



The Padilla Report:
Costs and Savings for the
Renewables Portfolio Standard
in 2016 (Pursuant to Public Utilities
Code Section 913.3)

May 1, 2017



About this Report

The purpose of this annual Report is to comply with Public Utilities Code Section 913.3. Each May 1, the CPUC is required to report to the Legislature the aggregated costs and savings of renewable energy expenditures and contracts for the previous year.

Report Authors

Robert Blackney – RPS Analyst

Cheryl Cox – RPS Analyst

Cheryl Lee – Supervisor RPS Section

Judith Iklé – Branch Manager, Procurement Oversight

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EXECUTIVE SUMMARY

In compliance with Public Utilities Code 913.3,¹ this report describes 2016 costs and savings data for the Renewables Portfolio Standard (RPS), across both the large investor owned utilities (IOUs) – Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), and San Diego Gas & Electric Company (SDG&E) and the small and multi-jurisdictional utilities (SMJUs) – Liberty Utilities (Liberty), Bear Valley Electric Service (BVES), and PacifiCorp.

The IOUs have continued to meet their RPS procurement obligations, consistent with California legislation. This report finds that the IOUs' average price for renewable energy contracts continues to decrease. The key findings in this report for 2016 are:

- 1. Due to the increase in overall RPS procurement, the total dollars spent on renewable energy procured in 2016 has increased compared to 2015.**

Large IOUs

- The Large IOUs' total renewable procurement increased from 45,991 GWh in 2015 to 48,509 GWh in 2016.
- The large IOUs spent a combined total of \$4.8 billion on RPS procurement in 2016, compared with \$4.6 billion in 2015.
- This increase in IOU procurement of renewable resources is consistent with evolving legislation, which has continued to increase RPS procurement goals and the amount of renewable energy.

Small and Multi-Jurisdictional Utilities (SMJUs)

- The SMJUs' total renewable procurement increased from 331 GWh in 2015 to 381 GWh in 2016.²
- Liberty spent approximately \$8.3 million on RPS procurement in 2016.
- BVES spent approximately \$116 thousand on RPS procurement in 2016.
- PacifiCorp stated that it could not provide procurement expenditure figures for 2016.

¹ The full text of Public Utilities Code Section 913.3 can be found in Appendix D.

² In order to use a consistent source to report the SMJU procurement information, Energy Division staff used RPS procurement figures from the SMJUs' RPS Compliance Reports that were submitted to Energy Division on September 1, 2016.

2. The average price of the IOUs' renewable energy contracts decreased in 2016 when compared to 2015 average contract prices.

Large IOUs

- On an aggregated basis, the cost \$/kWh decreased to 6.2 cents in 2016 for the large IOUs compared with average contract prices of 6.9 cents/kWh in 2015.
- On average, 2016 RPS expenses compare favorably to a long-term energy and capacity price forecast.
- This report illustrates that the average price of CPUC-approved contracts between 2003 and 2016 decreased from 9.4 cents/kWh to 6.2 cents/kWh.

SMJUs

- The Small IOUs' contract prices cannot be publically reported due to the Commission's confidentiality rules.

3. The Market Price Referent (MPR), used to determine "cost savings," found that SCE and SDG&E realized savings in 2016, while PG&E paid a premium for renewables.

- The Commission used the most recent Market Price Referent (MPR) data, as the best available methodology to determine the cost savings (benefits) of the RPS program.

Large IOUs

- Using the MPR, SCE realized \$224 million in avoided costs, while SDG&E realized \$62 million in avoided costs.
- PG&E did not avoid any costs in 2016, and instead paid a \$155 million premium compared to the MPR benchmark. (See page 11 for additional information.)

SMJUs

- Using the MPR, Liberty realized \$54 million in avoided costs, while BVES realized \$3.9 million in avoided costs.
- PacifiCorp stated that it could not provide procurement expenditure figures for 2016.

4. Updates by IOUs to their 2012-2015 previously reported data was incorporated in this report, which impacts the data trends.

Large IOUs

- SCE and SDG&E notified the Commission that its previous self-reported data for the years 2012-2015 had errors.
- The Commission has corrected for these errors in this report, which impacts the total weighted average price of SCE's RPS procurement expenditures for 2012-2015, and SDG&E's RPS procurement expenditures for 2015.

BACKGROUND

This is the fourth report to the Legislature describing costs and cost savings related to the Renewables Portfolio Standard (RPS). Specifically, the Legislature requires the California Public Utilities Commission (CPUC or Commission) to annually provide historic cost information related to the investor owned utilities' (IOUs) compliance with the RPS.

History

Senate Bill 836 (Padilla, 2011) requires the CPUC to report to the Legislature “the costs of all electricity procurement contracts for eligible renewable energy resources, including unbundled renewable energy credits, and all costs for utility-owned generation approved by the Commission.”³

In April 2011, Governor Brown signed Senate Bill (SB) 2 (1X) (Simitian), which codified the state's 33% RPS target to be achieved by December 31, 2020.⁴

In 2015, Governor Brown signed SB 697 (Hertzberg) adopting the Public Utilities Commission Accountability Act of 2015 and recasting some of the Commission's reporting requirements.⁵

In 2015, the Governor also signed into law SB 350 which further revised RPS targets by increasing the proportion of total retail electricity sales from renewable resources from 33% in 2020 to 50% by December 31, 2030. In addition, SB 350 adds interim RPS targets of 40% by December 31, 2024, and 45% by December 31, 2027.

This report is based on data and other information the CPUC gathered from PG&E, SCE, SDG&E, PacifiCorp, Liberty Utilities,⁶ and Bear Valley Electric Service (BVES), as well other publically available information.

³ More recent legislation made sweeping changes to the CPUC's reporting requirements. On September 29, 2016, the Governor signed SB 1222 (Hertzberg), which requires the CPUC to provide this annual Report to the Legislature on the IOUs' costs and savings (avoided costs) for the RPS program for all electrical corporations.

⁴ SB 2 (1X) added Section 910 to the Public Utilities Code (Pub. Util. Code). All further references to sections refer to the Pub. Util. Code unless otherwise specified.

⁵ Specific to this Report, SB 697 (Hertzberg) changed the numbering of the Pub. Util. Code Sections and, specifically, changed Section 910 to Pub. Util. Code Section 913.3. None of the original reporting requirements that were required under Pub. Util. Section 910 were modified by SB 697.

⁶ Formerly CalPeco.

RENEWABLES PROGRAM COSTS

This section addresses the costs associated with renewable resources in 2016, consistent with the requirements of Section 913.3(a)(1) and (2).

Section 913.3(a)(1)

For power purchase contracts, the commission shall release costs in an aggregated form categorized according to the year the procurement transaction was approved by the commission, the eligible renewable energy resource type, including bundled renewable energy credits, the average executed contract price, and average actual recorded costs for each kilowatthour of production. Within each renewable energy resource type, the commission shall provide aggregated costs for different project size thresholds.

Section 913.3(a)(2)

For each utility-owned renewable generation project, the commission shall release the costs forecast by the electrical corporation at the time of initial approval and the actual recorded costs for each kilowatthour of production during the preceding calendar year.

Section 913.3 (b)

The commission shall report all electrical corporation revenue requirement increases associated with meeting the renewables portfolio standard, as defined in Section 399.12, including direct procurement costs for eligible renewable energy resources and renewable energy credits.

The 2016 costs and savings discussed in this section for California's large and small investor owned utilities (IOUs) include:

- 1. RPS Procurement Expenditures**
- 2. RPS Aggregated Contract Prices**
- 3. Comparison of RPS Procurement Expenditures with IOU Revenue Requirements**

1. RPS Procurement Expenditures

Large IOU Procurement Expenditures for 2016⁷

The CPUC compiled detailed information regarding the IOUs' procured generation per facility, distinguishing the information by facility size and technology. This comprehensive 2016 data can be found in Appendix B of this report expressed by weighted average RPS procurement expenditures (\$/kWh). Table B-1 provides all procurement expenditure information for all RPS eligible projects, including contracts for the procurement of only renewable energy credits (REC-only) transactions.⁸ By contrast, Table B-2 presents this same procurement expenditure information for IOU bundled RPS energy projects only.⁹

Figure 1 on the next page illustrates the annual weighted average RPS procurement expenditure for bundled renewable energy in real dollars per kilowatthour (\$/kWh) for each of the large investor owned utilities (IOUs): Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E).

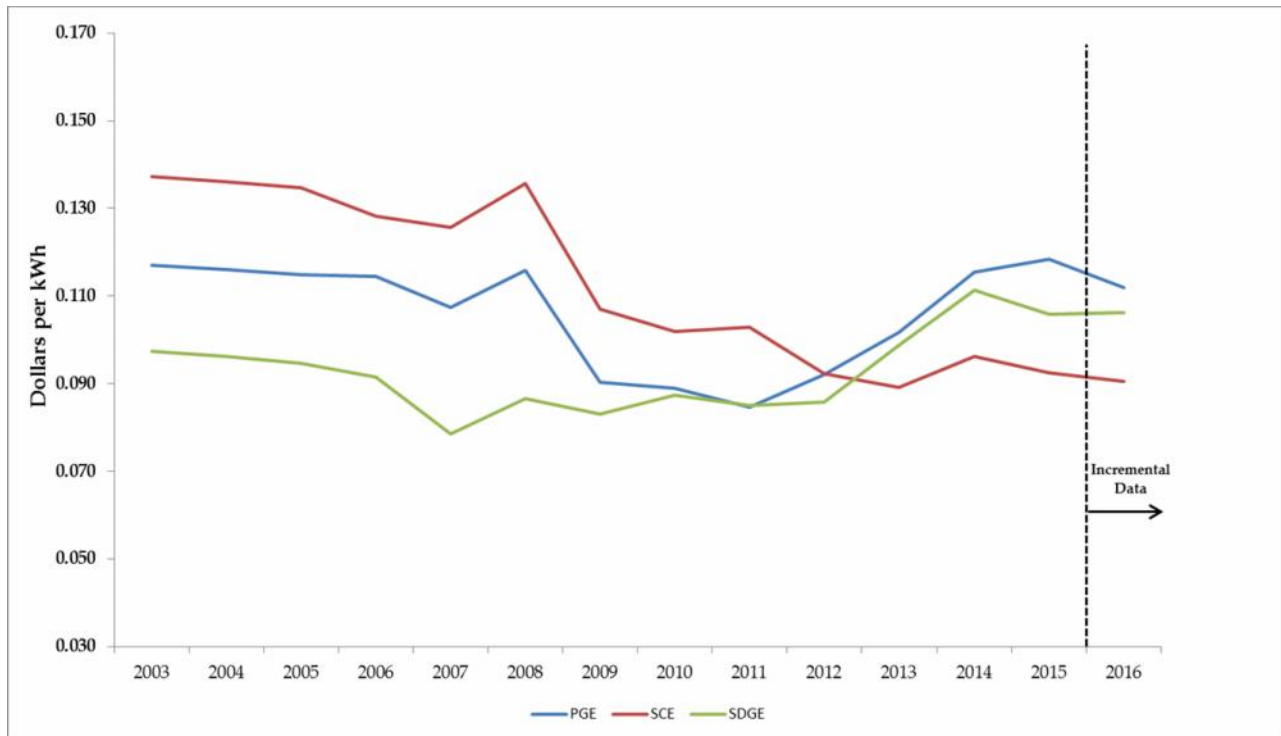
The key factor driving the cost differences between the utilities is the resource mix of RPS-eligible resources within an IOU's portfolio and the vintage of the IOU's RPS contracts. It is important to note that the resource mix will change over time as renewable prices and the IOUs' RPS portfolios change over time.

⁷ "Procurement Expenditures for 2016" include any/all generation from online, RPS eligible facilities that generated RPS eligible electricity in 2016. In addition, "Procurement Expenditures for 2016" do not include any generation from contracts that were approved by the CPUC in 2016 because it takes an RPS contract multiple years to achieve commercial operation.

⁸ Table B-1 can be found in attached Appendix B. Pursuant to the confidentiality rules in Public Utilities (Pub. Util.) Code § 913.3 and CPUC D.06-06-066, some of the costs in Appendix B have been redacted.

⁹ Contracts that only provide RECs are not included in Table B-2.

Figure 1. Weighted Average RPS Procurement Expenditures of Bundled Renewable Energy by Year in Real Dollars (2003 – 2016)¹⁰



In 2016, the weighted average RPS procurement expenditure was approximately 10.2 cents/kWh across all RPS contracts, including contracts for only unbundled renewable energy credits (RECs). The average procurement expenditure of 10.4 cents/kWh for RPS bundled products in 2016 was slightly higher than the 10.1 cents/kWh in 2015.

The total combined IOU direct RPS expenditures of \$4.9 billion in 2016 increased from \$4.6 billion in 2015.

¹⁰ The CPUC used the Handy-Whitman Index of Public Utility Construction Costs – Other Production Plant - Pacific region to convert 2016 nominal dollars into 2016 real dollar amounts for TOD-adjusted RPS expenditures. The 2016 real dollar figures have been adjusted by year for inflation, enabling comparison of quantities, as if prices had not changed.

Table 1. Comparison of IOU RPS Procurement vs. Total Portfolio Procurement in 2016¹¹

IOU	% RPS Generation of Total Procurement	Cost of RPS Procurement (billions)	Total Procurement (billions)	% RPS Procurement Expenditures to Total Procurement
PG&E	30.8%	\$2.4	\$6.5	36.9%
SCE	27.6%	\$1.8	\$5.4	33.3%
SDG&E	45.3%	\$.675	\$1.6	42.2%

The ratio of RPS Generation to RPS Procurement Expenditures indicates how IOU RPS expenditures compare to the total value of a utility’s portfolio. For instance, a ratio equal to one means that the price of RPS resources is average relative to the portfolio. Likewise, if the ratio is less than one, the IOU is paying a premium for RPS electricity relative to the value of the portfolio. Derived from Table 1, the ratio of RPS Generation to RPS Procurement Expenditures for each IOU in 2016 was:

- **PG&E:** 0.83
- **SCE:** 0.83
- **SDGE:** 1.07

¹¹ CPUC “California Electric and Gas Utility Cost Report” Pursuant to Public Utilities Code Section 913, May 2017.

SMJU RPS Expenditures for 2016

In 2016, the small IOUs' RPS portfolio expenditures were comprised primarily of wind resources and geothermal. As illustrated in Table 2, Liberty spent approximately \$8.3 million on geothermal expenditures, and BVES spent approximately \$116 thousand on wind expenditures. PacifiCorp stated that it could not provide any expenditure data by technology for this report.

Table 2. Direct RPS Procurement Expenditures by RPS Technology for 2016 (In Dollars)

	PacifiCorp	BVES	Liberty
Geothermal	*	-	8,332,211
Wind	*	116,595	-
Total	*	116,595	8,332,211

*PacifiCorp did not provide 2016 procurement expenditure data for this report.

2. RPS Aggregated Contract Prices**Large IOU Contract Prices for 2016**

The CPUC examined the IOUs' aggregated RPS contract prices approved by the CPUC in 2016. Contracts approved in 2016 are generally for generation from RPS resources that will not deliver RPS eligible procurement until 2017 or later. The CPUC found that 2016 RPS contract prices are lower than the prices of contracts approved in 2015. The average price of CPUC-approved contracts was 6.2 cents/kWh in 2016 versus 6.9 cents/kWh in 2015.

The average price of approved CPUC contracts between 2003 and 2016 decreased from 9.4 cents to 6.2 cents/kWh in real dollars.¹² The decrease in RPS contract prices indicates that the renewables market in California has matured, and it is robust and competitive.

SMJU Contract Prices for 2016

The CPUC did not approve three or more contracts for the SMJUs. Consequently, the Commission cannot report any of the cost information for these entities, due to confidentiality rules.

¹² Real dollar figures are nominal dollar figures adjusted for inflation. The real dollar figures are obtained by removing the effect of price level changes from the nominal dollars of time-series data, in order to obtain a truer picture of economic trends.

3. Comparison of RPS Procurement Expenditures with IOU Revenue Requirements

Large IOUs

In 2016, the percentage of RPS expenditures compared to an IOU’s revenue requirement ranged from 16.1% to 17.5%.

Table 3. Comparison of IOU RPS Procurement vs. Total Portfolio Procurement in 2016¹³

IOU	Cost of RPS Procurement (billions)	Revenue Requirement Procurement (billions)	% RPS Retail Sales of Total Revenue Requirement
PG&E	\$2.5	\$14.3	17.5%
SCE	\$1.9	\$11.8	16.1%
SDG&E	\$.677	\$4.0	16.9%

Table 3 shows that RPS procurement is a small fraction of the IOUs’ total revenue requirements. This is because the revenue requirement contains many large line items such as transmission expenditures, reliability costs, and administrative and capital expenses.

SMJU

Revenue requirement information for Liberty, BVES, and PacifiCorp for 2016 is currently confidential pursuant to Commission confidentiality rules. Consequently, the Commission is not able to perform an analysis on SMJU costs compared to these revenue requirements for 2016.

¹³ “Electric and Gas Utility Cost Report,” California Public Utilities Commission, April 2016. Available at: http://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Utilities_and_Industries/Energy/Reports_and_White_Papers/2014AB67Final.pdf

RENEWABLES PROGRAM “COSTS SAVINGS”

This section addresses the avoided costs associated with renewable resources in 2016, consistent with the requirements of Section 913.3(c).

Section 913.3(c)

The commission shall report all cost savings experienced, or costs avoided, by electrical corporations as a result of meeting the renewables portfolio standard.

It is difficult to quantify the capacity cost savings, or costs avoided, associated with the RPS program given that this requires assessing whether or not the RPS program deferred construction of alternative generation facilities, and the theoretical cost of those alternative resources. Accordingly, this report presents two methodologies, the market price referent (MPR)¹⁴ and current CAISO day-ahead market prices, to assess program benefits.

1. CPUC Methodology: The Market Price Referent (MPR)

The MPR was developed in order for the Commission to determine whether a competitively bid RPS contract had above-market costs. The MPR models what it would cost to own and operate a baseload combined cycle gas turbine power plant over various time periods. The cost of electricity generated by such a power plant, at an assumed technical capacity factor and set of costs, was the proxy for the long-term market price of electricity established by this Commission.¹⁵ While the MPR is no longer calculated, the CPUC finds that this is still the best method because it is a vetted and public methodology.¹⁶ However, the MPR values used in this report are based on inputs that no longer reflect the current and/or future market conditions (e.g., natural gas prices).

Large IOUs

To determine IOU avoided costs for 2016 RPS contracts, this report uses the 20-year MPR of 10.5 cents per kWh as most comparable to a typical RPS contract timeframe. The MPR determined that SCE avoided approximately \$224 million, while SDG&E avoided \$62 million in costs.

¹⁴ The MPR is the long-term ownership, operating, and fixed-price fuel costs for a new 500 MW natural gas-fired combined cycle gas turbine (CCGT) as forecasted by 12-day trading day average of NYMEX prices leading up to the close of an RPS solicitation bidding window.

¹⁵ Established in D.08-10-026.

¹⁶ The MPR was last calculated in 2011.

Table 4: IOU 2016 Avoided Costs of RPS using MPR

IOU	Avoided Cost (millions)
PG&E	*
SCE	\$224
SDG&E	\$62

*PG&E did not avoid costs, but paid a premium

However, PG&E did not avoid any costs in 2016, and instead paid a premium of \$155 million for their RPS procurement compared to the MPR benchmark. Specifically, PG&E paid an average of \$11.08 cents per kWh for their RPS procurement in 2016 which is approximately 6.5% higher than the 20 year MPR for 2016 (i.e., 10.5 cents per kWh). The CPUC expects that PG&E will have avoided costs when comparing the price of its portfolio to the MPR once PG&E starts receiving procurement from contracts executed between 2012 and 2016 that have lower prices.

The utilities' 2016 average RPS costs per kWh are shown in Tables B-1 and B-2 in Appendix B.

SMJUs

The CPUC also used the 20-year MPR of 10.5 cents per kWh as the most comparable timeframe for evaluating avoided costs for the small IOUs' 2016 RPS portfolios.

Table 5: Small IOU 2016 Avoided Costs using MPR

IOU	Avoided Cost (millions)
BVES	\$3.9
Liberty	\$54
PacifiCorp	*

*PacifiCorp stated that it could not provide 2016 data

2. IOU Methodology: Short-term Prices

As a point of comparison, this report also presents a second methodology prepared by the large IOUs that utilizes short-term prices for energy and capacity. The CPUC’s concern with the IOUs’ approach is two-fold. First, few, if any resources in any of the large IOUs’ portfolios would be considered cost-effective, including low-cost hydroelectric and nuclear resources. Second, the large IOUs’ calculations are based on short-run¹⁷ avoided costs, and it seems unlikely that the large IOUs would be able to procure 20% or more of their portfolios accounted for by the RPS program under short-term contracts.

Large IOUs

Table 6: Large IOU 2016 Avoided Cost Using CAISO Day-Ahead Data

IOU	Day-Ahead Market Price (kWh)	Capacity Costs (kW-year)	Total Avoided Costs (millions)	Avoided Cost (per kWh)
PG&E	2.98 cents	\$31.56	\$713	3.0 cents
SCE	2.79 cents	\$77.88	\$670	4.3 cents
SDG&E	3.18 cents	*	\$452	6.4 cents

*SDG&E calculated the avoided costs based only on the avoided energy and did not include avoided capacity

SMJUs

None of the SMJUs responded to the CPUC’s data request with costs savings calculations utilizing CAISO day-ahead market prices or costs of capacity in the CAISO market.

¹⁷ CAISO hour-ahead for generation and CAISO annual for capacity.

CORRECTIONS: 2012-2015 REPORTS

On May 1, 2016, the CPUC published IOU cost information for the years 2014 and 2015 in its May 1, 2016, Padilla Report to the Legislature.¹⁸ After the report was issued, SCE and SDG&E notified the CPUC that some of its self-reported data had errors. As a result, Commission staff worked with the utilities to review and revise the 2012–2015 data, and incorporated those corrections into this report.

The changes to IOU data are as follows:

SCE:

- Data corrections to utility owned generation (UOG) procurement expenditures for UOG solar and small-hydro projects for years 2012-2015.

SDG&E:

- Data corrections to various annual generation and cost figures for projects reflecting a variety of different technology types in 2015.

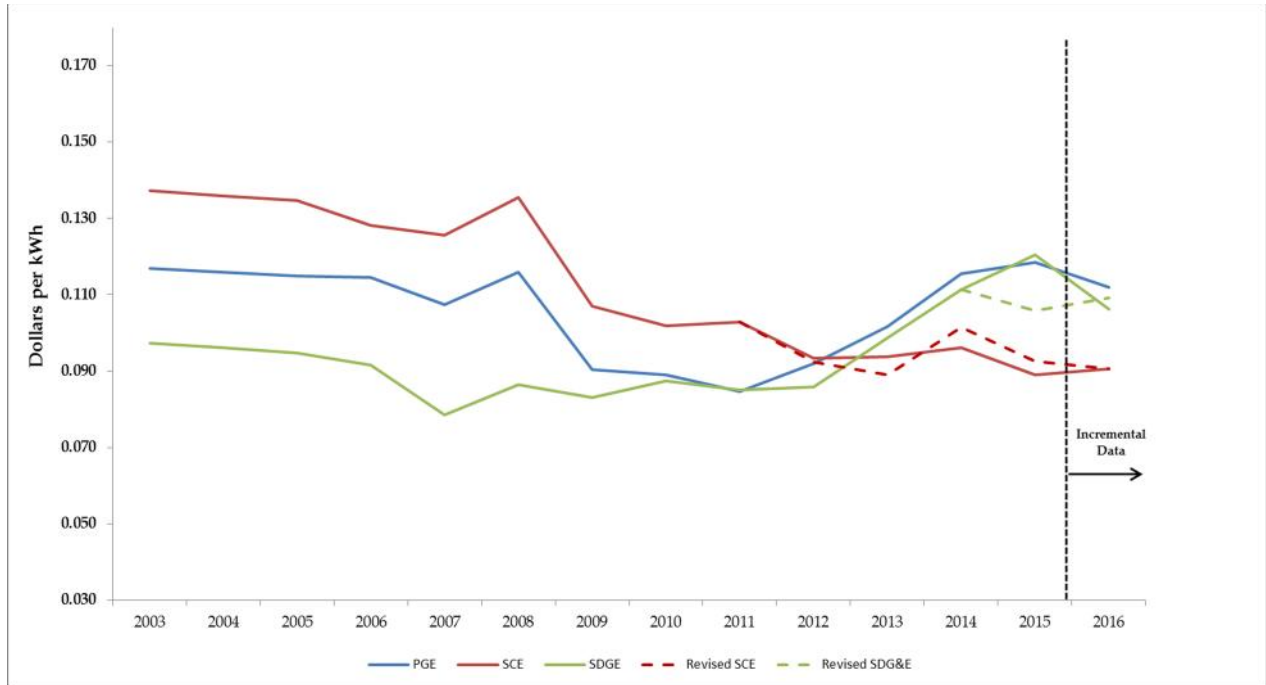
Figure 2 below illustrates the difference between the IOUs' original reported data and the final calculations using the revised data. Specifically, the corrected IOU data is reflected in the dotted lines. Tables D-1 through D-6 in Appendix D show the figures that were originally presented in the 2013-2016 Padilla Reports, the revised figures that were calculated for this report, and the difference between the two sets of figures.

Conclusions from Corrections and Methodological Changes

The final results of the cost analysis for 2012-2015 did not materially change after the errors were corrected.

¹⁸ The 2016 Padilla Report was released on May 1, 2016. The Report can be found at: http://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Utilities_and_Industries/Energy/Reports_and_White_Papers/Padilla%20Report%202016%20-Final%20-%20Print.pdf

Figure 2. Comparison of Original Weighted Average RPS Procurement Expenditures by Year (2012 – 2016) with Revised Data: Bundled Energy Product Only



REPORT APPENDICES

APPENDIX A

RPS Activities & Milestones

Timing	Deliverable	Notes
February 2016	Start of SB 1122 BioMAT Program	Pursuant to D.15-09-004, the IOUs started the first program period for SB 1122 BioMAT, the feed-in tariff program for bioenergy projects.
February 2016	Amended Scoping Memo for RPS proceeding (R.15-02-020)	Amends scope of RPS proceeding to include implementation of SB 350 and the Governor's Emergency Proclamation (October 30, 2015) as it relates to BioMAT for high hazard zones.
March 2016	Resolution E-4770: The Commission's Response to Governor's Emergency Proclamation	Resolution E-4770 orders PG&E, SCE, and SDG&E to hold a solicitation for contracts with facilities that can use biofuel from high hazard zones using the RAM procurement process.
June 2016	LCBF Ruling	Ruling to initiate reform of least-cost best-fit (LCBF) methodology used by utilities to evaluate and rank RPS bids.
August 2016	BioMAT Ruling	Administrative Law Judge's Ruling requesting comment on implementation of potential legislative changes related to the bioenergy feed-in tariff under the California Renewables Portfolio Standard and taking official notice of documents.
August 2016	RPS Calculator Portfolios Ruling	Administrative Law Judge's ruling that accepts 2016 RPS portfolios into the record for use in generation and transmission planning, i.e., the RPS Calculator.
October 2016	Determination of Retail Seller compliance for the first compliance period (2011-13)	Energy Division staff is reviewing the 2016 Final RPS Compliance Reports that were submitted on September 1, 2016, and determine which retail sellers were able to meet the RPS requirement of the first compliance period (2011-13). Energy Division Director will notify retail sellers of their RPS compliance status for the first compliance period once the review process is complete.

Timing	Deliverable	Notes
October 2016	Decision establishing guidelines for the RPS BioMAT program from SB 840 (Trailer Bill, 2016)	The decision adds specific new features to the bioenergy feed-in tariff, or bioenergy market adjusting tariff (BioMAT), for the California renewables portfolio standard established by SB 1122 (Rubio, 2016) implemented in Commission Decisions D.14-12-081 and D.15-09-004.
December 2016	Decision implementing a portion of RPS compliance rules from SB 350 (De Leon, 2016)	Decision (D.16-12-040) to implement the new compliance periods and procurement quantity requirements for the California RPS program for years beginning in 2021.
December 2016	Decision accepting retail sellers 2016 RPS Plans	The Decision (D.16-12-044) accepts, with some modifications, the draft 2016 RPS Procurement Plans, including the related solicitation protocols, filed PG&E, SCE, and SDG&E.
December 2016	Integrated Resource Planning workshop	Energy Division staff hosted a workshop on Integrated Resource Planning scenario development. At the workshop, staff presented a proposal for the scenarios to be modeled in 2017 along with an overview of the proposed modeling platform. The workshop was developed based on the feedback received over the course of two webinars conducted by Energy Division staff.

APPENDIX B

RPS Procurement Expenditures per Senate Bill 836 (Public Utilities Code § 913.3)

Overview of Tables

Tables B-1 and B-2 show, for each investor owned utility (IOU), the weighted average time-of-delivery (TOD) adjusted RPS procurement expenditures for 2016. Per the confidentiality requirements in Public Utilities Code § 913.3, some of the data within this report is redacted in order to protect market sensitive information. In addition:

- The “Average RPS Procurement Expenditures” represent the total weighted average payments made to renewable generators for that year.
- Procurement expenditures represent weighted averages on a per kilowatthours basis. All figures are in 2016 dollars.¹⁹

¹⁹ PG&E modified their method for calculating UOG small hydro costs for this report by using actual energy generated (kWh) in the denominator as opposed to annual average generation figures that were used in past years. PG&E also included an allocation of common costs in the numerator resulting in a higher Average Cost per kWh (in past years PG&E did not include any common costs). PG&E believes this new method is a more accurate approach for calculating UOG costs in their portfolio.

**Table B-1. Weighted Average RPS Procurement Expenditures
(All Projects – Including REC-only transactions) for 2016 (\$/kWh)**

	PG&E	SCE	SDG&E	Total
Biogas				
0-3 MW	0.1162	0.0873	0.1058	0.1027
+3-20 MW	0.1058	0.0861	0.0714	0.0940
+20-50 MW		Only 1 Project		Only 1 Project
Biogas Total	0.1072	0.0630	0.0852	0.0829
Biomass				
0-3 MW	Only 1 Project			Only 1 Project
+3-20 MW	0.1087			0.1087
+20-50 MW	0.1017			0.1017
+50-200 MW	Only 2 Projects			Only 2 Projects
Biomass Total	0.0938			0.0938
Geothermal				
+3-20 MW	0.0890	0.0699		0.0773
+20-50 MW		0.0602		0.0602
+50-200 MW		0.0659		0.0659
+200 MW	Only 1 Project	Only 1 Project		Only 2 Projects
Geothermal Total	0.0736	0.0583		0.0643
Small Hydro				
0-3 MW	0.0697	0.0841	Only 1 Project	0.0721
+3-20 MW	0.0555	0.0761	Only 1 Project	0.0581
+20-50 MW	0.0721			0.0721
Small Hydro Total	0.0669	0.0792	Only 2 Projects	0.0676
Solar PV				
0-3 MW	0.1360	0.1346	0.1221	0.1346
+3-20 MW	0.1201	0.0892	0.0843	0.1011
+20-50 MW	0.1525	Only 1 Project	Only 2 Projects	0.1446
+50-200 MW	0.1406	0.0914	0.1204	0.1211
+200 MW	0.1610	0.1031		0.1321
Solar PV Total	0.1501	0.1007	0.1188	0.1244
Solar Thermal				
+20-50 MW		0.1260		0.1260
+50-200 MW	Only 2 Projects	0.1456		0.1536
+200 MW	Only 2 Projects			Only 2 Projects
Solar Thermal Total	0.1942	0.1390		0.1773
Wind				
0-3 MW	Only 1 Project	0.0750		0.0749
+3-20 MW	0.0619	0.0457	0.0759	0.0550
+20-50 MW	0.0786	0.0658	Only 1 Project	0.0675
+50-200 MW	0.0759	0.1166	0.0656	0.0881
+200 MW		0.1014	Only 1 Project	0.1019
Wind Total	0.0782	0.1042	0.0717	0.0884
UOG Solar PV				
0-3 MW	0.4050	0.6224	0.6461	0.6038
+3-20 MW	0.1470	0.6243		0.2288
UOG Solar PV Total	0.1505	0.6236	0.6461	0.2705
UOG Small Hydro				
0-30 MW	0.1218	0.1378		0.1266
UOG Small Hydro Total	0.1218	0.1378		0.1266
Average of All Resources	0.1119	0.0942	0.0962	0.1024

**Table B-2. Weighted Average RPS Procurement Expenditures
(Bundled Energy Only) for 2016 (\$/kWh)**

	PG&E	SCE	SDG&E	Total
Biogas				
0-3 MW	0.1162	0.0873	0.1058	0.1027
+3-20 MW	0.1058	0.0861	0.0714	0.0940
+20-50 MW		Only 1 Project		Only 1 Project
Biogas Total	0.1072	0.0630	0.0852	0.0829
Biomass				
0-3 MW	Only 1 Project			Only 1 Project
+3-20 MW	0.1087			0.1087
+20-50 MW	0.1017			0.1017
+50-200 MW	Only 2 Projects			Only 2 Projects
Biomass Total	0.0938			0.0938
Geothermal				
+3-20 MW	Only 2 Projects	0.0699		0.0773
+20-50 MW		0.0602		0.0602
+50-200 MW		0.0659		0.0659
+200 MW	Only 1 Project	Only 1 Project		Only 2 Projects
Geothermal Total	0.0736	0.0583		0.0643
Small Hydro				
0-3 MW	0.0697	0.0841	Only 1 Project	0.0721
+3-20 MW	0.0555	0.0761	Only 1 Project	0.0581
+20-50 MW	0.0721			0.0721
Small Hydro Total	0.0669	0.0792	Only 2 Projects	0.0676
Solar PV				
0-3 MW	0.1360	0.1346	0.1221	0.1346
+3-20 MW	0.1201	0.0892	0.0843	0.1011
+20-50 MW	0.1525	Only 1 Project	Only 2 Projects	0.1446
+50-200 MW	0.1406	0.0914	0.1204	0.1211
+200 MW	0.1610	0.1031		0.1321
Solar PV Total	0.1501	0.1007	0.1188	0.1244
Solar Thermal				
+20-50 MW		0.1260		0.1260
+50-200 MW	Only 2 Projects	0.1456		0.1536
+200 MW	Only 2 Projects			Only 2 Projects
Solar Thermal Total	0.1942	0.1390		0.1773
Wind				
0-3 MW	Only 1 Project	0.0750		0.0749
+3-20 MW	0.0619	0.0457	0.0759	0.0550
+20-50 MW	0.0786	0.0658	Only 1 Project	0.0675
+50-200 MW	0.0969	0.1166	0.0933	0.1054
+200 MW		0.1014	Only 1 Project	0.1019
Wind Total	0.0941	0.1042	0.0940	0.0995
UOG Solar PV				
0-3 MW	0.4050	0.6224	0.6461	0.6038
+3-20 MW	0.1470	0.6243		0.2288
UOG Solar PV Total	0.1505	0.6236	0.6461	0.2705
UOG Small Hydro				
0-30 MW	0.1218	0.1378		0.1266
UOG Small Hydro Total	0.1218	0.1378		0.1266
Average of All Resources	0.1119	0.0942	0.1092	0.1041

APPENDIX C

Contract Price Data per Senate Bill (Public Utilities Code § 913.3)

Overview of Contract Price Data

Table C-1 shows the weighted average time-of-delivery (TOD)-adjusted contract price of all IOU RPS contracts approved by the CPUC in 2016. Per the confidentiality requirements in Public Utilities Code § 913.3, some of the data within this appendix are redacted:

- Contract prices were redacted if a) the power purchase agreement (PPA) is not already public on the CPUC's website per the CPUC's confidentiality rules, and b) there were less than three facilities in each category. If there was only one facility in a category and its PPA is publicly available on the CPUC's website, then the price information for that facility is reported. In addition, all qualifying facility (QF) contracts that do not require CPUC approval, feed-in tariff contracts, contracts with municipal governments, and utility-owned generation (UOG) costs are public and reported.
- Contract prices represent weighted averages on a per kilowatthours basis. All figures are in 2016 dollars.
- All contract price figures have been adjusted by TOD factors since generators are paid based on the time that the facility delivers electricity, according to each IOU's TOD factors. For example, IOU TOD factors place a premium on generation that occurs during peak demand hours. Therefore, generators that provide electricity during peak hours when electricity is more valuable receive a higher payment for electricity during that time period based on the TOD adjustment.
- The "Average Price of Contracts Approved" includes all CPUC-approved contracts except contracts that were subsequently terminated.

Table C-1. Weighted Average TOD-Adjusted Price of All Renewable Energy Contracts Approved (All Projects – There were no REC-only transactions) for 2016 (\$/kWh)

	PG&E	SCE	SDG&E	Total
Biogas				
+3-20 MW		Only 1 Contract		Only 1 Contract
Biogas Total		Only 1 Contract		Only 1 Contract
Biomass				
+3-20 MW		Only 1 Contract		Only 1 Contract
+20-50 MW		Only 2 Contracts	Only 1 Contract	0.1205
Biomass Total		0.1202	Only 1 Contract	0.1198
Geothermal				
+20-50 MW		Only 1 Contract		Only 1 Contract
Geothermal Total		Only 1 Contract		Only 1 Contract
Solar PV				
+3-20 MW	0.0593	0.0708		0.0692
+50-200 MW		0.0545		0.0545
Solar PV Total	0.0593	0.0601		0.0600
Solar Thermal				
+20-50 MW		0.0644		0.0644
Solar Thermal Total		0.0644		0.0644
Wind				
+50-200 MW		0.0523		0.0523
+200 MW				
Wind Total		0.0517		0.0517
Average of All Contracts	0.0593	0.0610	Only 1 Contract	0.0620

APPENDIX D

Revised Procurement Expenditure Information for Years 2012-2015

Overview of Tables

Tables D-1 through D-6 show revised RPS procurement expenditures for years 2012-2015 for SCE, and revised RPS procurement expenditures for 2015 for SDG&E. Per the confidentiality requirements in Public Utilities Code § 913.3, some of the data within this report is redacted in order to protect market sensitive information. In addition:

- Tables D-1 through D-6 compare RPS procurement expenditures calculated in past Padilla Reports (i.e., years 2012-2015). A column titled “Difference (Original minus Revised)” compares the numbers that were originally presented in previous Commission reports with the revised calculations. A positive number indicates that the final meter data is higher than the original information, while a negative number indicates that the final meter data is lower than the forecasted information in the 2013 report.
- Procurement expenditures represent weighted averages on a per kilowatthours basis. All figures are in nominal dollars.

**Table D-1. Revised Weighted Average RPS Procurement Expenditures
for SCE in 2012 (\$/kWh)²⁰**

	Original Calculation	Revised Calculation	Difference (Revised Minus Original)
UOG Solar PV			
0-3 MW	0.8901	0.3822	(0.5079)
+3-20 MW	0.8901	0.4305	(0.4596)
UOG Solar PV Total	0.8901	0.4090	(0.4811)
UOG Small Hydro			
0-3	0.1238	0.0888	(0.0350)
+3-20 MW	0.1238	0.1104	(0.0134)
UOG Small Hydro Total	0.1238	0.1076	(0.0162)
Total Costs - All Procurement	0.0817	0.0801	(0.0016)

²⁰ Only SCE's UOG figures changed. SCE's figures for all other technology types did not change in any way.

**Table D-2. Revised Weighted Average RPS Procurement Expenditures
for SCE in 2013 (\$/kWh)**

	Original Calculation	Revised Calculation	Difference (Revised Minus Original)
UOG Solar PV			
0-3 MW	0.1238	0.3732	0.2494
+3-20 MW	0.1238	0.3923	0.2685
UOG Solar PV Total	0.1238	0.3847	0.2609
UOG Small Hydro			
0-3	0.4700	0.1489	(0.3211)
+3-20 MW	0.4700	0.2123	(0.2577)
UOG Small Hydro Total	0.4700	0.2032	(0.2667)
Total Costs - All Procurement	0.0874	0.0830	(0.0044)
			0.0000

**Table D-3. Revised Weighted Average RPS Procurement Expenditures
for SCE in 2014 (\$/kWh)**

	Original Calculation	Revised Calculation	Difference (Revised Minus Original)
UOG Solar PV			
0-3 MW	0.0435	0.3766	0.3331
+3-20 MW	0.0488	0.3886	0.3398
UOG Solar PV Total	0.0464	0.3839	0.3375
UOG Small Hydro			
0-3	0.1652	0.2204	0.0552
+3-20 MW	0.1441	0.2096	0.0655
UOG Small Hydro Total	0.1470	0.2107	0.0637
Total Costs - All Procurement	0.0926	0.0956	0.0030

**Table D-4. Revised Weighted Average RPS Procurement Expenditures
for SCE in 2015 (\$/kWh)**

	Original Calculation	Revised Calculation	Difference (Revised Minus Original)
UOG Solar PV			
0-3 MW	0.0362	0.2956	0.2594
+3-20 MW	0.0338	0.2962	0.2624
UOG Solar PV Total	0.0348	0.2959	0.2611
UOG Small Hydro			
0-3	0.0876	0.2084	0.1208
+3-20 MW	0.1080	0.2571	0.1491
UOG Small Hydro Total	0.1053	0.2506	0.1453
Total Costs - All Procurement	0.0870	0.0905	0.0035

Table D-5. Revised Average RPS Procurement Expenditures
 (All Projects – Including REC-only transactions) for SDG&E in 2015 (\$/kWh)

	Original Calculation	Revised Calculations	Difference (Revised Minus Original)
Biogas			
0-3 MW	0.1040	0.1040	0.0000
+3-20 MW	0.0723	0.0723	(0.0000)
Biogas Total	0.0855	0.0855	0.0000
Biomass			
+3-20 MW	Only 1 Project	Only 1 Project	Confidential
+20-50 MW	Only 1 Project	Only 1 Project	Confidential
Biomass Total	Only 2 Projects	Only 2 Projects	Confidential
Small Hydro			
0-3 MW	Only 1 Project	Only 1 Project	Confidential
+3-20 MW	Only 2 Projects	Only 1 Project	Confidential
Small Hydro Total	0.0711	Only 2 Projects	Confidential
Solar PV			
0-3 MW	0.1287	Only 2 Projects	Confidential
+3-20 MW	0.0839	0.0839	0.0000
+20-50 MW	Only 2 Projects	Only 2 Projects	Confidential
+50-200 MW	0.1421	0.1209	(0.0213)
Solar PV Total	0.1395	0.1208	(0.0188)
Wind			
+3-20 MW	0.0773	0.0773	0.0000
+20-50 MW	Only 1 Project	Only 1 Project	Confidential
+50-200 MW	0.0697	0.0620	(0.0077)
+200 MW	Only 1 Project	Only 1 Project	Confidential
Wind Total	0.0767	0.0703	(0.0064)
Total	0.1019	0.0916	(0.0103)

**Table D-6. Revised Average RPS Procurement Expenditures
(Bundled Energy Only) for SDG&E in 2015 (\$/kWh)**

	Original Calculation	Revised Calculations	Difference (Revised Minus Original)
Biogas			
0-3 MW	0.1040	0.1040	0.0000
+3-20 MW	0.0723	0.0723	(0.0000)
Biogas Total	0.0855	0.0855	(0.0000)
Biomass			
+3-20 MW	Only 1 Project	Only 1 Project	Confidential
+20-50 MW	Only 1 Project	Only 1 Project	Confidential
Biomass Total	Only 2 Projects	Only 2 Projects	Confidential
Small Hydro			
0-3 MW	Only 1 Project	Only 1 Project	Confidential
+3-20 MW	Only 2 Projects	Only 1 Project	Confidential
Small Hydro Total	0.0711	Only 2 Projects	Confidential
Solar PV			
0-3 MW	0.1287	Only 2 Projects	Confidential
+3-20 MW	0.0839	0.0839	0.0000
+20-50 MW	Only 2 Projects	Only 2 Projects	Confidential
+50-200 MW	0.1421	0.1209	(0.0213)
Solar PV Total	0.1395	0.1208	(0.0188)
Wind			
+3-20 MW	0.0773	0.0773	0.0000
+20-50 MW	Only 1 Project	Only 1 Project	Confidential
+50-200 MW	0.1180	0.0910	(0.0270)
+200 MW	Only 1 Project	Only 1 Project	Confidential
Wind Total	0.1083	0.0932	(0.0150)
Total	0.1179	0.1035	(0.0144)

APPENDIX E

Text of PU Code 913.3

913.3. (a) Notwithstanding subdivision (g) of Section 454.5 and Section 583, no later than May 1 of each year, the commission shall release to the Legislature for the preceding calendar year the costs of all electricity procurement contracts for eligible renewable energy resources, including unbundled renewable energy credits, and all costs for utility-owned generation approved by the commission.

(1) For power purchase contracts, the commission shall release costs in an aggregated form categorized according to the year the procurement transaction was approved by the commission, the eligible renewable energy resource type, including bundled renewable energy credits, the average executed contract price, and average actual recorded costs for each kilowatthour of production. Within each renewable energy resource type, the commission shall provide aggregated costs for different project size thresholds.

(2) For each utility-owned renewable generation project, the commission shall release the costs forecast by the electrical corporation at the time of initial approval and the actual recorded costs for each kilowatthour of production during the preceding calendar year.

(b) The commission shall report all electrical corporation revenue requirement increases associated with meeting the renewables portfolio standard, as defined in Section 399.12, including direct procurement costs for eligible renewable energy resources and renewable energy credits.

(c) The commission shall report all cost savings experienced, or costs avoided, by electrical corporations as a result of meeting the renewables portfolio standard.

(d) This section does not require the release of the terms of any individual electricity procurement contracts for eligible renewable energy resources, including unbundled renewable energy credits, approved by the commission. The commission shall aggregate data to the extent required to ensure protection of the confidentiality of individual contract costs even if this aggregation requires grouping contracts of different energy resource type. The commission shall not be required to release the data in any year when there are fewer than three contracts approved.