Policy Research Paper

Solar PV in British Columbia: Status and Required Actions

Executive Summary

Harnessing solar power with photovoltaic (PV) cells provides economic (low cost with short time from conception to completion), social (long-term sustainable jobs) and environmental benefits (clean energy with a very small carbon footprint). As such, solar power is essential in meeting climate change targets. Yet, British Columbia, as a result of misguided policy, is holding back this essential industry, missing out on opportunities to rapidly decarbonize energy and transportation and create jobs. The province and BC Hydro are discouraging BC residents from adopting solar and scaring away their own burgeoning renewable energy industries through multiple obstacles and lack of positive incentives. A bold vision is acutely needed to address carbon emissions. Carbon-intensive hydro-electricity is not the answer. Non-emitting solar power is a key pillar of energy and transportation systems of the future and easing increased electrification of industries. Therefore, BC must turn its approach to solar energy on its head and implement a new policy that encourages individuals, communities and industries to invest in solar. The energy grid of the future is distributed, based on renewable energy with a very small carbon footprint, increased local control and provides extensive energy security. For social and economic reasons, together with physics, scalability, safety, rapid deployment, longevity, reliability, resilience and lack of emissions, solar must play an increasing role in the provincial energy mix. Action must be taken now to get serious about tackling decarbonization and before BC bleeds even more of its own innovative industries to provinces like Alberta and Ontario that already have policies to attract renewable, and particularly solar, energy jobs.

All points in the Executive Summary (above) and Recommendations (below) are fully explained in the sections "The case for solar power" and "The situation in British Columbia – Required Action" that follow.

Recommendations

Develop and implement policies that significantly and rapidly increase the solar contribution to BC's energy grid by creating a set of incentives for solar energy, removing existing disincentives and encouraging community (virtual) net metering province-wide. Specifically:

1. Institute incentives for solar to level the playing field with subsidized energies (gas, oil, hydro, etc.) for a transitional period. As proven in other provinces (AB, SK, MB, ON) and in the USA, such positive incentives leverage large amounts of private monies for solar and create local jobs; positive incentives also set the path for distributed electricity generation and accelerate decarbonization of energy and transportation. BC should consult international policy experts to identify best practices for the smartest path forward; incentive programs should be reviewed regularly. (see Appendix A for some references to best practices)

2. Allow community (virtual) net metering (CNM) so that participants in solar gardens can offset their energy use by their share of production in community solar arrays using kWh as currency. CNM is also essential to enabling PV projects for net-zero residential developments and for multi-tenant dwellings. Separate solar PV from other renewables within the existing net metering program.

3. Remove disincentives such as high permit costs, unrealistic and counterproductive caps on solar installations, uncertainties about the future of net metering, arbitrary capacity limits on solar installations, excessive costs for grid-connectivity, etc. Allow negotiations of long-term energy purchase agreements for solar. Some local hurdles like requirements for building permits and structural engineering assessments should be reviewed.

4. Carefully consider creating a specific program, like an SOP, specifically for solar to encourage community solar installations and take advantage of the important considerations for PV: generally smaller scale, simple scalability, local / distributed nature of installations, democratization of energy by providing local control, lack of line-losses in microgrids, essential decarbonization and short time from concept to solar energy production.

5. Debunk the persistent myths about energy production in BC by these facts: i) BC gets plenty of sunshine for solar to be an important source of energy; ii) Big hydro is a substantial and long-term emitter of carbon dioxide and methane from reservoirs and during/after passage through turbines; iii) The grid can easily support the fluctuations of energy sources like solar and accommodate much higher contributions from intermittent sources; iv) Non-emitting PV is more cost-effective than any fossil fuel, and highly competitive with large-scale hydro; v) Storage solutions are advanced, viable and cost-effective; BC actually has an advantage in this area with large storage capabilities in its existing hydro facilities.

6. Include solar (PV and thermal) as an essential part of the curriculum in provincial building trades and research programs. Education at every level is key to catching up with other jurisdictions and to going from laggards and followers to future leaders.

7. Work with municipalities to develop solar-friendly building standards to tie in with net-zero initiatives.

8. Regulate BC Hydro to increase the frequency of its integrated resource planning to fully capture the rapidly changing market pricing of distributed and renewable energy technologies like solar PV. This is a fast-moving field and BC Hydro's practice of using dated pricing in its analyses does not provide a useful or timely picture of energy options.

The case for solar power

Physics, environment

From a physics standpoint, there simply are no real alternatives to solar power for renewability, simplicity, environmental impact and longevity. In less than two hours, the sun delivers to earth the total energy consumed by humankind in a year. The energy can be captured as solar thermal, through

photovoltaic (PV) cells and by concentrating solar power (CSP) and variations on these themes. Solar power is freely available, inexhaustible and PV is clean, non-emitting, quiet, long-lived and requires little maintenance. Therefore, solar power should be a key pillar of any energy system for the future.

PV is cost-competitive

Solar technologies are mature, albeit still evolving, and very cost competitive; in fact, as of mid-2015, PV had already reached grid-parity with other means of generating electricity in over 80% of the world[1]; PV costs continue to tumble while efficiencies continue to increase. In fact, Tony Seba, a professor at Stanford University with an amazingly accurate track record of predictions in the energy arena, predicts that in two years, the cost of unsubsidized commercial PV will be below the current cost of transmission!

PV is distributed

PV can be installed easily and cheaply on individual, community and industrial scales, which none of the other power generation systems can claim. PV provides distributed (local) power and allows departure from the current large centralized systems of energy production with their inherent inefficiency in distribution, high transmission costs, substantial transmission losses, lack of energy security and institutional inertia to adapt in the rapidly changing field of energy generation. Therefore, models need to be explored to accommodate seasonal fluctuations and daily intermittency and to integrate PV with multiple storage systems, including electric cars. Although the intermittency is often raised as an argument against solar, these problems have already been solved on a large scale (*e.g.* Germany or large portions of western Europe). In spite of the dire predictions about the instability that solar energy would cause to the North American grid during the 2017 total (USA) and partial (Canada) eclipse of the sun, the grid did not collapse! In fact, nothing happened.

PV is low risk, highly modular and not capital intensive

Solar installations tend to be smaller scale than wind, making them ideally suitable for community and individuals in distributed settings. Because of the smaller scale, solar is less capital intensive than other renewables, while also generating returns much more quickly. Solar is highly modular, meaning that small arrays can be expanded simply and quickly if needed, for instance if a solar household decides to add an electric vehicle, requiring the addition of six to eight modules to remain at net-zero. The same expandability applies to solar farms, provided that interconnections with the grid allow expansion. Because of simple engineering and rapid construction, the risks of cost overruns for solar installations are minute. Further, costs for operation and maintenance are smaller than for any other means of electricity generation, and decisions are made locally and maintenance is done by locals. As such, solar installations constitute a low-risk investment and are largely protected from cost-overruns plaguing other electricity generators[4]. Ironically, average delays in constructions of dams alone are longer than the time it takes a solar installation to go from the drawing board to reality.

Short time schedule for PV

The time from planning to turn-key operation is shorter for PV than for any other energy generating system: in one bulk-purchase of 15 domestic solar PV systems on Galiano Island, it took less than six

months from formulating the idea to harvesting power from the first installation; Nelson Hydro's solar farm took less than two years from concept to completion; public installations on the high school on Saltspring Island and primary school on Pender Island were producing power within a year from conception including time for the fundraising. Also, solar installations are much longer lived than predicted (exceeding 35 years) or used in simulation models by competing projects.

Renewables create jobs

Low-carbon renewable energies (solar, wind, geothermal) create long-term employment for a sustainable future and generate a lot more well-paying jobs than many other industries. Data from other provinces show that incentives generate long-term jobs as well clean energy. More people are employed in solar and wind in the USA than in all fossil fuel industries (oil, gas, fracking, refining, pipelines, LNG, coal) combined. For each dollar invested, wind and solar generate 3-7 times more employment than fossil fuel industries.

No built-in obsolescence

A solar installation does not become obsolete the moment a better solar cell is invented or developed; instead, it continues to produce clean electricity reliably, silently and without any emissions for many years. At the end of useful life (at least 35 years), all components of standard modules can be recycled.

Solar is truly clean

Solar PV has a very small carbon dioxide footprint, generating 10 to 40 g CO_{2e} for every kWh of electricity produced. The carbon footprint for solar is much smaller than for hydro power: the long-term emission of greenhouse gases (CO_2 and methane) puts the carbon footprint of hydropower at 273 g CO_{2e} /kWh [2]. Although the carbon footprint of hydropower is less than for fossil fuels, it is 7 to 50-times higher than for solar or wind. Additional carbon emissions are created during dam construction and flooding of the reservoir area. Logically, hydro-electricity should be subject to an appropriate carbon pricing, cannot be the base of future efforts to electrify transportation and other industries and prevents decarbonization of the energy sector.

Solar expands in clusters

The clustering of solar installations noticed all over the world is rooted in word of mouth and logic: it simply makes sense to go solar from economic, environmental and health perspectives.

Solar consumes little space

A normal, well-insulated house usually has enough roof space for solar PV to bring the house close to net-zero. Shopping malls, warehouses and megastores have sufficient roof space to produce most of the energy used within, as demonstrated by Ikea, Home Depot, Walmart and many others in the USA. Commercial or community solar farms can be sited under power lines, over parking lots, on brownfields (landfill sites, abandoned mines, etc.), along highways and rail lines, on canals, on reservoirs, on tailing ponds, even on top of ski-lifts and thus do not need to take up agricultural land[5]. The aptly named agri-PV can be designed to allow livestock grazing underneath or to grow crops that require shade-cloth. The options are endless.

The Situation in British Columbia - Required Actions

Although blessed with plenty of sunshine - in fact 30% to 150% more than Germany - British Columbia is a laggard in Canada in supporting a burgeoning solar industry and has a pitiful record on overall solar array capacity. Solar accounts for less than 0.02 % of BC Hydro's annual provincial supply as opposed to California (>13 %) and Germany (7.4%), in spite of a few high-profile installations (*e.g.* T'Sou-ke Nation, Kimberley SunMine, Nelson Hydro's solar farm, Hudson's Hope community buildings), dominated by forward-thinking communities who took the initiative to invest in a zero-carbon economy. Because of a scale that is dwarfed by installations in other provinces, the solar industry is leaving BC for PV-friendly provinces, such as Alberta, where the government has solar installation targets and provides incentives for individuals, communities and industries to help meet their greenhouse gas reduction targets.

Lack of positive incentives

BC offers no real solar incentives, apart from a PST exemption for PV systems. The modest net metering rate by BC Hydro and Fortis has already been under attack (unsuccessfully in 2016) by Fortis at the BC Utilities Commission (BCUC). The general downward pressure on net metering rates in the US is driven by privately owned utilities that try to salvage their outdated business model at customers' expense. Worse, a recent decision by the BCUC in response to a request by Fortis, stipulates that PV capacity cannot exceed self-consumption, basically removing any incentive to 'overproduce'. In reality, this also limits the ability to develop community solar and monies invested in PV cannot be recouped *via* electricity trades or sales. In the long-term, such a policy prevents the development of local microgrids where producers can trade clean energy locally or regionally. Distributed local solar renders the energy production and distribution system much more efficient by avoiding the substantial line-losses incurred through long-distance transmission from centralized generation stations. While allowing individual solar installations, existing policies fail to address the bigger picture of decarbonization and block paths to zero emissions on a much larger scale.

Actions required:

- Institute positive incentives, like tax rebates to individuals, communities and industry, similar to those successfully implemented in AB, SK, ON and QC, ranging from 25 to 33% of costs of an installation. The PST exempt status should remain in place. Positive incentives accelerate installations, attract sustainable industries of the future and create long-term local jobs.
- Guarantee net metering rates for longer periods to enable long-term planning for individuals and communities.
- Provide Property Assessed Clean Energy financing (PACE), or on-bill financing, for home solar installations.

Net metering is restrictive

Under the current structure of net metering only those who own the perfect property, facing the sun and unshaded, can meaningfully participate in Net Metering programs. The existing policy towards

community (virtual) net metering (CNM) by BC Hydro is utterly counterproductive by demanding that a community solar farm is registered to a single BC Hydro customer and it is then up to this customer to dispense to other contributors to the farm the proceeds from solar energy. First, by this sleight of hand which contradicts the basic tenet of CNM - as practiced everywhere else - the farm is reduced to being a single net-metered customer and therefore subject to the vagaries of the net metering rate. Second, it means that energy is monetized (and is taxed as income), whereas in true CNM, the proceeds from the energy from the panels are apportioned and subtracted from the electricity usage of each customer - in kWh. For anybody versed with database design, this type of accounting requires a few lines of code in a computer program, but BC Hydro argues that their accounting system cannot handle such 'complex' interactions. The province of BC must make sure the billing systems meet the needs of its citizens. Curiously, CNM does not seem 'complex' to Nelson Hydro, the electrical department of the City of New Westminster, the state of New York or dozens of utilities in the USA and Europe! After all, BC Hydro is a public utility that should serve the public, embrace a technology that decreases its own substantial carbon footprint and not erect obstacles to community initiatives while preventing modernization and decarbonization of energy production and the grid. The absence of CNM for most of BC will only increase the rate of grid-defection, especially as local storage methods evolve and costs continue to drop, while driving up the cost of electricity for ratepayers.

Action required:

- Allow and encourage **Community Net Metering** (CNM) where electricity produced by a community solar farm or in apartment buildings, etc. is used as an energy credit to customer utility bills.

High Cost of permits and other hurdles

Punitive fees are currently levied by the BC Safety Authority. Fees scale with projected capacity and are out of line with what other provinces charge. In BC, the fees may amount to 10% of total costs of a small solar array.

Actions required:

- Decrease the fees by the BC Safety Authority to 2.0 % or less of the cost of a solar installation.
- Remove existing barriers in building permits and structural engineering assessments.

Annual cap on renewable energies

A few years back, BC Hydro imposed a combined cap ('target volume') of 150 GWh per year on development of renewable energies (their standing offer and micro-standing offer programs), with the cap filled until 2019. The cap is under review for 2020 and BC Hydro again accepts submission to their Standing Offer Programs. Under these conditions, it is impossible for any potential power producers - community or commercial - to do any serious planning or develop a meaningful business plan. Also, the cap amounts to a minute 0.28% of total capacity of BC Hydro – providing another sign that the corporation actively discourages development of renewable energies like solar or wind and shows no interest in the drastic decarbonization of the energy sector that is required to meet our Paris Agreement commitments.

Action required:

- Remove the annual cap altogether or increase it twenty-five-fold to encourage community and distributed generation of low-carbon electricity.

The annual cap discriminates against solar PV

The annual cap seems to have been designed specifically around wind and run-of-the-river installations that tend to be in the 5-15 MW capacity range, require large and complex financing, long permitting periods, spend years in the design phase and years to construct. Not surprising then that in the past, the cap was largely consumed by proposals for these two technologies that require long lead-times, making it difficult for solar PV to compete in this skewed playing field. Solar PV proposals with their smaller capacity (the SunMine in Kimberley BC - the largest solar installation in BC to date - has a capacity of 1.05 MW; next in size is the 500 kW array in Hudson's Hope), very short time from idea to realization and less capital intensity than other technologies follows a completely different approach. Of the 177 MW of electricity purchase agreements with BC Hydro up to March 2017, solar contributes a single MW (0.6% - through the SunMine). In the interest of lowering the carbon footprint of the energy sector in BC, it should be a moral and climate change imperative to remove the cap and give solar a chance. BC Hydro as a public utility should be leading the way with innovation instead of hanging on to outdated business dogma and blocking renewables. Carbon-intensive business as usual will not miraculously help the world meet the target of the Paris climate agreement. The time has come for BC to take solar seriously.[6]

Actions required:

- Create a program suitable for solar PV without a cap and perhaps limited to 5 – 25 MW per installation to guarantee truly distributed generation and to foster local community involvement.
- Require utilities to negotiate long-term electricity purchase agreements with communities.

Energy megaprojects are antidemocratic, carbon-intensive and do not serve the public

Providing funds – private or public - to carbon-intensive mammoth projects like megadams, LNG infrastructure or pipelines commits vast monies for long-periods, while pointlessly extending the life of GHG-emitting projects and providing skill training in industries that exacerbate climate change. At the same time, decision-making is taken out of the hands of communities and control is transferred to corporations and banks. Even worse, these types of perverse incentives will also require large additional amounts of public funds to mitigate the effects of climate change.[7] The longer we wait to decarbonize, the higher the costs of mitigation.

Action required:

- Provide positive incentives and offer special financing for distributed solar and wind energy generation by individuals, businesses and communities. This will create public enthusiasm, leverage private funds, decarbonize energy production, support renewable energy businesses, create a lot of permanent jobs, democratize the energy sector and enhance energy security.

References

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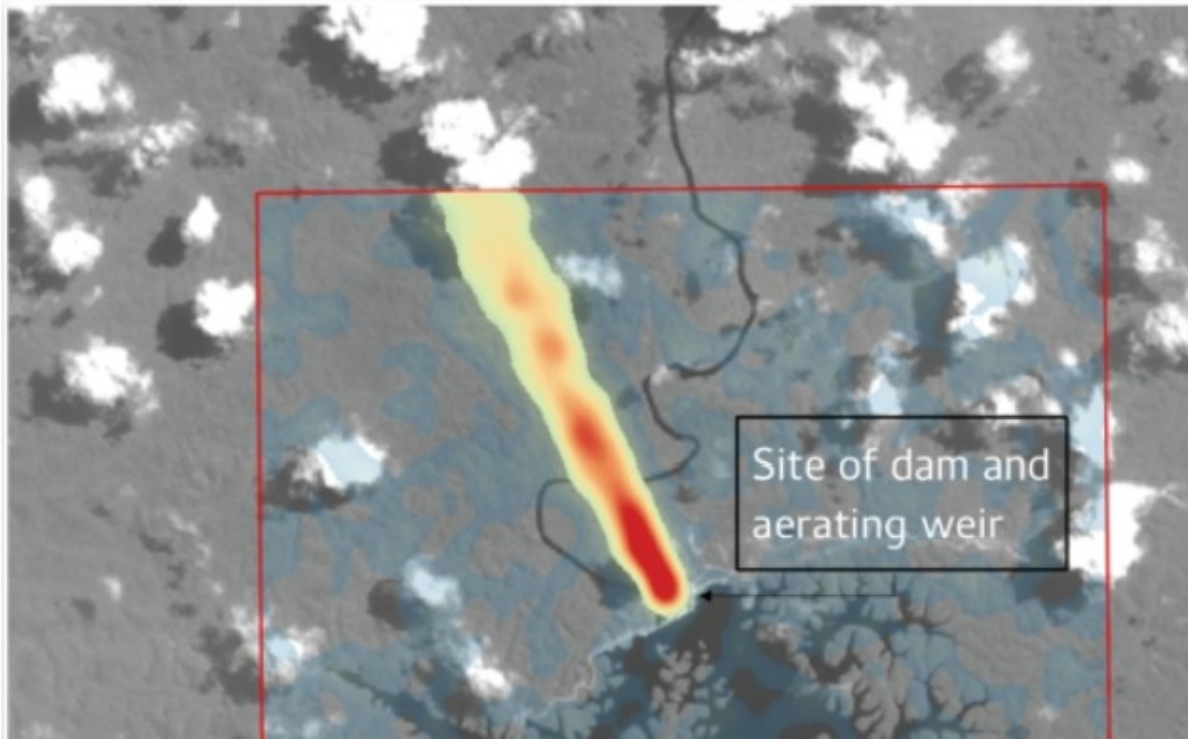

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