

Understanding International Energy Markets

March 2008

Energy is in the news. High prices, high profits, brown outs, blackouts, bottlenecks, cutoffs, and environmental degradation stare out at us from the headlines. If you want to understand the economics of why these things are happening and what is to be done about it, this course is for you.

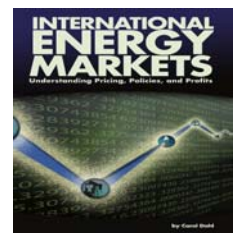
WHO SHOULD TAKE THE COURSE: The course is designed for engineers, natural and social scientists with good quantitative skills and a strong desire to understand energy markets at home as well as abroad. Decision makers in both the public and private sector, which need a good overview of energy markets, will learn important institutional detail, data sources, fundamental drivers and analytical techniques necessary for economic models, sound policy formation and profitable business strategy decisions. The student will apply the analytical skills learned in the course to a project to explain and present solutions to Ukraine's most pressing energy problems.

COURSE TOPICS WILL INCLUDE: Energy lessons from the past, coal markets, energy subsidies and taxes, electricity market regulation and restructuring, OPEC, monopoly, and oil, energy and climate change, game theory in global gas markets, optimal production profiles for non-renewable energy, managing price volatility with futures and options, the transition to renewable energy and managing in the multicultural global world of energy.

COURSE PRESENTER: Professor Carol A. Dahl



Professor Dahl is a Professor of Economics in the Mineral Economics Program at the Colorado School of Mines, as well as the Director of the Colorado School of Mines/Institute Français du Pétrole Joint Degree Program in Petroleum Economics and Management. She received her B.A. degree in economics from the University of Wisconsin and her Ph.D. from the University of Minnesota. She has published around 50 articles, made over 100 conference presentations worldwide, has had numerous grants and contracts, has been a visiting professor at over 20 Universities and international organizations worldwide, has supervised numerous Ph.D. students and has travelled to over 100 countries pursuing her interest in global energy markets. She is a member and senior fellow of the American Association for Energy Economics, a member of the International Association for Energy Economics, on the Editorial Board for *The Energy Journal*, and is a Fulbright technical expert. Her book - *International Energy Markets: Understanding Prices, Policies, and Profit* will be the course text.



The Colorado School of Mines



The Colorado School of Mines (CSM), (<http://www.mines.edu>) established in 1874, is a world-class provider of education and research in minerals, energy, and materials, with a focus on responsible stewardship of the earth. Its leadership in engineering, science, and economics is applied to resource production and utilization renowned. The Mineral Economics Graduate Program, developed in 1969, broadens and complements the school's focus to include the economics and management of energy, minerals, and related technological and environmental issues giving its students an interdisciplinary and international perspective to meet the challenges of a complex global economy.

Class 1 (Overview of the Course and Energy Markets – DVD or teleconference)

This lecture will motivate the course by broadly considering historical energy use, the drivers in the petroleum and other energy markets including prices, income, population, reserves, the environment, technology, market structure, and policy along with forecasting and drivers for the future. I will introduce supply, demand, and elasticities with applications to prominent energy issues including forecasting, supply disruption, subsidies and taxation, foreign exchange markets and Dutch disease.

Getting to know you: Upload a picture and bio to the class homepage.

1. Name:
2. Contact Information: preferred email contact
3. Undergraduate Major:
4. Favorite academic subjects:
5. Any special energy interests or experience:
6. Hobbies and recreational interests:
7. Jobs you have or have had:
8. Life Career Goals (not what you think you will be doing but what you **want** to be doing.)
 - What you would like to be doing in 5 years
 - What you would like to be doing in 10 years
 - What you would like to be doing in 20 years
9. What you feel are the most pressing energy issues in the Ukraine.

Reading Assignment: Chapter 1, 2, 3, 18, 19, (20 optional).

Homework: There are self tests at the end of each chapter. These are also posted online where you can click on the answer and see if you are correct. Students taking the course for credit will be asked to make up two new self test questions for each chapter covered except chapter 1. The question should relate to the Ukraine or other transitional economies. Answers that use interesting real world energy examples, are model applications including graphical or numerical solutions, correct existing questions or add new information not already contained in the question or text will receive more credit. For all homework in this class, be sure to provide proper references for materials used and any material copied verbatim should be in quotations. For full credit your question should be formatted as in the sample questions below because the best questions will be added to the online tests.

Self Test Sample Questions

Sample when answer is false

1. **True False** Mechanical energy comes from burning fossil fuel - coal, oil, and gas. (Contributed by Carol Dahl)

1. Incorrect. The correct answer is false not true. Mechanical energy is associated with motion such as is contained in wind and falling water.

1. Correct. The answer is false. Mechanical energy is associated with motion such as is contained in wind and falling water.

Sample when answer is true

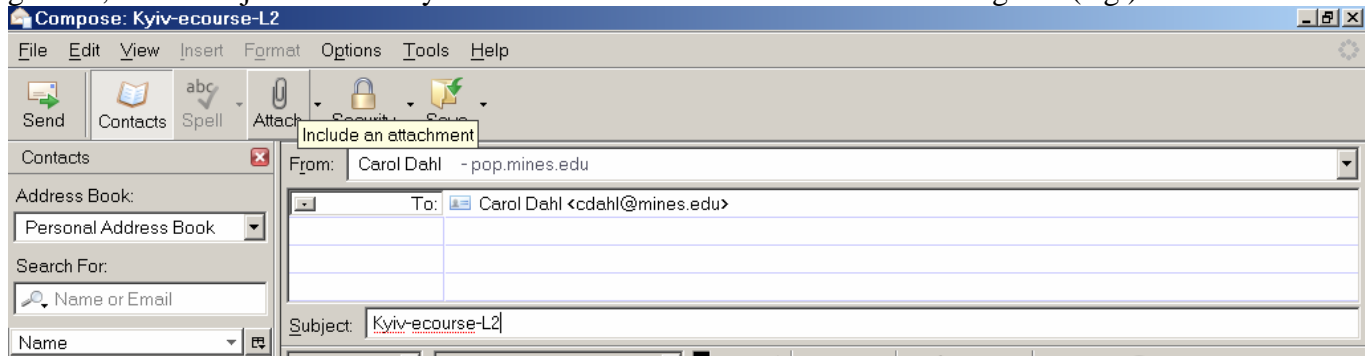
2. **True False** Chemical energy comes from breaking or changing molecular bonds. (Contributed by Carol Dahl)

2. Correct. The answer is true. Chemical energy comes from breaking or changing molecular bonds as is the case with the combustion of fossil fuels.

2. Incorrect. The answer is true not false. Chemical energy comes from breaking or changing molecular bonds as is the case with the combustion of fossil fuels.

Put your questions for each chapter in a separate file and label with st, chapter name, and your last name. (e.g. st9-Dahl)

All homework should be emailed to me cdahl@mines.edu as an attachment. So your assignment does not get lost, in the subject include Kyiv-ecourse and the lecture where it was assigned. (e.g.)



Handout: Powerpoint presentation

Class 2: (March 12: 15:00-18:00) Natural Monopoly, Electricity Regulation, and Restructuring.

Historically economies of scale made monopoly production of electrical power the most economical with government ownership or regulation to prevent high monopoly prices. Rate of return, peak load and fully distributed cost regulation will be considered. Given regulatory failures and changing electricity cost structure, many utilities are restructuring their industry and allowing competition in various sectors of the market including wholesale power markets, open access transmission, and even full retail competition.

Reading Assignment: Chapters 4 and 5

Handout: Powerpoint presentation

Homework: Self test questions. Add information to the entry for the Ukraine and add one new transitional economy to Table 5.4. Provide a page or two summary of the electricity sector in the Ukraine. If possible include a map of the power grid and generation facilities, high voltage interconnects, electricity production by fuel source, power imports and exports, and electricity consumption by sector. Two popular international sources of energy statistics are the International Energy Agency and U.S. Energy Information Administration:

Links: <http://www.iea.org/Textbase/stats/index.asp>

<http://www.eia.doe.gov/emeu/international/contents.html>

If you find better local sources be sure to include link or reference.

Class 3 (March 14: 15:00-18:00 Oil Market Structure, Monopoly, and the Role of OPEC.) Market power has been a dominant feature of the global oil market. Multinational oil companies and producer governments from Texas to the Middle East have all tried their hand at managing and manipulating this important commodity to keep its market from going from boom to bust. This class will consider multiplant monopoly and oil market dominant firm models, dynamic optimization along with optimal domestic and export pricing for OPEC.

Reading Assignment: Ch 6, 12, 13, 14

Handout: Powerpoint presentation

Assignment: Self test questions. Put together an overview of the FSU oil sector. Note refineries and their configuration, pipelines, oil production and reserves, oil and product imports and exports, oil product consumption by exports. Besides EIA and IEA other possible sources of information include the U.N., OPEC, and BP.

<http://unstats.un.org/unsd/jodi/DataViewRecord.aspx>

<http://www.opec.org/library/Annual%20Statistical%20Bulletin/ASB2006.htm>

<http://www.bp.com/multipleimagesection.do?categoryId=6840&contentId=7021557>

Oil and Gas Journal, Worldwide Report,

http://www.iea.org/Textbase/publications/free_new_Desc.asp?PUBS_ID=1461 Dec. 24, 2007.

Class 4: (March 19: 15:00-18:00) Transaction Cost Economics, Market Structure, and Strategy in the World Gas Market. The Russian-European, N. American, and Asia-Pacific natural gas markets have all involved in different ways. As transport costs have fallen, the gas market has become more global. The cost of transactions, the number of players, and government policy have helped determine whether a firm makes or buy's its inputs and the length or contracts. Market structure, geology, corporate strategy, and technology all are shaping whether gas is moved in pipelines or as LNG.

Reading Assignment: Chapter 7, 10, and 11.

Handout: Powerpoint presentation

Assignment: Self test questions. Pick an energy market in the Ukraine and in a page or two describe how its market structure has changed since 1990. Be sure to include all references.

Class 5: (March 21: 15:00-18:00 Environmental Drivers in the World Oil Market – Local and Global Pollutants) Energy production, transportation, conversion and consumption are all important sources of pollution. Pollution is a negative externality that causes markets to allocate resources inefficiently. This lecture considers policies to correct the market distortions for local pollutants such as particulate matter and global pollutants such as CO₂.

Reading Assignment: Chapter 8, 9

Handout: Powerpoint presentation, Dahl and Kuralbayeva (1999)

Assignment: Self test questions. Write a short report on the state of the environment in the Ukraine. Include the amount of various pollutants, the trends in pollution, energy sources of pollution, environmental laws and the state of regulatory enforcement.

Environmental and social indicator links.

http://unstats.un.org/unsd/environment/Questionnaires/country_snapshots.htm

<http://unstats.un.org/unsd/environment/indicators.htm>

<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTDATA/0,,menuPK:2875803~pagePK:64168427~piPK:64168435~theSitePK:2875751,00.html>

Many web sites including governments and NGOs publish environmental information on line. Some are scientifically sound and some are emotional and inaccurate. Find a world class web site that you believe publishes accurate information and find another that you believe is inaccurate and misleading. Indicate what led you to your evaluation of the two sites.

Class 6 (On DVD) Dealing with Price Uncertainty – Futures and Options Markets. As with all commodities, prices in unregulated competitive energy markets are volatile. Some market players may want to shed the risk of price volatility by hedging and others may want to take on risk by speculating. This lecture will consider how the financial derivatives – futures and options – will be used to transfer risk, how they make markets more transparent, and how they should be priced.

Reading Assignments: Chapters 15, 16

Handouts: Powerpoint presentation, Excel program on CD Rom.

Assignment: Self test questions.

Other interesting links

Emerging Technologies - http://www.factsonfuel.org/images/API_Emerging_Energy_Report.pdf

IEA – Energy Statistic Manual

http://www.iea.org/Textbase/publications/free_new_Desc.asp?PUBS_ID=1461

Grade Weights: 15% self test questions – due ?

15% other homework – due?

10% short report due April ? applying models and analysis from the course to a

Ukrainian energy problem.

60% final exam – April ?