DrinkerBiddle&Reath LLP

C. Baird Brown
215-988-3338 Direct
215-988-2757 Fax
baird.brown@dbr.com

Law Offices
One Logan Square, Ste. 2000
Philadelphia, PA
19103-6996

(215) 988-2700 phone
(215) 988-2757 fax
www.drinkerbiddle.com

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November 13, 2017

VIA ELECTRONIC DELIVERY

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

Re: Docket 16-EPIC-01, Roadmap for Commercializing Microgrids in California

This firm represents The Microgrid Resources Coalition ("MRC"). The MRC is pleased to submit its enclosed Comments to the Draft Roadmap for Commercializing Microgrids in California presented on October 2, 2017, in the California Energy Commission Docket 16-EPIC-01.

Please feel free to contact me directly at the telephone number above.

Very truly yours,

C. Baird Brown
Attorney for the MRC

Christopher B. Berendt
Attorney for the MRC

CBB/BCP
Enclosures

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CALIFORNIA ENERGY SERVICE COMMISSION

Docket 16-EPIC-01

COMMENTS BY THE MICROGRID RESOURCES COALITION IN RESPONSE TO THE OCTOBER 2, 2017 REVIEW DRAFT OF THE ROADMAP FOR COMMERCIALIZING MICROGRIDS IN CALIFORNIA

Dated: November 13, 2017

I. Introduction

The Microgrid Resources Coalition ("MRC") respectfully files its comments in response to the review draft of the Roadmap for Commercializing Microgrids in California ("Draft Roadmap") presented October 2, 2017 to the California Microgrid Joint Workshop, with an extended comment deadline of November 13, 2017 as set in the Commission's October 20th email. The MRC applauds the California Energy Commission's ("Commission") efforts to explore microgrid barriers and encourage microgrid development through a stakeholder process and appreciates the opportunity to participate in this proceeding.

The MRC is a consortium of leading microgrid owners, operators, developers, suppliers, and investors formed to advance microgrids through advocacy for laws, regulations and tariffs that support their access to markets, compensate them for their services, and provide a level playing field for their deployment and operations. In pursuing this objective, the MRC intends to remain neutral as to the technology deployed in microgrids and the ownership of the assets that form a microgrid. The MRC's members are actively engaged in developing and operating microgrids in many regions of the United States, including California.[1]

The MRC complements the California Energy Commission, California Public Utilities Commission and the California ISO staff for the work done in preparing the Draft Roadmap and in capturing many of the key issues in connection with this important topic. The MRC notes that

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[1] The Microgrid Resources Coalition is actively engaged in advancing the understanding and implementation of microgrids across the country. Members of the MRC include: Anbaric, Concord Engineering, Eaton, ENGIE, Icetec, International District Energy Association, NRG, Princeton University, Thermo Systems, University of Missouri and the University of Texas at Austin. MRC member organizations that maintain an office in California include Anbaric, Concord Engineering, Drinker Biddle & Reath LLP, Eaton, NRG, Thermo Systems, and ENGIE subsidiaries Green Charge and OpTerra Energy Services. The MRC's comments represent the perspective of the coalition and should not be construed as speaking for individual members.

many of the items discussed in the Draft Roadmap are consistent with the MRC's previous filing in this proceeding.[2] The MRC also wishes to express strong support for and highlight what the staff has said about the hybrid nature of the microgrid resource and its ability to overcome certain grid-scale integration challenges:

> *"By allowing the customer or microgrid operator to manage itself according to its needs, and then acting as an aggregated single entity to the distribution system operator, a number of innovations and custom operations are possible. The interconnect point only needs to know whether power should be sent into the microgrid or whether power is flowing out. Microgrids are able to overcome the problems of grid-scale integration by using DER as a "local portfolio" that can be managed at a distribution level, based on local conditions. Further, operation of the distribution system at the local level (customer or load level) is simplified and improved by the integration of microgrids into the electricity grid."*[3]

In response to the Commission's request for stakeholder comments on the Draft Roadmap, the MRC focuses below on a handful of important themes that recur throughout the Draft Roadmap document. Wherever possible, we have noted the relevant locations in the Draft Roadmap that are addressed by our discussion. In addition, Section IV below provides direct comments to the planning action items enumerated in the Chapter 3 of the Draft Roadmap.

II. Microgrid Economics, Investment and Management

The Draft Roadmap accurately describes many of the capabilities and possible benefit streams from microgrids. However, it provides more questions than answers as how microgrids will be paid for and managed, and what business models will support them. The MRC suggests that the answers are intertwined – microgrids will be built, managed and paid for by the stakeholders who accrue the most benefits from the

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[2] Microgrid Resources Coalition, *Comments by the Microgrid Resources Coalition in Response to the Proceeding on a Roadmap to Commercialize Microgrids in California*, Docket 16-EPIC-01, filed August 16, 2017.
[3] Draft Roadmap at 12.

microgrid or by developers who act and operate on their behalf. In most instances that will be energy customers (acting singly or in small groups) or communities. The regulatory posture of the microgrid will be a function of the status of beneficiary.

a. Customer benefit microgrids

If a customer is the owner or beneficiary[4] of a microgrid, then the customer is entitled to operate the microgrid (or cause the microgrid to be operated) to optimize its internal energy system for its benefit. It can balance its thermal needs and its electricity needs (and water needs as well) to maximize efficiency of its entire system, and make its own tradeoffs between metered energy and water savings and other less easily monetized values such as reliability and resilience. Indeed an individual customer is much better able to place monetary values on its loss of its internal activities than the grid can make on behalf of customers as a class.[5] The behind-the-meter values provided by the microgrid will most likely be the largest share of the values associated with a typical microgrid, and if they are insufficient to form a firm base for private investment (supplemented where possible by external revenues), the microgrid is unlikely to be built.

The customer can also trade off all of the behind-the-meter values against the option of reserving portions of the capability of the microgrid to sell services to the grid for its benefit. These services can include making sales in the CAISO wholesale markets for energy and ancillary services (directly or through an aggregator), participation in DSO operated demand response programs, or providing locally tailored services to support the operation of the distribution grid (in which the microgrid can act as generation, or storage, or a hybrid of both). So long as different resources within the microgrid are appropriately metered and communicate relevant information to the grid operators the microgrid can often provide multiple products to different markets (such as regulation around a fixed ramp). In any event, the management of the microgrid is still in

[4] In the sense that a third party developer contracts to provide all the services of the microgrid to or for the benefit of the customer.
[5] See Draft Roadmap at 18 at note 14.

the hands of the beneficiary except to the extent called for by the provision of a particular service or product to the grid.

The services provided by the microgrid customer for itself behind the meter are not subject to State economic regulation. Customers and developers are generally subject to interconnection standards, environmental standards, and communications and product definition requirements for sales of services. It is up to the customer as to how the microgrid is designed and deployed subject to those requirements. Indeed, adapting a microgrid to a collection of existing facilities with differing configurations and energy needs or even to a new development is necessarily an individual design exercise. The Draft Roadmap suggests several goals for the development and design of microgrids that may extend beyond the purview of the Commission. For example:

> "With regard to the physical interconnection of components to the microgrid, insuring open standards and access for these products and services will enable them to be valued at an appropriate price. . . . [and] will enable service providers and customers to evaluate costs and services on an apples to apples basis."[6]

It seems appropriate for state and federal regulators to determine the communications protocols and electrical characteristics that are required for particular products provided to the grid, but not to reach into the microgrid and decide that it has certain interchangeable components whose specifications are subject to their review. In addition, the Draft Roadmap articulates as challenges to deployment of microgrids the need to:

- Develop and provide clear and understandable business cases that will allow an end user or consultant to evaluate the cost and value of different microgrid configurations and make an educated decision on what system is right for them and/or which microgrid is not appropriate for them;[and]
- Develop and publish clear training materials for workers on how to install, maintain, and operate microgrids.[7]

[6] Draft Roadmap at 16.
[7] Draft Roadmap at 17.

For customer benefit microgrids, these are matters that are clearly the purview of equipment vendors, developers and consultants. State agencies might play a role in convening consultations about these matters, but would best not attempt to dictate.

The Draft Report also raises issues about investment in microgrids that should be settled (or at least clarified) by beneficial ownership analysis:

- Regulation and planning processes leave unclear who carries the cost of implementing microgrids and what fees will be applicable to microgrids.[8]

Where a customer has the beneficial use of the microgrid, it pays the cost of implementing the microgrid; or if a developer has developed the microgrid for the customer, it pays the cost subject to its contractual compensation from the customer. Customers and resources alike pay interconnection fees. So does a microgrid which is both. Indeed customer investment is one of the great system benefits of microgrids. As they are investing in microgrids for their own benefits, customers are frequently able to provide services to the grid as a coproduct, and reduce the cost of the service to the grid. Grid services provided at competitive cost by customer benefit microgrids lower costs for all customers.

b. **Other benefit models**

Hybrid allocation of microgrid asset benefits is possible. For example an asset owner by contract can commit a particular portion of the services of an asset to a third party (just as generation owners have subdivided ownership or contractual rights to manage portions of a generating unit for decades). For example, a developer/owner of microgrid assets could contract to provide certain services to microgrid customers and other services to the grid operator or DSO, or could retain the optionality of a portion of the assets for its own market strategies. This is not uncommon, in our experience, with electric storage assets, but is unusual (at least so far) with microgrids. In each case the contracts make clear who is

[8] Draft Roadmap at 18.

entitled to either particular services or to optimize the residual value of the assets. In such cases the obligation to invest generally follows the benefit unless the benefit is provided as a service as discussed above. However, that is generally up to the customer and developer to determine. In any event, if a developer retains a portion of the capability of microgrid assets for its own use, the regulatory posture of that portion is the same as any generator on the system.

Hybrid ownership of microgrid assets is also possible. A group of customers through an owners association can own microgrid distribution systems in common, or could also form an electric cooperative to own an entire system, or contract with a third party to develop generation and storage assets. As another example, a multi-customer microgrid could consist of distribution wires and islanding switchgear owned by a DSO, but be served by customer or developer owned generation that is operated for the benefit of customers (and separates as an island for the benefit of the customers unless paid to do so as a service by the DSO).[9] This could be particularly apropos in a community choice aggregation context, as discussed below. The contractual relationships would require careful review.

In some states, particularly on the east coast in the wake of Hurricane Sandy, public benefit microgrids have been proposed.[10] Some of these involve a local government as the organizer, and in that respect are customer benefit microgrids for purposes of the discussion above, and are funded with a combination of private investment and public funds. Some have also been proposed by utilities as rate based investments that will be operated by the utility in island mode (though third parties may own the generation). A major focus of both types has been continued operation of critical community facilities, public and private, during grid disruptions. To the extent that these microgrids combine quantifiable

[9] Returning to parallel operation would necessarily be under the control of the DSO, and MRC members have assisted utilities by deferring resumption of parallel operation until it was convenient for the utility, and providing a stable load profile once they resume.

[10] See, e.g., Potomac Electric Power Company, *Proposal for a Pilot Program to Create and Evaluate Public Purpose Microgrids*, MD PSC Case No. 9361, filed September 25, 2017; New Jersey Board of Public Utilities, *Town Center Distributed Energy Resources Microgrid Feasibility Study Incentive Program*, approved January 25, 2017, http://www.njcleanenergy.com/commercial-industrial/programs/der-microgrid-feasibility-studies.

customer benefits with local community judgements about public expenditure for resiliency, they do not raise difficult regulatory questions. The MRC's concern with the utility sponsored microgrids is that they will not take advantage of the customer efficiencies that are the hallmark of customer benefit microgrids.

If a DSO owns an asset in rate base it is generally required to use that asset to optimize the larger system for all of its customers. Of course, it can have distribution assets spread across a region to serve particular areas so long as it is providing the same general quality of service to all. It cannot generally use a rate base asset to provide specialized services to particular customers so as to optimize for those customers behind the meter.[11] Accordingly, DSOs simply cannot develop and operate the sorts of customer benefit microgrids described in the section above. They cannot take advantage of energy efficiencies that are a principal driver of customer benefit microgrids and a principal benefit of microgrids for the state. If utility developed microgrids displace economically feasible customer benefit microgrids, the energy efficiency benefits and private investment benefits are lost.[12]

III. Services and Their Value

a. Fair Value

The MRC supports a compensation framework that provides microgrids and all resources a fair value for services delivered to the grid and charges microgrids fair value for services they receive from the grid. To the extent possible, microgrids should be treated no differently than other resources receiving or providing the same services. Microgrids may be able to provide unique services (or services provided by a limited subset of resources) based on their ability to

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[11] If it does it raises complex regulatory questions about the allocation of the asset among rate base and non-rate base functions.

[12] SDG&E has installed a microgrid to serve the Borego Springs community. This microgrid allows SDG&E to island the entire community from its feeder line (which experienced frequent disruption) and maintain service in the community. Storage and generation assets in the community are owned by SGD&E and third parties. This is more a function of the reliable design of the distribution system than the management of any individual customer loads. In that sense it is part of a companion process of subdividing the entire distribution system into islandable regions and subregions with embedded microgrids and DER that allows for the flexible adaptation of the system to disruptions.

adjust their generation and load to shape their aggregate profiles to provide more finely tuned services beyond traditional demand response or ancillary services. The MRC believes this diversity of capabilities is best captured through valuation of the particular services provided by the microgrid.

Valuing services offers a technology neutral avenue and avoids the pitfalls of "value of resources" calculations that attempt to lump together environmental and resiliency attributes with multiple energy system performance measures. An effective structure should separate non-grid services such as environmental values and social benefit charges. These are important values, which the MRC supports, but microgrids are only one mechanism for implementing such values and should not be treated differently from other mechanisms, such as other advanced DER.

b. **Services to the Grid**

The MRC believes that first and foremost, the purchase of services from microgrids must be at prices that are just and reasonable to ratepayers who pay for them. A number of preferred approaches to valuations are possible, but competitive markets, such as the RTO wholesale markets, are always the first choice. Microgrids often participate in these markets through aggregators. For example, the recent CAISO tariff additions permit distributed energy resource aggregations to provide a net response at the pricing node level.[13] Aggregators of multiple DERs or microgrids that employ control systems and/or storage capabilities, would be able to 'smooth' the interactions of their customer base with the grid, and provide additional grid support when needed. Keeping separately metered and contracted services separate can avoid need for

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[13] See, California Independent System Operator Corporation's Distributed Energy Resource Provider Initiative, Tariff Filing, Docket No. ER-16-1085-000, filed March 4, 2016.

limitations on "stacked services." [14] Standardized products that microgrids can count on help provide revenue assurance to microgrid developers.

Microgrids can also provide hybrid generation services or manage their aggregate load profile to meet DSO requirements. The Microgrid needs to identify the aggregation of assets providing the service and provide suitable metering and communications. Microgrids can often provide multiple services simultaneously such as providing regulation around a fixed energy delivery or a defined ramp. Microgrids can also offer unique, customizable solutions to localized planning and operational challenges and microgrids employing multiple energy management technologies can simultaneously provide multiple services through multiple dynamic objective functions. Barriers to multiple and hybrid products can generally be overcome through implementation of smart metering technology and localized grid communications. The MRC urges the Commission's microgrid's efforts to include installation by DSOs of associated technologies that serve to permit the distribution grid to take advantage of services provided by microgrids.

Microgrids often include extensive energy management measures that allow load shifting strategies with unconventional resources (such as buildings themselves), and arbitrage strategies (such as electric vs. steam chillers). They can provide intelligent load shedding in emergencies and support for grid restart after a grid disruption. The grid should take full advantage of this range of services. The MRC is currently collaborating with DOE and Lawrence Berkeley National Laboratory to build distribution system models that assist in valuing unique distribution system services, or eventually translating them to more generalized tariffs. We are hopeful that

[14] Draft Roadmap at p. 21.

our efforts on this project may eventually prove useful as the Commission refines the California microgrid framework.

DSOs can run RFPs for services to support hot spots on the distribution system with "non-wires solutions." Competition for long-term contracts assures fair pricing, and respondents to RFPs may well have more knowledge around technical solutions and the economics of those solutions that depend on optimizing customer systems to respond to the grid's planning and operational needs. Such contracts provide strong support for financing. The Commission can permit the DSO to treat the long-term contract as a regulatory asset with a return that makes them indifferent to implementing a wires solution.

Services under the contract can be tailored to meet the particular needs of the distribution system in emergencies or in daily operation. As an example, a DSO could accept proposals from three microgrids to provide generation/load reduction to support a substation during critical periods as an alternative to distribution system reinforcement. The contract could call for response in a local crisis (not just peak system demand) and require that maintenance schedules between the three resources be coordinated. Such contracts can also specify specific liquidated damages for non-performance, which can provide a much finer tuned response than permanent adjustment of demand charges.

The MRC also encourages the Commission to consider a process based on Virginia's Public Private Transportation Act, [15] which allows private developers to make unsolicited proposals to resolve transportation system issues identified in state and regional transportation

[15] See Va. Code § 33.2-1800 et seq.

plans.[16] This statute permits, but does not require that unsolicited projects be bid out before they are awarded, in the discretion of the relevant public planning agency. In the energy context, customers and developers can identify locations where values to customers or developers support their microgrid investment (the risk of which is not borne by ratepayers). The Commission would either directly approve or give policy guidance on when a supplier would be permitted to proceed with a non-competitive procurement based on hot spots identified in DSO maps and considering factors such as the quality of the proposal and the urgency of the need. Such proposals can be competitively bid or directly approved by the Commission if just and reasonable.

c. **Services to Microgrids**

Both generators and load pay interconnection charges. So should microgrids, which are both. The charges should relate to the direct costs of connection to the distribution system and the additional protective gear, if any, required for the specific services (such as net export) that the microgrid expects to provide. While full plug and play may be too much to expect, similarly situated microgrids providing similar services should generally be treated alike except for the actual distance and terrain to the distribution system. As a general matter the DSO should build its system to accommodate behind the meter generation with limited net export. In other jurisdictions, residential customers have been treated differently for interconnection depending, for example, on whether the DSO legacy system happens to be a 4.5 KV or a 13 KV feeder. This should not be the customer's problem. Requirements above the typical can reasonably be charged to the customer or developer. Most microgrids will be able to manage on site generation

[16] A process identifying system issues in the distribution grid could be integrated with California's requirement for electrical corporations to create distributed resources plan proposals. California Public Utilities Code §769.

internally and will not be designed for net export unless there is a particular market opportunity. If a microgrid simply expects to act, in part, as a merchant generator, it should pay the interconnection costs of expected net export on the same basis as any generator. If a microgrid is established with a contract with the DSO to provide support to a substation or feeder on the DSO system, the DSO should cover the additional interconnection costs if any and treat them as a rate base investment in distribution system reliability.

Standby charges may or may not be a wise idea. They reduce customer incentives to curtail energy usage, and they add an additional disincentive (over and above actual commodity energy rates) for beneficial increases in electric use such as adoption of electric vehicles. To the extent they are employed they need to be priced based on actual risks to the system. A microgrid that can shed load internally should not pay standby charges based on its maximum load. (It can be penalized if it fails on a case-by-case basis.) More importantly, standby charges should be based on statistical underwriting criteria (like the insurance product it claims to be), not on an assumption that all self-generating customers will need to be supported in whole at once. Loss of any individual behind the meter resource is highly unlikely to be a material contingency, and the DSO needs to make prudent preparation for the statistical likelihood of coincident failure. The DSO is already paying for, and charging customers for, system reserves, and each interconnection should be sized, and the DSO compensated accordingly, for the full amount of services the customer expects to require. Customers should have the option to buy less standby "insurance" and be cut off instead in whole or in part.[17] In any event, standby charges are a disincentive to deployment of new, clean assets and should be disfavored.

[17] This may require smart disconnect switchgear, which would be included in the cost of the service or the related interconnection.

Departing load payments are unjust and anticompetitive. They should have no place in the regulatory scheme. DSOs should purchase a balanced portfolio with enough short-term purchases and exit options to manage likely load loss. Energy purchase reductions through clean energy microgrids should not be treated differently than purchase reductions through new, efficient air conditioning. Indeed, both should be encouraged. As discussed above, the state should do everything in its power to eliminate impediments to new clean energy investment by customers and developers in order to reach statewide clean energy goals.

d. **Multiproperty Microgrids**

California law places many barriers in the way of multi-customer microgrids. Microgrids that are confined to a single campus (with no included public roads) can be established with little difficulty. Multi-customer microgrids that span roads or multiple properties are largely blocked[18] (unless done in partnership with a DSO as described above). One available workaround is the establishment of a local cooperative for a few properties,[19] and a microgrid may also be possible as a subset of a community choice aggregation.[20] Eliminating barriers to customer-driven, local microgrids sized to an efficient aggregate load is a high priority, and encouraging DSO wires support without excessive cost for would also be a valuable policy.

While they involve a high degree of difficulty, there may be an economic case for establishing large microgrids that include residential or small business customers. Such

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[18] California Public Utilities Code § 218(b)(2).
[19] California Public Utilities Code §2776-8.
[20] The MRC expresses no opinion as to whether a community choice aggregation is legally entitled to provide differential services (e.g. the ability to island for resiliency) to a subset of community it serves. It seems likely that a public purpose microgrid, as described above, that provides benefits to customers who in turn are providing uninterrupted public services would be permitted.

microgrids raise questions about consumer protection that are similar to questions raised by private retail electric providers in states that have adopted retail electric choice.

The state may wish to establish protections for those customers.[21] Such customers could opt out if they do not wish to pay for services in island mode and have smart disconnect equipment at their distribution connection.

IV. Comments to Roadmap Planning Action Items

a. Microgrid Operation and Value

1. *Develop non-proprietary, publicly available educational and guidance materials for microgrids.*

The MRC encourages (and would be happy to assist in) developing public educational materials on how microgrids benefit their hosts, communities and regions. As detailed above, customers are often best positioned to take advantage of the efficiencies and resiliency offered by microgrids. Further, many are unaware that a microgrid can bring energy security to more than their own site. Beyond islanding and providing resiliency to their hosts, as part of a distribution level network of dispatchable resources coordinated by their local utility, microgrids can individually and collectively assist in grid stabilization and restoration.[22] They project their resiliency onto their communities and regions.

2. *Develop, evaluate, and publish improved metrics to assess microgrid system performance.*

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[21] New York GBS § 349-d Energy Services Company Consumers Bill of Rights.

[22] See, MRC Comments on RM18-1-000 Notice of Proposed Rulemaking on Grid Reliability and Resilience Pricing, filed October 23, 2017, p. 3, available at http://www.microgridresources.com/microgrids/viewdocument/mrc-submits-comments-to-ferc-on-gri; See also, Comments of Amory B. Lovins, Cofounder And Chief Scientist, Rocky Mountain Institute on RM18-1-000 Notice of Proposed Rulemaking on Grid Reliability and Resilience Pricing, filed October 22, 2017, p. 2-3.

The MRC supports the development of well-defined products and services that can be delivered by microgrids and other grid edge resources. We recommend the Commission explore how new performance measures could form the basis for enhanced products that recognize the capabilities of flexible and resilient resources located at the distribution level. We recommend the CPUC and DSOs examine, beyond avoided upgrade cost scenarios and constraint "heat mapping", performance metrics for mitigating imbalances and providing grid stabilization services that reflect how networkable and dispatchable resources can be coordinated by the DSO to create stable, self-healing smart grids with high levels of DER penetration.

3. *Complete research that defines the building blocks necessary to implement microgrids from start to finish.*

The MRC suggests that the technology building blocks necessary to implement microgrids from start to finish are well known as to individual microgrids. Rather, the MRC recommends focusing on the DSO network control technologies necessary to optimize the capabilities of microgrid fleets in furtherance of a smarter grid.

b. **Improving the Electric Grid with Microgrids**

1. *Develop methods to reduce cost barriers for microgrid participation in grid services requiring special metering and telemetry equipment.*

The MRC supports this action item and reiterates that enhanced interconnection and telemetry installed to enable the DSO / distribution control system to dispatch the microgrid for local distribution grid support should have their costs borne by the DSO.

2. *Clarify the microgrid participation rules and requirements to provide multiple revenue streams. Where possible, leverage the rules and requirements being developed for the energy storage industry or other DER systems.*

The MRC encourages clarifying that multiple revenue streams and simultaneous segmentation of services are allowed for microgrids as they often unify several supply and demand resources and are capable of dynamic service provision. We caution that rules relating to storage and other DER systems often are not applicable to advanced microgrids that frequently unify multiple load, generation and storage resources. For instance, MRC member microgrids have demonstrated higher levels of performance in ancillary service markets than storage and other DER.

3. *Develop and validate new benefit metrics for system resiliency that are provided by microgrids.*

While customers are the best judge of the value of resiliency behind the meter, the state and CAISO may wish to consider public values of resiliency. If they wish to do so they can treat identified resiliency assets or services: as a separate "resiliency tier" in an energy portfolio standard; or under special DSO tariffs enabling an exchange of services with microgrids (e.g. microgrids providing distribution support solutions to DSOs). We also suggest efforts to integrate state mandates with wholesale markets to avoid disruption of CAISO markets. The MRC encourages the Commission, as we have encouraged FERC, to consider a definition of resiliency that focuses (i) on the ability to preserve critical infrastructure and functions for communities and customers, (ii) adapt the grid rapidly to disruptions, and (iii) promptly restore service that is lost. We further suggest the incorporation of technology-neutral performance metrics that can form the basis of tariff frameworks in support of resiliency.

The metrics set forth below are consistent with our suggested definition. Again, we suggest an initial focus on local critical infrastructure, but note the implementation of such metrics will serve as immediate, incremental building blocks toward the creation an overall more resilient grid and are viable for evaluating any new enhanced CAISO products.

- *Proximity of a supply resource to critical demand-side infrastructure*.

  If a supply resource is proximate to critical infrastructure-related load as most interruptions take the form of transmission and distribution outages rather than interruptions in fuel supply to generators. Supply resources located near critical infrastructure with distribution channels minimize the potential disruption points.

- *Hybrid generation and storage*.

  If the resource has multiple different units and/or generation types, operation as an aggregation, especially with hybrid generation, is inherently more robust and less at risk from a single point of failure. Hybrid storage, from thermal and electrical to fuel, should also be included in the performance metrics (there are numerous other options for onsite and local storage in addition to solid fuels, including gaseous and liquid, e.g. CNG storage at the LDC network / local level proximate to gas-fired generation resources).

- *Fast start and black start capabilities*.

  If the multiple unit and/or hybrid generation aggregation proximate to critical infrastructure is able to fast start and black start allowing the supply resource to quickly respond to grid signals and conditions in order to support the proximate critical infrastructure.

- *Islanding capability*

  If supply resources and the critical infrastructure they are serving have the ability to island from the main grid system in an emergency allowing those resources to continue to support delivery of essential services to the community even in the event of a complete outage of the larger grid. It also permits the grid operator to shed load in emergencies without loss of critical services.

c. Microgrids’ Role to Implement State’s Policy Goals

1. *Develop different microgrid use cases that will support increased penetrations of renewables on the California electric grid.*

The MRC supports the examination of use cases and offers our support as sources for industry case studies. We encourage multi-customer, mixed-use development host microgrids be examined.

2. *Develop state level strategies to open wholesale and retail markets to microgrids that will support California's future energy policy goals.*

The MRC encourages such strategic planning. We note that retail choice often enables the comprehensive provision of commodity energy services by microgrid developers to hosts. Such ability can provide better microgrid economics in support of project finance.   Microgrids can best serve to optimize customer energy use if they face time-of-use pricing.

3. *Facilitate opportunities to work with California Tribal Communities and other special entities that want to include future microgrids in their utility operations.*

The MRC supports efforts to ensure all communities have an opportunity to benefit from microgrid development. Tribal communities are generally able to adopt their own permitting schemes or remain subject to federal jurisdiction. Materials on microgrids adapted to these circumstances would be helpful.[23]

4. *Complete detailed research studies and analysis on the role microgrids play in California utilities to meet future policy goals; and*
5. *Define the role of microgrids in future grid management with higher concentrations of DERs.*

The MRC believes that DSOs should look to microgrids as advanced resources that can be contracted, networked and utilized to deliver on the promise of a smart grid. In the grid of the future, DSOs should: (i) adopt advanced metering, telemetry and controls; (ii) ease interconnection and DER siting; (iii) contract with microgrids for locally customizable

[23] Distribution and district level microgrids, while frequently inclusive of multiple onsite generation resources, are often easier to develop than large central station resources with a greater footprint.

distribution system support services; and (iv) utilize advanced controls to allow grid regions and sub-regions and microgrids to island, reconfigure, support on another and adapt to changing conditions, including grid disturbances. Utility investment should focus on these tools to allow DSOs to "conduct the DER concert." Microgrids, as the most flexible resources on the grid system permit dispatch by CAISO or the DSO into a wide variety of different load/generation profile combinations enables microgrids to act as shock absorbers or stabilizers helping the grid adapt.

d. **Microgrid Technical Challenges**

1. *Develop and publish new processes and procedures where existing and future microgrids can provide publicly available lessons learned from fielded and operating microgrids.*

The MRC encourages the sharing of best practices and would welcome participation in a microgrid educational program.

2. *Complete research to identify new opportunities for potential economic revenue streams for microgrids for services they can provide their owner/operator, the utilities, and the California ISO.*

In accordance with all of our comments above, the MRC strongly supports recognition and fair compensation for performance.

3. *Develop a process to reduce the risks and problems of microgrid islanding.*

Microgrids today successfully island without substantial risk or difficultly. In returning to parallel operation, they coordinate with the DSO to reduce the difficulties of DSO system restoration. Moreover, the MRC believes this action item addresses only a small part of the picture. Today, and into the future, islanding will be a dynamic tool for utilities / DSOs to utilize in furtherance of stabilizing grid operations and accelerating grid restoration. In a modern grid system, islanding capabilities are an advantage, not a problem.

4. *Prepare guidelines to assist local government agencies and others in selecting and supporting future microgrid projects.*

Programs or consultants that can offer tailored assistance to local governments are more important than guidelines. The MRC supports the development of materials that recognize the wide range of options available to local governments.

5. *Evaluate how microgrids can provide new options to address the impacts of the aging California natural gas infrastructure.*

Microgrids often utilize a variety of thermal and electrical generation sources. As microgrids often include highly-efficient natural gas-fired cogeneration,[24] they offer better energy and carbon intensities per Btu and thus reduced gas transportation capacity demand per unit of energy service when compared to central station gas plants. To the extent that California continues to rely on gas generation, it should focus on applications where thermal loads require this use, permit greater efficiencies, and assist microgrids in balancing variable resources internally.

6. *Define minimum cybersecurity requirements for microgrids.*

The MRC is still in the process of formulating a position regarding cybersecurity requirements.

7. *Analyze and compare the commercial viability of different microgrid configurations.*

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[24] Utility scale steam turbines are approximately 35 percent efficient; a modern combined cycle gas turbine can reach 55 percent efficiency; a modern combined heat and power plant with a matched thermal load can achieve efficiencies approaching 85 percent.

The MRC supports such modeling and points to existing efforts underway at the National Labs, in particular Lawrence Berkeley National Laboratory, in furtherance of testing different microgrid configurations under different tariff and market environments.[25]

8. *Fund technical research to address current regulatory issues facing microgrid deployments.*

The MRC believes the current regulatory issues have more to do with traditional market roles, rules and tariffs than technical challenges. Often technical challenges stem from having to work around or within stale regulatory frameworks.

e. **How Microgrids Operate in the Current California Regulatory Framework**

1. *Develop microgrid service standards necessary to meet state and local permitting requirements.*

State and local permitting issues are likely to relate to individual generation assets, not to microgrids as such. The state should assure that building electrical codes support rather than hinder sophisticated behind the meter energy management. It is critical that any standard does not restrict the ability of hosts and developers to customize microgrids.

2. *Develop methods to reduce cost barriers for microgrid interconnection requirements.*

The MRC strongly supports reduction of interconnection costs and process barriers (including the elimination of departing load charges for microgrids that can serve as distribution system resources).

3. *Develop guidelines that determine what impact studies are required for microgrids to connect to the utility grid.*

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[25] See, the Lawrence Berkeley National Laboratory website for the Distributed Energy Resources Customer Adoption Model (DER-CAM) at https://building-microgrid.lbl.gov/projects/der-cam.

The MRC encourages these guidelines and impact studies to concentrate on the negative and positive impact of microgrid connections. Again, microgrids are stabilizing, distribution level resources and can mitigate, as opposed to present, the problems created by simple DER installations.

4. *Determine if separate utility rates and tariffs are necessary to support microgrids.*

The MRC supports analysis into new rates and tariffs that recognize the exchange of services between a microgrid, its host, the DSO and CAISO.

5. *Form a working group to codify standards and protocols needed to meet California utility and California ISO microgrid requirements.*

The MRC supports the formation of a working group to address the details in the wake of framework development.

f. **Economics of Microgrids**

1. *Develop and validate new benefit metrics for the system reliability provided by microgrids.*

The MRC strongly supports the development of new metrics for system reliability and resiliency.[26]

2. *Enact the state approved rules under which microgrids can participate in wholesale and retail markets.*

The MRC notes that post the EPSA v. FERC decision,[27] it is clear that microgrids have unfettered access to the wholesale markets. Again, revisiting retail choice frameworks in the context of microgrids is worth considering under new rules.

[26] See supra note 23.

3. *Define different revenue streams available to microgrids beyond the ones that currently exist, such as volt-amp reactive (VAR) services, flexible energy services, and emergency services.*

In accordance with all of our comments above, the MRC strongly supports recognition and fair compensation for performance.

V. Conclusion

The MRC thanks the Commission for the opportunity to provide comments on the Draft Roadmap. We look forward to continuing to engage further with the stakeholder process as the Commission moves forward with this proceeding.

[27] EPSA v. FERC, 136 S. Ct. 760 (2016).