

ENERGY MARKETS AND POLICY

BEPP/OPIM 763 WEMBA (EAST)

Spring Semester 2015, Fr 4:45-6:45PM, Vance Hall B10, Philadelphia

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Course overview. Over the last several decades, energy markets have become some of the most dynamic markets of the world economy. Traditional fossil fuel and electricity markets have seen a partial shift from heavy regulation to market-driven incentives, while rising environmental concerns have led to a wide array of new regulations and “environmental markets”. This changing energy landscape requires quick adaptation from energy companies, but also offers opportunities to turn regulations into new business. The objective of this course is to provide the economist’s perspective on a broad range of topics that professionals in the energy industry will encounter. Topics include the effect of competition, market power and scarcity on energy prices, the impact of deregulation on electricity and fossil fuel markets, extraction and pricing of oil and gas, geopolitical uncertainty and risk in hydrocarbon investments, the environmental impact and policies related to the energy sector, environmental cap-and-trade markets and the economics and finance of renewable energy.

Readings. A mix of newspaper articles, academic papers, reports, plus the following textbook: Nathaniel Keohane and Sheila Olmstead (KO), *Markets and the Environment*, Washington, D.C.: Island Press, 2007. Starred (*) readings are required. Many starred readings are short. Non-starred readings are optional but I will discuss them in class, and you are highly encouraged to read them if you need or want further background on a specific topic. The best way to use the readings is as a supplement to the lectures, which overlap partially (but certainly not perfectly!) with the readings. You will be responsible for required readings not covered in class.

Prerequisites. Managerial Economics (MGEC 611/612) or an equivalent intermediate microeconomics course approved by the instructor.

Strategy game. The OPEC game is a series of simulations of the world oil market. Student teams represent countries and try to maximize profits by making output decisions that determine the world oil price. This game requires 10 online oil production submissions in between class meetings.

Assignments and grading. Two equally weighted assignments (30%), a final exam (40%), the OPEC game (20%) and class participation (10%). The two assignments are take-home. You will be expected to complete them in groups of at most three individuals. The final exam will be given in class on the last scheduled class date. You should plan to attend the final exam in person.

Cheating policy. It should not be necessary to say this – but for completeness: all students are expected to comply with the University of Pennsylvania’s Code of Academic Integrity. It is the policy of the Department, and this course, to immediately fail any student for the course who is in violation of the University’s Code of Academic Integrity. Cheating in any manner, on a graded assignment or exam, or violating the rules of the strategy games, will result in a failing grade for this course. Additional sanctions may be imposed of the Office of Student Conduct. The Code of Academic Integrity can be reviewed at:
<http://www.upenn.edu/provost/PennBook/academic>.

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Lecture 1 (Jan 9): Course Introduction, Market Efficiency and Scarcity Pricing

Topics: market efficiency; scarcity pricing; electricity markets; refined products markets.

U.S. Energy Information Administration, 2014. *Annual Energy Outlook*, Executive Summary.

International Energy Agency, 2014. *World Energy Outlook*, Executive Summary.

(*) KO Chapter 4: “The Efficiency of Markets”.

(*) S. Borenstein, 2000. “Understanding Competitive Pricing and Market Power in Wholesale Electricity Markets”, *Electricity Journal*: 49-57 (pp. 53-57 are more relevant for the following lecture).

(*) J. Mouawad, “A Fast-Growing Independent Strikes Gold in Oil Refining”, *New York Times*, 5/18/05.

(*) J. Mouawad, “Oil Refiners See Profits Sink as Consumption Falls”, *New York Times*, 5/14/08.

(*) C. Krauss, “Oil Refining’s Fortunes Rise”, *New York Times*, 10/24/12.

Lecture 2 (Jan 16): **Market Power in Electricity Markets**

Topics: market power; deregulation; the California electricity crisis; the rise and fall of Enron.

(*) S. Borenstein, 2002. “The Trouble with Electricity Markets: Understanding California's Restructuring Disaster”, *Journal of Economic Perspectives* 16(1): 191-211.

(*) P. Healy and K. Palepu, 2003. “The Fall of Enron”, *Journal of Economic Perspectives* 17(2): 3-12 (pp. 13-26 are less relevant for this course).

(*) D. Fitzpatrick, R. Smith and R. Tracy. “J.P. Morgan Staring at Record Fine Over Energy”, *Wall Street Journal*, 7/17/2013.

J. Griffin and S. Puller, 2005. “A Primer on Electricity and the Economics of Deregulation”, in *Electricity Deregulation: Choices and Challenges*, Griffin and Puller eds., Chicago: University of Chicago Press, pp. 1-4 and 12-23.

W. Bernstein, 2004. “The Rise and Fall of Enron’s One-to-Many Trading Platform,” Lieff Cabraser Heimann & Bernstein, LLP, San Francisco, CA.

Lecture 3 (Jan 30): **Oil and Natural Gas: Extraction and Pricing & Introduction to the OPEC Game**

Topics: trends in oil and gas reserves; optimal extraction; Hotelling model.

(*) KO Chapter 6: “Managing Stocks: Natural Resources as Capital Assets”.

(*) Lecture notes about the Hotelling model for optimal resource extraction.

D. Yergin, 2008. *The Quest: Energy, Security, and the Remaking of the Modern World*, Chapter 11: Is the World Running out of Oil?, Chapter 12: Unconventional and Chapter 16: Shale Gas, New York: The Penguin Press.

Lecture 4 (Feb 13): **Oil and Natural Gas: Forecasting and Investment & OPEC Group Meetings**

Topics: oil price volatility; oil price forecasting; oil futures; NOCs vs. IOCs; upstream contracts; drilling investment under uncertainty; geopolitical risk; expropriations.

(*) J. Hamilton, 2009. “Understanding Crude Oil Prices.” *The Energy Journal* 30(2): 179-189 (remainder is optional). This reading is not in the course pack, but available at: <http://search.proquest.com/docview/222033546/8FA09AFA95F4ED1PQ/3?accountid=14707>

(*) “Slippery Negotiations: The Give and Take of Oil Contracts in Foreign Countries”, *Knowledge@Wharton*, 11/20/2012.

(*) A. Ulmer and C. Pons, “Venezuela ordered to pay Exxon \$1.6 billion for nationalization”, *Reuters*, 10/9/2014.

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Lecture 5 (Feb 27): OPEC Game Debriefing & Global Climate Change

Topics: measuring climate change impacts; the climate change debate; discounting; risk and uncertainty.

(*) B. Litterman, 2013. “What Is the Right Price for Carbon Emissions?”, *Regulation* 36(2): 38-43.

“In the balance”, *The Economist*, 4/5/14.

J. Oliver, “Climate Change Debate”, *Last Week Tonight*, 5/11/14, available at: <https://www.youtube.com/watch?v=cjuGCJJUGsg>

National Research Council, 2010. *Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use*, Summary.

Lecture 6 (Mar 13): Externalities and Policy Instruments: Taxes, Subsidies and Cap-and-Trade

Topics: environmental externalities; tragedy of the commons; taxes vs. subsidies vs. standards; effect of regulations on business; double dividend; basics of cap-and-trade; cost-effectiveness.

(*) “Sorting Frack from Fiction”, *The Economist*, 7/14/2012.

(*) KO Chapter 5: “Market Failures in the Environmental Realm”.

(*) KO Chapter 8: “Principles of Market-Based Environmental Policy”, pp. 125-143.

(*) KO Chapter 9: “The Case for Market-Based Instruments in the Real World”, pp. 153-168 (pp. 173-181 are optional).

(*) Lecture notes about the economics of cap-and-trade.

“Carbon Tax v Cap-and-Trade: Which is Better?”, *The Guardian*, 1/31/2013.

Lecture 7 (Mar 27): **U.S. and Global Policy Developments**

Topics: market design issues in cap-and-trade markets; EU Emissions Trading Scheme; U.S. climate change policy; international climate agreements.

(*) R. Newell, B. Pizer and D. Raimi, 2013. “Carbon Markets 15 Years after Kyoto: Lessons Learned, New Challenges”, *Journal of Economic Perspectives* 27(1), pp. 123-139 (remainder is optional).

(*) “ETS, RIP?”, *The Economist*, 4/20/13.

(*) J. Eilperin and S. Mufson, “Everything You Need to Know About the EPA’s Proposed Rule on Coal Plants”, *Washington Post*, 6/2/2014.

C. Davenport, “Large Companies Prepared to Pay Price on Carbon”, *New York Times*, 12/5/13.

Lecture 8 (Apr 10): **The Economics and Finance of Renewable Energy & Course Wrap Up**

Topics: overview of renewables industries; levelized cost; solar leasing; tax equity; tax credits; feed-in tariffs; learning-by-doing; renewable portfolio standards; trade disputes.

(*) S. Borenstein, 2012. “The Private and Public Economics of Renewable Electricity Generation”, *Journal of Economic Perspectives* 26(1): 67-92.

(*) “SolarCity is Not a Solar Company”, *Bloomberg New Energy Finance*, 10/12/12.

(*) D. Cardwell, “Bonds Backed by Solar Power Payments Get Nod”, *New York Times*, 11/14/13.

(*) D. Cardwell, “U.S. Imposes Steep Tariffs on Importers of Chinese Solar Panels”, *New York Times*, 6/3/2014.

Lecture 9 (Apr 24): **Final Exam**

PRELIMINARY DUE DATES

Assignment dates

Assignment 1: posted on February 27, due by March 27

Assignment 2: posted on March 27, due by April 24

OPEC Game

January 30	Introduction to the OPEC game in class
February 3	Production quantities due by midnight (EST) for phase 1, period 1
February 5	Production quantities due by midnight (EST) for phase 1, period 2
February 9	Production quantities due by midnight (EST) for phase 2, period 1
February 10	Production quantities due by midnight (EST) for phase 2, period 2
February 11	Production quantities due by midnight (EST) for phase 2, period 3
February 12	Production quantities due by midnight (EST) for phase 2, period 4
February 13	OPEC group meetings in class
February 16	Production quantities due by midnight (EST) for phase 3, period 1
February 18	Production quantities due by midnight (EST) for phase 3, period 2
February 20	Production quantities due by midnight (EST) for phase 3, period 3
February 23	Production quantities due by midnight (EST) for phase 3, period 4
February 27	OPEC strategy memo due before class
February 27	OPEC game debriefing in class

Final exam

The final exam will be in class on April 24th, from 4:45-6:45PM.