



Advancing Load Flexibility for Decarbonization of California's Electric Grid

Presentation to the Sacramento Municipal Utility District
August 10, 2021

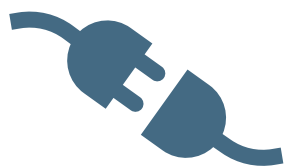


Mary Ann Piette, Lawrence Berkeley National Laboratory

CalFlexHub seeks to

Advance capability of buildings to provide a flexible load

- Identify, evaluate, develop, and demonstrate pre-commercial, load-flexible pre-commercial technologies
- Standardize the signals used to communicate dynamic price and GHG information to these technologies
- Emphasis is Load Shaping DR but CalFlexHub will also evaluate Supply Side DR
- CalFlexHub seeks to benefit all Californians, including those from disadvantaged communities.



HUB PORTFOLIO MANAGEMENT

Innovation,
Discovery &
Recruiting



Annual Review Cycle

**Technology
Assessment &
Prioritization**

**Research &
Development**

**Demonstration
& Deployment**

**Performance
Evaluation**

**Flexibility
Solutions
Adopted by
Industry and
building stock at
scale.**

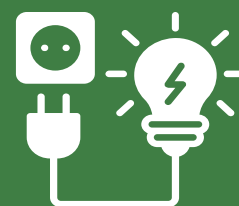
Identify,
analyze, and
screen
innovations



Develop &
validate
early-stage
innovations



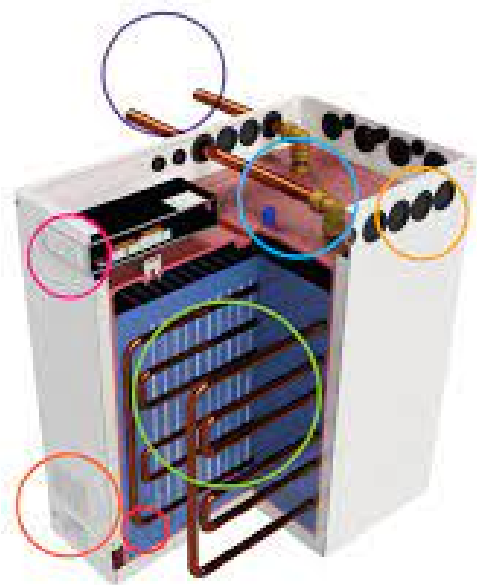
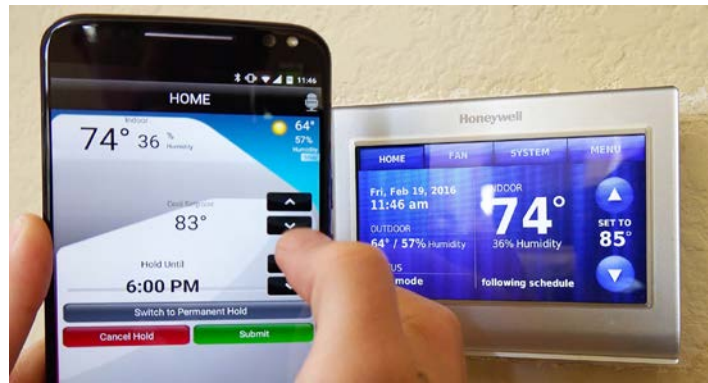
Refine
solutions &
validate
performance
in field



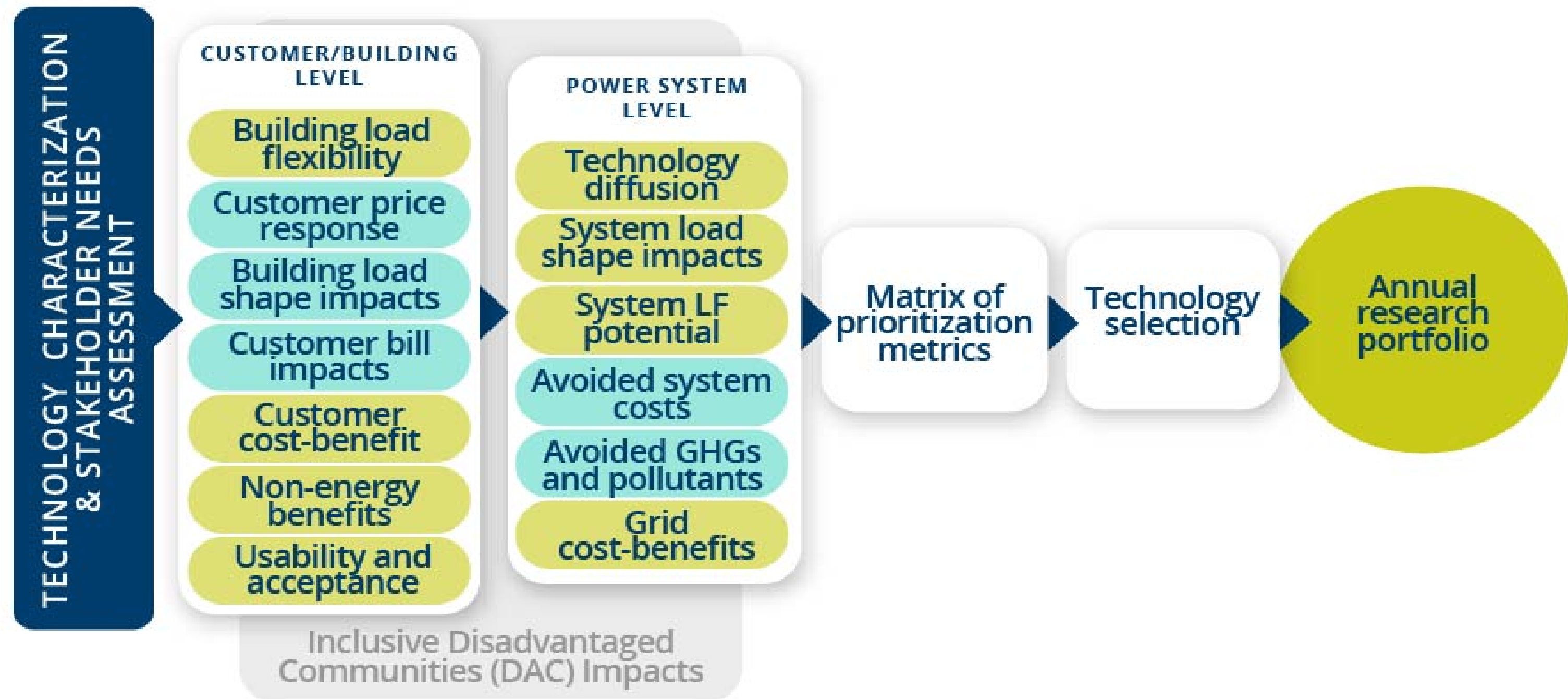
Quantify
potential
impact using
key metrics.



Numerous Load Flexibility Technologies to be Evaluate in Lab and Field



Annual Technology Assessment Process



Portfolio management framework for valuation of impacts of CalFlexHub technology portfolios and development of annual research portfolio. Berkeley Lab models (green); E3 models (turquoise).

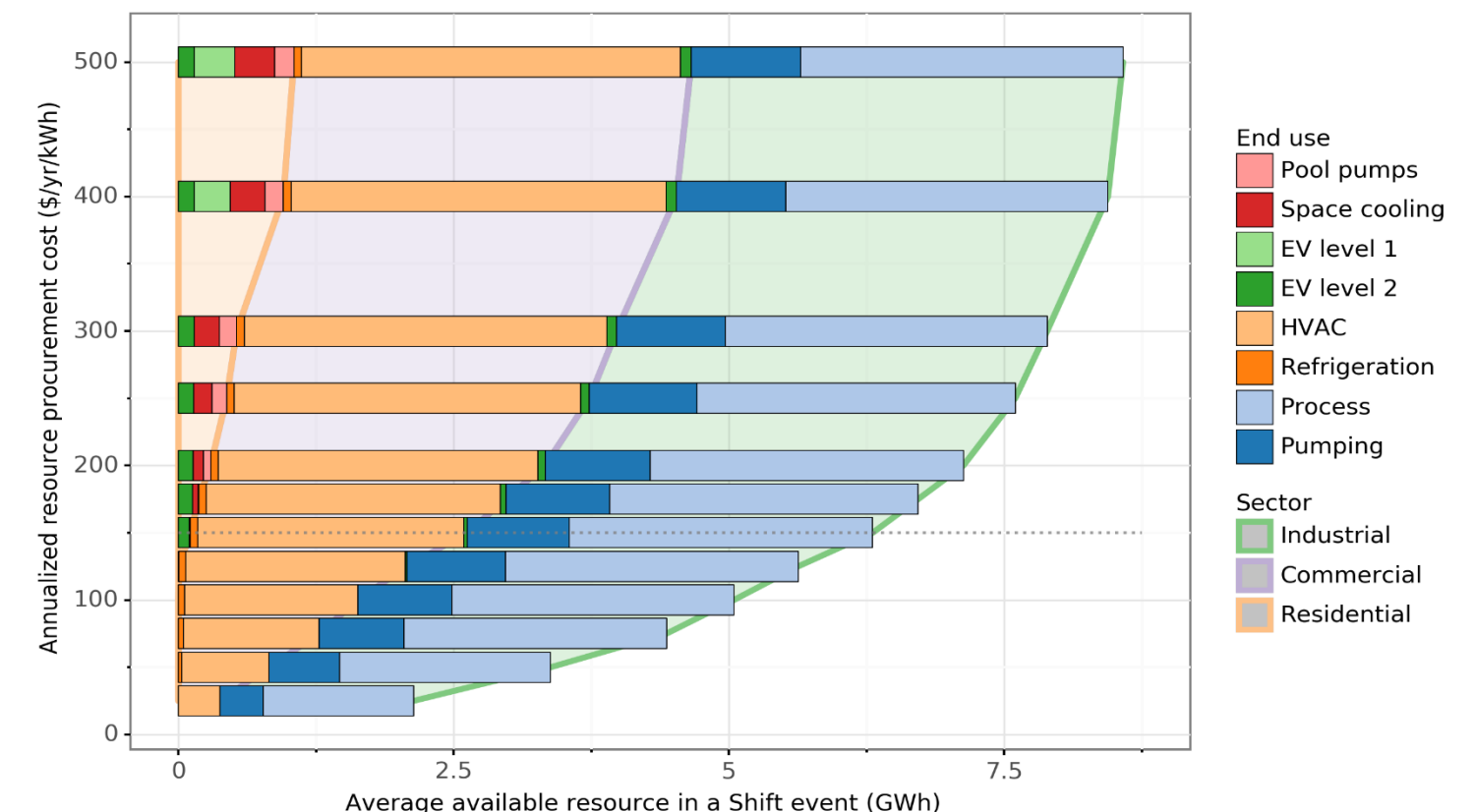
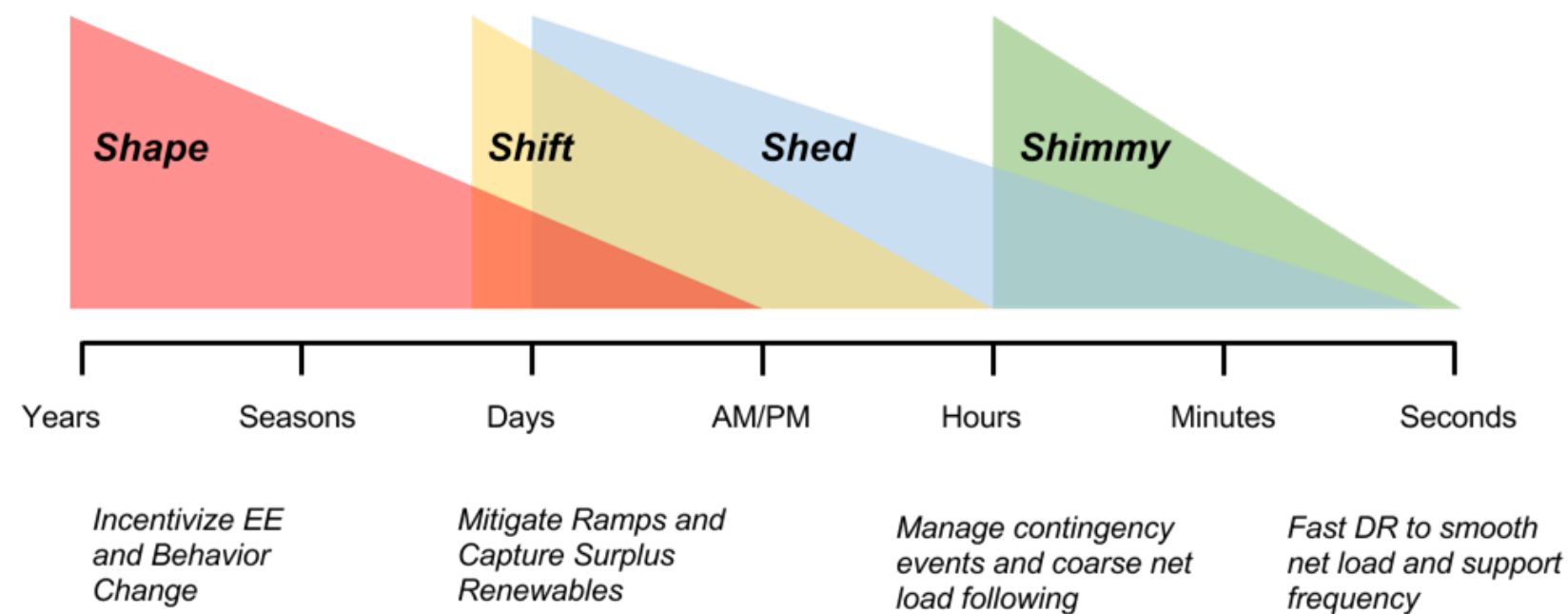
Funded and Cost Share Partners in CalFlexHub



CalFlexHub includes > 20 other partners, industry, building owners including SMUD

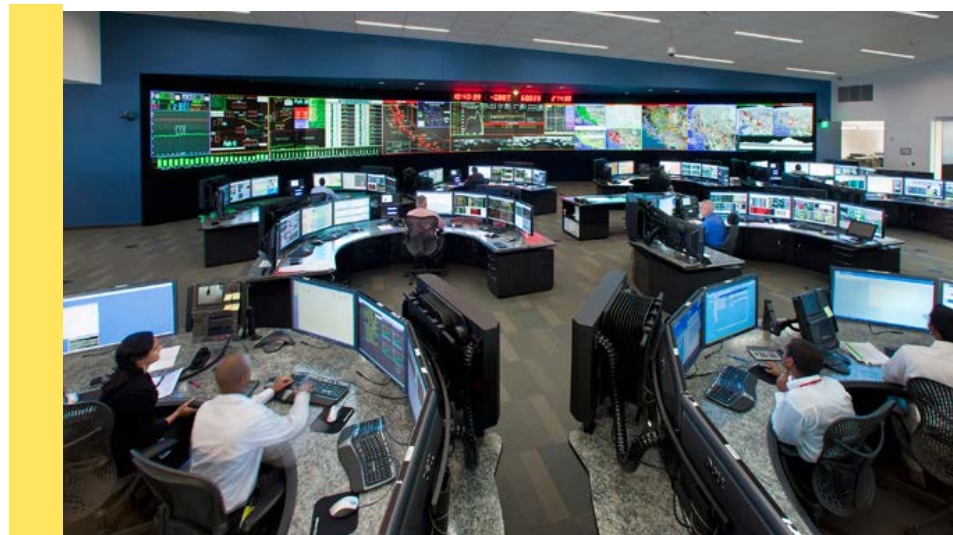
CPUC California Demand Response Potential Study

- DR Potential Study estimates future potential DR resource in California IOU service territories.
- Phases 1 and 2 estimated the potential for DR through 2025
- We identify 4 types of DR: Shed, Shift, Shape, and Shimmy.
- Phase 3 evaluated Shift potential through 2030.
- Study provides inputs to Integrated Resource Plan (IRP) regarding future availability and cost of DR resources.



Overview of Phase 4

- Phase 4 DR Potential Study
 - Focus on potential for **Shed, Shift, and Shape** DR.
 - Based on customer load data from IOUs, improved load-shape modeling and forecasting to 2050: 400,000 load shapes, 6000 clusters.
 - Expanded modeling of end-use **electrification**.
 - Improved modeling of **customer participation** in DR programs.
 - Improved treatment of **price-based approaches** to DR (Shape).
- Integration with EE Potential and Goals Study
- Integration with Integrated Resource Plan (IRP) modeling working with E3.



End-use Disaggregation & Forecasting

Phase 3 end-uses modeled

Sector	End use
Residential	Plug loads
	Pool pumps
	Space cooling
	Space heating
	Water heating
	EV charging
	Other
Commercial	HVAC
	Lighting
	Refrigeration
	EV charging
	Other
Industrial	Process
	Pumping
	Other

Additions

- ◆ Residential appliances
- ◆ Commercial space heating
- ◆ Medium & heavy duty EV
- ◆ Commercial water heating

Improvements

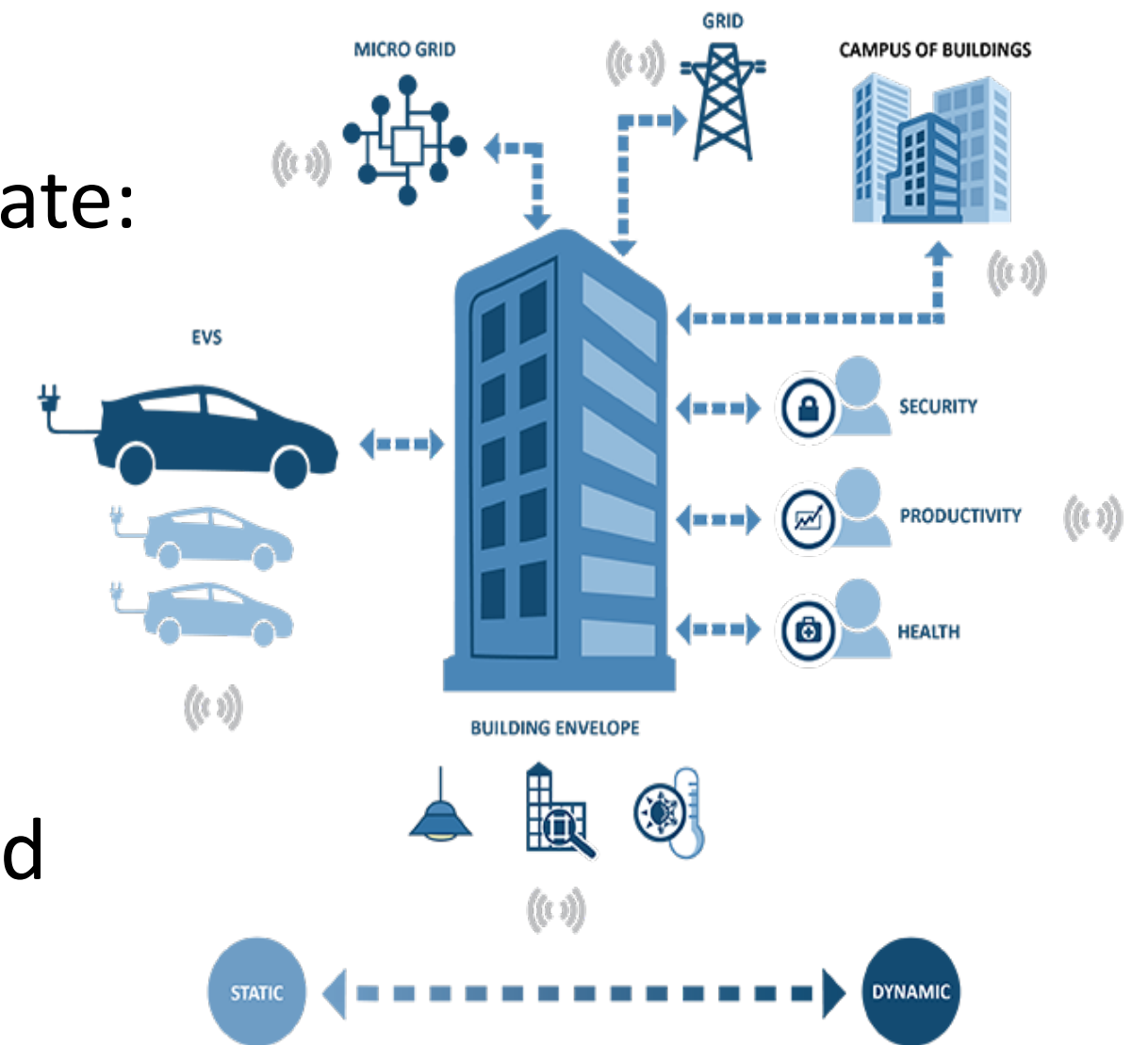
- ◆ Light-duty EV charging
- ◆ Industrial process loads: improved specificity
- ◆ Water supply pumping

Existing work

Future work

Summary and Next Steps

- CalFlexHub will support state goals to advance and integrate:
 - Energy Efficiency
 - Demand Response
 - Demand Flexibility
 - Distributed Energy Resources
- SMUD will serve on the Technical Advisory Committee and discussions are underway to share tools and data.



See also urls: DRRC.lbl.gov and CalFlexHub.org