

End-Use Energy Efficiency

Fridays 10 am – 12 pm & 1 – 2 pm

Professors:

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Office Hours:

- Chant: Open hours, via MS Teams, Tuesdays 2-3 PM and Wednesdays 9-10 AM
- Levin: Open hours, via MS Teams, Thursdays 3:30-4:30 PM

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Course Description: This course provides an overview of energy efficiency policies, programs and technologies at the federal, state, and local levels. We'll discuss the systems, policies, and legal frameworks enabling energy efficiency to serve as an energy resource. We will also highlight new approaches to program design, including the role of behavioral science in engaging customers and expanding access to energy efficiency. Most classes will combine lecture, class discussion, guest speakers, and student presentations. In 2020, the course will be held in a virtual live "synchronous" format with class meetings via MS Teams.

What Success Looks Like: It is important that you do the readings before class and come to class prepared for the discussion. The success of this course relies on your involvement and your engagement with the material. As the course progresses, we may add or modify the readings to align with class interests and topics that arise. We will give you plenty of notice. Students will be expected to attend the virtual live classes via MS Teams and keep video cameras on whenever possible, particularly during class discussion.

Class Discussions: All students are responsible for understanding the topics presented and coming to class prepared to contribute with references to the readings. Many of the links below are on the ACEEE website; these are accessible when you create a free account.

Guest Speakers: The course will be held virtually and will present an array of guest speakers working in various aspects of the energy efficiency field. Some guest speakers are tentatively booked; the schedule may change to accommodate their availability. We will inform you of any changes.

Final Paper: The primary class assignment is to write a policy paper that addresses a proposal for a specific energy efficiency legislative or regulatory action at the federal, state, municipal, or individual regulated utility level. The issue can be from any jurisdiction in the U.S. and can be on an existing proposal or one that is under discussion or part of an active docket or proposed legislation. The paper should outline precedent and / or jurisdictional requirements, and present relevant legislative or regulatory examples from other jurisdictions, pros and cons of the proposed approach, and other supporting material. You can take a position. Please include references and citations to support fully your work. We do want to see evidence that you can navigate filed documentation in public utility commission dockets. We expect the paper to be in the range of 10-15 pages (single-spaced, 1-inch margins, 11-12 point font). Final papers should be written in MS Word, and must be submitted by email to both faculty members **by 4 PM on Friday, August 7**. Your submission will be acknowledged.

Policy Presentation: In support of the final paper, you will share a 15-20 minute presentation of your policy topic with the class. The presentation will provide an opportunity to share your perspective on the policy topic and / or solicit feedback from the class to inform your final paper. When you choose to do your policy presentation may depend on whether you are more interested in gathering feedback as part of your research (present earlier in the semester) or in presenting your final case (later in the semester).

Requirements:

1. Attend class;
2. Complete the required readings;
3. Participate in class discussions;
4. Present on an energy efficiency policy topic of your choice, during class; and
5. Write a final paper on the same energy efficiency topic.

Grading:

Class Attendance*	15%
Class Participation	15%
Policy Presentation	20%
Final Paper	50%

* Please, whenever possible, notify both faculty by email in advance if you will not be able to attend class.

Class 1: Friday June 5, 2020

Introduction to Energy Efficiency and Federal Policy

- 1) In the first class, we will explore how energy efficiency initiatives reshaped the United States' relationship with energy, including the relationship between energy efficiency,

Gross Domestic Product, and decarbonization. This class will also introduce key definitions and provide an overview of energy efficiency technologies and practices. We'll also consider the role of federal energy efficiency policy, including both voluntary and mandatory approaches. Start sign up for policy presentation date

Readings

- 1) Enphase Energy, "What is a kilowatt hour?"
<https://www.youtube.com/watch?v=zRYESRObKqA>
- 2) ACEEE, The Greatest Energy Story You Haven't Heard: How Investing in Energy Efficiency Changed the US Power Sector and Gave Us a Tool to Tackle Climate Change (2016).
<https://aceee.org/research-report/u1604>
- 3) ACEEE, The Impact of Federal Energy Efficiency Programs (2018),
<http://aceee.org/sites/default/files/pdf/fact-sheet/impact-federal-ee-programs.pdf>
- 4) Columbia University, Sabin Center for Climate Change Law, "The Climate Consequences of Rolling Back Energy Efficiency" (April 21, 2020)
<http://blogs.law.columbia.edu/climatechange/2020/04/21/the-climate-consequences-of-rolling-back-energy-efficiency/>

Guest Speaker

- **Kara Saul-Rinaldi**, President & CEO, AnnDyl Policy Group
(<https://www.linkedin.com/in/kara-saul-rinaldi-694bbb4/>)

Class 2: Friday June 12, 2020

State Actions and Utility Regulation

We will explore the role that state governments play in energy efficiency and utility regulation. The class will look back at the history of state action on energy efficiency across the country and explore the work occurring to move energy efficiency forward. Students will read and discuss energy efficiency resource standards, utility versus third-party program administrators, utility regulation, program funding sources, and more. Finish sign-up for policy presentation.

Readings

- 1) National Governors Association Center for Best Practices, 2019, "State Energy Toolkit."
https://www.nga.org/wp-content/uploads/2019/11/NGA_CleanEnergy_Toolkit_Full_all-sections.pdf
- 2) ACEEE – The 2019 State Energy Efficiency Scorecard. Read Chapter 1 and scan contents of remainder. <https://www.aceee.org/research-report/u1908>
- 3) ACEEE – State Energy Scorecard website, <http://aceee.org/state-policy/scorecard> (find and read up on your state).

- 4) Scudder Parker and Jim Lazar, 2016, "The Old Order Changeth: Rewarding Utilities for Performance, not Capital Investment."
https://www.aceee.org/files/proceedings/2016/data/papers/6_474.pdf

Guest Speaker

- **Marion Gold**, Commissioner, Rhode Island Public Utilities Commission
(<https://www.linkedin.com/in/marion-s-gold-4ab2148/>)
- **Scudder Parker**, former Director of Energy Efficiency at Vermont Department of Public Service, former Vermont state legislator, and former Consulting Director, VEIC
(<https://www.linkedin.com/in/scudderparker/>)

Class 3: Friday June 19, 2020

Energy Efficiency as a Resource: Utility and Market Mechanisms

Is energy efficiency a resource? How does it fit into utility and grid operator planning processes? In this class, we will look at how energy efficiency is changing distribution and transmission planning processes and the regional integration of energy efficiency into wholesale electricity and carbon markets. We will also explore options to pay for energy efficiency, including utility direct investment, public benefit charges, and market mechanisms. We will dig into utility business model considerations and discuss strategies to overcome barriers to utility investment in energy efficiency.

Readings

- 1) Patti Poppe, CEO of Consumers Energy, Keynote address at 2019 ACEEE Energy Efficiency as a Resource Conference. <https://www.youtube.com/watch?v=u2eM4arYvo4> (associated presentation will be posted on TWEN)
- 2) Playing with the Big Boys: Energy Efficiency as a Resource in the ISO New England Forward Capacity Market Cheryl Jenkins, Blair Hamilton, and Chris Neme, Vermont Energy Investment Corporation, <http://www.veic.org/documents/default-source/resources/reports/playing-with-the-big-boys.pdf>
- 3) Decoupling Policies: Options to Encourage Energy Efficiency Policies for Utilities, NREL. <http://www.nrel.gov/docs/fy10osti/46606.pdf>
- 4) ACEEE – Role of Energy Efficiency in a Distributed Energy Future (2018). <https://aceee.org/research-report/u1802>
- 5) RGGI Proceeds Report 201. Read pg. 1-12. https://www.rggi.org/sites/default/files/Uploads/Proceeds/RGGI_Proceeds_Report_2017.pdf
- 6) SCE, Application of Southern California Edison Company (U 338-E) for Approval of its Clean Energy Optimization Pilot. Read pg. 1-5 (pilot description). [http://www3.sce.com/sscc/law/dis/dbattach5e.nsf/0/45EB1679CFDDB07F8825828F00010F51/\\$FILE/A1805xxx-SCE%202018%20CEOP%20Application.pdf](http://www3.sce.com/sscc/law/dis/dbattach5e.nsf/0/45EB1679CFDDB07F8825828F00010F51/$FILE/A1805xxx-SCE%202018%20CEOP%20Application.pdf)

Guest Speaker

- **Ethan Goldman**, Independent Consultant
(<https://www.linkedin.com/in/ethan-goldman-a33aa75/>)

Class 4: Friday June 26, 2020

Understanding Customers and Overcoming Barriers with Behavioral Science and Design Thinking

In this class, we'll explore the "customer revolution" in the energy efficiency industry. We'll investigate the role of behavioral science in policy and program design and play with design thinking tools that program designers leverage to improve customer experiences. We'll cover mechanisms for overcoming barriers, like technical assistance, incentives and financing for energy efficiency programs.

Readings

- 1) ACEEE, "How can we increase energy efficiency investments? Here are 10 suggestions," August 15, 2017. <https://www.aceee.org/blog/2017/08/how-can-we-increase-energy-efficiency>
- 2) Suzanne Shelton, "Creating a social norm around energy efficiency," April 3, 2017. https://www.aceee.org/sites/default/files/pdf/conferences/mt/2017/Shelton_Keynote_MT17_4.3.17.pdf
- 3) The Behavioural Insights Team, "MINDSPACE" Report (2010) <https://www.bi.team/publications/mindspace/>
- 4) Watch: TED talk, "How behavioral science can lower your energy bill" by Laskey https://www.ted.com/talks/alex_laskey_how_behavioral_science_can_lower_your_energy_bill?language=en

Guest Speaker

- **Elizabeth Palchak**, Senior Consultant, VEIC
(<https://www.linkedin.com/in/elizabeth-palchak-ph-d-12863345/>)

Class 5: Friday July 10, 2020

Broadening the conversation: Who pays? Who benefits? How do we know? Why do we care?

In this class we will discuss models for identifying and understanding energy burden and its effects. We will review energy efficiency and assistance programs from different parts of the country and the benefits these programs provide to low-income residential customers. We will

investigate issues of diversity, equity, and inclusion in the energy efficiency industry and efforts to better understand and direct the impacts of policies and programs.

Readings

- 1) U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, 2018, “Low-Income Household Energy Burden Varies Among States – Efficiency Can Help in All of Them.” https://www.energy.gov/sites/prod/files/2019/01/f58/WIP-Energy-Burden_final.pdf
- 2) Vermont Law School Institute for Energy and the Environment, 2014, “Energy Costs and Burdens in Vermont: Burdensome for Whom?” (summary report by the Energy Security and Justice Program of the Vermont Law School) <http://www.thetfordvermont.us/wp/wp-content/uploads/2015/03/Energy-Costs-and-Burdens-in-Vermont.pdf>
- 3) Elizabeth Chant and Frances Huessy, 2018, “Justice for All: Measures of Equity for Low-Income Programs.” <https://aceee.org/files/proceedings/2018/index.html#/paper/event-data/p394>
- 4) Ben Stacey and Tony Reames, 2017, “Social Equity in Energy State Policy: Indicators for Michigan’s Energy State Policy: Indicators for Michigan’s Energy Efficiency Programs.” <https://justurbanenergy.files.wordpress.com/2017/12/equity-in-energy-efficiency-investment-and-savings-report-2017.pdf>
- 5) Marti Frank and Seth Nowak, 2016, “Who’s Participating and Who’s Not? The Unintended Consequences of Untargeted Programs.” https://www.aceee.org/files/proceedings/2016/data/papers/2_542.pdf

Guest Speakers

- **Marti Frank**, Principal, Efficiency for Everyone (<https://www.linkedin.com/in/martifrank/>)
- **Tony Reames**, Assistant Professor of Energy Justice and Director, Urban Energy Justice Lab, University of Michigan (<https://www.linkedin.com/in/tonygreames/>)

Class 6: Friday July 17, 2020

Valuing Efficiency’s Benefits in Cost-Effectiveness Testing

This class will focus on the role of evaluation, measurement and verification (EM&V) to answer questions like: *Can you count on the results of efficiency?* We will examine techniques for quantifying energy efficiency savings and review the economic tests, known as cost-effectiveness screening, that represent choices for determining how much energy efficiency may be accomplished and at what cost. This class will also explore the non-energy benefits of energy efficiency. From health care to justice issues, air quality to carbon, externalities represent a method to consider the additional benefits of enacting energy efficiency. Finally,

the class will look at innovative ways to unlock new value streams and revenue sources for energy efficiency, including strategies to compensate energy efficiency more fully for its value to the grid and garner funding from the health care industry.

Readings

- 1) National Efficiency Screening Project, 2017, "National Standard Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources." Executive Summary, Chapter 1, and Appendix A. https://nationalefficiencyscreening.org/wp-content/uploads/2017/05/NSPM_May-2017_final.pdf
- 2) Synapse Energy Economics, 2018, "Avoided Energy Supply Components in New England: 2018 Report." Review Executive Summary, and then browse through report and Synapse website to gain general understanding of the components and costs of avoided energy supply. <https://www.synapse-energy.com/sites/default/files/AESC-2018-17-080-Oct-ReRelease.pdf>.
- 3) Northeast Energy Efficiency Partnerships, 2017, "Non-Energy Impacts Approaches and Values: An Examination of the Northeast, Mid-Atlantic, and Beyond." Read chapter on "Cost Effectiveness and NEIs" and scan remainder of report. <https://neep.org/sites/default/files/resources/NEI%20Final%20Report%20for%20NH%206.2.17.pdf>
- 4) Christopher Chan, Greg Clendenning, Beth Hawkins, Erin Rose, and Bruce Tonn, 2017, "Saving Lives through Energy Efficiency: Valuing the Health- and Safety-Related Benefits of Weatherization in Low-Income Homes." <http://www.nmrgroupinc.com/wp-content/uploads/2019/01/Gregs-paper.pdf>

Guest Speaker

- **Phil Mosenthal**, Partner, Optimal Energy
(<https://www.linkedin.com/in/phil-mosenthal-b0ab004/>)
- **Bruce Tonn**, President, Three3
(<https://www.linkedin.com/in/bruce-tonn-5698335/>)

Class 7: Friday July 24, 2020

Emerging Trends in Energy Efficiency: DERs, Devices, and Decarbonization

This class will explore the future of energy efficiency. We will look at innovations in energy efficiency delivery models and emerging technologies such as connected devices and zero energy buildings. We'll also consider how energy efficiency integrates with distributed energy resources, building and transportation electrification, demand flexibility, energy storage, and a decarbonized grid.

Readings

- 1) Listen: The Energy Gang (podcast), Energy Efficiency is Going Through Another Transformation. <https://www.greentechmedia.com/articles/read/a-new-paradigm-for-energy-efficiency>
- 2) Grueneich, D.M., The Next Level of Energy Efficiency: The Five Challenges Ahead. Electr. J. (2015). <http://dx.doi.org/10.1016/j.tej.2015.07.001>
- 3) Amory B. Lovins, "How big is the energy efficiency resource?" 2018 Environ. Res. Lett.13 090401. <https://iopscience.iop.org/article/10.1088/1748-9326/aad965>
- 4) Utility Dive, "Integration is the next step in demand side management: Here's how 3 utilities are pursuing it," Dec. 5, 2018. <https://www.utilitydive.com/news/integration-is-the-next-step-in-demand-side-management-heres-how-3-utility/543636/>
- 5) Acadia Center, 2018 Clean Energy Legislation in Massachusetts. <https://acadiacenter.org/wp-content/uploads/2018/08/Acadia-Center-Summary-of-2018-Clean-Energy-Legislation-in-MA.pdf>
- 6) Acadia Center, Clean Heating Pathways (2020). <https://acadiacenter.org/wp-content/uploads/2020/03/Acadia-Center-Clean-Heating-Pathways.pdf>

VEIC Field Trip

- **Jennifer Wallace-Brodeur**, Director of Transportation Efficiency, VEIC (<https://www.linkedin.com/in/jennifer-wallace-brodeur-23687a119/>)
- **Dan Fredman**, Senior Consultant, VEIC (<https://www.linkedin.com/in/danfredman/>)
- **Damon Lane**, Lead Analyst, VEIC (<https://www.linkedin.com/in/damonlane/>)

Class 8: Friday, July 31, 2020

Where Are We Headed?

In this final class, we will spend time synthesizing what we have covered through the semester and talk about where the industry is headed. We will discuss readings that cover recent news related to energy efficiency and energy policy and address new opportunities for clean energy in the U.S.

Readings

- 1) Massachusetts Energy Efficiency Advisory Council, 2020, "2020 Priorities." http://ma-eeac.org/wordpress/wp-content/uploads/DRAFT-2020-EEAC-Priorities_2.6.2020_Clean.pdf
- 2) MA EEAC Consultant Team, 2019, "Mass Save 2019 Residential Program Review: Opportunities and Recommendations for 2020 and Beyond." <http://ma->

eeac.org/wordpress/wp-content/uploads/2019-Residential-Program-Review-and-Recs.pdf

- 3) Clean Energy DC Omnibus Act of 2018, <https://dcclimate.org/wp-content/uploads/2018/12/DC-Climate-Omnibus-Bill-Fact-Sheet.pdf>.
- 4) Atlantic Magazine Blueprint: A Summit on Infrastructure and Transportation, 2019, “Sustainable Energy and Social Justice are not Mutually Exclusive.” <https://www.youtube.com/watch?v=36FcTYWa5IE&list=PLwj46yNDLyTXbNKtRAUexUFIUVUj3Njhr&index=5>

Speakers

- **Ted Trabue**, Director, DC Sustainable Energy Utility (<https://www.linkedin.com/in/ted-trabue-6222ba48/>)
- **Eric Belliveau**, Partner, Optimal Energy (<https://www.linkedin.com/in/eric-belliveau-960a5a11/>)