Six “Easy Steps” Towards Energy Sustainability

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Science and technology for a low GHG emission world.
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”

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

Lighting

Transportation

Appliances
Conservation

Lighting

Heating and Cooling

Transportation
Renewable Carbon Free Energy Resources

Exergy sources scaled to average consumption in 2004 (15 TW)
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**
- p'-germanium
- p-germanium
- n-silicon
- alumina
- aluminum
- 500 nm

High-efficiency thin-film concepts

**Advanced Combustion**

High-efficiency internal combustion engines

**Batteries**
- Initial Substrate
- After Cycling
- Lithium Nano-Wires for Battery Electrodes

**Hydrogen**
- Bio-hydrogen

The GCEP Research Portfolio: http://gcep.stanford.edu/
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