**ENERGY ALTERNATIVES**

UNIV 241, 3 credits
WINTER TERM, 2010

**Course Information:**

In politics and in business we hear increasing discussion about energy alternatives or alternative energy. What is our energy usage now, and what alternatives do we want to shift to? Are fossil fuels a problem, or merely our environmental, social, and political ideologies surrounding it? What is the emotional or “memory” connection to or against certain types of fuel? Are they based on reality? Can they be changed? Locally, how can we sustain ourselves in regard to energy ? What are the connections between our energy use and our land use planning? What ramifications does our shift to alternatives have for our land use for the future?

This course, co-taught by Richard Cairncross, Paul Salvaggio, and Dan Moscovici, will take up these questions--guest speakers will be featured, and small group meetings will facilitate critical thinking and research on the topic.

**Class Meeting Days and Times**

Lectures: Wednesday, 6:00-7:20 p.m., Disque 108
Sections: Wednesday, 7:30-8:50 p.m., Curtis 343 & 258

**Instructors, Contacts, Office Hours**

Richard Cairncross
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**Course Readings Available to Download:**

* [“It’s Scary, It’s Expensive, It Could Save the Earth: Nuclear power risking a comeback”. Petit, Charles *National Geographic Magazine*. April 2006](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK2_Nuclear_NationalGeo.ashx)
* [“Beneficial Biofuels – The Food, Energy and Environment Trilemma”, D. Tilman et al., *Science*, 325, 17 July 2009.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK3_Beneficial_Biofuels.ashx)
* [“Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change”, T. Searchinger et al., *Science*, 319, 29 February 2008.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK3_Bio_Fuels_Searchinger.ashx)
* [“Biofuels: Clarifying Assumptions – a response to T. Searchinger et al.”, V. Khosla*Science*, 322, 17 October 2008.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK3_Bio_Fuels_response_Searchinger.ashx)
* [Teague, Matthew. “Is Wood Heat the Answer.” *Fine Homebuilding*, no. 198 Nov 2008: 40-45.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK4_FHB001.ashx)
* [Richter, Daniel deB et. al. "Wood Energy in America." *Science*. Vol. 323 March 13, 2009.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK4_Wood_Energy_in_America.ashx)
* [“The Role of Forests in US Climate Policy” Laurie A. Wayburn. *Lincoln Institute of Land Policy Land Lines*. October 2009. 1 – 7](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK5_Wayburn_1694.ashx)
* [“Energy Alternatives” Tom Daniels and Katherine Daniels. *Environmental Planning Handbook*. Pg. 365 – 366.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK5_Daniels_renewableEnergy.ashx)
* [LEED for Neighborhood Development Pilot Checklist](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK5_LEED_ND.ashx)
* [Grondzik, Walter T. and Kwok, Alison G. and Stein, Benjamin and Reynolds, John S. Mechanical and Electrical Equipment for Buildings, 11th Ed. New York: Wiley & Sons, 2009. Chapter 2 “Environmental Resources.” p 27-48.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK6_MEEB_ch2.ashx)
* [Grondzik, Walter T. and Kwok, Alison G. and Stein, Benjamin and Reynolds, John S. Mechanical and Electrical Equipment for Buildings, 11th Ed. New York: Wiley & Sons, 2009. Chapter 6 “Solar Geometry and Shading Devices.” p 164-174.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK7_MEEB_ch6.ashx)
* [Grondzik, Walter T. and Kwok, Alison G. and Stein, Benjamin and Reynolds, John S. Mechanical and Electrical Equipment for Buildings, 11th Ed. New York: Wiley & Sons, 2009. Chapter 8 “Designing for Heating and Cooling” p 216-227 and p 264, 265.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK7_MEEB_ch8.ashx)
* [Aldrich, Robb. “Wisdom Way Solar Village.” *Home Energy* Mar/Apr 2009: 24-28](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK7_HomeEnergy003.ashx)
* [Lee, Jeffrey. “Real-Time Feedback.” *EcoHome Magazine*, vol 2, no. 1 Jan/Feb 2009: 28-31.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK8_Eco001.ashx)
* [Mays, Vernon. “Storage Barn.” *Architect*, vol. 98, no. 9 Sept 2009: 55-59.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK8_Architect004.ashx)
* [Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies, S. Pacala, and R Socolow, *Science* 305, 13 August 2004.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK9_Stabilization_Wedges.ashx)
* [Solving the Climate Problem, R Socolow, J.B. Greenblatt, and S. Pacala,*Environment*, December 2004.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK9_Solving_the_Climate_Problem.ashx)

**Course Schedule**

**Week 1: January 6: Climate Literacy**

**Excerpts from Films and Interactive Climate Change Websites:**

* Film: The Great Squeeze, [http://www.thegreatsqueeze.com](http://www.thegreatsqueeze.com/%22%20%5Ct%20%22_blank)
* Film: Six Degrees Could Change the World,[http://channel.nationalgeographic.com/episode/six-degrees-could-change-the-world-3188/Overview](http://channel.nationalgeographic.com/episode/six-degrees-could-change-the-world-3188/Overview%22%20%5Ct%20%22_blank)
* Article: A Plan to Power 100 Percent of the Planet with Renewables: Wind, water and solar technologies can provide 100 percent of the world's energy, eliminating all fossil fuels. Here's how, Mark Z. Jacobson and Mark A. Delucchi, *Scientific American*, November, 2009. Interactive Website: Powering a Green Planet
[http://www.scientificamerican.com/article.cfm?id=powering-a-green-planet](http://www.scientificamerican.com/article.cfm?id=powering-a-green-planet%20" \t "_blank)
* Climate Literacy: The Essential Principles of Climate Science,[www.globalchange.gov/resources/educators/climate-literacy](http://www.globalchange.gov/resources/educators/climate-literacy%20%22%20%5Ct%20%22_blank)

**Week 2: January 13: Our Historical and Future Reliance on Coal, Nuclear and Oil**

**Guest Panel:**

* Bill Maguire – Site Vice President of Peach Bottom Atomic Power Station & Drexel Alum
* Ned Leonard – Vice President Technology Policy – American Coalition for Clean Coal Electricity
* David Sexton – Vice President Business Development – Sunoco, Inc.

**Assigned Reading:**

* [“It’s Scary, It’s Expensive, It Could Save the Earth: Nuclear power risking a comeback”. Petit, Charles *National Geographic Magazine*. April 2006](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK2_Nuclear_NationalGeo.ashx)
* Clean Coal Video: [http://www.cbsnews.com/video/watch/?id=4199592n](http://www.cbsnews.com/video/watch/?id=4199592n" \t "_blank)
* Video: President Bush - [http://www.bing.com/videos/watch/video/we-need-to-increase-the-supply-of-oil/6x7v0fw](http://www.bing.com/videos/watch/video/we-need-to-increase-the-supply-of-oil/6x7v0fw%22%20%5Ct%20%22_blank)

**Week 3: January 20: Biomass and Bio-Fuels Evaluating the Myths and Realities?**

**Guest Speaker:**
Kevin Hicks – USDA Eastern Regional Research Center, Research Leader for the Crop Conversion Science and Engineering Division

**Assigned Reading:**

* [“Beneficial Biofuels – The Food, Energy and Environment Trilemma”, D. Tilman et al., *Science*, 325, 17 July 2009.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK3_Beneficial_Biofuels.ashx)
* Ethanol and Energy Policy Debate between Dale, Patzek, Pimentel and Sheehan,*National Press Club*, 23 August, 2005. Video available at [http://www.c-spanvideo.org/program/188549-1](http://www.c-spanvideo.org/program/188549-1%20%20%22%20%5Ct%20%22_blank)
* Biofuels and Indirect Land Use Change Effects: Debate between Dale and Searchinger, Ther German Marshall Fund, 25 September 2009. (Both video and Powerpoint slides available at [http://www.gmfus.org/event/detail.cfm?id=622&parent\_type=E](http://www.gmfus.org/event/detail.cfm?id=622&parent_type=E%20" \t "_blank))

**Supplemental Resources (Optional Readings):**

* [“Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change”, T. Searchinger et al., *Science*, 319, 29 February 2008.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK3_Bio_Fuels_Searchinger.ashx)
* [“Biofuels: Clarifying Assumptions – a response to T. Searchinger et al.”, V. Khosla*Science*, 322, 17 October 2008.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK3_Bio_Fuels_response_Searchinger.ashx)
* “Liquid Transportation Fuels from Coal and Biomass”, The National Academies Report , 2009, available at [http://www.nap.edu/catalog.php?record\_id=12620](http://www.nap.edu/catalog.php?record_id=12620" \t "_blank)

**Week 4: January 27: Biomass: Why Not Sustain Our Nation's Forest Ecosystems?**

**MID-TERM PAPER ASSIGNED -**[**DOWNLOAD Mid-Term Here**](http://www.drexel.edu/~/media/Files/greatworks/winter2010/Winter%202010%20Midterm.ashx)

**Guest Speaker:**
William McWilliams – Supervisory Research Forester – USDA Forest Service – Forest Inventory Analysis Division – Northern Station

**Assigned Reading:**

* USDA Forest Service Report – “Pennsylvania Forests 2004” – pgs. 2-3, 25-26, 72-75 - [http://www.nrs.fs.fed.us/pubs/rb/rb\_nrs20.pdf](http://www.nrs.fs.fed.us/pubs/rb/rb_nrs20.pdf%22%20%5Ct%20%22_blank)
* [Teague, Matthew. “Is Wood Heat the Answer.” *Fine Homebuilding*, no. 198 Nov 2008: 40-45.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK4_FHB001.ashx)
* [Richter, Daniel deB et. al. "Wood Energy in America." *Science*. Vol. 323 March 13, 2009.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK4_Wood_Energy_in_America.ashx)

**Week 5: February 3: What is the Role of Energy Alternatives in Land Use & Preservation?**

**FINAL PROJECT ASSIGNED**

**Guest Speaker:**
Tom Daniels, PhD – Professor of Environmental Planning – University of Pennsylvania

**Assigned Reading:**

* [“The Role of Forests in US Climate Policy” Laurie A. Wayburn. *Lincoln Institute of Land Policy Land Lines*. October 2009. 1 – 7](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK5_Wayburn_1694.ashx)
* [“Energy Alternatives” Tom Daniels and Katherine Daniels. *Environmental Planning Handbook*. Pg. 365 – 366](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK5_Daniels_renewableEnergy.ashx).
* [LEED for Neighborhood Development Pilot Checklist](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK5_LEED_ND.ashx)

**Week 6: February 10: Drexel & Sustainability**

**TOPIC & SHORT DESCRIPTION DUE (FINAL PROJECT)**

**Guest Speaker:**
Paul Salvaggio

**Field Trip:**
Sustainability Tour of Recreation Center & Integrated Sciences Building

**Assigned Readings:**

* [Grondzik, Walter T. and Kwok, Alison G. and Stein, Benjamin and Reynolds, John S. Mechanical and Electrical Equipment for Buildings, 11th Ed. New York: Wiley & Sons, 2009. Chapter 2 “Environmental Resources.” p 27-48.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK6_MEEB_ch2.ashx)

**Week 7: February 17: Solar Technologies!**

**Guest Speakers:**

* Nancy McMonigle – Representative with Solular – authorized agent with British Petroleum (BP) Solar
* Joe Gigantiello – Solular Installer

**Assigned Readings:**

* [Grondzik, Walter T. and Kwok, Alison G. and Stein, Benjamin and Reynolds, John S. Mechanical and Electrical Equipment for Buildings, 11th Ed. New York: Wiley & Sons, 2009. Chapter 6 “Solar Geometry and Shading Devices.” p 164-174.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK7_MEEB_ch6.ashx)
* [Grondzik, Walter T. and Kwok, Alison G. and Stein, Benjamin and Reynolds, John S. Mechanical and Electrical Equipment for Buildings, 11th Ed. New York: Wiley & Sons, 2009. Chapter 8 “Designing for Heating and Cooling” p 216-227 and p 264, 265.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK7_MEEB_ch8.ashx)
* [Aldrich, Robb. “Wisdom Way Solar Village.” *Home Energy* Mar/Apr 2009: 24-28](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK7_HomeEnergy003.ashx)

**Week 8: February 24: Leadership in Energy and Environmental Design – LEED with practical examples**

**Guest Speaker:**
Aaron Dahlstrom, P.E., LEED AP – Engineer – AKF Group

**Assigned Reading:**

* [Lee, Jeffrey. “Real-Time Feedback.” *EcoHome Magazine*, vol 2, no. 1 Jan/Feb 2009: 28-31.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK8_Eco001.ashx)
* [Mays, Vernon. “Storage Barn.” *Architect*, vol. 98, no. 9 Sept 2009: 55-59.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK8_Architect004.ashx)

**Week 9: March 3: Wind: What is it? Let’s go see it!**

**Field Trip:**
ACUA wind/solar facility in Atlantic City on Wednesday, departure at 2:45, tour at 4pm. followed by discussion section only

**Assigned Readings:**

* [Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies, S. Pacala, and R Socolow,*Science* 305, 13 August 2004.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK9_Stabilization_Wedges.ashx)
* [Solving the Climate Problem, R Socolow, J.B. Greenblatt, and S. Pacala, *Environment*, December 2004.](http://www.drexel.edu/~/media/Files/greatworks/winter2010/WK9_Solving_the_Climate_Problem.ashx)

**Week 10: March 10: Research Presentations**

**Supplemental Materials**

* ["Understanding the reductions in US corn ethanol production costs: An experience curve approach." Energy Policy 37 (2009) 190–203](http://www.drexel.edu/~/media/Files/greatworks/archive/Hettinga_EnergyPolicy.ashx)
* *[The New York Times:](http://www.nytimes.com/2010/01/31/business/energy-environment/31renew.html%22%20%5Ct%20%22_blank)*[China Leading Global Race to Make Clean Energy](http://www.nytimes.com/2010/01/31/business/energy-environment/31renew.html%22%20%5Ct%20%22_blank)
* [America’s Unfounded Fears of A Green-Tech Race with China](http://www.e360.yale.edu/content/feature.msp?id=2238" \t "_blank)
* *[YouTube:](http://www.youtube.com/watch?v=pA6FSy6EKrM" \t "_blank)*[The Story of Cap & Trade](http://www.youtube.com/watch?v=pA6FSy6EKrM" \t "_blank)
* *[MSNBC:](http://www.msnbc.msn.com/id/35421517/ns/business-oil_and_energy%22%20%5Ct%20%22_blank)*[Obama renews commitment to nuclear energy](http://www.msnbc.msn.com/id/35421517/ns/business-oil_and_energy%22%20%5Ct%20%22_blank)
* [It’s Official: Google Can Sell Power Like a Utility](http://www.greentechmedia.com/articles/read/it-official-google-can-now-sell-power-like-a-utility/%22%20%5Ct%20%22_blank)
* [iPhone and iPod Touch Smart Thermostat Application Released by ecobee](http://www.ecobee.com/company/article/articleid/114%22%20%5Ct%20%22_blank)