SYLLABUS

ENRGYENV 625E

Energy, Markets, and Innovation

Fall 2020 EMBA Superterm

In-person: September 13 – September 18, 2019

Distance: October 2 – November 28, 2019

Instructor	Teaching Assistant
Dan Vermeer dv24@duke.edu **Office hours:** Wednesdays 12:30-2:00 PM; email Dan to schedule appointment. **Office Phone:** (919) 660-1966 **Cell Phone:** (919) 448-5555	**Chris Lazinski** MBA/MEM Candidate 2021 christopher.lazinski@duke.edu

Description: The energy and transportation industries are some of the most capital-intensive and fastest-growing industries in the world. Emerging economies are rapidly building infrastructures to meet the rising needs of their citizens, while developed markets are evolving their systems to balance services, cost, consumer preferences, and environmental considerations. In this course, we will apply principles from economics, finance, and strategy to understand *energy transitions*, with a focus on electricity and transportation. Specifically, we will explore how supply and demand, industry structure, technology, policy, and prices evolve over time. We will also explore how value is created in these industries, and how risks are managed. Finally, we will also examine the role of public policy and regulation in shaping energy markets. Many of these factors will be demonstrated in a simulation exercise called CarbonSim that we will host during the residency.

By using targeted readings, case studies, lectures, and guest lectures, we will observe how these dynamics play out in specific market and historical contexts. In addition, we will learn how to use practical analytical tools such as cost curve analysis to make empirically grounded business decisions. With this grounding, we will consider the practical, political, and market factors that should be considered in debates about energy security, mobility, security, infrastructure, natural resources, climate regulation, and other hot topics. This class is designed to meet the learning needs of students with experience in the energy and/or transportation industries, but also to provide a valuable introduction to this dynamic space for non-specialists.

Course Requirements (I = Individual deliverable; T = Team deliverable):

Due Dates	Assignments	Points
	Class attendance and participation (I)	24
Sept 13, 14, 15, and Oct 2	Case/video assessments – 4 x 6 points/each (I)	24
Oct 2	*CarbonSim* debrief (T)	10
Oct 16	"Which Type of Power Plant?" case assessment (I)	12
Oct 30	*En-ROADS* evaluation (T)	10
Nov 27	Final project - paper and presentation (I)	20

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Evaluation criteria for this course include:

- **Class attendance and participation (24%):** Class attendance and participation is a crucial part of the learning process in this course. You will learn a great deal from the ideas of others in the class. It is essential that you come to class prepared to share your insights with others and to compare your perspective on the day's topic with the perspectives of your peers. You will be evaluated on the quality of your engagement in the discussion, creative and thoughtful insights, and respect for others' contributions. However, more is not better, so be prepared to contribute to a balanced conversation involving all participants.

- **Case assessments (24% total; 6 points each):** Please submit four brief statements (~500-600 words in PDF format, 12-point text, single spaced) on the following case studies/videos: ***Equinor (Sept 13)***, ***Enel (Sept 14)***, ***Ford (Sept 15),*** and ***Ørsted (Oct 2)***. Please note the guide questions in each class session description below.

- ***CarbonSim team assessment (10%):*** The *CarbonSim* simulation (created by Environmental Defense Fund) teaches the principles of emissions trading and brings carbon markets to life. This tool allows program administrators to test options for market design, and trains investors and industry participants to design carbon portfolio management strategies. Students will work in teams to participate in a large group exercise on Sept. 17 (facilitated virtually by EDF). After the residency, teams will document and submit their learnings in a Team Debrief document. Please submit a ~800-word debrief, in PDF format using 12-point single-spaced text. See target questions below.

- **"Which Type of Power Plant?" case assessment (12%):** Please write a memo (~1,000 words, in PDF format, 12-point single-spaced) providing a recommendation for the case study "Coal, Nuclear, Natural Gas, Oil, or Renewable: Which Type of Power Plant Should We Build?" See target questions below.

- ***En-ROADS team assessment (10%):*** The En-ROADS simulation (created by MIT and maintained by Climate Interactive) allows student teams to explore how changes in global GDP, energy efficiency, R&D, carbon price, fuel mix, and other factors can impact carbon emissions, energy access, and global temperatures. This simulation program allows for testing of hundreds of factors, making it ideal for decision-makers in government, business, NGOs, and civil society. Students will work virtually in teams to complete the En-ROADS exercise and document their strategy and insights in a Team Assessment document.

- **Final project – paper (15%) and presentation (5%) = (20%)**
  The electricity industry is currently undergoing profound shifts driven by new technologies, evolving policy priorities, emerging business models, and changing consumer needs and expectations. For your final project, please select one of

the below innovations, and assess its potential impact on electricity markets, customers, and system over the next 10 years.

You will write an individual paper on this topic. Imagine preparing this analysis to share with industry professionals and investors at a major "energy futures" conference in Rhode Island in 2020. Your paper should be a minimum of 1,200 words, single-spaced – but you will not be penalized if it is longer. You may also include relevant tables or graphics and provide proper citations. You should use multiple data sources and demonstrate the breadth of your research by considering different perspectives. Highlight any key assumptions or debates that impact your assessment.

In addition, you will prepare and deliver a 7-minute presentation, followed by 3-minute Q&A in one of the distance sessions.

Innovations:

1. Energy storage (batteries, new chemistries)
2. Electric/autonomous vehicles
3. Vehicle-to-grid applications
4. Offshore wind or other ocean-based energy sources
5. Energy efficiency
6. Demand management
7. Smart grid/microgrids
8. Green hydrogen
9. Electrification (especially of heat options)
10. Modular nuclear reactors
11. ***OTHER*** (topic to be approved ahead of time by instructor)

In your analysis, please consider the following questions:

1. What is the current utilization of this innovation in the energy system, and how is it likely to evolve over the next 10 years?
2. What is the value proposition of this innovation for the energy system – affordability? resiliency? customization? reduced environmental impacts? others? What are the potential drawbacks, risks, or liabilities?
3. Is this innovation appropriate for use on Aquidneck Island? What considerations should be taken into account in this context?
4. How might economic, political, regulatory, customer, and social trends over 10 years (global or regional) interact with this innovation?
5. Using concepts learned in class, what impact might this innovation have on electricity supply and demand in the US?
6. How might industry economics be affected by evolution of this innovation?
7. What enablers or barriers exist that might influence the deployment of this innovation?
8. What existing companies would be attractive investments in the scenario you describe? What kinds of new ventures would you expect to emerge in this space?

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Your paper should be an objective analysis of your target innovation – including both the promise and the challenges of adoption. Please conclude with a summary recommendation to energy industry participants and investors about what developments they might anticipate in the coming decade, and how they should respond. Keep in mind that your audience includes various stakeholders from Aquidneck Island.

Course Overview

Pre-assignment: Please review the below materials and come to class prepared to discuss the readings and Equinor case materials. Also note that brief case assessments are due on Sunday, Monday, and Tuesday during the residency. Each assignment should be based on careful study of the case materials and should inform the class discussion.

Background reading

- Smil, Vaclav. (2000). Energy in the Twentieth Century: Resources, Conversions, Costs, Uses, and Consequences. Annual Review of Energy and the Environment (25), pp. 21-51.
- Shively, Bob, and John Ferrare. (2019). *Understanding Today's Electricity Business*. 7th Edition. Laporte, CO: Enerdynamics.
    - Read Sections 4, 8, and 9. You can also review optional sections 1-3, 5-7 for additional background.
- Bakke, Gretchen. (2016). *The Grid: The fraying wires between Americans and our energy future.* Bloomsbury.
    - Read Introduction, pp. xi-xxx.

Case*: **Equinor's strategic repositioning*** (not a formal case study)

- Energy Perspectives 2019: Long-term macro and market outlook, read pp. 3-56.
- Equinor 2019 Sustainability Report, read pp. 2-54.
- Equinor 2019 Annual Report and Form 20-F, read *selectively* from pp.8-99 to answer below questions.
- **EDGE Seminar (10/11/17):** Gareth Burns, VP and Managing Director of Statoil Energy Ventures, Statoil/Equinor. (See 27:00-1:33:00).
- Merchant, Emma Foehringer. (2018, March 25). Statoil Is Now Equinor, in a Rebrand for the Energy Transition. Greentech Media.

ASSIGNMENT: ***Equinor assessment*** due on Canvas on **Sunday, September 13** by **11:00 AM ET (before first class)**. Questions for Equinor reflection include:

1. Based on your reading of Equinor's public literature, how serious are they about the energy transition, and the risks and opportunities of climate change? How well-aligned are their corporate priorities and sustainability commitments?
2. What key trends or discontinuities are they betting on? What are the most important uncertainties?

3. What investments are they making in the new energy economy? Are they missing anything critical? Where should they be investing more or less?
4. What impact will COVID have on Equinor? Will COVID-associated losses speed up or slow down their transition toward clean energy?
5. Would you invest in Equinor? Why or why not?

Session 1 (9/13): Introduction to Energy Markets and Innovation

Description: This session will include an overview of the importance of energy in the global economy, including share of global GDP, role in industrial production, geographic distribution of energy resources, trade flows, and different types of energy. Within electricity, we will review different fuel types, and explore the unique aspects of electricity (e.g. inability to inventory, regulation, lack of price transparency, externalities like environmental impacts). We will also introduce concepts that will be used in the course, including: industry and firm economics, economics of supply and demand, market price-setting, decision making across timescales, externalities, and effects of regulation. Finally, we will explore the case of Equinor (formerly Statoil), and assess the strategic choices the company has made in the context of changing energy markets, climate change, and future value creation in the industry.

Readings:

- Roberts, David. (2019, June 26). The global transition to clean energy, explained in 12 charts. Vox.com.
- Mann, Charles. (2013, May). What if we never run out of oil? Atlantic.com.
- Stockton, Nick. (2018, July 26). Much of the US Electric Grid could go the way of the landline phone. Wired.com.
- Newell, R. and Raimi, D. (2018, August 17). Despite renewables growth, there has never been an energy transition. Axios.com.
- Williams, M. and Rogers, D. (2019, July 31). Nearly 90% of Duke Energy's Coal Fleet Likely Unprofitable. Sierra Club.

ASSIGNMENT: **Enel assessment** due on Canvas on **Monday, September 14** by **2:00 PM ET**. Questions for Enel reflection include:

1. How does Enel make money? What is their business model?
2. Do you think Enel's approach to innovation will work? Why or why not?
3. From Enel's perspective, what are the most important technological, policy, and consumer changes occurring in the energy sector?
4. Do you think Enel will be successful over the next decade? Why or why not?

Session 2 (9/14): Energy Supply and Demand

Description: In this session, we will discuss the case study of Enel and evaluate the risks and opportunities of their current strategy. In the second half of the session,

we will also consider the dynamics of energy demand, identify primary demand segments, and assess seasonal, intraweek, and intraday demand profiles. Fionally, we will investigate relevant technological changes and consumer preferences and their implications for energy markets.

Case: Enel's Innovability: Global Open Innovation and Sustainability (2019).

Readings/video:

- **See *Duke Energy Conference 2017 Keynote***: Sayun Sakduang, CEO, ENGIE North America. (Length: 1 hour).
- Friedrich, K. (2019). What will it take to catalyze the energy transition? Clean Energy Finance Forum.
- Murray, Brian. (2019, July 19). The Energy Transition Is More Than Another Moonshot - It's Harder. Forbes.com.
- Giones, F., et.al. (2019). Strategic decisions in turbulent times: Lessons from the energy industry. Business Horizons 62, pp. 215-225. Available on Canvas.

ASSIGNMENT: **Ford assessment** due on Canvas on **Tuesday, September 15** by **6:00 PM ET**. Questions for reflection include:

1. In what ways are consumer preferences changing in Ford's different market segments and geographies?
2. How significant are the new industry entrants and their technologies? How should Ford respond to the competitive threats?
3. Which R&D initiatives should the company bet on, and how aggressively should it invest to build new capabilities?
4. Does the concept of "disruption" provide a helpful model for understanding Ford's current dilemmas?
5. How can a company reinvent itself when it has such a long history, an established business model, and massive legacy infrastructure? Has Mark Fields chosen the right approach?

Session 3 (9/15): Future of Mobility: Disruption or Continuity?

Description: Today's session will focus on the growing connections between electric utilities and the mobility industry. Changes in technologies, public policies, and consumer demand are threatening established incumbent players, and undermining traditional business models. We will explore the potential future scenarios for the industry, and how different companies and leaders are navigating this environment.

Case: Disruption in Detroit: Ford, Silicon Valley, and Beyond (A)

Readings:

- IEA report (2019, May 27): Global EV Outlook 2019. IEA web site.
    - Read Executive Summary, pp. 6-27.
- Engel, H., et.al. (2018, July). The potential impact of electric vehicles on global energy systems. McKinsey Center for Future Mobility.

- Ford's evolving sense of self: an interview with Hau Thai-Tang. (2019, February). McKinsey Quarterly.
- BNP Paribas report (2019, August). Wells, Wires, and Wheels…: EROCI and the tough road ahead for oil. BNP Paribas Asset Management.
    - Read Executive Summary, pp. 3-19.

Guest speaker: Chris Lazinski, on the regulatory context for new mobility models

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Session 4 (9/16): Climate, Risk, and Business Strategy

In this session, we will investigate the implications of climate change for the energy industry, and for the global economy overall. One of the primary drivers of global change is the pressure to rapidly decarbonize our economy, but there is heated debate about the urgency of the problem, solution pathways, risks, investment approaches, and responsibilities of different parties. While this discussion has largely been driven (or blocked) by governments and international bodies, the energy and transportation industries sit in the center of this debate, and face daunting challenges about what technologies to implement, where to invest, how to engage in the policy process, and many other issues. This discussion will be an important context for the choices made in the CarbonSim simulation in the following session.

Readings:

- Kross, K. and Vermeer, D. (2019, June). Climate Change & Business: What every MBA needs to know. EDGE publication.
- Henderson, Rebecca, et.al. (2020). Climate Change in 2020: Implications for Business. Harvard Business School Press, pp. 1-18. Available on Canvas.
- Duke Energy report (2020): *Achieving a Net Zero Carbon Future*, pp. 1-33.

Guest speaker: Travis Bradford, on the next phase of energy transition

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Session 5 (9/17): What Comes Next, and CarbonSim Preparation

Description: In recent years, renewable energy and batteries have grown rapidly as prices dropped and technology improved. While this first generation of clean energy is competing well in the market, it is clear that they will not be able to reduce carbon emissions fast enough to avert the worst consequences of climate change. Now a new generation of technologies is emerging that can rapidly decarbonize harder-to-abate sectors of the economy, such as transportation and industrial production. Today's session will look "over the horizon" at these new technologies to assess their promise and challenges. In addition, since this is the last session before our concluding class simulation, we will briefly review the distance portion of the class, describe remaining assignments, and discuss the final project.

Readings:

- IRENA Report (2018, April): Global Energy Transformation: A Roadmap to 2050, pp. 1-73.

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Session 6 (9/18): *CarbonSim* Simulation:

Description: We will divide the class into teams to experiment with the *CarbonSim* simulation, in order to explore design choices for the introduction of carbon markets. The goal of the simulation is to evaluate – from the perspective of market creators and market participants – the implications of specific choices regarding the design of carbon markets. Teams will be evaluated based on the insights generated from the exercise rather than superior performance. These insights will be shared in a team assignment completed by October 2 at 11:59 PM ET.

Readings:

- Preliminary materials for the *CarbonSim* simulation. Available on Canvas.
- Gillingham, K. et.al. (2017, October 31). Lessons from first campus carbon-pricing scheme. Nature.com.
- Easwaran Narassimhan, et.al. (2018). Carbon pricing in practice: a review of existing emissions trading systems. Climate Policy 18:8, pp. 967-991.
- C2ES Webinar: "Moving Forward with Carbon Pricing", YouTube.com (66 minutes)

Distance Session 7 (10/3): Environment, renewables, and subsidies

Description: In this session, we will introduce the growing importance of environmental impacts (particularly carbon emissions), the various methods for including these concerns in the economic equation (either through taxes or subsidies), and the market reactions to these efforts. We will also discuss how these dynamics affect R&D investment, shape capital flows and alter economic incentives. Finally, we will review a recent report from the International Renewable Energy Agency that describes a roadmap for energy system transformation to 2050.

Case: *Ørsted Goes Global*

Readings:

- Bakke, Gretchen. (2016). ***The Grid: The fraying wires between Americans and our energy future.*** Bloomsbury.
    - Read Chapters 1-3.
- McKibben, Bill. (2015, June 29). Power to the people. New Yorker.
- Lefevre-Marton, N., et.al. (2019, April). Scaling the US East Coast offshore wind industry to 20 gigawatts and beyond. McKinsey & Company.

ASSIGNMENT: ***CarbonSim team assessment*** **AND** ***Orsted case assessment*** due on Canvas **on Friday, October 2** by **11:59 PM ET.**

Orsted case: Questions for reflection include:

1. What were the primary drivers for DONG/Orsted to transition toward clean energy? Did they moved too fast/too slow/about right pace?

2. What characteristics of offshore wind make it like/different from other generation sources? How did these factors relate to the emerging opportunity in the US's East Coast?
3. How did Orsted's business model help to manage risk and reduce costs?
4. In the US, what key incentives for offshore investment did Orsted communicate to key stakeholders?
5. What strategic and organizational challenges did Orsted face in growing its US business?
6. What other competitors are well-positioned to challenge Orsted in the US market? What are Orsted's chances of staying ahead of the competition?

Distance Session 8 (10/17): Power Plant Economics

Description: Power companies have a wide range of factors to consider in selecting fuel sources to run their facility. Some of these factors are related to the economics of fuel and electricity generation while others relate to the interests of various stakeholders. In the prior simulation, our task was to decide whether to run assets, and at what price, based on economic factors. In this case, we will consider how generators make long-term, capital-intensive bets on fuel and plant options, based on assumptions about the market and future trends. In our distance session, please be prepared to share your recommendation for which type of plant PowerCo should build.

Readings:

- **Case**: *"Coal, Nuclear, Natural Gas, Oil, or Renewable: Which Type of Power Plant Should We Build?"*
- Roberts, David. (2018, July 13). Clean energy is catching up to natural gas. Vox.com.
- Styles, Geoffrey. (2017, July 20). Are Renewables Set to Displace Natural Gas? Energy Outlook blog.
- Ramana, M.V. (2018, June 23). The future of nuclear power in the US is bleak. TheHill.com.

ASSIGNMENT: **Case recommendation** due on Canvas **on Friday, October 16** by **11:59 PM ET** – Please write a memo (1,000 words) providing a recommendation for the case study *"Coal, Nuclear, Natural Gas, Oil, or Renewable: Which Type of Power Plant Should We Build*?"

- In your assessment, please consider the following questions (***Note***: you do not need separate sections on each question; just be sure to address all questions in your overall assessment):
    - Which technology is best (e.g. oil, natural gas, coal, or renewables)?
    - Which issues should be considered?
    - What features of the various options are important and why?
    - Which option is most financially attractive?

- Who are the primary stakeholders, and what views will they likely have?
- How should PowerCo balance financial and other considerations?

Distance Session 9 (10/31): Energy Markets, Energy Futures

In this session, we will discuss key insights and issues raised by the En-ROADS simulation. We will also connect some of these issues to the wider themes of the previous discussions in the class. We will also explore how these trends are playing out in real time by discussing BNEF's Energy Outlook 2018.

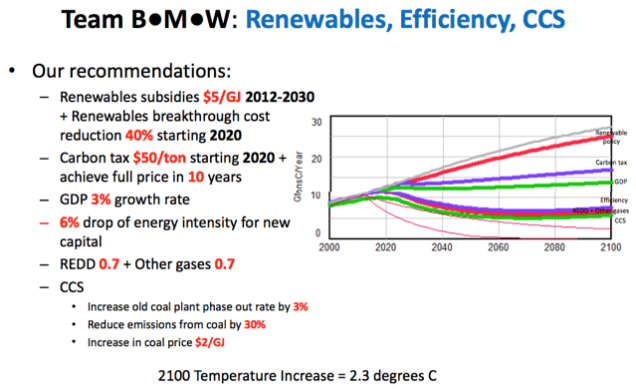
Readings:

- CERES Report (2015, November): Pathway to a 21st Century Electric Utility.
- Harvey, H., et.al. (2018). A Trillion Tons. ClimateInteractive.com

ASSIGNMENT: In preparation for this class, please work with your team to explore options in the ***En-ROADS simulation, and write a team assessment note*** due by **Friday, Oct 30** at **11:59 PM ET.**

Questions to consider in the simulation*:*
Please draft and submit a summary report (including relevant graphics from the simulation) summarizing your proposal.[1] Your proposal should address the following considerations:

1. **Proposal**. What were your settings in the simulation? How did you choose each of the settings? What "2100 Temperature Increase" did you achieve? These selections should be included in a graphic slide on the first page of your report, similar to below:



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2. **Meeting Goals:** Please comment on how well your proposal balanced the below considerations.
   a) ***Climate***: Make as much progress as possible towards limiting postindustrial temperature increase to two degrees C.
      - **Questions**: How well do you think your proposal does regarding meeting climate goals? If not well, why is this acceptable to you?

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[1] There is no required length for this report. Remember that this is a high-level proposal, so the text must be concise and direct. As a guideline, I suggest ~3 pages, including the proposal graphic.

b) ***Economy***: Support economic health. Drive a global energy transition that would least disrupt the economy and most address poverty.
   - **Questions**: If the world followed your recommendations, how would the economy be different in 2030? In what ways better? In what ways worse?

c) ***Equity***: Provide a solution that is fair for the poor and the rich.
   - **Question**: To what extent does your proposal seem fair and equitable regarding the rich and the poor?

d) ***Environment***: Minimize non-climate-related harmful effects on the environment.
   - **Question**: How much did you solve climate problems but create other environmental challenges?

e) ***Viability***: Be sure your solution could happen if human civilization was at its best.
   - **Question**: What would it take for your proposal to be realized?

3. **Implications:**
   a) ***Winners/Losers***. Who would be the biggest winners globally in your proposal future? Biggest losers?
   b) ***Role of business***. What would be required of global business to make your proposal happen? Which industries would require the most significant transformation in thinking and leading?
   c) ***Getting started***. For your proposal to be implemented, what would need to be the priorities for business, civil society and government over the next two years?

4. **Reflections**
   a) ***Risks***: What are the risks of pursuing this strategy? Which are known and which are unknown?
   b) ***Surprises***. What surprised you about the behavior of the energy system as captured in this simulation?
   c) ***Group diversity of views***. What were the components of your proposal that attracted the most debate and disagreement? What were the principles that differed underneath the debate?

Distance Session 10 (11/14): Individual presentations (Group A)

Description: Each student will present highlights from their final papers. They should prepare a 5-minute summary to share in the session, with a brief follow-up Q&A with the instructor and other students. Please develop a slide deck overview (template will be provided) to use in the webinar.

Reading:

- Bakke, Gretchen. (2016). ***The Grid: The fraying wires between Americans and our energy future.*** Bloomsbury.
  - Read Chapters 4-6.

ASSIGNMENT: **Slide deck overviews on final project** due on Canvas by **11:59 PM ET on Friday, November 13** *(for Group A students presenting this session).*

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Distance Session 11 (11/28): Individual presentations (Group B)

** See above for description and requirements

Reading:

- Bakke, Gretchen. (2016). ***The Grid: The fraying wires between Americans and our energy future.*** Bloomsbury.
    - Read Chapters 7-9.

ASSIGNMENT: **Slide deck overviews on final project** due on Canvas by **11:59 PM ET on Friday, November 27** *(for Group B students presenting this session).*

ALL Final Papers *(Group A and Group B students)* – due on Canvas by **11:59 PM ET on Monday, November 30**.

A Note on Late Assignments: Your grade will be adjusted downward by one full grade level for each day it is late, unless approved beforehand.

Fuqua Honor Code: Duke University is a community of scholars and learners, committed to the principles of honesty, trustworthiness, fairness, and respect for others. Students share with faculty and staff the responsibility for promoting a climate of integrity. As citizens of this community, students are expected to adhere to these fundamental values at all times, in both their academic and non-academic endeavors.

The Fuqua School of Business Honor Code applies to all aspects of this course. The nature of each assignment indicates the type of communication and consultation that is permitted. Work that is described as an individual effort is to be your work alone, without consultation or assistance from any other person. Work that is described as a team effort is to be your team's effort alone, again without consultation or assistance from anyone else. If you are uncertain about the nature of any assignment, please ask the instructor in advance.

Details on the Fuqua Honor Code can be found HERE. Please review the code before the first class.

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Appendix – Resources for Students

See below a list of resources that will help you deepen your understanding of the energy industry and its history, priorities, and debates.

Newsletters:

- Axios Generate
- American Energy Society
- Utility Dive (several sector newsletters)
- VERGE Weekly

Web sites:

- Greentech Media
- Greenbiz
- r/energy
- Climate Central

Podcasts:

- The Energy Gang
- Interchange (subscription required)
- The Energy Transition Show
- Columbia Energy Exchange
- Long Now: Seminars about Long-Term Thinking

Energy Thought Leaders

- David Roberts
- Amy Myers Jaffe
- Geoffrey Styles

Books:

- Ayres, Robert (2016). *Energy, Complexity, and Wealth Maximization*. Springer Press.
- Bradford, Travis (2018, forthcoming). *The Energy System*. MIT Press.
- Hawken, Paul (2017). *Drawdown: The most comprehensive plan ever proposed to reverse global warming*. Penguin Books.
- Mackay, David (2009). *Sustainable Energy – Without the Hot Air*. Chicago Review Press.
- O'Sullivan, Meghan L. (2017). *Windfall: How the new energy abundance upends global politics and strengthens America's power*. Simon & Schuster.
- Rhodes, Richard (2018). *Energy: A human history*. Simon & Schuster.
- Yergin, Daniel (2011). *The Quest: Energy, security, and the remaking of the modern world*. Penguin Press.