Clean Coalition
Making Clean Local Energy Accessible Now

California Independent System Operator
250 Outcropping Way
Folsom, CA
Attn: Kim Perez

RE: Moorpark-Pardee Transmission proposal comments

As always, we are grateful for CAISO's efforts and the opportunity to comment to assist in the rigorous analysis of proposals in order to deliver the most cost-effective and efficient renewable energy solutions to California's energy needs. Please accept these comments from the Clean Coalition as our effort to assist CAISO in its work.

I. Summary

The Moorpark-Pardee transmission line should be analyzed, subject to the understanding that meeting the Local Capacity Requirement (LCR) of the Moorpark area with relatively cheaper DER is the preferable alternative for ratepayers, reliability, and the environment. Only if the procurement of DER under the Moorpark RFP fails to procure adequate resources should the Moorpark-Pardee line be approved. However, in that event it is critical that the line be deployed as the second best among the many options, especially those involving fossil fuel generation.

1) The Clean Coalition's economic analysis demonstrates that DER can provide reliability at a lower overall ratepayer cost to meet the LCR when the cost of Operations and Maintenance, return on equity, and depreciation costs (jointly "O&M costs") are included as well as credit for the value of DER supplied energy, contrary to the unsupported statements in the LCR Plan.
2) The placement of the fourth transmission line in the same right of way as the other three lines is a less preferable solution that local generation because many of the events that could cause a N-2 contingency would also remove all four lines from

service. The right of way crosses rugged terrain prone to fires, just outside the foot print of the Thomas fire, prone to landslides, such as those to the north in Montecito or to the south in Burbank, and prone to earthquakes. Thus, the proposed line is a less preferred alternative to using DER to meet the LCR.

II. Description of the Stakeholder

The Clean Coalition is a nonprofit organization whose mission is to accelerate the transition to renewable energy and a modern grid through technical, policy, and project development expertise. The Clean Coalition drives policy innovation to remove barriers to procurement and interconnection of DER—such as local renewables, advanced inverters, demand response, and energy storage—and we establish market mechanisms that realize the full potential of integrating these solutions. The Clean Coalition also collaborates with load serving entities, DER developers, and municipalities to create near-term deployment opportunities that prove the technical and financial viability of local renewables and other DER.

III. Transmission is not cheaper than DER and should be viewed as a first alternative to DER only if needed.

The proposed Moorpark-Pardee line is both more expensive to ratepayers than the DER alternative and is highly vulnerable to foreseeable disruptions.

1. The Full Costs of Transmission are greater than the full costs of DER reliability services.

It is imperative that CAISO evaluate the full costs and values of both the transmission line and the DER alternative. Although costs of operations & maintenance, return on equity, and depreciation costs (jointly "O&M costs" here) typically scale with the capital cost, this is not the case when looking at non-wires alternatives. In this case, a solar+storage solution would be more cost effective when the long-run costs of energy exceed approximately $55/MWh.

A full-cost analysis reveals that when the and the value of energy are incorporated, Distributed Energy Resources are likely to be cheaper than new transmission. SCE states without any support that "[t]he proposed transmission option reduces the LCR

procurement need to 76 MW, at a customer cost that is much lower than what supply-side resources would yield."[1] While this statement is true if only capital costs are compared, if the full costs are compared, it is almost certainly false.

A full-cost comparison includes both all costs and an accounting for additional services. On the cost side, both options must include both capital costs and O&M costs over 30 years for both options. On the services side, it is critical to recognize that while transmission provides only reliability services, DER capacity provides both energy and reliability services. Thus, an actual comparison of the cost of providing reliability services must account for the value of the energy that also comes with DER. The following analysis relies on the best publicly available data and estimates we have access to, and we fully expect that CAISO will use somewhat different parameterizations where we do not already use CAISO's own parameter estimates (e.g., O&M Cost escalators for transmission). However, the general principles are sounds and represent the current best estimate of the comparative costs.

Estimated Transmission Costs

The full costs of a fourth transmission line must include the full costs of capital and the O&M costs. Based on CAISO's O&M estimates of cost increment schedule, the O&M costs over 30 years will be over five times the capital costs.[2] (Although the costs are likely incurred over a 50-year window and thus represent higher total costs, we modeled only the first 30 years.) While the capital costs of new transmission over hilly terrain can run upwards of $1.7 million per mile,[3] the long-term ratepayer commitments to O&M, equity

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[1] Southern California Edison, "Moorpark Sub-Area Local Capacity Requirements Procurement Plan of Southern California Edison Company Submitted to Energy Division Pursuant to D. 13-02-015" December 21, 2018, at 12.

[2] The O&M, return on equity, and depreciation costs for transmission are based on CAISO O&M escalator estimates integrated over 30 years.

[3] Western Energy Coordinating Council, "CAPITAL COSTS FOR TRANSMISSION AND SUBSTATIONS: Updated Recommendations for WECC Transmission Expansion Planning" (2014) available at https://www.wecc.biz/_layouts/15/WopiFrame.aspx?sourcedoc=/Reliability/2014_TEPPC_Transmission_CapCost_Report_B%2BV.pdf&action=default&DefaultItemOpen=1

return for the transmission owners, and depreciation (jointly "O&M costs" hereinafter) that run 3.91 times the capital cost according to CAISO's O&M schedules.[4] With the long-term ratepayer commitments added in over 30 years, the total costs of transmission to over $8.5 million per mile or more. Based on the $45 million capital cost reported by CAISO,[5] the proposed 26-mile transmission line would cost ratepayers some $221 million over 30 years in 2018 dollars. (Since the cost to ratepayers is the relevant comparison, it is imperative to use the ratepayer discount rate. Since ratepayers are not borrowing to finance electric bills for the most part and the ratepayers change identity over time, the appropriate discount rate is the rate of inflation.) These costs flow to ratepayers and must be included in the evaluation of the comparative costs.

Estimated DER Costs

By comparison, a solar+storage system would provide both reliability and also energy to the local community, displacing energy imports from outside the Moorpark area. Thus, the cost to ratepayers of the reliability service would be the capital and O&M costs minus the value of the energy these resources provide. Although the precise mix of the incremental DER needed to replace the transmission line to meet the LCR is somewhat flexible, our model identifies a combination of 240 MW of solar and 825 MWh of batteries (comprised of 210 MW of battery power capacity with a mix of two and four hour durations) to the most cost effective alternative DER replacement for the proposed transmission line, based on the load profiles from the model of the Moorpark subarea needs presented by CAISO to the Energy Commission in the Puente Application for Certification proceeding in August 2017. (We recommend that CAISO also model this same system to ensure adequate performance during the worst solar day in addition to the peak load day already measured to ensure that the modeled system can perform under the full range of conditions.) Overall ratepayer costs after the ITC and component cost declines by

[4] For the calculations, see the "Cumulative Ratepayer Costs" tab of the attached excel model.

[5] Presentation on Moorpark-Pardee 230 kV No. 4 Circuit Project, January 11, 2018, http://www.caiso.com/planning/Pages/TransmissionPlanning/2017-2018TransmissionPlanningProcess.aspx

2019 and including O&M would cost ratepayers on the order of $850 million. However, the 11.5 TWh of energy produced over 30 years would deliver a value of nearly $700 million, assuming a long run energy cost of $60/MWh. Thus, the residual costs of the reliability service that such a solar+storage system would be approximately $156 million, resulting in a $65 million savings for ratepayers compared to the transmission line. Under these assumptions, any long-run energy cost above $54.38/MWh drives a net rate payer savings from DER.

	Solar + Storage Alternative	**Moorpark-Pardee Transmission line**
Nameplate Solar (MW)	240	
Energy storage (MWh)	825	
2019 Installed Cost	$696,227,384	$45,000,000
After ITC benefit	$487,359,169	
MWh/year (1,600 MWh/year/MW)	384,000	0
30-year energy Total (MWh)	11,520,000	0
Operations & Maintenance ($/kW)	$50	
30-year O&M	$360,000,000	$175,950,000
Total Cost	**$847,359,169**	**$220,950,000**
Energy Long Run Cost (per MWh)	$60	
Total Energy Value	**$691,200,000**	**$0**
Total Ratepayer Cost	**$156,159,169**	**$220,950,000.00**
Net Ratepayer savings from DER	**$64,790,831**	

Overall, whether the fourth transmission line is more expensive and by how much depends on a detailed assessment of the precise mix of DER that would replace it and the

long run value of the energy provided. However, under reasonable assumptions, the transmission line would in fact cost ratepayers more for the reliability service than the DER solution.

Given that reality, there is scant justification for incorporating a transmission line as the preferred solution. Instead, SCE should be required to procure DER sufficient to meet the full LCR.

Therefore, we request that CAISO perform a similar evaluation of the full costs of the transmission line, including O&M, compared to the cost of the DER that would replace it, including credit for the produced energy in determining the relative value of the two solutions. However, if the DER procurement from the SCE RFP falls short of the full LCR need, we recommend the transmission line be considered as the first alternative approach.

2. Transmission is a vulnerable reliability solution

Although a transmission line is clearly preferable to any natural gas plant of any size, the proposed fourth line in the same right-of-way as the existing lines would be vulnerable to natural disasters, especially wildfire, landslides, and earthquakes. Although the LCR is designed to meet an N-2 contingency, the physical location of all four transmission lines in the same right-of-way increases the odds of an N-4 contingency. The right of way is located in wildlands immediately south of the Thomas fire, which may have been caused by electrical lines and was exacerbated by the failure of the grid to provide power because of the reliance on remote energy to power emergency equipment and water pumps. Last week, catastrophic mudslides wreaked tremendous damage on both sides of the proposed transmission line in Montecito and the Sun Valley/Burbank area. With greater risks of catastrophic fire under drier and hotter conditions, and mudslides under more extreme storms due to climate change, a DER solution should be deemed even more valuable for its resilience value, given the vulnerability of a transmission reliability solution to a local event that could remove all four lines from service causing an N-4 contingency.

Thus, the transmission line should be considered as an alternative non-preferred approach, only if robust and legitimate DER procurement processes fail to meet the full LCR.

3. Co-located solar+storage obviate the need for any transmission lines.

Although not directly related to the transmission line, CAISO should be aware than several other arguments against the role of DER provided in the LCR Plan are simply wildly mistaken. Thus, CAISO should carefully evaluate similar claims made by project proponents by considering the full range of capabilities of DER, much as CAISO did in the Puente Power Project proceeding. For example, statements in the LCR plan and related presentation that "[under] an N-2 [contingency], no ability to charge battery storage units (need energy)" are mistaken, since of course batteries would be charged from co-located solar in the system we model in association with these comments. Similarly, SCE states: "energy storage would be required to continuously discharge during the day in order to serve peak load and re-charge during hours when Goleta load is minimal. Given the limitations of the 66 kV tie lines from the adjacent system, there may not be enough energy in the off-peak hours to charge energy storage and serve the Goleta peak load needs the following operating day." Similarly, this would also not be true if the storage were to be charged during the day when solar generation exceeds local load. In fact, the Clean Coalition modeled an hour-by-hour dispatch of solar+storage based on the CAISO model, which in our understanding is the most up-to-date model of the Moorpark LCR need on an hourly basis.[6] In our modeling, the Clean Coalition demonstrated that with the 270MW of solar capacity, the addition of 130MW/990 MWh of storage (4-hour batteries) would be more than adequate to meet the LCR, including daily full charging from solar (of which 35 MW solar + 165 MWh would be needed even with the transmission line and the 240MW + 825 MWh would represent the additional capacity needed without the transmission line).

Given that solar+storage can meet the entirety of the projected peak load under an N-2 contingency, numerous other statements in the LCR Plan are similarly misguided. For example, SCE dismisses the capability of solar to meet LCR needs "For instance, if LCR needs are associated with peak demands and the local capacity area is summer peaking, then distributed solar resources may be valuable." In fact, storage co-located with solar

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[6] Puente Scenarios Cost Models (Supplemental Testimony of Dr. Doug Karpa re CAISO Study, Puente Power Project Application for Certification, Docket Number 15-AFC-01, Exhibit 7035, TN# 220961)

would not discharge during the day, but would rather charge from co-located solar and so would not need to rely on the 66kV system for recharge, and neither would the ability of solar co-located with storage be limited to meeting peak demands during summer daylight hours.

Similarly, SCE mischaracterizes the operational capabilities of demand response. Today, Demand Response (DR) is not limited to a small number of calls to large industrial users, but rather includes capabilities such as automated DR of non-critical load. When SCE mistakenly suggests that "[i]f LCR needs occur only on rare occasions associated with such summer peak periods, then DR programs with a limited number of calls may be valuable" SCE is ignoring the modern capabilities of DR technologies. For example, small reductions in air conditioning or electric water heaters would be capable of repeated calls at any time such calls were needed, even if sporadic and outside of summer peaks.

IV. Conclusion

Overall, the proposed Moorpark-Pardee line is the second best alternative to a full DER procurement to meet the Moorpark and Goleta LCRs. However, in recognition that that procurement has not yet been implemented successfully, it is critical that CAISO proceed to ensure that this alternative is available in the event that not enough DER are procured. However, CAISO should proceed with awareness that this alternative is almost certainly more expensive than the DER solution or at best only marginally cheaper.

We appreciate CAISO's diligence in these matters and look forward to being of assistance.

Respectfully submitted,

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Clean Coalition