



Behavioral Assumptions Underlying California Residential Energy Efficiency Programs

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Goals of the White Paper

- Identify assumptions made about consumers and behavior
- Consider in light of theory and research
- Explore alternatives & improvements
- Identify unknowns that merit attention
 - Research questions
- Suggest possibilities for innovation
 - Experimental and pilot approaches

What are “assumptions?”

- Something *assumed* – or *taken for granted as true*
- “A *fact or statement* – as a *proposition, axiom, postulate* – *taken for granted*” (Webster 2008)

Examples: “the sun will rise” “the leaves will fall”
“fat should be avoided” “strangers can’t be trusted”

We use them all the time – both *formal & informal*

Approach

How to discover “assumptions” in programs?

- Psychoanalysis is out
- Empirical information would be useful
- The best available data should be used
- Within constraints of time, budget and access

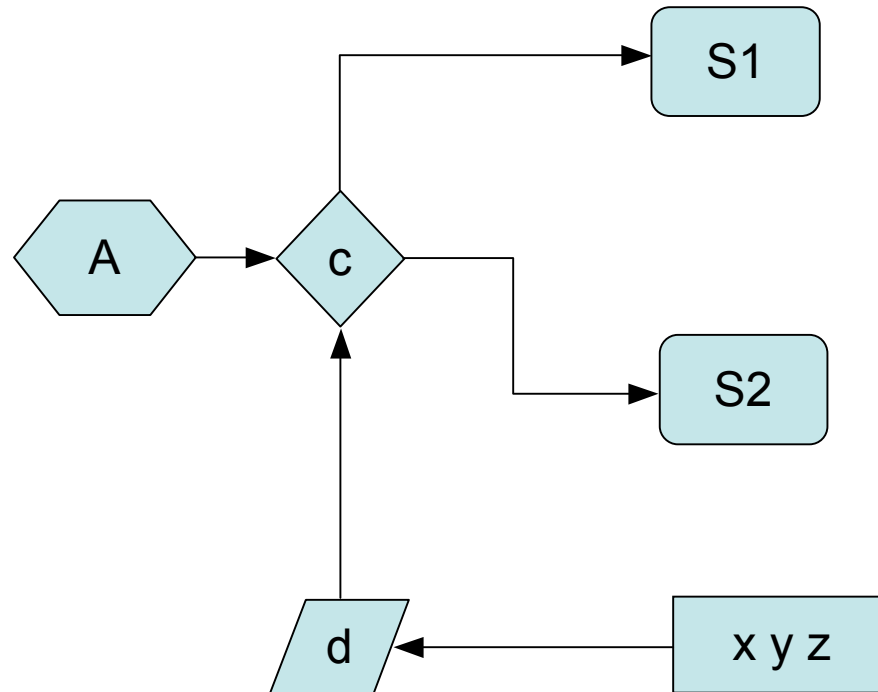
Data

- Regulatory guidance & policy documents
- Program information
 - Program Implementation Plans (PIPs), logic models, other filings, evaluation reports
 - Utility consumer websites
- Key informant interviews
- Energy policy & social science literatures
 - Existing critical reviews
 - Database search
 - Expert summaries

Strategy

1. Describe assumptions and the “policy frame”
2. Characterize programs – what they are, what they do
3. Consider criticisms – from social science theory and empirical research
4. Identify and assess alternatives
 - Behavior Econ., HH Anthro, Sociology of lifestyles, segmentation, UK/EU innovations
5. Link back to policy and program design

1. THE POLICY FRAME



History of energy efficiency policy

- Energy crises (1973, 1979)
- Conservation
- Amory Lovins' "Negawatts"
- Least-cost source of *supply*
- Demand-side management
- Supply curves, avoided cost, TRCs, impact evaluation . . .
- Evolution of *energy efficiency industry*

A Spartan policy frame

(from official policy and program manuals)

- Narrow brief – regulatory justification
- Physical-technical-economic model: *PTEM*
- Avoided cost
- Device-centered
- KWh/therm impacts and \$\$\$ savings
- Installed *measures* and energy *service levels*
- *Cost-effectiveness* tests

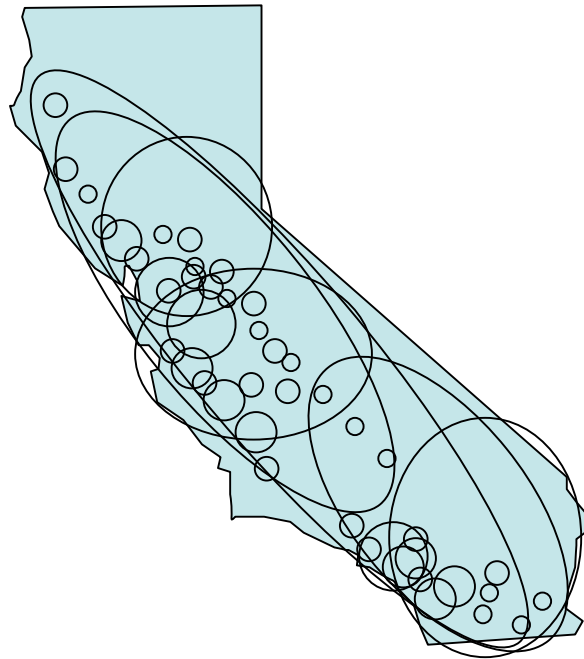
Applied to people (“Customers”)

- Sketchy depiction of behavior at best
- Mostly *absent*, but assumed to be ...
- Consciously using energy and devices
- Individuals; decision-makers
- Average/typical consumers
- Calculating, rational, economically-oriented (costs, benefits, investments, returns, pay-backs, discount rates)
- Knowledgeable and/or information-seeking

And with long-recognized problems

- Widespread irrational failure to adopt EE
- Extreme “discount rates” for investments
- “Efficiency gap” and “market failures”
- Barriers to adoption (e.g., “information deficit”)
- Some attention to *leakage* of resources
 - Rebound effects (“take-back”)
 - Free riders
 - Market effects

2. THE PROGRAMS



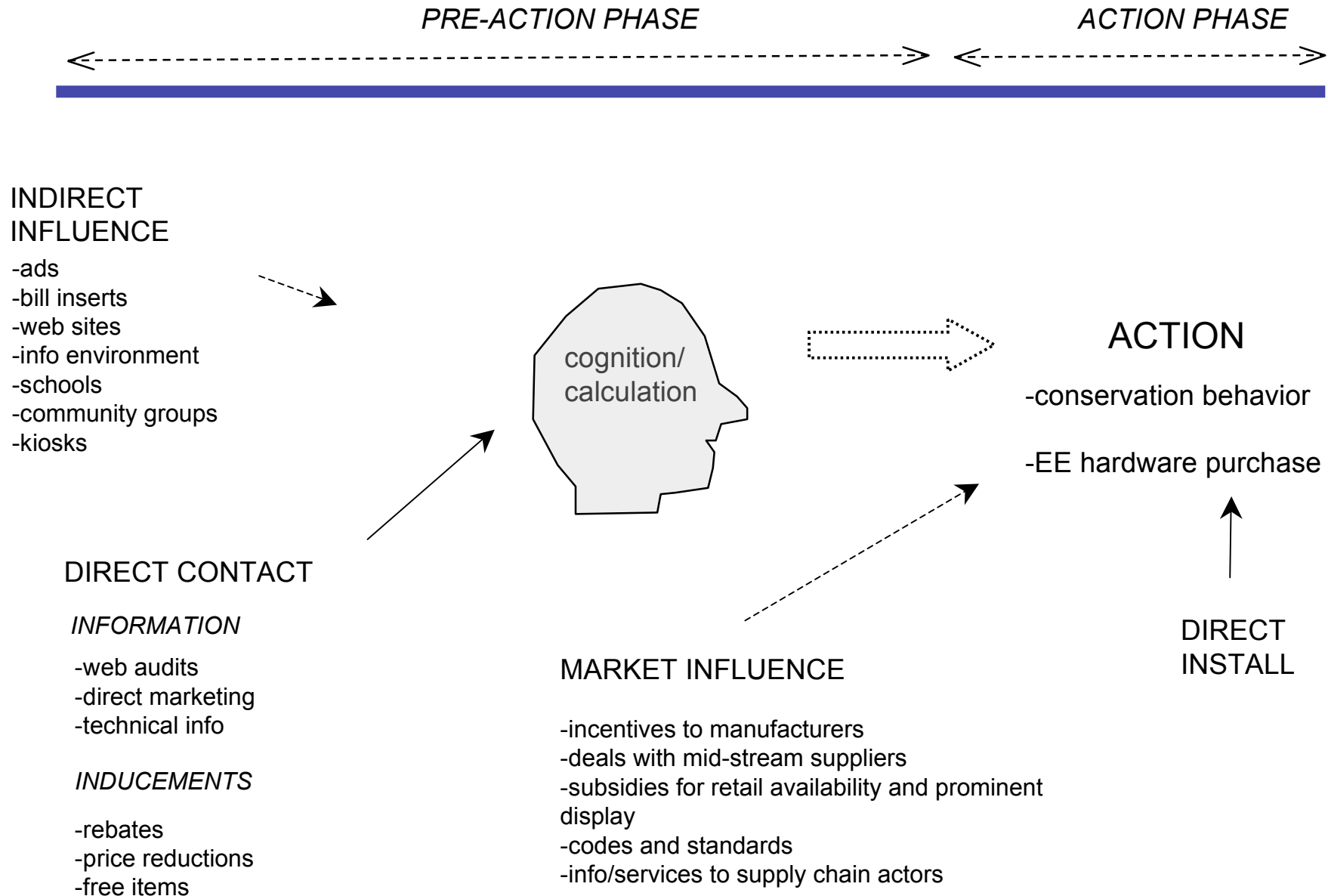
Inferred program behavioral goals

- A. Where behavior change is not possible =>
direct installation of measures
- B. Inducements/support necessary to produce
=> *improved energy efficiency decision-making*
- C. Improved information (+ inducements) in markets
=> *improved behavior by market actors*
- D. Where widespread change is desired, education
& media-messages =>
permanent change in attitudes and behavior

What *tools* are the 75 programs using?

- “Information deficit” correctives
 - mass info, tailored info, educ. projects
- Financial inducements (\$\$\$)
 - rebates, price reductions
- Gifts, direct installation
- Action in information/inducement environments (up/mid/down-stream)
 - proof, trust, \$\$\$, joint venture

Program Logics and Strategies



Programs snapshot

- Device-focused (*CFLs, HVAC*) . . . *BUT*
- Stretching the policy frame
 - Adding *information* elements
 - Adding *market* intervention elements
- Accumulation of experience & craft knowledge
- Innovation at the margins of permissible

“Mixed” messages: “*save energy, save money, good for the environment*”

Learning from utility and program implementer experience

- PIPs and formal documents \neq knowledge
- More complex understandings
- Experience and iterative learning
- Weak connections to theory and research
- “Craft knowledge” is crucial, but also *vulnerable*

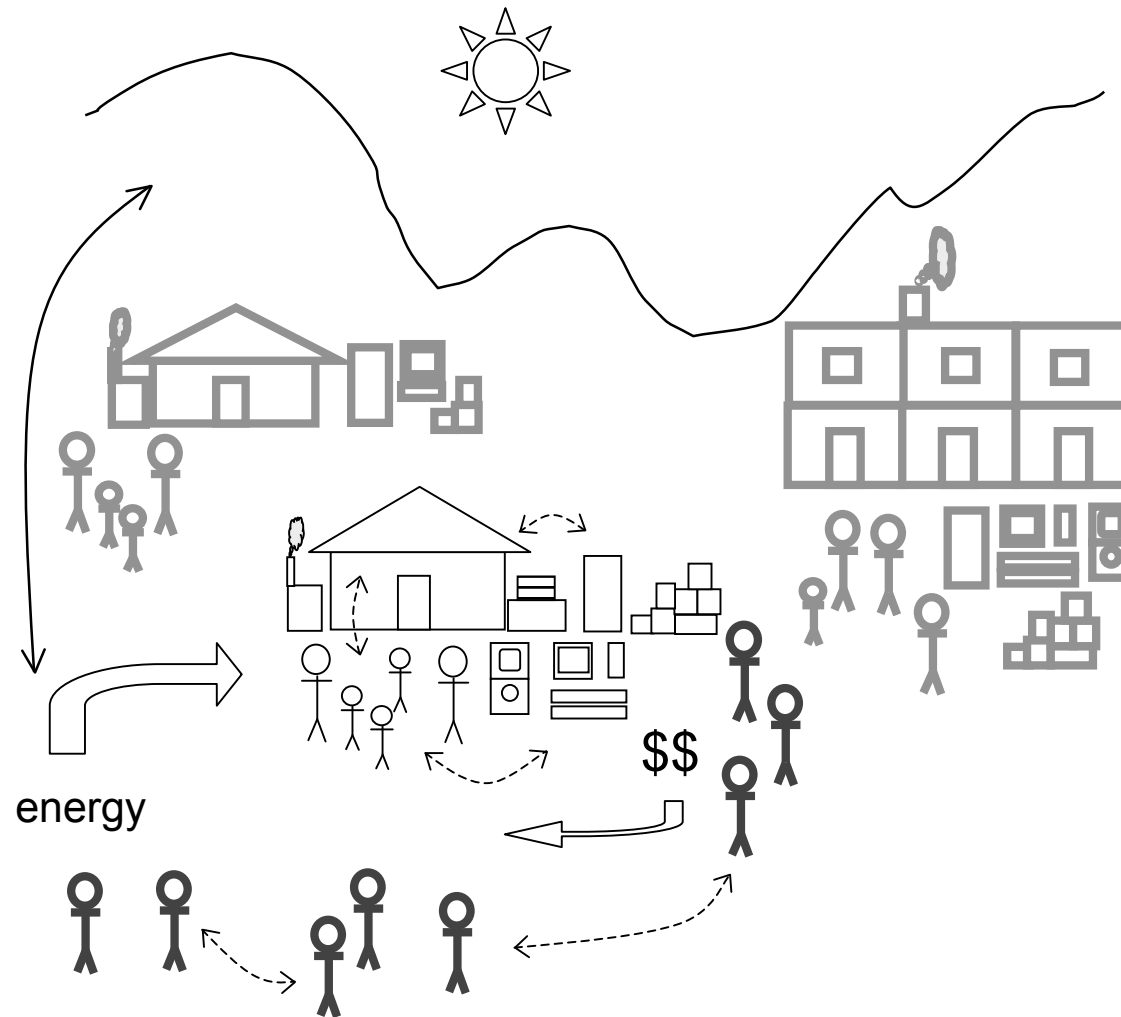
3. CRITIQUES OF POLICY FRAME AND PROGRAM ASSUMPTIONS

- Energy efficiency gap / market failures literature
- Wide range of social science literatures (30 yrs)
- Scattered, fragmented & uneven
- *Key reviews*
 - Lutzenhiser (social & behavioral factors) 1993
 - Wilhite et al. (climate & social systems) 2001
 - Keirstead (progress toward integrated models) 2006
 - Wilson & Dowlatabadi (resid. decision-making) 2007
 - Stern (psychology & envir.-sig. behavior) 2008

What does the social science research show ?

- Focus on *people* vs. devices
- Groups not individuals use energy
- Consumption and conservation is highly varied (no average or typical consumers)
- Lifestyles, cultures, social norms involved
- Host of actors other than residential customers
- System is characterized by *complexity*
 - Beyond arrays of devices

Residential consumption complex



What do we know about efficiency actions ?

- Choices infrequent
- Decisions often not carefully considered
- Everything but costs and benefits are important
- Little evidence of information seeking
- Not sure what to do with information
- Hierarchies of factors/variables important in consumption and conservation
 - habits, psychological, social, contexts, constraints

Factors influencing environmentally significant behavior & choice (Stern 2008)

Contextual Factors (constraint and facilitation)

- Available technology
- Embodied environmental impact (bldgs, vehicles, materials in consumer goods)
- Legal and regulatory requirements
- Material costs and rewards (payoffs)
- Convenience (e.g., of public transit, recycling)
- Social norms and expectations

Personal Capabilities

- Financial resources
- Literacy
- Social status
- Behavior-specific knowledge and skills

Habit and Routine Attitudinal Factors

- Personal values
- General environmentalist predisposition (abstract norms)
- Behavior-specific (concrete) norms and beliefs
- Non-environmental attitudes (e.g., about product attributes)
- Perceived costs and benefits of action

What do we know about interventions and models

- Little social science related to programs
- Different combinations of variables important for different behaviors or devices
- Mass information not very effective
- Psychological variables (e.g., attitudes, values) trumped by context and constraint
- No clear agreement among models, theories, perspectives
- Little progress toward an integration

European programs, policy frames and criticisms

- Why Europe?
- 20% carbon reduction by 2020 goal
- EE programs: device-oriented, not meeting goals
- Focus on information (even personal carbon allowances) and feedback
- Sustainable consumption framework
- Pro-environmental behavior change
- Wrestling with “green lifestyles” interventions

4. ALTERNATIVE APPROACHES

Behavioral economics – psychology of decisions

Anthropology – meanings & actions in everyday life

Sociology of lifestyles – class, culture & social structure

Segmentation

UK/EU perspectives on consumption systems

Behavioral Economics

- Proposes adding findings from psychology to improve neoclassical economics
- Focus on judgment and choice (re prices)
- Examples: loss aversion, framing effects, reference prices, role of emotions
- Weaknesses: individualistic, single-choice focused, rationalistic (w/ uncertainty)
- **Policy value:** focus on complexity of choice; intriguing, but not ready for EE policy prime time

Social & economic anthropology

- Cultural patterns: group actions, recurring through time; adapting and evolving
- Actions have *meanings* to consumers – personal and social
- Cultural goods – not energy – being consumed
- Social roles are key in cultural practices: age, kin group, gender
- EE can run up against cultural *prohibitions*
- **Policy value:** focus attention on depth/ complexity of diversity

Sociology of lifestyles

- Consumption is patterned in *lifestyles*
- Rooted in social structure – class, status, locale
- Strong element of socio-economic influence
- Not easily changed or individually “selected”
- Importance of display (conspicuous consumption)
- **Policy value:** focus attention on lower, higher and middle groups’ energy use, EE potentials, program approaches

Segmentation basics & goals

- Identifying consumer subgroups – “segments”
- Based on: usage levels, demographic traits, psychological responses, regional differences
- Used to target advertising, messaging, appeals
- The *Holy Grail*: finding “the” segments, identifying their “triggers” or “buttons,” tailoring stimuli for behavior change, even policy designs

Caveats and concerns

- Segments should be based on theory
- Simple demographics – often crude measures
- Extremes are obvious, but great “middle” hard to subdivide
- Psychographics – individualistic, use in EE unproven
- Range of sampling, data, statistical and modeling problems
- **Policy value:** match with EE policy tools, programs?

Still great intuitive (cultural) appeal

- SRI VALS™
 - Innovators, Thinkers, Achievers ... Strivers, Survivors
- Experian MOSAIC™
 - Affluent Suburbia, Upscale America, Small Town Success ... Metro Fringe, Urban Essence
- Claritas PRIZM™
 - Blue Blood Estates, Money and Brains, Pools and Patios, Golden Ponds, Norma Rae-Ville, Scrub Pine Flats, etc.
- BC Hydro – EE behavior-specific
 - Tuned Out and Carefree, Stumbling Proponents, Comfort Seekers, Entrenched Libertarians, Cost-Conscious Practitioners, Devoted Conservationists

Emerging UK/EU perspectives on consumption and social systems

- Movement toward sustainable consumption
- Digging deeper into lifestyles
- Understanding lifestyles in context
- Social science perspectives on culture, lifestyle, and consumption in larger systems
 - Social practices
 - Human-technology interactions
 - Socio-technical systems

Social practices

- Smaller than lifestyle; larger than *service*
- Strips of normative activity that have social importance
- Sets of competencies; cultural patterns; what's commonly done and what's required to do it
- Examples:
 - Eating, bathing, cleaning
 - Working, playing, communicating, socializing
- **Policy value:** new targets, greater diversity

Human-technology interactions

- Devices are involved in practices
- Control and constrain behavior
- Meanings of items – but also new experiences, new needs, creeping dependencies
- Social shaping of technologies (outside of hands of consumers)
- Problem of lock-in – embedded in *habits*
- **Policy value:** rethinking device and “needs”

Socio-technical systems

- Consumers now part of much larger systems
- Systemic dependencies; large-scale lock-in
- Different way of looking at supply chains
- Level of analysis for supply/demand studies
- *Systems of provision* – ways societies manage production & consumption – and *Co-provision*
- **Policy value:** improved understanding of market dynamics; enhanced consumer roles

5. CONCLUSIONS & RECOMMENDATIONS

- a. Climate Change and Energy Efficiency Policy
- b. California Crisis and New Policy Imagery
- c. Behavioral Knowledge Gaps – Research Needs
- d. Directions for Program Innovation
 - *Program Experiments*
 - *Adaptive Theory-Based Pilot Programs*

a. Policy Frames – efficiency

- Basis in historical commitments
- Significant investments and important savings
- Device-centered view and PTEM serve important policy purposes – prudent expenditures, accountability, etc.
- But weak in the case of residential consumers
- Focus, behavioral goals and tools limited
- Utilities experienced, skilled and innovative
- BUT constrained and reliant upon craft knowledge

Policy Frames – climate change (changes everything)

- *AB32 and California Energy Efficiency Strategic Plan*
- CPUC Bold Ideas – zero energy homes, transform lighting, whole-house retrofits, plug loads

Key Questions

- Is the EE policy frame up to the task?
- Do we know enough to proceed with confidence?

b. Case study: California crisis and the value of new imagery

- Lessons about consumers from the 2001 crisis
- Related to “new epochs” of environmental policy
- Beyond *measures* – behavior is powerful
- Conservation is routine and widespread
- Consumer efforts enhanced by outside support
- A new understanding of consumer potentials similar to EU “Co-Provisioning” – partnerships

c. Knowledge gaps and research needs

- Behavior change, consumer choice – new territory for energy policy
- Particularly at large scale and rapid implementation
- Draw on work by National Academies/National Research Council panels and California assessments (e.g, ARB research plans)
 - How does it work ?
 - How to intervene ?
 - How to make fundamental change ?

We need to better understand consumption and choice

- What are the fundamental dynamics of consumer behavior? (NRC)
- What determines household consumption of energy, water, natural gas, and transportation resources? (ARB)
- How do choices upstream from consumers affect behavior and choice? (ARB)
- What determines household choices among available homes and equipment? (ARB)

We need to better understand how to improve communications & influence

- How to construct indicators of environmentally significant consumption? (NRC)
- How to design and implement improved information transmission systems? (NRC)
- How can consumers better understand options for improving their home energy efficiency and reducing their carbon footprints? (ARB)

We need to better understand how to support joint private/public action

- How to better integrate information with other policy instruments? (NRC)
- How to decouple energy consumption from perceptions (and misperceptions) of well-being? (ARB)
- How can improved government links to energy users promote policy goals? (ARB)

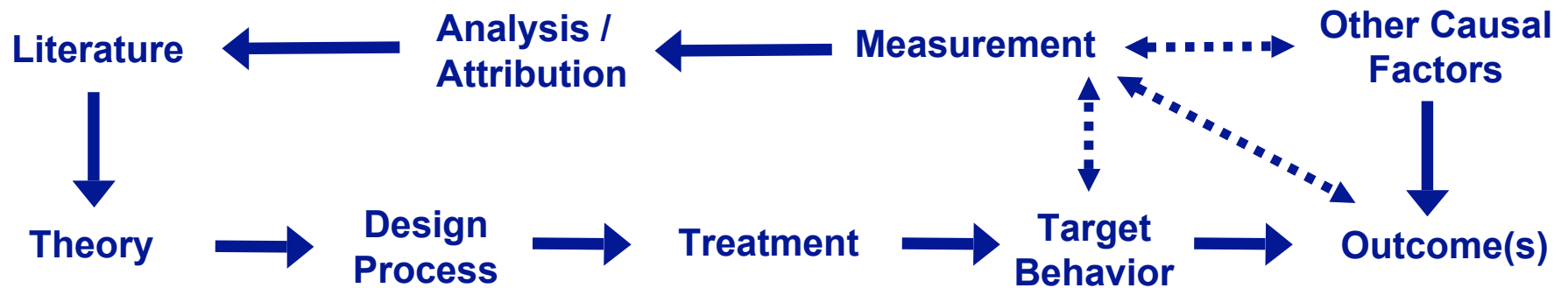
d. Program Innovation – need not wait for large-scale research results

- Social science research on energy and behavior has not focused on policies and interventions
- Need a significant commitment in this area
- BUT we can begin to improve program assumptions, designs and implementation – incorporating targeted research
- Two examples:
 - Program Experiments
 - Adaptive Theory-Based Pilot Programs

Program Experiments

- Experimental designs allow sorting out of the workings of causes, effects, program design elements, population characteristics, consumer choice processes, household dynamics, etc., etc.
- We can vary treatments, control variables and compare hypotheses based on observed outcomes
- Natural science model – but also used in education, public health, social services, etc.

Experimental process



Experiments – How to select ?

- Where we have the most experience
 - CFLs
- Where the demand savings may be largest
 - summer air conditioning behavior in hot places
- Where the total energy savings may be greatest
 - vampires
- Where we can most readily generalize to other cases
 - appliance A, B or C

Experiments – What to vary ?

- Information, education, knowledge, experience
 - form, content, delivery system, frequency, duration
- Incentives, inducements, costs, prices, subsidies
 - amounts, timing, recipient, delivery system
- Point-of-sale
 - signage, advertising, packaged with other items/services
- Mid-stream and upstream
 - education, inducement, service provision, competition
- *Controlling for/measuring multi-actor multi-level change*
 - *Household dynamics*
 - *Community effects*
 - *Culture change*

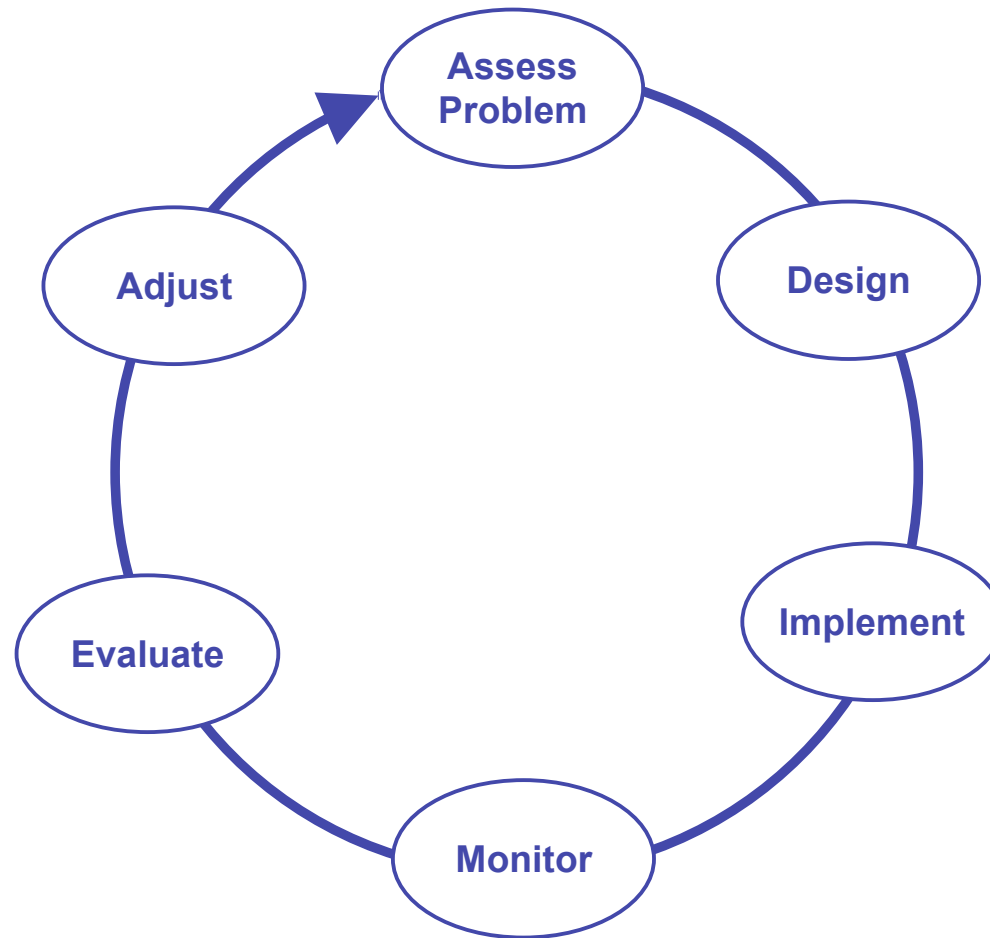
Caveats about experimental design

- Will vary by energy use and behaviors involved
- Difficult to design rigorous experiments
 - Very specific interventions
 - Controlled conditions
 - Randomized and/or carefully measured external factors
- Need to be relatively large scale to detect small effects
- Equity and legal issues

Adaptive Theory-Based Pilot Programs

- Alternative way to work with existing programs
- Takes into account uncertainty, short time frames, urgent goals
- Building on experience and knowledge
- Incorporates formal theory, observation, real-time feedback, and corrective action
- Can embed experiments
- Natural resources policy model (also NEEA)

Adaptive management process



Caveats about adaptive management

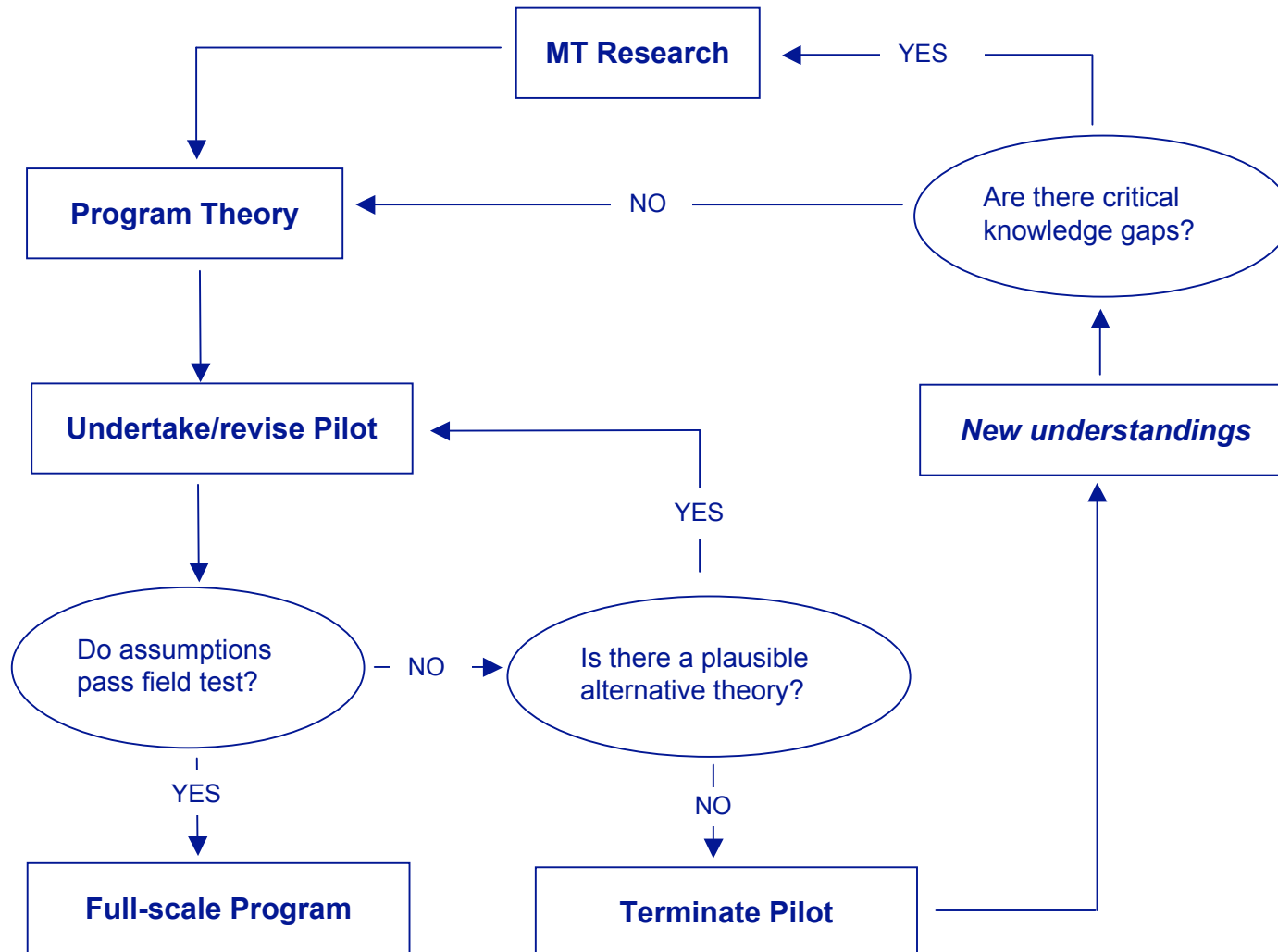
- Serious commitment of resources
- Must be closely observed in real time
- Outcomes must be carefully documented
- Role of stake-holders and participants more important
- Failure is imaginable and must be an accepted possibility

Theory-based market transformation approach

- Developed independently of AM, but shares many attributes
- Specifically applicable to energy efficiency change in market contexts
- Incorporates evaluation
- Links program design, implementation and evaluation with social science research

Theory-based MT pilot process

(Blumstein et al. 2000)



Requires innovation in program design and management

- Better linking of program knowledge and social science research
- Serious commitments to program theory
- New roles for evaluation (and new problems)
- Risk-taking unavoidable
- Complex – working on multiple system levels
- Real-time engagement, monitoring and feedback
- New forms of stakeholder involvement

Final thoughts . . .

- Need a better handle on behavior and consumers in a context of complexity and evolving systems
- Fundamental policy frames that made sense for energy efficiency don't work for climate change
- Unprecedented policy goals require new ideas, approaches, transparency and collaboration
- It will be hard. We have no choice. Time is short.

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