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Accelerating Clean Energy to the Grid

Ed Smeloff – CEERT and GridLab

May 4, 2023

Transmission Supply and Demand Paces Grid Decarbonization

- Transmission capacity to and in California is scarce compared to the demand for interconnection
- California paused transmission expansion after 2013 and is now catching up
- Since 2019 the CPUC ordered LSEs to procure 15.5 GW of clean energy resources for reliability
- Under SB 350, the CPUC initiated an IRP process with a focus on GHG emission reductions
- The current IRP resource portfolio calls for an additional 80 GW of clean energy resources by 2035
- CAISO's Cluster 14 window in 2021 experienced an unprecedented quantity of interconnection requests to meet the demand for new clean energy resources
- Planning for interconnection-driven upgrades has overwhelmed TO study capabilities causing delays
- Transmission planning needs to lead and focus resource procurement and interconnection requests
- Pace of transmission will be determined by the permitting process (CPCN, CEQA)

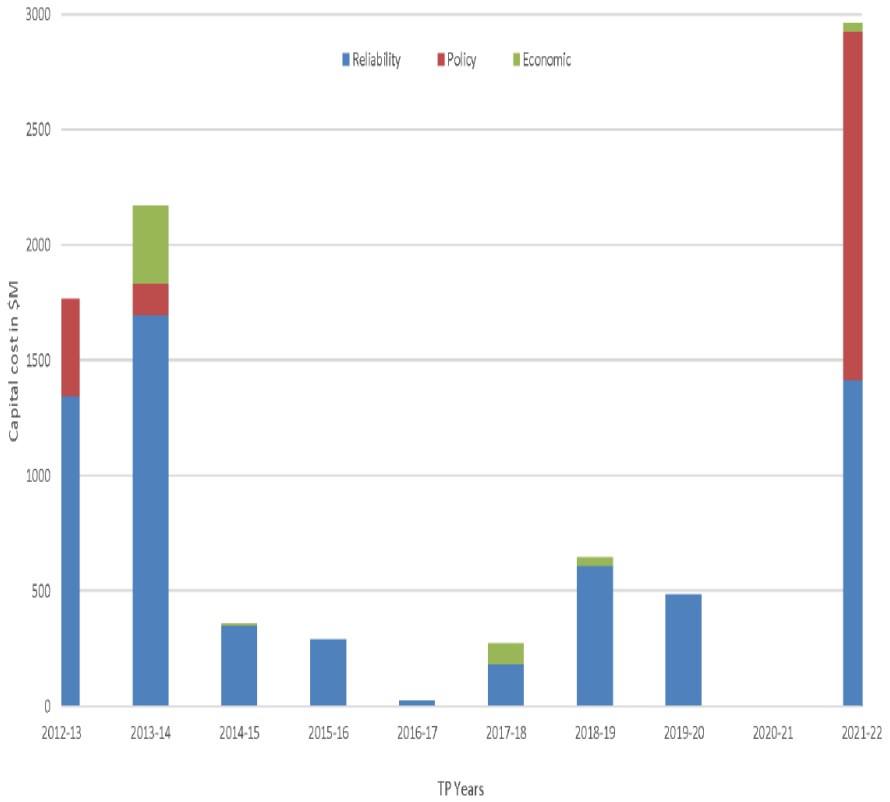
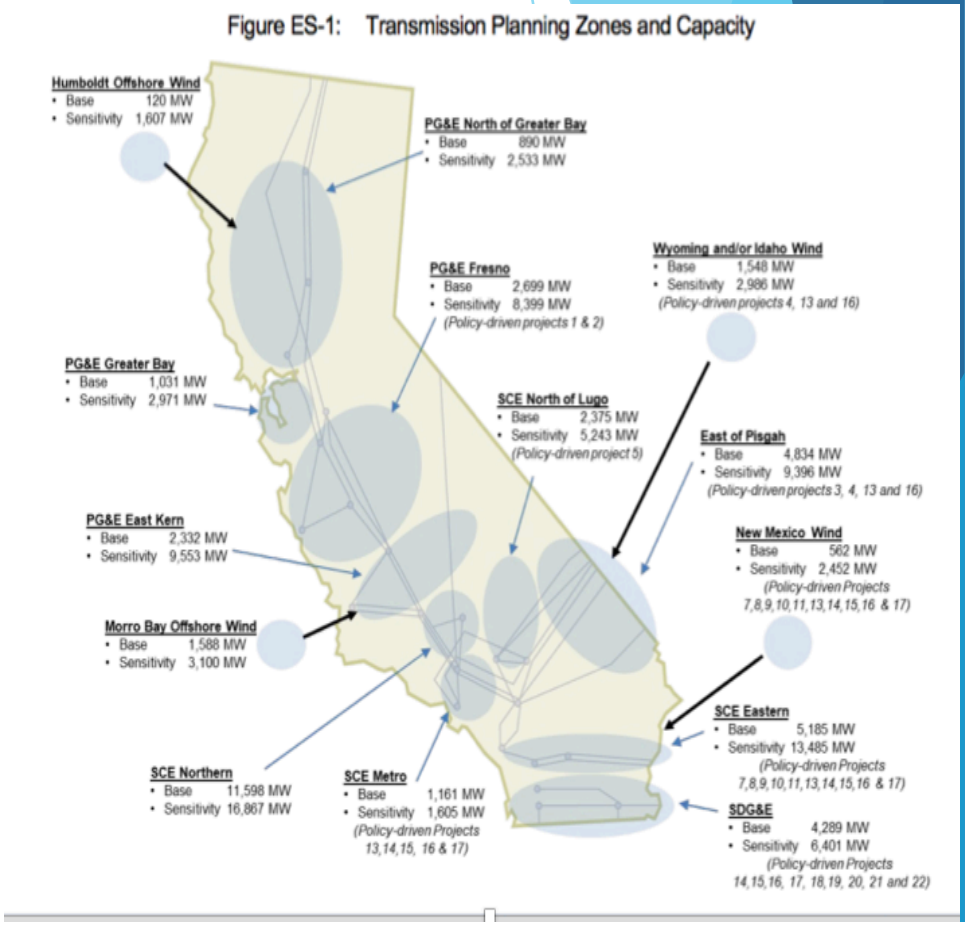


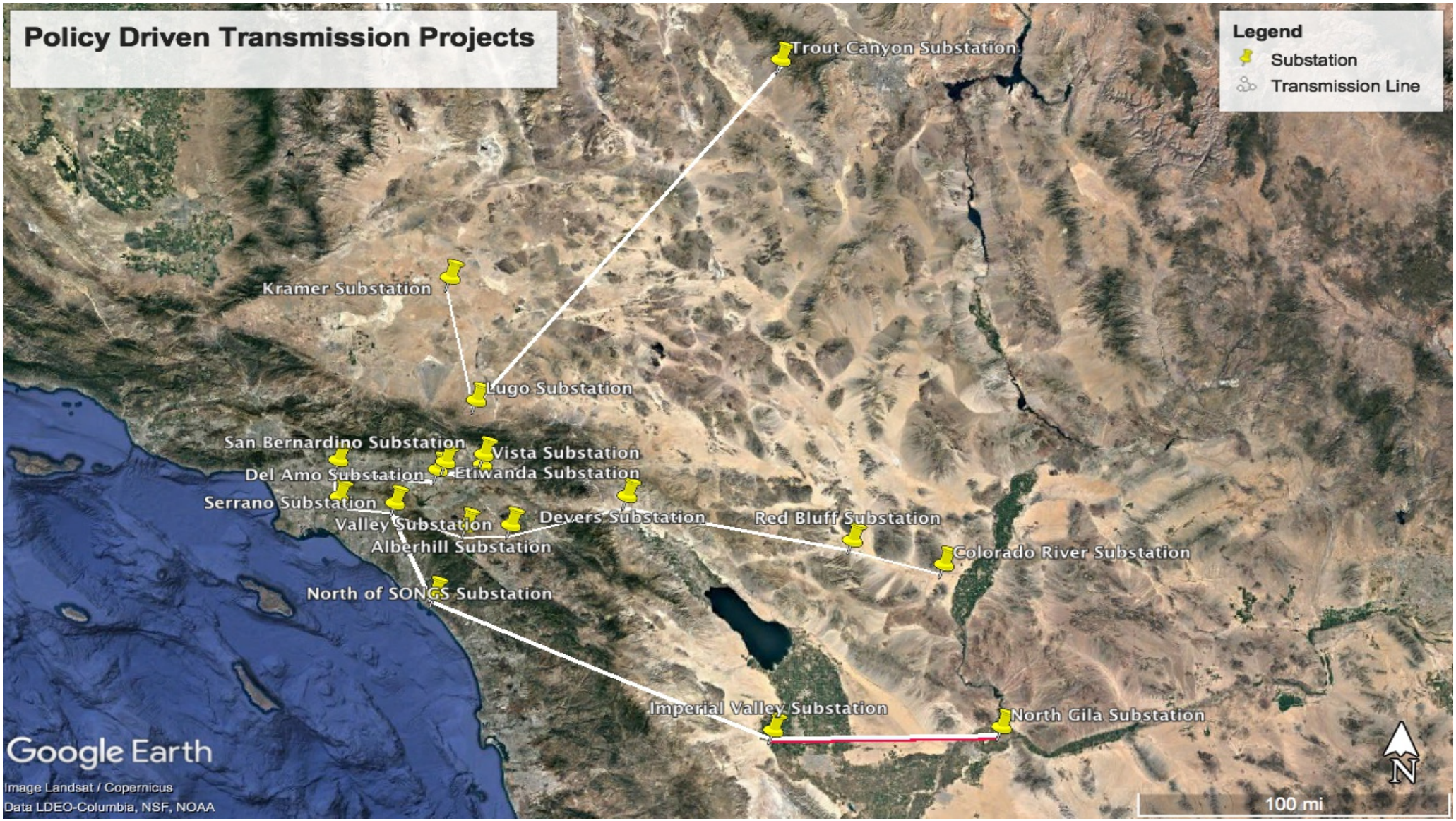
Table A1

Source: CAISO 2022-23 TPP Presentation September 28th, 2022.

Focus on Transmission from Resource Rich Zones to Load

- In the 2022-2023 Transmission Plan, the CAISO adopted a zonal focus for transmission planning.
- The CAISO uses 10 in-state zones, two offshore wind zones and two zones to access out-of-state wind.
- The draft plan calls for 22 policy-driven transmission projects located predominantly in 4 zones
  - East of Pisgah - $2,155 Million
  - North of Lugo - $482 Million
  - SDG&E - $3,248 Million
  - SCE Metro - $1,663 Million
- Out-of-state wind will be delivered to the CAISO largely through subscriber-based transmission
  - TransWest Express from Wyoming
  - SunZia from New Mexico
  - Interconnection studies will still be done for in-CAISO transmission upgrades
- Transmission for offshore wind will be studied in 2023-2024 Transmission Planning Process
  - Pacific Transmission Expansion Project would connect Central Valley to LA Basin via HVDC




Policy Driven Transmission Projects
Legend
Substation
Transmission Line
Trout Canyon Substation
Kramer Substation
Lugo Substation
San Bernardino Substation
Vista Substation
Del Amo Substation
Etiwanda Substation
Serrano Substation
Valley Substation
Devers Substation
Red Bluff Substation
Alberhill Substation
Colorado River Substation
North of SONGS Substation
Imperial Valley Substation
North Gila Substation
Google Earth
Image Landsat / Copernicus
Data LDEO-Columbia, NSF, NOAA
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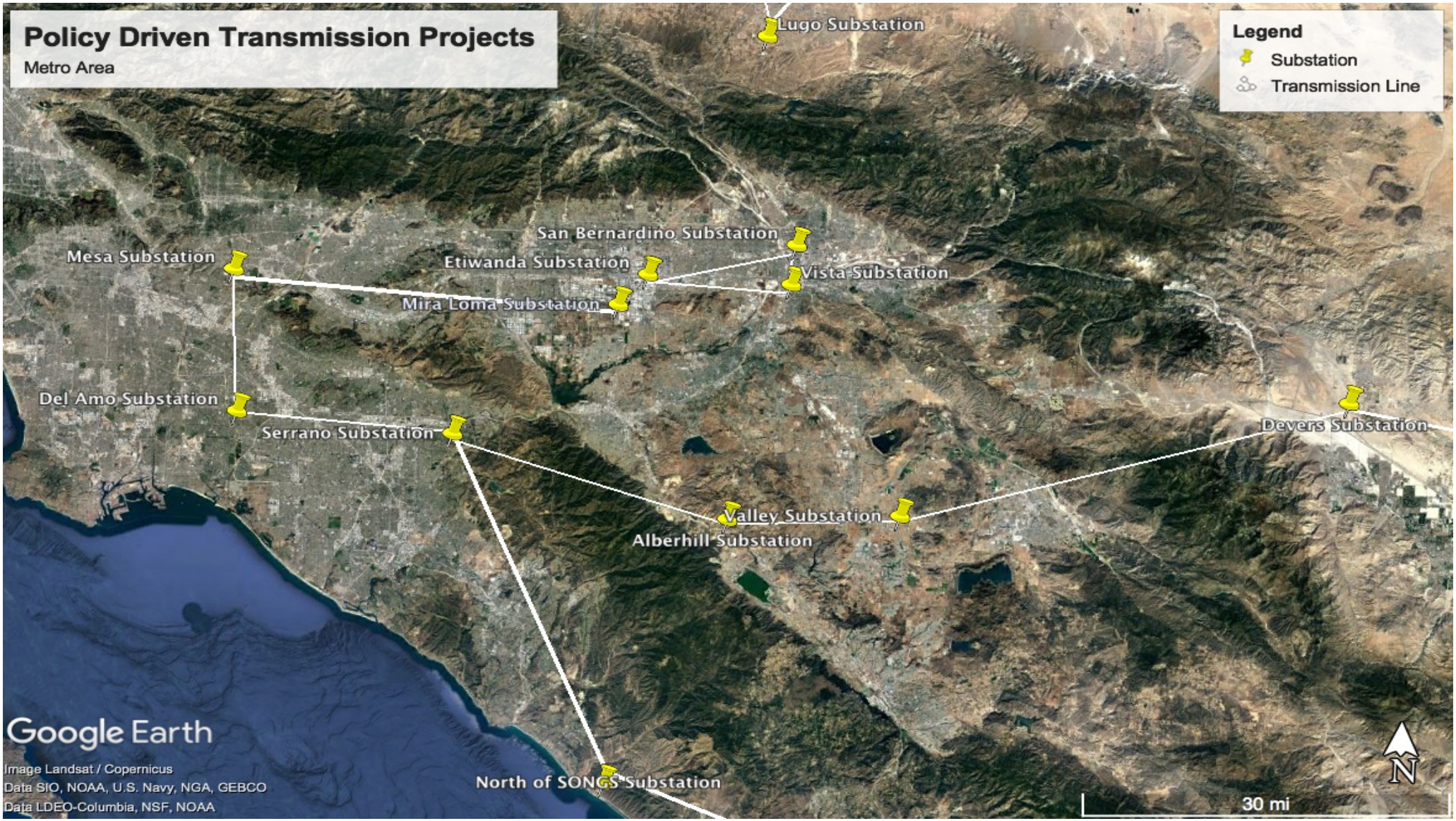
Policy Driven Transmission Projects
Metro Area
Legend
Substation
Transmission Line
Lugo Substation
San Bernardino Substation
Mesa Substation
Etiwanda Substation
Vista Substation
Mira Loma Substation
Del Amo Substation
Serrano Substation
Devers Substation
Valley Substation
Alberhill Substation
North of SONGS Substation
Google Earth
Image Landsat / Copernicus
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A Closer Look at the Interconnection Queue

Five Counties Drive In-State Clean Energy Development

County (Subregion)	Number of Projects	Total Megawatts
Riverside	37	14,411
San Bernardino	25	5,931
Fresno	22	4,544
Kings	13	3,292
Kern (Central Valley)	29	4,433
Kern (Antelope Valley)	27	8,465

Need for updated busbar mapping based on latest data from interconnection queue including Cluster 15 to focus 2023-2024 Transmission Planning Process

A Closer Look at the Central Valley

County (Subregion)	Technology	Number of Projects	Total Megawatts
Fresno			
	Stand-alone Solar	2	300
	Stand-alone Batteries	6	1139
	Hybrid (Solar + Batteries)	14	3105
Kings			
	Stand-alone Solar	1	20
	Stand-alone Batteries	1	32
	Hybrid (Solar + Batteries)	11	3240
Kern (Central Valley)			
	Stand-alone Solar	4	440
	Stand-alone Batteries	5	423
	Hybrid (Solar + Batteries)	20	3570

Central Valley Transmission is inadequate for the interconnection queue

Potential Central Valley Transmission Projects Identified in CAISO the 20-Year Outlook

Recommendations

- Build upon the geographical focus adopted by the CAISO for the 2022-2023 Transmission Plan
- Encourage (incentivize) interconnection requests to transmission zones with expanded transmission capacity
- Discourage (screen out) interconnection requests in areas that have limited transmission capacity
- The CPUC and CEC need to continuously update busbar mapping based on interconnection applications
- Prioritize transmission development in the Central Valley where there is significant commercial interest in solar generation and battery storage in the 2023-2024 Transmission Planning Process
- More transmission transfer capacity is needed between northern and southern California to alleviate congestion on Path 26 and to reduce the need for natural gas generation in the LA Basin
- The CEC should lead investigation of opportunities to use HVDC technologies to expedite transmission expansion in California and use existing rights of way
- Permitting reform is urgently needed if needed transmission projects are to proceed to financing and construction in a reasonable period of time.