Review of Draft State of Vermont Senate Bill S.230 version 4.1

An Assessment of the S.230 Bill's Impact on the Viability of Future Community Solar Projects

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ABSTRACT: Community solar projects incur ongoing operational expenses that subtract from the group net-metering benefit. When the ratio of these expenses to the group net-metering credit tilts too far towards the expenses then the project becomes economically unattractive. To be an attractive investment, the solar project's return on investment time horizon should be shorter than 10 years. We examine a community solar project's business model and the mechanisms available to improve its economic viability. We then consider Senate bill S.230 version 4.1 (2/27/2016) from the perspective of a group of citizens who might be considering the economic feasibility developing a group net-metering community solar project. Bill S.230 introduces many new solar siting and *Renewable Energy Credit* (REC) policies. Bill S.230 proposes to use a set of reductions in the economic benefit accrued by group net-metering as a mechanism to influence both solar project's siting and REC retention decisions. These policies alter the ratio of a solar project's operating expenses versus its net-metering benefits. Bill S.230 also requires reserving a decommissioning capital fund that further erodes solar project viability.

This study concludes that the Bill S.230 provisions if enacted as currently written could have the unintended consequence of discouraging future community solar project development.

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1. Introduction to a Community Solar Project Business Model

Bringing a community solar project to fruition is far more difficult than it might appear to someone who has not carefully examined its underlying economics. This document introduces the reader to the basic framework of a community solar project's business model and the challenges of organizing a non-profit organization that will remain solvent while providing operational stewardship throughout the project's multi-decade life cycle.

The business model spreadsheet discussed here was developed in year 2014 by the *Community Owned Solar Cooperative Inc.* (hereafter referred to as the "*Solar Cooperative*"). The Solar Cooperative was a member owned consumer cooperative organized pursuant to State of Vermont 11 VSA § 991. The Solar Cooperative was ultimately disbanded in late 2014 because no site could be found that satisfied all of the many mandatory economic constraints and siting requirements. Although the solar project was not built, the Solar Cooperative's spreadsheet provides an instructive tool through which we can examine the economic cost consequences of the policies proposed by draft bill S.230.

2. Initial Capital Outlays Independent of Project's Scale

The proposed site was available on friendly long-term lease terms and it was obscured from all neighbors by trees on all borders . However, the site was over 500 feet from the nearest GMP power line and it would incur major capital outlays to extend power ($8,600) and a service road to the site ($16,000). It also would have had the excavation cost of clearing and leveling the field of shrubs and small trees ($7,000). There was also a risk of the pilings supporting the solar racks encountering underground rock ledge. This would incur the extra cost of ballast mounted solar racks ($10,000). All of these site preparation costs were not strongly sensitive to the project's power generation capacity.

Beyond site preparation, there are a number of initial capital costs that are more dependent on the site's characteristics than they are on the project's power generation capacity. The following table identifies those initial cost components that interact with provisions found in the bill S.230 (or do not interact).

Initial Capital Cost Components	**How to Quantify a Component's Estimated Cost**	**Interaction with Bill S.230**
Service access road parallel to power line	$25 per foot from nearest public road	**YES -** Required for GMP power line extension to meet town's setback or to reduce visibility from a public road right of way
Power line extension running from nearest public power line to solar site.	$35 per foot when buried, $15 to $25 when pole mounted	**YES** – To meet town's setback requirements or burial to satisfy the aesthetics of a power line right of way
Marketing and legal	$1,000 per neighbor plus $175 to $250 per hour for attorney negotiations of a support letter or a contract (MoU). PSB hearing: $50,000 to $100,000.	**YES** – to acquire support of the project from adjacent neighbors or the town who might otherwise litigate the CPG permit.
Screening vegetation, landscaping	$50 to $75 per shrub or tree	**YES** – section (H)(5)(e)
Fencing around the project's perimeter	$322 per 50' fence fabric, $12 per post, plus vendor's labor	**NO** – Required by NEC and SoVT Dept. of Safety
Site preparation excavation and land clearing	$75 to $125 per hour of excavator operator time	**YES** – section (H)(5)(e)
Power management equipment and maintenance tool shed	$30 per square foot	**NO**
Construction loan interest	prime rate + prevailing market rate based on perceived risk	**NO**
Construction insurance	Not known	**NO**

3. Solar Project Ongoing Operational Expenses

The following table identifies the project's operational expenses and an estimate of their annual costs for a 150 peak Kilowatt solar array. Unless noted otherwise the expense must be paid in cash instead of net meter credits.

Operational Expense Category	**Cost Formula**	**Estimated Annual Cost**
Act 127: 32 VSA 8701 education property tax	4% of project's assessed value by State of VT taxation dept.	$733
Municipal property taxes exclusive of education related	$5.325 per $1,000 of project's assessed value (town-specific)	$5,809
Insurance premium against liability, property damage, etc.	Guessed at 0.15% of the solar project's capital value with a high deductible.	$750
GMP power service fee per year,	Single phase: $0.436 * 365,	$159
DSL Internet connection for solar array remote FCAPS operations	$50 * 12 months	$600
Lawn cutting service	$50 * 10 events	$500
Driveway snow removal service	$55 * 12 events	$660
Accountant/tax preparation services	$300 per year	$300
Legal expenses, post startup	$200 per hour * 2.5 hours per year	$500
Project's administrative manager	$18.54 per hour * 100 hours/year	$1,854
Reserve for solar equipment's repair and replacement	2% failure rate for solar panels and inverters over 25 year period, $991 raw cost per solar panel and its common equipment	$500/year for 630 solar panels

These operational expenses sum to $11,865 per year. As compensation in the lease agreement with the property owners, the property taxes would be paid by the Solar Cooperative. The $5,809 municipal property tax is by far the largest fraction of the total operating expenses. This reflects this proposed solar site being located on a 22 acre property within the town's commercial zone at an assessed value of $26,223 per acre plus an estimated solar array assessment of $514,000. Total assessment value after solar array construction is $1,090,900.

It should be emphasized that this solar array site being located in a town's commercial zone is one of the primary reasons why the property tax is so high. Even if the solar site qualified as being "locally preferred" as specified by the S.230 definition of a Category II Net-Metering System criteria (8), the applicable net-metering credit adjustments could not adequately compensate for the premium taxes being paid for valuable commercial/industrial land. Yet a solar array arguably should be positioned in an industrial or commercial neighborhood, not a residential or Agricultural zone. This suggests bill S.230 should consider imposing a waiver on such municipal property taxes when the project is developed in a commercial or industrial zone.

4. Solar Project Decommissioning Reserve Fund Cost

The bill S.230 section 20 revises 30 V.S.A. § 248(u) to require a decommissioning performance bond or comparable reserve fund. Tearing down the solar project is anticipated to consume as much labor as was expended to construct the project. The assumption is that the solar panels, scrap metal, and copper wiring will have 10% salvage value [2] of the original price, which would be about $90 per solar panel. A consultant used by the Solar Cooperative estimated the installation labor and overhead cost component per solar panel at about $266 per solar panel and common equipment rack slot. For a 150 KW solar array containing 630 solar panels, this implies a decommissioning reserve fund of $110, 880 after subtracting the salvage value of the solar panels and copper wiring. The fund would have to inflate in value over the 40 year period the solar array is in service.

- ➔ **This raises a hard question: Where is that $176 per solar panel of decommissioning money coming from? This is equal to about three years of net-metering credit from that solar panel. To be an attractive investment, the solar project's return on investment time horizon should be shorter than 10 years. Funding decommissioning appears to make that impossible to achieve.**

2 Some solar panel chemistries contain rare elements, such as Germanium and Tellurium, that would be worth extracting from the panel.

5. Solar Project Revenue Streams

A solar project has only four possible sources of revenue to pay for its operating expenses:

1. *Operational Overhead Paid by Solar* (OOPS) is simply assigning a subset of the array's net-metering credits to those vendors who are willing to accept such credits instead of cash as a payment for their services or products. This option works best for those vendors who have a long-term relationship with the Solar Cooperative.

2. *Solar Services Agreement* (SSA) is a long-term solar power purchase contract between the Solar Cooperative and one or more citizens and businesses who receive a net-meter credit on their electric utility bill each month. For each such solar Kilowatt-hour paid by net-metering to a person or business, they agree in return to pay the Solar Cooperative in cash a quantity less than the full value of the net-meter credit. The difference is a benefit to the individual or business. The cash payment to the Solar Cooperative defrays those operational expenses that must be paid in cash.

3. *Renewable Energy Credit* (REC) auction sale proceeds are the cash income acquired from selling the project's "renewable energy" bragging rights to a buyer who needs to offset their Carbon Dioxide pollution (or equivalent GHG emissions). The Solar Cooperative business model had elected to retain and retire its generated RECs and not give them away to the GMP utility. Therefore, this revenue source was being shunned by the Solar Cooperative. However, when bill S.230 goes into effect in January 2017, this choice comes at a cost of a $0.06 per Kilowatt-hour penalty in the Solar Cooperative project's net-metering benefit. Total losses incurred by the Solar Cooperative claiming its project generates renewable energy are $25,560 [3]. **This provision of S.230 makes it effectively impossible for citizens to honestly claim they have invested in renewable energy unless they can afford to ignore the collateral economic penalties.**

4. *Operations, Administration, and Maintenance* (OA&M) annual fee paid per solar panel by the Solar Cooperative's membership.

3 The Solar Cooperative 150KW array would generate about 213 Megawatt-hours of electricity per year. At $60 per MW-h, the forfeited REC auction revenue is worth $12,780. The forfeited $0.06 net-metering benefit is also worth $12,780, yielding a $25,560 loss of revenue.

For a 150 KW peak power solar array, some combination of the above revenue streams must add up to the $18.83 per solar panel [4]. If the solar array peak power was doubled in size to 300 KW peak AC and 1,240 solar panels then these operational expenses would be cut about in half.

As was explained earlier, community solar projects incur ongoing operational expenses that subtract from the group net-metering benefit. At the end of the day, the group net-metering credit is the solar project's only available revenue stream once the sale of RECs has been taken off the table. Both OOPS and SSA are simply net-meter credits being diverted to pay for expenses. When the ratio of operational expenses to the group net-metering credit tilts too far towards the expenses then the project becomes economically unattractive. To be an attractive investment, the solar project's return on investment time horizon should be shorter than 10 years.

6. Project's Postmortem Analysis Key Lesson: Scale Matters

For the most viable solar site among the seven that were considered by the Solar Cooperative, there turned out to be insurmountable cost barriers. We were particularly concerned about those initial capital outlays and operational costs that were fixed and did not depend on the scale of the project's power generation capacity. It seemed likely these factors would dampen the market's response to the solar project's offering of solar panels and its stock. If the scale of the project's power generation capacity could have been expanded beyond the ceiling imposed for the PSB lightweight group net-metering permitting process then these costs could shared over enough solar panels for the project to become feasible. Yet litigating a PSB permit process for a power generation capacity greater than 150 peak AC Kilowatts would cost an estimated $50,000 to $75,000.

The key observation drawn from this experience is that the economic viability of a solar project is fairly sensitive to the project having sufficient scale. Those initial capital and ongoing operational costs that are the same size regardless of the project's power generation capacity are best divided across a large number of solar panels [5] to keep the total cost of ownership per solar panel within the membership's ability and willingness to pay.

➔ An amendment to bill S.230 could remedy this issue by authorizing group net-metering projects

4 This assumes $11,865 operating expense / (630 solar panels).

5 The Solar Cooperative's project had 630 solar panels sharing the $41,600 of site preparation costs. This equals $66 per solar panel which is more than one year of net-metering credits from a solar panel.

up to 300 peak AC Kilowatts of power generation capacity to use the lightweight PSB permitting process.