

School of Industrial and Systems Engineering
School of Public Policy

Energy Technology and Policy

ISYE 8813

PUBP 8803

Thursday 3-6, Groseclose 403

Instructor: Valerie Thomas

Course Description

This course is about the science, technology, and policy of energy, its environmental and economic impacts, and the potential for innovation. The course addresses the status and science of key energy supply and utilization technologies, and the factors that shape energy policy. Topics include: history of energy technology and use, coal, petroleum supply, alternative fuels and vehicles, lighting, solar, wind, nuclear, fusion, wind, and water power, energy policy in the U.S. Congress, automotive fuel efficiency policy, international climate change policy approaches, and energy policy in the U.S. states. The course has no formal prerequisites.

Most of the readings will be journal articles posted on the library on-line reserve system. In addition, we will use: Smil, V. (2003 or 2005). *Energy at the Crossroads: Global Perspectives and Uncertainties*. MIT Press.

Week 1 (January 12): Energy Overview

Overview of energy issues: history of energy and energy services technology change. Human welfare and development; geopolitics; health; environment.

Smil Chapter 1.

A Thousand Years of Energy Use in the United Kingdom. *The Energy Journal* **19**(4). Fouquet R and Pearson PJG, 1998.

Week 2 (January 19). Energy History

The End of Cheap Oil, Colin J. Campbell and Jean H. Laherrere, *Scientific American* **278** (3) March 1998, pp. 78-83.

Smil Chapter 4, "Fossil Fuel Futures," (pp. 181-238).

Week 3 (January 26). Petroleum

Watch parts 1 and 2 of *The Prize*

Week 4. (February 2) Coal

Rubin, *Introduction to Engineering and the Environment*, Chapter 5. Electric Power Plants and the Environment.

Beer, J. M. (2000) "Combustion technology developments in power generation in response to environmental challenges", *Progress in Energy and Combustion Science*, **26**, 301 – 327.

Parts 3 and 4 of *The Prize*

Week 5. (February 9) Energy and the Economy.

Smil Chapter 2. Energy Linkages.

Reddy, Amula K. N., Williams, Robert H., and Johansson, Thomas B. (1997) *Energy After Rio*, Chapter 2, *Energy and Major Global Issues* (United Nations Development Program: New York).

www.undp.org/energy/publications/1997/1997a_ch02.htm

Parts 5 and 6 of *The Prize*

Week 6. (February 16) Efficient Use of Energy

Overbye, T. J. "Reengineering the Electric Grid", *American Scientist* **88** (3): 220-229, 2000

Nadel, S. "Appliance and Equipment Efficiency Standards", *Annual Review of Energy and the Environment*, **27**, 159 – 192, 2002.

Brown, Marilyn A. 2001. Market failures and barriers as a basis for clean energy policies. *Energy Policy* 29 (14): 1197-1207.

Jaffe, A. B. and R. N. Stavins, 1994. "The Energy-Efficiency Gap: What Does It Mean?" *Energy Policy*, **22**(10): 804-810.

Week 7. (February 23) Nuclear Energy

"Nuclear Power and Proliferation Resistance: Securing Benefits, Limiting Risk," Nuclear Energy Study Group of the American Physical Society Panel on Public Affairs, May 2005.

Lake, J. A., Bennett, R. and Kotek, J. F. (2002) "Next-generation Nuclear Power", *Scientific American* **286** (1): 72 – 75.

Lake, J. A., Bennett, R. and Kotek, J. F. (2002) "The Case for Nuclear Power", *Scientific American* **286** (1): 76 – 81.

Sailor, W. C., Bodansky, D., Braun, C. Fetter, S. and van der Zwaan, R. (2000) "A nuclear solution to climate change?" *Science*, **288**, 1177 – 1178.

Ramana, M. V. and Nayyar, A. H. (2001) "India, Pakistan and the Bomb", *Scientific American* **285** (6): 72 – 83.

Week 8. (March 2) Energy from the Sun

Smil Chapter 5: Non-Fossil Futures.

Lovins, Amory (1976) "Energy Strategy: The Road Not Taken", *Foreign Affairs*, 65 – 96.

Fairley, P. (2002) "Solar on the cheap", *Technology Review*, January/February, 48 - 53

Week 9. (March 9) Written Midterm Exam

Week 10. (March 16). Oral Midterm Exam

Spring Break March 20-24

Week 11. (March 30) Beyond Petroleum: New Fuels and Vehicle Technologies

- Keith, D. W. and Farrell, A. E. (2003) “Rethinking hydrogen cars”, *Science*, **301**, 315 – 316.
- Pacala, S., and Socolow, R. (2004) “Stabilization wedges: solving the climate problem for the next fifty years with current technologies”, *Science*, **305**, 968 – 971.
- John Turner (2004) “Sustainable hydrogen production”, *Science*, **305**, 971 – 974.
- Demirdoven, N. and Deutsch, J. (2004) “Hybrid cars now, fuel cell cars later”, *Science*, **305**, 974 - 976.
- Hoffert, M.I., et al., Advanced Technology Paths to Global Climate Stability: Energy for a Greenhouse Planet. *Science* **298** (5595): 981-987, 2002.

Week 12. (April 6) **Climate Change**

- “Pulling the Plug on Standby Power,” *The Economist*, March 9, 2006.
- “Dr. Strangedeal,” *The Economist*, March 9, 2006.
- “The World Wants Iran to Stop,” *The Economist*, March 9, 2006.
- “Wrong Ends, Means, and Needs: Behind the U.S. Nuclear Deal With India,” Zia Mian and M. V. Ramana. *Arms Control Today*, January 2006.
- Georgia Energy Policy Framework. www.georgiaenergyplan.org/

Week 13. (April 13) **Climate Technology and Policy**

Remarks of Secretary of State Condoleezza Rice at the Senate Foreign Relations Committee on the U.S.-India Civil Nuclear Cooperation Initiative. April 5, 2006.

Supplemental:

- Goldemberg, J. (1996) *Energy, Environment, and Development* (Earthscan: London, UK), 11 – 37.
- Gadgil, A. (1994) “Development, environment, and energy efficiency”, in *Industrial Ecology and Global Change*, Socolow, Robert; Andrews, Clinton; Berkhout, Franz, and Thomas, Valerie (Cambridge University Press: New York). Pages 451 – 466.

Week 14. (April 20) **Energy and the U.S. Federal Government**

- Abraham, S. (2004) “The Bush Administration’s Approach to Climate Change”, *Science*, **305**, 616 - 617.
- Wirth, T. E., Gray, C. B., and Podesta, J. D. (2003) “The future of energy policy”, *Foreign Affairs*, **82**, 132 – 155.
- Margolis, R. and Kammen, D. M. (1999) “Under-investment: The energy technology and R&D policy challenge”, *Science*, **285**, 690 - 692.

Week 15 (April 27) **Approaches to Energy Policy**

- Duane, T. P. (2002) “Regulation’s Rationale: Learning from the California Energy Crisis”, *Yale Journal on Regulation*, **19**, 471 – 540.
- Caroline Kroeze, Jaklien Vlasblom, Joyeeta Gupta, Christiaan Boudri, Kornelis Blok (2004) “The power sector in China and India: Greenhouse gas emissions reduction potential and scenarios for 1990–2020”, *Energy Policy* **32** 55–76.