City of Richmond

Report to Committee

To:	Public Works and Transportation Committee	**Date:**	January 28, 2016
From:	John Irving, P.Eng. MPA Director, Engineering	**File:**	10-6125-07-02/2015-Vol 01
Re:	**Solar Friendly Richmond Framework**		

Staff Recommendation

That the staff report "Solar Friendly Richmond Framework" dated January 28, 2016, from the Director, Engineering, be received for information.

John Irving, P.Eng. MPA
Director, Engineering
(604-276-4140)

Att: 2

REPORT CONCURRENCE			
ROUTED TO:	**CONCURRENCE**	**CONCURRENCE OF GENERAL MANAGER**	
Building Approvals Development Applications Policy Planning	☑ ☑ ☑		
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	INITIALS: DW	**APPROVED BY CAO**	

Staff Report

Origin

On May 20, 2015, Planning Committee directed staff to "examine using solar energy as a source of power in the city and report back." This report responds to this direction. 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.*

Background

In 2010, Council adopted targets in Richmond's Official Community Plan to reduce community greenhouse gas (GHG) emissions 33% below 2007 levels by 2020, and 80% below 2007 levels by 2050. The 2041 Official Community Plan also includes a target to reduce energy use 10% by 2020 below 2007 levels. Richmond's 2014 Community Energy and Emissions Plan (CEEP) outlines an array of strategies and actions for the City to take to reduce community energy use and GHG emissions. Many of these strategies and actions relate to solar energy, including:

Strategy 10: Utilize Local Energy Sources.

- **Action 26:** Promote building scale renewable energy - explore opportunities to implement education, incentives and requirements.

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

Analysis

Solar Energy Technologies

A variety of different solar technologies are applicable to buildings in Richmond, including:

- Solar photovoltaics (PV) – Solar PV panels produce electricity.
- Solar hot water – Solar energy is used to heat water for domestic use, swimming pools, etc.
- Solar air heating – A solar collector is used to pre-heat air, which is subsequently used in conditioned space.

Of these technologies, solar PV has experienced the greatest cost reductions in recent years. Some analysts suggest that it is now less costly to supply hot water using solar PV and a heat pump, than it is to install a solar hot water heating system. Solar air heating has proven cost effective in some applications, but is only applicable to a relatively small range of building types (such as warehouses), and typically will only be installed during major building renovations or new construction. In contrast, solar PV is applicable to a wide range of building types, and can be technically fairly simple to implement. For these reasons, this report focuses predominantly on the installation of solar PV.

Solar PV Costs

The costs of solar PV modules has decreased markedly, resulting in a trend of reduced costs for installing PV on buildings (see Attachment 1). One estimate of the current average Canadian cost of installing rooftop PV on residential buildings is $3.60/Watt (W) of solar panel capacity; presuming a typical residential solar PV system is 5kW in capacity, this equates to a cost of $18,000 for a residential solar system. However, the installed costs vary between jurisdictions, suppliers and projects; City staff have received estimates that the average cost to install solar PV in British Columbia currently ranges from $3.00/W to $5.00/W.

The cost of solar includes the following components:

- Solar module (e.g. the panel).
- Other hardware (inverters, charge controllers, racking/mounting systems, etc.)
- Financing cost
- Installer profit
- Soft costs
    - Permitting, inspection and interconnection (electrical permits, building permits, utility interconnection).
    - Labour
    - Customer Acquisition (marketing).

Importantly, while modules and hardware are global commodities and have similar costs across jurisdictions, "soft costs" vary markedly. In Germany, the cost of rooftop solar is approximately $2.20/W compared to an average of approximately $3.60/W in Canada (Attachment 2). This difference is attributable mainly to Germany's lower "soft costs." Reducing solar's soft costs through more efficient use of labour (less staff "downtime"), improved marketing, and simpler permitting and interconnection requirements is one of the most important opportunities to decrease the costs of solar and make it more financially viable.

In a number of North American jurisdictions with higher electricity prices, sunny climates and/or favourable incentive policy regimes, rooftop PV is now cost competitive with the retail price of electricity, and is said to have reached "grid parity." In these jurisdictions, solar is growing very rapidly; indeed, the Solar Foundation's 2015 Solar Jobs Census reports that solar accounted for one out of every 83 new jobs in the U.S.A. in 2015.

However, due to the Lower Mainland's relatively low electricity prices and low annual levels of sunshine, residential solar would need to cost approximately $2.00/W to be competitive with the retail price of electricity. This is comparable to the costs that currently prevail in Germany. Industry stakeholders vary in their estimates for when this threshold could be consistently reached, with some estimating 5 to 10 years. The cost thresholds for "grid parity" for commercial buildings will differ, as commercial buildings face different utility rates structures and there are some economies of scale to installing larger rooftop solar arrays.

Some building owners choose to install solar PV even when it is not competitive with retail electricity prices; this choice may reflect environmental values, technological interest, energy security concerns, leadership, and other reasons. However, reaching "grid parity" is widely seen as a key threshold, after which significantly greater volumes of buildings will opt to install solar PV.

BC Hydro's Net Metering Program

BC Hydro's net metering program is designed for residential and commercial customers who want to connect a small electricity generating unit to the BC Hydro distribution system. Generating units up to 100 kW in capacity that use a clean or renewable resource, including solar PV, are eligible to participate in the program. The program is open to residential and commercial customers with "smart metering."

When a net metering customer generates more electricity than they use, they receive a credit to their account that is subsequently applied to their future electricity use. At their anniversary date, participants with an excess generation credit remaining on their account will receive 9.99 cents per kWh from BC Hydro.

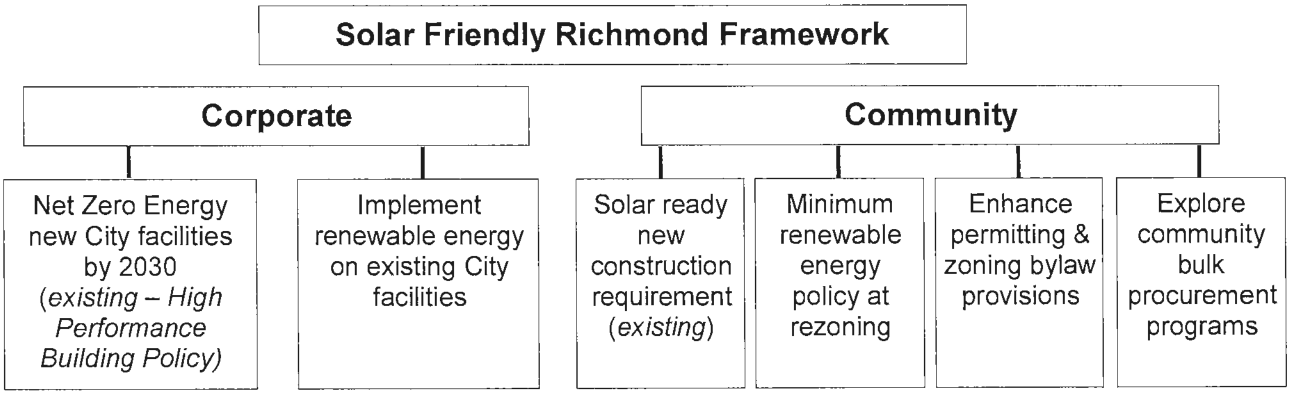
Other Energy Options

As costs decline in the future, solar is likely to play an increasing role in Richmond's energy supply mix. In the short to medium term, however, other energy technologies are anticipated to play a greater role in cost-effectively reducing energy use and greenhouse gas emissions in the community. Notably, energy efficiency technologies can deliver greater energy resources and emissions reductions for both existing and new developments at a fraction of the cost of solar energy. These technologies include heat pumps, which heat and cool spaces and provide hot water using renewable thermal energy sources (such a ground-source, air, or waste heat). Likewise, they include more efficient building enclosures, lighting, and mechanical equipment.

The City supports energy efficiency in a variety of ways – for example, by allowing an Energuide 82 or EnergySTAR for Homes (standards measuring of homes' energy efficiency) as part of its Townhouse Energy Efficiency and Renewable Energy policy. The City is also working with the province, utilities, and other stakeholders to develop a "stretch energy standard" for new buildings. Future City actions will focus on enabling both energy efficiency as well as renewable energy sources like solar to achieve the City's energy and emissions objectives.

A Framework for City Action on Solar

The diagram below illustrates a proposed comprehensive framework to enable greater uptake of renewable energy in Richmond. It includes both actions the City will take in its corporate operations, as well as actions to stimulate demand for solar in community buildings.



Elements of this framework are further explained below.

Corporate Action on Solar

The City of Richmond has taken a variety of leadership actions to integrate solar and other clean energy technologies into its corporate operations. In 2014, Council endorsed revisions to the "Sustainable High Performance Building Policy – City Owned Facilities" (Council Policy # 2307). Among other policies, it sets a goal to construct net zero energy and carbon neutral corporate buildings by 2030. This will necessitate the use of renewable energy.

The City has already integrated solar into a wide variety of corporate buildings and infrastructure. These include:

- Solar air heating on the South Arm Community Centre
- Solar hot water on Steveston Firehall No 2, South Arm Outdoor Pool, and Minoru Aquatic Centre.
- The Hamilton Fire Hall's "Trombe wall" solar collector
- Planned solar PV installations which will meet 33 per cent of electricity demand at the new Firehall No 1, and on the Minoru Complex building.

Opportunities to accelerate solar deployment

The City will continue to identify opportunities to integrate renewable energy into new and existing facilities. This may involve simply installing solar at a greater rate via the capital budgeting process, as solar becomes more affordable. Furthermore, other financing models may be considered, including third-party financing tools such as leases or power purchase agreements. Such third party financing tools are recognized as a means of accelerating solar deployment, as they do not require the owner to supply the required construction capital up front in order to install a solar system. Indeed, the majority of rooftop solar installed in North America in recent years uses third-party ownership mechanisms. Local governments can use such mechanisms, and also provide education about their availability to community members.

A number of local governments have also helped organize bulk procurement initiatives, involving municipal buildings as well as institutional, commercial, and residential properties in the community. For instance, bulk procurement of solar installations can reduce the costs of installation, making solar more viable.

Further research is required regarding what options are most appropriate for Richmond. For this reason, staff are continuing to evaluate procurement models to accelerate the implementation of solar on City facilities, and potentially other buildings within the community.

Renewable Energy Policy for New Construction

In 2010, Council opted in to the provincial Solar Hot Water Ready Regulation for new single family homes. This regulation requires new homes to be constructed so that solar hot water and/or solar PV may be installed in the future.

As part of discretionary development processes at time of rezoning, there is an opportunity to request that developments include a minimum level of renewable energy. One policy that has been applied in a number of jurisdictions in Europe is to require new developments to provide a certain minimum percentage of projected energy use via onsite renewable energy; a requirement to provide 10% of a building's energy needs through on-site renewables is widely referred to as the "Merton Rule," after the municipality that pioneered this measure. This policy ensures deployment of renewables, while also encouraging more energy efficient building systems.

Adoption of such a "*city wide minimum level of renewable energy policy*" requires consideration of many factors, including the costs imposed on building developments. Any such policy would consider air-source and ground-source heat pumps to count towards renewable requirements, to provide options for meeting requirements cost effectively and in developments without adequate solar exposure (e.g. shading). Additionally, the City is participating in the provincial Energy Efficiency Working Group, which is developing a "stretch energy code" that can be applied to new buildings. It is recommended that adherence to the "Stretch Code" be a viable compliance pathway, once it is available.

A renewable energy policy is being considered as part of the update of the Steveston Village Heritage Strategy scheduled to be presented to Council in early 2016. Following its consideration as part of the Steveston Strategy, Sustainability staff will continue to evaluate a minimum renewable energy requirement for new developments city wide.

Enhancing Regulatory Processes for Renewable Energy and Energy Efficiency

A number of land use regulations can impact the viability of installing renewable energy. For example, building height restrictions in the Zoning Bylaw could hinder solar installations, if the additional height of the PV panels result in buildings exceeding building height limits. Richmond has already taken a number of actions to better accommodate green building practices in the Zoning Bylaw and other regulations; for example, the Zoning Bylaw provides allows green infrastructure service areas to be exempted from calculations of floor area. Nevertheless, there may be opportunities to further accommodate solar and other green building features; strategies to explore include providing a height limit exemption for solar energy systems, the exclusion of the building footprint taken up by above-code insulation within building walls from floor area calculations, and other strategies aimed at removing barriers to green building features.

Staff will undertake a review of the Zoning Bylaw and development permit guidelines to identify potential changes to increase the provision of renewable energy and energy efficiency technologies. Staff are also evaluating options for building permitting processes for such installations.

Financial Impact

Costs associated with accelerating deployment of renewable energy on city facilities are encompassed within existing capital and operating budgets; opportunities for further deployment will be brought forward for Council's consideration. The development of any policies at time of rezoning will involve minor consulting expenses. These are covered within the existing operating budget. Efforts to reduce barriers to renewable energy and energy efficiency in existing regulations can be accommodated with existing staff resources as part of future work plans.

Conclusion

This report provides an overview of solar and other energy technologies and economics, and outlines a comprehensive framework for the City to support greater deployment of solar both in its corporate operations and in the community. Strategies which staff are pursuing include:

1. Exploring opportunities to accelerate the implementation of solar energy on City facilities.

2. Exploring policy for a minimum renewable energy requirement for new developments.

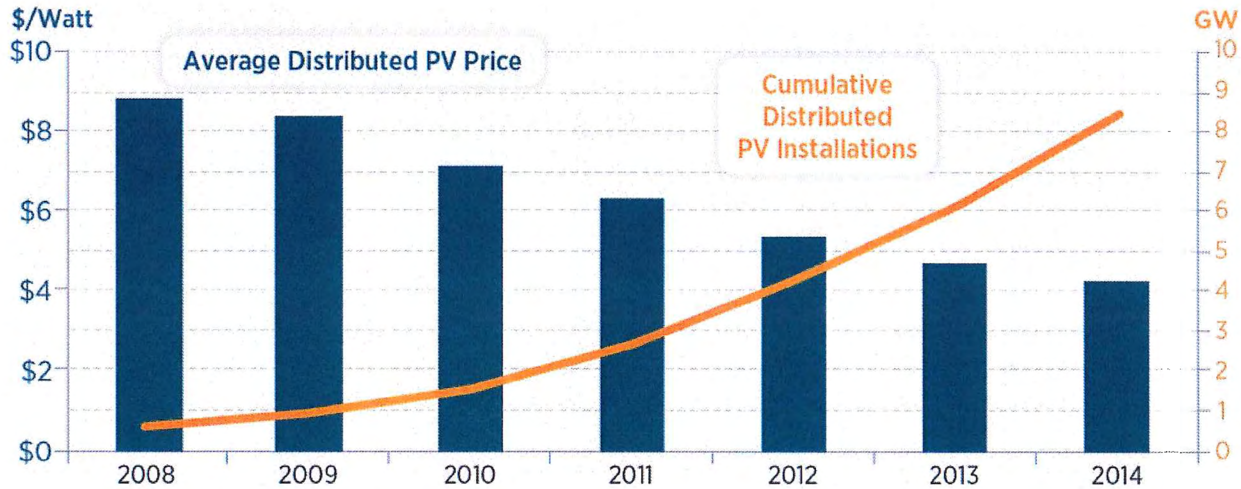
3. Identifying any potential barriers to green building strategies within the Zoning Bylaw, and exploring options to minimize regulatory processes.

Brendan McEwen
Sustainability Manager
(604-247-4676)

BM:bm

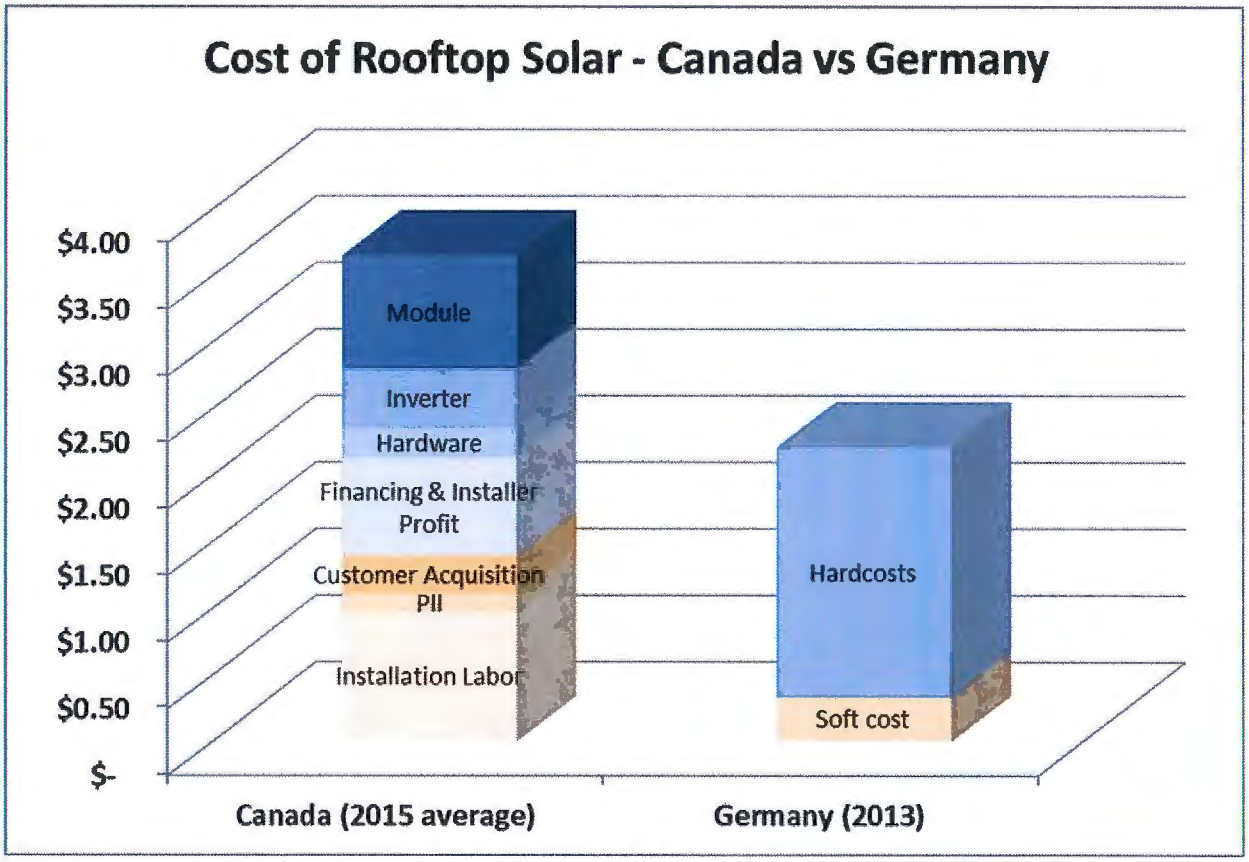
Att. 1: Cost trajectory of distributed solar PV in North America
2: Costs of Rooftop Solar – Canada vs. Germany

Attachment 1: Costs Trajectory of Distributed Solar PV in North America



Source: US Department of Energy. 2015.

Attachment 2: Costs of Rooftop Solar – Canada vs. Germany



Sources: HESPV; NRCan; Rocky Mountain Institute.