

Application No. 16-03-\_\_\_\_  
Exhibit No.: (SDG&E-\_\_\_\_)

**PREPARED DIRECT TESTIMONY  
OF CYNTHIA FANG  
ON BEHALF OF SAN DIEGO GAS & ELECTRIC COMPANY**

BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA



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Attachment A – JOINT IOU PROPOSED PROTOCOL FOR ENERGY STORAGE  
POWER CHARGE INDIFFERENCE ADJUSTMENT

1 **PREPARED DIRECT TESTIMONY**

2 **OF CYNTHIA FANG**

3 **ON BEHALF OF SDG&E**

4 **I. INTRODUCTION**

5 The purpose of my prepared direct testimony is to present San Diego Gas & Electric  
6 Company's ("SDG&E") cost recovery proposal for the energy storage systems that SDG&E  
7 intends to procure pursuant to Decisions ("D.") 13-10-040, D.14-10-045, and D.16-01-032. My  
8 testimony also will address SDG&E's cost recovery proposal for energy storage projects  
9 SDG&E intends to procure through its 2016 energy storage procurement solicitations, as  
10 explained in the accompanying testimony of Joshua Gerber.

11 SDG&E requests the Commission approve the cost recovery proposal described in my  
12 testimony below.

13 **II. COST RECOVERY**

14 **A. Background**

15 In adopting the Energy Storage Procurement Framework and Design program, D.13-10-  
16 040 established Energy Storage Procurement Targets for Southern California Edison Company  
17 ("SCE"), Pacific Gas and Electric Company ("PG&E"), and SDG&E, collectively "IOUs," for  
18 the biennial periods commencing in 2014, 2016, 2018, and 2020 as well as a total procurement  
19 target for the 2014 through 2020 planning period. In addition, the Energy Storage Procurement  
20 Framework and Design Program requires that the IOU's biennial procurement applications  
21 include a request for cost recovery authorization.<sup>1</sup>

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<sup>1</sup> D.13-10-040, Appendix A, Section 3(d).

1 On October 22, 2014, the California Public Utilities Commission (“Commission”) issued  
2 D.14-10-045 approving SDG&E’s initial 2014 *Application for Approval of its Energy Storage*  
3 *Procurement Framework and Programs as Required by Decision 13-10-040* (Application (“A.”)  
4 14-02-006). D.14-10-045 approved, among other things, the IOU-proposed cost recovery  
5 mechanisms for energy storage procurement through existing ratemaking mechanisms for the  
6 December 2014 solicitation cycle, with the exception of:

- 7 • Power Charge Indifference Adjustment (“PCIA”) extension beyond 10 years,  
8 pending further evaluation of the PCIA methodology for energy storage,<sup>2</sup> and
- 9 • Combined generation/distribution energy storage.<sup>3</sup>

10 As noted above, while D.14-10-045 provided the bulk of storage-related cost recovery  
11 determinations, further cost recovery issues are still being addressed in pending proceedings  
12 before the Commission. Very recently, in D.16-01-032, the Commission stated that:

13 We *defer* the resolution of the request for extension of the Power Charge  
14 Indifference Adjustment mechanism for market/“bundled” energy storage  
15 contracts beyond 10 years *until the Commission has addressed the Joint*  
16 *PCIA mechanism filed with the IOU’s 2014 storage contracts on*  
17 *December 1, 2015*. The Joint PCIA mechanism is expected to address the  
18 mechanisms of the PCIA in terms of how it should be applied when  
19 dealing with non-generation resources.<sup>4</sup>

20 By way of background, D.14-10-045 approved the PCIA cost recovery mechanism to  
21 recover above-market costs associated with departing load for “bundled” energy storage services  
22 procured via the 2014 solicitation, and it also required that the IOUs submit for Commission  
23 approval a “Joint IOU Protocol” proposal for a PCIA methodology to determine the potential

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<sup>2</sup> D.14-10-045 at 49 and COL 32.

<sup>3</sup> D.14-10-045 at 40, these two outstanding issues do not affect my proposal for 2016 storage project cost recovery set forth below. As further described, my testimony includes and seeks the Commission’s review and approval of the Joint IOU Protocol, to which SDG&E is a signatory, and which presents a proposed PCIA methodology for energy storage projects, in compliance with D.14-10-045. SCE and PG&E submitted this same Joint IOU Proposal in their applications (A.15-12-003) and (A.15-12-004), respectively.

1 above-market stranded cost of bundled service storage procured in the 2014-2016 solicitation.<sup>5</sup>  
2 SDG&E coordinated with the other IOU's to develop the proposed Joint IOU Protocol, but did  
3 not procure bundled service storage with a generation/market function that would rely on PCIA  
4 cost recovery during the 2014 cycle, nor does it propose to do so in the 2016 procurement cycle.<sup>6</sup>

5 However, since SDG&E did not execute any bundled service energy storage service  
6 contracts in the 2014 procurement cycle, SDG&E is complying with the directive noted above  
7 by submitting the Joint IOU Protocol in this biennial procurement plan to ensure its full  
8 consideration by the Commission in a storage-specific proceeding. Accordingly, the Joint IOU  
9 protocol is included here as Attachment A to my testimony, in order to ensure a timely resolution  
10 of the PCIA methodology mechanics, as applied to bundled service storage projects.<sup>7</sup>

#### 11 **B. Proposal for Storage Project Costs**

12 SDG&E's cost recovery proposal has two components: (1) Local and Flexible Capacity  
13 resources for Cost Allocation Mechanism ("CAM") cost recovery, and (2) Distribution  
14 Reliability/Power Quality resources for Distribution cost recovery.

15 First, as described in detail in the prepared direct testimony of witness Patrick Charles for  
16 the 2016 procurement cycle, SDG&E will pursue storage through two distinct solicitations. The

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<sup>4</sup> D.16-01-032 at 49 (emphases added).

<sup>5</sup> D.14-10-045 Ordering Paragraph 1(3) at 118 and Conclusion of Law 24 at 115. Identical Joint IOU Protocol Proposals have already been filed as part of SCE application A.15-12-003 and PG&E application A.15-12-004. SDG&E's identical Joint IOU Protocol proposal is included herein as Attachment A.

<sup>6</sup> For this reason, SDG&E is submitting for consideration the Joint PCIA proposal in this proceeding rather than its forthcoming March 30, 2016 application that will seek approval of various types of resources, and not exclusively storage resources. Also, by submitting the Joint PCIA proposal here, SDG&E is complying at the earliest possible opportunity with the Commission's objective of having the Joint PCIA proposal considered in pending storage-specific proceedings.

<sup>7</sup> As noted above in fn. 5, SCE and PG&E have also submitted this same proposal in their respective, storage-specific proceedings. SDG&E recommends that the Joint PCIA proposal be considered at the same time that the Joint PCIA proposal is considered in PG&E's and SCE's dockets. Further, to place all three utilities' submissions on the same track, they might be considered simultaneously in each utility's respective storage application proceeding.

1 first is a 2016 Preferred Resources Local Capacity Requirement (“LCR”) Request for Offer  
2 (“RFO”) Seeking Local and Flexible Capacity through All Domains: transmission, distribution  
3 and customer. In that RFO, SDG&E is soliciting offers for up to 140 MW of energy storage to  
4 meet local capacity needs. Based on prior cost recovery authorizations, SDG&E submits that  
5 energy procured through this RFO would thereby be subject to CAM cost recovery, as these  
6 resources are needed for local system or reliability purposes consistent with P.U. Code  
7 365.1(c)(2). In D.13-03-029, the Commission authorized SDG&E to implement the Local  
8 Generation Charge (“LGC”) rate component, which is designed to recover new generation costs  
9 for local reliability that are deemed to be subject to CAM policy adopted in D.06-07-029 and  
10 D.11-05-005. The LGC is a per kilowatt hour non-bypassable charge to all benefiting  
11 customers, including all bundled service, Direct Access (“DA”) and Community Choice  
12 Aggregation (“CCA”) customers.

13 Second, as described in the testimony of Patrick Charles, the second solicitation is a 2016  
14 Distribution Reliability/Power Quality Solicitation by which SDG&E intends to solicit up to 4  
15 MW of utility owned energy storage systems via a competitive Request for Proposal (“RFP”)   
16 process to potentially (1) enable some measure of distribution capacity deferral, and (2) address  
17 reliability or provide outage management support. The prepared direct testimony of Randall  
18 Nicholson (Chapter 3) discusses how the energy storage projects procured through this second  
19 solicitation will be serving a distribution reliability function. Accordingly, it is reasonable and  
20 appropriate for the costs associated with the storage system(s) procured by this solicitation to be  
21 recovered from all customers through distribution rates. This treatment is consistent with the  
22 cost treatment outlined by the IOUs and approved by the Commission in D.14-10-045.

1 Further, SDG&E respectfully requests that the Commission approve the Joint IOU  
2 Protocol proposal for the application of the PCIA methodology to energy storage resources. The  
3 purpose of the Joint IOU Protocol is to ensure that the above-market costs of generation/market  
4 participation energy storage resources are recovered from those for whom the resources were  
5 procured. To ensure that the “indifference principle” for PCIA is preserved such that the  
6 recovery of above-market costs associated with energy storage are recovered from those  
7 customers for whom the resources were procured, SDG&E asks that the PCIA mechanism  
8 apply to the full contract term of the energy storage contract and not limit the applicability of the  
9 PCIA mechanism to 10 years.

10 **III. CONCLUSION**

11 SDG&E respectfully requests that the Commission to approve the cost recovery proposal  
12 described above. This concludes my prepared direct testimony.  
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1 **IV. STATEMENT OF QUALIFICATIONS**

2 My name is Cynthia S. Fang and my business address is 8330 Century Park Court, San  
3 Diego, California 92123. I am the Rate Strategy and Analysis Manager in the Customer Pricing  
4 Department of San Diego Gas and Electric (“SDG&E”). My primary responsibilities include  
5 overseeing the electric load analysis, electric demand forecasting and electric rate strategy for  
6 SDG&E as well as the development of cost-of-service studies, determination of revenue  
7 allocation and electric rate design methods, analysis of ratemaking theories, and preparation of  
8 various regulatory filings. I began work at SDG&E in May 2006 as a Regulatory Economic  
9 Advisor and have held positions of increasing responsibility in the Electric Rate Design group.  
10 Prior to joining SDG&E, I was employed by the Minnesota Department of Commerce, Energy  
11 Division, as a Public Utilities Rates Analyst from 2003 through May 2006.

12 In 1993, I graduated from the University of California at Berkeley with a Bachelor of  
13 Science in Political Economics of Natural Resources. I also attended the University of  
14 Minnesota where I completed all coursework required for a Ph.D. in Applied Economics.

15 I have previously submitted testimony before the Federal Energy Regulatory  
16 Commission and have submitted testimony and testified before the California Public Utilities  
17 Commission regarding SDG&E’s electric rate design and other regulatory proceedings. In  
18 addition, I have previously submitted testimony and testified before the Minnesota Public  
19 Utilities Commission on numerous rate and policy issues applicable to the electric and natural  
20 gas utilities.



**ATTACHMENT A**

JOINT IOU PROPOSED PROTOCOL FOR ENERGY STORAGE POWER  
CHARGE INDIFFERENCE ADJUSTMENT

# PROPOSED JOINT- IOU PROTOCOL FOR ENERGY STORAGE POWER CHARGE INDIFFERENCE ADJUSTMENT

## 1. Executive Summary

### a. Development of Joint IOU Protocol

Decision (D.) 14-10-045 authorized use of the Power Charge Indifference Adjustment (PCIA) mechanism to recover the above-market costs of energy storage resources procured in 2014 Energy Storage solicitations that operate in the wholesale markets. The decision also directed the investor-owned utilities (IOUs) – Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas and Electric (SDG&E) – to propose for California Public Utilities Commission (Commission) review and approval a “Joint IOU Protocol” for determining the above-market costs of this “bundled service” storage concurrent with the IOUs December 1, 2015 energy storage contract applications.<sup>1</sup> The IOUs have reviewed the current Commission-approved PCIA calculation methodology and conclude that no adjustment to this methodology is necessary for the purpose of incorporating storage procurement contracts and proposes the following protocol for including storage resources in the PCIA calculation method:

1. Include fixed costs of contract, forecasted variable operations and maintenance (O&M) expense, and forecasted cost of “fuel” (electricity purchased to charge resources) in the Total Portfolio Costs component of the Total Portfolio Indifference Calculation for each vintage year beginning in the year the resource commitment is made.
2. Multiply forecast portfolio generation, which includes the storage resource megawatt-hours, or MWh, discharged to market, by the energy component of the market price benchmark for each vintage year.
3. Multiply the portfolio net qualifying capacity (NQC), which includes the NQC of the storage resource, by the capacity value for each vintage year in the

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<sup>1</sup> D.14-10-045, pp. 118-119, Ordering Paragraph (OP) 1, subsections 3 and 6.

same manner as generation resources and reflected in the existing capacity adder component of the market price benchmark.

The current PCIA calculation method was adopted in D.11-12-018 and Resolution E-4475. Each IOU calculates vintaged PCIA rates on an annual basis in their respective Energy Resource Recovery Account (ERRA) forecast applications. Under the existing PCIA calculation method, an Indifference Amount is calculated for each vintage year that represents the difference between the forecasted costs associated with the utility's resource portfolio as it existed that year (i.e., "vintage") and the "market value" of that portfolio based on a market price benchmark calculation approved by the Commission.<sup>2</sup> The resulting Indifference Amount represents the above-market costs associated with the vintage portfolio. These above-market costs become stranded when customers depart bundled utility service (the "departing load") unless departing customers pay their fair share of those above-market costs.<sup>3</sup> The Indifference Amount is allocated to all customers who received procurement service from the utility during the vintage year, including customers who departed after the vintage year. This calculation determines the vintage PCIA rates.

The IOUs conclude that the PCIA calculation method is appropriate for incorporating storage resources. Costs included in the Total Portfolio Indifference Calculation for a storage procurement contract are the purchase costs (i.e., fixed "capacity" costs, variable O&M expenses, and any other costs included in the contract) and the costs associated with charging the resource. The costs associated with charging the resource are analogous to fuel costs and represent the costs of charging the storage resource from the electric grid. These total costs are included in the total portfolio costs which are then benchmarked against a market value, as described below, to determine the portion of the costs that are above-market.

The benchmark contains capacity value attributed to the net qualifying capacity (NQC) value assigned to a resource by the California Independent

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- 2** The PCIA, and associated PCIA vintaged rates, are based on the "Total Portfolio Indifference Calculation" or "Indifference Amount". These terms are used interchangeably in this proposal.
  - 3** The concept of bundled customer indifference was adopted as a Guiding Principle for stranded cost recovery in D.08-09-012, pp. 10-11.

System Operator (CAISO), and a market energy value that reflects the average value of the portfolio. The IOUs propose to include the generation (i.e., megawatt-hours, or MWh) associated with the discharge of the storage resource into the calculation of the market value of the portfolio. Additionally, as with generation resources, if the storage resource has a NQC value, the resource will be attributed a capacity value. The difference between the costs associated with the storage resource and the market value (energy and capacity) of the resource will contribute to the determination of the portfolio above-market costs represented in the Indifference Amount.

**b. IOU Engagement with Affected Parties**

D.14-10-045 ordered the IOUs to consult with other affected parties in the development of the “Joint IOU Protocol” for incorporating storage procurement into the PCIA calculation methodology.<sup>4</sup> The IOUs consulted with other interested parties as required by D.14-10-045. Parties who responded to the IOUs’ invitation for consultation included: (1) the “CCA Parties,” consisting of Marin Clean Energy, Sonoma Clean Power, and City of Lancaster; (2) the “Joint Parties,” consisting of the Alliance for Retail Energy markets (AReM), Shell Energy North America (US), L.P., and the Western Power Trading Forum; and (3) The Utility Reform Network (TURN).

An overview of the steps followed by the IOUs to solicit feedback and respond to the other interested parties’ concerns and suggestions is provided in the table below.

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<sup>4</sup> The Application Decision, p. 119 (OP 6).

**TABLE 1  
JOINT IOU PROTOCOL PROCEDURAL SCHEDULE**

Line No.	Date	Action
1	July 1, 2015	Joint IOUs circulated Joint IOU Proposal and Consultation Schedule to interested parties.
2	July 21, 2015	Interested parties e-mailed written comments to IOUs.
3	August 4, 2015	Joint IOUs hosted first conference call regarding comments on the Joint IOU Proposal.
4	August 18, 2015	Joint IOUs circulated their response to comments.
5	August 21, 2015	TURN e-mailed the IOUs that they would not be providing further written comments.
6	August 28, 2015	The Joint Parties recommended in written comments that the PCIA methodology for energy storage be resolved in a policy proceeding prior to the IOUs filing their applications for approval of their 2014 energy storage solicitation.
7	August 29, 2015	CCA Parties e-mailed the IOUs that they would not be providing written reply comments and instead would take up the issue in a proceeding before the Commission.
8	September 8, 2015	Joint IOUs hosted second conference call regarding comments on the Joint IOU Proposal.
9	December 1, 2015	Submission of Joint IOU Proposal with applications for storage contract approval.

As shown in the timeline above, on July 1, 2015, the Joint IOUs e-mailed the draft *Proposed Joint IOU Protocol for Storage Power Charge Indifference Adjustment* (Joint IOU Protocol) for review and comment by parties to the energy storage rulemaking.

The draft Joint IOU Protocol included a consultative process for gathering and responding to the comments of parties potentially affected by the inclusion of energy storage procurement costs in the PCIA. Interested parties e-mailed their comments on the draft Joint IOU Protocol to the IOUs on July 21, 2015. Appendix A to this protocol includes a summary of the questions and concerns raised by parties in their comments. This summary was prepared by the IOUs to facilitate discussion on the August 4, 2015 conference call, and was circulated to the parties on July 31, 2015 in advance of the call. On August 4, 2015, the IOUs convened a conference call to discuss comments on the draft Joint IOU Protocol. The IOUs provided a response to parties' comments on August 18, 2015, which is included as Appendix B to this protocol. On August 21, 2015 the IOUs received notice from The Utility Reform Network (TURN), indicating that it did not intend to

provide any additional comments on August 28, 2015 but would participate in the second conference call regarding comments, scheduled for September 8, 2015. On August 28, 2015, the IOUs received comments from the Joint Parties stating that the PCIA methodology for energy storage be resolved in a policy proceeding prior to the IOUs filing their applications for approval of contracts from their 2014 energy storage solicitations. On August 29, 2015, the IOUs received notice from the CCA parties thanking the IOUs for the opportunity to provide comments; however, the CCA Parties felt the informal process was not productive and would not be submitting reply comments. Instead, the CCA Parties preferred to take up the issue in a proceeding before the Commission. The IOUs convened the second conference call on September 8, 2015, during which the representative of Shell Energy North America was the only non-IOU participant. He also thanked the IOUs and stated that his client would address its PCIA concerns directly to the Commission.

In summary, the IOUs jointly recommend that the existing PCIA calculation method requires no further modifications to incorporate storage resources. D.14-10-045 authorized PCIA treatment for storage resources procured in the first solicitation period.

## **2. Proposal Background**

D.14-10-045 authorized the use of the PCIA mechanism to recover the above-market costs associated with energy storage procured via the 2014 solicitation from future departing load customers.<sup>5</sup> The Commission ordered the IOUs, in consultation with other affected parties, to file a “Joint IOU Protocol” for incorporating storage procurement into the PCIA calculation methodology concurrent with the IOUs’ December 1, 2015, energy storage applications.<sup>6</sup>

The decision stated the Commission’s ongoing support for the “indifference principle” for PCIA which is designed to recover above-market costs of otherwise stranded procurement to serve utility bundled customers before they departed, but recognized the need for further consideration of how storage would be incorporated into that calculation.<sup>7</sup> The decision recognized that given the unique

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<sup>5</sup> D.14-10-045, p. 118 (OP 3).

<sup>6</sup> D.14-10-045, p. 119 (OP 6).

<sup>7</sup> D.14-10-045, pp. 40, 45-46.

attributes of a storage resource compared to a traditional generation resource, it is necessary to evaluate whether there is a need to make any modifications to how the PCIA is calculated specifically for storage resources.

### **3. Background on the PCIA**

The PCIA is intended to ensure that departing load pay their fair share of the above-market portion of utility portfolio costs incurred prior to the customer departures and thereby preserve the indifference of remaining utility customers (i.e., bundled customers who continue to receive energy services from the IOU) to such departures.<sup>8</sup> A customer who departs from utility service to purchase their energy service commodity from a Direct Access (DA) provider, Community Choice Aggregator (CCA), or other departing load option, pays a vintaged PCIA rate that represents the customer's share of above-market procurement costs incurred on the customer's behalf before they left the utility. The PCIA calculation methodology has been modified over time to incorporate new generation commitments made by the IOUs and refine the market price benchmark.

This concept of indifference was introduced in the DA Suspension Rulemaking (Rulemaking (R.) 02-01-011), which the CPUC initiated after the 2000-2001 energy crisis and the suspension of DA in 2001. This rulemaking adopted an allocation of costs associated with the California Department of Water Resources (DWR) long-term power purchase contracts signed in 2001 to ensure that customers who benefited from the DWR contracts were allocated a fair share of the above-market costs that would otherwise be stranded to prevent any cost shifting to remaining bundled customers. In D.02-11-022, the Commission first adopted a total portfolio indifference calculation method to quantify the portion of the above-market costs to be collected from non-exempt departing load in the form of a cost responsibility surcharge (CRS) called the DWR Power Charge.

In 2006, in D.06-07-030, the Commission adopted a settlement agreement for the prospective calculation of the Indifference Amount. The decision approved the use of the total portfolio indifference calculation for each of the IOUs, which allowed each IOU to calculate its own stand-alone Indifference Amount, and renamed the DWR Power Charge the "Power Charge Indifference Adjustment". The revised total portfolio indifference calculation compared the forecast costs

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<sup>8</sup> D.14-10-045, p.30, footnote 39.

and generation for each IOU's legacy (i.e., pre-2002) generation resource commitments plus each IOU's allocated DWR contract costs to a market price benchmark to determine above-market costs. Simply represented, the formula for determining the PCIA is:

$$\text{Portfolio Costs} - \text{Market Value} = \text{Indifference} = \text{Ongoing CTC} + \text{PCIA}^9$$

The specific methodology to calculate the non-bypassable charge for the IOUs' post-2002 generation resource commitments was approved in D.08-09-012, which was the Track 3 Decision in the 2006 Long-Term Procurement Plan proceeding. This decision also established vintaging requirements for the PCIA. Assigning a vintage to departing load customers ensures that departing load customers pay their fair share of the above-market costs associated with the vintage portfolio of resources that were acquired prior to their departure from bundled service. It also ensures that departing load customers do not pay for above-market costs associated with utility procurement commitments made after the customer departs.

The PCIA calculation method was further modified in D.11-12-018 to recognize regulatory and industry changes affecting utility procurement. Changes made to the market price benchmark included the addition of a "renewable adder" to the market price benchmark to reflect the value of the renewable portfolio standard-eligible resources included in the portfolio and a revised capacity adder. Other changes included revisions intended to better reflect time-of-use load variations and removal of load-related costs incurred by the CAISO and then charged to utilities. Detail on how the PCIA is calculated, including the various components of the market price benchmark, is provided in Section 4 below.

#### **4. Current Total Portfolio Indifference Calculation**

The current PCIA methodology calculates "vintaged" PCIA rates, which correspond to resource commitments in existence when the departing load was served by the IOU. The PCIA methodology calculates the above-market costs of

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<sup>9</sup> The ongoing competition transition charge (CTC) is calculated using the same methodology as the PCIA and represents the above-market costs associated with pre-1996 resources in the IOU's portfolio.



an IOUs' bundled resource portfolio for each applicable vintage by calculating the difference in the total costs of the vintage portfolio and a market value for the same portfolio, net of the ongoing CTC above-market costs related to the electricity industry restructuring of 1996. The total portfolio indifference calculation is "vintaged" so that new generation resource commitments are added to the portfolio in the year that the resource commitment was made. Departing load is also vintaged based on the year the customer departs from bundled utility service to ensure that departing load customers only pay for procurement obligations made prior to their departure. The calculated Indifference Amount for each vintage PCIA year is allocated to customer load served in that year to determine the vintage PCIA rate applied to customers who departed in that year.

**a. Total Portfolio Costs**

The total portfolio costs included in the indifference calculation reflect the utility's expected generation costs based on the efficient dispatch of available resources. Resources included in the total portfolio indifference calculation include, (1) utility-owned generation, (2) the IOU's legacy (i.e., pre-2002) generation qualifying facilities (QF) contracts and irrigation district and water agency agreements, and (3) post-2002 generation resource commitments, including utility owned-generation and new renewable and conventional generation contracts. The IOUs use various modeling techniques to forecast the resource portfolio costs as described in their respective ERRA testimony.

**b. Market Price Benchmark**

The market price benchmark is intended to reflect the market value of the portfolio given the energy, capacity, and renewable attributes of the resource portfolio. Each component of the benchmark is described below.

**1) Energy**

The market price benchmark calculation assigns an energy value to the forecasted generation associated with the utility's vintage resource portfolio based on forward energy market prices. The formula for determining the energy value was originally adopted in Appendix 1 of D.06-07-030 and was modified by Decision 07-01-025 (OP 2). The energy value calculation is made as follows:

- Collecting daily forward price quotes from October 1 through October 31 for 12 months of on-peak (6 days × 16 hours/day) and off-peak (6 days × 8 hours/day; 1 day × 24 hours/day) power delivered at North of Path 15 (NP-15) for the forecast year for PG&E and South of Path 15 (SP-15) for SCE and SDG&E, as published in *Platts-ICE Forward Curve – Electricity* for NP-15 and SP-15, respectively.
- Averaging the daily quotes to get an annual on-peak forward price and an annual off-peak forward price.
- Determining a weighted average forward power cost by multiplying the average on-peak and off-peak price times the weighting factors adopted in D.11-12-018, which are based on the most recent publicly available on- and off-peak bundled load weighting.

## 2) Renewable Adder

The renewable adder, or green adder, is intended to reflect the market premium associated with RPS-compliant resources in the portfolio. The renewable adder is calculated each year based on a 32 percent weighting of Department of Energy data on Western United States renewable energy premiums and a 68 percent weighting of IOU cost data for newly delivering RPS-compliant resources (based on the current and upcoming years). Inputs are provided by the Energy Division and the renewable adder is applied to the percentage of renewable energy in the vintage portfolio to determine the renewable adder's contribution to the portfolio's total market price benchmark.

## 3) The Capacity Adder

The capacity adder reflects the contribution portfolio resources provide to meeting the utility's resource adequacy requirements and is based on the portfolio resource's NQC. D.11-12-018 updated the capacity adder value. The capacity adder is applied to the portfolio as follows:

- **Capacity (CAP) ADDER** = {Sum of NQC for all resources in the Total Portfolio for PCIA Vintage year  $v$  \* CAP VALUE}/forecast of the sum of megawatt-hours (MWh) supplied by the Total Portfolio for PCIA Vintage year  $v$ }; where

- **CAP VALUE** = the going forward cost (sum of insurance, ad valorem, and fixed operations and maintenance costs) of a combustion turbine as determined by the most recent California Energy Commission *Comparative Costs of California Central Station Electricity Generation Report* for a small simple cycle merchant plant.

## 5. Protocol for Incorporating Storage Resources into the PCIA Calculation

### Method

As described in Section 4 above, the total Indifference Amount calculated to determine the PCIA is based on the difference between the total portfolio costs and the value of the portfolio using a market price benchmark calculation. This determines the above-market costs associated with the portfolio. The procurement of a *generation* resource results in an increase in the total portfolio costs to capture the contract price and any other costs, such as fuel, that may not be included in the contract price. The total portfolio costs, including storage costs, are benchmarked against a market value for the energy, capacity, and, in the case of a renewable resource, renewable attributes of the resource. For example, when the utility procures a conventional gas-fired resource through a power purchase agreement it receives energy and capacity benefits.

The procurement of a *storage* resource impacts the Indifference Amount in the same manner as a conventional *generation* resource. The addition of a storage resource to the utility's portfolio adds costs based on the fixed price of the resource. There are also "fuel" costs associated with charging the resource. The difference between a storage resource and conventional generation resource is that the fuel is the electricity drawn from the grid rather than a fuel commodity. The costs associated with the storage resource should be included in the total portfolio costs and benchmarked against the energy and capacity market values in the same manner as a generation resource because the PCIA is calculated for the portfolio as a whole. The energy value is multiplied by the total portfolio generation, which includes the discharge of the storage resource in MWh, and the capacity value is multiplied by the total portfolio NQC, which includes the NQC of the storage resource.

To illustrate the point that a storage resource impacts the Indifference Amount in the same manner as a generation resource, a comparison between a conventional generator and an energy storage resource is shown in Table 2. For

the purpose of the PCIA calculation, the IOUs will treat a storage resource unit the same as a conventional gas generator except that purchased electricity is the fuel source for storage rather than purchased natural gas.

**Table 2**  
**Comparison of Conventional Generation Resource**  
**and Storage Resource for PCIA Calculation**

Indifference Amount Component	Conventional Gas Generation Resource	Energy Storage Resource
Total Portfolio Costs: Fixed Costs	Annual cost of fixed capacity and O&M payments	Annual cost of fixed capacity and O&M payments
Total Portfolio Costs: Variable O&M	Variable O&M cost associated with forecasted generation	Variable O&M cost associated with forecasted generation (discharge)
Total Portfolio Costs: Fuel	Cost of fuel (natural gas) associated with forecasted generation	Cost of fuel (electricity) purchased to charge resource
Market Price Benchmark: Energy (MWh)	Forecasted generation	Forecasted generation (discharged to market)
Market Price Benchmark: Capacity (MW)	NQC	NQC
Market Price Benchmark: Renewable Premium (MWh)	N/A	N/A

As Table 1 demonstrates, with the addition of a storage resource to the portfolio it is appropriate to continue to compare the portfolio against forward energy prices as this provides a benchmark against what the utility would have paid absent the addition of the resource to the portfolio. Any capacity value assigned to the storage resource will also be captured in the existing market price benchmark.

#### **6. Protocol for Storage Resources Included in the PCIA Calculation**

The IOUs propose the following protocol be used for storage procurement contracts eligible to be included in the PCIA calculation (i.e., storage resources operating in the wholesale markets):

1. Include fixed costs of contract, forecasted variable O&M, and forecasted cost of “fuel” (electricity purchased to charge resources) in the Total Portfolio Costs component of the Total Portfolio Indifference

Calculation for each vintage year beginning in the year the resource commitment is made.

2. Multiply forecast portfolio generation, which includes the storage resource (i.e., MWh discharged to market), by the energy component of the market price benchmark for each vintage year.
3. Multiply the portfolio NQC, which includes the NQC of the storage resource, by the capacity value in the same manner as generation resources and reflected in the existing capacity adder component of the market price benchmark for each vintage year.

## **7. Conclusion**

It is unnecessary to adjust the PCIA calculation method to incorporate storage resources. The utilities propose to incorporate storage procurement contracts into the PCIA calculation by including the applicable costs associated with the procured resource in the same manner as a conventional generation resource with the exception that “fuel” costs associated with a storage resource are based on the costs of purchased electricity to charge the resource. The same market price benchmark methodology will be used when including storage resources in the portfolio.

The IOUs conclude that it is appropriate to include storage procurement contracts in the PCIA calculation and request that the Commission approve use of this protocol for incorporating storage resource procurement contracts procured in this solicitation.

## **APPENDIX A**

QUESTIONS AND ISSUES RAISED BY PARTIES IN RESPONSE TO THE PROPOSED  
JOINT INVESTOR-OWNED UTILITY (IOU) PROTOCOL FOR THE POWER CHARGE  
INDIFFERENCE ADJUSTMENT (PCIA) FOR ENERGY STORAGE RESOURCES

**Questions and Issues Raised by Parties in Response to the  
Proposed Joint Investor-owned Utility (IOU) Protocol for the Power Charge Indifference  
Adjustment (PCIA) for Energy Storage Resources**

On July 21, 2015, the IOUs received three submittals in response to the Proposed Joint IOU Protocol for the PCIA for Energy Storage Resources:

- Response of Alliance for Retail Energy markets (AREM), Shell North America (US), L.P. (Shell), and the Western Power Trading Forum (WPTF) to the Proposed Joint IOU Protocol for the PCIA In Compliance with Decision (D.) 14-10-045, Ordering Paragraph (OP) 1.3 (collectively, the Joint IOU Parties).
  - Comments on the Joint IOU Proposal for the PCIA in Compliance with D.14-10-045, OP 1.3 submitted by Marin Clean Energy (MCE), Sonoma Clean Power (SCP), and City of Lancaster (collectively, the CCA parties).
  - Preliminary Informal Feedback of the Utility Reform Network (TURN) on the Proposed Joint IOU Protocol for Energy Storage PCIA.
1. **The Community Choice Aggregation (CCA) Parties and Joint Parties, respectively, request that the issue of PCIA treatment for energy storage resources be addressed in Rulemaking (R.) 15-03-011 rather than the IOUs’ applications seeking California Public Utilities Commission (CPUC or Commission) approval of energy storage contracts.<sup>1</sup>**
  2. **The CCA Parties request that “system-level benefits” be considered when determining the market value of energy storage resources for the purpose of calculating the PCIA.<sup>2</sup>**
  3. **The CCA Parties and Joint Parties, respectively, request that “ancillary services benefits” be considered when determining the market value of energy storage resources for the purpose of calculating the PCIA.<sup>3</sup> The Utility Reform Network (TURN) request an explanation of why such benefits are not included in the Joint IOU Protocol.<sup>4</sup>**
  4. **CCA Parties request that reliability for distributed generation benefits be considered when determining the market value of energy storage resources for the purpose of calculating the PCIA<sup>5</sup> and TURN requests an explanation of why the IOUs do not include avoided transmission and distribution (T&D) costs in the Joint IOU Protocol.<sup>6</sup>**

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<sup>1</sup> CCA Parties, pp 5-6, Joint Parties, p. 4.

<sup>2</sup> CCA Parties, p. 3.

<sup>3</sup> CCA Parties, p. 3.

<sup>4</sup> TURN, p. 2.

<sup>5</sup> CCA Parties, p. 3.

<sup>6</sup> TURN, p. 2.

5. The CCA Parties and Joint Parties, respectively, request that an adder to the market price benchmark be developed to reflect the value a storage resource provides towards meeting the IOU's storage procurement target.<sup>7</sup> Joint Parties suggest that this adder be based on the storage resource's full cost.<sup>8</sup>
6. The CCA Parties and Joint Parties, respectively, request that the energy value for energy storage resources be calculated using forecasted peak prices rather than the average on-peak and off-peak prices.<sup>9</sup> TURN request an explanation of why generation from storage resources receives a weighted average energy price instead of an on-peak price related to its time of delivery.<sup>10</sup>
7. TURN requests that the IOUs provide a sample calculation for a hypothetical storage resource, including all components of the PCIA and how each is derived.<sup>11</sup>
8. TURN requests that the IOUs provide the expected time and cost pattern(s) for charging and discharging storage units of different sizes (e.g., storage of a given amount of electricity for 2 hours, 4 hours, 6 hours).<sup>12</sup>
9. TURN requests that the IOUs provide a calculation and qualitative explanation of how "fuel" (electricity) costs for storage assets are derived, including the relationship of such costs to the price paid for generation from storage projects.<sup>13</sup>
10. TURN requests that the IOUs indicate what types of storage assets are subject to the PCIA and which are not. For example, whether a storage asset connected at the distribution level that does not provide electricity to the wholesale market is subject to the PCIA.<sup>14</sup>
11. TURN requests that the IOUs should address whether the Joint IOU Protocol should include a computation of flexible capacity values and costs given the Commission's adoption of a flexible capacity procurement requirement in its Resource Adequacy program.<sup>15</sup>

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<sup>7</sup> CCA Parties, p. 5, Joint Parties, p. 1.

<sup>8</sup> Joint Parties, pp. 1-3.

<sup>9</sup> CCA Parties pp. 4-5, Joint Parties pp. 2-4.

<sup>10</sup> TURN, p. 2.

<sup>11</sup> TURN, p. 1.

<sup>12</sup> TURN, p. 1.

<sup>13</sup> TURN, p. 2.

<sup>14</sup> TURN, p. 2.

<sup>15</sup> TURN, p. 2.



**APPENDIX B:**  
IOUS RESPONSES TO QUESTIONS AND ISSUES RAISED BY PARTIES IN  
RESPONSE TO THE PROPOSED JOINT INVESTOROWNED UTILITY (IOU)  
PROTOCOL FOR THE POWER CHARGE INDIFFERENCE ADJUSTMENT (PCIA) FOR  
ENERGY STORAGE RESOURCES

To: Parties on California Public Utilities Commission (“CPUC”) Service List for Rulemaking (“R.”) 15-03-011<sup>1/</sup>

From: Pacific Gas and Electric Company (U 39-E)  
Southern California Edison Company (U 338-E), and  
San Diego Gas & Electric Company (U 902-E)  
(The Joint Investor-Owned Utilities or “Joint IOUs”)

Date: August 18, 2015

Subject: Joint Investor-Owned Utilities (“IOU”) Protocol for the Power Charge Indifference Adjustment (“PCIA”) in compliance with Decision (“D”).14-10-045, Ordering Paragraph 1.3

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Background:

On July 1, 2015, the Joint IOUs emailed the “Joint IOU Proposed Protocol for Storage Power Charge Indifference Adjustment” (“Joint IOU Proposal”) for review and comment by parties to the energy storage rulemaking (R.15-03-011) in accordance with the California Public Utilities Commission’s (“CPUC”) decision approving the 2014-2015 Energy Storage Plan of each IOU.<sup>2/</sup> The Joint IOU Proposal included a consultative process for gathering and responding to the comments of parties potentially affected by the inclusion of energy storage procurement costs in the Power Charge Indifference Adjustment (“PCIA”).

Interested parties emailed their comments on the Joint IOU Proposal to the IOUs on July 21, 2015. On August 4, 2015, the IOUs convened a conference call to discuss comments on the Joint IOU Proposal.

This memo transmits the Joint IOUs’ response to comments.

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1/ Order Instituting Rulemaking to consider policy and implementation refinements to the Energy Storage Procurement Framework and Design Program (D.13-10-040, D.14-10-045) and related Action Plan of the California Energy Storage Roadmap.

2/ D.14-10-045 Ordering Paragraph (“OP”) 1.3).

Next Steps:

If you have any questions about this process, please feel free to contact the appropriate IOU representative:

Pacific Gas and Electric Company (U 39-E)  
Wade Greenacre, Regulatory Affairs  
[WAG9@pge.com](mailto:WAG9@pge.com)

Southern California Edison Company (U 338-E)  
Desiree (Cua) Wong, State Regulatory Operations – Rate Design,  
[Desiree.Wong@sce.com](mailto:Desiree.Wong@sce.com)

San Diego Gas & Electric Company (U 902-E)  
Will Fuller, California and Federal Regulatory Affairs  
[Wfuller@semprautilities.com](mailto:Wfuller@semprautilities.com)

<b>Date</b>	<b>Status</b>	<b>Action</b>
July 1, 2015	✓	Joint IOUs circulate Joint IOU Proposal and Consultation Schedule to affected parties
July 21, 2015	✓	Interested parties e-mail written comments to IOUs
August 4, 2015	✓	Joint IOUs host first conference call regarding comments on the Joint IOU Proposal (call-in information will be e-mailed to affected parties prior to the call)
August 18, 2015	✓	Joint IOUs circulate their response to comments
August 28, 2015		Interested parties e-mail written comments to IOUs in response to the IOUs' comments
September 8, 2015		Joint IOUs host second conference call regarding comments on the Joint IOU Proposal
October-December 2015		Submission of Joint IOU Proposal with Applications for storage contract approval

August 18, 2015

**Responses to Questions and Issues Raised by Parties in Response to the  
Proposed Joint Investor-Owned Utility (IOU) Protocol for the Power Charge Indifference  
Adjustment (PCIA) for Energy Storage Resources**

On July 21, 2015, the IOUs received the following three submittals in response to the Proposed Joint IOU Protocol for the PCIA for Energy Storage Resources:

- Response of Alliance for Retail Energy Markets (AREM), Shell North America (US), L.P. (Shell), and the Western Power Trading Forum (WPTF) to the Proposed Joint IOU Protocol for the PCIA In Compliance with Decision (D.) 14-10-045, Ordering Paragraph (OP) 1.3 (collectively, the Joint Parties).
- Comments on the Joint IOU Proposal for the PCIA in Compliance with D.14-10-045, OP 1.3 submitted by Marin Clean Energy (MCE), Sonoma Clean Power (SCP), and City of Lancaster (collectively, the CCA Parties).
- Preliminary Informal Feedback of The Utility Reform Network (TURN) on the Proposed Joint IOU Protocol for Energy Storage PCIA.

The primary guiding principle that the California Public Utilities Commission (CPUC or Commission) has established for the PCIA is to maintain “bundled customer” indifference. That is, when a customer departs the IOU’s electric commodity service to purchase electricity from an alternative supplier, costs incurred by the remaining customers who receive commodity and electric service from IOUs (“bundled customers”) should not increase or decrease as a result. The Commission has consistently re-asserted this principle, including in the decision establishing the storage procurement targets.<sup>1</sup>

The IOU’s Joint Protocol for incorporating storage resources is based on this guiding principle. The purpose of the Protocol is to ensure that the above-market costs of generation-function energy storage are recovered from those for whom the resources were procured by ensuring that bundled customers and customers who depart bundled service after an energy storage resource is procured realize any benefits in a consistent manner.<sup>2</sup>

Below are responses from the IOUs to the issues and questions raised by these parties in response to the Joint IOU Protocol.

- 1. The Community Choice Aggregation (CCA) Parties and Joint Parties, respectively, request that the issue of PCIA treatment for energy storage resources be addressed in Rulemaking (R.) 15-03-011 rather than the IOUs’ applications seeking CPUC or Commission approval of energy storage contracts.<sup>3</sup>**

Joint IOU Response: The IOUs do not agree with the CCA and Joint Parties that the technical issue of how to incorporate storage resources into the PCIA calculation should be addressed in R.15-03-011. In D.14-10-045, the Commission approved the PCIA to

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<sup>1</sup> D.14-10-045, pp. 40, 45-46; D.08-09-012, pp. 9-11; and D.11-12-018, pp. 7-9 discuss the bundled customer indifference principle in further detail with D.11-12-018 (p.7) stating that “remaining bundled customers must be protected from any cost shifting and left economically indifferent as the result of DA customers leaving the system.”

<sup>2</sup> See *generally*, Resolution E-3813.

<sup>3</sup> CCA Parties, pp 5-6, Joint Parties, p. 4.

recover the above-market costs associated with departing load for energy storage projects procured under the 2014 solicitations and requested that the IOUs submit a Joint Protocol for including storage in the PCIA calculation when the IOUs submit their applications for approval of energy storage contracts. The IOUs are following the process directed by the Commission in D.14-10-045. Consideration of the Joint IOU Protocol as part of the IOUs' storage applications will ensure that clear direction on cost recovery treatment for energy storage contracts is provided to the IOUs when those contracts are considered for approval by the Commission. Track 1 of R.15-03-011 is concurrently addressing the policy questions of whether the PCIA should apply to all future solicitations, and the length of time for which the PCIA should apply.

**2. The CCA Parties request that “system-level benefits” be considered when determining the market value of energy storage resources for the purpose of calculating the PCIA.<sup>4</sup>**

Joint IOU Response: While it is not entirely clear what the CCA Parties mean by “system-level benefits,” that term inherently implies that the benefits are shared by all customers. For example, if energy storage systems lead to a more efficient electric system with lower market prices, those lower market prices will benefit all load served in the market. Because “system-level benefits” are shared by all customers, it is inappropriate to include an artificial adder to the market value of energy storage procurement in the PCIA (which would reduce the above-market costs to be recovered through the PCIA.) Doing so would result in those benefits being double counted because departing load customers would receive those benefits through a reduced PCIA and lower market prices passed on by their service provider.

**3. The CCA Parties and Joint Parties, respectively, request that “ancillary services benefits” be considered when determining the market value of energy storage resources for the purpose of calculating the PCIA.<sup>5</sup> TURN requests an explanation of why such benefits are not included in the Joint IOU Protocol.<sup>6</sup>**

Joint IOU Response: Ancillary services revenues received by other types of generation resources are not currently included in the PCIA calculation. The ancillary services revenues generated by resources operating in the California Independent System Operator (CAISO) market are de minimis relative to the overall net costs of the resources. The most recent CAISO annual report on market issues and performance estimated ancillary services costs (which reflect expected revenues the CAISO pays for ancillary services), to be less than 1 percent of total market costs.<sup>7</sup>

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<sup>4</sup> CCA Parties, p. 3.

<sup>5</sup> CCA Parties, p. 3.

<sup>6</sup> TURN, p. 2.

<sup>7</sup> CAISO, 2014 Annual Report On Market Issues & Performance, p. 9. Located at:

[http://www.caiso.com/Documents/2014AnnualReport\\_MarketIssues\\_Performance.pdf](http://www.caiso.com/Documents/2014AnnualReport_MarketIssues_Performance.pdf). “Ancillary service costs totaled \$69 million in 2014, representing a 21 percent increase from \$57 million in 2013. The increase is related to a decrease in ancillary services from hydro-electric generators compared to 2013 and an increase in natural gas prices. As shown in Figure E.5, ancillary service costs increased to \$0.30/MWh of load served in 2014 from \$0.25/MWh in 2013. Ancillary service costs represent 0.6 percent of wholesale energy costs, up slightly from 0.5 percent in 2013.

**4. CCA Parties request that reliability for distributed generation benefits be considered when determining the market value of energy storage resources for the purpose of calculating the PCIA<sup>8</sup>**

Joint IOU Response: It is not clear to the IOUs if “reliability for distributed generation resources,” is intended to mean increased grid reliability due to the addition of storage resources or increased reliability of the distributed generation resources themselves by balancing their generation (i.e., reducing the intermittency of the resources). Regardless of the interpretation, benefits are shared at either the system level (through potential lower market prices) or at the distribution level (if enhanced grid reliability is achieved) and would not remain solely with the utility’s bundled customers. Because reliability benefits are already realized and accounted for, no adjustment to the PCIA is necessary.

**5. TURN requests an explanation of why the IOUs do not include avoided transmission and distribution (T&D) costs in the Joint IOU Protocol.<sup>9</sup>**

Joint IOU Response: If storage projects lead to avoided T&D investments or deferral of T&D costs until some point in the future, those cost savings will be realized by all customers, including bundled and departing load customers, through lower transmission and distribution rates. Attribution of those cost savings, if any, as part of the PCIA calculation would double count the avoided and deferred costs and cause bundled customer generation rates to increase as a result. Therefore, an adjustment to the indifference calculation that provides a credit for any potential avoided T&D costs is not warranted and would be inappropriate

**6. The CCA Parties and Joint Parties, respectively, request that an adjustment to the market price benchmark be developed to reflect the value a storage resource provides towards meeting the IOU’s storage procurement target.<sup>10</sup>**

Joint IOU Response:

The CCA and Joint Parties argue that an adder, similar to the existing renewable adder, should be applied for storage resources to reflect the value a storage resource provides for contributing to the Commission-adopted storage procurement targets. The assumption is that the renewable adder and a potential storage adder are analogous. This is not the case. The IOU’s RPS compliance requirements are based on a percentage of load while the IOUs’ storage procurement targets are a fixed megawatt amount. This is an important distinction when considering the PCIA calculation method. The Commission established a “renewable adder” to account for the fact that when a customer departs IOU service, the

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Even though the 2014 numbers include a full year of regulation pay-for-performance payments, which began in June 2013, mileage costs remained low, representing just over 1 percent of total ancillary service costs compared to just under 1 percent in 2013.”

<sup>8</sup> CCA Parties, p. 3.

<sup>9</sup> TURN, p. 2.

<sup>10</sup> CCA Parties, p. 5, Joint Parties, p. 1.

RPS requirement for the IOU decreases and the IOU's progress towards meeting the reduced RPS requirement increases because the departing load customer's share of the RPS resource remains with the IOU.

When the energy storage procurement targets are fixed instead of based on a percentage of retail load, there is no potential reduction in storage procurement costs when a customer departs. If a customer departs from a utility's electric commodity service to be served by an alternative supplier, the IOUs' storage procurement target as a percentage of load would actually increase. Because the departure of customers from bundled customer service does not advance the IOUs progress towards their storage procurement targets, bundled customers receive no additional benefit from their departure, and it is inappropriate to provide any "energy storage" adder to the PCIA.

- 7. Joint Parties argue that because the energy storage market is just starting, price paid for the technology equals the market value of energy storage, resulting in zero stranded costs.<sup>11</sup>**

Joint IOU Response: As addressed in issues 2-6 above, it is not appropriate to include an adder for storage resources based on the cost of procuring the resources because doing so will result in a "double-counting" of benefits. The Joint Parties' suggestion to set the market value for a storage resource at its costs would require bundled customers pay 100 percent of the costs associated with storage. Thus, if customers later depart to be served by an alternative service provider, remaining bundled customers would bear all of the higher costs of energy storage. The Commission should preserve the principle of bundled customer indifference for energy storage.

- 8. The CCA Parties and Joint Parties, respectively, request that the energy value for energy storage resources be calculated using forecasted peak prices rather than the average on-peak and off-peak prices.<sup>12</sup> TURN requests an explanation of why generation from storage resources receives a weighted average energy price instead of an on-peak price related to its time of delivery.<sup>13</sup>**

Joint IOU Response: The Joint IOU Protocol addresses how storage resources are incorporated into the PCIA calculation. Specifically, the PCIA calculation is a portfolio-based calculation. The IOUs, like any other load-serving entities, each manage a portfolio of resources to meet its customers' time-of-use-specific energy needs. Because the portfolio costs reflect the fact that the IOU supply portfolio is constructed to serve the load of bundled service customers as that load varies from hour to hour, the Commission adopted the use of a weighted market price benchmark for the PCIA to ensure that the valuation of the supply portfolio reflects the same on-peak and off-peak weighting.<sup>14</sup> The dispatch of storage resources during the on-peak period will necessarily offset the need for the on-peak dispatch of another generation resource identified for that hour at on-peak

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<sup>11</sup> Joint Parties, pp. 1-3.

<sup>12</sup> CCA Parties pp. 4-5, Joint Parties pp. 2-4.

<sup>13</sup> TURN, p. 2.

<sup>14</sup> D.11-12-018, pp. 32-35.



pricing. As such, separately identifying and valuing the dispatched energy from storage resources, while continuing to evaluate the remainder of the portfolio based on the historical time-of-use weighting, would result in a market price benchmark that is too heavily weighted during the on-peak.<sup>15</sup> It is appropriate to continue to evaluate the costs and supply of resources on a total portfolio basis because the existing weighting mechanism properly measures the time-of-use-specific value of the portfolio.

**9. TURN requests that the IOUs provide a sample calculation for a hypothetical storage resource, including all components of the PCIA and how each is derived.<sup>16</sup>**

Joint IOU Response: Please see Appendix 1 for a summary calculation of how a hypothetical storage resource would be incorporated into the PCIA calculation with hypothetical values and identification of sources that would be used for the actual calculation. This example calculates the above-market costs, or the “Indifference Amount”, associated with the hypothetical storage resource. As explained in the Joint IOU Protocol, the storage resource would be included in the total resource portfolio once the resource begins delivery for each vintage year following the contract execution date.

An Excel version of this sample calculation is provided along with this response. Please see the tab titled “Storage PCIA Calculation” in the file titled “Response to PCIA for Storage Issues Attachment 1.”

**10. TURN requests that the IOUs provide the expected time and cost pattern(s) for charging and discharging storage units of different sizes (e.g., storage of a given amount of electricity for 2 hours, 4 hours, 6 hours).<sup>17</sup>**

Joint IOU Response: Appendix 2 provides example dispatch profiles for storage resources with 2-hour, 4-hour, and 6-hour durations, respectively, and *average* market prices by day. Each example shows how a 1 MW battery would have likely performed each hour of the day, on average, over the course of a hypothetical year (in this case, 2017) using 2014 CAISO day-ahead prices for NP-15, with losses, and assumes that the unit is not being used to provide ancillary services. Please note that these charts represent the profile for a storage resource on an average day and also show average market prices; results will vary by day.

An Excel version of the summary data used to populate these charts is provided along with this response. Please see the tab titled “Storage Profiles” in the file titled “Response to PCIA for Storage Issues Attachment 1.”

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<sup>15</sup> Hypothetical Example: The utility’s supply portfolio is procured to meet load that requires 60% of the energy during the on-peak period and 40% of the energy during the off-peak period. A storage resource is procured to provide 10% of the utility’s required energy needs, all of which will be provided during the on-peak period. The non-storage resources would thus be procured to meet 90% of the utility load—50% of the 60% required during the on-peak, and the 40% required during the off-peak. Weighting the storage resource at the on-peak price while continuing to weight the non-storage resources as though it were still being used to supply the entirety of the 60% on-peak/40% off-peak weighted bundled load would thus be “double-counting.”

<sup>16</sup> TURN, p. 1.

<sup>17</sup> TURN, p. 1.



**11. TURN requests that the IOUs provide a calculation and qualitative explanation of how “fuel” (electricity) costs for storage assets are derived, including the relationship of such costs to the price paid for generation from storage projects.<sup>18</sup>**

Joint IOU Response: Please see Appendix 3 for an example calculation of the “fuel” (i.e., electricity) costs associated with a 1 MW battery with 4 hour duration operating at 80 percent efficiency. This example shows a single day (April 1, 2015) of NP-15 day-ahead CAISO prices. For the purposes of the PCIA calculation, fuel costs (i.e., electricity) would be forecast for the entire year based on the operating characteristics of the specific storage resource and forecasted market conditions.

A storage resource is assumed to operate to maximize its revenue, which will typically be done by charging at the times of day with the lowest energy prices and discharging at the times of day with the highest energy prices. The forecasted energy prices associated with the forecasted charging of the storage resources will be used to determine the fuel cost. Thus, the calculation of “fuel” (i.e., electricity) costs for charging storage assets will be calculated by taking the sum of all of the hours in which the storage resource is forecasted to be charged and multiplying the megawatt-hours (MWh) of expected charging capacity in each hour by the forecasted energy market price for that hour. These costs will always be at most the value of the energy being generated by the asset as it would otherwise not operate.

An Excel version of this sample calculation is provided along with this response. Please see the tab titled “Fuel Costs Cal - Single Day” in the file titled “Response to PCIA for Storage Issues Attachment 1.”

**12. TURN requests that the IOUs indicate what types of storage assets are subject to the PCIA and which are not. For example, whether a storage asset connected at the distribution level that does not provide electricity to the wholesale market is subject to the PCIA.<sup>19</sup>**

Joint IOU Response: D.14-10-045 identified that energy storage resources providing “bundled services” (i.e., storage resources dispatching energy in the wholesale energy market) and not utilizing the cost allocation mechanism (CAM) for cost recovery purposes are eligible for PCIA treatment.<sup>20</sup> Costs associated with energy storage resources not operating in the wholesale markets would be recovered from all customers (bundled and departing load) through the appropriate distribution or transmission rate mechanism.

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<sup>18</sup> TURN, p. 2.

<sup>19</sup> TURN, p. 2.

<sup>20</sup> D.14-10-045, pp. 41-44.

**13. TURN requests that the IOUs should address whether the Joint IOU Protocol should include a computation of flexible capacity values and costs given the Commission's adoption of a flexible capacity procurement requirement in its Resource Adequacy program.<sup>21</sup>**

Joint IOU Response: It is inappropriate to include in the PCIA calculation an adder to account for the market value of the flexible capacity attributes of storage resources for two reasons. First, there is no premium associated with flexible RA at this time (i.e., flexible RA can be procured as a bundled product at the same cost as generic RA on its own). Second, even if there was a cost-based premium for procuring flexible RA, adding it to the current capacity adder included in the PCIA calculation would not provide a better approximation of the market price of storage. That is because the existing PCIA capacity adder is not based on actual transacted prices for RA capacity purchases. Rather, the capacity adder is based on the California Energy Commission's (CEC) determination of the going forward costs (i.e., fixed O&M, ad valorem taxes, and insurance) of an existing combustion turbine (CT) gas plant, a resource with both generic and flexible capacity attributes.<sup>22</sup> The sum of these costs exceeds current capacity prices based on the most recent available data released by the CPUC. The current capacity adder used for the purpose of the PCIA calculation is \$50.17/kilowatt-year (kW-year)<sup>23</sup> while the weighted average capacity prices reported by the Commission's Energy Division staff in April 2014 for 2014 RA transactions was \$3.46 kW-month.<sup>24</sup> The expected value associated with both the generic and flexible attributes should be generally recovered by these costs, making a flexible capacity adder unnecessary and potentially excessive.

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<sup>21</sup> TURN, p. 2.

<sup>22</sup> D.11-12-018, p. 30.

<sup>23</sup> Based on the CEC, Estimated Cost of New Renewable and Fossil Generation in California, March 2015, Table E-5, p. E-6. Located at: [http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-03/TN203798\\_20150309T154237\\_Estimated\\_Cost\\_of\\_New\\_Renewable\\_and\\_Fossil\\_Generation\\_in\\_Califo.pdf](http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-03/TN203798_20150309T154237_Estimated_Cost_of_New_Renewable_and_Fossil_Generation_in_Califo.pdf).

The utilities will propose to update this value to \$50.28 in their October 1 Advice Letter filing.

<sup>24</sup> CPUC, 2012 Resource Adequacy Report, April 2014, p. 23. Located at:

<http://www.cpuc.ca.gov/NR/rdonlyres/94E0D083-C122-4C43-A2D2-B122D7D48DDD/0/2012RAReportFinal.pdf>.

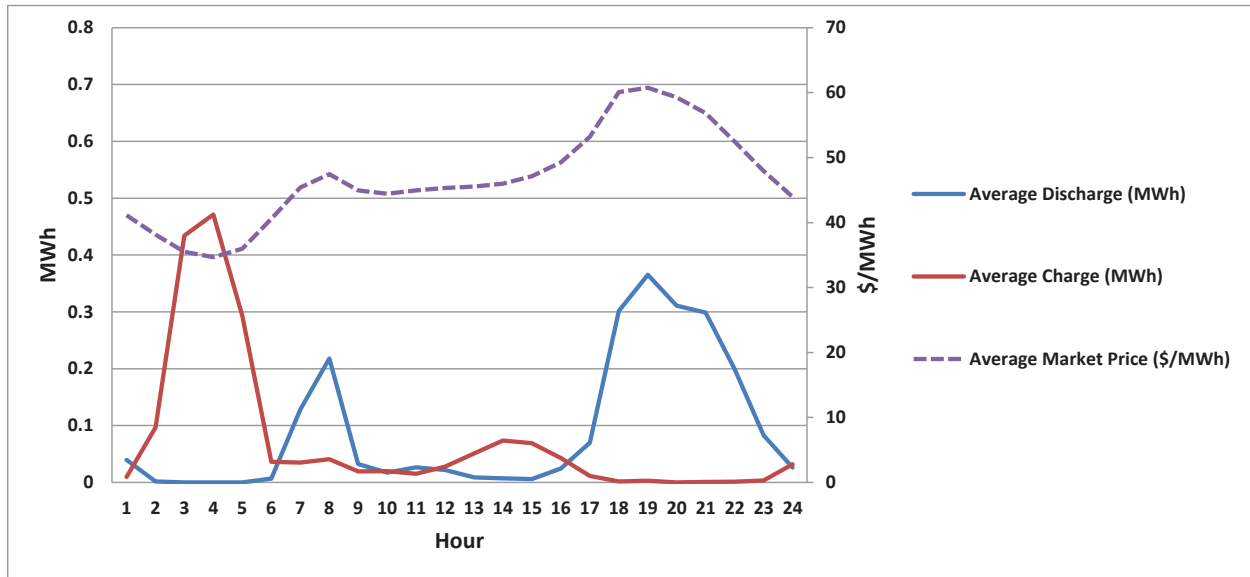
**Appendix 1:  
Sample PCIA Calculation for A Hypothetical Storage Resource**

Sample PCIA Calculation - Hypothetical Storage Resource			
<u>Hypothetical Resource Specifications and Contract Costs</u>		Calculation	Source
Capacity (MW)	10	n/a	Characteristics of resource
Duration (hours)	4	n/a	Characteristics of resource
Losses	0.2	n/a	Characteristics of resource
Charging Requirements (MWh)	50	(capacity * duration) / losses	Characteristics of resource
Discharging Capability (MWh)	40	capacity * duration	Characteristics of resource
Fixed costs (i.e., contract price) * (\$/kW-yr)	\$150,000	n/a	Contract for resource
Average Fuel Costs (\$/MWh)	\$20.00	n/a	Dispatch simulation modeling (see response to question #9 for further information)
<b>Annual Costs</b>			
Fixed costs (\$)	\$1,500,000	Fixed costs on \$/kW-yr basis * capacity	n/a
Fuel (\$)	\$365,000	Charging capability * average fuel costs	n/a
Total (\$)	\$1,865,000	Fixed costs + fuel costs	n/a
<b>Market Price Benchmark (MPB)</b>			
Energy Value (\$/MWh)	\$35.00	n/a	Forward price quotes for 12 months of on-peak and off-peak power for forecasted year, as published in Platts-ICE Forward Curve - Electricity
Capacity Value (\$/kW-yr)	\$50.28	n/a	Going forward costs of a new CT gas plant as published by the California Energy Commission (CEC)
Annual Energy Value (\$)	\$511,000	Discharging capability * energy value	n/a
Annual Capacity Value (\$)	\$502,800	Capacity * capacity value	n/a
Total Annual Value (\$)	\$1,013,800	Annual energy value + annual capacity value	n/a
<b>Above Market Costs</b>			
Annual Costs Less Total Annual Value (\$)	\$851,200	Annual costs - total annual MPB value	n/a
<b>Notes:</b>			
1) Assumes energy storage resource cycles once per day			
2) The capacity value is based on the resource's net qualifying capacity (NQC) as determined by the CPUC and the CAISO. In this example, the NQC is assumed to be 10 MW, the resource's capacity value, because the resource meets the minimum NQC eligibility requirements of 4 operating for four or more uninterrupted hours.			
3) All values provided here are hypothetical, rough general estimates with the exception of the capacity value			

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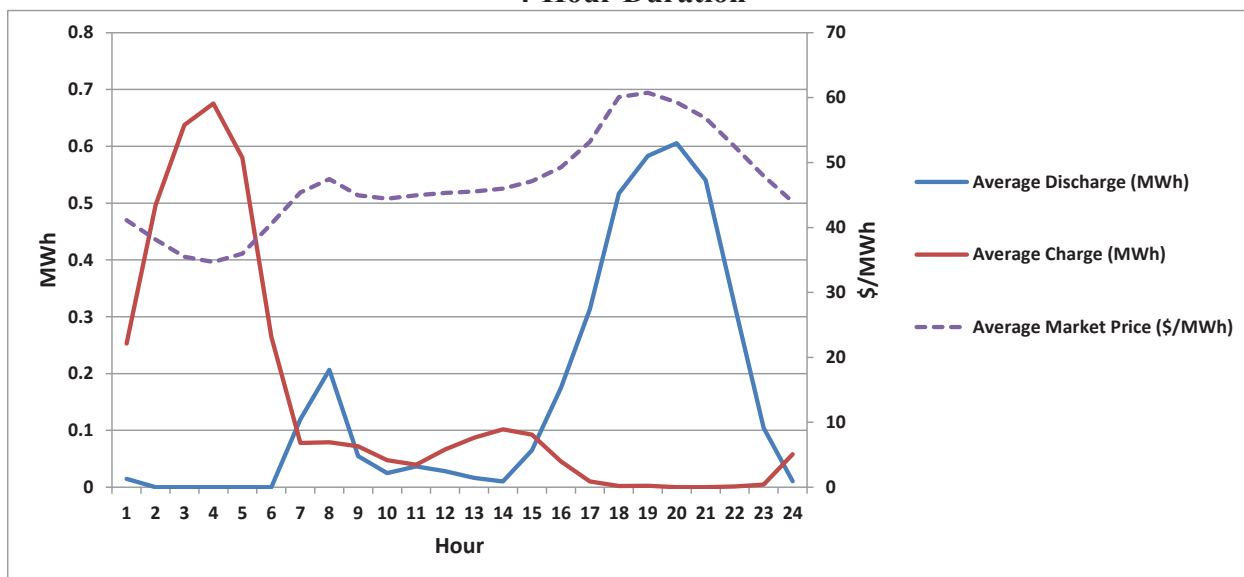
## Appendix 2: Example Dispatch Profiles for Storage Resources

### 2-Hour Duration

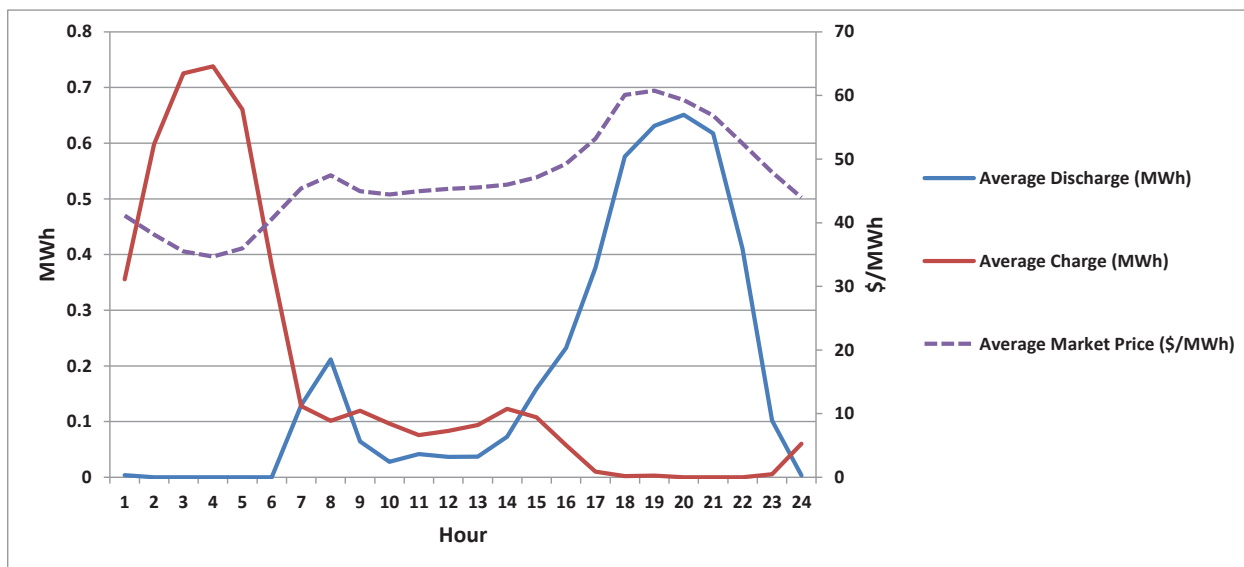


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### 4-Hour Duration



### 6-Hour Duration



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**Appendix 3:  
Example Fuel Cost Calculation for a Single Day**

Day	Hour	price	Rank	Lowest 5	Highest 4	Charging		
4/1/2015	1	\$ 25.64	20	1	0	Cost	\$ 118.83	
4/1/2015	2	\$ 23.84	22	1	0	Average price	\$ 23.77	
4/1/2015	3	\$ 21.52	24	1	0			
4/1/2015	4	\$ 23.13	23	1	0			
4/1/2015	5	\$ 24.69	21	1	0	<b>Discharging</b>		
4/1/2015	6	\$ 31.05	9	0	0	Value	\$ 166.62	
4/1/2015	7	\$ 41.50	3	0	1	Average Price	\$ 41.66	
4/1/2015	8	\$ 37.49	5	0	0			
4/1/2015	9	\$ 33.28	8	0	0			
4/1/2015	10	\$ 30.66	10	0	0			
4/1/2015	11	\$ 28.64	14	0	0			
4/1/2015	12	\$ 28.64	13	0	0			
4/1/2015	13	\$ 28.68	12	0	0			
4/1/2015	14	\$ 27.97	18	0	0			
4/1/2015	15	\$ 28.22	16	0	0			
4/1/2015	16	\$ 27.94	19	0	0			
4/1/2015	17	\$ 28.31	15	0	0			
4/1/2015	18	\$ 30.57	11	0	0			
4/1/2015	19	\$ 35.92	6	0	0			
4/1/2015	20	\$ 43.55	1	0	1			
4/1/2015	21	\$ 42.13	2	0	1			
4/1/2015	22	\$ 39.44	4	0	1			
4/1/2015	23	\$ 33.36	7	0	0			
4/1/2015	24	\$ 28.02	17	0	0			
<b>Assumptions:</b>		Prices are NP15 day-ahead						
		Assume 1 MW 4 hour battery, 80% efficiency						
		Assume starting empty						
		No ancillary services						
		Cycles only once during day						