



Stanford University
Global Climate & Energy Project

"It's *Easy* Being Green"
Event Sponsored by Congressman Honda
August 30, 2007

Six "Easy Steps" Towards Energy Sustainability

Professor Sally M. Benson
Energy Resource Engineering Department

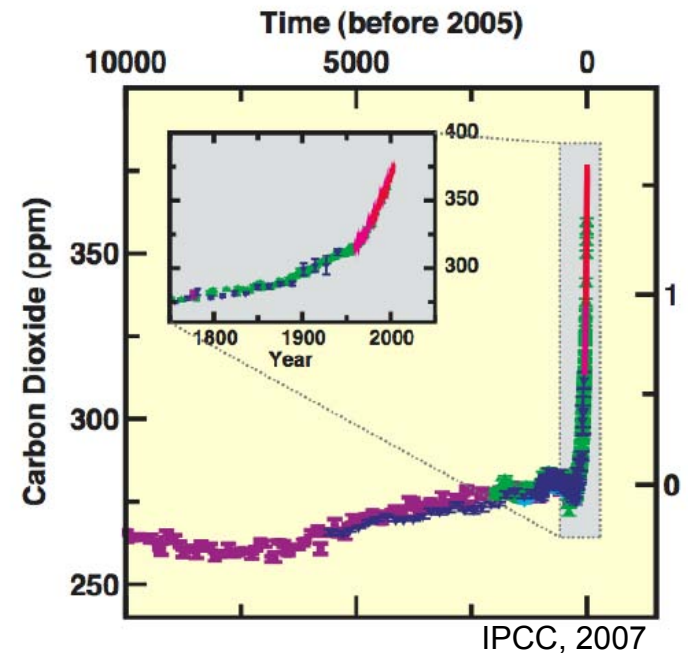
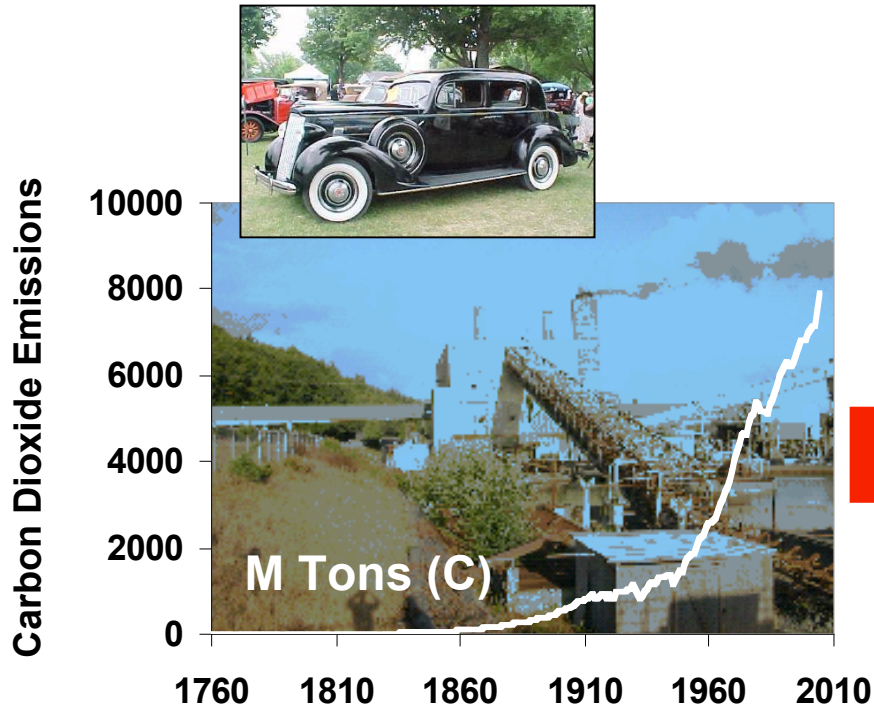
Science and technology for a low GHG emission world.



The Carbon Dioxide Problem



Carbon dioxide emissions have risen dramatically over the past two hundred years...



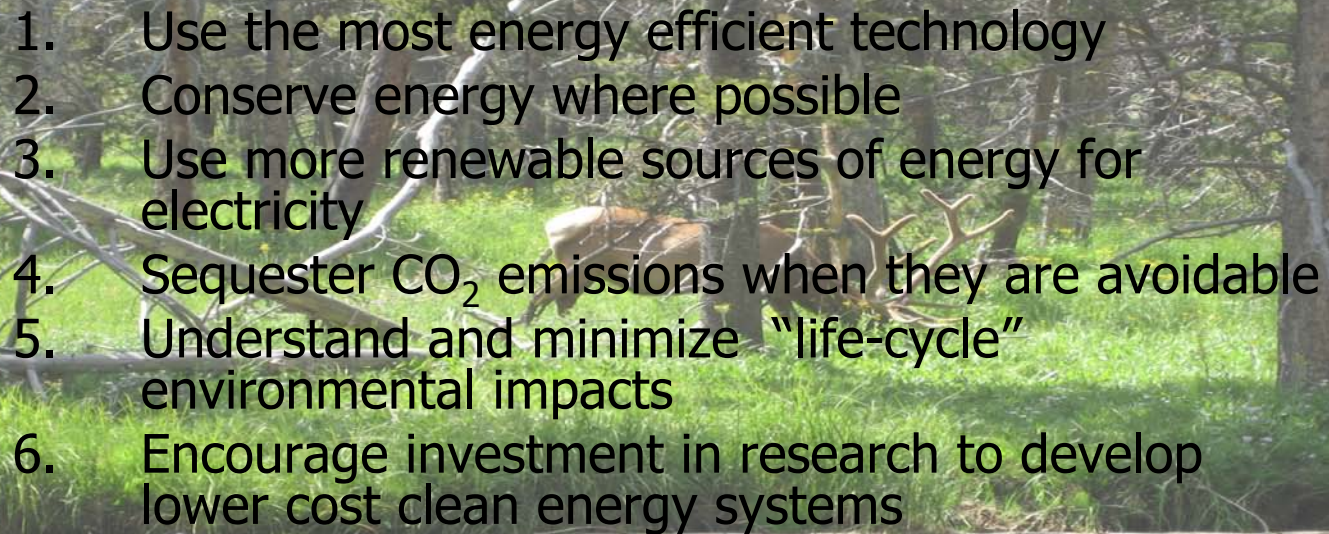
...leading to the buildup of carbon dioxide in the atmosphere.

This causes global warming.



Six “Easy Steps”



- 
- A background image of a forest scene with a deer standing in a clearing, surrounded by trees and a stream in the foreground. The image is framed by a black border with rounded corners and a white scroll effect on the left side.
1. Use the most energy efficient technology
 2. Conserve energy where possible
 3. Use more renewable sources of energy for electricity
 4. Sequester CO₂ emissions when they are avoidable
 5. Understand and minimize “life-cycle” environmental impacts
 6. Encourage investment in research to develop lower cost clean energy systems



Energy Efficiency



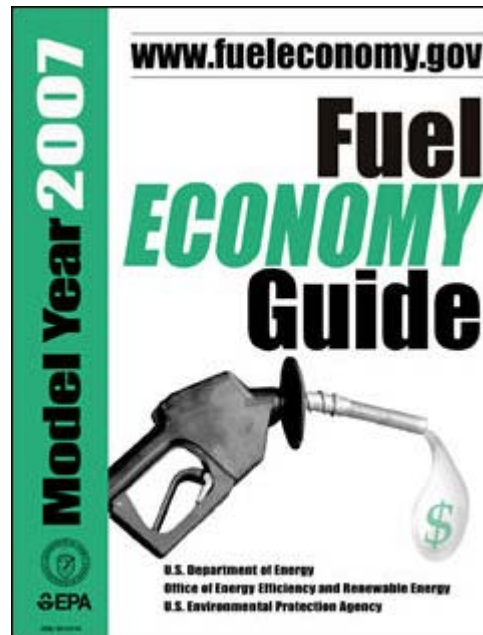
LIGHT OUTPUT EQUIVALENCY

To determine which ENERGY STAR qualified light bulbs will provide the same amount of light as your current incandescent light bulbs, consult the following chart:

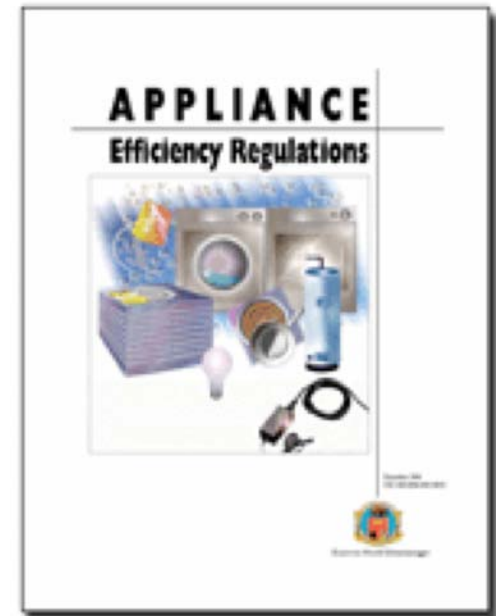
INCANDESCENT LIGHT BULBS	MINIMUM LIGHT OUTPUT	COMMON ENERGY STAR QUALIFIED LIGHT BULBS
WATTS	LUMENS	WATTS
40	450	9-13
60	800	13-15
75	1,100	18-25
100	1,600	23-30
150	2,600	30-52

LEARN MORE AT www/efuel.gov

Lighting



Transportation



Appliances



Conservation



Lighting



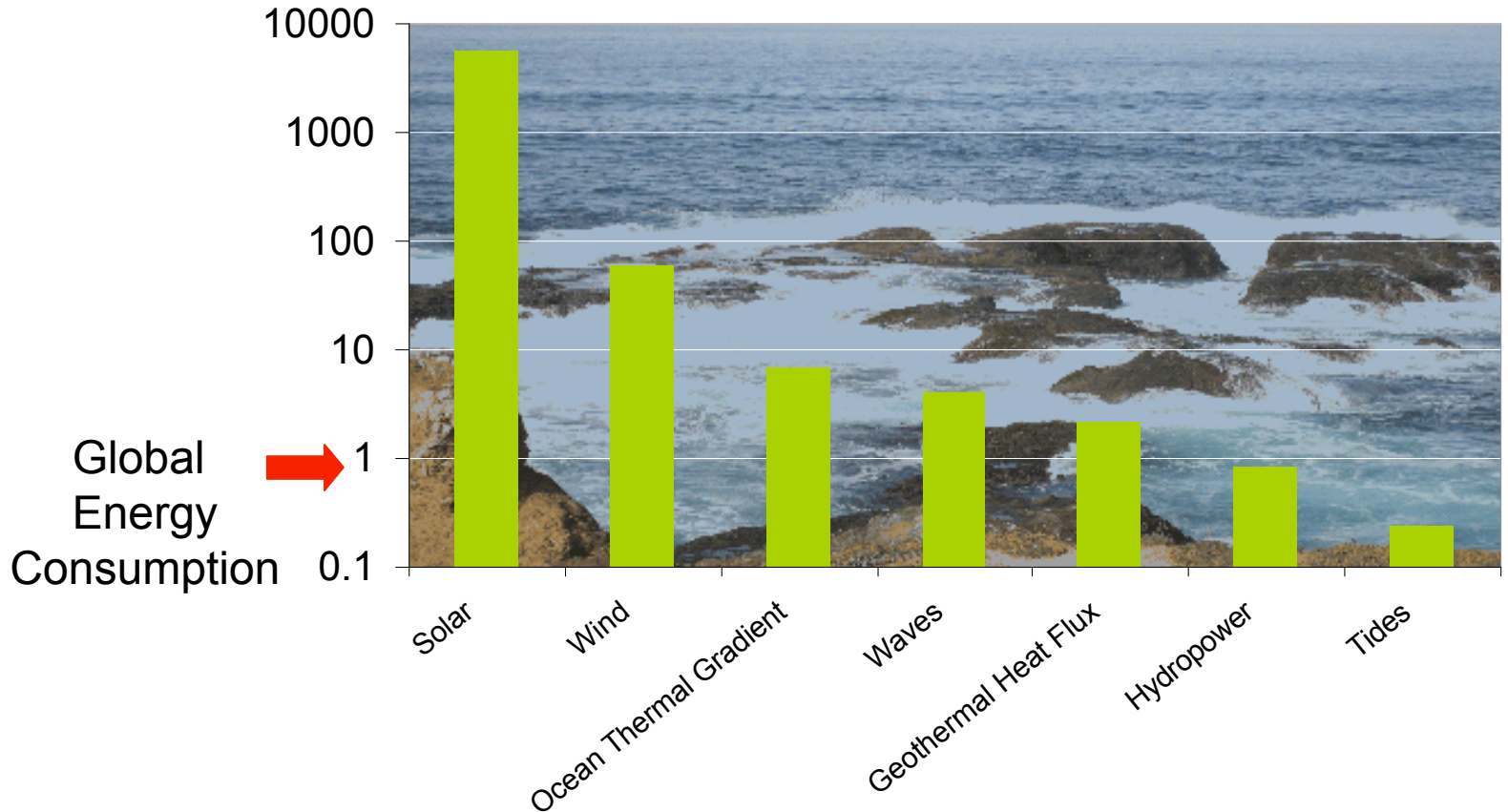
Transportation



Heating and Cooling



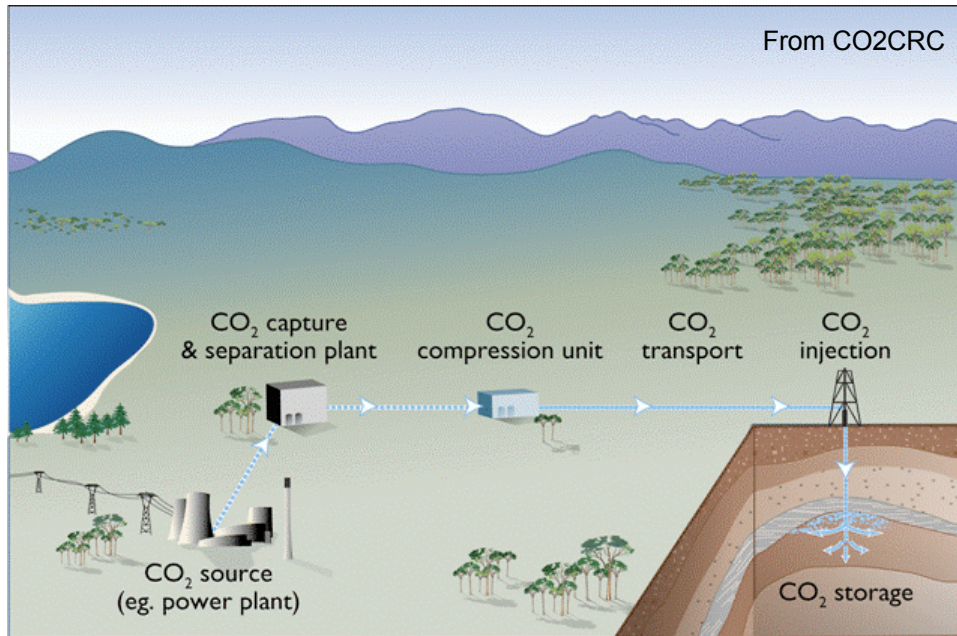
Renewable Carbon Free Energy Resources



Exergy sources scaled to average consumption in 2004 (15 TW)

From Hermann, 2006: Quantifying Global Exergy Resources, Energy 31 (2006) 1349–1366

Sequester Emissions When they are Unavoidable



Carbon dioxide can be scrubbed from power plant emissions and pumped underground.



Carbon dioxide emissions from air travel can be offset by growing or preserving well managed forests.



Understanding and Minimizing Lifecycle Emissions



Education

Informed Decisions

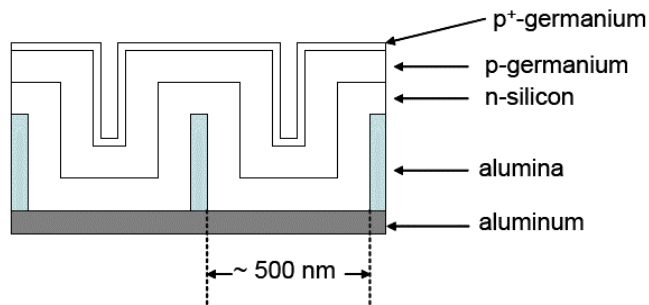
Conscious Choices



Research will Provide More Choices and Lower Costs

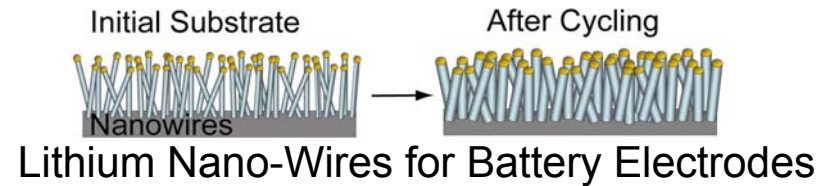


Solar Energy

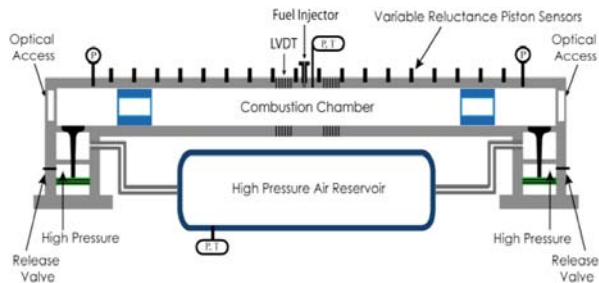


High-efficiency thin-film concepts

Batteries

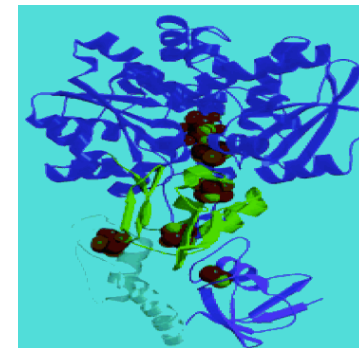


Advanced Combustion



High-efficiency internal combustion engines

Hydrogen

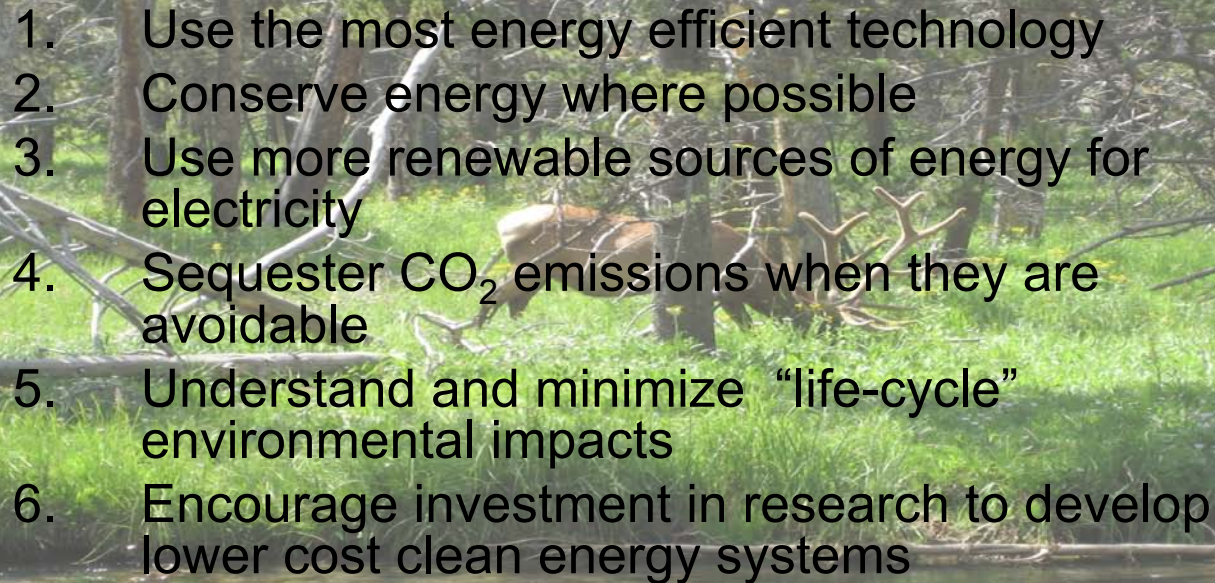


Bio-hydrogen



Six “Easy Steps”



- 
- A background image of a forest with a moose in the center, partially obscured by the text. The forest is lush with green trees and a body of water is visible in the foreground.
1. Use the most energy efficient technology
 2. Conserve energy where possible
 3. Use more renewable sources of energy for electricity
 4. Sequester CO₂ emissions when they are avoidable
 5. Understand and minimize “life-cycle” environmental impacts
 6. Encourage investment in research to develop lower cost clean energy systems