

History of Energy Resources and Utilization

| HIS 186 - CRN 27175 | SUS 186 – CRN 80337 | Spring 2018 | Mon-Wed 1815-1930 | Morey 525 |
| Instructor: Morris A. Pierce, PhD | x5-4331 | m.pierce@rochester.edu | Office hours Mon 1630-1730 RRL 401 |

This course will explore the many types of energy resources that have been used to provide heat, light, and power for residential, commercial, industrial, and transportation uses, along the various means by which they were converted to productive end uses. The major energy resources in the ancient world were muscle power and renewables (wind, solar, wood), and these changed very little until the end of the 18th Century when coal came into widespread use. In the late 19th Century petroleum began its rise to become the most widely used energy resource, with natural gas and nuclear energy securing significant market share in the 20th Century. Despite widespread recognition of the environmental consequences of widespread use of fossil fuels, the transition back to renewable resources continues at a very slow pace. This course will explore the history of these various energy resources and how they were utilized, wasted, and conserved, giving students an opportunity to use solid historical evidence to envision a successful and sustainable energy future.

Required Coursework and Grading

- **Three papers are required** – Double-spaced, include a list of reference materials you used. Paper copies are acceptable, double-sided printing preferred; e-mailed PDF files preferred but Word is ok. Papers are due by the end of class on the date due, late papers will lose points. If you prefer, you may use another media such as video or powerpoint to present the information, but let me know if you plan to do this to insure that it will meet the requirements.
- **Paper #1: Two options: History of energy consumption in a specific place; or of a specific energy utilization (30 points)** – Due February 19 – Research and write a 4–6 page paper describing historical energy usage in a specific location (which could be a city, state, country or other geographic location) or about a specific energy utilization (some form of heat, light, or power generation or application). For instance you can explore energy resources used in your home town over the past century, how warships changed from sail to coal to oil and nuclear power, why electric cars failed in the early 20th Century marketplace, how the internal combustion engine has survived and even thrived, how a past energy crisis affected one or more communities or countries, or how technologies such as photovoltaics, wind power, and hybrid and electric cars have resulted in positive change.
- **Paper #2: Analysis of current energy use in the same or different location (30 points)** – Due April 2 – Research and write a 4–6 page paper about the option not chosen for paper #1.
- **Paper #3: Present your view of the near and/or long-term energy future, or some portion of it (30 points)** – Due at noon on Sunday, May 13. Research and write a 10± page paper presenting your views about the future of energy resources and utilization in some specific place or application. This could be an analysis of someone else’s vision of an energy future, or your own. Include a discussion of near term (5 to 20 year) and/or long term (20+ years) opportunities that are either likely to happen or could happen with some political or economic intervention. This is a very broad topic but your analysis must be based on reasonable assumptions and available technologies. Topics could include weaning the University of Rochester or other institution or community off of fossil fuels. Be sure to address potential criticisms of your views and any viable alternative solutions. A fair number (and perhaps most) schemes proposed to eliminate fossil fuels in the near term (50 years) have serious shortcomings.
- **Up to ten additional points will be awarded for class participation, extra work, etc. (10 points)** Note: Class attendance is not required, but as a courtesy let me know if you won’t be attending a particular class.
- Assignment grades will be posted on Blackboard. The course grade will be based on the total number of points earned in the course, with letter grades assigned according to the following scale:

94-100	A	85-87	B	78-80	C	70-72	D
91-93	A-	82-84	B-	75-77	C-	68-69	D-
88-90	B+	80-81	C+	73-74	D+	0-67	E

Texts and Resources

Lecture slides and links to videos and other course materials will be posted on Blackboard.

There is no required textbook for the course as there are extensive materials available in print and on line. A list of on line resources will be provided on Blackboard, and relevant articles will be posted. A few recommended books:

- [*The Prize: The Epic Quest for Oil, Money and Power*](#) by Daniel Yergin. This was also turned into a PBS television series that will be shown in class.
- [*Energy in the American economy, 1850-1975; an economic study of its history and prospects*](#), by Sam H Schurr; Bruce Carlton Netschert; Resources for the Future.
- [*The American Petroleum Industry: The Age of Illumination, 1859—1899*](#), by Harold F. Williamson and

Arnold R. Daum, Evanston, 1959

- [The American Petroleum Industry: The Age of Energy, 1900—1959](#), Harold F. Williamson, Ralph L. Andreano, Arnold R. Daum, and Gilbert C. Kiose, Evanston, 1964
- *The American petroleum industry* by Bacon, Raymond Foss Bacon, Hamor, William Allen Hamor, McGraw Hill, 1916 | [Volume 1](#) | [Volume 2](#) |
- [The natural history of coal](#), by E. A. Newell Arber, Cambridge, 1911
- [The statistical history of the United States, from colonial times to the present](#), by Ben J. Wattenberg, Basic Books, 1970
- ["Atoms for Peace" in Pennsylvania](#), by Willis L. Shirk Jr., *Pennsylvania Heritage Magazine*, Volume XXXV, Number 2 - Spring 2009
- [Atoms for Peace and War, 1953-1961: Eisenhower and the Atomic Energy Commission](#) by Richard G. Hewlett, Jack M. Holl, California, 1989
- [Holzsparkunst](#), by Franz Kessler, 1618; translated the following year as [Espargne-Bois](#) [*Saving Fuel*, first book written on energy conservation, has never been translated into English.]
- [The Subterranean Forest: Energy Systems and the Industrial Revolution](#), by Rolf Peter Sieferle, Translated from the German original by Michael P. Osman. Cambridge: The White Horse Press, 2001.
- [The History of Energy Efficiency](#), Alliance Commission on National Energy Efficiency Policy, 2013
- [Powering The Past: A Look Back](#), Smithsonian Institution, 2002

Course Schedule:

1	17 January	Introduction and course objectives. What are energy resources, where do they come from, and how do they get extracted? What is the difference between primary and end-use energy. What is energy and power and how are they measured? Quads, MTOEs, Joules, Watts, etc. Overview of current energy resources used in the United States.
2	22 January	Overview of energy resources used in other parts of the world. Energy resources and utilization in ancient civilizations, particularly Greece and Rome – Muscles, Solar, Wind, Water, Biomass, Geothermal, and some Coal
3	24 January	Wood, deforestation, and energy conservation in Early Modern Europe and Colonial America
4	29 January	The Industrial Revolution in Britain and America
5	31 January	Illumination before electricity
6	5 February	Chemical batteries for telegraphs, etc.
7	7 February	The Steam Engine and Steam Turbine
8	12 February	The Internal Combustion Engine
9	14 February	Coal and the “Smoke Problem” in the 19 th Century (and before)
10	19 February	Drake’s folly and the petroleum industry Paper #1 due
11	21 February	<i>The Prize</i> Part 1 “Our Plan”
12	26 February	<i>The Prize</i> Part 2 “Empire of Oil”
13	28 February	<i>The Prize</i> Part 3 “The Black Giant”
14	5 March	<i>The Prize</i> Part 4 “War and Oil”
15	7 March	<i>The Prize</i> Part 5 “Crude Diplomacy”
	10-18 March	Spring Break – No class
16	19 March	<i>The Prize</i> Part 6 “Power to the Producers”
17	21 March	<i>The Prize</i> Part 7 “The Tinderbox”
18	26 March	<i>The Prize</i> Part 8 “The New Oil Order”
19	28 March	Thomas Edison and the widespread adoption of electricity for heat, light, and power.
20	2 April	Giant Power, Superpower and the public ownership debate; Rural electrification. Paper #2 due
21	4 April	Networks of Power – the growth of electric power generation, transmission, and use.
22	9 April	The Five-Year Plans: Energy Planning in the Soviet Union and elsewhere
23	11 April	The “Big Inch” pipeline and the growth of the natural gas industry after World War II.
24	16 April	The promise of nuclear power: Electricity would be “too cheap to meter”
25	18 April	Public input to energy projects – Hetch Hetchy, Astoria nuclear plant in Queens, Storm King Pumped Storage Project, Keystone XL oil pipeline, and various natural gas pipelines.
26	23 April	Hydraulic fracturing and the War on Coal
27	25 April	Can renewable resources and energy efficiency provide all of our future energy needs? Mark Z. Jacobson says yes. Christopher Clack isn’t so sure.
28	30 April	Potential near-term and long-term energy futures. Will batteries make a big difference?
	8 May	Final Project due at Noon on Sunday, May 13th