



The Real Drivers of California Electricity and Gas Rate Spikes

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Executive Summary

Californians are getting crushed by electric and gas utility rate hikes — with some residents seeing bills that DOUBLED or TRIPLED during the month of January 2023 alone. But even without the recent price spikes (caused partially by a disruption in natural gas supplies to the state), California's electricity and gas rates are substantially higher than the national average.

While California politicians are deflecting the blame to utility company profits, an analysis of utility rates in California conducted by the Transparency Foundation reveals that numerous “hidden state taxes” and costly state government climate mandates are actually behind the price gouging.

In fact, after examining the specific “rate cases” filed by utility companies with the California Public Utility Commission (CPUC), the Transparency Foundation discovered over \$4.5 billion in charges imposed by the state government for various discretionary state government programs — amounting to what we call a massive “hidden state tax” on utility bills at a total combined tax rate of over 10% on top of the rates already being charged (See costs shaded in green in full rate analysis in Appendices A & B).

Even worse, these taxes are not disclosed on individual ratepayer bills — and instead ratepayers are left to mistakenly believe that the modest “State Energy Tax” that appears on their bill is the only tax imposed.

On top of the \$4.5 billion in “hidden state taxes” on utility rates, California's aggressive climate change mandates have both increased the commodity prices of electricity and natural gas as well as been the primary contributor to price spikes during supply disruptions. The Transparency Foundation identified that between 70-80% of electric utility costs and 60-80% of gas utility costs are unnecessarily increased by additional state regulations (See costs shaded in yellow in full rate analysis in Appendices A & B).

California electricity rates are 67.1% higher than the national average — and 76.4% higher than rates in Texas. For natural gas, California's rates are 30.1% higher than the national average. While some of these costs could be market-driven, the Transparency Foundation concludes that California state government hidden taxes and mandates are resulting in an increased cost to consumers by at least 1/3rd of their bill — if not closer to half of their bill.

California Electricity Prices vs Texas & National Average

	<i>Rate – November 2022</i>	<i>% Cost Surcharge in CA</i>
<i>California</i>	<i>26.14¢ / kWh</i>	
<i>Texas</i>	<i>14.82¢ / kWh</i>	<i>76.4% higher in California</i>
<i>US National Average</i>	<i>15.64¢ / kWh</i>	<i>67.1% higher in California</i>

Source: US Energy Information Administration — November 2022

California Gas Prices vs Texas & National Average

	<i>Rate – November 2022</i>	<i>% Cost Surcharge in CA</i>
<i>California</i>	<i>\$20.34 / MCF</i>	
<i>Texas</i>	<i>\$17.10 / MCF</i>	<i>18.9% higher in California</i>
<i>US National Average</i>	<i>\$15.63 / MCF</i>	<i>30.1% higher in California</i>

Source: US Energy Information Administration — November 2022

These national rate comparisons tell an incomplete story, however, because they do not include an additional California fee known as the “High Usage” Tax. This tax is imposed on any household using more energy than the California state government thinks is “appropriate.” High Usage rates are 25% higher than the rates reflected above.

Worse, as more California state climate change mandates kick in (such as bans on natural gas appliances), California’s electricity and gas prices will skyrocket even higher.

10 Key Findings of the Transparency Foundation’s Analysis of California Electricity and Gas Utility Rates

► #1. State Politicians — Not the Utilities — Set Rates

Did you know that electric and gas utilities in California — as with other regulated utilities across the US--do not set the rates they charge you as a customer?

The high rates you are paying are actually set by the politicians through their appointees on the California Public Utilities Commission CPUC, and they do it by adding on extra programs and mandates that are essentially state taxes in disguise. These disguised taxes are duplicative or unrelated to the provision of core utility service.

If you are unhappy with the rates you pay, blame your state politicians for adding in unnecessary costs — not just the utility company (See Appendix C for more information).

► #2. The Profits of Utilities in California are Capped — to Benefit Politicians and Utility Companies, Not the Ratepayers

While California politicians and media outlets try to shift the blame of high rates to profit-taking by utility companies, The Transparency Foundation analyzed the audited financial statements of several utility companies in California for 2021 and found profit margins to be lower than the national average for similar utility companies.

Looking at the Profit Margins of the Utility Companies

	2021 Audited Financials % Profit Margin
National Average (EEI)	17.1%
SDG&E	14.88%
Southern CA Edison	6.2%
Pacific Gas & Electric	0.67%

*Profit margins combine both electric and gas services. National Average for utilities as calculated by Edison Electric Institute for 2021.¹

The simple fact is, state politicians not only control the rates you are charged, but they also control the amount of profit that a utility can make off of selling electricity or gas in the state. In fact, profit margins are highly regulated and capped by the CPUC — but there is a catch.

While the profit margin is capped, if the cost of providing electricity or gas increases because of state government mandates, the total dollar value of the profit generated by the utility also increases. This is almost certainly the reason why utilities remain silent about the true drivers of cost increases to ratepayers.

Utilities do not fight onerous hidden taxes and unnecessary mandates imposed by state politicians because in the end these costs are simply passed on to the ratepayers — and the dollar value of the utility profit margin increases. The utility's profits are protected by those same politicians.

So while politicians — and even the media — will claim rates are spiking because of excessive profiteering by energy executives, this data and the legal reality of rate-setting refute that claim. We must remember that any profit has been expressly approved by the politicians themselves — provided that utility companies keep their mouths shut on how the rates are set.

▶ **#3. Californians Forced to Pay Higher Rates to Subsidize Free Electricity and Gas for Their Neighbors**

Do you think you should be forced to pay your neighbor's electricity or gas bill when they decide to skip a month? Should you be forced to pay to install new windows or a new appliance in your other neighbor's home?

California politicians have imposed a “hidden state tax” on your utility bill called the “Public Purpose Program” to tax you to provide funding to a state government program run through the utility companies to provide free utilities and home retrofits to your neighbors who request them.

State politicians say these programs are needed to help the poor who can't pay high utility rates — so they increase utility rates with a hidden tax to generate funding which is given to utilities in order to cover certain households' bills. Of course the politicians promote these programs as though it came from their generosity when in fact the funds all came from ratepayers themselves.

California ratepayers are also forced to pay higher utility rates for various “diversity” programs to provide government assistance to “underrepresented communities.”

▶ **#4. California State “Climate Change” Mandates are Spiking Electricity and Gas Prices**

Starting nearly 20 years ago, California began putting most of the controversial “Green New Deal” climate change mandate proposals into law — and its high prices for electricity and gas are starting to reflect that decision.

In fact, in its 2023 rate case Pacific Gas & Electric admits the rate increases they seek are directly driven by **“the impact of the State's decarbonization strategy.”**

Among some of California's current climate change mandates are:

- **Supply Restrictions:** California has restricted the production of cost-efficient electricity and natural gas — ranging from costly regulations on existing facilities to outright bans (nuclear power plants). Any increased costs of production or commodity price spikes due to the state restricting the supply

of electricity and gas are automatically passed on to California ratepayers in the form of higher rates.

- **Cap and Trade Tax:** On top of regulations and supply restrictions, any carbon-based form of energy (e.g. natural gas) is immediately taxed under the cap-and-trade climate change tax in California. California's climate change tax is also passed on to rate payers in the form of higher utility rate costs. (CPUC takes a portion of cap and trade taxes and "returns" them ratepayers in the form of a modest credit once a year.)
- **Climate Change Charges:** These "hidden state taxes" raise the utility rates and the funds collected cover various government programs politicians have set up to fund climate change projects (more on this later)

The reality is renewable energy sources like wind and solar are substantially more expensive to use than traditional energy sources — and far less reliable. In fact, while politicians celebrate solar and wind, they do not disclose that natural gas plants are still needed to cover energy demand during the night or when the wind does not blow.

And things will only be getting worse. In 2022, California politicians approved legislation that codifies the state's goal of achieving carbon neutrality economywide by 2045 and a bill that sets a goal of 90% clean electricity by 2035.

Energy experts say that will cost hundreds of billions (possibly even trillions) of dollars in higher costs to California residents. The high rates being imposed on Californians seems to be the way state politicians intend to finance the costly Green New Deal transition to an all-renewable energy portfolio over the next twenty years.

California's self-inflicted energy problems are merely a glimpse of what Americans will see if the Green New Deal is implemented at the national level.

► #5. California State Policies Contributed to January 2023 Natural Gas Supply Disruptions and Rate Spikes – and New Natural Gas Appliance Bans Will Spike Prices Higher

In January 2023, SDG&E disclosed that the commodity price for its natural gas was \$3.45 — up from 60.7 cents in February 2022. More than five times higher! Of course, because the commodity price is only a component of the rate charged to consumers for natural gas, the resulting rate increase was double or triple for many Californians.

A major reason why the commodity price for natural gas spiked was due to a disruption in supply. According to the US Energy Information Agency, natural gas supplies were disrupted due to colder-than-expected temperatures in December across the country, unforeseen pipeline disruptions, and California's low storage rate of natural gas.

California, however, cannot be allowed to hide behind this supply disruption — because it has created its own supply disruptions through its misguided climate change mandates.

While in 2012 California produced 248 billion cubic feet of natural gas within the state, since then Gov. Gavin Newsom and California liberal politicians have enacted gas and oil bans — with a mandate now codified in law to eliminate all oil and gas production in the state no later than 2045.

An investment made by an energy company is typically made with a 30 to 50-year horizon for financial return. As a result of the impending bans, California state government decisions have made it impossible for energy and utility companies to invest in producing any additional natural gas supplies within the state.

Because of these policies, today California is forced to import over 85% of its natural gas. What's worse, energy experts all point to California's climate change mandates as the driver of a June 2021 decision by Pacific Gas & Electric to dramatically reduce its investment in natural gas storage in California. On March 28, 2022 Standard and Poor's reported:

Because of a declining outlook for gas demand in California, it made sense for PG&E to exit commercial storage activity rather than upgrade its storage facilities at a cost of nearly \$5 billion over a 20-year period. Instead, PG&E only maintains enough storage to balance its own system, supplemented by injection and withdrawal capacity from independent storage providers. The additional 51 Bcf of working gas capacity was necessary decades ago, but as winter-to-summer spreads continue to shrink and overall gas demand in California trends downward, (gas) storage has become less valuable.ⁱⁱ

With less investment in gas storage due to California's climate change mandates, there is less ability to cushion against supply disruptions.

In addition to statewide climate change mandates making natural gas investment financially impossible, nearly three dozen California cities have banned natural gas appliances in new homes — and two large cities (San Francisco and San Diego) are considering a costly retrofit mandate to force the removal of natural gas appliances in all existing homes and businesses.

Banning natural gas appliances is quite wasteful. Less than 20% of net US energy consumption comes from the electrical grid; all the rest is the direct use of fossil fuel in transportation, industry or buildings. Using a gas stove within a house utilizes 98% of the value of natural gas whereas burning natural gas to convert it into electricity at best results in recapturing less than half the value of gas.

Not only is direct use of natural gas much more efficient than electricity for water and space heating and clothes drying, but the question of where all the additional electricity will come from is noticeably absent from the narrative advanced by green energy advocates. Remember, because wind and solar are intermittent sources, with availability in the 30% range, electricity generation from natural gas as a back-up is always necessary. Ratepayers will end up paying higher costs for electricity than they would have paid by simply using natural gas and utilizing its energy potential to the max.

Utility executives understand all of this. In its 2023 gas rate case submitted to the CPUC, PG&E cites the impending ban on natural gas appliances as a core factor for its reduction in investment in natural gas capacity as well as its projection for higher gas utility rates:

Numerous cities have adopted ordinances prohibiting gas appliances in new construction. The projected decline in throughput may lead to a declining base of core customers who will pay for our gas system costs, with rate increases needed to cover that gap.ⁱⁱⁱ

► #6. California's Mismanagement of Wildfire Risk Results in Higher Utility Rates

Another "hidden state tax" on electric and gas bills in California relates to programs designed to manage the risk of wildland fires. There is no doubt that California needs to improve its management of wildland fires — but state government policies have actually been a much bigger driver of fires than utility operations.

PG&E admits in its 2023 rate case submission to the CPUC “Approximately 75% of the requested revenue requirement increase over 2022 adopted is for risk reduction in our gas and electric operations.”iv

Why should Californians pay a hidden tax on utility bills to fund wildland fire programs when state policies have yet to be modernized to reduce the risk of fire (e.g. allowing controlled burns, thinning of forests, buffer zones, etc.)?

▶ **#7. California Imposes Unnecessary Regulatory Costs by Duplicating Existing Federal Regulations**

In addition to “hidden state taxes” the Transparency Foundation analysis of the utility rate cases uncovered a number of costs associated with regulations imposed by California that may well duplicate federal regulations.

For example, the federal government has numerous safety regulations for natural gas pipelines that work well across the country. However, California imposed even more stringent regulations without regard for the cost because, after all, the costs will be imposed on unsuspecting ratepayers.

These duplicative state regulatory programs and their costs should be re-evaluated using aggressive cost-benefit analysis.

▶ **#8. California Failure to Produce Energy In-State Imposes Financial Losses on Ratepayers**

Because of the climate change mandates it has imposed, more than one-third of California’s electricity now must be imported from other states. This unnecessarily increases the costs to California ratepayers.

While natural gas can be transported across distances with little loss, transporting AC electricity results in a substantial loss of power purchased by ratepayers. Because this power is wasted during transport, California ratepayers are being forced to pay for MORE electricity than they actually receive. These costs are imbedded in the electricity purchase costs of utility rate cases.

According to Energy Information Agency data, more than a third of all US energy sources are used to generate electricity, but only half of this makes its way to the grid as useable electricity because of transmission and generation losses.

▶ **#9. Local Government Mandates Increase Costs to Ratepayers**

A number of local government fees and taxes are included in the rate cases submitted by utilities. Local governments have also engaged in predatory regulations and mandates that can substantially increase the cost of utility rates.

For example, some cities are shifting the burden of their street maintenance costs to utilities through “curb-to-curb” mandates requiring utilities to completely repave or replace a road even if they have only made modest cuts in the roadway for pipe installations and replacements.

Local government policies impacting utilities should be re-evaluated by the CPUC and monitored for appropriateness. Just as utilities don’t fight the imposition of state government mandates and taxes because the resulting added cost simply increases the dollar value of their profit, utilities also don’t fight local government mandates and taxes because the CPUC gladly allows them to pass these costs onto ratepayers.

▶ #10. Rate Cases Lack Transparency

The Transparency Foundation found it extremely difficult to fully classify costs presented in each utility's rate case on file at the CPUC — and believes the lack of transparency is intentional. CPUC should revise how rate cases are presented to maximize the public's understanding of what causes a utility to incur costs in each category.

In analyzing the rate cases (see Appendices A and B), our experts categorized the various cost categories and charges into three categories:

Hidden State Tax = Costs Completely Driven by State Mandated Program
Includes Increased Costs from State Regulations
Normal Costs for Utility Company



Recommendations for Policy Makers

The amount of excessive costs incurred by California utilities provides ample room for state politicians to provide immediate rate relief to Californians. While California politicians likely lack the political willingness to implement the following recommendations, financially these recommendations should be implemented immediately:

1 **\$2,500 Utility Rebates**

California ratepayers should be compensated for years of being forced to pay “hidden state taxes.” Specifically, the California state legislature could use existing General Fund revenues to provide immediate rebates of up to \$2,500 to California households. To accomplish this, the state would be hit with a one-time \$12-15 billion outlay.

2 **25% Immediate Rate Reduction**

California ratepayers should receive a 25% reduction in their electricity and gas rates. While this is far below the 67% surcharge Californians pay for electricity and the 30% surcharge they pay for gas, a 25% reduction can be made with immediate regulatory relief and elimination of the “hidden state taxes” within each rate case. If programs are deemed to be valuable by the legislature, General Fund revenues can provide the funding for these government programs — not rates imposed on state residents.

3 **5 Year Rate Freeze**

California lawmakers should signal to the energy industry that it has learned from its costly experiment with the Green New Deal and is reversing its climate change mandates. With these policy changes will come substantial new investment by the energy sector in both production and storage in California — allowing long-term electricity and gas utility rate reduction to occur.

Appendix A

California Electric Utility Rate Cases - 2021

Exposing Cost Drivers Within the Electricity Rate Cases Submitted by Utilities to State Regulators

Rate Component	Driver	PG&E	SCE	SDG&
Generation Total		5,073,429	5,237,899	1,413,699
Qualifying Facilities	CPUC Decisions	114,252	3,042,520	9,907
General Rate Case Revenues	CPUC Decisions	2,075,071	697,827	183,152
Renewable Portfolio Standard	CPUC Decisions	2,502,239	Qual Facilities	659,328
Other Utility Fuel & Purchased Power	CPUC Decisions	380,681	1,481,544	643,541
Other	CPUC Decisions	1,185	16,009	-82,229
Transmission Total		2,035,538	1,253,026	736,175
Reliability Services	Federal Regulation	10,316	-774	-242
Transmission Access Charge	Federal Regulation	57,898	258,290	-274,401
Transmission Owner Rate Case Revenues	Federal Regulation	1,967,324	1,086,756	1,023,524
Other - FERC Rate Case Revenues	Federal Regulation	0	-91,246	-21,410
Other		0	0	8,704
Distribution Total		5,595,486	6,587,686	1,599,694
General Rate Case Revenues	CPUC Decisions	5,595,486	6,587,686	1,599,694
Demand Reduction/Customer Programs Total		504,703	529,779	468,880
Self-Generation Incentive Program	CPUC Decisions	59,851	56,000	20,070
California Solar Initiative	CPUC Decisions	7,955	0	0
Demand Response Program	CPUC Decisions	71,840	-1,706	14,905
Energy Efficiency, PU Code 399.8	CPUC Decisions	84,151	123,058	0
Energy Efficiency (non-PUC 399.8)	CPUC Decisions	137,026	0	45,454
Electricity Program Investment Charge	CPUC Decisions	51,378	61,520	12,096
Low Income Energy Efficiency	CPUC Decisions	0	0	0
CARE Admin., CARE amortized in rates	CPUC Decisions	176,631	112,992	130,081
Renewables	CPUC Decisions	0	0	0
Other PPP	CPUC Decisions	18,778	128,441	58,097
Other	CPUC Decisions	-102,908	49,475	188,177
Other Regulatory Total*		669,090	432,214	6,970
Catastrophic Events	CPUC Decisions	128,139	82,373	0
Hazardous Substance Mechanism	CPUC Decisions	35,480	0	80
CPUC Fee	CPUC Decisions	100,348	100,183	0
Other	CPUC Decisions	405,123	249,658	6,890
Other Costs				
Nuclear Decommissioning	CPUC Decisions	78,836	-43,059	1,252
Wildfire Fund NBC	CPUC Decisions	403,357	388,714	90,159
Ongoing Competition Transition Charge	CPUC Decisions	0	0	13,483
Energy Recovery Bonds (PG&E only)	CPUC Decisions	24,387	0	0
Franchise Fee Surcharge**	CPUC Decisions	0	8,283	4,494
TOTAL COST BASIS FOR RATES		14,384,826	14,394,543	4,334,807
	Hidden State Taxes Collected	1,173,793	970,276	480,344
	Hidden State Tax Rate	8.2%	6.7%	11.1%
	Costs Impacted by State Regulations	77.6%	84.5%	71.6%

In addition to these rates, a special State Electric Energy Tax of \$.00030 per kWh of energy used by each consumer is imposed. This additional tax – not reflected above – generates roughly \$75 million annually in tax revenues for the state. Localities also impose utility taxes – such as a 4.5% utility tax imposed in Los Angeles.

Appendix B

California Gas Utility Rate Cases - 2021

Exposing Cost Drivers Within the Electricity Rate Cases Submitted by Utilities to State Regulators

Rate Component	Driver	PG&E	SDG&E	SoCalGas
Core Procurement Total		865,924	192,212	1,417,147
Core Gas Supply Portfolio	CPUC Decisions	475,721	192,212	1,406,003
Other	CPUC Decisions	370,549	0	0
Core Gas Hedging	Utility Decisions	16,136	0	0
Incentive Mechanism	CPUC Decisions	3,518	0	11,144
Transportation Total		3,783,288	585,603	3,896,051
Distribution	CPUC Decisions	2,130,066	442,148	2,971,090
Gas Pipeline Integrity Mgmt. (DIMP)	Federal Regulation	1,323,885	53,177	272,922
PSEP	CPUC Decisions	0	36,113	184,223
SoCalGas Only -- SIMP	Federal Regulation	0	0	23,096
Gas Pipeline Integrity Mgmt. (TIMP)	Federal Regulation	0	17,064	105,021
PSEP	CPUC Decisions	0	2,897	49,394
Self Gen Inc Prog (SGIP)	CPUC Decisions	12,990	1,545	16,272
Calif Solar Initiative (CSI)	CPUC Decisions	13,138	816	5,979
Annual Earning Assessment (AEAP)	CPUC Decisions	5,343	0	-315
Low Emission Vehicle (LEV)	CPUC Decisions	0	0	68,598
Haz Substance Mechanism (HSM)	CPUC Decisions	81,857	95	2,801
Non-Public Interest Research, Dvlp & Demo (RD&D)	CPUC Decisions	0	0	16,450
Core Pricing Flexibility Program	CPUC Decisions	0	0	333
Non-core competitive load growth program	CPUC Decisions	0	0	1,794
Other Balancing Accts Balances	CPUC Decisions	68,273	44,135	223,229
CPUC Fee	CPUC Decisions	29,100	0	0
Franchise Fees & Uncollectibles	CPUC Decisions	7,576	0	0
Franchise Fee Surcharge (G-SUR)	CPUC Decisions	9,643	3,352	18,229
AB 32 Cap-And-Trade	CPUC Decisions	-2,059	2,058	9,591
GHG Program	CPUC Decisions	103,476	25,333	184,057
Public Purpose Program Charge Total		277,667	28,663	324,052
Energy Efficiency (EE) Programs	CPUC Decisions	78,051	1,677	109,736
Low Income Energy Efficiency (LIEE)	CPUC Decisions	22,922	0	0
Public Interest RD&D and State BOE Calif Alternate Rates for Energy (CARE) Program	CPUC Decisions	11,217	1,230	12,755
School Energy Efficiency Stimulus (SEES) Program	CPUC Decisions	165,477	25,756	201,561
	CPUC Decisions	0	4,541	0
TOTAL COST BASIS FOR RATES		4,926,879	806,478	5,637,250

4,926,879 806,478 5,637,250

Hidden State Taxes Collected	610522	145007	111583
Hidden State Tax Rate	12.4%	18.0%	19.8%
Costs Impacted by State Regulations	60.4%	78.7%	77.6%

In addition to these rates, a special State Natural Gas Surcharge Tax of various rates per therm used by each consumer is also imposed. Local governments can also impose additional taxes. See:

<https://www.cdtfa.ca.gov/taxes-and-fees/tax-rates-stfd.htm>

Appendix C

Why are Utilities Rate-Regulated?

The answer is a combination of the immutable physical laws governing electricity, and the political climate of the early 1900s when electric utilities began to spread across the US.

Thomas Edison built the first commercial electricity grid system in New York City's Lower East Side in 1882—a direct current (DC) power and incandescent lighting system based upon a coal-fired generating dynamo at Pearl Street—and he did so on his own dime, inventing much of the power system hardware and technology along the way, confident that the advantages of electricity would eventually drive growth and profitability. Edison was right: despite business and technological competition with Westinghouse and Tesla (i.e., the DC vs AC “current wars”) the demand for electrical service quickly grew.

Had Edison been burdened with the kind of over-regulation and social program costs we see today, we might still be burning kerosene for light.

It was Edison's former secretary Samuel Insull, however, who created the modern electric utility model with the formation of Consolidated Edison in 1907 from 20 separate electric systems across Chicago. Insull saw that alternating current (AC) turbine generators and transformers¹ were a scalable technology; applied to a large enough market, this would create economies of scale that could solve the hard realities of electricity that remain with us today: peak/off peak demand, and the inability to store utility-scale electricity. Large markets power enabled differential pricing across a wide geographic area, allowing for more efficient and consistent load and reserve factors. Insull's innovations quickly brought power costs down.

These technology-based realities—the need to supply electricity on a constant basis, and the inability to store power—have not significantly changed.²

With the expansion of Insull-pattern electric utilities, however, came state regulation. In early 20th century “Progressive era”, the growth of large and increasingly essential electric utilities too readily echoed the experience of the railroad and other monopolies. The necessity of huge capital investment to build the electric system and large-market tremendous economies of scale to make the service affordable inevitably meant that a single company would come to dominate a market; this was recognized as a “natural monopoly” which therefore required state or other regulation so that society could enjoy its benefits without suffering the abuses all too common among monopolist owners.³

The Regulated Utility Model in Brief

The tensions of a desirable public service and benefit against the perceived dangers of monopoly found a balance in what has become a longstanding regulated utility rate model.

Essentially, this provides that all of a utility's operating costs are covered as a direct pass-through to rate payers, while capital investment earns a fixed rate of return based on a “rate base” of depreciated assets. The state public utility commission (PUC) regularly reviews the “rate case”, which includes reasonable operating costs, and determines the rate base ROI.

In other words, it is solely the net capital base that generates investment return, while operating costs are held harmless. The underlying theory is that all reasonable costs of providing a critical public utility

(including fuel, salaries, and maintenance) should be fully compensated to ensure good service, while investor return is sustained by steady stock- and bond-funded investment in the capital plant.

Rates to customers, then, are based on the PUC's determination of the utility's total annual revenue requirement, which is typically expressed as: $RR = R(P - D) + C$

Note: RR = revenue requirement; R = rate of return based upon the utility's weighted cost of capital across stocks and bonds; P = gross utility plant in service; D = accumulated depreciation; and, C = allowable operating costs, including depreciation expense and taxes.

This structure can work well, but as we have seen in California and elsewhere it does create the temptation for a state—acting through its PUC—to lard non-utility social and political agenda onto the utility in the guise of operating and capital mandates. Uneconomic renewable energy programs are a prime example. A PUC will take pains to keep its captive agenda-transmission utility host alive, however, by ensuring that the utility's additional, non-utility costs are covered by passing them through to ratepayers. These are taxes disguised as rates.

Just as some disciplined regulation of utilities is necessary, we note that the public benefits of the regulated utility model can be substantial. This most comprehensive example of this was the Bell telephone system, or Ma Bell, which was arguably a key element throughout the rise of the United States' economic power in the 20th Century. Bell extended and maintained physical, wired connections and supporting equipment across the country, and provided durable equipment and utterly reliable and dependable service; in exchange for all this, Bell earned a steady rate of return for its investors from its monopoly service charges. Bell perhaps went further, with its research and development arms (Bell Labs) that produced enormous technological advances in telecommunications and electronics.

Ironically the first major challenge to the regulated model came with some of Bell's innovations. The advent of the cellular or mobile phone technology by the 1990s obviated the need for a pre-built physically wired system, undercutting one of the key rationales for the regulated model. Mobile phone service could be deregulated because the technology was in the handset; and mobile towers were not only cheap but were modular in terms of capacity, and readily scaled up to meet increasing service demand as necessary.

Why Do Regulated Utilities Love Renewable Energy Standards?

Renewable energy standards are an example of how otherwise uneconomic political mandates are still palatable to regulated utilities.

As we noted above, Samuel Insull's problem of reliably managing peak/off peak demand in the absence of practical storage remains with us today 140 years later. What this means in real terms is that most "renewable" electric generating alternatives are in effect useless without fossil fuel back-up. Solar and wind farms are extremely low-density power sources and consume vast amounts of land, but their main constraint is that they are only available about a third of the time in any given day, while the electric utility's output must be 24/7. This is intuitive for solar systems, as useful sunlight is on average available for only eight hours a day, and that's not even allowing for rain or clouds. Solar systems in northern latitudes are even less useful in short winter days. Wind systems even in the best (windiest) locales only produce 40% of the time, and this capacity factor is more commonly in the 30% range.

As such, these systems are not economically practicable without heavy public subsidy. Wind power was quite common in Samuel Insull's day, by the way; farms across the US were dotted with prefabricated, mail-order "Aeromoter" rotary wind vanes that were used to pump water for livestock tanks. This was a practical application of wind power, since the pumping did not need to occur 24/7; when the tank was full, the mechanical pump simply disengaged.

For the utility struggling to produce reliable, consistent power, then, this means is that every new MW of solar or wind power must have fossil fuel back-up that is, moreover, instantaneously available should the wind suddenly die or cloud cover form. The only choice here is gas fired generation, which unlike a coal or nuclear plant can be powered up quickly.

So, instead of satisfying power demand with a single and quite reliable fossil or nuclear powered generating station, renewable energy mandates dictate that the utility shutters perfectly good fuel plants and replace them with two new facilities: a solar or wind farm that will work only a third of the time, and a new gas-fired power station that will likely be in operation from 70-100% of the time depending upon weather.

Under the regulated utility model, then, the utility gets to recoup two sets of operating costs, and two sets of capital costs, thereby expanding its rate base What's not to like? It's a very attractive "heads I win, tails you lose" hand.

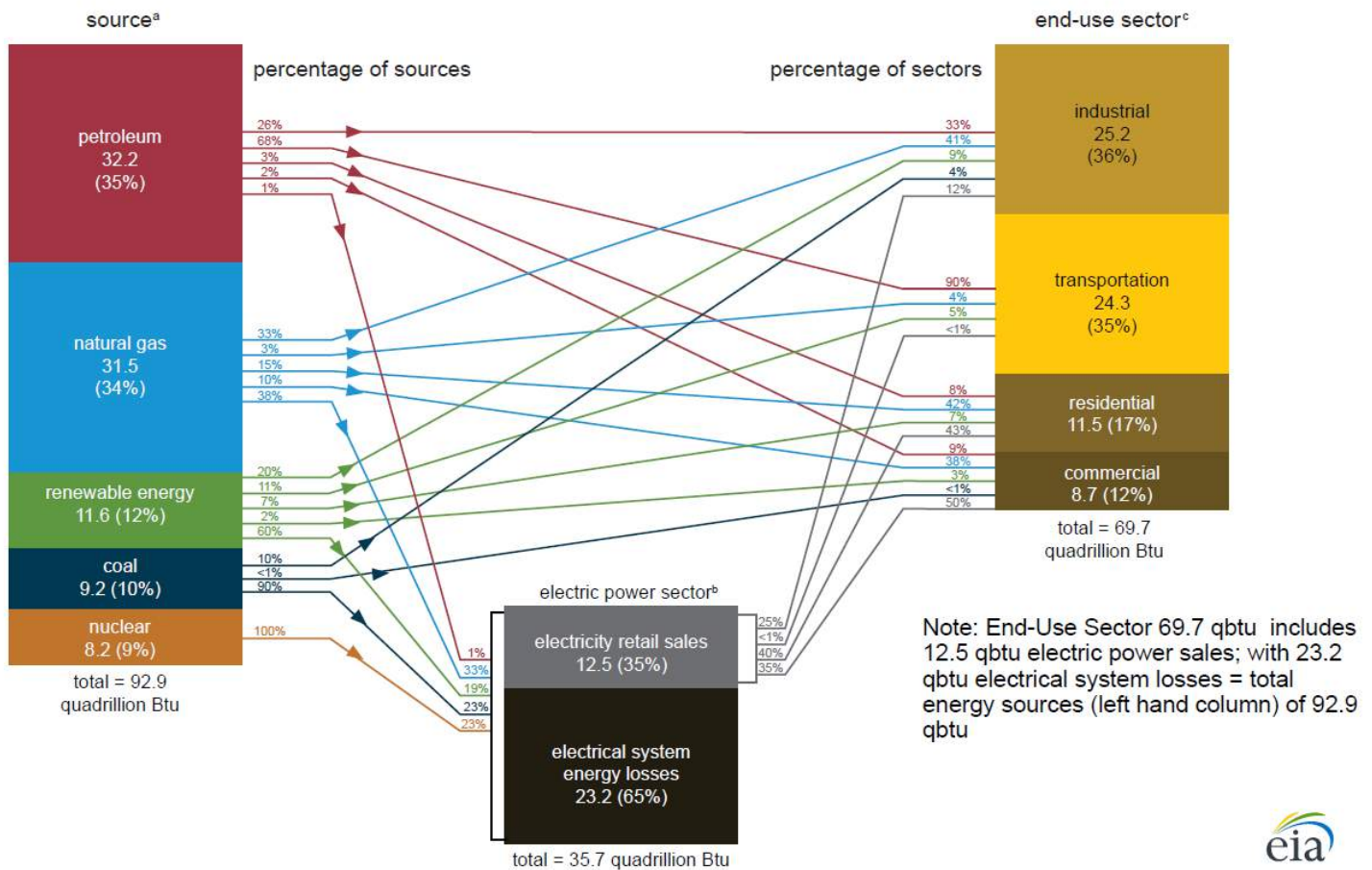
¹ The advantage of AC is that it is very efficient to change voltage up or down via simple transformers, enabling high voltage transmission can be stepped down to lower voltage for household use. DC remains much more efficient for long distance high voltage transmission, and is used, for example, to transmit power from Ontario Hydro to New York.

² Even Tesla's largest "grid battery systems" sound large (150 MW) but can only produce power for less than two hours. By comparison, a moderate-sized coal-fired generating station can produce 500 MW of continuous power, hour and after hour.

³ For electric and related water utilities, another route was municipal ownership, which we still have today California and other states (and exclusively so in some states such as Nebraska). The concepts of natural monopoly concept, right to fair return, and state power to regulate rates also have roots in various Supreme Court cases such as Binghampton Bridge (1865), Munn v. Illinois (1877), and Smyth v. Ames (1898).

U.S. energy consumption by source and sector, 2020

quadrillion British thermal units (Btu)



Sources: U.S. Energy Information Administration (EIA), [Monthly Energy Review](#) (April 2021), Tables 1.3 and 2.1-2.6.

Note: Sum of components may not equal total due to independent rounding. All source and end-use sector consumption data include other energy losses from energy use, not separately identified. See “Extended Chart Notes” on next page.

a Primary energy consumption. Each energy source is measured in different physical units and converted to common British thermal units (Btu). See EIA's Monthly Energy Review (MER), [Appendix A](#). Noncombustible renewable energy sources are converted to Btu using the “Fossil Fuel Equivalency Approach”, see [MER Appendix E](#).

b The electric power sector includes electricity-only and combined-heat-and-power (CHP) plants whose primary business is to sell electricity, or electricity and heat, to the public. Energy consumed reflects the approximate heat rates for electricity in [MER Appendix A](#). The total includes electricity net imports, not shown separately. Electrical system energy losses are calculated as the primary energy consumed by the electric power sector minus the heat content of electricity retail sales. See Note 1, “Electrical System Energy Losses,” at the end of [MER Section 2](#).

c End-use sector consumption of primary energy and electricity retail sales, excluding electrical system energy losses from electricity retail sales. Industrial and commercial sectors consumption include primary energy consumption by CHP and electricity- only plants contained within the sector.

Extended Chart Notes

The U.S. Energy Information Administration (EIA) *U.S. energy consumption by source and sector* chart illustrates energy that is consumed (used) in the United States. The data are from EIA's [Monthly Energy Review](#) (MER) and include the relatively small amount of electricity net imports, not shown separately. The chart does not show energy production, nor the losses associated with energy production.

Source:

Energy sources are measured in different physical units: liquid fuels in barrels or gallons, natural gas in cubic feet, coal in short tons, and electricity in kilowatt hours. EIA converts each source into common British thermal units (Btu) to allow comparison among different types of energy. See [MER Appendices A and E](#) for further explanation.

Petroleum: Equal to petroleum products supplied. Petroleum products are obtained from the processing of crude oil, natural gas, and other hydrocarbon compounds. Products include unfinished oils, hydrocarbon gas liquids, aviation gasoline, motor gasoline, jet fuel, kerosene, distillate fuel oil, residual fuel oil, petrochemical feedstocks, special naphthas, lubricants, waxes, petroleum coke, asphalt, road oil, still gas, and miscellaneous products. Petroleum excludes biofuels that have been blended with petroleum products.

Natural gas: A gaseous mixture of hydrocarbon compounds, primarily methane, formed deep beneath the earth's surface over millions of years from the remains of plants and animals, chemicals, heat, and pressure. Natural gas excludes supplemental gaseous fuels.

Coal: A combustible black or brownish-black sedimentary rock with a high amount of carbon and hydrocarbons formed from plant remains that have been compacted, hardened, chemically altered, and metamorphosed by heat and pressure over geologic time. Coal includes a relatively small amount of coal coke net imports.

Renewable energy: Energy resources that are naturally replenishing but flow limited. They are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. Renewable energy includes biomass, conventional hydroelectric power, geothermal, solar, and wind energy.

Nuclear: Electricity generated using the thermal energy released from the fission of nuclear fuel in a reactor.

Electric power sector:

Electricity retail sales: The amount of electricity sold to customers purchasing electricity for their own use and not for resale.

Electrical system energy losses: The amount of energy lost during the generation, transmission, and distribution of electricity, including plant and unaccounted-for uses. Electrical system energy losses are calculated as the difference between total primary consumption by the electric power sector (see MER Table 2.6) and the total energy content of electricity retail sales (MER Tables 7.6 and A6).

Most electrical system energy losses occur in the generation of electricity at electric power plants, which use primary energy to turn electric generators. This conversion loss is a thermodynamically necessary feature of steam-electric and combustion (gas) turbines. Other losses include power plant use of electricity, transmission, and distribution of electricity from power plants to end-use consumers, heat produced from combined-heat-and-power (CHP)

plants, and unaccounted-for electricity. See the endnotes of [MER Section 2](#) for further explanation.

Another part of electrical system energy losses is a result of imputing fossil energy equivalent inputs for noncombustible renewable energy sources (hydroelectric, geothermal, solar thermal, photovoltaic, and wind energy). See [MER Appendix E](#) for further explanation.

End-use sector:

Total energy consumption by end-use sectors in this chart exclude electrical system energy losses and differ from the totals published in MER Table 2.1, which allocates electrical system energy losses proportionally to the amount of electricity retail sales to each end-use sector.

Transportation: Includes energy used by automobiles; trucks; buses; motorcycles; trains, subways, and other rail vehicles; aircraft; and ships, barges, and other waterborne vehicles whose primary purpose is transporting people and/or goods from one physical location to another. Vehicles whose primary purpose is not transportation (e.g., construction cranes and bulldozers, farming vehicles, and warehouse forklifts) are classified in the sector of their primary use. Also includes natural gas used in the operation of natural gas pipelines.

Industrial: Includes energy consumed for manufacturing (NAICS codes 31-33); agriculture, forestry, fishing, and hunting (NAICS code 11); mining, including oil and gas extraction (NAICS code 21); construction (NAICS code 23); and combined-heat-and-power (CHP) generators that produce electricity and/or useful thermal output primarily to support the above-mentioned industrial activities.

Residential: Includes energy used for space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a variety of other appliances in the living quarters of private households.

Commercial: Includes energy consumed by businesses; federal, state, and local governments; other private and public organizations, such as religious, social, or fraternal groups; institutional living quarters; sewage treatment facilities; and CHP generators that produce electricity and/or useful thermal output primarily to support the activities of the above-mentioned commercial establishments.

Other energy losses:

Similar to electrical system energy losses, there are also other energy losses in energy production, distribution, and consumption. However, these losses are not shown separately in the chart because data are not available for EIA to estimate these losses.

All uses of primary energy have efficiency losses, in the form of heat, when energy is converted to do useful work. Examples include when motor gasoline is burned to move vehicles, when natural gas is burned to heat homes, or in any other use of combusted fuels. There are also losses in the transformation of one form of energy to another form of energy. For example, there are transformation losses in the process of refining crude oil into usable petroleum products, processing natural gas into marketable dry gas, and in the process of transforming energy from the sun into usable energy by solar panels. The [Lawrence Livermore National Laboratory](#) has published estimates of primary energy losses by end-use sector by applying an end use efficiency factor to EIA's *Monthly Energy Review* consumption data.

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End Notes

- i https://www.eei.org/-/media/Project/EEI/Documents/Issues-and-Policy/Finance-And-Tax/Financial_Review/FinancialReview_2021.pdf
- ii <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/natural-gas/032822-us-pacific-gas-storage-region-closes-gap-despite-massive-reclassification>
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