



# JOINT IOU PROPOSED PROTOCOL FOR ENERGY STORAGE POWER CHARGE INDIFFERENCE ADJUSTMENT (PCIA)

Workshop Presentation

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# Agenda

- 1. Background and Overview of Storage OIR and Joint IOU Protocol***
- 2. Power Charge Indifference Adjustment Overview***
- 3. Pro-Forma Storage Contracts***
- 4. Illustrative Calculation***

# Background

## Storage Resources in PCIA

### Decision 14-10-045 (Application Decision)

- Ordered the IOUs to develop a Joint IOU Proposal for incorporating storage resources into the PCIA total portfolio calculation.
- Required IOUs to present the Joint IOU Proposal in their respective December 1 RFO Applications.
- Required the IOUs to consult with other affected parties.
- Development of the Protocol included a consultative process for gathering and responding to comments from the affected parties, which is outlined in the Protocol

# Overview - Storage Resources in PCIA

## Joint IOU Protocol for Energy Storage - Conclusions and Recommendations

- No modification of the PCIA calculation is necessary to incorporate storage.
- The PCIA calculation should incorporate storage procurement contracts.
- Costs to include in the total portfolio would be fixed capacity costs, variable O&M expenses, other contractual costs, and costs to charge the resource.
- This is the same treatment afforded any other generation resource in the IOU's procurement portfolio.
- Costs associated with charging the resource are analogous to fuel costs associated with Generation.
- No modification to the market price benchmark is necessary or appropriate due to the inclusion of storage resources in the calculation.
- The market price benchmark contains capacity value, which is based on the net qualifying capacity of the resource.

# PCIA Overview

# Guiding Principles

## **The Power Charge Indifference Adjustment should:**

- Adhere to the bundled customer indifference principle<sup>1</sup>
- Reflect current market value<sup>2</sup>
- Be transparent, while maintaining confidentiality<sup>3</sup>
- Be durable
- Be administratively feasible<sup>4</sup>

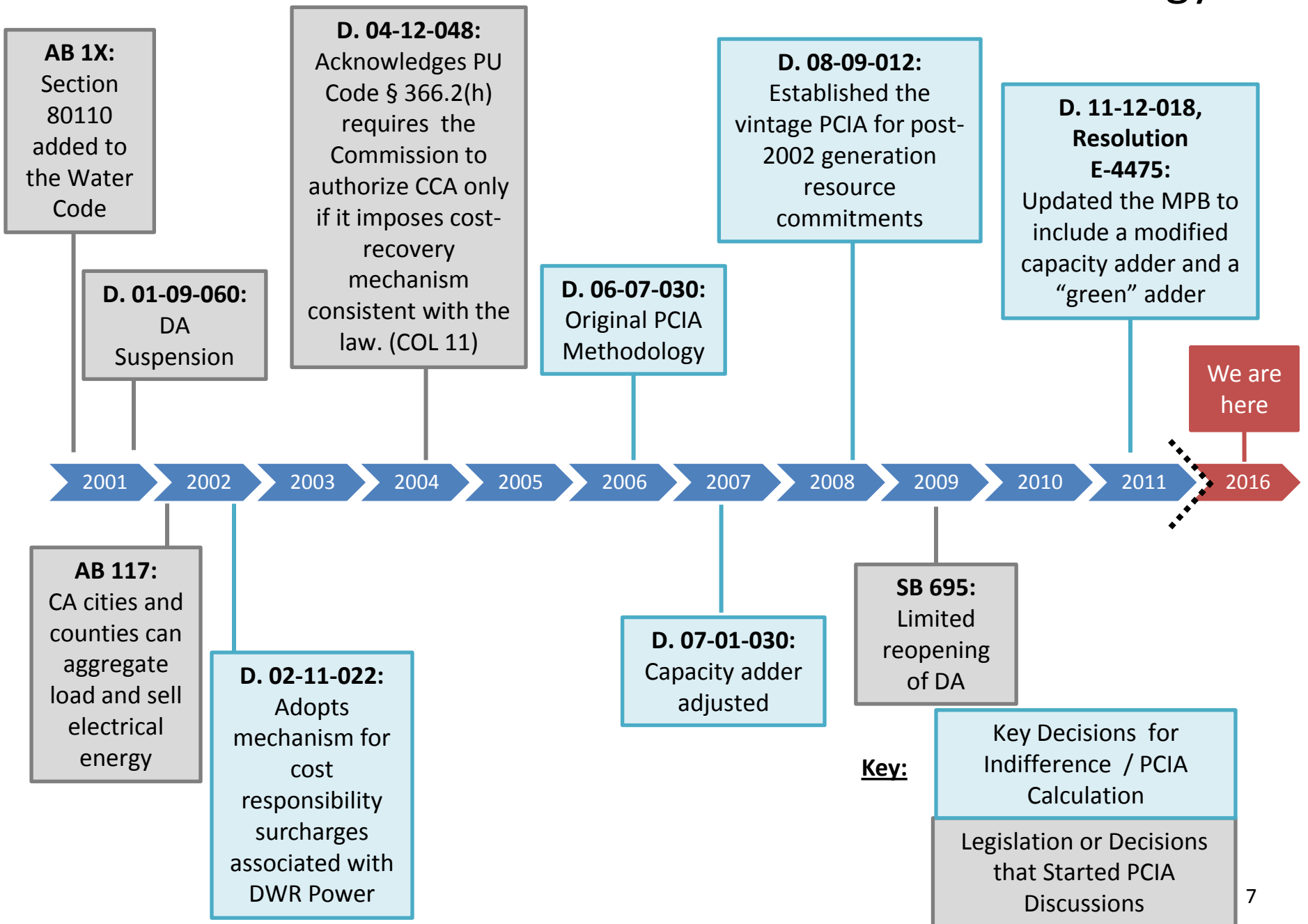
<sup>1</sup> Public Utilities Code, Section Nos. 365.2, 366.1(d)(1), 366.2(a)(4), 366.2(c)(7), 366.2, 366.2(d), 366.3; CPUC *Decision 08-09-012*

<sup>2</sup> CPUC Decision 11-12-018

<sup>3</sup> Public Utilities Code Section 454.5(g) and D.06-06-066

<sup>4</sup> CPUC Decision D.06-07-030

# CPUC Decisions that Created the PCIA Methodology

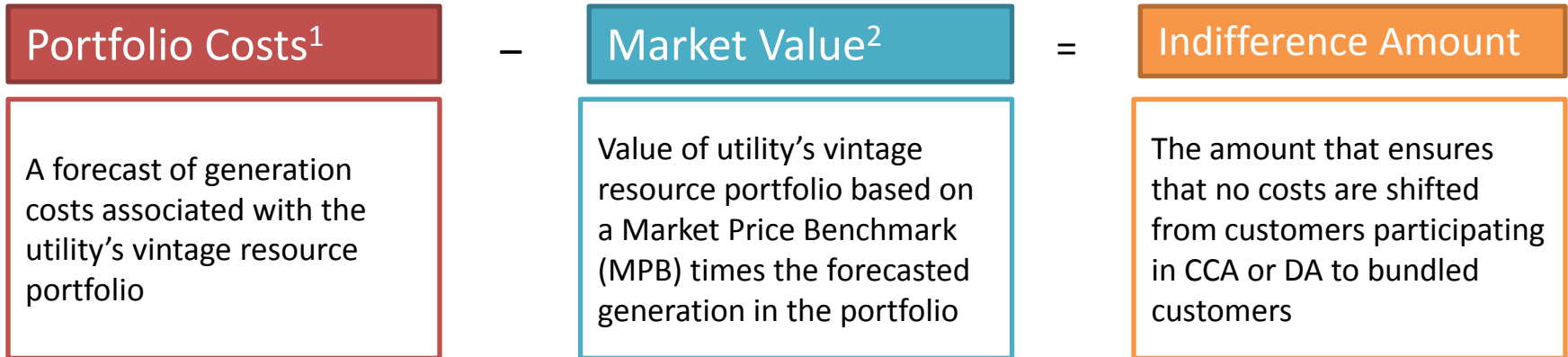


# Total Portfolio Indifference Calculation

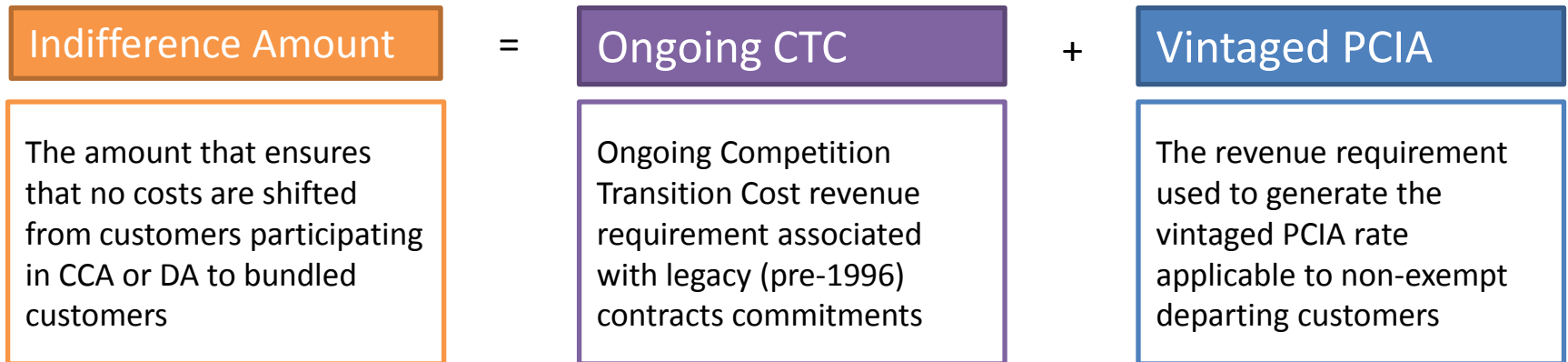


# PCIA Calculation Overview

For each vintage year (based on the timing of a customer's departure and the timing of resource commitments), a vintaged indifference amount is calculated using the following simplified formula:



The costs associated with the PCIA rate is then derived as follows:



<sup>1</sup> See slide 10 for additional details

<sup>2</sup> See slide 11 for additional details

# Details on the Portfolio Costs Calculation

## Non-Vintaged and Vintaged Resources

Portfolio (Costs & Generation) = Non-Vintaged Resources + Vintaged Resources

Non-Vintaged Resources = DWR Revenue Requirement + Legacy UOG + Legacy Contracts

DWR Revenue Requirement	Legacy UOG	Legacy Contracts
<p>If applicable, Department of Water Resources (DWR) revenue requirement and expected generation</p>	<p>Pre-1996 utility-owned generation (UOG)  (includes hydro and nuclear authorized revenue requirements, associated fuel costs, and expected generation output)</p>	<p>-Qualifying facility (QF) contract costs, fuel costs and expected generation output -Irrigation district and water agency (IDWA) agreements costs and expected generation output</p>

Vintaged Resources = Post-2002 UOG + Post-2002 Contracts

Post-2002 UOG	Post-2002 Contracts	
<p>Post-2002 utility-owned generation authorized revenue requirement, associated fuel costs, and expected generation output</p>	<p>Post-2002 renewable contract costs and conventional generation costs, associated fuel costs and expected generation output</p>	<p><b>Storage Resource costs, including fixed contract costs, variable O&amp;M costs, and associated costs to charge the resources (fuel costs)</b></p>

# Details on the Market Price Benchmark Calculation

$$\text{Market Value} = \text{Market Price Benchmark} \times \text{Generation TP} + \text{Storage Discharge}$$

$$\left( \text{BROWN} * \text{BROWN \%} + \text{GREEN} * \text{RPS \%} + \text{CAP ADDER} \right) \times (\text{LOSSES}) =$$

**BROWN** = energy market value

- *Weighted average of a 1-year forward strip of on-peak and off-peak power from Platts*
- *Based on IOU specific peak and off-peak weighting factors*

**GREEN** = RPS-compliant resources value, net of capacity

- *Energy Division updates based on formula*
- *IOUs provide RPS data to support the calculation*

**CAP ADDER** = resource adequacy (RA) Market value

- *Utilizes the going forward costs of a combustion turbine as determined by the California Energy Commission (CEC) times net qualifying capacity (NQC) associated with each vintaged portfolio (including storage NQC) divided by generation (MWh) in vintaged portfolio.*

# Pro-Forma Storage Contracts

## *Storage Resources Types*

1. Energy and Capacity
2. Capacity Only

# Storage Resource - Energy and Capacity

## Review Hypothetical Resource Assumptions

	<u>Illustrative Contract Terms and Resource Characteristics</u>	<u>Value</u>	<u>Calculation</u>
1	Capacity (MW)	10	n/a
2	Duration (Hours)	4	n/a
3	Losses	0.2	n/a
4	Charging Requirements (MWh)	50	(capacity * duration)/(1-losses)
5	Discharging Capability (MWh)	40	capacity * duration
6	Fixed Costs (i.e., contract price) * (\$/kW-yr)	50	n/a
7	Variable O&M Costs (\$/MWh)	10	n/a
	<u>Illustrative Dispatch Results</u>		
8	Average Fuel Costs (\$/MWh)	15	n/a
9	Charge and Discharge Days	200	Days
10	Annual Charge (MWh)	10,000	(Charging Reqmts * Annual Charge and Discharge)
11	Annual Discharge (MWh)	8,000	(Discharge Capability * Annual Charge and Discharge Days)
	<u>Annual Costs</u>		
12	Fixed costs (Nominal \$)	\$500,000	Fixed costs on \$/kW-yr. basis * capacity
13	Fuel (Nominal \$)	\$150,000	Annual Charge * average fuel costs
14	Variable O&M (Nominal \$)	\$80,000	Annual Discharge * variable O&M costs
15	Total (Nominal \$)	\$730,000	Fixed costs, variable O&M, fuel costs
<b>Notes:</b>			

- (1) Assumes energy storage resource cycles once per day
- (2) The resource's net qualifying capacity (NQC) is determined by the CPUC and 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 operating requirements of operating four or more uninterrupted hours.
- (3) All values provided here are hypothetical.

# Storage Resource - Capacity

## Review Hypothetical Resource Assumptions

<u>Line No.</u>	<u>Illustrative Contract Terms and Resource Characteristics</u>	<u>Value</u>	<u>Calculation</u>
1	Capacity (MW)	10	n/a
2	Fixed Costs (i.e., contract price) * (\$/kW-yr)	50	n/a
	<b><u>Annual Costs</u></b>		
3	Fixed costs (Nominal \$)	\$500,000	Fixed costs on \$/kW-yr. basis * capacity
4	Fuel (Nominal \$)	n/a	
5	Variable O&M (Nominal \$)	n/a	
6	Total (Nominal \$)	\$500,000	Fixed costs, variable O&M, fuel costs
<b>Notes:</b>			

- (1) The resource's net qualifying capacity (NQC) is determined by the CPUC and 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 operating requirements of operating four or more uninterrupted hours.
- (2) All values provided here are hypothetical.

# Market Price Benchmark

<u>Line No.</u>	<u>Market Price Benchmark (MPB)</u>	<u>Value Energy &amp; Capacity</u>	<u>Value Capacity</u>
1	Energy Market Value (\$/MWh)	35	35
2	Capacity Market Value - (\$/kW-yr)	58.27	58.27
3	Portfolio MWh w/o Storage and w/ losses	56,400,000	56,400,000
4	Portfolio MWh w/ Storage and w/ losses	56,407,520	56,400,000
5	Portfolio NQC (MW) w/o Storage	14,000	14,000
6	Portfolio NQC (MW) w/ Storage	14,010	14,010
7	Capacity Value - w/o Storage (\$/MWh) = Portfolio NQC (L.5) x Capacity Value (L.2) / Portfolio MWh (L.3))	14.464	14.464
8	Capacity Value - w/ Storage (\$/MWh) = Portfolio NQC (L.6) x Capacity Value (L.2) / Portfolio MWh (L.4))	14.473	14.475
9	Renewable Premium (\$/MWh)	45.00	45.00
10	Renewable Percent in Portfolio	33.3%	33.3%
11	Renewable Adder (\$/MWh)	15.00	15.00
12	Market Price Benchmark w/o storage (= Energy (L.1) + Capacity Adder (L.7) + Renewable Adder (L.11))	64.46	64.46
13	Market Price Benchmark w/ storage (= Energy (L.1) + Capacity Adder (L.8) + Renewable Adder (L.11))	64.47	64.47
14	T&D Loss factor @ 6%	6.0%	6.0%
15	Market Price Benchmark w/o storage w/ losses	68.33	68.33
16	Market Price Benchmark w/ storage w/losses	68.34	68.34
17	<p>Incremental Market Value due to the addition of storage:</p> <p>= (Market Value w/ Storage - Market Value w/o Storage)</p> <p>= (MPB w/Storage * Portfolio MWh w/Storage) - (MPB w/o Storage * Portfolio MWh w/o Storage)</p>	\$1,016,206	\$617,662

Changed by the inclusion of storage contracts

# Total Portfolio Calculation Results

## Energy and Capacity Contract

Total Portfolio Indifference Amount - with Storage				
Line No.				Renewable Percent
	<b>Total Portfolio Generation (GWh)</b>			
1		Conventional Generation Resources	40,000.0	
2		Renewable Generation Resources	20,000.0	33.3%
3		Storage Contract	8.0	
4		<b>Total Portfolio Generation</b>	60,008.0	
5		<b>Total Portfolio Generation (with Losses)</b>	56,407.5	
6				
7	<b>Total Portfolio Costs (\$1000s)</b>			
8		Conventional Generation Resources	\$ 2,600,000	
9		Renewable Generation Resources	\$ 2,400,000	
10		Storage Contract	\$ 730	
11		<b>Total Portfolio Costs</b>	\$ 5,000,730	
12	<b>Market Price Benchmark</b>			
13	Benchmark (\$/MWh)		68.34	
14	Market Value (Line 5 * Line 13)		\$ 3,854,823	
15	<b>Total Portfolio Above Market Costs (Line 11 - Line 14)</b>		\$ 1,145,907	
16	Indifference Results		\$ 1,145,907	
	<b>Notes:</b>			
	(1) Derivation of the PCIA RRQ for ratesetting is: PCIA + Ongoing CTC = Indifference.			
	(2) Indifference cannot be negative in equation.			
	(3) If Indifference is negative, PCIA RRQ formula sets indifference to zero and PCIA = -Ongoing CTC.			



# Total Portfolio Calculation Results

## Capacity Only Contract

Total Portfolio Indifference Amount - with Storage			Renewable Percent
Line No.			
	<b>Total Portfolio Generation (GWh)</b>		
1	Conventional Generation Resources	40,000.0	
2	Renewable Generation Resources	20,000.0	33.3%
3	Storage Contract	-	
4	<b>Total Portfolio Generation</b>	60,000.0	
5	<b>Total Portfolio Generation (with Losses)</b>	56,400.0	
6			
7	<b>Total Portfolio Costs (\$1000s)</b>		
8	Conventional Generation Resources	\$ 2,600,000	
9	Renewable Generation Resources	\$ 2,400,000	
10	Storage Contract	\$ 500	
11	<b>Total Portfolio Costs</b>	\$ 5,000,500	
12	<b>Market Price Benchmark</b>		
13	Benchmark (\$/MWh)	68.34	
14	Market Value (Line 5 * Line 13)	\$ 3,854,544	
15	<b>Total Portfolio Above Market Costs (Line 11 - Line 14)</b>	\$ 1,145,956	
16	Indifference Results	\$ 1,145,956	
	<b>Notes:</b>		
	(1) Derivation of the PCIA RRQ for ratesetting is: PCIA + Ongoing CTC = Indifference. (2) Indifference cannot be negative in equation. (3) If Indifference is negative, PCIA RRQ formula sets indifference to zero and PCIA = -Ongoing CTC.		

# Conclusion

- Wrap-up and Questions

# Appendix

# Details on the Market Price Benchmark Calculation

## *BROWN* (“Energy”) Details

$$\{1 - RPS\%_v\} \times \boxed{BROWN} + (RPS\%_v) \times GREEN + CAP\ ADDER_v\} \times (LOSSES) =$$

Revised MPB for year  $n$  and Vintage Total Portfolio  $v^{(1)}$

Intended to represent the energy value of the vintage portfolio

- *Value is updated based on a weighted average of a 1-year forward strip of on-peak and off-peak power based on October quotes provided by Platts.*
- *IOU specific peak and off-peak weighting factors are used, based on most recent publicly available load*

# Details on the Market Price Benchmark Calculation

## “*GREEN*” Details

$$\{1 - \text{RPS}\%_v\} \times \text{BROWN} + (\text{RPS}\%_v) \times \text{GREEN} + \text{CAP ADDER}_v\} \times (\text{LOSSES}) =$$

Revised MPB for year  $n$  and Vintage Total Portfolio  $v^{(1)}$

Intended to represent the market value, incremental to the energy and capacity value, associated with RPS-compliant resources in the vintage portfolio

- *Energy Division updates the GREEN Adder based on formula approved in D.11-12-018 and implemented via Resolution E-4475.*
- On an annual basis, the IOUs submit data to support the calculation via an October 1 advice letter. The information provided by the IOUs includes:
  - *Projected costs, net qualifying capacity, and volumes (MWh) for all RPS-compliant resources that are used to serve customers during the current year (i.e., most recent 12 months) and those projected to serve customers during the next year, which is weighted at 68%; and*
  - *Most recent 12-month figures derived from US Department of Energy survey of Western US renewable energy premiums in calculating a weighted proxy for the Market Price Benchmark compiled by the National Renewable Energy Laboratory, which is weighted at 32%.*

<sup>(1)</sup> Calculation per D.11-12-018

# “Capacity Adder” Details

$$\{1 - RPS\%_v\} \times BROWN + (RPS\%_v) \times GREEN + \boxed{CAP\ ADDER_v} \times (LOSSES) =$$

Revised MPB for year  $n$  and Vintage Total Portfolio  $v^{(1)}$

Intended to represent the market value of the resource adequacy (RA) that is provided by the portfolio

- Adder is based on the going forward costs (sum of insurance, ad valorem, and fixed operation and maintenance costs) of an existing combustion turbine as determined by the California Energy Commission (CEC)
- = {Sum of Net Qualifying Capacity (NQC) for all resources in the Total Portfolio for Vintage year  $v$  \* Capacity Value}/forecast of the sum of MWh supplied by Total Portfolio for PCIA Vintage year  $v$ }

# Market Price Benchmark Calculation

$$\{1 - RPS\%_v\} \times BROWN + (RPS\%_v) \times GREEN + CAP\ ADDER_v\} \times (LOSSES) =$$

Revised MPB for year  $n$  and Vintage Total Portfolio  $v^{(1)}$

MPB Component	Description	Reference Decision	Reference Slides
<b>n</b>	The year covered by the calculation, e.g., n=2012 for MPB for 2012		n/a
<b>v</b>	PCIA vintage year		n/a
<b>RPS%</b>	The fraction of RPS-compliant electric energy in the URG (Utility Resource Generation) Total Portfolio for PCIA Vintage year v in year n	D.11-12-018	n/a
<b>BROWN ("Energy")</b>	Weighted average of peak and off-peak forward prices for year n, weighting based on, for each IOU, the IOU bundled load profile data for the most recent year that is publically available. Peak and off-peak forward prices based on published data for NP15/SP15.	D.06-07-030	11
<b>GREEN ("Green Adder")</b>	0.68 x URGgreen + 0.32 x (BROWN + DOEadder)	D.11-12-018	11
<b>CAP ADDER ("Capacity Adder")</b>	{Sum of NQC for all resources in the URG Total Portfolio for PCIA Vintage year v * CAP VALUE}/forecast of the sum of MWh supplied by URG Total Portfolio for PCIA Vintage year v}	D.11-12-018	11
<b>LOSSES</b>	Line loss factors: PG&E 1.06, SCE 1.053, SDG&E 1.043	D.07-01-030	n/a

<sup>(1)</sup> Calculation per D.11-12-018