

## The Economics of Energy

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### Syllabus

U6056

Fall 2014

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TA Office Hours:	Thursdays, 8:00-9:00 and 10:00-11:00 a.m.
TA Office Location:	IAB 407
Lectures:	Mondays from 2:10 to 4:00 p.m. in IAB 403.
Recitations:	One of the teaching assistants will hold optional review sessions on Thursdays from 9:00 to 10:00 a.m. in IAB 407.
Credits:	This is a 3.0-credit class.

### A. COURSE OVERVIEW AND OBJECTIVES

What determines the cost of a ton of coal? Is OPEC an oligopoly? Should we subsidize low-carbon or tax fossil energy? Do Prius owners drive more?

The course has two goals: provides a set of tools to approach these and many other fundamental questions in energy economics, and teach us to talk about them in plain English. Come prepared to argue both sides of each issue in class. Regular 1,000-word essays will reinforce class discussions and ask you to pick a side. Think *Economist* leader: crisp, logical, and always with a point of view.

By the end of the semester, you will be well prepared to apply fundamental economic tools to a host of energy questions, and to do so without fear, favor, or jargon.

## B. PREREQUISITES

This course is targeted toward a wide audience. Still, we ought to speak the same language. Talk to me after the first class if you don't meet these formal requirements, if you have formal economics training but took the last economics class years ago, or have any other questions or concerns.

Prerequisite	Connection with Prerequisite
U4200 Economics, U6400 Economic Analysis	Any intermediate microeconomics class would be a good preparation.
U6072 Energy Systems Fundamentals	To allow us to build our discussions on a core energy skill set.

## C. COURSE MATERIAL

All readings are available online or on Courseworks under Files & Resources. See "Course Outline" for details of weekly readings.

There is no textbook and no reading pack. Reading amounts vary by topic, week, and type of material. Use your judgment. If the report is 150 pages long, skim it. If it's a non-technical, 5-page article, study it. Come prepared to discuss the gist of the reading materials and be able to participate in class discussions; 10 percent of your grade depends on it.

Some articles on the list are quite technical: lots of math and econometric intricacies. In general, skip the proofs. We won't be talking in symbols in class. But be prepared to discuss the intuition. Sometimes, of course, the math can be quite helpful, and we will indeed discuss and derive certain equations in class.

Given the rapidly changing nature of energy issues, this syllabus will inevitably evolve—most likely during the semester. I will announce any changes to the reading list at least a week before the respective assignments in class.

There are many good general surveys that aren't just interesting but also fun to read. One is Daniel Yergin's *The Quest: Energy, Security, and the Remaking of the Modern World*. Another is Vijay Vaitheeswaran's *Power to the People*. The introduction is part of the reading list for week one. The rest is terrific, too. Both will not just make you a better energy economist; they will also make you a better writer. Read *The Quest* by the time you write your essays on oil and OPEC. Read *Power to the People* by the time we discuss clean energy.

You may also enjoy [\*But Will the Planet Notice? How Smart Economics Can Save the World\*](#). It's not required reading, but reading it would prepare you particularly well for discussions beginning with Week 8.

All three books mentioned here are on reserve in the library.

## D. ASSESSMENTS

Type	Description	% of Final Grade
Participation	Come prepared to class to discuss the readings, actively engage in the conversation, and relate the subject matter to real-world applications. Bonus points for anyone able to point to recent news stories relevant to the topic at hand. (Ideally, please email them to me a day in advance.)	10%
Essays (x8)	<p>Eight essays (11.25% each) chosen from a possible twelve topics. Everyone completes the first assignment, plus at least two among the subsequent three.</p> <p>Essays are 1,000 words each (excluding footnotes and references), and are due as a Word or PDF file submitted in the Assignments tab on Courseworks, by Monday, 12:00 noon, one week after the topic appeared on the syllabus.</p> <p>Use “weekX_UNI.pdf/docx” as naming convention for your attachments (e.g. “week1_gw2245.pdf”) but otherwise do not add any identifying information—i.e. no name, UNI, or picture. Do add a word count at the end of your essay and make sure it comes within 50 words of 1000 to avoid point deductions.</p> <p>If you submit more than eight essays, your grade will be based on the best eight of the first nine submitted. The twelve possible topics are:</p> <p><i>Required:</i>  <b>Week 1:</b> Demand basics</p> <p><i>Complete at least two:</i>  <b>Week 2:</b> Supply basics  <b>Week 3:</b> World oil supplies  <b>Week 4:</b> Oil market behavior</p> <p><i>Choose any of these topics for a total of at least eight essays in the semester:</i>  <b>Week 5:</b> Green Paradox  <b>Week 6:</b> Energy security  <b>Week 7:</b> Electricity  <b>Week 8:</b> Carbon policy: How far and how fast?  <b>Week 9:</b> Designing mitigation policies  <b>Week 10:</b> Clean energy  <b>Week 11:</b> Energy paradox  <b>Week 12:</b> Development</p> <p>Each essay should address the main question discussed in class and apply the pertinent economic concepts covered up to that point in the course. This is not an English course. You will primarily be graded on your economics and how well you can convey key concepts in jargon-free language. By the end of the semester, you will have at least one—hopefully more—essays you should be proud to submit as writing samples to any prospective employer.</p>	90%
<b>Total</b>		<b>100%</b>

## E. GRADING POLICIES

All assessments are individual. Discuss the topic with each other; join up in reading groups; but submit your own, individual essays.

Essays are graded on a 10-point scale.

### Policy on late assignments:

If you need more time, you will need to optimize in light of the following time-grade tradeoff: You will lose half a point for each day the essay is late—i.e. minus  $\frac{1}{2}$  between Monday 12:01 and Tuesday 12:00 p.m., minus 1 between Tuesday 12:01 and Wednesday 12:00 p.m., etc. Submissions will be accepted until 12:00 p.m. on the Friday after the due date. After that point, your essay will be marked as a zero, assuming it's required (i.e. week 1, two more essays by week 4, and a total of eight essays for the semester).

### Academic Integrity Statement:

The School of International & Public Affairs does not tolerate cheating and/or plagiarism in any form. Those students who violate the Code of Academic & Professional Conduct will be subject to the Dean's Disciplinary Procedures. Cut and paste the following link into your browser to view the Code of Academic & Professional Conduct online.

[http://sipa.columbia.edu/resources\\_services/student\\_affairs/academic\\_policies/deans\\_discipline\\_policy.html](http://sipa.columbia.edu/resources_services/student_affairs/academic_policies/deans_discipline_policy.html)

Please familiarize yourself with the proper methods of citation and attribution. The School provides some useful resources online; we strongly encourage you to familiarize yourself with these various styles before conducting your research.

## F. COURSE OUTLINE

Week	Date	Title	Readings
1	Sep 8	Demand basics (elasticity): How do world markets react when U.S. oil consumption changes?	Vaitheeswaran, Vijay V. 2003. "The Coming Energy Revolution." Chapter one of: <i>Power to the People</i> : 3-20. Kamerschen David R., and David V. Porter. 2004. "The Demand for Residential, Industrial and Total Electricity, 1973-1998." <i>Energy Economics</i> 26: 87-100. Hughes, Jonathan E., Christopher R. Knittel, Daniel Sperling. 2008. "Evidence of a Shift in the Short-Run Price Elasticity of Gasoline Demand." <i>Energy Journal</i> 29 (1): 113-34. Small, Kenneth and Van Dender. 2007. "Fuel Efficiency and Motor Vehicle Travel: The Declining Rebound Effect." <i>The Energy Journal</i> 28(1): 25-51.

Week	Date	Title	Readings
2	Sep 15	Supply basics (Hotelling): How much for a ton of coal?	Anderson, Soren T., Ryan Kellogg, and Stephen W. Salant, " <a href="#">Hotelling Under Pressure</a> ," NBER working paper #20280. Krautkraemer, Jeffrey and Michael Toman. 2003. "Fundamental Economics of Depletable Energy Supply." RFF Discussion Paper 03-01. Nordhaus, William D. and Edward C. Kokkelenberg. 1999. <a href="#">Nature's Numbers: Expanding the National Economic Accounts to Include the Environment</a> . National Research Council. Pages 59-70.
3	Sep 22	World oil supplies: Are we running out of oil?	Bardi, Ugo. 2004. "Prices and Production over a complete Hubbert Cycle: the Case of the American Whale Fisheries in 19th Century." Association for the Study of Peak Oil and Gas. Campbell, Colin J. and Jean H. Laherrère. 1998. "The end of cheap oil." <i>Scientific American</i> 278 (3): 78-83. Holland, Stephen P. 2008. "Modeling Peak Oil." <i>The Energy Journal</i> 29 (2): 61-79. Maugeri, Leonardo. 2012. "Oil: The Next Revolution." John F. Kennedy School of Government Belfer Center Discussion Paper #2012-10. Keith, David W. 2009. "Dangerous Abundance." In: <i>Carbon shift: how the twin crises of oil depletion and climate change will define the future</i> , edited by Thomas Homer-Dixon with Nick Garrison, Random House Canada.
4	Sep 29	Market behavior: What determines the price of oil?	Alhajji, A.F. and David Huettner. 2000a. "OPEC and other commodity cartels: a comparison." <i>Energy Policy</i> 28: 1151-64. Alhajji, A. F., and David Huettner. 2000b. "The Target Revenue Model and the World Oil Market: Empirical Evidence from 1971 to 1994." <i>The Energy Journal</i> 21(2): 121-44. Mason, Charles F. and Stephen Polasky. 2005. "What motivates membership in non-renewable resource cartels? The case of OPEC." <i>Resource and Energy Economics</i> 27: 321-42. Kverndokk, Snoore and Knur Einar Rosendahl. 2010. "The effects of transport regulation on the oil market." RFF discussion paper 10-40.
5	Oct 6	Green Paradox: Can environmental policy lead to more pollution?	Jensen, Svern, Kristina Mohlin, and Thomas Sterner. "The Green Paradox: A Brief Introduction to climate policy and intertemporal emissions leakage." <i>Mimeo</i> . [Others TBD]

Week	Date	Title	Readings
6	Oct 13	Energy security: Can we achieve energy independence? Should we?	<p>Hamilton, James D. 2009. "Causes and consequences of the oil shock of 2007-08." <i>Brookings Papers on Economic Activity</i>, Spring 2009: 215-59.</p> <p>Yergin, Daniel. 2006. "Ensuring Energy Security." <i>Foreign Affairs</i> 85 (2): 69-82.</p> <p>Council on Foreign Relations. 2006. "National Security Consequences of US Oil Dependency." Independent Task Force Report No. 58. (Skim.)</p> <p>Hahn, Robert and Peter Passell. 2008. "The Economics of Allowing More Domestic Oil Drilling." Working Paper 08-21, REG – Markets Center.</p> <p>Ahn, Daniel P. 2009. "The information content of financial market passthrough: Decomposing oil shocks into demand and supply components." Working paper.</p> <p>Stewart, Jon. 2010. "<a href="#">An energy-independent future</a>." <i>The Daily Show with Jon Stewart</i>, June 16, 8 min video clip. (Warning: coarse language. Duh!)</p>
7	Oct 20	Electricity: How much should we pay for demand response?	<p>Electric Power Supply Association et al. vs. FERC. 2012. <i>Amici Curiae Brief</i>, USCA Case #11-1486.</p> <p>Joskow, Paul. 2008. "Lessons learned from electricity market liberalization." <i>The Energy Journal</i>: 9-42.</p> <p>Hogan, William W. 2009. "Regulation and Electricity Markets." Western Power Trading Forum presentation.</p> <p>Park, Haesun, James W. Mjelde, and David A. Bessler. 2006. "Price Dynamics Among U.S. Electricity Spot Markets." <i>Energy Economics</i> 28: 81-101.</p>
8	Oct 27	Curbing pollution: How far and how fast?	<p>National Research Council, <a href="#">Climate Change: Evidence, Impacts, and Choices</a> (2012). [skim]</p> <p>Schneider, Steven H. and Lawrence H. Goulder. 1997. "Achieving low-cost emissions targets." <i>Nature</i> 389: 13-4.</p> <p>William D. Nordhaus, "<a href="#">Why the global warming skeptics are wrong</a>," <i>New York Review of Books</i> (March 22, 2012)</p> <p>Martin Weitzman, "<a href="#">A Review of the Stern Review on the Economics of Climate Change</a>," <i>Journal of Economic Literature</i>, 45(3): 703-24 (2007).</p> <p>William D. Nordhaus, "The economics of tail events with an application to climate change," <i>Review of Environmental Economics and Policy</i> 5(2): 240-257 (2011).</p> <p>Robert S. Pindyck, "Fat tails, thin tails, and climate change policy," <i>Review of Environmental Economics and Policy</i> 5(2): 258-274 (2011).</p>



Week	Date	Title	Readings
9	Nov 10	Designing carbon mitigation policies.	<p>Gilbert E. Metcalf, "Designing a carbon tax to reduce U.S. greenhouse gas emissions," <i>Review of Environmental Economics and Policy</i> 3(1): 63-83 (2009).</p> <p>Nathaniel O. Keohane, "Cap-and-trade rehabilitated: The case for emissions trading to regulate greenhouse gases," <i>Review of Environmental Economics and Policy</i> 3(1): 42-62 (2009).</p> <p>Aldy, Joseph E, Alan J. Krupnick, Richard G. Newell, Ian W.H. Parry, and William A. Pizer. "Designing climate mitigation policy." RFF discussion paper 08-16.</p> <p>(Optional: Wagner, Gernot. 2011. <i>But Will the Planet Notice?</i> Hill &amp; Wang/Farrar, Strauss &amp; Giroux. Chapter 5: "Curious Company Kept.")</p>
10	Nov 17	Clean energy: Tax pollution or subsidize renewables?	<p>Jaffe, Adam, Richard Newell and Robert Stavins. 2005. "A tale of two market failures: technology and environmental policy." <i>Ecological Economics</i> 54: 164-74.</p> <p>Acemoglu, Daron, Philippe Aghion, Leonardo Bursztyn, and David Hemous. 2010. "The environment and directed technical change." Working paper, April 28.</p> <p>van Benthem, Arthur, Kenneth Gillingham and James Sweeney. 2008. "Learning-by doing and the optimal solar policy in California" <i>The Energy Journal</i> 29: 131-51.</p> <p>Barrett, Scott. 2009. "The coming global climate-technology revolution." <i>Journal of Economic Perspectives</i> 23(2): 53-75.</p> <p>Borenstein, Severin. <a href="#">"The Private and Public Economics of Renewable Electricity Generation"</a>, <i>Journal of Economic Perspectives</i>, 26(1), Winter 2012.</p> <p>(Optional: Wagner, Gernot. 2011. <i>But Will the Planet Notice?</i> Hill &amp; Wang/Farrar, Strauss &amp; Giroux. Chapter 6: "Mind versus Matter.")</p>
11	Nov 24	Energy Paradox: Why don't we all use CFLs and drive hybrids?	<p>McKinsey. 2009. <a href="#">"Unlocking energy efficiency in the U.S. economy."</a> Executive summary.</p> <p>Parry, Ian W. H., Margaret Walls, and Winston Harrington. 2007. "Automobile Externalities and Policies" <i>Journal of Economic Literature</i> 45(2): 373-99.</p> <p>Allcott, Hunt, and Nathan Wozny, <a href="#">"Gasoline prices, fuel economy, and the energy paradox,"</a> National Bureau of Economic Research Working Paper no. 18583 (November 2012).</p> <p>Fischer, Carolyn, Winston Harrington, and Ian WH Parry, <a href="#">"Should automobile fuel economy standards be tightened?,"</a> <i>The Energy Journal</i> (2007): 1-29.</p> <p>(Optional: Wagner, Gernot. 2011. <i>But Will the Planet Notice?</i> Hill &amp; Wang/Farrar, Strauss &amp; Giroux. Chapter 7: "Cars (And Planes).")</p>

Week	Date	Title	Readings
12	Dec 1	Development: Energy poverty vs. environmental protection.	<p>Davis, Steven J., Ken Caldeira and H. Damon Matthews. 2010. "Future CO2 emissions and climate change from existing energy infrastructure." <i>Science</i> 329: 1330-3.</p> <p>Chakravarty, Shoibal, Ananth Chikkaturb, Heleen de Coninck, Stephen Pacala, Robert Socolow, and Massimo Tavoni. 2009. "Sharing global CO2 emission reductions among one billion high emitters." <i>Proceedings of the National Academy of Sciences</i>.</p> <p>Wagner, Gernot. 2010. "Energy Content of World Trade." <i>Energy Policy</i>.</p> <p>McKinsey. 2009. "<a href="#">China's green revolution</a>." Summary of findings: 9-18.</p> <p>(Optional: Wagner, Gernot. 2011. <i>But Will the Planet Notice?</i> Hill &amp; Wang/Farrar, Strauss &amp; Giroux. Chapter 9: "A Billion Polluters.")</p>
13	Dec 8	Our energy future: Where to from here? And what does economics have to do with it?	<p>IEA. 2013. World Energy Outlook. (<a href="http://worldenergyoutlook.org/">worldenergyoutlook.org/</a>) (Focus on energy subsidies sections.)</p>

## G. Acknowledgements

This syllabus is largely based on Snorre Kverndokk and Knut Einar Rosendahl's Energy Economics class taught at Johns Hopkins in Spring 2009. I also take some cues from Paul Joskow's Energy Economics class at MIT, Bill Hogan's Energy Policy Analysis class at Harvard, Erin Mansur's Energy Economics & the Environment class at Yale, and invaluable feedback from Steve Salant, Thomas Sterner, Matt Zaragoza-Watkins, and Columbia SIPA students who have taken this course in the past. Thank you to all.