



To: General Purposes Committee

Date: April 9, 2017

From: John Irving, P.Eng, MPA
Director, Engineering

File: 10-6125-05-01/2017-
Vol 01

Re: Solar Energy Systems Project for Fire Hall No.1

Staff Recommendation

1. That the report titled "Solar Energy Systems Project for Fire Hall No. 1" dated April 9, 2017 from the Director, Engineering, be approved in the amount of \$450,000; and,
2. That the 5 Year Financial Plan (2017-2021) be amended accordingly.

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Director, Engineering
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REPORT CONCURRENCE		
ROUTED TO: Finance Department	CONCURRENCE <input checked="" type="checkbox"/>	CONCURRENCE OF GENERAL MANAGER
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	INITIALS: JI	APPROVED BY CAO

Staff Report

Origin

The purpose of this report is to bring forward an opportunity for Council consideration to incorporate solar photovoltaic (PV) energy generation and innovative storage technology at the new Fire Hall No.1.

This report supports Council's 2014-2018 Term Goal #4 Leadership in Sustainability:

Continue advancement of the City's sustainability framework and initiatives to improve the short and long term livability of our City, and that maintain Richmond's position as a leader in sustainable programs, practices and innovations.

4.1. *Continued implementation of the sustainability framework.*

4.2. *Innovative projects and initiatives to advance sustainability.*

This report supports Council's 2014-2018 Term Goal #6 Quality Infrastructure Networks:

Continue diligence towards the development of infrastructure networks that are safe, sustainable, and address the challenges associated with aging systems, population growth, and environmental impact.

6.1. *Safe and sustainable infrastructure.*

Background

In January 2014 Council adopted the Community Energy and Emissions Plan (CEEP) that outlines an array of strategies and actions for the City to take to reduce community energy use and GHG emissions. Some of these strategies and actions encourage the deployment of corporate solar energy systems, including:

Strategy 10: Utilize Local Energy Sources.

Strategy 13: "Lead by example" with City Operations Energy Management.

Council's commitment to corporate energy conservation, efficient resource use and GHG (greenhouse gas) emissions reductions, are key components that drive the City's sustainable business and operational practices. This commitment led to the update of the Sustainable "High Performance" Building Policy – City Owned Facilities (#2307) in February 2014, with strong energy conservation and sustainability performance targets for new and existing facilities. In accordance with the City's policy, the new Fire Hall No.1 targeted LEED® Gold certification for New Construction. These targets drove the building design to maximize waste heat recovery, minimize heat loss through improved building envelopes, use high efficient lighting and low flow water fixtures, and incorporate a rainwater collection system for site irrigation needs.

Incorporating energy conservation measures are anticipated to greatly increase the energy efficiency of the new Fire Hall No.1 as compared to the previous building. It is expected that the new fire hall will utilize approximately 50% less energy, while providing 35% more floor space.

In addition, the “Solar Friendly Richmond Framework”, presented to Council in January 2016, outlined opportunities for the City to accelerate solar PV deployment in the City, including installing solar on new or existing corporate buildings.

Analysis

During the design development, it was recognized that a solar PV electricity generation system was not a core operational feature. However, the building was designed to structurally support solar PV panels on the upper roof of the building. This structure design feature, along with other features, was crucial to incorporate in the initial design of the building in order to ensure that the systems could be integrated as seamlessly as possible now or in the future. In addition, this renewable energy infrastructure is essential for the City to achieve LEED® Gold certification for the Fire Hall No.1, and without it a lesser designation is expected to be achieved.

Staff worked to leverage support and funding through partnerships with external stakeholders. Through the Federation of Canadian Municipalities, the City was successful in receiving a 50% grant (up to \$67,000) to complete a comprehensive feasibility study on the potential design and benefits of a solar PV system at Fire Hall No.1, which included a review of innovative technical and financing options that the City could potentially utilize. Other larger external capital funding requests were not successful, including submissions to the Federal Energy and Innovation Program, New Build Canada Fund, and Canada 150 Fund, and the Provincial Community Energy Leadership Program. As other funding opportunities from senior levels of government become available, staff will continue to pursue funding from these programs that align with this project and other Council priorities.

Feasibility Study Results

A comprehensive feasibility study was completed that outlined various sizing options for a solar PV installation at Fire Hall No.1, and provided valuable information on innovation opportunities and cost benefit analysis.

The maximum size that the current roof area of Fire Hall No.1 will support is 57 kW. A solar PV installation of this size would reduce conventional energy use by approximately 60,000 kWh annually (or approximately 18% of the building’s projected annual use). In addition to a reduction in energy use, the feasibility study reviewed the benefits of including an energy storage component to this renewable energy system that would allow the facility to reduce its peak energy demand through the use of large energy storage batteries. Including the installation of a 100 kW battery component greatly increases the economic benefits that the City will be able to gain from completing this project (see Table 1 and 2).

The current commercial rate structure that BC Hydro has in place encourages customers to maximize the demand savings of potential renewable energy systems to obtain the greatest economic benefits, which is one of the reasons that including energy storage capacity with this project has been recommended.

Table 1 – Estimated Solar PV and Associated Infrastructure Costs

Asset Description	Combined Panels and Storage
Asset Size	157 kW
Total Estimated Cost	\$450,000
Maintenance Costs (\$/Yr.)	\$3,000/yr

Table 2 – Estimated Solar PV Financial Benefits

Asset Description	Combined Panels and Storage
Asset Size	157 kW
Cost avoidance savings (Yr. 1)	\$16,800
Cost avoidance savings (Yr. 10)	\$22,800
Payback	~20 years

The current economic challenge with integrating solar PV systems at Fire Hall No.1 is due to the current cost of the infrastructure, the region’s low electricity prices, the current electricity rate structure, and the comparably low annual levels of sunshine our region receives. Industry stakeholders have estimated that it will be 5 to 10 years before solar PV infrastructure costs will reach “grid parity” and be competitive with conventional electricity connection. As the City moves towards building carbon neutral and net zero energy buildings, solar PV technology will likely play an increasing role in our corporate energy supply mix.

The completed feasibility study also assessed increasing the implementation of solar PV energy systems on available corporate roof spaces through alternative financing, implementation, and operation models. This opportunity could involve the City’s wholly owned corporation, Lulu Island Energy Company, as a funder, delivery agent, and/or operating partner. Staff may report back at a future date should this type and scale of project prove viable after further analysis.

Recommendation

The proposed solar PV system with energy storage project at Fire Hall No.1 is eligible to be funded from the Federal Government Gas Tax provisional account and from Carbon Tax Provision account.

Completing this project along with the energy storage component would allow the City to immediately take advantage immediately of avoided operating costs once the facility is completed, and would help streamline construction through existing on-site contractors. Smart investments in renewable energy infrastructure help demonstrate to the community and region the opportunities that exist in terms of “green” building infrastructure, and promote the City as a leader in sustainable building development. With the planned solar PV system at Fire Hall No.1 being the City’s first solar PV installation, the City will also gain valuable internal experience in operating, maintaining, and optimizing a new renewable energy system.

In addition to the benefits listed above that the City would achieve, the inclusion of an energy storage system to the facility would add another disaster response resiliency element to the building.

Financial Impact

It is estimated that it would cost \$450,000 to complete the infrastructure associated with the proposed solar PV project and energy storage system. Funding for this work is available from existing Federal Government Gas Tax and Carbon Tax provisional accounts.

Once the solar PV energy systems are operational, it is expected that they will displace and offset approximately 60,000 kWh at Fire Hall No.1 and reduce energy demand during peak periods to maximize cost avoidance reductions. This electricity production and demand reduction from this renewable energy system will help the City avoid a combined \$16,800 in annual energy costs beginning in year 1 and increasing after that.

Conclusion

To further promote the City as a leader in sustainable development and demonstrate how smart investments in renewable energy infrastructure are feasible today, it is recommended that the City fund the installation of a solar PV energy system with storage capacity at the new Fire Hall No.1. Ensuring that the installation of solar PV energy systems is part of initial construction for the facility will allow the City to immediately benefit from the energy cost avoidance savings, and will enable the City to showcase this project as part of the building's opening. Promoting the incorporation of renewable solar PV technology will help to demonstrate to the community the current opportunities that these systems present and will help further increase its use throughout the City.



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