

A Behavior-Based Agent Model for Assessing Market Adoption of Solar Photovoltaics

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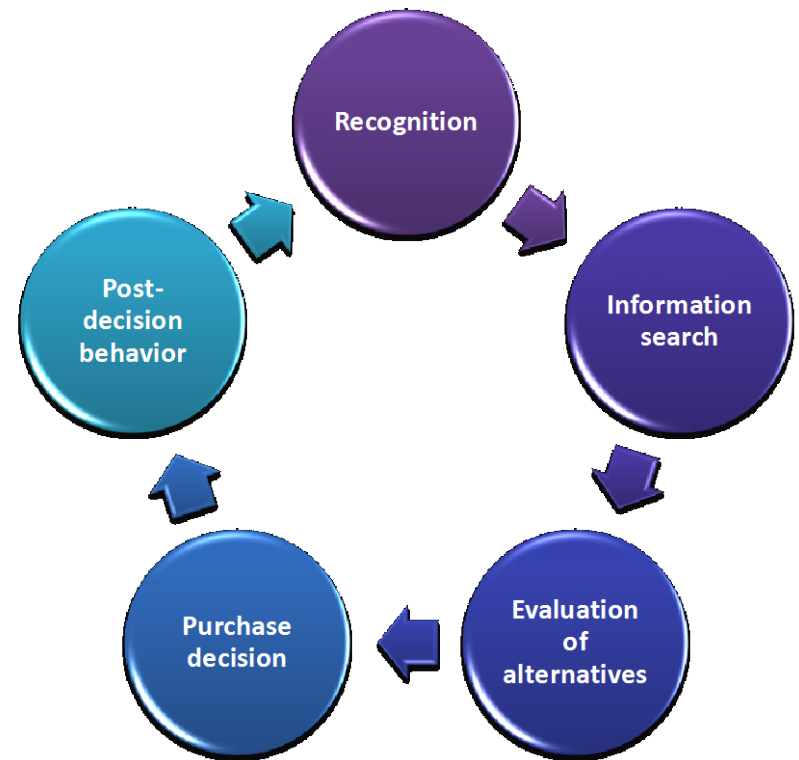
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Behavior - *What are we going to do with it?*

- How do we make consumer behavioral data and theories of decision making relevant to policy making?
- Current models of solar photovoltaic market adoption
 - Do not consider individual decision makers and their situations
 - Do not capture diversity in realistic decision behaviors
- Ideas from Behavioral Economics can help make better models of consumer decision-making
 - Bounded rationality
 - Social interactions and networks: Information and influence
 - Consumer learning

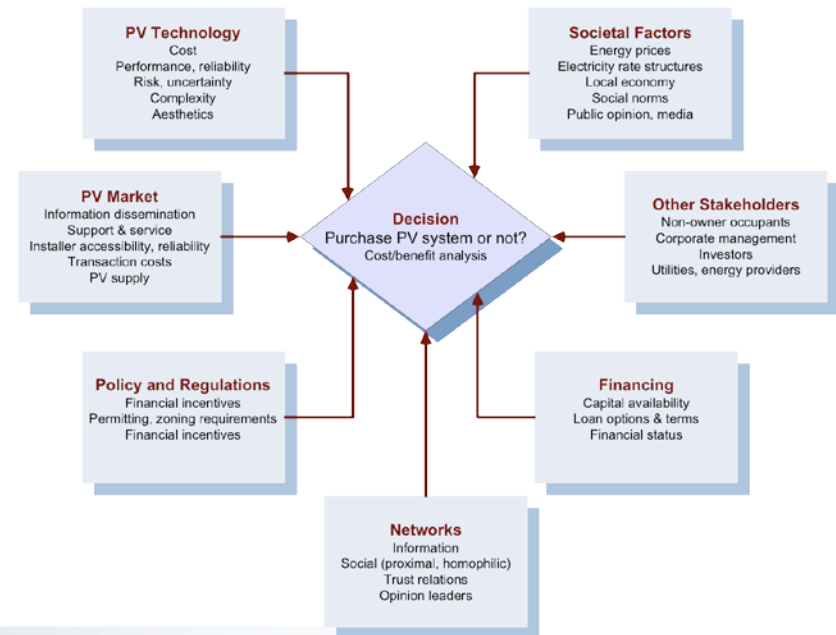


Residential Consumer Five-Step Decision Process

New data means better ability to predict market adoption

- We modeled the solar adoption decisions of thousands of consumers based on a behavioral model, in a large-scale agent-based model (ABM) – called **BE-Solar**
- We are applying the model in an attempt to replicate the rapid market adoption of residential solar PV in the Southern California market
- Lease-vs.-buy decisions

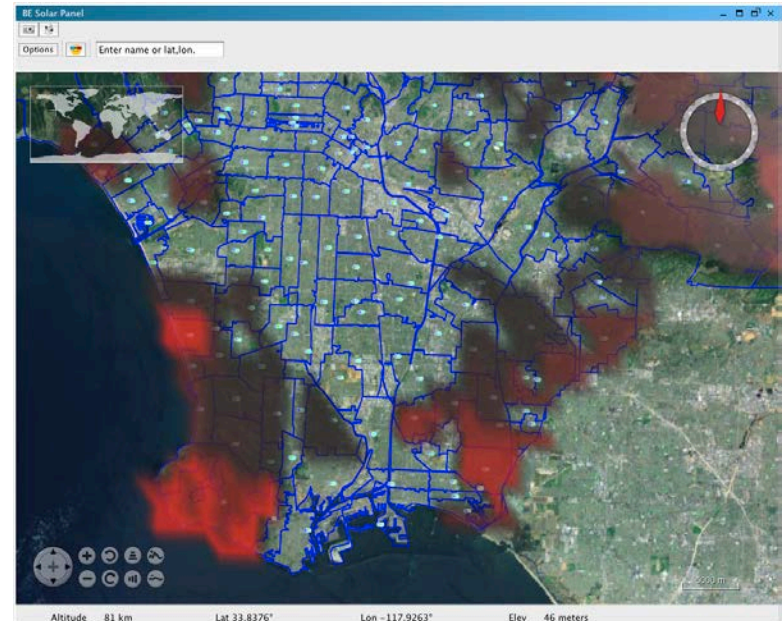
Consumer Decision Model



Residential Consumer Elements

- Housing units – by parcel, housing unit type, tied to owners
- Owners are the decision makers
 1. Owner, rents out, renter pays utilities (owner has no incentive for solar adoption)
 2. Renter (does not decide on solar adoption)
 3. Owner-occupied (decides on solar adoption)
- Installers
 - Initiate contact with potential customers
 - Limit adoption capacity

BE-Solar Model: Solar PV Adoption in Southern California

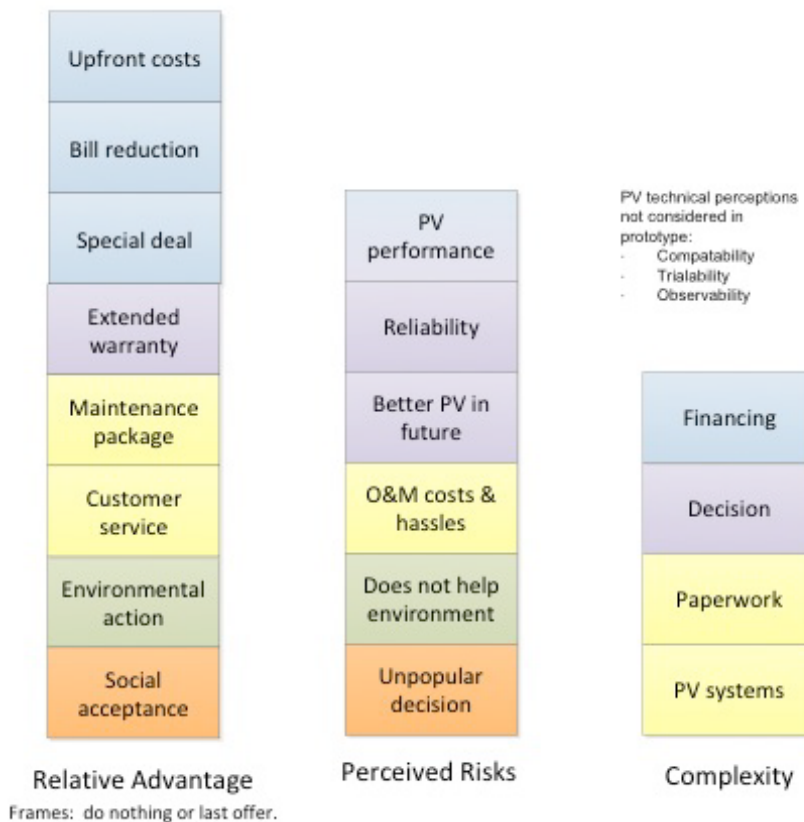


Residential Consumer Agent Decision Making

■ Adoption Attributes

- **Ability to Pay** (up-front cost)
- Energy Attitude (Prop 23 Yes, No)
- **Adoption Affect** (social contact with previous adopters)
- **Adopter Threshold** (per Rogers' adopter types)
- **Perceived Reliability**
- **Financial Metrics:** Minimum Payback (Buy) / Monthly Savings (Lease)
- **Demographics:** Income, Age, Education (per study*)

Residential Consumer's PV Technical Perceptions

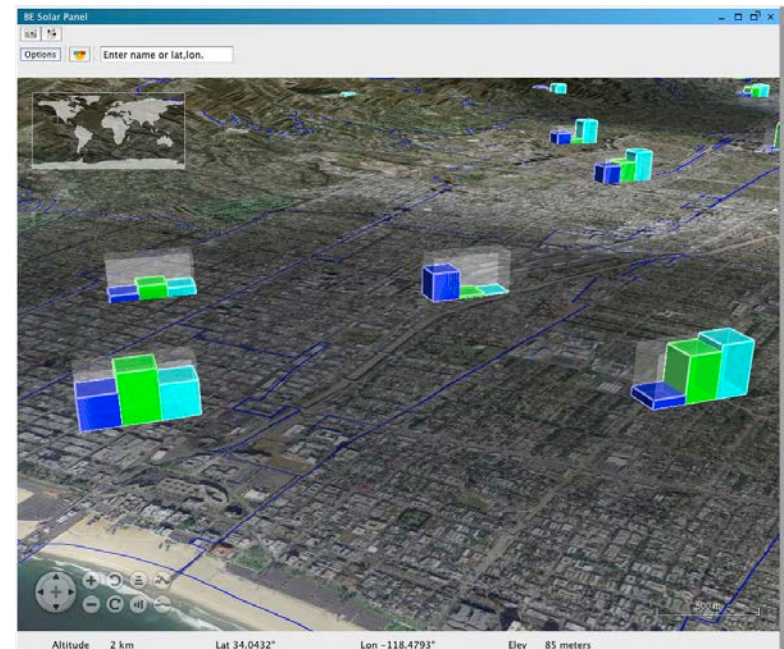


*Drury, E., M. Miller, C. Macal, D. Graziano, D. Heimiller, J. Ozik, T. Perry. 2011. **The Transformation of Southern California's Residential Photovoltaics Market through Third-Party Ownership**, submitted to *Energy Policy*.



Better predictions based on behavior

- We have incorporated behavioral approaches to improve models for the market adoption of solar photovoltaics
- Models that are sensitive to individual consumer attributes and housing stock yield more realistic estimates of market penetration
- As better data on consumer behavior becomes available, better predictions should result



***BE-Solar* Model Results for Solar PV Adoption in Southern California**

