Zonal Approach: Data Accessibility

Jeff Billinton, Director – Transmission Infrastructure Planning
Robert Sparks, Sr. Manager – Regional Transmission South
Binaya Shrestha, Manager – Regional Transmission North

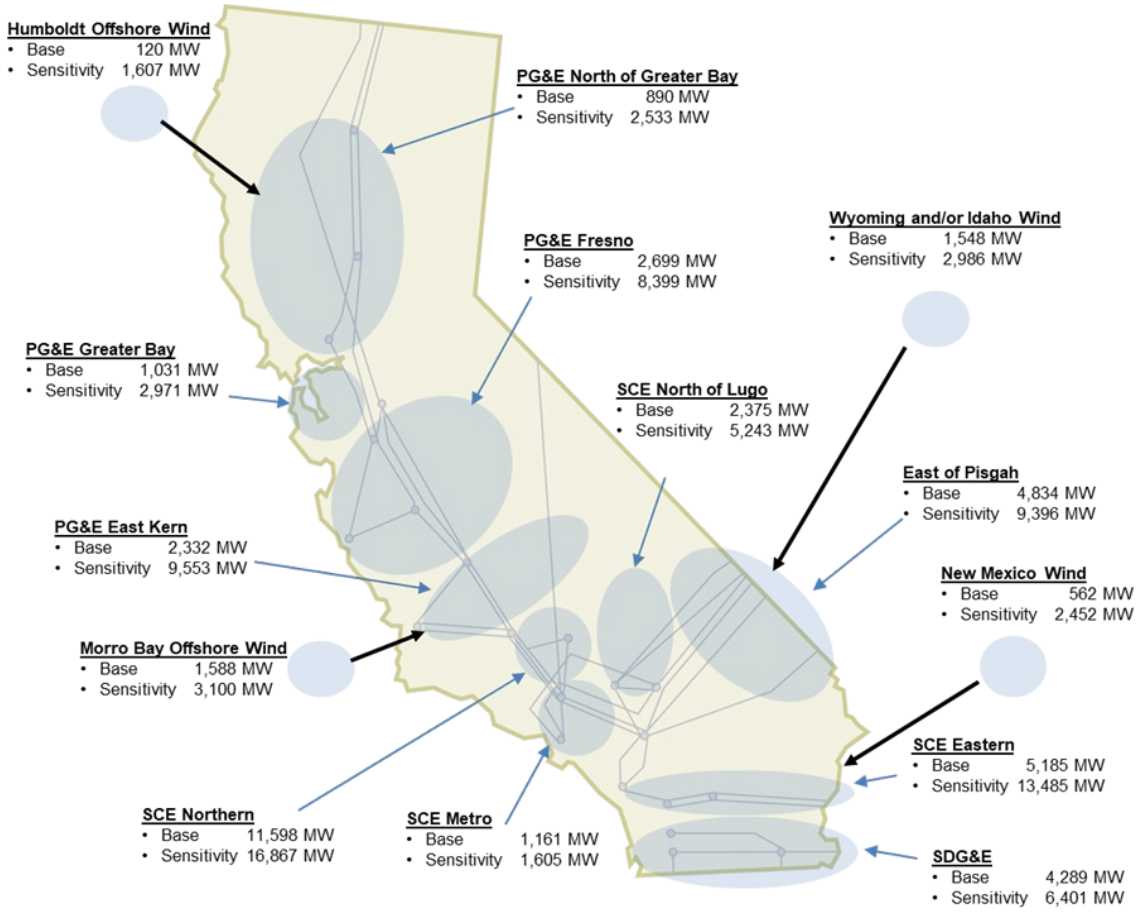
2023 Interconnection Process Enhancements - Track 2 Revised Straw Proposal

Zonal Approach

- As noted in the first principle, a central tenet of the ISO's reform is the zonal approach: the prioritization of projects that seek to utilize available capacity and are in zones where there are planned capacity additions approved in the ISO transmission planning process as established in state and local regulatory authority resource planning portfolios.

- Along with this approach, the ISO understands the importance of maintaining open access and providing a path for projects that seek to interconnect where no available transmission exists or has been approved.

Transmission Planning – Zones/Interconnection Areas Base and Sensitivity Portfolio Capacity



- General areas of the zones/interconnection areas with the base and sensitivity portfolio capacity that has been mapped to each of the interconnection areas
- The zones/interconnection areas are consistent between transmission planning and generation interconnection

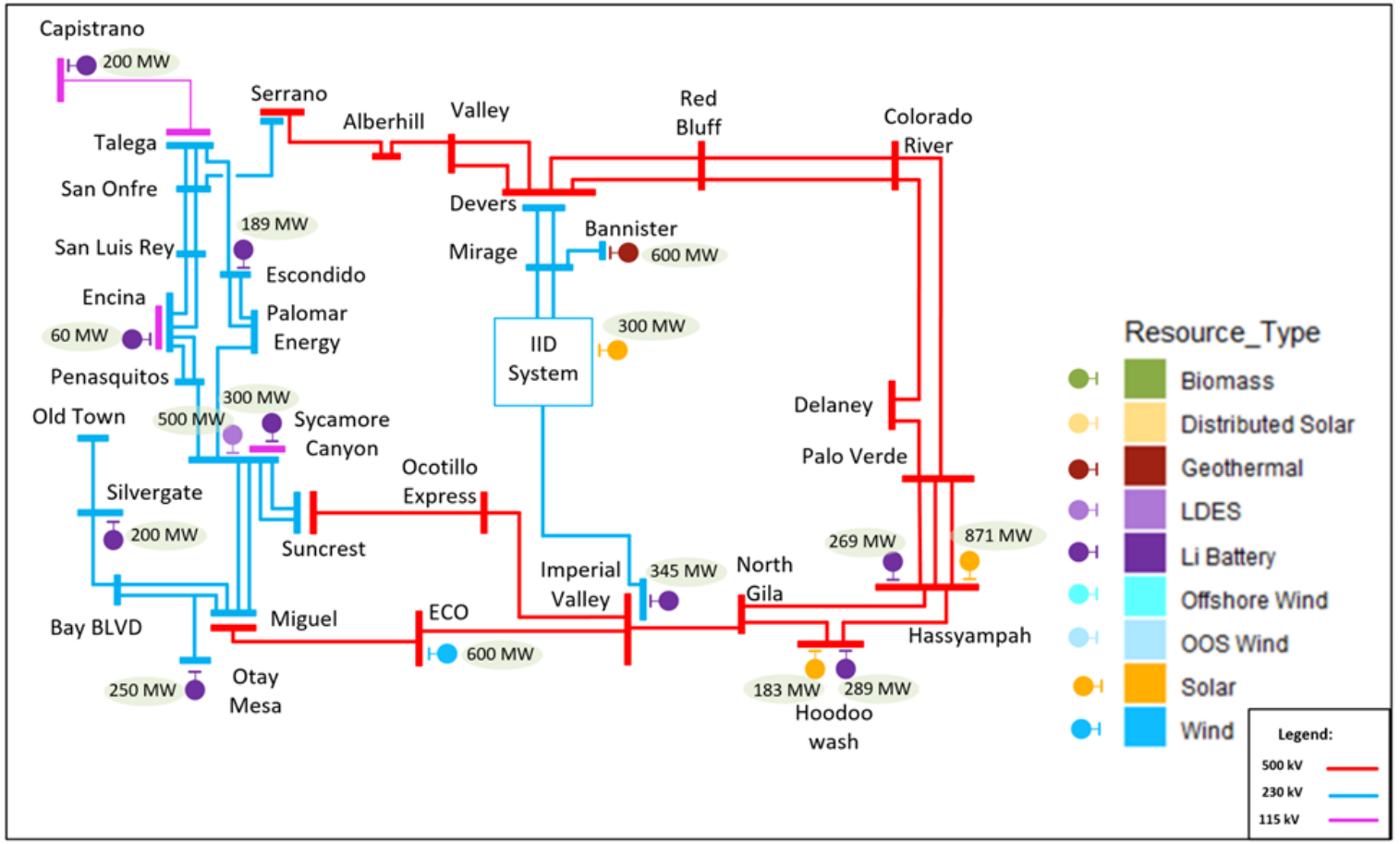
CPUC Portfolio busbar mapping workbook

- The CPUC busbar mapping workbooks (in the Mapping_bySub tab) identifies FCDS and EO capacity in the portfolio for the:
  - Interconnection Area
  - Substation
  - Resource type

				22-23 TPP 38 MMT Proposed Base Case Final Mapped Amount		
Transmisison Area	Substation	Voltage	Resource Type	FCDS (MW)	EODS (MW)	Total (MW)
PG&E Fresno Study Area	Alpaugh	115	Biomass/Biogas	3	-	3
SCE Northern Area	Antelope	230	Distributed Solar	3	-	3
SCE Northern Area	Antelope	230	Li_Battery	439	-	439
SCE Northern Area	Antelope	230	Solar	450	497	947
PG&E East Kern Study Area	Arco	230	Li_Battery	76	-	76
PG&E East Kern Study Area	Arco	230	Solar	125	28	153
SDG&E Study Area	Bannister	230	Geothermal	600	-	600
SCE Metro Study Area	Barre	230	Li_Battery	10	-	10
East of Pisgah Study Area	Beatty(VEA system	138	Geothermal	440	-	440
PG&E North of Greater Bay Study Area	Bellota	115	Biomass/Biogas	4	-	4
PG&E North of Greater Bay Study Area	Bellota	115	Li_Battery	132	-	132
SCE Northern Area	Big Creek Hydro Fa	230	Biomass/Biogas	6	-	6

Mapping of portfolio on interconnection area single-line-diagrams

- The portfolio resources have been mapped on the single line diagram based on the busbar mapping identified in the CPUC base portfolio



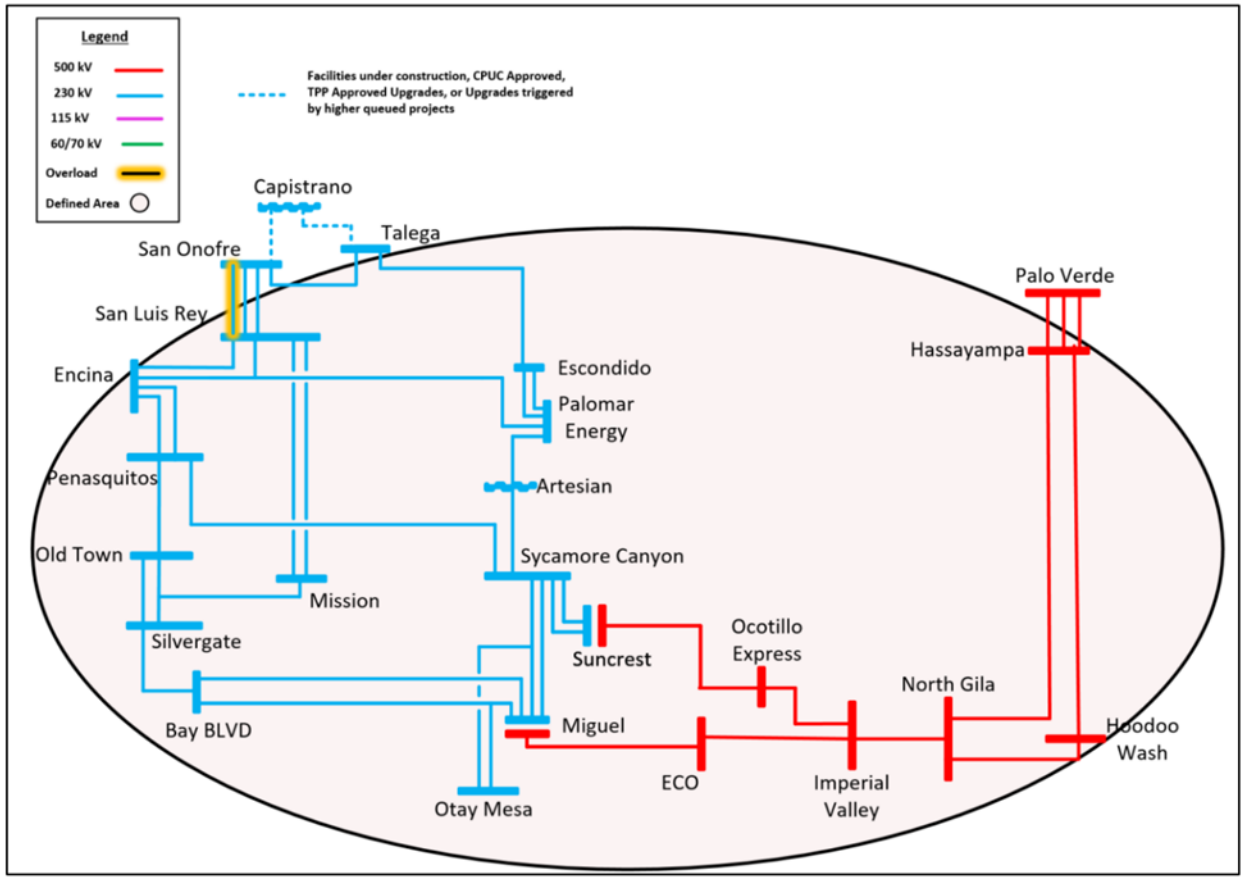
Transmission Capabilities Estimates

- The CAISO develops a whitepaper and workbook of transmission capability estimates
- CPUC utilizes these constraints and transmission capability estimates in their CPUC IRP

Transmission capability estimates for use in the CPUC's IRP process - Revised 6/28/2023						
Transmission Constraint	Affected Resource Locations	Condition Under Which Constraint is Binding (On-peak and/or Off-peak)	Estimated FCDS Capability Based on On-peak Study Resource Output (MW)**		ADNU & Cost Estimate ($million)	
			Transmission Plan Capability***	Incremental due to ADNU	ADNU (Time to Construct)	Cost (2022$)
SDG&E Interconnection Area Constraints						
Capistrano-San Onofre 230 kV constraint	SDGE local area	On-peak	1,500	920	Capistrano-San Onofre 230 kV upgrade (60 months)	$58
Chicarita 138 kV constraint	Baja, Imperial, SDGE local area	On-peak	224	700	Chicarita 138 kV Upgrades (48 months)	$100
El Cajon 69 kV constraint	SDGE local area	On-peak	406	547	El Cajon 69 kV Upgrade (48 months)	$15
Internal San Diego Area constraint	Baja, Imperial, SDGE local area	On-Peak, Off-Peak	1,001	2,757	Internal San Diego Area reconductors (48 months)	$107
Miguel 69 kV constraint	SDGE local area	On-peak	231	431	Miguel 69 kV upgrades (48 months)	$671
Encina - San Luis Rey 230 kV constraint	Baja, Imperial, Arizona, SDGE local area	On-Peak, Off-Peak	1,922	4,660	New Encina - San Luis Rey 230 kV line (120 months)	$84
East of Miguel constraint	Baja, Imperial, Arizona, Riverside East	On-Peak, Off-Peak	1,035	1,286	New Imperial Valley - Serrano 500 kV line (188 months)	$2,713
San Luis Rey-San Onofre 230 kV line constraint	Baja, Imperial, Arizona, SDGE local area	On-Peak, Off-Peak	2,018	4,254	New San Luis Rey-San Onofre 230 kV line (120 months)	$107
Ocean Ranch 69 kV constraint	SDGE local area	On-peak	274	692	Ocean Ranch 69 kV upgrade (48 months)	$28
Otay Mesa 230 kV constraint	Imperial, SDGE local area	On-peak	1,425	2,189	Otay Mesa 230 kV upgrade (60 months)	$80
Silvergate - Bay Blvd 230 kV constraint	Baja, Imperial, SDGE local area	On-Peak, Off-Peak	663	4,887	Silvergate - Bay Blvd 230 kV 3-ohm Series Reactor (36 months)	$30
Silvergate-Old Town 230 kV constraint	Baja, Imperial, SDGE local area	On-peak	1,221	2,522	Silvergate-Old Town 230 kV Upgrades (60 months)	$283
Talega 230 kV constraint	SDGE local area	On-peak	1,205	2,201	Talega 230 kV Upgrades (60 months)	$211
Trabuco-Capistrano 138 kV constraint	SDGE local area	On-peak	501	556	Trabuco-Capistrano 138 kV upgrade (48 months)	$103

Transmission Constraint Diagrams

- The ISO has developed diagrams that identify the area that constraint impacts
- These are included with the Transmission Capability Estimates Whitepaper and with the annual TPD Allocation Report

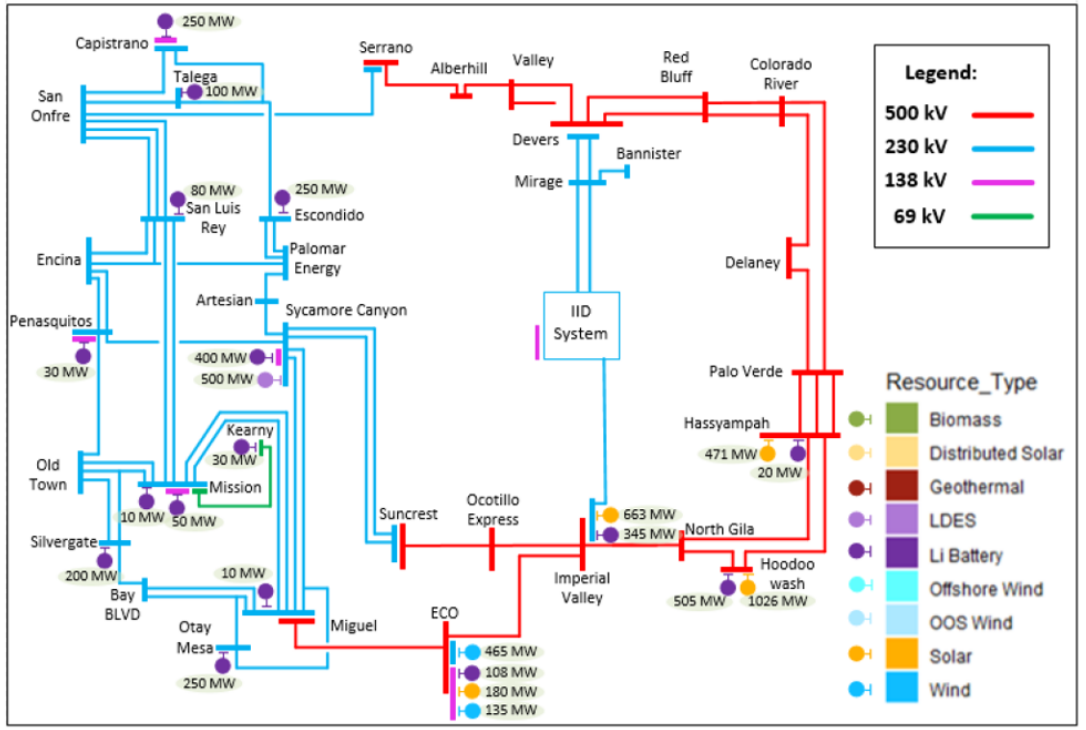


Stakeholder feedback

- Request for an annual report that included specific information.
  - The information is updated through various study processes at different times of the year so an annual report is not feasible
- There was a request to make information 6-9 months prior to a Cluster Study window opening
  - Again the information is updated through various processes and will be provided when available with notification of when the information is available
- The ISO intends to consolidate information, where practical, into one document for ease of access

CPUC Base Portfolio – Interconnection Area Mapping Resource Capacity and Location Planning for in Annual TPP

Base Portfolio: SDG&E Area



Resource Type	Base Portfolio		
	FCDS (MW)	EO (MW)	Total (MW)
Solar	650	1,690	2,340
Wind – In State	240	360	600
Wind – Out-of-State (Existing TX)	0	0	0
Wind – Out-of-State (New TX)	0	0	0
Wind - Offshore	0	0	0
Li Battery	2,617	0	2,617
Geothermal	0	0	0
Long Duration Energy Storage (LDES)	500	0	500
Biomass/Biogass	0	0	0
Distributed Solar	0	0	0
Total	4,007	2,050	6,057

FCDS
4,007
MW

Total
6,057
MW

Will provide list of substations within the Interconnection Area

CPUC busbar mapping workbook provides resources by type mapped to substations within the Interconnection Areas
2023-0223 TPP Base Portfolio (2035) link:
https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/integrated-resource-plan-and-long-term-procurement-plan-irp-ltpp/2022-irp-cycle-events-and-materials/busbardashboard2033_30mmt_hebase_vd_02-22-23.xlsx

CPUC Portfolio – by Interconnection Area

By Substation and Resource Type Summary of Mapped Results for the 23-24 TPP 30 MMT Additional Transportation Electrification Base Case Portfolio for 2035																	
					23-24 TPP 30 MMT High Electrification Base Portfolio Total Resources (2035)			Online, Updated Baseline Resources			CPUC and PTO Identified In-Development Resources			Incremental Generic Resources (2035)		
Transmission Area	CAISO Substation	Voltage	Out-of-CAISO Resource	Resource Type	FCDS (MW)	EODS (MW)	Total (MW)	FCDS (MW)	EODS (MW)	Total (MW)	FCDS (MW)	EODS (MW)	Total (MW)	FCDS (MW)	EODS (MW)	Total (MW)
SDG&E Study Area	Capistrano	138		Li_Battery	250	-	250	-	-	-	250	-	250	-	-	-
SDG&E Study Area	ECO	115		Li_Battery	108	-	108	-	-	-	97	-	97	10	-	10
SDG&E Study Area	Escondido	230		Li_Battery	229	-	229	114	-	114	65	-	65	50	-	50
SDG&E Study Area	Hassayampa	500		Li_Battery	20	-	20	-	-	-	-	-	-	20	-	20
SDG&E Study Area	Hoodoo Wash	500		Li_Battery	505	-	505	-	-	-	-	-	-	505	-	505
SDG&E Study Area	IID System	230	Yes	Li_Battery	150	-	150	-	-	-	150	-	150	-	-	-
SDG&E Study Area	Imperial Valley	230		Li_Battery	345	-	345	40	-	40	305	-	305	-	-	-
SDG&E Study Area	Kearny	115		Li_Battery	30	-	30	20	-	20	10	-	10	-	-	-
SDG&E Study Area	Miguel	230		Li_Battery	10	-	10	-	-	-	10	-	10	-	-	-
SDG&E Study Area	Mission	230		Li_Battery	10	-	10	-	-	-	10	-	10	-	-	-
SDG&E Study Area	Mission	138		Li_Battery	50	-	50	-	-	-	50	-	50	-	-	-
SDG&E Study Area	Otay Mesa	230		Li_Battery	250	-	250	175	-	175	75	-	75	-	-	-
SDG&E Study Area	Penasquitos	138		Li_Battery	30	-	30	30	-	30	-	-	-	-	-	-
SDG&E Study Area	San Luis Rey	230		Li_Battery	80	-	80	20	-	20	60	-	60	-	-	-
SDG&E Study Area	Silvergate	230		Li_Battery	200	-	200	-	-	-	100	-	100	100	-	100
SDG&E Study Area	Sycamore	138		Li_Battery	400	-	400	-	-	-	400	-	400	-	-	-
SDG&E Study Area	Talega	230		Li_Battery	100	-	100	-	-	-	-	-	-	100	-	100
SDG&E Study Area	ECO	115		Solar	-	180	180	-	-	-	-	110	110	-	70	70
SDG&E Study Area	Hassayampa	500		Solar	300	171	471	-	-	-	-	-	-	300	171	471
SDG&E Study Area	Hoodoo Wash	500		Solar	250	776	1,026	-	-	-	-	-	-	250	776	1,026
SDG&E Study Area	IID System	161	Yes	Solar	20	-	20	20	-	20	-	-	-	-	-	-
SDG&E Study Area	IID System	230	Yes	Solar	-	100	100	-	-	-	-	100	100	-	-	-
SDG&E Study Area	Imperial Valley	230		Solar	100	563	663	-	-	-	-	200	200	100	363	463
SDG&E Study Area	ECO	230		In-State Wind	105	360	465	105	-	105	-	-	-	-	360	360
SDG&E Study Area	ECO	115		In-State Wind	135	-	135	-	-	-	-	-	-	135	-	135
SDG&E Study Area	IID System	230	Yes	Geothermal	850	-	850	-	-	-	26	-	26	824	-	824
SDG&E Study Area	IID System	161	Yes	Geothermal	50	-	50	-	-	-	50	-	50	-	-	-
SDG&E Study Area	Sycamore	230		LDES	500	-	500	-	-	-	-	-	-	500	-	500

Interconnection Area Constraints Creating Sub-Zones in the Area

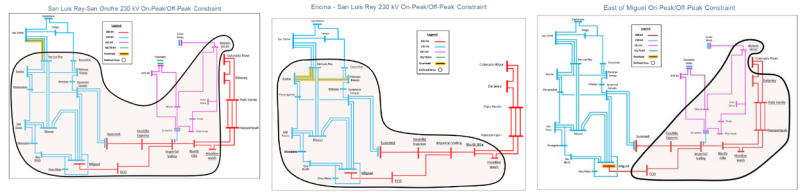
SDGaE Interconnection Area Constraints

Transmission Constraint	Affected Resource Locations	Condition Under Which Constraint is Binding (On-peak and/or Off-peak)	Estimated FCDS Capability Based on On-peak Study Resource Output (MW)**		ADNU & Cost Estimate ($million)		Estimated EODS Capability Based on Off-peak Study Resource Output (MW)**		AOPNU & Cost Estimate ($million)		Wind/Solar Area Designation
			Transmission Plan Capability***	Incremental due to ADNU	ADNU (Time to Construct)	Cost (2022$)	Transmission Plan Capability***	Incremental due to AOPNU	AOPNU (Time to Construct)	Cost (2022$)	
SDG&E Interconnection Area Constraints											
Capistrano-San Onofre 230 kV constraint	SDGE local area	On-peak	1,500	920	Capistrano-San Onofre 230 kV upgrade (60 months)	$58	1500*	N/A	N/A	N/A	N/A
Chicarita 138 kV constraint	Baja, Imperial, SDGE local area	On-peak	224	700	Chicarita 138 kV Upgrades (48 months)	$100	224*	N/A	N/A	N/A	N/A
El Cajon 69 kV constraint	SDGE local area	On-peak	406	547	El Cajon 69 kV Upgrade (48 months)	$15	406*	N/A	N/A	N/A	N/A
Internal San Diego Area constraint	Baja, Imperial, SDGE local area	On-Peak, Off-Peak	1,001	2,757	Internal San Diego Area reconductors (48 months)	$107	70	2,757	Same as ADNU	$107	Solar
Miguel 69 kV constraint	SDGE local area	On-peak	231	431	Miguel 69 kV upgrades (48 months)	$671	231*	N/A	N/A	N/A	N/A
Encina - San Luis Rey 230 kV constraint	Baja, Imperial, Arizona, SDGE local area	On-Peak, Off-Peak	1,922	4,660	New Encina - San Luis Rey 230 kV line (120 months)	$84	2,586	4,660	Same as ADNU	$84	Solar
East of Miguel constraint	Baja, Imperial, Arizona, Riverside East	On-Peak, Off-Peak	1,035	1,286	New Imperial Valley - Serrano 500 kV line (188 months)	$2,713	1,377	1,286	Same as ADNU	$2,713	Solar
San Luis Rey-San Onofre 230 kV line constraint	Baja, Imperial, Arizona, SDGE local area	On-Peak, Off-Peak	2,018	4,254	New San Luis Rey-San Onofre 230 kV line (120 months)	$107	6,764	4,254	Same as ADNU	$107	Solar
Ocean Ranch 69 kV constraint	SDGE local area	On-peak	274	692	Ocean Ranch 69 kV upgrade (48 months)	$28	274*	N/A	N/A	N/A	N/A
Otay Mesa 230 kV constraint	Imperial, SDGE local area	On-peak	1,425	2,189	Otay Mesa 230 kV upgrade (60 months)	$80	1425*	N/A	N/A	N/A	N/A
Silvergate - Bay Blvd 230 kV constraint	Baja, Imperial, SDGE local area	On-Peak, Off-Peak	663	4,887	Silvergate - Bay Blvd 230 kV 3-ohm Series Reactor (36 months)	$30	883	4,887	Same as ADNU	$30	Solar
Silvergate-Old Town 230 kV constraint	Baja, Imperial, SDGE local area	On-peak	1,221	2,522	Silvergate-Old Town 230 kV Upgrades (60 months)	$283	1221*	N/A	N/A	N/A	N/A
Talega 230 kV constraint	SDGE local area	On-peak	1,205	2,201	Talega 230 kV Upgrades (60 months)	$211	1205*	N/A	N/A	N/A	N/A
Trabuco-Capistrano 138 kV constraint	SDGE local area	On-peak	501	556	Trabuco-Capistrano 138 kV upgrade (48 months)	$103	501*	N/A	N/A	N/A	N/A

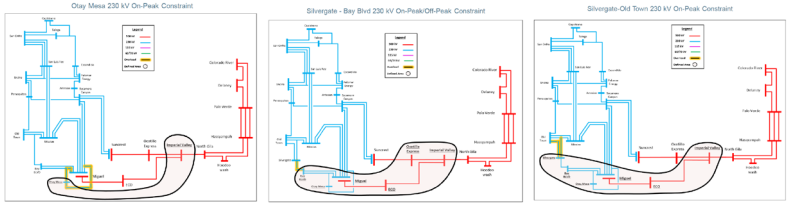
Will provide list of POIs from studies that are behind each constraint within the Interconnection Area

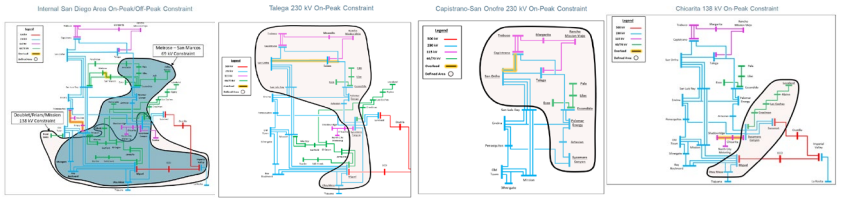
Annual TPD Allocation Report identifies TPD available behind constraints and allocated
Link to 2023 TPD Allocation Report (on Market Participant Portal): https://mpp.caiso.com/tp/Documents/2023%20TPD%20Allocation%20Report.pdf

- With the ISO's annual transmission planning process transmission is planned based upon the CPUC portfolio which utilizes the transmission constraints within its resource models
- Annual TPD Allocation Report identifies the TPD that has been requested, TPD that was allocated, and the remaining TPD behind the constraint
- The constraints create sub-zones within the interconnection areas
  - Some of the constraints can be nested within other constraints or overlapping within the area or with other areas

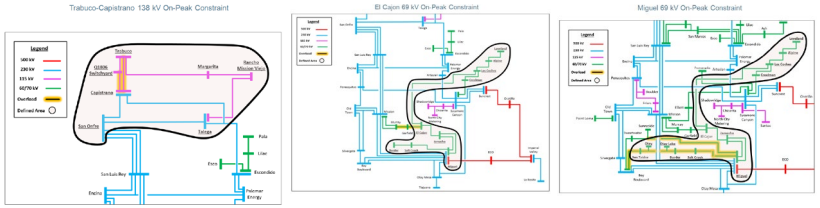


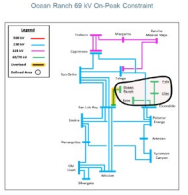
SDGaE Interconnection Area Constraints (continued)





SDGaE Interconnection Area Constraints (continued)





PDF of Interconnection Area of Information Consolidated

Assessing Available Capacity – Data Sources

- Transmission Capability Estimates
  - Constraint list
  - Available transmission capacities
  - Substation list (POI) for each constraint

- Public Queue
  - Project POI
  - MW at POI
  - TPD status

Transmission Capability Estimate Workbook

Workbook with List of POIs Studied Behind Constraints

Queue Report Information

- The ISO updated the information within the Queue Report in Q2 of 2023 to include additional information for each project in the active queue, including:
  - Which projects have TPD allocated to them as FCDS, PCDS (with percentages), or are Energy Only
  - The interconnection area where the queue project is located. The interconnection areas that are in the queue report do not reflect the current interconnection areas
- The ISO proposes to identify in the queue report where FCDS has been allocated and where FCDS has been requested and not yet allocated to each interconnection customer.
- The ISO will also update in RIMS the area information based on the current interconnection areas.

Queue Report Excel Workbook

Capacity Assessment Examples

Interconnection Heatmap

- FERC Order No. 2023 requires development of a heatmap, along with specific associated information, 30 days after the Cluster Study that No. Order 2023 applies to (i.e. Cluster 15), and 30 days after the restudy of that cluster study.

- The heatmap will provide information at the POI level of available capacity based upon the generation that was included in the latest cluster study and after the restudy.

Interconnection Heatmap - Order 2023

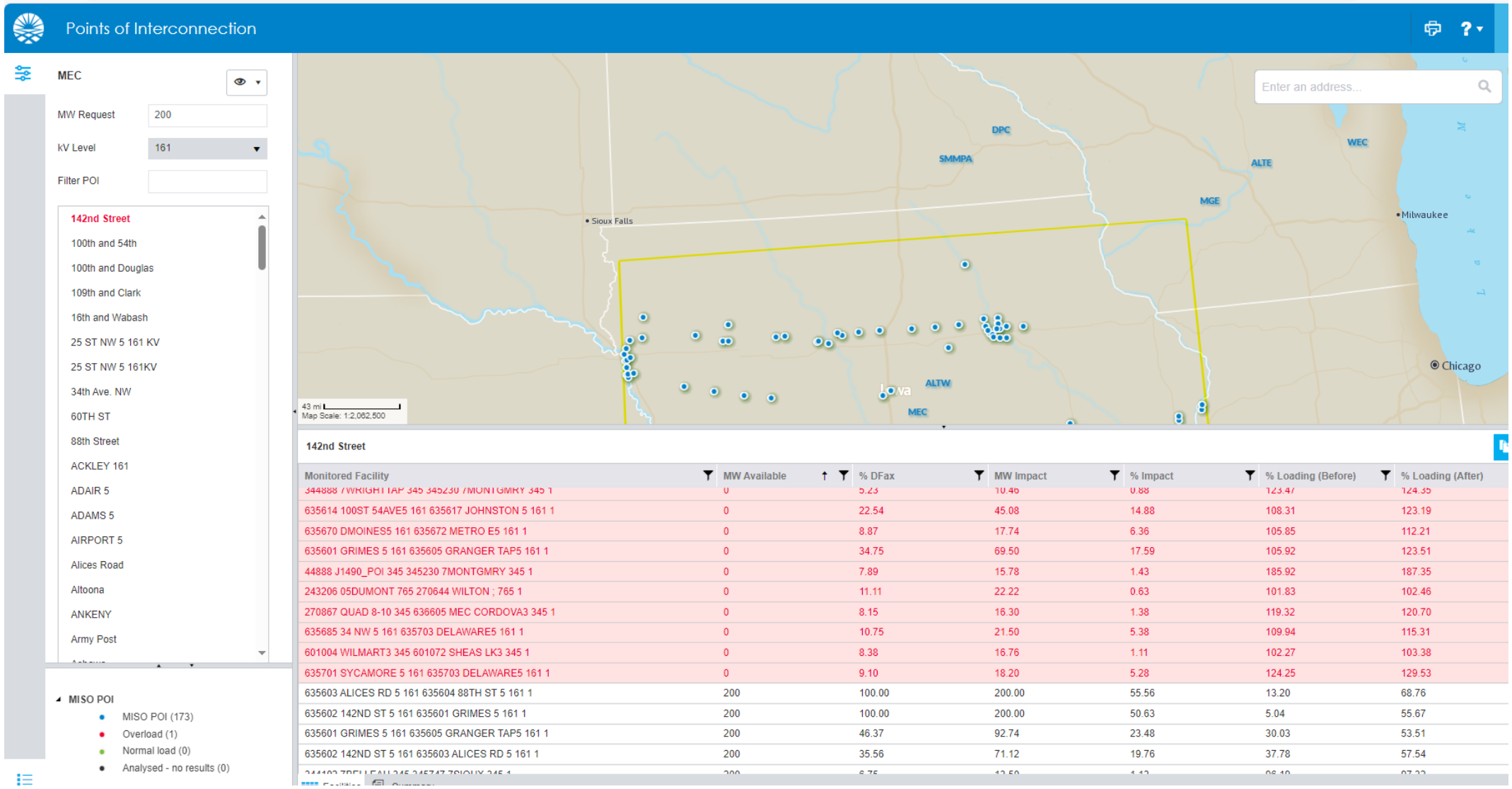
- must be calculated under N-1 conditions and studied based on the power flow model of the transmission system with the transfer simulated from each point of interconnection to the whole transmission provider's footprint.
- with the incremental capacity at each point of interconnection decremented by the existing and queued generation at that location.
- provide the following information as outputs at each point of interconnection:
  - (1) the distribution factor;
  - (2) the MW impact (based on the proposed project size and the distribution factor);
  - (3) the percentage impact on each impacted transmission facility(based on the MW values of the proposed project and the facility rating);
  - (4) the percentage of power flow on each impacted transmission facility before the proposed project; and
  - (5) the percentage power flow on each impacted transmission facility after the injection of the proposed project

Interconnection Heatmap

- The ISO is in the process of developing requirements for the heatmap and associated information and is working so the heatmap can be provided based on the Cluster 14 Phase II base cases as well as the 2024 Reassessment base cases; however, this will not be available 30 days after the Cluster 14 Phase II reports are issued.
  - Utilizing PowerGEM new TARA Advanced TrLim Add-on
- The ISO is targeting for the heatmap information to be available within Q2 of 2024.
- In addition to providing the heatmap based upon the latest cluster study and restudy, the ISO proposes to provide the heatmap information after the annual TPD allocation study

Heatmap – Current MISO as Example for Discussion

MISO's Heatmap



https://giqueue.misoenergy.org/PoiAnalysis/index.html

Interconnection Feasibility at POIs

- Stakeholders requested Information on the interconnection network upgrades at the POI of resources in the queue.
- The ISO currently makes the Interconnection Area Reports from each Cluster Study publicly available on the ISO's market participant portal.
- This provides details of the Cluster Study and the associated network upgrades that have been identified.
- The Interconnection Area reports do not include the specific interconnection network upgrades required to interconnect the generator at the specified POI.

Interconnection Reports

- The ISO proposes to post the individual interconnection reports on the ISO market participant portal in Appendix A of interconnection reports.
- They will be in redacted form removing confidential information.
- Appendix DD of the ISO tariff in Section 3.6 states:
  - "Except in the case of an Affiliate, the list will not disclose the identity of the Interconnection Customer until the Interconnection Customer executes a GIA or requests that the applicable Participating TO(s) and the CAISO file an unexecuted GIA with FERC."

Interconnection Reports

- At a minimum, this information will be redacted, unless an LGIA has been executed, and will assess if any additional information in the reports should be considered confidential.
  - The ISO seeks feedback from stakeholders on what information, if any, should be redacted
- This will provide generators information on available interconnection capability and potential interconnection requirements at points of interconnection being considered.

Interconnection Report Example for Discussion of Confidential Information

Non-CPUC jurisdictional LSE Resource Plans

- In addition to the portfolios received by the CPUC for the annual transmission planning process, the ISO will coordinate with the LRAs and non-CPUC jurisdictional entities to determine their approved resources in their individual IRPs to include in the transmission planning analysis.
- As part of the 2024-2025 transmission planning process the ISO will request the non-CPUC jurisdictional entities to provide their current approved resource plans as input into the development of the study plan that the ISO will engage stakeholders on in February.

Discussion