

ECO 314S: Energy and the Environment

CALENDAR DESCRIPTION:

This course surveys important features of energy markets and related environmental challenges. One of the central objectives is to provide an understanding of the key economic tools needed to analyse these markets and to develop an appreciation for the political and geopolitical centrality of energy issues. A related objective therefore is the development of a framework for understanding the public discourse on energy and the environment. Topics include the hydrocarbon economy (oil, natural gas and coal), electricity markets, global warming and other externalities, renewable energy, conservation, carbon taxes and 'cap-and-trade'.

Prerequisites: ECO200Y1/ECO204Y1/ECO206Y1,
ECO220Y1/ECO227Y1/(STA247H1,STA248H1)/(STA250H1,STA255H1)/(STA257H1,STA261H1)

Distribution Requirement Status: This is a Social Science course

Breadth Requirement: Society and its Institutions (3)

LOCATION AND TIME: LM162 M 2-5

EVALUATION:

Midterm 30% Monday October 24, 2016, in-class, 2-4.

Final Exam 50% Exam period.

Assignments 20% Due dates are as follows: Assignment 1 September 29; Assignment 2 October 19; Assignment 3 November 16; Assignment 4 December 7. Assignments are submitted electronically and must arrive by midnight. Late assignments will be penalized 10% per day.

There will be four assignments. You are required to submit solutions to all questions. However, only a subset will be graded. The list of questions that are to be graded will not be revealed in advance. Assignments will be submitted electronically, details to follow.

The only generally acceptable reason for missing a term test is illness. A medical certificate is required under such circumstances. We are asked to remind you that plagiarism and cheating are **serious** academic offences with potentially serious penalties. Programs such as "turnitin" may be used to ensure that the submitted work is original.

COURSE OBJECTIVES

1. Broad overview of major areas of energy economics and related environmental issues.
2. Understanding of important economic tools used to analyse energy markets.
3. Develop capacity to understand public discourse and critically assess energy and environmental debates, (e.g., decarbonization, fracking, renewable energy, markets v. regulation ...).
4. Facility with vast data resources on energy and related environmental issues.

COURSE MATERIALS

Required:

1. David Buchan, *The Rough Guide to the Energy Crisis*, Rough Guides, 2012. Hardcopy is difficult to obtain as it is out of print. Available electronically at Amazon.ca on Kindle. (You do not need a Kindle device as Kindle books can be read on Macs and PCs.)

2. Richard Muller, *Energy for Future Presidents*, Norton, 2012. Hardcopy and Kindle versions available.

Additional References:

1. Daniel Yergin, *The Quest*, The Penguin Press, 2011. Hardcopy and Kindle versions available.
2. Joseph Dukert, *Energy*, Greenwood Press, 2009.
3. Carol Dahl, *International Energy Markets*, PennWell, 2004.

IN THE NEWS

Students will follow current issues in energy by signing up for news alerts (e.g., through Google Alerts). Each class will begin with a brief discussion of the week's developments in energy. Students should regularly visit MIT Technology Review <http://www.technologyreview.com/> to review advances in energy. For insightful commentary on a range of issues, some related to energy, please sign up for the weekly briefing from Project Syndicate <http://www.project-syndicate.org/>.

LECTURE TOPICS

1. Background and Introduction
 - a. Yatchew, A. 2014: "Economics of Energy: Big Ideas for the Non-Economist", Energy Research and Social Science, available electronically through University of Toronto libraries.
 - b. Buchan, Part 1: Leaving the Comfort Zone.
 - c. Muller, Part I, Ch. 1 Fukushima, Ch. 2 The Gulf Oil Spill.
 - d. Muller, Part IV What is Energy?
 - e. Lawrence Livermore Laboratories, energy and carbon flow charts <https://energy.llnl.gov/>
 - f. U.S., Energy Information Administration, Canada Country Analysis Brief, International Energy Data and Analysis. Updated periodically on the EIA web-site.
2. Milestones in Energy History
 - a. Smil, Vaclav "World History and Energy" in *Encyclopedia of Energy*, Volume 6, 2004 Elsevier Inc. Available electronically through University of Toronto Libraries.
3. Economic Tools: Theory and Empirical Analysis.

Refer to your texts in microeconomics to review the following subject areas: supply/demand analysis; consumer and producer theory; industry structures – monopoly, oligopoly, monopolistic competition, perfect competition; game theory; externalities; public goods; taxes and deadweight loss; regulation and competition policy. See in particular: Competition Bureau Merger Enforcement Guidelines [http://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/vwapi/cb-meg-2011-e.pdf/\\$FILE/cb-meg-2011-e.pdf](http://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/vwapi/cb-meg-2011-e.pdf/$FILE/cb-meg-2011-e.pdf)
4. Environmental Issues
 - a. Muller, Part I, Ch. 3 Global Warming and Climate Change.
 - b. Economists' Voice, The Berkeley Economic Press.
 - i. Stiglitz, J. 2006, "A New Agenda for Global Warming"
 - ii. Arrow, K. 2007, "Global Climate Change: A Challenge to Policy"
 - iii. Schelling, T. 2007, "Climate Change: The Uncertainties, the Certainties, and What They Imply About Action"
 - c. Socolow, R. and S. Pacala

- i. "A Plan to Keep Carbon in Check", *Scientific American*, pp. 50-57. September 2006.
 - ii. "Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies", *Science*, Vol. 305, pp. 968-72, 2004.
 - d. Her Majesty's Treasury, *Stern Review on the Economics of Climate Change*, 2006, Executive Summary.
 - e. Sixteen Concerned Scientists, "No Need to Panic About Global Warming", *Wall Street Journal*, Op-Ed, January 27 2012. William Nordhaus (response) "Why the Global Warming Skeptics Are Wrong", *New York Review of Books*, March 22 2012. Cohen et al. and Nordhaus response, "In the Climate Casino: An Exchange", *New York Review of Books*, April 26 2012. Fred Singer, "The Climate Contrarians", *New York Review of Books*, August 16 2012.
 - f. Bill McKibben, *Global Warming's Terrifying New Math*, *Rolling Stone*, July 19, 2012.
- 5. Renewables, Alternative Energy and Conservation
 - a. Buchan, Part 2, Renewables, Wind power, Solar energy, Water, Biomass and biofuels, Hydrogen;
 - b. Muller, Part II, Ch. 7, Energy Productivity.
 - c. Muller, Part III, Ch. 8 Solar Surge, Ch. 9 Wind, Ch. 10 energy Storage, Ch. 11 The Coming Explosion of Nuclear Power, Ch. 13 Biofuels, Ch. 15 Alternative Alternatives: Hydrogen, Geothermal, Tidal and Wave Power.
 - d. Government of Ontario, *Green Energy and Green Economy Act*, 2009, http://www.ontla.on.ca/web/bills/bills_detail.do?BillID=2145
 - e. Yatchew, A. and A. Baziliauskas 2011: "Ontario Feed-In Tariff Programs", *Energy Policy*, 39, 3885-3893.
 - f. Green, R. and A. Yatchew 2012: "Support Schemes for Renewable Energy: An Economic Analysis", *Economics of Energy & Environmental Policy*, 1, 83-98.
 - g. *The Future of Solar Energy. An Interdisciplinary MIT Study led by the MIT Energy Initiative.* <http://mitei.mit.edu/futureofsolar>
- 6. Hydrocarbons – Oil, Natural Gas, Coal
 - Oil
 - a. Buchan, Part 2, Oil; Part 3, From the Seven Sisters to the NOCs.
 - b. Muller, Part II, Ch. 5 Liquid energy Security, Ch. 6 Shale Oil.
 - c. Muller Part III, Ch. 14 Synfuels and high-Tech Fossil Fuels.
 - Natural Gas
 - d. Buchan, Part 2, Gas.
 - e. Muller, Part II, Ch. 4 The Natural Gas Windfall
 - f. *The Future of Natural Gas. An Inter-disciplinary MIT Study*, 2011, <http://web.mit.edu/mitei/research/studies/naturalgas.html>
 - g. *Understanding Canadian Shale Gas* http://www.csur.com/sites/default/files/shale_gas_English_Web.pdf
 - Coal
 - h. Buchan, Part 2, Coal.
 - i. *The Future of Coal. An Inter-disciplinary MIT Study*, 2007, <http://web.mit.edu/mitei/research/studies/coal.shtml>
- 7. Electricity
 - a. Buchan, Part 2, Nuclear Power, Extending the Electrons.

- b. Muller, Part III, Ch. 16 Electric Automobiles.
 - c. The Future of the Electricity Grid: An Interdisciplinary MIT Study, 2011, <http://web.mit.edu/mitei/research/studies/the-electric-grid-2011.shtml>
8. Politics, Finance and the Energy Future
- a. Buchan, Part 3, Utilities, Energy and Money, Part 4, Part 5.
 - b. Muller, Part V Advice for Future Presidents.

ADDITIONAL SOURCES

1. International Energy Agency, most recent documents are available electronically through the University of Toronto Libraries. See also <http://www.iea.org/>
 - a. *World Energy Outlook (most recent edition)*
 - b. *Electricity Information (most recent edition)*
2. National Energy Board (Canada)
 - a. *Canadian Energy Overview 2014, Energy Briefing Note (June 2015)*
 - b. *Canadian Energy Dynamics: Highlights of 2015 – Energy Market Analysis*
3. BP <http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>
 - i. BP Statistical Review of World Energy 2016
 - ii. Statistical Review 2016 Workbook