

## 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. A related objective 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:** Wednesday 2-5, Emmanuel College 001.

**TUTORIALS:** Mathieu Marcoux is the TA for this course. Tutorials will be held from time to time. Please email Mathieu if you have questions arising out of problem sets [mathieu.marcoux@mail.utoronto.ca](mailto:mathieu.marcoux@mail.utoronto.ca).

### EVALUATION:

Midterm	35%	Wednesday February 13, 2013.
Final Exam	35%	Exam period.
Problems	30%	Due Tuesday April 2, 2013. Late submissions penalized 10% for each day late.

You are required to submit solutions to all problems. However, only a subset of problems will be graded. The list of problems that are to be graded will not be revealed in advance. Problems sets 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.

### 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:

David Buchan, *The Rough Guide to the Energy Crisis*, Rough Guides, 2010.

Recommended:

Richard Muller, *Energy for Future Presidents*, Norton, 2012.

Daniel Yergin, *The Quest*, The Penguin Press, 2011

Additional References:

Joseph Dukert, *Energy*, Greenwood Press, 2009.

Carol Dahl, *International Energy Markets*, PennWell, 2004.

## LECTURE TOPICS

1. Background and Introduction

- a. Buchan, Part 1, The great escape, The transition, Energy: who controls it?, Climate change (hardcopy pp. 1-44)
- b. Lawrence Livermore Laboratories, energy and carbon flow charts <https://energy.llnl.gov/>

2. 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/eng/01245.html#part2>

3. Environmental Issues

- a. 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"
- b. 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.
- c. Her Majesty's Treasury, *Stern Review on the Economics of Climate Change*, 2006, Executive Summary.
- d. Sixteen Concerned Scientists, "No Need to Panic About Global Warming", *Wall Street Journal*, Op-Ed, January 27 2012. William Nordaus (response) "Why the Global Warming Skeptics Are Wrong", *New York Review of Books*, March 22 2012. Cohen et al. and Nordaus 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.
- e. Bill McKibben, Global Warming's Terrifying New Math, *Rolling Stone*, July 19, 2012.

4. Renewables

- a. Buchan, Part 2, Renewables, Wind power, Solar energy, Water, Biomass and biofuels, Hydrogen, (hardcopy pp. 110-148);
- b. Government of Ontario, Green Energy and Green Economy Act, 2009, [http://www.ontla.on.ca/web/bills/bills\\_detail.do?BillID=2145](http://www.ontla.on.ca/web/bills/bills_detail.do?BillID=2145)

- c. Yatchew, A. and A. Baziliauskas 2011: “Ontario Feed-In Tariff Programs”, *Energy Policy*, 39, 3885-3893.
  - d. Green, R. and A. Yatchew 2012: “Support Schemes for Renewable Energy: An Economic Analysis”, *Economics of Energy & Environmental Policy*, 1, 83-98.
- 5. Oil
  - a. Buchan, Part 2, Oil (hardcopy pp. 47-61); Part 3, From the Seven Sisters to the NOCs, (hardcopy pp. 151-162).
- 6. Natural Gas
  - a. Buchan, Part 2, Gas (hardcopy pp. 62-72).
  - b. The Future of Natural Gas. An Inter-disciplinary MIT Study, 2011, <http://web.mit.edu/mitei/research/studies/naturalgas.html>
  - c. Understanding Canadian Shale Gas <http://www.neb-one.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/ntrlgs/prmrndrstndngshlgs2009/prmrndrstndngshlgs2009nrgbrf-eng.html>
- 7. Coal
  - a. Buchan, Part 2, Coal, (hardcopy pp. 73-84).
  - b. *The Future of Coal. An Inter-disciplinary MIT Study*, 2007, <http://web.mit.edu/mitei/research/studies/coal.shtml>
- 8. Electricity
  - a. Buchan, Part 2, Nuclear Power , Extending the Electrons, (hardcopy pp. 85-109).
  - b. The Future of the Electricity Grid: An Interdisciplinary MIT Study, 2011, <http://web.mit.edu/mitei/research/studies/the-electric-grid-2011.shtml>
- 9. Politics, Finance and the Energy Future
  - a. Buchan, Part 3, Utilities, Energy and Money), Part 4, Part 5 (hardcopy pp. 163-280).

## ADDITIONAL SOURCES

- 1. International Energy Agency, <http://www.iea.org/>
  - a. *Energy Statistics Manual*
  - b. *Electricity Information 2011, IEA Statistics*
  - c. *2011 Key World Energy Statistics*
- 2. National Energy Board (Canada)
  - a. *Canadian Energy Overview 2011, Energy Briefing Note* (July 2012)
- 3. BP <http://www.bp.com/sectionbodycopy.do?categoryId=7500&contentId=7068481>  
(formerly British Petroleum)
  - i. BP Statistical Review of World Energy 2012
  - ii. [Statistical\\_review\\_of\\_world\\_energy\\_full\\_report\\_2012.xlsx](#)

# A Rough Guide to the Energy Crisis – By David Buchan

**Page numbering corresponds to hardcopy.**

<b>Introduction</b>	
The energy crunch	vi
<b>Part 1: Leaving the comfort zone</b>	
Energy and transition	1
<b>The great escape</b>	
Where we are now and where we go next	3
<b>The transition</b>	
and the tools to make it happen	16
<b>Energy: who controls it?</b>	
Too important to be left to the market	23
<b>Climate change</b>	
The greatest market failure of all	34
<b>Part 2: The energy game board</b>	
Different fuels and the parts they play	45
<b>Oil</b>	
The black stuff that keeps the world moving	47
<b>Gas</b>	
The greenest fossil	62
<b>Coal</b>	
Deep down and dirty	73
<b>Nuclear power</b>	
Better the devil you know?	85
<b>Extending the electrons</b>	
New things in electricity	100
<b>Renewables</b>	
On the rise, but an uphill struggle	110
<b>Wind power</b>	
The answer, my friend	118
<b>Solar energy</b>	
Here comes the sun	122
<b>Water</b>	
Making waves	126

<b>Biomass and biofuels</b>	
The power of vegetation	134
<b>Hydrogen</b>	
The fuel fervour that faded	144
<b>Part 3: The players</b>	
The people and companies in control	149
<b>From the Seven Sisters to the NOCs</b>	
Where the big energy companies came from	151
<b>Utilities</b>	
More than just the name on the bills	163
<b>Energy and money</b>	
Which one makes the world go round?	168
<b>Part 4: Energy and emergency</b>	
How close are we to the edge?	181
<b>Security of supply</b>	
The serious business of keeping a nation switched on	183
<b>Energy, war and US policy</b>	
The American mix	193
<b>Future frictions and Arctic angst</b>	
	210
<b>Part 5: Energy prospects</b>	
What will the future look like?	215
<b>Saving energy</b>	
Getting better all the time	217
<b>Transport trauma</b>	
Reinventing the wheel	226
<b>Low-carbon energies</b>	
Picking winners	238
<b>Environmental politics</b>	
Resistance and pressure for change	247
<b>The new energy morality</b>	
Doing the right thing	270
<b>The new energy world</b>	
A slow dawn	275
<b>Resources</b>	
Further reading and useful websites	281
<b>Index</b>	
	289
<b>Picture credits</b>	
	299