VERMONT SUMMER PROGRAM
4TH TERM 2018
1:00 to 4:00--afternoon session
July 23-August 4

OIL AND GAS:
PRODUCTION, PIPELINES AND THE ENVIRONMENT

by
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NOTE TO 2018 STUDENTS: This is the Syllabus for last summer, 2017. The 2018 class will read the same two chapters printed in the VLS Bookstore Coursepack. Some of the other assignments will be updated, and memo assignments may be changed, but the 2018 course will be quite similar to what is listed below.

Welcome to this course! In just eight days we will survey the world of U.S. oil and gas production and pipeline regulation. We will look at the state conservation regulation that governs oil and gas extraction onshore and discuss local, state and federal regulations enacted to control the externalities of extraction. We will move offshore to look at the federal oil and gas leasing framework, the "cooperative federalism" of the Coastal Zone Management Act, and how safety and environmental issues are addressed there. We will delve into FERC regulation of both oil and gas pipelines and the use of eminent domain to build new pipelines to serve the shale oil and gas fields. Pipeline permits granted by FERC have led to street protests against FERC in Washington DC.

Broadly stated, the objective of this course is that you gain an understanding of:

- The interplay among federal, state, local, industry, and NGO actors in the regulation of the US oil and gas industry.
- The role of the common law in US oil and gas production: private property rights, tort and contract law.
- Key technical terms used in the petroleum industry. Lots of short video clips to watch of industry processes!
- Key sources of information that can be used in future research, such as Resources for the Future (an excellent source of unbiased research), as well as industry and NGO websites engaged in public dialogue on oil and gas issues.
- Current policy issues that allow you to become a better educated voter.
- The kind of work that employers may be offering in industry, in law firms, in NGOs, or in government.

Vermont is far removed from the sights or smells of an oil or gas field, but what happens at FERC and in U.S. oil and gas fields has impacts extending far beyond domestic

wellheads and pipelines. Indeed, the effects are felt both nationally and globally. The class will begin with a global view of the energy industry and the role of U.S. oil and gas production in world geopolitics.

Readings appear in the Coursepack, on TWEN, or on websites identified in the syllabus below.

The Vermont Book Store Coursepack contains:

Chapter 4, titled "Oil and Gas Production" from the casebook by Eisen et al, *Energy, Economics and the Environment* (4th ed. 2015). This book is abbreviated as "EEE4" in the Syllabus. (125 pp.)

Chapter 9 of EEE4, titled "Oil & Gas Pipelines: Opening Markets" (85 pp).

The material from EEE4 is copyrighted and permission has been obtained from the publisher to use it for classroom use only. Please do not distribute outside this class. The cost should be $45.

The VLS TWEN website and internet sources:

To save bookstore costs, I post other readings to the TWEN website at VLS for this course. The syllabus identifies all reading material posted on TWEN as numbered Items, like this: **TWEN Item 1-1; TWEN Item 2**, **TWEN Item 4A**, etc.

The final **2018 Syllabus** will be posted on TWEN under the "Syllabus" link.

Additional reading comes from sources available on the internet at the sites indicated in this syllabus. In some places in the syllabus, I have noted items that are purely optional reading, All readings are required unless they are marked optional.

Class reading averages about 35 pages per day (over 8 days) (not including visits to websites for information). I may not have accurately gauged the degree of difficulty or amount of discussion engendered by the reading each day. If we do not cover the reading assigned in one day, it will move to the next day. It won't be dropped unless I specifically tell you to delete certain pages.

Class assignment MEMOS to hand in. The syllabus notes when you should provide a short--no more than one typed page--written memo to me. Put your name on the memo in the first line. These short assignments, called Memos, are based on the class readings. Failure to hand in these memos will decrease your grade by half a point because we cannot have class discussion unless you have read the material. The memos are not meant to take more than 15-20 minutes to write. If you read the assignments, the memo is easy to write. There is a Memo a day. Do not email me your memos or post them to TWEN. Bring a hard copy to class for me to collect and read. Note: the Memos do not substitute for doing all the readings for that day.

DAY 1:

Come to class with the following information, legibly written on an index card or piece of paper:

- ***Your name, including any nickname you prefer to go by. Give first and last name only.***
- ***Your home state or country***
- ***Your home law school***
- ***Your career goal, if known already.***
- ***Your undergraduate university and your degree(s) with your major field of study.***
- ***Any work or practice experience that you have had to date, in any field.***
- ***Any special goal that you have for this course or reason for taking it.***

Topic 1: The Future of the Energy Industry in an Era of Globalization and Climate Change.

Read in advance: Visit this website link and read the Highlights of Exxon-Mobil's 2017 Energy Outlook to 2040. This takes only a few minutes to review at: http://corporate.exxonmobil.com/en/energy/energy-outlook/highlights/. These Highlights are directed at a public audience that is interested in very short presentations with colorful infographics. Then go to this BP link and listen to a 6.19-minute video from BP about its Energy Outlook through 2035: http://www.bp.com/en/global/corporate/energy-economics/energy-outlook.html. Listen carefully (indeed, take notes!) to these projections. Be prepared to ***discuss in class*** the major trends projected in energy supply and demand by these two Western super-majors:

- What fuels are growing the fastest? Oil? Renewables?
- Where is most of the future energy demand arising?
- What transportation sector is driving the demand for gasoline and diesel?
- Will gasoline demand peak? Why or why not?
- How do these company outlooks address the issue of global climate change?
- Key number: Today, the world is about 80% dependent on fossil fuels (oil, gas and coal) for its energy needs. What is the forecasted percentage in 2040?

The full ExxonMobil Energy Outlook to 2040 is 51 pages long, including many photos and is available for your ***optional*** viewing at: http://cdn.exxonmobil.com/~/media/global/files/outlook-for-energy/2017/2017_outlook_for_energy.pdf. A set of key statements and graphics used in this Outlook is posted as **TWEN Item 1-1** (and is also available at: http://corporate.exxonmobil.com/en/energy/energy-outlook/charts-2017). Look at the graphics posted here for projections of items like: the growth in the global middle class; the demand for air conditioning; and the countries/regions that will continue to burn coal through 2040. (What country will lead the way?) Most major oil companies have extensive website information. BP is famous for its Statistical Review of Energy, available at www.bp.com, under the link to "energy economics." BP's most famous

statistical chart shows oil prices since 1861 and aptly depicts the many tumultuous events in petroleum geopolitics in addition to the workings of market forces.

TWEN Item 1-2: Shell Energy Scenarios to 2050: Scramble v. Blueprints (selected pages). Shell's energy scenarios are purposefully quite different from the typical energy outlooks written by other oil companies or by government agencies (such as the International Energy Agency or the US Energy Information Administration). Rather, the scenarios tell stories, presented as narratives, about possible future paths, based on input from many political schools of thought and from experts in the social sciences, world religions, climate change, and socio-economic trends around the globe (such as rising inequality). This Item 1-2 compares the Scramble path scenario with the Blueprint path. **Read only these pages of the report (citations are to page numbers at the bottom of the report): Foreword on p. 4; Introduction pp. 6-8; pp. 13-15; 20-22; and 25-37**. This Shell report was written in 2008-2009, before the global financial crisis was in full effect. Oil prices were soaring and it seemed that the world would be short of oil forever. Shell's previous scenario had focused on the effect of 9/11 (the World Trade Center bombing) and the corporate financial scandals of Enron and other large corporations that had seriously tarnished the image of capitalism and free markets. This earlier scenario portrayed three global paths: (1) "Flags" (rising nationalism, closing borders to free flows of labor, capital and technology); (2) "Open Doors" (the opposite of Flags--an embrace of globalization and markets as bringing economic development): and (3) "Low-Trust Globalization" (globalization is inevitable, but is not trusted). The "Scramble" path in the Scenario you are reading represents a Flags approach to solving global energy issues, and the Blueprints path takes a collaborative "Open Doors" approach to such issues, especially climate change. Several organizations do scenario planning. The U.S. National Intelligence Council released its Global Trends through 2035 (NIC 2017-001) in January 2017 and it does not paint a pretty picture in any of its three scenarios.

TWEN Item 2: ExxonMobil: Energy and Carbon: Managing the Risks pp. 1-22 and page 30 (chart of greenhouse gas ("GHG") emissions for types of crude), also available on the XOM website. This Report, released on March 31, 2014, was written in response to shareholders' requests. It is easily skimmed.

TWEN Item 3: ExxonMobil: 2016 Energy & Carbon Summary, pp 1-2 only. This short document explains that XOM's Energy Outlook forms the foundation of its business decisions and is consistent with the aggregated COP21 Paris climate agreement commitments. Read pages 1-2 (using the document's pagination) as an update to TWEN Item 2 and writing Memo 1.

MEMO 1: Why does XOM think that its reserves will not be stranded in the ground because of climate change policies? ***Hand in Memo 1 in class is your answer to this question.

Optional: A critical assessment by Carbon Tracker of ExxonMobil's "Managing the Risk" appears at http://www.carbontracker.org/in-the-media/exxon-is-business-as-normal-the-right-strategy/, titled "Response to Exxon: An Analytical Perspective (2014)." The authors

think XOM is discounting the risks with an over-optimistic view of the future role of hydrocarbons.

I will show a Powerpoint that covers the broader geopolitical issues and trends in energy (including coal and renewables) that affect world energy markets today, using material from these three sources and others. We will then discuss in class:

- What implications do the ExxonMobil and Shell future outlooks have for U.S. national energy policy, in your opinion? Do you strongly disagree with any of these projections? Why? What would alter the long-term trends?
- Do you think the forecast by ExxonMobil is BAU (Business as Usual) --an evolutionary change over the next 20+ years, or a revolutionary change?
- What geopolitical events have transpired in the past year or so that you would characterize as Scramble versus Blueprint? Even during the next days in class, tucked away in this peaceful corner of Vermont, there will probably be events that signal one path or the other and that will affect you through the globalization of energy supply and demand.

Day 1: (continued)

In the Coursepack: EEE4: "Oil and Gas Chapter 4."

- **Pp. 132-151 (20 pp**) covering terminology, the oil and gas business, early history; and the oil and gas lease.
- Time permitting, we will answer the questions on page 151 (but no Memo required). Who knows what a DUC is?
- **TWEN Item 4A** is a typical oil and gas lease used for decades in the United States. Most case law precedent involving disputes between Lessees and Lessors derived from an oil and gas lease like this one. More recent leases used in shale plays often have different language for certain provisions, but the basic property right remains the same. For example, often several months pass between the time a well is drilled and the time it is completed (fractured). What if the primary term of a lease ends after the well is drilled, but not completed: What will happen to the lease, absent a modification?
- **TWEN Item 4B:** The federal OCS lease is even shorter, but it is also a fee simple determinable. Find the provisions that make it so. **TWEN Item 4B** is the OCS lease at issue in a case we read later; **TWEN Item 4C** is the newer BOEM lease, but it is still short (a mere 3 ½ pages long) and has the same granting clause and fee simple determinable structure.

A good glossary of terms used in the oil and gas sector is available at: **http://www.eia.gov/tools/glossary/.** Look up terms that you do not understand as you do the reading. And, be sure to ask in class if I use a term that you do not understand.

DAY 2:

Finish the nature of the property right under a US oil and gas lease, if necessary.
I will show a PPT on Geology that contrasts conventional and unconventional rocks.

EEE4 continued, pp 151-169 (28 pp) covering:

- **Pp 151-59.** Who owns the shale gas rock on split estates?
- **Pp 159-63** Surface vs mineral estate. Read the lease in **TWEN Item 4A** and find provisions that protect the surface. You will have to look hard.

******Hand in Memo 2 in class listing the provisions you found that protect the surface of the leased tract.***

I will show a PPT of Surface accommodation/conflict photos.

After a town called Denton voted to ban fracking in the Barnett Shale near Dallas, the Texas legislature quickly passed H.B. 40 that added a section to the Texas Natural Resources Code. This section is posted as **TWEN Item 5.** What is its effect?

- **Pp 163-169.** The common law Rule of Capture.

DAY 3:

The maps in the link below are part of your class reading to do before coming to class on Day 3:

- **Maps of shale plays in the U.S**.

Go to this link. https://www.eia.gov/maps/maps.htm#shaleplay to find " Summary Maps of Natural Gas in the US and North America." At the top of the page, see the beige-colored box listing 6 maps. Open up each of the 6 links and view the maps. One includes offshore gas production. Know where the Bakken, Eagle Ford and Marcellus basins are. Many more shale plays exist in the Permian Basin, Colorado, Ohio and Louisiana. The Permian Basin is the hottest play today.

Now--scroll down the list of maps available to the **"Shale play development history animations" and click on the link to the Eagle Ford Shale from 2006 to 2010.** It depicts how quickly hundreds of wells were drilled and how production ramped up steeply. Then click on the **Barnett Shale play animation** and watch the red and black dots grow, depicting the move from vertical wells to horizontal wells.

- **Watch the following YouTube video on technological change** in the productivity of shale drilling (about 2 minutes):

https://www.youtube.com/watch?v=XCUVEoSV82A

You may want to stop the video in spots to look at the charts more closely. Our Energy Information Administration (EIA) produced this video.

******Hand in Memo 3—first part. Summarize this last EIA video in no more than one paragraph. See below for additional item in Memo 3.***

- **Watch the YouTube video by Marathon Oil on fracturing (6.36 mins)**

https://www.youtube.com/watch?v=VY34PQUiwOQ and answer the following:

******Hand in Memo 3 based on the Marathon video: Answer these questions:***
What is the kick off point?
What is a perforating gun?
What is casing?
What percentage of the fluid pumped underground consists of water and sand?
How many years might a horizontal, fractured well produce?
Then, as a final question: Explain the factors in the well drilling/fracturing process that are designed to prevent groundwater pollution.

If you want more details on well drilling ***at your option*** watch the following (which are two out of a series of six videos produced by Chesapeake Energy) on the stages of drilling and fracking a well:

- The YouTube video by Chesapeake Energy on Hydraulic Fracturing: https://www.youtube.com/watch?v=qjP-K1VaI1k
- The YouTube video by Chesapeake on Horizontal Drilling: https://www.youtube.com/watch?v=fBQCQ6HL2Yw.

Additional videos in the series include preparation of the well pad.

- **TWEN Item 0** has recent developments and websites related to shale development, fracking and pipelines, most of which relate to externalities of oil and gas production and transportation. Read it any time during the course as a required reading assignment. It is a mere sampling of the flood of material that surrounds oil and gas development. I sought to summarize only reports or news that seemed credible.

EEE4 reading (cont'd) (20 pp total):

- State Conservation Regulation: Prorationing, pooling, unitization. Pp 169-186.
- Fracking and Trespass pp. 186-91.
- **Optional: TWEN Item 6.** "Shale Gas: Applying Technology to Solve America's Energy Challenges," by the NETL, with photos of actual operations (7 pp). Note the role of the DOE's R&D in the 1970s. Was this federal money spent wisely? Why did the DOE do this research in the late 1970s?

DAY 4:

- **Regulating Externalities, pp. 191-201**.
- **TWEN Item 7A**. RFF (Resources for the Future), Natural Gas Revolution: Critical Questions for a Sustainable Energy Future, pp 1-5 only (the list of 24 critical questions that need to be answered to assess the sustainability of the shale gas revolution. Read the 24 questions. How many do you think have been answered by good science? Be prepared in class to state which ones you think are most important to answer so that policymakers and citizens can vote rationally about shale and energy policies?
- **TWEN Item 7B.** Read this 4-page summary of the research that EDF has done jointly with many universities on methane emissions from oil and gas sites. Emissions appear to be significantly underestimated; note the "super-emitters" findings. The Obama administration announced in 2016 that it would seek to regulate methane emissions more tightly under the Clean Air Act, but the Trump administration is seeking to undo much of this regulation. The gas distribution lines running under some cities leak significant amounts of methane.
- **TWEN Item 7C,** Summary of frack-tort litigation by Prof. Blake Watson, pp 31-34 only, also available at https://udayton.edu/directory/law/documents/watson/blake_watson_hydraulic_fracturing_primer.pdf. Professor Blake Watson lists the cases by state, notes the case disposition (decided, settled, dismissed, pending) and also notes whether the litigation relates to earthquakes (generally caused by injection wells, not by the

fracking process). Case Summaries are posted after the lists. Go to pages 31-34 and follow the claims of the Ely plaintiffs in Dimock, PA, filed in 2009 and resulting in a trial and jury verdict of $4.24 million in March 2016, which was then overturned with a motion granting a new trial. Few families have the resources to engage in prolonged litigation like this. Note that of the 44 original plaintiffs only four remained. ***Optional website view***: The law firm of Arnold Porter has a "Frack chart" that lists all the lawsuits filed that involve hydraulic fracturing as of December 2015, by type. Put "Arnold & Porter frack chart" in your browser. The first page in this link classifies the types of lawsuits into categories, ranging from cases challenging municipal ordinances to SLAPP lawsuits. There is much work for attorneys here!

- **TWEN Item 7D. Summary Final EPA Report** on Drinking Water (2 ¼ pp)

[Optional for your research library: Watch the following YouTube video (6.88 mins) for an introduction to the EIA's energy information, presented in a very snazzy manner: https://www.youtube.com/watch?v=V7O_YlPWbOs. This video covers the EIA reports on oil and gas, electricity, energy infrastructure maps, other countries' energy overviews, and many other useful reports.]

The readings for Memo 4, below, finish the readings on onshore oil and gas, as follows:

- Visit the Center for Responsible Shale Gas Development (CRSD), originally called the Center for Sustainable Shale Gas Development (CSSD) at http://www.responsibleshaledevelopment.org. This Center developed 15 performance standards for shale development in the Appalachian basin that are often higher than the state or federal regulations that exist in this basin. A company that operates under the CRSD standards can earn a certificate if third-party auditors find that the company is in compliance will all the CRSD standards. The standards (19 pp) are at:

http://www.responsibleshaledevelopment.org/what-we-do/performance-standards.
and are also posted as **TWEN Item 8A.** A Comparison Table of the CRSD standards with the standards used by regulators in Pennsylvania, West Virginia and Ohio also appears at this link (and is posted as **TWEN Item 8B**). Why do you think the member companies of CSSD voluntarily agreed to these higher standards?

****Hand in Memo 4:*** ***Read two of the 15 performance standards set by the CRSD. Choose the standards based on what you are most interested in: air quality, water quality, impoundment pits, or groundwater. Then answer these two questions:***

- ***Summarize your two performance standards and then check the Comparison Table and note how your selected standards compare with the state regulations.***
- ***Do you feel comfortable assessing whether the CRSD standards are the best and most sustainable possible? Explain why or why not.***

We will discuss your memos for a few minutes at the start of the class.

Start Offshore Oil and Gas in EEE4:

- **Pp 201-22 Offshore Oil and Gas** (21 pp). The federal leasing process and NEPA and the CZMA.
- **TWEN Item 9:** Graphic on OCS leasing procedures (1 slide).

DAY 5:

Optional: Watch this video of an offshore drillship, also called a MODU (Mobil Offshore Drilling Unit) (7.50 mins): https://www.youtube.com/watch?v=9PNMDV2v9oA. The video is produced by JAMSTEC, the Japan Agency for Marine-Earth Science and Technology and is called "Deep-sea Drilling Vessel Chikyu." There are new terms to learn here, like what a "riser" is. The offshore industry sees entire "cities" of subsea oil and gas facilities, manned by robots, in its future. This video is a good way to start our move to the offshore context.

- **EEE4 Offshore oil (cont'd), pp. 222 -30.** Offshore wastes and the Clean Water Act.
- **EEE4 pp 230-56**. Spills, blowouts and SEMS.

I will show a PPT on the changes in regulation in the Gulf of Mexico after the BP/Deepwater Horizon/Macondo oil spill. It will focus on the SEMS rule and the Center for Offshore Safety (COS), discussed in this section of the EEE4 reading.

Optional but interesting: Visit this link to a NYTimes collection of interactive videos on the BP Spill: http://www.nytimes.com/interactive/us/spill_index.html The link has excellent videos on how a blowout preventer works; how the spill spread in the Gulf, day by day, and where it reached state shores; the failed attempts to stop the leak (e.g., the top kill and junk shot); photos of the spill's effect on people and the ecosystem; live videos of the spill; and an animation of the cementing process.

- Visit the Center for Offshore Safety's website at: http://www.centerforoffshoresafety.org

******Hand in Memo 5***. **(a)** ***Compare the COS's objectives to that of the Center for Responsible Shale Gas Development. (b) .How many companies are members of COS and what kind of companies are they? (c) Click on any other link to material that COS has produced and summarize what that material is by scanning its content and writing a few paragraphs about its content.***

Very optional but fun: YouTube video on subsea ROV working to release a chain….and a big whale appears: https://www.youtube.com/watch?v=IWNP4Nb9WfM.

DAY 6:

Read the Executive Summary of the COS First Annual Performance Report released April 2015 (based on the 2013 audits of COS members) posted as **TWEN Item 10** and also available at:

http://www.centerforoffshoresafety.org. You will struggle with the acronyms, but such is the world of technical standards. (Section 7.2 of the report may help!) Be prepared in the Day 6 class to discuss one of the Learnings in Section 5.3 of the Report. What seems to be the most dangerous offshore operation today?

******Hand in Memo 6 on Day 6: Summarize any one statistical graphic (be sure to note its title and page number) and summarize the Learning that you selected (noting its page number).***

We will spend 20 minutes or so discussing the Learnings. Think about how this peer-to-peer education or coaching can improve safety as a supplement/alternative to regulation.

Start EEE4 Chapter 9 on pipelines in your Coursepack:

- First Read the **Appendix** to this Syllabus on ratemaking (one page long--the last page of this Syllabus**).** Many of you may have had a full course on electricity ratemaking by public utilities. The concepts are very similar for pipelines.

EEE4 Ch 9, pp 539-572 (33 pp). FERC regulation of natural gas pipelines through 2005; price controls on gas, and the use of take-or-pay and long-term gas supply contracts; FERC restructuring of gas pipelines in Order 636 on Open Access; rate design; shortages. If you have had a course on regulated industries or on electricity, this material will be familiar because the NGA of 1938 was modeled on the earlier Federal Power Act that regulates interstate electricity transmission and sales.

DAY 7:

- **Pp. 572-88**. FERC regulation today (16 pp). The US Supreme Court decided the *Oneok v. Learjet* case after the casebook went to the printer. The Court's edited opinion is posted on **TWEN Item 11 (8 pp)**. A nice summary of the decision, written by Robert Ballentine, an LLM graduate of UHLC, appears in **TWEN Item 11A** (4 pp).

- **Pp. 588- 606**. Oil Pipelines. Ratemaking (18 pp).

******Hand in Memo 7--the answers to questions in Note 2 (a) and (b) on page 603. We will discuss the answers to (c) and (d) also, in class.***

DAY 8: We will make up or review any material that we did not cover adequately in the past two days on pipelines before starting Day 8.

Finish EEE4 Chapter 9 (18 pp) :

- **Pp 606-624.** Siting pipelines; eminent domain; crude by rail. (18 pp).
- **TWEN Item 12**. It is not often that FERC denies a certificate for a gas pipeline, but FERC did so in 154 FERC Para. 61,190 (March 11, 2016), Jordan Cove Energy Project L.P and Pacific Connector Gas Pipeline L.P., Docket Nos. CP 13-483-000 and CP 13-492-000.

**** * * Hand in Memo 8:*** ***Read only the following paragraphs of this docket case and write a memo summarizing why FERC did not approve this proposed gas pipeline connected with a proposed LNG terminal planned in Oregon. Read Paragraphs (not page numbers): 1-7 (the facts); 23, 28-29, 38-41, and 45-47.***

- **TWEN Item 13** on Disaster Plans for Oil Trains (3 pp, WSJ 5-13-15). Producers in the Bakken shale turned to rail to transport their oil--with very real consequences to the safety of many people living along rail lines that often pass through towns.
- We will look at the natural gas and pipeline graphics in the *FERC's Staff Report for 2016* (released April 2017) (in class, no reading in advance required) on the State of the Markets 2016, available on the FERC website at https://www.ferc.gov/market-oversight/reports-analyses/st-mkt-ovr/2016-som.pdf. Every year, the Staff prepares a "look back" at the previous year's major events in gas and electricity markets, presented with good graphics and short explanatory text. Before reviewing, do you think natural gas prices rose or fell in 2016? Which region of the US do you expect had the highest natural gas prices?

Time permitting, I will discuss this reading in class: **TWEN Item 14**: Gardner, "The Southwest Cold Snap: Extreme Weather at the Gas/Electric Interface." How could Texas have blackouts in the midst of the shale boom? What recommendations does the author make to minimize the risk of future blackouts?

FINAL EXAM PREVIEW:

The Final Exam will be an in-class exam, administered on Saturday August 4 from 1:00 pm to 4:00 pm. Laptop users must use ExamSoft; VLS will provide Bluebooks for those of you who prefer to write your exam by hand. Please see the appropriate Vice Dean at least a week before the exam on August 4 to secure approval for an exam accommodation allowed under VLS policies. You must use your student ID number as identification on the exam. Here are some general comments about the Final Exam:

- The exam will consist of some short-answer questions (***not*** multiple choice) that require only a few sentences to answer, such as defining terms, acronyms and the relationship between terms..
- The exam will have some targeted shorter essay questions that require no more than 2-3 paragraphs to answer.
- There will be two longer essay questions that cover the bigger picture view of
    1. Shale development (pros and cons, weaknesses in regulation, problem areas, etc.);
    2. How oil and gas pipelines are regulated in the US (differences, similarities, weaknesses in regulations, etc.).

  I *may* hand out one of these longer essay questionsat the end of our last class, and you can work on it as a take-home, open book question, but your answer must be restricted to the material in the class reading. You must bring your answer to class, printed as a hard copy, on the Saturday of the in-class exam.

- The questions will thus vary in point value, from short answers (5 points) to short essays worth 10 to 20 points, to the two longer essays (worth 50 points each). Do not spend 15 minutes on a 5-point question!
- Regardless of whether I decide the inc-class exam is open or closed book, do not expect that you will have time to find and read the assigned class reading material as you write your exam. Please keep up with the reading, take notes in class, and outline the material over the course of these two weeks.

Appendix: Ratemaking for Public Utilities:

Although the process varies from state to state and in different contexts at the federal level, most public utility regulation imposes the following general requirements:

1) **Certificate of Convenience and Necessity:** The business must obtain permission to enter into and operate within the regulated market. This is achieved by securing a "certificate of convenience and necessity."

2) **Monopoly Franchise:** As part of this licensing process, the government often creates a monopoly by establishing an exclusive geographic franchise. Within this service area, the utility has the right to serve the market without competition.

3) **Duty to Serve:** In return for this exclusive service territory, the government often requires the utility to provide a certain level of service to all customers within the service territory. The utility has a duty to serve customers and cannot selectively choose its customer base for its own private gain.

4) **Price Regulation:** The regulatory body will allow the utility to charge only "just and reasonable" rates to customers. This is normally done on the basis of the cost of providing service to each class of customers.

The cost-of-service ratemaking formula for public utilities is:

R = O + (B x **r)**where:

R is the utility's revenue requirement—the total amount needed to cover its costs.
O is operating costs, such as fuel and labor that vary with the level of production.
B is its rate base, or its capital investment in plant and other assets.
r is the rate of return allowed by regulators, earned on the capital invested in the rate base.

As a much-simplified example, consider the following:

- Assume that PUC Co. builds a power plant and transmission lines at a cost of $250,000,000 in order to provide 28,000,000 kilowatts per hour (kwh) of service to a single class of residential customers in a given year.

- PUC Co. incurs $10,000,000 in operating expenses per year.

- The average cost of PUC Co.'s various sources of capital (such as the interest it pays on its debt and the rate of return on its equity) is 10%.

PUC Co.'s revenue requirement is then: $10,000,000 + ($250,000,000 x 0.10), or $35,000,000. The Public Service Commission will set the residential rate for this class of consumer at $35,000,000 / 28,000,000 kwh, or $1.25 per kilowatt-hour.