AGENDA ITEM NO. 4.1

THE UNIVERSITY OF BRITISH COLUMBIA

REQUEST FOR DECISION

FORWARDED TO: BOARD OF GOVERNORS ON RECOMMENDATION OF PRESIDENT STEPHEN J. TOOPE

APPROVED FOR SUBMISSION:

Stephen J. Toope

DATE: 16.03.12

PRESENTED BY: Pierre Ouillet, Vice President, Finance, Resources & Operations
David Woodson, Managing Director, Building Operations
John Metras, Managing Director, Infrastructure Development
Peter Smailes, Treasurer

DATE OF MEETING: April 3, 2012

SUBJECT: Steam to Hot Water Conversion – Phase 2 and 3

DECISION REQUESTED: **It is recommended that Board 2 + 3 approval be granted for Phase 2 and 3 of the Steam to Hot Water Conversion project subject to tenders for construction components being received at or below budget. Removal of this condition will be based on results from approximately 80% of tenders. An initial funding release for Phase 4 is also requested at this time in order to commence design of the hot water peaking plant.**

Approval:

Capital Budget – Approved Overall	$84,800,000
New Capital Expense – Powerhouse demolition	$3,500,000
Revised Capital Budget – Project Overall	$88,300,000
Capital Budget – Phase 1 Previously Approved	$5,891,020
Capital Budget – Phase 2 + 3	$13,870,000
Capital Budget – Phase 4 (Peaking Plant Design)	$2,380,000
Preliminary Operating Budget:	See Report
Proceed to Working Drawings	
Award of Construction Contracts	
Funding Release:	$16,250,000

Information:

Expenses to Date:	$4,215,586
Funding Releases to Date:	$8,241,020

FOR APPROVAL (FINANCE COMMITTEE):
Approve internal financing of up to $14.3 million. This loan will be the second installment of a maximum $78.3M loan to be repaid over a period of up to 30 years at an expected rate of 5.75%. Debt service will be funded via cost savings from the project within Building Operations budget.

EXECUTIVE SUMMARY:
Board 1 approval for the Vancouver Campus District Energy System Steam to Hot Water Conversion project was received in February 2011. The first phase of the project was successfully completed on budget this spring. The project, which replaces the existing steam heating system infrastructure with a hot water district energy system, is integral to achieve UBC Vancouver's greenhouse gas (GHG) emission reduction target of 33% by 2015. It also provides a platform for future "UBC as a Living Laboratory" demonstration projects. Demolition costs for the existing powerhouse have subsequently increased the overall project budget from $84.8 to $88.3 million. The project team is currently exploring cost saving options and plans to present these options to the board at a future time.

Funding for the project will come primarily from a loan ($78.3M) paid through the University operating budget. Debt repayment costs will be offset by operating and energy costs savings attributable to the project which are estimated at approximately $4.0 million per year. The UBC Infrastructure Impact Charge (IIC) fund will also contribute $10M to the project.

The project is planned for implementation in 9 phases over the next 5 years. Board 2 + 3 approval is now being sought for Phases 2 and 3 which are scheduled to commence in April 2012. Additional funding is also being sought to complete detailed design on a new peaking plant in preparation for Phase 4 construction in the summer of 2013. Funding for Phase 2 and 3 and the peaking plant design will come from IICs ($2M of the total $10M funding allocated for the project) with the remainder being debt financed.

ORIGIN OF REQUEST AND ADVANCED CONSULTATION

Background
The conversion of the Vancouver campus from steam to hot water represent one of the largest hot water conversions in North America and is a key component to achieving the universities Greenhouse gas reduction targets.

Benefits of the conversion to hot water include:

- Reducing GHG emissions by 22% per year through increased energy efficiency.
- Replacing end-of-life, less efficient steam infrastructure with new, highly efficient hot water piping, heat exchangers and boilers that will serve the needs of our growing campus for generations to come.

- Generating approximately $4.0 million in average annual operational savings from reduced natural gas consumption, carbon liabilities (offsets & carbon tax), maintenance and personnel requirements.
- Providing an enabling platform for future "UBC as a Living Laboratory" demonstration projects (e.g. TRIUMF and Sewer waste heat recovery, Ocean thermal, Geothermal, Solar heating, thermal energy storage and distributed cogeneration) Note: the current steam system does not allow for integration of these options on the scale required by UBC as the temperature and pressure of the steam are too high.
- Facilitating commercial development of new products and technologies in partnership with industry and through linkages to key UBC resources (e.g. Clean Energy Research Centre, Inst. for Resources Environment & Sustainability, and University-Industry Liaison Office).

Many large institutions and cities around the world when faced with a similar decision regarding replacement of aging steam-based district energy infrastructure have opted to convert their systems to hot water to achieve the benefits noted above. Examples include Paris, Munich, Hamburg, Copenhagen, Univ. of Rochester and Stanford University. A larger list is included in Attachment 4.

Current Project Status
Since Board 1 approval of the overall project in February 2011, Kerr Wood Leidal + Associates Ltd Consulting Engineers has been engaged to undertake detailed design of Phases 1, 2 and 3 piping distribution system and energy transfer stations. General contracting for the Phase 1 project was awarded to Division 15 Mechanical, a local company with extensive experience in Hot Water District Energy Systems. The Phase 1 Project was completed on budget this spring. Board 2+3 approval is now sought in order to complete design and undertake construction of Phases 2 and 3.

DISCUSSION SUMMARY

Project Management
The project is being managed by UBC Project Services..

Consultants
FVB Energy Inc. is responsible for the schematic design of overall hot water system. Kerr Wood Leidal (KWL) Associates Ltd. Consulting Engineers has been commissioned to prepare the detailed design, working drawings and tender documentation for Phases 1-3.

Project Scope and Phased Implementation Strategy
This project involves the replacement of existing steam heating system infrastructure with infrastructure for a hot water district energy system. This will include installation of the following:

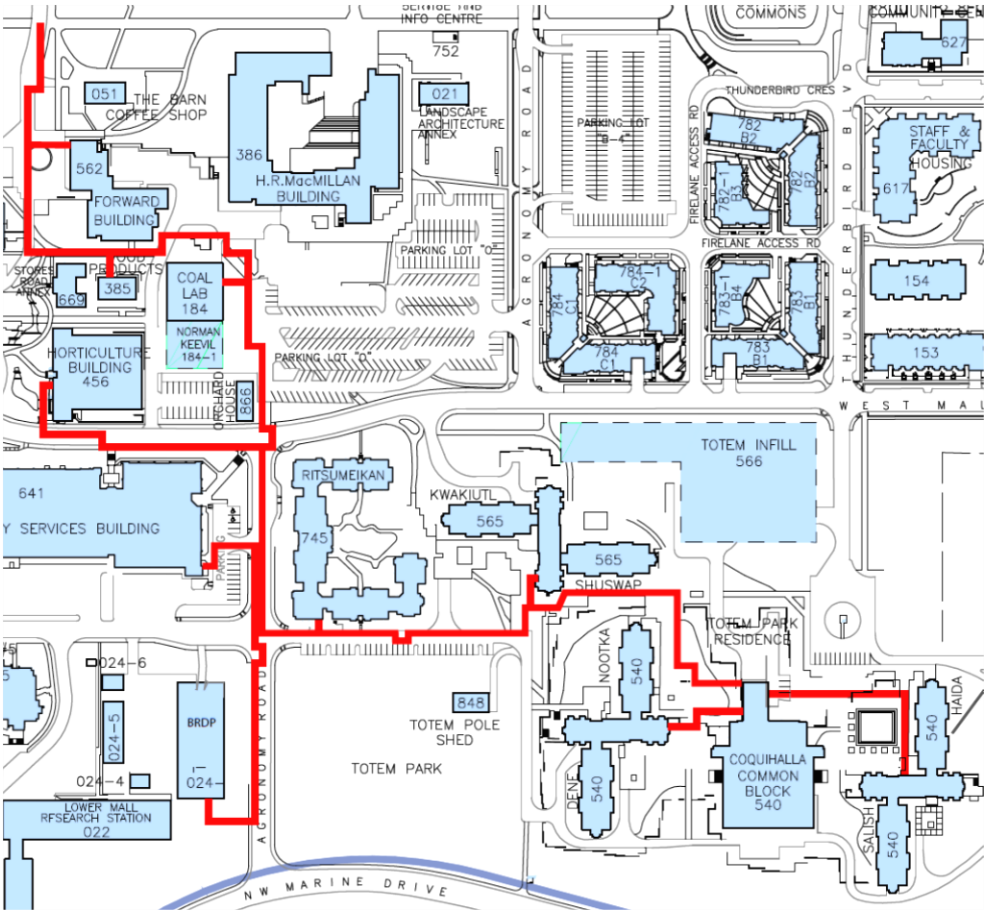
- 14 km of pre-insulated hot water distribution piping
- 131 energy transfer stations (ETS) in building mechanical rooms
- New 52 MW hot water peaking plant
- Onsite steam generation for buildings that require steam for research or operational purposes.

In order to minimize disruption and manage logistical and financial risks the project will be implemented in phases over a period of 5 years.

Phase 1 – Completion Report

The first phase of the Hot Water Conversion project was successfully completed on budget this spring. The project installed 1.1 km of distribution piping and converted 13 buildings from steam to hot water heating (see map below). The combination of improved distribution efficiency and waste heat recovered from the Bioenergy Research and Demonstration Project is currently on track to save 20,000 Giga Joules of natural gas and eliminate 1,000 tonnes of CO2 this year.

Phase 1 Piping Installation



Phase 1 - Lessons Learned and Indirect Benefits

1) Completion of the Phase 1 project on budget has confirmed with greater certainty the construction cost estimates and risks for the overall project.
2) Installation of direct buried piping under roadways was faster and caused less disruption than expected.
3) Existing steam piping was found to be poorly insulated and the energy savings for the overall project may prove to be greater than originally anticipated.
4) Owner supplied equipment for Phase 1 provided bulk rate discounts and cost savings to the project and will be expanded to include other major equipment such as heat exchangers and control valves in the future.

5) UBC Housing's planned renewal of building mechanical system is perfectly timed to maximize building side energy savings and avoid renewing redundant steam infrastructure.
6) A group of UBC researchers and the prime contractor for the Phase 1 project (Division 15 Mechanical) have begun a partnership to explore the benefits of using BIM (building information modeling) to design and fabricate building side hot water piping infrastructure. If successful the project has the potential to save costs and time by allowing for offsite fabrication.

Phase 2 and 3 - Main Mall and Place Vanier - Summer 2012
In coordination with the Public Realm enhancement projects on Main Mall, University Blvd and Memorial Road, the Phase 2 and 3 projects will install 4 km of distribution piping and 17 energy transfer stations. Phase 1, 2 and 3 will allow the hot water system concept to be evaluated in operation prior to construction of the hot water peaking plant and offers an exit strategy should unforeseen issues arise during initial implementation.

Phase 4 - New Hot Water Peaking Plant - Summer 2013
To meet the campus peak heating demand, a new 52 MW hot water boiler plant will be constructed. The team considered reusing the existing power house site. However, conversion of the existing powerhouse to hot water while maintaining service to the campus was determined to be too expensive and impractical. The new hot water plant will have a gross area of approximately 21,657 ft^2 (2,012m^2) and will house the major heating infrastructure for the campus including future clean energy technology. The building will be designed for a minimum LEED Gold certification. The plant will be located on a site on the north side of Thunderbird Boulevard between East Mall and Health Sciences Mall.

Phase 5 – West Mall Hot Water Conversion – Summer 2013
Connecting the Main Mall piping network to the new Peaking Plant, the Phase 5 project also includes the conversion of 15 buildings surrounding the intersection of West Mall and University Boulevard.

Phase 6 and 7 – North Campus Hot Water Conversion – Summer 2014
From the Museum of Anthropology on the west and the Chan Centre to the Student Union Building on the east, Phase 6 and 7 will significantly expand the Main Mall heating network and allow for decommissioning of most steam infrastructure north of University Boulevard.

Phase 8 and 9 - Southeast Campus Hot Water Conversion – Summer 2015
This is the last section of the campus to be converted. When complete the UBC steam plant will become redundant and decommissioned. The UBC Hospital and Life Sciences center are two buildings in particular that require large amounts of process steam for sterilization and HVAC equipment. Options for meeting these loads include installing clean steam generators in each building mechanical room or direct conversion with self standing autoclaves. An appropriate contingency has been reserved for these buildings in the project budget.

Capital Budget – Overall Project

Component	Capital Cost
Phase 1 - Piping, energy transfer stations and building modifications	$5,030,000
Phase 2 - Piping, energy transfer stations and building modifications	$5,900,000
Phase 3 - Piping, energy transfer stations and building modifications	$5,680,000
Phase 4 - 52 MW New Hot Water Peaking Plant	$24,000,000
Phase 5 - Piping, energy transfer stations and building modifications	$6,350,000
Phase 6 - Piping, energy transfer stations and building modifications	$5,670,000
Phase 7 - Piping, energy transfer stations and building modifications	$7,800,000
Phase 8 - Piping, energy transfer stations and building modifications	$9,040,000
Phase 9 - Piping, energy transfer stations and building modifications	$8,000,000
Steam process loads 41 buildings (to be allocated across each phase)	$4,000,000
Math / Geography building heating conversion	$500,000
HST @ 3.4%	$2,786,980
Preliminary Project Budget	**$84,756,980**
Demolition Cost (Existing Powerhouse)*	$3,500,000
Updated Project Budget	**$88,256,980**

*The demolish cost has been externally verified. The cost is attributable to the significant level of asbestos abatement required on the steam boilers, steam lines and pressure vessels and to the need to reconstruct the existing water pump house which will still be required for campus potable water distribution.

The above capital budget includes all required design, construction and project delivery costs as well as contingency and retained risk allowances.

Phase 2 and 3 Capital Cost Breakdown

Component	Cost
Construction	$9,709,789
Planning & Design Fees	$1,282,134
Permits/PO Charges/Legal/Insurance	$46,067
Commissioning & Testing	$34,500
Project Management	$848,695
Contingency	$520,961
UBC Infrastructure Impact Charge (IIC)	$75,750
UBC Retained Risk Fee	$130,240
Sub-total	$12,648,135
HST @ 3.4%	$425,609
Phase 2 and 3 Base Cost	$13,073,744
Allocation for orphaned process steam loads	$796,000
Phase 7 partial piping install to coordinate with Public Realm work	Included above
Total Phase 2 and 3 Total Cost	$13,869,744
New Peaking Plant Design (Phase 4)	$2,380,000
Total funding release request	$16,250,000

Project Valuation

Since Board 1 approval was received in February 2011, the project has adopted the Adjusted Present Value (APV) methodology as recommend by the Sauder School of Business. The table below provides an updated project valuation, including the reconciliation between the previously reported NPV and the APV methodology.

Project Valuation ($ million)	Discounted Cash Flow
February 2011 Board Approval (NPV)	**$18.07**
Change in methodology (APV) and minor assumptions	$3.26
Demolition cost of Old Powerhouse	($2.51)
Decrease in natural gas price	($1.78)
Total	**($1.04)**
Current Hot Water Valuation (APV)	**$17.03**

The cost saving analysis shows that the hot water system will cost the University significantly less in operating and capital expenditures over a 30-year period as compared to the business as usual steam system.

Explanation of Savings

1) Energy Savings – Improved efficiency from the combination of new hot water boilers and distribution piping will save 24% (240,000 Giga Joules/yr) of the natural gas currently consumed by the steam powerhouse. Additionally, a water based distribution system will allow for enhanced heat recovery from the Bioenergy plant. The combined result is anticipated to be a reduction in natural gas consumption of 280,000 GJ/yr, which results in an annual savings of $1.12 million at the current natural gas price of $4/GJ.
2) Carbon Savings – Starting in the Summer of 2012 UBC will pay $55/tonne ($2.74/ GJ) for carbon emissions. Reduced natural gas consumption will result in the elimination of 22% (14,000 tonnes in CO2e emission) and achieve $770,000/yr in carbon liability savings.
3) Water – Despite significant improvements, 136,000 cubic meters of water are annually required to make up for condensate losses in the steam distribution system. This costs UBC $136,000 per year. Modern hot water systems are closed looped with leak detections systems to prevent water losses.
4) Ongoing Maintenance –This includes annual maintenance budgets for the powerhouse and the steam distribution/condensate return system plus third party estimates for the replacement of a significant portion of the campus' aging heat exchangers and domestic hot water tanks. In total the annual maintenance on the steam system is nearly $1 million/yr.
5) Operator requirements – The UBC steam plant is required by regulation to have two operators on site 24/7, hot water plants are safer to operate and the proposed plant will only require one operator 24/7. Additionally the steam distribution/condensate return system currently requires two separate crews of six to maintain. Hot water distribution requires significantly less maintenance and will free up valuable personnel.
6) Capital avoidance – This includes currently pending large ticket items such as: seismic upgrades to the powerhouse $4 million, replacement of boilers $18 million, boiler controls $1 million, de-aerator $1.6 million, back-up generator $0.75 million, water and diesel pumps $3 million, and diesel storage $1 million. Total capital cost is estimated at $33.6 million required in the next 20 years ($42 million including small ticket items such as heat exchangers and domestic hot water tanks). Note that the above-mentioned large ticket items are currently not funded.

Risk Mitigation

Risk	Mitigation factors/strategies
Decrease in price of natural gas	• A natural hedge exists to protect against the effects of lower gas prices. Annual operating budget for the hot water plant is based on assumed gas prices. Lower prices will result in annual budget savings. A decrease in price does not therefore materially impact Building Operations ability to repay the loan.
Reversal of carbon tax and offset requirements by Provincial government	• A natural hedge exists to protect against the effects of reduced carbon tax and offsets. Annual operating budget for the hot water plant is based on assumed tax/offset rates. Lower rates will result in annual budget savings and will not therefore materially impact Building Operations ability to repay the loan.
Capital cost increase due to cost escalation or unforeseen technical issues	• Completion of the Phase 1 project on budget provides greater assurance of the accuracy of the overall project costs. • Project overages are insured through UBC Retained Risk policy. • Phased implementation will allow capital cost assumptions to be tested in Phases 1-3 before major investment in hot water peaking plant is required. • Experienced consultants have been engaged to undertake design.
Unrealized operational labour savings	• Labour issues are minimal as staff reduction for hot water can be absorbed by staff increases already budgeted for the Bioenergy plant.
Energy savings assumption is incorrect	• Phased implementation will allow savings assumptions to be tested before the hot water peaking plant is built.

Funding Sources

Total Project	
UBC Operating Budget (debt-financed from operational savings)	$78.3M
Infrastructure Impact Charges (IICs)	$10.0M
Total	$88.3M
Phase 1	
UBC Operating Budget (debt-financed from operational savings)	$3.9M
Infrastructure Impact Charges (IICs)	$2.0M
Total	$5.9M
Phase 2 & 3 (and Phase 4 design)	
UBC Operating Budget (debt-financed from operational savings)	$14.3M
Infrastructure Impact Charges (IICs)	$2.0M
Total	$16.3M

Financing

Proposed debt financing for the overall project will be a series of loans of up to $78.3M in the cumulative. The loans will be amortized over a maximum of 30 years from the date of issuance of the Phase 1 loan with an average projected interest rate of 5.75%. Specifically for Phases 2 & 3,

proposed debt financing will be a loan of $14.3M from UBC Treasury with a projected interest rate of 5.75%. The $14.3M loan will be amortized over 29 years and the annual debt service of approximately $999,000 will be funded by cost savings associated with Phases 2 & 3 of the project.

The University anticipates sufficient liquidity to facilitate the Phase 2 & 3 loan internally using working capital. The inclusion of this loan is within the University's mandated 5.5% debt burden ratio.

Schedule

The pending 2015 GHG reduction targets and the planned implementation of Public Realm work on Main Mall in 2012 make it necessary to proceed with Phases 2 and 3 of the steam to hot water conversion project immediately. The proposed project schedule is shown below. Board 1 approval for the overall project was received in February 2011. The plan is to bring each annual package of project phases forward for separate Board 2 + 3 approvals.

Board of Governors (Board 1 – Overall Project)	Feb 2011
Board of Governors (Board 2+3 – Phase 1)	Jun 2011
Construction – Phase 1 (Lower Mall) - Complete	**Summer 2011**
Board of Governors (Board 2+3 – Phase 2 & 3)	March 2012
Construction – Phase 2 + 3 (Main Mall and Place Vanier)	**Summer 2012**
Board of Governors (Board 2+3 – Phase 4 & 5)	Feb 2012
Construction – Phase 4 + 5 (Hot Water Plant + West Mall)	**Summer 2013**
Board of Governors (Board 2+3 – Phase 6 & 7)	Feb 2013
Construction – Phase 6 + 7 (North Campus)	**Summer 2014**
Board of Governors (Board 2+3 – Phase 8 & 9)	Feb 2014
Construction – Phase 8 + 9 (SE Campus)	**Summer 2015**

Attachments

1. Previous Board History
2. Capital Accountability Scope and Planning
3. Capital Accountability Budget and Funding
4. Steam to Hot Water Conversions Projects Around the World

Attachment 1

PREVIOUS BOARD HISTORY

Date:	June 8, 2011 – **Board 2+3 for Phase 1**	
Resolution:	**Approval:**	
	Capital Budget – Overall Project:	$ 84,800,000
	Capital Budget – Phase 1	$5,891,020
	Preliminary Operating Budget:	See Report
	Proceed to Working Drawings	
	Award of Construction Contracts	
	Funding Release:	$ 5,891,020
	Information:	
	Expenses to Date:	$62,700
	Funding Releases to Date:	$2,350,000
Date:	February 7, 2011 – **Board 1**	
Resolution:	**Approval:**	
	Preliminary Capital Budget:	$84,800,000
	Preliminary Operating Budget:	See Report
	Schedule	
	Project in Principle	
	Location	
	Consultant	
	Program	
	Proceed to Schematic Design	
	Funding Release:	$2,350,000
	Information:	
	Expenses to Date:	$0

Capital Accountability Scope and Planning

PROJECT NAME		CURRENT APPROVAL STATUS		
Project Name:	Steam to Hot Water Conversion		Level	Approval Date
Department/Unit:	Building Operations	Executive:	3	5-Jan-11
Sponsor:	Pierre Ouillet, VP FRO	Board:	2/3 (Phase 1)	8-Jun-11

PROJECT DESCRIPTION		PROJECT SCOPE
Development Type:	New Construction + Renovation	Scope Element
Facility Type:	Utility Infrastructure	14 km hot water distribution piping
Gross Building Area:	N/A	131 energy transfer stations in campus
Capital Cost:	$88,300,000	1 peaking hot water plant
Location/Site:	UBC Vancouver Campus	
Primary Users:	Building Operations Institutional Buildings	

PROJECT RATIONALE & BENEFITS	
Need/Benefit Area	Description
Sustainability	Reduces campus GHG emissions by 22%/year. Key to achieve targeted 33% GHG reduction by 2015.
Operational	Replaces existing end-of-life, inefficient steam infrastructure that would need to be replaced anyway.
Economic	Reduces campus energy demand by 24%. Reduces operator cost requirement. Delivers net savings.
Learning & Research Environment	Provides platform for Living Lab projects not offered by steam system (eg. TRIUMF heat recovery).
Other Benefits:	Facilitates commercial development of new technologies in partnership with industry. Provides proven solutions for similar sized institutions and municipalities.

SCHEDULE				SUSTAINABILITY GOALS		
		Target	Actual	Indicator	Target	Actual
Board 1		Feb 2011	Feb 2011	Certification:	LEED Gold (HW Plant)	
Board 2*	Phase 1	Apr 2011	Jun 2011	Energy Efficiency Level:	42% better than MNECB	
Board 3 *	Phase 1	Jun 2011	Jun 2011	Energy Use Intensity:	TBD (kWh/ft2)	
Construction Start	Phase 1	Jun 2011		GHG Reduction:	TBD % better than standard	
Substantial Completion	Phase 9	Aug 2015		Const Waste Recycling	75% recycling rate	
Board 4		Sep 2016		Water Use Efficiency	TBD % better than standard	
* Board 2 & 3 approvals will be requested for the phases proposed to be undertaken in a given year.				Innovative Features:		

DEVELOPMENT PROCESS			
Project Manager	UBC Project Services	Construction Manager	TBA
Consultant	FVB Energy	Infrastructure Development Rep	John Metras, Managing Director

	Date	Comments
AUDP Review		N/A
Dev. Review Committee		N/A
Public Open House		N/A
Development Permit		N/A
Building Permit	Apr 2012	

CAMPUS & COMMUNITY PLANNING COMMENTS

Capital Accountability Budget and Funding

PROJECT NAME	
Project Name:	Steam to Hot Water Conversion
Department/Unit:	Building Operations
Sponsor:	Pierre Ouillet, VP FRO

CAPITAL BUDGET ($000s)

Capital Development Cost	$000s	$/GSF
Phase 1 - Piping, ETS and building mods	$ 5,030	n/a
Phase 2 - Piping, ETS and building mods	$ 5,900	
Phase 3- Piping, ETS and building mods	$ 5,680	
Phase 4 - 52MW New Hot Water Peaking Pla	$ 24,000	
Phase 5 - Piping, ETS and building mods	$ 6,350	
Phase 6 - Piping, ETS and building mods	$ 5,670	
Phase 7 - Piping, ETS and building mods	$ 7,800	
Phase 8 - Piping, ETS and building mods	$ 9,040	
Phase 9 - Piping, ETS and building mods	$ 8,000	
Steam process loads 41 buildings	$ 4,000	
Math/Geography building heating conversion	$ 500	
HST (3.4%)	$ 2,787	
Sub-total	**$ 84,757**	**n/a**
Old powerhouse demolition allowance	$ 3,500	
Total Project Budget	**$ 88,257**	**n/a**

Capital Budget Notes: Budget includes all required design, construction and project delivery costs as well as contingency and retained risk

LIFE-CYCLE OPERATING BUDGET

Savings Component	%	30-Yr NPV ($000's)
Energy savings	33%	$27,355
Carbon savings	11%	$8,946
Water savings	2%	$1,922
Maintenance savings	8%	$6,344
Operator savings	23%	$19,443
Capital avoidance	23%	$19,592
Total Savings	**100%**	**$83,603**
NPV Feb 2011		**$18,070**
Assumption changes:		
New methodology (APV)		$3,260
Old powerhouse demolition		($2,510)
Natural gas price decrease		($1,780)
Current APV valuation		**$17,030**

Discount rate	variable (APV)	Carbon Tax	$30/tonne
Inflation	2.0%	Carbon Offsets	$25/tonne
NG Commodity Cost	$3.00/GJ		
NG Delivered Cost	$4.00/GJ		

FUNDING AGREEMENTS ($000s)

Funding Source	Liability with:	Committed	Secured*
Donor Fundraising			
GPOF - Faculty/Unit	Building Ops	$ 78,300	
GPOF - Central Admin			
Provincial Gov't			
Federal Gov't (CFI/WED)			
IIC	Central Admin	$ 10,000	$ 10,000
Total		**$ 88,300**	**$ 10,000**

* Funding paid or firmly committed to be paid before end of construction

Funding Notes:

FINANCING AGREEMENTS ($000s)

Debt Serviced By:	Loan Amt*	Amort.	Int.	Ann. Payment
	$ -			
Building Operations	$ 78,300	30	5.75%	$ 5,537
	$ -			
Total	**$ 78,300**			**$ 5,537**

Debt Capacity Impact: Long term debt associated with this project

PROJECT REQUIREMENTS CHECKLIST & SIGN-OFF

CHECK	REQUIREMENT	NAME	SIGNATURE	DATE
	Programmatic need and benefit	Building Operations Managing Director	David Woodson	13-Jan-11
	Project scope and budget Project manager assignment Swing space requirements	Infrastructure Development Managing Director	John Metras	13-Jan-11
	Project site Development review process Sustainability measures	Campus & Community Planning Associate Vice President	Nancy Knight	13-Jan-11
	Classroom/teaching lab review	Classroom Services Director	N/A	
	Food, housing and child care	Student Housing & Hospitality Services Managing Director	N/A	
	Funding & financing agreements	Project Sponsor VP FRO	Pierre Ouillet	13-Jan-11
	Funding & financing agreements Debt capacity	Treasury Treasurer	Peter Smailes	13-Jan-11
	Fundraising plan	Development Office AVP, Development Services	N/A	
	Life-cycle operating costs	Building Operations Managing Director	David Woodson	13-Jan-11

Attachment 4

Steam to Hot Water Conversions Projects around the World

Steam System location	Heating Capacity (MW)	Conversion Status	Conversion Period
University of British Columbia	70	In progress	2011-2015
Munich (Germany)	1250	In progress	2003-2012
Paris (France)	4285	In progress	2008-2030
Hamburg (Germany)	250	In progress	2002-2010
Kiel (Germany)	320	In progress	2002-2012
Salzburg (Austria)	170	Complete	2005-2009
Ulm (Germany)	150	In progress	2010-2017
Rock Island Arsenal (US)	130	Complete	1990-1995
Ft. Myer (US)	20	Complete	1995-1997
University of Rochester (US)	50	Complete	2005-2008
Copenhagen (Denmark)	900	In progress	2010-2025
Lakehead University (Canada)	25	Complete	2005-2008
Stanford University (US)	100	In progress	2010-2015
Auburn University (US)	5	Complete	2006-2009
Ball State University (US)	50	In progress	2009-2013