Prof. James H. Stock, Department of Economics **Fall 2015**

Freshman Seminar 42H
The U.S. Energy Revolution and its Implications

How we produce and use energy has major implications for the economy, energy security, and climate change. The U.S. "energy revolution" – nonconventional oil and gas production (fracking), increasing use of renewable energy, and reduced demand – has contributed to a sharp decline in U.S. oil imports, a 10% reduction in U.S. carbon dioxide emissions, and economic growth. This course examines the changing U.S. energy landscape, energy security, U.S. climate policy, and the connection between these issues and our own lives. The conceptual framework is economics (but no prior economics is assumed), a powerful tool for understanding market failures and for designing government policies that are efficient, effective, and appropriate. The course starts by looking at our – your – energy and carbon footprint, how much it can change, and how it connects with broader issues of energy markets, energy security, and climate change. The course then dives into four current policy issues: the regulation of CO2 emissions from fossil-fuel fired power plants, biofuels, the mining of coal from public lands, and divestment and other energy challenges confronting universities. In each case, critics complain that these policies are expensive, ineffective, and/or have unintended consequences, while others complain that they don't go far enough given the magnitude of the challenge posed by climate change, and we will evaluate these arguments.

Readings: Weekly readings listed below. Optional readings are more advanced, more technical, or just long – you probably won't follow all of the optional readings but they are still worth the time if you are particularly interested in the topic.

Course requirements: Class participation, one data exercise (Excel, no prior knowledge assumed), one oral presentation during weeks 7-13 (teams of 2), and a term paper (10 pages max). The course is self-contained and assumes no prior knowledge, and no math above pre-calc.

I. The energy transition in the United States: Overview
   1. Sept. 8: The changing energy landscape
      - Reading: "Climate Change and the Path Toward Sustainable Energy Sources," ch. 6 in: Council of Economic Advisers (2013), *Economic Report of the President*.
      - Skim: U.S. Energy Information Administration, Annual Energy Outlook 2015: Executive Summary.
   2. Sept. 15: Your (and our) energy and carbon footprint
      - Reading: Nordhaus, W., *The Climate Casino: Risk, Uncertainty, and Economics for a Changing World*, Yale University Press, 2013; preface and Ch. 1-3
      - Resources: U.S. EIA, "U.S. Energy-Related CO2 Emissions, 2013"; CoolClimate Network, Average Annual Household Carbon Footprint by Zip Code
   3. Sept. 22: Energy efficiency
      - Readings:

        - Bill McKibbon, "Power to the People," *The New Yorker*, June 29, 2015
        - Gillingham, Rapson, and Wagner, "The Rebound Effect and Energy Efficiency Policy", Resources for the Future, 2014.
    - Optional:
        - McKinsey Inc, *Energy Efficiency: A Compelling Global Resource*
        - Fowlie, Merideth, Michael Greenston, and Catherine Wolfram, "Do Energy Efficiency Investments Deliver? Evidence from the Weatherization Assistance Program," working paper, University of Chicago

II. Energy Externalities: Energy Security and Climate

4. Sept. 29: Energy security, oil imports, and the nonconventional oil and gas revolution
    - Readings:
        - Council on Foreign Relations, "Hydraulic Fracturing," at (follow at least three of the links in the article, your choice)
        - Rubenstein, J.L. and A.B. Mahani (2015), "Myths and Facts on Wastewater Injection, Hydraulic Fracturing, Enhanced Oil Recovery, and Induced Seismicity," *Seismological Research Letters*, July-August 2015.
        - US EPA (2015), *Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources* – Executive Summary.
    - Optional:
        - Metcalf, G. (2014), "The Economics of Energy Security."
        - Weingarten, M. et. al. (2015), High-rate injection is associated with the increase in U.S. mid-continent seismicity," *Science*, June 19, 2015, 1336-1340.
        - Prud'homme, Alex, *Hydrofracking: What Everyone Needs to Know*. Oxford: Oxford University Press, 2014.
5. Oct. 6: Markets, market failures, externalities, and corrective taxes
    - Readings:
        - Mankiw, N.G., "Smart Taxes: An Open Invitation to Join the Pigou Club," *Eastern Economic Journal* (2009), 35, p. 14-23.
    - Optional:
        - Greenstone, M., Looney, A. "A strategy for America's energy future: illuminating energy's full cost," *The Hamilton Project*, 2011.
6. Oct. 13: Quantifying climate externalities: the Social Cost of Carbon
    - Reading:
        - Nordhaus (2013), ch. 6-8, 12
        - U.S. Office of Management and Budget, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis*, 2010, and July 2015 update

III. Policy Issue #1: The Clean Power Plan

7. Oct. 20: Clean Power Plan I: Overview and New Source Performance Standards
   Visiting speaker: Dr. S. Julio Friedman, Principal Deputy Assistant Secretary, Office of Fossil Energy, U.S. Department of Energy

- Reading:
  - Center for Climate and Energy Solutions, "Electricity Overview"
- Optional: MIT Energy Initiative, *The Future of the Electric Grid*, 2011: Appendix B, "Electric Power Systems Basics"

8. Oct. 27: Clean Power Plan II: Economic and climate impacts of the rule (costs and benefits)
   - Reading: Selections of preamble of final 111(d) rule including Summary of Costs and Benefits (*final rule due out July 2015; draft rule at* https://www.federalregister.gov/articles/2014/06/18/2014-13726/carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility-generating)

IV. Policy Issue #2: The Transportation Sector and Biofuels

9. Nov. 3: Transportation sector challenges and potential solutions
   - Reading: National Academy of Sciences, *Transitions to Alternative Vehicles and Fuels*, 2013, Overview, Summary, and ch 1 and 2. (Register for free .pdf download).
10. Nov. 10: Biofuels: food v. energy security v. climate v. the local environment
    - Reading: National Academy of Sciences, *Renewable Fuel Standard: Potential Economic and Environmental Effects of U.S. Biofuels Policy*, 2013, ch. 2 and 3. (Register for free download)
    - Reading: Nuffield Council on Bioethics, *Biofuels: Ethical Issues*, 2011, Ch. 4 and 5
    - Optional (advanced): Roberts, Michael J., and Wolfram Schlenker. 2013. "Identifying Supply and Demand Elasticities of Agricultural Commodities: Implications for the US Ethanol Mandate." *American Economic Review*, 103(6): 2265-95.
11. Nov. 17: U.S. biofuels policy and the Renewable Fuels Standard
    Visiting speaker: Brooke Coleman, Executive Director, Advanced Biofuels Business Council
    - Reading: Stock, J.H. *The Renewable Fuel Standard: A Path Forward*, Columbia Center for Global Energy Policy Brief.

V. Policy Issue #2: Coal from Federal Lands

12. Nov. 24: Federal coal facts and policy issues
    - Readings:
      - U.S. Bureau of Land Management, *Federal Coal Leasing*.
      - Center for American Progress (2014), *Federal Coal Leasing in the Powder River Basin*
      - Hayes, David and J.H. Stock, "The Real Cost of Coal," *New York Times*, March 24, 2015
    - Optional: Nelson, R.H., *The Making of Federal Coal Policy*, Duke University Press, 1983, ch. 1-3.

VI. Policy Issue #4: University energy/climate issues

13. Dec. 1: Divestment, internal carbon adders and other university energy/climate issues