

Policy approaches to increasing electricity affordability in California

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Project overview

- California's electricity rates are high
- These high rates increase energy burden and also make it less attractive for residents and businesses to choose electrification, which is a critical path for decarbonization of buildings
- This project examines options for lowering rates using different approaches:
 - Reduce the utility's revenue requirement
 - Change rate design to lower marginal rates
 - Use income to inform who pays for the electric system
 - Increase utilization of the electric system through electrification
- We use Pacific Gas and Electric (PG&E) as the example utility for this analysis
- Results are meant to be indicative; they rely on assumptions
 - We have combined data from different years, for example, and do not have the utility's full detailed cost of service or current-year O&M plans
- Prime sources: FERC Form 1 filings (2020 and earlier); 2022 Annual Electric True-Up; 2020 GRC Cost of Service

PG&E's rates today

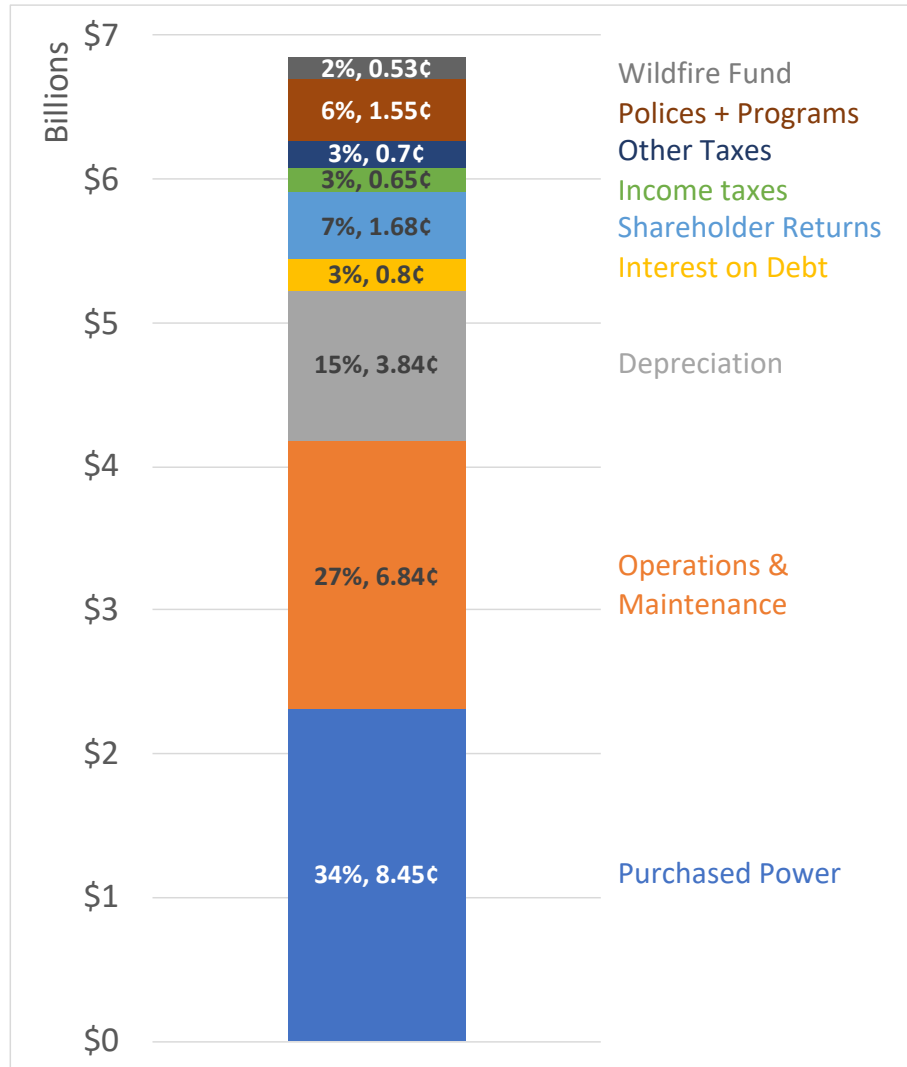
- PG&E's revenue requirement is approximately \$15.5 billion
 - \$7 billion covers the costs of bundled customers (for whom PG&E provides energy supply)
 - \$8.5 billion for unbundled customers (who get energy supply from direct access or a community aggregator)

	Revenue Req.	Sales (TWh)	Avg. Rate
Bundled	\$7B	27.3	25¢/kWh
Residential	\$3.5B	13.1	26.8¢/kWh
Unbundled	\$8.5B	45.5	17¢/kWh
Residential	\$3.3B	14.9	22.2¢/kWh

Bundled Residential average breaks down into:

- 30.9¢/kWh for E-1
- 19.4¢/kWh for CARE (low-income program)

PG&E's bundled revenue requirements today



- Bundled service revenue requirement approx. \$6.8 billion
- Bundled sales of 27.3 TWh
- Average bundled rate 25¢/kWh
- Chart shows the breakdown of the rate by purpose
- The labels show each contribution to the per-kWh rate
- PG&E-owned generation is captured in the capital and O&M sections, and is not included in Purchased Power

Sources: 2022 Annual Electric True-Up, FERC Form 1 filings, Synapse analysis.

Impact of electric rates on electrification

- Customers are choosing whether to electrify their homes and vehicles
- The marginal electric rates they face influence their decisions
- Assumptions:
 - Gas rates are PG&E’s 2022 annual average estimates: \$2.19/therm
 - Gasoline prices from the Jan. 31 AAA survey for CA: \$4.64/gallon
 - Assume equipment performs according to its rating or specification
- “Breakeven” electric rates that would make electric cheaper to run than FF:

Fossil Fueled	Electric	Breakeven
80 AFUE furnace	HSPF 10 heat pump	28.4¢/kWh
0.63 EF tank WH	3.0 UEF HPWH	36.9¢/kWh
0.81 EF tankless WH	3.0 UEF HPWH	28.7¢/kWh
25.4 MPG avg. new car	99 MPGe EV	53.2¢/kWh
52 MPG hybrid	120 MPGe EV	31.5¢/kWh

- Today’s avg blended rates: 30.9¢/kWh for E-1; 19.4¢/kWh for CARE

Policies

- Reduce the revenue requirement
 1. Transfer policy costs from ratepayers to taxpayers
 2. Use a bond to lower the cost of the transmission system
 3. Change the utility's capital structure and rate of return
- Change rate design to lower marginal rates
 4. Implement a fixed charge
- Use income to inform who pays for the electric system
 5. Make the fixed charge income-based
 6. Limit electric costs to 5 percent of income
- Increase utilization of the electric system
 7. Spread fixed costs over more units of electricity through electrification

1. Transfer policy costs from rates to taxes

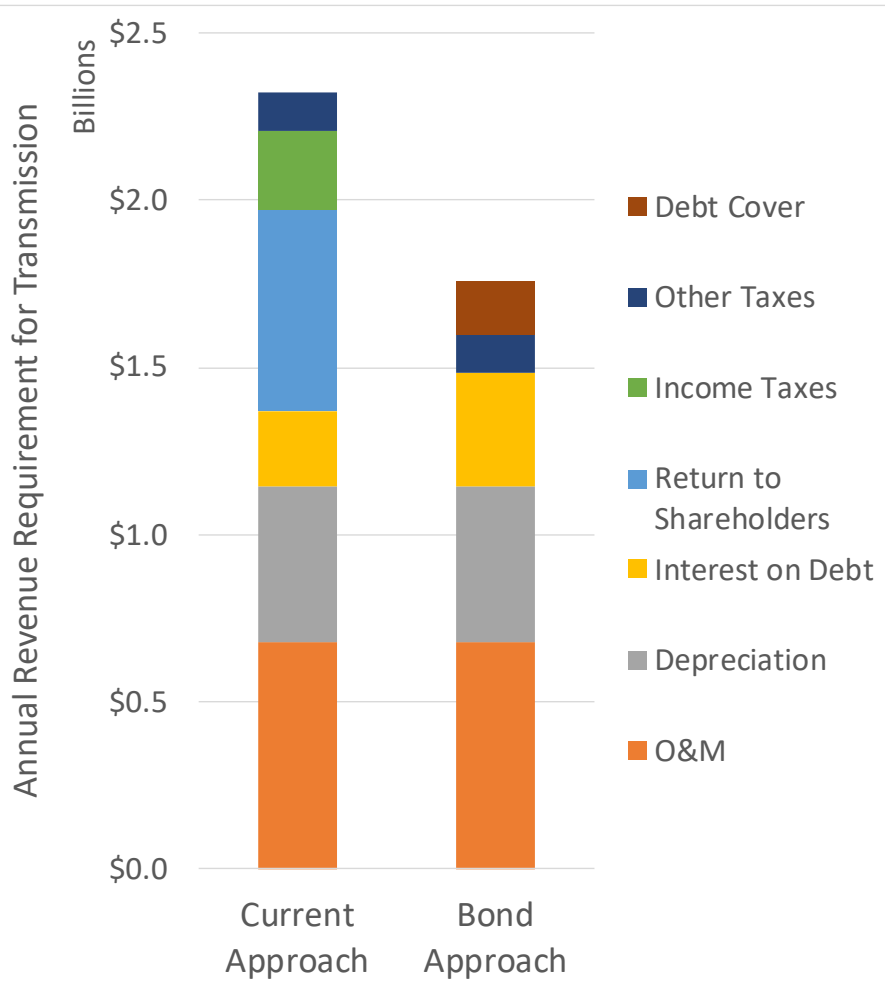
- Logic: Some costs on electric bills are not (directly) caused by electric consumption, so it could be economically efficient to pay for them through other means
- Options for costs to transfer:
 - Wildfire Fund charge
 - CARE and FERA programs (including program admin costs)
 - All costs that are not directly delivery related (i.e., all but transmission, distribution, generation)
- Results for residential bundled rates:

Bill and Rate Impacts Summary								
	E-1				D-CARE			
	Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)	Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)
Current	\$1,947		\$0.309		\$1,161		\$0.194	
Wildfire Fund	Δ \$(39)	-2%	Δ \$(0.006)	-2%	Δ \$0	0%	Δ \$0.0000	0%
CARE/FERA	Δ \$(77)	-4%	Δ \$(0.012)	-4%	Δ \$0	0%	Δ \$0.0000	0%
CARE & Wildfire Fund	Δ \$(116)	-6%	Δ \$(0.018)	-6%	Δ \$0	0%	Δ \$0.0000	0%
All non-delivery	Δ \$(139)	-7%	Δ \$(0.022)	-7%	Δ \$(17)	-1%	Δ \$(0.003)	-1%

Sources: 2022 Annual Electric True-Up, Synapse analysis.

2. Transmission revenue bond

- Logic: California's transmission system is a source of cost and risk. If this asset were securitized or put under ownership of a public entity, cost could be reduced in exchange for risk transferred from shareholders to the public.
- Approach:
 - Modeled as a change in the capital structure of PG&E's transmission system to 100% debt at a bond rate for a long-term state bond, estimated at 3%
 - Would need to buy out/refinance about \$11.3 billion in rate base
 - New structure has to make a "profit" to meet bondholder expectations for cash flow & risk management—we assume a debt coverage ratio of 1.2 (similar to municipal utilities and co-ops)
- We assume the bonded entity is nonprofit or governmental, and therefore pays no income tax.
 - ~\$70M/year reduction in state tax revenues—one possible use for the debt coverage funds



2. Transmission bond (cont.)

- Reduces total revenue requirement by about \$560 million
- Debt coverage generates an average of \$161M/year that could be a rainy day fund (e.g., for O&M risk), conditionally refunded to ratepayers, or used for other purposes

Bill and Rate Impacts Summary								
	E-1				D-CARE			
	Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)	Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)
Current	\$1,947		\$0.309		\$1,161		\$0.194	
Revenue Bond	Δ \$(71)	-4%	Δ \$(0.011)	-4%	Δ \$(67)	-6%	Δ \$(0.011)	-6%

Sources: FERC Form 1 filings, Synapse analysis.

3. Change capital structure and ROE

- Logic: PG&E shareholders have the opportunity to earn a rate of return on equity (ROE) that exceeds the average across the country, even though the equity portion of capital is average or higher. A lower rate of return would reduce both profits and income tax costs.
- PG&E currently can earn 10.25% on the equity portion of rate base, which is 52% of the total rate base.
- Approach:
 - Reduce the approved ROE to 9.5 percent while keeping 52% equity
 - Reduce the approved ROE to 7 percent while increasing equity to 55.5%
 - This keeps the same leverage ratio (a measure of creditworthiness) as today

3. Change capital structure and ROE (cont.)

- Results
 - Reduce the approved ROE to 9.5 percent while keeping 52% equity
 - Reduce revenue requirement by \$157 million (1.4%)
 - Reduce the approved ROE to 7 percent while increasing equity to 55.5%
 - Reduce revenue requirement by \$622 million (5.6%)

Bill and Rate Impacts Summary								
	E-1				D-CARE			
	Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)	Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)
Current	\$1,947		\$0.309		\$1,161		\$0.194	
9.5%, 52%	Δ \$(22)	-1%	Δ \$(0.004)	-1%	Δ \$(21)	-2%	Δ \$(0.004)	-2%
7%, 55.5%	Δ \$(89)	-5%	Δ \$(0.014)	-5%	Δ \$(84)	-7%	Δ \$(0.014)	-7%

Sources: FERC Form 1 filings, Synapse analysis.

4. Add fixed charge

- Logic: PG&E currently does not have a fixed or customer charge for its standard residential rates. If revenue is raised through such a charge, then less needs to come from the variable charge, so the variable charge can be lower.
- Approach: Modeling three levels of fixed charges
 - 1) Based on PG&E estimates of marginal customer cost
 - \$11.34/month (*from 2020 GRC Cost of Service*)
 - 2) Based on PG&E estimates of marginal customer cost for distribution hardware, but including average costs for all customer-related O&M (e.g., billing, customer service, meter reading)
 - May imply shifting a number of public policy-related costs into the fixed charge
 - \$20.33/month (*from 2020 GRC Cost of Service & FERC Form 1*)
 - 3) Based on Next 10 calculation, which limits variable costs to societal marginal cost and shifts all the rest to customer charge
 - \$74.02/month (*from “Designing Electricity Rates for An Equitable Energy Transition” from Next 10 and Haas*)
 - CARE and FERA customers receive comparable discounts on fixed charge to what they receive today on marginal rates; E-1 fixed charges are higher to achieve the same average

4. Add fixed charge (cont.)

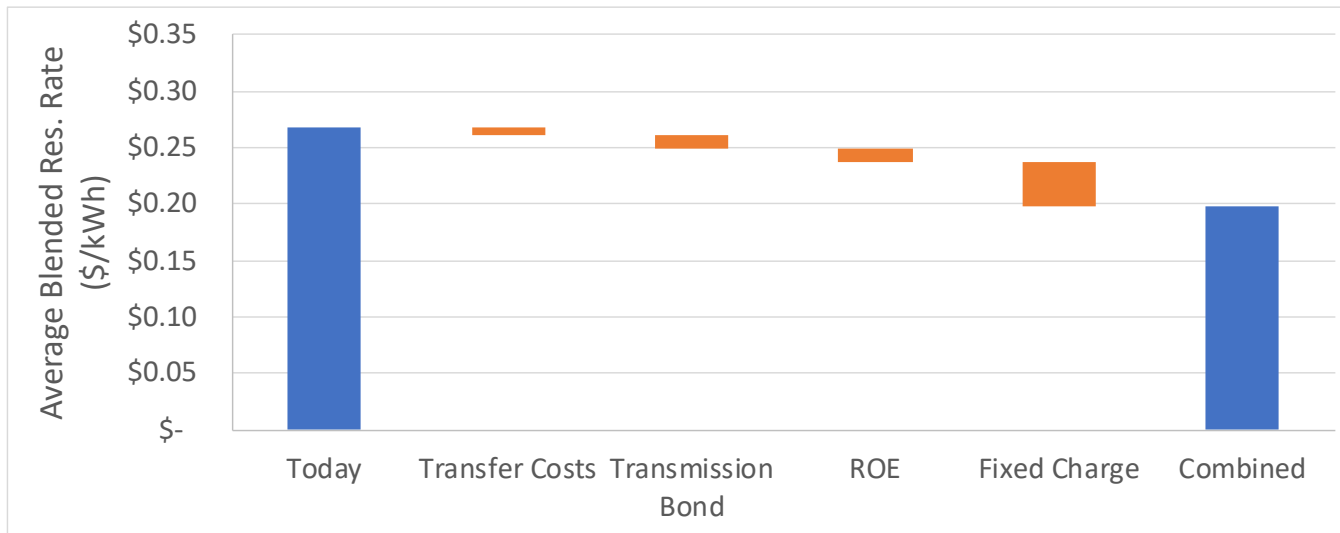
- No *average* bill impacts because the policy is intended to shift cost within the bill, and not change the bill on *average*
- High-use customers would see lower bills, and low-use customers higher bills

Bill and Rate Impacts Summary								
	E-1				D-CARE			
	Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)	Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)
Current	\$1,947		\$0.309		\$1,161		\$0.194	
\$11.34/mo.	Δ \$0	0%	Δ \$(0.025)	-8%	Δ \$0	0%	Δ \$(0.016)	-8%
\$20.33/mo.	Δ \$0	0%	Δ \$(0.045)	-15%	Δ \$0	0%	Δ \$(0.029)	-15%
\$74.02/mo.	Δ \$0	0%	Δ \$(0.163)	-55%	Δ \$0	0%	Δ \$(0.107)	-55%

- Note that in the \$74/Next 10 case, the remaining marginal rate for CARE customers (about 8.7¢/kWh) could be close to/lower than the power supply portion of the bill, which could cause challenges for community choice aggregators. (CCAs would need to somehow claim a portion of the fixed charge.)

Intermission: Policy Stacking

- The first four policies can be combined
- For example:
 - Remove CARE and Wildfire Fund costs
 - Use a bond approach to transmission
 - Change capital structure to 7%/55.5% for distribution and generation
 - Mid-level (\$20.33/mo.) fixed charge



Bill and Rate Impacts Summary								
	E-1				D-CARE			
	Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)	Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)
Current	\$1,947		\$0.309		\$1,161		\$0.194	
Combined	Δ (\$236)	-12%	Δ \$(0.082)	-27%	Δ (\$106)	-9%	Δ \$(0.047)	-24%

5. Income-based fixed charge

- Logic: Fixed charges can be regressive because they increase bills for low-consumption customers. Electricity can be made more affordable by adjusting the fixed charge based on income.
- Approach:
 - Model on Next 10 proposal, with fixed charges varying across 5 quintiles of household income
 - Average marginal rates same as in the fixed charge policy case
 - Can adjust fixed charge to be as progressive as the sales tax or as progressive as the income tax

Income Tier	Sales Tax	Income Tax	Household Income Range
Tier 1	0%	0%	\$0 - \$29,000
Tier 2	100%	100%	\$29,000 - \$53,500
Tier 3	123%	177%	\$53,500 - \$86,400
Tier 4	166%	288%	\$86,400 - \$147,300
Tier 5	280%	641%	Over \$147,300

Sources: Next 10 report, page 42; Synapse analysis of U.S. Census data.

5. Income-based fixed charge (cont.)

- As progressive as the sales tax
- Monthly fixed charges that raise the same revenue as the single fixed charges:

Quintile	\$11/mo.	\$20/mo.	\$74/mo.
1	\$0	\$0	\$0
2	\$8	\$15	\$55
3	\$10	\$19	\$68
4	\$14	\$25	\$92
5	\$24	\$43	\$155

Equiv. Charge	Income Quintile	Ann. Bill Before	Ann. Bill After	Change in Bill (\$)	Change (%)
\$11.34/mo.	1	\$1,194	\$1,093	-\$101	-8%
	2	\$1,456	\$1,447	-\$20	-1%
	3	\$1,591	\$1,592	-\$5	0%
	4	\$1,908	\$1,922	\$14	1%
	5	\$2,125	\$2,238	\$113	5%
\$20.33/mo.	1	\$1,194	\$1,013	-\$181	-15%
	2	\$1,456	\$1,432	-\$35	-2%
	3	\$1,591	\$1,588	-\$9	-1%
	4	\$1,908	\$1,933	\$25	1%
	5	\$2,125	\$2,327	\$202	10%
\$74.02/mo.	1	\$1,194	\$534	-\$660	-55%
	2	\$1,456	\$1,339	-\$128	-9%
	3	\$1,591	\$1,564	-\$33	-2%
	4	\$1,908	\$2,001	\$93	5%
	5	\$2,125	\$2,860	\$735	35%

5. Income-based fixed charge (cont.)

- As progressive as the income tax
- Monthly fixed charges that raise the same revenue as the single fixed charges:

Quintile	\$11/mo.	\$20/mo.	\$74/mo.
1	\$0	\$0	\$0
2	\$5	\$8	\$31
3	\$8	\$15	\$54
4	\$14	\$24	\$88
5	\$30	\$54	\$197

Equiv. Charge	Income Quintile	Ann. Bill Before	Ann. Bill After	Change in Bill (\$)	Change (%)
\$11.34/mo.	1	\$1,194	\$1,093	-\$101	-8%
	2	\$1,456	\$1,402	-\$65	-4%
	3	\$1,591	\$1,567	-\$30	-2%
	4	\$1,908	\$1,916	\$8	0%
	5	\$2,125	\$2,315	\$190	9%
\$20.33/mo.	1	\$1,194	\$1,013	-\$181	-15%
	2	\$1,456	\$1,351	-\$116	-8%
	3	\$1,591	\$1,543	-\$54	-3%
	4	\$1,908	\$1,922	\$14	1%
	5	\$2,125	\$2,465	\$340	16%
\$74.02/mo.	1	\$1,194	\$534	-\$660	-55%
	2	\$1,456	\$1,044	-\$423	-29%
	3	\$1,591	\$1,400	-\$198	-12%
	4	\$1,908	\$1,959	\$51	3%
	5	\$2,125	\$3,362	\$1,237	58%

5. Income-based fixed charge (cont.)

- Average marginal rates fall, same as for the uniform fixed charge
- Bill changes for E-1 and CARE customers vary further within each rate class (as detailed on previous pages)

Bill and Rate Impacts Summary									
		E-1				D-CARE			
Monthly Fixed Charge	Progressivity	Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)	Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)
Current		\$1,947		\$0.309		\$1,161		\$0.194	
\$11.34/mo.	Income tax	Δ \$42	+2%	Δ \$(0.025)	-7%	Δ \$(81)	-7%	Δ \$(0.016)	-8%
\$20.33/mo.	Income tax	Δ \$75	+4%	Δ \$(0.045)	-13%	Δ \$(145)	-12%	Δ \$(0.029)	-15%
\$74.02/mo.	Income tax	Δ \$275	+14%	Δ \$(0.163)	-46%	Δ \$(528)	-45%	Δ \$(0.107)	-55%
\$11.34/mo.	Sales tax	Δ \$33	+2%	Δ \$(0.025)	-7%	Δ \$(69)	-6%	Δ \$(0.016)	-8%
\$20.33/mo.	Sales tax	Δ \$59	+3%	Δ \$(0.045)	-13%	Δ \$(124)	-11%	Δ \$(0.029)	-15%
\$74.02/mo.	Sales tax	Δ \$216	+11%	Δ \$(0.163)	-46%	Δ \$(450)	-39%	Δ \$(0.107)	-55%

6. Energy burden limit (5%)

- Logic: By limiting electricity bills to a small percent of income, the lowest-income households will see reduced energy burden.
- Background:
 - Average CARE electric bills are about \$1,200/year, so a limit to 5% of income would impact CARE customers with annual incomes under about \$24,000
 - CARE program budget is about \$800M/year
 - Larger recently due to Covid – historically closer to \$600M
- Approach:
 - Increase CARE discount with income sensitivity to provide additional rate relief to CARE households to limit electric bills to 5% of income

6. Energy burden limit (5%, cont.)

- Limiting CARE-participant electric bills to 5% of income would require about \$300 million in additional support
 - Increase CARE budget from \$800 million to \$1.1 billion, or 35-40% increase
- These households would have \$300 million more income to support other necessities; other ratepayers would make up the difference
- If collected via residential electric rates, this would require additional 1.45¢/kWh from non-CARE customers (bundled and unbundled)

6. Energy burden limit (5%, cont.)

- Program participants see zero marginal electric rate
 - Burden limit could be tied to end-uses (e.g., space and water heating)
- Would likely require refocusing of low-income efficiency programs

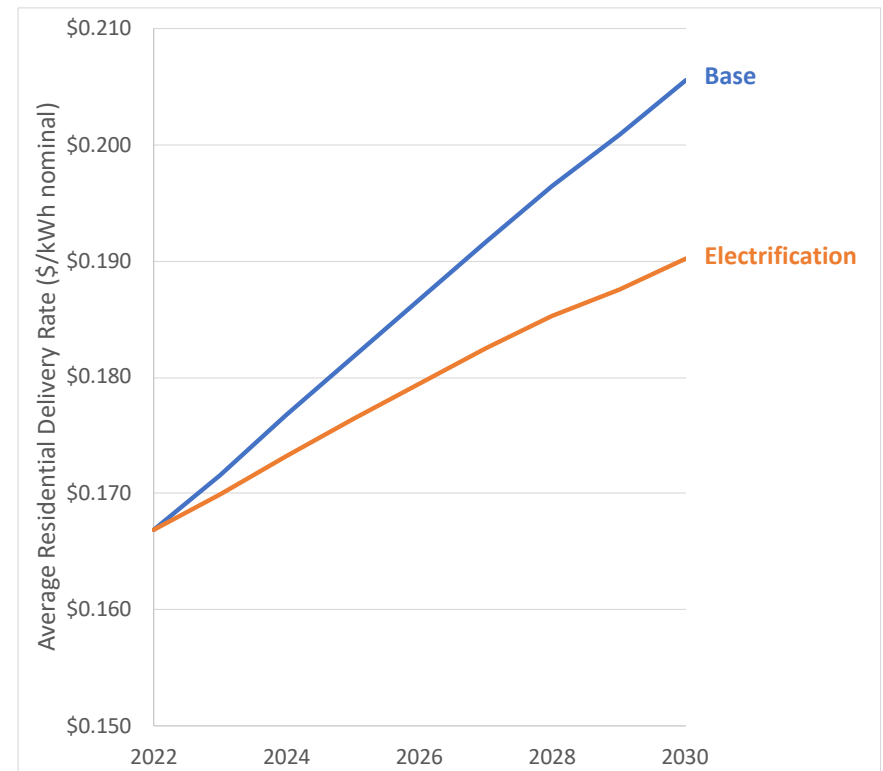
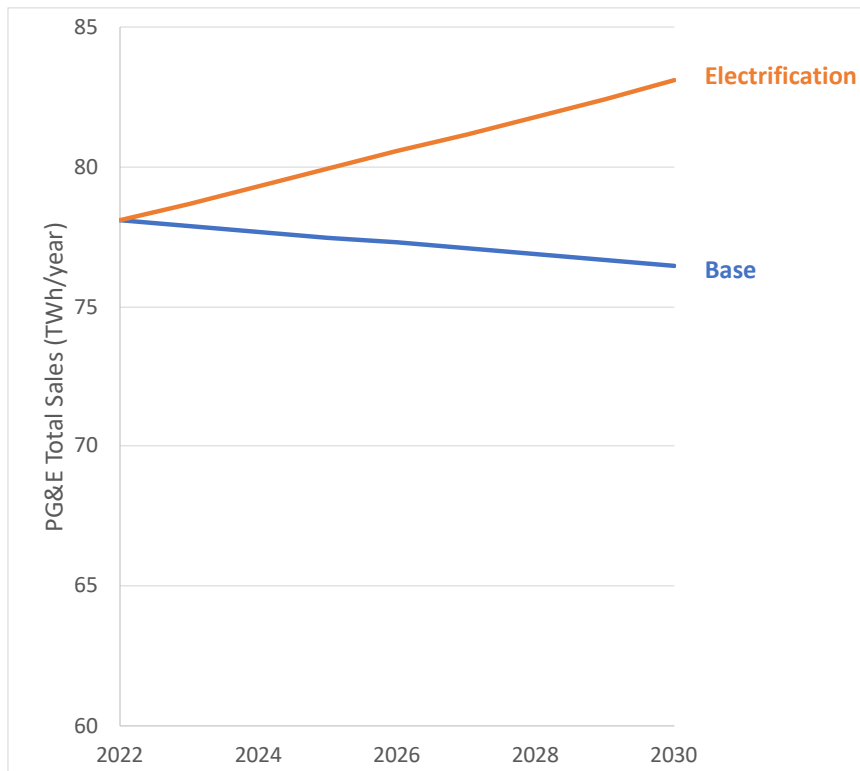
Bill and Rate Impacts Summary								
	E-1				D-CARE			
	Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)	Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)
Current	\$1,947		\$0.309		\$1,161		\$0.194	
5% limit	Δ \$100	+5%	Δ \$0.014	+5%	Δ (\$259)	-22%	Δ \$(0.194)	-100%

7. Spread costs with electrification

- Logic: The T&D system is built to handle peak loads, but most of the time load is lower. If the cost of that system can be spread over more units (kWh) without proportional increase in peak costs, then the per-unit cost can decline.
- Approach:
 - Compare the utility revenue requirement per kWh in a low-electrification/BAU future vs. a higher-electrification case
 - Based projections on two cases from the *California Energy Demand 2018-2030 Revised Forecast*
 - Base case: “Mid-Mid” case (Mid-level demand growth, mid-level efficiency)
 - Higher-load case: “High-Low” case (High-level demand growth, low-level efficiency)
 - Modeled only the non-generation portion of bills
 - Add marginal T&D costs as load grows
 - Marginal T&D costs from the 2021 *Distributed Energy Resource Avoided Cost Calculator*

7. Spread costs with electrification (cont.)

- By 2030, average residential non-generation-related rates are lower by about 1.5¢/kWh (in nominal terms) with the higher load projection
- Would correspond to \$90-100/year savings in 2030, if usage was the same
 - But the point is that it isn't, for many customers



Summary table

Bill and Rate Impacts Summary										
Policy	Method	Sub-method	E-1				D-CARE			
			Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)	Bills (\$)	Bills (% Δ)	Rates (\$)	Rates (% Δ)
CURRENT			\$1,947		\$0.309		\$1,161		\$0.194	
Cost Transfer	Wildfire Fund		Δ \$(39)	-2%	Δ \$(0.006)	-2%	Δ \$0	0%	Δ \$0.0000	0%
Cost Transfer	CARE/FERA		Δ \$(77)	-4%	Δ \$(0.012)	-4%	Δ \$0	0%	Δ \$0.0000	0%
Cost Transfer	CARE & Wildfire		Δ \$(116)	-6%	Δ \$(0.018)	-6%	Δ \$0	0%	Δ \$0.0000	0%
Cost Transfer	All non-delivery		Δ \$(139)	-7%	Δ \$(0.022)	-7%	Δ \$(17)	-1%	Δ \$(0.003)	-1%
Trans. bond			Δ \$(71)	-4%	Δ \$(0.011)	-4%	Δ \$(67)	-6%	Δ \$(0.011)	-6%
ROE	9.5%, 52%		Δ \$(22)	-1%	Δ \$(0.004)	-1%	Δ \$(21)	-2%	Δ \$(0.004)	-2%
ROE	7%, 55.5%		Δ \$(89)	-5%	Δ \$(0.014)	-5%	Δ \$(84)	-7%	Δ \$(0.014)	-7%
Fixed charge	\$11.34/mo.		Δ \$0	0%	Δ \$(0.025)	-8%	Δ \$0	0%	Δ \$(0.016)	-8%
Fixed charge	\$20.33/mo.		Δ \$0	0%	Δ \$(0.045)	-15%	Δ \$0	0%	Δ \$(0.029)	-15%
Fixed charge	\$74.02/mo.		Δ \$0	0%	Δ \$(0.163)	-55%	Δ \$0	0%	Δ \$(0.107)	-55%
Income-based FC	\$11.34/mo.	Income tax	Δ \$42	+2%	Δ \$(0.025)	-8%	Δ \$(181)	-7%	Δ \$(0.016)	-8%
Income-based FC	\$20.33/mo.	Income tax	Δ \$75	+4%	Δ \$(0.045)	-15%	Δ \$(145)	-12%	Δ \$(0.029)	-15%
Income-based FC	\$74.02/mo.	Income tax	Δ \$275	+14%	Δ \$(0.163)	-55%	Δ \$(528)	-45%	Δ \$(0.107)	-55%
Income-based FC	\$11.34/mo.	Sales tax	Δ \$33	+2%	Δ \$(0.025)	-8%	Δ \$(69)	-6%	Δ \$(0.016)	-8%
Income-based FC	\$20.33/mo.	Sales tax	Δ \$59	+3%	Δ \$(0.045)	-15%	Δ \$(124)	-11%	Δ \$(0.029)	-15%
Income-based FC	\$74.02/mo.	Sales tax	Δ \$216	+11%	Δ \$(0.163)	-55%	Δ \$(450)	-39%	Δ \$(0.107)	-55%
Limit burden	5% limit		Δ \$100	+5%	Δ \$0.014	+5%	Δ \$(259)	-22%	Δ \$(0.194)	-100%
Electrification		2030	Δ \$(97)	-4%	Δ \$(0.015)	-4%	Δ \$(92)	-7%	Δ \$(0.015)	-7%