Energy Policy

EVPP 432/533

Fall 2020

Tuesdays/Thursdays 9:00 am-10:15 am

Instructor
Dr. Jennifer Sklarew
Email: jsklarew@gmu.edu (preferred method of contact)
Hours: Tuesdays, 10:30 am to 11:30 am by appointment

Course description: Energy policy isn't just about allocation of energy resources. In this course, we will discuss resource options in the context of the 3E's: energy security, environment, and economics. We'll also examine how these considerations apply to 3 P's developed by Dr. Jennifer Sklarew: priorities, politics, and process. We'll look at the 3P's as frameworks for understanding how energy policymaking takes place. Through these three lenses, we'll examine the sustainability and environmental angles of various resources, reasons for specific nations' policy choices, and possibilities for future energy policies. These discussions will enable us to consider how energy policies can create cooperation and conflict domestically and internationally.

Course Learning Objectives:

1) how energy systems form and change;

2) existing energy resources and policy options;

3) how energy policy is formulated;

4) challenges energy policymakers face;

5) how the parameters for 1-4 vary for different countries, and even different states or cities; and

6) what these 5 issues mean for local, national, and international energy cooperation and conflict.

Weekly Learning Objectives:

Weekly learning objectives will help us to move toward our course learning objectives.

Readings:

Required text:
Bradford, Travis. 2018. *The Energy System: Technology, Economics, Markets, and Policy*. MIT Press.

Suggested Sites for Energy Supply and Demand Data

- World Bank: data.worldbank.org
- International Energy Agency (IEA): www.iea.org/statistics/
- U.S. Energy Information Administration (EIA): www.eia.gov
- U.S. Environmental Protection Agency (EPA): https://www.epa.gov/energy/power-profiler#/

Optional:
Richard Heinberg and Lerch, Daniel, ed. 2010. *The Post Carbon Reader-Managing the 21st Century's Sustainability Crises*. Watershed Media/ University of California Press.

Weekly readings: All students must read all of the required readings. Graduate students must also read the optional readings marked with **.

Assignments:

1) **Article for discussion:** At least once during the semester, each student will find one article (newspaper, journal, magazine, website posting, etc.) on the session topic for discussion in class. By midnight the Saturday before class, please send to me via email a) the article as a PDF and b) 2-3 questions for the class to discuss, so I can distribute them for everyone to read before class. Be prepared to lead a 15-minute discussion of the article and your discussion questions in class, starting with a brief summary of the article and how it relates to that week's topic. Graduate students also must create a short slide presentation summarizing their article and how it relates to their research interest, and must send their slide presentations to me by midnight the day before class. Late penalties for all submissions apply (see deadlines below).

2. **Semester project and interim assignments**: The overall assignment is to examine a) how a particular city, county, state, or country determines its energy portfolio (the balance of energy supply sources and demand-side measures); b) how the city, state, or country can attain the optimal energy portfolio, considering any challenges, and c) the role of the 3 E's and the 3 P's in determining how the area achieved its current energy profile, and how it can achieve the profile you think would be best. Graduate students also will add an individualized section that examines how their particular research interests affect or are affected by energy transitions. Examples include social entrepreneurship, food and/or water security, land use, and environmental ethics.

Questions to answer:

1. Does the current energy portfolio maximize all 3E's?

2. Who/what are the key stakeholders, motivations, and challenges?

3. What would the optimal energy portfolio for this area look like, and what challenges to its realization exist?

4. If the area already has an optimal portfolio, what lessons can we learn from their example?

Divided into (hopefully) manageable pieces due about once a month.

a. 3rd week: Choose a city, county, state or country for your project.

b. 5th week: Energy profile of the country, state or city and a list of criteria for choosing the best energy portfolio, as well as a list of references.

c. 9th week: Roadmap to get to that portfolio, challenges facing it, and a list of references. Graduate students will include a section on how the roadmap and challenges affect your specific area of research (social entrepreneurship, food/water security, etc.).

d. 12th week: Analyze how the 3Ps and 3Es apply to the country's, state's, or city's energy system, and how they addressed/could address challenges to achieve change. Graduate students also will analyze how your area of research interest will contribute to or be affected by the role of the 3Es and 3Ps on energy system change.

e. 15th week: Turn in 1) final papers incorporating revision of all interim assignments, including revisions to the roadmaps based on what you've learned about challenges; 2) presentation slides.

3. **Presentation:** At the end of the semester, each student must give a short presentation that explains his/her semester project results**.** Graduate students' presentations will include their additional research focus. More details will be provided later in the semester. Presentations will be scheduled during one to two class sessions and the final exam period.

4. **Extra credit presentation:** Sometime during the semester, you may give a short guest lecture on your area of research as it pertains to energy policy (up to five extra credit points).

Deadlines: In fairness to all students, I will lower your grade by ten points for each day that any assignment is late without a previously approved extension, starting from the deadline. E.g., if you hand in your assignment within 24 hours after the deadline, 10 points off; within 2 days, 20 points off, etc. Extensions will be granted only for written requests that involve an emergency or other reason deemed valid by the instructor.

Class participation/Group discussion: Aside from the textbook readings, I will post readings, including the article of the week chosen by you, on Blackboard, along with questions for you to consider while reading. We'll discuss these questions in class. Optional readings marked with ** are required for graduate students, who will summarize them in class. Your participation grade is

based on your attendance in class and your active participation, which enables me to assess your understanding of the readings and concepts.

Attendance:

- Missing class: If you need to miss class due to illness, travel, family obligations, etc., please notify me ahead of time via email**. To receive credit for the missed class, please choose two of the reading questions and email your responses to me within two days after the missed class or by a deadline approved by me**. If you have an unexcused absence and do not send answers to the questions, you will receive a zero for that day. If you have an excused absence but do not answer the questions, the class will not count toward your grade. If you decide to drop the course, please complete the necessary paperwork to avoid an automatic F at the end of the semester.
- Late arrival: If you are more than 15 minutes late to class without a valid explanation, your participation grade for that day will be reduced by 10 points.
- Cell phone/computer use: If you use a cell phone or computer during class time for purposes other than the class, you will receive an unexcused absence for that day. If you need to use one of these for an emergency, please step out of the room and/or let me know. (No need for personal details; just let me know that you are having a problem that requires phone/computer use.)

Basis of Grading: EVPP 432

Class participation	10%
Article Discussion Leadership	5%
Interim paper 1: 3-5 pages	15%
Interim paper 2: 3-5 pages	15%
Interim paper 3: 6-8 pages	15%
Semester Paper: 12-15 pages	20%
Final Presentation: 15 minutes	20%

Basis of Grading: EVPP 533

Class participation	10%
Article Discussion Leadership and Slide Presentation	5%
Interim paper 1: 5-7 pages	15%
Interim paper 2: 5-7 pages	15%
Interim paper 3: 8-10 pages	15%
Semester Paper: 18-25 pages	20%
Final Presentation: 20 minutes	20%

Grade table (General grading criteria for writing assignments, class participation and presentation will be provided separately, and specific criteria for each assignment will be provided during the semester.)

Grade	Percent
A	93-100%
A-	90-92.9%
B+	87-89.9%
B	83-86.9%
B-	80-82.9%
C+	77-79.9%
C	70-76.9%
F	<70%

Writing Assistance

Mason's Writing Center can provide tutoring and guidance on structure and grammar for course assignments, theses, and other projects. They provide in-person and on-line services. They are located in Robinson Hall, room 114A. Please see **http://writingcenter.gmu.edu/** or contact them at **wcenter@gmu.edu** or 703-993-1200.

General Support

Student Support and Advocacy Center (SSAC) and Resources for Crises: OSSCM -- https://ssac.gmu.edu -- provides comprehensive (and confidential) services for your safety and well-being.

Counseling and Psychological Services (CAPS): provides a wide range of services to students by a staff of professional counseling and clinical psychologists, social workers, and counselors. CAPS individual and group counseling, workshops and outreach programs are designed to enhance students' personal experience and academic performance. http://caps.gmu.edu/

WAVES: helps students develop and maintain healthy lifestyles through one on one support, interactive programs and resources. Topics include healthy relationships, stress management, nutrition, sexual assault, drug and alcohol use and sexual health. http://waves.gmu.edu/

Gender-based/Sexual Discrimination: The 1-page George Mason University Title IX Resources sheet may benefit those of you seeking resources to prevent, address &/or recover from gender-based discrimination – including sexual harassment, sexual assault, stalking, domestic violence, and sexual exploitation. It includes 16 on- and off-campus sources of assistance, including confidential ones.

Plagiarism Statement:

What is it? Plagiarism means using the exact words, opinions, or factual information from another person or source without giving that person or source credit.

Plagiarism and the Internet**:** Copyright rules also apply to users of the Internet who cite from Internet sources. Information and graphics accessed electronically must also be cited, giving credit to the sources. This material includes but is not limited to e-mail (don't cite or forward someone else's e-mail without permission), newsgroup material, and information from Web sites, including graphics. Even if you give credit, you must get permission from the original source to include any graphic that you did not create on your web page. Shareware graphics are not free. Freeware clipart is available for you to freely use. If the material does not say "free," assume it is not. Putting someone else's Internet material on your web page is stealing intellectual property. Making links to a site is currently acceptable, but getting permission is strongly advised, since many Web sites have their own requirements for linking to their material. (Source: http://mason.gmu.edu/~montecin/plagiarism.htm)

How to avoid it? Authors must credit original sources through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes; a listing of books and articles is not sufficient. Direct quotations always require citations. So do paraphrases and summaries of opinions or factual information formerly unknown to the writers or which the writers did not discover themselves. Exceptions include factual information that can be obtained from a variety of sources; the writers' own insights or findings from their own field research; and what has been termed common knowledge. Common knowledge is sometimes difficult to determine, so feel free to ask. Work that requires citations is not limited to text. Templates, data (facts/figures) for charts, and even cartoons used in presentations require citations! If you are uncertain about whether information should be cited, please cite to be safe, or ask me before turning in your work.

Why avoid it? Plagiarism is a violation of Mason's Honor Code: http://www.gmu.edu/facstaff/handbook/aD.html Plagiarism also reflects poorly on the intellectual capability of the person plagiarizing, and it is unfair to the original source of the plagiarized material. It also will earn you a failing grade in this class. I know professors who have failed students for plagiarism. Please don't turn me into one of them.

General Plan for Class Schedule

Class discussion of readings and article of the week: Tuesdays
Food/Drink: No set breaks, but feel free to bring power bars or other fuel sources to consume. ☺
Class lecture by instructor or guest speaker and discussion of lecture: Thursdays
Discussion of applications to projects: Tuesdays at the end of class
Lead-in to next class: 5 minutes

Session Topics and Readings:

I. WHY energy policy matters: Priorities

Week 1: Overview and syllabus review/Energy Systems & Energy Security

Session overview: We'll discuss energy systems and elements of energy policymaking and policy.

Readings and Reading Questions:

432 and 533 Questions: 1) What energy system traits, complexities and challenges does the *IEA World Energy Outlook* reflect, especially with regard to infrastructure, linkages to other sectors, and risk? 2) How do energy security, environmental concerns and economics influence energy systems?

1. Bradford textbook, p. 20 - top of p. 28: systems analysis: b) "defining the energy system"; c) "subsystems within the energy system;" d) supply chains: a special type of system; and E. What constrains the energy system? 1. Scarcity.

2. International Energy Agency. 2019. *IEA World Energy Outlook 2019*. Executive Summary. https://iea.blob.core.windows.net/assets/1f6bf453-3317-4799-ae7b-9cc6429c81d8/English-WEO-2019-ES.pdf

3. Trabish, Herman. 2017. Why utilities say grid security is the most pressing sector issue of 2017. Utility Dive. April 10. https://www.utilitydive.com/news/why-utilities-say-grid-security-is-the-most-pressing-sector-issue-of-2017/440056/

Lecture topics:

a. What is an energy system?

b. Policy vs. Policymaking

- The Three P's and 1 R: Priorities, Politics, Process, and Resources
- The 3E's: energy security/independence, environment, economics

c. Energy Security Considerations

Week 2: Environmental Considerations

Session overview: How does energy policy reflect or conflict with environmental priorities? We'll discuss topics including climate change, pollution and waste, land conservation, and ecosystem impacts.

Readings and Reading Questions:

432 Questions: 1) How do different stakeholders' environmental concerns vary? 2) Do U.S. energy policies cause conflicts among the 3 E's? 3) Why do we need an executive order on environmental justice?

533 Questions: 1) How can energy policies address stakeholder groups' divergent environmental priorities? 2) How is environmental justice addressed in energy policy at different scales, and is it addressed effectively? 3) What types of shifts in energy systems can balance environmental concerns with the other two Es, and why is entrenchment or lock-in a concern?

Required

1. Bradford textbook, Ecosystem Interactions: p. 1041-1081.
2. Pacala, S. and R. Socolow. 2004. Stabilization wedges: Solving the Climate Problem for the next 50 years with current technologies. *Science* 305: 968-972. (PDF)
3. Presidential Proclamation -- 20th Anniversary of Executive Order 12898 on Environmental Justice. (PDF)
4. U.S. Energy Information Administration. Electricity Explained: Electricity and the Environment. https://www.eia.gov/Energyexplained/index.cfm?page=electricity_environment
5. United Nations Framework Convention on Climate Change. 2015. Adoption of the Paris Agreement, Draft Decision/CP-21. December 12. (PDF)
6. Mooney, Chris. 2016. The Government Just Decided the Future of California's Desert, and Solar Companies Aren't Happy. September 14. (PDF)
7. The National Academies. 2010. Chapter 5, Environmental Impacts of Renewable Electricity Generation. *Electricity from Renewable Resources: Status, Prospects, and Impediments*. Washington, DC: The National Academies Press: 202-228. http://www.nap.edu/openbook.php?record_id=12619&page=195#p2001a9a59970195001
8. American Public Health Association. 2018. *The Public Health Impact of Energy Policy in the United States*. November 13. (7 pages) https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2019/01/28/public-health-impact-of-energy-policy

Optional

1. ** Berkhout, Frans. 2002. Technological regimes, path dependency and the environment. *Global Environmental Change* 12, no. 1 (4): 1-4.

2. Schaul, Jordon Carlton. 2013. The Impact of Energy Development on the Environment: A Look at Wildlife with Dr. Michael Hutchins. National Geographic. October 7. http://newswatch.nationalgeographic.com/2013/10/07/the-impact-of-energy-development-on-the-environment-a-look-at-wildlife-with-dr-michael-hutchins/

3. United Nations Environment Programme. 2006. The Energy and Air Pollution Challenge. http://www.unep.org/training/programmes/Instructor%20Version/Part_2/Activities/Innovations_and_Technology/Energy/Supplemental/Energy_and_Air_Pollution_Challenge.pdf

Week 3: Economics

Session overview: Why do economics matter, and what tools are used to shape energy policy? We'll discuss supply and demand side energy economics, regulations and incentives, and reasons to choose one option over another.

ASSIGNMENT DUE (by midnight): Via email or orally in class, please provide the city, county, state or country you plan to research for your semester project.

Readings and Reading Questions:

432 Questions: 1) What types of incentives are carrots (positive/reward incentives), and which are sticks (negative/punitive incentives)? 2) Why choose carrots vs. sticks,, and what are the effectiveness, benefits and challenges of each? 3) How do different stakeholders prioritize economics?

533 Questions: 1) Why choose carrots (positive/reward incentives) vs. sticks (negative/punitive incentives), and what are the effectiveness, benefits and challenges of each? 2) How do different stakeholders' economics priorities create conflicts or synergies that energy policies can address? 3) How is India's environment for electricity restructuring different from that of the U.S.?

Required

1. Bradford texbook, p. 197-219: Grid Economics.

2. Energy Information Administration. 2013. Feed-in tariff: A policy tool encouraging deployment of renewable electricity technologies. Today in Energy. May 30. https://www.eia.gov/todayinenergy/detail.cfm?id=11471

3. Walls, Margaret. December 2012. *Policies to Encourage Home Energy Efficiency Improvements: Comparing Loans, Subsidies and Standards.* Introduction and concluding remarks, p. 1-4 and 27-29. (The rest of the paper is optional reading.)

4. Kaufman, Noah. 2016. Carbon Tax vs. Cap-and-Trade: What's a Better Policy to Cut Emissions? World Resources Institute. March 1. http://www.wri.org/blog/2016/03/carbon-tax-vs-cap-and-trade-what's-better-policy-cut-emissions

5. Net Metering: What Is It and Why Does It Matter? http://www.govtech.com/fs/Net-Metering-What-Is-It-and-Why-Does-It-Matter.html

6. 2019. The 2019 U.S. Energy and Employment Report: A Joint Project of NASEO and EFI. **Read p. ii-iv, Preface (xv-xvi), and Summary (2-7).**

7. Trabish, Herman K. 2019. 3 state commissions upending the way utilities do business. *Utility Dive.* October 2.

8. Government of the United States. Department of Energy. Property Assessed Clean Energy Programs. https://www.energy.gov/eere/slsc/property-assessed-clean-energy-programs

9. Power Purchase Agreements. GlobalRenewableHub. https://globalrenewablehub.com/renewable-buyers-guide/ppas

Optional:

** Cropper, Maureen, Alexander Limonov, Kabir Malik, and Anoop Singh. February 2012. *Estimating the Impact of Restructuring on Electricity Generation Efficiency: The Case of the Indian Thermal Power Sector.* Introduction, Institutional Background, and Conclusions. P. 1-6 and 19-20.

** Morris, Adele. 2012. Clean Energy: Policy and Priorities. The Brookings Institution. http://www.brookings.edu/research/papers/2012/01/clean-energy-morris

Pacific Northwest National Laboratory. 2002. Utilities, Deregulation and Restructuring of U.S. Electricity Markets. http://www.purdue.edu/discoverypark/energy/assets/pdfs/History.pdf

Borenstein, Severin and James Bushnell. 2000. Electricity Restructuring: Deregulation or Reregulation? *Regulation*, vol. 23, no. 2. 46-52. http://www.ucei.berkeley.edu/ucei/bushnell/cato.pdf

II. HOW energy policies are decided: politics and process

Week 4: Politics

Session overview: How do politics influence energy policy? We'll discuss the roles of local interests, government relationships with the private sector and public, and intragovernmental and intergovernmental dynamics.

Readings and Reading Questions:

432 and 533 Questions: 1) How do politics influence prospects for energy transitions? 2) How do different stakeholders influence energy policy? 3) How can politics influence the roles of science and the 3Es in energy policymaking?

Required

1. Geri, Laurance and David McNabb. 2011. *Energy Policy in the U.S.: Politics, Challenges, and Prospects for Change*. CRC Press. P. 84-98.

2. Hess, David J. 2013. Sustainability transitions: A political coalition perspective. *Research Policy*. November. http://dx.doi.org/10.1016/j.respol.2013.10.008

3. Tucker, Aviezer. 2013. The New Power Map-World Politics after the Boom in Unconventional Energy. *Foreign Affairs*. January.

4. Daly, Matthew. 2016. EPA Fracking Report Offers Few Answers on Drinking Water. *U.S. News and World Report*. December 13.

5. Pyper, Julia. 2017. Large Corporations Are Driving America's Renewable Energy Boom. And They're Just Getting Started. *GreenTech Media*. January 10.

6. Marshall, Christa, and Sean Reilly. 2018. Scientists report political meddling, self-censorship. *E&E News*. August 14.

Optional:

Laird, Frank N. 2013. Against Transitions? Uncovering Conflicts in Changing Energy Systems. *Science as Culture*, 22:2: 149-156.

Week 5: Process

Session Overview: How does the energy policy process work at different levels and in different nations? What are the roles of the government, public and private sector?

ASSIGNMENT DUE (Thursday by midnight): Energy profile of the country, state or city and a list of criteria for choosing the best energy portfolio, as well as a list of references.

Readings and Reading Questions:

432 Questions: 1) What kinds of stakeholders play a role in the energy policymaking process? 2) How do politics and the policymaking process interact to affect energy system transitions?

533 Questions: 1) How does the U.S. energy policymaking process empower or disempower stakeholder groups' input of their priorities? 2) How do politics and the policymaking process interact to affect energy system transitions at different scales (e.g., local, state, regional, national)?

Required:

1. Bipartisan Policy Center. 2012. The Executive Branch and National Energy Policy: Time for Renewal. http://bipartisanpolicy.org/sites/default/files/BPC_Governance_Report_0.pdf

2. Kaufmann, John. 2010. CITIES, TOWNS, AND SUBURBS: Local Government in a Time of Peak Oil and Climate Change. *The Post Carbon Reader*.

3. Federal Energy Regulatory Commission. 2013. History of FERC. http://www.ferc.gov/students/ferc/history.asp

4. 15 State Attorneys General. 2016. Letter to President-Elect Trump regarding the Clean Power Plan. December 28. http://www.eenews.net/assets/2017/01/03/document_gw_03.pdf

5. Greshko, Michael, Laura Parker, Brian Clark Howard, Daniel Stone, Alejandra Borunda, and Sarah Gibbens. 2019. A running list of how President Trump is changing environmental policy. *National Geographic*. May 3. Skim p. 1-9.

6. Cama, Timothy. 2017. Regulators to consider changing gas pipeline approval policy. *The Hill*. December 21.

7. Cain, Andrew. 2018. FERC orders temporary halt to construction on Atlantic Coast Pipeline. *Richmond Times-Dispatch*. August 10.

8. Read the description of public comment process on Virginia's Energy Plan update: http://townhall.virginia.gov/L/comments.cfm?GeneralNoticeid=856. If interested, choose a few comments to read. Also read the description of VA's public comment process: http://townhall.virginia.gov/UM/forums.cfm

Optional:

1. Kemp, Rene. 1994. Technology and the Transition to Environmental Sustainability: The Problem of Technological Regime Shifts. *Futures* 26: 1023-1046.

2. Lucas, Nigel. 1985. *Western European Energy Policies: A Comparative Study of the Influence of Institutional Structures on Technical Change*. Oxford University Press, USA, June 13.

3. Pyper, Julia. 2018. Trade Agency to Accept 'Requests for Exclusion' From New Solar Tariffs. *Greentech Media*. January 24.

4. Truffer, Bernhard, Harald Rohracher, and Jochen Markard. "The Analysis of Institutions in Technological Innovation Systems - A Conceptual Framework Applied to Biogas Development in Austria." Paper presented at the DRUID Summer Conference. Copenhagen, Denmark. June 16-20, 2009.

III. WHAT factors affect demand

Week 6: Conservation and Efficiency

Session Overview: How do energy policies incorporate conservation and efficiency policies, and how can they impact energy supply policy decisions?

Readings and Reading Questions:

432 Questions: 1) What challenges do conservation and efficiency policies face? 2) Why would stakeholders support or oppose conservation and efficiency policies? 3) Are the state and country rankings for energy efficiency surprising, and what factors might affect states' or nations' abilities to improve energy efficiency?

533 Questions: 1) What challenges do conservation and efficiency policies face? 2) Why would stakeholders support or oppose conservation and efficiency policies? 3) Are the state and country rankings for energy efficiency surprising, and what factors might affect states' or nations' abilities to improve energy efficiency? 4) How might the rebound effect influence energy efficiency policies?

Required:

1. Bradford textbook, p. 884-915, from "4. Improving Industrial Thermal Energy".
2. McKinsey & Company. 2009. Executive Summary. *Unlocking Energy Efficiency in the U.S. Economy*. P. 1-14.
3. Fitzpatrick, Michael. "Japan's green energy evolution." CNNMoney. September 23, 2013: http://tech.fortune.cnn.com/2013/09/23/japan-energy/

4. Brown, Hillary. 2010. CITIES, TOWNS, AND SUBURBS: Toward Zero-Carbon Buildings. *The Post Carbon Reader.*

5. Natural Resources Defense Council. 2018. Trump Administration Energy Efficiency Delay Ruled Illegal. February 16. https://www.nrdc.org/experts/nrdc/trump-administration-energy-efficiency-delay-ruled-illegal

6. Perry, Mitch. 2019. Florida doesn't need energy efficiency goals anymore, utilities claim. *Florida Phoenix*. August 20, https://www.floridaphoenix.com/2019/08/20/florida-doesnt-need-energy-efficiency-goals-anymore-utilities-claim/

7. ACEEE. 2019. The 2019 State Energy Efficiency Scorecard. **Read pages vi-xi.** (PDF)

8. ACEEE. 2018. The 2018 International Energy Efficiency Scorecard. Read pages iii-iv and 11. (PDF)

Optional:

1. ** Gillingham, Kenneth and Rapson, David and Wagner, Gernot, 2015. The Rebound Effect and Energy Efficiency Policy. FEEM Working Paper No. 107. **Skim for understanding of the main ideas and arguments.**

2. Dixon, Robert K., Elizabeth McGowan, Ganna Onysko, Richard M. Scheer. 2010. US Energy Conservation and Efficiency Policies: Challenges and Opportunities. *Energy Policy* 38: 6398–6408.

3. Eusterfeldhaus, Marcel and Barry Barton. 2011. Energy Efficiency: A Comparative Analysis of the New Zealand Legal Framework. *Journal of Energy & Natural Resources Law* 29(4):431-470. https://www.researchgate.net/publication/279167137_Energy_Efficiency_A_Comparative_Analysis_of_the_New_Zealand_Legal_Framework

4. Gillingham, Kenneth, Richard G. Newell, and Karen Palmer. 2009. *Energy Efficiency Economics and Policy*. Resources for the Future.

IV. WHAT energy sources are currently available: Supply

Week 7: Fossil Fuels I: Oil and Natural Gas

Session Overview: How are oil and natural gas policies different in producing and importing countries? How have trends changed over time, and what role do the 3Es play?

Readings and Reading Questions:

432 Questions: 1) Which of the 3E's are national and local government and stakeholders prioritizing, and how do the 3P's impact oil and gas policies? 2) Do oil and gas policies cause conflicts among the 3 E's?

533 Questions: 1) How are the 3Es of oil and gas exploration, production, transport and end use represented in politics and process? 2) How do oil and gas policies cause conflicts or synergies among the 3 E's?

Required:

1. Bradford textbook, p. 268-284.

2. Simon, Darran, and Eliott McLaughlin. 2017. Keystone and Dakota Access pipelines: How did we get here? *CNN.* January 25. http://www.cnn.com/2017/01/24/us/dapl-keystone-pipeline-environment-protesters-trump-order/

3. Energy Information Administration. 2018. Natural Gas Explained: Where Our Natural Gas Comes From. December 3. https://www.eia.gov/energyexplained/index.php?page=natural_gas_where

4. Griswold, Eliza. 2011. The Fracturing of Pennsylvania. *The New York Times*. November 17. http://www.nytimes.com/2011/11/20/magazine/fracking-amwell-township.html?pagewanted=all&_r=0

5. Norse, Elliott A. and John Amos. 2010. Impacts, Perception, and Policy Implications of the BP/Deepwater Horizon Oil and Gas Disaster. *Environmental Law Reporter* 40 (11): 11058–11073. November. http://mcbi.marine-conservation.org/publications/pub_pdfs/Norse-and-Amos-2010.pdf

6. Atlantic Coast Pipeline. https://atlanticcoastpipeline.com **Read the Project Overview, Construction, and Environmental Protection pages.**

7. Twitmyer, Jane. 2017. Conflicts of interest pile up on the Atlantic Coast Pipeline project. *The Washington Post.* July 3. https://www.washingtonpost.com/opinions/conflicts-of-interest-pile-up-on-the-atlantic-coast-pipeline-project/2017/07/03/308e7b34-5ff8-11e7-80a2-8c226031ac3f_story.html?utm_term=.ab4f051f9bef

8. King, Pamela. 2019. Pipeline backers set stage for Appalachian Trail fight. *E&E News*. June 26. https://www.eenews.net/stories/1060656847

Optional:

1. ** Government of the United States. Federal Energy Regulatory Commission. 2017. Commissioner Cheryl A. LaFleur Statement: Order Issuing Certificates and Granting Abandonment Authority. October 13. https://www.ferc.gov/media/statements-speeches/lafleur/2017/10-13-17-lafleur.asp#.W3xeqy-ZPOT

2. ** Krupnik, Alan. June 2013. Managing the Risks of Shale Gas: Key Findings and Further Research. Resources for the Future. http://www.rff.org/RFF/Documents/RFF-Rpt-ManagingRisksofShaleGas-KeyFindings.pdf

3. ** Parfomak, P. W., Pirog, R., Luther, L., & Vann, A. 2013. *Keystone XL pipeline project: Key issues*. Washington, DC: Congressional Research Service.

4. Schroeck, Nicholas J. and Karisny, Stephanie. 2013. Hydraulic Fracturing and Water Resource Management in the Great Lakes. Case Western Reserve Law Review, Vol. 63, No. 4. Available at SSRN: http://ssrn.com/abstract=2343576 (21 pages)

5. Jacoby, H. D., F. M. O'Sullivan, et al. 2012. "The Influence of Shale Gas on U.S. Energy and Environmental Policy." (PDF - 1.2MB) *Economics of Energy & Environmental Policy* 1, no. 1: 37–51.

Week 8: Fossil Fuels II: Coal

Session Overview: How are coal policies different in producing and importing states and countries? How have trends changed over time, and what role do the 3Es play?

Readings and Reading Questions:

432 Questions: 1) Which of the 3E's are national and local government and stakeholders prioritizing, and how do the 3P's impact coal policies? 2) What challenges do coal technologies face?

533 Questions: 1) What 3Es/Ps conflicts emerge from coal policies across different groups at local, national and international scales? 2) How have the challenges and solutions to coal use changed over time?

Required:

1. Bradford textbook, p. 234-268.

2. Old King Coal. *The Economist*, February 25, 2012.

3. Coal in the Rich World-the Mixed Fortunes of a Fuel. 2013. *The Economist*, January 5.

4. Leistikow, Dan. 2013. A Potential Path to Emissions-Free Fossil Energy. August 20. http://energy.gov/articles/potential-path-emissions-free-fossil-energy

5. International Energy Agency. 2013. IEA *Technology Roadmap for CCS*. **Read pages 5-6.** https://www.iea.org/publications/freepublications/publication/TechnologyRoadmapCarbonCaptureandStorage.pdf

6. Biello, David. 2014. Can Carbon Capture Technology Be Part of the Climate Solution? Environment360. September 8. http://e360.yale.edu/feature/can_carbon_capture_technology_be_part_of_the_climate_solution/2800/

7. U.S. Department of Energy. Coal. http://energy.gov/coal

8. U.S. Department of Energy. Clean Coal Research. https://energy.gov/fe/science-innovation/clean-coal-research

9. International Energy Agency. 2016. 20 Years of Carbon Capture and Storage: Accelerating Future Deployment. **Read Executive Summary on pages 9-13.** https://www.iea.org/publications/freepublications/publication/20YearsofCarbonCaptureandStorage_WEB.pdf

10. DiChristopher, Tom. 2017. Trump's biggest obstacle in pushing clean coal could be his own White House. CNBC.com. March 10. https://www.cnbc.com/2017/03/10/trumps-biggest-obstacle-in-pushing-clean-coal-his-own-white-house.html

Optional:

1. Anderson, Soren, and Richard Newell. 2004. Prospects for Carbon Capture and Storage Technologies, *Annual Review of Environmental Resources* 29: 109-142. (PDF)

2. **Intergovernmental Panel on Climate Change. 2005. IPCC Special Report: Carbon Dioxide Capture and Storage**,** Summary for Policymakers, a Special Report of Working Group III of the Intergovernmental Panel on Climate Change Montreal, Canada: September 22-24. http://www.ipcc.ch/pdf/special-reports/srccs/srccs_summaryforpolicymakers.pdf

3. **Mann, Charles C. 2014. Renewables Aren't Enough. Clean Coal Is the Future. *Science*. March 25. http://www.wired.com/2014/03/clean-coal/

4. van der Zwaan, Bob and Jennie C. Stephens. 2008. Co2 Capture and Storage (Ccs): Exploring the Research, Development, Demonstration, and Deployment Continuum. http://belfercenter.ksg.harvard.edu/files/stephensandvanderzwaan200508.pdf

Week 9: Nuclear Power

Session Overview: How have nuclear power policies changed since the TMI, Chernobyl, and Fukushima accidents? What role do the 3Es play?

ASSIGNMENT DUE (Thursday by midnight): Roadmap to get to your ideal portfolio, challenges facing it, and a list of references.

Readings and Reading Questions:

432 Questions: 1) Which of the 3E's are national and local government and stakeholders prioritizing, and how do the 3P's impact nuclear policies? 2) Do nuclear policies cause conflicts among the 3 E's? 3) What challenges do nuclear technologies face?

533 Questions: 1) How do the 3Es and 3Ps differ for nuclear power compared to other energy technologies? 2) How does the uranium mining study reflect the 3Es and 3Ps? 3) How have challenges and solutions to nuclear technology use changed over time?

Required:

1. Bradford textbook, p. 288 and 312-336.
2. Mycle Schneider, Antony Froggatt et al. 2019. *World Nuclear Industry Status Report 2019*. Key Insights and Executive Summary. P. 15-28. https://www.worldnuclearreport.org/IMG/pdf/wnisr2019-v2-hr.pdf
3. U.S. Department of Energy. Small Modular Reactors (SMRs). http://www.energy.gov/ne/nuclear-reactor-technologies/small-modular-nuclear-reactors
4. U.S. Department of Energy. Benefits of Small Modular Reactors http://www.energy.gov/ne/benefits-small-modular-reactors-smrs
5. Gold, Russell and Cassandra Sweet. 2017. Nuclear Plants Fall Victim to Economic Pressures. *The Wall Street Journal.* January 9. http://www.wsj.com/amp/articles/nuclear-plants-fall-victim-to-economic-pressures-1483957802
6. World Nuclear Association. Nuclear Fusion Power. Updated December 20, 2016. http://www.world-nuclear.org/information-library/current-and-future-generation/nuclear-fusion-power.aspx
7. Pyper, Julia. 2017. How the US Nuclear Debate Transcends Traditional Party Lines. *GreenTech Media*. August 27. https://www.greentechmedia.com/articles/read/nuclear-us-debate-transcends-party-lines

Optional:

1. ** The National Academies. *Uranium Mining in Virginia: Scientific, Technical, Environmental, Human Health and Safety, and Regulatory Aspects of Uranium Mining and Processing in Virginia* . Washington, DC: The National Academies Press, 2012. Summary and Non-technical Summary. p. 1-27. http://www.nap.edu/openbook.php?record_id=13266&page=1

2. ** Cho, Adrian. 2019. Smaller, safer, cheaper: One company aims to reinvent the nuclear reactor and save a warming planet. ScienceMag.org. AAAS. February 21. https://www.sciencemag.org/news/2019/02/smaller-safer-cheaper-one-company-aims-reinvent-nuclear-reactor-and-save-warming-planet

3. Nuclear Accident Independent Investigation Commission. The Official Report of the Fukushima Nuclear Accident Independent Investigation Commission. 9-23. http://www.nirs.org/fukushima/naiic_report.pdf

Week 10: Alternative Fuels: Solar/Wind Readings Discussion & Site Visit to Mason's Hydropower Micro-turbine Installation

Session Overview: How have solar and wind policies affected expansion of these technologies, and what challenges do they face? What role do the 3Es play?

Readings and Reading Questions:

432 Questions: 1) Which of the 3E's are the U.S. and Germany prioritizing, and how do the 3P's impact our solar and wind power policies? 2) Do solar and wind policies cause conflicts among the 3Es? 3) What challenges do these technologies face?

533 Questions: 1) What 3Ps factors have influenced German and U.S. renewables policies? 2) What 3Es/Ps challenges does the New York legislation address? 3) How have renewables policies and challenges differed across the U.S., North Africa and China?

Required:

1. Bradford textbook, p. 350-391.

2. Stefes, Christoph, and Frank N. Laird. 2010. Creating Path Dependency: The Divergence of German and U.S. Renewable Energy Policy. *SSRN eLibrary* August 28. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1667615.

3. Mai, T.; Sandor, D.; Wiser, R.; Schneider, T. 2012. Renewable Electricity Futures Study: Executive Summary. NREL/TP-6A20-52409-ES. Golden, CO: National Renewable Energy Laboratory. Conclusions, p. 30-31. http://www.nrel.gov/analysis/re_futures/

4. Interstate Renewable Energy Council. 2017. *Charging Ahead: An Energy Storage Guide for State Policymaker*s. Executive Summary. *April 19.*

5. Trabish, Herman. 2017. Prognosis negative: How California is dealing with below-zero power market prices. Utility Dive. May 11. http://www.utilitydive.com/news/prognosis-negative-how-california-is-dealing-with-below-zero-power-market/442130/

6. Union of Concerned Scientists. 2017. Barriers to Renewable Energy Technologies. December 20. https://www.ucsusa.org/clean-energy/renewable-energy/barriers-to-renewable-energy#.W3x09C-ZPOQ

Optional:

1. Policy Blueprint for a Renewable Energy Future: America's Power Plan, September 23, 2013. http://www.onlinetes.com/policy-blueprint-for-renewable-energy-future-hot-topic-92313.aspx

2. ** Komendantova, Nadejda, Anthony Patt, Lucile Barras, and Antonella Battaglini. 2012. Perception of risks in renewable energy projects: The case of concentrated solar power in North Africa. *Energy Policy*, vol. 40: 103-109.

3. **Zhang, Sufang, Philip Andrews-Speed, and Xiaoli Zhao. 2013. Political and institutional analysis of the successes and failures of China's wind power policy. *Energy Policy*, vol. 56: 331-340.

4. Foxon, T. J., R. Gross, A. Chase, J. Howes, A. Arnall, and D. Anderson. 2005. UK innovation systems for new and renewable energy technologies: drivers, barriers and systems failures. *Energy Policy* 33, no. 16: 2123-2137.

5. Lewis, J. I. 2007. Technology Acquisition and Innovation in the Developing World: Wind Turbine Development in China and India. *Studies in comparative international development* 42: 208-232.

Week 11: Alternative Fuels Lecture & Discussion of Readings on Hydro, Biomass, Geothermal, Tidal, CHP, Waste-to-Energy, etc.

Session Overview: How have hydro, biomass, geothermal, CHP and waste-to-heat policies affected expansion of these technologies, and what challenges do they face? What role do the 3Es play in alternative energy technology use?

Readings and Reading Questions:

432 Questions: 1) Which of the 3E's are national and local government and stakeholders prioritizing, and how do the 3P's how do the 3P's impact hydro, biomass, geothermal, tidal and other renewables policies? 2) Do these policies cause conflicts among the 3 E's? 3) What challenges do these technologies face?

533 Questions: 1) How can renewables policies address the range of challenges and benefits presented by different technologies? 2) How have challenges to renewables technologies changed over time?

Required:

1. Bradford textbook, p. 289-312 (hydropower), p. 274 b) and 574-575 (CHP), and p. 391-413 (biomass/biogas, geothermal, ocean energy).

2. International Energy Agency. 2019. Tracking Power: Hydropower. https://www.iea.org/reports/tracking-power-2019/hydropower

3. U.S. Environmental Protection Agency. RE-Powering America's Land: Siting Renewable Energy on Potentially Contaminated Land, Landfills and Mine Sites. https://www.epa.gov/re-powering

4. Johnson, Scott. 2019. THERE'S HEAT IN THEM THAR HILLS — US report finds sky is the limit for geothermal energy beneath us. ars technica. June 11. https://arstechnica.com/science/2019/06/report-geothermal-could-power-up-to-16-of-us-grid-by-2050/

5. Jones, Nicola. 2018. Waste Heat: Innovators Turn to an Overlooked Renewable Resource. May 29. https://e360.yale.edu/features/waste-heat-innovators-turn-to-an-overlooked-renewable-resource

6. Greentumble. 2018. Waste Incineration Advantages and Disadvantages. August 2. https://greentumble.com/waste-incineration-advantages-and-disadvantages/

7. Conca, James. 2017. Tidal Energy -- All Renewables Are Not Created Equal. *Forbes*. July 27. https://www.forbes.com/sites/jamesconca/2017/07/27/tidal-energy-all-renewables-are-not-created-equal/#74998c2c4f4e

Optional:

1. Caputo, Jesse. 2009. *Sustainable Forest Biomass: Promoting Renewable Energy and Forest Stewardship.* Environmental and Energy Study Institute.
http://www.eesi.org/070609_sustainableforestbiomass

2. ** International Energy Agency. 2019. Overview: *Renewables 2019 Market Analysis and Forecast from 2019 to 2024.* October. **https://www.iea.org/reports/renewables-2019#**

3. ** Doris, Elizabeth, Claire Kreycik, and Katherine Young. 2009. *Policy Overview and Options for Maximizing the Role of Policy in Geothermal Electricity Development*. National Renewable Energy Laboratory. **Read pages 1-3 and conclusions. Skim other pages of interest.**
http://www1.eere.energy.gov/geothermal/pdfs/policy_overview.pdf

4. U.S. Department of Energy. 2014. Energy Dept. Report Finds Major Potential to Grow Clean, Sustainable U.S. Hydropower. http://energy.gov/articles/energy-dept-report-finds-major-potential-grow-clean-sustainable-us-hydropower

5. ACEEE. Combined Heat and Power (CHP). https://aceee.org/topics/combined-heat-and-power-chp

Week 12: Transportation

Session Overview: How has transportation policy changed over time in response to the 3 Es?

ASSIGNMENT DUE (Thursday by midnight): Analyze how the 3Ps and 3Es apply to the country's, state's, or city's energy system, and how they addressed/could address challenges to achieve change.

Readings and Reading Questions:

432 Questions: 1) What challenges do clean transport policies face? 2) What can make these policies appealing to various stakeholder groups? 3) How do the 3 Es affect these policies?

533 Questions: 1) Are the current solutions to clean transport challenges effectively addressing the challenges? 2) How do the challenges to clean transport differ across communities and nations? 3) What role do/should clean transport policies play in the broader context of the 3Es of energy systems?

Required:

1. Bradford textbook, p. 618-666.

2. Jenn, Alan, Katalin Springel, and Anand R. Gopal. 2018. Effectiveness of electric vehicle incentives in the United States. *Energy Policy* 1 (19): 349-356.

3. Government of the United States, Department of Transportation. 2018. Notice of Proposed Rulemaking: The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks. August 1. **Read p. 1-2 and skim pages 3-33 for main themes.**

4. Mock, Peter, and Zifei Yang. 2014. Driving Electrification: A Global Comparison of Fiscal Incentive Policy for Electric Vehicles. White Paper for the International Council on Clean Transportation. May. **Read the Executive Summary; the rest is optional.**

Optional:

1. ** Rajan, S.C. 2006. Climate Change Dilemma: Technology, Social Change, or Both? An Examination of Long-Term Transport Policy Choices in the United States, *Energy Policy* 34: 664–679.

2. Ramjerdi, Faridah, and Karin Brundell-Freij. 2008. The dynamics of the market for alternative fuel vehicles: The Swedish case study presented at the MistraTransport.

3. Lovins, Amory. 1976. Energy Strategy: The Road Not Taken, October*, Foreign Affairs,* pp 65-96.

4. Diamond, David. 2008. Impact of High Occupancy Vehicle (HOV) Lane Incentives for Hybrids in Virginia. *Journal of Public Transportation,* Vol. 11, No. 4: 39-58.

5. Greene, David. 1998. Why CAFÉ Worked. *Energy Policy* Vol 26, Issue 8: 595-613. (PDF)

6. Sharp, Philip. 2006. Testimony on CAFÉ Program Reforms, House Committee on Energy and Commerce, May 3, 2006. (PDF)

V. WHERE energy policy is heading

Week 13: The roles of innovation and resilience

Session Overview: What roles do innovation and resilience in energy policy? How do they interact with the 3Es and 3 Ps?

Readings and Reading Questions:

432 Questions: 1) What role can innovation play in meeting the 3Es? 2) How do the 3 Ps help or hinder innovation? 3) What roles do various stakeholders play in innovation, and what role should policies play in promoting it?

533 Questions: 1) How do innovation and resilience relate to one another in the context of energy systems? 2) How do the 3 Ps help or hinder innovation? 3) What role should governments, private sector and consumers play in innovation on energy technologies, and should this differ across nations?

Required:

1. John Holdren, 2006, The Energy Innovation Imperative, *Innovations,* spring, 3-23.

2. Rees, William. 2010. The Post Carbon Reader Series: Foundation Concepts: Thinking "Resilience." http://www.postcarbon.org/Reader/PCReader-Rees-Foundation.pdf

3. Skea, Jim. 2014. The Renaissance of Energy Innovation. *Energy and Environmental Science*, Issue 1: 21-24.

4. Smith, Lamar. 2017. Opening Statement, Hearing on Energy Technology Innovation. Committee on Science, Space and Technology, U.S. House of Representatives. July 19.

5. World Economic Forum. 2018. White Paper: Accelerating Sustainable Energy Innovation. http://www3.weforum.org/docs/Accelerating_sustainable_energy_innovation_2018.pdf

Optional

Osofsky, Hari M. 2014. Envisioning Legal and Policy Pathways for Energy Innovation Symposium: Introduction. *Minnesota Journal of Law, Science and Technology*. Vol. 15, No. 1: 287-291.

Week 14: Student presentations

Week 15: Student presentations