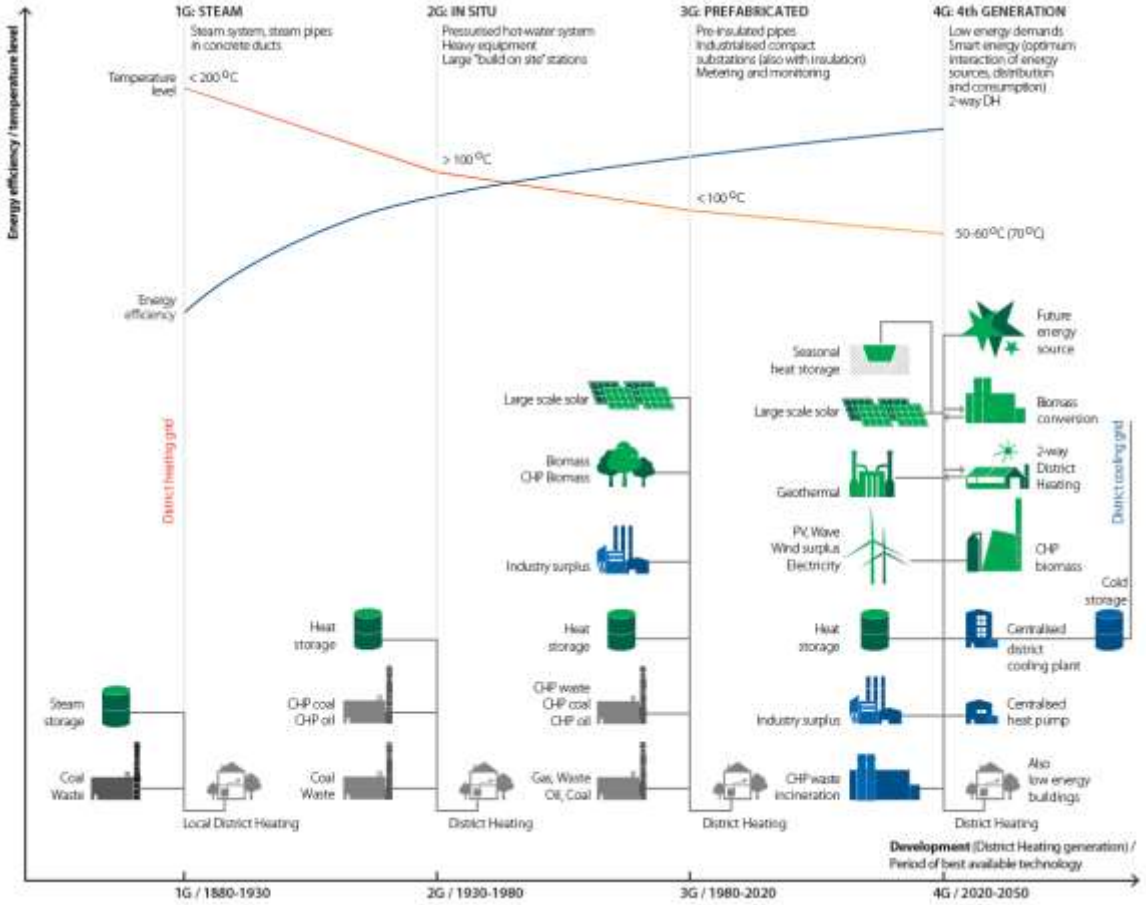
Brampton Simulation
Summary

- Simulation facilitates robust community discussion of measures and outcomes
- Informed by analysis not opinions
- Identified pathway to meet Community and Federal Targets
- Credible trajectory to “Net Zero” Emissions
- Represents complete transformation of energy use and supply for City
- Prerequisite to develop meaningful Final Community Energy Plan

But now the dog begins to wag the tail ...

Sheridan needs to find the appropriate response to take its strategic energy and carbon planning to the next level



Aalborg University, Denmark

Sheridan’s 2050 Plan

- Building retrofits for low-temperature heating networks
- New buildings to passivhaus envelope standards with hydronic
- Interconnection of thermal networks with the community
- Thermal storage
- Waste heat recovery
- Low-carbon thermal energy supply
- Renewable electric and thermal energy supply
- Flexible, optimized controls

Sheridan’s 2050 Plan

- Transportation
- Integration of natural heritage system to built form and infrastructure
- Restoring and enhancing biodiversity
- Reduction of unsustainable materials
- Zero waste to landfill
- Water resource conservation

Policy Driven | Policy Compliant | Self-Directed | Policy Driver

Incremental | Stretch | Breakthrough | Transformational

Reactive | Managing | Proactive | Revolutionary

Thank You!

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