DOCKETED	
Docket Number:	21-SIT-01
Project Title:	21-SIT-01, SB100 Implementation Planning for SB100 Resource Build
TN #:	241598
Document Title:	Agency Presentations for SB 100 Workshop Feb 22, 2022
Description:	Agency Presentations for the Joint Agency Workshop to Plan for Senate Bill 100 Resource Build – Analysis of Land Use Implications
Filer:	susan fleming
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	2/22/2022 8:05:03 AM
Docketed Date:	2/22/2022

Joint Agency Workshop to Plan for Senate Bill 100 Resource Build – Analysis of Land Use Implications

February 22, 2022

Agenda

1. Introduction
2. Agency Leadership Opening Remarks
3. Presentations: Current Status of Resource Build Planning and Coordination on Land Use
4. Panel Discussion: Perspectives on the 2040 SB 100 Starting Point Scenario and Next Steps to Plan for the Resource Build
5. Panel Discussion: Perspectives on Considering Land Use in SB 100

Public Comment Instructions

Rules
- 3 minutes per person
- 1 person per organization

Zoom
- Click “raise hand”

Telephone
- Press *9 to raise hand
- Press *6 to (un)mute

When called upon
- Unmute, spell name, state affiliation, if any

Written Comments:
- Due: Thursday, 3/10/22 by 5:00 p.m.
- Docket: 21-SIT-01
- Submit at: **https://efiling.energy.ca.gov/EComment/Ecomment.aspx?docketnumber=21-SIT-01**

3-MINUTE TIMER

Agency Leadership Opening Remarks

- **Karen Douglas**, CEC Commissioner
- **Siva Gunda,** CEC Vice Chair
- **Alice Reynolds**, CPUC President
- **Clifford Rechtschaffen**, CPUC Commissioner
- **Darcie Houck**, CPUC Commissioner
- **John Reynolds**, CPUC Commissioner
- **Elliot Mainzer**, CAISO President
- **Dr. Jennifer Norris**, Deputy Secretary for Biodiversity and Habitat, California Natural Resources Agency

California Public Utilities Commission
Jared Ferguson

Land Use Analysis and Coordination in IRP-related Activities

February 2022

Workshop on SB100 Implementation: Plan for Senate Bill 100 Resource Build – Analysis of Land Use Implications

Energy Division Staff Presentation

California Public Utilities Commission

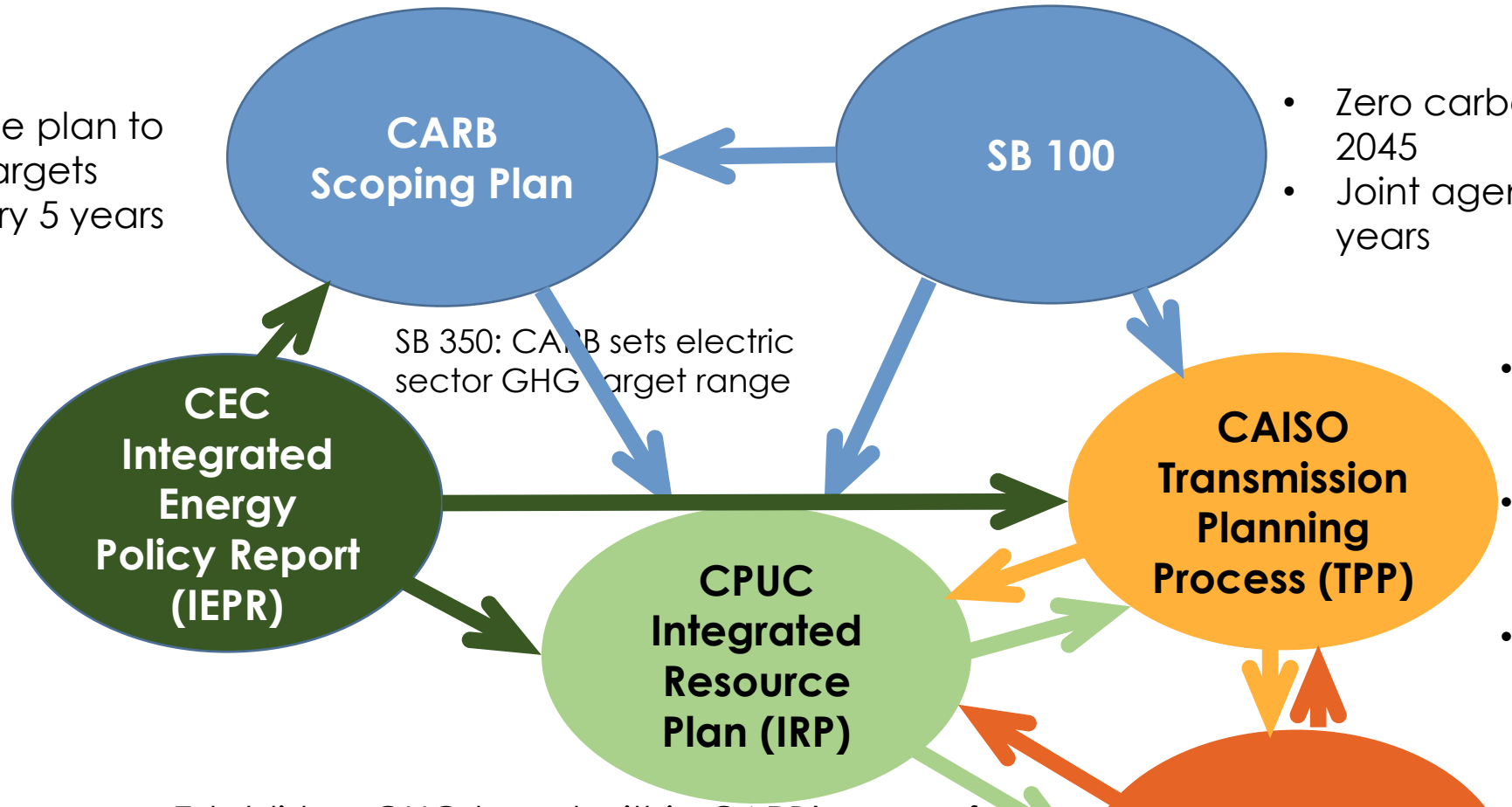
Outline

- Overview of Integrated Resource Planning (IRP)
- Summary of the 2021 Preferred System Plan (PSP)
- Land use analysis and coordination within IRP process
  - RESOLVE – IRP's capacity expansion model
  - Busbar Mapping
- Continued coordination in upcoming IRP cycle

Integrated Resource Planning (IRP) in California Today

- The objective of IRP is to reduce the cost of achieving greenhouse gas (GHG) reductions and other policy goals by looking across individual LSE boundaries and resource types to identify solutions to reliability, cost, or other concerns that might not otherwise be found.
- Goal of the 2019-2021 IRP cycle was to ensure that the electric sector is on track to help California reduce economy-wide GHG emissions 40% from 1990 levels by 2030, per SB 32, and to explore how achievement of SB 100 2045 goals could inform IRP resource planning in the 2020 to 2032 timeframe.
- The IRP process has two parts:
  - First, it identifies an optimal portfolio for meeting state policy objectives and encourages the LSEs to procure towards that future.
  - Second, it collects and aggregates the LSEs collective efforts for planned and contracted resources to compare the expected system to the identified optimal system. The CPUC considers a variety of interventions to ensure LSEs are progressing towards an optimal future.

IRP within California's Electricity Planning Ecosystem



- Economy-wide plan to reach GHG targets
- Updated every 5 years

- Zero carbon electricity by 2045
- Joint agency report, every 4 years

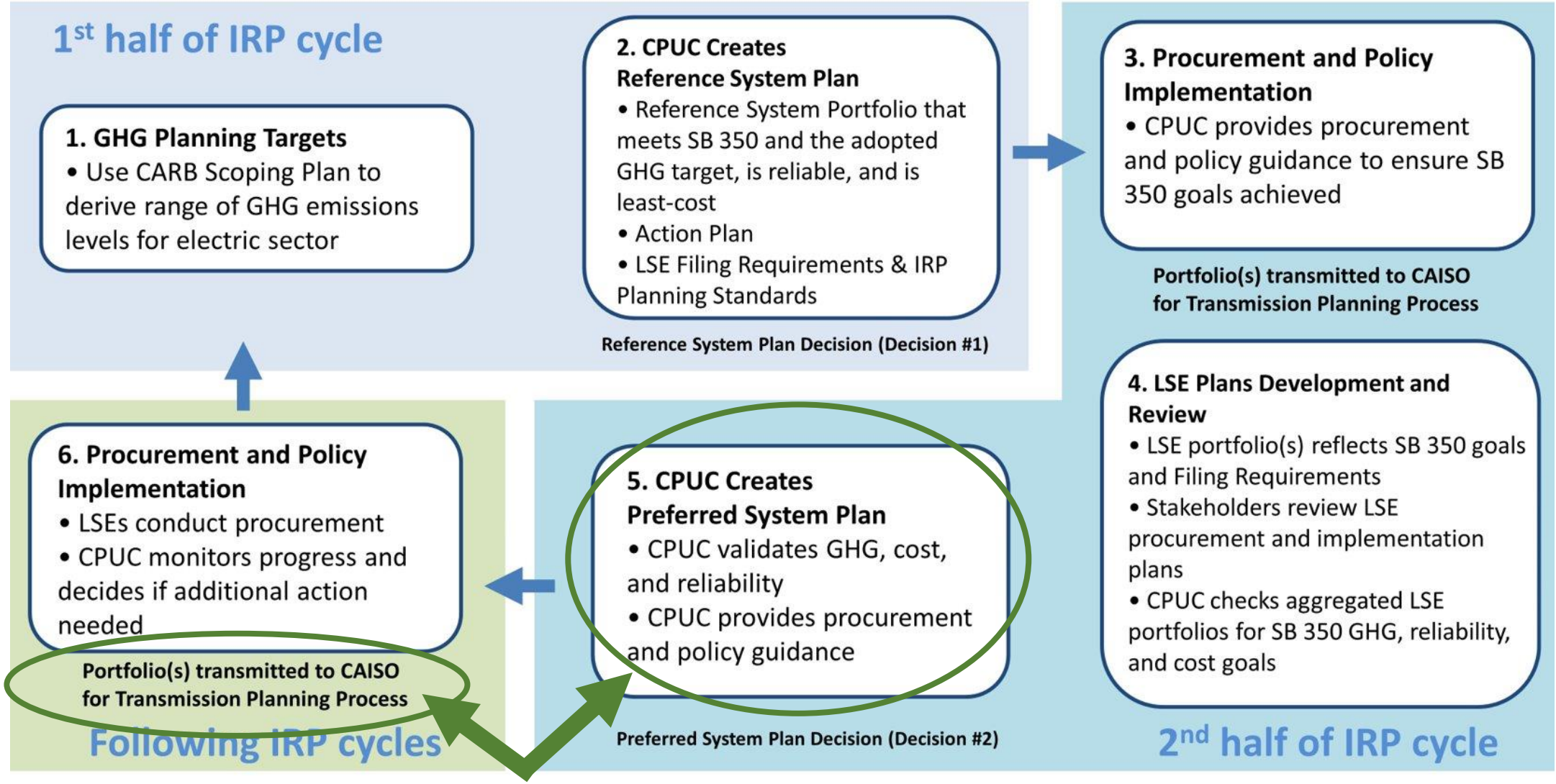
- Demand forecast for infrastructure planning
- Updated annually

- Assess transmission needs
- Conceptually approves new projects
- Updated annually

- Establishes GHG target within CARB's range for CPUC-jurisdictional LSEs
- Orders procurement + oversees compliance
- Annually transmits portfolios for CAISO transmission planning

- Plans filed per SB 350 + CPUC guidance
- Procurement in compliance w/ CPUC directives

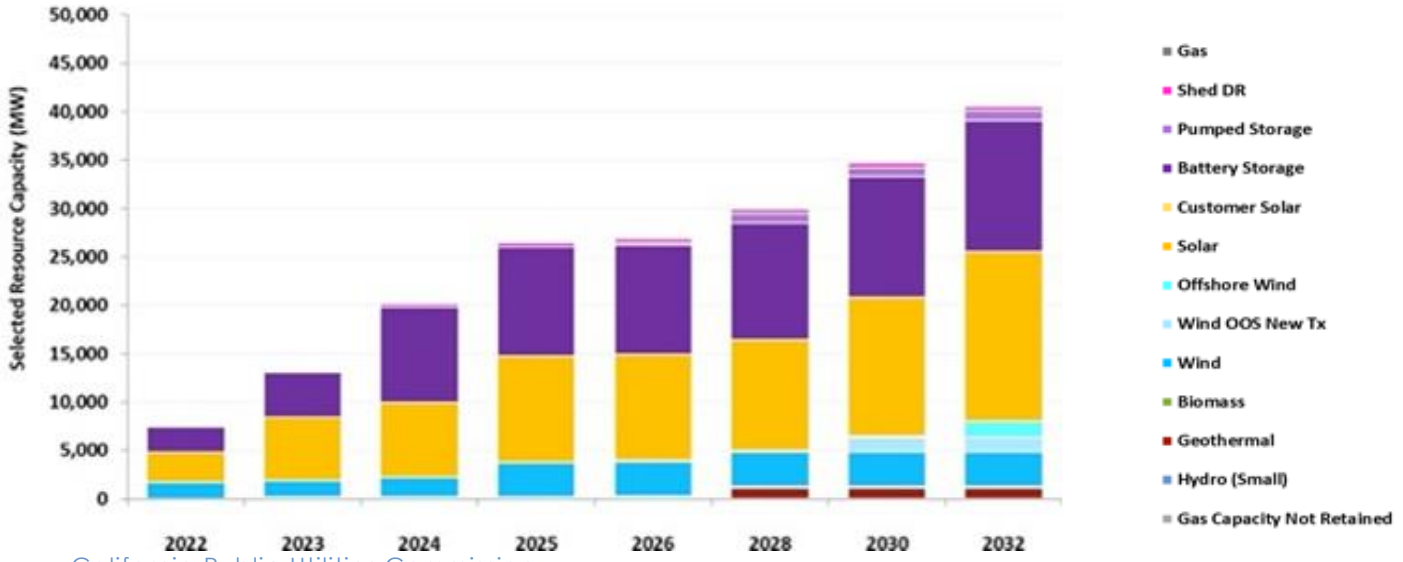
Overview of the 2019 – 2021 IRP Cycle



Recently completed with CPUC's adoption of the 2021 Preferred System Plan

2021 Preferred System Plan (PSP)

- Decision adopted by the CPUC on February 10, 2022:
  - Lowers the 2030 GHG target to 38 million metric tons (MMT) from the previous 46 MMT target adopted for the RSP earlier this cycle.
  - Includes a PSP Portfolio for use in planning, procurement, and to be transmitted to the California Independent System Operator (CAISO) for use in the 2022-23 Transmission Planning Process (TPP).
- PSP portfolio includes approximately 25,500 MW (nameplate) of new supply-side renewables and 15,000 MW of new storage and demand response resources by 2032.
  - Includes aggregated LSE plans and assumes procurement in compliance with the Mid-Term Reliability (MTR) Decision 21-06-035



Resource Type	MW by 2032
Biomass	134
Geothermal	1,160
Wind	3,531
Wind OOS New Tx	1,500
Offshore Wind	1,708
Utility-Scale Solar	17,506
Battery Storage	13,571
Long-duration Storage	1,000
Shed Demand Response	441
Total	**40,551**

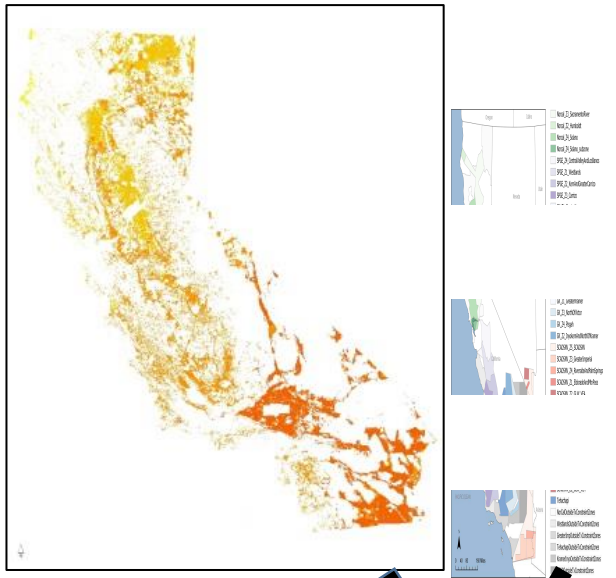
Land Use Analysis and Coordination in IRP

Two key points in the IRP for land-use /environmental data implementation and coordination:

- **Candidate Resource Screens in RESOLVE:** RESOLVE is used in the CPUC IRP process for capacity expansion modeling to create optimal least-cost portfolios that inform the resource types and quantities needed within specific time horizons
  - Utilized to help develop the portfolios adopted in the Reference System and Preferred System Plans
  - Model informs generation + transmission infrastructure planning needs within the planning horizon (i.e. now through 2035)
- **Resource to Busbar Mapping** ("busbar mapping"): The process for translating geographically coarse portfolios developed through IRP to plausible network modeling locations for use in the CAISO's annual Transmission Planning Process (TPP).
  - The CPUC typically transmits multiple distinct portfolios developed in the IRP process:
    - Reliability and Policy-Driven Base Case portfolio -> used by the CAISO in the TPP assessment to identify transmission solutions that then go to the CAISO Board of Governors for approval
    - Policy-Driven Sensitivity portfolio(s) -> used for study purposes and transmission solutions do not go for approval; results provide transmission information for future IRP work
  - Joint effort using stakeholder vetted methodology by a working group comprised of CPUC, CEC, and CAISO staff

Land Use Analysis in RESOLVE

- RESOLVE model utilizes a broad array of inputs and assumptions
  - Most recently developed at the start of the current IRP cycle in 2019 (I&A Document for 2019-20 IRP)
  - Some additional updates since (e.g. new resource cost and transmission limits)
- To identify amounts and locations of candidate renewable resources in RESOLVE, staff utilized CEC developed land use data and screens.
  - Worked with CEC staff to first implement screens in RESOLVE in 2016
  - Raw technical potentials were filtered through a set of environmental screens which
    - Excluded areas under Renewable Energy Transmission Initiative (RETI) Category 1 and 2 Lands
    - Included development areas identified in the Desert Renewable Energy Conservation Plan and San Joaquin Valley Solar Assessment
  - Resource potentials are aggregated into RESOLVE resources based on CAISO's transmission zones.



Screened Solar Resource Potential

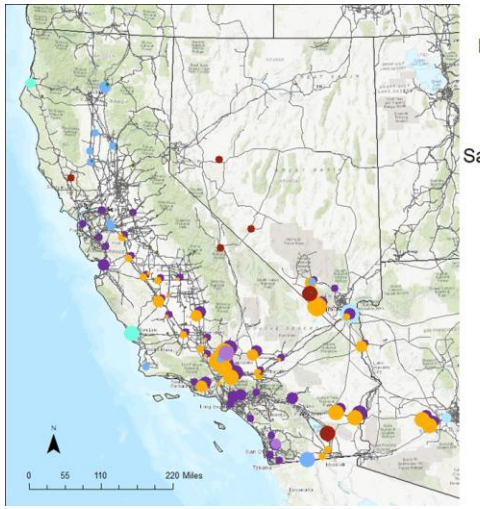
CAISO Transmission Zones in RESOLVE

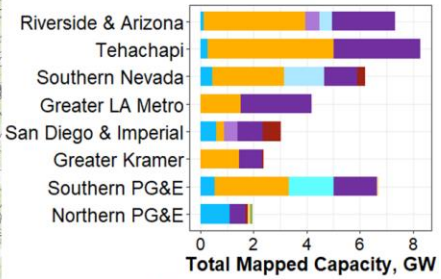
Solar potential aggregated into areas based on Tx zones for RESOLVE to select as candidate resources

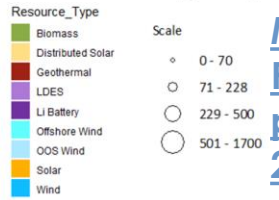
RESOLVE Solar Resources	MW Potential
Tehachapi	4,801
Westlands	56,151
Kern & Greater Carizo	8,329
Greater Imperial	35,216
Sacramento River	23,484

Land Use Analysis in Busbar Mapping (1/2)

- Busbar Mapping process described in detail in the most recent Methodology Document developed by the working group.
- Working Group's seeks to balance mapped resources' alignment with the following criteria:
  i. Distance to transmission
  ii. Transmission capability limits
  iii. Land use and environmental constraints
  iv. Commercial development interest
  v. Consistency with prior year's TPP mapping
- Additional criteria for stand-alone battery storage (i.e. prioritizing DACs and Non-attainment areas)
- CAISO staff produce transmission zone capability limits and upgrade cost estimates and provide feedback on transmission implications of mapping.
- CEC staff compile land-use and environmental data *(table right)* and implement screens to assess mapping's land use impact potential.







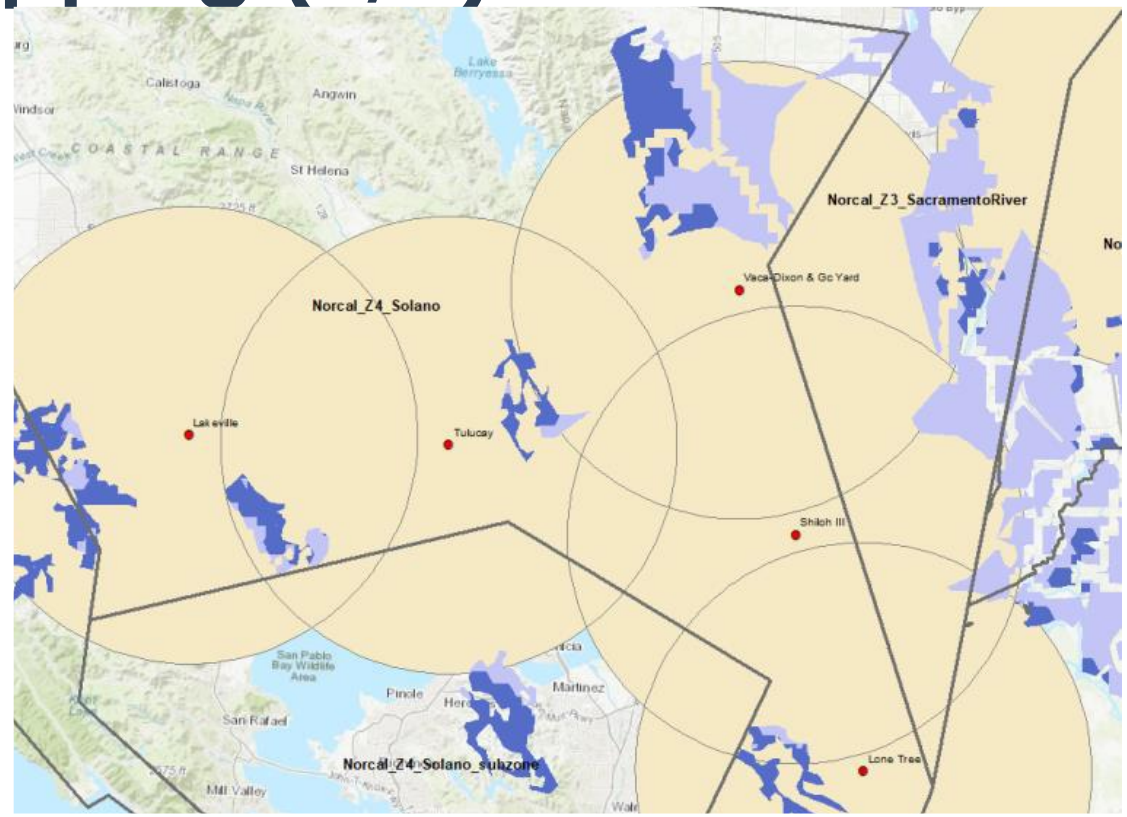
Mapping Results of the portfolio for the 2022-23 TPP

Environmental and Land Use Data Sets Utilized in Busbar Mapping

- Terrestrial Landscape Intactness (California Energy Commission and Conservation Biology Institute, 2016)
- Areas of Conservation Emphasis, version 3.0 (ACE III) (California Department of Fish and Wildlife, 2018)
  i. Terrestrial Connectivity
  ii. Biodiversity
  iii. Rarity
  iv. Native species
  v. Irreplaceability
- California Agricultural Value (California Energy Commission and Conservation Biology Institute, 2018)
- Natural Landscape Blocks
- Wildfire Threat
- Western Electricity Coordinating Council (WECC) Environmental Risk Dataset (utilized for resources mapped outside of California)

Land Use Analysis in Busbar Mapping (2/2)

- Implementation of Land Use and Environmental Data in busbar mapping:
  - Utilize geographic maps of resource potentials used by RESOLVE filtered to economical distances from existing and proposed substation.
  - Overlay environmental and land use information to identify potential implications.
- Working group seeks to minimize mapping to areas with high environmental and land use implications, while still aligning with other criteria.
- Busbar mapping methodology focuses on the 10-year planning horizon. It is not necessarily equipped to effectively account for the significant build out of renewables needed by 2045 as shown in the SB 100 report.



Blue areas indicate wind resource potential. Dark blue indicates higher potential impact based on land use screens; purple indicate lower potential impact. Faded yellow circles indicted 15-miles radius from substations.

Continued Collaboration in the Upcoming IRP Cycle

Updates to IRP's Inputs and Assumptions (I&A) as part of the start of the new IRP cycle:

- Includes planned refresh of the resource potentials and land-use screens used in RESOLVE.
- Collaborating with CEC to align RESOLVE's updated screens with CEC's SB 100 Land Use planned efforts and incorporate results developed by the CEC.
- Coordinating with CAISO to update RESOLVE's transmission information to incorporate results from most recent TPP and the 20-Year Transmission Outlook.

Busbar Mapping of Portfolios for the TPP:

- Continue collaboration through working group led mapping.
- Incorporate updated information from CAISO's transmission reports and from CEC's SB100 land use planning efforts.
  - Developing comparable screens for out-of-state resources.
- Work to incorporate recommendations from recent PSP PD and ruling comments into updated busbar mapping methodology

For more information:

Jared.Ferguson@cpuc.ca.gov

California Energy Commission
Erica Brand

Title: 2040 SB 100 Starting Point Scenario and Considering Land Use Implications in SB 100 Planning

Presenter: Erica Brand, Siting, Transmission, and Environmental Protection Division

Date: February 22, 2022

Consideration of land use in energy proceedings

Input: land use screens

CPUC Integrated Resource Planning

Planning and Procurement Timeline (up to 10 years ahead)

- Procurement and policy compliance focused

Busbar Mapping

Input: land use screens

SB 100 Resource Build Activities

Climate Goals Timeline (10-25 years ahead)

- **Example: Starting Point Scenario + 20-Year Transmission Outlook**
- Explore longer term requirements and options for meeting long term policies

Input: land use screens

Joint Agency SB 100 Analysis

Climate Goals Timeline (10-25 years ahead)

- **Example: SB 100 modeling**
- Focused on planning to achieve long term policies and identifying long term solutions

Portfolio evaluation

Senate Bill 100

Officially titled "The 100 Percent Clean Energy Act of 2018," Senate Bill 100 (SB 100, De León)

- Sets a 2045 goal of powering all retail electricity sold in California and state agency electricity needs with renewable and zero-carbon resources.
- Updates the state's Renewable Portfolio Standard to ensure that by 2030 at least 60 percent of California's electricity is renewable.
- Requires the CEC, CPUC, and CARB to use programs under existing laws to achieve 100 percent clean electricity and issue a joint policy report on SB 100 by 2021 and every four years thereafter.

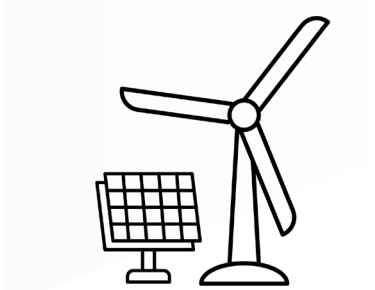
The 2021 SB 100 Joint Agency Report

The 2021 report was a first step to evaluate the challenges and opportunities in implementing SB 100.

It includes an initial assessment of the additional energy resources and the resource build rates needed to achieve 100 percent clean electricity, along with the associated costs.

The estimates will change over time as additional factors, such as generation technologies, system reliability, land use, energy equity, and workforce needs, are more closely examined.

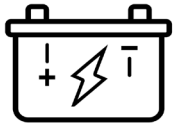
Resource Build Rates



Solar & Wind

3X

Solar and wind build rates need to nearly triple*



Battery

8X

Battery storage build rates need to increase by nearly eightfold**

Land-use-related Recommendations

The 2021 identified two key land-use-related recommendations:

- Analyze projected land-use impacts of scenarios and opportunities to reduce environmental impacts.

- Define and include social costs and non-energy benefits (NEBs) in future analyses: land-use impacts.

"Future system modeling and land-use impacts must be coordinated with any recommendations from the Climate Smart Strategy called for in Executive Order N-82-20 and the AB 32 Scoping Plan."

SB 100 Planning and Resource Build Activities

2021 Joint Agency SB 100 Report Published

SB 100 Resource Build Workshops (June, July, and August 2021)

Starting Point Scenario and Resource Map (September 2021)

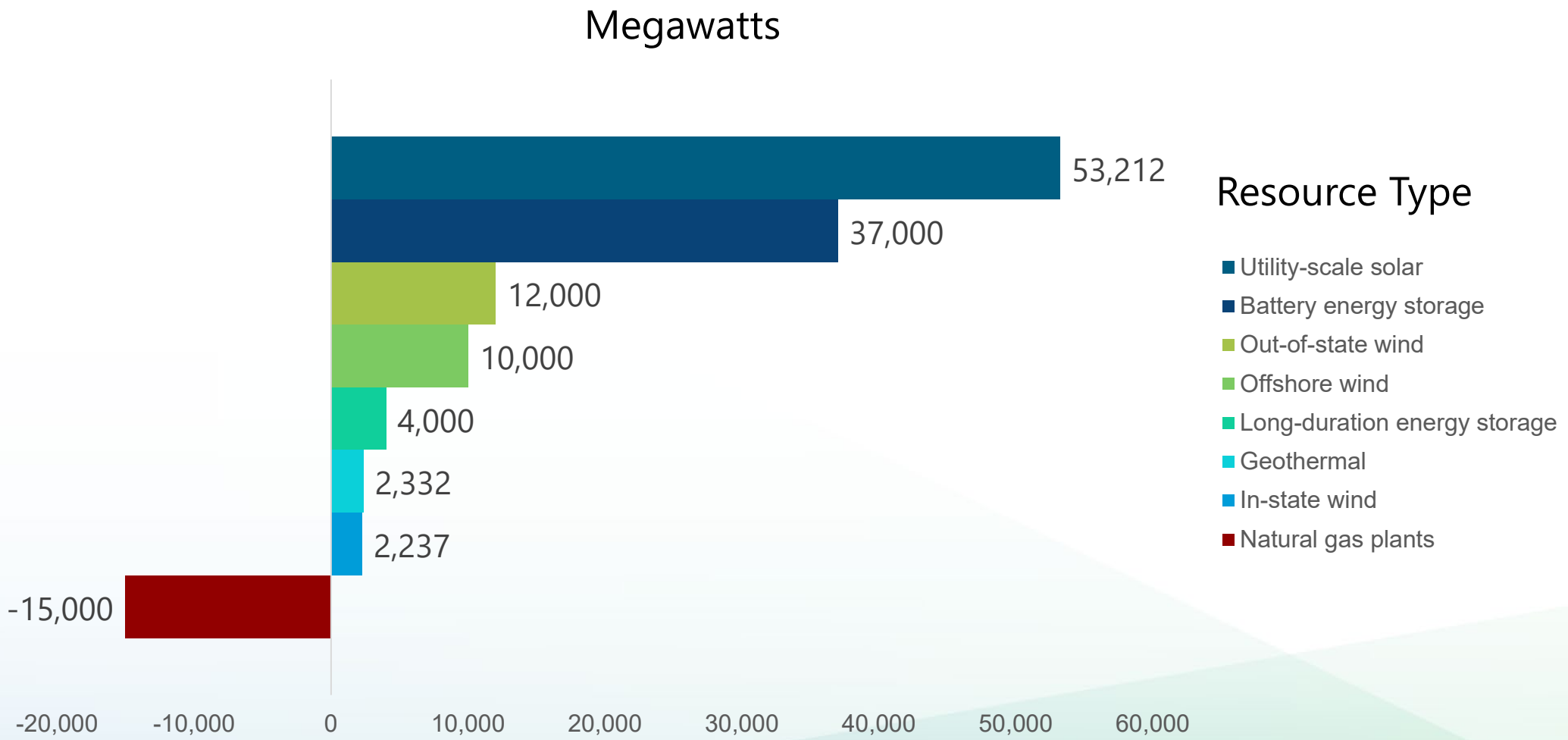
SB 100 60-Day Report to the Governor on Priority Actions (September 2021)

CAISO's Draft 20-Year Transmission Outlook (January 2022)

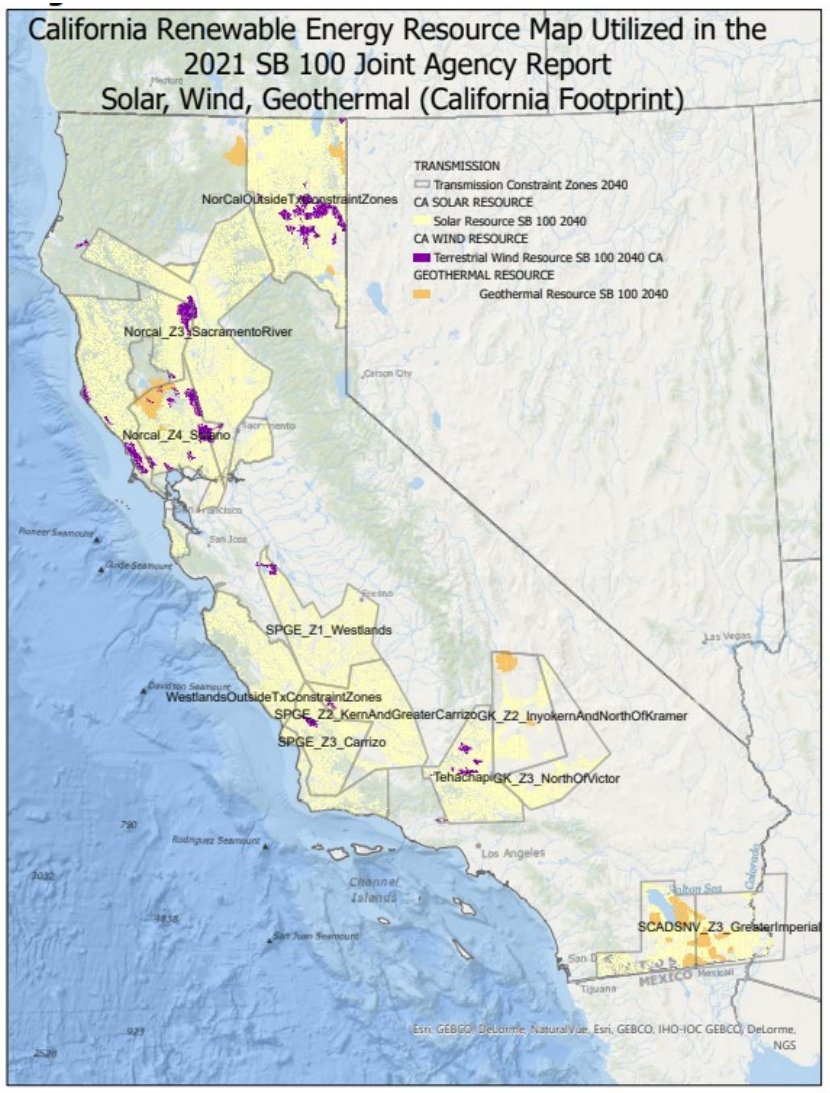
SB 100 Resource Build and Land Use Workshop (February 2022)

2021

Starting Point Scenario (2040)

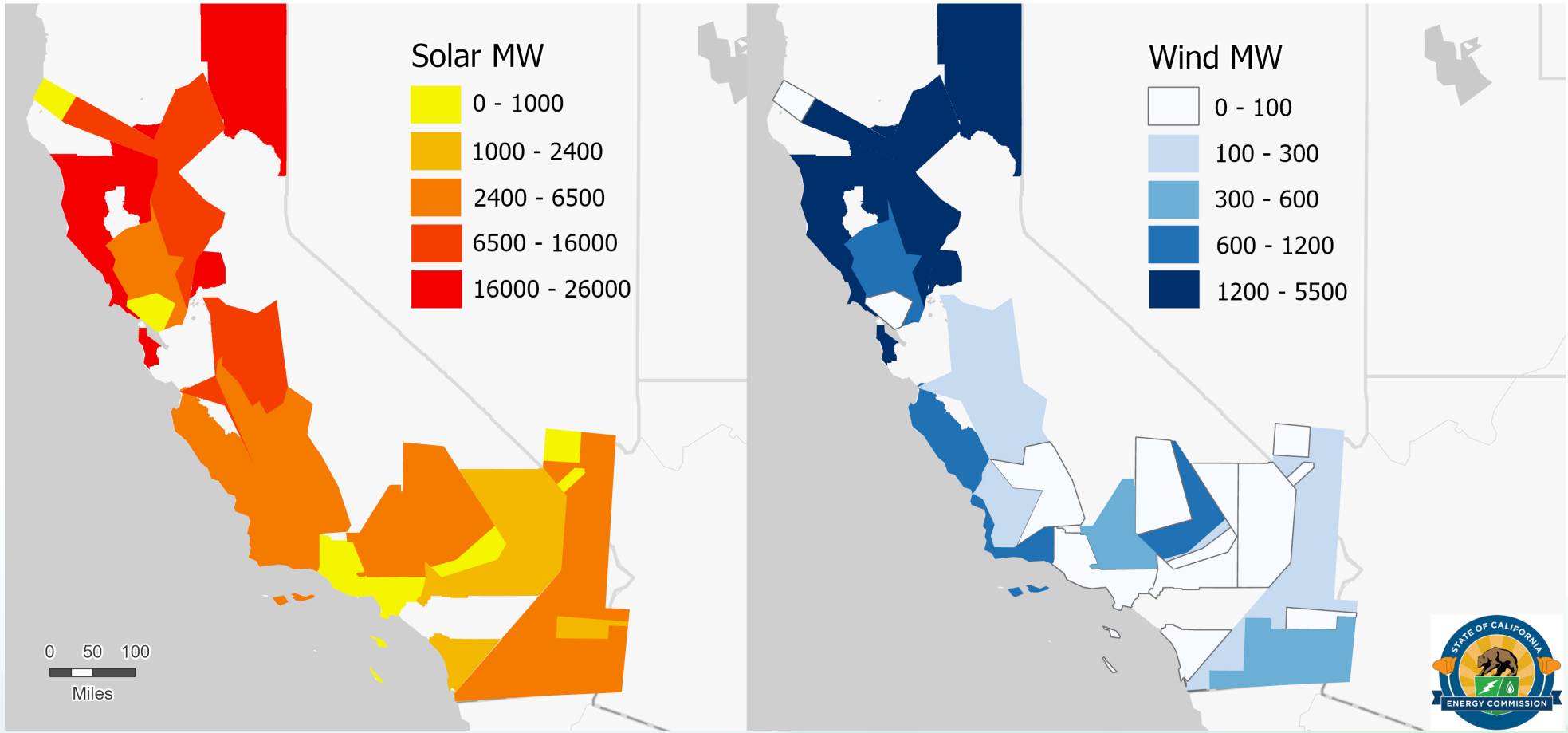


Starting Point Scenario: Geographic Allocation of Resources



Refining a Data Foundation

An Example of Screened Capacity by Transmission Zone



2022 Priority Land Use Activities

1. Continue interagency coordination on land use in energy resource planning.
2. Solicit input on future SB 100 modeling to best incorporate land use implications.
3. Local outreach and engagement on future resource build pathways to achieve SB 100.
4. Coordinate with IEPR team on a planning assumptions package that includes land use information.

IEPR 2022 & SB 100: Equity

- IEPR 2022 Update will address equity and leverage existing dockets for the energy sectors:
  - Power
  - Buildings
  - Transportation
  - Natural Gas
  - Industrial
- SB 100 will be the venue to address equity in the power sector.

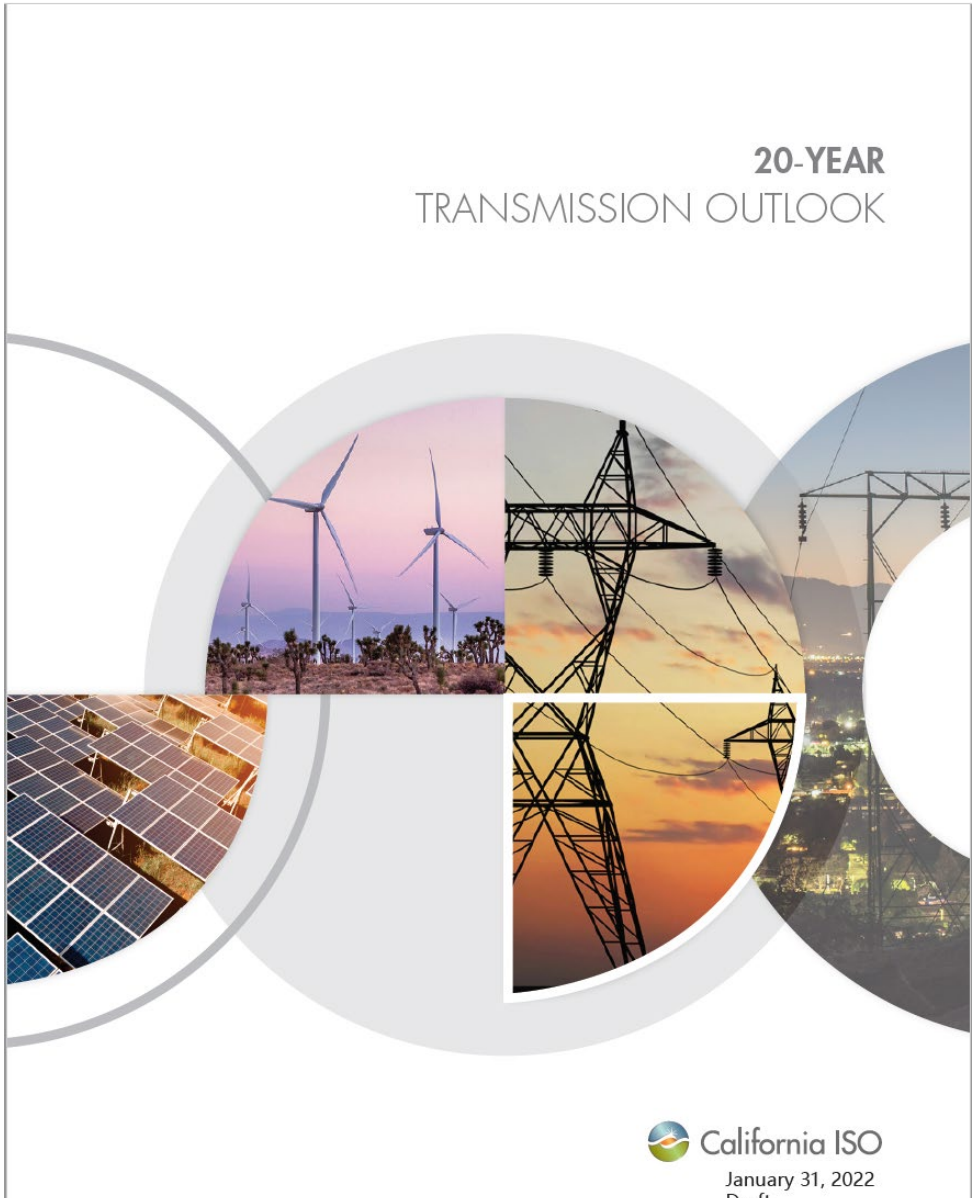
Thank You

California Independent System Operator
Jeff Billinton

Draft 20-Year Transmission Outlook

February 22, 2022

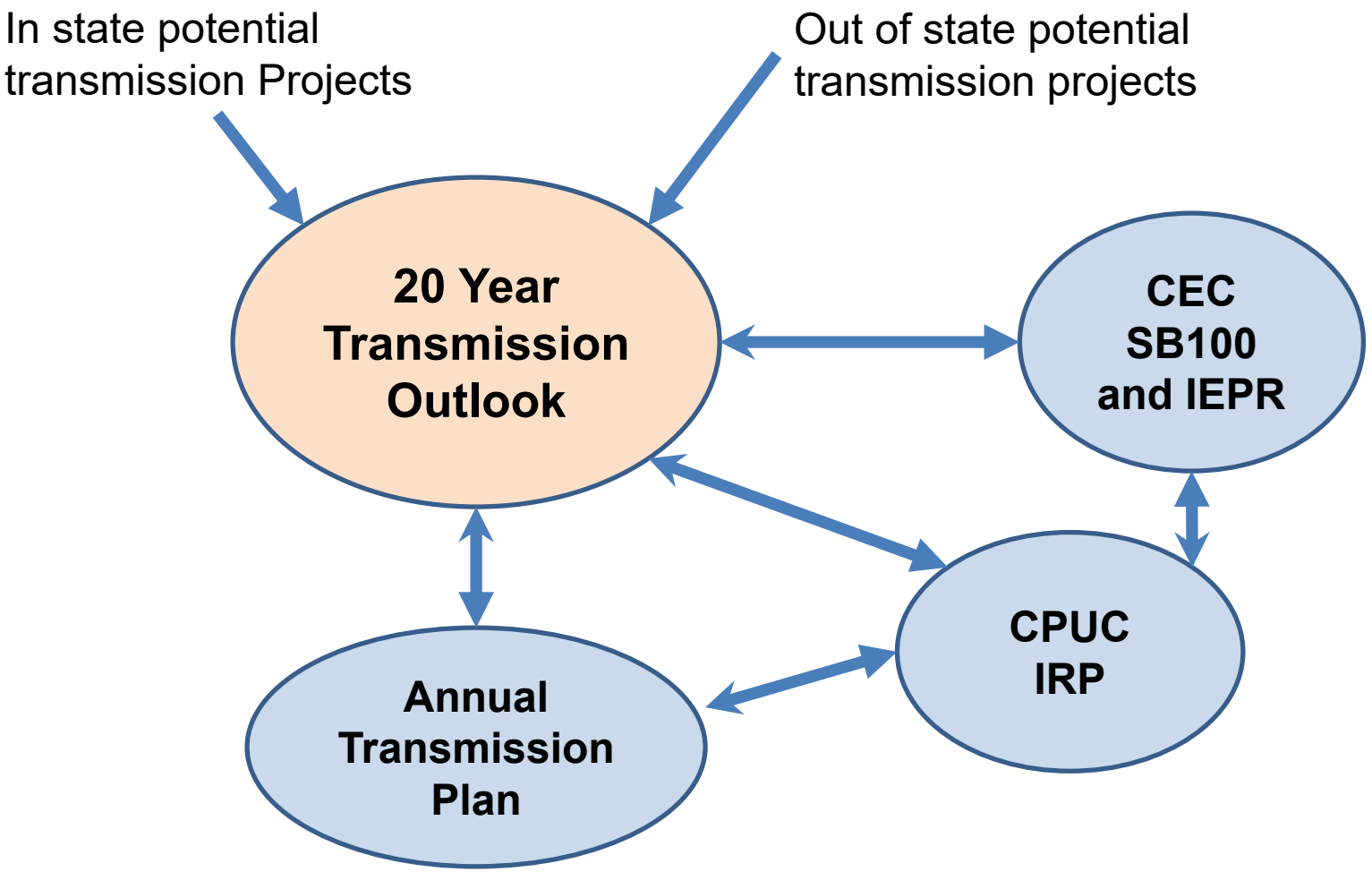
- The CAISO has produced its first ever 20-Year Transmission Outlook focused on providing a longer term view of transmission needed to reliably meet state clean energy goals
- Posted on CAISO website on January 31, 2022
  http://www.caiso.com/InitiativeDocuments/Draft20-YearTransmissionOutlook.pdf
- Is a draft and 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 annual 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" resource plan scenario that:
  - includes 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



20 Year Outlook – SB100 Starting Point Scenario

	Portfolios for 2020-2021 Plan (2030)	Portfolios for 2021-2022 Plan (2031)	*Authorized near and mid term (2025) procurement*	*Decision Preferred System Plan (2025)*	Decision Preferred System Plan (2032)	SB 100 Starting Point Scenario (2040)
Solar	6,763	13,044	*12,800 **	*11,000*	17,506	53,212
Wind	992	4,005		*3,531 in state* *0 OOS* *0 offshore*	3,531 in state 1,500 OOS 1,708 offshore	2,237 in state 12,000 OOS 10,000 offshore
Battery storage	1,376	9,368		*11,317*	13,571	37,000
Gas-fired						
Biomass				*107*	134	
Geothermal	0	651	*1,000 likely beyond 2026*	*114*	1,160	2,332
Pumped Hydro / Long Duration	1,256	627	*1,000 likely beyond 2026*		1,000	4,000
Total	**10,387**	**27,695**	***14,800***	***20,069***	**40,110**	**120,781**
Gas retirements	0	0			~1,000	-15,000

California ISO

* NQC value as opposed to installed capacity

Table does not include behind-the-meter resources and supply-side demand response

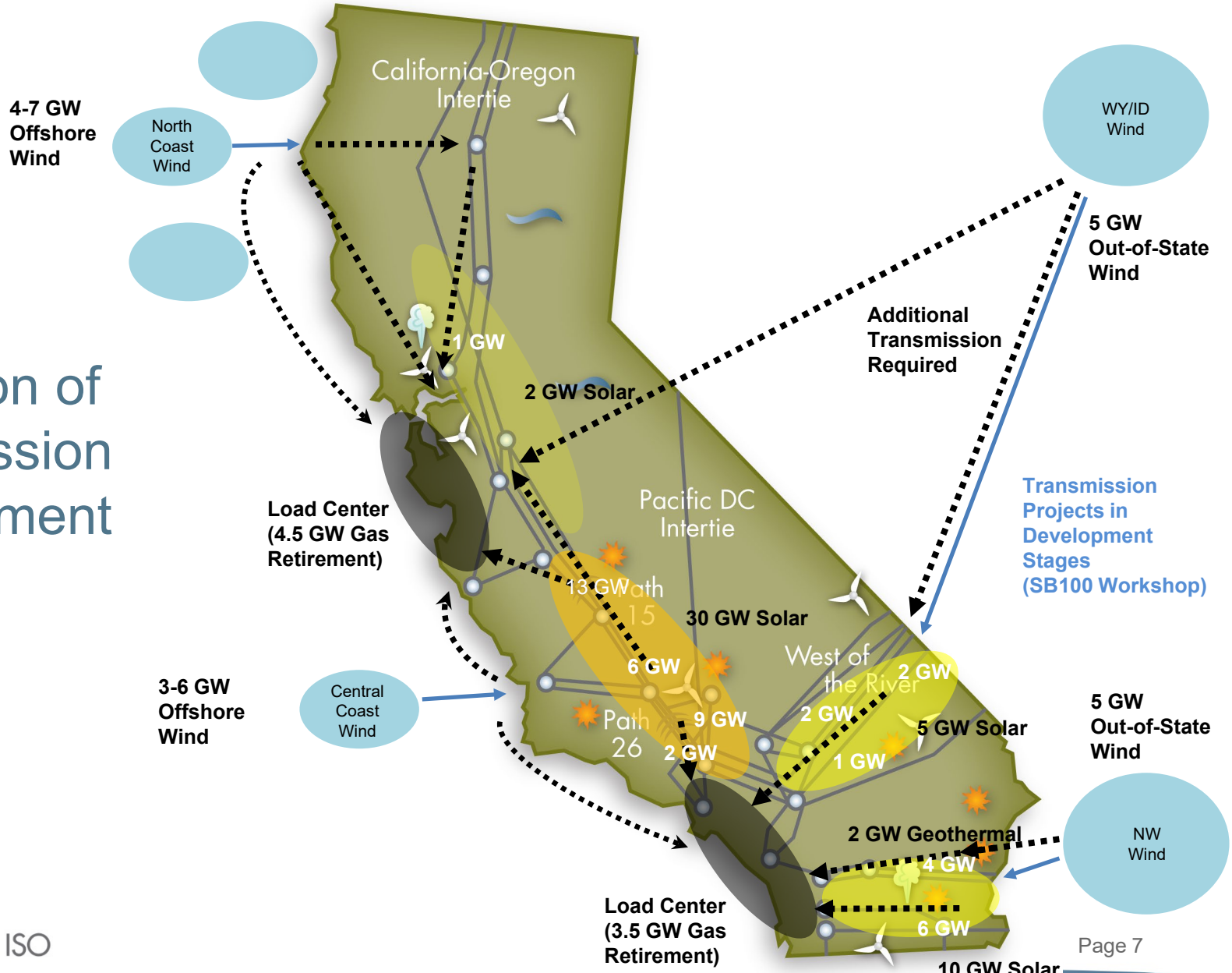
The outlook is based on a high electrification load scenario developed through the SB 100 process

- SB 100 Core statewide high electrification load projection is 82.3 GW in 2040
- This is an increase of 18.3 GW (28.5 percent) increase from the IEPR 2020 load forecast in 2031
  - CEC 2020 IEPR Mid-Mid (1-in-2 weather) scenario for 2031 statewide load is 64.1 GW.
- SB 100 Core scenario statewide forecasts behind-the-meter PV (BTM-PV) in the state of California to reach 33.8 GW in year 2040

Load and Installed BTM-PV	State	CAISO
CEC peak consumption forecast in 2031	64,076	57,498
SB-100 peak consumption in 2040	82,364	73,909
BTM-PV installed capacity in CEC 2031 forecast	25,092	22,655
BTM-PV in SB-100 in 2040	33,807	30,336

The starting point scenario provided the resources by area, that the CAISO mapped to specific locations to assess transmission needs

Illustration of Transmission Development



Transmission upgrades to existing CAISO footprint

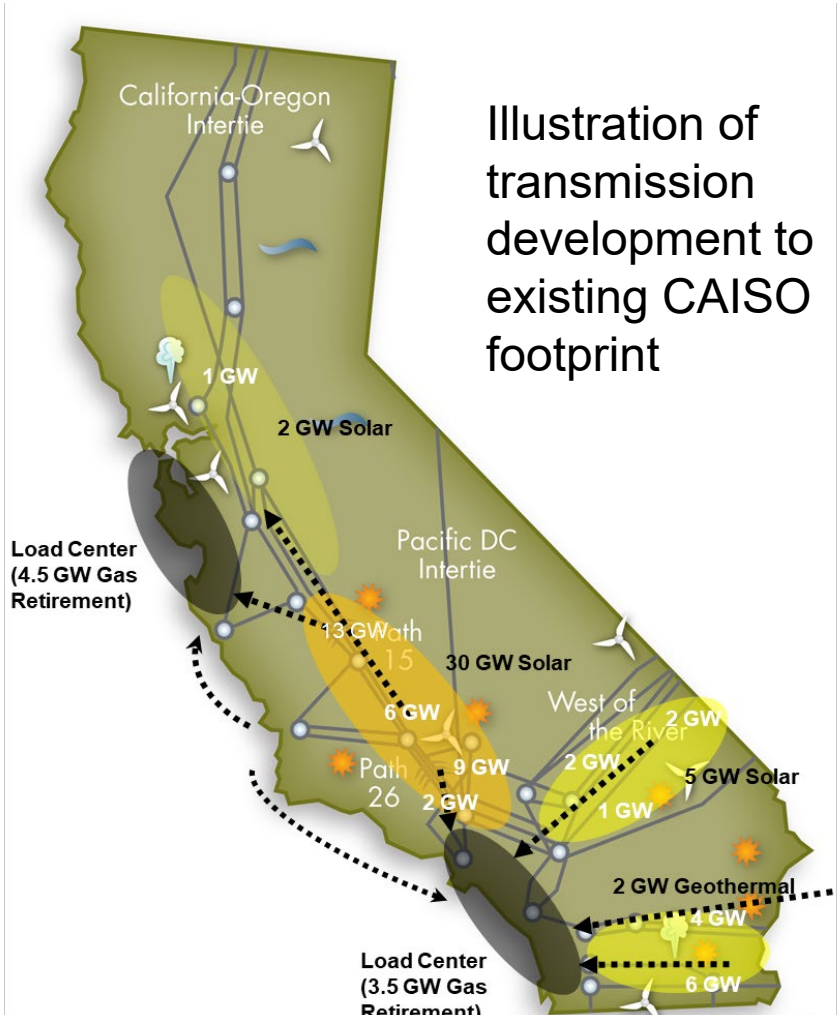


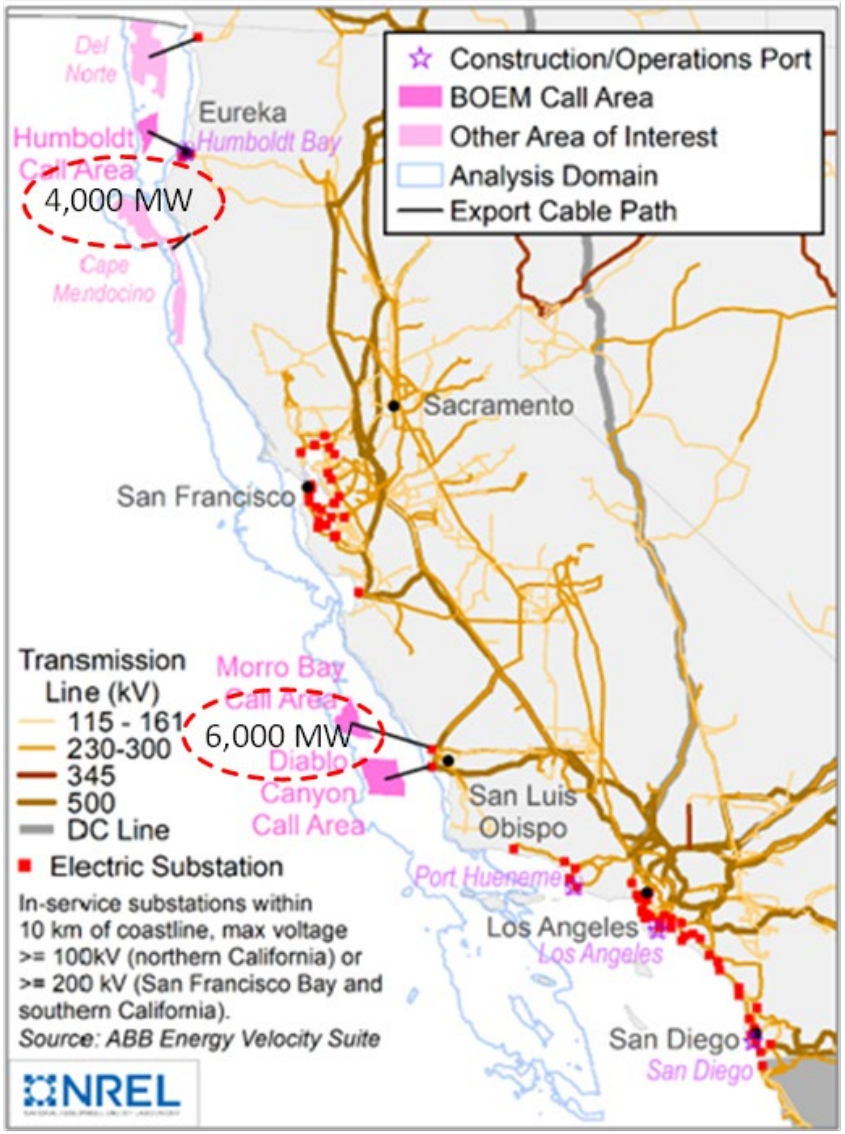
Illustration of transmission development to existing CAISO footprint

Transmission Development	Description	Cost Estimate
Upgrades to existing CAISO footprint		**10.74**
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 - Ref 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 – Alberthill 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

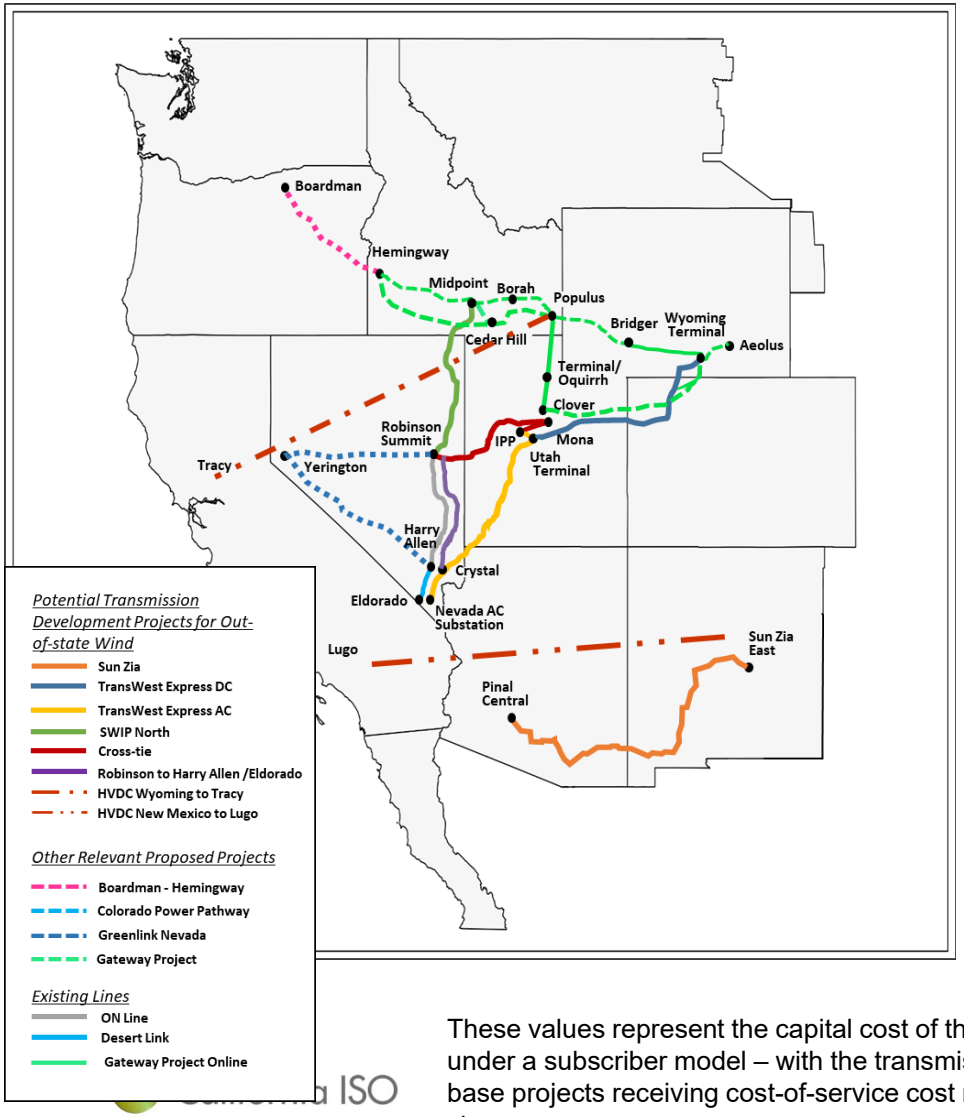
Accessing Offshore Wind

- 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
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-$1.0 B.	$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	0.11 B



Transmission development accessing out-of-state wind



Transmission Development	Description	Cost Estimate
Out-of-State Wind		**$11.65 B**
SWIP-North	275 mile 500 kV line from Midpoint to Robinson substation with upgrades 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:
  - Discuss the findings and garner feedback 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.

Panel Discussion

Perspectives on the 2040 SB 100 Starting Point Scenario and Next Steps to Plan for the Resource Build

- Danielle Mills, American Clean Power – California
- Kate Kelly, Consultant for Defenders of Wildlife
- Lorelei Oviatt, Director of Planning and Natural Resources, Kern County
- Shannon Eddy, Large-scale Solar Association
- Tony Braun, BBSW, Counsel to CMUA and the POU Balancing Authority Areas
- V. John White, Center for Energy Efficiency and Renewable Technologies

Break (5 minutes)