Clean Coalition

Making Clean Local Energy Accessible Now

Briefing on transmission access charges wholesale billing determinant initiative

Market Surveillance Committee Meeting
General Session

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TAC Wholesale Billing Determinant

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1. Preliminary Matters
   (Definitions and terminology)
2. Problem, Solution, and Why It Matters
3. CAISO Staff's Main Questions
   a. Effects on cost
   b. Effect on TRR
   c. Peak load conditions
   d. No settlement quality meter data at the T-D interface
   e. CPUC role in retail billing determinants
4. Discussion

Defining abbreviations and key terms (1 of 4)

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Abbreviation	Definition
CAISO	The California Independent System Operator (CAISO) is an independent non-profit that oversees the operation of California's bulk electric power system, transmission lines, and electricity market for its member utilities.
Customer Energy Downflow	Customer Energy Downflow (CED) refers to all energy that is sourced from the distribution grid and downflows across a customer meter. CED does not include any behind-the-meter generation and is not reduced by behind-the-meter generation that is exported. In PTO utility service territories, CAISO uses CED as the wholesale billing determinant for Transmission Access Charges (TAC). CAISO has referred to CED as End-Use Metered Load (EUML).
Distributed Generation	Distributed Generation (DG) is local generation sourced from the distribution grid. In the TAC context, DG refers to both wholesale DG and Net Energy Metering (NEM) exports, but excludes self-consumed NEM generation.
Distribution Provider	A Distribution Provider (e.g., PG&E, SCE, City of Palo Alto) owns and operates a distribution grid and bills benefitting customers for use of its grid.
FERC Order 1000	The Federal Energy Regulatory Commission (FERC) regulates inter-state energy transmission, and Independent System Operators like CAISO. Three of FERC Order 1000's six principles for cost allocation for new transmission projects are about cost-benefit alignment.

Defining abbreviations and key terms (2 of 4)

Abbreviation	Definition
Gross Load	Different organizations use Gross Load to mean different things. CAISO uses Gross Load to refer to all the energy that end users consume, including energy created by any behind-the-meter devices, like rooftop solar. To avoid confusion between varied interpretations, the Clean Coalition avoids using this term here.
Least Cost Best Fit	The Least Cost Best Fit (LCBF) rule, mandated by the California Public Utilities Commission (CPUC), requires utilities to select renewable resources that have the lowest cost and that best fit their system needs. Utilities evaluate energy project bids using LCBF analysis.
Load Serving Entity	A Load Serving Entity (LSE) is any entity that sells electricity to end-use customers, including utilities, Community Choice Energy (CCE) providers, Direct Access providers and Energy Service Providers.
Metered Sub-System	A Metered Sub-System (MSS) is an area that acted as an electric utility before CAISO was created, and now operates with a MSS agreement. MSS pay Transmission Access Charges (TAC) for each kilowatt hour of Transmission Energy Downflow (TED).

Defining abbreviations and key terms (3 of 4)

Abbreviation	Definition
Net Load	For the purposes of calculating Transmission Access Charges (TAC), Net Load is CED less energy produced by DG (i.e., local generation connected to the distribution grid, including NEM exports).
Participating Transmission Owner	A Participating Transmission Owner (PTO) is an entity that owns part of the transmission grid under CAISO's authority. The billing determinant for PTO utilities is the CED or End-Use Metered Load, meaning that DG in these areas is subject to TAC.
Transmission Access Charges	Transmission Access Charges (TAC) are per-kWh fees for using California's transmission system. CAISO assesses a High Voltage (HV; 200kV+) TAC and utility service territory-specific Low Voltage (LV; <200kV) TAC on LSEs to recover HV & LV TRRs.
Transmission Charges Correction	Transmission Charges Correction (TCC) refers to the prospective accounting fix whereby PTO utilities refund TAC that is erroneously collected on DG served by an embedded LSE, like a CCE.

Defining abbreviations and key terms (4 of 4)

Abbreviation	Definition
Transmission Energy Downflow	Transmission Energy Downflow (TED) is energy that is down-converted at substations that cross HV and LV transmission grid voltages and substations that cross transmission grid voltages and distribution grid voltages.
Transmission Revenue Requirement	The Transmission Revenue Requirement (TRR) is the amortized capital, operations & maintenance, and return-on-investment costs of California's transmission system assets. There is a separate High Voltage (HV) TRR and separate Low Voltage (LV) TRRs for each separate utility service area. The CAISO TRR refers to all aggregate HV and LV TRRs throughout the CAISO service territory.
Utility Service Territory	A Utility Service Territory (UST) refers to the geographic area where a utility provides energy to customers. For a Distribution Provider, this refers to the area served by its distribution grid.

Gross Load, End-Use Metered Load, and CED

Gross Load: defined as the wholesale billing determinant in the CAISO tariff. CAISO defines Gross Load as all energy consumed by customers, including self-generation that is consumed on-site, but there is likely inconsistent treatment of NEM export in Gross Load calculations between PTO utilities.

End-Use Metered Load (EUML): defined in the CAISO Issue Paper as the Gross Load minus any self-generation that is consumed on-site. In order to avoid potential inconsistencies in Gross Load calculations, CAISO defined EUML as the wholesale billing determinant.

Customer Energy Downflow (CED): the Clean Coalition's preferred term, synonymous with EUML but more intuitive.

TRR and the TAC Rate

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Transmission Revenue Requirement (TRR) refers to the costs associated with transmission facilities under CAISO's operational control and CAISO-approved transmission facilities that are not yet in operation. The costs of any transmission facility turned over to CAISO's operational control are fully included in the PTO's TRR.

$$\text{HV TAC Rate} = \frac{\text{Annual Authorized HV TRR (\$)}}{\text{Total CAISO CED (MWh)}}$$

$$\text{LV TAC Rate} = \frac{\text{Annual Authorized LV TRR dedicated to a UST (\$)}}{\text{Total CED for the UST (MWh)}}$$

(specific to each utility service territory)

Utility Service Territory's TAC Rate = (HV TAC rate) + (applicable LV TAC Rate)

Overview

Problem: In PTO utility service territories, distributed generation (DG) energy is subject to Transmission Access Charges (TAC) despite not being delivered through transmission. This distorts the value of DG, disadvantages DG in procurement decisions, shifts costs from transmission-sourced energy to DG, and leads to excess demand for new transmission capacity that lead to billions of dollars in unnecessary investment.

Solution: Align the TAC treatment for PTO utilities with the "Usage Pays" principle utilized in non-PTO utilities TAC system by changing the TAC wholesale billing determinant from Customer Energy Downflow (CED) to Transmission Energy Downflow (TED).

Expected Effect: Our solution would:

- Provide value to DG through avoided TAC, making them more competitive in procurement decisions
- Increased deployment of distributed energy resources (DER) and slow the growth of (or even decrease) TAC rates over time
- Save billions in delayed or avoided transmission investments
- Increase consistency, transparency, fairness, and alignment with FERC Order 1000

TAC metering fix is needed

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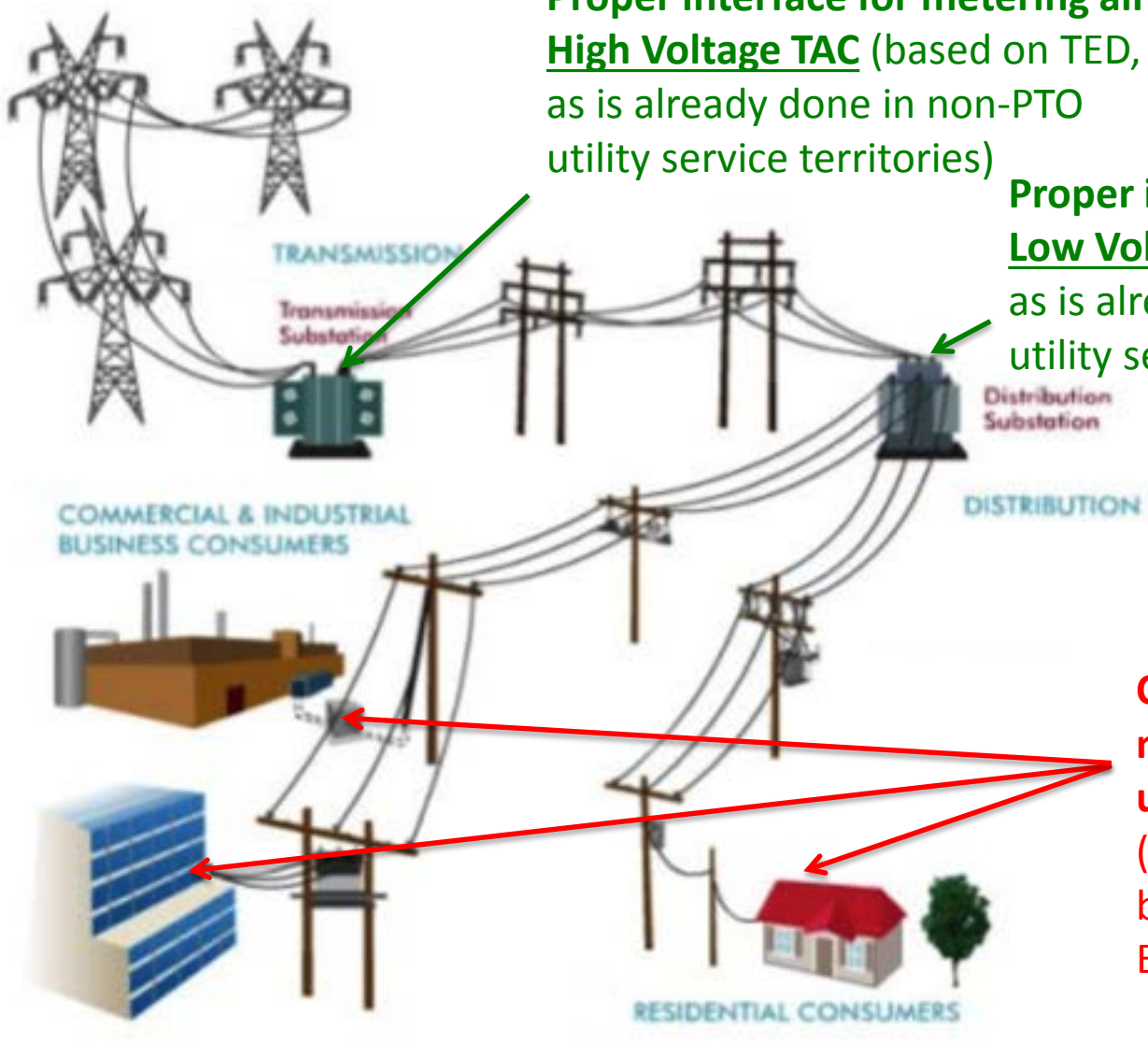
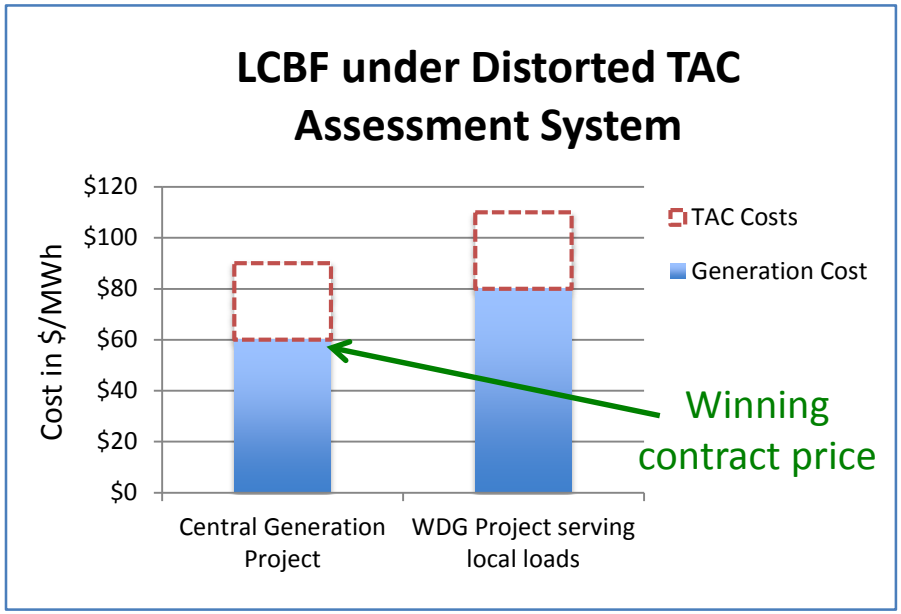


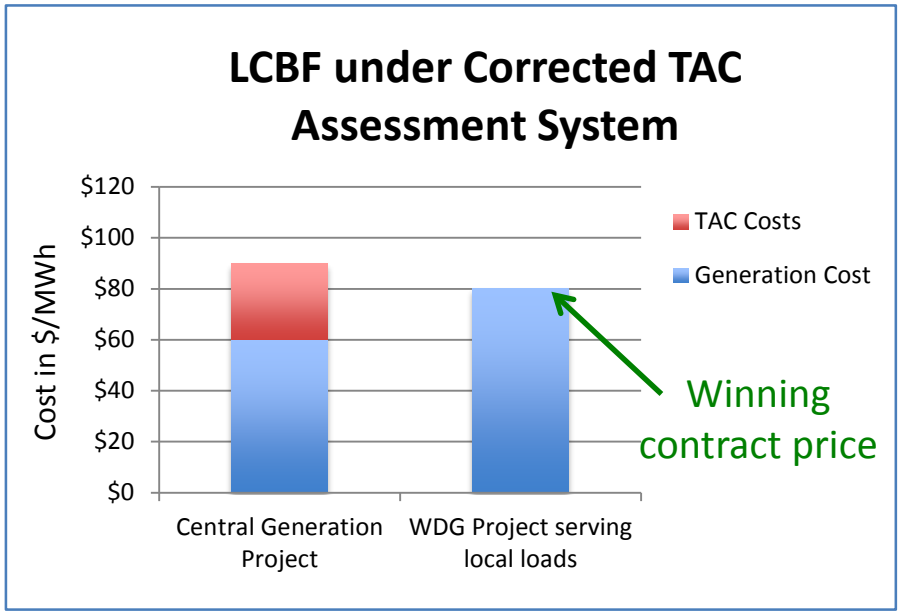
Proper interface for metering all <u>High Voltage TAC</u> (based on TED, as is already done in non-PTO utility service territories)

Proper interface for metering all <u>Low Voltage TAC</u> (based on TED as is already done in non-PTO utility service territories)

Current interface for metering TAC in PTO utility service territories (at customer meters based on Customer Energy Downflow)

The TAC fix corrects Least Cost Best Fit (LCBF) distortion





- Current TAC assessment unfairly increases the cost of local distributed generation (DG) even though it almost never uses the transmission system
- Fixing the TAC market distortion makes local generation more competitive
- Over time, more local generation will be built, making transmission upgrades less necessary, and decreasing overall system costs

Accounting Changes Needed to Enact the Proposal

An accounting adjustment will be needed to ensure that each LSE only pays its true pro rata share of transmission usage. This will only be an issue where a PTO Utility is also a Distribution Provider that serves other LSEs.

The Clean Coalition sees two options:

1. **The PTO Utility Distribution Provider pays 100% of the TAC, then bills other LSEs.**
   - Currently, CAISO bills each LSE separately, but total TAC assessments for all LSEs in a the service territory for a single Distribution Provider will relate to that area's measured TED, and the funds collected from customers will go towards that amount.
   - The Distribution Provider would then account for each LSE's responsibility, and bill them accordingly.

2. **All LSEs continue to make payments to CAISO, and the PTO Utility Distribution Provider continues to bill ratepayers for TAC.**
   - This would require a reimbursement arrangement to LSEs for all procurement of DG that was erroneously billed to their ratepayers on DG. The Clean Coalition has designed a transmission cost correction (TCC) process to achieve the required reimbursements.

CAISO Staff's Main Questions

1. **Effects on Cost:** Exempting some load from TAC charges does not decrease TRR, so would some costs be shifted to other customers?

   The TAC proposal functionally removes an existing cost shift, where costs that should fall on transmission-sourced energy are partially shifted to distributed generation. Our proposal aligns cost with transmission usage.

   - *The proposal incentivizes LSEs to use transmission only when cost-effective to do so, therefore the cost impact depends on the amount of DG being used by each LSE.*
   - *Current DG penetration is so small (<2% in each of the major IOUs) that any immediate change would be negligible.*
   - *Any immediate cost shift would be proportional to the difference in current DG penetration between PTO utilities—even less than 2%. It would equal the difference in DG resources between the utilities, a fraction of a percent.*

Cost Effect Example: Immediate

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2016 Scenario	IOU	CCA	ESP	Total	Notes
LSE Customer Energy Downflow (CED, in GWh)	70	30	10	110	*Current TAC wholesale billing determinant*
% of Total CED	64%	27%	9%	100%	*Share of total TAC basis (now)*
TRR (in thousands)	NA	NA	NA	$1,650	*Total Transmission Revenue Required*
TAC Rate per MWh (now)	$15.00	$15.00	$15.00	$15.00	*TRR/CED*
TAC payment (in thousands)	$1,050	$450	$150	$1,650	*TAC Rate x CED*
DG (GWh)	1.4	0.6	0	2	*2% is the highest percentage of DG in any PTO utility service territory today*
TED (GWh)	68.6	29.4	10	108	*Proposed TAC basis*
% of TED	64%	27%	9%	100%	*Share of total TAC basis (proposed)*
TRR (in thousands)	NA	NA	NA	$1,650	*Remains unchanged*
TED-based TAC Rate (per MWh)	$15.28	$15.28	$15.28	$15.28	*TRR/TED*
TED-based TAC payments (in thousands)	**$1,048 (-$2)**	**$449 (-$1)**	**$153 (+$3)**	**$1,650**	*New TAC Rate x TED*
% of LSE CED subject to TAC	98%	98%	100%	98%	

Marin Clean Energy (MCE) service offerings
(comparable electric bills for example residential customer)

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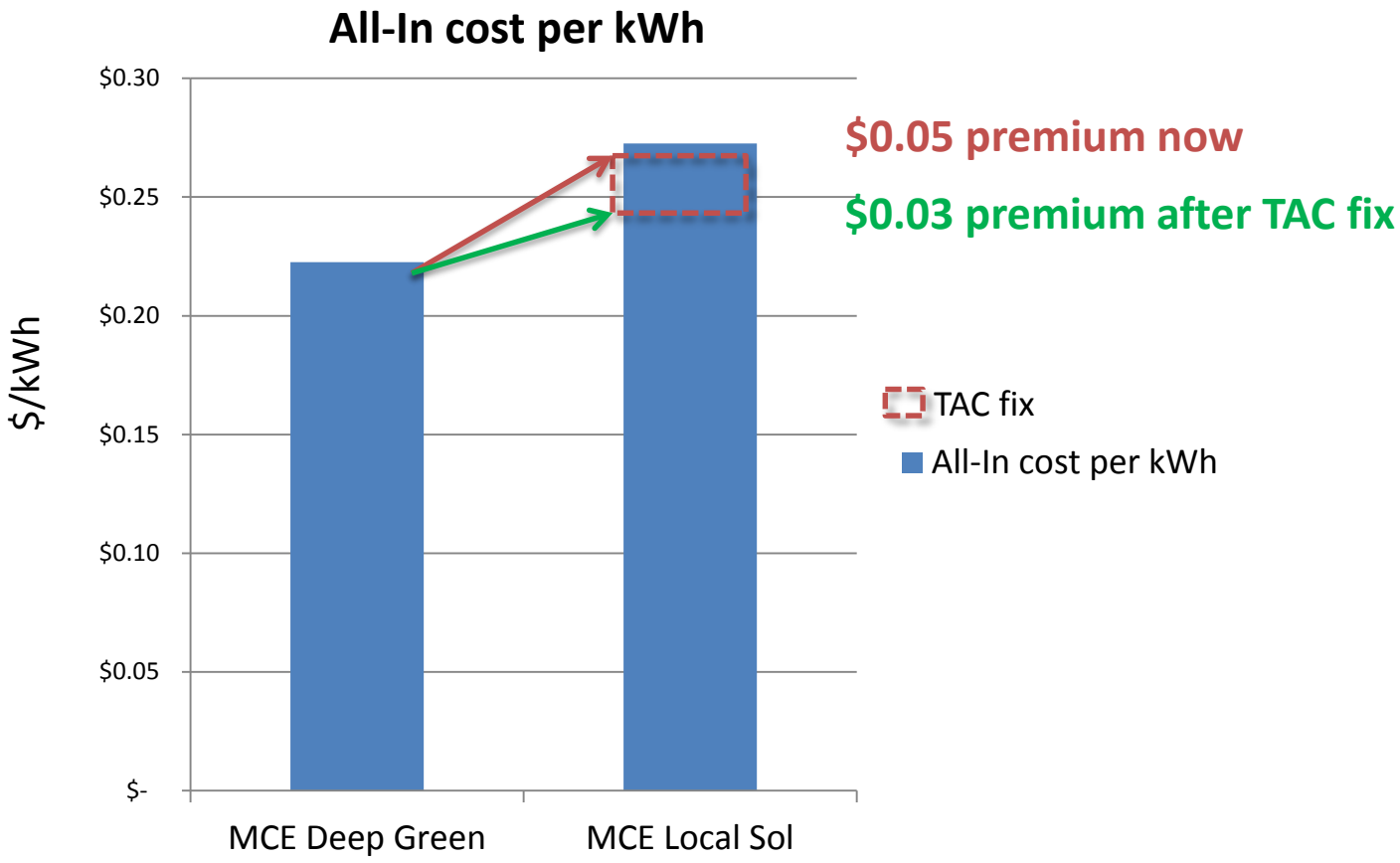
PG&E (Opt Out)	MCE Light Green	MCE Deep Green	MCE Local Sol
27% renewable energy*	56% renewable energy*	100% renewable energy*	100% local solar
$49.43 PG&E Electric Delivery	$49.43 PG&E Electric Delivery	$49.43 PG&E Electric Delivery	$49.43 PG&E Electric Delivery
$44.84 Electric Generation	$37.97 Electric Generation	$42.60 Electric Generation	$65.75 Electric Generation
– Additional PG&E Fees	$11.04 Additional PG&E Fees	$11.04 Additional PG&E Fees	$11.04 Additional PG&E Fees
$94.27 ave. total cost	$98.44 ave. total cost	$103.07 ave. total cost	$126.22 ave. total cost
OPT FOR 27% RENEWABLE	ENROLL IN 56% RENEWABLE	ENROLL IN 100% RENEWABLE	ENROLL IN 100% LOCAL SOLAR

- MCE defines local as “located in an MCE member community”
- Based on a typical usage of 463 kWh at current PG&E and MCE rates effective as of March 2016 under the Res-1/E-1 rate schedule. Actual differences may vary depending on usage, rate schedule, and other factors. Estimate provided is an average of seasonal rates.

TAC fix erases 40% of the Local Sol premium



CAISO Staff's Main Questions

2. **Effect on TRR:** New DG does not offset the cost of transmission that was previously approved and is now in service. How would the proposal impact TRR?

   The Proposal would have no effect on current year TRR, but it will dramatically reduce transmission investments in the future, saving taxpayers billions of dollars in delayed or avoided transmission investment.

Cost Effect Example: Long Term (+10% annual growth DER)

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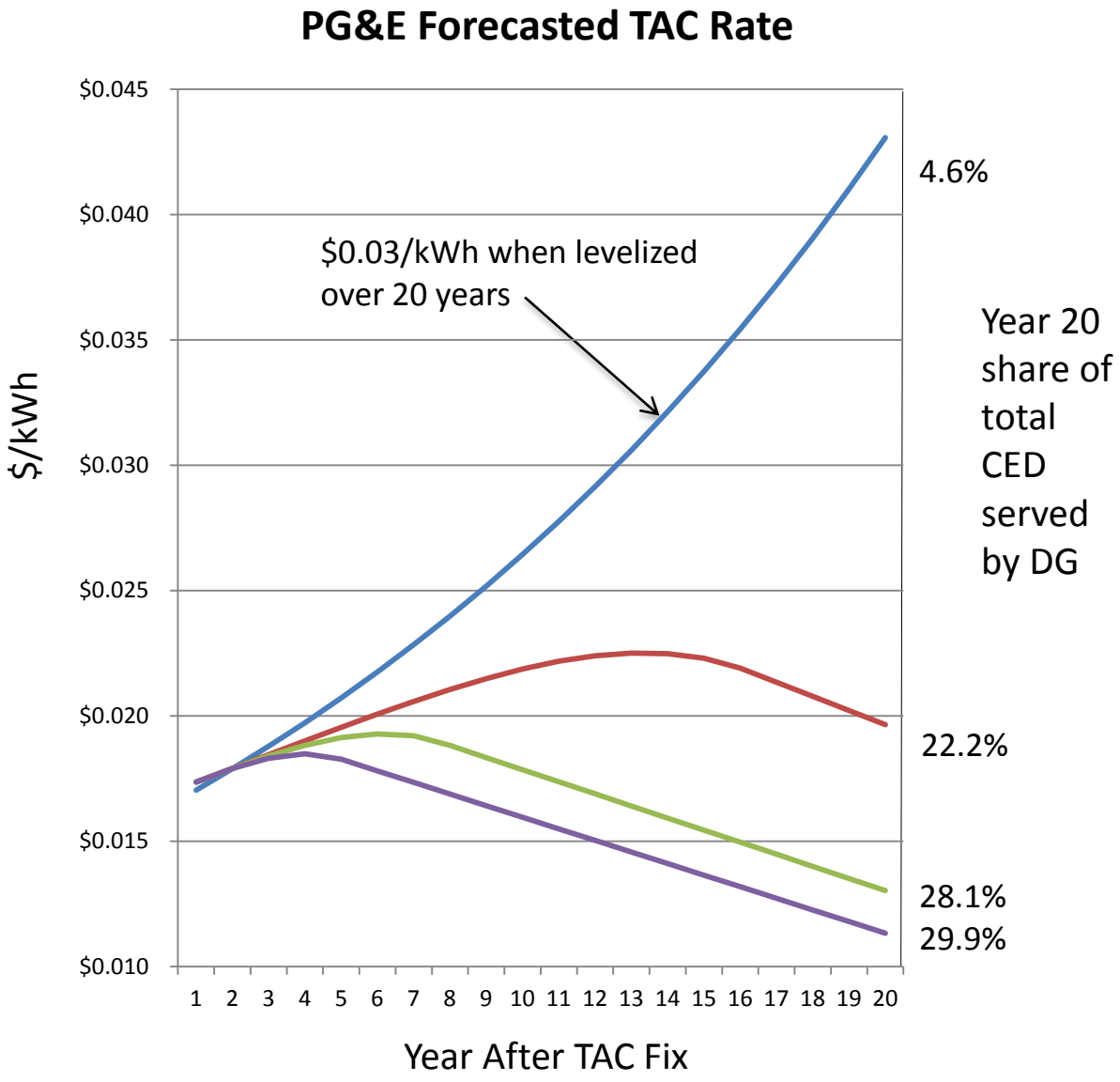
2026 Scenario	IOU	CCA	ESP	Total	Notes
LSE Customer Energy Downflow (CED; in GWh)	70	30	10	110	*Current CED and TAC basis*
% of CED	64%	27%	9%	100%	*Share of total TAC basis (now)*
TRR (in thousands)	NA	NA	NA	$1,650	*Total Transmission Revenue Required*
TAC Rate per MWh (projected 2026)	$24.00	$24.00	$24.00	$24.00	*TRR/CED*
TAC payment (in thousands)	$1,680	$720	$240	$2,640	*TAC Rate x CED*
DG (GWh)	4	6	0	10	*2% is the highest percentage of DG in any PTO utility service territory today*
TED (GWh)	66	24	10	100	*Proposed TAC basis*
% of TED	66%	24%	10%	100%	*Share of total TAC basis (proposed)*
TRR (in thousands)	NA	NA	NA	$2,420	*Remains unchanged*
TED-based TAC Rate per MWh (projected 2026)	$24.20	$24.20	$24.20	$24.20	*TRR/TED*
TED-based TAC payments (in thousands)	**$1,597 (-$83)**	**$581 (-$139)**	**$242 (+$2)**	**$2,420**	*New TAC Rate x TED*
% of LSE CED subject to TAC	94%	80%	100%	91%	

Over time, TRR & TAC rate decrease substantially



Notes & Assumptions

- All 3 scenarios assume:
  - Year 2 Business As Usual (BAU) 260 MW of DG plus 100 MW additional DG
  - Growth rate cited in scenario name is years' 3-20 growth in share of PTOs' new CED served by new DG
  - New DG never exceeds new CED

- Business As Usual (BAU): 260 MW added DG in Year 2 (2017)
- Post-TAC fix Scenario 1: 10% DG annual growth
- Post-TAC fix Scenario 2: 25% DG annual growth
- Post-TAC fix Scenario 3: 50% DG annual growth

Over time, less investment in transmission creates huge savings for all ratepayers

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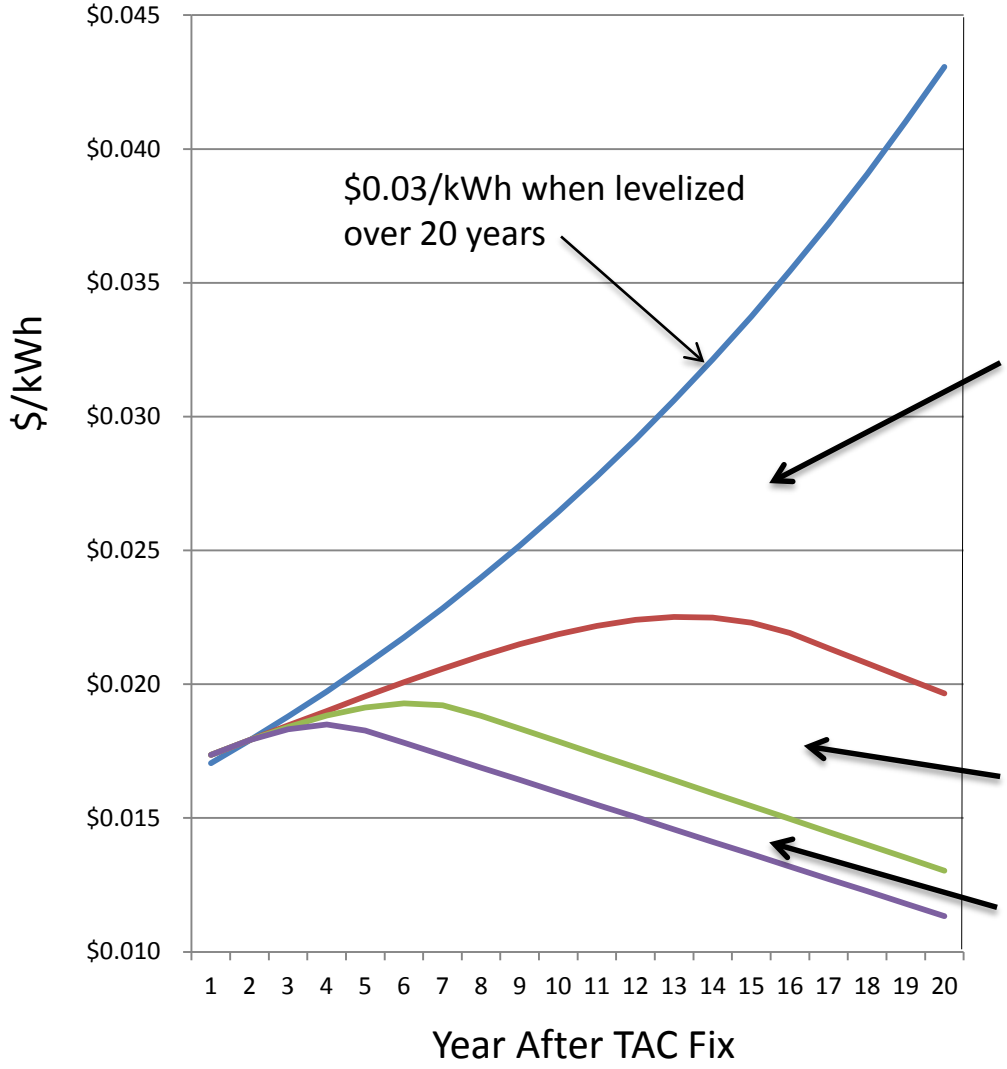

$35 billion

$20 billion additional

$8 billion additional

Ratepayer avoided TAC costs over 20 year period

CAISO Staff's Main Questions

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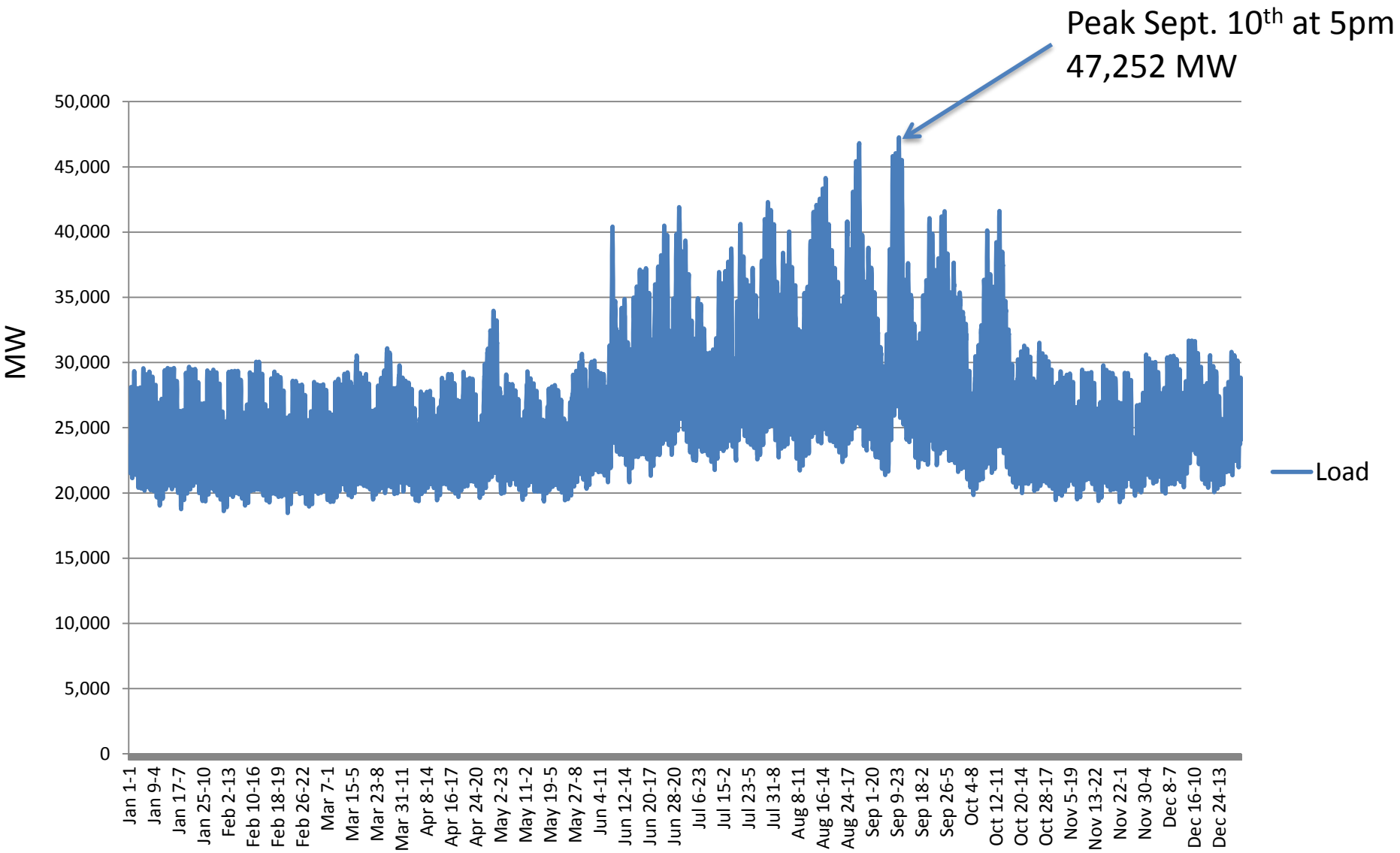
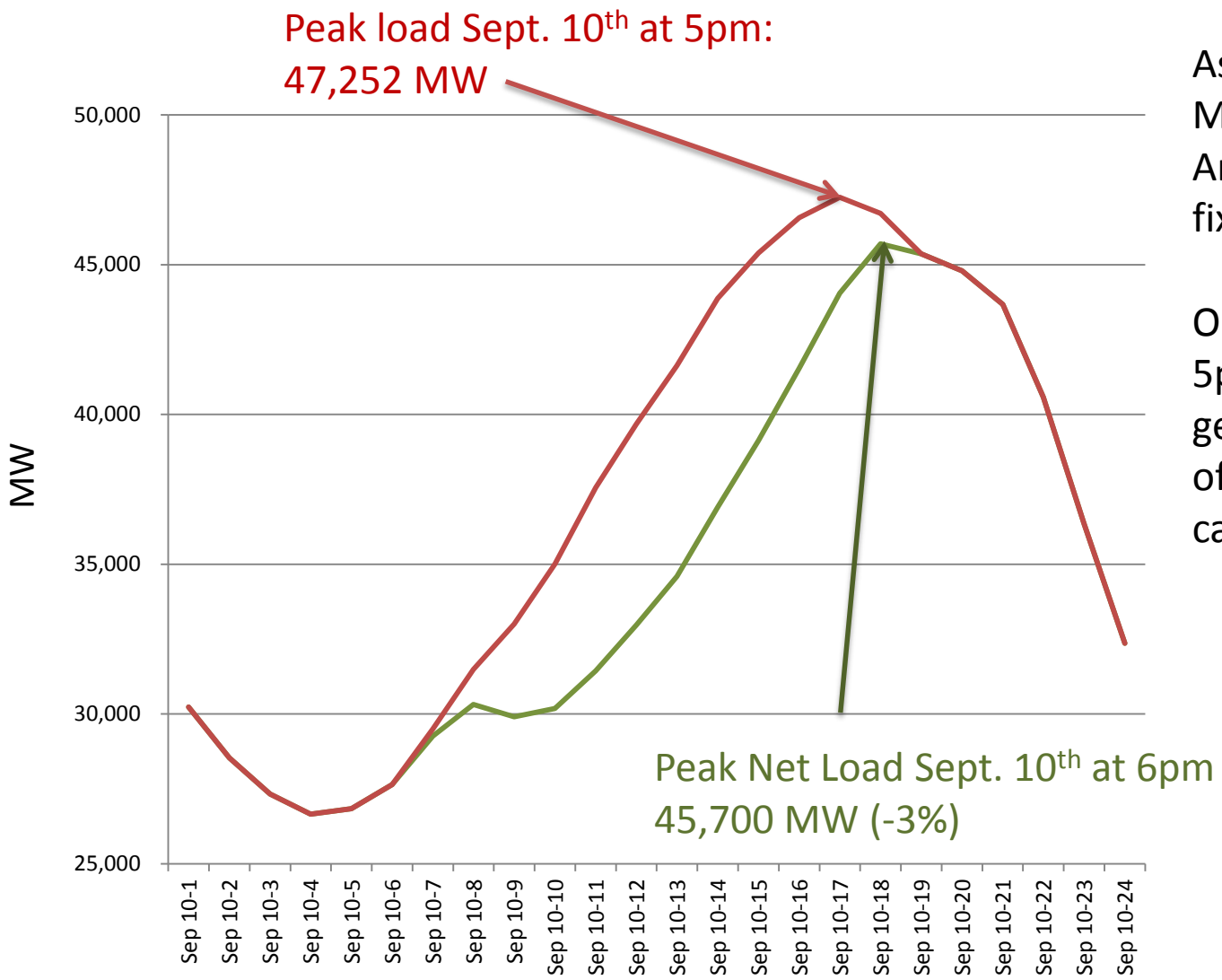
3. **Peak Load Conditions:** Transmission investment is mainly driven by peak load conditions, so how does the proposal reduce peak demand by adding DG?
    - *Current TAC are designed as usage fees. The TAC cost recovery system is not designed or intended to incentivize changing peak load conditions.*
    - *DG can and does address peak load conditions (e.g., rooftop solar produces during peak load conditions). This can be considered similar to NQC for RA.*
    - *The immediate TAC fix is straightforward and should be dealt with immediately regardless of whether a long-term effort is made to redesign TRR recovery around a demand charge. Peak demand on transmission is a non-issue for the immediately needed TAC fix, and there should be no conflating the two.*

CAISO 2015 Load Peaked September 10th at 5pm



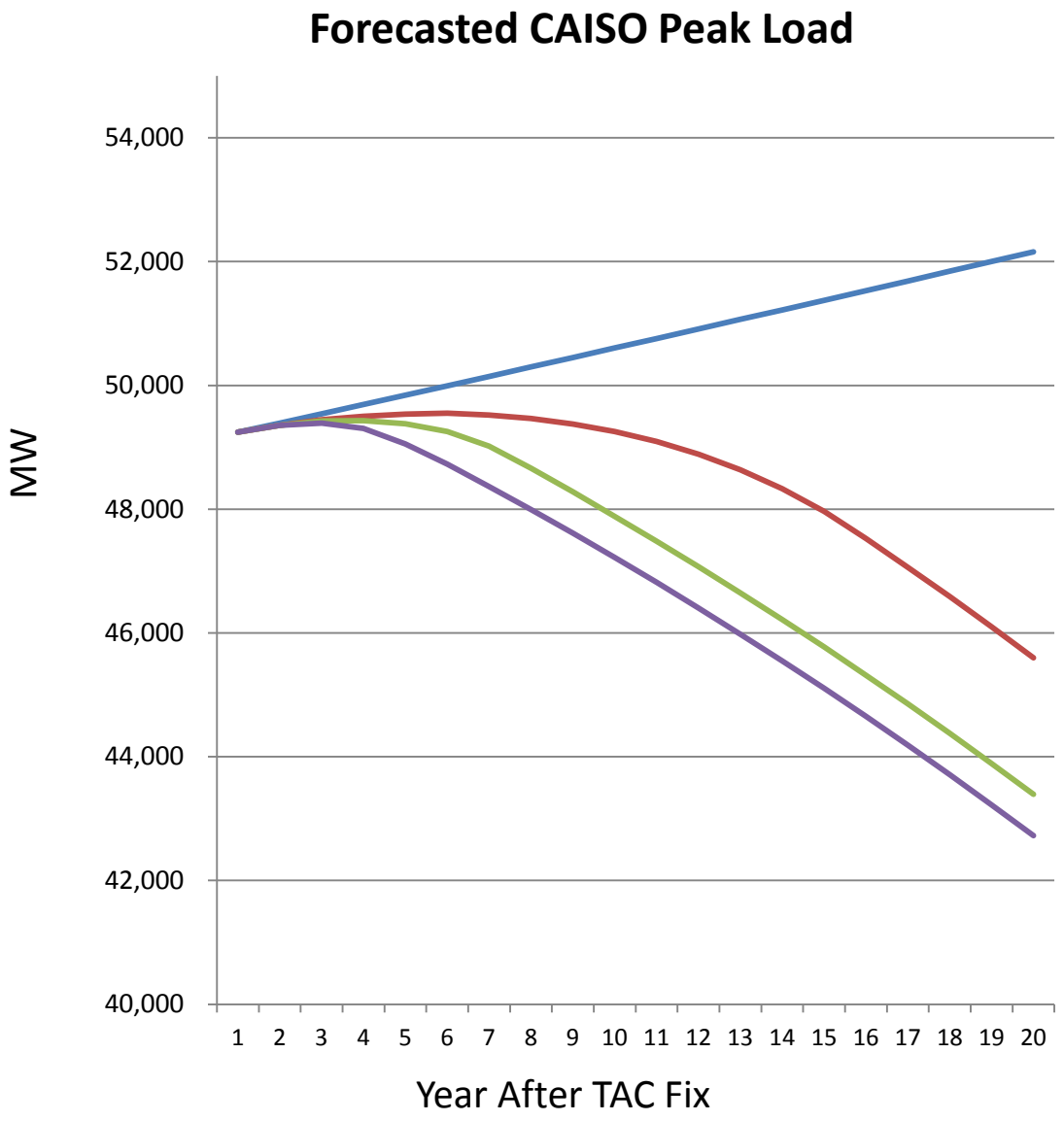
Solar does reduce CAISO peak load



Assumes 10,000 MW solar in Los Angeles facing SW, fixed.

On Sept. 10th at 5pm, solar generates at 46% of maximum daily capacity.

TAC fix reduces peak load through increased DG



Notes & Assumptions

- Assumes peak is July 20 at 4pm, and peak load during other days and times will not exceed peak load for July 20 at 4pm
- DG = Wholesale DG + NEM exports
- All 3 scenarios assume:
  - Year 2 Business As Usual (BAU) 260 MW DG plus 100 MW additional DG
  - Growth rate cited in scenario name is years' 3-20 growth in share of PTOs' new CED served by new DG generation
  - New DG generation never exceeds new CED

- Business As Usual (BAU): 260 MW added DG in Year 2 (2017)
- Post-TAC fix Scenario 1: 10% DG annual growth
- Post-TAC fix Scenario 2: 25% DG annual growth
- Post-TAC fix Scenario 3: 50% DG annual growth

CAISO Staff's Main Questions

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4. **No settlement quality meter (SQM) data at the T-D interface:** CAISO currently does not receive meter data at a sufficient quality to accurately assign shares of the TED metered load to each LSE.

   CAISO staff are currently investigating options for how much it would cost to place SQMs at each T-D interface.

   ***However,** this does not change our proposal. There are multiple ways to get the data needed to implement our proposal:*

   - *Get SQM data from transmission nodes and account for losses between nodal measurement and the T-D interface*
   - *Use CED minus DG (including NEM exports)*
   - *The Clean Coalition has received indications that upgrading to SQMs would cost approximately $2,000 per T-D interface substation, which is negligible compared to the billions of annual TAC dollars that accumulate.*

CAISO Staff's Main Questions

5. **CPUC Role in Retail Billing Determinant:** The Issue Paper notes that any change in the wholesale billing determinant will result in windfalls or deficits for LSEs unless the CPUC adopts coordinating retail billing changes.

   The CPUC role is a non-issue to the TAC proposal and is not a reason to defer this issue.

   There are many opportunities to harmonize the wholesale and retail rates.

   - *Changes in TAC assessments can be managed just as regular changes in TAC rates are managed today.*
   - *Changing CAISO assessment from each LSE directly to the PTO Utility/Distribution Provider and proportionally distributing costs among LSEs.*
   - *PTO Utilities/Distribution Providers manage balancing accounts to ensure that they are able to collect all transmission costs from their customers, so there is little to no risk of an LSE or Distribution Provider facing a windfall or deficit.*

The TAC Fix is backed by a broad range of organizations

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SolarCity

Backup slides

TAC stakeholder cash flows for ratepayers in non-PTO utility service territories

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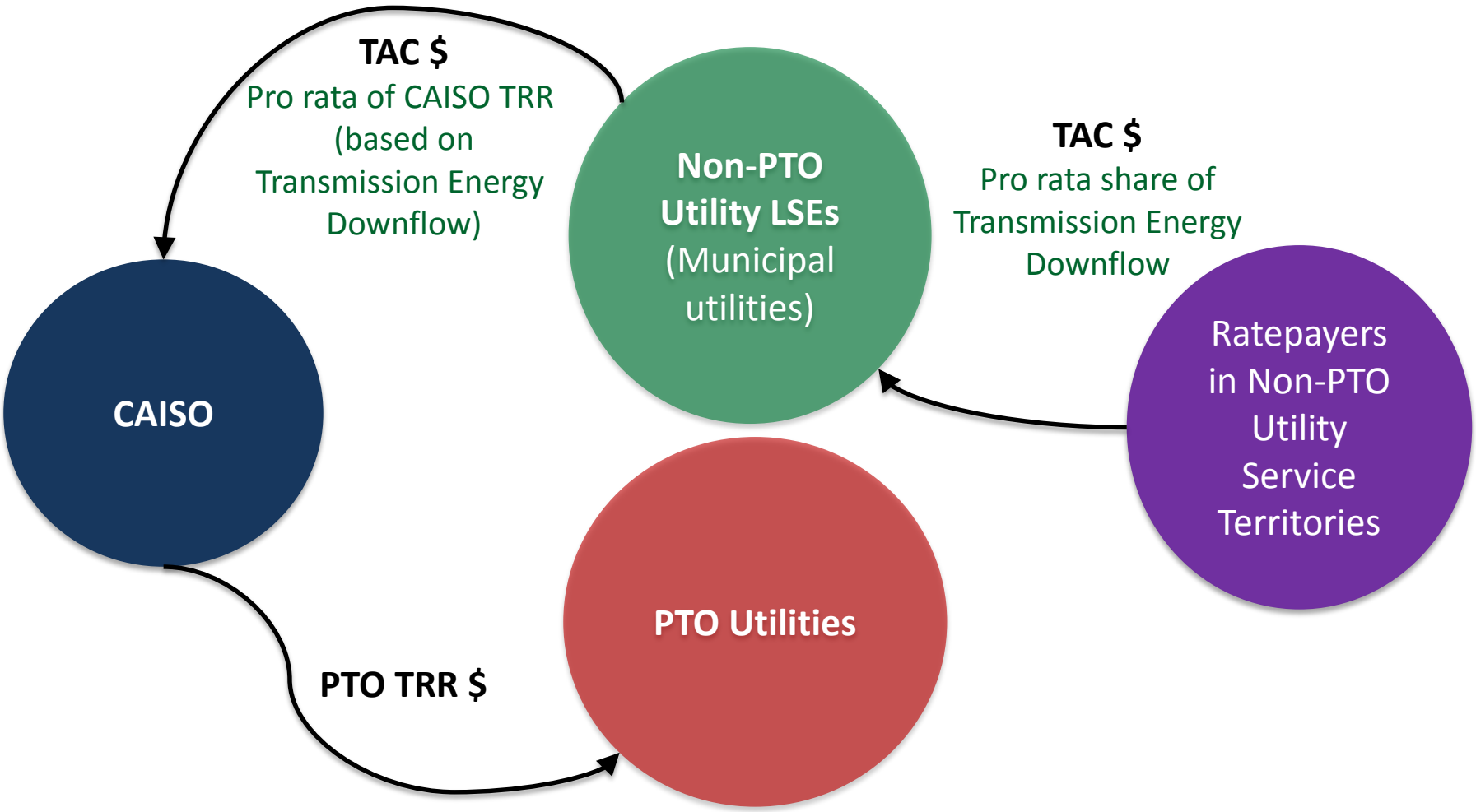

TAC stakeholder cash flows for ratepayers in PTO Utility Service Territories

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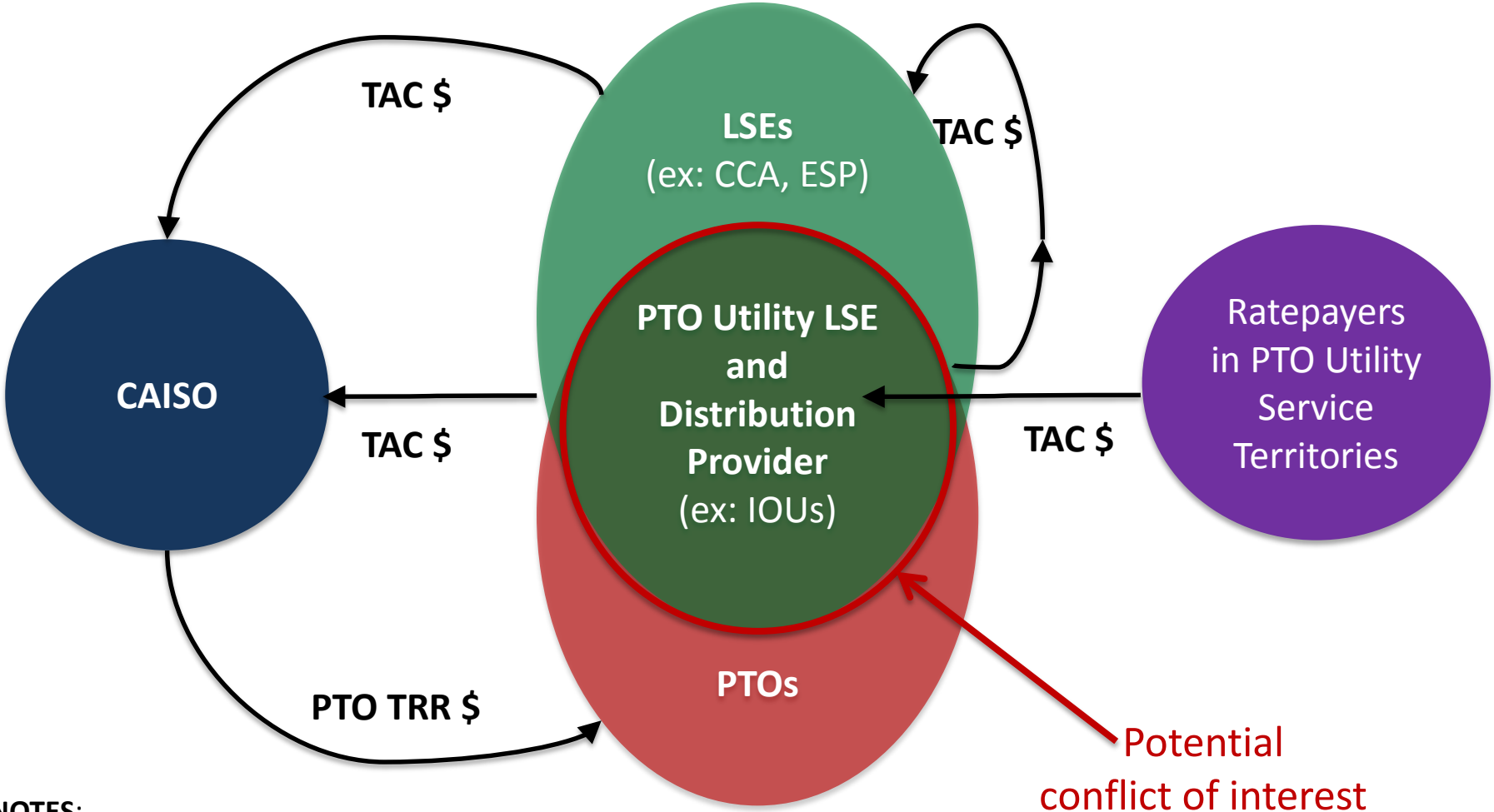

NOTES:

(i) TAC $, or TAC payments, are based on pro rata share of CED

(ii) TAC (Rate) is based on CAISO TRR ÷ CED

TAC growth & methodology

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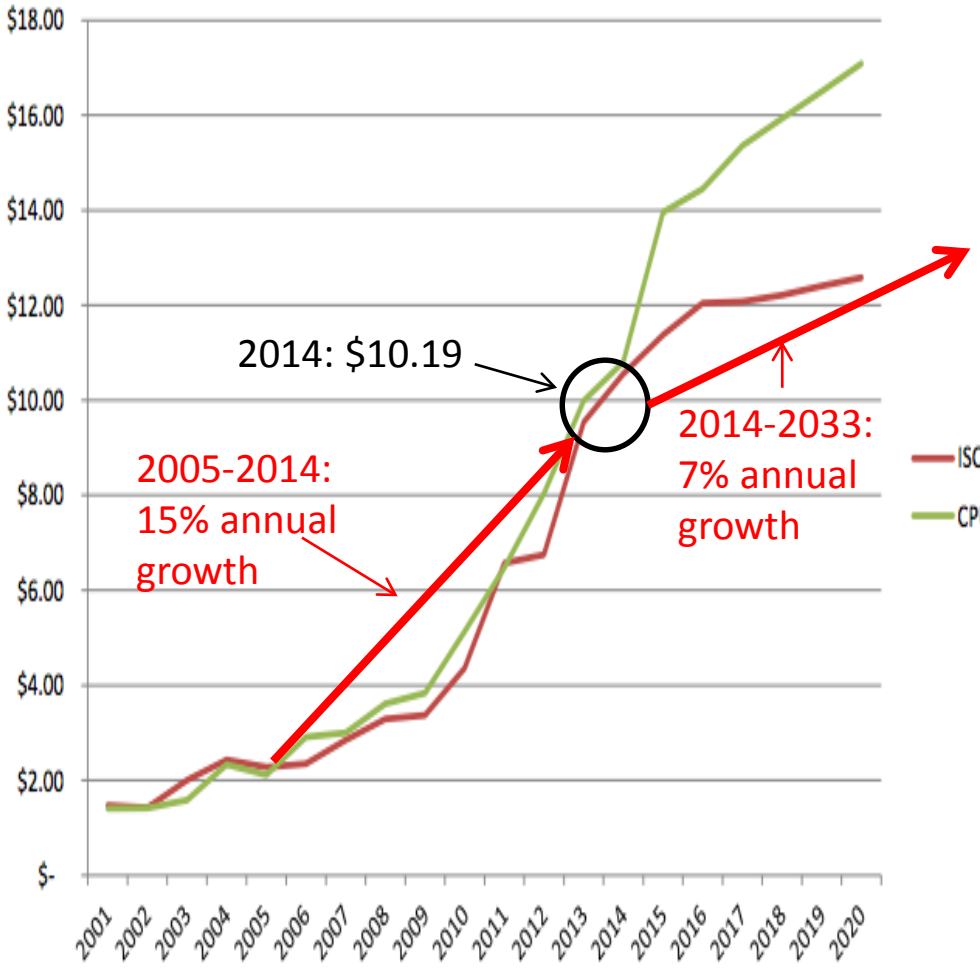
High Voltage Transmission Access Charges (HVTAC) ($/MWh)



Source: CAISO Memorandum on Long-term Forecast of TAC, Oct 25, 2012

2014 TAC (¢/kwh)

	HV	LV	Total
SDGE (A Sempra Energy utility)	1.019	1.398	2.4
PG&E	1.019	0.77	1.8
Southern California Edison (An Edison International Company)	1.019		Comparable; owns LV

TAC Growth

7% nominal CAGR -> 5% real
1.8¢ now -> 3.0¢ levelized 20 years

In 10 years, TAC > generation

After TAC fix, ratepayers avoid ~$50 billion in 20-year transmission costs

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Total PTO Cumulative TAC payments to CAISO	Year 1 ($ billions)	Year 20 ($ billions)	Year 20 Savings ($ billions)	Year 20 Reduction
Business As Usual (BAU): 260 MW added DG in Year 2 (2017)	$ 3.2	$ 131.0	$ -	-
Post-TAC fix Scenario 1: 10% DG annual growth	$ 3.2	$ 96.3	$ 34.7	27%
Post-TAC fix Scenario 2: 25% DG annual growth	$ 3.2	$ 75.8	$ 55.3	57%
Post-TAC fix Scenario 3: 50% DG annual growth	$ 3.2	$ 68.4	$ 62.6	83%

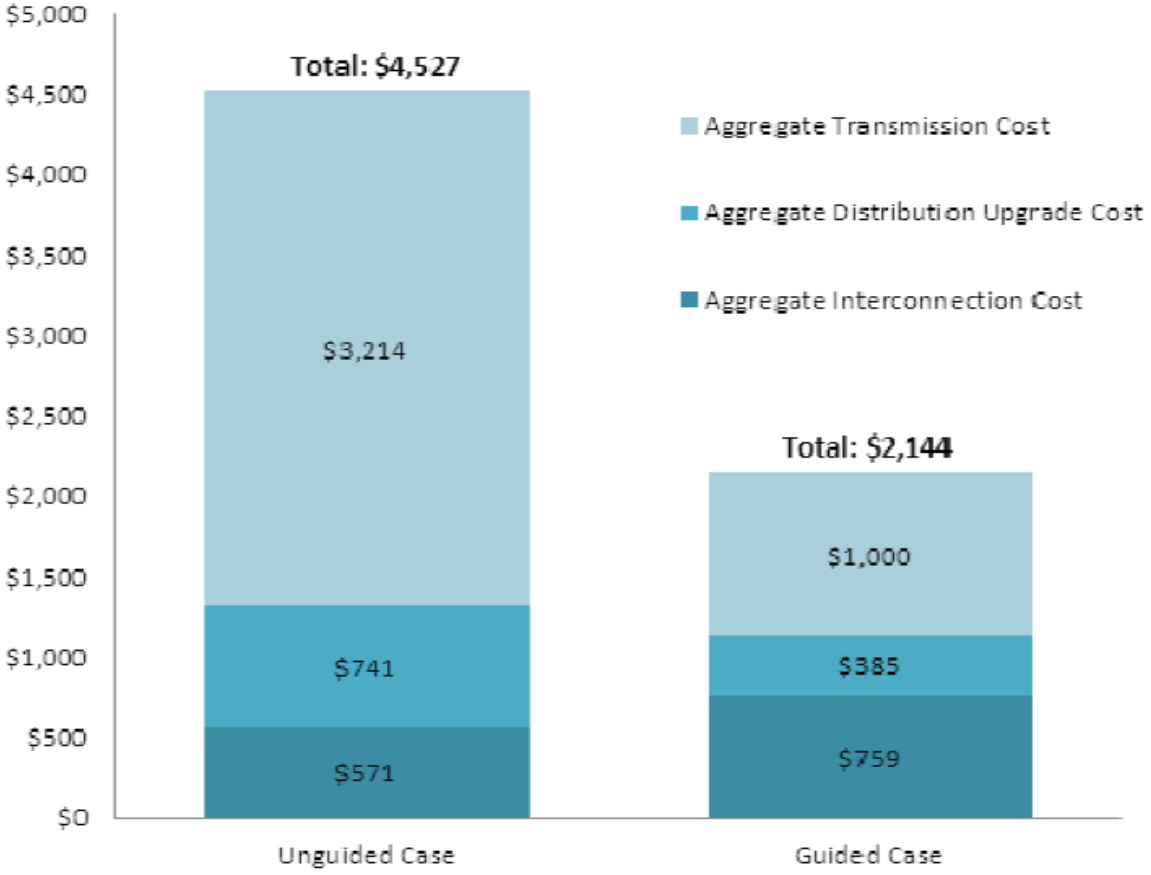
Notes & Assumptions

- DG = Wholesale DG (WDG) + NEM exports
- All 3 scenarios assume:
  - Year 2 Business As Usual (BAU) 260 MW DG plus 100 MW additional DG
  - Growth rate cited in scenario name is years' 3-20 growth in share of PTOs' new CED served by new DG generation
  - New DG generation never exceeds new CED

Transmission & interconnection savings

Location Matters for Applicants & Ratepayers

- Southern California Edison found that intelligently siting about 4 GW of local renewables would reduce SCE's transmission upgrade costs by over $2.2 billion



Source: Southern California Edison (2012)

Transmission are always borne by ratepayers

Key Points

- For PTOs, current TAC assessment unfairly increases the cost of local generation (DG) even though it generally does not use the transmission system
- Fixing the TAC market distortion makes local generation more competitive
- Over time, more local generation will be built, making transmission upgrades less necessary and decreasing overall system costs - for ratepayers
- The TAC “usage pays” fix aligns CAISO with FERC Order 1000, and provides consistent treatment across California - non-PTOs already meter TAC on TED

TAC costs initially remain constant despite slight usage decrease and slight rate increase

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Before TAC Fix	$2.22 billion (Total 2016 PTO filings)	**211,341 GWh** (CED)	**$0.01049/kWh** (HV TAC rate = CAISO HV TRR ÷ CED)	$2.22 billion (HV TAC Rate × CED)
After TAC Fix	**Same as above**	**207,471 GWh** (TED) = 3,870 GWh less than CED due to local DG (1.8%)	**$0.01068/kWh** ($0.00019/kWh increase, 1.8%)	**Same as above** (New HV TAC Rate × TED) Transmission usage now pays 100.0% of TRR, not just 98.2%

NOTE: To calculate the full TAC rate, LV TAC must also be considered. LV TAC is specific to each service territory. The total LV TAC costs to ratepayers, and within each service territory, also do not change after the TAC fix.

To the extent that PTOs serve different shares of their CED with Distributed Generation (which is currently minor for all PTOs – 1.8% for PG&E in 2016), fixing the TAC will result in negligible cost shifts between PTOs.