Solar Photovoltaic with Battery Backup (PVBB) for all.

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How does affordable security for energy, food, transportation and water rank in priority in Hawaii – Is it on the radar with anyone in government? I have been searching for ways to make "PVs for all" happen, so that
(a) The low-cost electricity produced by solar PV and wind can be available to all ratepayers and taxpayers,
(b) All the clean & renewable energy benefits (sustainability, energy security, lower pollution & health-care costs, low ocean acidification) will be there for all citizens and businesses,
(c) We can keep our utilities and their grid in business, and
(d) Quantitatively understand the rationale and fairness of present solar PV subsidies or tax credits

There may exist regions with low and stable electricity costs (<12 ¢/kWh now or <15 ¢/kWh for a 30-year levelized rate), or regions of low or highly seasonal insolation, for which PV may appear to not be most economical of all renewable energy choices[1]. However, if one does not ignore the hidden costs taxpayers now pay to support or fix fossil fuel-related costs to health care[2], pollution, global warming and crude oil "diplomacy," – all regions, especially Hawaii, have to vigorously continue to support PV expansion, for which I see 3 possible parallel paths:

1. Utilities convert more and more of their generators from central fossil-fired to (preferably distributed) solar and wind generation and share the resulting lower electricity cost with their ratepayers, as proposed in http://alohafuels.pbworks.com/f/PB-%2013-HELCO-IRP-PUC-0036.pdf in the scenario of Table 2, in which the 2020 rate could be 21 ¢/kWh if HELCO were to finance just 50% of residential PVs, and to make some other adjustments to their generation portfolio. This would be down from 44 ¢/kWh today, which (with the present business plan projection) may well escalate to ~80 ¢/kWh by 2020.
2. Taxpayers sign up to have a solar, grid-tied, roof-top PV installed in their homes or businesses and make appropriate payments to the organization that financed the PV (a bank, a utility or a solar utility) if they prefer the "no money down" option; and to the utility (Minimum Monthly Charge(MMC) for grid use, which is now at $20/month in Hawaii, regardless of whether the PV has battery backup or not, but should be $5/month for PVs with battery backup (PVBB)*, which are operated for minimum grid use or maximum "self-consumption." * see analysis at http://alohafuels.pbworks.com/f/PB-13-MMC.pdf
3. Taxpayers sign up to have a solar, off-grid, roof-top PV installed in their homes or businesses and make appropriate payments to the organization that financed the PV (a bank or a solar utility), but zero MMC. This PV installation would need battery backup (PVBB) and a PV that is about ~30 to 50% larger in relation to its average load, than the PV under (2) above, to compensate for the +/-50% peak-to-peak, day-to-day solar PV output variation from the average. Note that the daily PV output never comes close to zero. See more details at http://alohafuels.pbworks.com/f/PB-13-PVBB-LCC-Grid.pdf.

Note that the $20/month MMC averages amounts to about a 4 ¢/kWh addition to the ~16 ¢/kWh of a grid-tied, NEM PVBB, 30-year levelized electricity cost, and makes an off-grid PVBB system with ~17 ¢/kWh (30-year levelized electricity cost) look more attractive by 3 ¢/kWh, despite the added cost of its oversized PV.

Do installations of solar PVs or PVBBs still need to be subsidized? A recently published policy analysis on solar PV tax incentives by the University of Hawaii[3] seems to conclude that the IRR of 14% with state tax credits, and 10% without it, are not likely to increase the overall deployment of PV due to grid limitations, but rather spread the cost of installation from homeowners to other taxpayers and accelerate the rate at which Hawaii reaches its grid limitations. I applaud the stated objectives of the analysis, its mention of "on-bill financing," but have serious concerns about its conclusions, because it:

1. Starts from erroneous assumptions and, more importantly, it Ignores:
   a. State costs arising from fossil-based electricity generation (health care, ocean acidification, global warming),
   b. Benefits from using PVs to fuel EVs rather than with fossil fuels,
   c. Means to overcome maximum grid-tied PV interconnections by using on-site battery backup,
   d. Off-grid PVBB systems,
   e. Comparing subsidies for residential and commercial, whereby the latter has a much higher cap of 500 k$
2. And therefore comes up with conclusions, which if implemented, would hinder and slow our effort to achieve the state goals of increasing the use of renewable energy, of which reaping the overall societal health and economic benefits of solar PVs is part of. The authors imply that state subsidies for solar PVs are no longer needed, because:
   a. Such subsidies just increase the IRR for an average (and affluent) household from 10 to 14%,

b. "Tax credits are not likely to increase the overall deployment of PV, but rather spread the cost of installation from homeowners to taxpayers" and
c. "(Subsidies) accelerate the rate at which Hawaii reaches grid restrictions."

The subject study should have, but did not consider, the "Economic value of US fossil fuel electricity health impacts" as published by EPA authors in Environment International, Dec 2012[2]. According to that study, that health impact would add 14 to 35 ¢/kWh to the US average electricity rate, i.e. more than 100% of the present PV- or PVBB-based electricity cost.

In total dollars, the above impact amounts to 361 to 886 B$ each year. But the authors warn that even these large amounts are still underestimating the true impact, "because they do not include all externalities (extraction and transportation of fossil fuels and impacts on climate change and human welfare," nor "pollutants such as ozone precursors, nitrogen oxides, greenhouse gases, residual or hazardous waste products and water-borne pollutants."[2]

What does the above have to do with solar PV and its subsidies?

Clearly, the 30% federal and 35% state subsidies for the PV or PVBB capital expense, amounting to 7 or 10 ¢/kWh, respectively, are small compared to the amount we taxpayers now indirectly subsidize fossil-fuel electricity. Therefore, it seems to me that the UH report[3] conclusions that federal and state subsidies for solar PV (residential, commercial, industrial or utility) are excessive and can or should be reduced, is flawed because it is based on the consideration of only a few and not all benefits we can derive from solar PVs and PVBBs.

Can our PUCs, federal and state legislators help to bring about the above shift towards more secure, distributed solar and wind renewable energy? I believe so, if we can craft legislation to:

1. Have no delays nor "extra grid-related" charges to taxpayers who want to install grid-tied PVBBs (programmed, inspected and approved to operate at above e.g. 80% of self-consumption),
2. Incentivize PVBB installations (rather than plain PVs) by approving the MMC (Minimum Monthly Charge) of about $5/month for PVBBs (down from $20/month for PVs), because the on-site batteries: (a) Save the utilities the cost to install large-scale batteries on the grid, (b) Save transmission and distribution energy losses and (c) Save utility grid capital costs,
3. Make the battery-backup and maximum "self-sufficiency" incentive as fair as possible, e.g., by making the MMC proportional to the PV-to-grid injected monthly kWh, as Colorado may be leading to, at 5.9 ¢/kWh[1],
4. Maintain and/or increase solar PV subsidies or tax credits at the present rate, (rather than reduce them, as implied by the recent (I feel misleading) U of Hawaii report[3]) because at the present, equivalent rate of 7 to 10 ¢/kWh, they are small compared to the hidden costs and damages presently caused by the use of fossil fuels for electricity generation, transportation and heating. The estimated 14 to 35 ¢/kWh from ref.[2] only cover fossil-pollution-caused health care costs. The costs of securing such fuels via international "diplomacy" are comparable, before even adding the costs associated with global warming, ocean acidification and ocean level rises, and
5. Allow utilities to sell the low-cost electricity, which they could generate by financing and owning roof-top, distributed PVs and PVBBs (now reportedly prohibited by the Hawaii PUC).

References

[1] The CPUC (California PUC) has approved 30 contracts, for 400 MW of renewable DG capacity, for systems 3-20 MW in size] auctions. Of the 30 contracts, 23 were for solar PV projects (330 MW of a total 400 MW). The weighted average price of all contracts (post-time-of-delivery adjusted) from the first and second auctions was less than **9 ¢/kWh**. The third RAM auction closed on December 21, 2012.

In the second quarter of 2013, the Commission approved 21 contracts, representing 337 MW of capacity, from the third RAM auction. The weighted average price of all these contracts (post-time-of-delivery adjusted) was less than **8 ¢kWh**." http://votesolar.org/2013/12/05/latest-cpuc-report-on-cost-of-renewables-in-california/

[2] Justin Gerdes, "How much do health impacts from fossil fuel electricity cost the US economy?" 8 April 2013, http://www.forbes.com/sites/justingerdes/2013/04/08/how-much-do-health-impacts-from-fossil-fuel-lectricity-cost-the-u-s-economy/

[3] Makena Coffman, Sherilyn Wee, Carl Bonham & Germaine Salim (Univ. of Hawaii, Economic Research Organization), "Policy Analysis of Hawaii's Solar Tax Credit Incentive," Working Paper No. 2013-11, Honolulu, HI, November 2013, http://uhero.hawaii.edu/assets/WP_2013-11.pdf

[4] Ethan Howland, http://www.utilitydive.com/news/the-solar-net-metering-fight-heads-to-colorado/205368/ , 12 Dec 2013