

The background of the slide is an aerial photograph of a vast agricultural field, likely a cornfield, with rows of crops stretching towards the horizon. In the lower right foreground, there is a white, conical structure, possibly a grain elevator or a silo, partially obscured by the text.

# **MECH and ASSOCIATES Corporation**

**Greenhouse Gas Neutral  
Environmental Engineering**

**TOOLS AND RESOURCES FOR ASSESSING DISTRICT ENERGY  
OPPORTUNITIES**

**By Andre Mech PEng, MBA, CMVP**

**Monday March 31<sup>st</sup> 2014**

# Agenda

15 minutes plus 5 minutes for questions (fast)

Short History - Andre Mech - MECH and ASSOCIATES Corp

Why use RETScreen?

Fort McMurray, Regional Municipality of Wood Buffalo Project

Application of RETScreen

Results

Questions

# Short History MnAC

- Business Areas – 12 years
  - Energy Conservation Projects GHG Projects
    - » Europe and North America
      - Transportation
      - Combined Heat and Power Biomass
      - Commercial and Institutional Buildings
  - RETScreen Analysis
    - » Europe, North America
      - Fort McMurray – 3 Projects

# RETScreen Analysis

## District Energy Opportunities

Why RETScreen?

What problem does RETScreen solve?

# RETScreen Analysis District Energy Opportunities

Elected Officials ↔ Engineering Professionals

Speak Different Languages



# RETScreen Analysis

## District Energy Opportunities

Why Use RETScreen?

RETScreen jumps the communication gap.

What problem does RETScreen solve?

RETScreen allows Engineering Professionals to address objectives set by Municipal Decision Makers and present solutions in a manner that is understood by all.

**It reduces risk and reduces the fear of proceeding.**

# RETScreen Analysis for Municipalities

The screenshot shows the RETScreen software interface with several analysis stages highlighted by white arrows and text labels. The stages and their associated professional roles are as follows:

- Start** - Municipal
- Load and Network** - Engineering Professionals
- Energy Model** - Engineering Professionals
- Cost Analysis** - Engineering Professionals
- Emissions Analysis** - Engineering Professionals
- Financial Analysis** - Municipal/Engineering Professionals
- Risk Analysis** - Municipal/Engineering Professionals
- Tools** - Engineering Professionals

The software interface includes a sidebar on the left with categories like 'Proposed case energy efficiency', 'Proposed case energy efficiency measures', and 'Proposed case heating network'. The main window displays a table with columns for 'GJ', '\$/GJ', and '\$'. The bottom of the screen shows a Windows taskbar with various application icons.

# RETScreen Analysis

## District Energy Opportunities

- Start
  - Municipality sets the Objective(s)
    - District Heating System
    - Combined Heating/Cooling and Power System
    - Lower Costs
    - Reduced GHGs
  - Questions to be answered
    - Does this make sense?
    - Has something like this been done elsewhere?

# RETScreen Analysis

## District Energy Opportunities

- Load and Network
  - Gather Information from existing sources
    - Studies
    - Municipal Planning Departments
  - Determine what information is hard set
  - Layout
    - Map Review
    - Ground Level Review
    - Areal Review

# RETScreen Analysis

## District Energy Opportunities

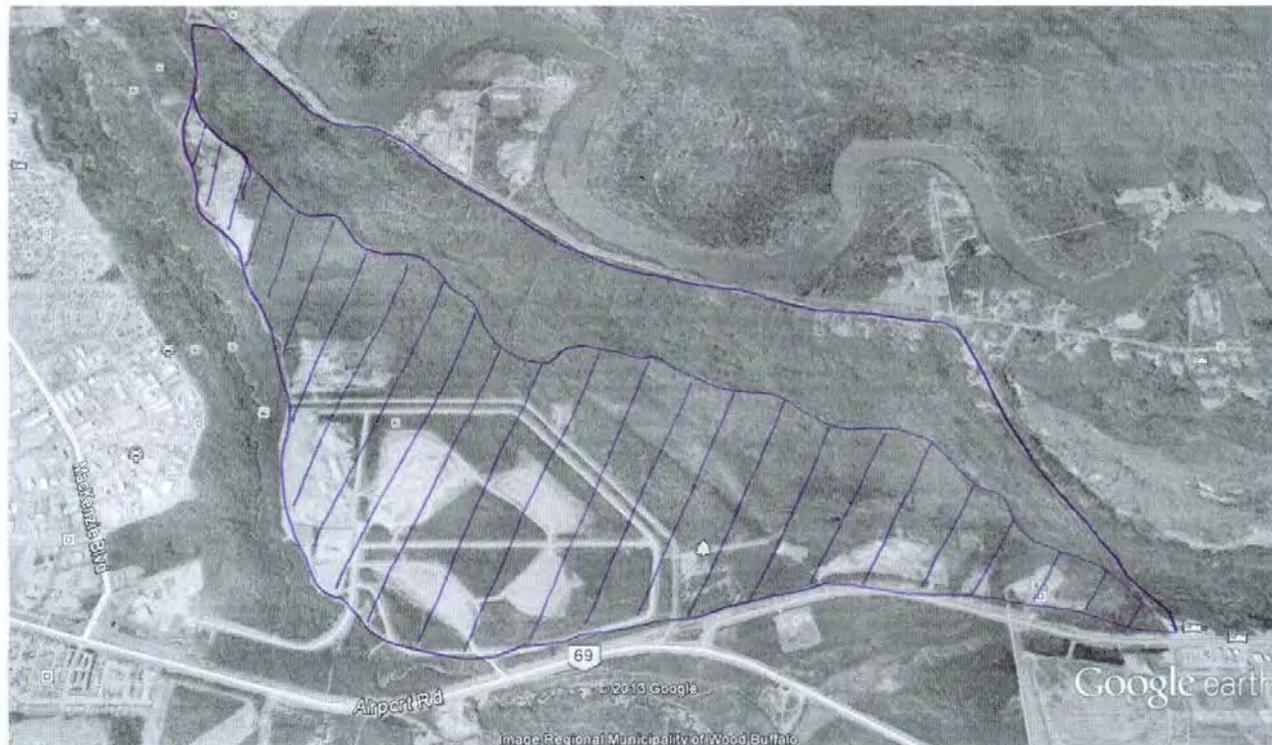


Google earth



# RETScreen Analysis

## District Energy Opportunities



Google earth



# RETScreen Analysis

## District Energy Opportunities



Google earth

miles 1  
km 2



# RETScreen Analysis

## District Energy Opportunities



# RETScreen Analysis

## District Energy Opportunities



# RETScreen Analysis

## District Energy Opportunities



# RETScreen Analysis

## District Energy Opportunities



# RETScreen Analysis District Energy Opportunities

RETScreen - Microsoft Excel - commercial use

RETScreen Load & Network Design - Combined heating & cooling project

Heating project Unit

Basic case heating system Multiple buildings - space heating

Building clusters

	1	2	3	4	5	6	7	8	9	10	11	12			
Heated floor area per building cluster	23,250	28,800	91,500	91,500	91,500	91,500	91,500	91,500	91,500	91,500	91,500	91,500			
Number of buildings in building cluster	2	2	500	500	500	500	500	450	450	400	250	250			
Floor type	Natural gas - GJ	Natural gas - GJ	Natural gas - GJ	Natural gas - GJ	Natural gas - GJ	Natural gas - GJ	Natural gas - GJ	Natural gas - GJ	Natural gas - GJ						
Seasonal efficiency	70%	70%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%			
Heating load calculation															
Heating load for building cluster	83	83	83	83	83	83	83	83	83	83	83	83			
Domestic hot water heating base demand															
Total heating	4,704	5,261	18,513	18,513	18,513	18,513	18,513	18,513	18,513	18,513	18,513	18,513			
Total peak heating load	1,930	2,158	7,595	7,595	7,595	7,595	7,595	7,595	7,595	7,595	7,595	7,595			
Fuel consumption - unit	GJ	GJ	GJ	GJ	GJ	GJ	GJ	GJ	GJ	GJ	GJ	GJ			
Fuel consumption - annual	24,993	27,054	74,053	74,053	74,053	74,053	74,053	74,053	74,053	74,053	74,053	74,053			
Fuel rate - unit	\$/GJ	\$/GJ	\$/GJ	\$/GJ	\$/GJ	\$/GJ	\$/GJ	\$/GJ	\$/GJ	\$/GJ	\$/GJ	\$/GJ			
Fuel rate	10,500	10,500	10,500	10,500	10,500	10,500	10,500	10,500	10,500	10,500	10,500	10,500			
Fuel cost	\$ 254,026	\$ 284,072	\$ 777,556	\$ 777,556	\$ 777,556	\$ 777,556	\$ 777,556	\$ 777,556	\$ 777,556	\$ 777,556	\$ 777,556	\$ 777,556			
Proposed case energy efficiency measures															
End-use energy efficiency measures	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%			
Net peak heating load	1,930	2,158	7,595	7,595	7,595	7,595	7,595	7,595	7,595	7,595	7,595	7,595			
Net heating	4,704	5,261	18,513	18,513	18,513	18,513	18,513	18,513	18,513	18,513	18,513	18,513			
Design supply temperature	C	80													
Design return temperature	C	60													
Differential temperature	C	20													
Section	Load kW	Length m	Pipe size mm	Is the building cluster supplied by this pipe section? (yes/no)											
				1	2	3	4	5	6	7	8	9	10	11	12
Section 1	10,032.8	4,000	DN 600	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Section 2															
Section 3															
Section 4															
Section 5															
Section 6															
Section 7															
Section 8															

# RETScreen Analysis

## District Energy Opportunities

- Energy Model
  - Design the system to address the Objective
    - District Heating Equipment
    - Combined Heating and Power Equipment
  - Check it against publicly available information
  - Cost Estimates
    - Prices
      - Per metre of pipe
      - Electricity
      - Heat
      - Equipment
      - Etc.

# RETScreen Analysis

## District Energy Opportunities

- Cost Analysis
  - Does it make sense?
  - Is it reasonable?
- Emission Analysis
  - Does it meet objectives?
  - Is it reasonable?
- Redesign the System to meet objectives
- Redesign it again

# RETScreen Analysis

## District Energy Opportunities

- Financial Analysis
  - Interest rates
  - Growth rates
  - Costs from
    - building the system
    - maintaining the system
  - Income from
    - sale of Electricity
    - sale of Offsets
    - sale of Heat
- Risk Analysis
  - Interest, fuel, electrical rates etc.
    - Increases
    - Decreases
  - Determine exposure

# RETScreen Analysis District Energy Opportunities

Elected Officials ↔ Engineering Professionals

Have the same information



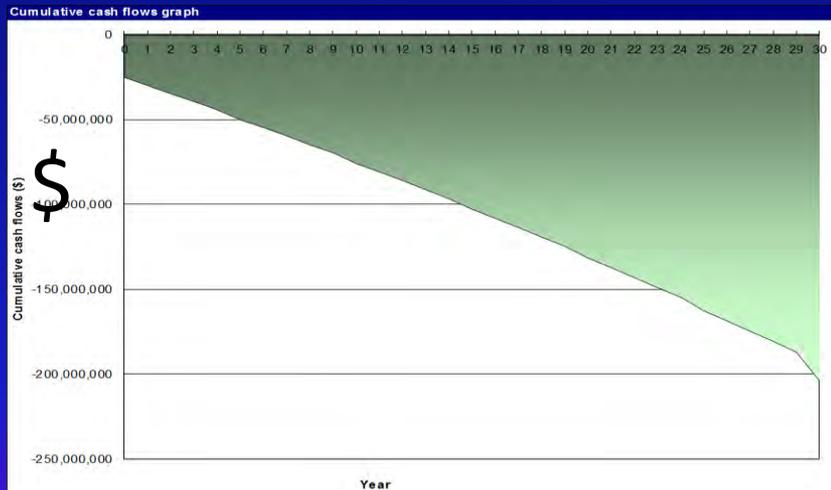
# RETScreen Analysis

## District Energy Opportunities

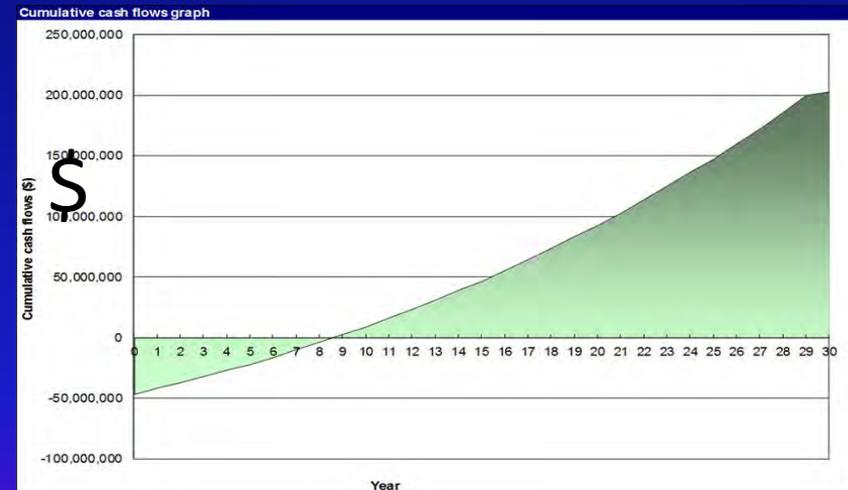
### Financial Analysis At a Glance

#### Heat Only

#### Combined Heat and Power



High Cost



No Cost

# RETScreen Analysis

## District Energy Opportunities

- With this information questions change from:
  - Can we do this?  
To
  - How can we bring break even point forward?
  - How can we minimize up front costs?

# RETScreen Analysis

## District Energy Opportunities

- At a Glance from the Financial Analysis
  - Municipal Decision Makers can see
    - Heat alone is not so good.
    - Combined Heat and Power is good!
  - Risks are understood.
- Decisions can be made with
  - **less risk and lower fear**
  - **using understandable information.**

# RETScreen Analysis

## District Energy Opportunities

- RETScreen can also be used for small projects such as this Combined Heat and Power Unit.



# RETScreen Analysis

## District Energy Opportunities

QUESTIONS

Andre Mech

Principal

MECH and ASSOCIATES Corporation

[andre.mech@sympatico.ca](mailto:andre.mech@sympatico.ca)

416.427.7616