Q&A Session

Responses added post-webinar can be seen in red.

Question

> **How does the busbar mapping related to the constraints mapping sheet? Is the latter produced based on inputs from the busbar mapping sheet? If yes, where is the methodology to do so documented?**

Reply

> Hi there, what exactly do you mean by "constraints mapping"? If you're referring to the "Transmission Capability Estimates" that CAISO provides biannually, the methodology is here: https://www.caiso.com/documents/transmission-capability-estimates-white-paper-2024.pdf
>
> I meant this sheet https://www.caiso.com/documents/attachment-b1-v8-constraint-mapping-2024-ipe.xlsx
>
> Thanks for clarifying. This sheet is also developed by CAISO through the same process as the transmission capability estimates. It is an input to busbar mapping.
>
> Here is the webpage where the last estimates and constraint mapping were posted: https://www.caiso.com/library/transmission-capability-estimate-inputs-for-cpuc-integrated-resource-plan-aug-29-2024
>
> Thank you for your reply. Can you please be so kind to provide the link to attachment A and B mentioned in the document you linked above?
>
> Have there not been updates to these documents since 2024? When will the next version be posted?
>
> The next versions will be posted later this summer.

Question

> **Why did you remove the annual build limit on in-state wind?**

Reply

> We removed the technology-wide annual build limit to avoid over-constraining the in-state wind resource. Our limits on in-state wind are the interconnection queue projects (before 2036) and the geospatial resource potential (after 2036). Those updates result in comparable availability compared to the 26-27 TPP inputs.

Question

> **Is there any data available to calibrate the 10-year project timeline for geothermal? Fervp's first well at Cape Station was drilled in 2023 and they reached COD in 2026 - seeming to imply a much quicker development cycle.**

Reply

Thanks for your question. The 10-year project timeline applies to "generic" geothermal that is not already in the queue or otherwise in development and specifically "in-state" geothermal. This build limit for California geothermal was informed by comments from stakeholders in the past cycle.

Question

Is the latest commercial interest for Baja and Northeast CA wind (~700 MW) higher or lower than the previous busbar mapping cycle?

Reply

It is higher. Northeast CA (1,015 MW) and Baja California (1,910 MW) potentials updated to reflect latest commercial interest, totaling ~700 MW of additional resource potential by 2036

Question

Do you provide the geolocation for busbars/substations that have been selected for potential resources in California? I see the substation names in the spreadsheet but it would be great to have geolocation to map them out.

Answered later in the transcript.

Question

Slide #22: For the near-term OOS build limits, the slides show Nevada EGS on SWIP-N available as early as 2028 (800 MW) and Wyoming Wind via TransWest available by 2030 (900 MW). What is Staff's confidence level that these resources & associated transmission will achieve CODs by these dates?

Reply

The availability of WY wind in 2030 is based on the estimated CODs of wind resources already in the queue and aligns with assumptions in the past several IRP cycles. The online dates for NV EGS are also informed by queue data and informal conversations with EGS developers.

Regarding Staff confidence in transmission line development: SWIP-N received construction permits in January 2026 and appears on-track for a 2028 ISD. TransWest is currently under construction with a 2030-2031 ISD. Consequently, Staff view resource interconnections as more constraining than completion of the lines themselves.

Question

Slide #23: The SWIP-N $67/kW-yr of transmission cost is a nameplate-based cost. Given the higher capacity factor for the Nevada EGS resources, presumably, the effective transmission cost per MWh delivered is presumably much higher for Idaho wind than for Nevada EGS, right?

Reply

> That would be correct for the effective transmission cost ($/MWh). The bundled resource+Tx cost, however, would be cheaper for wind given lower resource CAPEX.

Question

> **Slide #29: What is the basis for assuming the additional Trout Canyon-Lugo tranche at $2.106B (i.e., the 1.25x cost multiplier)? Not clear from what was said when thsi slide was covered.**

Reply

> The multiplier is generic, but intends to reflect an escalating cost to develop a second line providing comparable value to the transmission system. Please provide feedback in comments with any recommended revisions to the multiplier, or other ways address incremental TPD needed for OOS resources.

Question

> **On slide 29, why is the original T-L line cost added to RESOLVE non-optimized costs? Is this done for other approved upgrades deemed as sunk in RESOLVE?**

Reply

> In major I&A cycles, RESOLVE's non-optimized costs are refreshed using the California Energy Demand Electricity Rate Revenue Requirement Forecast, which includes costs for CAISO-approved upgrades. In off-cycle years (such as this one), a singular adjustment to account for Trout Canyon-Lugo has been made.
>
> In the alternative years, then Staff adds each approved upgrade's costs in non-optimized costs? Or is T-L being treated uniquely in someway.
>
> That's right; mechanically, we are simply adding a line-item in RESOLVE's reporting of non-optimized costs to account for T-L. T-L is the only project receiving this treatment for the 27-28 TPP but conceptually this isn't unique; T-L will be included in the CED analysis next time non-opt costs are fully refreshed.

Question

> **Is the second tranche of the Trout Canyon/Lugo upgrade baked into the model or just available for selection?**

Reply

> Just available for selection

Question

> **Slide #29: Where does the Incremental Capability 5,410 MW figure come from? Can you identify what “deliverability” study validated it?**

Reply

> This value was identified by CAISO in the Busbar Mapping Working Group, based on the 25-26 Transmission Plan study.

Question

> **Similarly on slide 29, did you consider whether the T-L line could be expanded at a cost less than that of the original project?**

Reply

> This was not considered. Please provide in your informal comments any recommendations to modify Staff's modeling of projects/costs incremental to the approved T-L upgrade.

Question

> **Re slide 31, given that CAISO approved in 25-26 TPP an upgrade to Path 15, and given that CAISO said it would consider the reconductoring of a path within Path 15, wouldn't be appropriate to study P15 and P26 individually within RESOLVE?**

Reply

> There are a number of data availability and modeling limitations that would make such a disaggregation very challenging at this time. Also, the incremental benefit to RESOLVE (i.e. impact on the TPP portfolios) may not be material. Please share any additional thoughts in your comments for Staff consideration.
>
> There also is a lot of solar/storage development in the GBA and Fresno areas that would seem to influence P15 in a certain manner and P26 in a different manner. How will RESOLVE manage this or how will staff manage this outside of RESOLVE if the upgrades remain coupled?
>
> Resources in Fresno/Kern are behind some of CAISO's 2024 Whitepaper constraints (e.g. Gates TB #11/#12) that restrict the interconnection of new resources in those areas. Similarly for GBA and Tesla-Bellota and Tesla-Tracy Pump. There's a real trade-off (in model run time and complexity) between representing Path 15 as an hourly congestion constraint vs annual deliverability constraints (such as these).

Question

> **Slide 31: How did the busbar mapping working group determine the in service dates for the new Path 15/26 upgrade options? Is there a sense that the congestion risk does not begin until 2037/2040?**

Reply

> The first available year for these upgrades reflects development timelines for comparable high-voltage transmission lines studied by CAISO in recent TPPs and Whitepaper ADNUs. It does not reflect/make any statement on the congestion risk.

Question

> **Slide #30: Introduce a new "HW–NG and PV–Colorado River Deliverability Constraint" with 4 GW headroom and no modeled upgrade. How does this new Arizona constraint interact with existing Colorado River constraint, and has the 4 GW headroom been validated against CAISO's latest deliverability studies?**

Reply

> This constraint is further "upstream" of the Colorado River constraint, applying to 3 busbars in Arizona (PV, Hassayampa, Hoodoo Wash) and lines from those locations delivering to North Gila and Colorado River. These 3 busbars were not added to the Colorado River 500/230 kV Area Deliverability Constraint.
>
> The 4 GW value was provided by CAISO in the working group and is (presumably) informed by latest deliverability studies.
>
> Please provide any other thoughts on this new deliverability constraint in informal comments.
>
> One additional remark - we anticipate this constraint being included in the 2026 Whitepaper.

Question

> **What (if any) effect will CAISO's cancellation of the Serrano-Del Amo-Mesa 500 kV line have on the 27-28 busbar mapping? Will it have any effect on the deliverability of resources behind the Mira Loma-Mesa constraint? Will it influence mapping of battery resources in the SCE Metro area?**

Reply

> This is a live topic under consideration. Staff anticipates that the upcoming 2026 Transmission Capability Estimates Whitepaper will provide revised TPD values reflecting cancellation of this project, as well as additional guidance with regards to CPUC Busbar Mapping.

Question

> **[Cal Advocates] The latest transmission plan states that the next draft plan will recommend the approval of a 500kV upgrade, from Windhub to Tesla, for avoided congestion costs. Why is this upgrade an option in RESOLVE, rather than a "sunk" upgrade?**

Reply

> Thanks for your question. Although the 25-26 TPP signaled likely approval of this upgrade next cycle, it has not yet technically been approved and therefore should not be modeled as "sunk."

Question

> **[Pushkar Wagle] Today's presentation does not appear to address offshore wind directly. What are Does that mean that the current assumptions for offshore wind and related transmission in the 27-28 TPP portfolios are identical to those in 26-27 TPP?**

Reply

> Hi Pushkar, this webinar is focused on possible busbar mapping methodology updates (how we map resources), and possible resource potential updates inputs into RESOLVE. This webinar is not focused on portfolio inputs and assumptions, which will happen later on in our cycle.

Question

> **If a new contract is signed in the fall after the busbar mapping is complete, can it still influence the CAISO TPP through baseline reconciliation or is that process just dealing with projects that don't appear in the white paper but did appear in the portfolio development? (Hillary Hebert)**

Reply

> Contracts that are in this category are handled on a case-by-case basis. If busbar mapping is truly complete (Final Decision has been posted), the resource wouldn't be included as an in-development resource in the mapped portfolio or in the baseline reconciliation data transmitted to the CAISO. However, CAISO handles these special cases in their modeling at their own discretion.

Question

> **[Pushkar Wagle] BTW, all questions identifying "slide #:" are my questions.**
>
> *No reply provided.*

Question

> **[Ellen Wolfe] Re slide 46 and considering interconnection costs in mapping, how will staff optimize between these costs and RESOLVE considered costs? O, for example will those costs only involve tradeoffs within a RESOLVE build cluster?**

Reply

> Hi Ellen. Interconnection costs could influence both the placement of resources within and between clusters in busbar mapping.
>
> [E Wolfe] If it is the case that busbar mapping's consideration could shift mapping between clusters, then how does Staff or the process trade off RESOLVE-optimized findings with subsequent adjustments between clusters/areas? Thx.
>
> One might imagine a case where a RESOLVE-selected Tx upgrade (made without considering full Ix-upgrade costs) is less cost-effective than another Tx upgrade when those Ix-upgrade costs are considered. In that case, staff may remap resources to avoid triggering either/both the Ix and Tx upgrade costs.
>
> Additionally, resources are mapped to busbars within the same CAISO study area to achieve a similar aggregate portfolio as what was produced by RESOLVE. Mapping between transmission clusters can be necessary for many reasons (including the example provided

above), not just interconnection/transmission criteria alignment. Each mapping decision is handled on a case-by-case basis and assesses all relevant criteria..

Question

For filtering on basis of cropland, are considering agrovoltaics, which may allow using those areas on the map.

Reply

The CEC Cropland Index Model evaluates soil quality and farmland rank in a suitability analysis. It takes into account measurements of the soil quality (sodium adsorption ratio, electrical conductivity and the CA Revised Storie Index, a common soil rating score) and a ranking of Important Farmland. It does not evaluate land suitability for agrivoltaics; that is outside the scope of the model.

Question

[Nancy Rader] Did the CEC consider CalWEA's evidence showing that the land-use screens would have screened out >40% of existing wind turbines?

Reply

Hi Nancy, yes, we have considered this. The screens are high-level datasets intended to give estimates of resource potential in a given areas, and are not meant to preclude particular project siting.

Question

[Pushkar Wagle] Slide #31: Appreciate the additional detail on the Path 26/15 tranches. However, Tranche 1 alone costs $3.187B and Tranche 2 adds another $6.09B — totaling over $9 billion. Given that the Working Group identified that a Path 26 upgrade studied in isolation,

Reply

Answered in 2nd part

Question

[Pushkar Wagle] Slide #31 (Cont'd): "would not provide significant congestion reduction, as Path 15 would remain constrained," is there a risk that RESOLVE selects Tranche 1 but not Tranche 2, resulting in a multi-billion dollar investment with limited congestion benefit?

Reply

Both tranches of upgrade will provide congestion benefit. Tranche 1 (Windhub-Tesla) upgrades both Path 26 and Path 15, and aligns with the specs (cost, incremental MW) identified by CAISO in the 25-26 TPP. Tranche 2 is more expensive because Staff assumes

that, in addition to new lines along Path 26/15, additional lines from Windhub southward (to Lugo) would be required to avoid congestion further south.

Question

Is there a pre-existing list of environmental screens/factors that could be considered for inclusion in the environmental evaluation process for Deep EGS? If so, where can that be accessed?

Reply

Yes, slide 22 of the CEC presentation lists the environmental factors that would be considered for Deep EGS. If there are other environmental factors to be considered for deep EGS please write in public comments.

Question

[Ellen Wolfe] Re land use screening for EGS that leverage a 15mi radius around substations, how will this be applied/extended to north-east CA EGS development where new high-voltage substations may be needed for delivery?

Reply

Currently, we have three substations in the north east of CA (Hilltop, Leavitt (Proposed) and Madeline (Proposed) which we can use as the center points for our land use/environmental evaluation. If there are any other methods that you can think of to address this issue, please share in comment.

Question

Is the concern of an EGS being in a high fire risk area related to running a transmission tie line through the area creating a potential fire source or simply having the generating resource in a high fire risk area which risks the reliability of the resource?

Reply

Hi Eric, it's both of those.

Question

[Nancy Rader] Did you consider evaluating earthquake risks with EGS, especially near urban areas?

Reply

Hi Nancy, we considered earthquakes in our recent "Land Use Screens 2.0" workshop which we held last week. Please see Slide 46 of: https://efiling.energy.ca.gov/GetDocument.aspx?tn=270502&DocumentContentId=107747

I was not aware of that workshop. Was it noticed to the CPUC's IRP service list?

No, it was noticed through CEC's docket: https://www.energy.ca.gov/event/workshop/2026-06/land-use-screens-electric-system-planning-proposed-updates-workshop

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Question

(Tyson Siegele on behalf of MGRA): Will pumped storage candidate resources be required to have current FERC project-level documentation (i.e., active FERC application, active FERC license, or an active FERC preliminary permit)?

Reply

We currently include PSH sites that have documentation in the FERC docket, even if they do not have an active permit or license. We do this to be consistent with previous cycles. We are not sure how to analyze PSH projects that have no FERC documentation. If you have potential data sources, on PSH sites, for us to consider, then please provide that information in written comments. We want to make sure we capture all the potential PSH plants we can.

Question

Resharing this question. I believe it got lost earlier:Do you provide the geolocation for busbars/substations that have been selected for potential resources in California? I see the substation names in the spreadsheet but it would be great to have geolocation to map them out.

Reply

Apologies for the delay in answering! We do not provide this in our process. Please submit comments on your thoughts here.

Question

Staff analysis identified CCGT units suitable for CCS retrofits; those units have been excluded from non-retention. Which specific units were excluded?

Reply

This list is on slide 80 (currently being presented).

Question

Could staff clarify whether there is any process for Commercial Interest to feed back into busbar mapping? In particular, if CI MW significantly exceed mapped MW for a given busbar, is there any process to remap more MW to that busbar? (Slide 60)

Reply

Yes, we quantify when CI MW significantly exceed mapped resources and seek to either minimize large exceedances or justify them.

Question

> **[Pushkar Wagle] Slide #80: The 14 facilities exempted from non-retention total approximately 9 GW. What is the total volume of CCGT and peaker capacity that RESOLVE selects for non-retention in the 27-28 TPP base portfolio?**

Reply

> Those capacities were introduced in the Baseline Updates section (Slide #36).

Question

> **[Pushkar Wagle] Slide #80 (Cont'd): If the CCS exemption effectively shields ~9 GW from being scored, does this force RESOLVE to concentrate retirements on a smaller pool of remaining units, potentially retiring newer, more efficient units simply because they don't have CCS development possibility?**

Reply

> While the total capacity "pool" in RESOLVE is reduced, RESOLVE does not see unit-level data and will only be making non-retention decisions by technology and zone. The decision on which units to model as not retained will be made as part of the busbar mapping process later this summer/fall.

Question

> **[Pushkar Wagle] Slide #80: The Stanford study cited as supporting evidence. Is it facility-specific, or is it a general assessment of CCS opportunities in California? Can Staff identify which specific findings from the Stanford study support exempting each of the 14 listed facilities?**

Yes, the study cited is facility-specific. The process by which units were selected is described in box 3-1 of EFI-Stanford-CA-CCS-FULL-rev2-12.11.20_0.pdf (page 73). Exact plants are identified in the supporting materials (available at https://sccs.stanford.edu/sites/g/files/sbiybj17761/files/media/file/technoeconomic_model.xlsx). Staff note that this study was only one factor; inclusion as one of the study's identified units is insufficient on its own to identify the CCS resource potential.

Question

> **When will the slides be shared ? And where ?**

Reply

> They are already posted here for the CPUC: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2024-26-irp-cycle-events-and-materials/assumptions-for-the-2027-2028-tpp. CEC slides will be posted ASAP

Question

> **Thanks all!**
>
> *No reply provided.*

Question

> **Regarding Commercial Interest, has CPUC contemplated annual surveys, RFIs, or enhanced stakeholder review to improve the quality of initial mapping results? One area of concern is the zonal interconnection process, which makes the queue a less useful source of information when CI exceeds mapped MW.**

Reply (post-webinar)

> Comments on the alignment of mapped portfolios with commercial interest (as represented by the queue and otherwise) are welcome in initial comments.
>
> We are not familiar with the problem you describe “when CI exceeds mapped MW” but we welcome follow-up explanations and engagement through comments and informal meetings.