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Title: What-If Modeling to See Energy Futures Under Climate Change: The Case of Air Conditioning

Abstract: Where do energy policy maker visions of a climate-changed future come from, and how do they get translated to planning? Historically, energy efficiency-centered planning has modeled energy futures based on penetrations of specific technologies and efficiencies along with exogenous demographic changes. In the era of climate change, envisioning energy futures must handle a wider range of influences and consequences. At a minimum, there are: major weather changes, anticipated shifts away from fossil fuels transforming the nature of the power grid, longer time scales, and high awareness of topics such as system feedbacks, resilience, equity, unintended consequences, and other people-centered concepts that don't suit being tackled in averages.

Being able to practically think this way requires suitable modeling tools and metrics. Research studies can do some of this work, but time frames are long, results can be distant and static, and the practical policy “how to” is not integrated with visions nor synced with the history of how hard directed change can be. Well-designed nimble tools can step in to create new quantitative and structural frameworks that make it feasible for planners to tangibly apply their knowledge and imagination. These tools also create a ready way to use new data streams -- such as AMI data -- as they emerge, versus leaving useful data underutilized.

We developed a working prototype What-If “Sandbox” model intended for use by research and policy staff. The tool uses an agent-based structure and focuses on residential air conditioning—one of the most uncertain and critical end uses in California’s hotter future. Air conditioning is already the biggest electricity use in some areas, has major effects on grid adequacy, and is critical to everyday comfort and health. Since AC is integral to overall house design, transitions in cooling provision are especially sensitive to policy influences. One pathway could lock cooling into inflexible if efficient modes of compressor-based air conditioning; another could foster a more flexible and diverse array of cooling methods.

The presentation has three components. First, it reviews this rationale and demonstrates the tool, showing how its structure and output can assist planning. Second, it ties this modeling to the enterprise of envisioning energy in decades ahead, drawing in historical examples to think about how to anticipate the unplanned and the nonlinear. Third, we engage the audience to discuss how such tools could help the research, planning, and civil society communities test and craft sociotechnical pathways in a way that takes better advantage of the creativity and data available than is currently possible.