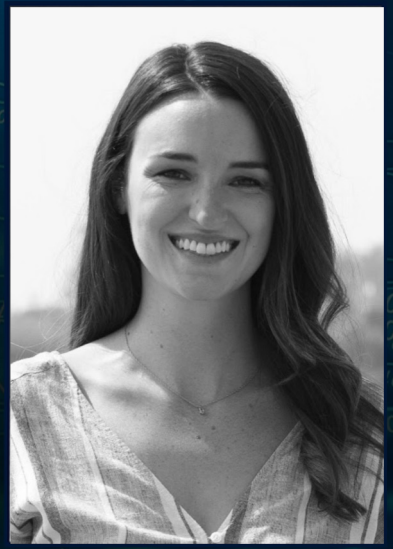
CALFLEXHUB SYMPOSIUM

NOVEMBER 3 | 8am-4pm PT



SARAH SMITH

SARAH OUTCAULT

CALFLEXHUB RESEARCH SPOTLIGHTS

SPEAKERS:

Sarah Smith
Researcher, Berkeley Lab

Sarah Outcault
Market Transformation Research Director, UC Davis

2023

CalFlexHub

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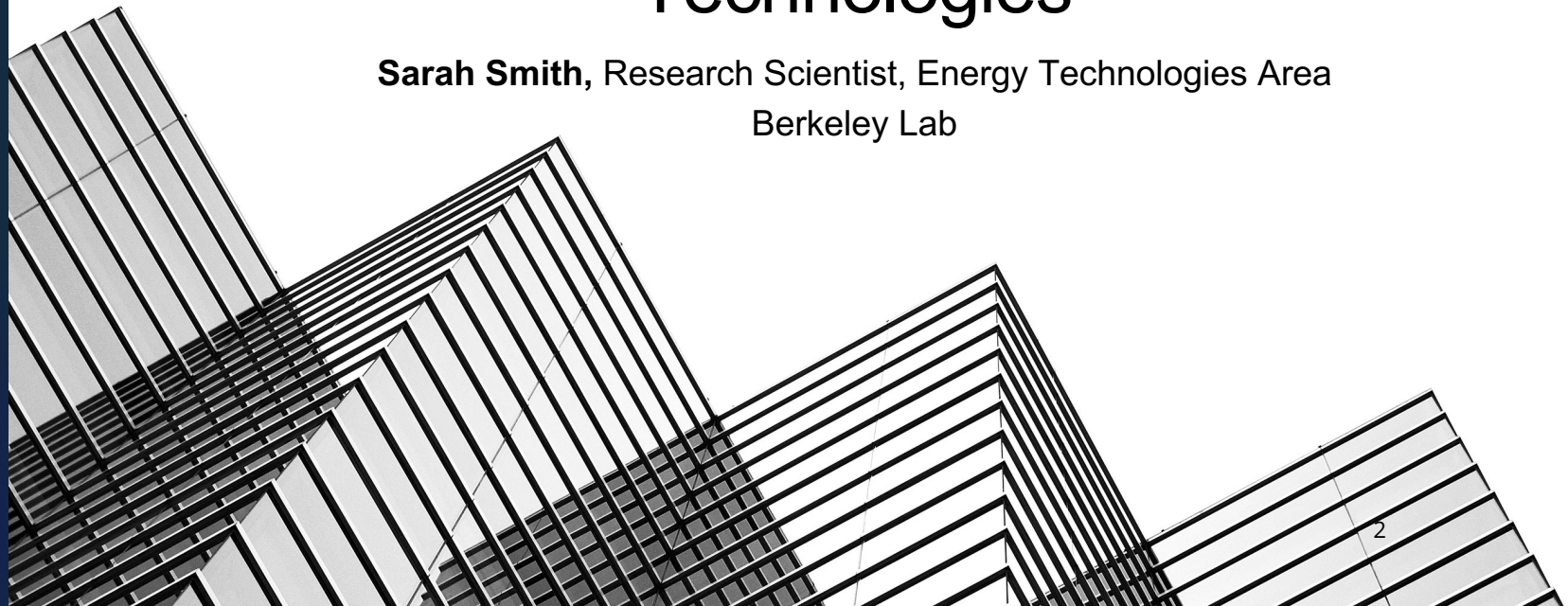
STATE OF CALIFORNIA ENERGY COMMISSION

MOMENTUM

#CALFLEXHUB23

Valuation of Load Flexibility Technologies

Sarah Smith, Research Scientist, Energy Technologies Area
Berkeley Lab



Our goal

is to assess the **costs and benefits** of load flexibility technologies to **customers and the grid.**

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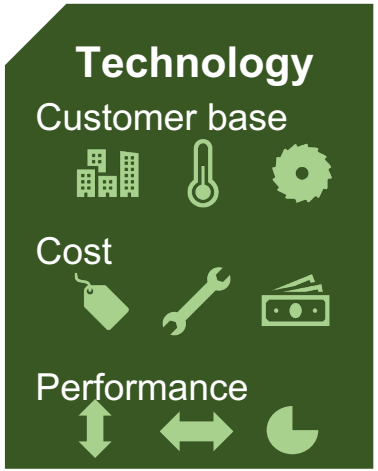
We model

Widespread future adoption of technologies, present-day costs and performance, and hypothetical price signals



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Baseline for comparison

Cost of *added flexibility* only. Potential customer base may be segmented based on differences in assumed existing equipment. **Present-day costs are used (or estimated).**

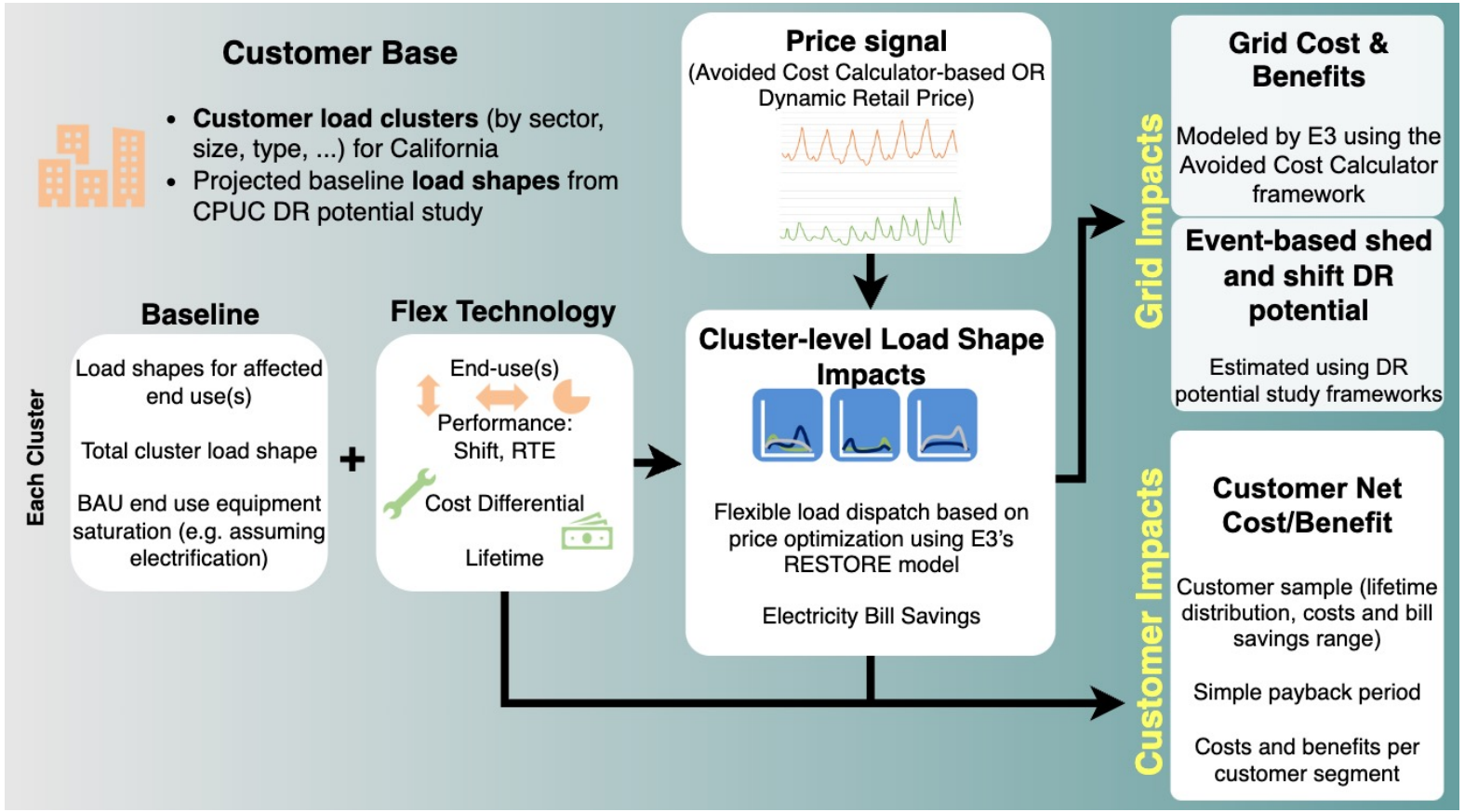
LBNL-Load model developed for CPUC DR Potential Studies models IOU-wide load based on 2019 meter data; forecasts to 2050. **2030 end use/appliance saturations and total loads are used.**

- Heating and cooling loads from temperature regression
- EV loads based on EVI-Pro load shapes and 2019 RASS responses
- Other aggregate end-use load shapes (water heaters, pool pumps) from 2019 CEC Load Shapes study
- Adjustments made for expected increase in TOU penetration

Technologies modeled

Target Sector		Short Name	Flexible components required
Res	Cooling	Smart Fan	Fan(s) and, for some (75%), smart thermostat
	Cooling, Heating	Res Smart Tstat	Smart thermostat, for half, and sensors
	Cooling, Heating, Water Heating	Res Dyn HP	CTA2045 port for WH + cost difference for flex-enabled split heat pump systems on the market
		Int HP Storage	TES and integration for AC and water heater and flex programming
		Res TES	TES component and flex programming
	Water Heating	Res WH	Cost difference of controllable equipment on the market
	LDEV	Res Flex EV	Cost difference for smart chargers on the market
	Pool Pumps	Res Pool Pumps	Cost difference of controllable equipment on the market
Small-Med Com	Cooling	Small Com EMS	EMS and smart thermostat
		Int Small Com EMS	EMS and smart thermostat
		Com Dyn HP	Cost difference for communicating heat pumps on the market
District Energy Systems	Cooling	Com DES MPC	MPC controls upgrade, and for some (65%), EMS. Cost of TES is not included.
Large Com	Cooling, Heating	Lg Office MPC	MPC controls upgrade
Com	Water Heating	Com WH	Cost difference of controllable equipment on the market
Com	LDEV and stationary battery	Com Batt MPC	MPC controls upgrade

Modeling Framework



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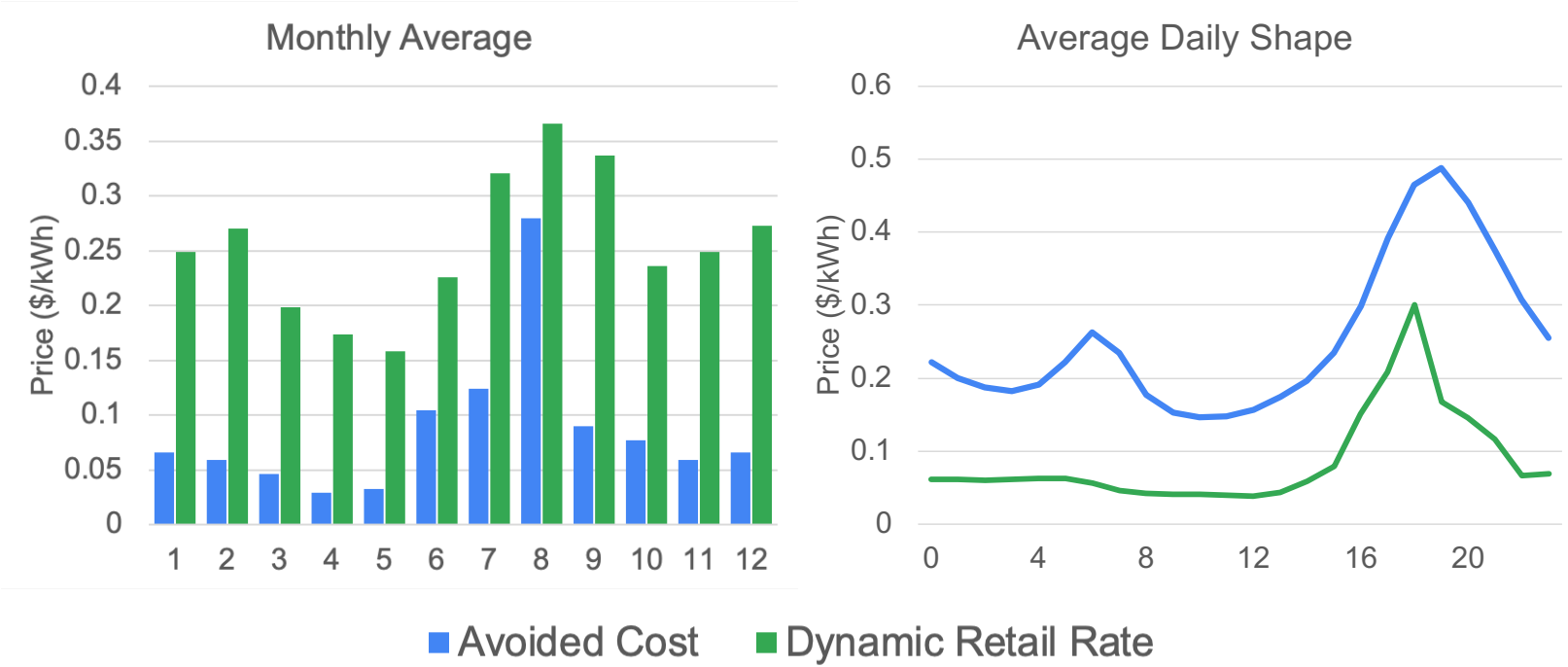
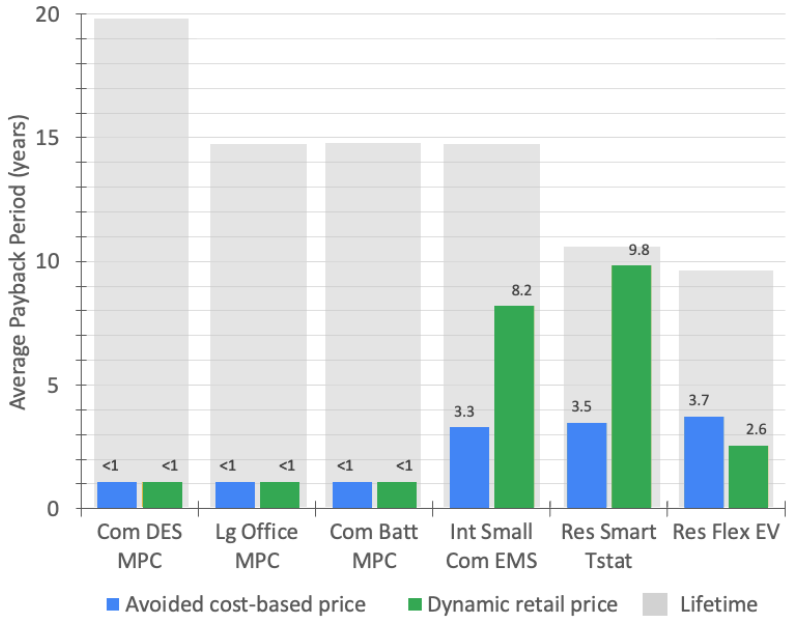
Hypothetical price signals



Technology payback period

ranges widely across technologies assessed; 6 “best” outcomes shown

- Low-cost, controls-based technologies that target large customers are most attractive
- Other controls technologies are promising, especially if the price signal design is well-aligned with the targeted end use
- Technologies that require equipment modifications or new equipment (e.g. TES) will need to lower costs or improve load impacts to create customer value



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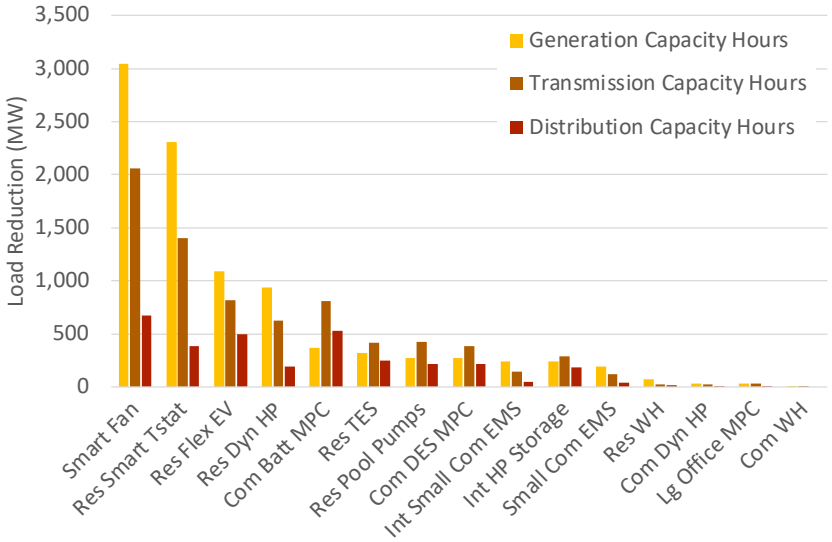
System benefits – capacity reduction

depends on the coincident baseline demand of the end use(s) and customers being targeted, as well as the technology performance

Results show:

- Res cooling ~2.5 GW
- Res EV ~ 1 GW
- Res pool pumps ~300 MW
- Com EV & batteries* ~ 400 MW



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* Battery impact is incremental to behavior in response to TOU rates

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Thank You.

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