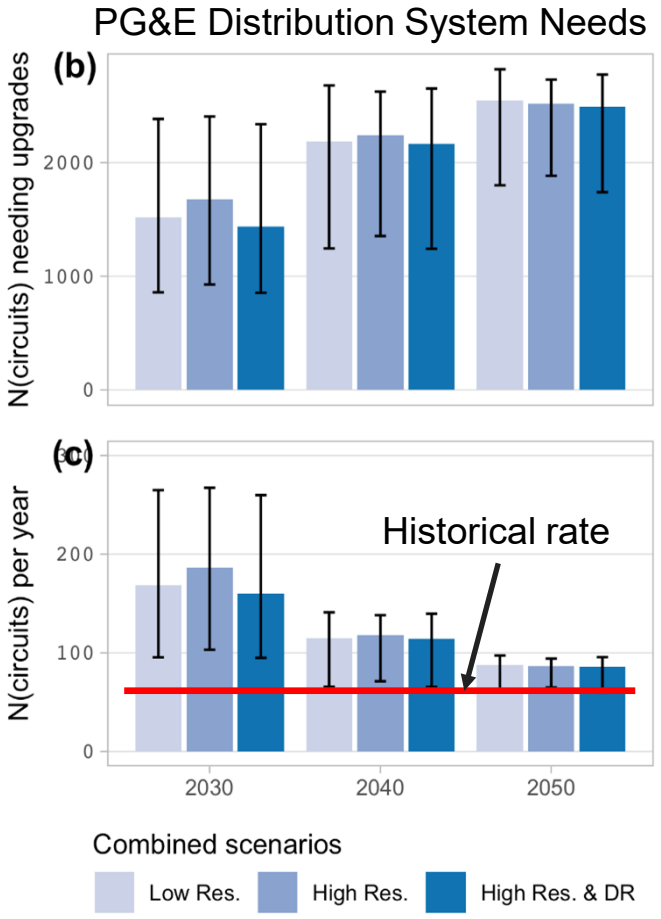
Innovation for California's Energy Goals

Duncan Callaway

Chair, Energy and Resources Group

Impediment: Distribution System Capacity

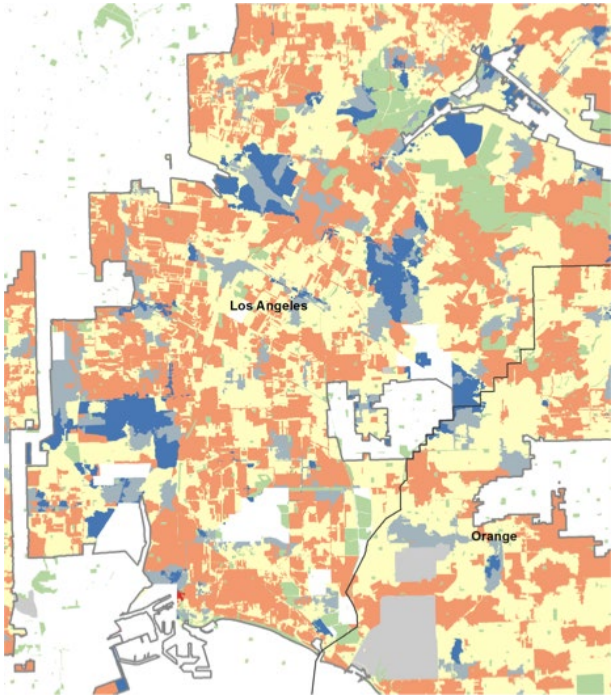
- Several recent studies show significant buildout to support electrification pathways
- Can distribution equipment **supply chains** deliver?
- Is the utility **workforce** ready?
- Will all communities have **equal access**?



Elmallah et al, ERIS, 2022

R&D solutions: Distribution System Capacity

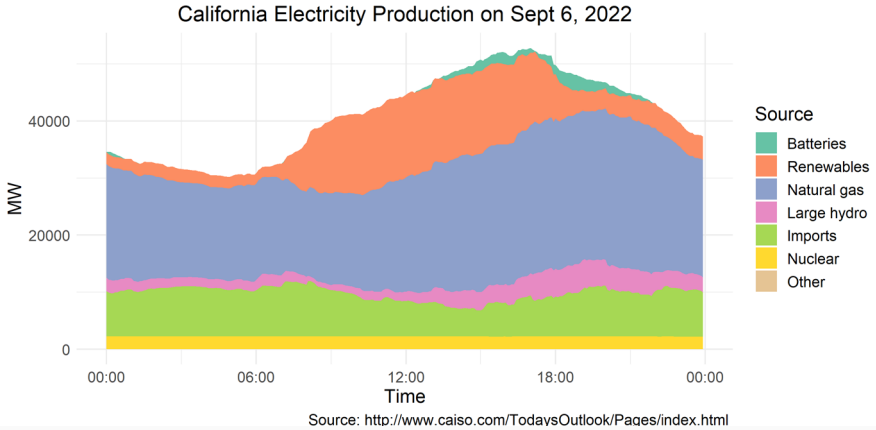
- Distribution grid-focused smart charging
  - Delays the need to build new capacity
  - Is price-based response sufficient? Fair? How to balance transmission needs?
  - Accelerate development of hardware, software; customer engagement
- Longer term distribution planning tools to enable proactive buildout
  - “IRP for distribution systems”
  - Enables workforce planning
  - Enables supply chain commitments
  - Scenario selection is critical, needs stakeholder engagement

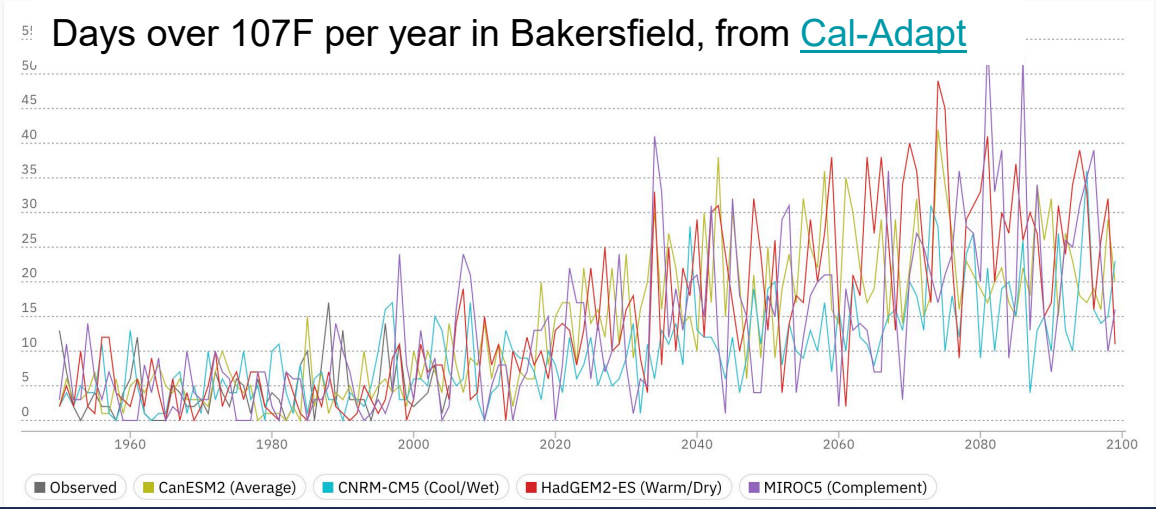


New DER capacity for a portion of SCEs service territory including parts of Los Angeles and Orange Counties. (Brockway et al, Nature Energy, 2021)

Impediment: Resource adequacy, forecasting

- Electrification, renewables buildout could stall if system is unreliable
- Electricity planning scenarios need to include climate change projections
- CEC: Sept 6 2022 was a 1-in-14 year event according to *historical* data
- What if more of WECC had been experiencing a heat wave?

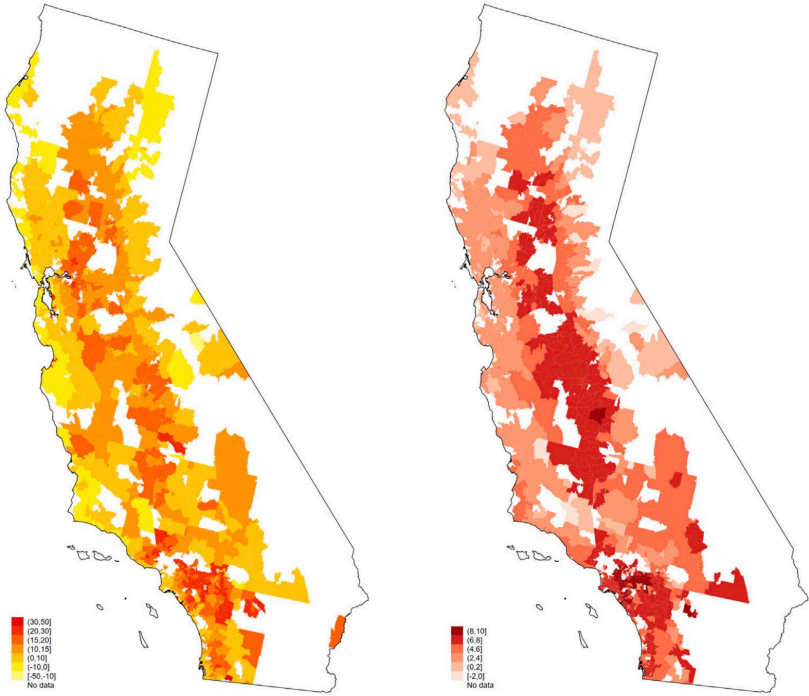




Berkeley
UNIVERSITY OF CALIFORNIA

R&D solutions: Resource adequacy, forecasting

- Incorporate climate projections into demand forecasting tools
  - Include “extensive margin” for adopting new appliances
- Pursue *decision making under deep uncertainty* methods
  - What paths are robust to a wide range of possible futures?
  - What paths enable adaptation to changing conditions?
- Harmonize forecasting tools across agencies

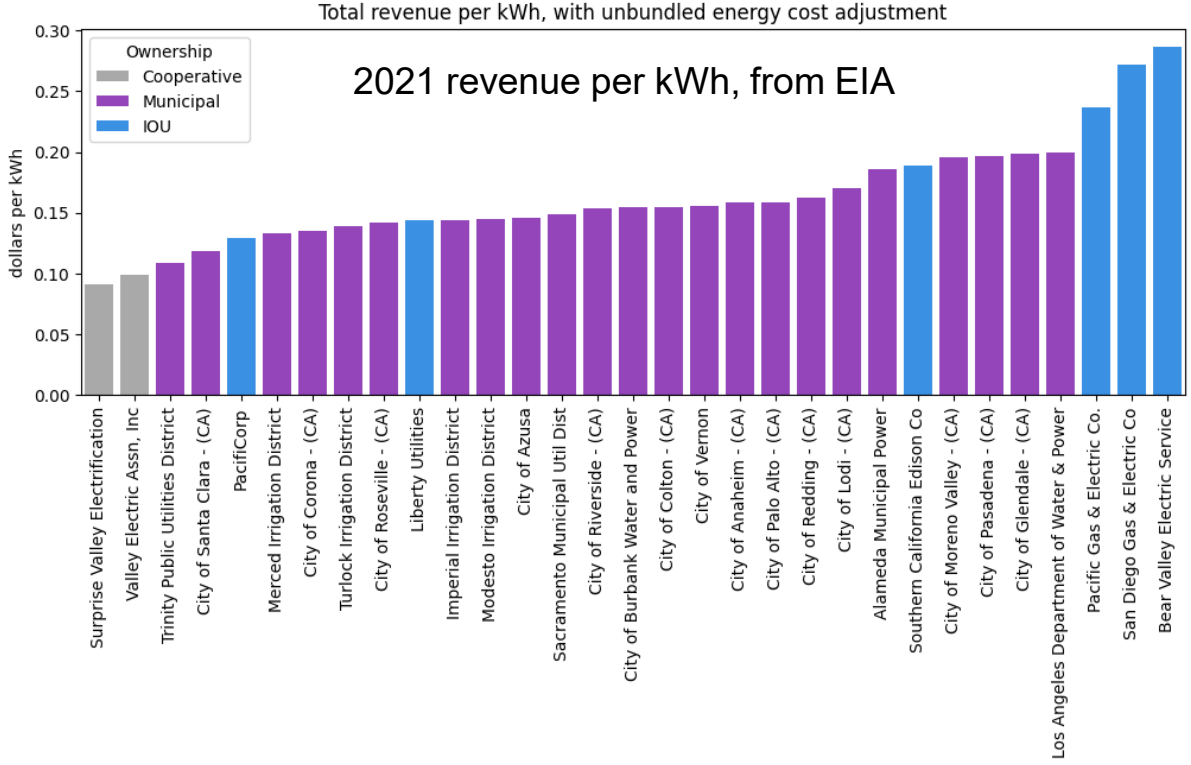


(a) Intensive Margin (b) Extensive Margin Delta

Auffhammer, JEEM, 2022

Impediment: Retail tariffs

- Retail tariffs, especially for CA IOUs, are high and growing
  - Hawaii: 43c/kWh
  - PG&E: 35c/kWh (Tier 1), 44 c/kWh (Tier 2)
  - Energy cost is a sliver of this
- Private cost implications:
  - Heat pumps and EVs don't have an operating cost advantage
  - This will hit low income and renters hardest



R&D solutions to retail tariff obstacle

- Cost containment
  - Wildfire mitigation technology
  - New models for regulation (e.g. performance-based regulation)
  - Greater CPUC analyst budget and capacity for oversight
- Tariff redesign
  - Tariff innovations that enable reducing volumetric ($/kWh and $/kW) costs
  - Moving “taxes” away from lower income groups
- Deeper investigation of how different utility models perform in California