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Focus on Hardening Microgrids

The purpose of my comments is to draw attention to the role direct current microgrids (see SB 1339, Ch.4.5, Microgrids,8371 (f)) and energy efficient structures (see www.PHIUS.org,) scaled at the city block level ([http://www.cired.net/publications/workshop2018/pdfs/Submission_0322_Paper_\(ID-21011\).pdf](http://www.cired.net/publications/workshop2018/pdfs/Submission_0322_Paper_(ID-21011).pdf)), and electromagnetic pulse (EMP), cornmeal mass ejections (CME) and cyber hardened could be an avenue for:

investing in American manufacturing and workforce;
Expanding access to energy efficiency and clean energy for families, communities and businesses;
Delivering reliable, clean, and affordable power to more Americans;
Building the technologies of tomorrow through clean energy demonstration;
Improve the all-hazards resilience of the electrical grid against disruptive events;
Generate the greatest community benefit in reducing the likelihood and consequences of disruptive events;
Advance DOE's equity, environmental and energy justice priorities, including the Justice40 initiative.

(slides 4 & 5 from the presentation)

In addition, I would also like to include in this discussion the DOE's efforts to provide a greater public understanding of how the electricity grid works and what it will take for the US to decarbonize, digitize and decentralize the grid by investing in concepts such as energy sheds (similar to water shed), tools for which DOE is currently looking to fund (see DE-FOA-0002565). I can see a DC city block microgrid, aggregating an all DC passive house (90% less energy for heating, 50% less energy for cooling, and with all DC appliances, given PV and storage already using dc and any appliances using electronics also requiring dc, maybe up to 40% energy savings from the plug loads) being designated as an energy shed. Imagine that city block with its own dc microgrid (the only inverter needed by the block would be at the common point of contact with the big grid) being able to aggregate all the excess energy resources available to the community and provide a community income stream either by being part of a virtual power plant providing ancillary services back to the big grid, providing DC fast charging to EVs on the block and/or participating in the wholesale market when FERC 2222 get resolved. Of course a blockchain based transitive energy system would also be of value (see LO3 Energy, Brooklyn, NY). The creation of this income stream would also go a long way in meeting one of DOE's goals in its Energyshed funding, the goal of creating energy democracy and ownership (see p 8 of DE-FOA-0002565).

Two more points:

There is a huge market outside the US that does not seem to be part of the energy transition discussion here. There are billions of people outside the the US who either have access to no electricity, access to poor, intermittent electricity, are still cooking with fossil fuels and/or have no access to the internet. One way this need will be met is with DC microgrids (see The Future of Direct Current electrical Systems for the off-grid market (<https://e4sv.org/wp-content/uploads/2017/05/TR8-The-future-of-direct-current-electrical-systems-for-the-off-grid-environment-web.pdf>, Demand DC: Accelerating the Introduction of DC Power in the Home, and IEEE article DC is the Future (<https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9080680>). We need to drive the cost of these systems down so that can provide affordable services in the developing world. Unfortunately, the the US capacity to provide these plug and play systems does not seem to be part of the energy transition discussion.

Finally, the move to microgrids, with California and Hawaii taking the lead, seems to be done without any provisions for the protections listed above for EMP, CME and cyber. This is a mistake, given the prevalence of attacks on the existing grid, both physical (Metcalf, California) and cyber. We need this protection built into the design rather than being retrofitted later of (see Microgridsâ€™A Watershed Moment (<https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9080680>)

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