FINANCIAL MANAGEMENT COMMITTEE

TO: THE MAYOR AND COUNCILLORS

SUBJECT: BURNABY DISTRICT ENERGY SYSTEM – PROPOSED ASSOCIATED PROJECTS

RECOMMENDATIONS:

1. THAT Council approve staff's participation in a pilot project of sorption heat transformer technology with the Simon Fraser University, School of Mechatronic Engineering and that the allocation of $120,000 a year for five years (total: $600,000) from the capital program included in the 2023-2027 Financial Plan be allocated to support this participation.

2. THAT Council approve the City of Burnaby to become a funding and founding partner in the establishment of a green hydrogen hub in Burnaby, and that a grant of $800,000 from the Operating Climate Action Reserve to support this work be authorized for distribution to Simon Fraser University, who is leading creation of the hub.

REPORT

The Financial Management Committee, at its meeting held on February 21, 2023, received and adopted the ***attached*** report seeking Council approval for staff to participate in projects associated with the Burnaby District Energy System, with corresponding funding allocations, specifically: the decarbonization of district energy systems; and the creation of a Burnaby green hydrogen hub.

Respectfully submitted,

Councillor Dhaliwal
Chair

Councillor Gu
Vice Chair

2022 February 21

COMMITTEE REPORT

TO:	CHAIR AND MEMBERS FINANCIAL MANAGEMENT COMMITTEE	**DATE:**	2023 February 15
FROM:	GENERAL MANAGER LANDS AND FACILITIES	**FILE:**	39000-01

SUBJECT: BURNABY DISTRICT ENERGY SYSTEM - PROPOSED ASSOCIATED PROJECTS

PURPOSE: To request Council approval for staff to participate in projects associated with the Burnaby District Energy System, with corresponding funding allocations, specifically: the decarbonization of district energy systems; and the creation of a Burnaby green hydrogen hub.

RECOMMENDATIONS:

1. **THAT** the Financial Management Committee request Council to approve staff's participation in a pilot project of sorption heat transformer technology with the Simon Fraser University, School of Mechatronic Engineering and that the allocation of $120,000 a year for five years (total: $600,000) from the capital program included in the 2023-2027 Financial Plan be allocated to support this participation.

2. **THAT** Financial Management Committee request Council to approve the City of Burnaby to become a funding and founding partner in the establishment of a green hydrogen hub in Burnaby, and that a grant of $800,000 from the Operating Climate Action Reserve to support this work be authorized for distribution to Simon Fraser University, who is leading creation of the hub.

REPORT

1.0 BACKGROUND

Pursuing district energy systems and shifting to renewable energy sources for civic buildings and fleets were originally identified as important actions for the City of Burnaby to undertake within the Burnaby Environmental Sustainability Strategy (2016), and the Community Energy and Emissions Plan (2016). This direction was subsequently expanded and reinforced with the Burnaby Climate Action Framework (2020), and the City Energy Strategy (2021).

Since that time, staff have pursued feasibility studies with retained consultants and Metro Vancouver staff. On January 25, 2021, Metro Vancouver provided City staff a report outlining that recovering waste heat from the Metro Vancouver Waste-to-Energy facility located in South Burnaby via a Burnaby District Energy System (DES) is a feasible project that would benefit the residents of Burnaby with safe, reliable, and cost-competitive thermal energy. The Metro Vancouver's Waste-to-Energy Facility has operated in Burnaby since 1988 and handles about 260,000 tonnes of garbage per year – roughly a quarter of the region's garbage. It is a mass-burn facility that turns waste into electricity (enough to power 16,000 homes a year)

The feasibility study also concluded that there is an abundant amount of heat available at the Waste-to-Energy facility and that the system can be expanded to Vancouver and New Westminster, which solidifies the feasibility and cost effectiveness of the DES. For example, a DES serving the Metrotown Town Center, Edmonds Town Center, and River District in Vancouver can provide clean, reliable and cost-competitive thermal energy to customers. As such, developing a Burnaby District Energy System (DES) has been included in the 2023-2027 Financial Plan for a stated total of $27,000,000.

In January 2022, Metro Vancouver and Burnaby City Council announced that a new agreement with Metro Vancouver will see River District Energy purchase up to 10 megawatts of heat from Burnaby's Waste-to-Energy Facility starting in 2025. This agreement is an example of the potential of the DES to power entire neighbourhoods by capturing heat from the Metro Vancouver facility.

2.0 POLICY SECTION

The City's participation in the described opportunities, coordinated through the Civic Innovation Lab, are aligned with the following Council-adopted policies and plans/strategies: the City Energy Strategy (2021), the Climate Action Framework (2020), the Corporate Strategic Plan (2022), the Environmental Sustainability Strategy (2016), the Community Energy and Emissions Plan (2016), and the Economic Development Strategy (2007).

3.0 PROPOSED PILOT PROJECT – SORPTION HEAT TRANSFORMER TECHNOLOGY

Building upon the momentum of the DES project, an opportunity has emerged to engage in an innovative pilot project with Dr. Majid Bahrami, a Professor with the Simon Fraser University, School of Mechatronic Systems Engineering. Dr. Bahrami is the Canada Research Chair in Alternative Energy Conversion Systems, and a highly regarded expert in a number of areas including district energy networks, decarbonizing thermal systems in buildings, hybrid micro grids, and sustainable heat pumps/air conditioning systems.

The connection with Dr. Bahrami was fostered through the Civic Innovation Lab (CIL), which is a non-profit society incorporated in 2022 May and jointly controlled by the City of Burnaby and Simon Fraser University (formation approved by Council in 2022 March).

Should the collaboration be pursued, CIL staff are available to support with project implementation and management. CIL staff currently consist of a 1.0 FTE individual seconded from each founding partner (Executive Director and Research Project Manager).

More specifically, an opportunity has been identified to pilot Dr. Bahrami's patent-pending Sorption Heat Transformer technology, which is a waste-heat driven heat pump/air conditioner and long-term thermal storage systems that improves the efficiency of district energy systems. The highly innovative sorption heat transformer systems run on low-grade heat (temperature < 90°C), requires negligible electrical power to achieve heat pumping and air conditioning, and are flexible to provide heating and/or cooling using only waste-heat. For example, this technology can provide air conditioning without the need to install a new chilled water pipe loop in district energy networks. The technology is also a sustainable initiative as it operates via a thermochemical reaction and therefore produces no GHG emissions. It has no moving parts (quiet operation) and contains no harmful refrigerants or materials.

Via discussions with Lands and Facilities and CIL staff, Dr. Bahrami has proposed a 5-year project which would entail a variety of milestones including designing and building a customized, modular sorption heat transformer specifically for the City of Burnaby, including developing models to meet the duty cycle and load profile of the DES, and installing and optimizing the transformer in real-life operating conditions while collecting and analyzing performance data. The project would also advance community-centred climate innovation a priority area of SFU's 2023-2028 Strategic Research Plan[1].

The overall project budget for the project is approximately $2.5 million, including the participation not only of Dr. Bahrami but also PhD students, Post-Doctoral fellows, Lab Engineers and others. Dr. Bahrami's lab, with support from the CIL if required, is eligible to apply for significant funding for such work via Natural Sciences and Engineering Research Council of Canada (NSERC) Alliance Grants[2] and BC Ignite funding[3]. However, such streams of funding are contingent upon the presence of private or public sector partners (such as the City of Burnaby), and core, committed 'seed' funding.

Participating in such a pilot project is a unique opportunity for the City of Burnaby to elevate its planned District Energy System initiative for improved efficiency, reduced GHG emissions, and increased flexibility (e.g. both heating and cooling). Enabling staff support is available via the CIL, with technical expertise brought in on an as-needed from Lands and Facilities, Engineering, and Planning and Development department staff.

1 For more information, please visit https://www.sfu.ca/research/strategic-research-plan
2 For more information, please visit https://www.nserc-crsng.gc.ca/innovate-innover/alliance-alliance/index_eng.asp
3 For more information, please visit www2.unbc.ca/events/67286/innovate-bc-ignite

2.1 Proposed Sorption Heath Transformer Pilot Project Funding $120,000 a year for 5 years, $600,000 total

To enable the City of Burnaby to participate in the unique sorption heat transformer pilot project, in related to the Burnaby District Energy System, staff are recommending that $120,000 annually for five year ($600,000) of the funding. This project was not included in the 2023-2027 Financial Plan, to accommodate this, funding will be reallocated from the DES project. This committed funding will support Dr. Bahrami's lab to leverage funding applications to higher orders of government, as described above. In the unlikely circumstance that these funding applications are unsuccessful, the requested budget allocation will be reexamined.

4.0 CREATION OF A HYDROGEN HUB IN BURNABY

Simon Fraser University is in process of building a green hydrogen hub on the Burnaby campus, to demonstrate and advance technologies for hydrogen production, utilization and related applications. Green hydrogen is hydrogen produced via the electrolysis of water, with the input electricity coming from renewable sources. The campus site has unique proximal advantages to an existing hydroelectricity substation for low cost, clean electricity and is encircled by natural gas pipelines. The hub once constructed will deliver up to 1 MW of on-site clean hydrogen.

As part of the Provincial CleanBC Plan[4], which outlines pathways for British Columbia to meet its emissions reduction targets by 2030 and achieve net zero by 2050, hydrogen power is identified as an important avenue for reducing emissions across a wide range of sectors in B.C., including:

- Medium and heavy-duty transportation;
- Industry and refining;
- Displacing natural gas; and
- Displacing diesel used for electricity generation in remote communities.

The Province has subsequently developed the BC Hydrogen Strategy[5], and established the BC Hydrogen Office to advance efforts to increased hydrogen sector capacity and availability in B.C. The Provincial Hydrogen Strategy has identified the immediate priorities of, among others:

- Developing regional hydrogen hubs where production and demand are co-located;
- Exploring the use of hydrogen in a variety of applications; and
- Incentivizing the production of renewable and low-carbon hydrogen.

---

4 For more information, please visit https://www2.gov.bc.ca/assets/gov/environment/climate-change/action/cleanbc/cleanbc_roadmap_2030.pdf
5 For more information, please visit https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/renewable-energy/hydrogen-office

Burnaby has become an incubator community for innovative energy-related industries and businesses, including Ballard Power, Inonomer Innovations, and CellCentric. This growing industry profile, combined with SFU's world-leading research capability in the area has created a unique opportunity for the development of a hydrogen hub, which directly aligns with Provincial hydrogen-related strategies. The hub will contribute to the critical infrastructure needed to build BC's hydrogen economy, while providing researchers/businesses with the data required to scale-up innovative technologies needed to make cost-effective hydrogen production realistic. The project also advances community-centred climate innovation which, as mentioned above, is a priority area of SFU's 2023-2028 Strategic Research Plan.

In 2022 December, the City of Burnaby provided a support letter, signed by Mayor Hurley, to the project's in-progress funding negotiations with a higher level of government funder. The City has the further opportunity to become both a founding and funding partner in this local industry-defining hydrogen hub project, to the amount of $800,000. The stated amount has been identified through staff conversations, via the Civic Innovation Lab (CIL), with the SFU Cleantech Partnerships Hub in relation to the overall multi-million dollar project budget. This overall budget is still in negotiation with the higher order of government funder.

By solidifying its position as a contributing partner in the hydrogen hub, the City of Burnaby has the opportunity to not only to contribute to related local economic growth in the area of clean energy, but also to benefit as an organizational entity via future access to green hydrogen power. Access to this alternative power source is in relation not only to the approved Burnaby District Energy System but also potentially as a future option for City facilities in proximity, and for heavy duty fleet vehicles.

As the Committee is aware, Burnaby City Council declared a Climate Emergency in 2019. This emergency declaration set new carbon reduction targets for the City of Burnaby for the next three decades that align with regional, provincial, national and international targets, to achieve a 45% reduction in emissions by 2030 and carbon neutrality by 2050. The subsequently developed Burnaby Climate Action Framework (2020) and City Energy Strategy (2021) both emphasize the need both for climate leadership on the part of Burnaby, as well as the need to pursue alternative, low-carbon power sources via partnerships and other opportunities. Enabling staff support is available via the CIL, with technical expertise brought in on an as-needed from Lands and Facilities, Engineering, and Planning and Development department staff.

4.1 Proposed Burnaby Hydrogen Hub Grant $800,000

To position the City of Burnaby as a funding and founding partner in the development of a green hydrogen hub at the SFU Burnaby campus, staff are recommending that Council authorize a grant of $800,000 to SFU. Should Council authorize this grant, it is recommended that up to $800,000 be allocated from the Operating Climate Action Reserve in the 2024 – 2028 Financial Plan. This committed funding will contribute to the

development of a green hydrogen hub, which will enable the co-creation of regional clean energy transition solutions through the collaboration of SFU's world-leading research capability and regional stakeholders, including the City of Burnaby and industry partners. Should authorization be granted, staff will pursue the development of a corresponding grant agreement with Simon Fraser University, including itemization of City-owned, associated items including boilers and upgraded pipes.

5.0 RECOMMENDATIONS

The City of Burnaby has a unique opportunity to participate in two innovative, industry-leading projects related to the Burnaby District Energy System – more specifically a sorption heat transformer pilot project, and the development of a green hydrogen hub at the SFU Burnaby campus. Both projects have the potential to greatly contribute to the City's overall emissions reduction goals, and to elevate the efficiency and sustainability of the Burnaby District Energy System.

As such, it is recommended that the Financial Management Committee request Council to approve staff's participation in a pilot project of sorption heat transformer technology with the Simon Fraser University, School of Mechatronic Engineering and that the allocation of $120,000 a year for five years (total: $600,000) from the capital program included in the 2023-2027 Financial Plan be allocated to support this participation.

It is also recommended that the Financial Management Committee request Council to approve the City of Burnaby to become a funding and founding partner in the establishment of a green hydrogen hub in Burnaby, and that a grant of $800,000 from the Operating Climate Action Reserve to support this work be authorized for distribution to Simon Fraser University, who is leading creation of the hub.

James Lota, P.Eng, MBA, MPA
General Manager, Lands and Facilities

RM/nh

Copied to: Chief Administrative Officer
Deputy Chief Admin Officer CFO
General Manager Engineering
General Manager Planning and Development
General Manager Corporate Services
City Solicitor