May 17, 2023

Neil Millar
VP Transmission
California Independent System Operator Corporation
250 Outcropping Way
Folsom, CA 95630

RE: Analysis of Lotus Infrastructure Partners' alternative to the CAISO proposed Trout Canyon – Lugo 500 kV project

Mr. Millar,

GridLiance West ("GLW") applauds the California Independent System Operator's ("CAISO") efforts in finalizing the 2022-23 Transmission Planning Process ("TPP") and its strategic and proactive approach towards the transmission build-out needed to achieve the state's transition to 100% clean energy while maintaining grid reliability.

In a letter dated April 24, 2023, Lotus Infrastructure Partners ("Lotus") outlined the Mead – Adelanto Project ("MAP Upgrade Project") as a "superior and simpler solution to other project alternatives for mitigating the Lugo – Victorville 500 kV Area Constraint, including the Trout Canyon – Lugo 500 kV project ("Project") recommended by CAISO. As a result of this request, GLW respectfully requests that the CAISO, in its assessment, take into consideration the analysis and conclusions provided in this letter. As discussed below in more detail, this analysis shows that the Project remains the superior option for the CAISO and California ratepayers in both the near and longer terms.

1. The MAP Upgrade Project does not address all the identified constraints nor meet the policy needs for future transmission expansion

As outlined in the Draft 2022-23 Transmission Plan published on April 3, 2023, the Project is identified as the most cost-effective solution to meet the following policy-driven needs:

1. Mitigate the Lugo – Victorville 500 kV area constraint
2. Mitigate the GLW 230 kV area constraints
3. Improve the deliverability of GLW and Valley Electric Association ("VEA") resources and enable access to Nevada's renewable-rich areas
4. Unlock transmission access to Nevada's geothermal resources.

While the proposed MAP Upgrade Project potentially addresses the Lugo – Victorville 500 kV area constraint identified as #1, it fails to meet needs #2, #3 and #4 above. GLW addresses each of these additional needs below.

<u>Mitigate the GLW 230 kV area constraints</u>

In the 2022-23 TPP Sensitivity portfolio, which largely aligns with the mapped generation for the GLW area in the 2023-24 TPP Base portfolio, the outage of the Trout Canyon – Sloan Canyon segment (one or both lines, as recommended in the 2022-23 Draft Transmission Plan) results in overloads of the following facilities:

- Amargosa 230/138 kV transformer

- Sandy-Amargosa 138 kV line
- Gamebird – Sandy 138 kV line
- Innovation – Desert View 230 kV No. 1 line
- Innovation – Desert View 230 kV No. 2 line

The MAP Upgrade Project does not provide any mitigation to these contingency conditions. In contrast, the CAISO-recommended Project parallels these contingencies, significantly reducing loadings while improving overall resiliency and operability to a highly diverse resource part of the system needed to serve customers across California, and specifically for the strategic injection into the Los Angeles Basin.

Improve the deliverability of GLW and VEA resources and enable access to Nevada's renewable-rich areas

As demonstrated by the current interconnection queue, including the increased generation requests in Cluster 15, a large number of generation resources in GLW are to be located at Trout Canyon or upstream on the GLW system.

This is further reinforced by the generation mapped by the CPUC as part of its Integrated Resource Plan (IRP). Based on the Draft 2022-23 Transmission Plan, the sensitivity results show 1,646 MW of undeliverable baseline and portfolio resources. The 2023-24 CPUC base portfolio further reinforces the area deliverability need with 5,400 MW of resources (3,690 MW of Full Capacity Deliverability Service ("FCDS")) mapped to Trout Canyon and North, and over 9,000 MW of FCDS resources East of Pisgah.

In parallel, generator developer interest continues to grow in this area. There is currently close to 29 GW of renewable projects permitted around Trout Canyon and upstream along the GLW system, based on public records from the Bureau of Land Management.

The proposed MAP Upgrade Project does not support the deliverability of many of these resources, while CAISO's proposed Project provides the appropriate performance, expandability, and, most importantly, foresight to integrate these resources onto the grid, which is critical for the State of California to meet its policy and clean energy goals

Unlock transmission access to Nevada's geothermal resources

Similar to its failure to improve overall renewable deliverability to CAISO, the MAP Upgrade Project does not unlock transmission access to Nevada's geothermal resources. Geothermal generation continues to be of growing importance to the CAISO supply stack given the increasing penetration of variable renewable generation and the impending retirement of other previous base load generation such as once-through-cooling resources. The SB100 Joint Agency Report projects the need for 2.3 GW of new geothermal resources to reach 100% clean energy by 2045 but remaining California stores of geothermal are only available (with very minimal exceptions) in the Salton Sea area, which is not directly connected to the CAISO grid. Thus, accessing geothermal-rich areas in Nevada will be key for the State of California to support overall resource adequacy while reaching 100% clean energy by 2045.

According to the US Geological Survey's ("USGS") assessment, Nevada has over 15% of the US' geothermal resources, nearly 15% of the country's additional undiscovered resources, and nearly 20% additional geothermal potential that could likely be developed through enhanced geothermal systems ("EGS"). This translates into USGS' estimates of 1.4 GW of identified resources, 4.4 GW of undiscovered resources, and 103 GW of EGS opportunities.

Nevada geothermal is included in the 2022-23 TPP with 440 MW FCDS of geothermal in the Base portfolio for the GLW area. This mapping is increased to 500 MW in the 2023-24 TPP Base Portfolio.

As discussed in the TPP Report, this policy need can be efficiently fulfilled by the Project identified by the CAISO.

2. The cost of the MAP Upgrade Project is projected to be more expensive than the CAISO-recommended Project

Based on scope of the MAP Upgrade Project described in the April 24, 2023 letter, GLW has estimated the following anticipated costs for that project. In preparing this estimate, GLW evaluated the component costs using Southern California Edison's ("SCE") most recent Per Unit Cost Guide (submitted in 2022) for all components except the proposed converter stations, which are not part of the Per Unit Cost Guide scope. SCE's Per Unit Cost Guide was selected for this estimate as the most suitable of all CAISO Transmission Owners' cost guides due to the proximity of the MAP Upgrade Project to SCE's territory. SCE's Per Unit Cost Guide can be found in the following section of the CAISO's website: https://www.caiso.com/InitiativeDocuments/SCE2022FinalPerUnitCostGuide.xlsx.

As for the cost estimate assumptions for the 3,500 MW converter stations, GLW is referring to the results of the independent engineering review of proposed project costs for the New York ISO Long Island Offshore Wind Export Public Policy Transmission Need, dated April 25th, 2023. Appendix B, page 56 shows the cost of comparable 1,200 MW converter stations estimated at ~$375 MM: https://www.nyiso.com/documents/20142/37589436/LI_PPTN_Appendices_051623_ESPWG.zip/ce8f838b-a846-35b8-b3fb-867f68825561. This cost estimate is in line with recent HVDC vendor quotes received by GLW's parent company, NextEra Energy Transmission.

GLW conservatively assumes that the two new converter stations can be located within 0.1 miles of the connecting substations, which is highly dependent on land availability for the estimated 60-acre footprint per converter station assumed by Lotus.

Finally, GLW conservatively aligns the project cost calculation with Lotus' assumption that the MAP Upgrade Project can be online before the 2033 required in-service date for CAISO's recommended Project and assumes a 2030 in-service date, which will be discussed in further detail below.

GLW proposed calculation of the MAP Upgrade Project is outlined below and shows a total estimated cost for the MAP Upgrade Project of **more than $2.7 B**:

Project Component	Length (Miles)	Cost Assumption	Unit Cost in 2022 $ ($000s)	Cost Estimate in 2022 $	2030 Inflation Factor	Unit cost in 2030 $
Marketplace 3,500 HVDC converter station		NYISO Independent Engineering Study = $375 MM / 1,200 MW	$313	$1,093,750,000	1.1474	$1,254,968,750
Marketplace Converter-Substation AC Tie	0.1	SCE: Single Circuit, Lattice Tower, 500 kV AC	$5,288	$528,803	1.1474	$606,749
Marketplace-Eldorado AC Tie	1	SCE: Single Circuit, Lattice Tower, 500 kV AC	$5,288	$5,288,035	1.1474	$6,067,491
Adelanto Converter-Substation AC Tie	0.1	SCE: Single Circuit, Lattice Tower, 500 kV AC	$5,288	$528,803	1.1474	$606,749
Adelanto 3,500 HVDC Converter station		NYISO Independent Engineering Study = $375 MM / 1,200 MW	$313	$1,093,750,000	1.1474	$1,254,968,750
Loop In Adelanto to Vincent-Lugo 500kV Tie (1)	17	SCE: Double Circuit, Strung on both sides, Lattice Tower, 500 kV AC	$11,111	$188,892,895	1.1474	$216,735,708
Total MAP Upgrade Project Cost Estimate						**$2,733,954,197**

The total estimated cost of the MAP Upgrade Project, assuming a 2030 in-service date, is thus well above the $1.5 – 2.0 B estimate for the Project identified by the CAISO.

It is also of note that the two new converter stations and associated AC tie-ins up to a point within 100 feet of the connecting substations property line are not upgrades to existing facilities and thus are eligible for competitive solicitation.

3. The MAP Upgrade Project presents significant schedule risks

The proposed MAP Upgrade Project scope relies on the construction of two new 3,500 MW HVDC converter stations. The current worldwide demand for HVDC converter stations, coupled with the limited amount of HVDC vendors, will result in extended procurement lead time. This risk is further exacerbated by the size of the proposed converter stations, which further limits the universe of vendors having the required capabilities. For those reasons, and based on the vendor outreach conducted by GLW, an in-service date earlier than 2033 appears highly improbable.

To summarize, the above analysis shows that the MAP Upgrade Project does not mitigate all the constraints addressed by the CAISO's identified Project while being significantly more costly to California ratepayers without evident schedule benefits.

GLW respectfully requests that the CAISO considers this analysis in its assessment of the MAP Upgrade Project as an alternative to the proposed Project and is available to provide any additional information required by the CAISO.

Sincerely,

Fanny Kidwell
Executive Director, Development
NextEra Energy Transmission / GridLiance West LLC