

ATTACHMENT A

5-18 Update on ACC Project SERVVM benchmarking test

Summary and background:

In 2020 the CPUC adopted an Avoided Cost Calculator (ACC) update based on the results of the CPUC's production cost modeling of the Integrated Resource Plan (IRP) Reference System Plan (RSP).

In a December 2020 IDER workshop, several parties expressed concerns with the price levels and distributions from the Avoided Cost Calculator (ACC) update in 2020, which appeared to overly value energy in the middle of the day. Heat rates were also increased in the middle of the day relative to historical CAISO price trends.

In response to party comments both at the December 2020 workshop and in subsequent informal emailed comments, the CPUC's IRP modeling team analyzed the price formation in our model to determine if errors were made, better methods could be established, and to better simulate energy prices that were more consistent with the way the CAISO arrives at hourly energy prices in the energy market. It appeared for example that CAISO is not basing energy prices solely on the marginal operating generator, but instead on bids which sometimes arrive at prices below the operating costs of the marginal generator. This can happen, particularly in the middle of the day, when thermal resources are online in order to ensure ability to ramp up in the evening.

Once the modeling team was more confident with the distribution of price amounts in SERVVM, we would be ready to again conduct modeling with the NoNewDER scenario and update the for 2021 with more harmonized prices that are more indicative of the value of DER resources in the future.

For the ACC update in 2020, 2007 weather year was chosen as the "normal" year due to average wind generation. In 2020, wind profiles were not robust so staff minimized their impact on results. This year, the modeling team has recreated wind profiles which are much more robust, and that issue is not significant this time.

Changes to inputs

- Shifted wind profiles
 - 4 Hour shift in California wind shapes to better align with CAISO historical wind generation data. Shifted profiles four hours earlier. Shifted the profiles for CA zones plus wind in BPA and Arizona to remedy an apparent mismatch.
 - Import limit – removed the 5000 MW import limit for the NoNewDER cases.
 - Overgen_prices
 - Overgen_price defines the expected price when a certain quantity of renewable is getting curtailed. SERVVM sorts the available overgen_price definitions descending and determines the price based on the corresponding volume of curtailment. (e.g. if the first 500 MW of curtailable generation has a \$20 overgen_price, and the next 500 MW has a \$15 price and the next 500 has a \$10 price, whenever 0-500 MW of generation is curtailed the price would be \$20. Whenever 500-1000 MW is curtailed, the price would be \$15. Whenever 1000-1500 MW is curtailed the price is \$10. Once all renewable capacity with overgen_price defined is exhausted, the price is set to overgen_penalty.
 - Adjusted the overgen_penalty to \$20 so the price would go to -\$20 whenever curtailment exceeded the overgen price quantity available.
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Results:

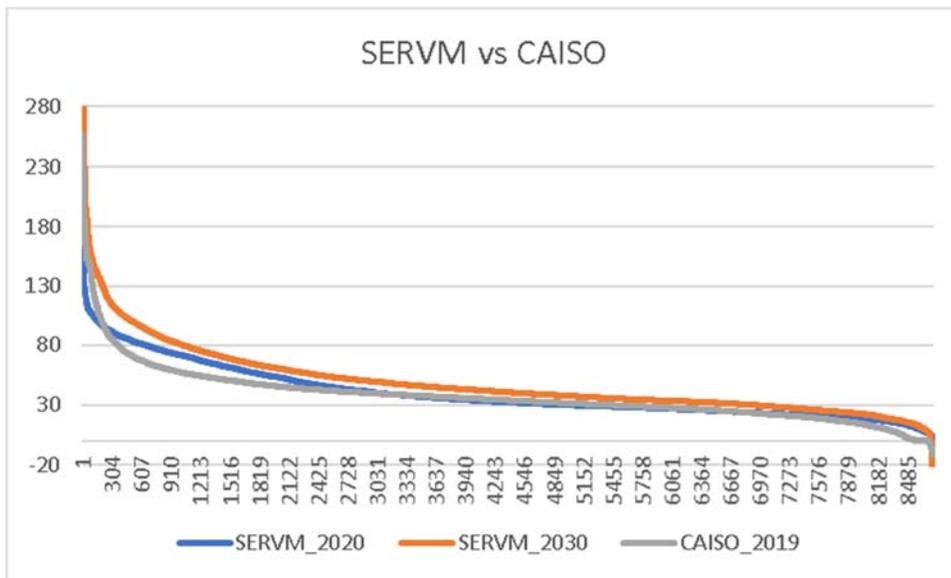
The modeling team performed modeling with a variety of modeling input sensitivities and with a variety of modeling methods and arrived at what we consider to be our best route to harmonize with CAISO prices. The key insight was that the modeling team developed market prices from incremental dispatch costs instead of marginal unit commitment decisions as was done in the ACC update in 2020.

The modeling team attempted to match CAISO hourly energy prices from 2019 (just the energy component, not congestion or losses due to SERVM not being a nodal model) with the results of SERVM 2020 modeling. The latest IEPR fuel price data as well as other data in SERVM was not complete for 2019 so simulating 2019 in SERVM was impractical. CPUC staff determined historical 2019 and simulated 2020 were likely to be comparable in determining confidence in ability to generate patterns of prices, even if not attempting to precisely match each hourly price.

While SERVM 2020 results do not match the pattern of 2019 exactly, the modeling team is more confident that the low price portion of the distribution is covered, and the high price portion is not overly weighted or represented more frequently than realistic. SERVM 2030 shows higher prices due to increase in electric demand and increased fuel prices in 2030.

Figure 1 is a price duration curves of these hourly prices, which illustrate that SERVM prices overall show very similar area under the curve as the CAISO price curve.

Figure 1 Price Duration - CAISO 2019 vs. SERVM 2020 and SERVM 2030



ATTACHMENT B

Tom Beach

From: Morgenstern, Joy <joy.morgenstern@cpuc.ca.gov>
Sent: Thursday, May 20, 2021 9:47 AM
Subject: Re: [EXTERNAL] Follow up to Information Provided on Draft Resolution E-5150

Figure 1, from the file ““Additional SERVM information,” includes cap & trade prices. The figure below it, which is from “2021 ACC SERVM Prices v1a,” does NOT include cap & trade prices.

Each hour’s prices and marginal heat rate depend on the extent to which there are fossil fuel plants running in that hour, so each hour may have a different cap and trade adjustment.

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From: Jeanne Armstrong <JArmstrong@seia.org>
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Cc: Morgenstern, Joy <joy.morgenstern@cpuc.ca.gov>

Subject: [EXTERNAL] Follow up to Information Provided on Draft Resolution E-5150

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Service List R. 14-10-003

Please see copied below an email sent by the Solar Energy Industries Association on May 19, 2020 to Joy Morgenstern of Energy Division requesting clarification regarding certain information provided by Energy Division regarding Draft Resolution E-5150. At Ms. Morgenstern's request we are serving this email on the entire service list .

Joy –

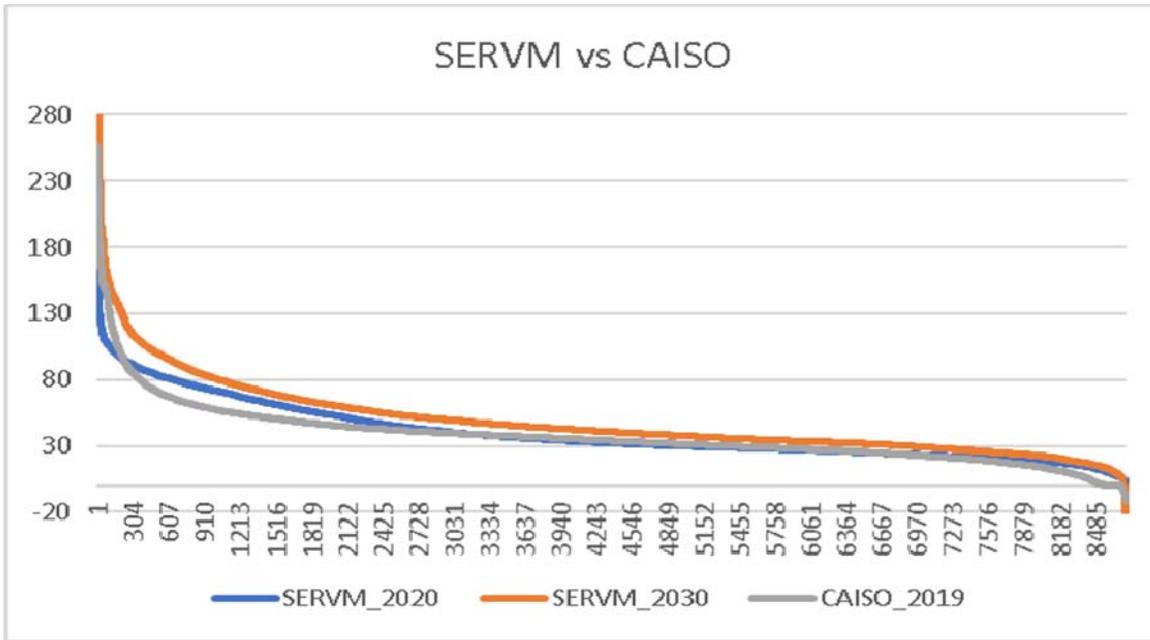
We appreciate the additional information that Energy Division has provided on Draft Resolution E-5150. We have one follow-up question on the information that Energy Division provided today that we do not understand.

The "Additional SERVM information" file includes a Figure 1, reproduced below, which compares the 2020 and 2030 SERVM prices to 2019 CAISO market prices. However, the 2020 and 2030 SERVM prices shown (the blue and orange lines) are not the SERVM prices used in the draft 2021 ACC. Those prices are shown in the second figure below, which is a comparable price duration curve that averages the NP-15 and SP-15 prices from the "SERVM Price Inputs" tab of the "2021 ACC SERVM Prices v1a" spreadsheet posted with the materials for the draft 2021 ACC. These prices are described in cell F2 of that tab as "Hourly prices output from SERVM using IEPR gas price forecast." As you can see on the right side of the second figure, the SERVM prices used in the 2021 ACC include numerous hours where the price is at or near \$0. We count 834 hours with prices of \$0 or \$1/MWh in the 2020 SERVM results, and 1,963 such hours in the 2030 SERVM prices. In contrast, the 2020 and 2030 SERVM prices that are in the Figure 1 we received from you this afternoon have only a handful of hours with zero or below-zero prices. Please help us understand this discrepancy.

Thank you for your attention to this clarifying question.

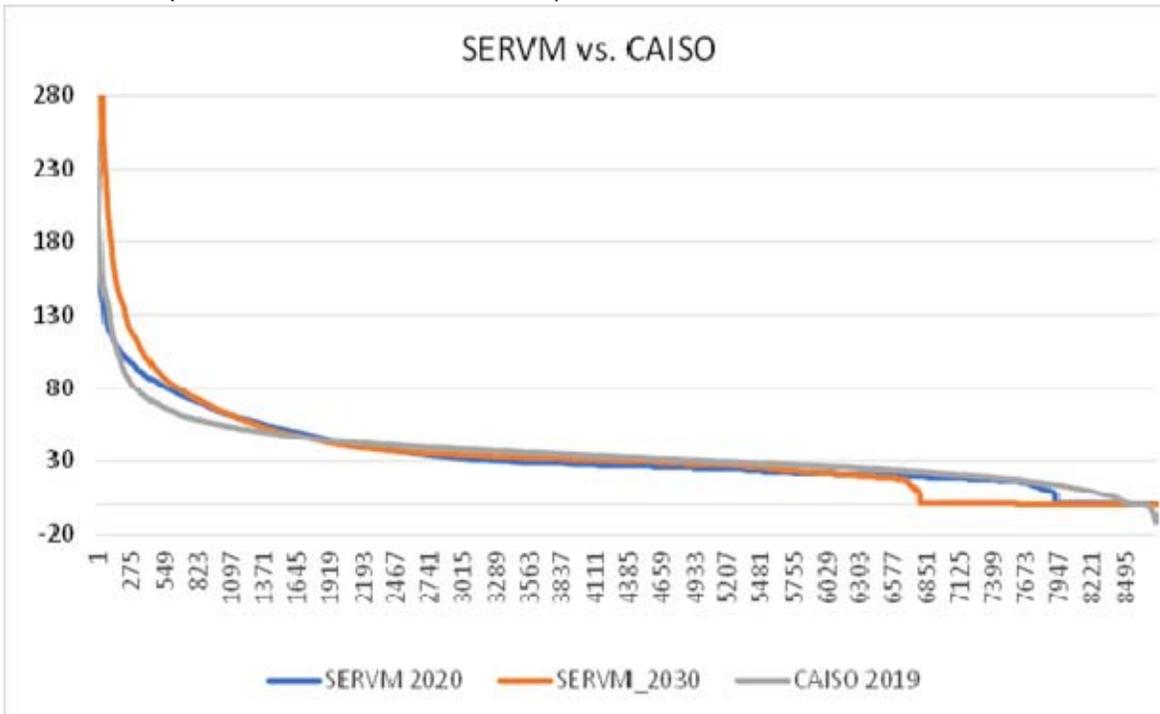
Tom

Figure 1 Price Duration - CAISO 2019 vs. SERVM 2020 and SERVM 2030



Price duration curve comparing 2019 CAISO to average NP-15/SP-15 prices from the “SERVM Price Inputs” tab of the “2021 ACC SERVM Prices v1a” spreadsheet.

Note the many hours of zero- or close-to-zero prices in the SERVM 2020 and SERVM 2030 results.



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What's Happening at SEIA:

[SEIA Finance & Tax Seminar](#) | June 24 | New York, NY

[SPI, ESI & North America Smart Energy Week](#) | September 20-23 | New Orleans, LA

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ATTACHMENT C



Solar Energy Industries Association And Vote Solar Comments on 2019 IEPR Workshop on the *Revised Natural Gas Price Forecast and Draft Outlook Electricity Modeling and Results*

I. Introduction and Summary

The Solar Energy Industries Association (SEIA)¹ and Vote Solar² appreciate the opportunity to comment on the California Energy Commission's (CEC) *Revised Natural Gas Price Forecast and Draft Outlook Electricity Modeling and Results* for the 2019 Integrated Energy Policy Report (IEPR). The IEPR natural gas forecast is a critical input into the work of the CEC and other responsible state energy agencies such as the California Public Utilities Commission (CPUC). SEIA's and Vote Solar's ongoing involvement in the CPUC's ongoing Integrated Resource Planning (IRP) proceeding, in which the CEC's 2019 IEPR natural gas forecast will be used, has surfaced a significant concern with the draft forecast and motivated these comments. We also provide our feedback on a number of less significant technical issues with the draft forecast.

Our major concern is that the draft natural gas forecast does not include any projection of future increases in the tariffed cost of intrastate transportation within California. The forecast simply uses the current tariffed rate and assumes that this rate will apply without change in nominal terms for the next twenty years. The draft forecast appears to be based on tariffed intrastate transportation rates as of April 2019 for Pacific Gas & Electric (PG&E). For Southern California Gas (SoCalGas), the intrastate rates used are significantly lower than current rates, and appear to date from about 2017. The CEC IEPR forecast shows no change in these rates in years after 2019.

As discussed below, this assumption of no future escalation in intra-California gas transportation rates is no longer tenable, given both the rapid escalation in these rates over the last decade and the certainty that these increases will continue. These sharp increases are driven by the dual realities of increasing costs and declining throughput as California tries to meet the dual goals of both enhanced safety and carbon reduction. We respectfully submit that this issue needs to be addressed, because intrastate transportation costs now comprise a significant portion

¹ SEIA is the national trade association of the United States solar industry. The views contained in these comments represent the position of SEIA as an organization, but not necessarily the views of any particular member with respect to any issue.

² Vote Solar is a non-profit advocacy organization working to foster economic opportunity, promote energy security and fight climate change by making solar a mainstream energy resource.

– up to 40% for EG plants on the PG&E local transmission system³ – of the burnertip cost of natural gas, and this percentage is highly likely to increase in the future. A failure to include a more realistic escalation than zero in future intrastate gas transportation rates may call into question other planning efforts in which the IEPR gas forecast is a key assumption, including the ongoing CPUC’s IRP proceeding and other resource planning dockets.⁴

II. Comments

A. Escalation rates

California’s ambitious goals to reduce greenhouse gas emissions to 40% below 1990 levels by 2030, and to be carbon neutral by 2045, will have major impacts on California’s natural gas system that are now coming into focus. In particular, reaching the state’s carbon reduction goals will result in a significant drop over time in natural gas use among all types of gas customers. Gas throughput on the PG&E and SoCalGas systems is already starting to decline, dropping by about 5% per year over the last five years, as shown in **Table 1**’s recorded data for 2013-2018 from the *2019 California Gas Report Supplement*.⁵

Table 1: Recorded Statewide Gas Supply (MMcfd)

Year	Throughput
2014	6,504
2015	6,399
2016	5,934
2017	5,862
2018	5,107
Average Annual Change	-5.9% per year

As the CEC is well aware, in recent years there have also been serious safety incidents on the California gas system – first, the 2010 San Bruno explosion of a PG&E gas transmission line that killed eight people and destroyed a neighborhood and, second, the 2015 well failure at SoCalGas’ Aliso Canyon storage field that resulted in a major release of methane, with lengthy

³ As an example using public data, in PG&E’s current short-run avoided cost (SRAC) posting of QF energy prices, intrastate transportation costs presently comprise 43% of the posted burnertip cost of gas. See, for example, PG&E’s October 2019 SRAC posting, which has a bidweek border commodity gas price of \$2.32 per Dth (57%) and an intrastate transportation cost of \$1.75 per Dth (43%). Available at https://www.pge.com/en_US/for-our-business-partners/energy-supply/prices-for-qualifying-facilities-and-eligible-combined-heat-and-power-facilities/prices-for-different-facilities.page?ctx=business.

⁴ SEIA will be filing similar comments in December in the CPUC’s IRP docket, R. 16-02-007, where the draft IEPR gas forecast for EG plants is being used. SEIA also has submitted testimony and an alternative long-term gas forecast in CPUC Docket R. 14-10-003, which is considering changes to the CPUC’s avoided cost calculator (ACC). The ACC is used to assess the cost-effectiveness of demand-side, distributed energy resources (DERs) including energy efficiency, demand response, distributed generation including behind-the-meter solar, and behind-the-meter storage.

⁵ Available at https://www.socalgas.com/regulatory/documents/cgr/2019_CGR_Supplement_7-1-19.pdf, see pages 12 to 16.

evacuations and adverse health impacts for nearby residents. As a result of San Bruno, the California gas utilities have made major investments in replacing and upgrading their gas transmission infrastructure. New regulations for gas storage fields after Aliso Canyon are likely to result in the decommissioning of some older storage fields and to raise future costs to store gas.⁶ Largely driven by these safety-related investments, PG&E's adopted revenue requirement for its gas transmission and storage facilities has increased from \$462 million in 2010⁷ to the \$1,580 million that the Commission just authorized for 2022 in D. 19-09-025, the final decision in the PG&E Gas Transmission & Storage rate case.⁸ This is an average increase of 10.8% per year over 12 years.

Gas transportation rates paid by gas-fired electric generators (EGs) are calculated with the costs of the pipeline and storage infrastructure in the numerator and gas throughput in the denominator. With the numerator rising due to safety-related costs and the denominator decreasing as the result of programs to reduce carbon emissions, the result has been dramatic escalations over the last decade in the gas transportation rates paid by EG customers. For example, **Figure 1** shows PG&E's actual G-EG transportation rate from 2004 to 2018 (blue line), including the new G-EG rates adopted in September 2019 in D. 19-09-025 (yellow line).⁹ The figure indicates that, during the 10-year period from 2009 to 2018, PG&E's G-EG rate escalated at an average rate of 25% per year. Over a somewhat longer 15-year period (2004 to 2018), the average escalation in the G-EG rate was 15% per year. The new rates for 2019-2022 just adopted in the PG&E GT&S rate case decision indicate that the escalation rate from 2009 to 2022 will average 16% per year (red dashes). Obviously, this rate escalation is roughly consistent with the 11% annual increase in revenue requirement (2010 to 2022) and the 6% annual decline in throughput (2014 to 2018) cited above.

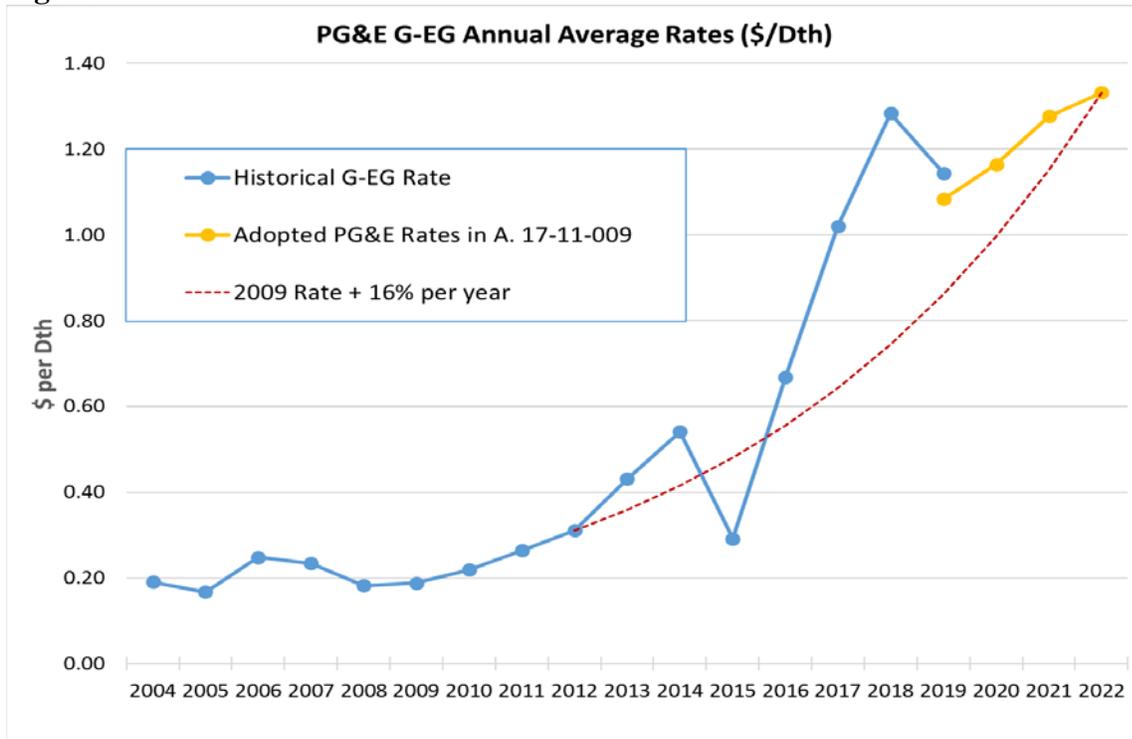
⁶ See the Commission's recent approval of PG&E's plan to decommission two older storage fields, in D. 19-09-025, the final decision in the PG&E Gas Transmission & Storage rate case, A. 17-11-009.

⁷ See D. 11-04-031, at p. 16.

⁸ See D. 19-09-025, at Appendix E, Table 1.

⁹ We note that these rates do not include certain additional charges, such as the municipal surcharge.

Figure 1



Two recent studies, including one for the CEC, have indicated that these sharp escalations in gas transportation rates in California are likely to continue.

E3 Gas Study for the CEC. At a California Energy Commission (CEC) workshop on June 6, 2019, the consultants from Energy and Environmental Economics (E3) presented new work on the impact of California’s carbon reduction goals on future natural gas rates in California, as part of a Public Interest Energy Research (PIER) grant.¹⁰ The purpose of the study was to evaluate the implications of a low-carbon future in California for the customers of the natural gas system, including both economic and health impacts. This study reached the following major conclusions:

- Continuing to use fossil natural gas in buildings at today’s levels of consumption will not meet the state’s carbon reduction goals.
- Using renewable natural gas (RNG) to decarbonize buildings, by replacing fossil methane with RNG, would maintain gas throughput and could meet the state’s climate goals, but would be an expensive strategy for the state.
- Building electrification is a lower-cost strategy to achieve the state’s climate goals.
- Building electrification will further reduce gas throughput and raise rates for

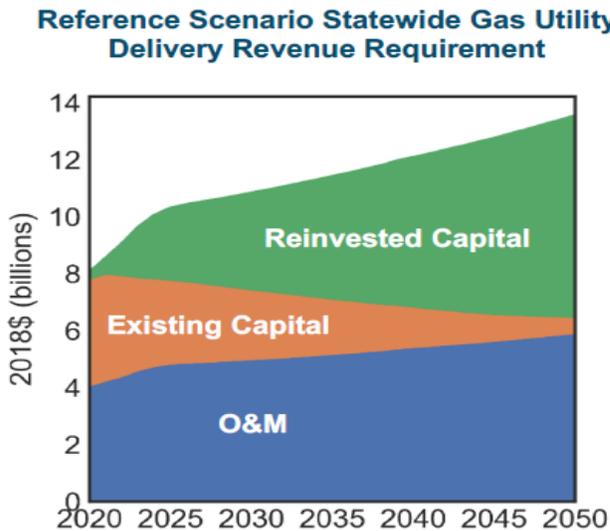
¹⁰ E3, “Draft Results: Future of Natural Gas Distribution in California,” presented at the CEC Staff Workshop for CEC PIER-16-011 on June 6, 2019. Hereafter, “E3 Gas Study.” Available at https://ww2.energy.ca.gov/research/notices/2019-06-06_workshop/2019-06-06_Future_of_Gas_Distribution.pdf.

remaining gas customers, in addition to the expected declines in EG gas use due to electric sector programs such as the RPS.

- A gas transition strategy is needed to reduce the costs of the gas system and protect consumers from high future rates.
- Building electrification improves air quality and health outcomes in urban centers.¹¹

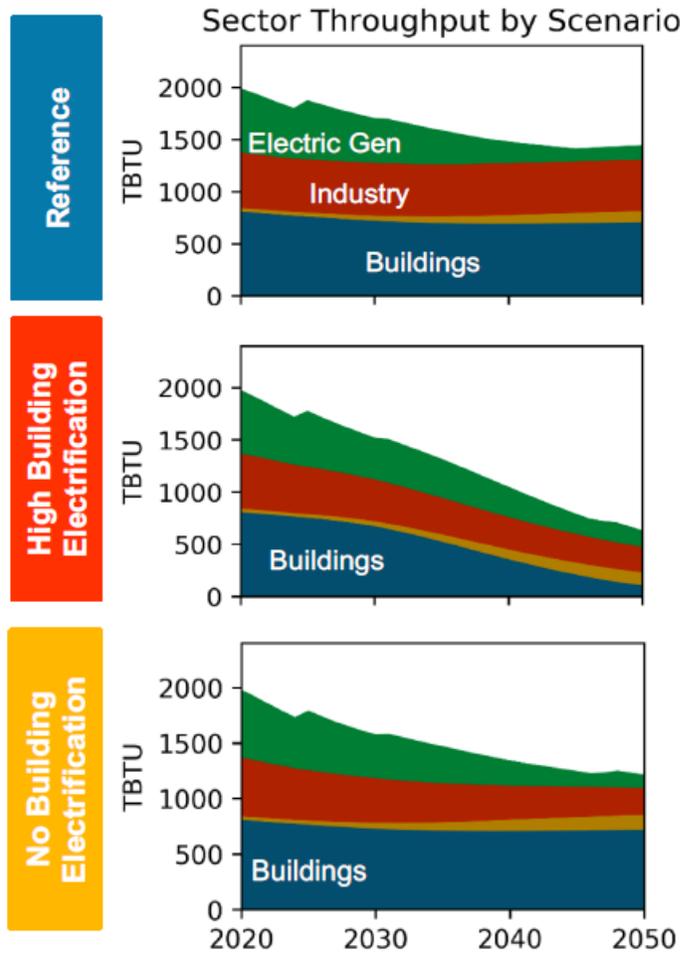
E3’s study projects continued sharp increases in the revenue requirements for the gas utilities of 5% real per year (i.e. 5% above inflation) through 2025, due to continuing safety-related investments, then increasing at 1% real thereafter through 2050. See **Figure 2** below, which is Slide 22 from the E3 Gas Study. At the same time, in the favored high building electrification case, overall throughput on the gas system declines at about 3.5% per year from 2020-2050, with EG throughput dropping at 5% per year in all scenarios. See **Figure 3**, which is Slide 16 from the E3 Gas Study.

Figure 2: Slide 22 from the E3 Gas Study



¹¹ E3 Gas Study, at Slides 6 and 15.

Figure 3: Slide 16 from the E3 Gas Study



Assuming that EG customers’ share of the overall revenue requirement changes in proportion to their share of the overall throughput, the E3 results suggest a long-term real escalation in EG rates in excess of 10% per year through 2025 (continuing the trend since at least 2010) and 5% to 10% per year after 2025, unless steps are taken to reduce future gas system revenue requirements. The E3 study suggests a number of steps that could be taken (but have yet to be adopted) to mitigate future rate increases, including the accelerated depreciation or targeted retirement of gas assets.

Gridworks Gas Study. On September 19, Gridworks released a new study, *California’s Gas System in Transition: Equitable, Affordable, Decarbonized and Smaller*. The lead author of this study is former CPUC commissioner Mike Florio.¹² This work focuses on the transition strategies that could be used to mitigate the rapidly-growing gas rates that will result from the

¹² Available at <https://gridworks.org/initiatives/cagas-system-transition/>, hereafter “Gridworks Study.” This study was funded jointly by PG&E and the Energy Foundation, with technical input from E3 and a broad group of stakeholders, including Tom Beach of Crossborder Energy, a consultant to SEIA who assisted in the preparation of these comments.

steep decline in gas throughput from widespread building electrification. The Gridworks Study's participants reviewed in detail and accepted the conclusion of the E3 Gas Study that a high building electrification scenario will be the least-cost way to meet the state's goals to reduce carbon emissions.¹³ The study succinctly summarizes the challenge that the state faces with keeping future gas rates affordable:

The simple fact is that meeting California's GHG reduction goals, a statewide priority and absolute necessity to combat climate change, inevitably means a substantial decline in gas throughput in the state.

At the same time that gas demand is projected to decline over time, the costs of operating a safe and reliable gas delivery system in California have been increasing.¹⁴

The study shows that intrastate gas rates will increase significantly for all classes of gas customers, including EG plants, and that it is the remaining residential gas customers who will face the largest increases, unless the state adopts a comprehensive, carefully-planned set of mitigation measures. The report emphasizes that, as gas rates increase, this will only increase the incentive for residential customers to adopt electrification measures, further reducing gas throughput.¹⁵ The Gridworks Study provides an in-depth discussion of a range of possible mitigation strategies that state policymakers could pursue to lower future rates for small customers, including accelerated depreciation, reduced investments and targeted retirements, securitization, and cost allocation and rate design changes for gas distribution costs. The Gridworks Study shows that these mitigations could have a significant impact to reduce the escalation in future rates for residential and other small customers, but would not have a major impact in reducing the escalation in EG rates.¹⁶

SEIA and Vote Solar submit that these important new studies show conclusively that assuming zero future escalation in today's gas transportation rates does not produce a useful forecast and does not reflect the reality of California's gas industry, either in the recent past or going forward. For example, based on future increases in intrastate rates that SEIA and Vote Solar believe are realistic, by the early 2030s the cost of intrastate transportation for some California EG plants could be as large as the commodity cost of gas at the California border.

With respect to EG rates, SEIA and Vote Solar recommend that the IEPR forecast should assume that current intrastate rates will increase at real escalation rates of 9% per year to 2025, then 4% thereafter to 2050 (in nominal terms, this would be 11% per year to 2025, then 6% per year thereafter, assuming 2% inflation). This recommendation is consistent with the EG rate scenarios in the Gridworks Study even with the best-case suite of mitigations that have yet to be

¹³ See Gridworks Study, at pp. 1 and 4-5.

¹⁴ *Ibid.*, at p. 1.

¹⁵ *Ibid.*, at pp. 1-2 and 9-10.

¹⁶ The Gridworks Study acknowledges, at page 14, that the severe increases in residential rates could generate future pressure to shift costs from small customers to large users such as EG plants, further increasing EG rates. The Gridworks Study states that such a re-allocation of costs would need to be "carefully considered" given that it would increase electric rates and could shift carbon emissions to out-of-state EG plants.

adopted.¹⁷ The Commission also should consider adopting substantial escalation rates for the intrastate gas transportation rates of other types of natural gas consumers, with the work from the E3 Gas Study and the Gridworks report as guides.

B. Impact of intrastate backbone rate escalation on NamGas results

The NamGas modeling is used to produce gas commodity prices at the PG&E city-gate market. The PG&E city-gate is downstream from the PG&E backbone transmission paths to the California-Arizona (Topock) and California-Oregon (Malin) border markets. PG&E's backbone transportation rates will be subject to the same influences discussed above for the intrastate rates downstream from the PG&E city-gate. PG&E's backbone rates also have escalated sharply over the last decade, and will continue to increase faster than inflation as throughput declines. It is not clear to SEIA and Vote Solar that NamGas is including realistic information about future increases in intrastate costs on the PG&E backbone system when computing an equilibrium set of prices and flows for the PG&E city-gate market.¹⁸

C. Double-counting certain intrastate rates

The CEC IEPR forecast for PG&E also appears to include double-count certain intrastate rate components. For PG&E, the CEC IEPR forecast includes intrastate transportation costs, in all years, of \$0.80 per Dth for backbone EG customers and \$1.70 per Dth for local transmission EG customers. The backbone EG cost appears to be based on the April 2019 PG&E G-EG-BB rate of \$0.6798 per Dth plus, incorrectly, the Redwood backbone path MFV usage rate of \$0.1160 per Dth. The Redwood path rate is upstream of the PG&E city-gate and thus these costs already are included in the CEC IEPR's PG&E city-gate forecast.

¹⁷ See, for example, Figure 9 on page 14 of the Gridworks Study.

¹⁸ We assume that the NamGas SoCalGas hub is the SoCal/Arizona border (e.g. Topock) market, not the SoCalGas citygate. Thus, there are no intrastate backbone paths upstream of the SoCalGas Hub.

III. Conclusion

SEIA and Vote Solar respectfully ask the Commission to revise the final IEPR gas forecast to include a realistic escalation in future intrastate gas transportation rates. The California natural gas industry is facing major changes as the state moves to limit substantially the emissions from burning fossil fuels, including natural gas. Gas throughput will be declining, and gas transportation rates will continue to escalate sharply, as they have for the last decade.

We appreciate the CEC's consideration of these comments.

Respectfully submitted,

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