COLUMBIA UNIVERSITY
School of Professional Studies

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Master of Science in Sustainability Management

Financing the Clean Energy Economy (SUMA PS 5197)
Spring 2020, Mondays 6:10-8:00pm
3 credits

Instructor: Curtis Probst, CFA; csp2138@columbia.edu (cell, if urgent: 646 645 6595)

Office Hours: By appointment (email to schedule), preferably before or after class
Response Policy: Email is my preferred mode of communication (normal response the same or next business day)

Course Overview

We need to transition towards a more environmentally-sustainable society given both pollution and its health effects, and the impacts of extreme weather and climate change. The production and consumption of energy is the largest contributor to these concerns, and so the transition to a clean energy economy is essential. At the same time, given the energy needs of the world's growing population, affordability and energy security are also critical issues. New technologies and effective policies are needed to help drive increased deployment of renewable energy and energy efficiency. And importantly, finance is increasingly being recognized as a key lever to drive the implementation of clean energy. The availability and cost of capital is a key determinant in scaling renewable energy and energy efficiency technologies.

This course focuses on the finance and market aspects of the clean energy economy, and integrates technology, policy and finance to evaluate both the opportunities and challenges. There is a focus on renewable energy generation, as mass electrification using clean generation sources is necessary to sustain our energy-dependent lives and economies. The course also looks at energy efficiency, including specific end-uses of energy that are responsible for the majority of emissions (e.g., personal vehicles, buildings). Throughout the course, finance will be analyzed as a barrier to, or enabler of, greater adoption of clean energy.

Interactive lectures, and guest speakers where appropriate, will cover these topics in the first twelve classes (the final two remaining classes will be reserved for group presentations). The course can be divided into three sections (class numbers shown in parentheses):

- Acquiring a basic understanding of the U.S. electricity market: (1) historical context and the importance of finance, (2) energy fundamentals and current state of electricity markets, and (3) clean energy and grid integration.
- Applying the tools of finance to clean energy: (4) overview of key finance concepts, (5) financial modeling for energy projects, and (6) financial modeling for other clean energy measures.
- Integrating knowledge of the electricity market and finance to explore: (7) opportunities and challenges of clean energy, (8) rate design and the financing of distributed energy resources, (9, 10) financing mechanisms for clean energy, (11) building energy efficiency, and (12) electric vehicles and the grid.

Course assignments will include financial models, problem sets, case studies, and a final group presentation. The financial modeling will be designed to consider the varying levels of student experience. An important aspect of the course is for students to learn some of the analytical tools used by industry practitioners to make investment decisions. While no specific financial modeling experience is required, students should have basic spreadsheet skills or be prepared to learn them. As the course progresses, students will learn to appreciate the roles of technology, policy, and finance in the transition to a clean energy economy. Upon completion of this class, students should understand the fundamentals of the U.S. electricity sector, the role of clean energy, the opportunities and limitations of finance, and some of the different mechanisms to support clean energy finance.

This is an elective course designed for both students with a limited background in finance but with an interest in building that skill set, and students with prior backgrounds in finance that are seeking to apply those skills to financing the clean energy economy. Space permitting, the course is open to cross-registrants from other Columbia University graduate programs, and students from several schools at Columbia have successfully completed this course (Arts and Sciences, Business, Engineering and Applied Science, International Public Affairs, Professional Studies, and Social Work). The course is approved for the Certificate in Sustainable Finance requirement.

Learning Objectives

By the end of this course students should be able to:

L1. Describe how the existing electricity markets function in the U.S., and how clean energy technologies are developing within, and apart from, these markets
L2. Assess the implications of larger adoption of clean energy technologies to the broader electric grid
L3. Summarize some of the existing business models and financial techniques for bringing clean energy to markets
L4. Create basic financial models for evaluating clean energy opportunities and demonstrate good technique in the development of these models
L5. Discuss some of the key opportunities and challenges faced in transitioning to clean energy
L6. Identify mechanisms that can be used to support the development and deployment of clean energy

Considering the breadth of the energy and financial markets, and the rapidly evolving nature of each, the goal is not to learn about every means of financing clean energy. The course's objective is to provide students a new level of comfort in discussing the role of finance in the transition to a clean energy economy. Students will focus on several examples of that transition through the class materials, and may choose a specific area in which they have personal interest for the group presentation.

Readings

Required

American Wind Energy Association. "Wind Facts at a Glance." *awea.org*, 2019. Web. 2 Jan 2020. https://www.awea.org/wind-101/basics-of-wind-energy/wind-facts-at-a-glance (N.pag)

Clean Energy States Alliance. "A Homeowner's Guide to Solar Finance: Leases, Loans, and PPAs." *cesa.org*, Nov 2018: pp. 2-17. Web. 2 Jan 2020. http://www.cesa.org/assets/2015-Files/Homeowners-Guide-to-Solar-Financing.pdf (16 pages)

Environment America. "The True Value of Solar." *environmentamerica.org*, Jul 2019: pp. 1-12. Web. 2 Jan 2020. https://environmentamerica.org/sites/environment/files/resources/AME%20Rooftop%20Solar%20Jul19%20web.pdf (12 pages)

Federal Energy Regulatory Commission. "Energy Primer: A Handbook of Energy Market Basics." *ferc.gov*, Nov 2015: pp. 1-4, 35-56. Web. 2 Jan 2020. https://www.ferc.gov/market-assessments/guide/energy-primer.pdf (26 pages)

Fitzgerald, Garrett, Chris Nelder and James Newcomb. "Electric Vehicles as Distributed Energy Resources." *rmi.org*. Rocky Mountain Institute, 2016: pp. 6-9. Web. 2 Jan 2020. http://www.rmi.org/pdf_evs_as_DERs (4 pages)

Fitzgerald, Garrett et al. "The Economics of Battery Energy Storage: How multi-use, customer-sited batteries deliver the most services and value to customers and the grid. Executive Summary." *rmi.org*. Rocky Mountain Institute, Oct 2015. Web. 2 Jan 2020. https://rmi.org/wp-content/uploads/2017/05/RMI_Document_Repository_Public-Reprts_RMI-TheEconomicsOfBatteryEnergyStorage-ExecutiveSummary.pdf (8 pages)

Lazar, Jim. "Teaching the 'Duck' to Fly, Second Edition." *raponline.org*. The Regulatory Assistance Project, Feb 2016: pp. 5-9. Web. 2 Jan 2020. http://www.raponline.org/wp-content/uploads/2016/05/rap-lazar-teachingtheduck2-2016-feb-2.pdf (5 pages)

Lazard. "Lazard's Levelized Cost of Energy Analysis-Version 13.0." *lazard.com*, Nov 2019. Web. 2 Jan 2020. https://www.lazard.com/media/451086/lazards-levelized-cost-of-energy-version-130-vf.pdf (20 pages)

Lazard. "Lazard's Levelized Cost of Storage Analysis-Version 5.0." *lazard.com*, Nov 2019. Web. 2 Jan 2020. https://www.lazard.com/media/451087/lazards-levelized-cost-of-storage-version-50-vf.pdf (47 pages)

National Renewable Energy Laboratory. "Federal Tax Incentives for Energy Storage Systems." *nrel.gov*, Jan 2018. Web. 2 Jan 2020. https://www.nrel.gov/docs/fy18osti/70384.pdf (1 page)

National Renewable Energy Laboratory. "Ten Years of Analyzing the Duck Chart." *nrel.gov*, 26 Feb 2018. Web. 2 Jan 2020. https://www.nrel.gov/news/program/2018/10-years-duck-curve.html (3 pages)

NC Clean Energy Technology Center. "Commercial Guide to the Federal Investment Tax Credit for Solar PV." *dsireusa.org*, Dec 2015. Web. 2 Jan 2020. http://www.dsireusa.org/resources/presentations-and-publications/commercialitc_factsheet_final-dec2015update/ (6 pages)

Norton Rose Fulbright. "Corporate Renewable PPAs – a framework for the future?" *nortonrosefulbright.com*, May 2017. Web. 2 Jan 2020. http://www.nortonrosefulbright.com/knowledge/publications/149117/corporate-renewable-ppas-a-framework-for-the-future (5 pages)

Solar Energy Industries Association. "Solar Industry Research Data." *seia.org*, 2019. Web. 2 Jan 2020. https://www.seia.org/solar-industry-research-data (N.pag)

U.S. Department of Energy. "Solar-Plus-Storage 101." *energy.gov*, 11 Mar 2019. Web. 2 Jan 2020. https://www.energy.gov/eere/solar/articles/solar-plus-storage-101 (8 pages)

U.S. Energy Information Administration. "Electricity explained: Electricity in the United States." *eia.gov*, 19 Apr 2019. Web. 2 Jan 2020. https://www.eia.gov/energyexplained/electricity/electricity-in-the-us.php (4 pages)

U.S. Energy Information Administration. "Electricity explained: Electricity generation, capacity, and sales in the United States." *eia.gov*, 19 Apr 2019. Web. 2 Jan 2020. https://www.eia.gov/energyexplained/electricity/electricity-in-the-us-generation-capacity-and-sales.php (8 pages)

U.S. Energy Information Administration. "Use of energy explained: Energy use for transportation (basic)." *eia.gov,* 10 May 2019. Web. 2 Jan 2020. https://www.eia.gov/energyexplained/use-of-energy/transportation.php (3 pages)

U.S. Energy Information Administration. "Use of energy explained: Energy use for transportation (in depth)." *eia.gov,* 28 Aug 2019. Web. 2 Jan 2020. https://www.eia.gov/energyexplained/use-of-energy/transportation-in-depth.php (3 pages)

Wilson Sonsini Goodrich & Rosati. "Innovations and Opportunities in Energy Efficiency Finance." *wsgr.com*, May 2014. Web. 2 Jan 2020. https://www.wsgr.com/publications/PDFSearch/WSGR-EE-Finance-White-Paper-14.pdf (32 pages)

Wilson Sonsini Goodrich & Rosati. "Project Finance Primer for Renewable Energy and Clean Tech Projects." *wsgr.com*, Sep 2014. Web. 2 Jan 2020. https://www.wsgr.com/publications/PDFSearch/renewable-energy-primer-0914.pdf (20 pages)

Optional

Hargrave, Marshall. "Weighted Average Cost of Capital (WACC)." *investopedia.com*. Investopedia, 30 Jun 2019. Web. 2 Jan 2020. https://www.investopedia.com/terms/w/wacc.asp (N.pag)

Hayes, Adam. "Internal Rate of Return – IRR." *investopedia.com*. Investopedia, 25 Jun 2019. Web. 2 Jan 2020. https://www.investopedia.com/terms/i/irr.asp (N.pag)

Heyford, Shauna Carther. "Understanding the Time Value of Money." *investopedia.com*. Investopedia, 25 Jun 2019. Web. 2 Jan 2020. https://www.investopedia.com/articles/03/082703.asp (N.pag)

Kenton, Will. "Net Present Value – NPV." *investopedia.com*. Investopedia, 25 Jun 2019. Web. 2 Jan 2020. https://www.investopedia.com/terms/n/npv.asp (N.pag)

NARUC. "Distributed Energy Resources Rate Design and Compensation." *naruc.org*. National Association of Regulatory Utility Commissioners, Nov 2016. Web. 2 Jan 2020. https://www.naruc.org/rate-design/ (181 pages)

Resources

The readings have been carefully chosen to provide up-to-date resources on the topics covered in this course. For additional materials, or for academic support more generally, students may wish to consider the resources listed below.

Columbia University Information Technology

Columbia University Information Technology (CUIT) provides Columbia University students, faculty, and staff with central computing and communications services. Students, faculty, and staff may access University-provided discounted software downloads (https://columbiait.onthehub.com/).

Columbia University Library
Columbia's extensive library system ranks in the top five academic libraries in the nation, with many of its services and resources available online: https://library.columbia.edu/.

SPS Academic Resources
The Office of Student Affairs provides students with academic counseling and support services such as online tutoring and career coaching: http://sps.columbia.edu/student-life-and-alumni-relations/academic-resources.

Course Requirements (Assignments)

The expected assignments, their contribution to your final grade, and the learning objectives to which they relate are described below. Each assignment may be modified based on the progress of the class over the course of the semester.

I. Statement of purpose (4% of grade)

Students will prepare a one-page (double-spaced) statement of purpose that (a) discusses what you are looking to get out of the class, (b) highlights any particular skills you can contribute to the class or to your group, and (c) identifies one or more clean energy technologies, currently being deployed, in which you have a particular interest (this may help you identify a topic for the group presentation and fellow group members). Please include your (a) name and (b) UNI. Please submit it to the course website on or before the due date, and please submit a hard copy to the instructor in class on the due date.

II. Six assignments during the semester (66% of grade)

Assignment 1 (4%) (L4): Students will build a simple Excel financial model based upon a series of instructions. **Please pay attention to the financial modeling "best practices" discussed in class**. The model will focus on basic Excel concepts and good modeling techniques, and introduce certain financial concepts discussed in greater detail later in the course. Students will be required to (a) submit a hard copy of the financial model that is legible, labeled appropriately and formatted neatly to the instructor, and (b) submit a soft copy of the same financial model to the course website.

Assignment 2 (10%) (L4): Students will create another financial model(s), this time used to calculate the levelized cost of energy for a specific technology(ies). This model will take the basic financial concepts and good modeling techniques practiced in Assignment 1, and apply them to specific clean energy applications.

Assignment 3 (10%) (L4): Students will create a financial model for a clean energy project. The model will focus on more complex model design, and will also build on the skills practiced in Assignments 1 and 2.

Assignment 4 (14%) (L4): Similar to Assignment 3, students will develop a financial model for a clean energy project. This model will involve the application of more concepts based on the discussion of project finance.

Assignment 5 (14%) (L1, L2, L5, L6): Students will answer a set of quantitative and qualitative short answer questions. These questions will discuss the basic elements of: U.S. electricity markets, clean energy technologies, integration of clean energy into the grid and financial techniques for bringing clean energy to market.

Assignment 6 (14%) (L3, L4): Students will review one case study on financing the transition to clean energy. Students will answer a series of questions based on their knowledge of the markets and/or financial analyses that they will perform.

III. Group Presentation (25%) (L1, L2, L3, L5, L6)

Students will work in groups to present the key aspects of a particular clean energy technology or project. The deliverable will be the in-class presentation, plus the associated PowerPoint slides. The targeted group size and length of presentation will depend, in part, upon final enrollment in the class, but would likely be groups of 4-6 students and presentations 15-20 minutes in length. The final grade will be based (a) 20% upon instructor/teaching assistant evaluation of the assignment, and (b) 5% upon peer evaluations provided by fellow group members who will evaluate your relative contribution.

IV. Class Participation (5%)

Attendance alone does not count toward your participation grade. Contributing to class discussions means enhancing the quality of the class experience for yourself and others. It involves making relevant, useful and non-obvious comments, or posing pertinent questions, in clear and succinct language.

Evaluation/Grading

The final grade will be calculated as described below:

FINAL GRADING SCALE

Grade	Percentage
A+	98–100 %
A	93–97.9 %
A-	90–92.9 %
B+	87–89.9 %
B	83–86.9 %
B-	80–82.9 %
C+	77–79.9 %
C	73–76.9 %
C-	70–72.9 %
D	60–69.9 %
F	59.9% and below

ASSIGNMENT	% Weight
Statement of Purpose	4%
Assignment #1	4%
Assignment #2	10%
Assignment #3	10%
Assignment #4	14%
Assignment #5	14%
Assignment #6	14%
Group Presentation	25%
Class Participation	5%

Course Policies

Participation and Attendance

You are expected to complete all assigned readings, attend all class sessions, participate in class, and engage actively and cooperatively with others in completing the final group presentation. In particular, please be especially attentive to guest speakers, and develop appropriate questions in advance. Your participation will require that you answer questions, defend your point of view, and challenge the point of view of others. If you need to miss a class for any reason, please discuss the absence with the instructor in advance.

Late work

There will be no credit granted to any written assignment that is not submitted on the due date noted in the course syllabus without advance notice and permission from the instructor. Assignments submitted late with permission from the instructor will normally be graded down one letter grade (e.g., from an A to a B) absent extenuating circumstances.

Citation & Submission

All written assignments must cite sources (use any acceptable citation style e.g., APA, Chicago, MLA), and be submitted to the course website (not via email). For certain assignments (if so indicated), students may also be required to submit a printed hard copy.

School Policies

Copyright Policy

Please note—Due to copyright restrictions, online access to this material is limited to instructors and students currently registered for this course. Please be advised that by clicking the link to the electronic materials in this course, you have read and accept the following:

The copyright law of the United States (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted materials. Under certain conditions specified in the law, libraries and archives are authorized to furnish a photocopy or other reproduction. One of these specified conditions is that the photocopy or reproduction is not to be "used for any purpose other than private study, scholarship, or research." If a user makes a request for, or later uses, a photocopy or reproduction for purposes in excess of "fair use," that user may be liable for copyright infringement.

Academic Integrity

Columbia University expects its students to act with honesty and propriety at all times and to respect the rights of others. It is fundamental University policy that academic dishonesty in any guise or personal conduct of any sort that disrupts the life of the University or denigrates or endangers members of the University community is unacceptable and will be dealt with severely. It is essential to the academic integrity and vitality of this community that individuals do their own work and properly acknowledge the circumstances, ideas, sources, and assistance upon which that work is based. Academic honesty in class assignments and exams is expected of all students at all times.

SPS holds each member of its community responsible for understanding and abiding by the SPS Academic Integrity and Community Standards posted at http://sps.columbia.edu/student-life-and-alumni-relations/academic-integrity-and-community-standards. You are required to read these standards within the first few days of class. Ignorance of the School's policy concerning academic dishonesty shall not be a defense in any disciplinary proceedings.

Accessibility

Columbia is committed to providing equal access to qualified students with documented disabilities. A student's disability status and reasonable accommodations are individually determined based upon disability documentation and related information gathered through the intake process. For more information regarding this service, please visit the University's Health Services website: https://health.columbia.edu/services/ods/support.

Class Recordings

All or portions of the class may be recorded at the discretion of the instructor to support your learning. At any point, the instructor has the right to discontinue the recording if it is deemed to be obstructive to the learning process.

If the recording is posted, it is considered confidential and it is not acceptable to share the recording outside the purview of the faculty member and registered class.

Course Schedule/Course Calendar

Session, Date	Topics and Activities	Readings (due this day); required unless otherwise indicated	Assignments (due on this date)
One 1/27	**History of the Energy Industry and the Importance of Finance (L1)** Topics: *Introductions *Goals/ Context *Course Key Themes/ Goals *Class Deliverables *Brief History of Energy Industry *Importance of Finance Activities: *Course Overview *Lecture *Discussion	n/a	--

Two 2/3	**Energy Fundamentals and Electricity Markets Today (L1, L2)** Topics: *Forms of Electricity Production *Basic Terminology *Production Efficiency *LCOE *Variable Costs *Fixed Costs *Electricity Prices Activities: *Class Introductions *Recap of Prior Lecture *Lecture *Discussion	Federal Energy Regulatory Commission. "Energy Primer: A Handbook of Energy Market Basics." pp. 1-4, 35-56. (26 pages) U.S. Energy Information Administration. "Electricity explained: Electricity in the United States." (4 pages) U.S. Energy Information Administration. "Electricity explained: Electricity generation, capacity, and sales in the United States." (8 pages)	--
Three 2/10	**Clean Energy and Grid Integration (L1, L2)** Topics: *Grid context of clean energy technologies *Major energy "products" *Role of renewable generation *Net metering and load-based resources *Role of storage and EVs in grid integration Activities: *Recap of Prior Lecture *Lecture *Discussion *Class Exercise	American Wind Energy Association. "Wind Facts at a Glance." (N.pag) Fitzgerald, Garrett et al. "The Economics of Battery Energy Storage: How multi-use, customer-sited batteries deliver the most services and value to customers and the grid. Executive Summary." (8 pages) National Renewable Energy Laboratory. "Ten Years of Analyzing the Duck Chart." (3 pages) Solar Energy Industries Association. "Solar Industry Research Data." (N.pag) U.S. Department of Energy. "Solar-Plus-Storage 101." (8 pages)	Statement of purpose Assignment #1: Basic Excel financial model
Four 2/17	**Overview of Key Financing Concepts (L3)** Topics: *Basic financial concepts *Capital structure (debt vs. equity) *Importance of market conditions *Different types of financing *Tax aspects of financing *Project finance *Basics of financial modeling Activities: *Recap of Prior Lecture *Lecture *Discussion *Model-Building Demonstration	*For the Lazard report, please review key charts and assumptions to get an understanding of LCOE. It is not necessary to read each page in detail.* Lazard. "Lazard's Levelized Cost of Energy Analysis-Version 13.0." (20 pages) NC Clean Energy Technology Center. "Commercial Guide to the Federal Investment Tax Credit for Solar PV." (6 pages) National Renewable Energy Laboratory. "Federal Tax Incentives for Energy Storage Systems." (1 page)	

		Optional: *For those without previous finance knowledge, Investopedia.com has articles on relevant topics including:* Hargrave, Marshall. "Weighted Average Cost of Capital (WACC)." (N.pag) Hayes, Adam. "Internal Rate of Return – IRR." (N.pag) Heyford, Shauna Carther. "Understanding the Time Value of Money." (N.pag) Kenton, Will. "Net Present Value – NPV." (N.pag)	
Five 2/24	**Financial Modeling for Energy Projects (L3, L4)** Topics: *How to do a financial model of an energy project *How to determine a levelized cost of energy (LCOE) *The overall structure of project finance transactions Activities: *Recap of Prior Lecture *Lecture *Discussion *Group Formation	*For the Lazard report, please review key charts and assumptions to get an understanding of how LCOS is calculated and communicated. It is not necessary to read each page in detail.* Lazard. "Lazard's Levelized Cost of Storage Analysis-Version 5.0." (47 pages) Wilson Sonsini Goodrich & Rosati. "Project Finance Primer for Renewable Energy and Clean Tech Projects." (20 pages)	Assignment #2: Levelized cost of energy models
Six 3/2	**Financial Modeling for Other Clean Energy Measures (L3, L4)** Topics: *Other examples of how to model clean energy *How to model financial transactions *Four different examples of financing clean energy assets Activities: *Recap of Prior Lecture *Lecture *Discussion *Group Meeting Time	Clean Energy States Alliance. "A Homeowner's Guide to Solar Finance: Leases, Loans, and PPAs." (16 pages)	

Seven 3/9	**Opportunities and Challenges of Clean Energy (L5)** Topics: *Applicability of project finance in developing renewables *Ways in which early-stage companies/ technologies are financed *Financing of mature/ late-stage companies Activities: *Recap of Prior Lecture *Lecture *Discussion *Guest Speaker I	n/a	Assignment #3: Financial model for a clean energy project
3/16	**- NO CLASSES –**		
Eight 3/23	**Rate Design and the Financing of Distributed Energy Resources (L5)** Topics: *Basics of setting rates for electricity *Complexities of rate design *Distributed energy resources (DERs) *Rate design issues that are relevant to DER economics and possible future rate design approaches Activities: *Recap of Prior Lecture *Lecture *Discussion	Environment America. "The True Value of Solar." (19 pages) Lazar, Jim. "Teaching the 'Duck' to Fly, Second Edition." (5 pages) Optional (as a reference guide for particular topics where you would like additional information): NARUC. "Distributed Energy Resources Rate Design and Compensation." (181 pages)	Assignment #4: Financial model for a clean energy project
Nine 3/30	**Financing Mechanisms for Clean Energy (L6)** Activities: *Recap of Prior Lecture *Lecture *Discussion *Guest Speaker II	Norton Rose Fulbright. "Corporate Renewable PPAs – a framework for the future?" (5 pages) Wilson Sonsini Goodrich & Rosati. "Innovations and Opportunities in Energy Efficiency Finance." (32 pages)	
Ten 4/6	**Financing Mechanisms for Clean Energy (continued) (L6)** Activities: *Recap of Prior Lecture *Lecture *Discussion *Guest Speaker III		Assignment #5: Quantitative and qualitative short answer questions

Eleven 4/13	**Building Energy Efficiency (L5, L6)** Topics: *Importance of buildings in aggregate energy use and some of the various factors driving energy use *Differences between new buildings and existing buildings *Additional benefits of building energy efficiency and the general process *Case studies of building energy efficiency Activities: *Recap of Prior Lecture *Lecture *Discussion *Class Exercise		Assignment #6: Analytical case study
Twelve 4/20	**Electric Vehicles and the Grid (L5, L6)** Topics: * Importance of transportation in general, and automobiles in particular, as a use of energy and source of emissions *Different alternatives to traditional automobiles *EV opportunities and challenges Activities: *Recap of Prior Lecture *Lecture *Discussion *Guest Speaker IV	Fitzgerald, Garrett, Chris Nelder and James Newcomb. "Electric Vehicles as Distributed Energy Resources." (4 pages) U.S. Energy Information Administration. "Use of energy explained: Energy use for transportation (basic). (3 pages) U.S. Energy Information Administration. "Use of energy explained: Energy use for transportation (in depth)." (3 pages)	
Thirteen 4/27	**GROUP PRESENTATIONS DAY 1 (L1-L6)** Activities: *Group Presentations/Q&A	n/a	Group Presentation: first set of teams*
Fourteen 5/4	**GROUP PRESENTATIONS DAY 2 (L1-L6)** Activities: *Group Presentations/Q&A *Course Recap	n/a	Group Presentation: second set of teams*

* Group presentation order based on random selection, although attempts will be made to accommodate the bona fide scheduling concerns of any groups. Class may need to be extended past 8:00pm one or both days in order to accommodate all group presentations (this will be discussed in class after groups are formed).