FILED
08/07/20
02:07 PM

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Forward Resource Adequacy Procurement Obligations.	Rulemaking 19-11-009 (Filed November 7, 2019)

TRACK 3.B PROPOSAL OF
CENTER FOR ENERGY EFFICIENCY AND RENEWABLE TECHNOLOGIES

MEGAN M. MYERS
Attorney for the Center for Energy
Efficiency and Renewable Technologies
Law Offices of Sara Steck Myers
122 – 28th Avenue
San Francisco, CA 94121
Telephone: (415) 994-1616
Facsimile: (415) 387-4708
E-mail: meganmmyers@yahoo.com

JAMES H. CALDWELL, JR.
1650 E. Napa Street
Sonoma, CA 95476
Telephone: (443) 621-5168
Facsimile: (415) 387-4708
E-mail: jhcaldwelljr@gmail.com

For: CENTER FOR ENERGY EFFICIENCY AND RENEWABLE TECHNOLOGIES

Dated: August 7, 2020

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Forward Resource Adequacy Procurement Obligations.	Rulemaking 19-11-009 (Filed November 7, 2019)

TRACK 3.B PROPOSAL OF
CENTER FOR ENERGY EFFICIENCY AND RENEWABLE TECHNOLOGIES

The Center for Energy Efficiency and Renewable Technologies (CEERT) respectfully submits its Track 3.B Proposal in Rulemaking (R.) 19-11-009 (Resource Adequacy (RA)). CEERT's Track 3.B Proposal is filed and served pursuant to the Rules of Practice and Procedure of the California Public Utilities Commission (CPUC or Commission) and the Assigned Commissioner's Amended Track 3.A and 3.B Scoping Memo and Ruling, dated July 7, 2020 (Amended Scoping Memo).

I.
INTRODUCTION

The Amended Scoping Memo in Section 2.2 sets forth the issues that will be considered as Track 3.B of this proceeding. These issues include: (1) examination of the broader RA capacity structure to address energy attributes and hourly capacity requirements, (2) other structural changes or refinements to the RA program identified during Track 1 or Track 2, and (3) other time-sensitive issues identified by Energy Division or by parties.[1] The Amended Scoping Memo also invites parties to submit Proposals on the issues identified as being part of Track 3.B.[2] CEERT makes one modest proposal for Track 3.B to update and harmonize counting rules to establish Net Qualifying Capacity (NQC) and, if proposed changes to the RA structure

[1] Amended Scoping Memo, at pp. 4-5.
[2] Amended Scoping Memo, at p. 5.

are adopted, Net Qualifying Energy (NQE)[3] values for hybrid resources to align with the modified RA paradigm resulting from Track 3 and the ongoing California Independent System Operator (CAISO) Stakeholder Initiative on Hybrid Resources.[4]

CEERT specifically acknowledges the contributions of Mark Ahlstrom of NextEra Energy Resources, and Lorenzo Kristov, an Independent Consultant formerly with the California Independent System Operator to this filing and this proposal. Mr. Ahlstrom's recent comments on the subject of hybrid resources at a FERC Technical Conference are attached hereto as Attachment A for reference.

II.
BACKGROUND

California's energy policy goals for the 2020s and beyond, and their implications for the electric power sector, include long-term sustainability with emphasis on decarbonization, resilience of electric service to customers and communities when grid disruptions occur, and advancing environmental justice by rapidly reducing pollution in disadvantaged communities. The evolving power system must serve these goals, in addition to the traditional 20th century requirements — reliability, safety, efficiency, and affordability.

Given these goals and the rapid advances in technologies, the power system is transitioning to higher penetration of distribution-level resources, devices and controls (DERs) on both sides of the customer meter, as well as new utility-scale renewables hybridized with energy storage ("hybrid resources").[5] With DERs, customers have alternative ways to obtain and

[3] The Term "NQE" refers to a metric that Southern California Edison (SCE) and California Community Choice Association (CalCCA) are proposing in their Track 3.B proposal. CEERT generally supports the SCE/CalCCA proposal and looks forward to a robust dialogue to refine this proposal leading to a favorable Track 3 decision by the Commission.
[4] See CAISO, Hybrid Resources Draft Final Proposal, August 3, 2020. CEERT generally supports this proposal and looks forward to a favorable vote on the refined Final proposal by the CAISO Board scheduled for November 2020.
[5] These resources comprise over 25,000 MW or roughly one-half of the CAISO Interconnection Queue of new resources in development in the CAISO Balancing Authority.

manage electric service besides kWh from the grid, and those ways are becoming ever more flexible and cost-effective. With DERs, customers are becoming participants in energy markets, not just consumers. Proposals for how to begin to integrate DERs directly into the RA program are being considered in Track 3.A.[6] With this proposal, CEERT suggests how to begin integrating hybrid resources into an evolving RA framework as part of Track 3.B.

The current RA paradigm operating in California was designed for a 20th century power system — exclusive supply from large single technology central station generators, long-distance transmission, one-way energy distribution, and inelastic load that was predictably forecasted (aka "ratepayers") with no alternative to grid-delivered kWh. With exogenous load pre-determined, "adequacy" was defined as having sufficient generation to meet peak system load with a low probability of lost load due to supply shortfall. Power system infrastructure had to be built and generating capacity made available to meet extreme conditions during a small number of annual peak hours. The 20th century paradigm thus drove investment to build a system with large amounts of excess capacity the vast majority of the time.

Now technology advancements like DERs and hybrids and microgrids are making that paradigm obsolete. The future will be much more interactive with customers and aggregations of numerous small customer-owned and owner/operator optimized resources forming a portfolio of diverse, flexible generating and storage resources to provide cost-effective reliability and resilience. Instead of today's RA paradigm that relies on conventional fixed generation being bid and dispatched to balance forecasted load, the future will look much more like flexible load being bid and dispatched to meet forecasted generation, all lubricated with energy storage located at all levels of the grid. The RA paradigm needs to adapt accordingly.

[6] Amended Scoping Memo, at pp. 2-4.

Several key groups around the country - for example, the IEEE Resource Adequacy Working Group and Energy Systems Integration Group (ESIG) - have initiated efforts to revolutionize how RA is conceptualized and implemented. Rather than working to just incrementally tinker with an outdated paradigm, the CPUC needs to consider a fundamental reworking of RA, starting from first principles, and leveraging other expert group efforts and stakeholder inputs in a process that allows for a deeper discussion and broader reforms.

A new RA framework needs to be based on principles that will achieve California's policy goals of decarbonization, resilience and equity (including environmental justice). These principles should create participation models for and recognize the value of all technologies in providing RA, particularly hybrids, DERs and microgrids, which have until now been limited or ignored in the RA framework due to real but solvable accounting and compensation challenges. The framework needs to recognize the value that hybrids can provide to the system beyond that of standalone renewable generation and standalone storage and that DERs effectively aggregated are part of the solution for both flexibility and peak load conditions. Conventional bulk system resources should not be the exclusive way to meet RA requirements. Instead, reliability and RA should be framed through the lens of consumer needs and recognize that customer ownership and control of a diverse portfolio of grid resources is essential to achieving California's decarbonization goals.

RA reform requires an intentional transition from the notion that generation capacity alone is needed to meet inflexible load. The ESIG Redefining RA initiative notes the following: 1) the role of load participation in RA is essential; 2) there is no perfect capacity resource (including thermal capacity); 3) RA accounting must be grounded in transparent economic criteria rather than outdated simplified metrics that assume load is fixed and all generation is central station dispatched via wholesale markets; and 4) RA requires modeling and metrics that are suitable for a modern decarbonized power system (e.g., modeling chronological operations across all hours for many representative years; and moving beyond the use of a single LOLE metric, which is insufficient to capture the value of electric service to diverse customers).

CEERT does not claim that RA issues are simple or that a comprehensive transition should or even can be accomplished in one iteration after a series of workshops and planning exercises to discuss hypothetical challenges. We believe the parties to this and related proceedings can work together in a deliberative process over several years with the Commission and other policy makers to develop an RA paradigm for the 2020s and beyond that supports the achievement of the state's major policy goals — sustainability, resilience and environmental justice.

More to the point of near term decision making, innovation with new product design and real-world operating experience with the new resources should guide movement toward the desired reformed RA paradigm. What is critical is that the distributed and hybrid resources be eligible to meet RA needs, be accountable for performance, be valued fairly and accurately and be paid comparably to conventional generation when providing required grid services.

In this context, hybrid resources can be seen as a combination of technologies that are physically and electronically controlled by the owner/operator behind the Point of Interconnection (POI), offered to the CAISO markets and purchased for Commission RA showings as a single resource at that POI. A hybrid resource is an "intelligent agent" where the owner/operator designs, builds, and manages the characteristics of the various components behind the POI and offers energy, ancillary services and resource adequacy capacity at the POI in the same way as a conventional thermal resource. Compared to conventional thermal resources, hybrids have more flexibility and fewer operating constraints (such as minimum load, start-up time, minimum down time, etc.) through the coordinated use of generation, storage, power electronics and software technologies.

It is not possible to define a generic hybrid resource with metrics that can be used in capacity expansion and production cost models to assign an accurate and durable QC or NQC or other performance metric to each individual hybrid project. There are simply too many design and asset management variables subject to the discretion of the owner/operator and the whims of nature that are informed by the owner/operator's view of capital, operating and opportunity costs, and potential value streams for providing energy and grid services. Besides the standard problem of dealing with site specific renewable production profiles that vary over various space and time scales with imperfect forecast accuracy, variables like solar panel layout, mounting structure, inverter loading ratio[7], deliverability rights at the POI, expected network transmission congestion, financing structure, and locational opportunity costs with the particular customers offer too broad a range of performance to assign class average values to each individual hybrid project for RA purposes. To use a class average approach for all hybrid projects will stifle innovation, turn performance monitoring into a least common denominator exercise, and leave significant value on the table to the detriment of the owner/operator, the grid operator and

[7] Inverter loading ratio refers to the DC rating of the generation source divided by the AC rating of the inverter that interconnects with the grid. PV solar developers, in particular, have long known that project economics are improved by oversizing the PV array (inverter loading ratios higher than 1.0). In the early days of utility scale PV during the 1980s, inverter loading ratios were roughly 1.05-1.1 to account for DC losses and array shading. When time of delivery rate schedules and responsibility for financing grid network upgrades came into vogue a decade or so ago, these changes rewarded more predictable, flatter production profiles. Furthermore, panel prices as a percentage of total project costs have fallen significantly. As a result, inverter loading ratios rose to roughly 1.3. This caused "clipped energy" produced during the relatively few hours that the PV array produced energy at or near its nameplate rating but above the inverter capacity to be simply discarded prior to conversion to AC or any revenue metering. With the advent of cost effective storage, this clipped energy found a home for later production to the grid when energy is scarce and prices are high by charging the battery during the middle of the day when energy is surplus and prices are lower – even on high summer demand days. With storage, inverter loading ratios are forecast to rise to roughly 1.8 -2.0. This means historic performance of low inverter loading ratio PV projects offers little insight into the capabilities of newer hybrid PV/storage projects.

consumers. Hybrid NQC and related performance metrics simply must be calculated and monitored on an individual project basis.

III.
TRACK 3.B PROPOSAL

CEERT proposes that the NQC value for RA purposes (and the NQE value if required by modifications to the basic RA structure based on other Track 3.B proposals) be calculated on a project specific basis at the time of the Interconnection Studies conducted at the CAISO when all of the relevant variables for each individual project are known, and individual project performance metrics are established for the CAISO Generator Master File. The calculations need to be done separately for system, local and flex RA due to the variation in load shapes for the local load pockets versus the system as a whole, and the seasonal variations between system and flex maximum demands that define the RA "need."

The QC calculations would use standard Commission developed and authorized models and protocols, granular CEC forecasts of loads and load shapes, and the "and" methodology that sums the individual capacity contributions of the individual generating and storage components of the hybrid while taking account of any charging restrictions or POI constraints that could limit the NQC of the combined resources below the algebraic sum of the component QCs. Details of how these calculations are performed can be "workshopped" in the CAISO Stakeholder Initiative on Hybrid Resources and considered and adopted for RA purposes by the Commission in the June 2021 RA decision that adopts system, local and flex RA needs for 2022.

IV.
CONCLUSION

CEERT appreciates the opportunity to submit this Track 3.B Proposal and looks forward to melding it with other party proposals in Track 3.B, the examination of DERs in Track 3.A and aligning these enhancements with evolving CAISO tariffs and business practices.

Respectfully submitted,

August 7, 2020

/s/ MEGAN M. MYERS

Megan M. Myers
Law Offices of Sara Steck Myers
122 – 28th Avenue
San Francisco, CA 94121
Telephone: (415) 994-1616
Facsimile: (415) 387-4708
E-mails: meganmmyers@yahoo.com

And

James H. Caldwell, Jr.
1650 E. Napa Street
Sonoma, CA 95476
Telephone: (443) 621-5168
E-mail: jhcaldwelljr@gmail.com

FOR: CENTER FOR ENERGY EFFICIENCY AND RENEWABLE TECHNOLOGIES

ATTACHMENT A

COMMENTS OF MARK AHLSTROM

FERC TECHNICAL CONFERENCE ON HYBRID RESOURCES

Docket No. AD20-9-000

July 23, 2020

The power grid is an amazing machine. I graduated in the earlier days of computers, spending twenty years in the software industry before coming to electric power for my last twenty, but I greatly admire the engineering creativity that was used to solve complex problems with mechanical components and analog devices in our conventional resources.

For any machine, however, what really matters is what it does for us. It's the services at the interface that provide value to the user, the customer, or the engineer who is using that machine as part of a larger system. Whether we accepted a machine because it inherently provided some useful services or explicitly specified the services and then designed the machine to provide them, there is a set of services provided by any machine or device, and those services are what has value to us.

Viewed in this light, it is easy to see why the digital revolution has transformed other industries and our lives. In the early days of software and digital electronics, we learned that hardware and software are interchangeable to a surprising degree. Consider what happened to photography—some amazing digital cameras look and act very much like earlier cameras that used film and mechanical shutters, but are built from completely different technology. Other amazing digital cameras look like cell phones. But to the user, they are all cameras, and we've found that digital cameras not only provide us with all the traditional services of a camera, but can be cheaper and faster, while also fostering ongoing innovation that has given us new services that we couldn't even imagine before. Given sufficient electronics, software, energy and storage, we can create essentially any kind of camera that we want.

When it comes to the power grid, we are cautious about changing things. We put a high value on reliability and we are evolving the world's most complex machine while it continuously operates. We make huge investments in our electrical machines and expect them to run for decades. Even so, we have diverse resources in the grid and we know that different technologies can provide similar services and responses at their point of interconnection. We have defined interconnection requirements, performance standards and market products around these services, and because we know that there are multiple ways to provide a service, we've learned that we want such requirements and market products to allow performance-based and technology-agnostic solutions whenever possible.

So, what does this have to do with hybrid resources? I define a hybrid resource as a combination of multiple technologies that are physically and electronically controlled by the hybrid owner/operator behind the point of interconnection and offered to the grid operator (or to some other customer) as a single resource. As with digital cameras, given sufficient electronics, software, energy and storage, we can create essentially any kind of electrical machine that we want. The services and performance levels that we require at the point of interconnection may affect the design and the cost, but there is no doubt that we can build it.

To be clear, we live in a physical world and electrical machines have a physical manifestation at their point of interconnection, such as injecting power, supporting voltage, responding to frequency deviations and so forth. Our digital resources, including hybrid resources, give us more options for providing services at the point of interconnection, and this is true for both co-located resources that are offered as multiple resources at a shared point of interconnection and hybrid resources that are offered as a single resource. However, particularly as storage becomes less expensive and the size of the storage component continues to increase, it will be the "hybrid as a single resource" that allows us to exploit the flexibility and the power of innovation to its full capability.

As with digital cameras, hybrid resources also give us the option of emulating a conventional device (which is largely what we have required so far, such as with Order 842 and 827 for frequency response and voltage support) or providing somewhat different responses that might be better or allow more efficient use of new resource types (such as with Order 841 for energy storage resources). For hybrid resources, it is worth looking at both approaches.

For the first approach, our established services and responses came from what we knew. Given the conventional resources that were available when we built the grid and initially designed the markets, we largely accepted the characteristics of these resources and we made it work. We didn't have a lot of flexibility to change them. At this point, we have a lot invested in our approaches, our market design, and our energy management and market software.

So, this is a valid and logical starting point—in addition to emulating the desired kind of electrical machine, a hybrid resource can use its software and analytics to look like a conventional resource, but with fewer constraints and more flexibility. All RTOs should allow a hybrid, if it wishes to do so, to use an existing market participation model but alter the master data file values. It may not be the optimal way to extract the full value from a hybrid resource, but I see no logical reason why we would prevent a hybrid that wishes to be treated like a gas plant (but with no startup cost, startup time or minimum run time) from participating in this way.[8]

But we should also recognize that resources that are flexible and can more dynamically adapt to what the system needs should be encouraged and rewarded, and this applies not just to the hybrid resources that we are discussing here today, but to a wide range of emerging flexible resources that we will see in the future. Moving more resources toward one-part offers without advance commitment requirements, startup costs, minimum generation levels or other constraints is a benefit to the system. Resources that can make a broad set of offers, allowing the market to select the services that are most needed and valued through co-optimization, are a benefit to the system. Resources that respond logically, flexibly, quickly and accurately to control signals, price signals and contingencies are a benefit to the system. The fundamental rule for maintaining reliability is to keep the system balanced in real time, so flexible, logical and responsive resources that can help do that should be encouraged and valued.

In return for these benefits to the system, we should expect future progress and innovation in our day ahead, intraday and real time markets and operating practices. We should consider how rules can better reflect the capabilities of modern flexible resources, acknowledging that we can get the maximum value from all highly flexible resources by allowing offers and schedules to be updated as close to real time as practical. For example, flexible, variable or energy-limited resources of many types would benefit from intra-hour schedule adjustments that are analogous to the rolling five-minute forecasting treatment that all RTOs provide to variable resources. Intra-hour schedule adjustments would allow them to offer additional services that would be beneficial to the system, and this could largely be done with the existing dispatch software that is used for variable renewable resources.

The critical issue for hybrids, both for the hybrid plants and the markets that use them, is that we retain (and encourage) ongoing innovation. A battery is more than just an energy price arbitrage device. A hybrid combination of generation and storage is different than separate generation and storage plants. By increasingly drawing our attention to the services that are most needed by the system at any given time—by thinking about what the system would truly like to have, rather than making do with what conventional plants could inherently provide in the past—we can evolve toward more elegant and powerful power systems. We must avoid our current trends toward increasing complexity through a patchwork of exceptions. Instead, we should encourage our markets and our resources to think creatively about how to define and provide more ideal services and to innovate more freely in providing and using them. This is our pathway toward more elegant and powerful markets for the future.

Some will argue that it is simply more "globally efficient" to continue to keep all components separate and allow the grid operator to have complete visibility, control and optimization responsibilities. Some will argue that a resource cannot confidently provide reliability services if the system operator cannot directly verify the details of exactly how much stored energy is already available now for providing some service later. Others will argue that a hybrid must inherently be a more expensive and risky way to provide services. While these feelings may initially seem intuitive, there are numerous examples from a wide range of other industries and applications that show that these intuitive feelings are incorrect when it comes to real-world applications and implementations. In many other industries, the leading players who discounted the innovative potential of digital alternatives to their traditional products were left behind.

The real questions for today are simple and important to consider: If a resources wishes to provide services and responses at the point of interconnection as a hybrid that is treated as a single resource, and if it can provide such services with the same quality, reliability and forced outage rate as a conventional resource, with offers to do so that are fair and competitive, why should it not be allowed to do so? If markets can adapt their focus toward the essential services that they ideally want and need, not being forced to simply accept the characteristics that conventional resources could offer in the past, why would we not encourage this as a path toward more elegant and inclusive markets? A hybrid, and particularly the option of having a hybrid that participates as a single resource, is a critical step that will allow both resources and markets to evolve toward more powerful and elegant solutions.