



## CAISO Transmission Planning Process

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# Draft 2021-2022 Transmission Plan Briefing

- Posted on CAISO website on January 31, 2022  
<http://www.caiso.com/InitiativeDocuments/Draft-2021-2022TransmissionPlan.pdf>
- The draft transmission plan represents the CAISO's current thinking on system needs over the next 10-years and is an opportunity for stakeholder input before final recommendations are advanced to the CAISO Board of Governors in March



# This session is focusing on the 10 year plan approvals initiating projects in this year

December 2021

April 2021

March 2022

## Phase 1 – Develop detailed study plan

State and federal policy

CEC - Demand forecasts

CPUC - Resource forecasts and common assumptions with procurement processes

Other issues or concerns

## Phase 2 - Sequential technical studies

- Reliability analysis
- Renewable (policy-driven) analysis
- Economic analysis

Publish comprehensive transmission plan with recommended projects

## Phase 3 Procurement

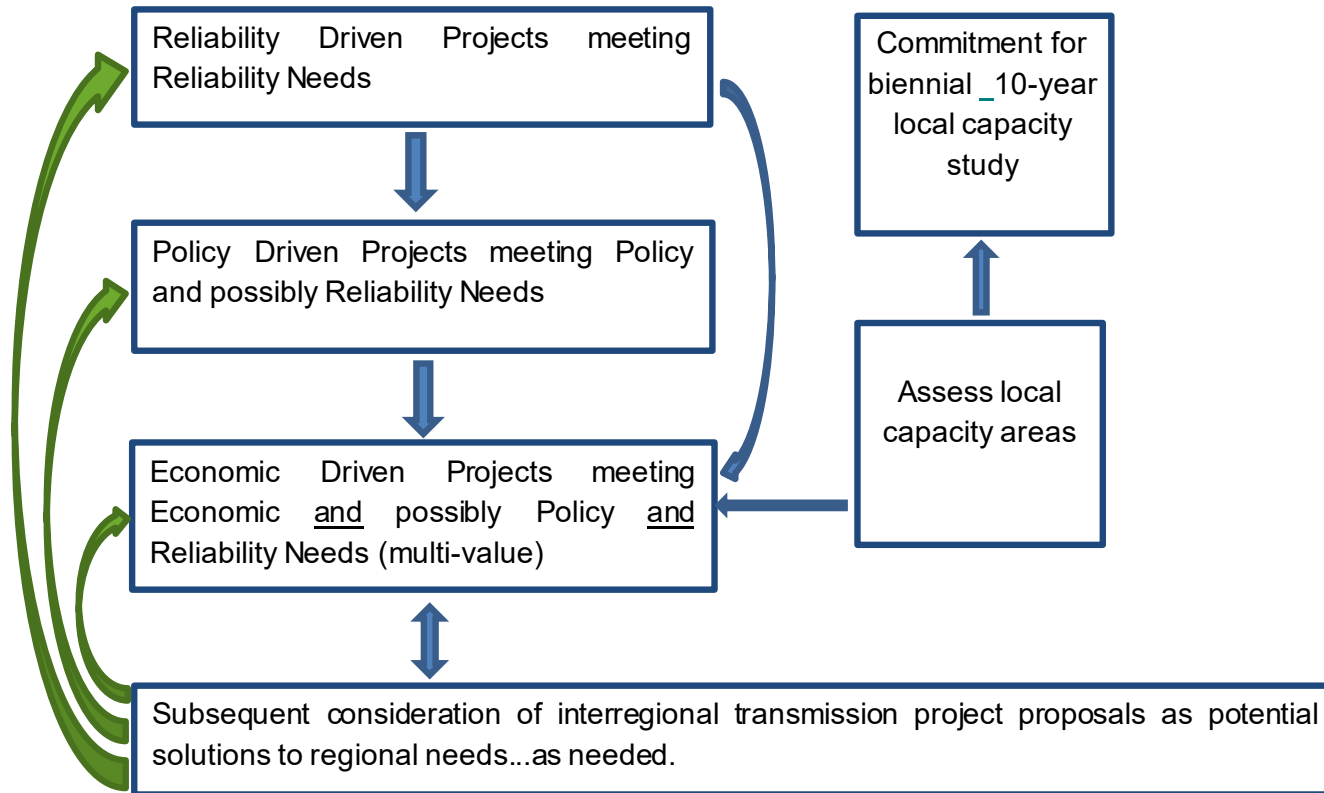
Stakeholder session #4 on Feb 7<sup>th</sup>  
Comments on Feb 22<sup>st</sup>

Revised Draft posted on Mar 10  
with B of G material  
Approval at March 16-17 B of G

## Coordination with state agencies is a critical aspect of the ISO's planning process:

- CPUC provided renewable generation “base” portfolio – based on 46 MMT GHG target to be used to determine transmission investments needed (augmented with other inputs)
  - Sensitivities testing 38 MMT and 30 MMT GHG - the later with offshore wind – were provided for information purposes
  - Base case has 2.7 times more installed capacity per year than last year. Next year will have 4.1 times more than last year.
- The ISO used the California Energy Demand Updated Forecast 2020-2031 adopted by California Energy Commission (CEC) on January 25, 2021

# Studies are coordinated as a part of the transmission planning process



# 2021-2022 Transmission Plan

- Reliability Assessment to identify reliability-driven needs (*Chapter 2*)
- Policy Assessment to identify policy-driven needs (*Chapter 3*)
- Economic Planning Study to identify needed economically-driven elements (*Chapter 4*)
- Interregional Transmission Planning Process (*Chapter 5*)
  - In year two (odd year) of 2 year planning cycle
- Other Studies (*Chapter 6*)
  - Long-term Congestion Revenue Rights
  - Frequency response
  - Wildfire Assessment – Southern California

## The CAISO found the need for 24 projects totaling \$2,944 million:

- Reliability-driven projects - 16 projects totaling \$1,412 million, including:
  - San Jose Area HVDC Lines (Newark to NRS) \*
  - San Jose Area HVDC Line (Metcalf – San Jose) \*
- Policy-driven projects - 7 projects totaling \$1,512 million, including:
  - New Collinsville 500 kV substation \*
  - New Manning 500 kV substation \*
  - GridLiance transmission upgrade project
- Economic-driven project – 1 project totaling \$20 million

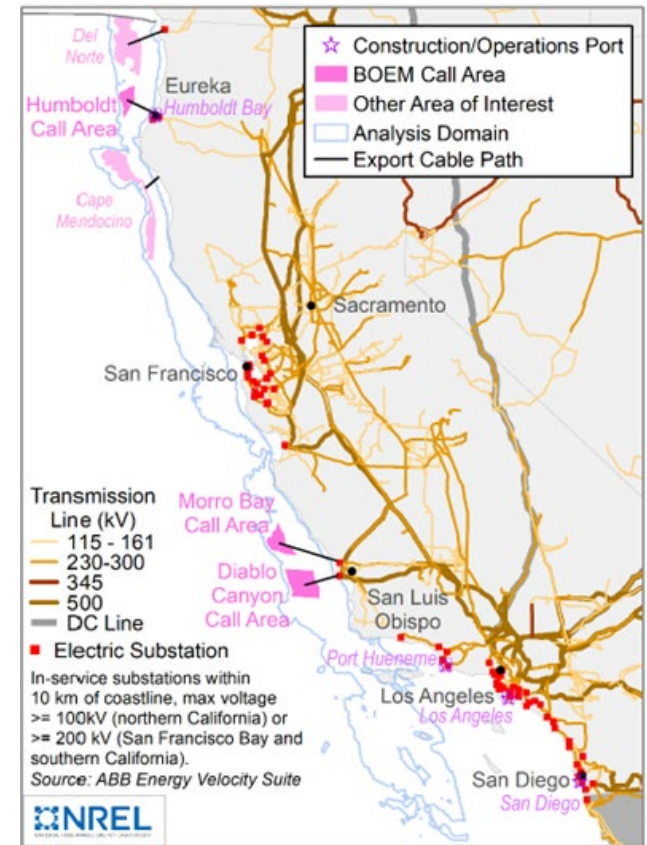
# Informational studies also explored out-of-state wind

- Out-of-state wind studies considering two cases; 1,062 MW being injected into the CAISO system from each of Idaho/Wyoming or New Mexico in the base case, but not both simultaneously, and 1500 MW from Idaho/Wyoming and from New Mexico
  - A wide range of outcomes were found based on assumptions outside of California – they will be heavily influenced by procurement interest and interregional coordination processes
  - The ISO will be exploring interest in accessing Idaho resources responding to interest from LS Power in the SWIP North project



# Informational studies also explored offshore wind

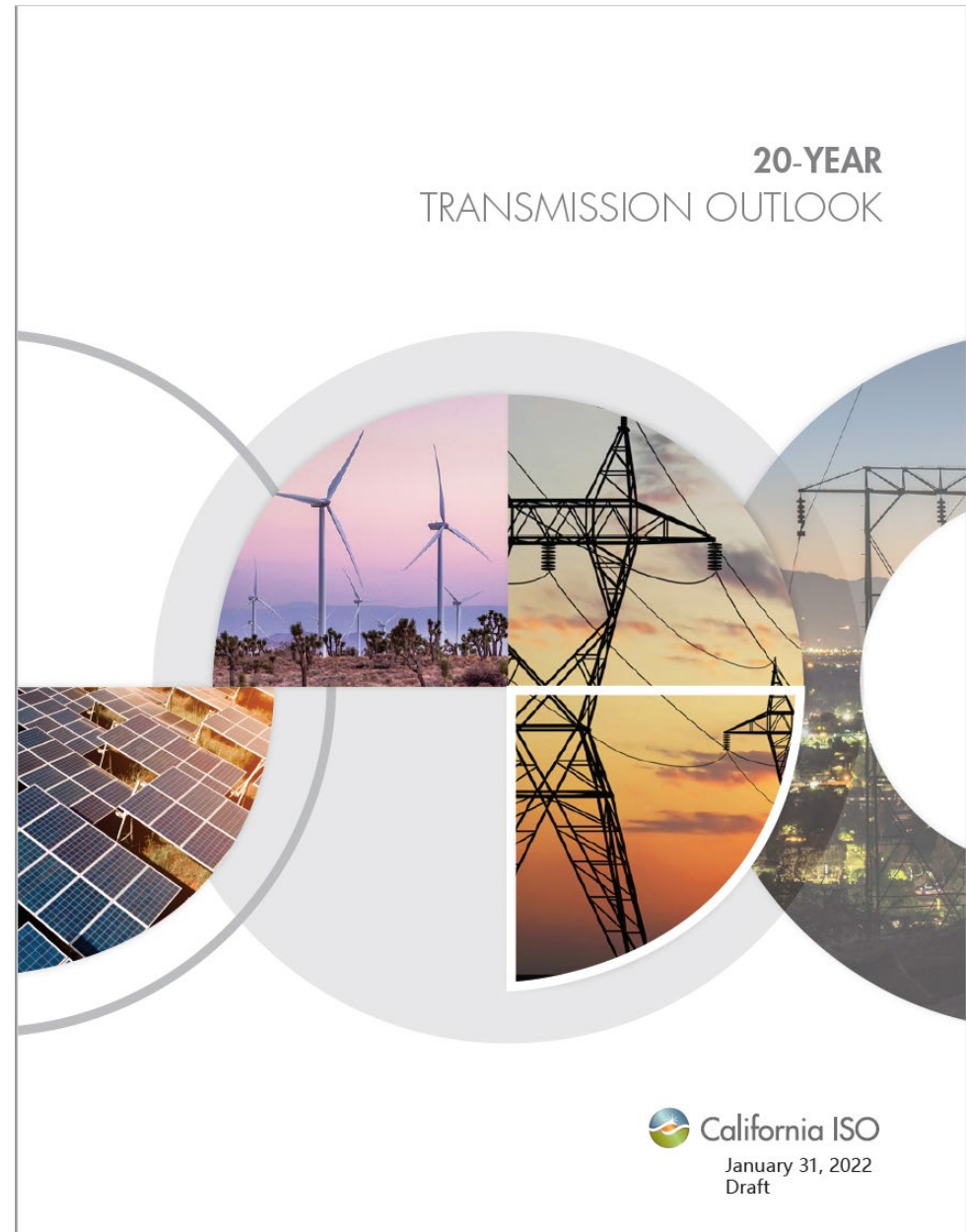
- Sensitivity 2 of CPUC portfolio included the following offshore wind resources:
  - Humboldt: 1.6 GW
  - Diablo Canyon: 4.4 GW
  - Morro Bay: 2.3 GW
- In addition, an outlook assessment will be performed to accommodate the remaining OSW resource potential:
  - Del Norte: 6.6 GW
  - Cape Mendocino: 6.2 GW
- The total offshore wind in the outlook is 21,171 MW



Source: [The Cost of Floating Offshore Wind Energy in California Between 2019 and 2032 \(nrel.gov\)](#) (Page 39)

# Draft 20-Year Transmission Outlook

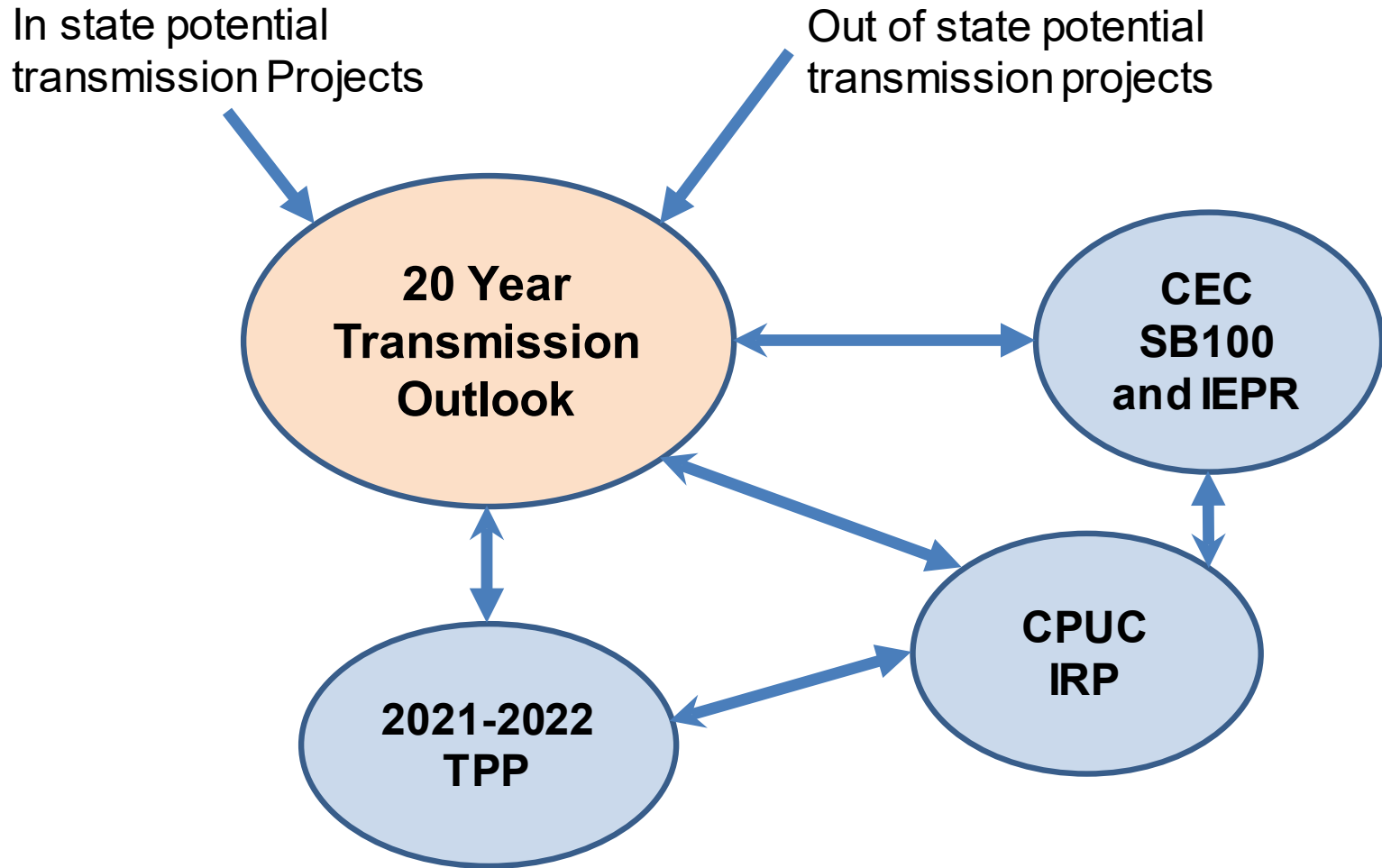
- The CAISO has produced its first ever 20-Year Transmission Outlook focused on providing a longer term view of transmission needed to reliably meet state clean energy goals
- Posted on CAISO website on January 31, 2022  
<http://www.caiso.com/InitiativeDocuments/Draft20-YearTransmissionOutlook.pdf>
- Is a draft and not as a final document – will be finalized in March in parallel with the 2021-2022 Transmission Plan



# The 20-year transmission outlook provides a “baseline” architecture setting stage for future planning activities:

- Is intended to:
  - help the state to further refine resource planning,
  - scope the challenges we face,
  - and provide longer term context for decisions made in the 10 year transmission plan process.
- Includes high level technical studies to test feasibility of alternatives, focusing on the bulk transmission system
- Used a “Starting Point” scenario docketed that:
  - has diverse resources known to require transmission development such as offshore wind energy, out-of-state resources, and geothermal
  - gas power plant retirements that may require transmission development to reduce local area constraints.

# Primary Paths for Coordination with Other Initiatives



## The 20-Year Transmission Outlook relied on collaboration with state agencies for key inputs:

- The SB 100 Starting Point scenario developed for the outlook totaled over 120 GW of new resources, including 53 GW grid-connected solar, 37 GW battery storage, 2.3 GW geothermal, 4 GW pumped hydro/long duration storage, 24 GW wind (split between in state, out of state, and offshore)
  - Wind generation was split into 2.2 GW in state, 12 GW out of state, and 10 GW offshore
  - The scenario also assumed retiring 15 GW of gas-fired generation
- SB 100 Core statewide high electrification load projection of 82 GW in 2040, reflecting 30 GW behind the meter solar, was used.

# Illustration of Transmission Development

4-7 GW Offshore Wind

North Coast Wind



Load Center (4.5 GW Gas Retirement)

3-6 GW Offshore Wind

Central Coast Wind

California-Oregon Intertie

1 GW

2 GW Solar

Pacific DC Intertie

13 GW Path

15

6 GW

9 GW

2 GW

West of the River

2 GW

1 GW

5 GW Solar

2 GW Geothermal

4 GW

Load Center (3.5 GW Gas Retirement)

6 GW

10 GW Solar

WY/ID Wind

5 GW Out-of-State Wind

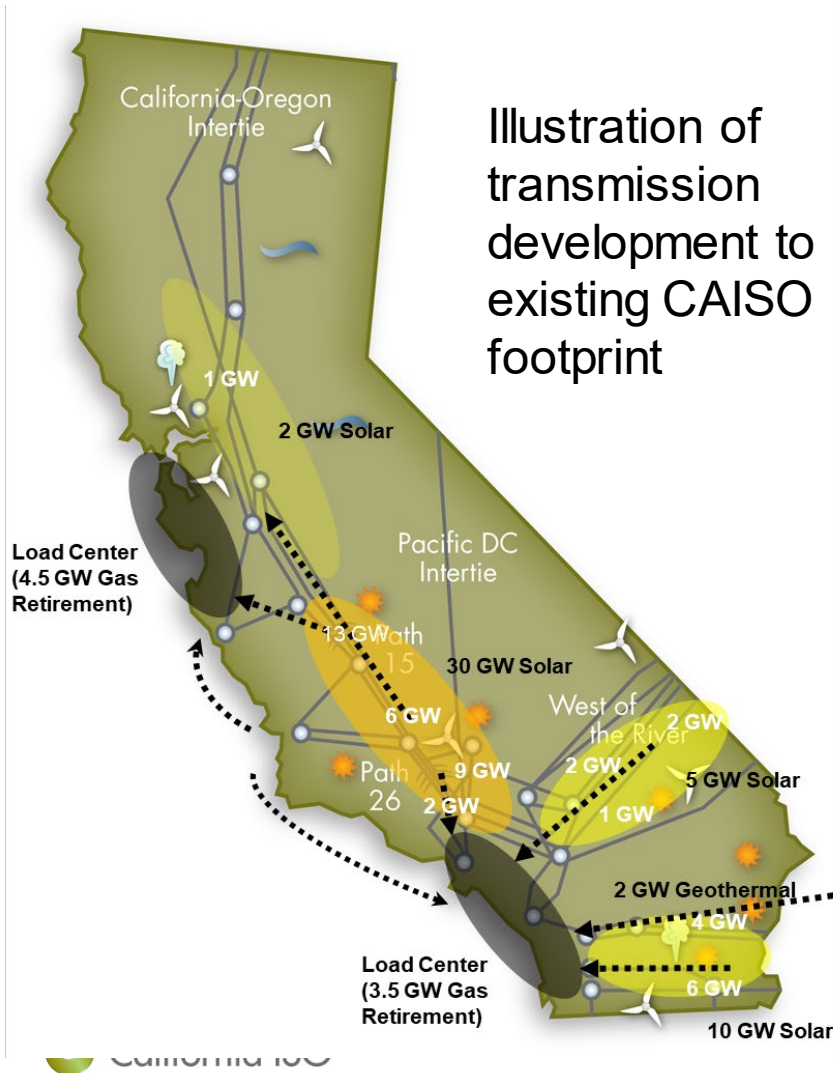
Additional Transmission Required

Transmission Projects in Development Stages (SB100 Workshop)

5 GW Out-of-State Wind

NW Wind

# Transmission upgrades to existing CAISO footprint

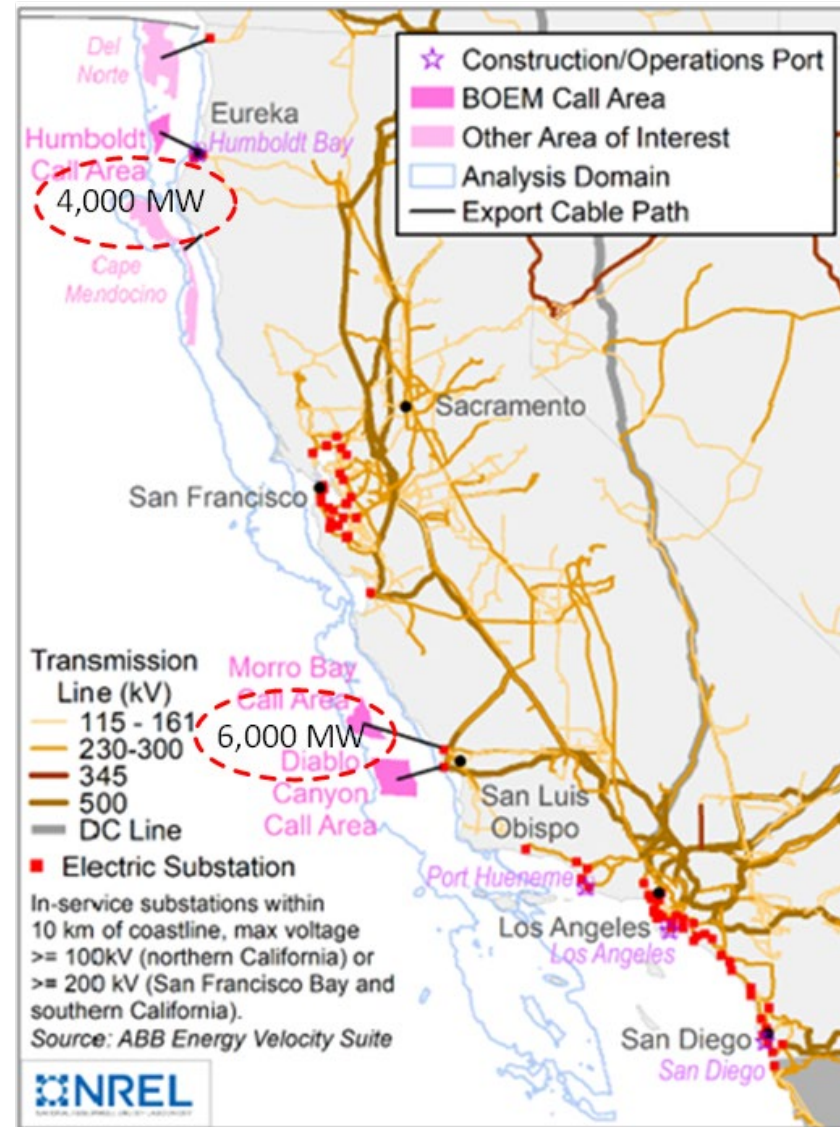


Transmission Development	Description	Cost Estimate
<b>Upgrades to existing ISO footprint</b>		<b>10.74</b>
Eldorado – Lugo 500 kV line	- 180 mi of 500 kV line - Series compensation in number of locations	\$1 B
Colorado River – Devers 500 kV line	- Devers – Red Bluff 500 kV line - Red Bluff – Colorado River 500 kV line	\$1.2 B
North Gila – Imperial Valley 500 kV line	- 85 mi of 500 kV line - Series compensation	0.5 B
Westland 500/230 kV station	- 50 mi of 500 kV line - New 500/230 kV substation with two transformers (\$200M)	0.5 B
Second Los Banos – Tracy 500 kV line	- 67 mi of 500 kV line	\$0.33 B
Third Collinsville – Pittsburg 230 kV cable	- 230 kV cable	\$0.14 B
Manning – Moss Landing 500 kV line	- 78 mi of 500 kV line - New 500/230 kV substation with two transformers (\$100M)	\$0.50 B
Devers – La Fresa HVDC	- 100 mi of DC cables - Two VSC HVDC converter	\$1.2 B
Lugo – LA Basin HVDC	- 80 mi of DC cables - Two VSC HVDC converter	\$1.0 B
Sycamore – Alberhill HVDC	- 82 mi of DC cables - Two VSC HVDC converter	\$1.0 B
Diablo – South HVDC	- Four VSC converter stations - 250 miles HVDC cables	\$1.85 B
Diablo – North HVDC	- Four VSC converter stations - 200 miles HVDC cables	\$1.60 B
Round Mountain 500/230 kV Transformer	- Add one 500/230 kV transformer	\$0.1 B
Lugo 500/230 kV Transformers	- Add one 500/230 kV transformer	\$0.1 B

# Offshore Wind

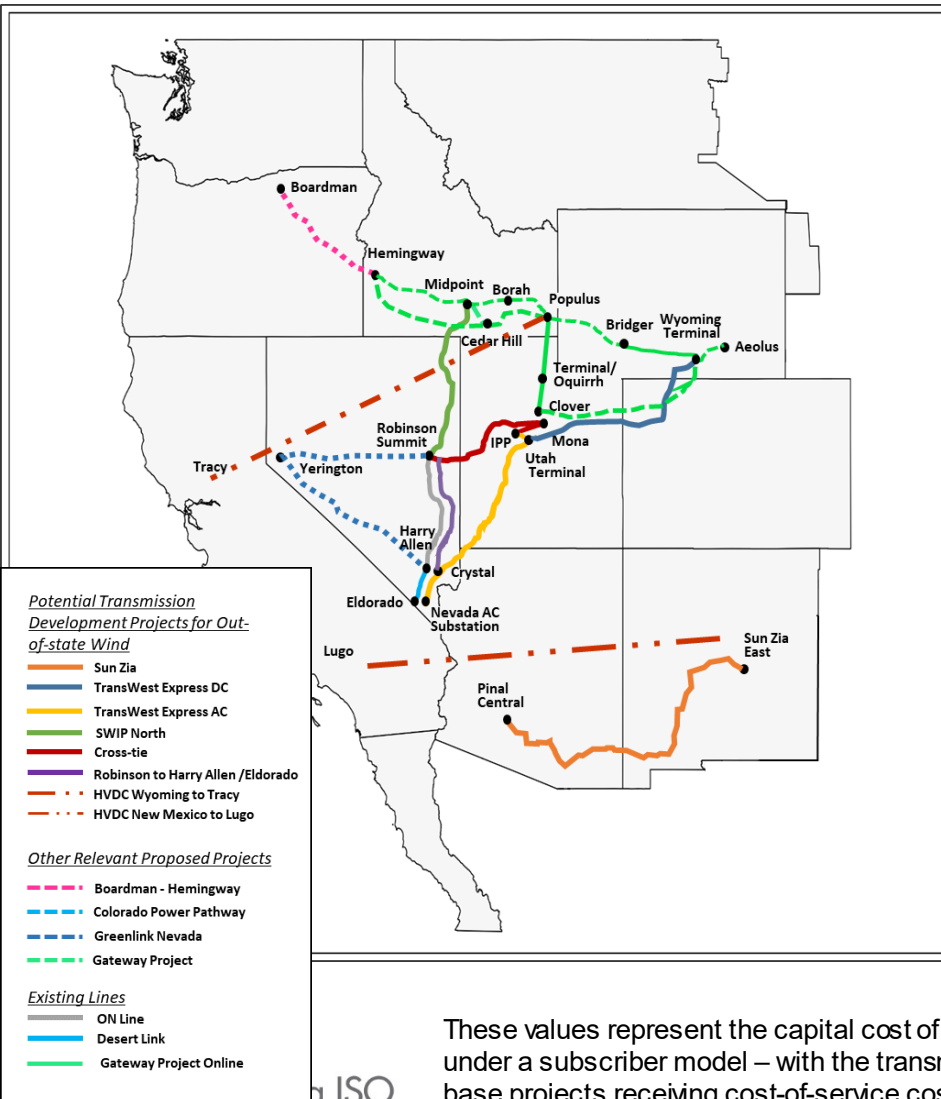
- 10 GW of offshore wind
  - 6 GW in central coast
  - 4 GW in north coast
- Current areas of environmental and leasing development at Bureau Ocean Energy Management (BOEM)
  - Humboldt call area
  - Morro Bay call area

Transmission Development	Description	Cost Estimate
Offshore Wind		\$8.11 B
Humboldt Bay Offshore wind area	Total of 4,000 MW offshore wind connected through two of the following options: - Option 1 (Fern Road): \$2.3 B - Option 2 (Bay Hub): \$4.0 B - Option 3 (Collinsville): \$3.0 B Facilities required to interconnect the transmission options connecting to the different offshore wind areas: \$0.5B-\$1.0B.	\$5.8 B– \$8.0 B
Diablo – Morro Bay Offshore wind area	- Total of 6,000 MW offshore wind. Connected to Diablo 500 kV and the new Morro Bay 500 kV substation. - The cost estimate is only for a 500 kV switching station and looping in the existing Diablo – Gates 500 kV line into it.	0.11 B





# Transmission development for out-of-state wind



Transmission Development	Description	Cost Estimate
<b>Out-of-State Wind</b>		
<b>\$11.65 B</b>		
SWIP-North	275 mile 500 kV line from Midpoint to Robinson substation with upgrade to On Line from Robinson to Harry Allen to access Idaho wind resources	\$0.64 B
Cross-Tie	214 mile 500 kV line from Robinson to Mona/Clover to access Wyoming wind resources	\$0.67 B
Robinson-Eldorado	500 kV transmission line from Robinson to Harry Allen/Eldorado	\$0.64 B
TransWest Express	732 Mile transmission system consisting of HVDC and 500 kV facilities to access Wyoming wind. Project is designed to potentially provide 1500 MW to LADWP at the IPP facilities in Utah and 1500 MW to the CAISO at Harry Allen/Eldorado	\$2.1 B
SunZia	530 mile HVDC line and 35 mile 500 kV AC line plus scheduling rights on existing lines from Pinal Central to Palo Verde connecting to the CAISO system to access New Mexico wind resources	\$2.6 B
Additional transmission for additional wind resources from Wyoming/Idaho area	HVDC transmission line from the wind resource area to northern California (Tesla area)	\$2.5 B
Additional transmission for additional wind resources from New Mexico area	HVDC transmission line from the wind resource area to southern California (Lugo area)	\$2.5 B

These values represent the capital cost of the identified projects; several are currently being developed under a subscriber model – with the transmission costs incorporated into the energy costs – and not rate-base projects receiving cost-of-service cost recovery that would be added to CAISO transmission access charges.

## Conclusions and next steps

- The 20-Year Transmission Outlook provides a long-term conceptual plan of the transmission grid in 20 years, meeting the resource and electric load needs aligned with state agency input on integrated load forecasting and resource planning, as the basis for further dialogue.
- After finalizing this draft in March, the CAISO intends to:
  - Look for discussion of the findings in ongoing SB 100 processes and perhaps additional stakeholder sessions
  - Collect input on issues and parameters that could be considered and refined in a future outlook development cycle – thinking about 2023
  - Provide industry an update on the 20-Year Outlook activities and communicate intentions going forward, by year end.



# Draft 2022-2023 Transmission Planning Process - Study Plan

- Posted on CAISO website on February 18, 2022

<https://stakeholdercenter.caiso.com/RecurringStakeholderProcesses/2022-2023-Transmission-planning-process>

The draft study plan represents the CAISO's current assumptions for the 2022-2023 transmission planning process and will be finalized based upon comments by the end of March 2022

2022-2023 Transmission Planning Process  
Unified Planning Assumptions  
And Study Plan

February 18, 2022

Draft

# 2022-2023 Transmission Planning Process

January 2022

April 2022

March 2023

## Phase 1 – Develop detailed study plan

State and federal policy

CEC - Demand forecasts

CPUC - Resource forecasts and common assumptions with procurement processes

Other issues or concerns

## Phase 2 - Sequential technical studies

- Reliability analysis
  - Renewable (policy-driven) analysis
  - Economic analysis
- Publish comprehensive transmission plan with recommended projects

## Phase 3 Procurement

CAISO Board for approval of transmission plan

# 2022-2023 Transmission Plan Milestones

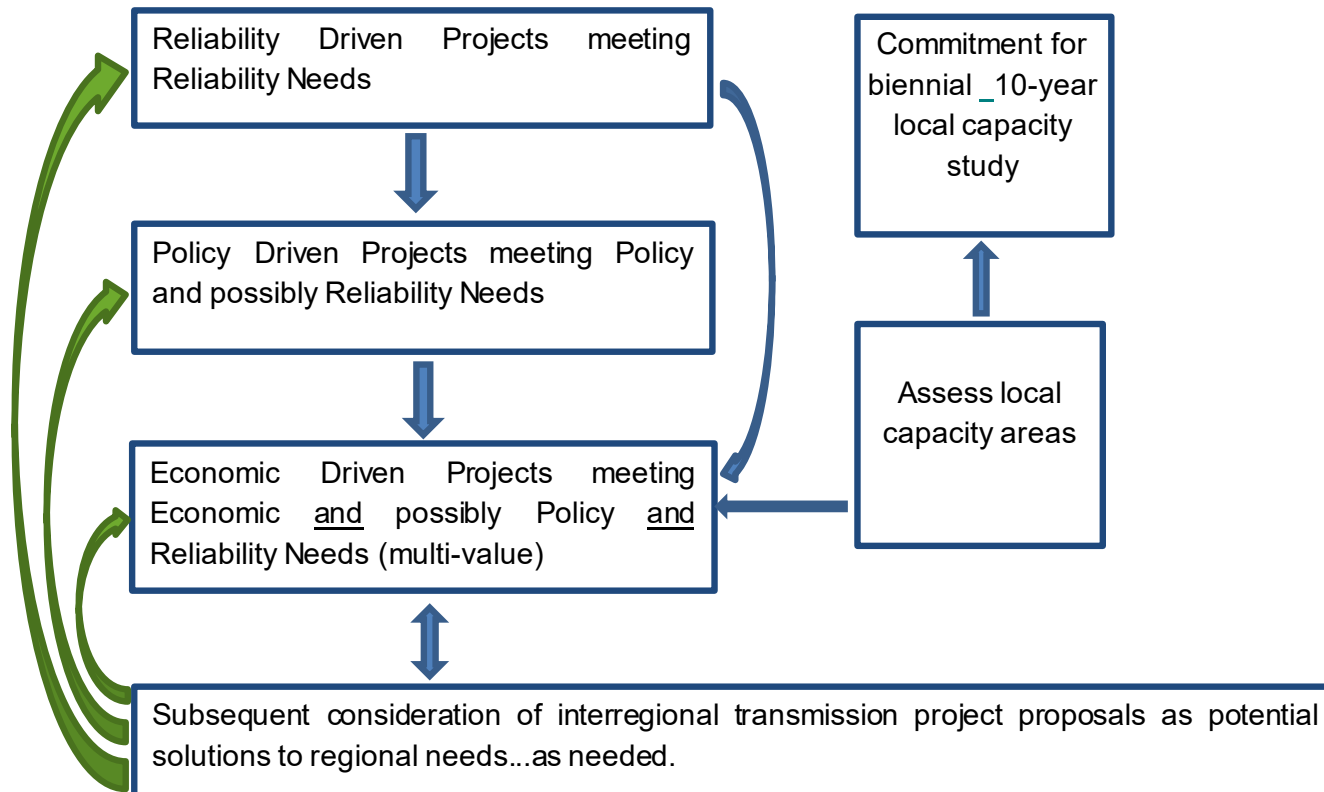
- Draft Study Plan posted on February 21
- Stakeholder meeting on Draft Study Plan on February 28
  - Comments to be submitted by March 14
- Final Study Plan to be posted on March 31
- Preliminary reliability study results to be posted on August 15
- Stakeholder meeting on September 27 and 28
  - Comments to be submitted by October 12
- Request window closes October 15
- Preliminary policy and economic study results on November 17
  - Comments to be submitted by December 5
- Draft transmission plan to be posted on January 31, 2023
- Stakeholder meeting in February
  - Comments to be submitted within two weeks after stakeholder meeting
- Revised draft for approval at March Board of Governor meeting

# 2022-2023 Transmission Planning Process

## Key Inputs

- Portfolio included in CPUC Decision 22-02-004 for use in CAISO 2022-2023 transmission planning process  
<https://docs.cpuc.ca.gov/SearchRes.aspx?docformat=ALL&docid=451412947>
  - Baseline portfolio
    - Reliability, Policy and Economic Assessments
  - Sensitivity portfolio
    - For special study
- 2021 IEPR California Energy Demand forecast adopted by the CEC on January 26, 2022  
<https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2021-integrated-energy-policy-report/2021-1>

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# 2022-2023 Transmission Plan Study Plan

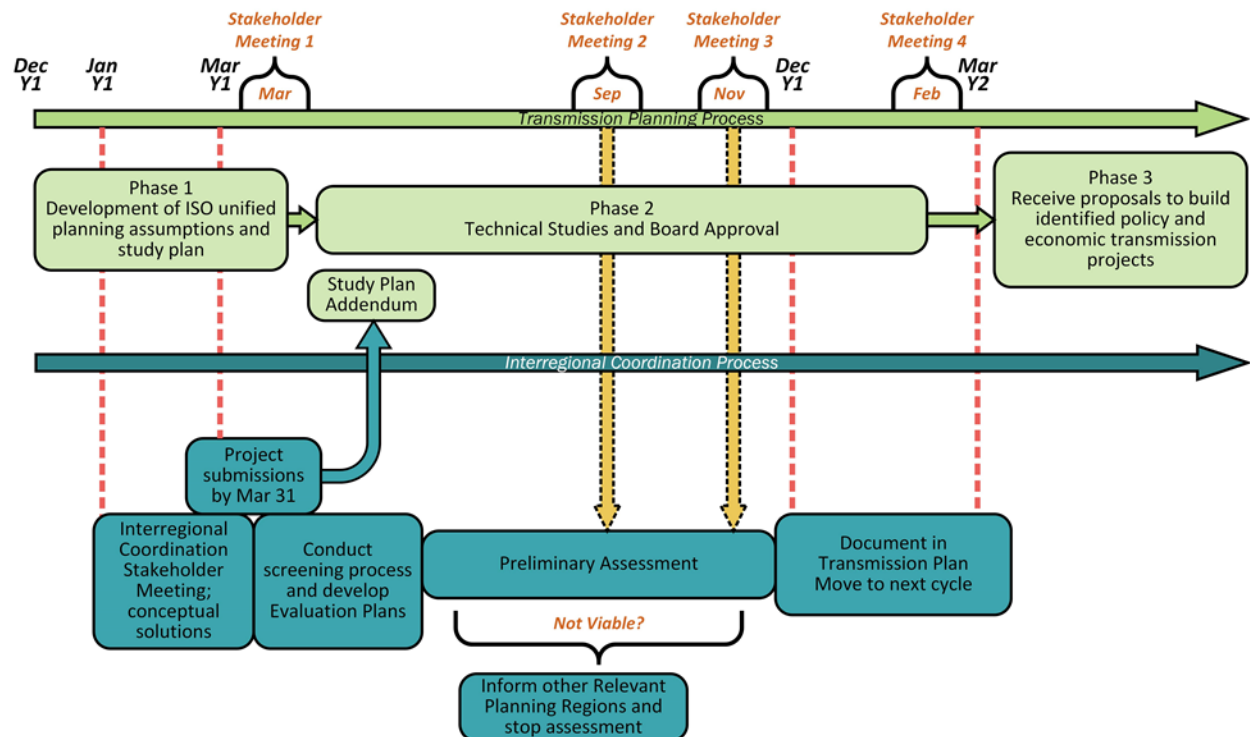
- Reliability Assessment to identify reliability-driven needs
- Policy Assessment to identify policy-driven needs
- Economic Planning Study to identify needed economically-driven elements
- Other Studies
  - Local Capacity Technical studies
    - Long-term local capacity technical study will be conducted
  - Maximum Import Capability expansion requests
  - Long-term Congestion Revenue Rights
  - Frequency response



# Interregional Transmission Coordination - Year 1 of 2

- Open window (January 1 through March 31) for proposed interregional transmission projects to be submitted to the CAISO for consideration in the CAISO's 2022-2023 TPP planning cycle
- The CAISO will host a joint western planning regions' stakeholder call on March 4, 2022.

## Year 1 (Even Year) - Interregional Coordination Process



<http://www.caiso.com/planning/Pages/InterregionalTransmissionCoordination/default.aspx>

# Special Studies

## High Electrification Scenario

- To evaluate the potential reliability impacts to the transmission facilities based on a high electrification scenario.
  - The CEC, in collaboration with the CPUC and the CAISO, is developing a demand scenario that places a greater emphasis on electrification than is embedded within the CEC's 2021 IEPR energy demand forecast.
  - The CPUC will also be developing a resource portfolio based upon the high electrification scenario.
  - The CEC and CPUC are targeting to provide the high electrification scenario load forecast and resource portfolio to the CAISO by June 1, 2022.
  - The CAISO will engage stakeholders when further details are available.

# Special Studies

## Reduced Reliance on Aliso Canyon Gas Storage

- Transmission study to evaluate the potential reliability impacts to the transmission facilities in the LA Basin and to some extent the San Diego-Imperial Valley local capacity areas in the CAISO Balancing Authority Area due to strong interaction between these two areas.
- The CAISO will work with the CPUC to obtain potential ranges of gas-fired generation capacity impacts.
- The CAISO will engage stakeholders when further details are available.