

ENVI 529: Sustainable Energy

Course Syllabus
First Trimester, 2009

Environmental Studies Programme
School of Geography, Environment and Earth Sciences
Victoria University of Wellington

Course Description: This interdisciplinary course surveys energy technologies, resources, economics, environmental impacts, and public policies, with an emphasis on renewable energy and energy efficiency for the power, transport, and building sectors. Comparative assessments among clean energy technologies and conventional fossil fuel technologies lead to analysis of policy options at local, national, and international levels. Options for long-term sustainable energy futures for New Zealand and globally are discussed.

Course Objectives: The course is intended to provide a broad overview of sustainable energy concepts and issues. By the completion of the course, students will be able to demonstrate an understanding of (a) key concepts in understanding energy technology, economics, environmental impacts and policy; (b) how to evaluate and compare renewable and fossil-fuel-based supply technologies and energy-efficiency options; (c) the need for public policy and different perspectives on policy solutions, both in New Zealand and internationally; and (d) how to think realistically about sustainable energy futures.

Prerequisites/Further Information: No course prerequisites. Simple quantitative calculations on assignments are suitable for students from a variety of backgrounds. Please contact instructor in advance with any concerns about level of preparedness or for further information about the course.

Workload: Course is 15 points. Students are expected to undertake up to 150 hours work, including classes, reading, and assignment preparation.

Time/Location: First Trimester (March 2 to June 5). Class sessions occur for first four weeks, March 5-27, Thursdays and Fridays, 13:40-16:30, Railway West Wing 414 (Pipitea Campus, Wellington Railway Station building entrance on Featherston). Assignments and assessment period end May 21.

Instructor: Dr. Eric Martinot, eric.martinot@vuw.ac.nz, 04-463-5233 x8396, Cotton 206, Kelburn.

Instructor Office Hours: March 2-25, Mondays 12:30-14:00 and Wednesdays 16:00-18:00 (includes week before first class for consultations), Cotton 206, Kelburn campus.

Discussion (Optional): March 9-23, Mondays 11:00-12:30 (tentative), Cotton 206, Kelburn campus. In addition to discussion during regular class times, students are invited to engage in group discussion and questions with the instructor (time subject to group agreement during first class).

Readings: Assigned readings include articles, reports and book chapters taken from a variety of literature. For some readings, only specific sub-sections of an article are assigned (see notes in brackets [] in reading list), although the entire article is recommended. Readings distributed electronically. Additional handouts provided during class and supplemental readings also available.

Course Blackboard: Announcements, copies of lecture slides and assignments, additional readings, and other materials will be posted to Blackboard. (Students accessing Blackboard for the first time who experience log-on problems should contact Suzanne Weaver, Programme Administrator, Cotton 311, Kelburn campus, 04-463-6108.)

Assignments: Course work includes four weekly assignments containing mixed numeric problems and essay questions and a final research paper. The final research paper of approximately 4500-6000 words is due by May 21. Students are free to choose a research paper topic of interest, but topic must be policy-related or policy-relevant – no purely technical papers allowed. Research paper must include an abstract and references and citations. Further guidance on the research paper will be provided in class. Assignments 1-3 are due in class on the dates indicated in the class schedule. Assignment 4, the research paper abstract, and the research paper are due by email to the instructor by noon on the dates indicated. Work handed in late without extensions or extenuating circumstances will be penalized. The maximum penalty will be 5% of the assessment task's possible marks, for every day late.

Research Paper Consultations: At least one in-person consultation with instructor is required. Consultations arranged by appointment during March 30-April 1 or at other agreed times.

Grading: Grade based on four assignments (45%), research paper (45%), and participation (10%).

CLASS SCHEDULE AND ASSIGNMENTS

Class	Date	Topic	Assignments
1	March 5	Energy's role in social, economic, and sustainable development. Conventional energy technologies and resources. Oil, gas, coal, electric power, motor vehicle fuels. Technical conversion efficiencies and losses.	
2	March 6	Renewable energy and energy efficiency technologies. Solar PV, solar hot water, wind, hydro, biomass, biofuels. Indicators of energy intensity and efficiency. Efficiency in industry, buildings, appliances, lighting, and vehicles.	
3	March 12	Environmental comparisons and climate change impacts. Environmental impacts and comparisons across a range of energy supply technologies. Human health impacts. Environmental assessment chains.	Assignment #1 due
4	March 13	Economic analysis and comparisons. Life cycle analysis, financial analysis, cost of conserved energy, and externalities. Cost assessment of supply technologies vs. energy-efficiency. Learning curves and cost trends.	
5	March 19	Policy options I. Market failures and justifications for public policy intervention. Electric utility regulation and restructuring, emissions limits and fees, incentives for energy efficiency, other tax and incentive policies.	Assignment #2 due
6	March 20	Policy options II. Renewable energy policies, including feed-in tariffs, portfolio standards, policy targets, tax incentives, and biofuels mandates. International policies for climate change and energy security.	
7	March 26	Sustainable energy futures. Global scenarios, promising technologies, and development pathways. Clean coal and carbon sequestration. Electric vehicles, energy storage, distributed generation, and smart grids.	Assignment #3 due
8	March 27	New Zealand's sustainable energy future. What mix of technologies and policies is possible or desirable? New Zealand's energy strategy to 2050. Consideration of transport, buildings, and bulk power generation.	
	March 28		Deadline for consultation on research paper
	April 2		Assignment #4 due
	April 9		Research paper abstract due
	May 21		Research paper due

ENVI 529 READING LIST

1. CONVENTIONAL ENERGY TECHNOLOGY AND RESOURCES

BP. 2008. *Statistical Review of World Energy* (London), 45 pp. [Familiarize yourself with types of statistics available; see especially recent reserves-to-production ratios for fossil fuels on pp. 43.]

Rogner, HH et al. 2000. "Energy Resources" in *World Energy Assessment* (New York: United Nations Development Programme, United Nations Department of Economic and Social Affairs, and World Energy Council), pp. 135-171 [Read pp. 137-150 on fossil fuel resources]

Tester JW, Drake EM, Driscoll MG, Golay MW, and Peters WA. 2006. "Electric Power Sector," in *Sustainable Energy: Choosing Among Options* (Cambridge, MA: MIT Press), pp. 693-726. [Read pp. 694-709 on history and power generation.] **Available via library electronic course reserve.**

Aleklett K. 2006. "Oil: A Bumpy Road Ahead," *Worldwatch* 19(1): 10-12 (special issue on peak oil). [Other articles in the issue provide further perspective.]

Supplemental Materials

World Bank. 2006. *Little Green Data Book 2006* (Washington, DC), 235 pp. [2006 is the most recent edition; more recent numbers from World Bank 2008 below.]

World Bank. 2008. *World Development Indicators 2008* (Washington, DC). <http://go.worldbank.org/5N1P8XHF70> [Full data tables no longer available for free; see data/quick reference sections for individual country statistics, including CO2 emissions/capita under environment and passenger cars/capita under infrastructure.]

International Energy Agency. 2008. *World Energy Outlook 2008*. Paris.

Goldemberg J and Johansson TB, eds. 2004. *World Energy Assessment Overview: 2004 Update* (New York: United Nations Development Programme, United Nations Department of Economic and Social Affairs, and World Energy Council), 85 pp.

Riccio J. 2008. "Nuclear Power Crawling Forward" in *Vital Signs 2008* (Washington, DC: Worldwatch Institute).

2. RENEWABLE ENERGY AND ENERGY EFFICIENCY TECHNOLOGIES

Turkenburg WC, et al. 2000. "Renewable Energy Technologies" in *World Energy Assessment* (New York: United Nations Development Programme, United Nations Department of Economic and Social Affairs, and World Energy Council), pp. 221-267. [Read only for basic characteristics of technologies; skip market details which are outdated.]

Jochem E, et al. 2000. "Energy End-Use Efficiency" in *World Energy Assessment* (New York: United Nations Development Programme, United Nations Department of Economic and Social Affairs, and World Energy Council), pp. 175-211. [Read pp. 175-200, just focusing on technology options and global potentials, not regional details.]

REN21. 2008. *Renewables 2007 Global Status Report* (Paris: REN21, and Washington, DC: Worldwatch Institute), 51 pp. [Read "Global Market Overview," pp. 9-15.]

International Energy Agency. 2007. "REHC Technologies" in *Renewables for Heating and Cooling* (Paris), pp. 10-28. [Read pp. 10-23.]

Electric Power Research Institute. 2008. "Technology Primer: The Plug-in Hybrid Electric Vehicle" (Palo Alto, CA), 2 pp.

Jon Gibbins J and Chalmers H. 2008. "Carbon Capture and Storage," *Energy Policy* 36 (12): 4317–4322. [Read basics of technology, pp. 4318-4319.]

Supplemental Materials

World Resources Institute. 2009. "Earthtrends Data Table: Energy Consumption by Sector 2005" (Washington, DC), 4 pp.
<http://earthtrends.wri.org/datatables/index.php?theme=6>

Lovins AB, Datta EK, Bustnes OE, Koomey JG, Glasgow NJ. 2005. "Saving Oil" and "Substituting for Oil" in *Winning the Oil Endgame* (Snowmass, CO: Rocky Mountain Institute), pp. 43-122.

International Energy Agency. 2003. "Feedstock and Process Technologies" in *Biofuels for Transport: An International Perspective* (Paris: OECD), pp. 33-49.

3. ENVIRONMENTAL COMPARISONS

Holdren JP, Smith KR, et al. 2000. "Energy, the Environment, and Health" in *World Energy Assessment* (New York: UN Development Programme, UN Department of Economic and Social Affairs, and World Energy Council), pp. 61-110.

Serchuk, Adam. 2000. "The Environmental Imperative for Renewable Energy," Renewable Energy Policy Project Special Report (Washington, DC: REPP), 28 pp. [Also read summary tables, pp. 5-7 in the Executive Summary, which is a separate document.]

Supplemental Materials

Goldemberg J, Coelho ST, Guardabassi P. 2008. "The sustainability of ethanol production from sugarcane," *Energy Policy* 36 (6): 2086– 2097.

Thornley P, Upham P, Huang Y, Rezvani S, Brammer J, Rogers J. 2009. "Integrated assessment of bioelectricity technology options," *Energy Policy* 37 (3): 890–903.

Greenpeace. 2008. "Getting Serious about Nuclear Power - Too little, too late, too expensive – and too dangerous" (Amsterdam), 2 pp.

International Energy Agency, Clean Coal Center. 2008. "Profiles: Emissions Factors for Coal" PF 08-07 (London), 2 pp.

Wüstenhagen R, Wolsink M, Bürer MJ. 2007. "Social acceptance of renewable energy innovation: An introduction to the concept," *Energy Policy* 35 (5): 2683–2691.

4. ECONOMIC ANALYSIS AND COMPARISONS

Boyle G, Everett B, Ramage J. 2003. "Costing Energy," in *Energy Systems and Sustainability: Power for a Sustainable Future* (Milton Keynes, UK: Oxford University Press in association with the Open University), pp. 477-516. **Available via library electronic course reserve.**

Kammen D and Pacca S. 2004. "Assessing the Costs of Electricity," *Annual Review of Environment and Resources* 29: 301-344.

European Commission. 2003. *External Costs: research results on socio-environmental damages due to electricity and transport*. Report EUR-20198 (Brussels), 22 pp.

International Energy Agency. 2000. *Experience Curves for Energy Technology Policy* (Paris), 127 pp. [Read Introduction, pp. 9-22]

Supplemental Materials

Owen AD. 2004. "Environmental Externalities, Market Distortions and the Economics of Renewable Energy Technologies." *The Energy Journal* 25(3): 127-156.

Rotman D. 2008. "The Price of Biofuels," *Technology Review* (Jan/Feb): 42-51.

5. POLICY OPTIONS I

Martinot E and McDoom O. 2000. Tables A1-A3, Barriers to Renewable Energy and Energy Efficiency, in *Promoting Energy Efficiency and Renewable Energy* (Washington, DC: Global Environment Facility), pp. 40-42.

Golove WH and Eto JH. 1996. *Market Barriers to Energy Efficiency: A Critical Reappraisal of the Rationale for Public Policies to Promote Energy Efficiency*, report LBL-38059 (Berkeley, CA: Lawrence Berkeley National Laboratory), 51 pp. [Read section 2.5 on "Market Failures and the Efficiency Gap", pp. 18-22.]

Jochem E, et al. 2000. "Energy End-Use Efficiency" in *World Energy Assessment* (New York: United Nations Development Programme, United Nations Department of Economic and Social Affairs, and World Energy Council), pp. 175-211. [Read pp. 200-211 on obstacles/market imperfections and policies.]

Beck F and Martinot E. 2004. "Renewable Energy Policies and Barriers," in *Encyclopedia of Energy* (San Diego: Elsevier Science/Academic Press), pp. 365-383. [Read Section I on barriers and Section V on electric power restructuring.]

Geller H. 2003. "Market Transformation," in *Energy Revolution: Policies for a Sustainable Future* (Washington, DC: Island Press), pp. 93-129. **Available via library electronic course reserve.**

Strbac G. 2008. "Demand side management: Benefits and challenges," *Energy Policy* 36(12): 4419-4426. [Read at least Section 4 on DSM techniques, pp. 4423-4425.]

Supplemental Materials

Lovins AB, Datta EK, Bustnes OE, Koomey JG, Glasgow NJ. 2005. "Implementation" in *Winning the Oil Endgame* (Snowmass, CO: Rocky Mountain Institute), pp. 127-242.

Nadel S. 2002. "Appliance and Efficiency Standards," *Annual Review of Energy and the Environment* 27: 159-192.

Howden-Chapman P, Viggers H, Chapman R, O'Dea D, Free S, O'Sullivan K. 2009. "Warm homes: Drivers of the demand for heating in the residential sector in New Zealand," *Energy Policy*, in press.

6. POLICY OPTIONS II

REN21. 2008. *Renewables 2008 Global Status Report* (Paris: REN21, and Washington, DC: Worldwatch Institute), 51 pp. [Read "Policy Landscape," pp. 21-31]

Beck F and Martinot E. 2004. "Renewable Energy Policies and Barriers," in *Encyclopedia of Energy* (San Diego: Elsevier Science/Academic Press), pp. 365-383. [Read Section II on policies and Section VI on distributed generation.]

International Energy Agency. 2008. *Deploying Renewables: Principles for Effective Policies, Executive Summary* (Paris: OECD), 10 pp.

Bullis K. 2009. "The Cost of Cutting Carbon: Will putting a price on carbon increase the use of renewables?" (Jan/Feb), 2 pp.

Sawin J and Hughes K. 2007. "Energizing Cities," in *State of the World 2007: Our Urban Future* (New York: WW Norton), pp. 90-111. [Read pp. 100-106 on policies.]

Supplemental Materials

Bird LA, Holt E, Carroll GL. 2008. "Implications of carbon cap-and-trade for US voluntary renewable energy markets," *Energy Policy* 36(6): 2063-2073.

Toke D. 2008. "The EU Renewables Directive—What is the fuss about trading?" *Energy Policy* 36(8): 3001-3008.

Hebburn C. 2007. Carbon Trading: A Review of the Kyoto Mechanisms," *Annual Review of Environment and Resources* 32: 375–393.

United Nations. 1992. *United Nations Framework Convention on Climate Change* (Geneva), 24 pp.

United Nations. 1998. *Kyoto Protocol to the United Nations Framework Convention on Climate Change* (Geneva), 20 pp.

Cossent R, Gómez T, Frías P. 2009. "Towards a future with large penetration of distributed generation: Is the current regulation of electricity distribution ready? Regulatory recommendations under a European perspective," *Energy Policy* 37 (3) 1145–1155.

Gillingham K. 2009. "Economic Efficiency of Solar Hot Water Policy in New Zealand," *Energy Policy*, in press.

Rouleau T, Lloyd CR. 2008. "International policy issues regarding solar water heating, with a focus on New Zealand," *Energy Policy* 36(6): 1843–1857.

Saunders C, Kaye-Blake W, Marshall L, Greenhalgh S, de Aragao Pereira M. 2009. "Impacts of a United States' biofuel policy on New Zealand's agricultural sector." *Energy Policy*, in press.

Supplemental Materials – Policy Impact Analysis

Sorrell S. 2007. Improving the evidence base for energy policy: The role of systematic reviews," *Energy Policy* 35 (3): 1858–1871.

Lund PD. 2007. "Effectiveness of policy measures in transforming the energy system," *Energy Policy* 35(1): 627–639.

Lipp J. 2007. "Lessons for effective renewable electricity policy from Denmark, Germany and the United Kingdom," *Energy Policy* 35(11): 5481–5495.

7. SUSTAINABLE ENERGY FUTURES

Martinot E, Dienst C, Liu W, Chai Q. 2007. "Renewable energy futures: targets, scenarios, and pathways," *Annual Review of Environment and Resources* 32: 205-239.

International Energy Agency. 2008. *Energy Technology Perspectives 2008: Strategies and Scenarios to 2050, Executive Summary* (Paris: OECD), 10 pp.

Greenpeace and European Renewable Energy Council. 2008. *Energy [R]evolution: A Sustainable Global Energy Outlook* (Amsterdam), 212 pp. [Read Executive Summary, pp. 9-14.]

Tester JW, Drake EM, Driscoll MG, Golay MW, and Peters WA. 2006. "Electric Power Sector," in *Sustainable Energy: Choosing Among Options* (Cambridge, MA: MIT Press), pp. 693-726. [Read pp. 719-723 on sustainability.]

Roth D. 2008. "Driven (the Future of the Electric Car)." *Wired* (Sep): 118-127; 158.

Walsh B. 2008. "The Chevy Volt: GM's Huge Bet on the Electric Car," *Time/CNN* online (16 Sep), 4 pp.

Pepermans G, Driesen J, Haeseldonckx D, Belmans R, D'haeseleer W. 2005. "Distributed generation: definition, benefits and issues," *Energy Policy* 33 (2005): 787–798.

Hall PJ and Bain EJ. 2008. "Energy-storage technologies and electricity generation." *Energy Policy* 36 (12) 4352–4355.

Supplemental Materials – Integrated Perspectives

Electric Power Research Institute. 2007. "The Power to Reduce CO2 Emissions: Discussion Paper" (Palo Alto), 56 pp.

Smil V. 2005. "Possible Futures" in *Energy at the Crossroads: Global Perspectives and Uncertainties* (Cambridge, MA: MIT Press), pp. 317-373.

Worldwatch Institute and Center for American Progress. 2006. *American Energy: The Renewable Path to Energy Security* (Washington, DC), 38 pp.

Supplemental Materials – Advanced Power Grids and Energy Storage

International Energy Agency. 2008. *Empowering Variable Renewables: Options for Flexible Electricity Systems* (Paris: OECD), 30 pp.

Hall PJ. 2008. "Energy storage: The route to liberation from the fossil fuel economy?" *Energy Policy* 36 (12) 4363–4367.

Ibrahim H, Ilinca A, Perron J. 2008. "Energy storage systems—characteristics and comparisons." *Renewable and Sustainable Energy Reviews* 12 (5): 1221–1250.

Hadjipaschalis I, Poullikkas A, Efthimiou V. 2009. Overview of current and future energy storage technologies for electric power applications. *Renewable and Sustainable Energy Reviews*, in press.

Karger CR and Hennings W. 2009. "Sustainability evaluation of decentralized electricity generation." *Renewable and Sustainable Energy Reviews* 13 (3): 583–593.

European Commission. 2005. "Towards Smart Power Networks: Lessons Learned from European Research FP5 Projects," Report EUR-21970 (Brussels), 44 pp.

Supplemental Materials – Advanced Vehicles

Sperling D, Gordon D. 2008. "Advanced Passenger Transport Technologies," *Annual Review of Environment and Resources* 33: 63–84.

Bradley TH and Frank AA. 2009. "Design, demonstrations and sustainability impact assessments for plug-in hybrid electric vehicles." *Renewable and Sustainable Energy Reviews* 13(1): 115–128.

Sovacool BK and Hirsh RF. 2009. "Beyond batteries: An examination of the benefits and barriers to plug-in hybrid electric vehicles (PHEVs) and a vehicle-to-grid (V2G) transition." *Energy Policy* 37 (3): 1095–1103.

Talbot D. 2009. "Lifeline for Renewable Power," *Technology Review* (Jan/Feb), 8 pp.

Fairley P. 2008. "Renault Bets on Electric Cars," *Technology Review* (Nov/Dec), 4 pp.

8. NEW ZEALAND'S SUSTAINABLE ENERGY FUTURE

New Zealand Ministry of Economic Development. 2007. *New Zealand Energy Strategy to 2050* (Wellington), 107 pp.

New Zealand Energy Efficiency and Conservation Authority. 2007. *New Zealand Energy Efficiency and Conservation Strategy* (Wellington), 84 pp.

Chapman, R. 2008. "Transitioning to Low-Carbon Urban Form and Transport in New Zealand." *Political Science* 60 (June): 89-98.

Supplemental Materials

Duke M, Andrews D, Anderson T. 2009. "The feasibility of long range battery electric cars in New Zealand." *Energy Policy*, in press.

VICTORIA UNIVERSITY OF WELLINGTON
Te Whare Wānanga o te Ūpoko o te Ika a Māui



GENERAL UNIVERSITY POLICIES AND STATUTES

Students should familiarise themselves with the University's policies and statutes, particularly those regarding assessment and course of study requirements, and formal academic grievance procedures contained in the statutes in the VUW website.

The University Statute on Student Conduct and Policy on Staff Conduct

The Statute on Student Conduct together with the Policy on Staff Conduct ensure that members of the University community are able to work, learn, study and participate in the academic and social aspects of the University's life in an atmosphere of safety and respect. The Statute on Student Conduct contains information on what conduct is prohibited and what steps can be taken if there is a complaint. For queries about complaint procedures under the Statute on Student Conduct, contact the Facilitator and Disputes Advisor. This Statute is available in the Faculty Student Administration Office or on the website at: www.vuw.ac.nz/policy/StudentConduct.

The policy on Staff Conduct can be found on the VUW website at:

www.vuw.ac.nz/policy/StaffConduct.

Academic Grievances

If you have any academic problems with your paper you should talk to the tutor or lecturer concerned or, if you are not satisfied with the result of that meeting, see the Head of School or the Associate Dean (Students) of Science. Class representatives are available to assist you with this process. If, after trying the above channels, you are still unsatisfied, formal grievance procedures can be invoked. These are set out in the Academic Grievances Statute which is published on the VUW website:

www.vuw.ac.nz/policy/AcademicGrievances.

Reasonable Accommodation Policy

The University has a policy of reasonable accommodation of the needs of students with disabilities. The policy aims to give students with disabilities an equal opportunity with all other students to demonstrate their abilities. If you have a disability, impairment or chronic medical condition (temporary, permanent or recurring) that may impact on your ability to participate, learn and/or achieve in lectures and tutorials or in meeting the course requirements, then please contact the Course Coordinator as early in the course as possible. Alternatively you may wish to approach a Student Adviser from Disability Support Services to confidentially discuss your individual needs and the options and support that are available. Disability Support Services are located on Level 1, Robert Stout Building, or phoning 463-6070, email: disability@vuw.ac.nz. The name of your School's Disability Liaison Person can be obtained from the Administrative Assistant or the School Prospectus.

Plagiarism

Victoria University defines plagiarism as the copying of ideas, organisation, wording or anything else from another source without appropriate reference or acknowledgement so that it appears to be one's own work. This includes published and unpublished work, the Internet and the work of other students and staff. Plagiarism is an example of misconduct in the Statute of Student Conduct. Students who have plagiarised are subject to a range of penalties under the Statute. See the website: <http://www.vuw.ac.nz/policy/StudentConduct>

The following text has been adapted from Writing Tutorial Services, Indiana University, Bloomington, IN.

What is Plagiarism and Why is it Important?

At university, we continually engage with other people's ideas: we read them in texts, hear them in lectures, discuss them in class, and incorporate them into our own writing. As a result, it is very important that we give credit where it is due. Plagiarism is using others' ideas and words without clearly acknowledging the source of that information. This can vary from two lines cut and pasted from a web site to copying a chapter from a book. Penalties are severe.

To avoid plagiarism, you must give credit whenever you use

- another person's idea, opinion, or theory;
- any facts, statistics, graphs, drawings--any pieces of information--that are not common knowledge;
- quotations of another person's actual spoken or written words; or
- paraphrase of another person's spoken or written words.

How to Recognize Unacceptable and Acceptable Paraphrases

Here's the original text, from page 1 of *Lizzie Borden: A Case Book of Family and Crime in the 1890s* by Joyce Williams et al.:

The rise of industry, the growth of cities, and the expansion of the population were the three great developments of late nineteenth century American history. As new, larger, steam-powered factories became a feature of the American landscape in the East, they transformed farm hands into industrial laborers, and provided jobs for a rising tide of immigrants. With industry came urbanization the growth of large cities (like Fall River, Massachusetts, where the Borden's lived) which became the centers of production as well as of commerce and trade.

Here's an UNACCEPTABLE paraphrase that is plagiarism:

The increase of industry, the growth of cities, and the explosion of the population were three large factors of nineteenth century America. As steam-driven companies became more visible in the eastern part of the country, they changed farm hands into factory workers and provided jobs for the large wave of immigrants. With industry came the growth of large cities like Fall River where the Borden's lived which turned into centers of commerce and trade as well as production.

What makes this passage plagiarism?

- the writer has only changed around a few words and phrases, or changed the order of the original's sentences.
- the writer has failed to cite a source for any of the ideas or facts.

If you do either or both of these things, you are plagiarizing!

NOTE: This paragraph is also problematic because it changes the sense of several sentences (for example, "steam-driven companies" in sentence two misses the original's emphasis on factories).

Here's an ACCEPTABLE paraphrase:

Fall River, where the Borden family lived, was typical of northeastern industrial cities of the nineteenth century. Steam-powered production had shifted labor from agriculture to manufacturing, and as immigrants arrived in the US, they found work in these new factories. As a result, populations grew, and large urban areas arose. Fall River was one of these manufacturing and commercial centers (Williams 1).

This is acceptable paraphrasing because the writer:

- accurately relays the information in the original
- uses his/her own words.
- lets his/her reader know the source of her information.

An example of quotation and paraphrase used together, which is also ACCEPTABLE:

Fall River, where the Borden family lived, was typical of northeastern industrial cities of the nineteenth century. As steam-powered production shifted labor from agriculture to manufacturing, the demand for workers "transformed farm hands into factory workers," and created jobs for immigrants. In turn, growing populations increased the size of urban areas. Fall River was one of these manufacturing hubs that were also "centers of commerce and trade" (Williams 1)

This is acceptable paraphrasing because the writer:

- records the information in the original passage accurately.
- gives credit for the ideas in this passage.
- indicated which part is taken directly from his/her source by putting the passage in quotation marks and citing the page number.

NOTE: Using another person's phrases or sentences without putting quotation marks around them is considered plagiarism **even if** the writer cites in his/her own text the source of the phrases or sentences he/she has quoted.

Plagiarism and the World Wide Web

The World Wide Web has become a popular source of information for student papers, and many questions have arisen about how to avoid plagiarizing these sources. In most cases, the same rules apply as to a printed source: when a writer refers to ideas or quotes from a WWW site, he/she must cite that source. If a writer wants to use visual information from a WWW site, many of the same rules apply. Copying visual information or graphics from a WWW site (or from a printed source) is very similar to quoting information, and the source must be cited.

Strategies for Avoiding Plagiarism

1. Put in **quotations** everything that is directly from the text especially when taking notes.
2. **Paraphrase**, but be sure you are not just rearranging or replacing a few words. Instead, read over what you want to paraphrase carefully, then cover up the text. Write out the idea in your own words.

Check your paraphrase against the original text to be sure you have not accidentally used the same phrases or words, and that the information is accurate.