Balancing Economic and Environmental Goals in Distributed Generation Procurement: A Critical Analysis of California's Renewable Auction Mechanism (RAM)

by Jessica Wentz*

In 2010, Governor Jerry Brown proposed an ambitious plan to promote renewable energy development in California. A key objective in Governor Brown's "Clean Energy Jobs Plan" is the construction of 12,000 MW of distributed renewable energy generation by 2020.[1] Distributed generation ("DG") is the generation of electricity from installations that are located at or in close proximity to the point of consumption. Governor Brown's objective complements California's other energy-related goals, including the state's greenhouse gas ("GHG") reduction targets[2] and its Renewable Portfolio Standard ("RPS").[3]

In order to expedite the deployment of DG resources, the California Public Utilities Commission ("CPUC") recently introduced an innovative, market-based approach to wholesale DG procurement.[4] The Renewable Auction Mechanism ("RAM") is a reverse auction in which developers can submit bids for proposed DG projects from 3–20 MW in capacity.[5] California's three large investor-owned utilities ("IOU") are then required to procure a specified capacity of renewable DG in each auction by selecting the lowest-cost bids until they have reached their capacity targets.[6] Thus far, the IOUs have procured approximately 730 MW of renewable DG over the course of three auctions.[7] A fifth auction has been scheduled for June 2014.[8]

Results from the first four auctions suggest that the RAM is an economically efficient mechanism for wholesale DG procurement. The IOUs have managed to purchase renewable DG at relatively low cost, thus alleviating concerns about cost-competitiveness and impacts to ratepayers.[9] However, the RAM has been less effective at achieving certain environmental goals. Specifically there are three core concerns about the RAM: (1) in each auction, the IOUs have failed to meet their procurement targets;[10] (2) the winning projects do not represent a diverse array of renewable energy resources;[11] and (3) most of the winning projects are not situated close to load centers.[12] These concerns raise questions about whether the RAM rules favor cost-competitiveness at the expense of other program goals and whether the rules should be revised to achieve a better balance between economic and environmental objectives.

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1. Governor Jerry Brown, *Clean Energy Jobs Plan,* Ca.gov (2010), *available at* http://gov.ca.gov/docs/Clean_Energy_Plan.pdf; *see also*, Jeremy Carl et al., *Renewable and Distributed Power in California, Simplifying the Regulatory Maze—Making a Path for the Future*, Shultz-Stephenson Task Force on Energy Policy, Hoover Inst., Stan. U. 26 (2012) ("this is the most ambitious target for local distributed generation anywhere").
2. Assemb. Bill 32, 2005–2006 Gen. Assemb., Reg. Sess. (Cal. 2006) (articulated a goal to reduce GHG emissions to 1990 levels by 2020).
3. California's RPS is one of the most ambitious programs in the country. It requires investor-owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable resources to 33% of total procurement by 2020. S. Bill X1-2, 2011–2012 Senate, Reg. Sess. (2011).
4. Cal. Pub. Utils. Comm'n, Decision Adopting the Renewable Auction Mechanism (2010), *available* at http://docs.cpuc.ca.gov/word_pdf/FINAL_DECISION/128432.pdf.
5. *Id.*
6. *Id.*
7. *See infra* Fig. 1.
8. Cal. Pub. Utils. Comm'n, Res. E-4582 (May 9, 2013), *available at* http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M065/K182/65182791.pdf.
9. Cal. Pub. Utils. Comm'n, Res. E-4489 (Apr. 19, 2012), *available at* http://docs.cpuc.ca.gov/word_pdf/FINAL_RESOLUTION/164684.pdf.
10. *Id.*
11. S. Cal. Edison, Advice Letter 2712-E, at 5 (May 2, 2012).
12. Advice Letter 2785-E/E-A, at Appendix D (Nov. 14, 2012).

The purpose of this Article is to highlight the strengths and weaknesses of the RAM program and to recommend reforms that advance environmental objectives without compromising cost-competitiveness. Section I provides background information on the benefits of DG generation and the rationale for introducing a wholesale DG procurement program in California. Section II describes the objectives and program mechanics of the RAM. Section III evaluates the effectiveness of the RAM based on the first three auctions and identifies ways in which the RAM could be modified to achieve program objectives relating to procurement targets, project diversity, and project location. The Article concludes by highlighting some of the most important recommendations from Section III.

I. Background on Distributed Generation in California

CPUC has defined DG as "small scale electric generating technologies installed at, or in close proximity to, the end-user's location."[13] DG facilities are typically connected to the distribution network[14] and may be "installed on the end-user side of the meter, or on the grid side."[15] Although the California Public Utilities Code previously defined distributed energy resources as electric generation technology that is "five megawatts or smaller in aggregate capacity,"[16] the state has recently expanded its definition of DG resources. The California Energy Commission ("CEC") now defines DG as projects that are less than 20 MW.[17] The RAM applies to projects that range from 3–20 MW.[18]

There are two different types of DG installations: "wholesale" or "supply-side" installations, which are primarily intended to produce electricity for export and sale in the wholesale market,[19] and "retail" or "customer-side" DG installations, which are primarily intended to generate electricity for on-site use, thus offsetting the customer's demand for electricity provided by a utility.[20] As discussed below, the RAM is California's primary procurement tool for wholesale DG projects and it complements other state policies which provide procurement opportunities for smaller retail DG projects.[21]

This section will review the benefits of DG resources, including the specific benefits associated with wholesale DG projects, in order to explain why California decided to introduce the RAM as a procurement mechanism for wholesale DG. This section will also explain how the RAM fits in with California's other public programs to promote the deployment of renewable DG resources, highlighting the unique niche that the RAM fills in the state's portfolio of energy policies.

A. Benefits of Distributed Generation

There are a number of benefits associated with incorporating DG resources into the electric system.[22] These include:

1. ***Enhanced System Reliability*** — DG resources can enhance system reliability by providing ancillary services, alleviating system congestion, and contributing to a diversified energy supply.[23] In addition, DG systems can be used to provide emergency power during a system interruption to facilities, such as hospitals.[24]
2. ***Reduction or Deferral of Infrastructure Investments*** — DG systems can be "strategically deployed throughout the distribution system, pinpointing congested, high-cost areas," thus reducing or delaying the need for distribution and transmission investments.[25]
3. ***Load Management and Peak Shaving*** — The additional energy generated by DG resources, particularly

13. Cal. Pub. Utils. Comm'n, Order Instituting Rulemaking into Distributed Generation, OIR 99-10-025 (Oct. 21, 1999). CPUC slightly modified this definition in a 2006 rulemaking: "Distributed Generation (DG) is a parallel or stand-alone electric generation unit generally located within the electric distribution system at or near the point of consumption." Cal. Pub. Utils. Comm'n, OIR.04-03-017 (Mar. 17, 2004). The California Energy Commission ("CEC") adopted a similar definition of DG in its 2002 strategic plan for DG resources: "DG is electric generation connected to the distribution level of the transmission and distribution grid usually located at or near the intended place of use." Cal. Energy Comm'n, Distributed Generation Strategic Plan, P700-02-002, at 2 (June 2002).
14. Itron, inc., Impacts of Distributed Generation 3–2 (Jan. 2010) (report prepared for the California Public Utilities Commission Energy Division Staff).
15. Cal. Pub. Utils. Comm'n, OIR.99-10-025, at Section III-C (Oct. 21, 1999).
16. Cal. Pub. Util. Code § 353.1(c).
17. Cal. Energy Comm'n, Distributed Generation and Cogeneration Policy Roadmap for California, CEC-500-2007-021, at 1 (Mar. 2007).
18. *See* Cal. Pub. Utils. Comm'n, D.12-05-035 (May 31, 2012) (revising section 399.20 Feed-in-Tariff and changing the minimum project size for RAM to projects greater than 3 MW).
19. Jeffrey Russell & Steven Weissman, California's Transition to Local Renewable Energy: 12,000 Megawatts by 2020, A Report on the Governor's Conference on Local Renewable Energy 35 (U.C. Berkeley Ctr. for Law, Energy & the Env't 2012).
20. Although customer-side DG is typically generated and consumed on-site, excess electricity from these installations may be resold to the utilities under California's net metering laws. Russell & Weissman, *supra* note 19, at 37.
21. *See* Cal. Pub. Utils. Comm'n, D.12-05-035 (May 31, 2012) (revising section 399.20 Feed-in-Tariff and changing the minimum project size for RAM to projects greater than 3 MW).
22. For additional information on the benefits associated with DG, *see* Mark Rawson, Pub. Interest Energy Research, Cal. Energy Comm'n, Distributed Generation Costs and Benefits Issue Paper (Jul. 2004).
23. N.Y. State Energy Res. and Dev. Auth., Deployment of Distributed Generation for Grid Support and Distribution System Infrastructure: A Summary Analysis of DG Benefits and Case Studies, (NYSERDA Report 11-23), Final Report Summary Task #6 2, 5 (Feb. 2011) [hereinafter NYSERDA].
24. *See id.* at Conceptual Benefits to Deployment of DG for Grid Support Task #1 18.
25. Amory Lovins, Rocky Mountain Inst., Reinventing Fire: Bold Business Solutions for the New Energy Era 207 (2011); *see also* U.S. Dep't of Energy, The Potential Benefits of Distributed Generation and Rate-Related Issues That May Impede Their Expansion 4–14 (2007) (DG can also be "used to provide ancillary services, particularly those that are needed locally such as reactive power, but also those that contribute to the reliable operation of the entire system, such as back-up supplies and supplemental reserves"); Cal. Energy Comm'n, 2011 Integrated Energy Policy Report, Publication # CEC-100-2011-001-CMF 11 (Feb. 2012).

solar photovoltaic ("PV") installations, can reduce peak power requirements. This peak load reduction can have a positive impact on electricity rates because it allows utilities to avoid operating the most expensive peaking generation units[26] and avoid or defer expensive investments in new power plants and retrofits.[27]

4. ***Reduced Transmission Losses*** — Because DG systems can be strategically sited close to the loads that they serve, they can reduce transmission losses as compared with centralized facilities that are typically sited in more distant locations.[28]

5. ***Reduced Land Use Effects*** — DG systems occupy relatively small areas and some forms of DG can be sited on rooftops and other urban structures, thus reducing land-use effects.[29]

6. ***Faster Project Timelines*** — The average project timeline for a DG system is relatively quick as compared with a large, central generation facility, because such projects are subject to lower upfront capital costs, are easier to site, and can potentially use existing transmission and distribution infrastructure.[30] Thus, DG resources can be deployed more rapidly, which is compatible with California's ambitious renewable energy goals.

7. ***Lower Financial Risk and Enhanced Investment Flexibility*** — The relatively small size and short lead time of DG projects may also allow utilities to "reduce financial risk by building capacity in increments more closely matched to changing customer demand, easily ramping investment up or down as new demand information unfolds."[31]

8. ***Customer Empowerment*** — DG systems can be viewed as a "means of harnessing local sources of generation to let consumers bypass the centralized system of generation and dispatch and, in many cases, to meet their own electricity needs."[32]

9. ***Transition to a More Flexible, Networked Electric System*** — Finally, DG systems have the potential to transform the U.S. power sector by replacing old systems that rely on central power plants and extensive transmission infrastructure with new systems that rely on local networks of small-scale generation sited close to consumption.[33]

In addition, the installation of renewable DG resources (solar, wind, geothermal, biomass, etc.) can yield significant environmental benefits, including reductions in GHG emissions as well as traditional air pollutants.[34]

There are also several important benefits associated with wholesale DG. One key advantage is that wholesale DG installations typically generate more electricity per project than customer-side DG installations, thus contributing to California's 12,000 MW goal.[35] Mid-sized systems are also viewed as more economically efficient than smaller systems, both because there are fewer transaction costs per megawatt-hour of electricity produced and because they are generally large enough to achieve economies of scale.[36] Finally, there is an economic incentive for developers to invest in these projects, because they can potentially profit from the wholesale sale of DG electricity. Thus, the wholesale DG model represents a promising approach for the future of electric generation in California and elsewhere.

Although there is widespread support for the incorporation of DG resources into the electric grid, there are also some economic and technical concerns about this process. As noted in a recent study by the Shultz-Stephenson Task Force on Energy Policy[37]:

> Critics of [DG] highlight the high cost of distributed sources of power generation relative to centralized power stations and the danger of subsidies and incentives for [DG] technologies creating unsustainable industries. They also point out the negative disruptive effects of attempting to integrate small-scale generation and storage systems into a power infrastructure not designed to accommodate them. In a sector that depends more than any other on predictability and reliability of operations, they argue, any attempt to move away from a highly centralized and controlled system to a new paradigm based on the aggregation of numerous, independently run assets comes with enormous direct and indirect costs.

With respect to economic concerns, the long-term costs of DG relative to centralized generation are not well under-

26. NYSERDA, *supra* note 23, at 5.
27. *Id.*
28. U.S. Dep't of Energy, *supra* note 25, at 3–18.
29. *Id.* at 6–10; *see also,* Russell & Weissman, *supra* note 19, at 1("Because they are for the most part installed in the built environment, either directly or with or close to energy consumers, they do not impact sensitive habitats and species like many of the larger, remotely located projects do.").
30. Vote Solar Initiative, Wholesale Distributed Generation (WDG): A Guide to Creating a Successful Solar WDG Program 6 (2012) ("WDG [Wholesale DG] projects sized below 20 MW generally can connect at distribution voltages (69 kV and below) and can potentially use existing transmission and distribution ("T&D") infrastructure, thereby potentially reducing the need for complex transmission studies, queuing processes, and grid upgrades often associated with large-scale projects. Many solar WDG facilities additionally have flexible siting options, and can take advantage of locations such as rooftops, parking lots and already disturbed land, which helps to minimize environmental impacts and shorten permitting timelines. All of these factors generally speed the planning and deployment process for WDG projects.").
31. Lovins, *supra* note 25, at 207 ("In contrast, coal and nuclear units require many years to build, have no convenient off-ramps that preserve value, and are justified using forecasts that must try to peer through the fog for decades. The small, fast units' lower financial risk can increase their value by as much as several fold."); *see also,* NYSERDA, *supra* note 24, at 2 ("Utilities should recognize the option value that DG offers when it defers the need for T&D upgrades. Once made, large utility investments are irreversible. By reducing demand at congested locations in the T&D system, DG buys time for the utility to assess whether or not their growth projections materialize. This can save the utility by reducing the cost of overestimating demand.").
32. Carl et al., *supra* note 1, at 31.
33. *Id.*
34. U.S. Dep't of Energy, The Potential Benefits of Distributed Generation and Rate-Related Issues that May Impeded Their Expansion: A Study Pursuant to Section 1817 of the Energy Policy Act of 2005, at 1, 4 (2007).
35. *Id.* at vii.
36. *Renewable Energy Deployment: Wholesale Distributed Generation*, Solar Energy Industries Ass'n, http://www.seia.org/policy/renewable-energy-deployment/wholesale-distributed-generation (last visited Jun. 4, 2013).
37. Carl et al., *supra* note 1, at 31.

stood, both because the costs of DG technologies are steadily decreasing[38] and the external economic benefits associated with DG (e.g., reduced need for distribution and transmission infrastructure) are difficult to quantify. The reality is that the relative cost of a DG system will vary depending on factors like its location and the technology it utilizes.[39]

The "disruptive effects" of DG refers to its incompatibility with certain existing distribution systems and, in some cases, its potential to compromise system reliability. These impacts may occur for several reasons. One barrier to DG deployment is that most distribution grids are designed to transport power in one direction and thus problems may occur when DG generators attempt to sell power back into the grid in the opposite direction.[40] Another concern associated with the deployment of DG resources is that utilities must constantly monitor the electric grid, adjusting production to ensure a close match between electric generation and consumption; the addition of multiple DG resources may complicate this process.[41] This concern is particularly salient in the context of certain renewable DG resources: the intermittent nature of solar and wind DG may have a negative impact on grid reliability, absent extensive planning to ensure that intermittent resources can be integrated into the grid with minimal disruption.[42] Fortunately, these technical challenges are not insurmountable, and with appropriate planning, DG resources can be successfully integrated into the grid to enhance system reliability and resilience.[43]

B. *California Introduced the RAM as a Wholesale Procurement Mechanism to Complement Other DG Programs*

Due to the benefits associated with DG, California regulators have promoted the installation of renewable DG technologies through a variety of programs. California's customer-side DG programs include a net metering policy ("NEM"),[44] which was established in 1996,[45] and a variety of incentives for the installation of on-site renewable energy technologies.[46] The primary goal of these policies is to encourage customers to offset their own electricity use by producing energy on site.[47]

One key limitation of California's customer-side DG policies is that they do not provide a legal framework for the wholesale sale of renewable energy produced from DG installations. Although the NEM allows customers to receive compensation for excess generation, the only projects that are eligible for the program are those that are "intended primarily to offset part or all of the customer's own electrical requirements."[48] Thus, "[s]ystems that are sized larger than the customer's electrical requirements would not be eligible for NEM."[49] Moreover, the system capacity limit is 1 MW for most systems and 5 MW for systems that are operated by local governments or universities that participate in California's bill credit transfer program.[50] As a result of these restrictions, the benefits of the NEM are not available for medium-scale DG projects (greater than 1 MW) or for any DG project where the primary goal is to sell electricity on the wholesale market.

California also introduced a Feed-in Tariff ("FIT") in 2006, which provided a procurement option for smaller projects (less than 1.5 MW, revised in 2012 to include projects up to 3 MW).[51] The FIT requires all IOUs and publically owned utilities ("POU") with 75,000 or more customers to make a standard FIT available to qualifying renewable energy installations that contract with the utility for the sale of electricity. Unlike the NEM, the FIT is designed for small producers who intend to export energy to the grid and not merely to offset their own use. It guarantees predictable energy prices over a fixed contract term.[52] The size constraints of the FIT, however, render many potential wholesale DG projects ineligible for this program.

Wholesale DG suppliers also can participate in competitive solicitations and sign a Request for Offers Power Purchase Agreement ("PPA") with one of California's three large

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38. *See* David Feldman et al., Photovoltaic (PV) Pricing Trends: Historical, Recent, and Near-Term Projections, Technical Report DOE/GO-102012-3839 (Nov. 2012) ("Reported installed prices of U.S. residential and commercial PV systems declined 5%–7% per year, on average, from 1998–2011, and by 11%–14% from 2010–2011, depending on system size. Preliminary data and bottom-up analysis suggest that the price reductions have continued in 2012. Specifically, bottom-up analysis for systems quoted in Q4 2011 (and installed in 2012) yields installed prices of $4.39/W for 5.1-kW residential systems, $3.43/W for 221-kW commercial rooftop systems, and $2.79/W for 191.5-MW fixed-tilt utility-scale systems, corresponding to a 25%–29% year-over-year reduction compared to Q4 2010 benchmarks." In addition, "[a]nalysts estimate that the global module average selling price will decline from $1.37/W in 2011 to approximately $0.74/W by 2013 and that inverter prices will also decline over this period.").
39. *See, e.g.,* Lovins, *supra* note 25, at 207 ("[S]ome [DG] resources can also add costs. For instance, high fractions of distributed resources may add more distribution costs than they avoid or defer. Aside from avoided delivery costs, though, these costs and benefits are not represented in our analysis because they're site- and technology-specific.").
40. RUSSELL & WEISSMAN, *supra note* 19, at 3; Cal. Pub. Utils. Comm'n, *supra* note 16, at 3 ("Utility engineers have expressed concern that reverse power flows can damage obsolete transformers and other high-priced electrical equipment designed to receive electricity at one end and discharge it at the other.").
41. Russell & Weissman, *supra* note 19, at 17.
42. Russell & Weissman, *supra* note 19, at 3.
43. *See generally* J.A. Peças Lopes et al., *Integrating Distributed Generation into Electric Power Systems: A Review of Drivers, Challenges and Opportunities*, 77 (9) Electric Power Sys. Research 1189 (2007).
44. California's net metering policy ("NEM") allows customers to sell excess electricity generated from on-site installations back to the utility, thus offsetting their electricity bills.
45. Cal. Pub. Utils. Code § 2827, *et seq*. (West 2014).
46. These include the Self-Generation Incentive Program (2000), California Solar Initiative (2006), and New Solar Homes Partnership ("NHSP") (2006). For more information, *see Distributed Generation in California*, Cal. Pub. Utils. Comm'n, http://www.cpuc.ca.gov/PUC/energy/DistGen/ (last visited June 4, 2013).
47. Cal. Pub. Utils. Code § 2827(b)(4) (West 2014).
48. *Id.*
49. Cal. Pub. Utils. Comm'n, Net Surplus Compensation FAQ 1 (2011), *available at* http://www.cpuc.ca.gov/NR/rdonlyres/C085BDE6-7DC1-4FD8-8208-52300A082672/0/FAQs_NSC_91411.pdf.
50. California's renewable energy self-generation bill credit transfer program (RES-BCT) allows local governments and universities to generate electricity at one account and transfer any available excess bill credits (in dollars) to another credit account owned by the same local government or university. Cal. Pub. Utils. Code § 2830 (West 2014).
51. The FIT program was established in AB 1969 (2006), and expanded to 3 MW in CPUC D.12-05-035 (2012). *See* Cal. Pub. Utils. Comm'n, D.12-05-035, at 4, 124 (2012).
52. *Id.* at 3, 17.

IOUs or negotiate a bilateral PPA.[53] Although the IOUs are required to procure specified quantities of renewable energy based on California's RPS, there is no set-aside in the RPS for DG and thus no incentive for the IOU to select DG projects over central station renewable projects.[54] Rather, IOUs typically procure renewable resources "using a statutorily specified 'least cost/best fit' criteria with intense competition for lower cost."[55] In this context, wholesale DG producers are at a disadvantage for two reasons: (1) it is difficult to compete on a price-per-kilowatt hour basis with centralized facilities that can take advantage of economies of scale; and (2) smaller projects typically cannot absorb the higher transaction costs associated with PPA procurement.[56]

Thus, prior to the commencement of the RAM in 2011, California did not have a robust market for wholesale DG suppliers.[57] Rather, state policies tended to favor large, centralized renewable energy projects or small, customer-side DG installations.[58] A 2007 report from the CEC explained the situation as follows:

> The DG industry is still a nascent industry that survives despite some difficult market conditions. There are numerous institutional, industry and market barriers that have impeded the growth and adoption of DG to date. Due to low penetration rates, DG installations do not have a large impact on, nor [are they] integrated with, the state's electric and natural gas infrastructures.[59]

The report found that "[m]any early DG entrants have been unsuccessful and exited the market" due to limited procurement opportunities and imperfect price signals.[60] Based on these findings, the CEC recommended that California pursue an "Informed Energy" scenario which would "leverage market structures that would allow alternative resources to compete more readily with central power plants to meet California's energy needs."[61] The CEC also recommended transparent rate structures which would "connect customers more closely to market forces" and internalize externalities, such as environmental impacts and transmission costs.[62]

In order to create an enabling market for wholesale DG, CPUC made two important decisions in 2009 and 2010. First, it authorized each of the IOUs to own and operate solar PV facilities and to execute solar PV power purchase agreements with independent power producers ("IPP") through a competitive solicitation process.[63] The IOU PV programs are expected to yield up to 1,100 MW of new solar PV capacity between 2010 and 2015.[64] The size of eligible projects differs for each IOU: 1–2 MW for Southern California Edison ("SCE"), 1–20 MW for Pacific Gas and Electric ("PG&E"), and 1–5 MW for San Diego Gas and Electric ("SDG&E").[65] These programs provide a specific market for solar PV installations and they also offer a standard PPA to streamline the procurement process.[66]

Second, CPUC introduced the RAM as the primary mechanism "for the procurement of smaller renewable energy projects that are eligible for the California [RPS] Program."[67] The decision to use a reverse auction for wholesale DG procurement was informed by several years of consultation regarding the possible expansion of the FIT program.[68] Stakeholders desired a "streamlined procurement program" with a standard contract, much like the FIT, but they "eschewed administratively determined prices in exchange for market-based pricing through a reverse auction mechanism."[69] Based on stakeholder preferences, CPUC adopted a final decision implementing the RAM in December 2010.[70]

II. Understanding the RAM: Objectives and Mechanics

The RAM is a reverse auction for the procurement of electricity from DG projects greater than 3 MW and less than 20 MW in capacity.[71] DG sellers place bids based on the projected cost of generation, and then California's three IOUs (SCE, PG&E and SDG&E) select bids by lowest prices until the auction capacity is met.[72] To be eligible for a contract, the bids must also comply with various project viability requirements, discussed below.

This section will begin by reviewing the objectives of the RAM program to provide context for the design choices that CPUC has made. The section will then conclude with a concise overview of the RAM program mechanics.

53. Carl et al., *supra* note 1, at 43.
54. *See* Timothy Simon, California Distributed Generation (DG), Presentation to Harvard Electricity Policy Group, 68th Plenary Session (2012).
55. Carl et al., *supra* note 1, at 43.
56. Vote Solar Initiative, *supra* note 30, at 7 (Vote Solar further notes that "the cost, complexity, length and uncertainty of the traditional RFP process has led regulators to consider other procurement options to bring online solar projects that are too small to secure a significant market presence under traditional utility wholesale procurement practice and too large to be well-sited for retail customer programs.").
57. *See* Cal. Energy Comm'n, *supra* note 17, at 2.
58. *See* Carl et al., *supra* note 1, at 43.
59. Cal. Energy Comm'n, *supra* note 17, at 2 (More specifically, the report found that in 2007, DG penetration was only 2.5% of total peak demand in California.).
60. *Id.* at 7–9 (In particular, the report noted that "energy prices are not transparent" and the "current rate structure is based on averaged pricing that does not include locational and environmental externalities." The report concluded that the "[l]ack of a price signal that will change customer behavior undervalues the environmental, temporal and locational aspects of DG or cogeneration.").
61. Cal. Energy Comm'n, *supra* note 17, at 12.
62. *Id.* at 15.
63. *Investor-Owned Utility Solar Photovoltaic (PV) Programs*, Cal. Pub. Utils. Comm'n (Jun. 2, 2013), http://www.cpuc.ca.gov/PUC/Templates/RPS.aspx?NRMODE=Published&NRNODEGUID=%7b5C37AA16-4349-4EFC-AE5D-1597AD1DB13E%7d&NRORIGINALURL=%2fPUC%2fenergy%2fRenewables%2fhot%2fUtility%2bPV%2bPrograms%2ehtm&NRCACHEHINT=Guest#PGE.
64. *Id.*
65. *Id.*
66. *Id.*
67. Cal. Pub. Utils. Comm'n, D. 10-12-048, at 2 (Dec. 16, 2010).
68. *Id.*
69. U.S. P'ship for Renewable Energy Fin. (US PREF), Ramping up Renewables: Leveraging State RPS Programs amid Uncertain Federal Support 40 (2012) [hereinafter US PREF].
70. Cal. Pub. Utils. Comm'n, D. 10-12-048, at 80, 97 (Dec. 16, 2010).
71. *Renewable Auction Mechanism*, Cal. Pub. Utils. Comm'n, http://www.cpuc.ca.gov/RAM (last visited June 3, 2013).
72. Cal. Pub. Utils. Comm'n, D. 10-12-048, at 11–12 (Dec. 16, 2010).

A. Objectives

In the decision to adopt the RAM, CPUC specified that it chose a reverse auction as the "primary contracting tool for this market segment" because doing so would "promote competition and elicit the lowest costs for ratepayers, encourage the development of resources that can utilize existing transmission and distribution infrastructure, and contribute to RPS goals in the near term."[73] As illustrated by this statement, CPUC had several different goals in mind when it was formulating the RAM procurement targets, auction procedures and other rules.

The fundamental purpose of the RAM is to promote the deployment of renewable DG resources by creating a predictable and accessible market for wholesale DG projects.[74] Specifically, CPUC wanted to provide a procurement opportunity for smaller RPS-eligible projects which have not been able to effectively participate in the annual RPS solicitations due to the transaction costs associated with those solicitations.[75] CPUC thus sought a mechanism that would create a market for qualifying projects, streamline the procurement process for all parties involved, and minimize other transaction costs associated with this process.[76]

CPUC also intended for the RAM to achieve certain goals relating to the types of the projects supported by the program. First, CPUC wanted the RAM to support a variety of different technologies and resources, including baseload resources (e.g., geothermal, hydroelectric, biogas), peaking intermittent resources (e.g., solar PV), and non-peaking intermittent resources (e.g., wind).[77] Second, CPUC wanted the RAM to promote the development of projects that can utilize the existing transmission and distribution structure to avoid or defer the need for additional infrastructure investment.[78] Third, CPUC wanted the RAM to promote the development of smaller projects that can come online quickly, to help the state reach its overall procurement goals (12,000 MW of DG by 2020).[79]

Another key purpose of the RAM is to ensure that the IOU will procure electricity from the most economically efficient projects, to minimize adverse impacts of the program on ratepayers.[80] The program's emphasis on cost-effective projects also serves a related purpose—promoting competition between different DG developers to encourage innovation and efficiency in this sector—thus strengthening the overall market for renewable DG resources.[81] While a FIT and other financial incentives do not necessarily discriminate between more or less efficient projects, the competitive nature of an auction favors projects with lower installation and operation costs. Over time, the auction approach should provide an expanded market share for the most promising technologies and skillful developers while weeding out less effective projects.[82]

The auction approach is also useful insofar as it provides a market-based pricing mechanism for electricity sales from renewable DG resources. Prices are set through a competitive bidding process, which is designed to achieve economically efficient results based on real market conditions. As such, there is no need for regulators to establish fixed prices based on predictions of future market conditions and technological development.[83] In its decision adopting the RAM, CPUC explicitly cited the regulatory cost of determining an appropriate fixed price for the wholesale of renewable DG resources as one of its reasons for using a reverse auction to set prices.[84] CPUC also noted that a market-based price would provide greater flexibility for both developers and the IOUs and would better reflect changing market conditions.[85]

These objectives are closely interrelated, and they all relate to the basic purpose of the RAM program: to expedite the deployment of DG resources at the lowest possible cost. Given the inherent trade-off between expedited renewable deployment and economic efficiency, there is an inevitable degree of tension between some of the specific program goals. For example, it has been difficult to reconcile the program's focus on low-cost DG procurement with the goal of promoting DG resource diversity. These trade-offs are discussed in greater detail in Section III.

B. Program Mechanics

This section highlights some of the key features of the RAM program as they relate to the aforementioned objectives. Specifically, this section will review: (1) the program timeline, (2) IOU procurement targets, (3) the standard contract used in the RAM, (4) the process of bid selection, (5) project eligibility requirements, (6) provisions for cost-containment and protection against speculative bidding, (7) expedited regulatory review of RAM contracts, (8) procedures for modifying the RAM rules, and (9) the RAM's relationship with the RPS and Fit. Additional details are available at the CPUC

73. Cal. Pub. Utils. Comm'n, D. 10-12-048, at 2 (Dec. 16, 2010).
74. *Id.* at 2–4.
75. *Id*.
76. *Id.* at 37.
77. Cal. Pub. Utils. Comm'n, Res. E-4414 10 (Aug. 18, 2011).
78. *Id.* at 2.
79. Cal. Pub. Utils. Comm'n, D. 10-12-048, at 75 (Dec. 16, 2010).
80. *Id.* at 14 (One goal of the program is "executing contract prices that are financeable for the developer but also not an overpayment from a ratepayer perspective.").
81. Cal Pub. Utils. Comm'n, D. 10-12-048, at 14, 17 (Dec. 16, 2010).
82. Vote Solar Initiative, *supra* note 30, at 13.
83. *Id.* ("In place of administrative comments and testimony, an auction or solicitation gets market participants' assessment directly through competitive proposals. The competition to win an auction encourages efficient project siting and optimized energy production. Ongoing auctions will let prices adjust automatically to account for market changes and technological evolution, as bidders take these conditions into account in preparing bids and competing to win.").
84. Cal. Pub. Utils. Comm'n, D. 10-12-048, at 15 (Dec. 16, 2010) ("We also consider the regulatory cost of determining the appropriate fixed price to put in a published tariff. There are costs for data collection and analysis. IOU, parties, and staff will incur costs to participate in Commission proceedings, the outcome of which may be appealed. The time and cost of an administrative process to set a fixed price is not zero, and could be the same as or more than the sum of all bid preparation costs. Accordingly, we find that the price as bid and standard contracting aspects of RAM would reduce transaction costs for the seller, utility, and regulator.").
85. *Id.* at 4–5 ("While stability and predictability for both buyer and seller are advanced by fixed prices and TOD periods, they can also be undermined by pre-determined, inflexible prices and TOD periods that bear little relationship to changing market conditions.").

website[86] and in the most recent resolution modifying the RAM.[87]

1. Program Timeline

The initial decision creating the RAM called for a total of four auctions over the course of 2 years (2011–2013).[88] Specifically, the IOUs were instructed to hold concurrent auctions every 6 months, and project developers were allowed bid in all auctions.[89] CPUC's goal was to have a pilot period during which time the IOUs, developers and regulators could assess the strengths and weaknesses of the program, and decide whether to continue with the same model in future years. The first four auctions closed in November 2011, May 2012, December 2012, and June 2013.[90] CPUC decided to continue the RAM for an additional year to extend the timeframe in which the IOUs could meet their procurement targets and thus has scheduled a fifth auction for June 2014.[91]

2. IOU Procurement Targets

CPUC's original decision directed the IOUs to procure at least 1,000 MW in total capacity from renewable wholesale DG installations.[92] CPUC selected this target because it was "sufficiently large to test the adopted program but sufficiently small to provide protection against adverse outcomes."[93] This target was subsequently revised to 1,330 MW in response to requests from SCE and SDG&E to transfer some of their IOU Solar PV Program[94] capacity requirements to the RAM.[95]

Each IOU is required to procure its proportionate share of DG electricity at each auction based on each IOU's relative electricity sales.[96] There is some flexibility, however, in the event that the IOU determines that bids are not cost-competitive.[97] If the IOUs do not meet their targets for a particular auction, the remaining capacity is added to their target for the subsequent auction.[98] After the procurement targets were initially revised in 2012, SCE's target was 723.4 MW overall (171.5 MW per auction).[99] PG&E's target was 420.9 MW overall (105.2 MW per auction).[100] SDG&E's target was 154.7 MW overall (44.9 MW per auction).[101] These "per auction" targets were based on the original auction schedule, which consisted of only four auctions.[102] However, because the IOUs failed to reach their procurement targets in the first three auctions, CPUC added the fifth auction without adding any additional procurement obligations.[103] CPUC also increased SCE's overall procurement target from 723.4–754.4 MW in 2013 to allow SCE to transfer additional credits from the IOU Solar PV program to the RAM.[104]

The RAM rules also direct the IOUs to specify how much electricity they intend to procure from each of the following categories: (1) baseload electricity (e.g., biomass, biogas, landfill gas, geothermal); (2) peaking electricity (e.g., solar PV, solar thermal); and (3) non-peaking intermittent (e.g., wind, small hydroelectric).[105] CPUC has directed the IOUs to target a minimum of 3 MW in each product category.[106]

3. Standard Contract

The RAM rules specify that each IOU should offer a standard contract for all winning bids that is "simple, streamlined, and has already been vetted by stakeholders through another CPUC program."[107] The price, terms, and conditions of these contracts are not negotiable.[108] The contracts also must incorporate certain requirements regarding project viability and developer commitment, as discussed below.[109] In addition, the contracts must specify that projects will be online within 24 months of contract execution, with a 6 month extension available in the event of regulatory delays.[110]

4. Bid Selection

Sellers compete for RAM contracts by developing a bid price that reflects the cost to build and operate the project, plus a reasonable return on their investment.[111] Bids are then selected by lowest price until the auction capacity is met.[112]

In the original decision, CPUC stated that bid selection should be based exclusively on price.[113] In August of 2011, CPUC modified this rule by requiring the IOUs to add esti-

86. *Renewable Auction Mechanism*, *supra* note 71.
87. Cal Pub. Utils. Comm'n, Res. E-4489 (Apr. 19, 2012).
88. Cal Pub. Utils. Comm'n, Res. E-4582, at 2, 4 (May 9, 2013).
89. Cal Pub. Utils. Comm'n, Res. E-4489, at 28 (Apr. 19, 2012).
90. Cal Pub. Utils. Comm'n, Res. E-4582, at 4 (May 9, 2013).
91. *Id*. at 7.
92. Cal. Pub. Utils. Comm'n, D. 10-12-048, Adopting the Renewable Auction Mechanism 3 (Dec. 16, 2010).
93. *Id*. at 82.
94. This program is discussed *infra* at Part I.B.
95. *See generally* Cal. Pub. Utils. Comm'n, D. 12-02-002 Partially Granting San Diego Gas & Electric Company's Petitions for Modification of Decision 10-09-016 (SEP) and Decision 10-12-048 (RAM), at 1 (Feb. 1, 2012); Cal. Pub. Utils. Comm'n, D. 12-02-035 Partially Granting Southern California Edison Company's Petition for Modification of Decision 09-06-049 (SPVP) and Making Conforming Changes to Decision 10-12-048 (RAM), at 3 (Feb. 16, 2012); Cal. Pub. Utils. Comm'n, D. 13-05-033 Partially Granting Southern California Edison Company's Petition for Modification of Decision 12-02-035, at 2 (May 23, 2013).
96. Cal Pub. Utils. Comm'n, D. 10-12-048, at 3.
97. *Id*.
98. *Id*. at 31.
99. Cal Pub. Utils. Comm'n, D. 12-02-035, at 2.
100. *Id*.
101. *Id*.
102. *Id*. at 2 n.4.
103. Cal. Pub. Utils. Comm'n, Res. E-4582, at 6–7 (May 9, 2013) (For the fifth auction, CPU authorized the IOUs to "procure additional RAM contracts to meet their previously authorized RAM capacity allocation, and to replace capacity from any previously executed RAM contracts which, by that time, have failed or have been terminated prior to reaching their commercial operation date.").
104. *See* Cal. Pub. Utils. Comm'n, D. 13-05-033 Partially Granting Southern California Edison Company's Petition for Modification of Decision 12-02-035, at 2 (May 23, 2013).
105. Cal. Pub. Utils. Comm'n, D. 10-12-048, at 6, 35 (Dec. 16, 2010).
106. Cal. Pub. Utils. Comm'n, Res. E-4414, at 10 (Aug. 18, 2011).
107. Cal. Pub. Utils. Comm'n, Res. E-4489, at 30 (Apr. 19, 2012).
108. *Id*.
109. *Id*.
110. *Id*. at 10.
111. *Id*. at 29–30.
112. Cal. Pub. Utils. Comm'n, D. 10-12-048, at 2 (Dec.16, 2010).
113. *Id*. at 35.

mated transmission network upgrade costs to the bids for ranking purposes (to be determined based on the bidder's most recent interconnection study).[114] Following the first auction, CPUC modified the rules again to allow the IOUs to account for the "resource adequacy" benefits[115] provided by a seller with full capacity deliverability status.[116] Specifically, CPUC now allows the IOUs to rank bids using the following formula: bid price + ratepayer funded transmission upgrade costs — resource adequacy benefits.[117] The IOUs may not use any additional criteria for the evaluation and selection of offers without CPUC approval.[118]

5. Project Eligibility

To be eligible for the RAM, projects must be sized between 3 and 20 MW.[119] Projects also must comply with specific "viability requirements" to be eligible for a RAM contract.[120] Specifically: (1) the project must be located in one of the IOU's service territories;[121] (2) the project developer must demonstrate 100% control over the site, either through direct ownership, lease, or an option to lease or purchase that may be exercised upon award of the RAM contract;[122] (3) one member of the development team must have begun construction on or completed at least one project of a similar technology capacity;[123] (4) the project must be based on commercialized technology;[124] and (5) the project's interconnection application must have been filed and the bidder must have received results from a System Impact Study or a Phase I Interconnection Study or must have documentation establishing that the project has passed Fast Track screens.[125]

There are also specific rules for the timeline in which selected projects must come online. Originally, the RAM rules specified that approved projects must come online within 18 months of contract execution with a possible 6-month extension for regulatory delays.[126] Following the first auction, CPUC extended this timeline: projects must now come online within 24 months of contract execution, and there is still a 6-month extension available for regulatory delays.[127]

There are no firm requirements which govern the location of eligible projects. However, IOUs will consider the cost of connecting the project to the existing grid when assessing the cost-competitiveness of each bid. IOUs are required to provide "preferred location" maps to assist developers in identifying good interconnection sites.[128] The RAM rules specify that these maps should identify the available capacity at the substation and circuit level and should be updated on a monthly basis.[129]

6. Cost Containment and Protection against Speculative Bidding

As noted above, CPUC capped the program at 1,000 and later 1,330 MW in order to limit the potential program costs to ratepayers.[130] The RAM rules also contain several additional provisions to ensure that the IOUs will only procure competitively priced products, and that the RAM market will not be overrun with speculative bids.[131] These provisions are set forth below.

First, the IOUs have discretion to reject bids where there is evidence of market manipulation or where prices are not competitive with other RPS procurement options.[132] If the IOU wishes to utilize this discretion, it must submit an advice letter to CPUC explaining its decision to reject a contract.[133]

Second, RAM rules require successful developers to post a development deposit[134] as well as a performance deposit.[135] The deposits are due upon execution of the contract with the IOU and they will be refunded only when the project achieves commercial operation.[136] The sizes of the deposits vary depending on the anticipated capacity of the project.[137]

114. Cal Pub. Utils. Comm'n, Res. E-4414, at 57 (Aug. 18, 2011).
115. IOU in California are required to ensure that they will have adequate resources to serve all customers in real time—this "resource adequacy" requirement is explicitly integrated into planning procurement regulations. *See Resource Adequacy*, Cal. Pub. Utils, Comm'n, http://www.cpuc.ca.gov/PUC/energy/Procurement/RA/ (last visited Jun. 3, 2013).
116. Cal. Pub. Utils. Comm'n, Res. E-4489, at 14 (Apr. 19, 2012).
117. *Id.*
118. *Id.*
119. *Renewable Auction Mechanism*, Cal. Pub. Utils, Comm'n, http://www.cpuc.ca.gov/RAM (last visited June 3, 2013).
120. Cal. Pub. Utils. Comm'n, D. 10-12-048, at 65 (Dec. 16, 2010).
121. *Id.* at 3.
122. *Id.* at 66.
123. *Id.*
124. *Id.* at 67.
125. Cal. Pub. Utils. Comm'n, Res. E-4414, at 12 (Aug. 18, 2011).
126. Cal. Pub. Utils. Comm'n, Res, D. 10-12-048, at 90 (Dec. 16, 2010).
127. Cal. Pub. Utils. Comm'n, Res, Res. E-4489, at 11 (Apr. 19, 2012).
128. Cal. Pub. Utils. Comm'n, Res, D. 10-12-048, at 78 (Dec. 16, 2010). The interconnection maps are available at the RAM website, *RAM*, Cal. Pub. Utils. Comm'n, http://www.cpuc.ca.gov/RAM (last visited June 4, 2013).
129. *Id.* at 92.
130. Cal. Pub. Utils. Comm'n, Summary of Renewable Auction Mechanism (RAM) Program Rules 2 (Jan. 2012).
131. Speculative bidding and market manipulation are a significant concern for auction-based procurement mechanisms. As noted by US PREF, "Reverse auctions, similar to other price-focused procurement efforts, are known to generate speculative bids. Oftentimes in a 'lowest price wins' environment where the supply of bidders significantly exceeds available contract demand, many inexperienced bidders use this opportunity to provide unreasonably low bids in order to win a contract, with no intention of following through and building out the facility. The high attrition rates of unviable projects within previous renewable procurement solicitations proves that maintaining a solely 'price' focused mechanism erodes the effectiveness of the efforts of all involved." US PREF, *supra* note 69, at 40.
132. Cal Pub. Utils. Comm'n, D. 10-12-048, at 3 (Dec. 16, 2010). CPUC notes that the IOU's ability to reject uncompetitive bids also brings the program into compliance with FERC rules re: market-based electricity prices. FERC has jurisdiction over the sale of electric energy at wholesale in interstate commerce, and this jurisdiction has been interpreted to extend to intrastate sales where the transmission system "is interconnected and capable of transmitting [electric] energy across the State boundary, even though the contracting parties and the electrical pathway between them are within one State." Florida Power & Light Company, 29 FERC 61,140 at 61,291–92.
133. Cal. Pub. Utils. Comm'n, Res.E-4414, at 25 (Aug. 18, 2011).
134. Cal. Pub. Utils. Comm'n, Res, D. 10-12-048, at 53–54 (Dec. 16, 2010).
135. *Id.* at 56.
136. *Id.* at 90.
137. Specifically, the required development deposit is $20/kW hour for projects ≤ 5 MW; $60/kW for intermittent projects from 5–20 MW; and $90/kW for baseload projects from 5–20 MW. The performance deposit is equal to the development for projects less than 5 MW, and 5% of project revenues for projects 5 MW and larger. *Id.*

Third, the project viability requirements discussed above are also intended to prevent speculative bidding.[138] Specifically, they discourage participation from "concept-only" projects "that have not been sufficiently vetted for economic viability, permitting risks, interconnection costs, and development schedule[s]."[139] For example, the 100% site-control requirement is useful for "demonstrating that project development has advanced beyond the conceptual stage."[140] Similarly, the development experience requirement is useful, because developers that have worked on similar projects are more likely to submit realistic bids and meet contractual requirements.[141] Finally, the information that the bidders must provide regarding project location, commercialized technology, developer experience, and interconnection studies should make it easier for IOUs to evaluate whether the bid price is realistic with respect to a particular project.[142]

7. Expedited Regulatory Review

Expedited regulatory review of the winning contracts is facilitated by two key conditions: (1) CPUC pre-approval of the content of each IOU's standardized contract; and (2) the bidding projects must meet the eligibility requirements described above and, in particular, the interconnection requirements.[143] This is important for smaller projects, especially those in the 3–20 MW range, because a prolonged regulatory review process can substantially increase project cost and uncertainty.

8. Process for Modifying the RAM

Recognizing that the RAM is, in effect, a pilot program, CPUC designed the program so that it could be continually modified based on input from the IOUs and other stakeholders. CPUC solicits comments from IOUs and project developers following each RAM and CPUC staff can also recommend program changes based on evidence and the staff's experience and expertise.[144] In addition, the IOUs are required to hold a program forum each year to solicit feedback from participants and to submit annual reports on RAM outcomes.[145]

9. Relationship with the RPS and the FIT

Electricity procured under the RAM is RPS-eligible and thus provides the IOUs with direct credit towards their 33%-by-2020 RPS requirements.[146] Although there is no overlap in project eligibility between FIT-eligible projects (less than 3 MW) and RAM-eligible projects (3–20 MW), the RAM does have a direct bearing on the prices used in the FIT program.[147] Specifically, in 2012, CPUC decided to link FIT prices to the bid prices established at contemporaneous RAM auctions.[148] The FIT prices are now linked to the weighted average of the highest priced executed contracts for each IOU resulting from the RAM auction held in November 2011.[149] These prices are to be "adjusted based on time of delivery and then adjusted upward or downward every two months based on market responses."[150]

II.I Effectiveness of the RAM: Experience from the First Four Auctions

Based on the results of the first four auctions, the RAM has generally been effective as a procurement tool for low-cost renewable DG energy. But, as noted in the introduction, the program has been less effective at achieving other environmental goals. This section will highlight the strengths and weaknesses of the program, by reviewing progress toward overall procurement, economic, project-specific, and adaptive learning goals. This section will also recommend some modifications to the RAM rules that could be used to address potential problems or weaknesses in the program.

A. Overall Procurement Goals

Ideally, a wholesale DG procurement program like the RAM "should offer market opportunities of sufficient volume and duration to make a meaningful contribution to the goal of creating robust and sustainable renewable generation markets," but it also should be "small enough to minimize the potential impact of unexpected adverse outcomes and higher than expected ratepayer costs."[151] The size of the program should also reflect the state's overall renewable energy targets and other utility portfolio needs.[152]

CPUC initially structured the RAM as a pilot program with modest procurement targets to mitigate against potential adverse outcomes.[153] The 1,330 MW target represents a sizeable piece of California's goal to construct 12,000 MW of renewable DG by 2020. However, the program will argu-

138. *Id*. at 85 ("A requirement that a project meet certain minimum project viability criteria to submit a bid provides an initial screen of more viable from less viable projects; simplifies bid review and selection; provides an incentive for bidders to submit realistic, competitive bids; complements the provision of limited time to commercial operation; assists with reasonable queue management; and should reduce the number of extension requests.").
139. Vote Solar Initiative, *supra* note 30, at 19–21 ("If a program has low barriers to entry, such as limited development security requirements and minimal project maturity demonstrations, program participants may have less commitment to or less experience with actual development of their projects and submit proposal with overly optimistic assumptions.").
140. *Id*. at 21.
141. *Id*. at 22.
142. *Id*. at 22–23.
143. Cal. Pub. Utils. Comm'n, Res, D. 10-12-048, at 37–38 (Dec. 16, 2010).
144. *Id*. at 74.
145. *Id*. at 79 ("Regulator reports on the RAM program are also necessary and we require each IOU to provide an annual report on the RAM.").
146. *Id*. at 2, 10.
147. Cal. Pub. Utils. Comm'n, Rulemaking 11-05-005, at 38 (May 5, 2011).
148. *Id*. at 40.
149. *Id*. at 43.
150. Russell & Weissman, *supra* note 19, at 39.
151. Vote Solar Initiative, *supra* note 30, at 14.
152. *Id*.
153. *See* Cal. Pub. Utils. Comm'n, D. 10-12-048 3 (2010); *California Approves Innovated Program to Spur Mid-Sized Solar, Renewable Development*, BusinessWire (Dec. 16, 2010), http://www.businesswire.com/news/home/20101216006917/en/California-Approves-Innovative-Program-Spur-Mid-Sized-Solar.

ably need to be expanded and extended to meet the statewide target.[154]

During the first three auctions, the IOUs steadily increased their procurement totals but nonetheless failed to meet their auction-specific targets. This made it very unlikely that the IOUs would be able to procure 1,330 MW of DG capacity in the timeframe initially set out for the program. CPUC addressed this issue by extending the period between the third and fourth auction to one full year and adding a fifth auction to be held in June 2014. Based on the results of the fourth auction, it appears that both PG&E and SDG&E are on track to meet their respective targets during the fifth auction: PG&E has procured 372 MW of its 420.9 MW target and SDG&E has procured 105.1 MW of its 154.7 target. SCE, however, has only procured 399.3 MW through the auctions in addition to 73.8 MW from the IOU Solar PV program that was credited towards SCE's RAM allocation, meaning that it would need to procure an additional 281.3 MW during the fifth auction to meet its 754.4 MW target.[155] In the aggregate, the IOUs have procured approximately 876 MW of capacity from renewable DG projects.[156]

Interestingly, the IOUs did not meet their procurement targets despite robust participation from project developers in each auction.[157] Rather, the IOUs actually rejected the vast majority of projects that passed the viability screening process on the grounds that these projects were not cost-competitive.[158] As noted earlier in this paper, the IOUs have discretion to reject uncompetitive bids—the goal being to protect ratepayers against unwarranted increases in electricity prices. It is difficult to assess the reasonableness of these determinations because the specific bid prices for each offer are confidential and thus not available to the public. Nonetheless, CPUC may want to evaluate the manner in which IOUs define "competitive" projects in light of the fact that the IOUs have repeatedly failed to meet their procurement targets despite an abundance of bids from eligible projects. On the one hand, the rejection of so many bids may coincide with the interests of California ratepayers (insofar as a more competitive program will result in lowest-cost projects).[159] On the other hand, it may be possible for the IOUs to slightly modify their threshold for what constitutes a "competitive" project without causing any substantial rate hikes.[160]

Several other factors also impeded the ability of the IOUs to meet their auction-specific target. The first problem was that not all of the winning projects are actually constructed: several developers have withdrawn their projects after they were selected as winning bids,[161] and other projects have been terminated at later stages of the development timeline.[162] The second problem is that the IOUs have not received a sufficient number of competitive bids to fulfill their category-specific targets for baseload and non-peaking intermittent projects, thus contributing to their difficulty in meeting their overall procurement targets.[163] Finally, the RAM rules require the IOUs to adjust their procurement targets for each subsequent auction to incorporate any remaining capacity from the prior auction.[164] Thus, the respective targets for the IOUs have increased in each subsequent auction to reflect the capacity they did not procure in the previous auction, making it more difficult for them to meet those targets.

CPUC could address the first problem of developer withdrawal and project termination by modifying the RAM rules to impose more stringent penalties on developers who withdraw their project after submitting a bid or executing a contract with one of the IOUs. As an alternate approach, CPUC could add to the existing list viability requirements for bidding projects. The current requirements appear to be sufficient in most respects, though, and any further requirements

154. As of 2013, California had an estimated 3,233 MW of renewable distributed energy already online, 2,141 MW of pending capacity, and 3,677 MW of additional authorized capacity. Thus, the state will need to procure an additional 2,949 MW before 2020 in order to meet its target. This minimum figure assumes that all pending and authorized capacity will come online by 2020. Robert B. Weisenmiller, Cal. Energy Comm'n, From Research to Deployment: California's Solar Energy Progress 8 (2013).

155. These figures are based on information provided by the IOUs in their 2014 Annual Compliance Reports. Appendix A contains several tables which further illustrate the progress that each IOU has made towards its procurement targets during the first four RAM auctions. For a more detailed overview of the status of all projects that have won bids during the RAM, *see* Southern California Edison Company's (U-338-E) First Compliance Report on the Renewable Auction Mechanism Program (January 17, 2014); Pacific Gas and Electric Company's (U 39 E) January 17, 2014 Compliance Report on the Renewable Auction Mechanism Program (January 17, 2014); San Diego Gas & Electric Company (U 902 E) Renewable Auction Mechanism Program Annual Compliance Report (January 17, 2014).

156. This figure does not include winning projects which were terminated after the contract was executed with the IOU.

157. The total number of megawatts offered to each IOU in each auction greatly exceeded the number of offers and megawatt selected. For example, SCE received offers totaling 1,261 MW and only executed contracts for 67 MW during the first auction. A similar trend can be observed for both SCE and PG&E in subsequent auctions. *See* Advice Letter 4114-E, at 4 (Sept. 28, 2012); *see also* Advice Letter 2712-E, at 7 (Mar. 29, 2012).

158. *See* Southern California Edison Company's (U-338-E) First Compliance Report on the Renewable Auction Mechanism Program (January 17, 2014); Pacific Gas and Electric Company's (U 39 E) January 17, 2014 Compliance Report on the Renewable Auction Mechanism Program (January 17, 2014); San Diego Gas & Electric Company (U 902 E) Renewable Auction Mechanism Program Annual Compliance Report (January 17, 2014).

159. Comments of the Division of Ratepayers on Draft Resolution E-4582 (Apr. 29, 2013), *available at* https://www.pge.com/regulation/RenewablePortfolioStdsOIR-IV/Pleadings/DRA/2013/RenewablePortfolioStdsOIR-IV_Plea_DRA_20130429_273302.pdf.

160. This issue is discussed in further detail *infra* at Part I.C ("Economic Goals").

161. For example, SCE had selected nine offers during RAM 1, but two of the winning developers subsequently decided not to sign a contract with SCE, thus leaving SCE with only seven contracts after RAM 1. *See* Advice Letter 2712-E, at 6 (May 2, 2012). In RAM 2, SCE selected ten offers and five subsequently decided not to sign a contract. *See* Advice Letter 2875-E, at 3 (Oct. 1, 2012). Similarly, PG&E originally selected eight bids in RAM 2, but one of the winning developers also withdrew its contract. *See* Supplemental Filing to Advice Letter 4114-E-A, at 2 (Oct. 26, 2012).

162. *See, e.g.*, Southern California Edison Company's (U-338-E) First Compliance Report on the Renewable Auction Mechanism Program, Attachment E (Jan. 17, 2014) (identifying nine projects which won bids but were subsequently terminated).

163. *See* Appendix A for tables which illustrate the specific types of resources targeted and procured in each auction.

164. This is common practice with reverse auctions. *See* Daniel Sinaiko, *Renewable Energy—Finance: Financing US Renewable Energy Projects in a Post-Subsidy World*, 29 (10) Natural Gas and Electricity 7 (2013) ("[w]ith a reverse auction, either (1) prevailing bidders will underprice their bids and projects will not be built or (2) bidders will accurately price their bids and projects will be successful. Under customary program rules, the capacity associated with incomplete projects is returned to the procurement pool to be re-bid. Correctly priced projects may be elbowed out of the way by more aggressive bidders in the short term, but, in the long run, as completion costs become more certain and bids become more realistic, viable tariff rates are likely to prevail.").

would increase the cost for developers without providing any additional certainty that their bid will be successful. CPUC could also modify the RAM to rules to require the IOUs to select alternative bids which the IOUs can then rely on if a winning bid subsequently withdraws its contract.

One way to address the second problem of the lack of competitive baseload and intermittent non-peaking projects would be to relax the category-specific procurement targets. This might, however, undermine the goal of promoting technological and resource diversity in renewable DG installations. This issue is discussed in further detail in Section III(C)(1) ("Project Diversity").

B. *Economic Goals*

As noted above, the RAM program is designed to achieve the rapid deployment of wholesale DG technologies at the least possible cost to utility customers. The program is also designed to open up the market for DG installations, foster competition between developers, and promote the growth of a sustainable long-term market for DG resources.[165] Thus far, it appears that the RAM has been quite successful at achieving these economic goals. The only concern is that the program may even be *too competitive* because of the extremely high number of rejected bids.[166] Whether this fact is viewed as a strength or a weakness depends largely on perspective, i.e., whether the program is assessed from the point of view of IOUs and ratepayers or DG project developers.

1. Cost-Competitiveness of Executed Contracts

In RAM 1, the weighted average of the *highest* executed contract price from each of the three IOUs was approximately 8.9 cents/kWh.[167] This price was well below 2011 retail electricity rates in California, which ranged from 12.6–16.8 cents/kWh.[168] As another point of comparison, the RAM 1 contract prices fell within the range of the 2011 Market Price Referents ("MPR"), which are based on prices from the 2011 RPS Solicitations and used to determine FIT prices starting in January 2012.[169] The RAM also appears to be more cost competitive than the RPS PPAs signed after the Request for Offers ("RFO").[170]As noted in the previous section, the IOUs rejected a large number of bids on the basis that such bids were not "competitive" despite the relatively low contract prices in the first auction.[171]

As a result, the IOUs failed to meet their procurement targets in each auction. CPUC may need to revisit the "cost competitive" standard in order to ensure that procurement targets are still met. However, CPUC is constrained in this context by FERC rules, which require CPUC to rely on market-based rates for wholesale electricity sales[172] or to set prices at avoided cost for IOU purchases from qualifying facilities.[173] CPUC decided to pursue the market-based approach in order to avoid any potential legal disputes with FERC and also implement a new procurement mechanism as quickly and efficiently as possible. As a result, it is unclear whether CPUC could curtail IOU discretion in rejecting uncompetitive bids, e.g. by adopting clearer guidelines for what constitutes a competitive bid.

2. Developer Participation and Competition

Another key economic goal of the RAM is opening the DG market and fostering competition between developers in order to encourage the development of efficient DG projects.[174] Participation levels from the first three auctions suggest that the program has succeeded in this regard. The number of bids and MW offered greatly exceeded the number of bids and MW actually selected by the IOUs.[175] As noted by PG&E in its 2014 Program Compliance Report, there was a "robust responses to the RAM solicitations" and this is a "good indication of a competitive market."[176] In addition, PG&E found that the price behavior that was observed during the first four auctions supports the finding that there is sufficient competition between developers.[177]

The advice letters also indicate that the vast majority of bids did survive initial screening processes (which are used to verify that projects meet the viability requirements).[178] For example, in RAM 3, SCE found that ninety-three projects with a total capacity of 1,404 MW survived its initial screens.[179] Similarly, PG&E only eliminated one project dur-

165. *See* Eric Wescoff, *California Renewable Auction Mechanism RAM Now Official*, GreenTechMedia (Aug. 18, 2011), http://www.greentechmedia.com/articles/read/california-renewable-auction-mechanism-ram-now-official.
166. Adam Browning, *RAM Results: 11 projects, 130 MW Total, Most Solar, All Under 8.9 cents/kWh*, Vote Solar Initiative, http://votesolar.org/2012/03/30/ram-results-11-projects-130-mw-total-most-solar-all-under-8-9-centskwh/ (last visited Oct. 6, 2013).
167. Individual contract prices are lower, but it is impossible to know how much lower because this information is confidential. *See* Cal. Pub. Utils. Comm'n, D. 12-050035, Order Instituting Rulemaking to Continue Implementation and Administration of California Renewables Portfolio Standard Program (May 24, 2012) at 110; Carl et. al., *supra* note 1, at 84.
168. *Rate Charts and Tables — Electricity*, Cal. Pub. Utils. Comm'n, http://www.cpuc.ca.gov/PUC/energy/Electric+Rates/ENGRD/ratesNCharts_elect.htm (last visited Jun. 13, 2013).
169. Specifically, the 2011 MPRs range from 7.6–9.2 cents/kWh for a contract starting in 2012, depending on the duration of the contract. The MPRs have been used to calculate the FIT prices prior to the amendments to the FIT rules in 2013, which now link FIT prices to the highest executed contract in the RAM auctions (referred to as the "renewable market adjusting tariff" or "RE-MAT"). *See Feed-in Tariff Price*, Cal. Pub. Utils. Comm'n, http://www.cpuc.ca.gov/PUC/energy/Renewables/Feed-in+Tariff+Price.htm (last visited Jun. 13, 2012); Cal. Pub. Utils. Comm'n, Res. E-4442 (Dec. 1, 2011) (adopting the 2011 MPRs for determining the FIT prices); Cal. Pub. Utils. Comm'n, D. 12-05-035 (May 24, 2012) (adopting the RE-MAT as the new mechanism for determining FIT prices).
170. Specifically, CPUC has estimated that the average rate of electricity procured through the RFO process through 2020 will be approximately $105.85/MWh (or $1.05/kWh). Carl et al., *supra* note 1, at 45.
171. *See generally* Advice Letter 2785-E/E-A (Nov. 14, 2012); Carl et. al., *supra* note 1.
172. *See* Order No. 697, Market-Based Rates For Wholesale Sales Of Electric Energy, Capacity And Ancillary Services By Public Utilities, 119 FERC ¶ 61,295, at 2 (2007).
173. Public Utility Regulatory Policies Act (PURPA), 16 U.S.C. § 824a-3 (2006).
174. *See Renewable Auction Mechanism*, *supra* note 71.
175. *See* Appendix B for an overview of Offers, Parties Submitting Offers and Executed Contracts, as well as an overview of offered and procured capacity.
176. Pacific Gas and Electric Company's (U 39 E) January 17, 2014 Compliance Report on the Renewable Auction Mechanism Program (Jan. 17, 2014) at 6.
177. *Id.*
178. *See* Advice Letter 2712-E, at 243 (Mar. 29, 2012); *see also* Advice Letter 2785-E, at 9 (Oct. 1, 2012).
179. *See* Advice Letter 2894-E, at 8 (Mar. 29, 2012).

ing the screening process in RAM 3. Thus, there has been an ample supply of bids that represent potentially viable projects.[180]

In light of these findings, it is clear that the RAM has successfully attracted a large number of interested developers and that the project viability requirements are not overly stringent. These findings also suggest that procurement targets could be successfully expanded without compromising the integrity of the program. There is still a question, however, regarding the cost-competitiveness of many project offers since the IOUs rejected many bids on this ground.

3. Reasonableness of Project Viability Requirements

Project viability requirements help to ensure that selected bids represent realistic and viable projects, as opposed to speculative or "low-ball" estimates for unrealistic projects.[181] However, these viability requirements also create barriers to entry for smaller developers and unconventional projects. Thus, there is a potential tradeoff between project security and broad participation in the RAM auctions. For example, "[r]equiring large fees and securities in order to bid could limit the number of potential bidders to only well capitalized companies"[182] and may also screen out more innovative projects. Similarly, the requirement that projects must be based on commercialized technology may coincide with the program goal of accelerating wholesale DG development at the lowest cost to ratepayers. However, this criterion also means that experimental technologies cannot obtain financing under the RAM.[183] Finally, the Vote Solar Initiative notes that stringent viability requirements may create "development bubbles" insofar as they require developers to achieve certain milestones in advance of contracting (e.g., the developer must submit interconnection study requests and the project must be ready to come online within 24 months).[184] These requirements may result in unintended regulatory consequences, such as flooded interconnection queues.[185] They also place significant risk on project developers during the early stages of project development.[186]

Based on the relatively high participation levels in the first three auctions, it does not appear that the RAM viability requirements are overly stringent. Thousands of bids have been submitted, and the vast majority of these have survived the initial screening process.[187] Because cost-effectiveness is one of the primary program goals, it makes sense that the program focuses on commercialized technologies. The state can target experimental technologies with other programs that provide research and development funding and incentives.

However, because many "viable" bids have been rejected, it may be possible that the RAM has indeed created to a "development bubble" with many developers investing time and money into the development of projects that will never be financed through the RAM. It may be prudent for CPUC or another state agency to evaluate the fate of unsuccessful projects and determine if too much risk is being placed on these developers or if considerable investment has gone into projects that will never be developed. This information will be important for the ongoing viability of the program because if developers lose faith in the program, the RAM may cease to be an effective procurement tool.

4. Speculative Bidding

The large number of projects that passed initial viability screens suggests that the majority of bids are based on realistic projections and reasonably well-developed projects. The fact that many developers have withdrawn their contracts after receiving an offer from an IOU, however, raises questions about whether those bids were speculative.[188] Details on individual offers are confidential, so it is not possible to identify the exact reason for withdrawal. It is clear, however, that CPUC may wish to incorporate additional features into the RAM so as to deter this behavior in future auctions.

One issue that CPUC may wish to reconsider is the due date of development deposits. Currently, development deposits are not due until the signing of the contract.[189] Thus, the developers may revoke their offer after selection by the IOU, but before signing the contract.[190] The rules could be modified to require developers to post some sort of security during the auction, which would then be refunded for rejected bids. Alternatively, CPUC could directly impose a penalty on developers who withdraw projects after a winning bid.

Another option would be to increase the flexibility of the program to make it easier for IOUs to select alternative bids in the event that a winning developer decides against signing a contract. As noted in subsection A ("Procurement Goals"),

180. As noted in Part III.B.3, the high number of rejected bids that represented potentially viable problems may be problematic, insofar as it may create a "development bubble" that deters other developers from participating in the program in the long-term.

181. *See* Russell & Weissman, *supra* note 19, at 46 (citing Cal. Pub. Utils. Comm'n, D. 10-12-048, at 53-54 (Dec. 16, 2010)) ("In response [to concerns about underbidding], other stakeholders pointed to the safeguards included in the [RAM] program to ensure project viability… According to the Commission decision approving the program: "to the extent putting capital at risk in the form of a security [or 'development'] deposit will screen more speculative projects out of the solicitation, it is to ratepayers' benefit to require such deposits. … Further, a reasonable deposit will help filter out projects that investors believe have no chance of success.").

182. Vote Solar Initiative, *supra* note 30, at 20.

183. Cal. Pub. Utils. Comm'n, Res. E-4489, at 32 (Apr. 19, 2012) at 32.

184. Vote Solar Initiative, *supra* note 30, at 19–20.

185. *Id.*

186. *Id.*

187. *E.g.*, For RAM 1 SCE received 92 offers and 45 remained after screening. *See* Advice Letter 2712-E, at 5 (May 2, 2012). During RAM 2 SCE received 142 offers and 113 offers remained after initial screening. *See* Advice Letter 2785-E/E-A, at 6 (Nov. 14, 2012). Similarly, for RAM 3 SCE received 130 offers and 93 offers remained after initial screening. *See* Advice Letter 2894-E, at 6–7 (May 1, 2013).

188. Cal. Energy Comm'n, 2011 Integrated Energy Policy Report 30 (Feb. 15, 2013) (noting contract failure rates as high as 40%).

189. Cal. Pub. Utils. Comm'n, Res. E-4582, Changes to the Renewable Auction mechanism for Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company 19 (May 9, 2013).

190. Cal. Pub. Utils. Comm'n, D. 10-12-048, at 31 (Dec. 16, 2010) (the "development deposit is due on the date of contract execution in the form of cash or letter of credit from a reputable U.S. bank; development deposit forfeited if project fails to come on line within 18 months or other 6-month extension granted by IOU.").

CPUC could even require the IOU to select "second place" bids, which would serve as backup projects to ensure that each IOU meets its capacity target in each auction.

5. Progress toward Grid Parity and Sustainable DG Markets

Another purpose of the RAM, inextricably related to cost-competitiveness and DG deployment, is to promote grid parity between renewable DG resources and other power sources.[191] Achieving grid parity will require that renewable DG prices continue to decrease.[192] The U.S. Partnership for Renewable Energy Finance ("US PREF") describes how the RAM is designed to achieve this objective:

> The CA RAM program combines competitive program elements that drive reductions from the entire cost structure of ground mount PV systems in CA and help accelerate grid parity for solar PV projects that meet the relatively standardized requirements of the program. Developers know that to win, cost-reducing innovations are required from all aspects of a project, from development to construction to the ultimate financing structures used. Innovation will be paramount in the three remaining RAM auctions where potentially 6 GW of sub-20 MW projects in CA compete for the remaining 688 MW of remaining CA RAM program volume.[193]

Given the modifications to the procurement targets and the addition of a fifth auction (without any additional capacity), the competition during the remaining two auctions should be even higher than anticipated by US PREF.

In addition to the competitive framework, it is anticipated that the structure and certainty offered by the RAM program also will contribute to cost reductions in the long-term.[194] The Vote Solar Initiative[195] asserts that the "creation of consistent, predictable, and repeated market opportunities over a sufficient period of time will help drive cost reductions and develop self-sustaining solar [Wholesale Distributed Generation] markets."[196] Specifically, Vote Solar explains:

> Renewable developers need ample market opportunities in order to accelerate labor and managerial learning, technology and process improvement, product standardization, and create economies of scale. Persistent and iterative experience with renewable generation will also encourage utility management, transmission and distribution planners and engineers grid operators, financial institutions, equipment suppliers and state regulators and policy makers to adapt their current approaches to electricity procurement and system planning and operation as required for high penetration of distributed renewable resources.[197]

US PREF also notes that the transparency, structure and capacity targets in the RAM provide "the kind of regulatory certainty required to attract significant private capital to the renewable sector and build an industry of the scale required to squeeze out costs and begin to compete with conventional sources of electric generation."[198]

The RAM also serves an important function insofar as it provides valuable market information for investors and developers. As noted by the Vote Solar Initiative, the creation of "robust and sustainable renewable generation markets" will require "not only renewable technology investment and deployment, but also a complementary dissemination of knowledge throughout the entire energy market."[199] US PREF concludes that the RAM achieves this purpose "[b]y providing market transparency and a frequent feedback loop to communicate the average auction clearing price, the program enables price discovery informing participants that in six months the next clearing price will likely be lower."[200] The RAM feedback loop also helps developers identify which technologies and systems are most efficient for providing renewable energy at the lowest cost.[201]

There is evidence that wholesale DG prices are already declining relatively quickly in California, although it is impossible to attribute this result solely to the RAM when there are many other policies in place to promote DG development. US PREF notes that the DG industry is already transforming "as module manufacturers have ramped up capacity and brought down the largest cost component of a solar PV facility."[202] Solar PV technologies have experienced a sharp drop in prices, significantly more so than other DG technologies.[203] This cost reduction raises an interesting question about whether the RAM rules should encourage or require the IOUs to procure a more diverse array of DG resources (to facilitate price reductions for other technologies) or instead allow the IOUs to focus on procuring DG from relatively inexpensive solar PV installations.

C. Project Goals

In addition to the broad procurement goals and economic goals discussed above, the RAM program is also designed to achieve certain project-specific goals to maximize the benefits associated with DG development. One such goal is to ensure that projects will come online and produce energy within a reasonable timeframe.[204] Although a few of the RAM 1 projects are now operating, the vast majority of RAM projects are still in construction and thus there is insufficient data to assess the program's success on that point. Instead, this section will examine goals related to project diversity and optimal siting. Based on the executed contracts from RAM 1 and

191. US PREF, *supra* note 69, at 42.
192. *Id.*
193. *Id.*
194. Vote Solar Initiative, *supra* note 30, at 8.
195. The Vote Solar Initiative is a California-based initiative which promotes the expansion of California's solar resources. Additional information is available on their webpage: http://votesolar.org/.
196. *Id.*
197. *Id.*
198. US PREF, *supra* note 69, at 42.
199. Vote Solar Initiative, *supra* note 30, at 7.
200. US PREF, *supra* note 69, at 41.
201. *Id.*
202. US PREF, *supra* note 69, at 42.
203. Cal. Energy Comm'n, 2011 Integrated Energy Policy Report, Commission Final Report, Publication # CEC-100-2011-001-CMF, at 10 (Feb. 15, 2012).
204. *See infra* Part III.B.3.

RAM 2, and the proposed contracts from RAM 3, it appears that the program has not successfully fostered the development of a diverse array of DG projects nor has it contributed significantly to the development of DG projects that are sited close to load centers.[205]

1. Project Diversity

The RAM program has been highly successful at promoting the procurement of solar PV projects, but other technologies have been underrepresented in both submitted and successful bids.[206] For example, solar PV accounted for over 95% of all bids in the first auction, and thirteen of the fifteen winning projects were solar PV projects.[207] Since RAM 1, the number of baseload and non-peaking intermittent bids has steadily increased, and the procurement of such resources has grown modestly.[208] However, the IOUs have still repeatedly failed to meet their procurement targets in those categories.[209]

The lack of project diversity can be explained by the fact that solar PV technology is well-developed and less expensive than other DG options, and thus, this technology has a clear advantage in the auction.[210] During the first auction, the key problem was that solar PV installations accounted for an overwhelming percentage of project bids, which prevented the IOUs from meeting their targets in other areas.[211] As noted by Carl et al.:

> The November 2011 first RAM auction was a learning process. PG&E, for example, aimed to accept bids for 105 MW of capacity split evenly over the three project categories (baseload, peaking, intermittent), but could not fill its quota for renewable baseload projects and as-available, off-peak intermittent projects (geothermal, landfill gas, biomass, small wind, and small hydro) while peaking projects (mostly solar PV) were far oversubscribed. PG&E requested CPUC approval for just 63 MW of projects.[212]

Similarly, SCE failed to procure any baseload or intermittent non-peaking energy because ninety-one of the ninety-two offers it received were for solar PV installations.[213] CPUC responded to this situation by requiring the IOUs to engage in more outreach to non-solar PV developers, to encourage their participation in RAM 2.[214] These efforts were partially successful, leading to a significant increase in the capacity of bids from non-solar generators in RAM 2.[215]

The IOUs nonetheless failed to meet their baseload and non-peaking intermittent targets in subsequent auctions.[216] They rejected most of the offers in these categories because they determined that the offers were not cost-competitive.[217] SCE, for example, has yet to procure a single megawatt of baseload electricity through the RAM, notwithstanding the fact that the company was directed to target a minimum of 3 MW per auction.[218] None of the IOUs procured any baseload DG in RAM 3.[219]

If CPUC is concerned about project diversity, then CPUC also could impose more stringent quotas for the procurement of a diverse portfolio of resources. This approach would not run afoul of FERC jurisdiction because FERC already has conceded that states may require utilities to purchase electricity from specified resources.[220]

Ultimately, this issue is a question of trade-offs and policy preferences.[221] Provisions to promote cost-effectiveness must be weighed against the desire to promote the development of a diverse array of different DG resources and technologies.[222] That said, from a long-term sustainability outlook, it makes sense to design a program that will facilitate procurement of different types of DG resources, including—perhaps most importantly—baseload DG.

2. Project Location

Another concern about the RAM program is that many of the winning projects are sited in relatively remote areas. For example, the first auction "resulted in projects that are sited . . . . almost exclusively in the sparsely-populated high desert region east of Los Angeles."[223] This trend appears to have continued in the second and third auctions, as many of the winning projects were located in relatively remote areas, far away from population centers.[224] The vast majority of the bids are sited in rural areas and therefore the IOUs have very

205. *See supra* note 215; *Renewable Auction Mechanism, supra* note 71.
206. *See supra* note 187; *see, e.g.*, Advice Letter 2482-E at II.B.
207. *See supra* note 187; S. Cal. Edison Advice Letter 2712-E (May 2, 2012); PG&E Advice Letter 2420-E (May 2, 2012); SDG&E Advice Letter 2343-E (May 2, 2012).
208. *See supra* note 215; *See e.g.* S. Cal. Edison Advice Letter 2849-E (June 3, 2013).
209. *See* Appendix A for tables which illustrate the specific types of resources targeted and procured in each auction.
210. *See* US PREF, *supra* note 69, at 41–42. "Although individual contract pricing is not publicized, we know from the average high clearing price that energy-only solar PV is going for sub $90/MWhr prices and is likely headed lower." *Id.* at 42.
211. *Id.*
212. Carl et al., *supra* note 1, at 57, n 116.
213. S. Cal. Edison Advice Letter 2712-E, at 5 (May 2, 2012).
214. *See* Carl et al., *supra* note 1, at 57 n 114.
215. *See infra* Appendix A, Fig. 3.
216. *See infra* Appendix A.
217. S. Cal. Edison Advice Letter 2712-E (May 2, 2012) at App. Accion Report 9; *see* supra note 189.
218. *See infra* Appendix A; *see also* Advice Letter 2894-E (U-338E) (May 1, 2013), at 3.
219. *See infra* Appendix A.
220. Order on Petitions for Declaratory Order, 132 FERC ¶61,047 (July 15, 2010).
221. *See* Vote Solar Initiative, *supra* note 30, at 17. (The Vote Solar Initiative explains the considerations that may factor into this decision: "[w]hile it is appropriate for utilities to signal the product they want to procure based on their portfolio needs, and to look at time-of-delivery profiles in evaluating bids, a program focused on accelerating renewable development at the lowest cost to ratepayers may want to be technology neutral. Technology-specific quotas have the ability to erode the market's ability to achieve economically competitive outcomes that meet renewable targets at lowest possible costs. Nonetheless, quotas may be a useful part of the program design in markets where more mature technologies with lower costs are displacing promising, but less mature technologies with higher costs, or in situations where quotas are necessary to achieve specific societal or environmental goals, such as conversion of agricultural waste to energy.").
222. Russell & Weissman, *supra* note 19, at 40.
223. *Id.* at 5.
224. *E.g.*, most of PG&E's winning projects from RAM 2 and RAM 3 were sited in central California (PG&E). *See* Advice Letter 4216-E, at 10 (May 29, 2013); Advice Letter 4114-E, at 9–10 (Sept. 29, 2012). Most of SCE's winning projects were located in the desert in the southeast portion of California. *See* Advice letter 2894-E, at Appendix E (May 1, 2013); Advice Letter 2785-E/E-A, at Appendix E (November 14, 2012).

few choices that are truly "local" in the sense that they are proximate to load centers.[225]

The consequence of remote siting is that many of the benefits associated with DG projects have not been fully realized (e.g., reduced transmission losses, deferred investment in transmission and distribution infrastructure, easier load management). As noted by the Interstate Renewable Energy Council ("IREC"):

> DG projects can provide a host of benefits, but not every DG project offers the benefits equally. Siting of DG facilities is critical because many of the benefits are location-specific and are maximized when DG is located near the customers it serves. The closer generation is to load, the less the energy has to travel to serve its intended purpose, thereby reducing line losses and the infrastructure that is required to transmit the energy.[226]

Remotely sited DG projects also can cause problems for rural electricity systems that are intended to serve smaller populations. The IOUs already have expressed concerns about this matter.[227] According to representatives from SCE, the "biggest barrier to the interconnection of [local energy resources] is that projects tend to locate in remote areas."[228] The SCE anticipates that the influx of DG projects in rural areas will require significant infrastructure upgrades, as compared with DG projects in urban load centers.[229]

The SCE noted that DG is often sited in rural areas "because land costs are lower, permitting may be simpler, and generator output may be maximized."[230] The sparsely populated regions in California's Central Valley and the desert east of Los Angeles also provide ample sunlight for solar PV installations and greater wind flow for wind installations.[231] Thus, California policymakers cannot simply expect DG project proposals to be sited in optimal locations. Although the RAM program does provide information that may facilitate efficient siting practices (e.g., the "preferred location" maps prepared by the IOUs),[232] the program does not effectively incentivize efficient siting of DG projects near load centers.

Specifically, critics argue that the RAM has failed to encourage development of truly "local" projects because it does not contain locational restrictions for eligible projects.[233] As noted by Russell and Weissman (2012), "[t]he current framework for the Renewable Auction Mechanism places very few restrictions on the types, sizes and locations of projects that are eligible for the auction,"[234] and moreover, "[t]here are no incentives to locate local projects where they can help avoid network modifications, improve grid resilience, or provide energy close to load."[235] The IREC similarly found that California's DG procurement programs, including the RAM, "do not prioritize development in higher-value locations, having the lowest interconnection costs and the greatest potential to defer utility upgrades to their transmission and distribution systems."[236] This raises questions as to whether and how CPUC should introduce location-based incentives or requirements for project developers that participate in the RAM.

It is important to keep in mind that the lack of locational restrictions may have advantages as well as disadvantages. As noted by Russell and Weissman (2012) in a recent survey of RAM stakeholders: "[o]ne of the benefits of such an unfettered, market-based approach is that it can result in less expensive projects and lower costs for ratepayers" even if it is a less potent tool for achieving other objectives such as land preservation and reduced transmission losses.[237] The authors find that this trade-off between different program objectives is indicative of what many stakeholders perceive as a "fundamental conflict" between policies that aim to promote the development of DG resources at specific locations and programs such as the RAM which favor lowest cost projects.[238]

However, with respect to project siting, there may not actually be a "fundamental conflict" between cost considerations and other goals.[239] On the contrary, remotely sited DG projects could ultimately result in higher costs to ratepayers and reduced economic benefits. Russell and Weissman further explain:

> [T]he sites that present the least expense and level of complexity to develop resemble, in many respects, sites for utility-scale projects. They are located in similarly remote parts of the state where there is plenty of inexpensive and undeveloped land. Those projects would do little to generate jobs within cities or balance existing pockets of load on the grid, though they would meet the articulated auction goals or developing renewables as quickly as possible at the lowest cost possible. Remotely-located projects could require expensive transmission upgrades and contribute to existing transmission line congestion during the hours of peak load. They also… are less efficient that [sic] projects located closer to load due to line losses.[240]

Thus, from a broader economic standpoint, it may be prudent to encourage the development of projects that are sited closer to load centers even if this results in higher bid prices.

225. *See* Appendix B for maps of project bids.
226. Interstate Renewable Energy Council (IREC), Blueprint for the Development of Distributed Generation in California 3 (2012) [hereinafter IREC].
227. Russell & Weissman, *supra* note 19, at 5.
228. *Id.*
229. *Id.* at 18 (citing Letter from Kelly Boyd, Director, Legislative Affairs, Southern California Edison, to the Center for Law, Energy & the Environment (March 23, 2012)).
230. *Id.*
231. *See id.* at 75.
232. *See* Advice Letter 3809-E, at 2, 19 (Feb. 25, 2013).
233. Russell & Weissman, *supra* note 19, at 5. ("The many economic, environmental and societal benefits of localized energy resources are not captured or supported by existing energy policies due to the absence of critical locational criteria in the definition of "localized generation." A definition that includes locational attributes—including, at a minimum, connection to the distribution grid in areas where energy can supply load without backflowing into the transmission system—is critical to development of procurement programs and other state policies to capture the manifold benefits of 12,000 megawatts of localized energy resources.").
234. *Id.* at 6, 50.
235. *See id.* at 6 (quoting comments from conference participants).
236. *See* IREC, *supra* note 226, at 6.
237. *See* Russell & Weissman, *supra* note 19, at 50.
238. *Id.* at 98–99.
239. *Id.*
240. Russell & Weissman, *supra* note 19, at 47.

CPUC has made two attempts to promote more "localized" siting of DG projects procured through the RAM. First, as noted above, CPUC requires the utilities to publish interconnection maps, which identify the best areas for DG procurement opportunities.[241] Second, CPUC revised the RAM rules to allow utilities to account for ratepayer funded transmission upgrade costs as well as the resource adequacy value of different DG bids.[242]

These modifications to the RAM might be more effective if the IOUs received more offers from load centers, because such offers might ultimately be considered more cost-competitive under the revised pricing guidelines. Because most of the offers are sited in remote locations, however, CPUC may need to adjust the rules to either incentivize developers to submit offers for local projects or impose specific locational restrictions. Russell and Weissman made several recommendations to this effect. First, they recommend that CPUC use a revised definition of "localized generation" which includes, at minimum, "connection to the distribution grid in areas where energy can supply load without back flowing into the transmission system."[243] Second, CPUC could require each IOU to obtain a certain percentage of wholesale DG based on locational criteria (e.g., sited within particular distance from consumption center, connected to distribution rather than transmission grid).[244] Third, CPUC could amend the RAM "to provide financial incentives to developers for siting projects in optimal locations."[245] Fourth and finally, CPUC could establish "separate, smaller auctions with criteria for location, size and other attributes that direct development to preferred sites such as rooftops" to accomplish objectives such as rooftop development, land preservation or job creation.[246]

Russell and Weissman also noted that CPUC could expand the FIT program instead of modifying the RAM, because eligibility for the FIT requires connection to the distribution system.[247] Like the RAM, the FIT could be further "tailored to encourage development of projects in specific locations or of certain technologies."[248]

In addition, the IREC notes that a project's location on the distribution system is only one relevant factor in the determination of a project's value.[249] The IREC recommends that procurement programs "use a more nuanced view of DG that looks at more than whether the project has a distribution or transmission level interconnection, particularly in light of the amount of sub-transmission in place in the state."[250] Moreover, the IREC recommends that the benefits of locating DG in higher-value areas should be further quantified so that "DG developers that locate in higher-value areas under wholesale procurement programs [can] be compensated for the benefits associated with their site selection."[251]

Going forward, it is clear that all of the above proposals will require extensive data about interconnection needs and locational benefits. The interconnection maps provided by each IOU under the RAM are an important first step towards this goal. Russell and Weissman further recommend that regulators develop a more comprehensive, statewide data clearinghouse for localized renewable energy generation planning.[252] This clearinghouse could include items such as "detailed information about the existing distribution grids and planned upgrades, natural resource values, land use constraints, and availability of local and state incentive programs."[253]

D. *Adaptive Learning*

With a pilot program such as the RAM, it is helpful to incorporate procedures for ongoing monitoring, reporting, and revision of program features. Such procedures ensure that program rules can be revised to account for unexpected contingencies as well as lessons learned. Moreover, ongoing monitoring and reporting also can "accelerate market learning and experience," which is one of the objectives of the RAM.[254]

Based on evidence from the first three auctions, the RAM appears to have adequate provisions in place to promote adaptive learning. Specifically, the program rules require each IOU to use an Independent Evaluator ("IE"), who is not connected to any market participant, to oversee the RAM auctions.[255] The IE must monitor the auctions and submit a report evaluating the outcomes and assessing their reasonableness.[256] As noted in Section III.B, the rules also require each IOU to produce annual reports which "shall address the competitiveness of the auctions; auction timing and design issues; and project status, including the time and the cost necessary to interconnect and bring projects on-line."[257] In addition, the IOUs must "work with [CPUC] staff to develop a simple methodology to measure the status of project development" and, having established that methodology, report on project development milestones.[258] Finally, the rules provide for relatively streamlined and expeditious modification of the program. In particular, the rules specify that the Commission "can modify any element of the program at any time through a Commission resolution."[259] The rules also allow the IOU to "proactively modify" their interconnection pro-

241. *See* Cal. Pub. Util. Comm'n, D. 10-12-048, at 72 (Dec. 16, 2010).
242. *See generally* Cal. Pub. Util. Comm'n, Public Utility Code Section 748 Report to the Governor and the Legislature on actions to Limit Utility Cost and Rate Increases (2013), *available at* http://www.cpuc.ca.gov/NR/rdonlyres/67AEBAAC-A9B7-4A28-9400-0598F92E0A0/0/SB695report2013final.pdf.
243. Russell & Weissman, *supra* note 19, at 5.
244. *See id*. at 70.
245. *Id*.
246. *Id*. at 50.
247. *Id*. at 53.
248. *Id*. at 47.
249. *See* IREC, *supra* note 226, at 3.
250. *Id*. at 6.
251. *Id*.
252. Russell & Weissman, *supra* note 19, at 11.
253. *Id*.
254. Vote Solar Initiative, *supra* note 30, at 28.
255. Cal. Pub. Utils. Comm'n, D. 10-12-048, at 36–37 (Dec. 16, 2010).
256. *Id*. at 95.
257. Cal. Pub. Utils. Comm'n, D. 10-12-048, at 75 (Dec. 16, 2010).
258. *Id*. (noting that the "purpose of the RAM is the procurement of projects that come online quickly" and that periodic reporting on project development milestones is necessary "in order to ensure that the program protocols and program design result in that outcome").
259. *Id*. at Appendix A, at 6.

tocols[260] and their standard contracts, noting the need for flexibility in this context.[261]

Thus far, the ability to modify the RAM rules following each auction has resulted in some beneficial changes to the program. Two key modifications include: (1) IOUs can now account for transmission and upgrade costs and the resource adequacy value of DG projects when deciding on bids;[262] (2) the timeframe in which projects must come online after execution of RAM contracts has been extended from 18–24 months.[263]

As noted in Section III.C.1, the first auction also provided useful information for regulators, IOUs, and project developers about the universe of potential DG projects, which allowed the IOUs and regulators to adjust the program accordingly.

IV. Conclusions and Recommendations

The RAM program has been initially successful at expediting the procurement of renewable wholesale DG resources at a relatively low cost to ratepayers. Although the IOUs have not met their procurement targets on schedule, they have managed to secure approximately 876 MW of renewable wholesale DG resources at cost-competitive rates and will presumably meet their targets by July 2014.[264]

Another key strength of the RAM program is that it can be quickly and efficiently modified following each auction to incorporate lessons learned. Thus far, CPUC has quickly responded to concerns about project timelines that were too short, project bids that did not account for resource adequacy considerations, and unrealistic procurement goals.[265]

There are, however, several limitations to the RAM program. First, the program has failed to promote the procurement of a diverse array of renewable technologies.[266] Second, the program has failed to ensure that winning projects are actually sited locally to take full advantage of the benefits that DG has to offer.[267] Third, the IOUs have not met their procurement targets on time both because certain winning bids subsequently withdrew their contracts and because the IOUs determined that many bids were not cost-competitive.[268] Ultimately, these three limitations all relate to the overarching concern that the RAM supports the lowest cost projects without taking other key factors into account.

CPUC could address all three of these limitations by modifying the RAM rules, in accordance with some of the recommendations set forth in Section III.[269] Yet, such modifications may conflict with CPUC's goal to keep costs as low as possible for ratepayers. In order to make an effective trade-off between cost-competitiveness goals and other program goals, this Article concludes with the following recommendations:

- ***Local Siting*** **—** Ensuring that the winning projects are truly "local" will yield economic and environmental benefits, and thus, CPUC should prioritize this goal.
- ***Project Diversity*** **—** If CPUC decides that economic considerations are paramount, then a technology-neutral program is probably the most effective way to achieve low-cost procurement. However, if CPUC would like to place more emphasis on project diversity, then it could experiment on a small scale without placing an unwarranted burden on ratepayers (e.g., by establishing small, technology-specific targets for each IOU, taking into account their respective circumstances, or by holding smaller, separate auctions for baseload and intermittent non-peaking energy).
- ***Achieving Procurement Targets*** –CPUC could modify the RAM rules to allow IOU to select "second place" bids, which the IOUs can then rely on if a winning bid subsequently withdraws its contract. CPUC also could consider imposing an additional penalty on developers who withdraw their bids after the contract. Finally, CPUC may wish to curtail the discretion of IOUs to reject bids that are not "cost-competitive" to reduce the number of bids that are rejected for that reason. However, CPUC must proceed cautiously in this context to avoid a conflict with FERC rules.

Finally, and more generally, this Article recommends that the RAM should be extended beyond its initial pilot period and that CPUC should expand the capacity targets for subsequent auctions. As noted by the IREC, California's DG programs already have stimulated significant investment in new DG capacity, but these programs are reaching the end of their allocated capacity.[270] At the same time, demand for DG procurement opportunities appears to be growing, and there are still a number of projects in their development stage.[271] Thus, the IREC concludes that

260. *Id.* at 91.
261. *Id.* at Appendix C, at 5 ("we must avoid creating an inflexible system where, if successful in reaching a 20% or 33% RPS resource base, we have fixed the economic prices and signals with contract requirements for RPS projects to sell electricity that is too expensive in the wrong TOD periods.").
262. *Id.* at 65.
263. For further details, *see* Vote Solar Initiative, *supra* note 30, at 18 (noting that this revision was largely based on "permitting and interconnection challenges resulting from the CAISO's cluster studies" which were "hindering project ability to meet an 18 month deadline and reducing the pool of eligible program participants…. Thus, an important 'lesson learned' from the California experience is the need to ensure that the procurement and development timelines are well-coordinated with interconnection timelines." (citing Cal. Pub. Utils. Comm'n Draft Resolution E-4489, (April 19, 2012)).
264. *See* discussion *supra* Part III.A.
265. *See* discussion *supra* Part III.D.
266. *See* discussion *supra* Part III.C.1.
267. *See* discussion *supra* Part III.C.2.
268. *See* discussion *supra* Part III.A.
269. For example, imposing more stringent quotas for the procurement of resources, developing statewide data clearinghouses for localized renewable energy planning, requiring deposits and/or securities from bidders, increasing program flexibility with respect to selecting alternate bidders, or selecting second place bids. *See supra* Part IV.
270. The fifth RAM auction will only provide limited procurement opportunities, and "most of the State's available FIT capacity is subscribed. Additionally, while QF enrollment is uncapped, the price is currently too low to attract significant new DG." *See* IREC, *supra* note 226, at 5.
271. *Id.* ("At the same time, as evidenced by the continuing growth in interconnection requests, a significant number of projects are currently under develop-

if the RAM and other procurement programs "come to an abrupt end, considerable investment in time and resources could be lost, which in turn would harm the nascent DG market."[272] In addition, California's residents would lose the opportunity to benefit from the investments that have already been made in DG facilities that are still under development.[273]

Thus, this Article concludes that the RAM program has been initially successful and holds much potential for facilitating DG procurement. The RAM also may provide a useful model for other states and regulators that are interested in the reverse-auction approach. Arizona recently has enacted a similar mechanism (the Arizona Public Service Company ("APS") Small Generator Standard Offer Program)[274] and other countries currently are experimenting with reverse auctions for renewable procurement.[275] Reverse auctions also have been used by the U.S. General Services Administration to procure renewable energy for federal agencies and there has been at least one legislative proposal for a federal reverse auction that renewable project developers could use to compete for federal funding.[276] Thus, there appears to be a growing recognition of the value of reverse auction mechanisms. Ideally, California's success with the RAM will help motivate other states to adopt similar mechanisms for renewable wholesale DG procurement, and the state's experience will provide useful information on how to effectively structure such programs.

ment in an attempt to gain contracts for the capacity that does remain in these programs.").

272. *Id.* at 5–6.

273. *Id*. at 6.

274. The APS program is a reverse auction procurement mechanism for renewable generation projects ranging from 2–15 MW.

275. *E.g.*, Italy and Brazil are in the process of replacing FIT provisions with reverse auction mechanisms.

276. *See* Proposed Bill H.R. 909, 112th Cong. (2011) (calling for the establishment of a Federal Reverse Auction Authority (RAA), which would be a private sector non-profit entity overseen by the U.S. Department of Energy (DOE), to initiate and conduct reverse auctions to support the development of domestic, renewable energy growth).

Appendix A: Procurement Totals and Targets

These figures reflect the original bid capacity (MW) for all executed contracts that were approved by the CPUC, minus those contracts for which projects have been terminated as of January 2014.[277]

Figure 1. Overview of capacity procurement totals (MW) from first four auctions.

	RAM 1	RAM 2	RAM 3	RAM 4	Total	Target	RSC*	Remaining
SCE	47	78	135.5	138.8	399.3	754.4	73.8	281.3
PG&E	62.7	121	115	73.3	372	420.9	N/A	48.9
SDG&E	15	22.9	41.7	25.5	105.1	154.7	N/A	49.6
Total	124.7	221.9	292.2	237.6	876.4	1330	N/A	379.8

* In Resolution E-4445, CPUC approved PPAs totaling 144 MW from the 2010 Renewables Standard Contracts ("RSC") Program and credited them towards SCE's RAM allocation. However, certain approved RSC contracts have terminated, reducing the current RSC cotnracts MW total counting for RAM credit to 73.8 MW. For the purposes of this paper, the RSC credits are not included in the "total" amount of DG capacity procured through the RAM, but they are credited to SCE's overall progress towards its procurement target.

Figure 2. Overview of capacity procurement totals from RAM 1.

RAM 1 — Procurement								
	Baseload		Peaking As Available		Non-Peaking as Available		Total	
	Target	Procured	Target	Procured	Target	Procured	Target	Procured
SCE	5	0	55	47	5	0	65	47
PG&E	35	14	35	40	35	8.7	105	62.7
SDG&E	5	0	10	15	5	0	20	15
Total	45	14	100	102	45	8.7	190	124.7

Figure 3. Overview of capacity procurement totals from RAM 2.

RAM 2 — Procurement								
	Baseload		Peaking As Available		Non-Peaking as Available		Total	
	Target	Procured	Target	Procured	Target	Procured	Target	Procured
SCE	10	0	166	78	10	0	186	78
PG&E	14	7.5	119	93.5	14	20	147	121
SDG&E	5	4.5	35	18.4	5	0	45	22.9
Total	29	12	320	189.9	29	20	378	221.9

277. These figures are based on information provided by the IOUs in their 2014 Annual Compliance Reports. *See* Southern California Edison Company's (U-338-E) First Compliance Report on the Renewable Auction Mechanism Program (January 17, 2014); Pacific Gas and Electric Company's (U 39 E) January 17, 2014 Compliance Report on the Renewable Auction Mechanism Program (January 17, 2014); San Diego Gas & Electric Company (U 902 E) Renewable Auction Mechanism Program Annual Compliance Report (January 17, 2014).

Figure 4. Overview of proposed capacity procurement totals from RAM 3 (based on proposed contracts as of June 15, 2013).

RAM 3 — Procurement								
	Baseload		Peaking As Available		Non-Peaking as Available		Total	
	Target	Procured	Target	Procured	Target	Procured	Target	Procured
SCE	15	0	200	128	15	7.5	230	135.5
PG&E	13.5	0	105	95	13.5	20	132	115
SDG&E	6	0	40	27	6	14.7	52	41.7
Total	34.5	0	345	250	34.5	42.2	414	292.2

Figure 5.

RAM 4 — Procurement								
	Baseload		Peaking As Available		Non-Peaking as Available		Total	
	Target	Procured	Target	Procured	Target	Procured	Target	Procured
SCE	15	0	146	103	20	35.8	181	138.8
PG&E	10	0	62	48	10	25.3	82	73.3
SDG&E	3.5	5	16.9	15	3	5.5	23.4	25.5
Total	28.5	5	224.9	166	33	66.6	286.4	237.6

Appendix B: Developer Participation in RAM Auctions

Based on the advice letters from SCE and PG&E, the auctions also have been highly competitive in terms of the overall capacity that was bid, as compared with procured capacity.[278]

Figure 1. Overview of Offers, Parties Submitting Offers, and Executed Contracts.

	RAM 1			RAM 2			RAM 3		
	Offers	Parties	Contracts	Offers	Parties	Contracts	Offers	Parties	Contracts
SCE	92	28	7	142	39	6	130	40	13
PG&E	122	52	4	160	52	8	127	45	5
SDG&E	32	19	2	55	19	4	93	N/A	4

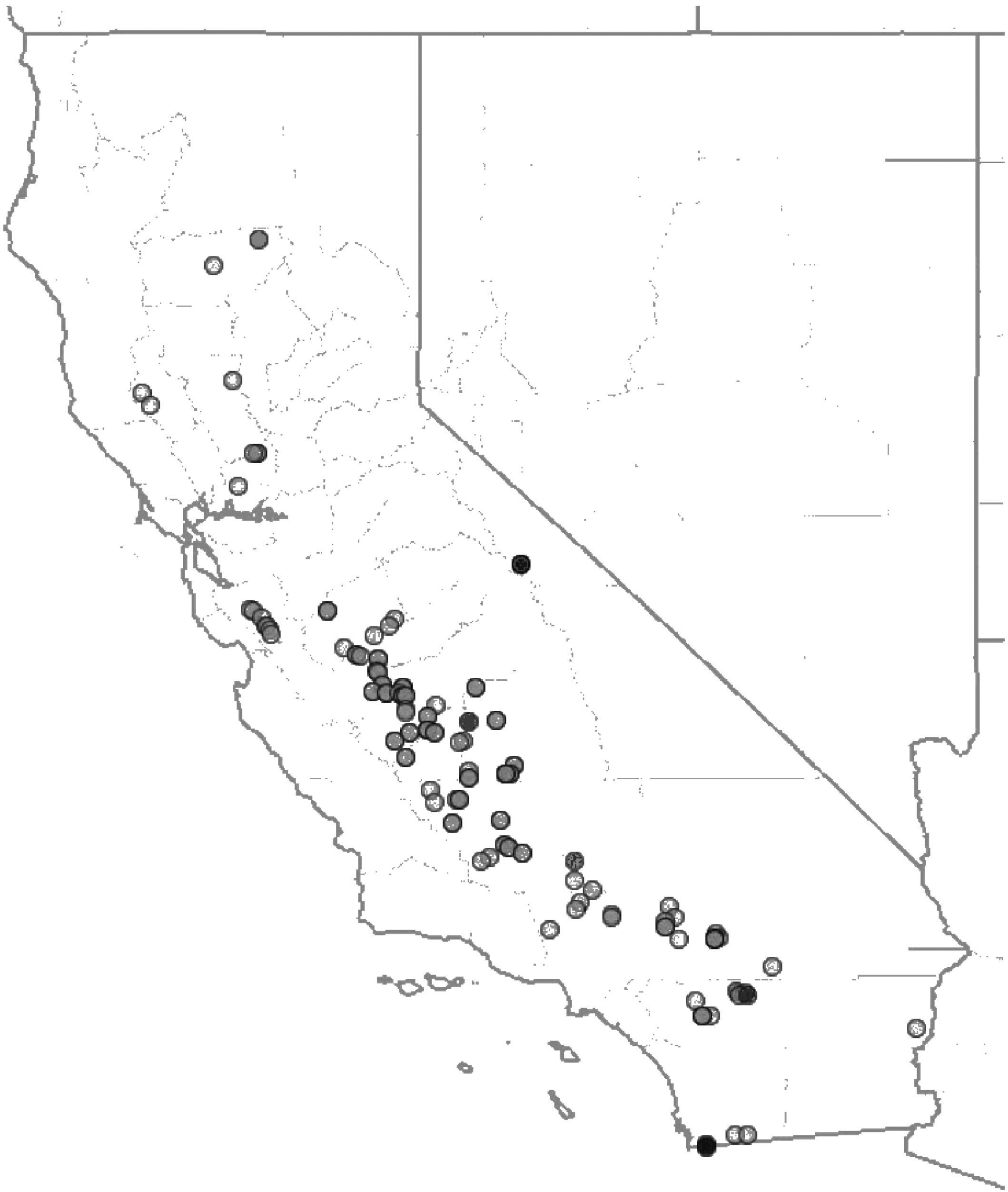
Figure 2. Overview of Offered and Procured Capacity.

	RAM 1		RAM 2		RAM 3	
	Offered	Procured	Offered	Procured	Offered	Procured
SCE	1,261 MW	67 MW	2,133 MW	97 MW	1,928 MW	180.5 MW
PG&E	1,470 MW	63 MW	1,669 MW	120 MW	1,412 MW	115 MW

278. *See* Advice Letter 4114-E, at 4 (Sept. 28, 2012); *see also* Advice Letter 2712-E, at 7 (Mar. 29, 2012).

Appendix C: Project Bid Maps

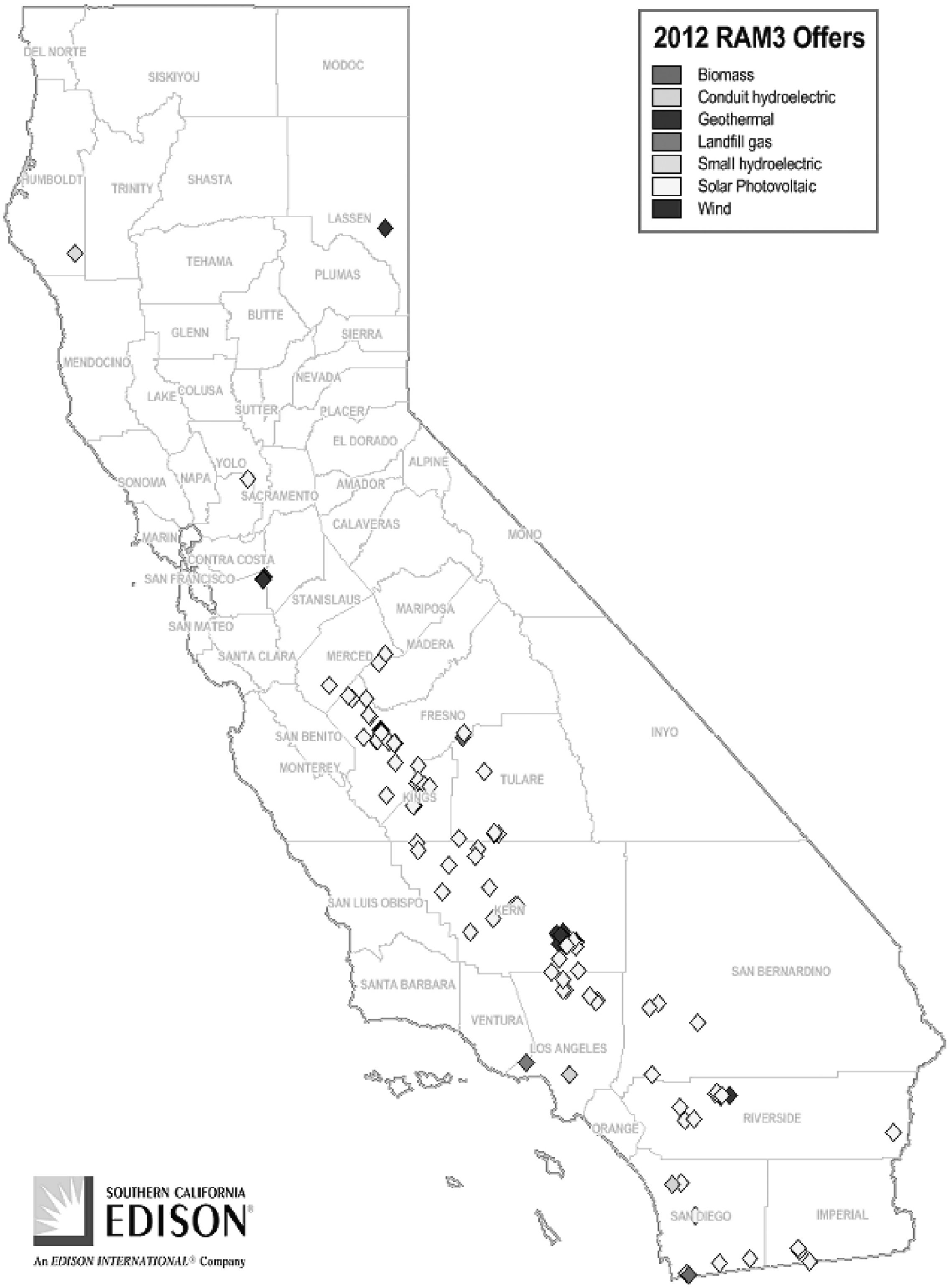
Figure 1. RAM 2 Bid Locations for Southern California Edison (SCE).[279]



Map created at GPSVisualizer.com
US Counties from The National Atlas - Terms of Use

279. Advice Letter 2785-E/E-A, at Appendix D (Nov. 14, 2012).

Figure 2. RAM 3 Bid Locations for Southern California Edison (SCE).[280]



280. Advice Letter 2894-E, Appendix D (May 1, 2013).

Figure 3. RAM 2 Bid Locations for Pacific Gas & Electric (PG&E).[281]

281. PG&E Advice Letter 4114-E, at Appendix H (November 9, 2012).

Figure 4. RAM 3 Bid Locations for Pacific Gas & Electric (PG&E).[282]

282. Advice Letter 4216-E, at Appendix H (May 29).