



SUSTAINABLE
SPACES

Improving Home Performance

Energy Efficiency, Indoor Air Quality, Comfort

California Solar Forum

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Agenda

- The Case for Performance
- House as a System
 - Energy Efficiency
 - Indoor Air Quality
 - Comfort
- Production vs. Consumption
- An integrated Approach

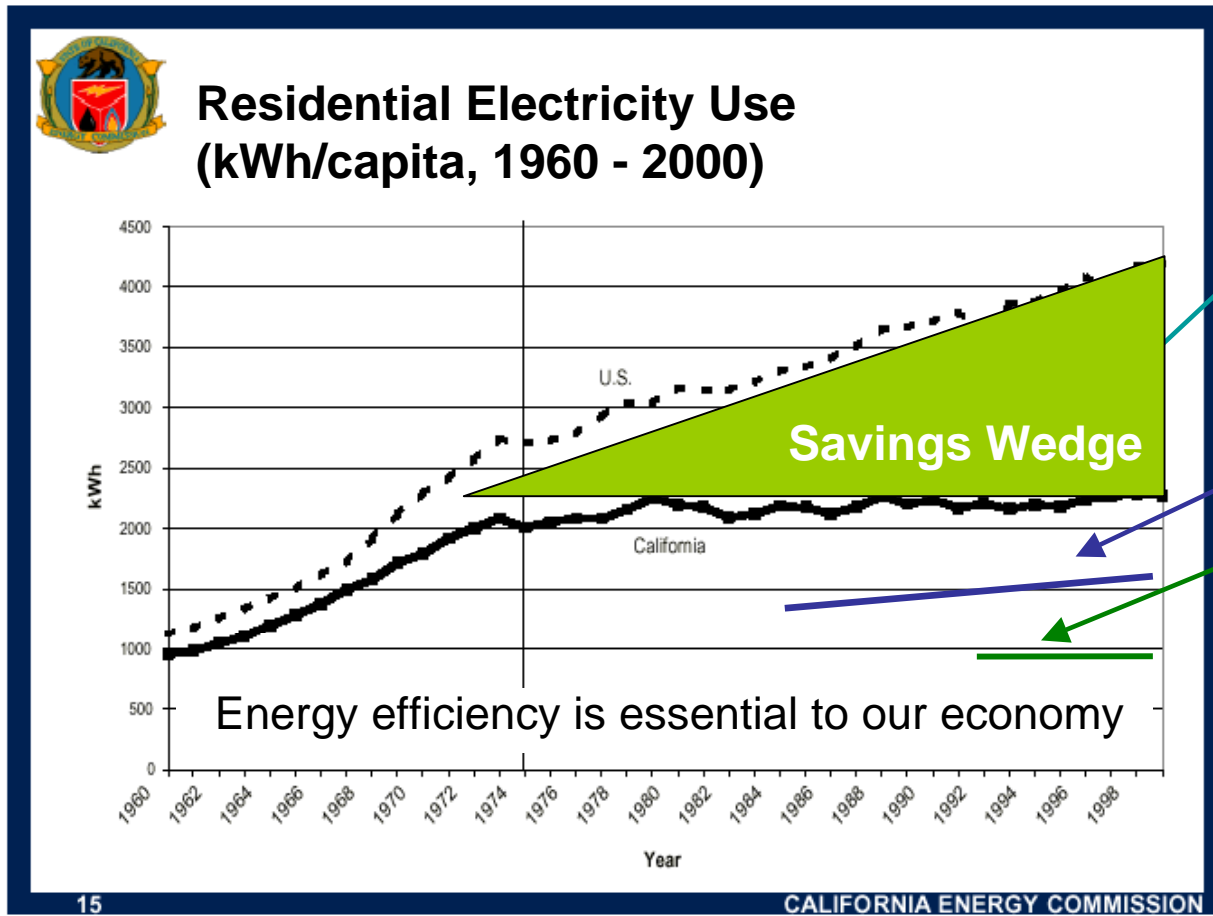


Building Energy Consumption

- 36% of total U.S. energy use
- 65% of electricity consumption
- 30% of greenhouse gas emissions
- 30% of raw materials use
- 30% of waste output
- 12% of potable water consumption.



Conservation Has BIG Results!



Energy Star Home

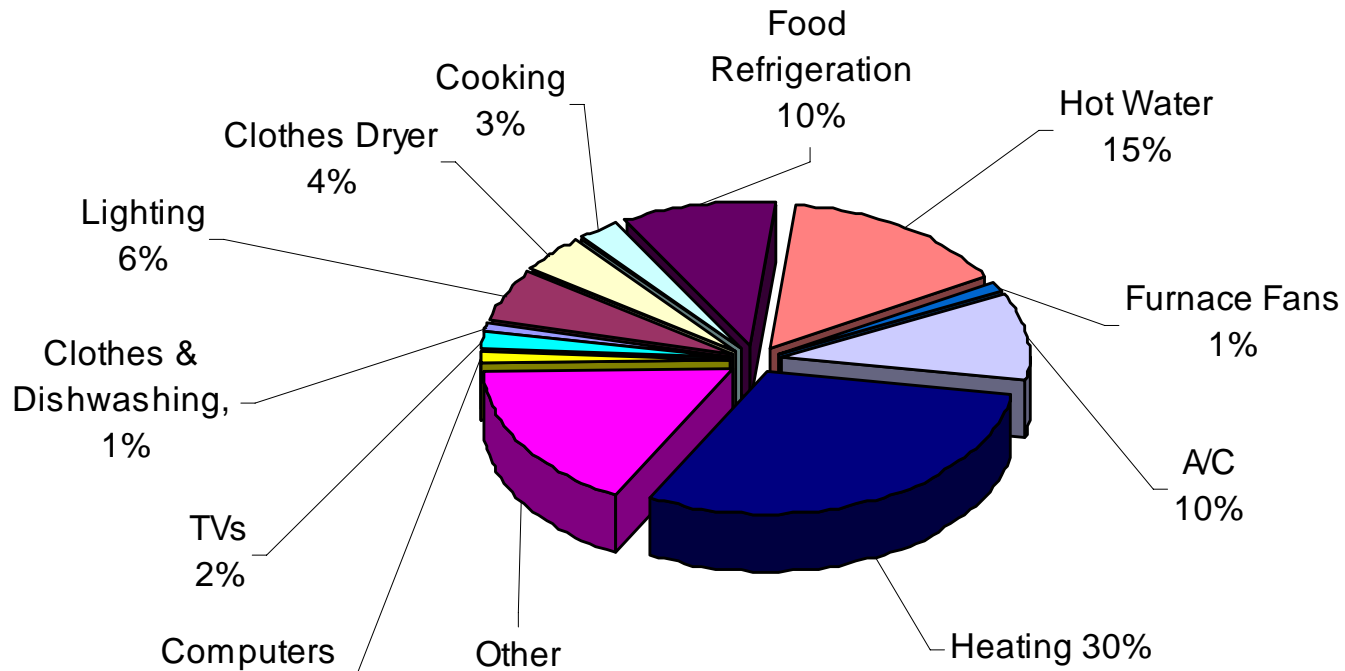
Average in Berkeley

Average Dane



Where is all the Energy Going?

California Average Home Energy Use





House as a System

It All Works Together!

- *Insulation*
- *Ducts*
- *HVAC Equipment*
- *Building Shell*
- *Windows & Doors*
- *Combustion Safety*
- *Water Heating*
- *Appliances & Lighting*

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Building Science

The driving forces behind building problems.

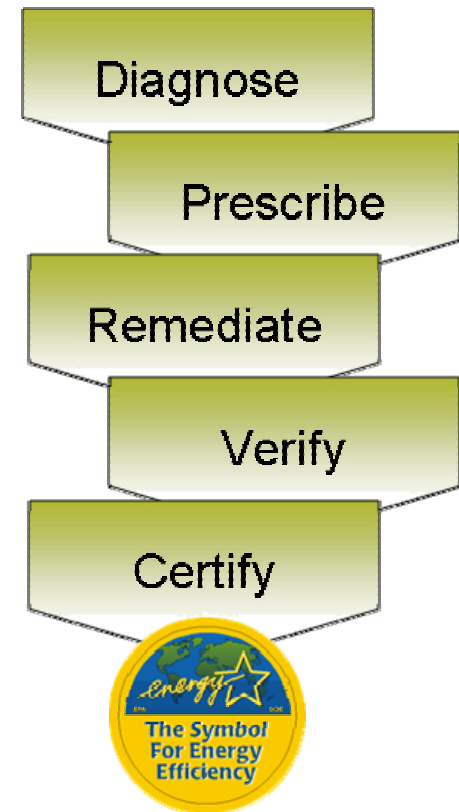


1. Heat Flow
2. Pressures
3. Moisture
4. Dew Point



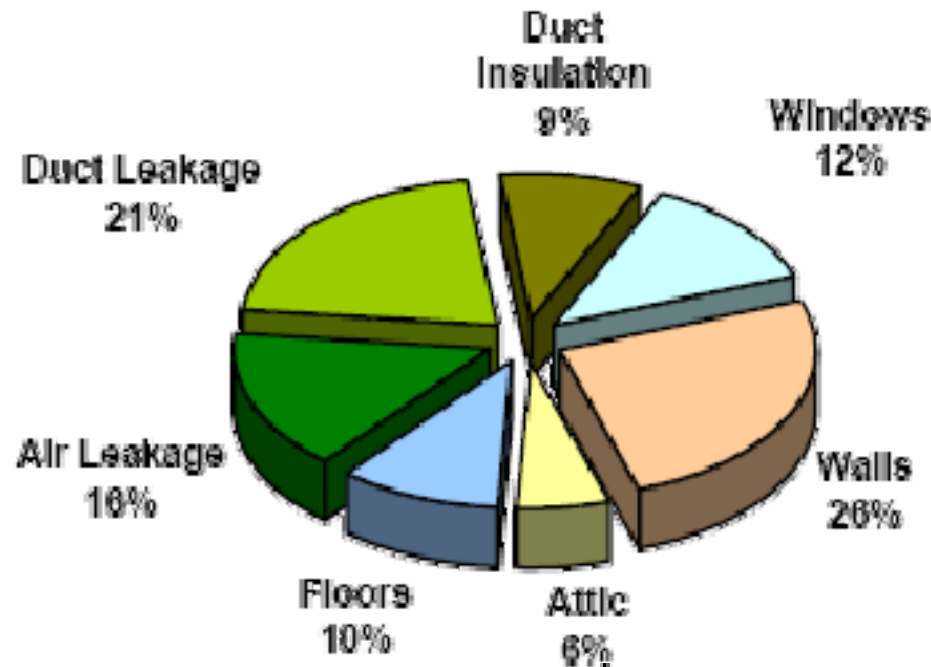
Performance Testing

- House as a System Testing
 - Quantitative Testing
 - Identify Source of Problems
 - Fix Underlying Causes
 - Re-Test to Confirm Solution





Heating and Cooling Loads



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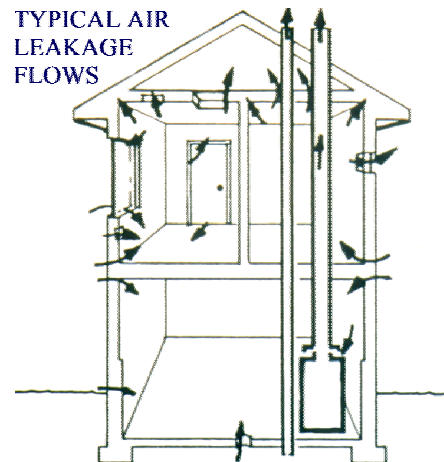
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Blower Door



- Measure Air Leakage
- Find Infiltration Points





Duct Blaster

- Measure Duct Leakage
- California Average 30% Leakage!



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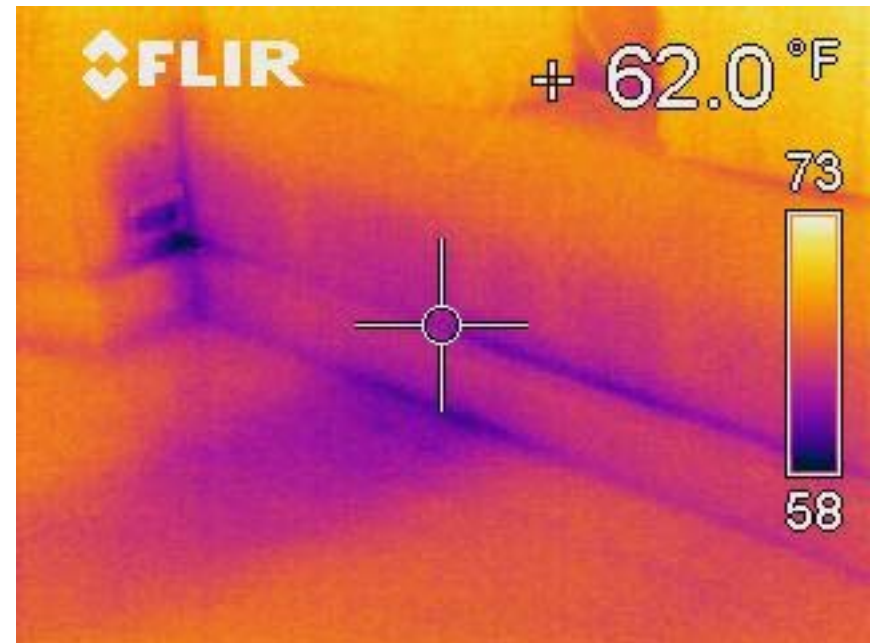
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Insulation and Envelope

- Insulation Defects
- Air Leakage





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Combustion Testing



- Test Combustion Efficiency
- Test Flue Systems
- Check Carbon Monoxide

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MECHANICAL System Efficiency

- Right-sizing (not too big or too small)**
- Equipment efficiency (SEER, AFUE)**
- Location (best within conditioned space)**
- Design, layout (efficient and appropriate?)**
- Installation (sloppy or careful?)**
- Maintenance (regular or non-existent?)**
- Specify everything in your contract**



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Performance Improvement Results

- **30% to 40% Reduction in Energy Bills**
 - Reduce Green House Emissions
 - Save Money!
- **Better Indoor Air Quality**
 - Indoor air is on average 2-5 times worse than outdoor air quality.
 - It can be better than outside air!
- **Improved Comfort and Safety**
 - Every room should be comfortable all year, or something is wrong



Production vs. Conservation

- Natural tensions exist
- Combined projects yield greatest results
 - Efficiency
 - Health
 - Comfort
- What is best for clients and the public good.



Defining the Future Model

- How can we integrate efficiency and renewable energy?
- What is best for our clients?
- What is best for the environment?
- How can we create an integrated approach that works for everyone?



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Question and Answer

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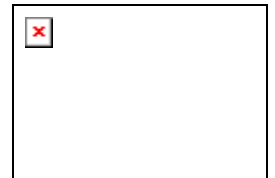
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