

# Value of DERs – A Utility Perspective

ESIG Spring Technical Workshop  
Obadiah Bartholomy  
March 20<sup>th</sup>, 2020



Powering forward. Together.

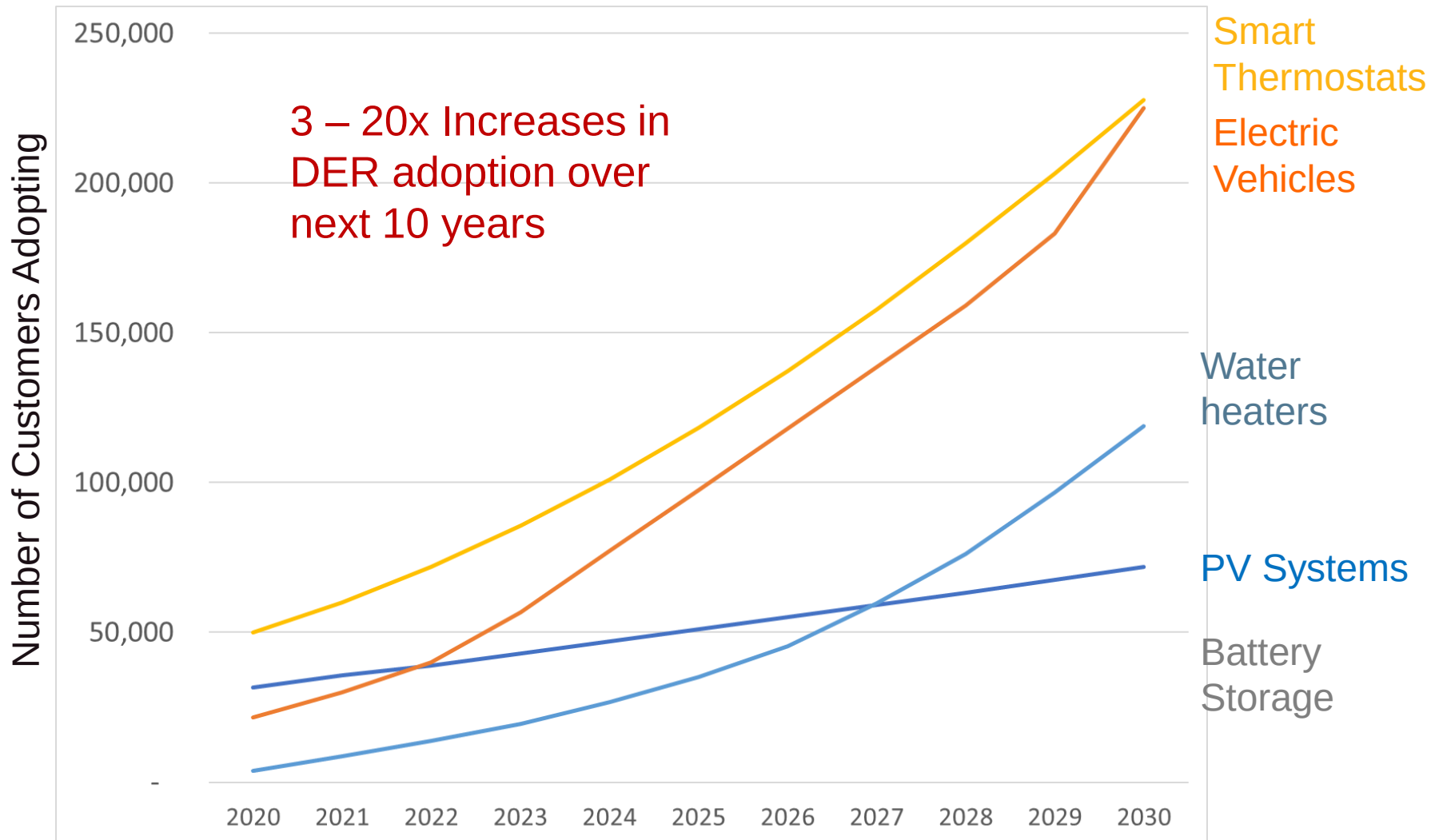


# SMUD's 2019 Integrated Resource Plan

## NET-ZERO-CARBON ELECTRICITY BY 2040

|                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>Electrification</div> <div><br/>\$1.7B</div> <div><br/>880k EVs</div> | <div>Renewables</div> <div><br/>\$3.9B</div> <div><br/>290 MW<br/>Rooftop PV</div> | <div>Reliable Power</div> <div><br/>540 MW<br/>Local Storage<br/>\$800M</div> <div><br/>Transmission<br/>Batteries<br/>Hydro<br/>and Gas<br/>Keep the lights on</div> | <div>Maximize Community Benefits</div> <div><br/>Affordable Rates<br/>Local Energy<br/>DAC Benefits<br/>Local Air Quality</div> <div></div> | <div>Lower GHG Emissions</div> <div><br/>SMUD<br/>70% Below 1990<br/>Sacramento<br/>64% Below 1990</div> <div><br/>405k All Electric<br/>Smart Homes</div> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

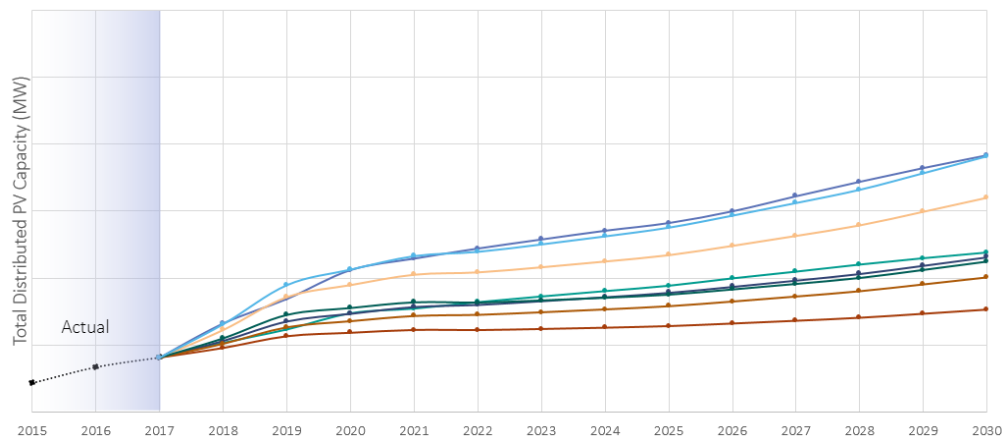
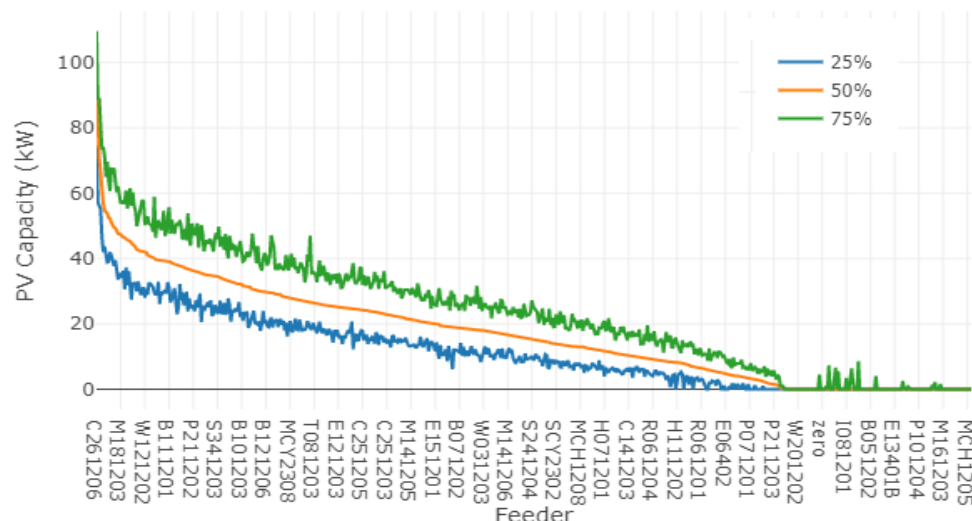
# DER Adoption Forecasts in IRP



# Valuing DERs in Grid Planning – Predicting Adoption

- To provide value in planning for grid upgrades, need confidence in ability to predict adoption
  - Spatial and temporal confidence ahead of normal planning lead-times
- SMUD co-developing WattPlan Grid with Clean Power Research to model individual customer DER choice
  - Scenario analysis based on rate design, technology costs

PV Adoption Capacity Quantiles by Feeder

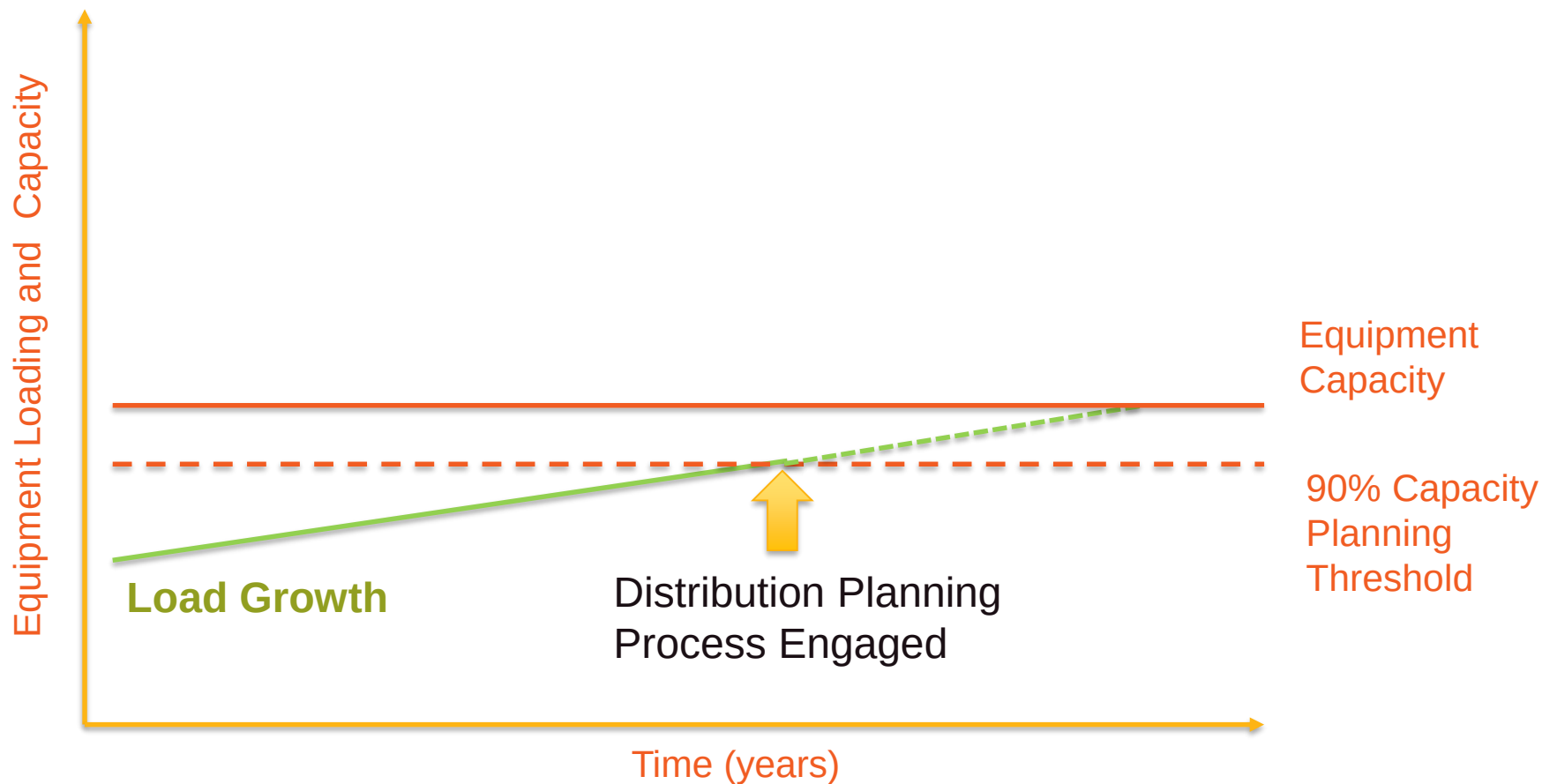




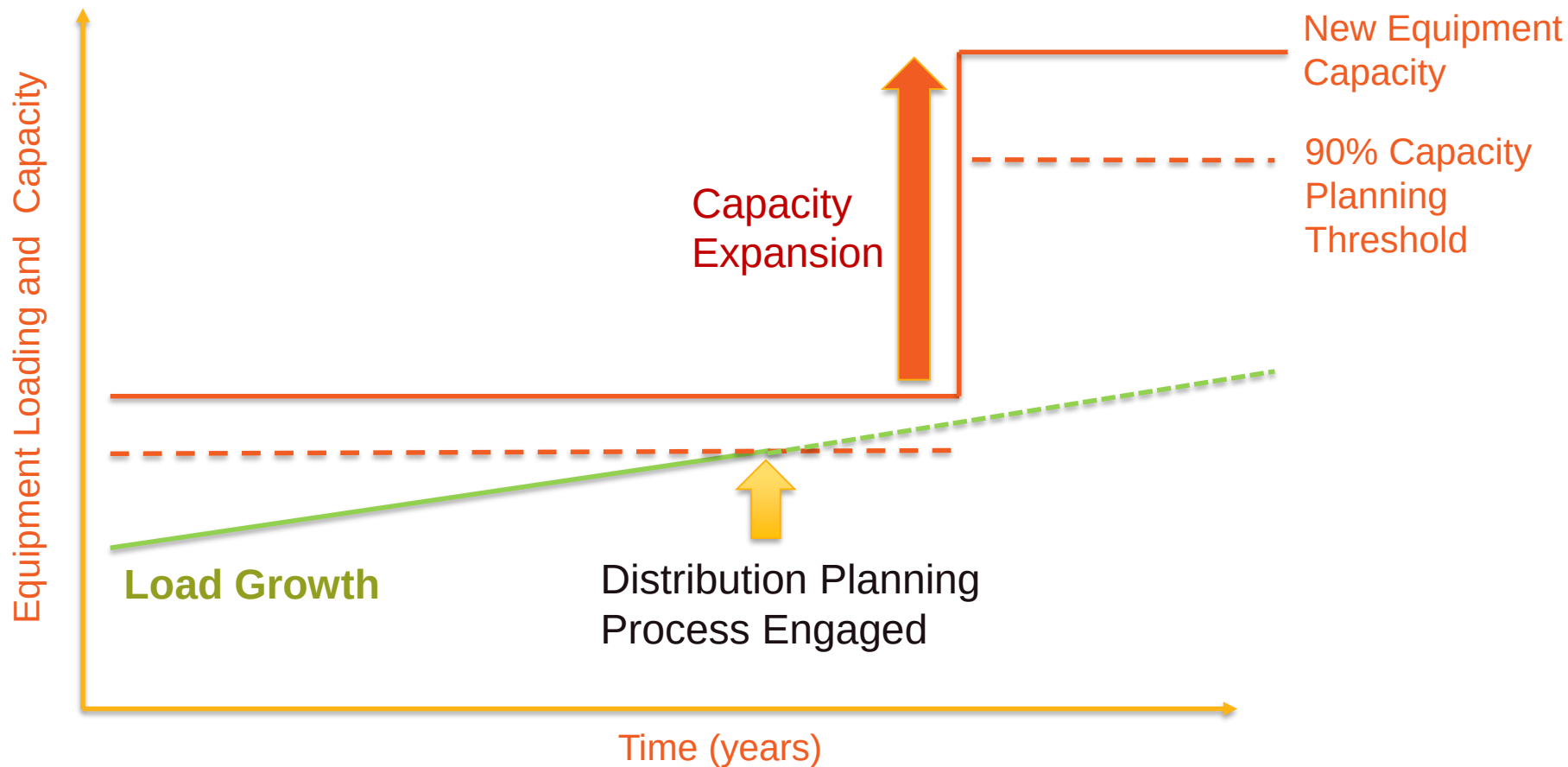
# Specified and Unspecified Capacity Deferral

- Specified capacity avoidance – DERs contracted to displace wires solution as part of distribution planning process
  - Challenges to fit within timing of typical process make it difficult to leverage organic adoption, lead to higher cost DER solutions (e.g. contracted storage)
- Unspecified capacity avoidance – Organic DER adoption reduces demand ahead of distribution planning process / capacity upgrade being triggered
  - Leverages organic adoption, attribution of capacity value to DERs challenging (many actors, considerations to attribute value)
- DER Planning Threshold – concept for threshold to be set ahead of Distribution Planning Process threshold, triggering modest locational benefit adder
  - Leverages organic adoption with slight economic signal boost, expands set of resources that could contribute to avoiding capacity upgrade

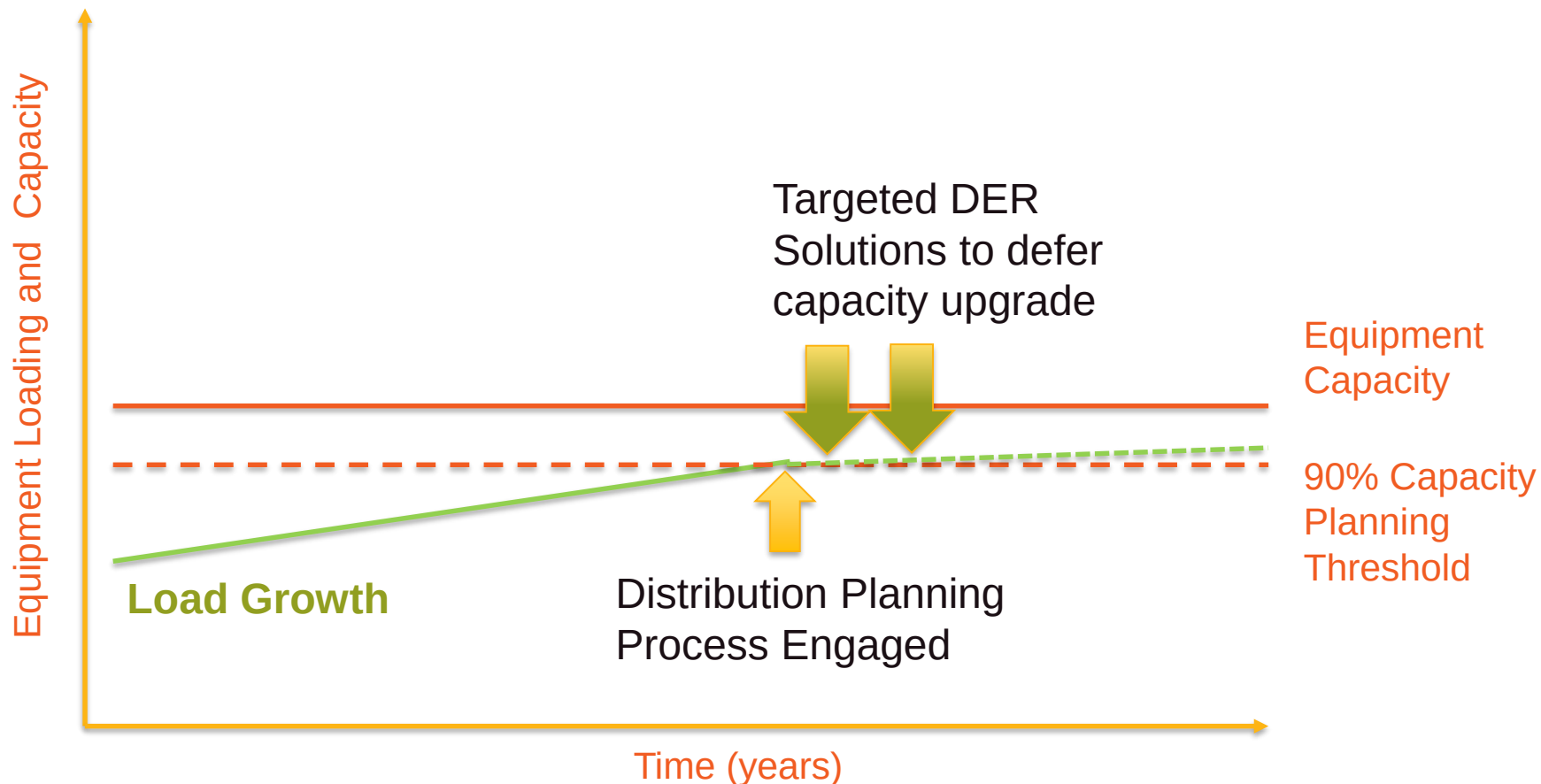
# Specified vs. Unspecified Deferral and a DER Planning Threshold Concept



# Specified vs. Unspecified Deferral and a DER Planning Threshold Concept – Traditional Upgrade

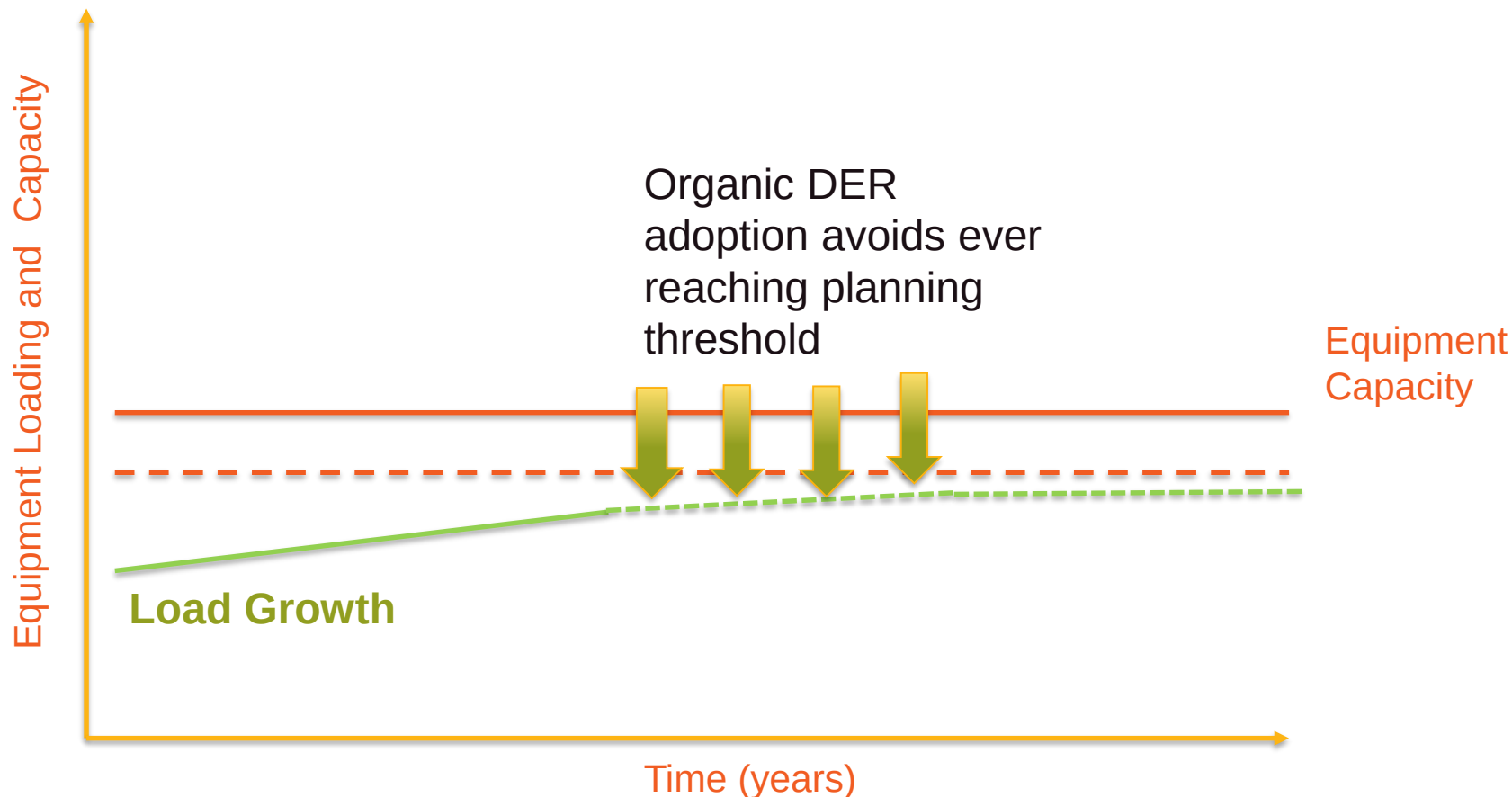


# Specified vs. Unspecified Deferral and a DER Planning Threshold Concept – Specified Avoidance

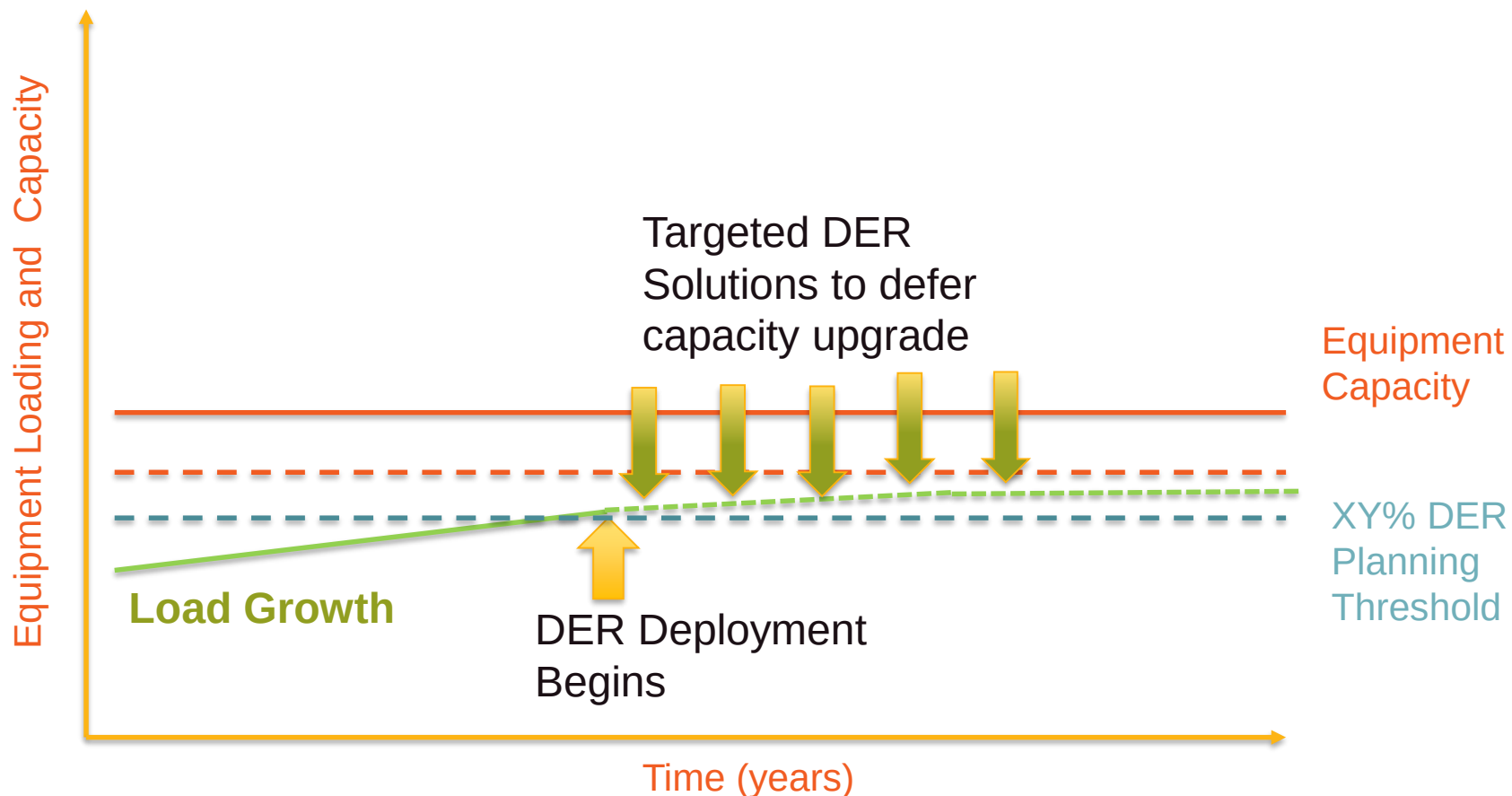




# Specified vs. Unspecified Deferral and a DER Planning Threshold Concept – Unspecified capacity deferral



# Specified vs. Unspecified Deferral and a DER Planning Threshold Concept – DER Planning Threshold Concept



# Operational Considerations for Value of DERs

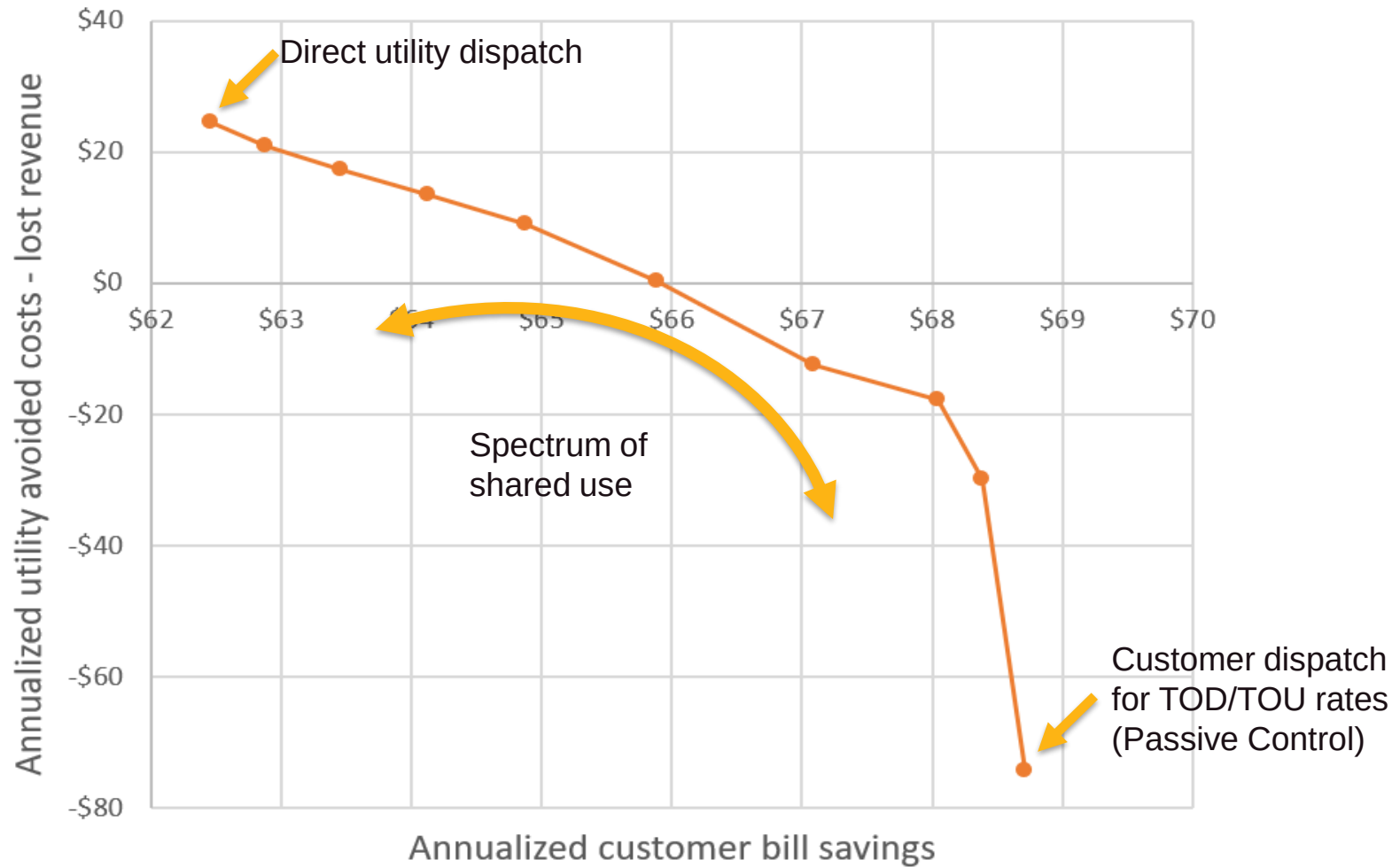
- Fixed vs dynamic DERs
  - PV and EE have a fixed, predictable shape, unaffected by pricing or signaling
  - Storage, EV, HVAC, water heating are all dynamic
- Different values for dynamic DERs



Need to consider value tradeoff with increased cost for accessing direct control

# Customer / Utility Tradeoffs with DER Control

Economic Impact of 4 kW Residential Battery with PV



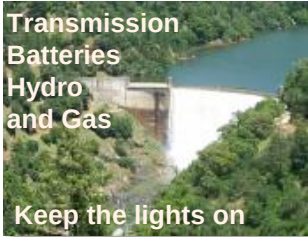
# SMUD NEM 2 Value of Solar and Solar + Storage Study

- Currently nearly 30,000 solar customers (10% of SF houses) with solar, SMUD estimates \$30M per year in cross-subsidy from NEM
- Value of Solar & Storage study underway to review benefits and costs of generation, T/D, environmental and societal impacts of BTM solar and storage
- Examining customer dispatched and utility dispatched valuations
- Results expected Summer 2020
- Series of community workshops to follow before rate proposals in 2021



# SMUD's 2019 Integrated Resource Plan

## NET-ZERO-CARBON ELECTRICITY BY 2040

|                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>Electrification</div> <div></div> <div>\$1.7B</div> <div></div> <div>880k EVs</div> | <div>Renewables</div> <div></div> <div>\$3.9B</div> <div></div> <div>290 MW<br/>Rooftop PV</div> | <div>Reliable<br/>Power</div> <div></div> <div>540 MW<br/>Local Storage</div> <div>\$800M</div> <div></div> <div>Transmission<br/>Batteries<br/>Hydro<br/>and Gas</div> <div>Keep the lights on</div> | <div>Maximize<br/>Community<br/>Benefits</div> <div></div> <div>Affordable Rates<br/>Local Energy<br/>DAC Benefits<br/>Local Air Quality</div> <div></div> | <div>Lower<br/>GHG<br/>Emissions</div> <div></div> <div>SMUD<br/>70% Below 1990<br/>Sacramento<br/>64% Below 1990</div> <div></div> <div>405k All Electric<br/>Smart Homes</div> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



# Primary Value of DERs for SMUD in Accelerating Carbon Reduction

- Expect electrification investments to substantially exceed grid upgrades (dependent on incorporating DER controls)
- SMUD adopted Carbon Metric for Efficiency / Electrification programs in 2020
- Tool developed in 2019 with E3 to evaluate hourly carbon benefits of EE, EB, EV, PV, will be adding storage, load shifting

| Technology          | Lifetime Carbon Savings (2020 install) | Cost per tonne to other SMUD Customers |
|---------------------|----------------------------------------|----------------------------------------|
| Rooftop Solar (5kW) | 12.2                                   | \$ 905                                 |
| HP Water Heating    | 11                                     | \$ 180                                 |
| HP Space Heating    | 22.8                                   | \$ 112                                 |
| AC 16 SEER          | 3.3                                    | \$ 212                                 |
| Electric Vehicle    | 32                                     | \$ 44                                  |

Thank you.

