PA 567
Energy Resources: Policy & Administration

Official Course Description
Reviews the history, politics, and institutions related to current energy policy and administration with particular attention to the Pacific Northwest and development of hydroelectric power. National energy policy history is reviewed including political, financial, and environmental problems. Explores the roles of interest groups; state, local, national, and international governments; and regional governing institutions. It explores the changing distribution of social costs and benefits as both a cause and result of policy change. Passage of the 1980 Northwest Power Act, the Northwest Power Planning Council created in the act, and the implementation of the act will be studied, as will current issues like energy conservation, regional power planning, deregulation and the status of institutions involved in energy policy, and Columbia basin fish and wildlife conservation.


Figure 1: Source www.Hopeforthehills.org

Background
Energy drove the industrial revolution and is driving the post-industrial revolution as well. Call centers, mobile phones, and quantum computers all share the need for reliable energy supplies. When combined, the transportation, building, and industrial energy industries create, by far, the largest economic sector in the world. Because of its socio-economic importance, as well as its substantial environmental footprint, the energy industry is heavily regulated.

Against this backdrop, the electricity sector is undergoing especially turbulent times as traditional business models are being altered due to renewable energy targets, climate change legislation, as well as energy efficiency and distributed generation requirements. Utilities are being required to deliver renewable electricity to their customers, but transporting the renewable electricity from rural to urban areas is increasingly difficult due to citizen and environmental opposition to new power lines. The Northwest electricity sector includes federal hydropower suppliers with large impacts on regional market development. With rapid decarbonization policies being promulgated that typically entail fuel switching from natural gas to renewable electricity technologies, natural gas suppliers' historical business models are also under flex.

PA 567 provides social science theories and analytical tools to help graduate students and energy sector professional navigate the complexities of the energy sector. The course is broken down into two primary modules. Module one prepares students to perform analyses of energy sector projects as well as the regulatory system overlaying the energy sector. The learning objective for module one also includes energy analysis in MS Excel to make students competitive for energy sector employment and academic research. Module two applies the skills learned in the first module to a range of energy policy topics relevant to the Western US. The policy and history of energy policy in the Western US is included throughout the course. This course is recommended as a pre-requisite for PA 573 Smart Grid and Sustainable Communities.

Course Information

Time: **Tuesdays 6:40-9:20**
Room: FMH B128
CRN: 42909

Instructor

Hal T. Nelson, Ph.D., CFA
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503.725.5190

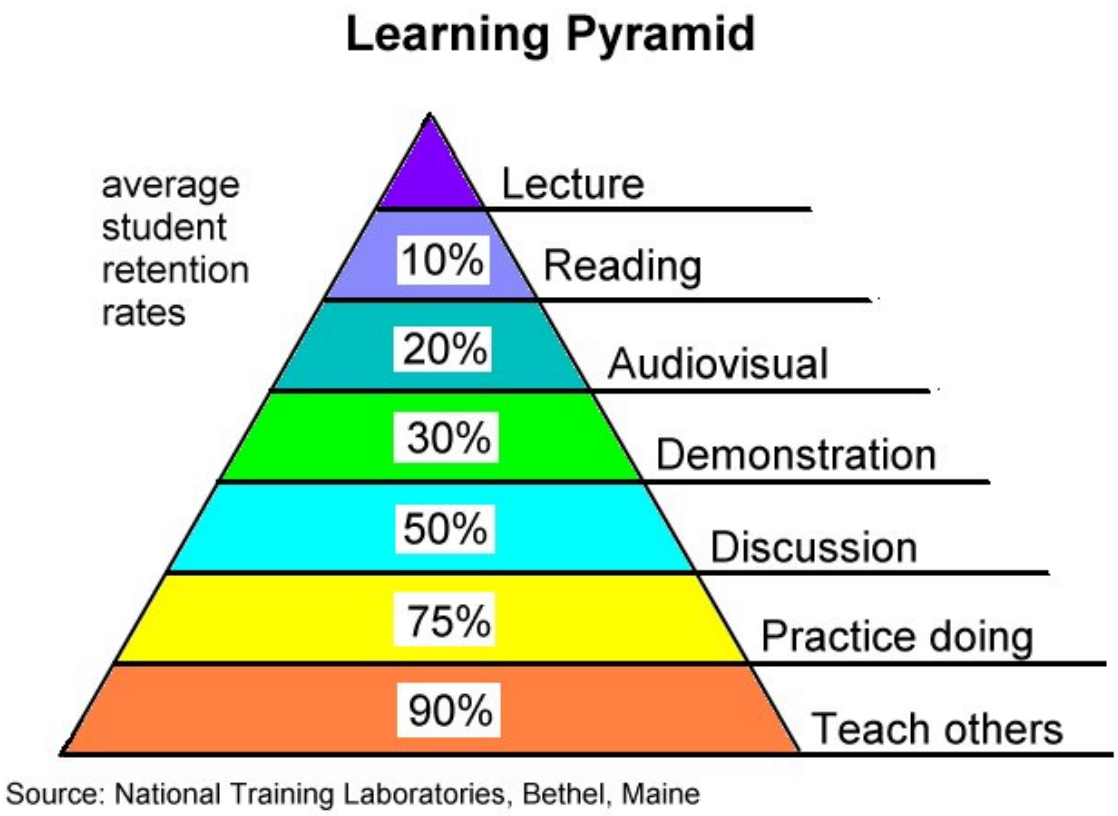
Office Location: URBN 670C
Office Hours: Tuesdays 4:30-5:30 & by appointment (preferred)
The best way to get in touch with me is via email. I will endeavor to respond to email/voice messages within 1+/-1 business day. **Please include PA 567 in the subject line.**

Course Prerequisites

Graduate-level policy process, policy analysis, microeconomics, and statistics courses are suggested.

The Learning Pyramid as a (rough) Heuristic: Average retention rates for material taught using various methods (estimated percentages and ordering of teaching strategies may vary for individuals and the subject matter).[1]

[1] http://www.washingtonpost.com/blogs/answer-sheet/wp/2013/03/06/why-the-learning-pyramid-is-wrong/



Source: National Training Laboratories, Bethel, Maine

Because lectures are the worst means of learning material, I use a mixed bag of pedagogical techniques in the class in order to increase learning rates in a seminar style. Learning by "practice doing" in the form of homework is one pedagogical strategy. Social science theories are incorporated into current energy policy problems to help integrate theory and practice. We also flip the classroom and students are given an opportunity to present their research as well as one of the course readings over the term.

Course Competencies

PSU's Department of Public Administration has developed a list of "key competencies" that students are expected to develop through their various course and experiences at PSU. The following key competencies are supported by this course.

1. Conceptualize, analyze, and develop creative and collaborative solutions to challenge in public policy, leadership and management.
2. Assess challenges and explore solutions to advance cross-sectoral and inter-jurisdictional cooperation in public programs and services.

3. Demonstrate verbal and written communication skills as a professional and through interpersonal interactions in groups and in society.

4. Think critically and self-reflectively about emerging issues concerning public service management and policy.

By the end of this course, students will be able to:

1. Students will develop a knowledge of energy supply and demand basics.
2. Students will understand the socio-political context of energy policy in the Western US.
3. Students will understand how the institutional history of the NW power system impacts current policy proposals and outcomes.
4. Students will understand linkages between energy production and consumption and its environment impacts.
5. Students will be able to perform energy policy analysis using MS Excel
6. Students will gain practice creating socio-economic impact assessments
7. Students will understand the changes to the electricity sector from climate change legislation, distributed renewable energy, as well as conservation policies.
8. Students will learn about energy infrastructure siting dynamics.
9. Students will be able to write a clear and concise policy paper.
10. Students will be able to present research results effectively in a professional setting.

Expectations, Logistics, and Course Policies

- Bring-your-own-device (BYOD): We are attempting to make this course paper-free, and as such, we will view materials electronically during class. If you need additional time to view these materials, then you will need to bring an electronic device that is suitable for viewing documents and PDFs.
- Cell phones and laptops: Please make sure that your cell phone ringer is turned off. If you have an emergency call during class, please be sure to make it outside the classroom. Laptops are viewed as a privilege and can be used for taking notes, but ***students are not to use laptops or cell phones for extra-curricular activities during class.***
    - Please do not surf the web or answer emails during class;
        - Students doing so will be penalized in their course participation component.
- **Ethics: Plagiarism is a no-no and is grounds for failing the class and expulsion from PSU**.
    1. For- credit students must take the quiz located here:
       http://cw.routledge.com/textbooks/bailey/questions.asp?unit=1
       You must take the quiz the first week of courses.
       Upload a PDF of your quiz results to the Activities>Assignments>Quiz:

        - Everyone must score 18/25 or better to pass the quiz.
    - Cite all sources if you are paraphrasing, and use quotation marks if you are quoting. Scientific and Professional Ethics require that the work you do in this course must be your own. Feel free to build on, react to, criticize, and analyze the ideas of others but, when you do, make it known whose ideas you are working with. You must explicitly acknowledge when your work builds on someone else's ideas, including ideas of classmates, professors, and authors you read. If you ever have questions about drawing the line between others' work and your own, ask and I will give you guidance.
    - **Course papers may be required to be submitted through TurnitIn, a plagiarism software platform.**
    - You can collaborate on the homework, but your submitted work should be your own. In many cases in the past, "joint" homework answers have been incorrect. If I suspect copying, I may give unannounced in-class quizzes to test for comprehension of the homework knowledge domains.
- Late work. Late work is accepted, but will result in penalties for tardiness of one full letter grade. This is done for equity reasons to level the playing field for those who manage to turn their work products in on time. Incompletes are not granted except in the case of hardship.
- Attendance. For-Credit students are expected to attend all classes in-person unless not feasible. Students who are unable to attend class must seek permission for an excused absence from me or my teaching assistant. Unapproved absences or late attendance for two or more classes may result in a lower grade for the course. If a student has to miss a class, s/he should arrange to get notes from a fellow student and is strongly encouraged to obtain the missed material.
    - If you observe a religious occasion on the same day as class, please let me know prior to the day of observance.

  Since the course modules will be recorded and available offline students who are not able to attend will be required to view the videos prior to the next week's class.

Accommodations for Students with Disabilities: PSU values diversity and inclusion; we are committed to fostering mutual respect and full participation for all students. My goal is to create a learning environment that is equitable, useable, inclusive, and welcoming. If any aspects of instruction or course design result in barriers to your inclusion or learning, please notify me. The Disability Resource Center (DRC) provides reasonable accommodations for students who encounter barriers in the learning environment. If you have, or think you may have, a disability that may affect your work in this class and feel you need accommodations, contact the Disability Resource Center to schedule an appointment and initiate a conversation about reasonable accommodations. The DRC is located in 116 Smith Memorial Student Union, 503-725-4150, drc@pdx.edu or https://www.pdx.edu/drc
If you already have accommodations, please contact me to make sure that I have received a faculty notification letter and discuss your accommodations.

Please be aware that the accessible tables or chairs in the room should remain available for students who find that standard classroom seating is not useable.

- Mental Health Resources: Graduate school is a context where mental health struggles can be exacerbated. If you find yourself struggling, please ask for help. If you wish to seek out campus resources, here is some basic information about mental health resources at PSU: https://www.pdx.edu/shac/counseling

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Title IX Discrimination and Harassment Policy: As an instructor, one of my responsibilities is to help create a safe learning environment for my students and for the campus as a whole. We expect a culture of professionalism and mutual respect in our department and class. You may report any incident of discrimination or discriminatory harassment, including sexual harassment, to either the Office of Equity and Compliance or the Office of the Dean of Student Life.

- Please be aware that as a faculty member, I have the responsibility to report any instances of sexual harassment, sexual violence and/or other forms of prohibited discrimination. If you would rather share information about sexual harassment or sexual violence to a confidential employee who does not have this reporting responsibility, you can find a list of those individuals. For more information about Title IX, please complete the required student module Creating a Safe Campus in your D2L.

Evaluation: For-Credit Students

1. Each student is required to be the discussion leader (student chat) for one of the scholarly articles (preferred) or book chapters (less preferred) assigned over the term (20%).
   News articles by themselves are not adequate for discussion leaders.
   a. Students can choose from any of the assigned readings over the term
      i. Again, scholarly articles are the preferred subject for discussion leaders.
      The sign up for discussion leaders is here:
      https://docs.google.com/spreadsheets/d/1vwb9aSe6qqH60vZ0dj4tVYSglhvFpvzPlPTNblNNhrY/edit?usp=sharing
      Make sure that your weekly topic is what you think it is in case the schedule has changed.

	PA 567 Student Chat Sign Up Sheet-- Modified 12 Feb			
#	WEEK	Scheduled Topic (Reading Topics #1 and #2)	Student Name	Paper name or speaker integration
1	**7-Jan**	**Introduction of class members and syllabus**	**NA**	**NA**
2	**14-Jan**	**The Institutional Context of NW Energy Policy**	**NA**	**NA**

3	21-Jan	The Electricity and Natural Gas Sectors-Overview		
4	28-Jan	Integrated Resource & Distribution Planning		
5	4-Feb	Energy Efficiency and Demand Response	Margaret Ryan	Behavior Change Programs
6	11-Feb	Energy Economics and Modeling	Matt Kirsch	Transactive Energy
7	18-Feb	Grid Modernization	Parker Mullins	More Than Smart
8	25-Feb	Lower Snake River Management: Dam Breaching	David Mueller	Economic Tradeoffs
9	3-Mar	Carbon and Renewables Policies	Elena San Jose	Community solar
10	10-Mar	Where the Rubber Meets the Road	NA	NA
11	17-Mar	Debate	NA	NA

b. Presentation should be a 15-minute presentation using PowerPoint or handouts followed by student Q&A.
c. Instead of presenting only on one of the readings, I also offer (encourage) you to offer an integration and evaluation of the speaker's material with the readings for that week (or the appropriate week). This is more of a real-time analysis, with less preparation but similarly requires you to "know" the module's reading assignments.
d. If you choose a book chapter, you should need to compare and contrast the chapter with the news article for the week. Other relevant class materials may be brought into the presentation as well.
e. NEW: Great information can be found on energy policy and management in the NW through the local industry newspaper. You need to sign up in the Clearing Up tab Google Sheet with your name and PSU email here: https://docs.google.com/spreadsheets/d/108vCxB2Sluek5ZW2bNuiuin8qPJsh4XC8IxPzS6ZX_I/edit?usp=sharing

2. You are required to compose a group research paper that integrates the course learning objectives into an arena of your choosing (25%).
    a. There will be a paper proposal due in February that will outline the research design and methods assignment (this is worth 1/5 of the research paper grade).
        i. More information on the research paper and proposal will be given out at a later date.

ii. Each member of the group will be graded on the quality of their own unique contribution to the paper. Each group member's effort on the paper will be graded by their peers.
iii. You are expected to be able to write at the graduate level, including concise summaries of policy concepts and results. I may refer you to the writing center: http://www.pdx.edu/writing-center/
iv. Put your ideas for possible paper topics into the google sheet here: https://docs.google.com/spreadsheets/d/108vCxB2Sluek5ZW2bNuiuin8qPJsh4XC8IxPzS6ZX_I/edit?usp=sharing

b. Students are expected to give a short presentation of their research topic the last week of class. This "mini-conference presentation" is a key learning outcome (15%)

3. One Homework assignment (20 %)
   a. The homework will cover material from the text, lectures, as well as the other readings.
4. Finally, in-class participation is critical to the course learning environment (20%). Student evaluation of their participation is based on Instructor evaluation. Participation will be evaluated over the entire term.
   a. You need to upload your current professional bio here: **https://docs.google.com/document/d/1YXvE5NsTV0UOC3ktJPK6Hoz2Jm3rRwizGyCSDQ5hJOw/edit?usp=sharing**

Class Participation evaluation criteria include the following:

Guidelines	
Clarity:	Answering the question with Unambiguous claims (arguments), that are backed with evidence from the readings
Professionalism:	Your writing will reflect "good communication, organized thought, a high standard of grammar and language, carity and conciseness" (Wikipedia: Professional Writing)
Technical Skill:	Superior responses will demonstrate an understanding of the technical components of energy and environmental policy
Overall:	The best responses will compare and contrast assumptions, methodologies, and/or findings of the course readings or relevant outside readings.

- For full credit, students must also keep their class input "on-target" and relevant to the course materials.

Evaluation: Professional Development Participants

- Professional development participants MUST complete the assignment to prepare a one paragraph bio on their history, interests, and future plans/desires.
  - Participants are strongly encouraged to join one of the research paper groups and offer their sage counsel to their peers.

- Participants are also encouraged to bring in relevant news articles / reports to share with the class.
- **The Google Doc to add your bio to is here: https://docs.google.com/document/d/1YXvE5NsTV0UOC3ktJPK6Hoz2Jm3rRwizGyCSDQ5hJOw/edit?usp=sharing**

- NOTE: If you take the class through the professional development option, you will not be able to retroactively have it count towards the Graduate Certificate in Energy Policy and Management. If you think you may want to pursue the certificate, I suggest that you enroll for the class as for-credit.
  - **Here is the link to the Zoom session: https://pdx.zoom.us/j/265147079**

Grading Scale

Your grade will be calculated using the following scale. Grades with plus or minus designations are at my discretion.

Letter Grade	Grade Point	Description	Learning Outcome
A	4.0	Complete mastery of course material and additional insight beyond course material	Insightful
B	3.0	Complete mastery of course material	Proficient
C	2.0	Gaps in mastery of course material; not at level expected by the program	Developing
U	0	Unsatisfactory	Ineffective

Grading Details

Letter Grade	Range	Letter Grade	Range
A	93-100	C+	77-79
A-	90-92	C	73-76
B+	87-89	C-	70-72
B	83-86	Let's talk	<70
B-	80-82		

- Grade Appeals: If you want to appeal a grade that you received on a work product, please submit a short written summary of your argument as well as relevant documentation. Grade change requests will not result in a lower grade being given.

Required Course Readings

All students are **required** to buy the following book:

- Randolph, J., & Masters, G. M. (2018). *Energy for sustainability: technology, planning, policy*. 2nd Ed. Island Press. ISBN 9781610918206

This book is in the PSU bookstore. If you buy it online, be sure to get expedited shipping as we will be using it immediately.

Handouts from other book chapters will be given for the reading assignments. Additional readings are in the Files folder.

In addition to the course text, **other required** journal articles and book chapters will be posted on D2L.

- If something is missing please email me immediately.
- Optimal readings are always coming across my desk. The syllabus may contain TBA (to be announced) when I have yet to find an optimal reading to exhibit the learning goals of the week. Thus, the syllabus should be considered a living document that will change over the course of the term. *The most current version can always be found on D2L and you should consult it before doing the readings each week*.

Recommended Readings

I reserve the right to distribute additional readings as the term progresses. I will usually bring some elements of the recommended readings into the class discussions, so some familiarity with them (i.e. quick scan) on your part will be beneficial to your learning environment.

Important Dates for Graded Students

- Important dates for dropping or changing grading options can be found here:
- Homework: Homework will be due electronically on D2L at 6:40 on the day of class
  - HW#1 due: **25 Feb** at 6:40. There is a video lecture on the HW here: https://media.pdx.edu/media/PA+567+NPV+Lecture+and+HW1/0_x6gccw8p
- Final paper due: **17 March at** 6:40 **pm**
  - Paper Proposal Due: **18 Feb** at 6:40
  - Optional draft paper for comments Due : **10 March** at 6:40
  - Student research presentations: **10 March** at 6:40 pm in-class
- All work products for the class due no later than **17 March at** 6:40 pm

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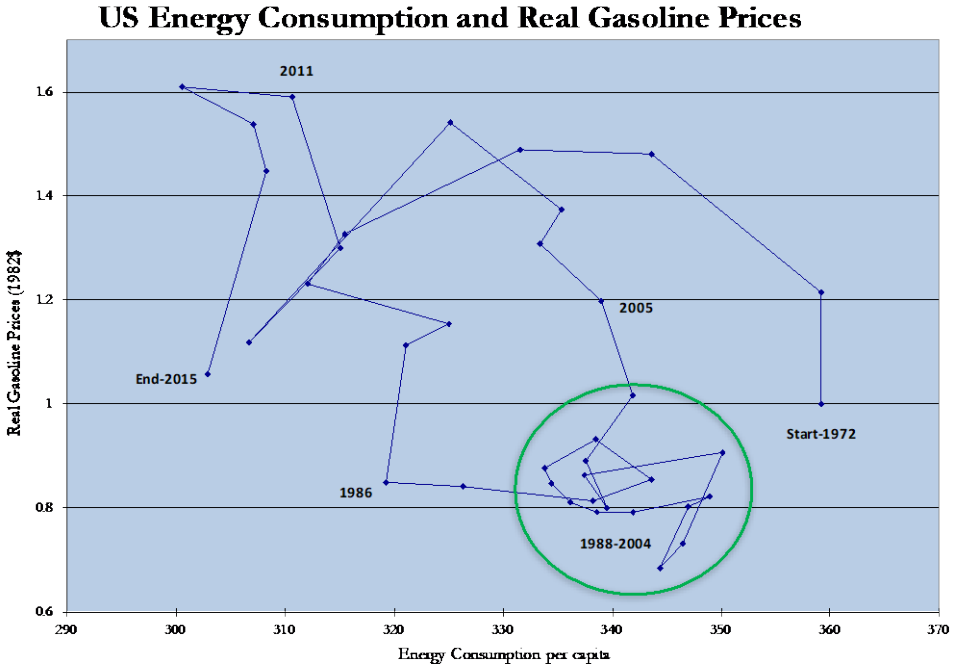
Schedule (Click to see each module's readings)

Week	Date	Placeholder Topic	Speaker	Deliverable
1	7-Jan-20	Introduction of class members and syllabus	Nelson	
2	14-Jan-20	The Institutional Context of NW Energy Policy	Jeff Hammarlund PSU (Confirmed) (until 9:45)	
3	21-Jan-20	The Electricity and Natural Gas Sectors-Overview	Nelson	
4	28-Jan-20	Integrated Resource & Distribution Planning	Seth Wiggins PGE Confirmed	
5	4-Feb-20	Energy Efficiency and Demand Response	Tina Jayaweera NW Council Confirmed	
6	11-Feb-20	Energy Economics and Modeling	Dan Aas E3 Confirmed	
7	18-Feb-20	Grid Modernization	TBD PNNL (or Mark Osborn)	Paper Proposal
8	25-Feb-20	Lower Snake River Management: Dam Breaching	Roger Gray PNCG confirmed Joseph Bogard SOWS Confirmed	HW#1
9	3-Mar-20	Carbon and Renewables Policies	Anna Chittum NWN Confirmed	
10	10-Mar-20	Where the Rubber Meets the Road	Elliot Mainzer BPA (confirmed)	Paper PPT Draft paper (opt)
11	17-Mar-20	Solutions? **Debate**	Andy Macklin PGE (invited) Nelson Students	Final Paper

Course Modules and & Reading Assignments:

Introduction of class members and syllabus
Course Overview
The Importance of Energy
For the first time since president Nixon declared energy "independence" as a policy priority, the gap between US energy production and energy consumption has begun to narrow, due in large part to shale oil and gas production in the U.S.—but also to improving energy efficiency and policy-driven incentives.

Others have described this as a commodity "super-cycle", but this doesn't do justice to the underlying supply and demand dynamics. See the "Cobweb graph" with inflation adjusted gas prices on the Y-axis and per capita energy consumption on the X axis. Start on the right side of the chart in 1972 and work to the left to follow the two big cobweb patterns since 1972.



The Importance of Hydropower in the Northwest

The antithesis of the fossil fuel super-cycle is cheap hydropower. The Northwest enjoys abundant hydro resources, that have (somewhat) stable production costs, but these resources are integrated into a power market that includes the entire Western US, including California.

DISCUSSION QUESTIONS:

1. What do you think causes the relationship between energy and price in the above graph?
2. What effects might this pattern have on investment and consumption decisions, and how might these dynamics it be mitigated (if at all)?

Reference

- Arango, S., & Moxnes, E. (2012). Commodity cycles, a function of market complexity? Extending the cobweb experiment. Journal of Economic Behavior & Organization, 84(1), 321-334.

What Is Distinctive about the Institutional Context for Northwest Energy Policy?
Guest Lecturer: Jeff Hammarlund **(Back to Top)**

- Northwest Power and Conservation Council (2017), *The Value of the Federal Columbia River Power System.* August https://www.nwcouncil.org/media/7491266/2017-7.pdf.
- Northwest Power and Conservation Council (2017*). A Guide to Major Hydropower Dams of the Columbia River Basin.* https://www.nwcouncil.org/ext/storymaps/damguide/index.html

- Northwest Power and Conservation Council. *Council Briefing Book (2019).* Focus especially on Sections 1 (The Northwest Electricity System Background) and 2 (Power Planning). https://www.nwcouncil.org/sites/default/files/2019-2.pdf
- Hammarlund, J. (2002) Oregon's Role as an Energy Innovator: A Historical Perspective. *Oregon's Future Journal*. Spring. Available on D2L. (Note: this is an abbreviated version of the full article that used to be available at Oregon's Future on-line site. The full article, Electricity, Institutions and Innovation: Oregon's Role in the Development of National Electricity Policy, is listed under Additional Recommended Readings and is also available on D2L
- Brunner, J, (2011) The High-Stakes Math Behind the West's Greatest River. Updated online version of article that appeared originally in *Forbes Magazine*, November. https://www.forbes.com/sites/jonbruner/2011/10/20/the-high-stakes-math-behind-the-wests-greatest-river/#2a10ef7d222b
- BPA (2017). *BPA Facts or BPA Pocket Facts.* https://www.bpa.gov/news/AboutUs/Pages/default.aspx
- Hammarlund, J., (2001). California's Search for Energy Incites Fear in the Northwest. San Francisco Chronicle, June 20, available on D2L.
- BPA and US Army Corps of Engineers. (2013), News Release: US Entity Releases Final Recommendation on the Future of the Columbia River Treaty with Canada, December 13. https://www.crt20142024review.gov/Files/CRTR%20News%20Release%20Regional%20Recommendation%20Final%20%2012-13-13.pdf

Additional Recommended Reading:

- US Army Corp of Engineers, BPA, BoR. (2003). *The Federal Columbia River Power* System. August 2003. https://www.bpa.gov/p/Generation/Hydro/hydro/fcrps_brochure_17x11.pdf
- BPA and US Army Corps of Engineers. (2013). *US Entity Regional Recommendation for the Future of the Columbia River Treaty After 2024 and Cover Letter*. December 13.
- https://www.bpa.gov/Projects/Initiatives/crt/CRT-Regional-Recommendation-eFINAL.pdf
- Congressional Research Service. (2019) Columbia River Treaty Review. https://fas.org/sgp/crs/misc/R43287.pdf
- US State Department, Columbia River Treaty (official US website with links; https://www.state.gov/columbia-river-treaty/
- Sowards, A (2019), Renegotiating the Columbia River Treaty, Six Decades Later, (HighCountry News), https://www.hcn.org/issues/51.12/reckoning-with-history-renegotiating-the-columbia-river-treaty-six-decades-later

Reference

- Vogel, E. (2007). The Columbia river's region: Politics, place and environment in the Pacific Northwest, 1933-Present (Doctoral dissertation, University of Oregon). http://docs.streamnetlibrary.org/Theses-Disserts/Vogel2007-ColumbiaRiversRegion.pdf

DISCUSSION QUESTIONS:

1. The Northwest Power System has many features that are very similar to those found in other regions of the country, but it also includes a number of features that are quite distinctive if not entirely unique. What are some of the most important power system

features that can be found in common in all parts of the country? What are some of the most important features are at distinctive in the Northwest? Why are these distinctive features important to development of Northwest energy policy?
2. How does the history of the NW energy system influence current policies?
3. How might the increase in fixed costs to protect salmon in the Columbia system impact NW energy supply and demand?

The Electricity and Natural Gas Sectors-Overview (Nelson)

- Randolph, J., & Masters, G. M. (2018). *Energy for sustainability: technology, planning, policy*. Island Press. Chapter 9.
- NEW: Peters, B. Guy (2019). *American public policy: Promise and performance, 11th Edition*. Los Angeles, CA: Sage. (10th edition is OK too) Ch 3: Explaining Policy Choices. On D2L.
- NEW: Ohrenschall, M. (2019). Exploring Consequences of the October BC Gas Pipeline Rupture. *Clearing Up.* 4 Jan. On D2L.
- PBS. (2008). Heat. Chapter 4: America's Addiction to Coal. http://www.pbs.org/wgbh/pages/frontline/heat/view/ **IN CLASS**
- CA ISO. (2016). Fast Fact: What the duck curve tells us about managing a green grid. https://www.caiso.com/Documents/FlexibleResourcesHelpRenewables_FastFacts.pdf

Recommended

- NEW: US EIA. (2019). Natural gas pipeline rupture in Canada affects U.S. energy markets. 18 Oct. https://www.eia.gov/todayinenergy/detail.php?id=37312
- US EIA. (2011). What is shale gas and why is it important? August 4th. http://www.dnr.louisiana.gov/assets/TAD/reports/about_shale_gas.pdf
- US EIA. (2011). Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays. http://www.eia.gov/analysis/studies/usshalegas/pdf/usshaleplays.pdf

Reference

- Nersesian, R.L. (2007). Energy for the 21st Century: A Comprehensive Guide to Conventional and Alternative Sources. NY: ME Sharpe. Ch 2 and 7—Electricity and natural gas.

DISCUSSION QUESTIONS:

1. Why might the operating and engineering attributes of gas turbines be particularly suited for deregulated electricity markets (R&M)?
2. How might the combination of distributed solar + batteries make even gas turbines obsolete?
3. What are the likely effects of cheap sources of natural gas on future US electricity generation sources? How will this impact GHG emissions?

Integrated Resource Planning including Distribution Planning **(Back to Top)**

- Trabisch, H. (2019). Renewables' variability sends wary utilities from traditional DR to DER and load flexibility. 14 Aug. https://www.utilitydive.com/news/renewables-variability-sends-wary-utilities-from-traditional-dr-to-der-and/560669/?utm_source=Sailthru&utm_medium=email&utm_campaign=Issue:%202019

-08-14%20Utility%20Dive%20Newsletter%20%5Bissue:22433%5D&utm_term=Utility%20Dive

- Wilson and Biewald. (2013). *Best Practices in Electric Utility Integrated Resource Planning: Examples of State Regulations and Recent Utility Plans*. The Regulatory Assistance Project. June. http://www.raponline.org/wp-content/uploads/2016/05/rapsynapse-wilsonbiewald-bestpracticesinirp-2013-jun-21.pdf

News Article:

- Vaughan, A. (2017). Coal in 'freefall' as new power plants dive by two-thirds. The Guardian. 22 March. https://www.theguardian.com/environment/2017/mar/22/coal-power-plants-green-energy-china-india

OR

- Bade. G. (2015). The top 10 trends transforming the electric power sector. UtilityDive.17 Sept. http://www.utilitydive.com/news/the-top-10-trends-transforming-the-electric-power-sector/405798/

Reference

- E3 (2016). Avoided Cost Methodology. 2016 Interim Update Examine model through perusal of pp. 1-12 of methodology. https://www.ethree.com/public_proceedings/distributed-energy-resources-der-avoided-cost-proceedings/

DISCUSSION QUESTIONS:

1. What lessons about unintended consequences does China's push for coal-to-gas have for other environmental policies meant to reduce an externality from the energy sector? (Vaughan). Can this be compared to the ongoing dam breaching controversy in the NW?

Energy Sector Economics and Modeling and Policy Analysis: **(Back to Top)**

- NEW: Ming et al. (2019). Resource Adequacy in the Pacific Northwest. March. https://www.ethree.com/wp-content/uploads/2019/03/E3_Resource_Adequacy_in_the_Pacific-Northwest_March_2019.pdf
- New: Starret, M. (2019). Electric Transmission Utilization in the Northwest. 5 March. https://www.nwcouncil.org/sites/default/files/2019_0312_p4.pdf
- Randolph, J., & Masters, G. M. (2018). *Energy for sustainability: technology, planning, policy*. Island Press. Chapter 3.
- Varian, H. (2003). *Intermediate Economics.* 6th Ed. NY: Norton. CH 15.
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Linear programming

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Sensitivity and scenario analysis

- Lane, et al. (2005). *Background Material B: Foresight Scenarios For The Uk Domestic Sector*. PP 1-8. Based on the report: http://www.foresight.gov.uk/Energy/Fuelling_the_Future_Nov_2000.pdf
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- Pohekar, S. D., & Ramachandran, M. (2004). Application of multi-criteria decision making to sustainable energy planning—a review. *Renewable and sustainable energy reviews*, 8(4), 365-381.

DISCUSSION QUESTIONS:

1. How can we simulate the effects of coal retirements on NW resource adequacy?
2. How would you conduct a multiattribute evaluation of the acid rain program: cost-effectiveness (efficiency), effectiveness of SO2 reductions, equity, ease of implementation (Lauraine and Mills).
3. What are the benefits to consumers and the grid from a transactive system? What are the barriers to the development of a large scale transactive grid?

Carbon and Renewables Regulation (Back to Top)

Community-Scale Renewable Energy Systems

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    b. The NW Energy Coalition's response to the report can be found here: http://nwenergy.org/featured/new-study-optimistic-about-a-low-carbon-energy-system-for-the-northwest/

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- **News Article:** Trabish, H. (2016). Community solar poised for growth as utilities gain confidence, familiarity. *UtilityDive*. 7 April. http://www.utilitydive.com/news/community-solar-poised-for-growth-as-utilities-gain-confidence-familiarity/416725/
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- Pizer, W. (2002). Combining Price and Quantity Controls to Mitigate Global Climate Change. *Journal of Public Economics*. 85. pp. 409-434.
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DISCUSSION QUESTIONS:

1. How does Nelson argue that renewables quotas and CO_2 policies should be designed? What lessons are there for Oregon's proposed cap and trade legislation, given its current policies?
2. With widespread adoption of rooftop solar as well as deep energy efficiency savings, there will be fewer kWh sold to pay for fixed costs of the "poles and wires" (much less new investment). Who should pay for the fixed costs, how should the revenues be generated, and what are the equity implications?
3. What are the implications for grid resiliency in the NW from increased penetration of solar and wind?

4. Extra Credit: Why might a carbon tax be preferred to a cap and trade program to mitigate CO_2 emissions?

Energy Efficiency and Demand Side Management

- BPA. (2018). CTA-2045 Water Heater Demonstration Report. **SKIM** https://www.bpa.gov/EE/Technology/demand-response/Pages/CTA2045-DataShare.aspx
- NW Council. (2016). 7th Power Plan: Chapter 12: Conservation Resources. https://www.nwcouncil.org/media/7149926/7thplanfinal_chap12_conservationres.pdf
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- Nelson and Gebbia. (2018). Cool or School: The Role of Building Attributes in Explaining Energy Burden*. Energy Efficiency.*
- Reuven Sussman and Maxine Chikumbo (2016). Behavior Change Programs: Status and Impact. October. https://aceee.org/research-report/b1601 On D2L.
- **News Article:** NEW: Walton. R. (2020). Seattle to test paying for commercial building efficiency through long-term PPAs. Utility Dive. 28 Jan. https://www.utilitydive.com/news/seattle-to-test-paying-for-commercial-building-efficiency-through-long-term/571173/

Recommended

- **NEW**: BPA. (2019). *2020-2021 BPA EE Implementation Plan*. 24 Jan. On D2L
- **NEW**: BPA Lichtenfels. (2018). *Energy Efficiency Looking Ahead*. 7 Dec. On D2L
- **News Article:** Giroaurd, C. (2019). Behavioral demand response gives Baltimore Gas and Electric a business reason to reduce peak usage. 28 Jan. https://www.utilitydive.com/news/behavioral-demand-response-gives-baltimore-gas-and-electric-a-business-reas/546895/?utm_source=Sailthru&utm_medium=email&utm_campaign=Issue:%2020 19-01-28%20Utility%20Dive%20Newsletter%20%5Bissue:19124%5D&utm_term=Utility%20Dive
- Nadel, S. (2012). *The Rebound Effect, Large or Small? http://aceee.org/files/pdf/white-paper/rebound-large-and-small.pdf*
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- Sorrell, S. (2004). Understanding Barriers to Energy Efficiency. In Sorell, et al. *The Economics of Energy Efficiency*: *Barriers to Cost-Effective Investment.* Cheltenham, UK: Edward Elgar. Pp. 25-95

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- State of California. (2002). California Standard Practice Manual: Economic Analysis Of Demand-Side Programs And Projects. July. http://www.calmac.org/events/spm_9_20_02.pdf

DISCUSSION QUESTIONS:

1. What are the assumptions behind the nationwide estimates for energy savings—why haven't all cost effective energy savings technologies already been adopted?
2. Might public funds be justified in funding energy efficiency? Why / not?
3. Extra Credit: What is the difference between technical, economic, and achievable conservation supplies and how do we estimate the different tranches

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Grid Modernization **(Back to Top)**

- Resnick Inst (2015). More than Smart: A Framework to Make the Distribution Grid More Open, Efficient and Resilient. http://morethansmart.org/wp-content/uploads/2015/06/More-Than-Smart-Report-by-GTLG-and-Caltech-08.11.14.pdf
- Guess, M. (2017). A look at the new battery storage facility in California built with Tesla Powerpacks. *Arc Technica*. 31 Jan. https://arstechnica.com/business/2017/01/a-look-at-the-new-battery-storage-facility-in-california-built-with-tesla-powerpacks/
- PNNL. (2015). 2.0 The Transactive System https://www.smartgrid.gov/files/TPR02TheTransactiveCoordinationSystem.pdf
- Breakthrough Energy Ventures. (2019). *Advancing the Landscape of Clean Energy Innovation* (Executive Summary is fine) http://www.b-t.energy/reports/advancing-the-landscape/
- **NEWS ARTICLE:** NEW: Trabish, H. (2020). Geothermal's surprise: Cheap renewables could keep states from achieving climate goals. 28 Jan. https://www.utilitydive.com/news/geothermals-surprise-cheap-renewables-could-keep-states-from-achieving-cl/569807/?utm_source=Sailthru&utm_medium=email&utm_campaign=Issue:%202020-01-28%20Utility%20Dive%20Newsletter%20%5Bissue:25352%5D&utm_term=Utility%20Dive

RECOMMENDED

- On future reliability challenges and shifting paradigms // NE-ISO Fuel Security Analysis https://www.iso-ne.com/static-assets/documents/2018/01/20180117_operational_fuel-security_analysis.pdf
- Gergen, et al. (2017). CAISO Expects It May Need to Curtail Up to 8,000 MW This Spring and Up to 13,000 MW By 2024, Which Could Test Curtailment Risk Allocation Provisions in Renewable PPAs. 12 March. http://www.cleanenergylawreport.com/energy-regulatory/caiso-expects-it-may-need-to-curtail-up-to-8000-mw-this-spring-and-up-to-13000-mw-by-2024-which-could-test-curtailment-risk-allocation-provisions-in-renewable-ppas/
- Trabish, H. (2019). A utility regulatory process for the 21st century gets a test run in Hawaii. 19 March. https://www.utilitydive.com/news/a-utility-regulatory-process-for-the-21st-century-gets-a-test-run-in-hawaii/550146/?utm_source=Sailthru&utm_medium=email&utm_campaign=Issue:%202019-03-19%20Utility%20Dive%20Newsletter%20%5Bissue:19951%5D&utm_term=Utility%20Dive

DISCUSSION QUESTIONS:

1. What does the future of the electricity grid look like given smart appliances, storage, and distributed generation?
2. Given higher penetration of intermittent renewables in the NW system, can we use the extra electrons more efficiently than mandatory curtailment?
3. How can we incentivize (otherwise very risk averse) utilities to support innovative technologies?

Lower Snake River Management: Dam Breaching **(Back to Top)**

- ECONorthwest. (2019). *Lower Snake River Dams Economic Tradeoffs of Removal Lower Snake River Dams Economic Tradeoffs of Removal.* July. https://econw.com/projects-collection/2019/7/29/lower-snake-river-dams-economic-tradeoffs-of-removal
- Miller, K. (2020). RE: *Draft Lower Snake River Dams Stakeholder Engagement Report Comments*. 23 Jan. ON D2L.
- Cary, A. (2020). Oregon governor calls for tearing out Snake River dams. Washington reps are outraged. *Tri-City Herald*. 14 Feb. https://www.tri-cityherald.com/news/local/article240314146.html

Recommended

- Leslie, J. (2019). On the Northwest's Snake River, the Case for Dam Removal Grows. *Yale Environment 360.* Oct. https://e360.yale.edu/features/on-the-northwests-snake-river-the-case-for-dam-removal-grows

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Solutions? **(Back to Top)**

- Nelson, H. (2020). Electrify Everything? Heat and Light in Deep Decarbonization Policies. *Public Utilities Fortnightly.* Jan. pp. 62-67. https://www.fortnightly.com/fortnightly/2020/01/electrify-everything?authkey=88797425a2dfc29e2603efc4c5c5d6456577351fbd74219b22a45477b39033fa
- Randolph, J., & Masters, G. M. (2018). *Energy for sustainability: technology, planning, policy*. Island Press. Chapter 17 (Skim). Chapter 18.
- Nelson, Hal T., et al. (2015). Intergovernmental Climate Change Mitigation Policy: Theory and Outcomes. *Journal of Public Policy*.
- Tainter. J.A. (1995). Sustainability of Complex Societies. *Futures.* 27 (4). Pp. 397-407.
- Einstellung effect. http://en.wikipedia.org/wiki/Einstellung_effect
- Flink Energy. Hydrogen and Methane from Renewable Electricity. PPT. https://flinkenergy.com/resources/Hydrogen%20and%20Methane%20from%20Renewables.pdf
- Farnsworth, et al. (2018). Beneficial Electrification. RAP. https://www.raponline.org/wp-content/uploads/2018/06/6-19-2018-RAP-BE-Principles2.pdf
- **News Article:** Plumer, B. (2017). Scientists made a detailed "roadmap" for meeting the Paris climate goals. It's eye-opening. *Vox*. http://www.vox.com/energy-and-environment/2017/3/23/15028480/roadmap-paris-climate-goals

- NYT. (2018). Time to Panic. Good opinion piece on the climate's need to decarbonize our energy system: https://nyti.ms/2V2QLA2
- Matthew Wilburn King (2019). BBC: How brain biases prevent climate action . http://www.bbc.com/future/story/20190304-human-evolution-means-we-can-tackle-climate-change?ocid=ww.social.link.email

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- Plumer, B. (2014). Two degrees: The world set a simple goal for climate change. We're likely to miss it. https://www.vox.com/2014/4/22/5551004/two-degrees
- Jenkins and Thernstorm (2017). Deep Decarbonization Of The Electric Power Sector Insights From Recent Literature. March. http://innovationreform.org/wp-content/uploads/2017/03/EIRP-Deep-Decarb-Lit-Review-Jenkins-Thernstrom-March-2017.pdf

DISCUSSION QUESTIONS:

1. What are the energy efficiency policy design implications from Nelson et al's (2015) analysis of intergovernmental conflicts?
2. What does the Einstellung effect predict about our ability to develop (costly) institutions to solve problems regarding sustainability (Tainter)?

Where the Rubber Meets the Road (Back to Top)

- BPA. (2018). 2018-2023 Strategic Plan. https://www.bpa.gov/StrategicPlan/Pages/Strategic-Plan.aspx
- Barker, R. (2018). This agency spends the most to help Northwest salmon. But cuts are coming. *Idaho Statesman.* 30 Jan. http://www.idahostatesman.com/news/local/news-columns-blogs/letters-from-the-west/article197393289.html
- NW Council. (2018). Climate Change Impacts Will Affect Timing, Volume of River Flows And Hydropower, Study Asserts. 26 Nov. https://www.nwcouncil.org/news/climate-change-impacts-will-affect-hydropower-river-flows-study-asserts
- Roth, R. (2018). Rewiring the Northwest's Energy Infrastructure. Center for Sustainable Energy. http://centerforsi.org/wp-content/uploads/2018/09/CSI-Energy-Report.pdf

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Week 11: Course Held at Regular Time During Finals Week!

- **Course Evaluations**
- **Final Team Paper Due on Assignments in Final Paper Folder (6:40)**
- **Team Evaluations Due on Activities>Assignments in Team Evaluation Folder (6:40)**
- **All Materials for Class Due (6:40)**