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BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Develop an Electricity Integrated Resource Planning Framework and to Coordinate and Refine Long-Term Procurement Planning Requirements	Rulemaking 16-02-007 (Filed February 11, 2016)

THE PROTECT OUR COMMUNITIES FOUNDATION COMMENTS ON PROPOSED DECISION ADOPTING PREFERRED SYSTEM PORTFOLIO AND PLAN FOR 2017-2018 INTEGRATED RESOURCE PLAN CYCLE

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Pursuant to the March 18, 2019 Proposed Decision of Administrative Law Judge Julie Fitch, Proposed Decision Adopting Preferred System Portfolio and Plan for 2017-2018 Integrated Resource Plan Cycle ("Proposed Decision"), the Protect Our Communities Foundation ("POC") submits the following comments.

I. INTRODUCTION

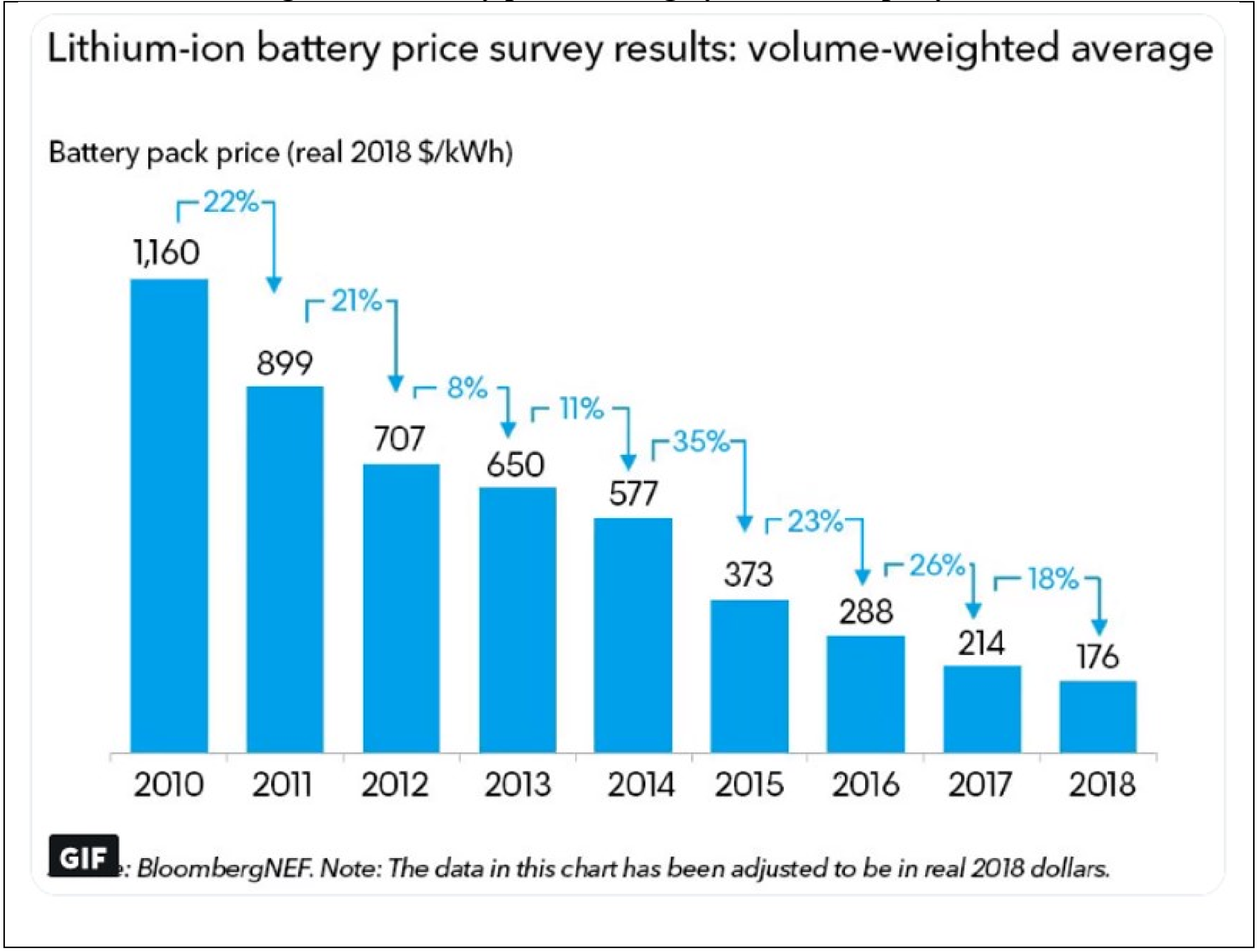
POC recommends updating modeling inputs for solar and storage prices before making any procurement decisions. The solar price inputs are 3.5 times higher than industry expert projections for 2030 and storage price inputs are 4 times higher than expert projections for 2030 as well. These two inputs impact optimal resource procurement, resource mix, and how quickly California can transition to 100% GHG-free energy in a cost-effective manner.

II. DISCUSSION

a. Procurements Using Current Modeling Would Be Selecting Resources Blindfolded

The Commission Staff and Commission consultants have not kept up with the rapidly changing costs of renewable energy. Battery prices have been dropping at a rate of approximately 20% per year for the last 4 years according to Bloomberg New Energy Finance ("BNEF"). See Figure 1.

Figure 1 – Battery prices falling by about 20% per year[1]



[1] Bloomberg New Energy Finance, available at https://twitter.com/BloombergNEF/status/1075410072283594753 [as of March 3, 2019]. (The average is 20.5% = (22+21+8+11+35+23+26+18) ÷ 8)

While the cost reductions can not continue forever, the cost are still falling rapidly. In March 2019, BNEF released a report showing that lithium-ion batteries' levelized cost of energy has fallen by 35% to $187/kWh since the first half of 2018.[2] Their findings were based on a survey of 7,000 energy projects around the world.

These rapidly falling costs were not expected by Commission Staff or consultants and thus not properly reflected in the modeling inputs. And, to be fair, the 35% price drop for storage in the last year was not predicted by anyone. In fact, today's battery prices are not only lower than Staff assumed for current prices, today's prices are lower than staff assumed would be achievable by 2030.

Figure 2 shows three battery prices. The first is $286/kWh,[3] which is the price that Staff assumed lithium-ion batteries would cost in 2030.[4] The second price is $186/kWh, reported by BNEF as today's pricing. The third price is $70/kWh, the price BNEF is projecting batteries will hit in 2030.[5]

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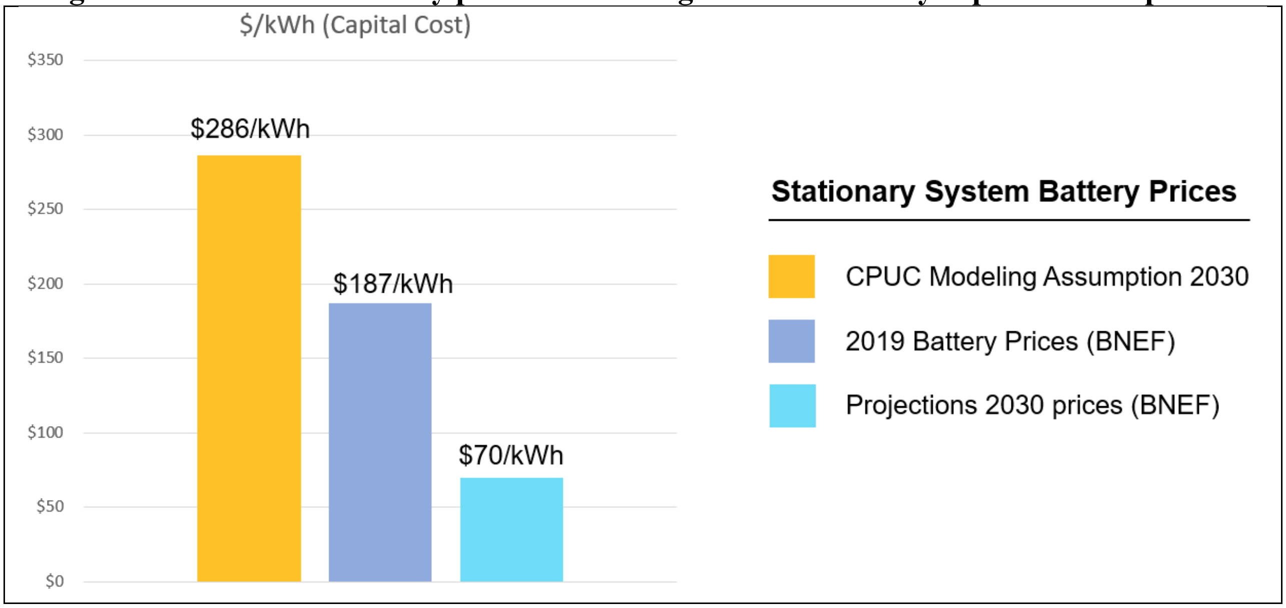
[2] Bloomberg New Energy Finance, *Battery Power's Latest Plunge in Costs Threatens Coal, Gas,* (March 26, 2019), Available at https://about.bnef.com/blog/battery-powers-latest-plunge-costs-threatens-coal-gas/

[3] *RESOLVE Documentation: CPUC 2017 IRP Inputs & Assumptions* (September 2017) Table 29, pp 42-43, available at: http://cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/ElectPowerProcurementGeneration/irp/AttachmentB.RESOLVE_Inputs_Assumptions_2017-09-15.pdf

[4] The $286/kWh price is only the energy component and does not include the additional balance of system cost, which would push the capital cost even higher. For instance, if including the balance of system cost, for a 4 hour system would push the price up to $352/kWh.

[5] Bloomberg New Energy Finance, *New Energy Outlook 2018.* available at https://bnef.turtl.co/story/neo2018?teaser=true, [as of April 8, 2019]. (The 70/kWh price is a pack level price and thus is comparable to the CPUC modeling cost for energy only.)

Figure 2 – RESOLVE battery prices 4 times higher than industry experts' assumptions [6]



Thus, RESOLVE uses price inputs four times higher than other energy experts are assuming for 2030. While it is impossible to say with certainty what the battery costs will be in 2030, the pricing is already $100 lower than RESOLVE is using for 2030. It is clear that the modeling cost inputs for batteries need to be updated -- both for 2030 as well as modeling assumptions for current costs.

In addition to the battery pricing, RESOLVE modeling also incorporates solar inputs which exceed any current solar prices. Solar pricing has been falling quickly as well and thus the same logic holds in regards to 2030 pricing: 2030 solar projects will be much cheaper than today's projects. RESOLVE's inputs for in-state 2030 pricing is $56-$67/MWh. For the purposes of discussion, these comments will use the low end of that pricing range: $56/MWh.

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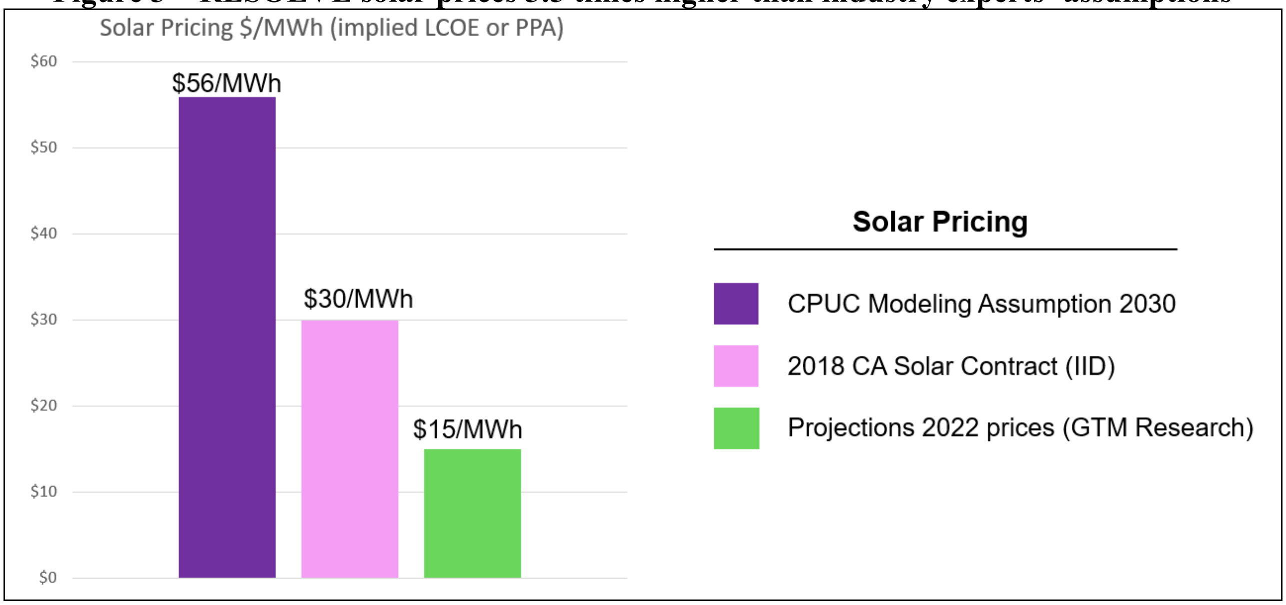
[6] See the preceding paragraph for the full list of sources for the figure.

Figure 3 below is similar to Figure 2 but based on solar prices. The first price is the low-end RESOLVE model input price for 2030 at $56/MWh.[7] The second price, $30/MWh is a power purchase agreement ("PPA") signed by the Imperial Irrigation District ("IID") in 2018 for a project with a projected operation date of June 2019.[8] The last price listed, $15/MWh, is a GTM Research projection for likely PPA contracts signed in 2022.[9]

Figure 3 – RESOLVE solar prices 3.5 times higher than industry experts' assumptions



The RESOLVE model assumes 2030 solar pricing to be 3.5 times higher than industry experts project contracted in 2022.

When combining the fact that the RESOLVE model has inputs for solar and batteries that are several times higher than the facts would indicate, one can see that in the IRP 2017-2018

[7] *RESOLVE Documentation: CPUC 2017 IRP Inputs & Assumptions*, Table 21, p 36.
[8] Imperial Irrigation District*, eGreen power purchase agreement approved* (January 9, 2018). Available at: https://www.iid.com/Home/Components/News/News/611/30?arch=1 . (The pricing listed in the news release is $19.83/MWh, however according to an email from the IID spokesperson on April 3, 2019, the actual price is $29.75/MWh. The email said "There are two numbers. IID contracted to pay $29.75 per MWhr for 20 MW of solar generation; the plant is 30 MW. Citizens is donating the other 10 MW the plant can produce. When you blend the two, the overall rate is $19.83 per MWhr.")
[9] GTM Media, *The Floor for Ultra-Low Solar Bids? $14 per Megawatt-Hour* (August 2, 2018). Available at https://www.greentechmedia.com/articles/read/the-floor-for-ultra-low-solar-bids-14-per-megawatt-hour#gs.4q26t0

cycle RESOLVE has been selecting far too little solar plus storage than would be optimal. In fact, based on the current modeling, there is no way to tell what the least cost energy solution would be for 2030. A recent IRP Ruling noted how important accurate inputs are. "Commission staff also note that the resource and transmission costs are highly uncertain, and modest cost changes can affect [] the optimal buildout."[10] The input inaccuracies at this point have expanded far beyond the "modest" threshold to the point where the model can not be relied upon to inform reasonable procurement decisions. As such, the model only served to provide a false sense of confidence that future energy generation pricing is well understood.

b. Long Term Contracts With Fossil Fuel Generators Hampers the Transition to Renewable Energy and Wastes Money In The Process.

The Proposed Decision ("PD") took a strong stance that any resource can be categorized as a renewable energy integration resource regardless of generation type (e.g. fossil based or renewable based). The PD states "the modeling also shows that existing gas-fired plants are needed in 2030 as operable and operating resources, providing a renewable integration service."[11] It further stated "[W]e anticipate the need to require more focus on renewable integration long-term commitments as time goes on to ensure that we are adequately implementing the Legislature's direction to optimize among three coequal goals: environmental, reliability and cost."[12]

The PD signals the intent of the Commission to use the upcoming procurement track to sign, among other things, long-term contracts with fossil fuel generators. However, long term

[10] R.16-02-007, Administrative Law Judge's Ruling Seeking Comment on Proposed Preferred System Portfolio And Transmission Planning Process Recommendations (January 11, 2019). p 16.
[11] R.16-02-007, Decision Adopting Preferred System Portfolio and Plan For 2017-2018 Integrated Resource Plan Cycle (March 18, 2019), p 129.
[12] R.16-02-007, Decision Adopting Preferred System Portfolio and Plan For 2017-2018 Integrated Resource Plan Cycle (March 18, 2019), p 133.

contracts are the opposite of what California needs in a rapidly changing energy landscape. Every year, the prices for solar generation and battery storage drop significantly as noted in above in section II(a). The solar contracts anticipated by GTM Research in 2022, $15/MWh,[13] would be less costly than the fuel, operations, and maintenance budget of least cost fossil fuel generators, $26/MWh.[14] Additionally, the 2017 Padilla Report announced that as of 2016 SDG&E was already spending less on its renewable energy procurement on a per unit basis than its fossil fuel procurement.[15]

Both the renewable energy price reductions, as well as the anticipation that solar will cost less than existing fossil fuel generation sources, point to the possibility that fossil fuel generators will not be needed by 2030. And while it is possible that some fossil generation will be needed, it is impossible to say with any certainty. Thus, there is a better option than signing long term contracts – merchant generators.

It would be more cost effective for California's Load Serving Entities ("LSE") to allow the fossil fuel generators' contracts to expire forcing the generators into merchant status if the generators continued to operate. That would force the generators to compete daily with renewable generators and would push down generation prices. It would also relieve the problem currently faced by California where flexible fossil generators continue to run throughout periods of high solar production and low energy demand as happens during the spring each year. The fossil generators continue to run because they have contracts that do not allow for LSEs to curtail

[13] GTM, *The Floor for Ultra-Low Solar Bids? $14 per Megawatt-Hour* (August 2, 2018).
[14] Lazard's Levelized Cost of Energy Analysis Version 12.0, Lazard (November 2018), p 11. (The reference is to the gas combined cycle generator's cost in the graph "Levelized Cost of Energy Components—Low End." The prices for the cost components are $1 + $4 + $21 = $26/MWh.)
[15] California Public Utilities Commission, *The Padilla Report: Costs and Savings for the Renewables Portfolio Standard in 2016, Pursuant to Public Utilities Code Section 913.3* (May 1, 2017), p 7. (see list showing the ratio for SDG&E at 1.07. Ratios above 1 indicate that renewable energy is less expensive.)

the fossil generation and instead buy lower cost greenhouse-gas-free ("GHG-free") energy from the market. If a fossil generator announces its intention to retire, the state always has the opportunity to retain it through backstop procurement as a last resort. While backstop procurement is more expensive than a standard contract, it immediately makes renewable alternatives even more appealing on an economic basis. Thus, backstop procurement for any given generator would only last for a year or two before the GHG-free replacement enters operation.

Technology breakthroughs should also be discussed. There is always the possibility of breakthroughs in solar or storage technology which could even more quickly eliminate the need for fossil generation than we anticipate. Tesla recently purchased an ultracapacitor developer and manufacturer, Maxwell Technologies. In addition to ultracapacitors, Maxwell recently developed a dry electrode film that doubles battery life, nearly doubles energy density, and reduces production costs.[16] That is a breakthrough. There is no reason to believe it will be the last breakthrough especially now that electric vehicle manufacturers have allocated more than $300 billion for electric vehicle development and manufacturing.[17]

c. New Resources Can Be Brought Online at Any Speed and at Any Time. California Does Not Need Immediate Procurement.

The PD voices concern regarding long project lead times based on specific resources.

"Beyond this, we also need to begin taking steps to acquire some resources that will be needed further out in the planning period, potentially by 2030 or slightly beyond, depending on the progress of electrification efforts in the next decade. As the advocates for pumped hydro solutions and out-of-state wind point out, there are very long lead times associated with the

[16] CleanTechnica, *The Ultracapacitors, Electrodes, & Battery Manufacturing Tech Tesla Gets With Maxwell Technologies* (February 4, 2019). Available at https://cleantechnica.com/2019/02/04/the-ultracapacitors-electrodes-battery-manufacturing-tech-tesla-gets-with-maxwell-technologies/

[17] Reuters, *Exclusive: VW, China spearhead $300 billion global drive to electrify cars* (January 9, 2019) available at https://www.reuters.com/article/us-autoshow-detroit-electric-exclusive/exclusive-vw-china-spearhead-300-billion-global-drive-to-electrify-cars-idUSKCN1P40G6

development of these types of resources, and we may not be able to wait until the end of the next IRP cycle to begin the procurement and development process."[18]

To unpack that statement, one needs to look at all of the assumptions used. First, the statement assumes that long lead time resources are an optimal part of the generation and storage mix. Second, the statement assumes that California needs pumped hydro and out-of-state ("OOS") wind. Third it assumes that those resources are cost effective. As the following paragraphs explain, each of those assumptions are either incorrect, highly questionable, or unknowable.

As noted in section II(b) above, electricity generation technology and pricing changes rapidly. Just as with fossil fuel generation, proceeding with a planning process or contract process that locks California into specific resource selections many years from now would be a poor strategic decision. Additionally, there is no need for planning with such a long time-horizon. For instance, pumped hydro takes a long time to plan and build, but an alternative storage type, lithium-ion batteries do not. Tesla famously built a 129 MWh battery system in Australia in approximately 60 days, well below the 100-day timeline.[19] Tesla also managed to install all the hardware for a 7 MWh battery system in 2 days.[20]

A 7 MWh system is the size battery system that could be sprinkled around California communities providing local reliability, grid services, load balancing, and load shifting. Thus lithium-ion batteries beat pumped hydro throughout a plethora of categories. In fact, the only feature where hydro is currently out competing lithium-ion storage is cost. Thus, the calculation

[18] R.16-02-007, Decision Adopting Preferred System Portfolio and Plan For 2017-2018 Integrated Resource Plan Cycle (March 18, 2019), pp 135-136.
[19] Vox, *Elon Musk bet that Tesla could build the world's biggest battery in 100 days. He won.* (December 20, 2017). Available at https://www.vox.com/energy-and-environment/2017/11/28/16709036/elon-musk-biggest-battery-100-days
[20] GTM Media, *Tesla Installs 7-Megawatt-Hour Battery for Emergency Power at a Japanese Railway* (March 28, 2019). Available at https://www.greentechmedia.com/articles/read/tesla-installs-largest-battery-asia-japanese-railway#gs.4sm7z7

for value of one storage option versus the other is a result of the dollar cost to dollar benefit ratio which will change based on location, LSE need, and a variety of other factors. Due to the many factors involved, leaving storage procurement decisions up to the LSEs would appear to make the most sense. But one thing is certain, storage systems can be designed and built within a matter of days, not years.

The second assumption was that California would need OOS wind and pumped hydro. The previous paragraph conclusively shows that pumped hydro is not only is not needed but lacks many features available through other storage options. Turning to OOS wind, the modeling concerns from the section II(a) show that based on the current RESOLVE inputs, it is impossible to say if OOS wind would be an optimal selection as part of the California energy mix.

The third assumption was that the resources would be cost effective. Commission Staff produced an interesting review recently of the cost effectiveness of OOS wind both with and without new transmission. POC, in its comments, noted that if BNEF battery projections were used instead of outdated pricing, OOS wind would no longer be cost effective.[21] If the POC comments had also changed the solar pricing to reflect updated expert projections, the OOS wind would not have even been close. Figure 4 is a reproduction of the POC comparison. The changes are in red. The original table without revisions can also be found in POCs previous comments.[22]

[21] R.16-02-007, The Protect Our Communities Foundation Comments on The Proposed Preferred System Portfolio and Transmission Planning Process Recommendations, (January 31, 2019), p 10. Available at http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M264/K403/264403001.PDF
[22] *Ibid.*

Figure 4 – POC Review of Cost Competitiveness of OOS Resources[23]

2030 Portfolio Metrics Comparison Table (Revised)

Includes costs from any new TX OOS	Case	A	B	C	D
	Name	42RSPw/2017IEPR	32w/ExistTXonly	32w/NewTX&WYNM	32w/NewTX&anyOOS
Annual Cost Metrics	*Unit*	2030	2030	2030	2030
New Renewables Fixed Costs	$MM	$ 2,422	$ 4,000	$ 4,485	$ 4,512
New Storage Fixed Costs	$MM	$ 39	$ 255	$ 91	$ 37
New In-state Transmission Fixed Costs	$MM	$ -	$ 83	$ -	$ -
Total Operating Costs	$MM	$ 4,605	$ 3,601	$ 3,582	$ 3,523
Total New Resource Costs + Operating Costs	$MM	$ 7,066	$ 7,939	$ 8,158	$ 8,072
Delta relative to Case B	$MM			$ (300)	$ (558)
Delta % relative to Case B	$MM			-3.4%	-6.4%
Operational Portfolio Metrics	*Unit*	2030	2030	2030	2030
System Greenhouse Gas Emissions	MMtCO2	34.0	25.9	25.9	25.9
Marginal GHG Cost	$/tCO2	$ 190	$ 287	$ 251	$ 187
Effective RPS (incl. banked RECs)	% of Retail Sales	60%	71%	71%	71%
Renewable Curtailment	% of RPS Gen.	5.9%	6.6%	6.5%	6.4%
Actual Reserve Margin	%	22%	25%	18%	17%
Load	GWh	255,038	256,784	256,784	256,784

Another way to review the cost effectiveness of out of state resources is to compare a resource that is connected directly to a distribution grid with one that requires transmission. The IID solar array discussed in section II(a) above ties directly into a distribution grid and will be used as the example project in the following figure. Figure 5 shows the cost of transmission in SDG&E service territory[24] as well as the most recent OOS wind project listed in the 2018 Padilla report.[25] That pricing is compared to the IID solar project.[26]

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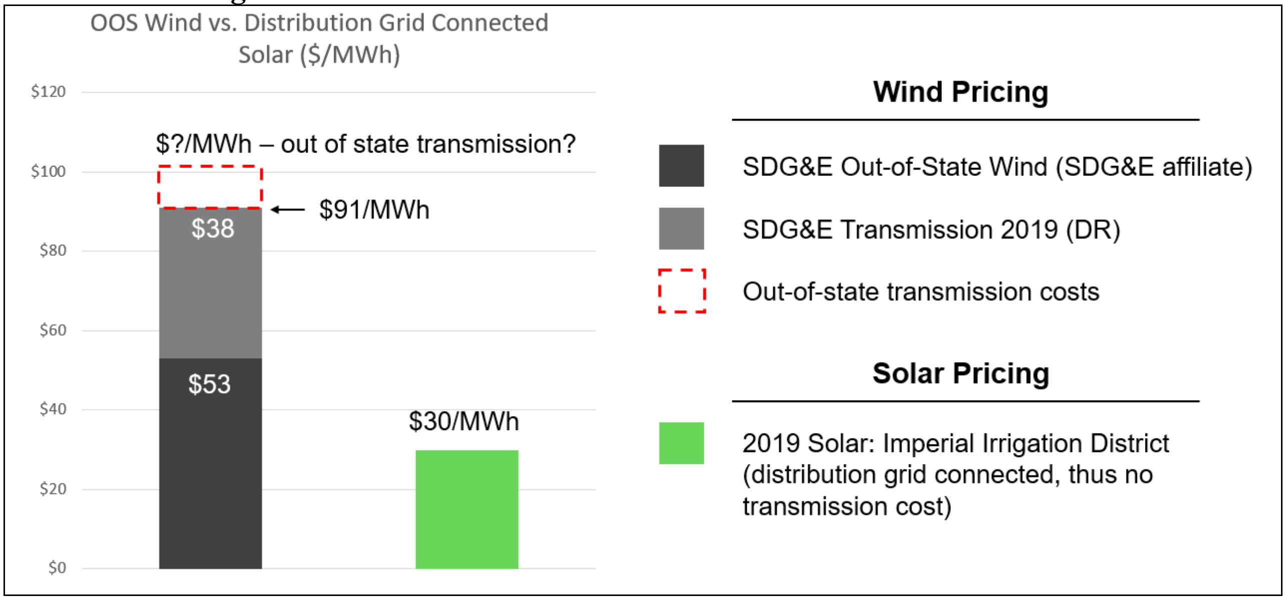
[23] R.16-02-007, The Protect Our Communities Foundation Comments on The Proposed Preferred System Portfolio and Transmission Planning Process Recommendations (January 31, 2019), p 10. Available at http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M264/K403/264403001.PDF

[24] SDG&E, tariff schedule DR (effective March 1, 2019) available at http://regarchive.sdge.com/tm2/pdf/ELEC_ELEC-SCHEDS_DR.pdf

[25] California Public Utilities Commission, *2018 Padilla Report: Costs and Savings for the RPS Program Public Utilities Code Section 913.3* (May 1, 2018), p 8. Available at http://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/About_Us/Organization/Divisions/Office_of_Governmental_Affairs/Legislation/2018/MASTER%202018%20PADILLA%20REPORT_FINAL.pdf

Figure 5 – Distribution Connected Resources vs. OOS Resources



The $91/MWh versus $30/MWh comparison does not include any new transmission builds to accommodate OOS resources. Additionally, when GHG-free generation by-passes the transmission system it also provides a service to every other transmission customer by reducing transmission line congestion.

California has plenty of time to allow LSEs to determine their own path to the most cost effective and GHG-free energy solution. Rushing to procure resources which are not needed for a decade will likely result in a suboptimal cost allocation due to unforeseen technology innovations as well as incremental improvements of existing solar and storage.

d. LSEs Are Better Positioned to Select Energy Generation Sources with the Lowest GHG Emissions and the Lowest Cost.

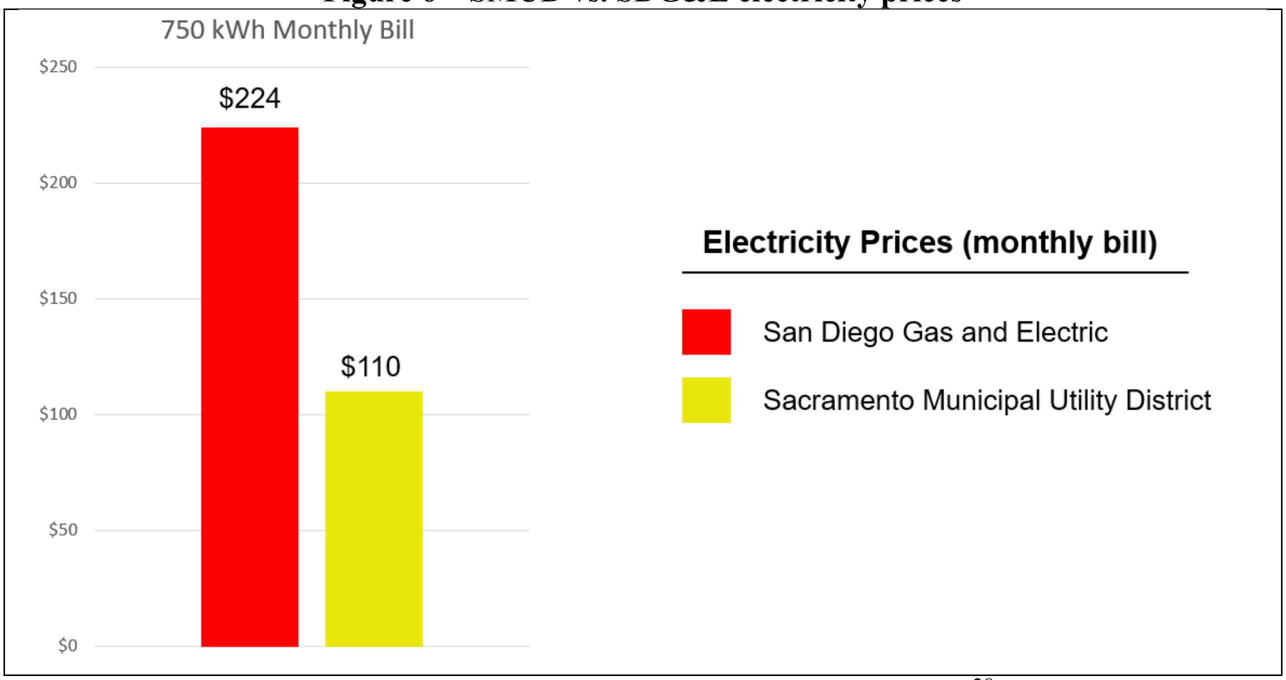
The PD stated that Integrated Resource Plans are needed because the IRP "produces an optimized electric resource portfolio to enable California to achieve a decarbonized electric

[26] Imperial Irrigation District, *eGreen power purchase agreement approved* (January 9, 2018). Available at https://www.iid.com/Home/Components/News/News/611/30?arch=1

system that also functions reliably and at least cost to ratepayers overall, something that no individual LSE can achieve on its own."[27] The evidence does not support that conclusion.

First, municipal utilities have been optimizing their systems for years and are beating the Commission regulated utilities on price by a large margin. To illustrate, Figure 6 shows a comparison between Sacramento Utility District's ("SMUD") electricity prices and SDG&E's electricity prices.

Figure 6 – SMUD vs. SDG&E electricity prices



Both prices from figure 6 come from SMUD's latest annual report.[28] Not only are SDG&E's prices double that of SMUD, the disparity in price between the two regions has been growing for years. In fact, the pricing difference is so extreme that it has resulted in a clear case of multiple customer classes: municipal customers versus investor owned utility customers. The

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[27] R.16-02-007, Decision Adopting Preferred System Portfolio and Plan For 2017-2018 Integrated Resource Plan Cycle (March 18, 2019), p 3.

[28] Sacramento Municipal Utility District, *Sacramento Municipal Utility District Annual Report 2017* (May 2018) p 6. Available at https://www.smud.org/-/media/About-Us/Reports-and-Statements/2017-Annual-Report/2017-Annual-Report.ashx

low cost SMUD electricity prices are just one example of what an "individual LSE can achieve on its own."

Two other examples of high performing LSEs are:

1) Silicon Valley Clean Energy with 100% GHG free[29]
2) Peninsula Clean Energy with 100% GHG-free by 2021[30]

Silicon Valley Clean Energy and Peninsula Clean Energy both are achieving these impressive clean energy metrics while maintaining lower rates than the competing investor owned utility. Based on the examples listed, IRP directed procurement has not had the Commission's desired effect to meet the three priority metrics of reliability, least cost, and environmental goals.

III. Conclusion

For the reasons stated above, POC recommends updating inputs and assumptions to align with industry expert pricing for solar and storage, eliminating consideration of long or medium-term contracts for fossil generators, eliminating consideration of OOS resources until after solar and storage modeling updates have been incorporated, and postponing the initiation of a procurement track until at least the 2021-2022 cycle.

Respectfully submitted,

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[29] Silicon Valley Clean Energy, Green Start generation service, webpage: https://www.svcleanenergy.org/choices/#GreenStart

[30] Peninsula Clean Energy, see "Strategic Goals" on webpage: https://www.peninsulacleanenergy.com/