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Resource Adequacy and Wholesale Market Structure for a Future Low-Carbon Power System in California

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Acknowledgments

This is an independent white paper describing issues and options for a future resource-adequacy and wholesale-market structure for California's electric system.

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This report, however, reflects the analysis and judgment of the author alone and does not necessarily reflect the views of these utility companies.

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1. EXECUTIVE SUMMARY

This white paper is intended to contribute to the on-going discussions among stakeholders in California regarding elements of policy and market design that may need to change to help ensure that California has an affordable and reliable power system in the future as it transitions toward much-deeper reliance on low-carbon energy resources and moves from highly centralized to more decentralized resource-procurement models.

In recent months and in light of the many changes underway in California's electric system, state policy makers, including the members of the California Public Utility Commission ("CPUC") and the California Energy Commission ("CEC"), have been actively considering what changes are necessary to address the combined challenges of keeping the lights on while also assuring that the state's consumers can afford to pay their electricity bills and that California can meet its clean energy goals.[1]

Over the past 20 years, California has introduced significant changes into its electric industry structure, its sources of supply, the outlook for demand, and the state's goals for renewable energy and for decarbonizing its electric system.[2] California is now experiencing accelerating consumer interest in turning to non-utility sources of electricity supply, driven by technology (such as rooftop solar) and/or policy (such as through Community Choice Aggregators ("CCAs") and the current, limited direct-access program).

California's investor-owned electric utilities ("IOUs") will soon provide electric supply to only two thirds of their distribution-service customers and, by the mid-2020s, may supply only 15 percent of electricity supply to the customers connected to their distribution systems.[3]

These changes have introduced tensions in California's electric industry, notably with respect to what roles will be played and approaches will be relied upon by market participants, regulators and other state policy makers to assure that the state's future power system has adequate resources for reliable, efficient and affordable electricity supply, and without unfairly shifting costs among customers and disadvantaged communities.[4]

This report describes a proposed "Strawman" for a future electricity market design in California that addresses both resource-adequacy ("RA") considerations as well as the operations of the wholesale

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[1] *See*, for example, statements by the CPUC President, the CEC Chair, and CPUC and CEC commissioners at two separate En Banc hearings held jointly by the CPUC and CEC on May 19, 2017 and on June 22: 2018. http://www.cpuc.ca.gov/general.aspx?id=6442453394; http://www.adminmonitor.com/ca/cpuc/en_banc/20180622/,

[2] These changes are described in several recent reports: CPUC (Staff), "Consumer and Retail Choice, the Role of the Utility, and an Evolving Regulatory Framework Staff White Paper," May 2017 (hereafter referred to as "May 2017 Staff White Paper"); CPUC (Energy Division Staff), "Current Trends in California's Resource Adequacy Program: Energy Division Working Draft Staff Proposal," February 16, 2018 (hereafter referred to as the "February 2018 Staff Draft RA Proposal"); and CPUC (Staff), "California Customer Choice: An Evaluation of Regulatory Framework Options for an Evolving Electricity Market - Draft Green Book," May 2018 (hereafter referred to as the "May 2018 Green Book").

[3] May 2017 Staff White Paper, page 3.

[4] California Public Utilities Code §365.1, §366.2, §366.3, and §380.

power system, taking into account the particular features of the state's evolving institutional energy-supply and industry structure.

The focus here is on an "end-state" structure for resource adequacy and for the operations of the bulk power system, rather than on the elements of the transitional steps or policies that will be needed to get from here to there. Although many specific statutory and regulatory policies might need to change to accomplish this new structure, the focus of the paper is on what the structure would look like, rather than on what might need to occur to get there. The development of this proposal has not been constrained by questions about what, if any, new statutory changes might be needed to enable its adoption and how to accomplish changes in state regulation of retail activities and federal regulation of wholesale activities.

The proposed Strawman incorporates a basic two-part structure for RA and energy production: It includes a "Resource-Adequacy Construct" and an "Energy-Production Construct." This two-part structure relies on a combination of cost-based and market-based elements to help assure that California's system operates reliably and efficiently as it provides affordable and clean power supply to consumers in a low-carbon economy.

This construct also relies upon a centralized entity (a "Central Buyer") as a mechanism to procure local and potentially other resources that are needed by electricity consumers for reliable electricity supply. This Central Buyer entity (e.g., a willing distribution utility; a new state power authority; a willing load-serving entity ("LSE"); California Independent System Operator ("CAISO")) in any transmission zone would conduct targeted solicitations to determine the portfolio of local resources needed to assure to assure reliable, as well as clean, supply to all customers in each zone.

The Strawman market design focuses on helping to ensure that California attracts and maintains the right type of resources in the right place in a future system that is quite different from the one that existed when the current electric-market structure and RA approach were put in place. And the proposal aspires to rely on economically efficient procurement and operating principles, with a recognition that market monitoring and/or regulatory oversight may be needed for resources that provide critical locational or operational attributes but possess market power.

The white paper describes assumptions about future trends in and goals for California's future electric system that have influenced the development of the proposed market and industry reforms. Those assumptions about and for California's future electric system have implications for why a new RA approach is needed and what it should look like. The Strawman Proposal is described in Section 5, followed by an assessment of how the proposal could enable the state's electric system to deliver affordable, reliable and low-carbon services to the state's electricity consumers and economy.

What is (and is not) addressed in this White Paper:

This report examines an outlook for California's resource-adequacy and wholesale power-generation market design consistent with the state's least-cost and low-carbon principles.

This report outlines the features of a specific proposal, recognizing that there may (and likely will) be other reasonable approaches to establishing a workable and efficient market design and industry structure.

This white paper does not directly address many issues that are part of the on-going discussions in California regarding the future of the electric market in the state:

- Customer choice
- Retail rate design
- Distributed energy resources ("DERs")
- Responsibility for provider-of-last-resort ("POLR") service
- The role of the utility in distribution-system planning, operations or markets
- Transmission system issues
- Western power markets

Nor does this paper describe the elements of the transition that would need to occur in California and in wholesale tariffs approved by the Federal Energy Regulatory Commission to arrive at the types of future resource-adequacy and market-design issues and outcomes described here.

2. WHY A REFRESHED RESOURCE-ADEQUACY APPROACH IS NEEDED IN CALIFORNIA

California's current RA program has its roots in the aftermath of the electricity crisis of 2000-2001. In that period, the state's electricity system experienced (among other things) significant wholesale price spikes after years of insufficient investment in capacity additions and declining reserve margins. On numerous occasions, there was literally insufficient capacity to meet customers' electricity requirements, and the CAISO managed voltage reductions, other emergency actions, and rolling blackouts to maintain the integrity of the grid.

In response, the California legislature directed the CPUC to perform several functions directly or indirectly relating to resource adequacy. The legislature enacted AB 57 in 2002 to reestablish the role of IOUs in procuring energy resources for their customers and required the CPUC to approve long-term procurement plans. And AB 380 in 2005 directed the CPUC to set reserve requirements for all LSEs in the state and to determine the appropriate means for ensuring investment in sufficient generating capacity.[5]

Since then, the legislature has further amended the resource-adequacy requirements, and the CPUC has issued numerous decisions that establish the requirements that LSEs procure set amounts of resources for system, local and flexible needs, and that determine the terms and conditions under which IOUs procure and recover the costs associated with long-term resources for their customers. Additionally, SB 350 directs the CPUC to conduct integrated resource planning ("IRP") processes to plan how all LSEs will meet not only reliability, but also renewable-energy and greenhouse gas ("GHG") emission-reduction goals at lowest cost.

This overall framework has worked well from the point of view of resource adequacy and clean energy. In the years following the state's electricity crisis, reserve margins in the state have been robust and relatively stable electricity prices have resulted from efficient energy markets administered by the CAISO. California has achieved both energy-efficiency and clean-energy goals. And the state has done so in part through reliance on IOUs' procurement processes to help accomplish those outcomes.

But the framework now needs to be updated and changed (as the CPUC has explicitly acknowledged and begun to act upon in recent proceedings[6]). California's RA construct and the state's broader wholesale electricity market structure were not designed for an electric system with the kinds of conditions that have been emerging over the past few years and which will likely accelerate in the future.

[5] Assembly Bill 380 (2005). The CPUC's jurisdiction over RA issues varies across the different types of LSEs in California. The CPUC does not supervise RA considerations for publicly owned utilities.

[6] *See* the CPUC's resource-adequacy docket Rulemaking 17-09-020, as well as the joint CPUC/CEC May 19, 2017 and June 22: 2018 en banc hearings.

These circumstances include:

- **Changing generating mix and supply:** For years, generating capacity has been entering into the wholesale market in large part due to policies for renewable energy, distributed energy resources, and low-carbon supply, but not necessarily in response to growth in demand and wholesale market economics. This has created a portfolio that is aligned with the state's clean-energy goals, but it has also created and maintained surplus capacity in the wholesale markets. Wind and solar resources are entering the market in large part due to the state's policies (such as Renewables Portfolio Standard ("RPS"), net energy metering and rate design). This is leading to the entry of significant capacity (e.g., central-station and distributed energy resources) with close-to-zero variable cost of operations and typically non-dispatchable, in advance of need from a traditional RA point of view.

  Thus, California is projected to have a continuing surplus of capacity, with implications for prices in wholesale markets. With gas-fired generating units typically operating on the margin, low natural gas prices have led to (and are expected to continue to lead to) low locational marginal energy prices in CAISO's energy markets and a very-flat supply curve for substantial hours of the year. Plus, the upcoming once-through-cooling requirements for thermal generating units in California, in combination with increasing entry of distributed energy resources and low locational energy prices, will likely lead many fossil units to seek to retire, affecting the locational need for non-renewable capacity and energy with flexibility services available to the system.

  But until there is a much-higher penetration of storage technologies and controllable loads, gas-fired units' flexible operational capability will still be needed for integrating renewables and balancing loads, but with those units producing less power over time. And the CAISO has been entering into reliability-must-run ("RMR") contracts and Capacity Procurement Mechanism ("CPM") contracts to retain resources on the grid where they are needed for local reliability. A revised RA and wholesale power-market structure needs to address these changing conditions, which are likely to continue into the future.

- **Growing market dis-equilibrium:** These conditions are leading to a fundamental decoupling of short-run marginal costs from long-run marginal costs in California's electricity market. A number of conditions – surplus capacity in the CAISO footprint, the state's relatively flat supply curve, declining capacity factors at existing fossil units, and low revenues – are creating missing-money challenges for many existing power plants, especially related to recovery of fixed costs for those units without long-term contracts and with little opportunity for true scarcity pricing in CAISO's energy market. It is unlikely, politically, that genuine energy-market scarcity pricing will be allowed to occur in California's wholesale energy markets, given typical concerns over whether those prices reflect true market conditions rather than market manipulation (and given the memories of the California electricity crisis.

  Further, generating units needed to provide locational reliability and/or balancing services may have market power for providing local reliability and energy services. Such conditions can lead to gaming or other behaviors that are not consistent with markets or consumer protections. Thus

a revised California electricity market design needs to take steps to prevent the exercise of market power for multiple products/services that RA suppliers provide. In some circumstances, the local monopoly context experienced by such units may require non-market based approaches (e.g., cost-of-service contracts with prescribed cost-based rules for bidding into CAISO spot markets).

- **Increasing customer migration**: Retail customers are migrating away from buying their power from traditional IOUs in California. Even though California policy makers took steps to end broad retail choice in the aftermath of the electricity crisis,[7] many electricity consumers have found ways to exercise other options besides buying full, bundled electricity service from IOUs. As of 2017, nearly 5.8 million homes in California had installed rooftop solar,[8] and starting two years from now, new homes in the state will be required to have solar panels.[9] CCAs and Energy Service Providers ("ESPs") now provide supply to close to 25 percent of IOUs' customer loads, with the amount increasing each year.[10] There is growing interest by some customers in expanding the state's current direct-access program (which is subject to statutory limitations and is not available to residential customers).[11]

  These changes, combined with the states' requirements for increasing supply from renewable resources, are leaving California IOUs long on generation resources in some elements, given their historical role in procuring long-term resources for customers in their geographic footprint. Given the outlook for continued customer migration away from IOUs' bundled service, a revised RA structure needs to address these changing conditions. The CPUC had begun to address this issue in its recent Track 1 order, where it has adopted new "refined" requirements for RA, including that: all jurisdictional LSEs that plan to serve load in a following calendar year participate in the year-ahead RA process; jurisdictional LSEs begin participating in a multi-year forward RA program as of 2020; and a central-buyer structure for multi-year local RA requirements be implemented effective for 2020 compliance.[12]

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[7] California open up its electric system to full retail choice in the late 1990s, but curtailed it for most customers in 2002 after the electricity crisis. *See* Assembly Bill No. 57 (2002) and the May 2018 Green Book, Appendix 1. Currently, direct access is available to non-residential customers, up to a limit established annually. California Public Utilities Code §365.1.

[8] California Fact Sheet from SEIA (Solar Energy Industries Association), available at https://www.seia.org/state-solar-policy/california-solar.

[9] Ivan Penn, "California Will Require Solar Power for New Homes," *The New York Times*, May 9, 2018, https://www.nytimes.com/2018/05/09/business/energy-environment/california-solar-power.html.

[10] May 2017 CPUC Staff White Paper, page 3.

[11] Hertzberg SB 237.

[12] CPUC, "Decision Adopting Local Capacity Obligations for 2019 and Refining the Resource Adequacy Program," R.17-09-020, Decision June 21, 2018 (hereafter referred to as "Track 1 RA Order"), pages 24-33, 52. "This decision also makes minor changes to the Resource Adequacy program, and provides policy and procedural guidance for future tracks of this proceeding…[T]he Commission believes that there is value to having a multi-year local RA requirement to ensure that resources needed for reliability are procured in an orderly fashion, and intends to implement a multi-year local RA requirement in Track 2 of this proceeding. Although it is premature to spell out the details of such a requirement at this point in the proceeding, we can lay the groundwork to support implementation of a multi-year local RA requirement for 2020. We do not intend to adopt multi-year requirements for flexible and system RA in this proceeding at this time, particularly in light of anticipated changes to the flexible RA construct, but this decision does not preclude LSEs from procuring flexible

- **Evolving resource-adequacy construct:** Increasingly, the current definition of RA and the current RA-procurement framework, which focuses based on summer peak-demand requirements and with CPUC oversight only over the IOUs' RA-procurement processes, is becoming misaligned with changing reliability needs (e.g., integrating variable energy resources) and changing load-serving responsibilities (with more loads shifting away from IOUs' provision of bundled service to its customers) in the state. One implication is growing concern about the inability of the current RA framework to produce the appropriate mix of resources (in the right places, right amounts, etc.). Also, the short-term character of most recent new RA commitments (e.g., less than one-year ahead) has caused the CAISO to implement stop-gap measures (including the RMR and CPM contracts needed for local reliability purposes). Finally, California's IOUs have different appetites with regard to continuing to play the RA-procurement role for meeting all retail customers' local RA requirements within those IOUs' service territories. The CPUC's on-going RA proceeding is examining such issues.[13]

- **Growing interactions across wholesale and retail parts of the electric system:** There are uncertain trends with regard to the interaction between growing amounts of distributed energy resources ("DERs") and the wholesale markets in California, as well as between California's system and other parts of the Western region. Areas of uncertainty include not only the implications for additions to the bulk-power transmission system (e.g., is more needed or less needed in the future?) and the role of the distribution-system operator (and/or LSEs) in coordinating the RA and operational features of DERs vis-à-vis wholesale system conditions.

- **Increasingly complex institutional and procedural landscape.** California has a multiple set of regulatory actors, service providers, processes, and programs that complicate the environment in which resource determinations are made and acted upon by actors in the private sector and in civil society. These many institutions, programs, and policies affect which resources will be maintained, retire from or enter the market, with the potential for inconsistent outcomes and tensions in California's electric system. For example:

    - The number of LSEs is growing year by year, with different aspirations for their supply mix and different capabilities to undertake long-term resource commitments.

attributes of capacity that is procured to meet the local RA requirements. In fact, when an LSE procures capacity to meet its multi-year local RA requirement and that local capacity is capable of flexibility, the LSE should procure the flexible attributes along with the local capacity." Track 1 RA Order, pages 2, 28.

[13] The Commission has just issued its order in Track 1 of the RA proceeding. (Track 1 RA Order). In the next two phases (the second of which is now underway), the Commission will consider "more complex and slightly less time-sensitive modifications and refinements to the Commission's RA program." CPUC, "Scoping Memo and Ruling of Assigned Commission and Administrative Law Judge," R.17-09-020 (hereafter referred to as the "RA Proceeding Scoping Memo"), page 7. Among other things, the Track 2 proceeding is anticipated to address implementation issues relating to Multi-Year Local RA Requirements and any related refinements to Local Area Rules, including (among other things) seasonally varying Local Capacity Requirements and increased transparency regarding which resources are essential for local and sub-area reliability (and for which there might be more targeted consideration of potential alternatives to highly polluting plants located in disadvantaged communities). RA Proceeding Scoping Memo, pages 7-8.

- The timing of RA processes and procurement cycles, aimed at assuring the availability of different types of resources in future time periods, is sometimes out of sync with the timing of decisions about the disposition of existing resources given the different end-dates of many existing long-term contracts.
- The IRP processes that influence LSEs' portfolios for providing reliable, low-carbon and least-cost supply have 2-year procedural time frames that are somewhat in tension with the fast-changing dynamics of California's electric-industry landscape. And the CPUC lacks the authority to directly control the procurement activity of non-IOU participants.[14]
- The CAISO's annual Transmission Planning Process ("TPP"), conducted in coordination with the CPUC and CEC,[15] relies on detailed analyses over a 10-year planning horizon and has implications for investment in long-lead-time elements on the high-voltage grid and for the types of resources that may be required for reliability in various parts of the system.
- Myriad regulatory policy and technological developments affect the timing, location and types of DERs entering into the distribution systems of IOUs in California.

These many trends underway – a changing generation mix and supply, growing market dis-equilibrium, increasing customer migration, an evolving resource-adequacy program, growing interactions across wholesale and retail parts of the electric system, and an increasingly complex institutional and procedural landscape – provide a strong rationale for a revised RA and electric-market structure in the future.

[14] See the CPUC's "Decision Setting Requirements for Load Serving Entities Filing Integrated Resource Plans," Order Instituting Rulemaking to Develop an Electricity Integrated Resource Planning Framework and to Coordinate and Refine Long-Term Procurement Planning Requirements, R.16-02-07, Decision February 8, 2018.

[15] CAISO describes this coordination process as: "The 2017-2018 planning assumptions and scenarios were developed through the annual agency coordination process the ISO, CEC and CPUC have in place and performed each year to be used in infrastructure planning activities in the coming year. This alignment effort continues to improve infrastructure planning coordination within the three core processes: • Long-term forecasts of energy demand produced by the CEC as part of its biennial Integrated Energy Policy Report (IEPR), • Biennial integrated resource plan proceedings (IRP) and long term procurement plan proceedings (LTPP) conducted by the CPUC, and • Annual transmission planning processes performed by the ISO." CAISO, 2017-2018 Transmission Plan, March 22, 2018, page 4.

3. ASSUMPTIONS ABOUT AND GOALS FOR CALIFORNIA'S FUTURE ELECTRIC SYSTEM

In light of the changes underway in the industry, this report's proposed Strawman approach has been informed by the author's assumptions about characteristics of the future electric system, its operations and its participants. It has also been designed with certain goals in mind (which the author views as consistent with state policy makers' aspirations for the electric system and for consumers). The assumptions about future conditions and the goals for a healthy electric system have implications for what (and why) changes are needed in the California's resource-adequacy and wholesale market structure (which are described in the next section).

Assumptions about California's future electric system:

- **The role of electricity in California's economy**: Consistent with the state's policies for decarbonizing its economy, it is likely that the role of electricity will expand in California's energy mix (including into transportation, buildings and industrial processes) and that the future electricity system will need to rely on increasing supplies of low-carbon resources. To play that role, the electric system will need to remain reliable and electricity will need to be affordable.
- **State policies affecting generation resources:** California's RPS requirements will continue to pull increasingly renewable resources into the power system, presumably through long-term contracts with LSEs. The contracts will likely be needed to finance capital-intensive projects, given the outlook for relatively low wholesale electric-energy prices (which in turn results from increasing supplies of non-dispatchable capacity with close-to-zero variable cost of operations, of low wholesale prices for natural gas, and a very-flat supply curve for substantial hours of the year). Many of the state's fossil units are likely to seek to retire, affecting the locational need for non-renewable capacity and energy with flexibility services available to the system and in some cases the need for RMR contracts to keep plants in place where needed for operational reliability. Until there is a much-higher penetration of storage technologies and controllable loads, California's gas-fired units' flexible operational capability will still be needed to maintain reliability by integrating renewables and balancing loads, but with those units producing less power (and emissions) over time.
- **Wholesale market and operations more generally**: Although security-constrained economic dispatch will likely continue, with carbon prices internalized into the cost of production, price formation in the state's electric energy market may need to be re-examined, considering the expected large volume of resources providing energy at zero (or even negative) marginal cost and the likely existence of particular non-renewable resources that have market power in certain parts of the state. Presumably, the Federal Energy Regulatory Commission ("FERC"), which has jurisdiction over price formation in the CAISO energy and ancillary services markets, will need to entertain proposals that reflect and accommodate the changing conditions in the electric industry in California.
- **Utility roles:** Distribution utilities will continue to provide monopoly distribution and regulated transmission service, and serve as the distribution system operator.

- **Continued customer migration**: Technology options and customer preferences are likely to continue the push for customers to find options besides bundled electricity service from their local electric utility.
- **Level playing field:** To avoid market distortions and negative unintended consequences for the electric industry and its customers, the state's policies will need to assure a level playing field in which retail customers and potential service providers make informed and efficient decisions about their preferred provider of commodity supply. This is consistent with California's statutory requirements about avoiding cost-shifting from one group of customers to another. In the long-term, California policy makers will likely also face decisions with regard to what entity holds the obligation to be the "provider of last resort" ("POLR") or to provide back-stop commodity service, including in situations where CCAs or other LSEs cannot or do not continue to provide energy service to their customers.

Goals for California's future electric system:

The bedrock goal for California's electric system in the future is that it must be capable of supplying and delivering reliable, affordable and low-carbon electricity to consumers, even as it enables customers to play active role in managing and providing their own supply.

From a market-design point of view, there are several principles for resource-adequacy and wholesale market design to accomplish that core goal, consistent with the conditions likely to exist in the industry in the future. The market structure should:

- ***Support public policy objectives***: The market design should incorporate elements that directly or indirectly create incentives that support state policy goals (such as reducing GHG emissions from the power sector and the broader economy, reducing inequities associated with adverse impacts of emitting generating resources on local communities, assuring reliability and resilience).
- ***Promote efficient electric-resource investment and operations***: Any market structure should create incentives for efficient operation of the grid in the short run and investment in the long run. At the same time, the structure must also support additional regulatory mandates to incorporate policy-preferred resources/infrastructure that are otherwise uneconomic. The structure must support cost recovery and should do so through market-based means to the extent possible, create incentives for efficient performance of the elements on the system, send appropriate signals to capital markets, and encourage operations that use of the lowest-cost resources first.
- ***Assign risk fairly and efficiently*:** Power markets and regulation should provide equitable treatment with respect to risk across producers and consumers, including for consumers who lack the resources and options to by-pass the grid for part or all of their service. To the extent reasonable and practicable, financial risk would be assumed by those market participants best positioned to mitigate it.
- ***Mitigate the exercise of market power***: Markets and regulation should avoid the presence of, or mitigate the exercise of market power so as not to undermine markets and render them unable to

produce competitive prices for those products in which market power exists. Where market-power cannot be eliminated, regulation must step in to avoid uncompetitive prices.

- ***Promote innovation and be robust to alternative futures***: Markets and regulation should accommodate and promote innovation. The investment climate will benefit from establishing a market structure/construct that can perform well under a diverse set of possible future electricity sector configurations (including different pace and content of future states: Deep DERs? Load growth due to new electric end-uses (e.g., electric vehicles)? Pressures for broadening the size of the regional market? Pace of improvements in cost and performance of storage? Level and character of participation of demand side resources in the market?)

4. IMPLICATIONS FOR THE DESIGN OF A NEW RESOURCE-ADEQUACY AND WHOLESALE MARKET DESIGN IN CALIFORNIA

These assumptions about California's future electric system have important implications for the need to evolve the state's resource-adequacy and wholesale power market design.

First, although the CPUC is already introducing changes into the operations of the RA program in the near term, the definition of RA will need to further evolve, to better reflect the changing character of what it means to assure the adequacy of resources at all times and in all places on the grid.

The current RA approach focuses on assuring sufficient capacity to cover peak load and reserve requirements on an annual and monthly basis (e.g., through system resources). And although the approach recognizes and solicits for certain aspects of capacity (e.g., certain geographical and operational needs of the electric system), it does not account for other attributes of resources (such as heat rate, emission rates, impacts on disadvantaged communities) that make them more or less suited to support the changing character of the electric system and the state's significant energy and economic needs and objectives.

Under the surplus system-level capacity conditions that currently exist and that are anticipated in California over the next few years,[16] and with declining amounts of existing resources under long-term contract, it is possible that solicitation of the lowest-priced resources to meet current RA capacity requirements will not result in the selection of resources that are better suited to support the system in the longer term, especially if the RA contracting continues to be largely limited to annual and monthly terms. Without certainty of contracts, some of those resources best suited to meet future needs might not be able to continue in operations, and instead resources with lower current operating costs may be retained even though they are not effective at meeting future needs. Because California has a priority objective to reduce carbon emissions, it must ensure that a long-term plan exists to support and retain the flexible and location-specific power plants that most cost-effectively ensure reliable grid operations as more carbon-free resources are developed.

Going forward, a future RA approach must retain some aspects of the current approach while also incorporating new elements. Like today, tomorrow's RA construct/structure will need to continue to take into account elements that reflect the near-term operational needs of the system: the attributes of the resources including their physical location and their performance characteristics (e.g., flexibility; dispatchability) and the portion of the grid (e.g., load pockets; distribution versus transmission) to which resources are connected.

But that future RA structure should also take into account additional characteristics of (or services provided by) resources that will be needed to support the system for some number of years into the future. The evolving RA structure needs to support retirement of some carbon-emitting resources in the near term while retaining those resources with operating and/or locational attributes that are needed to support reliable, clean and affordable electricity for California's future. And the RA

[16] *See*: February 2018 Staff Draft RA Proposal, pages 29-41; North American Electric Reliability Corporation, "2017 Long-Term Reliability Assessment," page 73.

structure needs to consider the need to retain some gas-fired capacity on the system in the future, to serve as an insurance policy: establishing a mechanism to compensate an owner to keep the capacity available, without expecting it to operate very often, if at all, outside of certain emergency conditions or extenuating circumstances.

Further, a new RA/market structure needs to balance the important role that California policy makers play in shaping resource preferences for RA while also ensuring that some entity (e.g., a new state power authority, a distribution utility, a designated load-serving entity ("LSE"), the CAISO, or some other player) has responsibility for meeting reliability obligations that are not conducive for allocation to all LSEs as part of California's RA program.

For example, if an existing quick-start fossil peaking unit or package of demand-response ("DR") services were needed to support local-area reliability, it might be highly impractical or inefficient to expect each and every LSE to procure its load-weighted share of the peaker's capacity. Instead, some designated entity would likely be better situated to procure the peaker or DR resource to ensure its locational availability and allocate the net cost of operations fairly to all benefiting customers through a regulatory mechanism.

As the CPUC recently noted on page 32 of its Track 1 RA Order, "we believe that a central buyer system – for at least some portion of local RA – is the solution most likely to provide cost efficiency, market certainty, reliability, administrative efficiency, and customer protection."

For resources subject to new policy mandates (e.g., storage RA; a fossil peaker maintained for capacity and with operations constrained to emergency conditions), the central-buyer approach might also be attractive as a way to efficiently procure and fairly pay for the mandated assets and RA capabilities. Such a central-buyer approach could also make it easier (than a decentralized procurement process for local RA resources) to consider wires versus non-wires solutions to resolve local reliability needs.

A central buyer might also be considered a back-stop procurement agent for other types of reliability needs (e.g., flexible RA) that cannot be readily allocated to all LSEs.

Also, to the extent that LSEs, for example, were to lack either the means (e.g., credit-worthiness) or appetite for entering into long-term contracts tied to certain local RA needs and requirements, then the central buyer could carry out such procurement and contracting functions with respect to needed RA and the benefits and costs of the procured resources allocated on a load-weighted share basis to all customers. Such an approach might help to evolve the state's RA regime to align it with the changing character of the system and its evolving set of LSEs.

If the definition of RA in California's electric industry were to continue to evolve away from its historical focus on ensuring coverage of annual and monthly peak demand and reserve requirements and toward a construct that more explicitly ensures the adequacy of different types of resources (e.g., flexible, local, low-carbon) to meet system requirements around the clock, then the CPUC might also be able to evolve its influence over all LSEs' support for long-term resource commitments in different places and time frames.

In moving in this direction, it would be necessary, of course, to address concerns of the CPUC and other state policy makers with regard to the CPUC's ability to execute on this agenda. The CPUC has limited (and still being defined) regulatory oversight on the procurement activities of ESPs and CCAs that service CPUC-jurisdictional load, but the CPUC can influence such procurement through its RA program requirements. The CPUC does not have oversight over the RA responsibilities of publicly owned utilities in California.[17]

In this overall context, CAISO could continue to play an important role in analyzing the system's suite of RA resources relative to the needs identified by the CPUC, and to calculate the amounts that all LSEs together (and importantly, each LSE individually) must provide to satisfy those various requirements, and if necessary, what is required to back-stop short-term resource procurements across the state. CAISO might need to evolve its TPP process to encompass local RA planning. And if the CPUC were not authorized to expand its role over all LSEs (including publicly owned utilities), then the CAISO might end up needing to play a larger role to assure resource adequacy in the state.

Finally, the changes described here would need to be crafted a way that can gain approval by the FERC for those aspects of the approach that would fall under its jurisdiction under the Federal Power Act.

The Strawman proposal has been developed with these various implications and issues in mind. It is intended to be one approach to addressing the challenges of meeting California's multiple requirements for reliable, affordable and clean energy. There may be (and likely are) other reasonable approaches, including implementation of a centralized capacity market.[18]

[17] This situation may create incentives for some LSEs (such as CCAs) that are under the jurisdiction of the CPUC to explore non-jurisdictional status through municipalization of the distribution system.

[18] Various groups, scholars and analysts have begun to characterize appropriate designs for electricity markets with high penetration of high-capital-cost, low-variable-cost and low carbon emission resources. Notable examples include recent papers from experts at the National Renewable Energy Laboratory ("NREL"), scholars at Resources for the Future ("RFF"), analysts (Brendan Pierpont and David Nelson) at the Climate Policy Initiative ("CPI"), from an industry expert (Steve Corneli), and a fellow (Eric Gimon) at Energy Innovation LLC. Additionally, the staff of the CPUC has recently issued a white paper that describes a multi-year local RA framework for the state. *See:* Bielen et al., "The Future of Power Markets in a Low Marginal Cost World," Resources for the Future, RFF WF 17-26, December 2017; Corneli, "Efficient Markets for High Levels of Variable Renewable Energy," *Forum*, The Oxford Institute for Energy Studies, June 2018; February 2018 Staff Draft RA Proposal; Ela et al., "Evolution of Wholesale Electricity Market Design with Increasing Levels of Renewable Generation," NREL/TP-5D00-61765, September 2014; Gimon, "On Market Designs for a Future with a High Penetration of Variable Renewable Generation," September 8, 2017; and Pierpont and Nelson, "Markets for low carbon, low cost electricity systems," Climate Policy Initiative, September 2017.

These papers start with common premises about the changes underway in various wholesale (and retail) electric systems, and land on different ways to satisfy the goal of providing reliable, efficient, and low-carbon electricity supply. Notably, the Pierpont/Nelson and Corneli approaches have both identified a two-part market structure: Pierpont/Nelson's concept relies on a long-term energy market and a short-term delivery market; Corneli's approach would include a regional or interregional "configuration market" and a short-run energy market.

5. STRAWMAN PROPOSAL FOR A FUTURE RESOURCE-ADEQUACY CONSTRUCT AND ENERGY-PRODUCTION APPROACH FOR CALIFORNIA

Overview

The Strawman proposal includes two elements, or constructs, that together would ensure adequate resources are available to provide each type of electricity service or attribute (e.g., coverage of peak loads and installed reserves; flexibility and other capabilities needed for operational security; local capacity in constrained areas; declining emissions profile of the resource portfolio over time) the electric system is expected to need in an upcoming period.

For simplicity, these two elements are referred to here as the "Resource-Adequacy Construct" (or "RA Construct") and the "Energy-Production Construct" (or "EP Construct"). They refer to the two parts of a bifurcated RA and wholesale power production design: assurance of the availability of appropriate and valuable resources installed on the electric system, on the one hand, and provision of operational electricity service at all times, on the other.

This Strawman also relies upon a centralized entity (a "Central Buyer") as a mechanism to procure local and other resources that are needed by electricity consumers for reliable electricity supply. This Central Buyer entity (e.g., a new state power authority; a willing distribution utility or LSE; CAISO) in any transmission access charge ("TAC") zone would rely on targeted solicitations to determine the portfolio of local resources needed to assure reliable as well as clean supply to all customers in each zone. For other required RA products, RA obligations would fall to each LSE.

These resource-adequacy products (and the activities of LSEs and the Central Buyer with respect to resource adequacy) would be regulated by the CPUC. The CAISO would operate the bulk-power system, with its security-constrained dispatch and wholesale rates for the provision of energy and ancillary services regulated by the FERC.

Resource Adequacy Construct

1. **RA definition:** The CPUC would eventually adopt a new definition of RA, as well as a revised framework for determining RA obligations and compliance.[19] Presumably this could occur by an order of the CPUC or through a change in its regulations relating to RA (or through legislation as needed to assure that all LSEs in California carry common obligations with regard to RA). Whereas today's RA program was initially designed to ensure that CPUC-jurisdictional LSEs have sufficient capacity to meet their peak load plus a 15-percent reserve margin and to demonstrate annually and monthly their ability to meet their RA obligations in the subsequent period, the revised RA program would focus on ensuring that California's LSEs collectively and each LSE individually also have sufficient capacity to satisfy other criteria in addition to meeting these load and reserve requirements. The additional RA criteria established each year by the CPUC for a multi-year period into the future would include locational and operational services or

[19] http://www.cpuc.ca.gov/RA/. Notably, as discussed previously in this White Paper, the CPUC is in the process of refining certain aspects of its current RA program in its R.17-09-020 docket.

attributes of resources (e.g., local capacity; flexible capacity; "insurance" resources, such as gas-fired generating units, that are to be retained on the system but with the expectation of minimal generation output except during emergencies or other conditions).

Informed by the IRP process (which focuses on clean-energy and climate needs and on LSEs' plans to achieve them in a least-cost way), the CPUC would identify what types of RA resources are needed and the loading order (or preference order) of different types of resources. The CAISO would identify in a transparent process the amounts of resources needed for each type of RA product in each year of the upcoming multi-year (e.g., 3-year, or 5-year) period. (A longer period has the advantage of helping to facilitate the orderly configuration of a portfolio of facilities, the efficient financing of assets on the system, and consideration of both demand-side, supply-side, and transmission options.)

The CPUC would identify certain types of resources whose capacity would need to be maximized (e.g., zero-carbon assets) or minimized (e.g., carbon-emitting generation) in the RA process administered by CAISO and the LSEs (described *below).* This overall resource-determination process for RA purposes could be accomplished through the CAISO's TPP, revised as necessary to enable it to support this more-frequent schedule for analyses about changes in the system and its resource needs.

Additionally, the CPUC would determine the types of RA products that cannot be practically or efficiently procured through a decentralized approach and/or fairly allocated to all benefitting customers and which would need to be satisfied through a centralized procurement process. (As explained further below, those RA products could be collectively referred to as "Centrally Procured RA Products," and would include local RA as well as any other RA products, such as mandated resources (e.g., storage) that the CPUC identifies as needed by the system and that every LSE should support, and that would be most efficiently procured through a central procurement process.)

The RA products that are determined to be amenable to decentralized procurement, as determined by the CPUC, would be assigned to LSEs and would be called "LSE RA Products."

2. **LSE RA obligations and demonstrations:** Consistent with the prior discussion of redefined RA products and processes, all LSEs would have the same obligation to financially hold and support a portfolio of resources that satisfies the LSE RA Product requirements for their retail customers, as defined in the CPUC's RA program. This obligation would be directly satisfied by the LSE for these RA products.

   At pre-determined intervals, each LSE would provide the CPUC and the CAISO with a demonstration that the LSE has commitments sufficient to cover its allocated portion of the system's overall LSE RA Product requirements in each time period for which the CPUC has assigned RA requirements (e.g., 3 or 5 years). The LSEs' periodic demonstration submissions would be required to show increasing percentages (the closer the time frame to the operating year) of future customer loads covered by resources that provide the LSE RA Products. For example, for a 5-year forward commitment obligation period, each LSE would demonstrate that it held:

- 100 percent demonstration of each LSE RA Product for the upcoming year/months within forward year 1;
- 90 percent of LSE RA Products for forward year 2;
- 75 percent of LSE RA Products for forward year 3;
- 65 percent of LSE RA Products for forward year 4; and
- 50 percent of LSE RA Products for forward year 5.

The declining commitments for the later forward years would accommodate uncertainty with regard to future customer loads served by an LSE. And the annual demonstration would be to reconcile changes in loads or resources that would have occurred from one year to the next.

The CAISO would assess each LSE's demonstration against its specific LSE RA Product obligations, and determine any remaining collective or individual LSE obligation that would need to be covered through a back-stop centralized forward procurement by the Central Buyer. The CAISO would then calculate the aggregate system-wide amounts of procurements needed for each type of LSE RA Product (e.g., generic system capacity; flexible capacity) in each relevant forward time period and each relevant location (see below). For example, for forward year 3, CAISO would evaluate each LSEs' demonstration relative to the 75-percent target; to the extent that any LSE falls short of 75 percent of its LSE RA Product requirements, then CAISO would identify the gap that needs to be filled to bring the LSE up to 75 percent. Looking across the set of all LSEs that came out short on their resources relative to their compliance levels, CAISO would determine the total amount of forward procurement that would need to be filled for that forward year by the Central Buyer. This could be referred to as the Back-Stop RA Procurement (described further below).

3. **Central Buyer responsibility and demonstration:** The Central Buyer for each TAC would have defined procurement responsibilities for different purposes, as determined by the CPUC. The activities and rates charged by the Central Buyer would be regulated by the CPUC.

   There could be different entities performing the Central Buyer function in different TAC zones. For example, if California were to establish a statewide centralized procurement entity as the Central Buyer, it could procure for all TAC zones or for only those zones where no willing utility seeks to take on the centralized procurement function within that TAC zone.

   Specifically, the Central Buyer would be obligated to conduct procurement processes to solicit and contract with resources for two types of RA needs:

   - A "front stop" procurement responsibility: to solicit on behalf of all LSEs in the TAC zone for all Centrally Procured RA Products.
   - A "back stop" procurement responsibility: to solicit on behalf of those LSEs with a gap in their LSE RA Product resources, as the procurer of Back-Stop RA Products (thus procuring the aggregate backstop LSE RA Products for a forward year as identified through the CAISO's RA demonstration process).

Cost allocations for the different procurements would vary according to the beneficiaries of each type of RA procurement, as described below.

4. **Central Buyer RA procurement process:** Annually, the Central Buyer for any TAC zone would conduct a solicitation for resource commitments to provide RA products (by attribute, location) in a particular forward year (e.g., for delivery 5 years into the future), under the direction and regulatory oversight of the CPUC. The Central Buyer would structure the procurement process to enable competitive offers from all types of resources eligible to supply a particular RA product. Suppliers of existing and new resources (including IOUs and other LSEs that are long on RA resources for any future year covered by the solicitation) would be eligible to offer resources into the solicitation.

   Bidders would propose an offer tied to recovery of their resources' levelized fixed costs, and compete for the opportunity to become part of the winning RA portfolio and enter into a long-term contract for delivery of that capacity (with relevant locational and performance attributes and requirements) in that year.

   Selection of the portfolio of winning bids would be based not just on minimizing costs in a single year, but rather optimizing a portfolio taking into account the multiple attributes being procured over a designated planning window. Those resources selected for contracts would have individually tailored terms (e.g., with respect to length, performance requirements) that could vary by location and type (e.g., emitting versus non-emitting resource) of RA resource being procured. (This would therefore not be a centralized capacity auction with a clearing price.)

   The solicitations would be designed to procure high percentages of Centrally Procured RA Products across the full forward RA commitment period. Assuming a 5-year forward RA commitment period consistent with the LSE RA Product requirements discussion above, the Central Buyer would procure 100 percent of all Centrally Procured RA Products needed for the first three forward years, 95 percent in the fourth year, and 90 percent in the fifth year. For any Back-Stop RA Products procured for an LSE by the Central Buyer, those LSEs' annual and monthly RA compliance requirements for such LSE RA Products would be reduced by that amount for each relevant forward year.

   Some individual resources may qualify for more than one type of RA product. Any resource procured by the Central Buyer as a Centrally Procured RA Product and which is capable of providing other collateral RA products (e.g., flex, system, "insurance" resources) would be required to sell those other RA products to the Central Buyer as well. The net costs of such resources would be charged to LSEs' retail customers in conjunction with the collective reduction of all LSEs' annual and monthly RA requirements that result from that year's Centrally Procured RA Products.

   The Central Buyer's annual resource solicitation would also procure any incremental Centrally Procured RA Products and Back-Stop RA Products for each of the nearer-term forward years, reflecting updated information from results of prior years' RA procurements and from the Central Buyer's and LSEs' demonstrations for the relevant year. Existing resources that are not

successful in the central RA procurement process can decide whether to retire or remain in operation, with or without long-term supply agreements with LSEs.

The CAISO would periodically evaluate and identify any existing resources that have market power with respect to one or another attribute (e.g., location; flexibility; operating period) and that are needed for system operations in a particular location or time. Such resources would be required to offer into the Central Buyer's solicitation, and would enter into a cost-of-service contract with the Central Buyer.[20] The amount of capacity (of a particular type and at a location) associated with that resource would reduce the amount of other RA resources that are otherwise to be assigned to and procured by the LSE or the Central Buyer (depending upon the particular RA products provided by this resource with market power).

The Central Buyer's procurement solicitation could also include emerging technologies and other policy-driven resources that the CPUC would want to demonstrate.

5. **Cost recovery of RA products procured by the Central Buyer:** The costs and quantities of RA resources that succeed in the solicitation would be assigned in a variety of ways, depending on the classes for which they were procured:

   - For Centrally Procured RA Products, the capacity and net costs (i.e., total resource costs less market revenues) would be assigned to all customers in the relevant TAC area, and collected through a CPUC-regulated, non-bypassable charge on retail customers' bills.
   - For Back-Stop RA Products procured by the Central Buyer, the net costs would be assigned to the customers of the LSEs whose commitment gaps led to the procurement of these products in any forward year. The capacity and net costs would be assigned in a way that is proportional to the set of LSEs causing the need for the backstop procurement.

6. **Qualifying capacity:** For each type of RA attribute (operational, emissions profile) and technology/resource type and for each forward long-term RA period, CAISO would periodically calculate each resource's maximum capacity eligible to be counted towards meeting the CPUC's RA requirement for that attribute and time period. Such calculations would apply to each type of resource (e.g., renewable and non-renewable central-station units; DERs, including utility-scale solar and rooftop solar; firm demand response) that seeks to qualify to supply RA to an LSE. (It may be difficult to standardize such calculations in a prospective way for local RA resources, whose interactions on the local grid may affect the amount of capacity that can qualify.)

7. **RA resource obligations with respect to energy production:** To the extent that an LSE seeks to rely upon a specific resource for RA obligations, that resource in turn would take on obligations

[20] This aspect of the proposed Strawman assumes that changes would need to occur both in the federally regulated CAISO tariff, as well as in many aspects of state statutes and regulation. Were this Strawman (or any version of changes in the wholesale market along these lines) to be supported, relevant stakeholders in California would need to adopt the transitional steps to accomplish this type of restructured market design, and to make proposals as needed before the FERC in order to harmonize the state-jurisdictional and federal-jurisdictional elements of it. *See* further discussion in the description of the EP-Construct, below.

in the short-term energy-production system consistent with the CAISO's current must-offer process for RA resources. In this manner, such a resource (e.g., a generating unit; a DR resource) would need to make its output available to CAISO's system for supplying energy and ancillary services. A DER providing RA products would need to firmly commit, as appropriate, to either reducing load or injecting supply into the system as dispatched by CAISO.

Energy-Production Construct

This element of the bifurcated market design would be centrally administered by the CAISO, using security-constrained economic dispatch under the terms of a tariff approved by FERC. Some resources would participate in this economic dispatch on a must-offer basis: these would include any resources selected as Centrally Procured RA Products, as well as any storage, generation, net DERs, and other flexible loads that are part of LSEs' portfolios of LSE RA Products. Other available resources (e.g., imports, injections from DERs, other dispatchable and non-dispatched resources that are not counted as RA resources) would participate in the California energy production system on a voluntary basis.

The energy and ancillary services markets would no longer be a clearing-price market as they are today, in large part due to the expectation that many, if not most (and eventually all) of the generators with significant variable costs (such as gas-fired generators with fuel, variable operations and maintenance, emission-allowance costs) would have market power.[21]

The security-constrained economic dispatch could be based on production costs for resources supplying RA Products to the Central Buyer and to the LSEs, and on as-bid offer prices from other non-RA resources. Prices paid to resources in this EP Market would reflect their costs; prices paid by loads would vary by location (e.g., TAC zone). Presuming that resources with long-term contracts with the Central Buyer operate under agreements that cover the fixed costs of those resources, then those resources would cover their variable costs through retain revenues obtained from dispatch in the CAISO market.[22]

Further details of this EP Market would depend, at a minimum, upon the form of RA program adopted by California, anticipated changes in California's resource fleet, any evolution in California's emissions-reduction programs, and the ability to gain federal regulatory support for this approach.

[21] Presumably, resources with market power would not be allowed to sell their output at market-based rates.

[22] Another way to structure these contracts might be as contracts-for-differences, with price terms that incorporate fixed and variable cost estimates, trued up by market revenues resulting from actual energy production. Any such approach would need to pass muster with Federal Power Act requirements relating to FERC's role in approving prices in interstate commerce.

6. ASSESSMENT OF THE STRAWMAN PROPOSAL AGAINST VARIOUS POLICY AND OPERATIONAL OBJECTIVES FOR CALIFORNIA'S POWER SYSTEM

This section seeks to examine whether the proposed Strawman would support appropriate goals[23] for market design and the reliable, efficient, and clean provision of electricity while also taking into account trends in and assumptions about the future of California's electric system[24]?

- ***Support state public policy objectives***? Yes, the proposal explicitly attempts to incorporate provisions that allow California policy makers (e.g., the CPUC) to exercise their preferences with regard to various features of the electric system (e.g., reducing GHG emissions from the power sector, increasing reliance on renewable energy supplies, loading-order of preferred resources, minimizing GHG emissions, equity considerations such as reducing adverse impacts of emitting generating resources on disadvantaged communities). This would be accomplished through the process in which the CPUC would identify the required characteristics of RA resources.

- ***Promote efficient electric resource investment and operations?*** Yes, the proposal has taken into account the need to incorporate efficient incentives for cost-effective operation of the grid in the short run and for investment in the long run, while also recognizing the need for supporting fixed cost recovery. The Strawman assumes there may need to be scale economies associated with RA procurement in the future where there is a large number of LSEs and the distribution utilities serving fewer bundled-service customers, and this approach allows the Central Buyer to provide that function. It relies on competitive solicitations for offers from prospective suppliers of Centrally Procured RA Products. It also attempts to address the need for other decision criteria (besides lowest offer price) in the selection of least-cost, reliable RA resource portfolios.

- ***Assign risk fairly and efficiently*****?** The proposal has attempted to balance the assignment of risks to consumers and producers in a system where there are significant, continuing but yet uncertain dynamic market-driven changes in the near term, but where the system will also need to facilitate the efficient financing and entry of low-carbon electric assets with large up-front capital costs. The proposal – through, for example, a centralized procurement of local RA resources – attempts to socialize support for RA resources across broader customer bases so as to assure that the system includes the variety of such diverse resources needed for system reliability and security at all times.

- ***Mitigate the exercise of market power?*** Yes, the proposal explicitly assumes that at least for some period of time, market power concerns will accompany the expectation that certain carbon-emitting RA resources will need to be supported on the system so that they can be available for system security and balancing when needed. In light of California's carbon-reduction policy, those plants are likely to be decreasing in number and operating only when needed, with the implication that these plants would have market power if their offer prices were not based on

[23] See Section 3 (goals), above.

[24] See Section 2 and the "assumptions" portion of Section 3, above.

cost. The proposal has attempted to limit the amount of and time period of the capacity that is supported by the system, with costs of such spread across a broader customer base on a cost of service basis in order to mitigate that market power.

- ***Promote innovation and be robust to alternative futures?*** Although the proposal is grounded in the assumption that there will be a fundamental shift toward low-carbon/low-marginal-cost resources, it does not presume the pace or pattern of technology adoption, either on the supply or demand side. The RA Construct is designed to adjust the specifications of needed and procured RA resources over time as technologies and services evolve and as the system changes over time.
- ***Assume customer migration?*** Yes; the proposal explicitly seeks to create an equitable playing field for RA and energy supply for all LSEs relative to each other, regardless of customer migration among LSEs. The proposal's provision for a Central Buyer with responsibility to procure local RA and to assign its costs to all consumers on a non-discriminatory basis is one element intended to address the likelihood of customer migration and the need to charge all customers in a fair way.
- ***Incorporate regulatory oversight over resource adequacy?*** Yes; the proposal explicitly attempts to build off of the CPUC's existing statutory jurisdiction (but with changes in policy and perhaps from new legislation) and the essential character of its relationship to the CAISO on RA issues. The Strawman proposal assumes implicitly that changes in CAISO tariffs would be adopted by stakeholders, the CAISO and the FERC for approval, but the report does not discuss how that process would occur.
- ***Modify the resource-adequacy construct?*** Yes, the proposal explicitly addresses the changing RA/reliability needs (e.g., integrating variable energy resources) and changing LSE responsibilities (with more loads shifting away from distribution utilities' provision of bundled energy-procurement service to its customers).
- ***Provide roles for different entities in assuring back-stop resource adequacy?*** Yes, the proposal explicitly addresses the need for procurement of near-term and longer-term resources that fit California's changing reliability requirements and changing arrangements for the provision of unbundled commodity service to retail electricity consumers. The proposal could be effectuated either by establishing a new California entity (such as a state power authority along the lines of the Illinois Power Authority or the New York Power Authority), a willing distribution utility, a willing LSE, or the CAISO to serve as the Central Buyer.
- ***Accommodate and support the changing generating mix and supply?*** Yes, the proposal explicitly addresses and attempts to solve for the expectation that current market designs will not provide sufficient signals for the right kinds of resources to be developed or retained in the right places, in the changing electric-system landscape.
- ***Address the growing dis-equilibrium in electricity-market fundamentals?*** Yes, the proposal explicitly reflects the expectation that current RA structures and wholesale market rules will lead to a decoupling of short-run marginal cost from long-run marginal cost, with an expectation that

conditions in the future will not resemble a 'market' for many attributes of wholesale electric supply and that such parts of the system will require more cost-based regulation.

- ***Reflect interactions of the wholesale market/system with other systems?*** Possibly. The proposal assumes that the CAISO TPP process would be modified to enable it to serve to inform the analysis of how much of each type of RA resource is needed. Such changes would be needed to assure a nimble process as well as to provide for the ability to incorporate sophisticated and transparent modeling of resource needs and available resources (on the customer-side of the meter, on the distribution system, on California's bulk-power system, and on the regional grid), with implications for in-state resource-adequacy needs and potential investments in transmission.
- ***Take into account different institutional roles and responsibilities?*** Yes, the proposal has explicitly attempted to address the timing and other issues associated with IRPs, RA requirements, and TPP processes – although the proposal does not describe transitions or hand-offs from one process to another.
- ***Reflect core roles for the distribution utility?*** Yes, the proposal explicitly assumes that distribution utilities will continue to provide monopoly distribution and regulated transmission service. It also assumes that distribution utilities will serve as the distribution system operator.
- ***Provide a level playing field?*** Yes, the proposal relies on the bedrock assumption that there needs to be a level playing field for providers of power supply to retail consumers.
- ***Reflect evolving definitions of resource adequacy?*** Yes, the proposal explicitly incorporates a redesign of the RA concept.
- ***Address CAISO wholesale market and operations more generally (beyond RA issues)?*** Yes, the proposal attempts to address the implications of a new RA construct for system operations and the provision of wholesale generation service.

7. ISSUES NOT ADDRESSED IN THIS REPORT

The Strawman does not explicitly deal with certain open questions in the long-term structure of California's electric system. For example, this report is silent on the following questions:

- How would California transition from today's RA and wholesale market construct into the framework envisioned in the Strawman proposal?
- How would California statutes need to change in order to provide a level playing field with regard to RA issues across LSEs (including IOUs, direct-access service providers, CCAs, and publicly owned utilities)?
- How would this program, which is based on a strong role of the CPUC (and other state policy directives) in shaping the portfolio of resources on the system, on the one hand, and a strong role for the FERC-regulated CAISO in determining the rates paid in organized wholesale markets, ensure that the framework satisfies the requirements of the Federal Power Act?
- What process would be used to introduce necessary changes in CAISO tariffs that would be discussed by stakeholders and the Board, and eventually approved by the FERC?
- How would retail rates need to evolve to align with the RA and wholesale market design?
- What entity is responsible for POLR service?
- What are the roles of the distribution system operator, including with respect to coordinating resources on the distribution system and wholesale markets?
- How would DER offers to provide RA resources into the wholesale market take into account any reliability requirements of distribution-system operations (such as in situations where the DSO needs the DER to operate in a way different that its assumed performance in the RA Construct and EP Construct)?

Further, the report does not address the wider range of policy and operational issues associated with such things as customer choice, the role of the distribution utility in planning, operations or markets, transmission planning considerations, and the Western power market.

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