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

California Public Utility Commission

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Experience you can trust.

Overview of Today's Presentation

- **Study Context, Scope, and Methods**

- **Overview: Key Findings and Recommendations**

- **Market Effects & Market Transformation: Realities, Definitions, Theories**

- **Emerging Practices in Program Design and Management: Use of Research and Evaluation**

- **Evaluation of Market Effects**

- **Recommendations in Detail**

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Project Context

- **Strategic Plan targets deep reductions in all end uses, invoking rhetoric and methods of market transformation**

- **CPUC Decision 07-10-032 setting framework for 2009 – 2011 public benefits charge programs**

  – Policy goal: make energy efficiency "business as usual"

  – Market transformation specifically named as a goal

  – Requires practical steps to promote market transformation

- **Market effects studies**

- **Key Questions**

  – Can energy savings associated with market effects be measured reliably?

  – How to treat these measurements in regulation?

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Project 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

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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

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But first, the conclusions...

- **Key Findings/Theses**

  1. Ratepayer-funded energy efficiency programs have contributed significantly to market transformation.

  2. Success requires consistent collection and analysis of market data and integration of results into program design

  3. Energy efficiency programs influence measure adoption outside the program, but in limited time periods.

  4. Many methodologically sound approaches are available to estimate out-of-program adoptions.

- **Key Recommendation**

  – Count savings associated with market effects in the PEB for programs likely to achieve them.
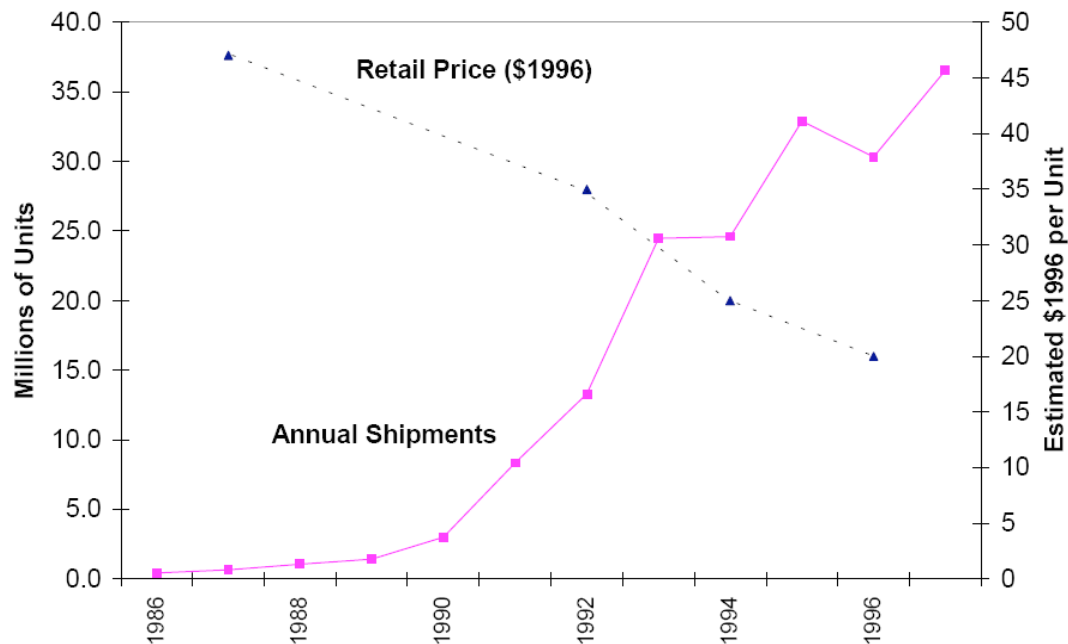
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Thesis # 1: Market effects and market transformation actually do happen.

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The case of electronic ballasts
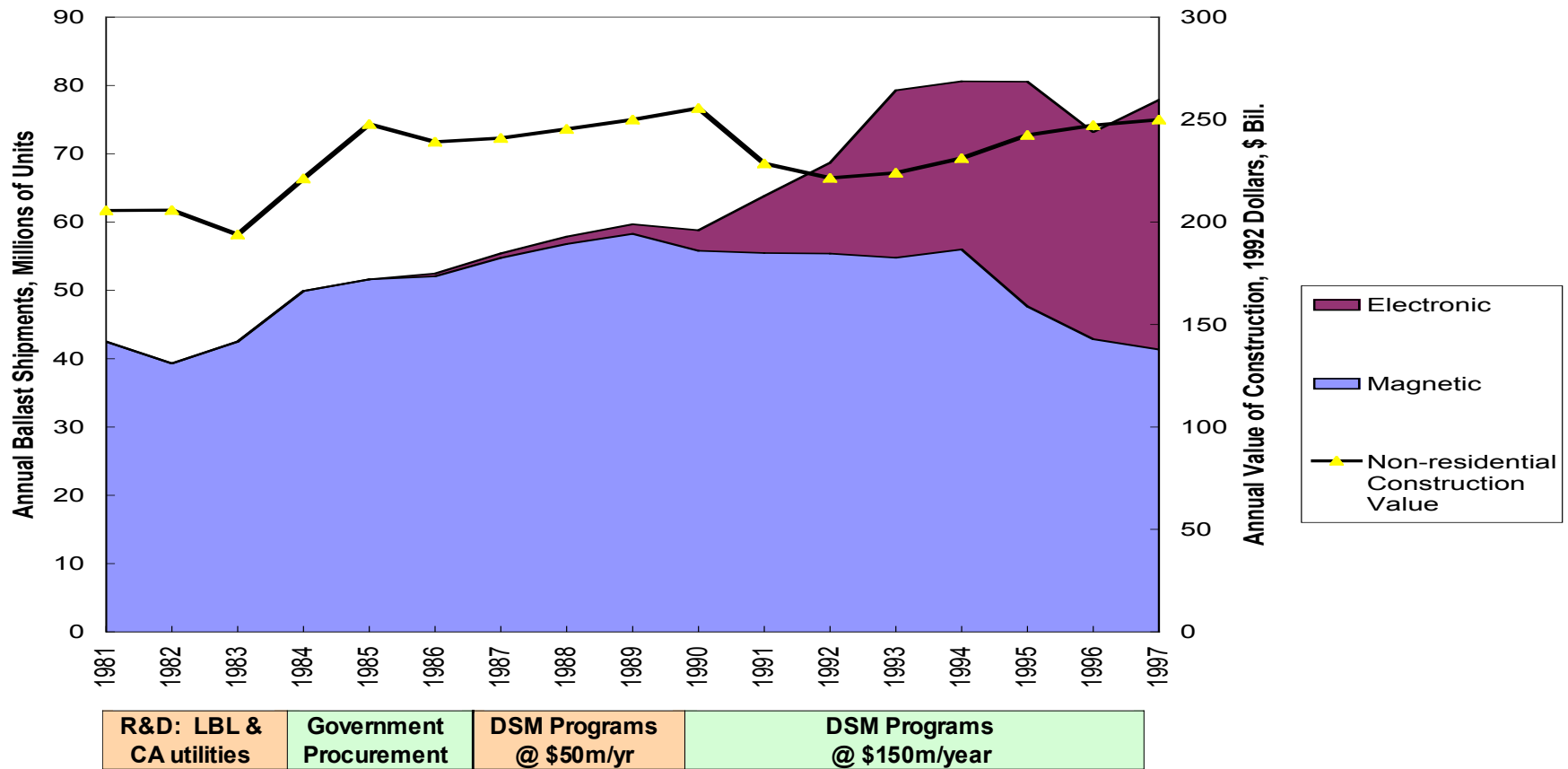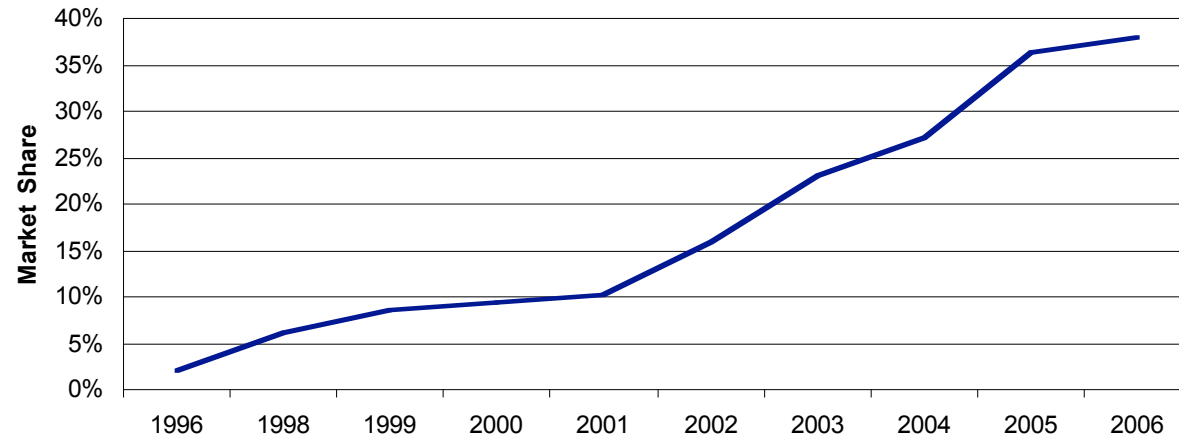

Programs Underway

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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

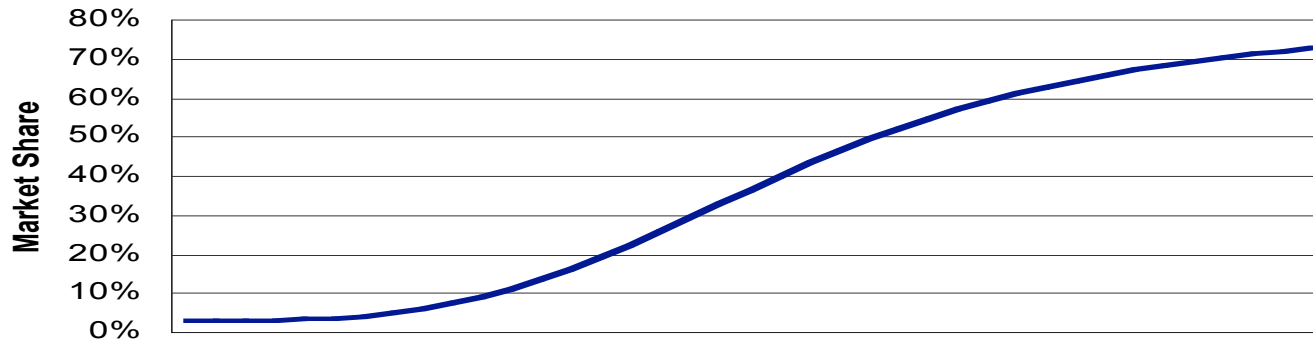**KEMA**

The case of resource-efficient clothes washers

	1998	2000	2002	2004	2006
Local Programs in Effect	12	50	70	100+	90
ENERGY STAR & Other Federal Events	1st ENERGY STAR specification (1997)	DOE announces new min. standard	National promotions initiated	Federal min standard increased	(2007) Fed min standard and ENERGY STAR increased
Manufacturers producing ENERGY STAR models	8	14	17	21	24
Number of ENERGY STAR models	18	35	84	125	212*

* Includes only those that meet the revised 2007 specification.

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

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Policy & Programs to Accelerate MT

Introduction	Early Acceptance	Take Off	Maturity
SUPPLY CHAIN ORIENTED Government lab R&D Sponsored corporate R&D Technology road mapping Mediate technology standard setting Development of performance metrics and testing protocols	Vendor technical and sal es training Co-advertising Vendor merchandising support Development & promotion of voluntary product efficiency standards Product testing	Vendor technical and sales training Co -advertising Vendor merchandising support Upstream product subsidies Initiate c onsideration of higher product standards Develop common service specifications	Mandatory codes and standards Promulgate higher voluntary standards
DEMAND ORIENTED Purchase of p rototype s or early models Develop and publicize case studies of applications	Bulk purchase Customer education Rebate programs General EE public relations	Customer education Rebate programs General EE public relations	Continued customer education Rebate programs for higher efficiency units only

Stages in Product Life Cycle

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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**

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Applications of Market Research to Program Planning & Management

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

X = Important Source
O = Potentially Useful Source

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Thesis #3: Some energy efficiency programs cause significant levels of out-of-program adoptions within the program area, (participant and nonparticipant spillover), but the duration of these effects is limited.

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Evidence of spillover from mass market programs

- **CFLs**

  - Pacific NW 2001: non-rebated sales = 56% of total

  - Vermont 2004: non-rebated sales = 42% of total; Annual purchases per hh = 1.1 v. ~ 0.3 nationwide

  - Wisconsin 2003: non-rebated sales = 50% of total; Annual purchases per hh = 0.6 v. ~ 0.3 nationwide

- **ENERGY STAR Clothes Washers**

  - California 2004-5: non-rebated sales ~ 55% of total. ENERGY STAR partner market share 35.7% v. US – 27.2%

  - Vermont 2001: non-rebated sales = 37% of total ENERGY STAR partner market share 25.0% v US – 10.3%

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Evidence that large out-of-program effects may be short-lived

- **CFLs**

  - Draft CA CFL Market Effects Study: Little difference in CFL purchase/HH between CA and non-program areas

- **ENERGY STAR Clothes Washers**

  - Vermont 2001: cross-sectional model estimate of net-to-gross ratio ~ 1.30

  - Massachusetts 2004: cross-sectional model estimate of net-to-gross ratio ~ 1.0

  - Vermont 2003: cross-sectional model estimate of net-to-gross ratio ~ 0.29 using similar methods

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VT clothes washer programs: What's happening to local program influence
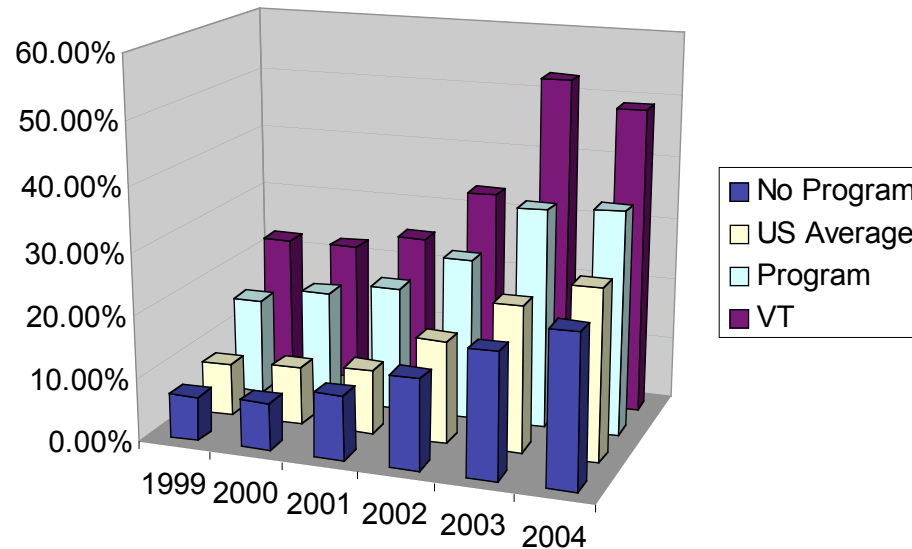
- **Results**

  - 'Non-program Area' market shares rising faster than market areas

  - Impending federal minimum standard changes

  - Attractive product for manufacturers, retailers

- **Market development narratives suggest cumulative effects but difficult to show statistically without retrospective data**

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Thesis #4: Many methodologically sound approaches are available for estimating out-of-program adoptions (but you need to figure out which ones to use and when).

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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; historical tracing; cross-sectional comparisons
  - Criteria for selection
    - Type of adoption data available
    - Timing of study in relation to market development
    - Budget & logistics

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Measures of Adoption: Nothing is Perfect

Basic Source/Relative Advantages	Limitations
Surveys of Customer Purchases Can be deployed quickly, relatively inexpensively, repeatedly over extended time frames Can be deployed in program and non -program areas	Limited accuracy on key details: number, timing, efficiency rating of purchases Non -response bias a problem, particularly in early stages of market development Difficult to validate results in absence of some comparison to sales or program volumes
Surveys of Supply -Side Actors Taps into close kn owledge of local markets Respondents sufficiently knowledgeable to provide accurate information on product features	Difficult to build measures of sales volume – may need to be content with estimates of market share In many jurisdictions (not CA) populat ion available to be sampled is small Difficult to validate results in absence of some comparison to sales or program volumes
Shipment and Sales Data Conceptually, the most accurate and detailed measure of adoption: quantity, efficiency, timing	Requires negotiated cooperation of manufacturers and retailers; risk of drop -outs Difficult to obtain coverage of all sectors, time periods, regions Quality control is difficult

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Practical Implications of Imperfection

- **Value of adoption data is greatly enhanced by comparability over time and between regions**

- **Shipment and Sales Data**

  – Requires early and continual deployment of resources

  – Requires cooperation with other jurisdictions, sponsors

- **Survey Data**

  – Replicability requires well-documented sampling methods

  – High precision needed for significant comparisons

  – Bias minimization

- **Use of multiple sources can cut both ways**

  – Customer and supply side reports often at odds, particularly in early stages

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Alternative Attribution Approaches

Basic Approach /Relative Advantages	Limitations
Customer -reported Free Ridership & Spillover Can be deployed quickly, relatively inexpensively, repeatedly over extended time frames Can probe adoption process & decisions Consistent with current PEB methods	For nonparticipants, requires that customers be aware of the program and able to judge its impact on adoption decisions
Cross -sectional Methods Closest to conventional social science research methods; intuitively satisfying. Data provide insight into ex ogenous factors, working of market beyond program boundary	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 & time consuming
Expert Judging 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.	Not a statistical estimation process Difficult to identify and account f or factors affecting individual judgments
Historical Tracing Builds narrative to provide context for "snapshot" statistical studies. Provides basis for judgments regarding attribution where statistical methods not applicable: e.g. some R&D programs	Not a statistical estimation process. Relies heavily on objectivity and skill of the researcher – difficult for the research user to validate independently Does not yield a quantitative estimate of net adoptions

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On the Cross-Sectional Frontier

- **Application to C&I Programs and Products**
  - Wisconsin study compares market share of fluorescent high bay lighting, hi-eff A/C, and VFDs in WI v. IL. Use of ratio estimation to account for differences in sales volumes.
  - Based on supply-side actor self-reports
  - Phase 1 (Baseline) finds large differences in fluorescent high-bay, some difference in HVAC & Controls, none in VFD
- **Big Picture Policy Analysis**
  - Marvin Horowitz *Energy Journal,* 2004, models state commercial Wh/ $ state service GDP as a function of DSM spending, total GDP, weather, statistical corrections
  - MT and RA programs lowered electrical intensity by 13.5 Wh/year per $ GDP

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Expert Judging: Worth a Try

- **Good Applications**

  – R&D Programs: NRC studies of DOE programs; Evaluations of NYSERDA Programs

  – 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

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Key Recommendation: Count energy savings from out-of-program adoptions attributable to energy efficiency programs as benefits for the Performance Earnings Basis.

OK, but how?

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Consistent Findings and Advice from Other Jurisdictions

- **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

  – 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 rigor thresholds for award of incentives. Best if these expectations clarified before doing the study.

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Recommended Action Plan

- **Steps for Counting Market Effects in the PEB**
  - Identify programs likely to generate market effects in the current 3-year cycle
  - Convene Peer Review Groups if not done already
  - Develop logic models
  - Develop initial, high level evaluation plans
- **Other Recommendations**
  - Provide research support for exit strategies
  - Provide research support for selection of technologies to be supported by the ETP
  - Conduct market effects studies of at least one service or practice-oriented program
  - Research validity of indicators of sustainability

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