



Energy Efficiency Potential in California

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with

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Main Findings

- CA can save 5.9 GW & 30 TWh with 4-fold increase in EE program spending
- Save ~ 50% of expected D growth
- Net Benefits to CA ~ 12 B\$
- EE is a key option for future CA Energy policy





Presentation Overview

- Background & Objectives
- Overview of Statewide Results
- Summary Findings
 - Residential Sector
 - Commercial Sector
 - Industrial Sector
- Upcoming Studies
 - Summary Study
 - In-depth Industrial
 - New Construction

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Background & Project Objectives

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Why this Project?

- Energy efficiency is a resource
- Like other resources, characterization needed periodically
- In wake of CA energy crisis, importance and need for efficiency increased
- With EE back in Procurement & CPUC/CEC/CPA joint push for it, need potential information

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Key Research Questions

- How much EE potential is there in California?
- How much of the EE potential is cost-effective to pursue?
- How much savings can be achieved through EE programs?
 - How does this vary by program activity level?
 - How does this vary under alternative energy cost forecasts?

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Project Components

- Completed studies
 - Commercial Electric Potential
 - Commercial Natural Gas Potential
 - Residential Electric and Gas Potential
- In progress
 - Industrial Electric and Gas Potential
 - New Construction Potential
 - Statewide Summary Study

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Snapshot of Methods

- Covers usage of major IOUs: PG&E, SCE, SGG & SDG&E: 80% of electric; 99% of gas use statewide
- Excludes new construction & emerging technologies
- Forecast EE potential from 2003-2012
- Calculate Technical, then Economic, then Achievable
- Three Energy Cost Scenarios
 - Base (current forecast), Low, High
- Four Program Activity Scenarios
 - Continued Current, 50% Increase, 100% Increase and Maximum Achievable

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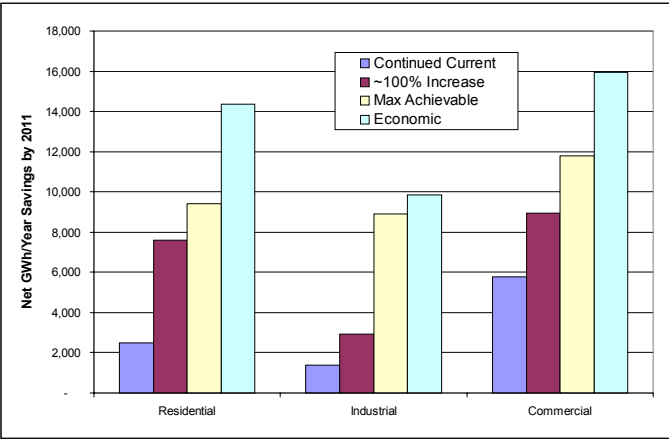


Overview of Statewide Results

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Achievable Electric Savings by 2011- GWh per Year

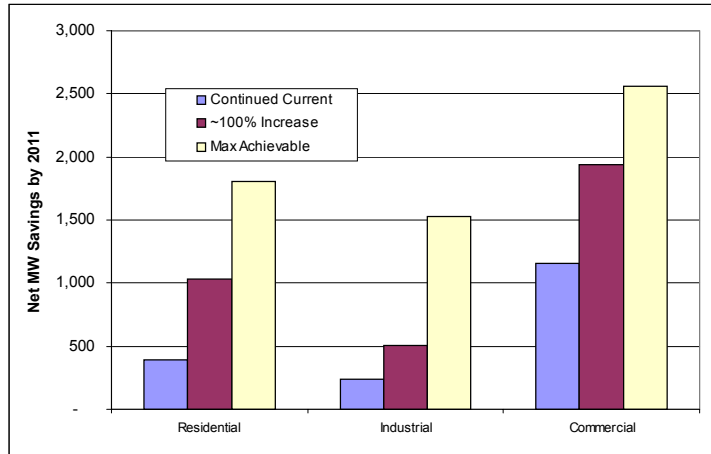


Note: Data represents all of California. IOUs represent ~90%, MUNIs and other, ~10%.
Source data: The Energy Foundation, 2002. California's Secret Energy Surplus: The Potential for Energy Efficiency – Final Report, Prepared by XENERGY.

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Achievable Demand Savings by 2011- MW per Year

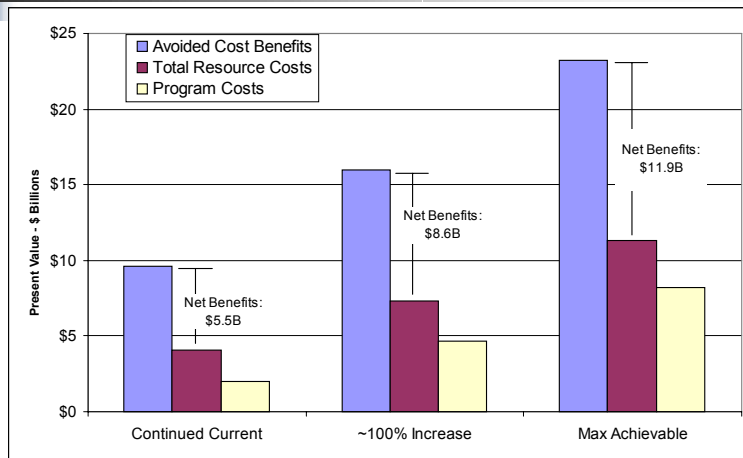


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Note: Data represents all of California. Source data: The Energy Foundation, 2002.



Summary of Benefits & Costs (Electricity Savings only)



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Note: Data represents all of California. Source data: The Energy Foundation, 2002.





Key Cost-Effective Measures

Residential

- High-Efficiency Windows
- High-Efficiency Pool Pumps
- CFLs
- Early Replacement of Older Refrigerators

Industrial

- Adjustable Speed Drives
- Motor System Improvements
- Lower-Cost Process Improvements
- Compressed Air System Improvements
- T8 Lamps with Electronic Ballast

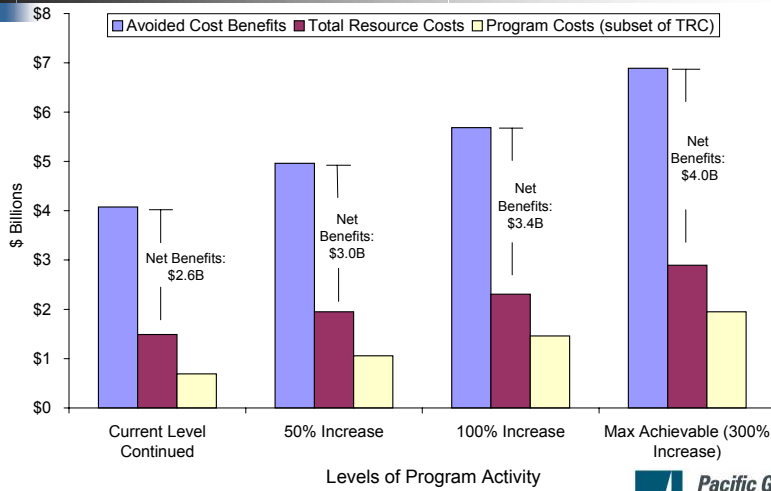
Commercial

- T8 Lamps with Electronic Ballast
- Lighting Occupancy Sensors
- CFLs
- High-Efficiency Chillers
- High-Efficiency DX Air Conditioners



Summary Findings

Commercial Electric Benefits & Costs: 2003-2012



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Note: Date represents IOU Service Areas only



Commercial Electric Program Potential Results

Program Activity Scenario	Net GWh Savings	Net MW Savings	TRC
Continued Current	4,042	785	2.73
50% Increase	5,256	1,090	2.55
100% Increase	6,112	1,294	2.47
Max Achievable	7,758	1,650	2.38

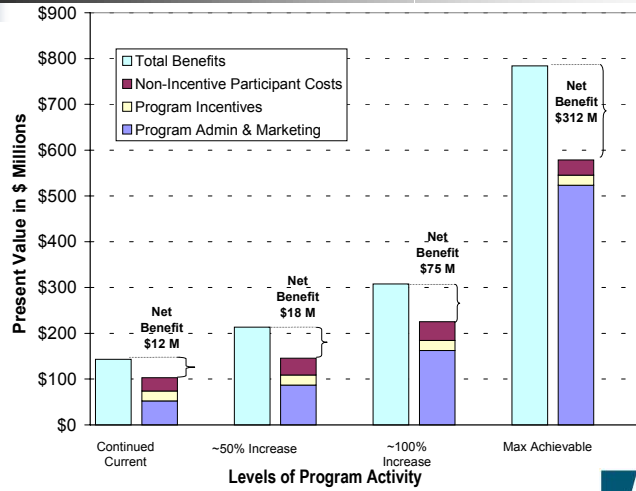
*Under base energy cost scenario

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Note: Date represents IOU Service Areas only



Commercial Gas Benefits & Costs: 2003-2012



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Note: Date represents IOU Service Areas only



Commercial Gas Program Potential Results

Program Activity Scenario	Net Mth Savings	TRC
Continued Current	30	1.39
50% Increase	49	1.46
100% Increase	75	1.36
Maximum Achievable	193	1.36

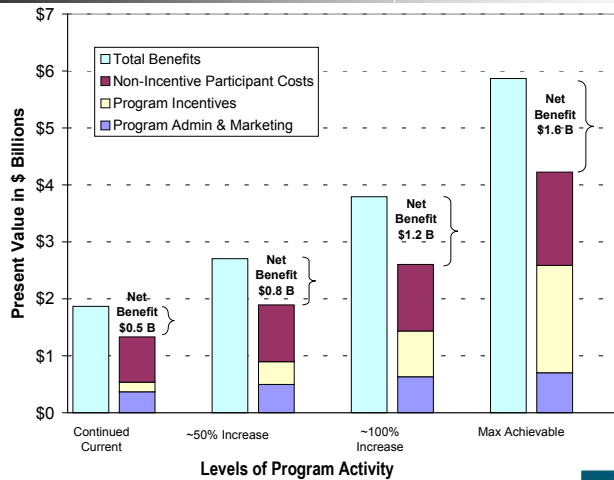
*Under base energy cost scenario

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Note: Date represents IOU Service Areas only



Residential Electric Benefits & Costs: 2003-2012



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Note: Date represents IOU Service Areas only



Residential Electric Program Potential Results

Program Activity Scenario	Net GWh Savings	Net MW Savings	TRC
Continued Current	2,413	385	1.40
50% Increase	4,149	611	1.43
100% Increase	6,327	907	1.46
Maximum Achievable	9,826	1,773	1.39

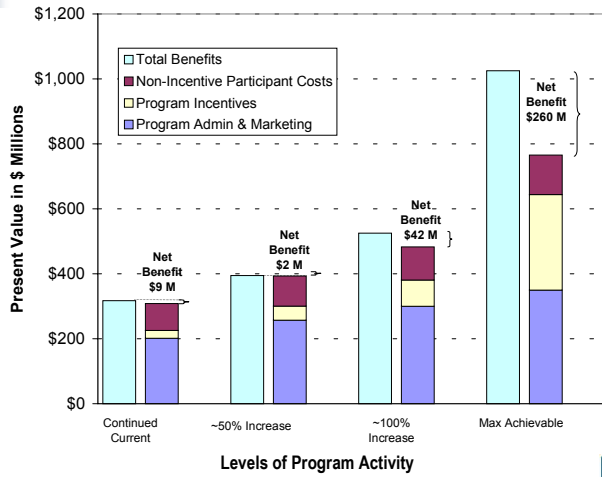
*Under base energy cost scenario

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Note: Date represents IOU Service Areas only



Residential Gas Benefits & Costs: 2003-2012



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Note: Date represents IOU Service Areas only



Residential Gas Program Potential Results

Program Activity Scenario	Net Mth Savings	TRC
Continued Current	51	1.03
50% Increase	73	1.00
100% Increase	109	1.09
Maximum Achievable	238	1.34

*Under base energy cost scenario

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Note: Date represents IOU Service Areas only



Industrial Program Potential (Electric only, all CA)

Program Activity Scenario	Net GWh Savings	Net MW Savings	TRC
Continued Current	1,195	206	2.71
100% Increase	2,475	424	2.51
Maximum Achievable	7,533	1,296	1.98

**Under base energy cost scenario*

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Note: Data represents all of California. Source data: The Energy Foundation, 2002.



Preliminary Industrial Gas Results

Meets 3 year or less Payback Threshold

Natural Gas	Mth
Boilers	330
Process Heat	136
Total Gas	466
Total	932

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Note: Data represents major IOU territories only. Source data: PG&E, 2001. California Industrial Energy Efficiency Market Characterization Study. Prepared by XENERGY.





Upcoming Studies


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Industrial Potential Study

- Based on California industrial mix
- Integration of national-level research
- Adjust to reflect California data
- Address key electric and gas industrial end uses
- Due: Fall, 2003

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New Construction Study

- **Developing methodology tailored to unique characteristics of NC markets**
- **Examine 4 California markets:**
 - Single Family
 - Multifamily
 - Commercial
 - Industrial
- **Integrate new construction with codes & standards and emerging technologies**
- **Analysis will include traditional & non-traditional measures (Cx, ETs)**
- **RFP this Summer; Completion mid 2004**

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Statewide Summary Study

- Using existing studies & bottom-up approach provide results by end-use for each sector, and aggregated SW
- Characterize savings streams in procurement-friendly format
- Produce output suited for policy environment that supports D-side programs (EE & DR)

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Conclusions




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Conclusions & Final Thoughts

- Significant EE savings opportunities remain
- Can increase spending ~ 4-fold to increase savings similarly
 - Increased spending to 8.2 B\$
 - Saves 30 TWh
 - 5.9 GW ~ 50% expected D growth
 - 12 B\$ net benefits
- More research needed to fine-tune program elements & capture ongoing progress





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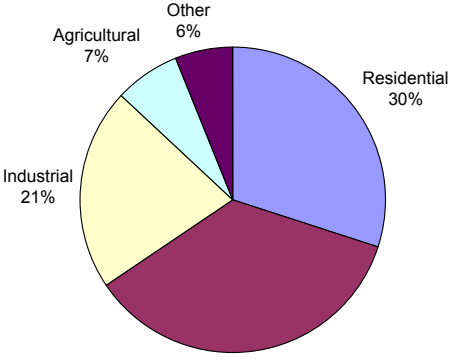


Appendix A: Energy Use By Sector

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California Electricity Use by Sector: 2000




Sector	Percentage
Residential	30%
Commercial	36%
Industrial	21%
Agricultural	7%
Other	6%

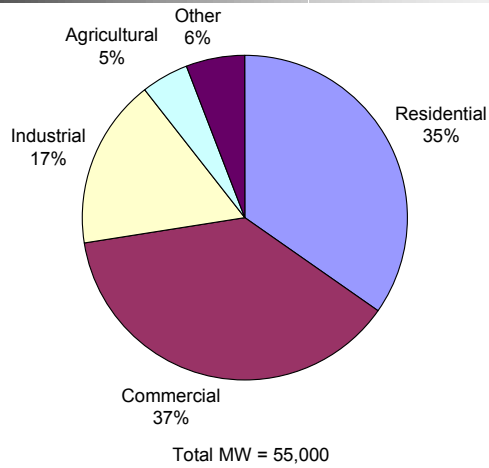
Total GWh = 280,000

Source: Brown & Koomey, 2002 and CEC, 2002. California Energy Demand: 2000-2010.

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California Peak Electricity Demand by Sector: 2000



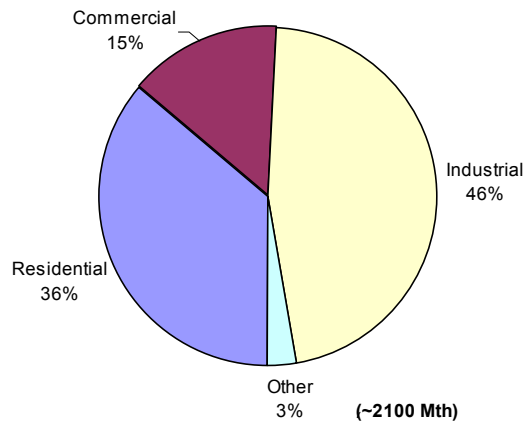
*Includes line losses.

Source: CEC, 2001. 2002-2012 Electricity Outlook. P700-01-004.



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California Natural Gas Use by Sector: 2000



*Excludes natural gas used for electricity production.

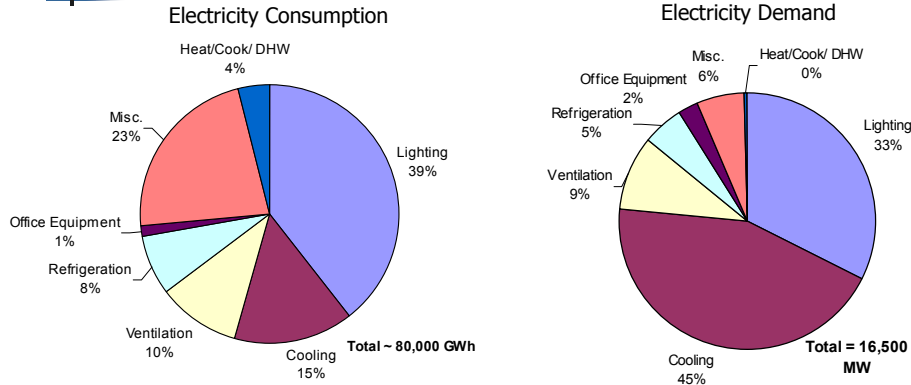
Source: CEC, 2000. California Energy Demand: 2000-2010.



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Commercial Electric: In Scope



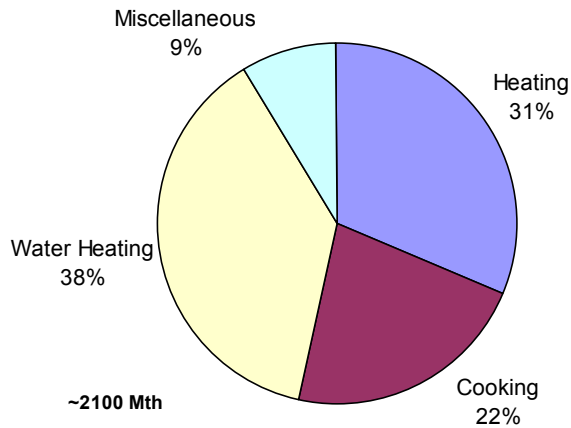
*In scope electric usage for major IOUs represents 80% of statewide usage.
 Source: CEC 2000. California Energy Demand: 2000-2010 & XENERGY/RER analysis.



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Commercial Gas: In Scope

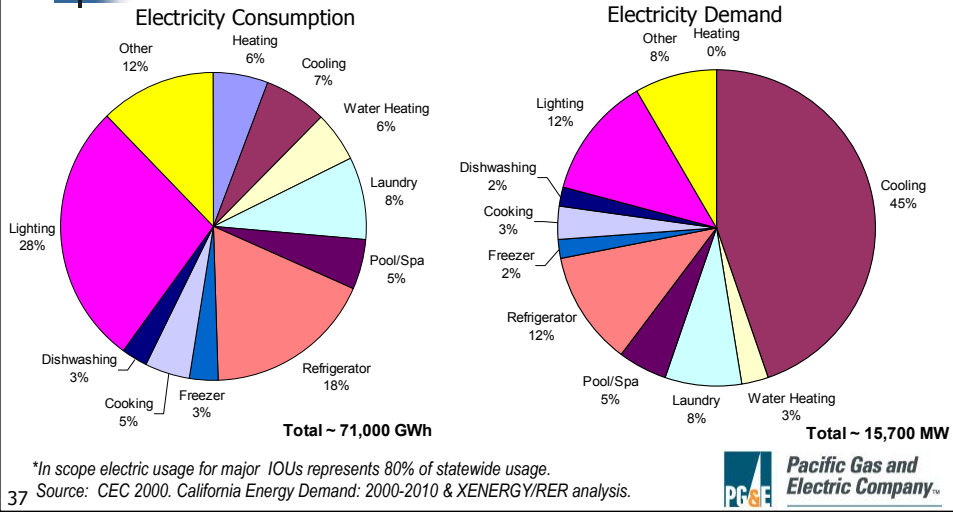


*In scope gas usage for major IOUs represents 99% of statewide usage.
 Source: CEC 2000. California Energy Demand: 2000-2010 & XENERGY analysis.



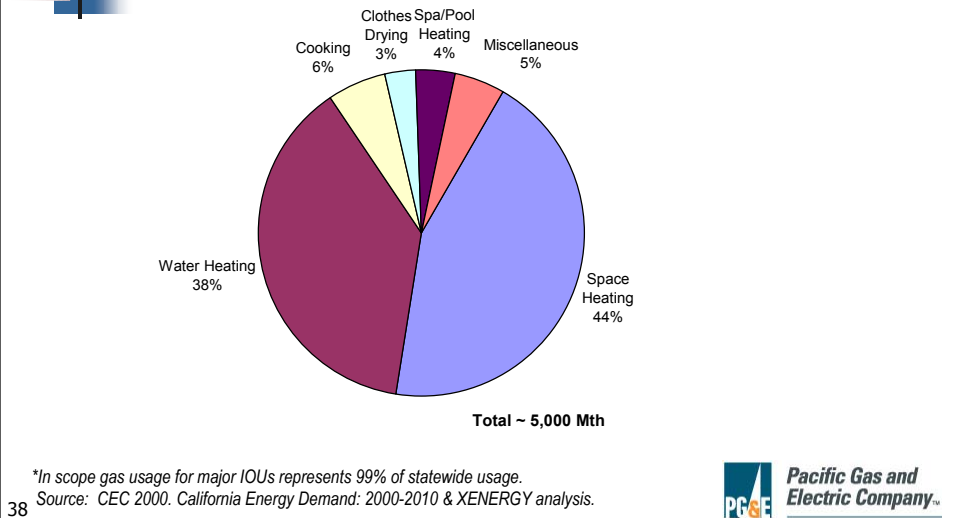
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Residential Electric: In Scope




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Residential Gas: In Scope




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Appendix B: Study Methods

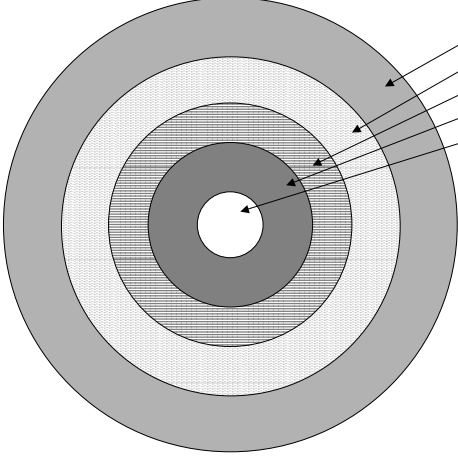
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Types of Potential

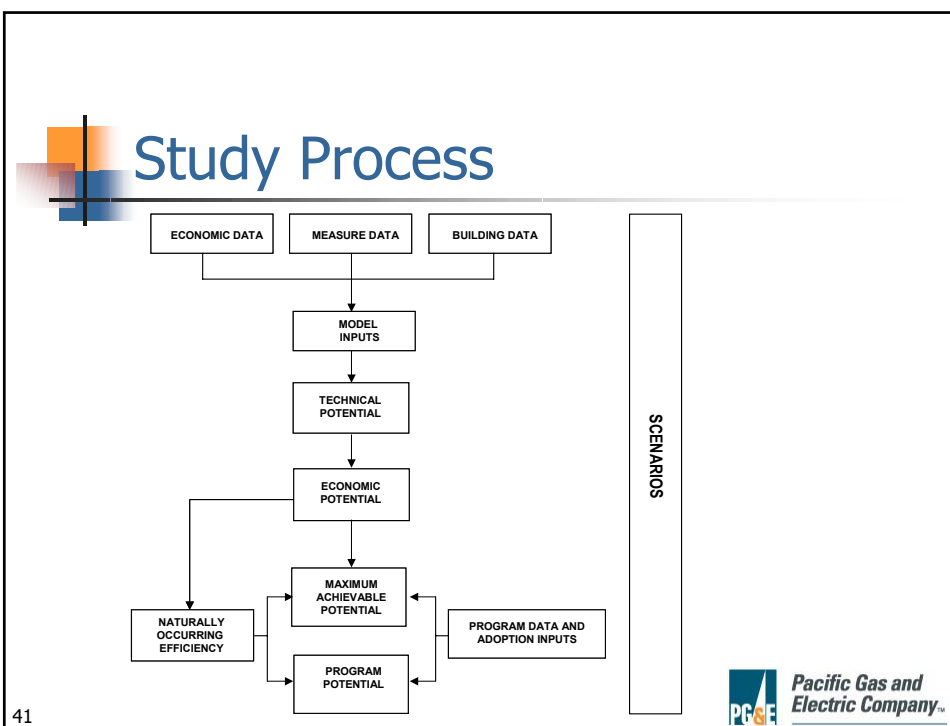



- Technical
- Economic
- Maximum Achievable Program
- Naturally Occurring

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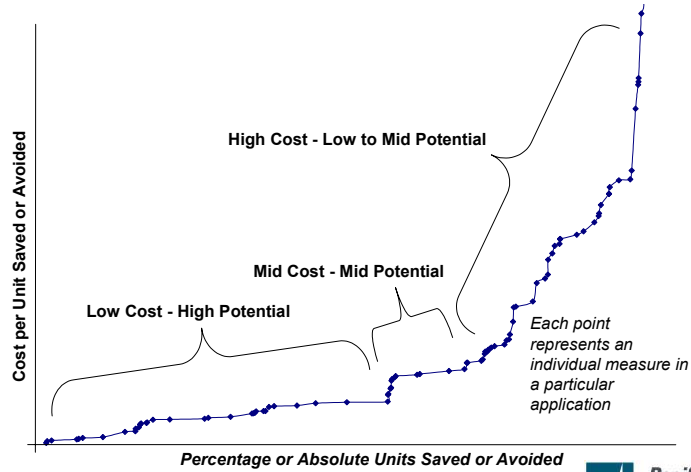


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- ## Key Inputs
- Measure data
 - Costs, savings, applicability, saturation
 - End Use data
 - UECs, saturations, load shapes
 - Building data
 - Total units (ft², households, etc.) by segment
 - Economic data
 - Avoided costs, rates
 - Discount rates (utility/society, participant)
 - Inflation rate
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Efficiency Supply Curve



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Program Budgets by Scenario

Program Costs by Scenario (Millions)	Com. Electric	Com. Gas	Res. Electric	Res. Gas
Continued Current	\$ 693	\$74	\$527	\$223
50% Increase	\$1,058	\$109	\$814	\$284
100% Increase	\$1,492	\$185	\$1,270	\$348
Maximum Achievable	\$1,952	\$545	\$2,413	\$592

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