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Marnay Microgrid Roadmap Comments

see attached file

Additional submitted attachment is included below.

Microgrid Design of Mendocino LLC



13 November 2017

Mike Gravely
California Energy Commission
Dockets Office, MS-4
Re: Docket No. 16-EPIC-01
1516 Ninth Street
Sacramento, CA 95814-5512

Dear Mike:

Attached are my comments on the draft Roadmap for Commercializing Microgrids in California released before the CAISO workshop on 2 October.

Sincerely,

Chris Marnay
Principal

COMMENTS ON THE CEC-CPUC-CAISO
ROADMAP FOR COMMERCIALIZING MICROGRIDS IN CALIFORNIA
Chris Marnay – 13 Nov 2017

General Comments:

The perspective of the roadmap is misplaced. The *Roadmap* begins with reasonable description and definition of microgrids, but then appears to make the assumption that the *raison d'être* of a microgrid is to provide services to the legacy centralized power sector, the *megagrid*. This when it's clearly stated that no such microgrid exists, whereas examples of microgrids of other types abound in California. Rather a microgrid's intent is to provide *superior energy service quality* to the end-use devices within it. Superior service quality might include economic improvement, e.g. as lower cost enabled by revenue streams, such as from providing services to the megagrid, but it may provide other value streams entirely, such as resilience or just a sense of independence. What constitutes superior service quality should be determined by the microgrid itself, and its strategy determined accordingly. It may or may not include provision of megagrid services. In some circumstances, less reliable than megagrid service might actually be attractive, e.g. if it enables use of a low quality local resource with attractive cost or environmental properties. Because end-use services and the devices that serve them are highly heterogeneous, microgrids will likewise be heterogeneous. They may be sophisticated economic actors, but they may or may not trade non-energy products with the megagrid depending on their own goals and approaches. The roadmap is mired in old paradigm thinking, namely that service quality is only measured by cost and the traditional IEEE metrics, e.g. SAIDI, and that only improvement measured by them is valuable. To reach the state's renewable goals more creative thinking is needed.

I suggest the Roadmap should start from a more general statement of possible microgrid drivers in our state, then they should be explored more evenhandedly. In the list offered on page 7, the first three of the California microgrid developer motivations are reasonable, but #4 sounds more like a research need than a microgrid driver. The 5 motivations for microgrids that I normally list are:

1. reduce direct cost of meeting energy service requirements
2. reduce indirect costs (emissions, noise, ... etc., or equivalently increase renewable fraction)
3. reliability and resilience
4. market opportunities (aggregation, demand response, ancillary services, variability buffering, etc.)
5. independence and surety

An understanding of microgrid drivers should suggest barriers, stimulants, and policies to guide deployment in ways supportive of state goals. I believe a structure built around these drivers will be clearer.

While a potential role for combined heat and power (CHP) is mentioned, the general characterization of microgrids as electricity-only networks is too narrow. They almost certainly

involve electricity generation, distribution, and use, but decarbonization requires integrating energy service supply. For example, cooling a building can be partially achieved by overnight venting and thermal storage augmented by heat pumps, room air conditioners, and photochromic windows, all assuming insulation, cool roof, and shading opportunities have all been considered. The goal of microgrids isn't to deliver electricity to this building, it's to adequately cool it, hopefully with an extremely low carbon footprint. It's true that analysts rarely speak of microgrids that do not involve electricity, and further that electrification of many processes is widely seen a desirable path to a carbon-free economy, but it's misguided to characterize microgrids, as the roadmap does, almost exclusively as electricity networks.

There is scant mention of microgrid experience outside California. While this is clearly intended to guide policy and rule-making in this state, considerable experience with microgrids exists both in other parts of the U.S. and internationally. Surely, our state wants to learn from rather than duplicate that experience.

Some language is unacceptably vague, e.g. "a history of energy issues or specific energy needs." What does this mean exactly? A history of poor reliability, concern about wars in the Middle East, need to store medicines,...?

The Roadmap suffers from a tension between offering comprehensive analysis in some areas, especially the regulatory environment, and trying to be a generally digestible introduction/overview. Understanding that striking the right balance is desirable but difficult, the text needs to be leveled. Perhaps short and longer versions might be produced, or much material move to technical appendices?

Specific Comments:

Page 3

Focus on renewables, especially given California's aggressive decarbonization goals, is reasonable, and focusing the state's efforts on high renewable content microgrids distinguishes its efforts from northeastern programs, which are resiliency-focused.

Page 4

Adoption of the DOE definition as a starting point is reasonable. Nonetheless, the roadmap should mention the origin of CEC's definition, and reasons for the two changes, i.e. addition of variable service quality and removal of remote microgrids.

While this definition is widely used and has stood the test of time, a couple of more recent microgrid developments are missing: 1. the possibility of nested microgrids, e.g. a DC network within an AC microgrid, often called a *nanogrid*; 2. clarification of the place of remote microgrids in development and deployment of the technology.

Borrego Springs is an excellent microgrid demonstration, but using it as the solitary example is deceptive. The description of "customers" within the microgrid gives the impression the

microgrid is a utility, and therefore regulated. This is certainly a legitimate type of microgrid, often called a *milligrid*, but it's only one of several possible types. Indeed, the most common current format is a single large customer, e.g. a campus, that adds the necessary functionality to operate islanded, such as Blue Lake Rancheria. Notably, many of the Superstorm Sandy success stories were of this type, e.g. New York and Princeton Universities. This distinction may not be too important from a technical perspective, but it's critical from a regulatory perspective.

The suggested requirement that a microgrid must have a controller is a little deceptive. Clearly, it requires the ability to function islanded safely and economically, and during grid connected operation, microgrid assets, especially storage, need to be managed, i.e. there needs to be control. This could be achieved by a hardware controller, but there are other possibilities, e.g. simple manual control, or a cloud service. In the early days of the Borrego Springs demonstration, control was fairly rudimentary, and restoring any service following 6 September 2013 storm took 4.5 h. This does not make it an illegitimate microgrid.

Use of "utility" in sentences such as "... managing the grid remains the responsibility of the utility" and that it must "ensure the system is more resilient and secure" needs some clarification. Management of the California electricity supply infrastructure is the responsibility of diverse entities, so what exactly is being referred to here? CAISO, a muni utility, other? And again, this approach is stuck in old paradigm thinking. The megagrid (roughly upstream of the substation) needs to have exactly the level of resilience and security such that end-use services can be provided at an acceptable quality level. In many cases, providing for critical loads will be the responsibility of microgrids, and the megagrid may be freer to adopt standards more amenable to its overriding objective of decarbonization. The roadmap seems to recognize this in one direction, i.e. some microgrids will have responsibility for supporting critical infrastructure, but not the other, namely the megagrid is thereby relieved of this responsibility. The latter is as important for decarbonization because it suggests the megagrid could adopt resilience and reliability norms compatible with a high renewable fuel mix.

Page 6

The goals listed at the bottom of the page seem to be a confusion of goals, policies, and expectations. The motivations for microgrid development are varied and generating revenue by providing energy or services to the megagrid or other entities may or may not be one of them, as described in the first section above. While I surely a better way to state the goal would be something like

To decarbonize energy supply and use to the maximum extent possible without impeding the economy, our quality of life, or other goals.

page 10

The one mention of CHP makes an important point that should be expanded. Building or multi-building CHP systems offer an attractive platform for microgrid development, in fact they often already are. But they provide a fertile environment for other microgrid features, renewable generation, load control, storage, etc. CHP systems in themselves may or may not reduce

overall carbon emissions, but as we decarbonize, the inefficiencies of single cycle power plants will become increasingly unacceptable. CHP may already be unacceptable.

page 11

Some of the better sentences in the draft begin “Reliability and resilience are dealt with locally ...” The idea here is an important one, namely that some current megagrid responsibilities can be taken over by microgrids. This should raise two questions. 1. How should the microgrid be compensated for relieving the megagrid? And 2. Does this mean the megagrid can ease up on its standards?

In contrast, one of the worst sentences begins “As previously mentioned, there are no specific ...” What would a utility directive to use microgrids look like?

pages 11-13

The analysis of current regulation is comprehensive and informative, but this is where the failure to define various types of microgrids impedes understanding. The type of interconnection, ownership, and other characteristics will change the effect of the existing regulatory framework.

page 15

I think that “The role of standards cannot be [*overstated*]” was intended.

More coverage of the IEEE and other standards is needed. These are key to the character of microgrids and they were developed by a lengthy and detailed process.

Bibliography

"Is there a role for microgrids in the energy future of Quebec and Canada?" Trottier Institute for Sustainability in Engineering and Design public event on 25 April 2017, playlist of event presentations available at:

https://www.youtube.com/playlist?list=PLq4UOPfBHnAXKMlepjJzPT_-KAjsHQvWE

Marnay, Chris. “Microgrids: Finally Finding their Place,” chapter in Fereidoon P. Sioshansi, ed., *Future of Utilities: Utilities of the Future*, Academic Press, London, 2016.