
Prairie Vista Estates Subdivision
District Energy System
TOWN OF VULCAN
ALBERTA

Summary

- Vulcan has achieved a unique success in obtaining FCM, AB BioFuel and NRCan Solar funding support
- The project has received very strong “support of concept” through reviews by at least three peer review panels
- Financial challenges remain
 - They can be mitigated through
 - Recovery of costs through housing lot sales
 - Efficient design of the district heating network
 - Thermal plant construction expansion that matches energy demand
 - Control of construction costs
 - Capture of institutional and commercial users for thermal energy
 - Participation in district heating segment of “AB Natural Gas Rebate”
 - Creating home owner and business appeal through participation in the most exciting renewable energy subdivision in Alberta and Canada

Information required is now available

- Government application results have been received
 - FCM
 - Loan of \$ 2 million, prime less 1%
 - Grant of approx \$ 200,000
 - Alberta BioFuels
 - Grant of approximately \$ 414,000
 - NRCan Solar Program – Solar energy panel installation
 - Grant of approximately \$ 430,800
 - Canada Alberta Municipal Rural Infrastructure Fund
 - The Vulcan project did not qualify for support

- Initial communications with key customers is positive
 - Hospital (CRHA) may be a thermal energy customer
 - Tri-services, RCMP is interested
 - Industrial clients

- Utility construction for Prairie Vista Estates Subdivision is a critical milestone ?
 - Defining the timing of utility installation will drive other critical dates

Ownership Options

- Option 1
 - 100% ownership & operation by Town
 - Hospital, Tri-Service and other commercial customers are critical to run an economic utility
 - Lot prices will be a required part of the financing
 - Option 2
 - Shared ownership with utility (possible 20 year term & revert to Town)
 - Option 3
 - Split in facility ownership
 - Third party owns plant & sells energy to the Town
 - Utility runs thermal plant
 - Cdn Solar panel companies have asked to make a proposal to the Town
 - Town owns district pipe and manages retail sale of thermal energy
 - Option 4
 - Full ownership by a utility
 - contractual agreement between Utility and residents and businesses in Town
 - Utility has rights to sell energy to industrial customers
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Revised Deployment Plan

- Year 1. – Planning, Design, Partners and Approvals
 - Optimized plan partially compensates for lack of infrastructure grant
 - CHRA (hospital) and Tri-Services pay for their connection pipe to thermal plant
 - Locate central plant close to Prairie Vista Estates to achieve lowest cost pipe design
 - Apply to Alberta Energy for “Natural Gas Rebate” qualification
 - Construct access roads
 - Preliminary contours and road plan
- Year 2: – Focus on district energy operation
 - Install district pipe in initial phase of Prairie Vista Estates construction
 - first plant is a skid mounted temporary natural gas boiler plant
- Year 3: – Addition of wood biomass operation
 - Possible Partnership with Southern Alberta Waste to Energy Alliance
 - Construct wood biomass thermal plant
 - Natural gas boilers deployed to meet peak demand
 - Connect additional district heat customers, residential & commercial
- Years 4 & 5:– Addition of solar collectors
 - Construct solar collectors and integrate to wood biomass operation.
 - Connect full subdivision and commercial customers.

Key Milestones to implement First District Heat

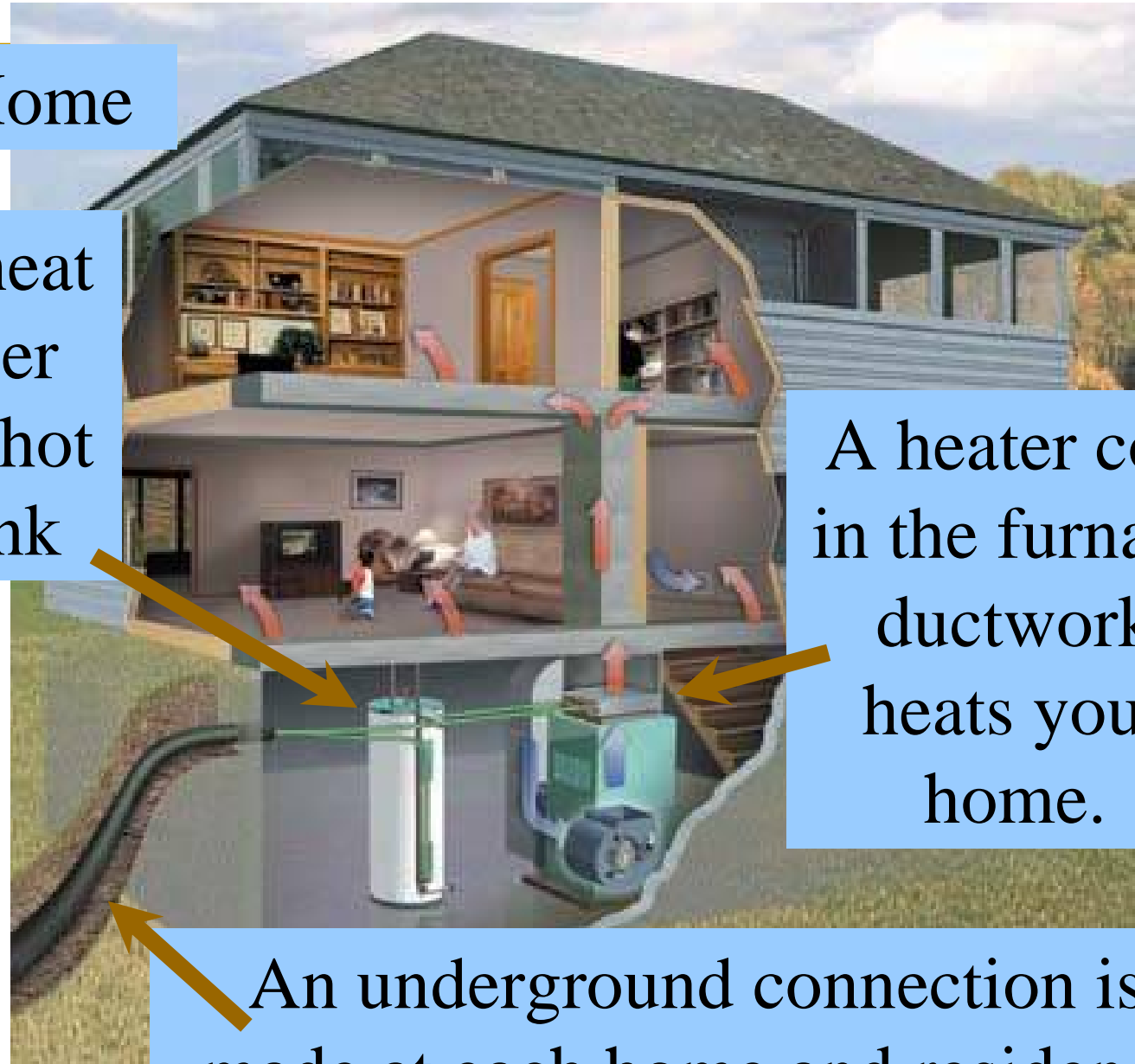
- ❑ Design district pipe network based on subdivision layout
- ❑ Details of home connections
- ❑ Home heating and hot water appliance guidelines to ensure all units are capable of using district heat
- ❑ Call for bids on key materials for District Energy
 - Skid mounted temporary natural gas thermal plant
 - District heating pipe
 - Home connection components, (heat exchangers, valves)
- ❑ Utility installation
- ❑ Connection to homes

Typical Home

A small heat exchanger heats the hot water tank

A heater coil in the furnace ductwork heats your home.

An underground connection is made at each home and residence



Full Build-out to District Heating

- Year 1
 - Full scale thermal plant
 - Optimize investment by choosing balance between serving
 - base heating with biomass
 - peak load with natural gas

- Year 2
 - Addition of solar collectors to thermal plant
 - size to meet 80 to 100% of summer demand

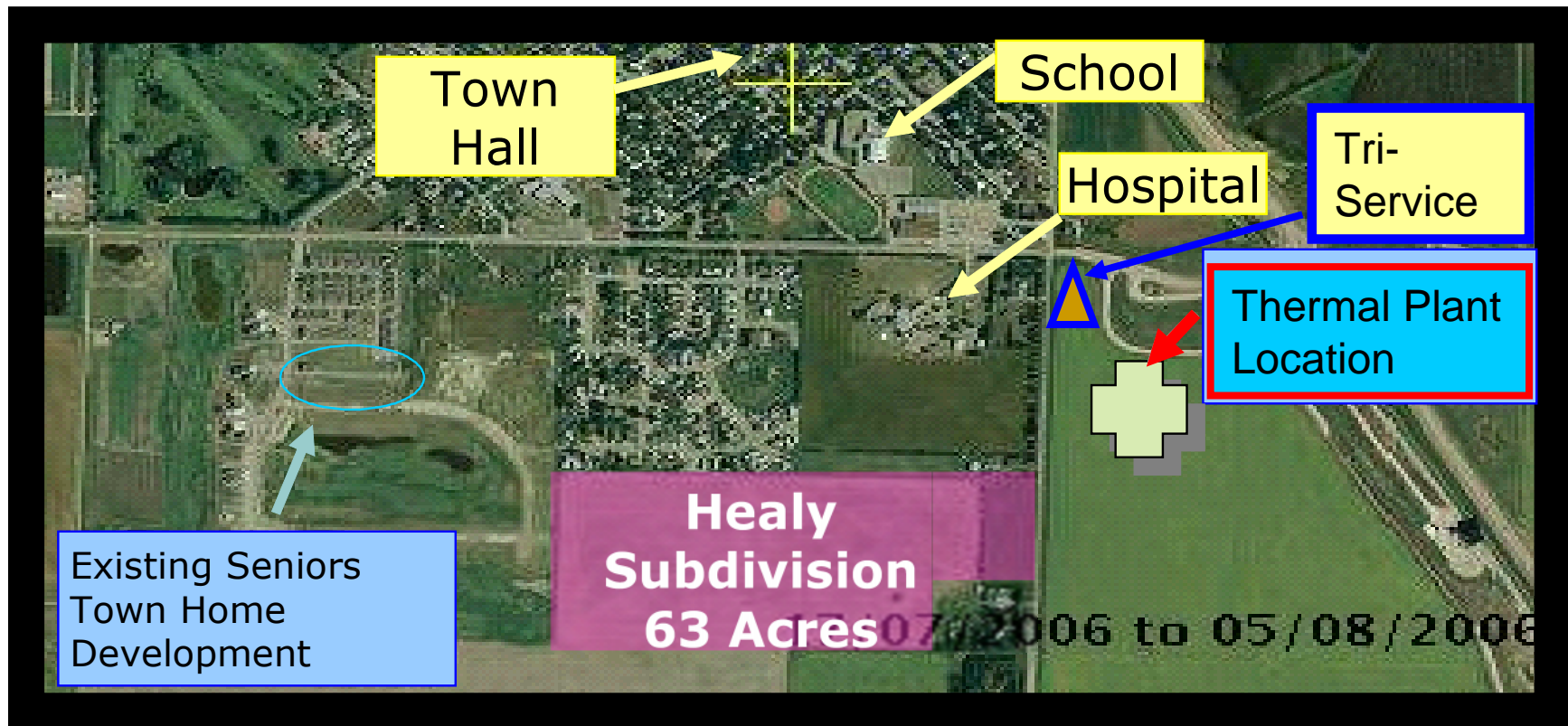
- Year 3
 - Application of district heating to full subdivision and commercial customers

Stakeholder discussions

- Negotiation with possible commercial customers
- Cost estimates of key components
 - district energy pipe
 - thermal plant
- Integration of urban design, engineering and builders
 - Liaison with Vulcan County
 - Engineer Municipal Design
 - Thermal plant design
 - District Heating pipe design
 - Clarification that system will use minimal water
 - Home builders
 - Apartment builders
- Thermal energy utility
 - Application to Alberta Energy to qualify under “Natural Gas Rebate”
 - Possible Partnership with Southern Alberta Waste To Energy Alliance
 - Negotiation and contract with biomass suppliers

Location of Prairie Vista Estates

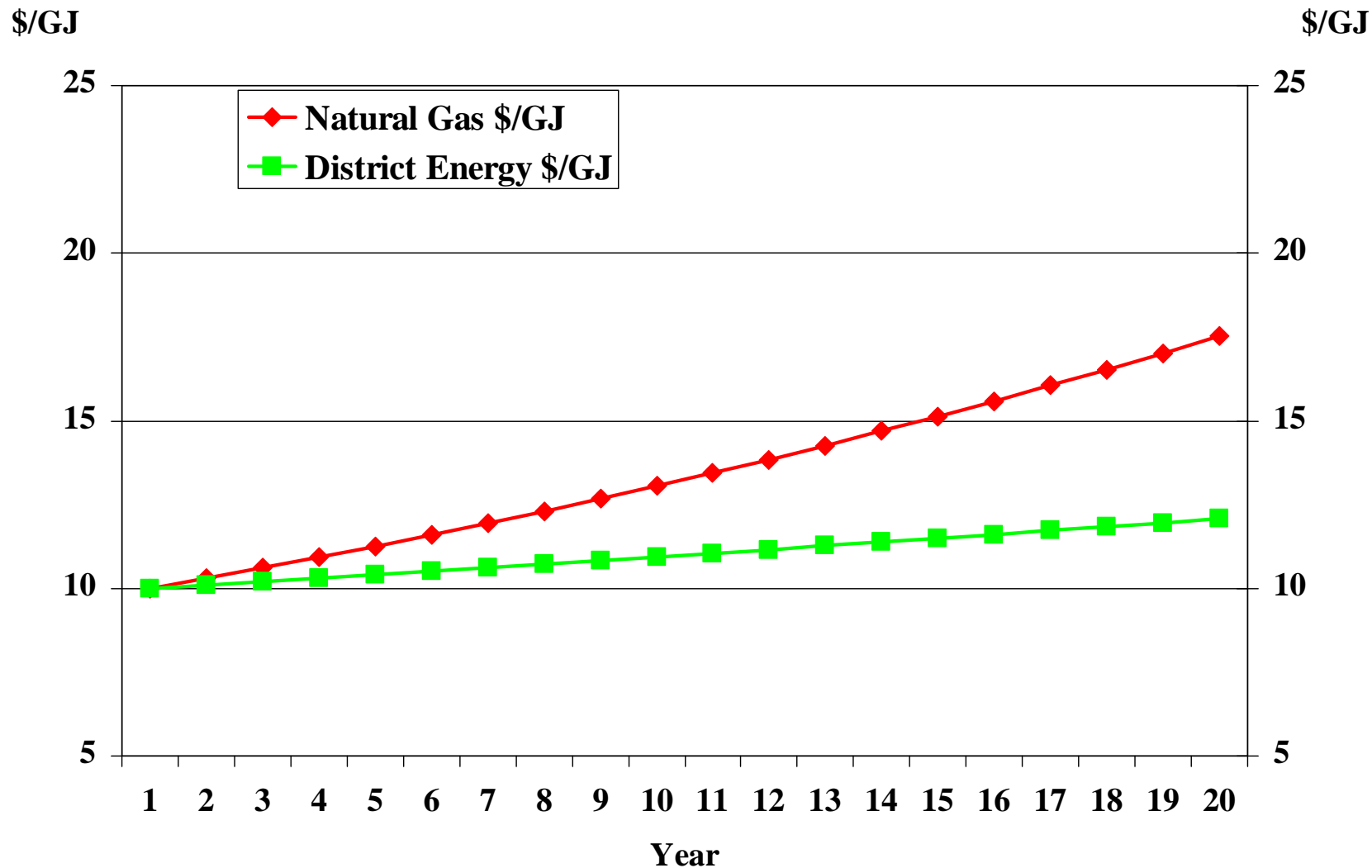
- Proximity to hospital and tri-service will allow connection to commercial customers
- Access from service road will reduce interaction of biomass trucking and residential traffic



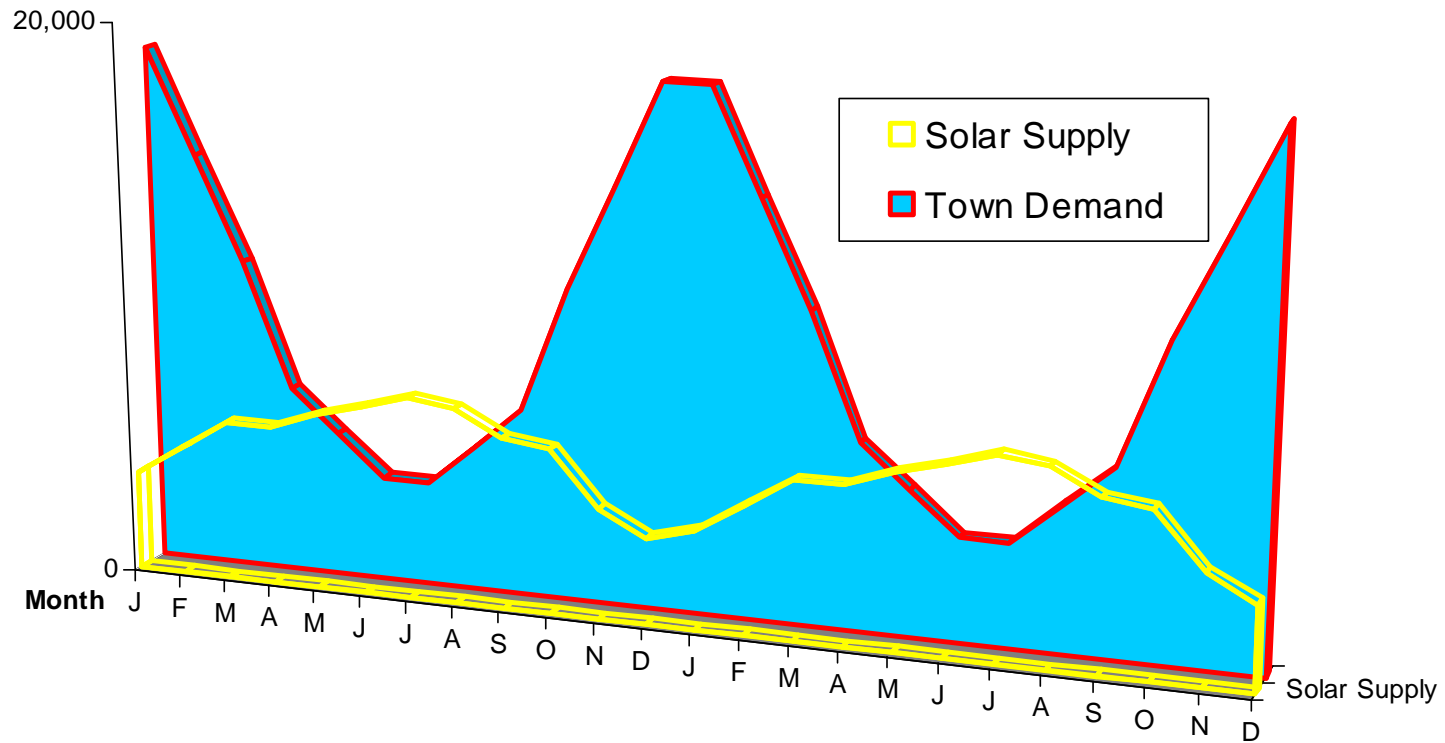
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Consumers are protected from rising natural gas prices



Conceptual Energy Model for the Town of Vulcan



Capital spending estimate (dates may be deferred by one year)

■ Annual Distribution of Capital Spending

□ Year 1

■ Thermal housing, skid structure	50,000	
■ District heating monitoring and pumping equipment	200,000	
■ Two Natural gas boilers	86,000	
■ District Heating Pipe, 80 homes, 1.5 km	<u>900,000</u>	
	1,236,000	16%

□ Year 2

■ Permanent thermal plant	1,215,000	
■ Wood biomass, four boilers at 1.25 MW each	1,610,000	
■ District heating monitoring and pumping equipment	203,000	
■ Biomass handling bins and automated feed	345,000	
■ District Heating Pipe	<u>900,000</u>	
	4,273,000	57%

□ Year 3

■ Solar collectors, 2,500 m2 at \$300/m2,	863,000	
■ Thermal storage	460,000	
■ District Heating Pipe	<u>730,000</u>	
	2,053,000	27%

■ Total for all years

■ Year 1 to Year 3		\$7,562,000	100%
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Potential to meet capital with district energy supplemental

	<u>Option 1</u>		<u>Option 2</u>
■ 150 individual lots			
□ \$ 20,000 per lot	\$ 3,000,000	\$10,000 / lot	\$ 1,500,000
■ 150 apartment units			
□ \$ 10,000 per lot	<u>\$ 1,500,000</u>	\$10,000 / lot	<u>\$ 1,500,000</u>
■ Total			
□ Combined	\$ 4,500,000		\$ 3,000,000
■ Capital requirement	<u>Option 1</u>		<u>Option 2</u>
□ Capital investment	\$ 7,600,000		\$ 7,600,000
□ Lot revenue	(4,500,000)		(3,000,000)
□ Grants	(1,044,800)		(1,044,800)
□ Loan requirement	\$ 2,055,200		\$3,555,200

Simplified Cash flow (300 units & commercial)

■ Revenue, (94,500 GJ at \$12 per GJ)		
□ Residential	\$	540,000
□ Commercial (Tri-services & Hospital)		<u>594,000</u>
□ Combined		1,134,000
■ Expenses (94,500 GJ / 0.85 losses at \$4.00 per GJ)		
□ Purchase biomass energy	\$	444,706
□ Operating costs		<u>200,000</u>
□ Total		644,706
■ Cash flow to service debt		
□ Revenue less Expenses	\$	489,294
■ Annual loan payment, if \$2,215,700 borrowed		
□ FCM \$ 2,000,000, 4% rate, 25 yr		127,292
□ ACFA \$ 55,200, 5% rate, 25 yr		<u>3,892</u>
	\$	131,184 / year

Revenue:	Residential = 150 GJ/home/year * 300 units * \$12 /GJ	= \$540,000
	Commercial = 150 GJ/home/year * 330 eqiv. units * \$12/GJ	= \$594,000

Fuel Supply Options:

- Possible Partnership with Southern Alberta Waste to Energy Alliance
 - Local wood waste supply
 - Vulcan County Waste Commission
 - first source if available in sorted, may require processing
 - Crowsnest Pass & Sundre Region
 - Wood processing plants on eastern slopes of Rockies are the nearest large scale producers of wood biomass
 - Municipal wood waste
 - Contract supply with companies currently extracting wood biomass fuel from Edmonton and Calgary landfill sites
 - Pacific Bio-Energy Corporation
 - Wood pellets from Pacific Bio-Energy
 - shipped via rail, approximately \$9.00 per GJ including shipping to Vulcan
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