

Integrated DER Planning at SMUD



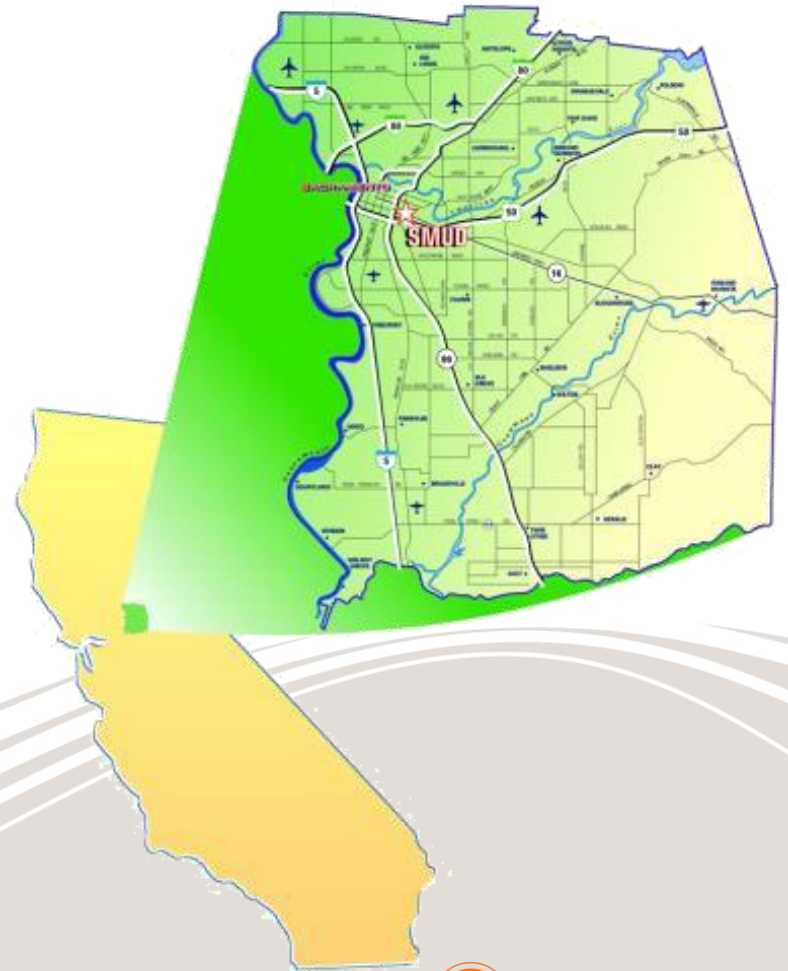
Obadiah Bartholomy
UVIG Fall Technical Workshop
Nashville, TN October 11, 2017

Powering forward. Together.



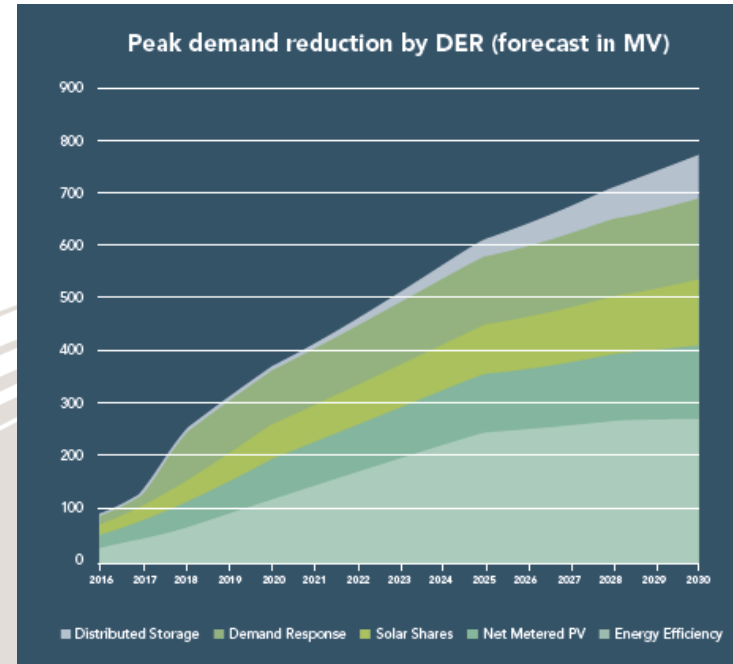
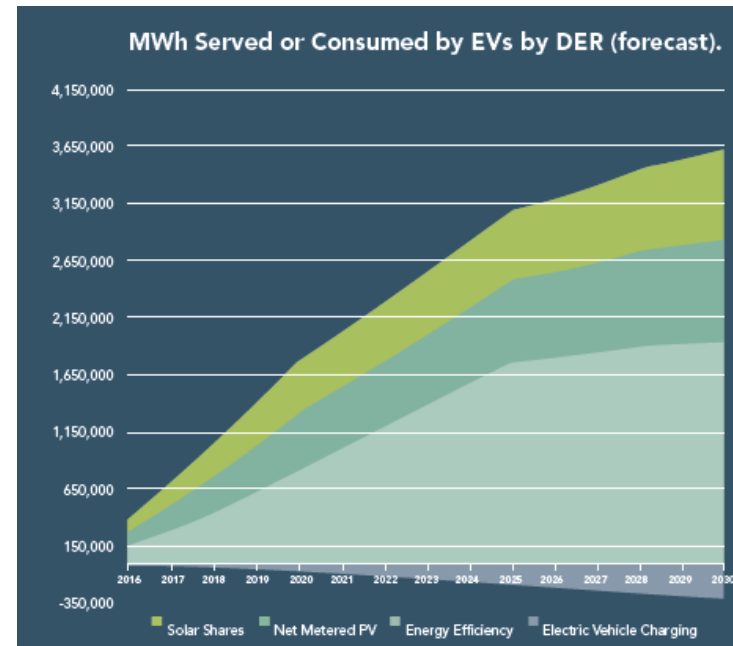
About SMUD

- Independently governed Publicly Owned Utility serving electricity to ~600,000 accounts
- Peak demand of 3,300 MW
- Annual sales of 10,500 MWh
- ~800 MW of combined cycle natural gas, 700 MW of hydro, 250 MW of wind, 250 MW of PV
- Average rates ~\$0.13/kWh



DER Investment at SMUD

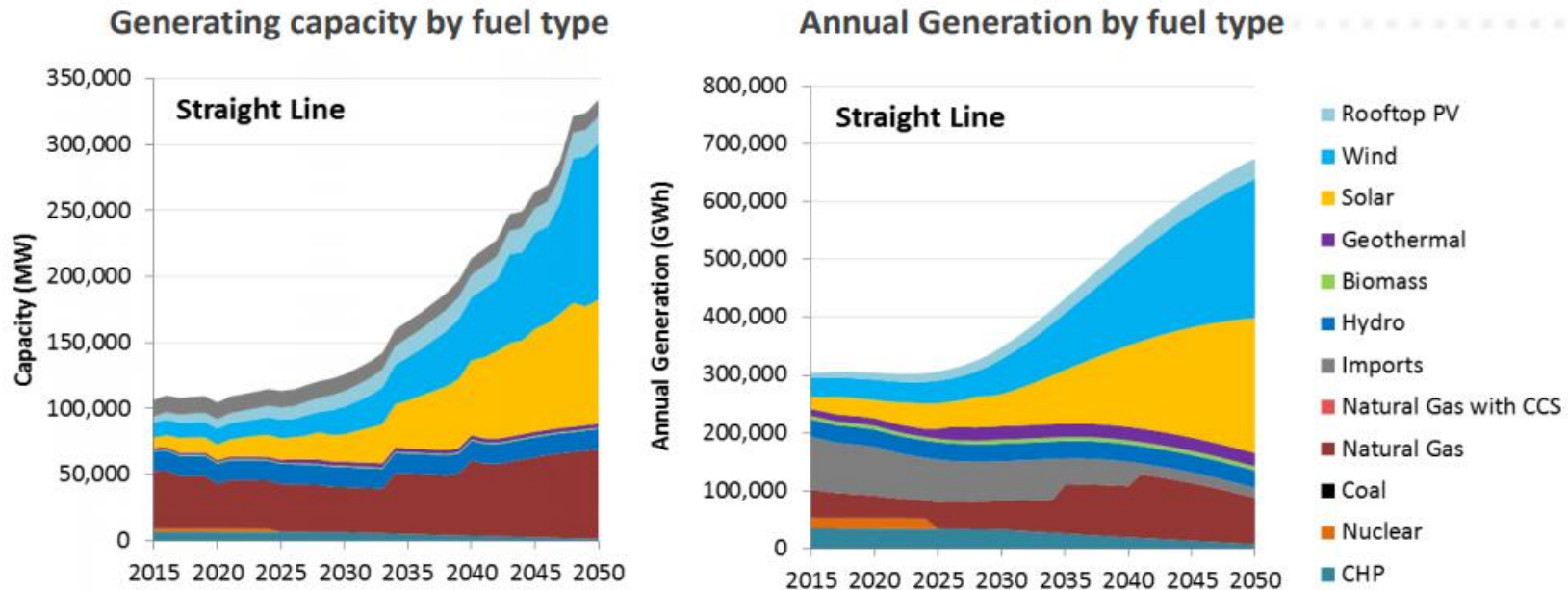
- Customers investing \$150-\$200M / yr in new PV and EE, 2-3X more than SMUD is spending on 50% RPS annual expansion
- DER adoption being driven by combination of rates and incentives
- Under very high adoption scenarios, 10% reduction in retail sales over 15 years and 20% reduction in peak demand possible
 - Significant stranded asset risk, financial risk without rate modifications



California Context

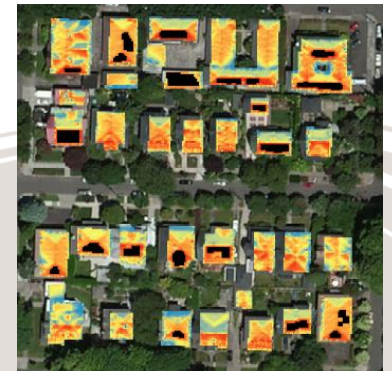
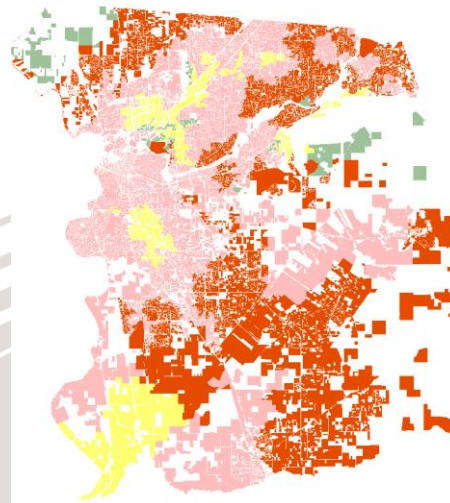
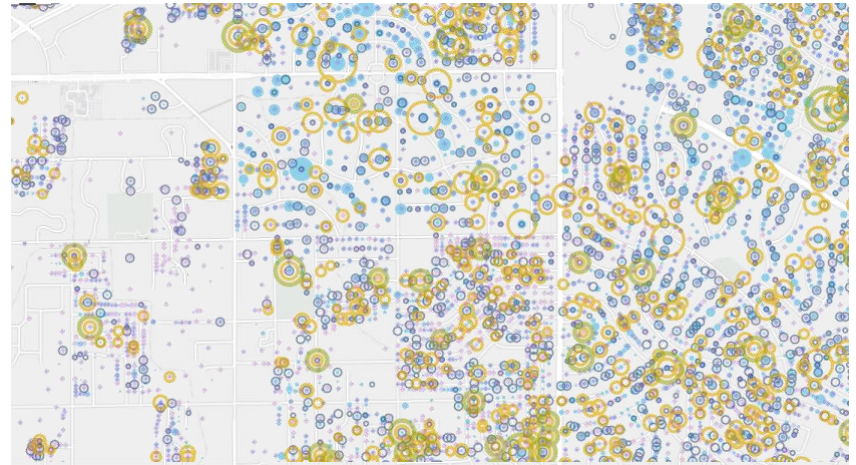
- 4 pillars guiding California electricity policy – Reliability, Affordability, Decarbonization, Customer Choice
- Draft legislation to reach 100% carbon free grid by 2045

- Electric loads increase significantly between 2030 – 2050 due to fuel switching in buildings, industry & transportation



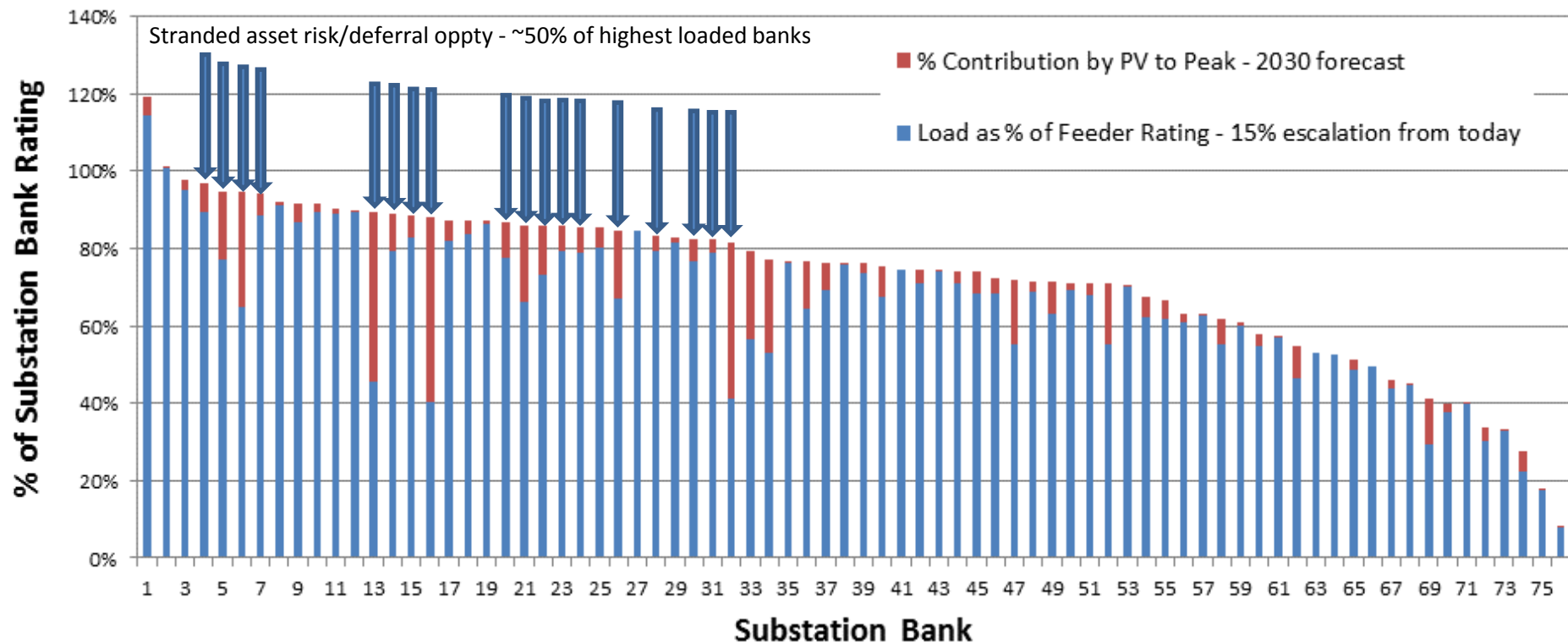
Integrated DER Analysis at SMUD

- Working with Black & Veatch, Combined individual DER adoption forecasts from independent studies
 - Typically used averaged load shapes for several dozen customer classes
- Disaggregated to customer level using B&V developed dispersion approach with Customer PRIZM & past DER adoption information
- Evaluated distribution impacts, bulk system values, revenue implications

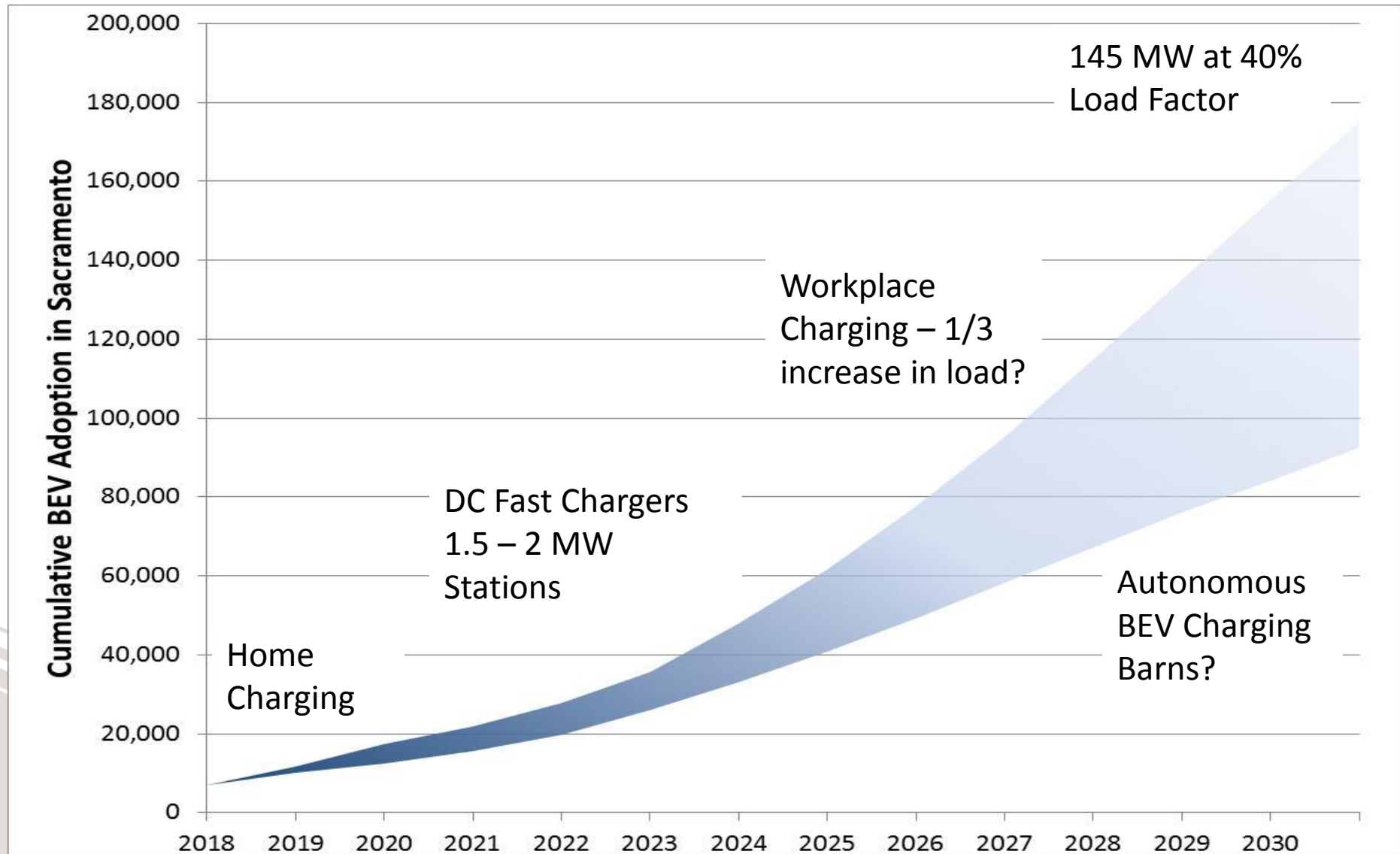


High PV Growth Case 720 MW by 2030

- Uneven adoption – important to understand for stranded assets risks



Electric Vehicles – LDV Growth and Potential Charging Infrastructure Models

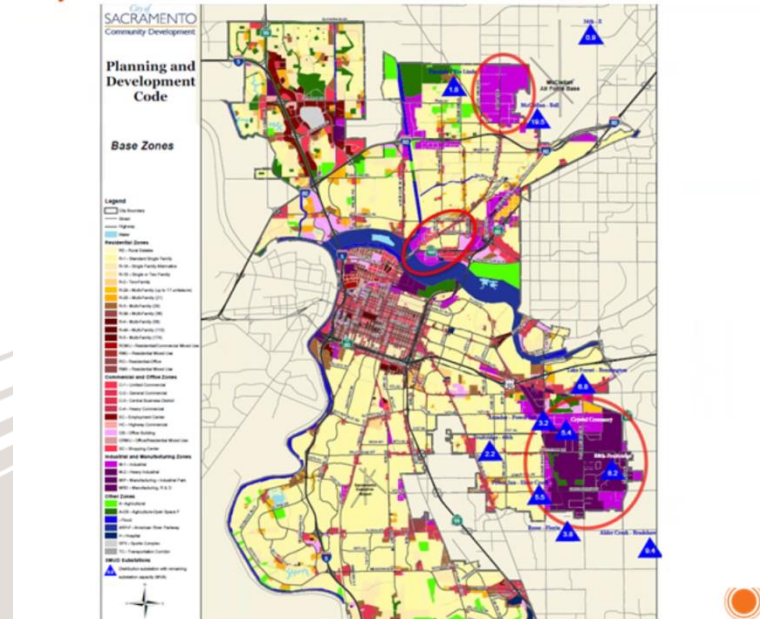


Indoor Agriculture

- Tremendous growth in indoor agriculture due to legalization of cannabis in 2017
- Concentrated growth in existing industrial areas
 - Warehouse rents up 4-5X
- 50 – 150 MW in new service applications over next 1-2 years, baseload



City of Sacramento Industrial Zoned Areas of Interest

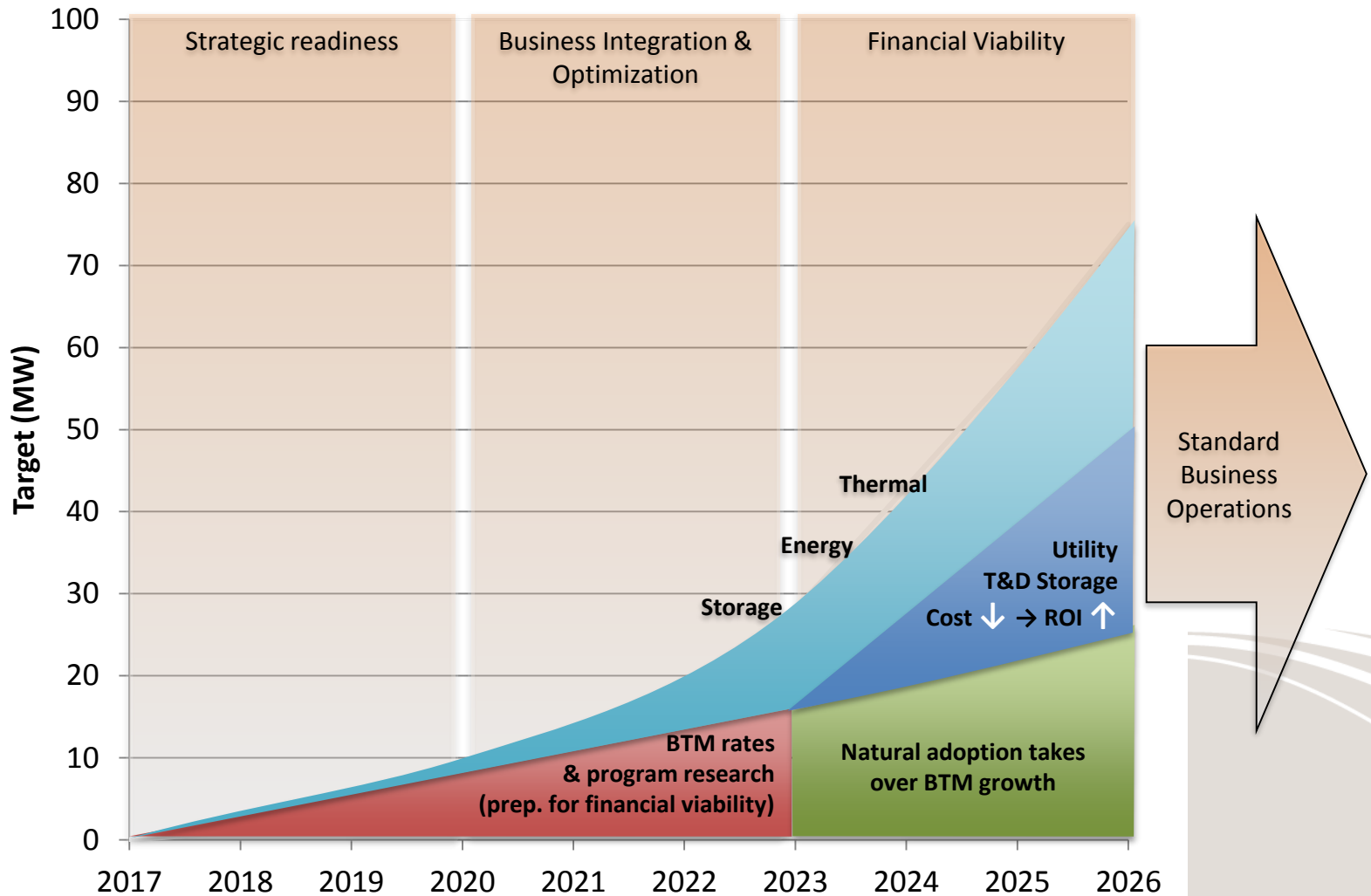


Electrifying Buildings

- Air-source heat pumps, heat pump water heaters provide energy efficiency vs. gas, save carbon, and create new shiftable loads
 - Sacramento currently 80+% natural gas for water and space heating
- HPWH's ~2kWh/day, 500W, technical potential of 150 MW of shiftable load
- ASHP's ~5-10 kWh/day in shoulder months, potential for up to ½ this in shiftable loads (add'l 150-200 MW)
- Peak demand impacts lower than summer AC so no distribution re-sizing should be needed
- Market share needs to be at 50% of sales by 2030 to be on track to meet state carbon goals

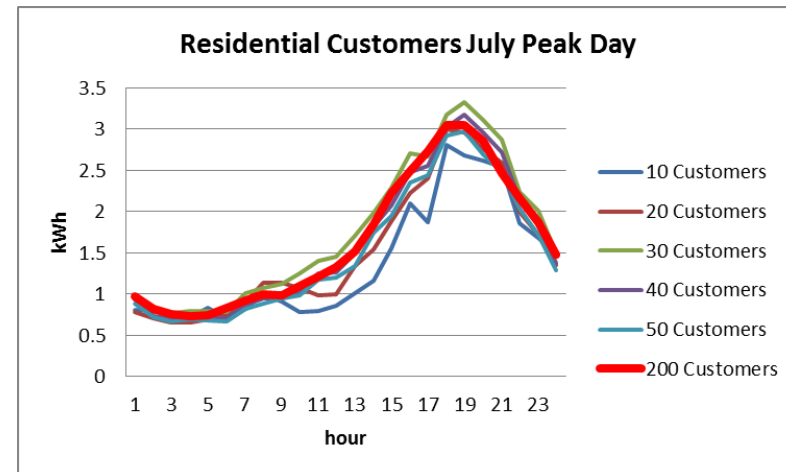


SMUD Board Energy Storage Targets



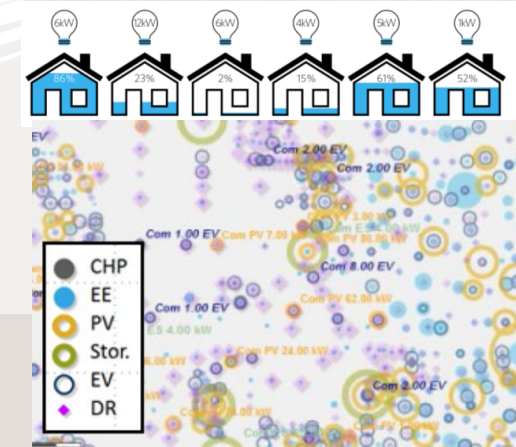
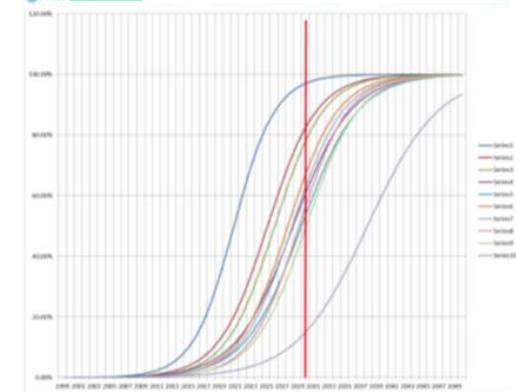
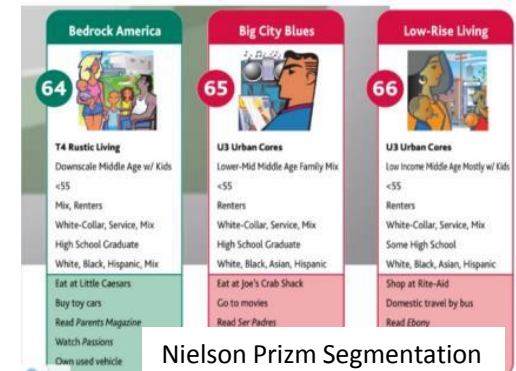
Gaining Confidence – Customer Aggregation

- For distribution planning confidence, need measured outcomes for technologies that are often un-metered
- Customer load predictability key for EE, DR outcome confidence
- Geographic diversity key for PV predictability confidence (challenging on compact feeders)
- EE metering currently underway to measure hourly outcomes and loadshapes of EE measures using AMI



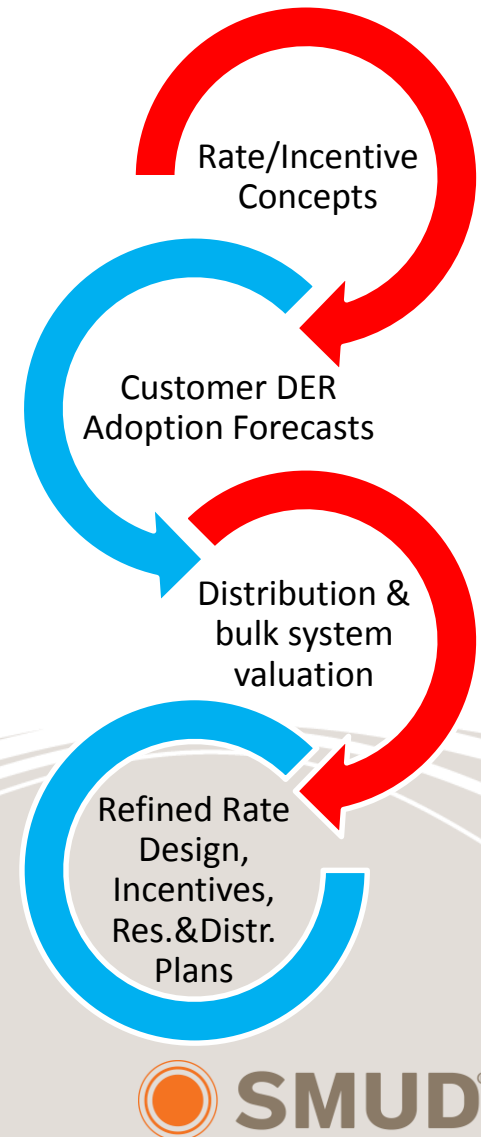
Integrated DER Forecasting

- Working with software developer to develop customer-level adoption forecasts
- Segmentation, payback evaluation historical adoption training, clustering correlation
- Regular feedback based on adoption to refine predictive algorithms
- Feeder-level load impact profiles with ability to export into Distribution Planning Tools
- Rapid analysis of new rate design and incentive implications on adoption



Integrated Planning Process

- Opportunity to connect rates process to IRP through DER procurement lens
- Distribution capacity value, opportunity to create space for electrification, enhance utilization of existing grid
- Renewables integration value
- Leverage customer investment to accelerate transition



Preparing for the
distributed energy future

Thank You!

