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Knowledge to Shape Your Future

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Energy Efficiency Potential Analyses: Useful Policy Tools or Impossible Dreams?

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Agenda for Today

- Components of Energy Efficiency Potential Forecasts
- Evolution of potential studies
- Uses and Abuses of Potential Studies (PS)-
- Strengths and Limitations of PS
- Lessons learned from four perspectives
  - Regulators, State Policy Maker, Program Administrator& Consultants
- Key Policy Challenges moving forward- 3 slides

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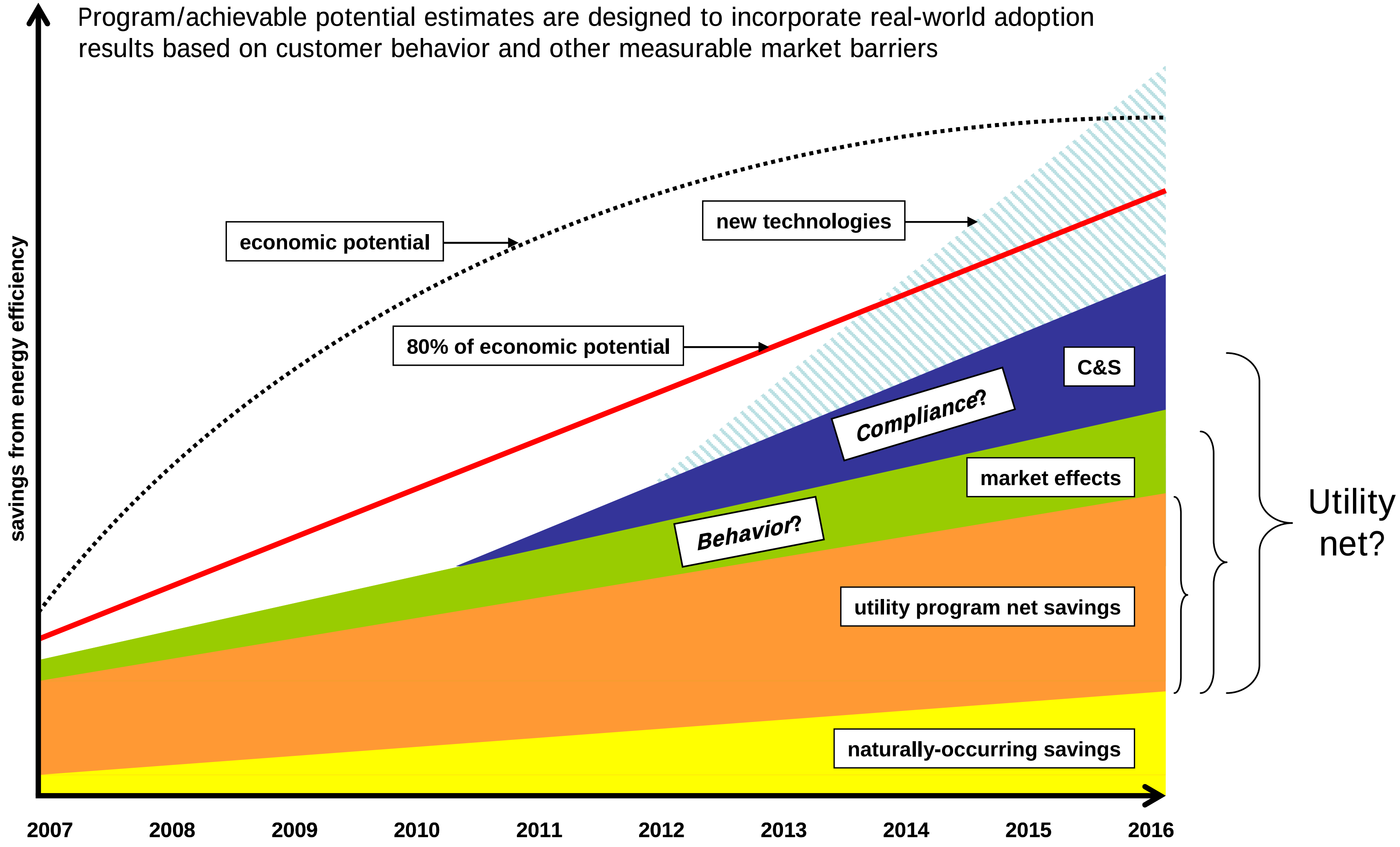
Some Inconvenient Truths

- Estimates of Energy Savings and Potential are All Relative
  - To projections of Relative Service Demand
  - To projections of naturally occurring conservation trends
  - To estimates of marginal supply avoided

  - Example 1- 1000 MW of Potential in Utah or New York
  - Example 2- My trip to Washington DC today
- Background/Bias of potential's author::mine= Electricity forecaster, policy advisor, building and appliance stds, program designer and program evaluator, goals developer

Components of Energy Efficiency Potential Analyses

Technical and economic potential are highly theoretical constructs
Program/achievable potential estimates are designed to incorporate real-world adoption results based on customer behavior and other measurable market barriers



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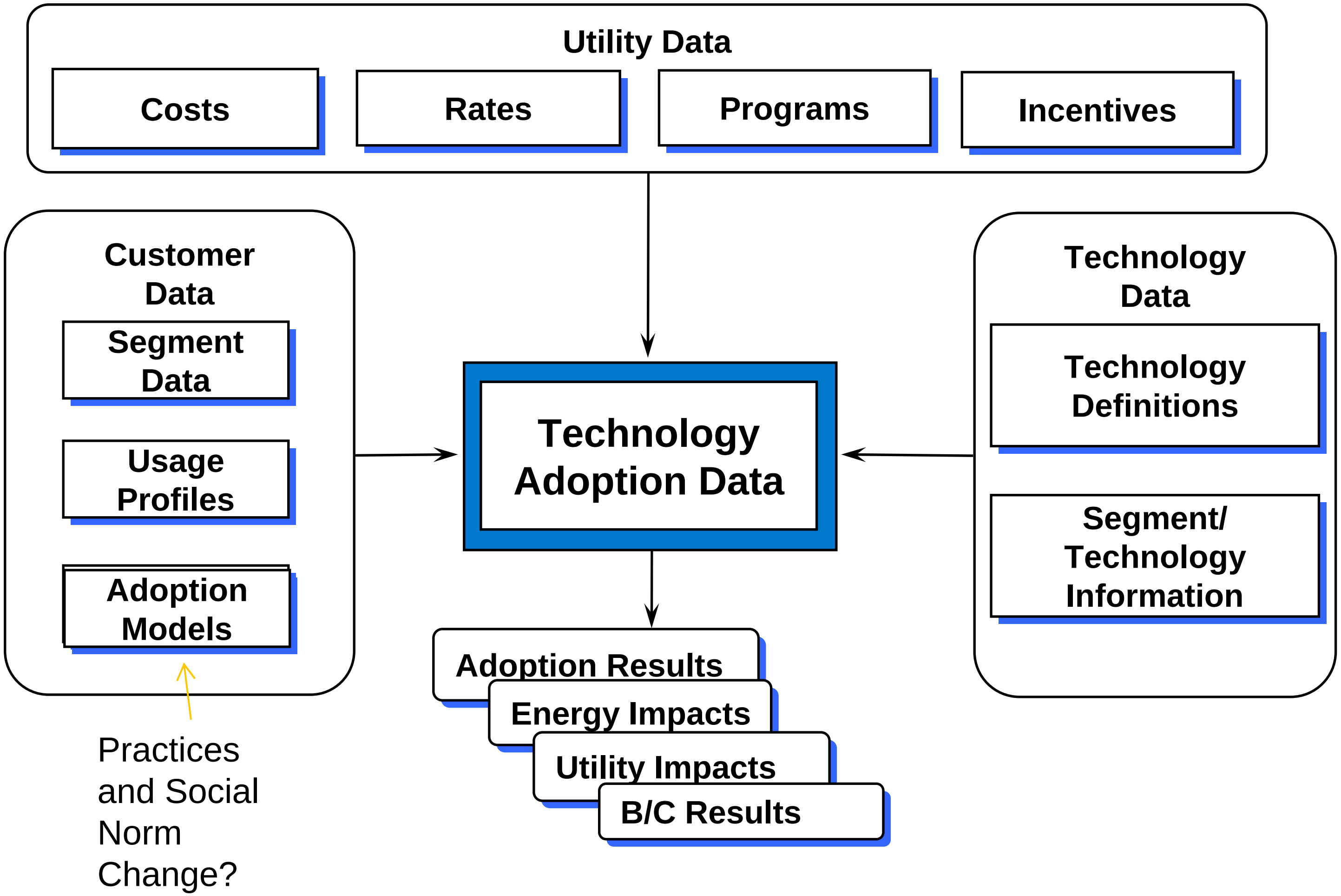
Components of Potential Models-

Key question: How to forecast change in multiple inputs over time?



Evolution: Scope and Purpose of Potential Studies

- 1970's – Judgments of "feasible" penetration of EEMs within end use modeling framework- (A. Lovins, 1976, Energy Policy: the Road not Taken, or M. Messenger, 1981: A high technology low Energy Use forecast for Western Europe: Energy Journal)
- 1980's – First Modeling of technology adoption and comparison of cost of conserved energy to supply costs (XENERGY potential studies, A. Meier& A.Rosenfeld (LBNL), EPRI REEPs models)
- 1990's- Customer adoption modeled using forecasts of economic, awareness and energy use baselines, forecasts linked to IRP processes (CEC Electricity report in CA , MA, BPA)
- 2000's- Explicit link of potential studies to develop energy savings goals over time. (CEC and Energy Foundation leverage IOU work in *Secret Surplus* Study (Rufo/Coito/KEMA-XENERGY 2002-03)

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Evolution of Policy Uses of Potential Studies

- 1970’s- “Results” used to form the first public policy programs to promote energy efficiency (DOE appliance standards, Utility EE programs, CEC building standards)
- 1980’s – Results used to encourage development of resource planning; concept of balanced portfolio of supply and demand resources, make efficiency programs “profitable”
- 1990’s – Results used to target Utility/State Program Planning and develop Performance incentive mechanisms, Cost of Conserved Energy policy rationale goes mainstream

Evolution of Policy Uses of Potential Studies

- 2000= Results used as Justification for EE as "First Resource" in loading order, Detailed savings goals/EERS (original EER in 2 states, now in 26 states)
- 2008- Conservation Supply curve concepts transferred to GHG policy analysis by Mckinsey and others
- 2009- Results used to help reconcile Program Evaluation results with Mainline Utility Forecast to ensure Savings are not being double counted in resource planning and better understand impact on energy service demand
- 2010-???

Uses and Abuses of Energy Efficiency Potential Studies

Beneficial Uses

- Identification of Target Markets and End Uses
- Support of the political will to develop savings targets
- Creation of a more level playing field in procurement
- Support of the use of probability analysis in potential and forecasting models
- Better understanding of naturally occurring EE investments
- Better understanding of customers

Negative Abuses/Impacts

- Over optimistic estimates of program capabilities to achieve rapid savings ramp up
- False confidence in ability of P models to produce precise point estimates that feed performance mechanisms
- Focus by PA to capture existing low hanging fruit rather than stimulating innovation/ new measures

Potential Studies/Models: Strengths and Weaknesses

- Strengths:
  - Use of saturation data
  - Use of stock accounting
  - Organizational frameworks for managing data
  - Calibration to program and market accomplishments
  - Tracking of savings over time
  - Framing estimates of technical and economic potential
  - Ability to efficiently handle multiple scenarios
  - Works well with "widgets"
  - Ability to model interactions between stnds, programs and labels
- Weaknesses:
  - Lack of empirical data at bldg type
  - Lack of quality characteristics data
  - Challenges associated with:
    - Discrete and static measure lists
    - Measure interactions
    - Systems/practices
    - Effect of economic vs. non-economic factors on adoption
    - Forecasting Program and naturally-occurring adoption
    - Spillover and Market effects
    - "Out-of-sample" initiatives
  - Data intensiveness often leads to false perceptions of precision in savings forecasts
  - Point estimates, with limited presentation of uncertainty

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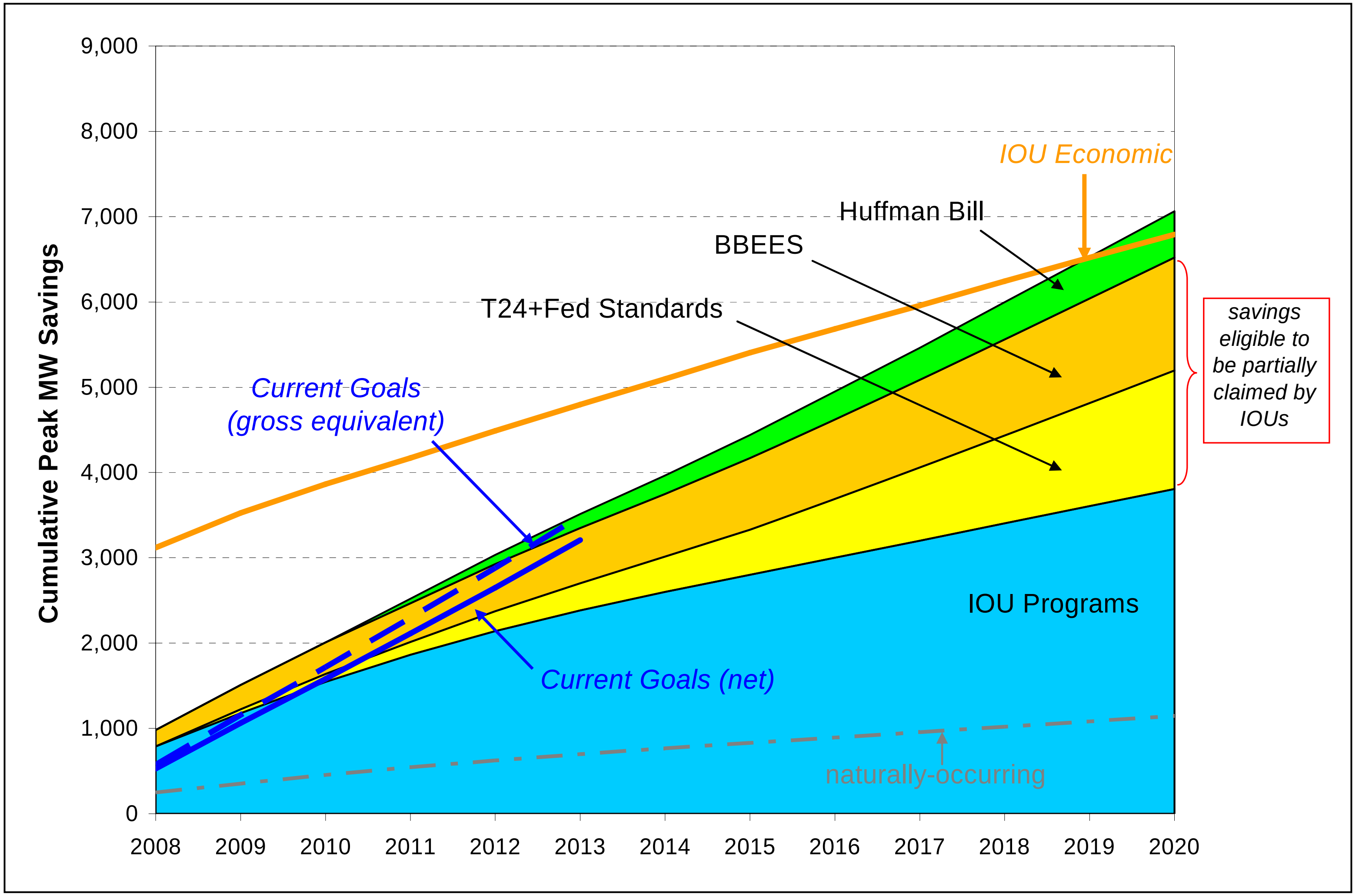
Use of Potential Studies to Support EERS Standards

- Initial Potential Results were used as motivational tools
- Starting in late 1980's, potential models began to be used as basis for developing energy savings goals
- In mid 1990's used as component of program performance incentive mechanisms by Utilitiy Commissions
- Scope of Models evolve= Utility programs... Building and Appliance Standards.. Social Marketing impacts?
- Example next page

Delivery Mechanism Interactions in California and Scope Differences- CA example



What is the purpose of a Savings *Goal*?

- Maximize cost-effective (C-E) societal energy savings?
- Maximize C-E societal savings *as quickly as* possible?
- Maximize C-E savings from *utility* programs?
- Maximize savings *as cost-effectively* as possible?
- Set benchmark for utility performance incentives?
- Produce high reliability for procurement?
- Contribute maximum possible to GHG reduction goal?

How important are tradeoffs among:

- Cost-effectiveness?
- Attribution?
- Reliability?
- Rate vs. bill impacts?
- Magnitude?

Metrics for use in Defining Energy Savings Goals

- Different metrics for different purposes:
  - “Narrow” net savings:

    Claimed savings for direct program participants incremental to savings that would have otherwise occurred in a program-cycle (i.e., net of free riders)

  - “Expansive” IOU net savings:

    Program-induced savings inclusive of market effects from IOU programmatic efforts (including codes & standards development and market transformation) but exclusive of savings from pure free riders

  - “Total Market” gross savings:

    All savings to society regardless of delivery mechanism

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Lessons Learned-Regulatory Perspective

- Be Careful what you wish for- Stretch goals can backfire
- Economic Potential ≠ Achievable Potential in short run and without assumption of standards as closer
- Pay attention to markets and actual electricity usage in addition to potential forecasts
- Profits are a more powerful motivator than achieving goals or capturing forecasts of potential savings

Lessons Learned-State Policy Maker Perspective

- Potential Studies need to consider interactions between state and utility programs, building standards, public opinion and “energy crises”
- Understanding likely trends in measure costs is extremely important as a driver of potential savings results and actual costs need to be tracked
- Interaction between Energy Savings and future Energy Service demand is still not well understood
- Energy Service demand growth has exceeded savings growth rates in 8 of last 10 years

Lessons Learned-Program Administrator Perspective

> Diversify your program portfolio, don't bet the farm on savings potential results in one sector or for a given end use (Remember microwave clothes dryers)

> Potential results are good; but market research to understand your customer needs is often more productive

Lessons Learned-Consultant Perspective

> Avoid optimistic or conservative value perspectives in forecasting trends in key indicators

> Expected value orientation is best tool in the tug of war contest between policy makers and regulators who favor higher potential estimates and program administrators who lean toward lower/conservative estimates

> Be clear on definitions for results/terms-

- Narrow net vs expansive market gross savings
- Economic compared to Achievable Potential

Future Uses of EE Potential Studies

- Tool to allow for identification of Sustainable communities with low carbon footprint on GIS maps
- Tool to Monitor Compliance with EERS and forecast outcomes of GHG policies at state and international level
- Tool to integrate planning and evaluation domains.
- To provide periodic assessment on the impact of emerging technologies and new program designs on federal EERS standards
- Others???-Send in your thoughts to me at mike.messenger@itron.com

Conclusions

- Potential Studies have had a significant effect on policy development resource planning, and motivation of program administrators
- High value in 10,000 foot view- range of efficiency opportunities across many market segments and technologies,
- Good at describing range of plausible future outcomes but should not be used like map quest driving directions
- Future evolution of models looks promising
- Potential models are useful policy tool but can cause nightmares if used like a scale.