



CITY OF VANCOUVER

ADMINISTRATIVE REPORT

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TO: Standing Committee on City Services and Budgets

FROM: Manager of City Sustainability Group in consultation with the General Manager of Engineering Services, Project Manager of Southeast False Creek and the Olympic Village, and Director of Financial Planning & Treasury

SUBJECT: False Creek Neighbourhood Energy Utility

RECOMMENDATION

- A. *THAT Council approve in principle the creation of a False Creek Neighbourhood Energy Utility (NEU) to provide for space heating and domestic hot water to multi-family residential, commercial, institutional and industrial buildings, with interim financing of a maximum of \$14.0 million provided by the Capital Financing Fund.*
- B. *THAT Council approve the following work program for the first phase of the NEU (See Figure B) which includes the Olympic Village and the private land parcels developing prior to the Olympics ("Phase 1"):*
- i. Preliminary and final design of the NEU distribution system for Phase 1;*
 - ii. Preliminary design work for a sewer heat recovery energy plant to serve Phase 1 of the NEU, and*
 - iii. further investigation of the feasibility of biomass heat as an alternative heat source in Phase 1 or later phases.*

at a cost estimated to be \$970,000 including project management; this cost to be financed from the source identified in Recommendation A on terms acceptable to the Director of Finance, with repayment being subject

to long term financing arrangements to be reported back, noting that should the NEU not proceed, the General Manager of Engineering Services, in consultation with the Director of Finance will identify an alternative funding source.

- C. THAT Council authorize the General Manager of Engineering Services to enter into a contract with FVB Energy Inc. for the design of Phase 1 NEU heat distribution system outside the Olympic Village, as described in this report and on such terms and conditions as are approved by the Director of Legal Services.*
- D. THAT Council instruct the Director of Legal Services to seek from the Provincial Government appropriate amendments to the Vancouver Charter in support of the NEU objectives outlined in this Report.*
- E. THAT Council approve a temporary project manager in Engineering Services to complete the preliminary design of the energy plant and work with the Southeast False Creek and Olympic Village Project Office to complete the detailed design and construction of the distribution system for Phase 1 at a cost of \$84,000 annually. The position is funded from the same source as noted in Recommendation B, which includes funding for the first two years of the position.*
- F. THAT Council instruct the City Engineer and Manager of the Sustainability Group, in consultation with the SEFC and the Olympic Village Project Manager, to report back by November 30, 2006 on the:
 - i. Short- and -long term ownership, operations, and governance strategy for the NEU;*
 - ii. long-term financing options;*
 - iii. policy recommendation with regard to requiring private property owners within a defined service area to connect to the NEU for all new development, and*
 - iv. business and operational plans, including additional resources required to complete Phase 1 and scope of work for future Phases.**
- G. THAT Council instruct staff to seek support for the NEU through grants from senior levels of government and other partners.*

CITY MANAGER'S COMMENTS

This staff report on the feasibility of a community energy system in the Southeast False Creek neighbourhood is follow-up on a preliminary feasibility study completed in February 2005. The project is considered to be an economically and technically viable way to work towards the "GHG neutral" goal contained in the Southeast False Creek Official Development Plan. In addition, a community energy system is a way in which the City can work towards achieving its community GHG targets while achieving a financial return on its investment.

Approval of the recommendations of this report will commit the City to act as the developer of a neighbourhood energy utility (NEU), with a projected capital investment requirement from the City of \$14.0 million by 2010.

The Capital Financing Fund is being proposed as source of interim financing until a permanent financing plan can be developed. It must be noted that a commitment of \$14.0 million from the Capital Financing Fund at this time will reduce the flexibility that Council currently possesses to fund other projects that may emerge between now and 2010, or until permanent financing is in place.

Due to timing issues, direction from Council is needed now as to whether a Neighbourhood Energy Utility in False Creek is supported, so that the installation of the heat distribution pipe network can be coordinated with other servicing work in Southeast False Creek. If Council approves today's recommendations, Council will receive a further request in May of this year for approximately \$4.9 million, to be drawn from the \$14.0 million allocation described above, related to the installation of the heat distribution pipe and will receive additional requests for subsequent stages in the development of the utility.

As with any new venture there are risks. The proposal before you mitigates risk and provides an exit strategy should the City not wish to continue the operation. For example, the City could recover its investment by selling the system to another service provider.

The City Manager recommends approval of A thru G.

COUNCIL POLICY

On October 16, 1990, Council approved in principle Clouds of Change Recommendation #1 to reduce carbon dioxide emissions by 20 percent as part of the actions to address global climate change issues, subject to future reports on costs and trade-offs involved in achieving the objectives and targets. Reduced greenhouse gas (GHG) production through better energy efficiency was recommended.

In 1995, Vancouver joined the Federation of Canadian Municipalities' "20 percent Club", which became the Partners for Climate Protection Program in 1998.

In 2001, the Southeast False Creek Policy Statement was adopted by Council to shape the sustainable growth of the remaining 50 acres of waterfront land on False Creek, including the development of energy efficient buildings and technologies.

On April 23, 2002, Council adopted a Definition and Principles of Sustainability to guide, prioritize, and improve the sustainability of City actions and operations.

On May 2, 2002, Council carried the motion, proposed by the Federation of Canadian Municipalities, to support the Canadian Government's ratification of the Kyoto Protocol.

On March 25, 2003, Council approved an emissions reduction target of 20 percent from 1990 levels for the corporation of the City of Vancouver by 2010, subject to evaluation of the implications of the target to ensure it is realistic. On this same date, Council created the Cool Vancouver Task Force and requested that it report back with a report on the components of a Greenhouse Gas Reduction Action Plan for both the corporation and the community.

On June 24, 2003, Council received the Cool Vancouver Task Force's Discussion Paper on Greenhouse Gas Reduction Planning and approved (in principle) a target of 6 percent below

1990 emissions levels by 2010 for the city (community) as a whole, subject to evaluation of the implications of the target to ensure it is realistic. Council also approved a process to develop GHG Reduction Plans for both the City (Corporate) and the Community and approved \$30,000 for technical support for the development of these plans.

On December 2, 2003, Council unanimously approved the Corporate Climate Change Action Plan as proposed from the Cool Vancouver Task Force, affirming the target of a 20 percent reduction from 1990 levels by 2010 of emissions from the City's own operations and facilities.

On June 8, 2004, Council approved revisions to the Energy Utilisation By-law to improve the energy performance of new, large commercial and residential buildings by approximately 13 percent by updating references to the 2001 version of ASHRAE90.1.

On July 8, 2004, Council approved a work program to analyze the development of a Green Building Strategy for all new buildings in the City.

On March 1, 2005, Vancouver City Council approved the Southeast False Creek Official Development Plan (ODP) at Public Hearing. The ODP provides a framework for the environmental, social and economic sustainability objectives, intent and policies in the South East False Creek Policy Statement. It set out that "a neighbourhood energy system be developed for Southeast False Creek, starting with the 2010 Olympic Village sub-area, that advances district energy production through sustainable technologies and measures, with the goal of creating a GHG neutral energy system that has the capacity to grow incrementally over time, both throughout South East False Creek and to neighbourhoods adjacent to South East False Creek."

On March 29, 2005, Council approved the Community Climate Change Action Plan to reduce greenhouse gas emissions by 6 percent below 1990 levels by 2010. The Plan contains specific elements related to creating community energy systems that provide energy without contributing to GHG emissions.

On May 12, 2005 Council approved the establishment of the SEFC and Olympic Village Project Office (the "Project Office") to manage the development of the Olympic Village and the other City-owned lands in SEFC, as well as the design and facilitation of the public infrastructure for the entire ODP area. This includes designing and constructing the buildings on City lands as well as designing and constructing the parks, streets, waterfront, other public spaces, and site servicing infrastructure including sewer, water, storm water, energy, and other utilities.

On July 19, 2005 Council authorized the City Manager to enter into a contract with Stantec Consulting Ltd. to complete the design of the public infrastructure required in the Olympic Village sub-area of Southeast False Creek including the NEU.

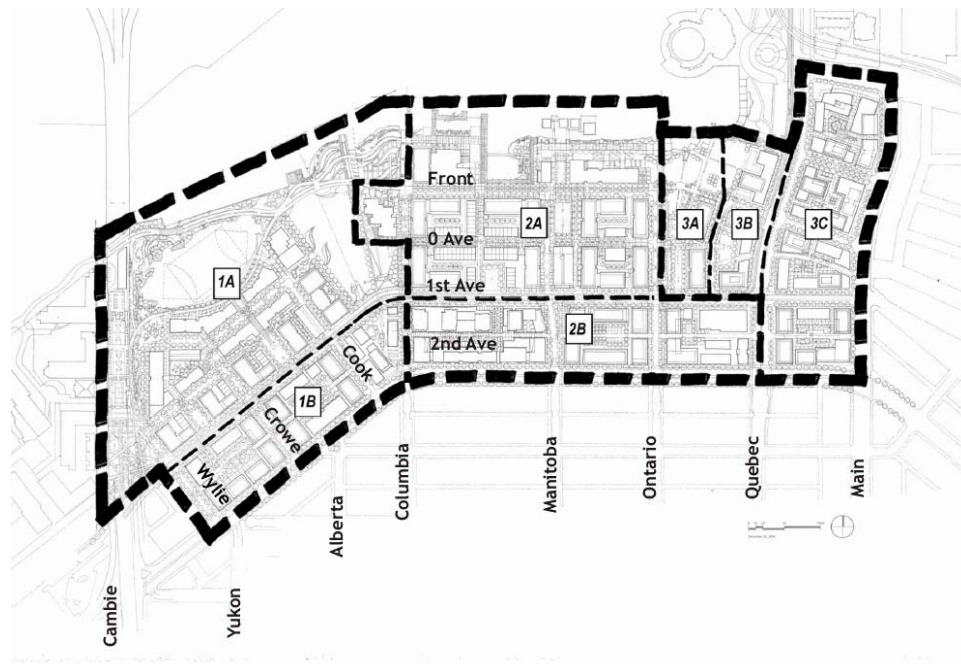
On November 3, 2005, Council approved the Green Building Strategy to update specific Building Bylaws for all buildings regulated under Part Three of the Vancouver Building By-law (e.g. generally buildings four stories and above) for increased environmental performance in the areas of stormwater management, water and energy efficiency, indoor air quality, and resource conservation.

BACKGROUND

On April 12, 2005, Council received a report from staff that outlined a concept for the development of a NEU in the vicinity Southeast False Creek (SEFC). Council directed staff to undertake a comprehensive study to define technology options, capital costs, operational parameters, partnership strategies, and a business case for the development and operation of a community energy system to meet City sustainability and greenhouse gas (GHG) reduction goals. These goals include, but are not limited to, the Southeast False Creek ODP sustainability goals.

Since that time, staff have engaged the services of a team of consultants, including FVB Energy, Sheltair, Stantec and Compass Resource Management, who are experienced in the technical and business analysis relating to development of community energy systems. Reflecting the context in which Council authorized the study, the focus of this work has been on evaluating the merits of developing a NEU that would service the SEFC ODP area (See Figure A). To assist in understanding the risks and opportunities associated with such a system, alternative scenarios have been developed that variously reduce or increase the maximum service area of the NEU. Copies of the reports from these consultants are available in Sustainability Group offices.

Figure A: Southeast False Creek Official Development Plan (ODP)



This work has progressed in parallel with other land use and development planning for Southeast False Creek and surrounding areas. City staff have been working to develop policy and new planning directions for the areas around the False Creek Basin, stretching from the Plaza of Nations area in North False Creek, to the undeveloped lands south of City Gate, to the large industrial area of the Flats and into the SEFC ODP area.

In the immediate context, detailed design of the infrastructure for the 2010 Olympic Village (OV) is nearing completion and construction will begin in the next few months. This timing has led to a decision point on the development of a NEU prior to all of the work requested by

Council being completed, specifically the final determination of heat source and the ultimate ownership and operation model for the NEU.

In addition, 8-9 private landowners in the SEFC ODP area are preparing to move forward with their own developments. These owners are seeking clarity as to whether or not a community energy system will be available as this will have implications on their strategy to achieve LEED Silver status, as required by the SEFC ODP, and on detailed building design work. Staff have held four workshops with these landowners to date, to keep them informed on the City's progress with regard to the community energy system decision-making and development.

DISCUSSION

1. Objectives and Methodology

Two sustainability dimensions - economic and environmental benefits - are the most relevant for evaluating whether the City should proceed with a NEU. While there may be some social benefits to proceeding with an NEU, staff believe that these are relatively minor in comparison to the other two objectives.

A "Business As Usual" (BAU) scenario provides a model of what would happen in terms of heating technology in the absence of the implementation of a NEU. Against this baseline, an "NEU Base Case" (described in the next section) was developed. Economic and environmental benefits of proceeding with the NEU Base Case were evaluated and alternative scenarios to the NEU Base Case were developed to facilitate sensitivity analysis.

Environmental benefits were quantified by calculating reductions in greenhouse gas (GHG) emissions achieved by the NEU Base Case, and alternative scenarios, relative to the BAU case. Economic benefits were quantified by calculating a Return on Investment (ROI), which can be compared against the City's cost of debt and the ROI allowed to utility companies that are regulated by the B.C. Utilities Commission. Some additional benefits of proceeding with an NEU, both economic and environmental, which are not easily quantified, were identified and are listed later in this report. Risks and obstacles to successful development of an NEU were also identified and are listed later in this report.

2. The "Business as Usual" Scenario

Under the BAU Scenario energy provision in the area would have the following characteristics:

- each building responsible for its own heating, cooling and emergency power systems;
- systems installed by individual developers;
- systems ultimately owned and operated by building owners;
- majority of heating and cooling met with electricity and smaller portion with natural gas (70% v. 30%)*;
- regular electricity service provided by BC Hydro;
- natural gas provided by Terasen Gas, and
- code building efficiency and standard heating and cooling equipment.

* The average percentage of multi unit residential buildings (MURB) heated with electric heat (70 percent) reflects current practice in the Lower Mainland. The extent to which this would happen within the SEFC ODP area, given the strict energy efficiency and green building requirements, is uncertain.

3. The “NEU Base Case” Scenario

Development of an economically and environmentally balanced Base Case for the NEU consumed the most resources in this analysis. Several assumptions and judgements were key to this process and had a significant impact on the outcome. The most significant assumptions were:

i) Technology

Many technologies are available to be applied in Southeast False Creek that offer varying degrees of environmental benefits at various costs. The costs and benefits of ground-source heat recovery, sewer heat recovery, biomass heating (burning of wood waste) and natural gas-fired hydronic heating were evaluated.

The result of this evaluation was that ground-source heat recovery was eliminated as too costly.

Biomass heating was the lowest cost option, and would achieve the highest GHG benefits, however it was eliminated for consideration in the NEU Base Case because of uncertainty regarding siting and because of potential permitting difficulties relating to local air emissions, in particular emissions of particulate matter.

Sewer heat recovery with natural gas boilers to manage peak loads, while slightly more costly, was chosen over straight natural gas heating for the Base Case due to its favourable economic and environmental cost benefits.

A summary of the relative costs of the various technologies appears in Appendix A.

ii) Service Area

The service area for the NEU Base Case was assumed to be the SEFC Official Development Plan area. This assumption was made for a variety of reasons:

- The ODP refers specifically to the desirability of a community energy system;
- the development schedule and program for this area is reasonably well-understood;
- innovative heat sources, such as sewer heat recovery, benefit from the integrated infrastructure development now underway in SEFC, and
- economies of scale for phasing the NEU are optimized.

iii) Demand Projections

In contrast to many other community heating systems which have been developed in existing communities or in areas with multiple property owners, the ultimate demand for energy in the SEFC ODP area is more certain. Forty percent of the development will be on City owned lands over which Council has control. The balance of the private lands development is required to meet high standards of environmental performance, providing incentive for private owners to connect to the proposed NEU. Finally, Council could mandate this connection.

The NEU Base Case assumes that all development on City-owned lands, and on the privately-owned parcels within the ODP area, will ultimately connect to the NEU. The pace at which this uptake occurs was assumed to be consistent with current SEFC pro-

forma estimates. In contrast to other community heating systems that have been established in recent years, there is a large and fairly well-defined load for the NEU at start-up, which greatly reduces the risks associated with this initiative.

iv) Rates and Revenue Forecasts

Revenues were estimated based on avoided customer costs. Commercial/institutional revenues were estimated based on the expected cost of gas heating plus the avoided costs for on-site boilers. Residential revenues were estimated based on the expected share of electric and gas heating under Business as Usual (i.e., about 70% electric space heating vs. 30% natural gas space heating).

In the case of electric heat, revenues were based on expected electricity rates plus a 10% premium, which is consistent with recent experience in similar developments within B.C. This 10% over electricity premium is roughly equal to residential gas rates. A premium is justifiable based on the environmental and other performance benefits of non-electric heating. This equates to utility rates that are about 10% higher than current regulated electricity rates and about equal to gas rates. However, higher efficiency buildings could lower overall per unit energy costs as compared to current reference buildings.

The projected return on investment in the Base Case (with a premium) currently exceeds debt costs and allowed rates of return for similar utilities, suggesting that a premium may not be necessary to meet both economic and environmental objectives. However, these rate-setting decisions ultimately will depend upon NEU connection policies, the pace of load growth, the final energy sources, capital costs and prevailing energy prices at the time the NEU is launched.

v) Availability of Grants

Staff believe that the City should be able to secure federal or provincial grant support for the innovative nature of the project. As a point of reference, the City of North Vancouver received a \$2 million grant from the Federation of Canadian Municipalities (FCM) to support the creation of Lonsdale Energy Corporation (LEC), which is currently pursuing high-efficiency gas-fired heating sources. The SEFC ODP area alone will be more than twice the size of LEC at full build-out, and the connected loads in Phase 1 of the SEFC ODP would be substantially larger than the currently connected loads of LEC. The consideration of alternative heat sources would represent a significant level of innovation. The NEU Base Case, low and worst case scenarios assume a grant in the amount of \$2 million. A larger grant of \$4 million is assumed for the expanded service scenario covering the SEFC ODP area and False Creek Flats South.

vi) Accounting for Costs

Costs were assigned to the NEU as if it were privately owned. This assumption ensured that all costs such as land, property tax (excluding income taxes), insurance costs, and working capital were accounted for as part of the analysis.

Whether or not property taxes will be charged to the NEU is an issue that Council can determine once the ownership and governance issues are addressed. However, for the purposes of modelling, the real ROI treats property taxes as a cost to the NEU. If property taxes are not charged to the utility, the real ROI would improve. If property

taxes are charged, they could be viewed as a benefit to the City because it is likely that property taxes paid by the NEU on the heat plant would not be available to the City in the absence of the NEU.

It should be noted that while the business model has the capacity to include income taxation modelling, the scenarios developed here assumed income taxes would not be paid by the utility. If the utility remains owned by the City or another non-taxable structure, these returns can be compared to the allowed after-tax returns of private utilities. If the utility were to become a taxable entity, the returns should be compared to the allowable before tax returns of private companies.

The business model also gives the City the ability to assign a value to GHG reductions. A nominal value of \$10 per tonne for monetized GHG reductions was added initially to the utility revenues in calculating the return on investment for the NEU, but the results presented here are without that nominal value. While this nominal valuation of GHG has little bearing on the modeled ROI, it provides a mechanism to value GHG to help the City make longer-term business decisions related to climate change investments and revenues. It is possible to monetize GHG reductions but, even if the City chooses not to in the near term, they have nominal internal value to the City based on the cost of other alternative means of meeting corporate and community GHG reduction goals.

4. Alternative Scenarios

Sensitivity analyses were conducted to determine the factors that most influence returns and alternative scenario analyses were conducted to test returns.

Table 1 summarizes four scenarios:

- The Base Case is as discussed above. It limits NEU service only to the SEFC ODP area, assumes 100% interconnection of loads from the City Lands and Private Lands within this area, and assumes a \$2 million grant.
- A "High Outcome" scenario was developed, which represents long-term development potential beyond the SEFC ODP area. It assumes eventual extension of the NEU throughout the SEFC ODP area and the False Creek Flats South to the Great Northern Way Campus, 100% interconnection of anticipated loads in these development areas (based on existing zoning), a \$4 million grant (\$2 million in Phase 1 and another \$2 million in Phase 2), and the lower cost biomass heating option. This scenario has more than twice the GHG reduction benefit as the Base Case, but there would be some reduction in economic returns as a result of the lower densities of development currently contemplated in the South Flats. The addition of a large load such as the proposed Providence Health Care Facility to the North of the Flats could further improve the return on investment and GHG benefits associated with system expansion.
- A "Low Outcome" scenario was developed that assumes the NEU is limited to Phase 1 of the SEFC ODP development only, with no change in capital assumptions, which is conservative since capital costs for Phase 1 reflect some oversizing of equipment and space to allow for growth. This scenario assumes only 75% of the Phase 1 private lands are ultimately interconnected and no premium over electric heat. This case results in a significantly lower ROI and only half the GHG reductions compared to the Base Case.

- A “Worst Case” scenario was developed which limits the customer base to City lands in SEFC only. It assumes no connections to private lands within SEFC. It reflects the possibility that the private landowners may be uninterested in connecting to a community heat system. This is an extreme scenario since it does not consider the option of adjusting rates in order to capture additional loads and thereby recover some sunk capital. This scenario was not contemplated in the conceptual plans for the distribution system or heat plant. A conservative adjustment to distribution capital was made assuming the system would not require the same length of trunk lines as contemplated under the original Base Case.

Table 1: Scenario Overview

	Base Case	High Outcome	Low Outcome	Worst Case
Technology	Sewer heat source	Biomass heating source	Sewer heat source	Natural Gas heat source
Service Area	Service limited to SEFC ODP Area Only	Service extended to False Creek Flats South	Service limited to <u>Phase 1</u> SEFC ODP development only	Service area limited to SEFC ODP City lands only
Demand Projections	100% interconnection to NEU	100% interconnection to NEU	100% connection of City lands. 75% interconnection of Phase 1 private lands to NEU	100% connection of City lands. 0% interconnection of private lands to NEU
Rate Forecast	Energy sold at 10% price premium to electricity	Energy sold at 10% price premium to electricity	No premium over electricity price	No premium over electricity price
Availability of Grants	\$2 million grant	\$4 million grant	\$2 million grant	\$2 million grant

5. Analysis and Results

A financial model was developed by the City’s consultants, which accepted the above assumptions as inputs. The model calculated an expected outcome, both in terms of GHG reductions and real (i.e., net of inflation) ROI. The model determined projected cash flows, which anticipated the necessary investments, revenues and costs. This allowed for a determination of the amount of start-up capital which the City will eventually need to contribute in order to build out the heat distribution system.

The outputs of this model are summarized in Table 2.

Table 2: Scenario Results

	Base Case	High Outcome	Low Outcome	Worst Case (Note 1)
Annual GHG Reductions (tonnes/year)	6,200	14,000	3,000	0
Real return on Investment (net of inflation)	7.4%	5.4% (Note 2)	2.8% (Note 3)	2.1% (Note 4)
Cumulative Value of Fixed Assets in 2020 (Excluding Depreciation)	\$27million	\$42.4 million	\$16.2 million	\$10.3 million
Cumulative Net Capital Contribution Required from City	\$14 million in 2010 increasing to \$16.3 million by 2015	\$12.3 million in 2010 increasing to \$22 million by 2015	\$13.7 million in 2010	\$5.6 million in 2010 increasing to \$6.9 million by 2015

Note 1: Inputs to the economic model for the "Worst Case" scenario carry more uncertainty compared those used for the other scenarios. Consequently, the results presented above for this scenario are less accurate than the results presented for the other three scenarios.

Note 2: The ROI declines because the Flats has lower development density and the much higher GHG benefits are given only a nominal value for the investment analysis,

Note 3: ROI is 3.8% if property taxes are excluded (i.e., treated as a benefit for the City rather than a cost for the NEU).

Note 4: ROI is 3.2% if property taxes are excluded (i.e., treated as a benefit for the City rather than a cost for the NEU).

i) Achievement of Objectives

As mentioned earlier, the two major objectives against which the NEU concept are measured are GHG reductions and economic return.

The GHG benefits of the Base Case, compared to Business as Usual, are significant. By complete build-out, anticipated annual GHG emission reductions under proposed heating technologies will total almost 6,200 tonnes per year within the SEFC ODP area. This represents a doubling of all the expected emissions reductions as called for in the Community Climate Change Action Plan for all multi-family buildings in Vancouver planned by 2012. Combining the NEU's system efficiencies with participating buildings efficiencies, the NEU provides a cost-effective strategy for meeting Vancouver's climate change commitments consistent with the Kyoto Accord targets and lays the critical organizational groundwork to implement future additional emissions reductions as the system expands.

As for economic return, the Base Case return on investment of 7.4% compares favourably with the City's inflation-adjusted cost of debt of approximately 4%, and with the inflation-adjusted after-tax and pre-tax returns on capital allowed to similar regulated utilities of approximately 5.4% and 6.3% respectively. The higher pre-tax return reflects the return that would be required if the utility was ultimately subject to income taxation (i.e., transferred to the private sector). The latter reflects some equity in the utility's capital structure and an equity risk premium. Returns are based on current avoided customer costs. Returns that are higher than relevant benchmarks could also be used to lower rates and/or to invest in technologies with higher efficiency and lower GHG emissions.

The "High Outcome" scenario produces a return on investment of 5.4%, which still compares favourably with relevant benchmarks, but more than doubles GHG reductions compared to the Base Case. The "Low Outcome" scenario yields an ROI of 2.8%, however, if property

taxes are excluded (or considered as a benefit to the City) that return increases to 3.8%, slightly below the City's cost of debt.

In contrast to most other GHG reduction strategies contained in the Community Climate Change Action Plan, this initiative would provide direct financial returns to the City in addition to the substantial economic benefits to individuals or businesses that reduce their energy use.

ii) Capital Requirements

The development of a NEU would require the City to make a significant capital investment. The following table illustrates the projected contributed capital and annual revenues at various stages in the Base Case scenario:

Table 3: NEU Projected Capital and Annual Revenues

Year	Cumulative Contributed External City Capital (\$2005)*	Projected Annual Property Taxes (\$2005)	Projected Annual NEU Revenue (\$2005)
2010	\$14.0 million	\$85,000	\$2.1 million
2015	\$16.3 million	\$135,000	\$4.0 million
2020	\$16.0 million	\$135,000	\$4.7 million

*Net of anticipated grants.

The ability of the City to finance these expenditures is considered further in the Financial Implications section that follows.

iii) Sensitivity Analysis

The sensitivity analysis conducted by the City's consultants demonstrated that economic returns are most sensitive to revenue assumptions. Revenues in turn are most sensitive to the rate of development and the percentage of development that can be captured by the utility. Both of these are greatly influenced by City policy. Once customers are connected, heat demand tends to be stable and thus revenues are secure.

6. Additional Benefits

In addition to contributing significantly to Vancouver's GHG reduction goals in an economically feasible manner, the creation of the NEU would deliver numerous environmental, social, and economic benefits for the City and the utility's customers. The benefits have been categorized below according to their predominant effects (environmental, social, and economic), although there is much overlap and synergy between them.

The following is a brief summary of those benefits.

Environmental:

- Immediate efficiency improvements arise from better equipment and integrated operations.
- A community hot water heating system provides a highly flexible platform for future heat sources such as biomass gasification, cogeneration, fuel cells, and solar thermal, and allows the utility to capture waste heat from large institutional and commercial customers such as hospitals and high-tech industries.
- Annual savings from longer amortization periods, lower discount rates, lower capital costs and lower operating costs can be re-invested into environmental enhancements, such as:
 - o Better emission controls;
 - o Even more efficient equipment; and
 - o Environmental off-sets (e.g., GHG off-sets for natural gas and electricity used).
- The utility will have a better understanding of environmental impacts and the means to address them through an integrated system, than multiple owners each with multiple systems.
- As partial or full owner of the utility, the City can function as regulator rather than BC Utilities Commission (BCUC) and can internalize environmental issues in system operations, making trade-offs between customer rates, financial returns and environmental performance. In contrast, private utilities operate under BCUC regulation and must adhere to a least-cost approach, only considering current and probable environmental regulations in their selection of technologies.
- If off-sets are purchased for residual environmental impacts such as natural gas consumption during peak heating periods, these costs can be recovered in service rates paid directly by utility customers, rather than funded by all City taxpayers.
- At the regional scale, the impacts of replicability are pronounced. With significant greenfield development occurring throughout the GVRD and British Columbia, successful demonstration of these technologies could influence many new developments, leading to a provincial network of environmentally sensitive and economically viable energy systems.

Economic:

The utility has numerous financial and economic benefits compared to individual buildings' heating systems, and benefits that result from coordinating the utility's development with construction of new neighbourhoods.

- A utility takes over the investment decision of installing and maintaining energy systems from individual building owners, who are most sensitive to "first costs" and tend to install inexpensive equipment that has higher life cycle costs and lower performance.
- Utilities typically have longer amortization periods, lower carrying costs for capital, and economies of scale in equipment purchases, operations and maintenance. This allows investment in technologies that offer better environmental performance, and flexibility to adopt alternative technologies in future. In effect, such a utility could shift customer focus away from energy prices exclusively, and instead promote attention to energy costs, particularly when the utility serves an area with buildings designed to operate on significantly less energy than conventional buildings.
- The SEFC development offers a timely opportunity of sufficient scale to warrant the organizational effort for the City to develop a community heating system. Viability is dependent upon development patterns and requirements that are influenced by the City, such as requiring interconnection of loads.

- A major brownfield development provides an opportunity to coordinate installation of energy infrastructure and other municipal infrastructure (e.g., water, sewer, streets) at much lower cost.
- If the City chooses to retain ownership, the utility can provide a long-term revenue-producing asset. Profits can be reinvested in other City initiatives, or used to reduce customer rates.
- Alternatively, the City can exit at a future date. There is considerable evidence of willing buyers of operating community energy systems who are looking to acquire low-risk, stable cash-flow businesses such as this.

Social:

Social implications are not as immediately obvious, as the NEU and the structuring of a service model focus primarily on economic and environmental performance. However, social gains are not secondary in the larger picture of sustainability.

- All individuals that choose to purchase or locate in buildings within the NEU service area would see reduced exposure to energy cost escalation as a result of efficiency gains (lower energy consumption), utilization of local resources such as waste heat, and the utility's ability to change heat sources over time.
- The NEU would encourage confidence and pride associated with environmental leadership, building a robust and long-term social network.
- Customers receive premium heating services (comfortable and highly reliable hydronic heat) in all types of housing in the community, at lower cost than if buildings installed stand-alone hydronic systems.

Green technology economic development could provide employment opportunities for residents. The NEU has the potential to stimulate the development of local expertise in building and heating technologies with markets in other parts of the City, province, country and world.

7. Risks and Obstacles

i) Technical Risks

There are technical risks with the sewer heat recovery energy plant option. While extraction of thermal heat from sewage is proven, the consultants found only two examples internationally of such systems that use untreated waste, as would be the case for SEFC. There is some level of uncertainty about the design parameters and long-term reliability of such a system. If the system is less reliable than anticipated, the utility would rely more on natural gas to meet customer demands in the near term than is currently anticipated. The result would be similar costs (although more exposure to natural gas price volatility) and higher GHG emissions. Further preliminary design work is required to confirm the technical feasibility and cost estimates which have been developed to date.

The biomass heat plant option (which could be located in the False Creek Flats area) presents less technical risk than sewer heat recovery, and has superior performance in terms of reducing greenhouse gases, but has increased risk exposure from a permit-ability and siting perspective. The main concern would be particulate matter emissions. Biomass heating plants are common in Europe, and recent North American examples include Revelstoke and St. Paul, Minnesota. Any biomass plant would use the most advanced emission control technologies (95% reduction in particulate matter) and in the long-run conversion to gasification (with

emissions similar to natural gas boilers) would be likely. Initial conversations with GVRD staff indicate that such a plant would require a permit related to air emissions. At this time, it is unclear how the GVRD or public would view a possible air quality permit application. Further work is required to investigate permitting issues and to examine the feasibility of obtaining and developing an acceptable site.

Buildings that connect to the utility's distribution system present an operational efficiency risk to the utility. Each building's hydronic system must be properly designed to efficiently handle the utility's supply and return temperature specifications. To achieve this, the NEU will need to work closely with the developers' design teams to ensure proper design and equipment specification of in-building hydronic systems.

ii) Development Risks

As illustrated by the scenarios described above, revenues and returns are sensitive to the actual customer load for the NEU. This load or heat demand is well understood for various building types, and is therefore mostly dependent on how much development occurs, when, and whether or not buildings connect to the system.

In comparison with most proposed community energy systems, the development quantity and timing for the SEFC ODP area are well understood. In particular, the schedule for the Olympic Village is firm, and eight private parcels included in SEFC all have active rezoning applications underway and intend to complete construction by 2010. Foreseeable changes to their schedules do not have long term impacts on the utility. Prior to 2010, the only significant development risk is whether new buildings connect to the system. Whether connection should be mandatory is noted below as an important policy issue.

For the remainder of the SEFC ODP lands, the amount and form of development is clearly defined by the ODP, and development is estimated to be completed by 2020. This timing is consistent with all SEFC pro-forma estimates, although it is subject to future market conditions.

iii) Future Policy Issues

There are several key future policy issues that affect the NEU's economic and environmental performance assumptions. One notable issue is City authority and policy with respect to potential connection requirements for all new buildings with the NEU service area. Alternatives to mandatory interconnection do exist, including providing credits for interconnection towards other requirements, such as building efficiency performance and LEED certification requirements.

Other future policy issues will affect the NEU if Council decides to own or regulate the NEU. The most critical factor will be the NEU's guiding principles and formula in setting customer rates. Determining whether or not to invest in better environmentally performing heating and distribution technologies and how to reflect increased costs in the rates will affect the ROI. Determining the value of GHG offsets and how aggressive the NEU is in pursuing GHG neutrality as envisioned by Council also will affect the utility's pro forma. Potential pressure from residents could affect rate setting.

Finally, determining the heat source for Phase 1 will affect future policy direction. If the City decides to pursue the biomass plant as part of the first or subsequent phases, it will require a rigorous and uncertain process of obtaining an air quality permit from GVRD. Siting the plant

and getting public acceptance for a local energy generator with local emissions bring further policy implications. The chosen heat plant ultimately affects the NEU's operational efficiencies, pro forma, and environmental footprint and the potential costs of mitigating the environmental impacts through GHG offsets.

iv) Scheduling Issues

The pace of this parallel work is already impacting decision-making on the NEU. In order for the installation of the required hot water pipes in the Olympic Village to be coordinated with all other utilities this year, it is necessary for the City to act as the initial developer. There is not sufficient time left in the schedule for the City to select an outside company which can implement the NEU without City financial involvement.

Funding for preliminary design of the Energy Plant is required at this time because design work must begin in order to complete the Energy Plant in time to service Phase 1 of Southeast False Creek. Also, this will allow the preliminary design of the Energy Plant to be integrated into the design for the relocated Cambie Street sewer pump station which is currently being sited and designed.

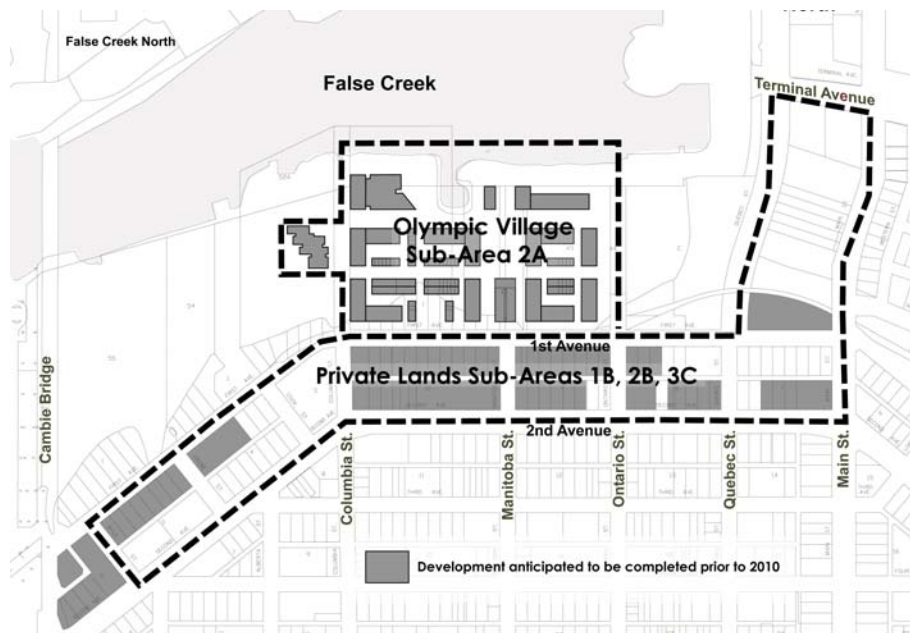
8. Staff Proposal

Staff propose that, subject to Council approval, the City proceed with establishing, designing, and constructing the NEU in a prudent, phased manner that will meet the timing demands of SEFC and Olympic Village development, while addressing business issues, maintaining ownership and operating options, and mitigating risks.

Key decisions, such as commitments to fund significant components of the project, will be reported to Council as and when required, with the intent that the necessary certainty about technologies, business models, Charter authorities, and other issues is obtained in time for each Council decision.

The recommendations in this report reflect this proposed strategy by seeking confirmation of Council's intent to create the NEU, and focussing efforts on critical path issues within the active development area of the NEU. Phase 1 of the NEU is therefore defined as the Olympic Village and adjacent private SEFC lands which are expected to redevelop prior to 2010, as shown in Figure B.

Figure B: Proposed NEU Phase 1: Olympic Village and SEFC Private Lands



Staff advise that timing is of the essence to assure successful delivery of the NEU. As such, funding is presently sought to complete the design of the NEU distribution system for Phase 1, and to undertake preliminary design for the Phase 1 heat plant. This will ensure that the distribution piping installation can be tendered this spring and constructed with the other SEFC utilities this year, and the design of the heat plant can be integrated with design of the SEFC sewer pump station, for which preliminary design is now underway. The associated tender awards will be reported to Council with their funding requirements, in May 2006 (pipe installation) and fall 2006 (heat plant detailed design) respectively.

Concurrently, staff will detail the overall business and operational plan, including recommendations on long term financing, ownership, governance, and regulation, along with appropriate supporting amendments to the Vancouver Charter, and then report back to Council by the end of 2006.

As the NEU will be a significant new undertaking for the City, and timing is critical, a project manager is recommended to spearhead and coordinate the design and construction of the various components of the system. In addition, the project manager will coordinate technical issues with the developers of buildings that will connect to the NEU. This position is most appropriate within Engineering Services, as Engineering is also responsible for the City's other utilities (water, sewers, and solid waste) and has control of the proposed heat source and utility rights of way. If the City chooses to retain ownership of the NEU, Engineering Services would most likely be the department responsible for its management and/or operation.

The NEU business case is based on a sewer heat plant, but staff believe that the benefits of biomass heat generation (lower cost, better GHG performance, and simpler technology) are significant enough to justify further exploration of this alternative. Also, potential partners in False Creek Flats have expressed interest in a biomass project located at their site, for interconnection with the NEU. Although biomass heat generation is in widespread use in Europe, it is expected to be difficult to obtain local public support and permit approval.

Therefore, it is recommended that preliminary investigations for a biomass plant be undertaken in parallel with the sewer heat plant preliminary design, to evaluate the likelihood of a biomass heat plant being supportable as part of the NEU, and if so, when and where. If a biomass plant is not likely to be achievable in Phase 1, the work will serve as background for future phases of the NEU.

Finally, preliminary discussions with funding agencies such as the FCM, and private investors such as other energy utilities, indicate significant interest in Vancouver's NEU project. However, lead times to acquire these sources of funding can be several years, therefore, staff are proposing to begin pursuing these opportunities as soon as Council has approved in principle the NEU.

In the medium term, from 2007 through 2009 (prior to commissioning the system), the major NEU activities envisioned include:

- Creation of the NEU business entity approved by Council;
- detailed design, tendering, and construction of the Phase 1 heat plant;
- design and construction of building service connections and ETS units in each new building that connects to Phase 1 of the NEU;
- resolution of outstanding policy issues such as: property taxation for heat plants, sub-metering requirements within buildings, treatment of GHG savings achieved by the utility, offsetting residual GHG impacts from the use of electricity and natural gas peaking - boilers, etc.;
- creation and approval of a NEU by-law outlining the terms of service, rate structure, and initial rates for customers, and
- determination of future service areas and associated policies (such as mandatory or voluntary connection) for long term expansion outside the SEFC ODP area.

The NEU will be commissioned prior to occupancy of the Phase 1 buildings, anticipated in 2009. After the 2010 Olympics, the expectation will be to complete construction of the NEU to service the remainder of the SEFC ODP area, as and when required between 2010 and 2020. The NEU would also evaluate and pursue expansion opportunities into new service areas such as False Creek Flats, in accordance with its established expansion policies and as development opportunities arise

FINANCIAL IMPLICATIONS

Development of the NEU will require the City to make a significant capital investment. The following Table 3 illustrates the projected contributed capital at various stages in the Base Case scenario.

Table 3: NEU Projected Capital and Annual Revenues

Year	Cumulative Contributed City Capital (\$2005)*	Phasing
2010	\$14.0 million	Phase 1: Olympic Village & 8 Private Lands
2015	\$16.3 million	Phase 2: SEFC ODP area
2020	\$16.3 million	Phase 3: SEFC OPD area and South False Creek Flats

*Net of anticipated grants.

The estimate in Table 3 reflects the external capital contribution to the NEU required from the City under the Base Case scenario. This assumes 100% municipal ownership and 100% debt financing. The amounts are cumulative. For example, the incremental contribution required between 2010 and 2015 is estimated at \$2.3 million. The cumulative capital contribution required from the City is less than the cumulative capital investment of the NEU. The difference reflects assumptions about external grants and surplus cash produced by the utility operations to fund investment internally. Under the base case assumptions, the NEU would be capable of funding growth from its accumulating surplus after approximately 2015. Changes in financing, ownership and dividend policies could alter the amount of internal surplus available to fund growth.

Should Council choose to proceed with the development of the utility for Phase 1 (the Olympic Village and adjacent private lands developing before 2010) a total capital contribution estimated at \$14.0 million will be required. While significant additional investments would be required to continue development of the utility beyond 2010 and beyond the SEFC ODP area, these are separate business decisions that can be made in the future.

As there is currently no authority to finance this contribution through issuance of debt, proceeding will require the use of internal funds. It is proposed that this financing be provided on an interim basis, with long-term commitments and financing decisions being based on ownership and governance of the utility and proposed changes in Vancouver Charter authorities related to the utility. Interim financing terms would reflect the opportunity cost of capital as well as reference to the cost of City debt and the risks associated with the project. If the long-term decision is that the City will own and operate the utility, this interim financing would likely be repaid from utility-specific borrowing similar to the current practice for sewer and water capital. If the utility is sold to a third party, the City would look to recover its investment from the sale. Details of this financing mechanism would be included in the more detailed business model to be reported to Council in November 2006. If the utility should not proceed, any costs incurred would have to be funded from an alternative source to be identified by the City Engineer in consultation with the Director of Finance.

The Director of Finance notes that the only source of internal funds that could be accessed for the NEU would be the Capital Financing Fund as other sources are fully committed during the next five years. The CFF provides internal financing for City projects that can financially support operating and financing costs. However, it is noted that the commitment of up to \$14.0 million from the CFF by 2009 will limit Council's ability to internally finance other civic projects.

While the four year commitment, should Council decide to proceed, is up to \$14.0 million, this report seeks \$970,000 funding to:

- i) Complete preliminary and final design of the NEU distribution system for Phase One (\$402,000).
- ii) Undertake preliminary design for a sewer heat recovery energy plant to serve Phase One of the NEU (\$300,000).
- iii) Investigate the feasibility of biomass heat as an alternative heat source in Phase One or later phases of the NEU (\$100,000).
- iv) Fund the first two years of a temporary project manager (\$168,000).

Staff propose that the NEU distribution system design referred to in i) above be split into the Olympic Village area, which is covered under the existing integrated site servicing design contract with Stantec, and the remaining Phase One area, which staff recommend be designed by FVB Energy Inc.. The Olympic Village portion of the work can be performed by Stantec under existing authorities. However, the remaining work is not covered by any existing contract and staff recommends that this work be sole-sourced to FVB Energy Inc., based on their performance to date consulting on the work described in this report and their proven understanding of the technical and development issues at the site.

Consultants for the work described under items (ii) and (iii) above would be selected by way of a RFP process and then reported on to Council for authority to enter into contracts. In May 2006 staff anticipate reporting to Council with a tender recommendation for pipe supply and installation for Phase 1, at an estimated cost of \$4.9 million. Subsequent funding requests, such as the detailed design and construction of the heat plant, are anticipated concurrently with the November 2006 report back to Council, or thereafter.

PERSONNEL IMPLICATIONS

The ongoing work will be split into two areas. The ongoing business and policy analysis will continue within the workplans of management in Engineering Services, Sustainability Group, SEFC Project Office, and Financial Planning. Additional workload demands will require the creation of a new position, a temporary project manager to oversee the design and construction of the NEU, at \$84,000 per year, including benefits and overhead subject to classification and compensation review by Human Resources.

CONCLUSION

Staff have developed a number of conclusions as a result of the technical assessment and the business and socioeconomic analysis.

- A NEU to provide thermal heating and domestic hot water in the False Creek Precinct is recommended and offers opportunities for increased efficiency, lower costs, lower risks, lower environmental impacts and more flexibility to adopt new technologies over the full life of the development in comparison to the BAU.
- Due to timing opportunities and constraints related to the build out of the SEFC ODP and Olympic Village, staff recommend that the City develop Phase 1 of the NEU as described above.
- Further analysis of ownership, operations, and governance options is needed, but does not preclude the City from developing Phase 1.

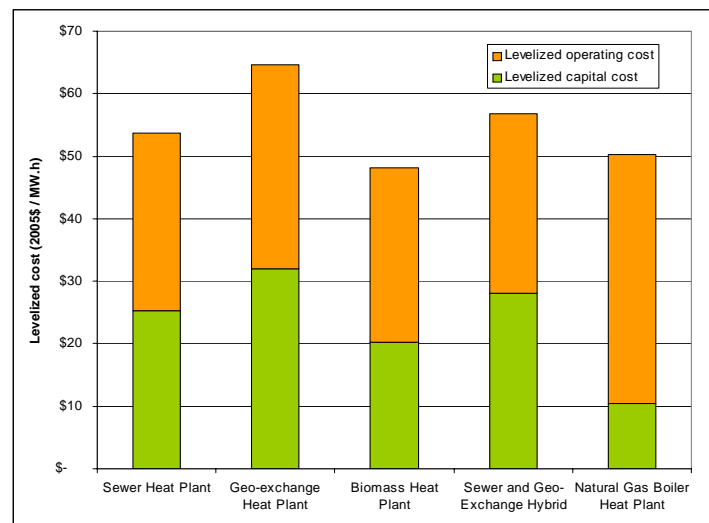
APPENDIX A: EVALUATION OF ALTERNATIVE HEAT SOURCES FOR SEFC

The technical analysis examined a range of possible heat sources including solar, gas-fired boilers, co-generation, biomass, ground-source heat, and sewer heat. Based on preliminary screening of technical and economic feasibility, five options were examined more closely in the business analysis: 1) a sewer heat plant; 2) a biomass plant; 3) a geo-exchange plant; 4) a hybrid sewer and geo-exchange plant; and 5) a natural gas boiler plant. All of the alternative energy systems rely on natural gas for peaking and back-up to reduce costs and increase reliability. In each case, the alternative energy source is expected to provide 65 - 70% of total annual energy output. Heat plants would be built in two to three stages to match load growth. Plants may be located at more than one site, depending upon the mix of sources and available space. Final decisions about the type and location of heat plants in Phase 2 and beyond may be deferred to allow revisions in response to changes in technology costs, fuel prices, and load growth.

Figure A-1 compares the lifecycle cost of the various heat options considered. Each option varies in terms of capital, operating and total costs, and GHG emissions profile. Biomass has the lowest lifecycle cost of all of the options considered. Biomass also provides the largest reduction in GHG emissions of all the plants considered. The analysis assumes a biomass plant would be located in the Flats and includes an allowance for advancing distribution capital to interconnect the biomass plant in Phase 1 of the NEU implementation. However, there is some uncertainty about public acceptance of a biomass plant and whether the plant would receive an air quality permit from the GVRD. The next best alternative energy system is sewer heat. The sewer heat plant would be located at the re-located Crowe Street pumping station.

The business analysis assumes the higher cost sewer heat plant as the Base Case but staff is seeking support to continue to explore the possibility of permitting a biomass heat plant because of its superior economic and GHG emissions profile. A final analysis and recommendation on the Phase 1 heat plant will be brought back to Council by the end of 2006.

Figure A-1: Lifecycle Cost Comparison of Alternative Heat Sources



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