

SCE's Recent Storage Procurement and Use Cases

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California Energy Storage Procurement Targets

Storage Grid Domain (Point of Interconnection)	2014	2016	2018	2020	Total
Southern California Edison					
Transmission	50	65	85	110	310
Distribution	30	40	50	65	185
Customer	10	15	25	35	85
Total SCE	90	120	160	210	580
Pacific Gas and Electric					
Transmission	50	65	85	110	310
Distribution	30	40	50	65	185
Customer	10	15	25	35	85
Total PG&E	90	120	160	210	580
San Diego Gas and Electric					
Transmission	10	15	22	33	80
Distribution	7	10	15	23	55
Customer	3	5	8	14	30
Total SDG&E	20	30	45	70	165
Total – all 3 Utilities	200	270	365	490	1,325

SCE Solicitations resulting in procured energy storage

- 2013 Local Capacity Requirements (LCR) RFO (~260 MW)
 - “All Source” procurement to meet system reliability needs caused by retirement of Once Through Cooling facilities and SONGS
- 2014 Energy Storage RFO (16.3 MW)
 - First of required biennial storage solicitations
- Preferred Resources Pilot (PRP) 2 RFO (~120 MW)
 - SCE Pilot activity to determine if portfolio of Preferred Resources can successfully meet forecasted load growth
- 2016 Aliso Canyon RFO/RFP (40 MW)
 - Energy Storage procurement to address reliability risks associated with moratorium on gas injections at Aliso Canyon, projects required to be online by EOY 2016

SCE's procured energy storage

SCE has made great strides in energy storage procurement, roughly 485 MW* to date

Contracted:	430
Utility Owned:	55
Total:	485
Counts towards targets:	424
Recent Terminations	15
Total Progress Towards Target	409

Given targets and domain transfer flexibility, SCE has roughly 170 MW* of procurement remaining, all in the Transmission and Distribution domains and has surpassed the 2018 requirement

* Numbers are approximate and could change due to varying project online success

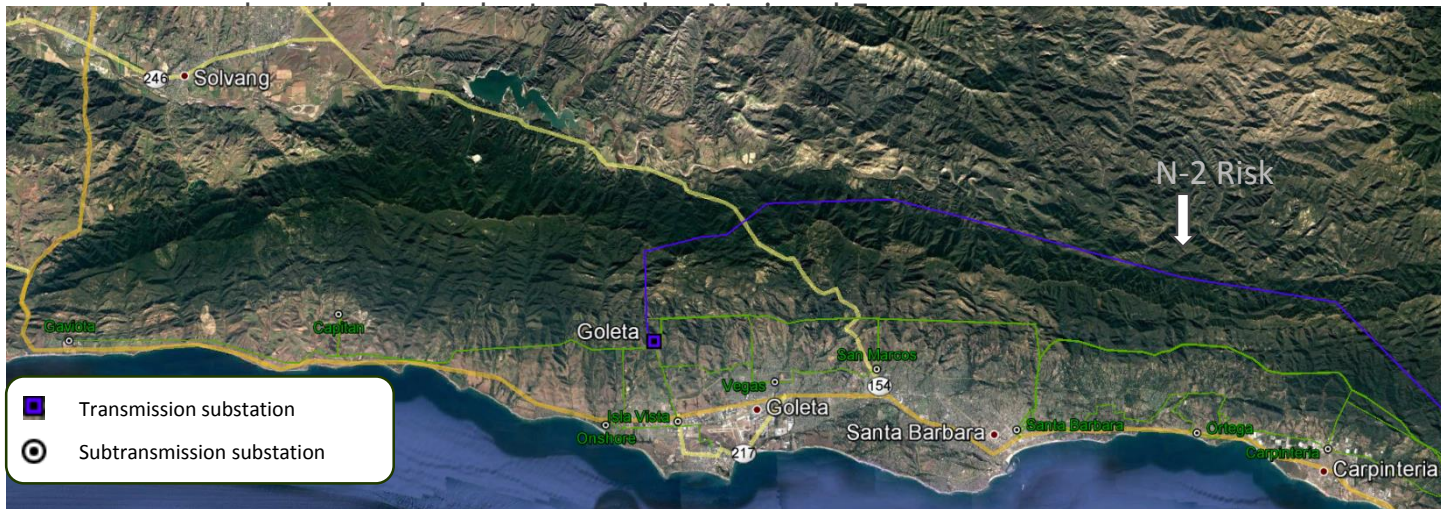
Use Cases

Goleta Challenge

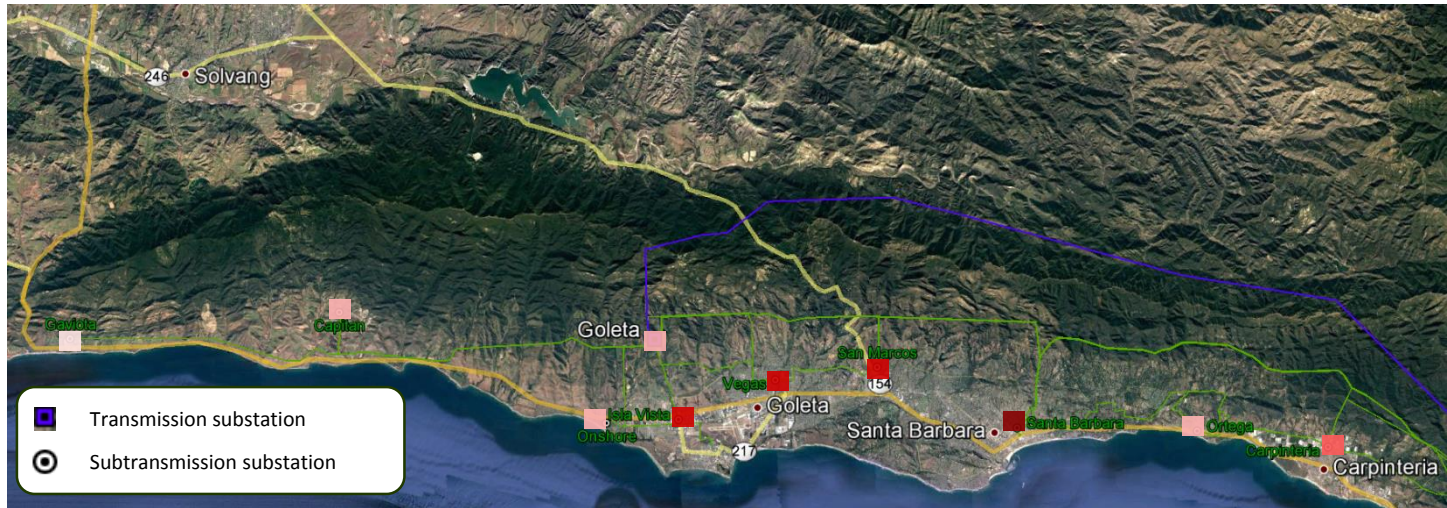
- Purchase a portfolio of local resources to manage N-2 risk
- Solution likely to include some energy storage
 - Mix of resources will be critical
 - Very little charging capacity from outside the local area during N-2 condition

Goleta Area – Location Overview

- The Santa Barbara/Goleta region lies at the northern-most end of SCE's electric system
- It is roughly defined as:
 - The portion of the grid that extends from areas near Concepcion and Jalama Beach on the north of the system, down to areas near Carpinteria to the south
 - This area is bounded to the west and south by the Pacific Ocean and to the



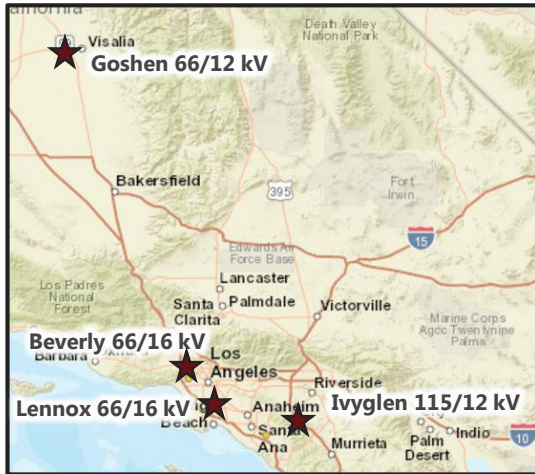
Goleta Area – Load Density



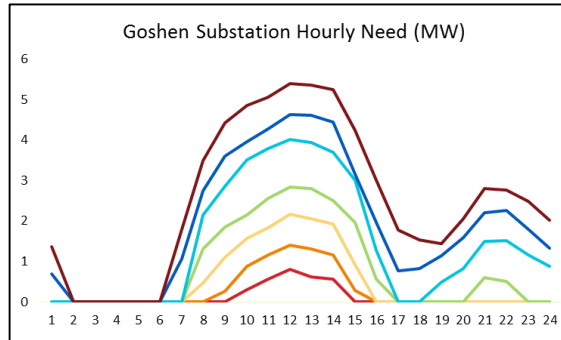
Aliso Canyon

- Large gas storage facility initially shutdown, subsequently availability for withdrawal only on an emergency basis
- State desire to reduce the need to mitigate the loss of the gas storage facility use for electric generation
- CPUC order SCE to procure energy storage
 - SCE launched RFO in May 2016
 - Projects required to be on-line by the end of 2016
 - Price benchmark based upon what SCE had previously paid for energy storage contracts
- Result
 - Third party facilities
 - Entered into 3 contracts with 2 successfully completed 22 MW/88 MWH
 - Utility owned
 - Tesla built 2 adjacent 10 MW/40MWH facilities on SCE property
 - GE built 2 different 10 MW/4.3 MWH facilities integrating energy storage with existing combustion turbines
 - Allowed participation of the entire facility in the spinning reserve market
- Impact – changes planning paradigm for how quickly resources can be brought on line to fulfill needs

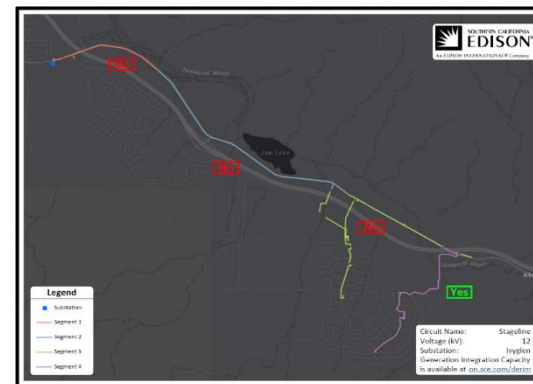
Using DERs to meet distribution deferral needs proved challenging



- Intent was to analyze whether DERs can effectively defer traditional distribution upgrades without a loss of reliability across a range of characteristics:
 - Climate zone
 - Customer type
 - Geographic diversity
- Distribution deferral projects targeted at four diverse B-bank substations
- Mix of substation and/or circuit needs that had to be met

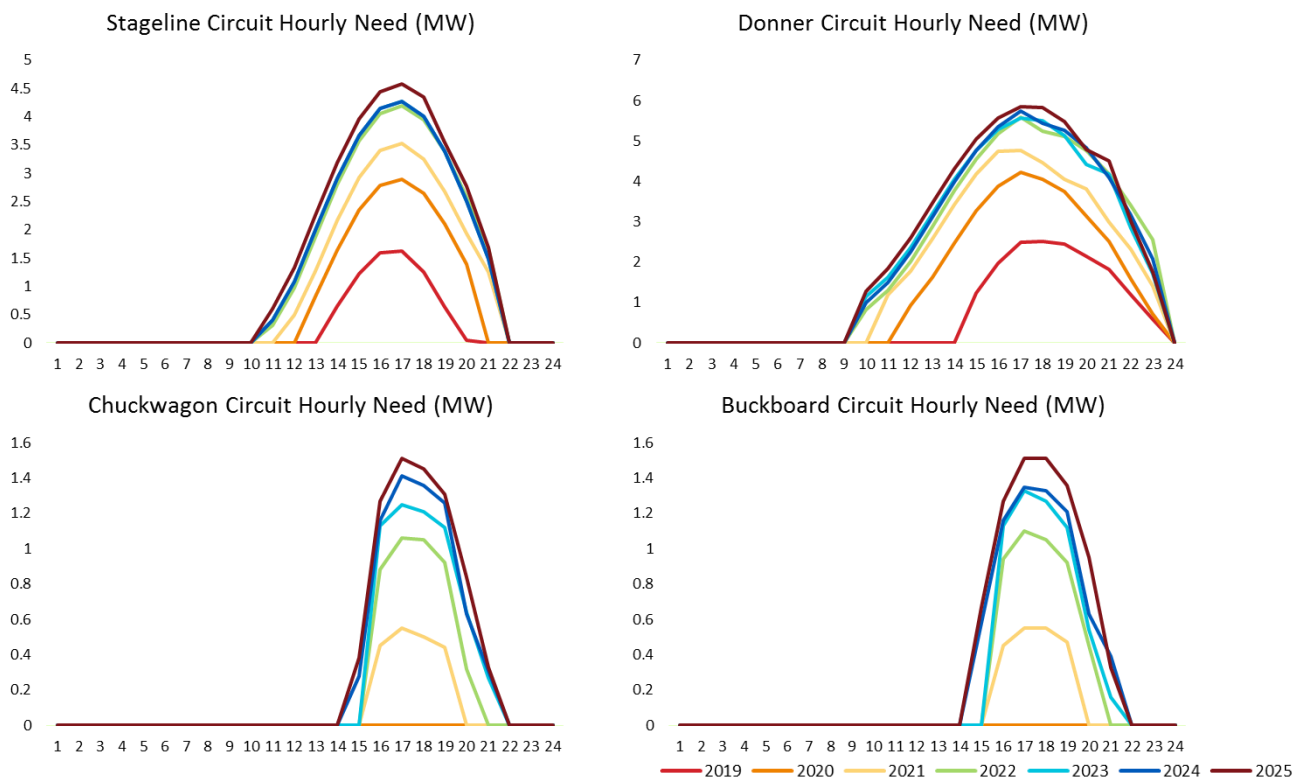


Distribution needs spanned multiple hours and expanded in duration and size over time



Only specified circuits and circuits segments helped meet the need

Different need profiles heavily influence the resource mix and cost of the DER solution

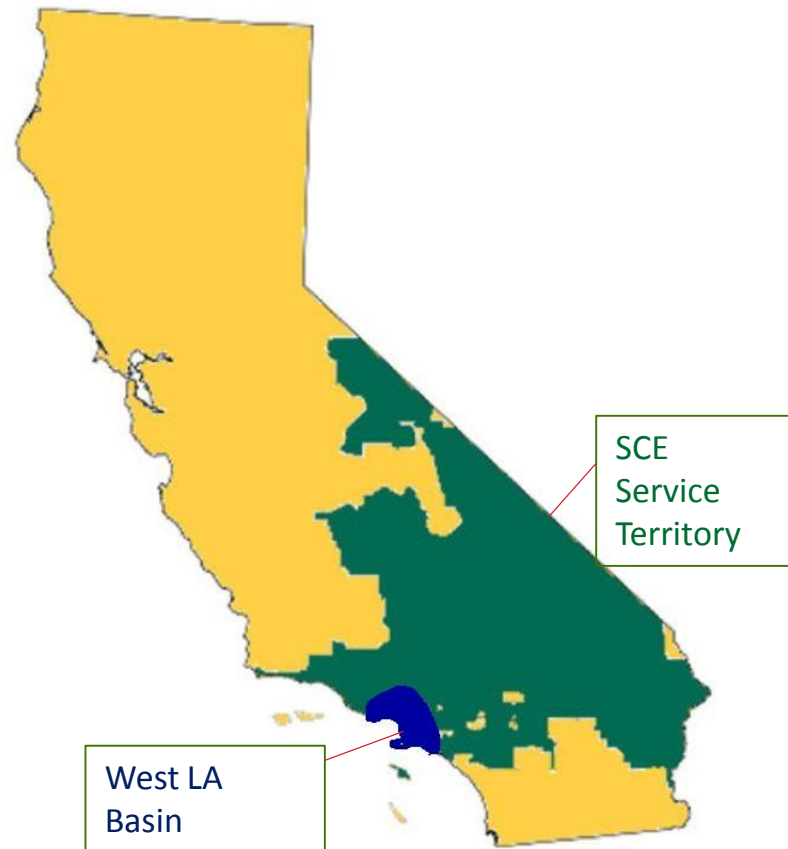


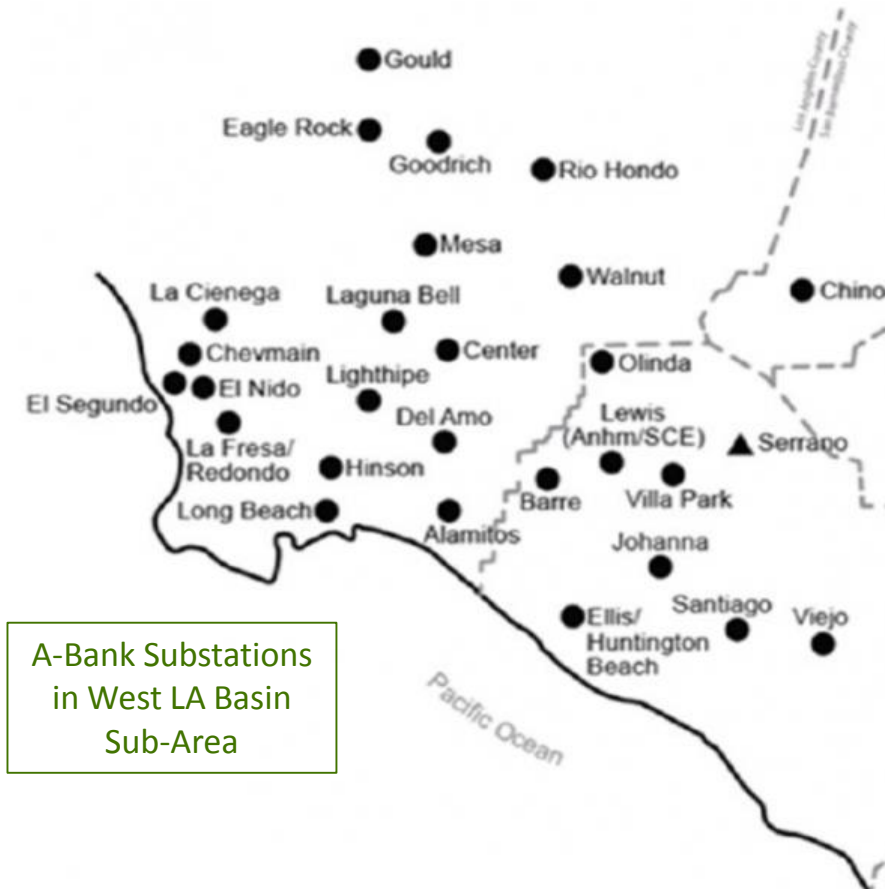
Local Capacity Resources RFO

Signed over 1,800 MW of contracts including:

100 MW of in front of the meter energy storage

160.6 MW of behind the meter energy storage





A-Bank Substations
in West LA Basin
Sub-Area