



## SSC 2030: Energy Systems & Sustainability

Fall 2019

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Meeting times:

Lecture: MWF, 10:00 – 10:50 am in GRE 116

Moodle: Note that Canvas links to my own course web site where extensive materials and resources are posted: [richmond-hall.weebly.com/ssc-2030.html](http://richmond-hall.weebly.com/ssc-2030.html)

Office hours: See my schedule at <http://richmond-hall.weebly.com/contact--schedule.html>.

Mailbox: in the Green Hall Faculty Lounge

### **Course objectives:**

This course studies the historical, societal, economic, and technological factors that drive the development of a sustainable energy infrastructure.

3 credits; 3 hours of lecture

### **Course outcomes:**

- Effective oral, written, and team communication skills
- Effective scientific and quantitative reasoning and problem-solving skills appropriate to the student's program field
- Effective qualitative and algorithmic reasoning skills
- Informed personal, civic, and social awareness
- Informed aesthetic and cultural awareness
- Effective and ethical decision-making skills
- Ability to find and critically consider information from a wide range of sources

### **Required texts:**

- Osha Gray Davidson (2012) *Clean Break: The Story of Germany's Energy Transformation and What Americans Can Learn from It*, Inside Climate News, Kindle Single (and free online)
- Justin Gerdes (2016) *Quitting Carbon: How Denmark Is Leading the Clean Energy Transition and Winning the Race to the Low-Carbon Future*, self-published, Kindle (\$2.99)

Supplemental texts on reserve at Hartness Library:

- *'Energy Systems and Sustainability'*, 2/e, edited by Godfrey Boyle, Bob Everett, and Janet Ramage (2012) Oxford University Press; ISBN 0-19-959374-4
- *'Renewable Energy'*, 2/e, edited by Godfrey Boyle (2004) Oxford University Press & the Open University; ISBN 0-19-926178-4

**Study and work expectations:**

Students enrolled in college courses should expect to spend 2 hours working on the course for every hour of course meeting. This course is reading and writing intensive. I expect you to spend time on required readings. We will be discussing them in class and reading will also help you with assignments. In terms of writing, I am looking for quality and will consider spelling, grammar, structure and persuasive argument. I expect you to have written a research paper and to be familiar with developing theses, outlines, and arguments and with citing references. Expect a short writing assignment each week and a few longer papers. Over the course of the semester I expect your writing to become more critical and analytical.

**Assignments**

***Participation:***

Class meetings will combine lecture and discussion. Some discussion will use Canvas discussion forums. Participation requires attendance, questions and contributions to discussions.

***Reading ‘quizzes’:***

Simple, open-book ‘quizzes’ or homework questions will help you keep up with assigned readings, videos or other media. These quizzes will be assigned often, at least weekly. At times they will be replaced by discussions.

***Writing assignments:***

Short writing assignments, generally one to two pages, will be assigned each week. Most will direct you to answer an essay or opinion question, respond to an article or reading from the text, or to find and review articles relevant to the material we are covering in class. Longer writing assignments are five- to ten-page research papers. These will be developed over time and I will explain due dates and points given for finding reference materials, developing a thesis, submitting an outline, creating a draft and for the final paper.

I don’t require, nor do I appreciate, fancy cover pages. But I do require that you cite any material that you refer to in the article. I prefer APA but will accept MLA citations. I require assignments to be submitted electronically and prefer Microsoft Word, or compatible software. All students have access to this software and we can discuss any issues you might have.

\*Please be aware that I have the ability to check your writing submissions against anything published by others or posted on the web.

**Grading scheme:**

I post grades on Canvas’ ‘grade book’. All assignments will be announced in class and posted on my Weebly site and Canvas. I give partial credit on all assignments. Students are responsible for keeping all graded material until final grades are in so that we can resolve any grading disputes.

Participation	10%
Reading ‘quizzes’	15%
Short writing assignments	35%
Longer writing assignments	40%

\* I will drop your lowest reading quiz grade of the semester and the lowest grade from your short writing assignments, provided you completed all of them.

A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
97-	93 -	90 –	87 –	83 –	80 –	77 –	73 –	70 –	67 –	63 –	60 –	< 60
100	96.9	92.9	89.9	86.9	82.9	79.9	76.9	72.9	69.9	66.9	62.9	

**Attendance:**

On-time attendance is expected. I report excessive absences through the college's academic alert system and as part of academic warnings. Students missing class are responsible for material covered; get handouts from a classmate or the course website. **Please notify me if and when you must be absent and explain why you were unable to attend.**

**Communication:**

My official course-related communication will be via your official college email address. You are responsible for regularly reviewing email as important course information may be delivered this way. If you use your own e-mail system, arrange to have your college email forwarded. See IT or <http://support.vtc.edu> for assistance.

**Cell phones:**

Students must surrender their phones during class. I will make exceptions when warranted.

**Focus on learning:**

During class our focus must be learning. Please respect this focus. If I find that your behavior is preventing others from focusing on learning, I may ask you to leave.

**Academic integrity:**

Students are expected to practice academic honesty, understand and abide by Vermont Technical College's Policy on Cheating and Plagiarism (T107). I expect students to prepare and submit their own work for all assignments. I strongly encourage you to read widely and discuss this course with others but expect you to cite work that you refer to or use as a source. You are welcome to work in groups or with tutors, but all work you submit must be demonstrably your own. ***Be aware that I will be using software to check your work against other sources.*** If you have any questions regarding the appropriateness of collaborating on homework or projects, check with me before the assignment is due.

<https://www.vtc.edu/my-vermont-tech/my-vtc-home/policies-procedures>

**If you need help with this course:**

Students having problems with course material or assignments should feel free to talk with me. In addition, if anything regarding the classroom environment interferes with a student's learning experience, it should be brought to the attention of the instructor. Students experiencing special difficulties should take advantage of recitation hours and my office hours and should feel free to schedule extra hours with me or with tutors available at the Center for Academic Success.

<https://www.vtc.edu/my-vermont-tech/my-vtc-home/center-academic-success>

**Disabilities and accommodations:**

Anyone who feels they may be eligible for an accommodation based on the impact of a disability should contact me to arrange an appointment to discuss the course format and the sort of supports that may be needed. I rely on the Learning Specialist's office for assistance in verifying the need for accommodations and developing accommodation strategies. If you have not contacted the Learning Specialist, I encourage you to do so. Robin Goodall is available in the Center for Academic Success (Conant 224), ext. 7-1278, or by email at [rgoodall@vtc.edu](mailto:rgoodall@vtc.edu).

<https://www.vtc.edu/my-vermont-tech/my-vtc-home/center-academic-success>

The schedule of topics includes due dates for two research papers and mentions the final project during finals week. In addition, expect the following **regular assignments**:

- **Daily:** assigned readings or videos with short 'reading' quizzes.
- **Weekly:** writing assignments as listed in the schedule (below)  
Please note that I'm happy to read and comment on drafts of all writing assignments as long as I'm given several days to do so.

Week	Lecture
1	<b>Introduction to the course: energy, sustainability and systems</b> <ul style="list-style-type: none"><li>• Course structure, delivery, expectations</li><li>• What is energy? What is sustainability? What are systems and why are they critical?</li></ul> > <a href="#">Evaluating sources with lateral reading</a>
2	<b>The elephant in the room: global climate change</b> <ul style="list-style-type: none"><li>• What is GCC? What's the evidence for GCC? Causes of GCC?</li><li>• Paradigms, change, revolutions and transitions</li><li>• Decarbonization and the energy trilemma</li></ul> > <a href="#">Short writing assignment: which GCC America have you seen?</a>
3	<b>Energy forms and uses &amp; wood, our first 'non-solar' energy source</b> <ul style="list-style-type: none"><li>• Primary and secondary sources of energy</li><li>• Energy use: efficiencies and waste</li><li>• Wood: our first experience with scarcity and policy</li></ul> > <a href="#">Short assignment: What criteria should we use to evaluate energy sources and technologies?</a>
4	<b>Coal: the dawn of the fossil fuel revolution</b> <ul style="list-style-type: none"><li>• Coal: from start to (nearly) finish</li><li>• Coal-fired innovation (technology) and the Industrial Revolution<ul style="list-style-type: none"><li>▪ Steam engines, electricity and lighting</li></ul></li></ul> > <a href="#">Short writing assignment: critical review of an energy article and its source</a>
5	<b>The transition to liquid fossil fuels</b> <ul style="list-style-type: none"><li>• Oil and natural gas</li><li>• Fracking</li></ul> > <a href="#">Short writing assignment: compare and contrast sources with different POVs or biases</a>
6	<b>A stalled transition: nuclear power, fission and fusion</b> <ul style="list-style-type: none"><li>• The science of fission</li><li>• Risks and special considerations</li><li>• Fusion: is it possible? When is it likely to be in use?</li></ul> > <a href="#">Due: Thesis and three sources for research paper 1 and revision</a>
7	<b>Old, baseline renewable energy technologies</b> <ul style="list-style-type: none"><li>• Hydropower</li><li>• Biomass: traditional and modern</li><li>• Biogas (aka anaerobic digestion)</li></ul> > <a href="#">Due: Outline for research paper 1 and revision</a>

- 8 Variable renewable energy technologies**
- Solar thermal and photovoltaic power
  - Concentrated solar power and storage
  - Wind power small to massive, onshore to deep ocean
- > [Due: Draft for research paper 1](#)
- 9 Critical challenges: energy transmission and storage**
- Central vs. distributed power production
  - Smart grids and international connections
  - Energy storage: batteries to grid
- > [Due: Final draft of research paper 1](#)
- 10 Current and changing patterns of energy use**
- Global use: US vs other nations
  - Change in the US? Which states are leading and lagging?
  - Vermont's energy use and Comprehensive Energy Plan
- > [Due: Thesis and three sources for research paper 2 and revision](#)
- 11 Energy systems transitions: models**
- Energy system transitions: models and leaders
    - 2,000-Watt model
    - Targeted renewable energy production mandates
    - Carbon pricing (aka carbon taxing)
- > [Due: Outline for research paper 2 and revision](#)
- 12 Energy system transitions: examples (1)**
- Die Energiewende (Germany) 2000 – 2011
  - Die Energiewende (Germany) 2011 – present
- > [Due: Draft for research paper 1](#)
- 13 Energy systems transitions: examples (2)**
- Danish transition
  - Swedish transition
  - Norway's sovereign wealth fund
- > [Due: Final draft of research paper 2](#)
- 14 Geoengineering and extreme approaches to GCC and transition**
- Clean coal?
  - Carbon capture and storage and/or carbon capture and use
  - Biological carbon sequestration
  - Solar shielding
- > [Using lessons learned to create criteria for designing a sustainable energy system](#)
- 15 Finals week exercise:** Lessons learned? Planning for a sustainable energy future

**\*\*NOTE:** *The instructor reserves the right to change the syllabus at any time.*