

The background of the slide is an aerial photograph of a green field with a white wind turbine. The turbine is positioned in the lower right quadrant of the image, and its blades are visible. The field is a mix of green and brown, suggesting a natural or agricultural setting.

# **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.

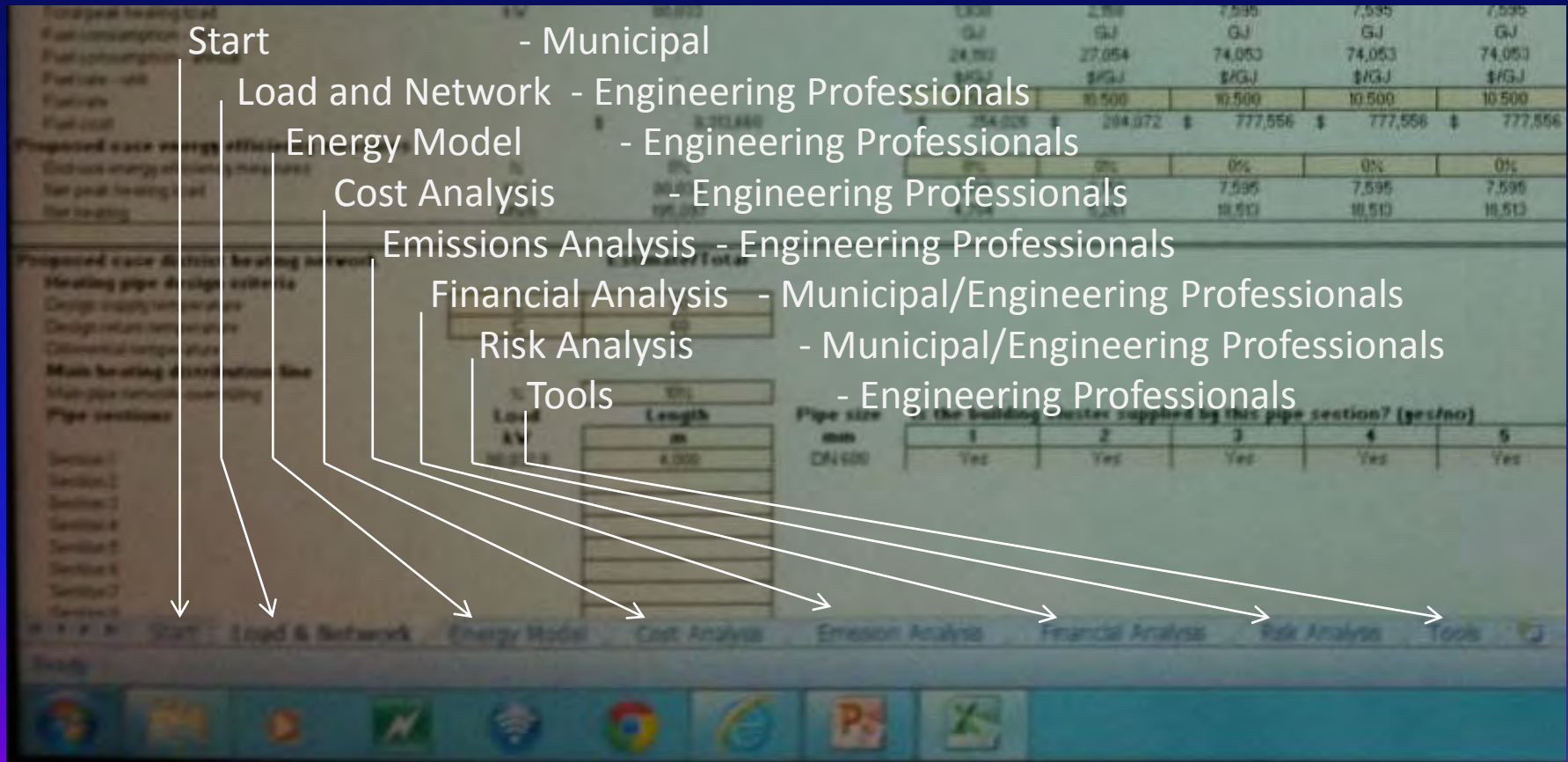
What problem does RETScreen solve?

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 displays the RETScreen software interface, which is used for energy and financial analysis. The interface is divided into several sections, each corresponding to a step in the analysis process. White arrows point from text labels to the respective sections in the software. The labels and their corresponding sections are as follows:

- Start** - Points to the **Start** section.
- Municipal** - Points to the **Start** section.
- Load and Network** - Points to the **Load & Network** section.
- Engineering Professionals** - Points to the **Load & Network** section.
- Energy Model** - Points to the **Energy Model** section.
- Engineering Professionals** - Points to the **Energy Model** section.
- Cost Analysis** - Points to the **Cost Analysis** section.
- Engineering Professionals** - Points to the **Cost Analysis** section.
- Emissions Analysis** - Points to the **Emission Analysis** section.
- Engineering Professionals** - Points to the **Emission Analysis** section.
- Financial Analysis** - Points to the **Financial Analysis** section.
- Municipal/Engineering Professionals** - Points to the **Financial Analysis** section.
- Risk Analysis** - Points to the **Risk Analysis** section.
- Municipal/Engineering Professionals** - Points to the **Risk Analysis** section.
- Tools** - Points to the **Tools** section.
- Engineering Professionals** - Points to the **Tools** section.

The software interface shows various input fields and tables. The **Start** section includes fields for **Building heating fuel**, **Fuel consumption**, **Fuel conversion factor**, **Fuel cost**, and **Proposed case energy efficiency**. The **Load & Network** section includes fields for **Heating pipe design criteria**, **Design supply temperature**, **Design return temperature**, **Differential temperature**, **Main heating distribution line**, **Main pipe network overlying**, and **Pipe sections**. The **Energy Model** section includes fields for **Load** and **Length**. The **Cost Analysis** section includes fields for **Cost** and **Length**. The **Emission Analysis** section includes fields for **Emission factor** and **Length**. The **Financial Analysis** section includes fields for **Interest rate** and **Length**. The **Risk Analysis** section includes fields for **Risk factor** and **Length**. The **Tools** section includes fields for **Tool** and **Length**.

# 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



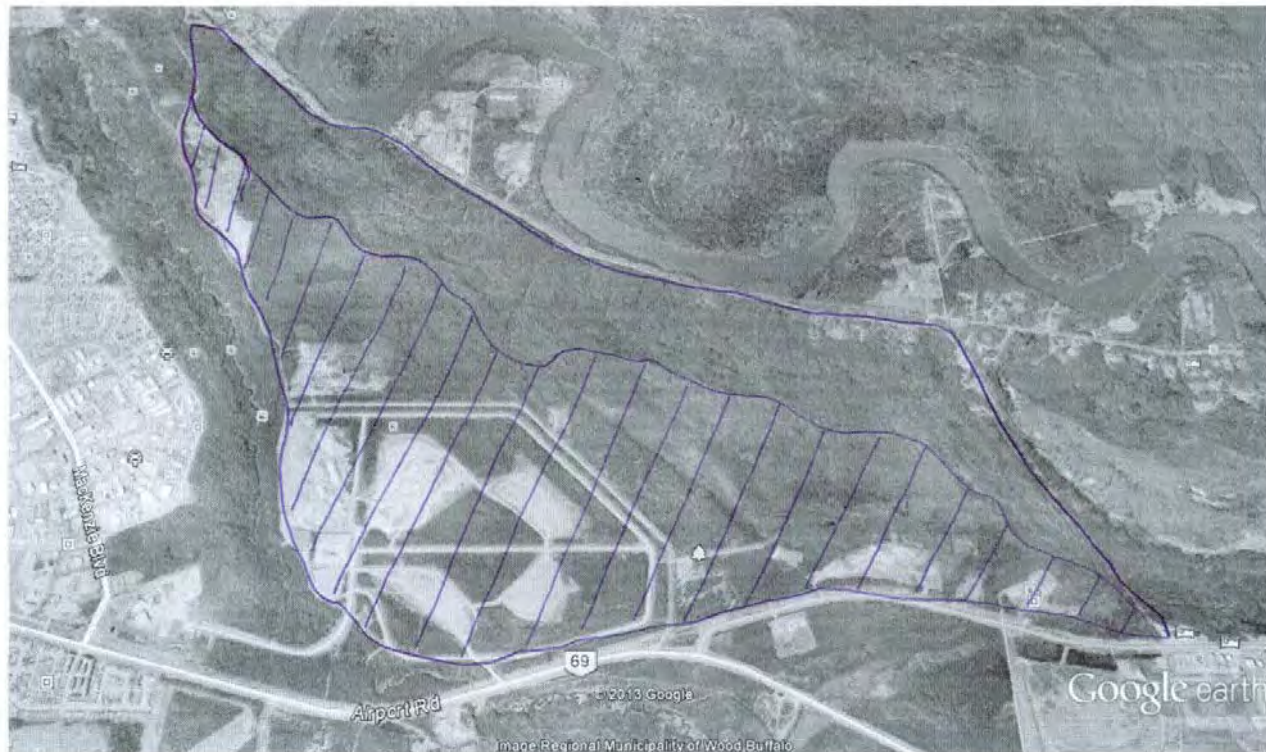
Google earth

miles 1  
km 2



# RETScreen Analysis

## District Energy Opportunities



Google earth

miles  
km





# 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 non-commercial use

File Home Insert Page Layout Formulas Data Review View PDF Acrobat RETScreen

Clipboard Font Alignment Number Styles Cells Editing Privacy

RETScreen Load & Network Design - Combined heating & cooling project

Heating project Unit

Base case heating system Multiple buildings - space heating

Heated floor area per building cluster 964,350 m<sup>2</sup>

Number of buildings in building cluster 4,405

Building clusters

	1	2	3	4	5	6	7	8	9	10	11	12
Heated floor area per building cluster	23,250	28,000	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	450	450	400	400	350	350
Natural gas - GJ	70%	70%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Total heating	83	83	83	83	83	83	83	83	83	83	83	83
Total peak heating load	4,704	5,261	18,513	18,513	18,513	18,513	18,513	18,513	18,513	18,513	18,513	18,513
Fuel consumption - unit	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 - annual	24,393	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	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
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

Proposed case energy efficiency measures

End-use energy efficiency measures

Net peak heating load

Net heating

Proposed case district heating network

Heating pipe design criteria

	C	Estimate/Total
Design supply temperature	80	
Design return temperature	60	
Differential temperature	20	

Main heating distribution line

Pipe section

	Load kW	Length m	Pipe size mm	Is the building cluster supplied by this pipe section? (yes/no)
Section 1	10,032.8	4,000	DN 600	Yes
Section 2				Yes
Section 3				Yes
Section 4				Yes
Section 5				Yes
Section 6				Yes
Section 7				Yes
Section 8				Yes
Section 9				Yes
Section 10				Yes
Section 11				Yes
Section 12				Yes

Ready

Start Load & Network Energy Model Cost Analysis Emission Analysis Financial Analysis Risk Analysis Tools

21:54 AM 24/03/2014

# 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



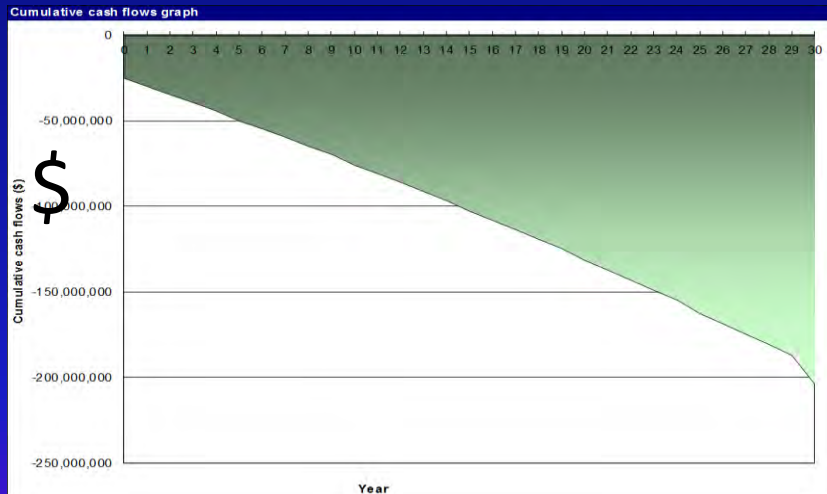
# RETScreen Analysis

## District Energy Opportunities

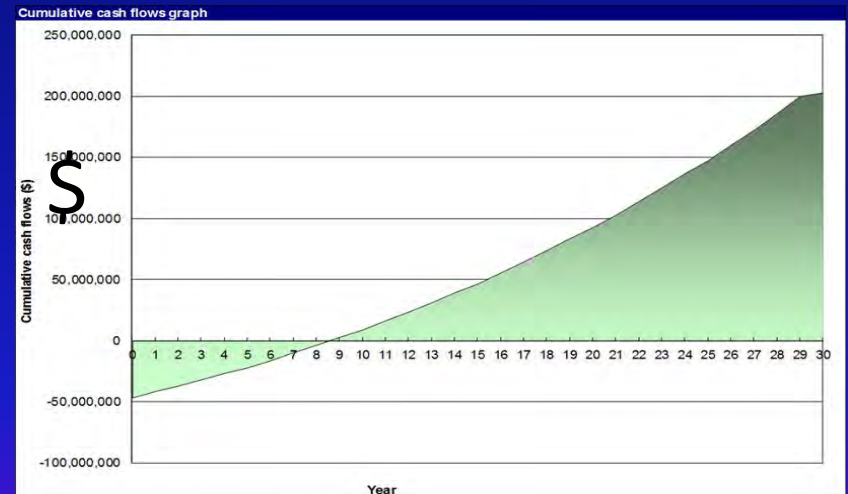
Financial Analysis At a Glance

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

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