PA 567

Energy Resources: Policy & Administration

Fall 2022 Last Modified 28 OCT

CLICK TO SEE SCHEDULE

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 SEQ Figure * ARABIC 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.
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- This course is recommended as a prerequisite for PA 573 Smart Grid and Sustainable Communities.

Course Information

Time:	**Tuesday 6:40-9:20**
Room:	Parkmill 11 & Online via Zoom
CRN:	12761

Instructor

Josh Keeling
Adjunct Instructor
Email: bjorg@pdx.edu
Phone: 971.222.8615 (mobile)

"Attend Anywhere" Course Zoom Meeting Information

Topic: PA 567 Energy Policy
Time: Sep 27, 2022 06:30 PM Pacific Time (US and Canada)
https://pdx.zoom.us/j/87366298596

Meeting ID: 873 6629 8596

Telephone Commands:
*6 - Toggle mute/unmute
*9 - Raise hand

Dial
+1 253 215 8782
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Technology Specialist/Professional Development Coordinator
Josh Metzler: jmetzler@pdx.edu
503.725.5190

Virtual Office Hours: Tuesday 3:00-4:30 & by appointment (preferred)
You can join via Zoom and wait in the virtual waiting room until I am done with the previous student. **Please send me a meeting invite or email to reserve your office hours spot!**

https://pdx.zoom.us/j/82048106471

Meeting ID: 820 4810 6471

Telephone Commands:
*6 - Toggle mute/unmute
*9 - Raise hand

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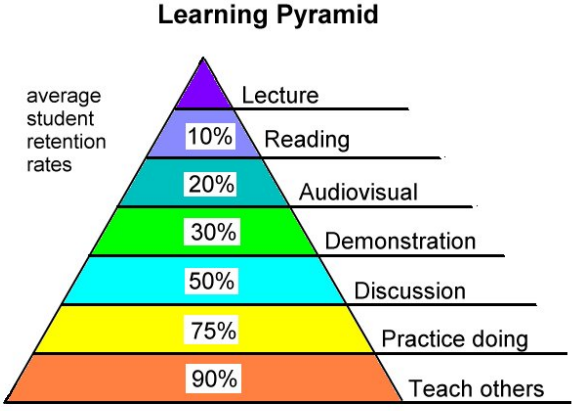
The best way to get in touch with me is via email. I will endeavor to respond to email/voice messages within 1+/-1 business day. **Please include PA 567 in the subject line.**
FYI: In my elusive quest for work-life balance, I try not to check email on the weekends.

- **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]

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.



[1] http://www.washingtonpost.com/blogs/answer-s

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:

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 basic energy analysis using MS Excel
6. Students will understand the changes to the electricity sector from climate change legislation, distributed renewable energy, as well as conservation policies.
7. Students will be able to write a clear and concise policy paper.
8. Students will be able to present research results effectively in a professional setting.

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%).
    a. Students can choose from any of the assigned readings over the term
        i. Again, scholarly articles and white papers are the preferred subject for discussion leaders.

The sheet sign up for discussion leaders is here https://docs.google.com/document/d/1be527BISpNkOElSBkQJ-CQFtdXz4cdI_1q0Vc6hY3E4/edit?usp=sharing .

b. Presentation should be a 10-minute (MAX) presentation using PowerPoint or handouts followed by Q&A.
c. Instead of presenting only one of the readings, I also 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 compare and contrast the chapter with the news article for the week. Other relevant class materials may be brought into the presentation as well.

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.
        i. 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.
        ii. 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/
        iii. Put your ideas for possible paper topics in Canvas
        iv. More information on the research paper and proposal will be given out at a later date.
3. PPT and Presentation of the research paper: 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%)
4. Homework assignment (20 %)
    a. The homework is an energy analysis assignment and will cover material from the text, lectures, as well as the other readings. There is a video lecture on the HW from your regularly scheduled instructor (Hal Nelson): https://media.pdx.edu/media/PA+567+NPV+Lecture+and+HW1/0_x6gccw8p
5. 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. As part of your participation grade, you also need to upload your current professional bio on the collaboration page in Canvas (and here https://docs.google.com/document/d/1HVe-abwLgrbJjcWxRaotMt__fU_2LiGqcc2RkFXMfjI/edit?usp=sharing).

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. This lives on the collaboration page in Canvas (and here https://docs.google.com/document/d/1HVe-abwLgrbJjcWxRaotMt__fU_2LiGqcc2RkFXMfjI/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.

Course Policies

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.

- **Remote learning expectations**
    - Remote learning in grad school is not ideal. However, we do have an opportunity to create similar sense of trust and a common identity as students using this format as well as in-person.
    - Some requirements exist for this to happen though, as it requires exercising self-care and community care.
        - Be civil: All discussions will be professional and not personal. If you have concerns about the class dialogue, please see me immediately, don't let issues with your classmates (or professors) fester.
            - Statements made in class by students and guest lecturers are assumed to represent their personal opinion (unless otherwise stated) and not any organization that they may work for.
            - Do not post any material from this course on a public-facing website without my approval.
        - Emotional subject matter: This class contains analysis of topics that can bring forth emotional responses. Graduate school is not a twitter feed that one can scrutinize for PC-ness.
            - We want to build a strong container for the class so that students feel comfortable sharing their experiences and perceptions. Please support each other and me in building and maintaining the container! I tend to fall back on evidence-based arguments so keep me on track to elevate lived-experiences too!
    - In order to develop community, PLEASE leave your video on when possible as we would in an in-person class.
- Interactive video conferencing is an art, not a skill! Feel free to ask questions via audio when you have them. However, the timing of asking is the art-part:
    - Wait for the speaker to pause, or until you think they are about to pause, before inserting your question. (Also make sure your audio is unmuted).
    - Listen for others speaking and yield the mic when in doubt. Talking over others and interjecting repeatedly makes for a less successful session.
- We will be using the interactive tools that are built-in to Zoom.
    - One set of tools is nonverbal feedback in the participants button at the bottom: click on that and there are icons for what you are feeling: Raise hand, away, need a break, go slower, faster, yes, no.
- We will be recording the Zoom sessions for later review and integration

- Because the sessions will be recorded, and I don't know what all gets recorded, be careful about what you write in the chat and say in the chat rooms. Do not communicate personal information that you don't want others to see!!

Zoom/Technical Issues

- Everybody should remember to breathe deeply at all times. *We are going to make this work the best we can and beyond that not worry about it.*
    - Please use my office hours to schedule a time to meet with me to let me know how the course is going for you
- Students will not need to register with Zoom for an account to join but you will need authentication from being logged into your pdx.edu account. You can always sign onto the PSU zoom account to see the recorded videos and change your settings: www.pdx.zoom.us
- If the Zoom meeting fails, look for an email from me on next steps
- If your internet bandwidth is limited, call in to Zoom on the phone#, and use the computer for video.
    - If the audio keeps breaking up, then turn off the video and let me know via the Zoom chat function the audio quality was bad.
- Most of the major wireless providers have removed data limits, so you can probably set up your smart phone as a hotspot for the class.
- If you don't have internet access at home check this out: https://www.digitalinclusion.org/free-low-cost-internet-plans/
- Two student computer labs will remain open during spring term — with proper health practices in place — in the first floor of Millar Library and in the basement of Fariborz Maseeh Hall.
- OIT has laptops to check out for students who need them (maybe). See below for free software sources. https://library.pdx.edu/study-spaces-computers/equipment/
- Resources on practicing Zoom.
    - Breakout Rooms: https://support.zoom.us/hc/en-us/articles/206476093-Getting-Started-with-Breakout-Rooms
    - Non-verbal Feedback: https://support.zoom.us/hc/en-us/articles/115001286183-Nonverbal-Feedback-During-Meetings
    - Sharing a Screen: https://support.zoom.us/hc/en-us/articles/201362153-How-Do-I-Share-My-Screen
    - Chat: https://support.zoom.us/hc/en-us/articles/203650445-In-Meeting-Chat
- Some (unfortunately) don'ts: Students are not to multi-task with extra-curricular activities during class.
    - Please do not surf the web or answer emails during class
    - Try to save your Tuesday Zoom fatigue allotment for PA 567!

    - Turn off your video only for personal responsibilities or if you are emotionally exhausted.
- **Maintaining Confidentiality:** Class discussions benefit greatly when professional experiences and actual situations are incorporated to illustrate key issues. When discussing personal/professional experiences, students should avoid, insofar as possible, revealing the identities of colleagues or others whose confidentiality may be compromised in the course of the discussion. All students participating in class discussions should similarly maintain the confidence of their peers' experiences that are shared in the spirit of academic discourse.
- **How to be successful in this class**

  1) Build on the readings with active studying, to integrate the material with your experiences and existing understandings. Then, you will be ready to ask questions (draft these prior to class to reduce stress about asking them).
  2) Take argumentative writing seriously (and early in the term)

Required Course Readings

All graduate 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 1st edition is OK too, but you need to make sure the chapters #'s match up with the syllabus.

Professional development students without an energy background will also find the book useful.

- 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 Canvas.

- 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 Canvas 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.

Great information can be found on energy policy and management in the NW through the local industry newspaper, *Clearing Up. Clearing Up* is available to anyone with a PDX.EDU email.

- You need to sign up in the Clearing Up tab Google Sheet with your name and PSU email here:

List of Acronyms (LoA-- Sorry I couldn't resist)

Note that there is a list of common acronyms used in the energy world here: https://docs.google.com/document/d/1hIMPrWGk152RHgGwDglQzseVwu9tj44BWHwFeo4ZxIo/edit?usp=sharing

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Important Dates for Graduate Students

- Important dates for dropping or changing grading options can be found here
- Last day to change to Pass/Fail grade option: 14 Nov
- Homework: Homework will be due electronically on Canvas at 6:40 on the day of class
  - Paper Proposal Due: **8 Nov** at 6:40
  - HW #1 due: **8 Nov** at 6:40.
- Final paper due: **10 Dec at** 6:40 **pm**
  - Student research presentation PPT due: **4 Dec** at 6:40
  - Student research presentations: **6 Dec** at 6:40 pm in-class
- All work products for the class due no later than **10 Dec at** 6:40 pm

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Schedule (Click on the hyperlink to see each module's readings)

Week	Date	Placeholder Topic		Speaker	Deliverable
1	27 Sept	Introduction of class members and syllabus		Josh Keeling PSU	
2	4 Oct	The Electricity and Natural Gas Sectors-Overview		Josh Keeling PSU	
3	11 Oct	The Institutional and Historical Context that Impacts Today's Northwest Energy Policy		Jeff Hammarlund PSU	
4	18 Oct	Integrated Resource & Distribution Planning		Ahlmahz Negash Tacoma Power	
5	25 Oct	The Case of the Lower Snake River Dams		Kurt Miller, NW River Partners Joseph Bogaard,	

				Save Our Wild Salmon Shannon Wheeler, Nez Perce Tribal Executive Committee	
6	**1 Nov**	**Energy Efficiency and Demand Response**		Jenn Light NW Council	
7	**8 Nov**	**Energy Economics and Modeling**		Elaine Hart Moment Energy Insights	HW #1 Due Paper Proposal Due
8	**15 Nov**	**Wholesale Markets and Transmission**		Pam Sporborg PGE	
9	**22 Nov**	**Equity in Energy**		Scott Reeves Cadeo	
10	**29 Nov**	Transportation Electrification		Shanna Brownstein Tesla	Draft PPT due 6 Dec
11	**6 Dec**	**Where the Rubber Meets the Road** & Student Paper Presentations		Dan James BPA PSU Students	Presentations (Paper due: 10 Dec)

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o Week 1: 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. Climate change and increasing amounts of wind and solar electricity are also changing the value of hydropower.

Quick Reference

- UM Center for Sustainable Systems (2022). *U.S. Energy System* https://css.umich.edu/sites/default/files/u.s.%20energy%20system_css03-11_e2021_0.pdf
- Otherlab (2018). Super Sankey https://www.otherlab.com/blog-posts/us-energy-flow-super-sankey http://energyliteracy.com/

DISCUSSION QUESTIONS:

1. How do you expect the dynamics between fuel markets and electricity markets to evolve over time?
2. How do you expect this to flow down to retail consumers and how might it vary by geography or segment?
3. What regulatory or governance issues do you think might emerge as the industry evolves?

Week 2: The Electricity and Natural Gas Sectors-Overview

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Introductory Corner:

- Randolph, J., & Masters, G. M. (2018). *Energy for sustainability: technology, planning, policy*. Island Press. Chapter 9.
- PGE. (2022). Understanding My Bill: Guide to charges and other important information. https://portlandgeneral.com/help/help-topics/understanding-my-bill
- Peters, B. Guy (2019). *American public policy: Promise and performance, 11th Edition*. Los Angeles, CA: Sage. Ch 3: Explaining Policy Choices. On Canvas.
- Northwest Power and Conservation Council (2021). *Northwest Power Plan 3-page Summary* https://www.nwcouncil.org/media/filer_public/45/b0/45b02281-e3da-4788-ad74-355e5c755a75/2022-2.pdf

Required Reading

- Billamoria, S., et al (2019) *Leading Utility Regulatory Reform Process Options and Lessons From Oregon* https://www.raponline.org/wp-content/uploads/2019/03/rap_rmi_billimoria_shipley_guccione_leading_utility_regulatory_reform_oregon_2019_march.pdf
- Ohrenschall, M. (2019). Exploring Consequences of the October BC Gas Pipeline Rupture. *Clearing Up.* 4 Jan. On Canvas.

- CA ISO. (2016). Fast Fact: What the duck curve tells us about managing a green grid. https://www.caiso.com/Documents/FlexibleResourcesHelpRenewables_FastFacts.pdf
- Bandyck. M. (2020). Pacific Northwest poised to test 100% renewables as utilities weigh gas vs. storage. *Utility Dive.* 17 Dec. https://www.utilitydive.com/news/pacific-northwest-poised-to-test-100-renewables-as-utilities-weigh-gas-vs/592019/
- McCarthy, E. (2021). Los Angeles plans to jump-start a green hydrogen market in the US. *Canary Media*. https://www.canarymedia.com/articles/hydrogen/los-angeles-seeks-to-jump-start-a-green-hydrogen-market-in-the-u-s

Reference

- FERC (2020). *Energy Primer: A Handbook for Energy Market Basics* https://www.ferc.gov/sites/default/files/2020-06/energy-primer-2020_0.pdf
- 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
- 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.
- Sabatier, P. Weible, C. et al. (2018). The Advocacy Coalition Framework. In Sabatier, P. Weible, C. *Theories of the Policy Process.*

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. If Washington and Oregon are not likely to site new gas-fired electricity generation stations, and are retiring their coal-fired assets, how will we maintain system resilience?

Week 3: The Institutional and Historical Context that Impacts Today's Northwest Energy Policy

Guest Lecturer: Jeff Hammarlund **(Back to Top)**

Required Reading:

- Hammarlund, J. (2002) "Oregon's Role as an Energy Innovator: A Historical Perspective". *Oregon's Future Journal*. Spring. (available on Canvas)
- Bonneville Power Administration (2021), *BPA Facts*
- Bonneville Power Administration (2021), *Fact Sheet-Preparing for a Resilient Columbia River Hydropower System*
- US Department of State (2022), *Columbia River Treaty (Official Website)*. Read History and Background and Pressing Forward.

- Northwest Power and Conservation Council, *The State of the Columbia River Basin, Fiscal Year 2021*, pages 7-18.
- 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.
- Hammarlund, J., (2001). "California's Search for Energy Incites Fear in the Northwest". *San Francisco Chronicle*, June 20. (Canvas)
- Barringer, F. (2018) ***Changing Currents: Picturing a Northwest Without Cheap Public Hydropower*****.** Stanford University, The Bill Lane Center for the American West, January 29.

Additional Recommended Reading:

- US Army Corps of Engineers, Bonneville Power Administration and Bureau of Reclamation (2003), *The Federal Columbia River Power System*.
- 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
- Congressional Research Service (2020), *Columbia River Treaty Review, December 15 Update*
- Sowards, A (2019). *Renegotiating the Columbia River Treaty, Six Decades Later*, (*High Country News*).

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?

Week 4: Integrated Resource Planning and Distribution Planning

Guest Lecturer: Ahlmahz Negash, Tacoma Power **(Back to Top)**

- 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**. EXECUTIVE SUMMARY, OREGON PP 13-15, AND CH 4.** SKIM THE REST http://www.raponline.org/wp-content/uploads/2016/05/rapsynapse-wilsonbiewald-bestpracticesinirp-2013-jun-21.pdf
- LBNL (2019) Exploring the relationship between planning and procurement in Western U.S. electric utilities

- LBNL (2016) The future of electric resource planning
- Tacoma Power (2020) Tacoma Power IRP Summary
- PGE. 2021. Distribution Plan. Part 1. **Executive Summary: PP 7-20** Other sections according to your interest. http://edocs.puc.state.or.us/efdocs/HAD/um2005had104621.pdf
- Ming et al. (2019). Resource Adequacy in the Pacific Northwest. E3. March. **EXECUTIVE SUMMARY. CHAP 1 & 2, CHART ON P. 53.** https://www.ethree.com/wp-content/uploads/2019/03/E3_Resource_Adequacy_in_the_Pacific-Northwest_March_2019.pdf

News Article:

- 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/

OR

- Trabisch, H. (2021). California's dilemma: How to control skyrocketing electric rates while building the grid of the future. 26 April. https://www.utilitydive.com/news/californias-dilemma-how-to-control-skyrocketing-electric-rates-while-buil/597767/

Recommended

- Tacoma Power (2020) Tacoma Power Full IRP Document
- GridLab (2019) Integrated Distribution Planning: A Path Forward https://gridlab.org/wp-content/uploads/2019/04/IDPWhitepaper_GridLab-1.pdf
- Interstate Renewable Energy Council. (2018). Key Lessons from the California Integrated Capacity Analysis. 16 Oct. https://irecusa.org/2018/10/key-lessons-from-the-california-integrated-capacity-analysis/
- Ben Kajala. (2020). Exploring Key Power Supply Questions Through Scenario Analysis. NW Council. 26 Feb. https://www.nwcouncil.org/news/exploring-key-power-supply-questions-through-scenario-analysis

DISCUSSION QUESTIONS:

1. Are public participation practices in NW energy planning adequate?
2. What are the primary differences between Distribution System Planning and Integrated Resource Planning?
3. What is the role of behind the meter (customer-sited) storage in NW resource adequacy?

Week 5: Finding the Proper Balance among the Multiple-Uses of the Columbia and Snake Rivers: The Case of the Lower Snake River Dams

Guest Speakers: Kurt Miller, NW River Partners; Joseph Bogaard, Save Our Wild Salmon; Shannon Wheeler, Nez Perce Tribal Executive Committee; Heather Stebbings, Pacific Northwest Waterways Association

Introductory Corner:

- Walker.M. and Chris Cameron (2022). *New York Times.* *Plaintiffs in Long Fight Over Endangered Salmon Hope a Resolution Is Near*. 15 August.
- AP. (2021). *Oregonlive*. *Sprawling Snake River dam removal, fish preservation case put on hold by federal judge*. 27 Oct.
- Mapes, L. (2022) *Seattle Times*. *White House Weighs in on Lower Snake Dam Breaching in an Usual Way*. 12 July.
- US Department of Interior for the Biden Administration. (2022). *Biden-Harris Administration Announces Continued Progress to Improve Conditions for Salmon and Other Native Fish in the Columbia River Basin* 4 August.
- Bonneville Power Administration (2022). *Hydropower Impact* (website) See especially section on hydropower fuel mix.
- Bharath, D. (2022) AP. *Columbia River's Salmon Are at the Core of Ancient Religion*. 15 August.
- Federal Executive Agencies (2022). *Columbia River Basin Fisheries: Working Together to Develop a Path Forward*. 28 March.
- Mapes, L. (2021). *GOP congressman pitches $34 billion plan to breach Lower Snake River dams in new vision for Northwest.* 7 Feb.
- Ernst, S. (2022). (*Clearing Up*) *Inslee-Murray: Breaching Off the Table Until Energy Benefits Replaced.* 26 August. On Canvas.

Required Readings:

- *Governor Inslee's and Senator Murray Final Lower Snake River Dams Benefits Replacement Report and Recommendations.* August 2022. Read at least the Executive Summary (12 pages) and Recommendations (6 pages). Skim the rest if you have time.
- Yakama Nation (2022). *Yakama Nation Responds to Final Murray and Inslee Salmon Report*, August.
- Saluskin, D., Kat Brigham, Jonathan Smith, and Samuel Penney 2022 (*Seattle Times* Guest Editorial). *The Future of the Lower Snake River Dams: Do the Right Thing for Salmon, Tribes and Communities.* 8 July.

- E3 Energy + Environmental Economics for BPA (2022). *BPA Lower Snake River Dams Power Replacement Study*. July. Read at least the Executive Summary (5 pages), page 41 and Conclusions and Findings. Skim the rest if you have time.
- Nez Perce Tribe (2022.) *Nimiipuu Energy, Empowering Tribes through Energy* and *Nimiipuu Energy* (9-minute video).
- Energy Strategies for the NW Energy Coalition (2022). *Lower Snake River Dam Replacement Study*. 18 May. At least skim.
- Northwest River Partners (2021). *Dollars & Sense: Addressing the False Assumptions about Energy & Economics of the Lower Snake River Dams*. 1 July. Read at least the Introduction and Summary of Key Findings. Skim the rest if you have time.
- NW Energy Coalition (2022). *Smart Planning Will Drive Replacing the Power from Lower Snake River Dams*. 22 February. Read at least the Executive Summary or the One Pager. Skim the rest if you have time.
- Northwest River Partners (2021). *Dollars & Sense Part II: An Examination of Reservoir Methane Claims*. 11 October.
- Save Our Wild Salmon Blogpost. (2022), *Sen. Murray & Gov. Inslee's Historic Decision: Replace the Services, Remove the Dams, Restore Salmon*. 1 September.
- Northwest River Partners (2022). *An Examination of Northwest Energy Coalition February 2022 White Paper on Replacing the Lower Snake River Dams*.
- NW Energy Coalition (2022). *Addressing the Lower Snake River Dams' Peaking Capacity*. April.
- Walker, M. (2022). *New York Times. Beaching Dams 'Must Be an Option' to Save Salmon, Washington Democrats Say*. 31 August
- Barker, E. (2022). *Lewiston Review*. *Snake River Spring Chinook Struggling Like Never Before, Fed Decide Against Classifying Them as 'Endangered'*. 25 August.
- Schick, T. (2002). (*Oregon Public Broadcasting and ProPublica*). *How the BPA Is Contributing to Salmon's Decline in the Northwest*. 4 August.

o Additional Recommended Readings:

- Miller, S. (2022) *The Bend Bulletin*. *Guest Column: Reasons to Oppose Dam Breaching on the Snake River. 11 January.*
- Freilich, J. (2022) *The Bend Bulletin. Guest Column: Keep to the Facts on Power, Salmon and the Lower Snake River Dams.* On Canvass'
- Levy, S. (2022) *Memo to All Concerned on Lower Snake River Dams*. September. On Canvass.
- NOAA Fisheries for Biden Administration. (2022) *Rebuilding Interior Columbia Basin Salmon and Steelhead*. 11 July.

- Berton, H. (2022). *Seattle Times.* *Dam Politics: Why Public Power Utilities Are Pouring Cash into the Campaign to Support the Lower Snake River Dams*. 28 June.
- Schick, T. and Irena Hwang. (2002) (Oregon Public Broadcasting and ProPublica). *The US Has Spent More than $1 Billion on a Plan to Save Salmon. The Fish Are Vanishing Anyway*. 24 May.
- Energy Strategies for the NW Energy Coalition (2018*). The Lower Snake River Dams Power Replacement Study*. 27, April. (Note: options include a 4-page overview and a 1 page summary)
- Energy GPS for Northwest River Partners (2020), *Comments on Northwest Energy Coalition's April 2018 Lower Name River Dams Power Replacement Study*. 20 January. Read at least the Executive Summary. Slim the rest if you have time.

Week 6: Energy Efficiency and Demand Response

Guest Speaker: Jennifer Light, NW Power and Conservation Council **(Back to Top)**

Introductory Corner:

- Randolph, J., & Masters, G. M. (2018). *Energy for sustainability: technology, planning, policy*. Island Press.
  - Chapter 8.1-8.5, Building Technologies
  - Chapter 16.1-16.3, Market Failures and Solutions
  - Chapter 18.1, State Energy Policy
- US EPA (2021). Energy Efficiency Policies and Programs.

Required Readings

- NW Council. (2021). 2021 Power Plan. Chapter 5. https://www.nwcouncil.org/fs/17680/2021powerplan_2022-3.pdf
- Nelson and Gebbia. (2018). Cool or School: The Role of Building Attributes in Explaining Energy Burden. *Energy Efficiency.* 11 (8). Pp. 2017-2032. On Canvas.
- Sussman and Maxine Chikumbo (2016). Behavior Change Programs: Status and Impact. October. https://aceee.org/research-report/b1601 On Canvas.
- **News Article:** Smith, D. (2020). Local/State: Seattle City Light Deploys Energy Efficiency as a Service to Break Split Incentive. ÊSM. 26 Dec. https://energyservicesmedia.com/2020/12/local-state-seattle-city-light-deploys-energy-efficiency-as-a-service-to-break-split-incentive/
  OR
- Trabisch, H. 2021. Two barriers to utility and customer savings with flexible loads and how regulators can help. *Utility Dive. 6 Jan.* https://www.utilitydive.com/news/two-barriers-to-utility-and-customer-savings-with-flexible-loads-and-how-re/592084/

Recommended Readings

- BPA. (2018). CTA-2045 Water Heater Demonstration Report. **SKIM** https://www.bpa.gov/EE/Technology/demand-response/Pages/CTA2045-DataShare.aspx
- Methodology for Estimating Energy Efficiency Savings in the Northwest: https://www.nwcouncil.org/reports/methodology-estimating-energy-efficiency-savings-northwest/
- Energy Efficiency: Values and Challenges: https://www.nwcouncil.org/reports/energy-efficiency-values-and-challenges-0/
- BPA. (2019). *2020-2021 BPA EE Implementation Plan*. 24 Jan. On Canvas **SKIM**
- 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/

References

- Nadel, S. (2012). *The Rebound Effect, Large or Small? http://aceee.org/files/pdf/white-paper/rebound-large-and-small.pdf*
- 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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Week 7: Energy Sector Economics and Modeling

Guest Speaker: Elaine Hart, Moment Energy Insights **(Back to Top)**

Introductory Corner:

- Randolph, J., & Masters, G. M. (2018). *Energy for sustainability: technology, planning, policy*. Island Press.
  Chapter 3: Energy Futures.

Required Reading

- US EPA (2021). Co-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA). https://cobra.epa.gov/
- NW Council. (2021). The 2021 Northwest Power Plan: https://www.nwcouncil.org/fs/17680/2021powerplan_2022-3.pdf
  - Also, go to NW Council supporting material site map and read up on one subject that you are particularly interested in. Some possibilities are climate change,

transportation electrification, energy efficiency assessment, etc. Hopefully that will make for some interesting questions in the class that get a bit more into the details. Here is the link for the supporting material: https://www.nwcouncil.org/2021powerplan_sitemap

Recommended/Reference

- Resource costs and resource economics:
  - Lazard Levelized Cost of Energy, Levelized Cost of Storage, and Levelized Cost of Hydrogen Reports (https://www.lazard.com/perspective/levelized-cost-of-energy-levelized-cost-of-storage-and-levelized-cost-of-hydrogen/)
  - LBNL's Land-Based Wind Market Report (https://emp.lbl.gov/wind-technologies-market-report)
  - LBNL's Utility-Scale Solar Report (https://emp.lbl.gov/publications/utility-scale-solar-2021-edition)
  - Chapter 6 of PGE's 2019 IRP (https://edocs.puc.state.or.us/efdocs/HAA/lc73haa162516.pdf)
- Capacity expansion modeling:
  - NREL ReEDS model documentation (https://www.nrel.gov/docs/fy21osti/78195.pdf)
  - Appendix G of PSE's 2021 IRP (https://www.pse.com/-/media/PDFs/IRP/2021/appendix/18-IRP21_AppG_033021.pdf?sc_lang=en&modified=20220307202830&hash=DC60FAB79FAA589462C902F98F4A1303)
- Production cost modeling in action:
  - NREL Electrification Futures Study (https://www.nrel.gov/docs/fy21osti/79094.pdf)
  - LA 100 Study (https://www.nrel.gov/docs/fy21osti/79444-ES.pdf)
  - GridLab California 2030 Study (https://gridlab.org/wp-content/uploads/2022/05/GridLab_California-2030-Study-Technical-Report-5-9-22-Update1.pdf)
- Resource adequacy modeling:
  - Redefining Resource Adequacy for Modern Power Systems, ESIG Report (https://www.esig.energy/resource-adequacy-for-modern-power-systems/)
  - GridPathx RA Toolkit (https://gridlab.org/gridpathratoolkit/)
- Economy-wide decarbonization modeling:
  - Oregon Clean Energy Pathways Analysis (https://www.cleanenergytransition.org/projects/deep-decarbonization-pathways/oregon-clean-energy-pathways-analysis)
- **DISCUSSION QUESTIONS:**

1. If 1) natural gas price forecasts are unreliable (EIA, 2021) and 2) are arguably the most important driver of future marginal electricity costs, what is the purpose of energy modeling?
2. Why haven't the full range of co-benefits of renewable energy and efficiency been included in modeling estimates (US EPA)?

Week 8: Wholesale Markets and Transmission

Guest Speaker: Pam Sporborg, PGE **(Back to Top)**

Last Minute Add (these are references I thought had been added to the doc but got lost in version limbo somewhere)

- CAISO (2019) INITIATIVE: Extended day-ahead market https://stakeholdercenter.caiso.com/StakeholderInitiatives/Extended-day-ahead-market
- Western Power Pool (2022) Western Resource Adequacy Program https://www.westernpowerpool.org/about/programs/western-resource-adequacy-program
- Fairley, Peter (2020) How a Plan to Save the Power Grid Disappeared. https://www.theatlantic.com/politics/archive/2020/08/how-trump-appointees-short-circuited-grid-modernization/615433/

Introductory Corner

- Randolph, J., & Masters, G. M. (2018). *Energy for sustainability: technology, planning, policy*. Island Press. Chapter 10 **OR** 11 (based on your interests), Chapter 12.
- ODOE. (2020). Energy 101: Transmission Lines. In Oregon 2020 Biennial Energy Report. Pp 3-15 (103-115). https://energyinfo.oregon.gov/ber

Required Reading

- Abolhosseini, S., & Heshmati, A. (2014). The main support mechanisms to finance renewable energy development. *Renewable and Sustainable Energy Reviews*, 40, 876-885. On Canvas.
- Nelson, H., Hass, S., Sarle, K., Renerie, A. (2021). Communities of Place vs Communities of Interest: Citizen Information and Locally Unwanted Land Uses. *Environmental Impact Assessment Review.* Link above and On Canvas.

Recommended

- Corneli, et al (2019). Wholesale electricity market design for rapid decarbonization: Adding new long-term markets to today's spot markets. Utility Dive. 30 July. https://www.utilitydive.com/news/wholesale-electricity-market-design-for-rapid-decarbonization-adding-new-l/559748/
- Nelson, H., Swanson, B., Cain, N. (2018). Close and Connected?: The Effects of Proximity and Social Ties on Citizen Opposition to Electricity Transmission Lines. *Journal of Environment and Behavior.* Vol 50, Issue 5, pp. 567 – 596 . (Impact factor 3.15-2018) https://doi.org/10.1177/0013916517708598

- Deign, J. (2020). So what exactly is Green Hydrogen? *Greentech Media.* 29 June. https://www.greentechmedia.com/articles/read/green-hydrogen-explained
- Hauker, C. (2021). Power Market Design for an Era of Rapid Decarbonization. *NRRI Insights*. Oct. https://pubs.naruc.org/pub/96C4BEAF-1866-DAAC-99FB-D4C1060DDF7D
- Uhlenhuth, K. (2020). Power from the Prairie aims to link West Coast sun with Midwest wind Energy News. 24 Feb. https://energynews.us/2020/11/24/west/power-from-the-prairie-aims-to-link-west-coast-sun-with-midwest-wind/

Reference

- Partnership for Market Readiness (PMR) 2017. *Carbon Tax Guide: A Handbook for Policy Makers*. Washington, DC. License: Creative Commons Attribution CC BY 3.0 IGO https://openknowledge.worldbank.org/bitstream/handle/10986/26300/Carbon%20Tax%20Guide%20-%20Main%20Report%20web%20FINAL.pdf?sequence=1&isAllowed=y

DISCUSSION QUESTIONS:

1. Are the market design recommendations in Corneli et al, 2019 consistent with a cap and reduce?
2. How do the HI proposal and OR's Cap and Reduce differ in terms of policy tools, timelines, and coverage of GHG emissions?

Week 9: Equity in Energy

Scott Reeves, Cadeo **(Back to Top)**

Required Reading

- Greenlining Institute (2019). Equitable Buidling Electrification https://greenlining.org/wp-content/uploads/2019/10/Greenlining_EquitableElectrification_Report_2019_WEB.pdf
- World Resources Institue (2015). Building Climate Equity https://files.wri.org/d8/s3fs-public/building-climate-equity-072014.pdf
- SIF on Diversity, Equity, and Inclusion in the Power Plan (2021) https://www.nwcouncil.org/meeting/sif-2021-power-plan-and-dei-february-19-2021/
- Charity Fain and Oriana Magnera (2020). Best Practices for Community Engagement https://www.oregon.gov/puc/utilities/Documents/DSP-Archive.pdf **(Webinar #6)**
- Mariel Thuraisingham (2022) Centering Equity in Washington's Clean Energy Transition https://frontandcentered.org/centering-equity-in-washingtons-clean-energy-transition/

- PacifiCorp (2021) Public Engagement Plan https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/ceip/210305-Pac-Plan-7.30.2021.pdf
- PacifiCorp (2021) Clean Energy Implementation Plan - Development of Custoemr Benefit Indicators https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/ceip/PAC-CEIP-12-30-21_with_Appx.pdf **(Chapter 2 only)**

Reference

- White House (2022). Justice40 Inititative https://www.whitehouse.gov/environmentaljustice/justice40/
- Initiative for Energy Justice. December 2019. The Energy Justice Workbook. https://iejusa.org/workbook/
- Energy Trust of Oregon (2021) 20221 Diversity, Equity, and Inclusion Operations Plan https://www.energytrust.org/wp-content/uploads/2021/03/2021-DEI-Operations-Plan.pdf
- National Conference of State Legislatures (2022). Energy Justice and the Energy Transition https://www.ncsl.org/research/energy/energy-justice-and-the-energy-transition.aspx
- Washington State Department of Health (2022). Environmental Health Disparities Map. https://doh.wa.gov/data-and-statistical-reports/washington-tracking-network-wtn/washington-environmental-health-disparities-map

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Week 10: Transportation Electrification

Shanna Brownstein, Tesla **(Back to Top)**

Required Reading

- Brockway, A. et al (2022). Can Distribution Grid Infrastructure Accommodate Residential Electrification and Electric Vehicle Adoption in Northern California?https://haas.berkeley.edu/wp-content/uploads/WP327.pdf
- Synapse. (2020). Electric Vehicles Are Driving Rates Down. https://www.synapse-energy.com/sites/default/files/EV_Impacts_June_2020_18-122.pdf
- Smith, C. (2020). Utilities Investing $766 Million in Underserved Communities. EVHUB. https://www.atlasevhub.com/data_story/utilities-investing-766-million-in-underserved-communities/

- NEW: Walton, R. et al (2021). 'A long way to go': How utilities are helping 6 cities meet big EV goals . 30 Nov. https://www.smartcitiesdive.com/news/how-utilities-are-helping-6-cities-meet-big-ev-goals/610711/
- US EPA. (2021). Low-Income Energy Affordability Data (LEAD) Tool. https://www.energy.gov/eere/slsc/maps/lead-tool
- Henderson, A. (2021). Power shutoffs deepened pandemic toll while utilities collected millions in relief. *Energy News Network.* 8 Nov. https://energynews.us/2021/11/08/power-shutoffs-deepened-pandemic-toll-while-utilities-collected-millions-in-relief/

NEWS ARTICLE:

- Walton, R. (2021). 2021 Outlook: The future of electric vehicle charging is bidirectional — but the future isn't here yet. *Utility Dive*. 12 Jan. https://www.utilitydive.com/news/2021-outlook-the-future-of-electric-vehicle-charging-is-bidirectional-bu/592957
- St. John. (2021). Why EV fast-charging stations are going big on batteries. *Canary Media*. 15 Oct. https://www.canarymedia.com/articles/ev-charging/fast-ev-chargers

Recommended

- ODOE. (2020). Policy Brief: How Utilities Are Assessing and Managing Electric Cars on the Grid. **Pp. 122-129**. https://www.oregon.gov/energy/Data-and-Reports/Documents/2020-BER-Policy-Briefs.pdf#page=244

Reference

- PNNL. (2020). Electric Vehicles at Scale: Phase 1 Analysis. July. EXECUTIVE SUMMARY. On Canvas

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Week 11: Where the Rubber Meets the Road

Dan James, BPA **(Back to Top)**

Course Held at Regular Time During Finals Week!

- Paper Presentations
- Course Evaluations

Introductory Corner

- BPA. (2018). 2018-2023 Strategic Plan. https://www.bpa.gov/StrategicPlan/Pages/Strategic-Plan.aspx
    1. Also see the 2020 update here: https://www.bpa.gov/StrategicPlan/Pages/Strategic-Plan.aspx

Required Reading

- 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
- Tainter. J.A. (1995). Sustainability of Complex Societies. *Futures.* 27 (4). Pp. 397-407.

Recommended

- Columbia River Final EIS executive summary is here: https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll7/id/14957
- T&D World. (2021*). Reliability Analysis of U.S. West Reviews Barriers to Renewable Future.* 5 Feb. https://www.tdworld.com/transmission-reliability/article/21154102/reliability-analysis-of-us-west-reviews-barriers-to-renewable-future

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WEEK 12 (I Wish) Solutions? **(Back to Top)**

Introductory Corner

- PowerMag. (2018). How does the Western Energy Imbalance Market Work?. 1 Oct. https://www.powermag.com/how-does-the-western-energy-imbalance-market-work/

Required Reading

- FERC. (2020). FERC Opens Wholesale Markets to Distributed Resources: Landmark Action Breaks Down Barriers to Emerging Technologies, Boosts Competition. https://www.ferc.gov/news-events/news/ferc-opens-wholesale-markets-distributed-resources-landmark-action-breaks-down
- USDOE. (2021). FERC Order 2222 Recommendations for the U.S. Department of Energy. https://www.energy.gov/sites/default/files/2021-04/EAC%20FERC%20Order%202222%20Recommendations%202021-04-15_finalDraft.pdf
- St.John, J. (2021). Can customers' batteries, thermostats and EV chargers keep California's grid up and running? 12 Oct. *Canary Media*. https://www.canarymedia.com/articles/grid-edge/can-customers-batteries-thermostats-and-ev-chargers-keep-californias-grid-up-and-running

NEWS ARTICLE:

- Trabisch, H. (2020). Ensuring DER inclusion in capacity markets may require a rethink of resource adequacy. *Utility Dive*. 24 Aug.

https://www.utilitydive.com/news/ensuring-der-inclusion-in-capacity-markets-may-require-a-rethink-of-resourc/583590/

- St. John. (2021). Green Mountain Power and Tesla break grid barriers with behind-the-meter batteries. *Canary Media*. 21 May. https://www.canarymedia.com/articles/batteries/green-mountain-power-and-tesla-break-grid-services-barriers-for-behind-the-meter-batteries

RECOMMENDED

- CETI. (2021). Oregon Clean Energy Pathways. SKIM, esp p. 44. https://uploads-ssl.webflow.com/5d8aa5c4ff027473b00c1516/60de973658193239da5aec7b_Oregon%20Clean%20Energy%20Pathways%20Analysis%20Final%20Report.pdf
- WA DoC. (2020). WA State Energy Strategy. https://www.commerce.wa.gov/wp-content/uploads/2020/12/Appendix-A.-WA-SES-EER-DDP-Modeling-Final-Report-12-11-2020.pdf
- APPA. (2016). *Rate Design Options for Distributed Energy Resources*. Pp. 1-8.& one rate design of your choice. (Take the 20% PV generation on pp 1-5 with a grain of salt: PV penetration in most states is in single digits. But it's an important topic: Especially when we get to discussions of decommissioning the gas grid) https://www.publicpower.org/system/files/documents/ppf_rate_design_options_for_der.pdf
- Energy Storage News. (2021). California opens up opportunities for microgrids to play role in boosting reliability of energy mix. 21 Jan. https://www.energy-storage.news/news/california-opens-up-opportunities-for-microgrids-to-play-role-in-boosting-r
- Wang, H., & Redfern, M. A. (2010, August). The advantages and disadvantages of using HVDC to interconnect AC networks. In *45th International Universities Power Engineering Conference UPEC2010* (pp. 1-5). IEEE. (On Canvas).
- Cazalet, et al. (2020). Complete & Low-Cost Retail Automated Transactive Energy Systems (RATES). June. SKIM https://ww2.energy.ca.gov/publications/displayOneReport_cms.php?pubNum=CEC-500-2020-038

Reference

- US AID. (2021). Primer on Rate Design for Cost-Reflective Tariffs. January. https://pubs.naruc.org/pub.cfm?id=7BFEF211-155D-0A36-31AA-F629ECB940DC
- Gridworks. (2019). *California's Gas System in Transition: Equitable, Affordable, Decarbonized And Smaller.* https://gridworks.org/wp-content/uploads/2019/09/CA_Gas_System_in_Transition.pdf
- Carleton & Greenstone. (2021). Updating the US Government's Social Cost of Carbon. On Canvas. **SKIM**
- Randolph, J., & Masters, G. M. (2018). *Energy for sustainability: technology, planning, policy*. Island Press. Chapter 17 (Skim). Chapter 18.
- Einstellung effect. http://en.wikipedia.org/wiki/Einstellung_effect

News Articles:

- 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

Recommended

- Nelson, Hal T., et al. (2015). Intergovernmental Climate Change Mitigation Policy: Theory and Outcomes. *Journal of Public Policy*.
- 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

DISCUSSION QUESTIONS:

1. TBD
2. What does the Einstellung effect predict about our ability to develop (costly) institutions to solve problems regarding sustainability (Tainter)?

Mandatory PSU Language About Covid Stuff

The University has established rules and policies to make the return to the classroom as safe as possible. It is required for everyone to follow all the Return to Campus rules and policies. To participate in this class, PSU requires students to comply with the following.

Vaccination

- Be vaccinated against COVID-19 and complete the COVID-19 vaccination attestation form. Those students with medical or nonmedical exemptions or who will not be on campus at all must complete the process described on "COVID-19 Vaccine Exemption Request Form" to establish those exemptions.

Health Check, Illness, Exposure or Positive Test for COVID-19

- Complete the required self-check for COVID-19 symptoms before coming to campus each day.
- If you are feeling sick or have been exposed to COVID-19, do not come to campus. Call SHAC to discuss your symptoms and situation (503.725.2800). They will advise you on testing, quarantine, and when you can return to campus.
- If you test positive for COVID-19, report your result to SHAC and do not come to campus. SHAC will advise you on quarantine, notification of close contacts and when you can return to campus.

- Please notify me, (i.e. your instructor), should you need to miss a class period for any of these reasons so that we can discuss strategies to support your learning during this time.
- If I become ill or need to quarantine during the term, either I or the department chair will notify you via PSU email about my absence and how course instruction will continue.

Failure to Comply with Any of these Rules
As the instructor of this course, the University has given me the authority to require your compliance with these policies. If you do not comply with these requirements, I may ask you to leave the classroom or I may need to cancel the class session entirely.

In addition, failure to comply with these requirements may result in a referral to the Office of the Dean of Student Life to consider charges under PSU's Code of Conduct. A student found to have violated a university rule (or rules) through the due process of student conduct might face disciplinary and educational sanctions (or consequences). For a complete list of sanctions, see Section 14 of the Student Code of Conduct & Responsibility

Guidance May Change
Please note that the University rules, policies, and guidance may change at any time at the direction of the CDC, State, or County requirements. Please review the University's main COVID-19 Response webpage and look for emails from the University on these topics.

More Resources
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 Canvas.