



# Market Effects and Market Transformation: Their Role in Program Design and Evaluation

## U. S. Environmental Protection Agency

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# Overview of Today's Presentation

- **The CPUC White Paper: Scope, and Methods**
- **Overview: Key Findings and Recommendations**
- **Market Effects & Market Transformation: Definitions and Realities**
- **Emerging Practices in Program Design and Management: Use of Research and Evaluation**
- **Evaluation of Market Effects**
- **Recommendations from Program Sponsors and Regulators**

# CPUC White Paper: Scope and Methods

- **Scope:**

- Initial: survey of market effects assessment methods and their use in structuring frameworks for energy efficiency program regulation
- Evolved to include use of market intelligence, research & evaluation in program design & management

- **Methods**

- Literature review. Over 90 items in the Annotated Bibliography
- Interviews with regulators and program sponsors in regions outside CA: New York, New England, Pacific NW, Wisconsin, British Columbia

# Key Definitions

- **Market Changes**

- Changes in the structure or operations of a market during the course of an energy efficiency program that indicate increased adoption of energy efficiency measures by customers and/or increased promotion and delivery by supply-side actors.

- **Market Effects: adds attribution**

- Market changes that can be attributed to program(s) under review

- **Market Transformation: adds intentionality, sustainability**

- Market effects that were:
  - Targeted by the program
  - Likely to be sustained in absence of the program

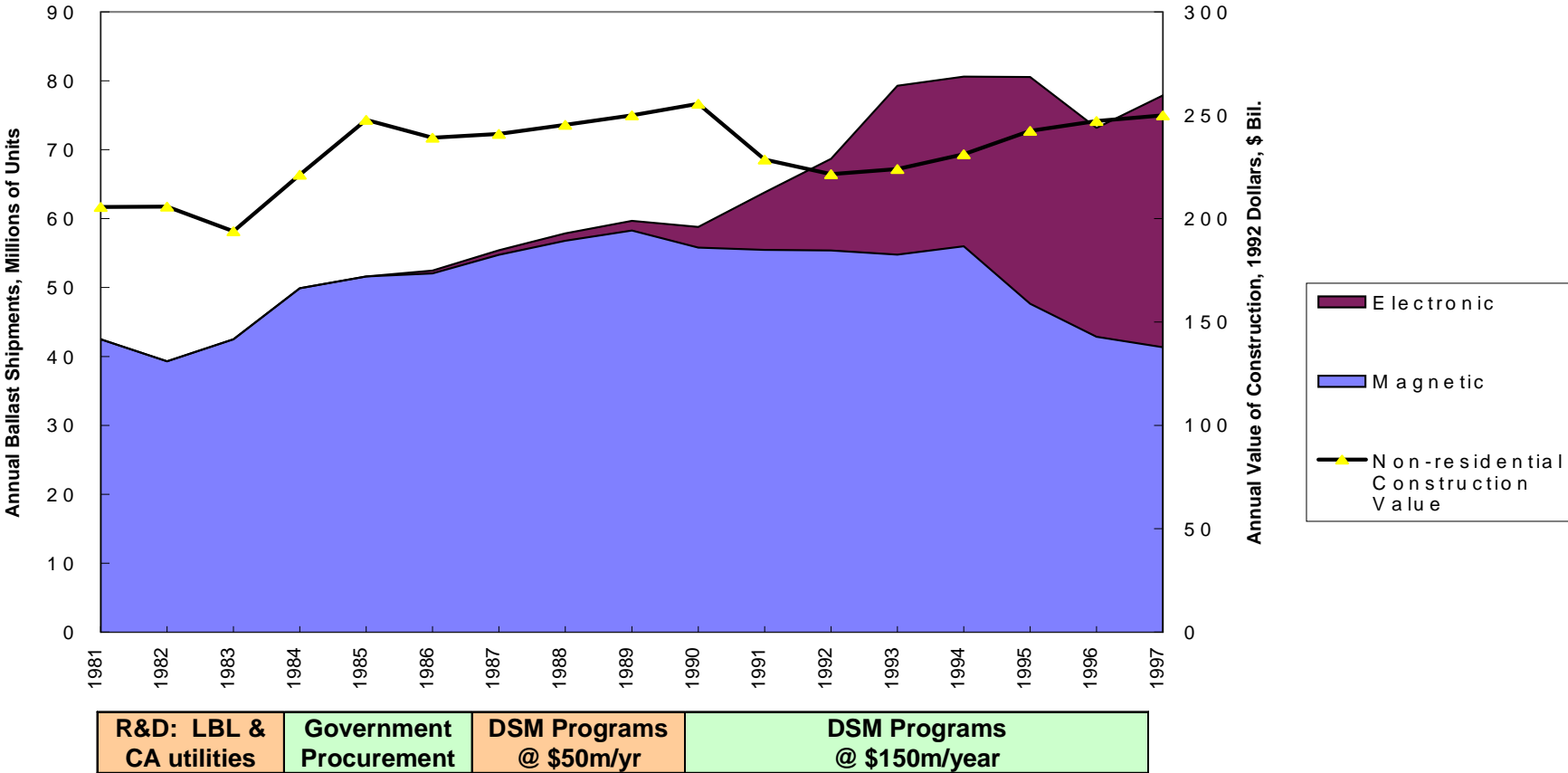
# But first, the conclusions...

## Key Findings/Theses

1. Public purpose energy efficiency programs have contributed significantly to the transformation of key energy equipment and service markets.
2. Success in market-oriented programs requires consistent collection and analysis of market data and integration of results into program design
3. Many methodologically sound approaches are available to estimate out-of-program adoptions and assess program attribution, **but** their successful application depends on the nature of the technology, the nature of the program, and the state of market development

Thesis # 1: Market effects and market transformation actually do happen.

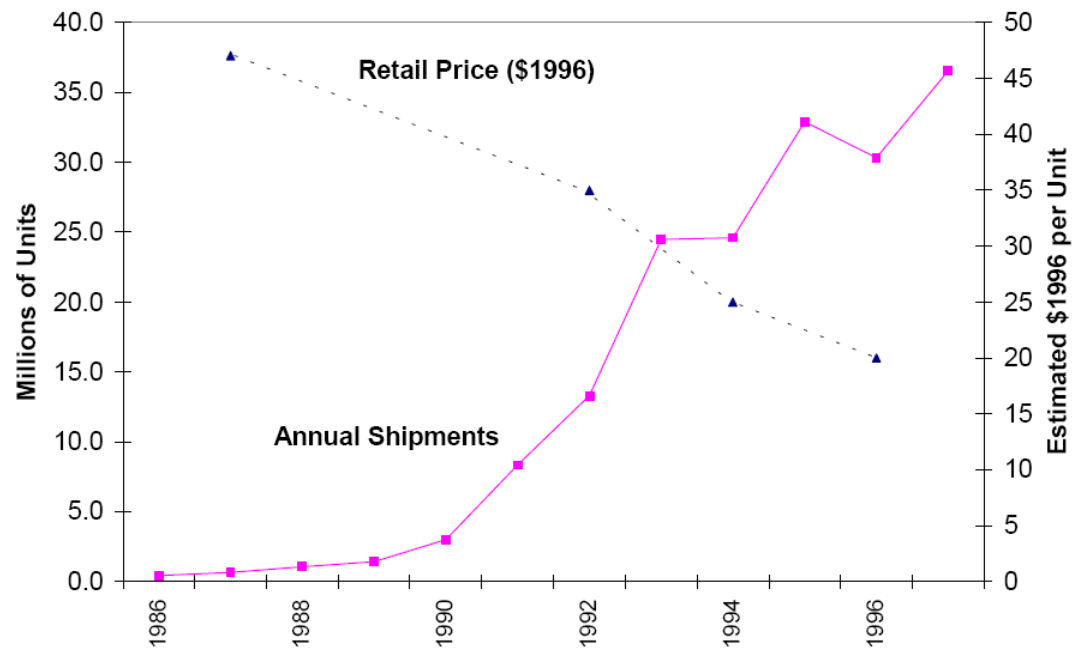
# The case of electronic ballasts



Programs Underway



# The case of Electronic Ballasts (cont)



## Additional indicators of market transformation

- Price decrease: many configurations less expensive than magnetic
- Effectively required by most commercial building codes
- Federal product standards effectively prohibit magnetic ballasts by 2011

Thesis # 2: Success in market transformation programming requires consistent and continual gathering and analysis of market intelligence and formal research.

# Regulators and sponsors interviewed stress market intelligence → success

## Key applications of informal intelligence and research

- Match strategy to stage of technology and market development
- Identify key supply side market actors and their motivations
- Identify key customer segments; characterize their motivations and barriers to adoption
- Identify codes, standards, and other regulatory influences on adoption
- Develop and track market change indicators to inform mid-cycle program decisions → quick turnaround studies
- Assess sustainability of observed changes

# Applications of Market Research to Program Planning & Management

Type of Study/ Information Source	Technology Assessment	Market Characterization	Advisory Committees	Market Progress Assessments	Summative Evaluations
<b>Select Products and Markets to Support</b> Potential energy savings Cost effectiveness Likelihood of success: Stage in Product Cycle	X	O		O	O
<b>Develop Program Theory/ Logic Model</b> Identify activities, outputs, outcomes Hypothesized causal links Indicators of market change	X	O	X	X	X
<b>Develop/Revise Program Design</b> Identify program strategies Set goals Assess mid-cycle progress	O	X	X	O	O
<b>Assess Sustainability</b> Status of identified barriers Status of related codes & standards	O	X	X	X	

**X** = Important Source

**O** = Potentially Useful Source

Thesis #3: Many methodologically sound approaches are available for estimating out-of-program adoptions (but you need to figure out which ones to use and when).

# Key Factors in Method Selection

- **Availability and quality of measure adoption data**
  - Basic sources: manufacturer shipment, sales, customer purchase self-reports, supply side actor self reports
  - Time frame covered
  - Geography covered, particularly program v. non-program
- **Applicability of attribution methods**
  - Available methods: free ridership/spillover surveys; expert judging; cross-sectional comparisons
  - Criteria for selection
    - Type of program; type of adoption data available
    - Timing of study in relation to market development
    - Budget & logistics

# Indicators of Adoption: Nothing is Perfect

Basic Source/Relative Advantages	Limitations
<p><b>Surveys of Customer Purchases</b></p> <p>Can be deployed quickly, relatively inexpensively, repeatedly over extended time frames</p> <p>Can be deployed in program and non-program areas</p> <p>Generally produces reliable data on number of purchases/adoptions</p>	<p>Limited accuracy on key details: exact number, timing, efficiency rating of purchases</p> <p>Non-response bias a problem, particularly in early stages of market development</p> <p>Difficult to validate results in absence of some comparison to sales or program volumes</p>
<p><b>Surveys of Supply-Side Actors</b></p> <p>Taps into close knowledge of local markets</p> <p>Respondents sufficiently knowledgeable to provide accurate information on product features</p>	<p>Difficult to build measures of sales volume – may need to be content with estimates of market share</p> <p>In many jurisdictions population available to be sampled is small</p> <p>Difficult to validate results in absence of some comparison to sales or program volumes</p>
<p><b>Shipment and Sales Data</b></p> <p>Conceptually, the most accurate and detailed measure of adoption: quantity, efficiency, timing</p>	<p>Requires negotiated cooperation of manufacturers and retailers; risk of drop-outs</p> <p>Difficult to obtain coverage of all sectors, time periods, regions</p> <p>Quality control is difficult</p>

# Alternative Attribution Approaches

Basic Approach/Relative Advantages	Limitations
<p><b>Customer-reported Free Ridership &amp; Spillover</b>            Can be deployed quickly, relatively inexpensively, repeatedly over extended time frames            Can probe adoption process &amp; decisions            Consistent with current PEB methods</p>	<p>For nonparticipants, requires that customers be aware of the program and able to judge its impact on adoption decisions</p>
<p><b>Cross-sectional Methods</b>            Closest to conventional social science research methods; intuitively satisfying.            Data provide insight into exogenous factors, working of market beyond program boundary</p>	<p>Increasingly difficult to find non-program areas            Difficult to verify comparability of non-program areas            Appears to be effective only in time-limited periods            Logistically demanding &amp; time consuming</p>
<p><b>Expert Judging</b>            Focuses insights from experienced market participants and observers            Results can be expressed in terms of net adoptions            In some cases, can be deployed fairly rapidly.</p>	<p>Not a statistical estimation process            Difficult to identify and account for factors affecting individual judgments</p>

**Best practice is to use at least two of these methods.**

# Estimating Energy Savings with Market Data: CA High Bay Lighting

	Item	Value	Notes/Sources
1	Total square feet served by 2006 – 2008 HBL Purchases	458 mil.	Estimated from CA end-user survey
2	Average watts per square foot (lighting power density): Program Area Efficacy	0.62 w/sf	Estimated based on technology share results from the CA contractor survey
3	Average watts per square foot (lighting power density): Baseline Efficacy	0.71 w/sf	Estimated based on technology share results from the Comparison Area contractor survey
4	Total MW of high bay lighting purchased: Program Area	293.7 MW	Row 2 * Row 1
5	Total MW of high bay lighting purchased: Baseline Efficacy	326.3 MW	Row 3 * Row 1
6	<b>Difference in MW installed: Program Area v. Baseline Efficacy</b>	<b>32.7 MW</b>	Row 5 – Row 4
7	<b>Difference in GWh/Year Usage: Program Area v. Baseline Efficacy</b>	<b>97.2 GWh/Year</b>	Row 6 * average annual operating hours per lighting logger study conducted for Impact Evaluation of 2006 – 2008 Small Commercial Program

# Estimating Savings Attributable to the CA Programs

Row	Calculation Step	Quantity/Outcome
1	Energy savings associated with adoption of efficient HBL technologies, net of baseline adoptions. This quantity includes net savings estimated through <i>Protocol</i> methods (adjusted gross savings * (1-free ridership))	97.2 GWh/Year
2	Net <i>ex post</i> savings estimated via 2006 - 2008 impact evaluations (program transactions only)	67.0 GWh/Year
3	Savings from out-of-program adoptions, net of baseline adoptions: (Row 1 – Row 2)	30.2 GWh/Year
4	Low estimate of savings from out-of-program adoptions, net of baseline, that are attributable to the program: (0.5 * Row 3)	15.1 GWh/year
5	High estimate of savings from out-of-program adoptions, net of baseline, that are attributable to the program: (0.9 * Row 3)	27.2 GWh/year
6	<b>Low estimate of net program energy savings: (Row 2 + Row 4)</b>	<b>82.1 GWh/year</b>
7	<b>High estimate of net program energy savings: (Row 2 + Row 5)</b>	<b>94.2 GWh/year</b>

- **Lines 4 & 5 are the low and high estimates of spillover**
  - Cannot distinguish participant and non-participant spillover: too few self-reported participants in the CA end-user sample

# Rationale for Attribution Level

- **Assessed four alternative hypotheses concerning drivers of observed differences between CA and the Comparison Area in technology market shares**
  1. Effects of the program on contractor specification practices and customer adoption of efficient HBL technologies
  2. Effects of 2005 Title 24 lighting power allowances
  3. Systematic differences between CA and the Comparison Area in customer purchase decision-making structure and criteria
  4. Systematic differences between CA and the Comparison Area in support for contractor promotion of efficient HBL technologies from distributors and manufacturers
- **Strong evidence found for Hypothesis 1**
- **Relatively weak evidence found for Hypotheses 2 & 3**
- **Evidence from surveys contradicts Hypothesis 4**

# Expert Judging: Worth a Try

- **Good Applications**

- R&D Programs: NRC studies of DOE programs; Evaluations of NYSERDA Programs; PIER
- Codes & Standards: CA statewide evaluations; PIER support for efficient external power supplies
- Forecasts of future market share desirable: MA ES Homes

- **Practical Tips**

- Allow sufficient time for recruitment & second/third iterations
- The tighter the specification of questions in terms of variables and time frames, the better
- Allow sufficient time and budget for developing background fact packages

# Consistent Findings and Advice from Program Administrators & Regulators

- **Concentrate on programs likely to produce market effects**
  - Mass market, up-stream, heavy publicity, (potential) high commercial interest to supply channels, in take-off stage
- **Collect market data early and often**
  - Program planning and management value for “proximate” or leading indicators: recognition, understanding, willingness to pay
  - Look for signals regarding when to deploy ‘summative’ methods with attendant expense and expectations
- **Negotiate evaluation goals, expectations, methods**
  - Not all summative evaluations will meet formal rigor thresholds. Best to clarify expectations and applications of results before doing the study.

# Thanks for your attention

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