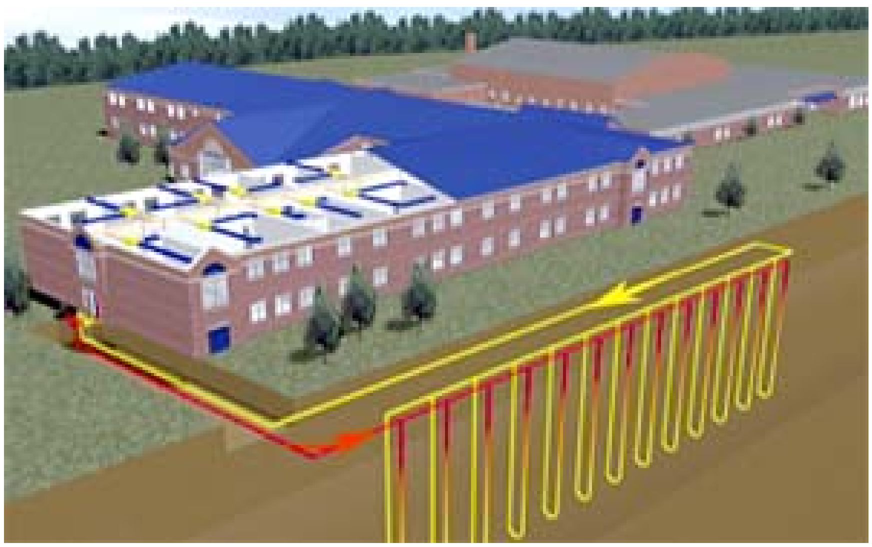
Business Plan

FUNDING THE INSTALLATION OF GEOTHERMAL HEATING ON UBC RESIDENTIAL DEVELOPMENTS



With special thanks to Helen Goodland of GVRD, who helped us when we were struggling with the concept, and the UBC SEEDS office for the opportunity and much support.

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Executive Summary

There is ample evidence of the need to incorporate sustainable technologies into new housing developments, and of the consumer's willingness to pay for this technology. From the point of view of developers, however, the increased risks and up-front costs to them of incorporating such technologies means that little progress has been made on this front.

The University of British Columbia ("UBC") is currently considering plans for further development of residential units. This development provides an excellent opportunity to incorporate sustainable technologies, provided that the concerns of the developer can be addressed. This business plan sets out a methodology for converting the up-front cost to developers into an asset that is attractive to investors. We propose to implement one sustainable technology, geothermal energy, for heating the residential units.

The basis of this business plan is an Alternative Energy Trust (the "Energy Trust"), which will bring together the developer, householders, and investors to demonstrate a viable business model for incorporating sustainable technology in new housing developments.

The Energy Trust will issue units ("energy investment certificates" or "EICs") to appeal to socially responsible investors. Fubnds from that issuance will be used to construct a geothermal system to serve householders, with additional investment being sought to install additional infrastructure as the development increases in size. The revenue to fund operations and returns to investors will be generated from fees, for the supply of heat, paid by householders.

The target development will be an initial 1,000 residential units to be constructed through 2010 as part of the UBC Development. Use of geothermal energy for heating is expected to reduce total energy consumption from 20.8 GWH[i] per year to a 15.4 GWH per year, resulting in an annual reduction in electricity consumption equivalent to $282,000.

A secondary role of the Energy Trust will be to evaluate new technologies and to determine if opportunities exist for utilizing such technologies to supply electricity (in addition to heat) to the householders, using a model similar to that used for the supply of geothermal-generated heat. If the Energy Trust is not successful in identifying such opportunities, it will continue in existence to maintain and renew the geothermal system in the long term.

A trust structure has been identified as the optimal method of pursuing this opportunity to balance the interests of the various stakeholders, to ensure that the aims of the project continue to be carried forward in the long term independently of the interests of any one stakeholder, and to manage the exposure of the project in the long term to income tax. The Energy Trust will be established with three trustees – one elected by the investor group, one elected by UBC and one elected by the householders – to further emphasize the balance between the different interest groups. The trustees will oversee management of the operations of the Energy Trust, but day-to-day operations will be undertaken by employees of the Energy Trust or by contractors.

In the short term, the Energy Trust will raise significant cash for use in constructing the geothermal system. It is not expected to generate positive cash-flow in the short term. The Energy Trust will, however, begin to accumulate significant cash balances once the UBC development is completed, since it will no longer be funding significant capital expenditures. Within the constraints of meeting the required returns to investors, the trustees will be empowered to reduce the cost of heat to householders, or to fund additional sustainable technology development.

This is not a business plan for a for-profit business, and, as such, does not address in detail issues such as developing a sustainable competitive advantage or earning a return in excess of a normal return (rents). Instead, it is written to show that the Energy Trust is a viable financial entity that can be marketed to developers, investors, and to householders, who each have an interest in encouraging the development of renewable energy opportunities while also aiming to minimize their own financial risks.

Introduction

The Energy Trust is in a single line of business, being the provider of an alternative energy system, namely geothermal energy, to consumers. Although geothermal systems are commercial available, these units are not commonly installed in residential developments due to various barriers in the existing marketplace. The Energy Trust endeavours to overcome these barriers by providing a service that aligns the needs of the developers, investors, and householders. Marketing strategy for the energy trust will be tailored to the three parties: encouraging participation by developers and investors, while leveraging householders' willingness to adopt the new technology.

It is our intention to showcase the Energy Trust as part of UBC's residential developments, with the initial phase being the mid-campus development. By highlighting a business approach towards sustainable residential development, the Energy Trust will validate a model that can be imitated on a global scale. The Energy Trust at UBC will itself serve as a marketing tool for the University as it aspires to be a world leader in global sustainability.

The Opportunity

Huge fluctuations in the price of oil[ii], international dependency on fossil fuels, the Kyoto protocol[iii], and ongoing urban growth have all contributed to the wide recognition of the need to develop sustainable technologies.[iv] However, the role of the construction sector is often ignored or underestimated when considering how to develop and promote these technologies.[v] The sizable up-front capital cost of installing sustainable technologies in residential developments is viewed by developers as a sunk cost since they do not realise any of the long term benefits and do not believe that they can monetise that capital cost. Those up-front capital costs are, therefore, often a major deterrent to the adoption of these technologies, in spite of their overall lower life-cycle cost. Concerned with maximizing profits, developers, to date, have been unwilling to alter their traditional approach towards residential developments. This reluctance has resulted, for example in a housing market awash with electric baseboard heaters, despite their relative energy inefficiency.

Investors

The traditional barriers presented by the developers can be overcome by having the Energy Trust seek out investors who are interested in socially responsible investments. There is a significant pool of investors in the market who are more interested in socially responsible investments than in earning maximum returns[vi].

It appears that the demand for socially responsible investments greatly exceeds supply. The Social Investment Forum estimates that over $2 trillion of invested U.S. assets are invested through some type of environmental or social screen.[vii] Finding investors who are interested in a stable, socially responsible investment should not be difficult.

The Energy Trust allows investors an opportunity to invest in an entity that will promote sustainable energy use while earning a normal return and minimizing risk. The investors' capital allows the Energy Trust to create an asset, the geothermal system, providing householders with a sustainable energy source and generating returns for the investors.

Householders

The market failure results in a lack of sustainable housing developments, despite indications of market demand and an increase in willingness to pay by consumers. For example, surveys in the United States have shown that the average consumer would be willing to pay up to 10% more for energy efficient or green housing.[viii] Locally, GVRD householders are willing to pay between 3-7% more for green housing.[ix]

This business plan does not require householders to incur additional costs for sustainable energy which should make it even more attractive to them. Instead, they will pay the same purchase price for each unit as for a comparable conventional unit. They will also pay a fee to the Energy Trust equivalent to the conventional units energy cost – so their costs will be no higher than for a conventional unit.

Householders will enjoy the advantages of clean, quiet, heating and cooling, from a low maintenance system. They will also benefit in the long term from the enhanced property value of such high-performance buildings[x].

UBC

UBC is currently considering plans for development – it expects to construct 1,112 housing units by 2012, with a total estimated energy consumption of 71,000 GJ/year[xi] with further expansion to 3,900 by 2021. This development therefore affords a significant opportunity to demonstrate that both the needs of the consumer and the developer can be met.

Role of the Energy Trust

The Energy Trust will serve as a vehicle to bring together the developer and the future householders of the UBC's residential development. It will provide value to householders by allowing their heating needs to be met through the use of geothermal energy (rather than conventional sources). The costs and risks of installing and operating the geothermal system will be borne by the Energy Trust. It will also provide value to the householders by providing a mechanism for the future evaluation and implementation of other sustainable technologies.

Successful implementation will provide UBC with a global showcase development, which can provide the expertise and knowledge to promote similar projects in Greater Vancouver and around the world. This concept is also aligned with Canada's commitment to the Kyoto Protocol, as well as UBC's desire to be a global leader in green technology.

Marketing

The marketing strategy must promote the Energy Trust to all three stakeholders; the consumer, the developer, and the investors. The positive environmental impact of the project will be leveraged as the primary marketing tool, supported by the robust financial model set out in this business plan.

Marketing to the developer

A developer would be normally required to install in-unit heating system, such as baseboard or under-floor heating, powered by electricity or a boiler and radiators powered by gas. In this case, the developer will instead be required to install the in-unit infrastructure that connects with the geothermal system. Marketing efforts can therefore concentrate on the provision of a cost analysis to the developer that demonstrates that installation of the in-unit infrastructure will be no more complex or costly than for the regular heating systems. The intangible benefit of being identified as a green builder, together with the tangible benefit of having units with more marketing potential, should be promoted to the developer. Finally, emphasis should be placed on the competitive advantage gained from undertaking such a project: the developer will learn new skills that can be utilized in any subsequent projects.

Marketing to the consumer

The consumer for the UBC development will be householders in the area who want to live in a new development and who can afford a home which costs up to $1.4m[xii]. New developments will generally be marketed to such consumers through a combination of realtors and direct sales[xiii]. In the case of direct sales, a third party will often be employed to market the development.

Marketing efforts for this development will use the same channels as a regular development, but with additional emphasis on the intangible benefits of living green. It will therefore be necessary to develop additional marketing and training materials to explain these benefits to those responsible for marketing to consumers. In particular, promotional material must clearly set out all the benefits of the geothermal system, the impact of the Energy Trust on the environment, the cost structure for the consumer and an explanation of the low risks that will be borne by the consumer. Consumers should also be made aware of the enhanced property value of these high performance buildings[xiv].

Marketing to the investor

The project offers a value proposition to investors that is based on a combination of a robust long-term revenue stream and the promotion of building and living green. Investors may include venture capital and ethical funds[xv] that are interested in environmentally friendly projects and see the long-term potential of such housing developments. Research is ongoing, supported by the UBC SEEDS office, to identify specific investors for the project.

Geothermal Energy

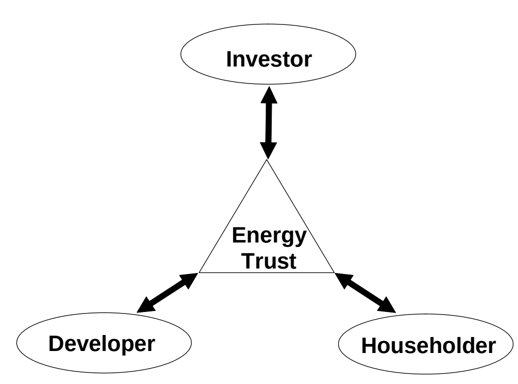
Geothermal energy has been increasingly used around the world to provide residential heating and hot water because of its availability, environmental friendliness, high performance and low total cost of ownership. The technologies to provide the Earth Loop and Heat Pump, two of the major components in a geothermal system, are mature and available from multiple suppliers (see appendix 1 for a description of how a geothermal heating system works). There are several steps that are required in order to confirm that a geothermal system is feasible in the UBC development. Preliminary engineering studies performed by UBC indicate high potential for geothermal systems[xvi].

The first task is to confirm the geographic conditions through on-site drilling. Parameters such as soil composition and temperature will be collected to provide a basis for selecting geothermal suppliers. This will be a one-time cost; the parameters collected will also be used to determine installation cost. The second task is to provide developers with the recommended processes and technologies to integrate geothermal systems into the new buildings. These processes will be monitored and refined continuously to ensure that developers can build their geothermal-integrated buildings cost-effectively.

The third task is to develop an effective way to measure household energy consumption so the fee paid to the Energy Trust can be established. Homeowners will pay the Energy Trust the cost of heating, which is calculated as if the equivalent energy were provided by conventional electricity or natural gas (see appendix 2).

The Energy Trust

The Energy Trust will be established to provide geothermal energy to householders in the UBC residential development.



Energy Trust: key relationships

It will issue trust units ("energy investment certificates" or "EICs") to an investor or investors, which will bear a stated rate of return (6.5%) and will be redeemable on a stated date. The funds from issuance of the units will be used to construct the geothermal system, with additional funds being raised to install additional infrastructure as the development increases in size.

The Energy Trust will buy power from BC Hydro to operate the geothermal system, it will maintain the system, and it will pay returns to investors, including the eventual return of their capital. The revenue to fund operations and the returns to investors will be generated from householders.

Specifically, householders will receive a monthly bill from the Energy Trust for the provision of heat. This will replace the bill that a householder would otherwise receive in a "regular" strata for electricity or gas used for heating. The initial level of bill received by householders connected to each geothermal loop will be related to the electricity cost that they would have incurred in heating their units. Price increases will be linked to the cost of domestic power acquired from BC Hydro.

Legal form and management of the Energy Trust

Generally, business trusts[xvii] are structured with between three and five independent trustees, together with one or more employees who are responsible for conduct of the business. Given the comparatively small size of this business, it would appear appropriate to have three trustees. One trustee will be elected by the investor group, one by UBC and the other elected by the householders as a group. This will ensure that the Energy Trust is operated in a manner that does not prejudice the interests of any of the developer, the investors, the householders or UBC.

There will be two classes of beneficiary in the Energy Trust; the investors, who will have the right to a preferred return on their EICs and to the eventual redemption of the EIC, and the householders, who will have an initial minimal interest in the Energy Trust but who will have a residual interest in the trust. The EICs will resemble preferred equity interests, rather than debt. We have assumed that the EICs will be issued with a twenty-year maturity, with additional EICs issued as the Energy Trust requires more funds, and that they will bear an annual return of 6.5%, based on comparison with current mortgage rates and the overall nature and risk profile of the investment. Final pricing of the EICs would, however, be determined in discussions with the investors.

It is expected that the Energy Trust will begin to accumulate significant cash balances once the UBC development is completed, since it will no longer be funding significant capital expenditure. Within the constraints of meeting the required payments to investors, the trustees will be empowered to reduce the cost of heat to householders, to return funds to householders as residual beneficiaries of the Energy Trust or to fund initial additional sustainable technology development on the South Campus.

Trusts and income tax

Many businesses are currently being structured as trusts, rather than as corporations, to reduce the amount of income tax borne by the business. Specifically, where all the taxable income of a trust is distributed to its members (in this case the holders of the EICs), then the trust is not subject to income tax. This contrasts with a corporation, which cannot deduct dividends paid to investors.

Key management personnel

Given the nature of this opportunity, industry knowledge plays a key role when assembling the management team. For this business venture, the management team members should combine the following skills:

- An understanding of property development and the incorporation of new technology into current building codes; industry experience definitely an asset;
- Familiarity with current and upcoming relevant sustainable technologies, including energy efficient building and alternative energy technologies;
- Negotiation skills, to discuss commercialization of any identified but unavailable technology with the developers of the technology;

- Financial management skills to address financial viability and manage the risks associated with this venture; and
- Investor relation skills, to allow liaison with investors such as venture capitalists, and/or representative of investors such as fund managers.

Under the direction of the trustees, the management team would mainly be responsible for controlling costs. They will be salaried staff, with a performance-based bonus tied to attaining a particular level of cost saving. At the outset, the management team may be too small to encompass all the necessary skills; technical aspects of the project may have to be contracted out until the business becomes more established.

Sales and marketing of the residential units will be the responsibility of the developer and realtors, while formation of the Energy Trust and identification of the initial investors will be the responsibility of UBC.

Economics of the Business

The primary long-term financial goal of the business will be to generate consistent positive cash flow. Initially, this will be dependent upon equity financing from investors. The ability to pay stable returns to investors as well as transition to substantial positive cash flows from operations will ultimately drive the financial success of the Energy Trust.

Gross and operating margins

The gross margin per residential unit per year is approximately $600 (appendix 4). It is equivalent to the difference between the heating fees provided by the owners of each unit (revenue) and the cost to produce the geothermal energy (expense). The operating margin is positive by the fourth year and is nearly 20% within five years (See appendix 5 for details).

Profit potential and durability

The profit potential is subject to the risks associated with this project (see the section on Risk Analysis And Evaluation below and Appendix 6). The revenue stream will be written into the legal ownership documentation of the residential units (resembling the requirement to belong to a strata corporation and pay fees to it) and so a high durability and profit potential is expected, as identified in the income statement (appendix 7).

Fixed, variable, and semi-variable costs

Fixed costs include the geothermal system earth loop installation, heat pump installation and life-cycle replacement cost. Indirect fixed (semi-variable) costs include administration (office rent, salaries, marketing, and administrative expenses). The variable costs include electricity consumed by the geothermal system, and the associated annual maintenance cost (See appendix 5 for specific calculations).

Years to break even and reach positive cash flow

It is anticipated that cash flow will be positive in the first year, based on the assumption that financing from investors will offset the initial negative cash flow from operations (See appendix 9). The Energy Trust is expected to break even by year 16 (appendix 10).

The Financial Plan

Highlights

This plan incorporates the benefits of installing a geothermal system as viewed from the "total cost of ownership" perspective. The entire plan should be viewed over the life-cycle of the system in order to fully obtain the financial benefits of this approach (see appendix 11 for Financial Summary). The financial plan will take the Energy Trust through five distinct stages, which are identified in Table 1 below.

Pro forma income statements and balance sheets

The pro forma income statement and balance sheet projections reflect the long-term perspective required to realize the benefits of the Energy Trust. See appendices 7 and 8 for pro forma income statements and balance sheets.

Pro forma cash flow analysis

As discussed, the transitions in cash flow will reflect the various stages of the Energy Trust operation. See appendix 9 for the pro forma cash flow analysis.

TABLE 1: Projected Cash flows

Phase	**I**	**II**	**III**	**IV**	**V**
Years	1-9	10 to 16	16 to 25	25 to 30	30+
Cash from Operations	-	+	+	+	+
Cash from Financing	+	+	0	-	-
Cash From Investing	-	-	0	0	-

Phase I	The Energy Trust invests in geothermal system installations.
Phase II	The Energy Trust is financing additional geothermal installations through operations and further issuance of EICs.
Phase III	Once the Energy Trust reaches the break-even point, it enters the third phase, where the Energy Trust is generating large amounts of cash from its operations.
Phase IV	Cash from operations is used to commence returns of capital to the EIC holders
Phase V	Cash from operations is used complete returns of capital to EIC holders, and to invest into new technologies.

See appendix 9 for specific projected cash flow amounts. The changes in the projected sources of cash helps to explain why developers would not be interested in performing this type of service -it is not in their core business, and it will take nearly sixteen years before the Energy Trust becomes a net cash generator.

Break-even point

Based on projected revenue and cost, the Energy Trust will reach break-even point at year 16 (2022). Prior to year 16, revenue increases come mainly from the growing number of households utilizing the geothermal system. After year 16, growth of the revenue stream will slow. Future increases in revenue will come from energy price increases. Apart from the variable costs, which primarily consist of the cost of electricity to run the geothermal system, other major expenses include depreciation[xviii] and dividend pay-out to investors. As dividend expenses decrease with the retirement of the EICs, growth in overall expenses will begin to level off beginning year 16 and will stabilize in year 25.

Risk Analysis And Evaluation

Housing market crash: the financial model incorporates a lower than 100% occupancy. If decreases in housing prices continue for any significant length of time, UBC will likely scale back its residential developments. Curtailment of the developments is not expected to render the project uneconomic.

Insufficient rate of return: if interest rates increase, it can be assumed that the return demanded by investors will increase. Equally, however, increasing interest rates are generally an indication of increasing inflation, which would in turn be reflected in increasing energy costs and increasing charges to householders. It is therefore possible that the rate of return paid to later investors can be increased without negatively impacting the cash flow of the Energy Trust. If future investment cannot be obtained, geothermal systems would not be installed in future parts of the development.

Technology defects: the technology has been installed in various locations and has operated successfully in those locations[xix]. Test bores must be drilled at UBC early in implementation to ensure that the geothermal system will generate the required energy output.

Maintenance costs are significantly higher than expected: maintenance costs will be controlled as far as possible by contracting with third parties on a retainer basis. The Energy Trust will also maintain a prudent cash balance to buffer against unexpected maintenance costs. It must be recognized, however, that ongoing significant maintenance costs in excess of those expected could materially impact the long-term cash flow position of the Energy Trust.

Supplier failure: there is more than one supplier of geothermal technology in Canada, and the failure of a supplier should not therefore have a catastrophic effect on the project. Supplier failure could, however, lead to significant additional costs to the Energy Trust if it occurs during the course of a construction project.

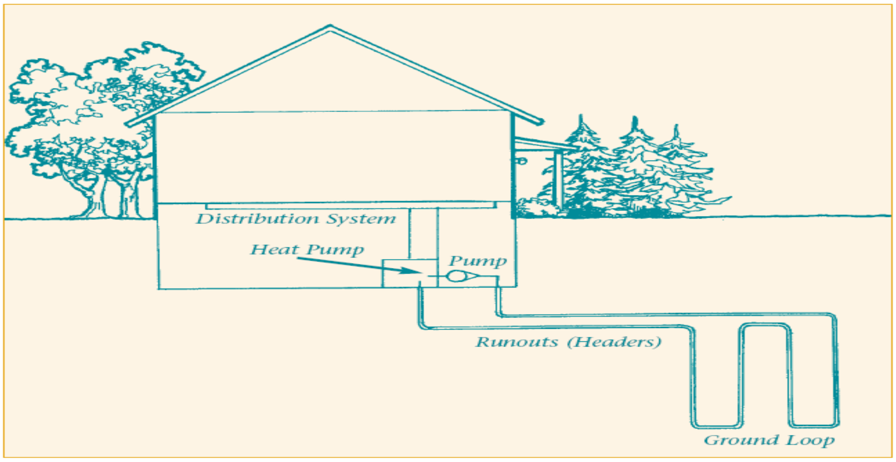
Potential government interference: the Energy Trust will be an energy provider. It is possible that the Federal or Provincial governments will determine that the Energy Trust is subject to regulation, either now or in the future. Regulation may have the impact of requiring additional investment by the Energy Trust, requiring reductions in the charges for heating to householders or reductions in the rate of return to the residual investors.

Key Tasks And Timeline

Stage I – feasibility
1. Confirm site-specific viability of geothermal system through on-site drilling – requires funding, decision in principle, contracting with the third party to carry out work, and evaluation of results.
Stage II – design
2. Identify potential investors in conjunction with UBC, BC Hydro and Western Economic Diversification (a department of the Federal Government).
3. Refine and update the business plan, identify and appoint staff responsible for liaison with potential investors, agree timeline for implementation.
Stage III – implementation
4. Structure Trust, agree contracts with developer and geothermal system provider, manage construction.

It is difficult at this stage to develop a timeline for implementation of the plan, for two reasons. First, timing of the project is dependent upon its acceptance by UBC. Secondly, implementation will be closely tied to the UBC residential development. Given the need to bring together the developer, UBC, investors and the supplier responsible for installing the geothermal system, we consider it likely that a lead time of six to nine months at a minimum will be needed for implementation.

Appendix 1: How Geothermal Works



Components of a typical Earth Energy System.

"The heat energy taken from the ground by your Geothermal System is considered low-grade heat. In other words, it is not warm enough to heat your home without being concentrated or upgraded somehow; however, there is plenty of it – the average temperature of the ground just a few metres below the surface is similar to (or even higher than) the average annual outdoor air temperature. A Geothermal System is made up of three main parts: a loop, the heat pump and the distribution system.

The loop is built from plastic pipe which is buried in the ground outside your home either in a horizontal trench (horizontal loop) or through holes drilled in the earth (vertical loop). Your Geothermal System circulates liquid (the heat transfer fluid) through the loop and to the heat pump located inside the home. The heat pump chills the liquid and distributes the heat collected from it throughout the home. The chilled liquid is pumped back into the loop and, because it is colder than the ground, is able to draw more heat from the surrounding soil. After a Geothermal System has taken the heat energy from the ground loop and upgraded it to a temperature usable in your home, it delivers the heat evenly to all parts of the building through a distribution system."

Source: http://www.canren.gc.ca

Appendix 2: Geothermal, Natural Gas & Electricity Comparison

Source for calculation methodology: http://www.canren.gc.ca

Estimated Heating Energy Usage in KWH						
Enter the heated area of your home (in square metres) in Column A in Row 1, 2 or 3 (whichever best describes your home). Multiply the area (from Column A) by the KWH shown in Column B to calculate the KWH usage for heating your home.						
	A		B*			C
Older home - insulation etc. not upgraded	0	x	200	=	1	0
Average Home	0	x	150		2	0
R-2000 certified home	200	x	70		3	14,000
			Result	=		14,000

Estimated Hot Water Energy Usage in KWH						
In Column A, enter the number of people in your household in addition to yourself. Multiply the number of people by the number in Column B.						
	A		B			C
First person in home	1	x	1,900	=	4	1,900
Number of additional people	3	x	1,250		5	3,750
Add Lines 4 and 5 to determine the total KWH needed to head water for a home like yours					6	5,650

Cost of Heat and Hot Water Using Electricity		
Ask your electrical utility for the cost of electricity per KWH. Enter in Column C, Line 7.		
		C
Cost of electricity per KWH	7	0.065
Multiply Line 1, 2, or 3 by Line 7 to determine the cost of heating your home using Electricity	8	910
Multiple Line 6 by Line 7 to determine the cost of heating water of your household using Electricity	9	367.25
Total		1277.25

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Cost of Heat and Hot Water Using Natural Gas						
Determine in what units your utility sells natural gas, and what the Basic Utility Charges is. Enter this figure in the appropriate line in Column A.						
	A		B			C
Cost of Natural Gas (per cubic metre)	0.42	/	10.35	=	10	0.04059
Cost of Natural Gas (per gig joule or GJ)		/	277.79		11	0
Enter the COP (coefficient of performance) of ONE of the gas furnaces shown in Column B in Column C	B					C
Old gas furnace with pilot light	0.65				12	
Newer gas furnace with pilot light(before 1995)	0.76				13	
Mid-efficiency gas furnace	0.83				14	0.83
High-efficiency gas furnace	0.93				15	
Divide Line 10 or Line 11 by Line 12, 13, 14, or 15 to calculate the cost per KWH					16	0.048891
Add Basic Utility Charge**					17	120
Multiply Line 1, 2, or 3 by Line 16 to determine the total cost of heating your home using Natural Gas					18	684.47
Multiply Line 6 by Line 16 to determine the cost of heating water for your household using Natural Gas					19	276.235
			Total			960.712

Cost of Heat and Hot Water Using Geothermal System		
Determine the COP of the Geothermal you are considering from the manufacturer or your contractor. Enter this in Column C		
		C
Enter COP of the Geothermal System in Line 30	30	3.2
Divide the cost of electricity in Line 7 by the COP of the Geothermal System in Line 30	31	0.02031
Multiply the cost of electricity in Line 31 by 2	32	0.04062
Multiply Line 1, 2 or 3 by Line 31 to calculate the cost of heating your home with a Geothermal System	33	284.37
Multiply Line 6 by Line 32 to find the cost of heating water for your household with a Geothermal System	34	229.53

* Average consumption for residences in Canada
** The “Basic Utility Charge” or “Delivery Charge” is charged by most utilities for monthly service, whether the fuel is used or not. Since most homes will have electrical service for lighting and other uses to which a basic utility charge would be applied, it should not be added to the energy cost of homes heated with Electric Heat or a Geothermal System.

Appendix 3: Fixed Cost Estimation

Category	*Value*	*Assumptions*
Rental Expense Per square foot	20	Assume $20 / SF, UBC Rate
Square footage per office	100	Assume 100 SF / Office
50% markup	50%	Assume 50% Mark-up of each office
Total square footage per office	150	Total SF / Office = 100 + 100 x 50%
Admin Assistant	40,000	Salary of one Admin Assistant
Tech Manager	60,000	Salary of one technical engineer
General Manager	70,000	Salary of one General Manager
Total Employee	3	
Total Office	3	
Total square footage	450	
Total Rental	9,000	
Total Wage	170,000	
Admin Expense	17,000	Total Admin Expense
Total Fixed Cost (Year 1-5)	196,000	Fixed Cost for year 1 to year 4
Fixed Cost (Year 5-15)	300,000	Fixed Cost for year 5 to year 15
Fixed Cost (Year 16-30)	400,000	Fixed Cost for year 16 to year 16

Appendix 4: Net Present Value Calculation Per Residential Unit

Category	*Value*	*Source*
Geothermal System Revenue	1,120	See appendix 2
Geothermal System Variable Cost (Direct)	514	See appendix 2
Initial Investment	6,000	See appendix 6
Profit	606	Profit = Revenue – Cost
Discount Rate	7.3%	Use UBC standard Discount Rate
Number of Years to Pay Back (1)	18.07	
Present Value	6,000	
NPV	0	
Gross Margin	54%	

(1) Based on the net present value calculation for a single unit, it takes just over 18 years to generate sufficient cash to pay back the initial investment

Appendix 5: Assumptions Used To Create Pro-forma Financial Statements

Name	***Value***	***Description***	***Sources***
Total New Residential Units	4,000	Total number of unit to be build in UBC south campus from year 2006 to year 2021	UBC South Campus Integrated Study
New Units Per Year	267	Average number of new unit to be build in UBC south campus per year	UBC South Campus Integrated Study
Average SM per Unit	200	Average square feet per unit	http://www.canren.gc.ca
Electricity Cost	1,277	Cost of heating and hot water using electricity per unit per year	http://www.canren.gc.ca
Natural Gas Cost	961	Cost of heating and hot water using natural gas per unit per year	http://www.canren.gc.ca
Geothermal System Revenue	1,119	The revenue generated by geothermal system (equal to the cost of heating and hot water using conventional methods.) The average cost of using electricity and natural gas is used here.	http://www.canren.gc.ca
Geothermal System Variable Cost (Direct)	514	The cost of producing energy for a typical home for a year using Geothermal System. See appendix 2 for details.	Calculation
Cost of Earth Loop	4,500	Cost of geothermal system installation per unit. Cost of ground digging is the major part of this cost. Conservatively assumed to use vertical closed loop on rock. (This is the most expensive combination). As this number is based on individual single house, it is very conservative due to potential economic of scales.	http://www.canren.gc.ca/app/filerepository/348A4C62E2F245E7B840ECA7B280CEFC.pdf
Heat Pump, Thermostat, Air Conditioning and auxiliary heaters	1,500	This cost is similar to conventional furnace and air-conditioning. Half of it (heat distribution equipment & equipments inside each suite) will be covered by developers and the other half is funded by the Energy Trust.	http://www.canren.gc.ca/prod_serv/index.asp?CaId=163&PgId=914
Electricity Price	0.065	Electricity cost per KWH	BC Hydro
Electricity Price Increase Rate	3.00%	Conservatively assumed increase rate of electricity price	BC Hydro
Years to Heat Pump Replacement	12	Heat pump need to be replaced around year 15	http://www.canren.gc.ca

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Name	***Value***	***Description***	***Sources***
Bond(EIC) Life (Years)	25		Assumption
Bond Coupon Rate	6.50%		Assumption
Earth Loop Depreciation Rate	2.50%	From historical data, most Earth Loop systems still operate efficiently after 40 years, so a 2.5% depreciation rate is assumed.	
Bad Debt	0.50%	The bad debt is expected very low due to the fact that target consumers are property owners at a very exclusive neighbourhood	Assumption
Interest Rate	4%	Interest rate earned on cash balances	Assumption
Earth Loop Insurance Rate	0.25%	The insurance of Earth Loop per unit per year	Assumption
Occupancy Rate	95%	Assume only 95% of the units will be occupied.	Assumption
Maintenance Service Contracts	15	Assume 1% of the cost of the pump is the maintenance cost	Assumption

Appendix 6: Supporting Data For Financial Statements

Year	1	2	5	10	15	20	30
Number of Units	267	533	1,333	2,667	4,000	4,000	4,000
Revenue	0	300,739	1,314,502	3,428,703	6,183,033	7,679,817	10,321,032
Variable Cost	0	149,388	651,475	1,693,553	3,045,090	3,772,687	5,049,541
Gross Margin	0	151,351	663,027	1,735,150	3,137,942	3,907,130	5,271,491
Gross Margin %	0%	50%	50%	51%	51%	51%	51%
Contribution Margin %	0%	50%	50%	51%	51%	51%	51%
Pump Replacement Cost	0	0	0	0	400,000	400,000	400,000
Fixed Cost (appendix 3)	196,000	196,000	196,000	300,000	300,000	400,000	400,000
Bad Debt	0	757	3,315	8,676	15,690	19,536	26,357
Marketing & Testing	200,000	200,000					
Insurance Expense	3,900	7,700	18,500	34,500	48,000	40,500	25,500
Operating Expense	439,900	484,457	417,815	743,176	1,363,690	1,460,036	1,451,857
Operating Margin	-439,900	-333,105	245,211	991,975	1,774,253	2,447,094	3,819,633
Operating Margin %	0%	-111%	19%	29%	29%	32%	37%
Earth Loop (Investment)	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000		
Assets Before Depreciation	1,600,000	3,200,000	8,000,000	16,000,000	24,000,000	24,000,000	24,000,000
Depreciation Expense	40,000	80,000	200,000	400,000	600,000	600,000	600,000
Accumulated Depreciation	40,000	120,000	600,000	2,200,000	4,800,000	7,800,000	13,800,000
Assets After Depreciation	1,560,000	3,080,000	7,400,000	13,800,000	19,200,000	16,200,000	10,200,000
EIC Issuance	3,000,000	3,000,000	2,000,000	2,000,000	2,000,000		
EIC Retirement							2,000,000
EICs outstanding	3,000,000	6,000,000	12,500,000	22,500,000	32,500,000	32,500,000	20,000,000
Dividend Expense	195,000	390,000	812,500	1,462,500	2,112,500	2,112,500	1,300,000
Interest Income	0	32,204	79,016	113,878	232,028	423,041	962,042
Net Income	-634,900	-690,901	-488,273	-356,647	-106,219	757,635	3,481,675
Cash Flow from Operations	-594,900	-610,901	-288,273	43,353	493,781	1,357,635	4,081,675
Cash Flow From Financing	3,000,000	3,000,000	2,000,000	2,000,000	2,000,000	0	-2,000,000
Cash Flow From Investing	-1,600,000	-1,600,000	-1,600,000	-1,600,000	-1,600,000	0	0
Cash Flow	805,100	789,099	111,727	443,353	893,781	1,357,635	2,081,675
Cash Balance	805,100	1,594,199	2,087,123	3,290,304	6,694,486	11,933,667	26,132,731
Equity	-634,900	-1,325,801	-3,012,877	-5,409,696	-6,605,514	-4,366,333	16,332,731

Appendix 7: Income Statement

	Year 1	Year 2	Year 5	Year 10	Year 20	Year 30
	2006	2007	2011	2016	2026	2036
Sales (a)	0	300,739	1,314,502	3,428,703	7,679,817	10,321,032
Cost of Good Sold (b)	0	149,388	651,475	1,693,553	3,772,687	5,049,541
Gross Profit	0	151,351	663,027	1,735,150	3,907,130	5,271,491
Operating Expenses						
Miscellanous Expenses (c)	396,000	396,000	196,000	300,000	400,000	400,000
Depreciation Expenses (d)	40,000	80,000	200,000	400,000	600,000	600,000
Bad Debt (g)	0	757	3,315	8,676	19,536	26,357
Insurance Expense	3,900	7,700	18,500	34,500	40,500	25,500
Pump Replacement	0	0	0	0	400,000	400,000
Net Operating Income	-439,900	-333,105	245,211	991,975	2,447,094	3,819,633
Non-operating Expenses						
Dividend Expense (e)	195,000	390,000	812,500	1,462,500	2,112,500	1,300,000
Interest Income	0	32,204	79,016	113,878	423,041	962,042
Net Income Before Tax	-634,900	-690,901	-488,273	-356,647	757,635	3,481,675
Income Tax (f)						
Net Income	-634,900	-690,901	-488,273	-356,647	757,635	3,481,675

a) As geothermal is used to provide heating and hot water, sales equal to the equivalent cost of producing the same amount of heating and hot water using and alternative method such as electricity or natural gas. The average cost of using electricity and natural gas is used here. See appendix 2 for how this number is derived.

b) Geothermal consumes electricity and produces heat, hot water, and air conditioning. Maintenance cost is also included in this item. The cost is the electricity consumed See appendix 2 for how this number is derived

c) Miscellaneous Expenses include initial testing on geothermal system in UBC area, employee compensation, office rental, and other daily expense. See appendix 3 for how this number is calculated

d) From historical data, most Earth Loop systems still operate efficiently after 40 years, so a 2.5% depreciation rate is assumed.

e) Dividend expense is calculated as 6.5% of total issued EICs.

f) Due to the structure of the business as a trust, it is expected that little or no income tax expense will occur in the business.

g) The bad debt is expected very low due to the fact that target consumers are property owners at a very exclusive neighbourhood

Appendix 8: Balance Sheet

	Year 1 2006	Year 2 2007	Year 5 2011	Year 10 2016	Year 20 2026	Year 30 2036
Asset						
Cash	805,100	1,594,199	2,087,123	3,290,304	11,933,667	26,132,731
Earth Loop & Pump (a)	1,600,000	3,200,000	8,000,000	16,000,000	24,000,000	24,000,000
Less Accumulated Depreciation (b)	40,000	120,000	600,000	2,200,000	7,800,000	13,800,000
Non-Cash Asset	1,560,000	3,080,000	7,400,000	13,800,000	16,200,000	10,200,000
Total Assets	2,365,100	4,674,199	9,487,123	17,090,304	28,133,667	36,332,731
EIC	3,000,000	6,000,000	12,500,000	22,500,000	32,500,000	20,000,000
Equity	-634,900	-1,325,801	-3,012,877	-5,409,696	-2,317,868	16,332,731
Total Liability and Owner's Equity	2,365,100	4,674,199	9,487,123	17,090,304	30,182,132	36,332,731

a) The earth loop and pump are the main assets of the Energy Trust. The book value of the system is equal to its cost and installation costs.
b) From historical data, most Earth Loop systems still operate efficiently after 40 years, so a 2.5% depreciation rate is assumed.

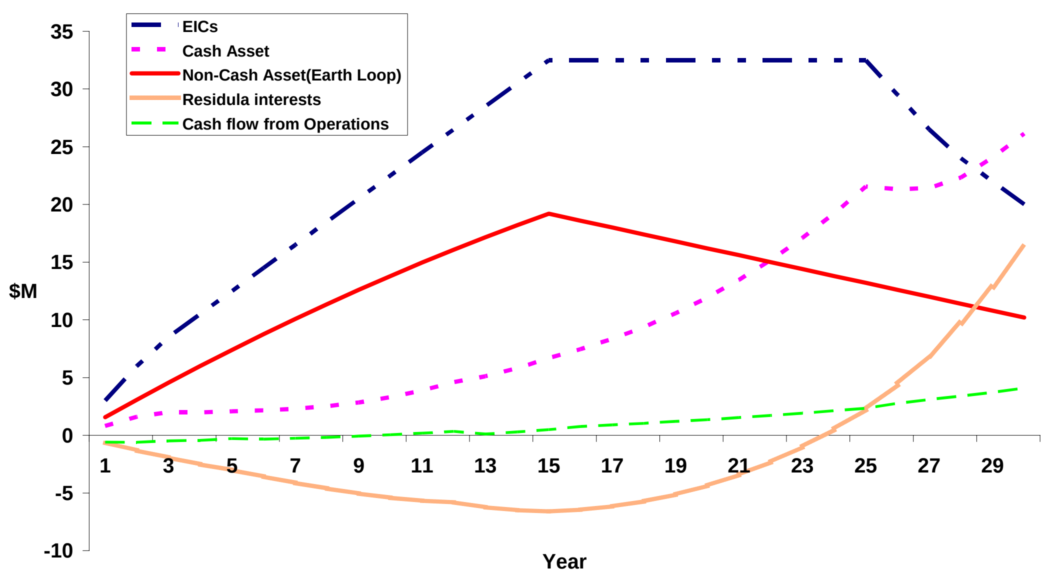
Appendix 9: Cash Flow

	Year 1 2006	Year 2 2007	Year 5 2011	Year 10 2016	Year 20 2026	Year 30 2036
Net Income	-634,900	-690,901	812,500	-356,647	757,635	3,481,675
Depreciation Expense	40,000	80,000	200,000	400,000	600,000	600,000
Cashflow from Operations	-594,900	-610,901	1,012,500	43,353	1,357,635	4,081,675
Cashflow from Investing (a)	-1,600,000	-1,600,000	-1,600,000	-1,600,000	0	0
Cashflow from Financing (b)	3,000,000	3,000,000	2,000,000	2,000,000	0	-2,000,000
Cash Increase	805,100	789,099	1,412,500	443,353	1,357,635	2,081,675
Cash Balance in Previous Year	0	805,100	1,975,396	2,846,951	10,576,032	24,051,055
Cash Balance this year	805,100	1,594,199	3,387,896	3,290,304	11,933,667	26,132,731

(a) Investing in the earth loop
(b) Cash from EIC issuance

Appendix 10: Breakeven Analysis

Appendix 11: Financial Summary



Notes

[i] Giga-Watt Hour. Electricity is generally measured in Kilo-Watt Hours (KWH) or "units" – a Giga-Watt Hour is 1,000,000 Kilo-Watt Hours.

[ii] Oil prices are currently around $52.50 a barrel, down from $55 earlier in the week and up around 75% from a year ago. See, for example, http://biz.yahoo.com/ap/041027/oil_prices_14.html.

[iii] Canada's commitment under the Kyoto Protocol is to reduce net GHG emissions (covering 6 GHGs and 'sinks') to 6% below 1990 levels between 2008 and 2012. http://www.ec.gc.ca/international/multilat/unfccc_e.htm#com.

[iv] "*It is now that timely action can avert disaster. It is now that with foresight and will such action can be taken without disturbing the essence of our way of life, by adjusting behaviour, not altering it entirely*", British Prime Minister Tony Blair, September 15th, 2004 as reported at http://news.bbc.co.uk/1/hi/uk_politics/3656812.stm.

[v] Helen Goodland, Senior Advisor Sustainable Buildings, GVRD, "*Investing in energy savings: reaping the rewards for energy efficient building design*", draft paper, June 29, 2004.

[vi] A brief web search on "green investments" produces over a million hits. Locally, Ethicalfunds (www.ethicalfunds.com) and Vancity Credit Union (www.vancity.com) are both known for their attempts to identify and support ethically responsible investments. The Clean Power Income Fund (www.cleanpowerincomefund.com) is only one example of an investment opportunity that appeals to investors interested in sustainable energy.

[vii] Social Investment Forum (1999), Socially Investment Forum News 1999 Report on Socially Responsible Investing Trends in the United States.

[viii] Roberts, Jennifer *"The state of Green Building"* 2001 http://www.housingzone.com/green/index.asp.

[ix] CMHC greater Vancouver healthy housing survey on Consumer Demand. May 2003.

[x] Khan, Aleisha. Institute for Market Transformation. "*Recognizing the asset value of high-performance building*", 2002 http://www.imt.org.

[xi] UBC South Campus Sustainability Report, June 2004.

[xii] http://www.vanmag.com/0309/f3.htm.

[xiii] http://www.assignmentscanada.ca/definitions/presales.html.

[xiv] Khan, Aleisha. Institute for Market Transformation. "*Recognizing the asset value of high- performance building*" 2002 http://www.imt.org.

[xv] See for example, Vancity Credit Union at http://www.vancity.com/Personal/Investing/SociallyResponsible, (Vancity is referenced as a potential investor in the Goodland paper above, along with BC Hydro) and Ethical Funds at http://www.ethicalfunds.com/do_the_right_thing/about_ef/newsroom/2004_articles/10_01_04.asp.

[xvi] Discussion with David Grigg (UBC Planning Department), January 2005

[xvii] This mirrors the governance structure of many public business trusts.

[xviii] Which is a non-cash expense but which effectively represents the costs of the long-term renewal of the system.

[xix] Information on actual projects can be found on http://www.geoexchage.org