

Tufts University
*Graduate Department of Urban and
Environmental Policy and Planning (UEP)*

THE NUCLEAR POWER OPTION
SYLLABUS – UEP-294BA: SUMMER, 2010

DATE of this VERSION: July 25, 2010

The current – and official – version of this syllabus is posted here on Blackboard. It will be updated periodically. When you register for the course, please sign up for (and become familiar with) the Blackboard site: <http://blackboard.tufts.edu>.

NOTE: Please read selections in the order in which they are listed.

Class #1: Introduction to the Course
Wed., July 7

- We who are taking and teaching the Nuclear Power Option
- Introduction to the course
- The major issues -- a media review
- Why nuclear power is relevant now
- Our own attitudes

Video viewing: After an introduction, we will watch a 56-minute video, “Half Lives: History of the Nuclear Age,” produced in 1996 by Films for the Humanities and written by Michael Olmert. It examines the development of nuclear power from a weapon to an energy resource, relying heavily on interviews with scientists and engineers who participated in the Manhattan Project, which developed the atomic bomb.

Readings:

- 📖 Zoellner, Tom, *Uranium: War, Energy, and the Rock that Shaped the World* (New York: Penguin, 2009), Ch. 2, pp. 15-42 [please read the entire book in the next four weeks].
- 📖 Burns, John F., "Nuclear Missile Subs Collide, France and Britain Report," *New York Times*, Feb. 17, 2009, p. A6 [Blackboard].
- 📖 Kanter, James, "Extreme Makeover: Nuclear Power Plant Edition," *New York Times* [Green Inc. blogs], Nov. 7, 2008, at <http://greeninc.blogs.nytimes.com/2008/11/07/extreme-makeover-nuclear-power-plant-edition/> (and view reader responses, Nov. 12, 2008, at: <http://greeninc.blogs.nytimes.com/2008/11/12/readers-respond-nuclear-powers-image-makeover/>).
- 📖 Wald, Matthew L., "After 35-Year Lull, Nuclear Power May Be in Early Stages of a Revival," *New York Times*, Oct. 24, 2008, p. B3 [Blackboard].
- 📖 "Nuke Revival: When It Rains, It Pours," *Electricity Journal*, vol. 21, issue 1 (Jan./Feb. 2008), p. 3 [Blackboard].
- 📖 "Growth and Skepticism in Nuclear Power" [graphic], *New York Times*, Dec. 24, 2009, p. B1 [Blackboard].
- 📖 Rohter, Larry, "2 Endorsements of Nuclear Power, but Sharp Differences on Details," *New York Times*, Oct. 10, 2008, p. A23 [Blackboard].
- 📖 Kanter, James, "Sweden Takes Another Look at Nuclear Power," *New York Times*, Feb. 6, 2009, www.nytimes.com [Blackboard].
- 📖 "U.K. Is Unequivocal in Offering Support to Nuclear Power," *Electricity Journal*, vol. 21, issue 2 (March 2008), p. 3 [Blackboard].
- 📖 Erlanger, Steven, "French Plans for Energy Reaffirm Nuclear Path," *New York Times*, Aug. 17, 2008, §1, p. 6 [Blackboard].
- 📖 Iwata, Mari, "Six Japan Firms Team Up to Sell Nuclear-Power Technology," *Wall Street Journal Asia online*, July 6, 2010 [Blackboard].
- 📖 Nossiter, Adam, "Eager to Settle into China's Embrace," *New York Times*, Apr. 25, 2010, §1, p. 6 [Blackboard].
- 📖 Jolly, David, "Two Nuclear Power Plants Approved by Finland," *New York Times*, July 2, 2010, p. B5 [Blackboard].

Class #2:
Mon., July 12

Introduction to Nuclear Power

- Fission: Background
- How nukes work
- Nukes and GHGs -- an introduction
- Atomic energy and atomic warfare
- Uranium (and plutonium)

- 📖 Garwin, Richard L. and Georges Charpak, *Megawatts and Megatons: The Future of Nuclear Power and Nuclear Weapons* (Chicago: U. Chicago Press, 2002) [hereinafter, "*Megawatts and Megatons*"], pp. vii-xvii, 3-57.
- 📖 Massachusetts Institute of Technology, *The Future of Nuclear Power: An Interdisciplinary MIT Study* (Cambridge, Mass.: MIT: July 2003), at: <http://web.mit.edu/nuclearpower/> [hereinafter, *MIT Report*], Ch. 2 (pp. 17-23), Ch. 4 (pp. 29-35), App. 1 (pp. 101-108), App. 5E (pp. 152-156).
- 📖 Massachusetts Institute of Technology, *Update of the MIT 2003 Future of Nuclear Power: An Interdisciplinary MIT Study* (Cambridge, Mass.: MIT: 2009), at: <http://web.mit.edu/nuclearpower/> [hereinafter, *MIT Report Update*], pp. 3-5.
- 📖 Keystone Center, *Nuclear Power Joint Fact-Finding* (Keystone, Colo.: The Keystone Center for Science and Public Policy, 2007), at: [www.keystone.org/spp/documents/FinalReport_NJFF6_12_2007\(1\).pdf](http://www.keystone.org/spp/documents/FinalReport_NJFF6_12_2007(1).pdf) [hereinafter, *Keystone Report*], pp. 19-20, 93-94.
- 📖 *Megawatts & Megatons*, Ch. 5, pp. 107-124.
- 📖 Lester, Richard K. and Robert Rosner, "The Growth of Nuclear Power: Drivers & Constraints," pp. 19-30, in *American Academy of Arts & Sciences, Daedalus*, "On the Global Nuclear Future," vol. 1, fall 2009 (vol. 138, no. 4) [hereinafter, *Global Nuclear Future*].
- 📖 *Megawatts & Megatons*, Ch. 8, pp. 207-212.
- 📖 Fortson, Danny, "The Great Uranium Stampede," (London) *Sunday Times Online*, Sun., Jan. 31, 2010 [Blackboard].
- 📖 Bradsher, Keith, "Fuel Maker for Reactors Has China as Investor," *New York Times*, Sat., June 19, 2010, p. B1 [Blackboard].
- 📖 Wald, Matthew L., "Companies Bet on Rise in Demand for Uranium," *New York Times*, Sat., June 19, 2010, p. B4 [Blackboard].

Class #3:
Wed., July 14

The Electricity Industry -- Past and Future

- Types of generation resources
- Supply and demand sides
- Economics of electricity
- Industry restructuring and retrenchment
- The California experiment
- Nuclear power and the rise of competition

📖 Komor, Paul, *Renewable Energy Policy* (New York: iUniverse, 2004), Ch. 3, "Electricity Restructuring and Renewables: A Primer," pp. 65-81 [Blackboard].

📖 *Megawatts & Megatons*, Ch. 9, pp. 244-247.

📖 Bradford, Peter A., "Events Now Long Past: The 20-Year Road from Three Mile Island to Utility Restructuring," Speech, TMI 20-year commemoration, National Press Club (sponsored by the Union of Concerned Scientists), Washington, D.C., March 22, 1999 [Blackboard].

📖 Blumsack, Seth A., Jay Apt and Lester B. Lave, "Lessons from the Failure of U.S. Electricity Restructuring," *Electricity Journal*, vol. 19, issue 2 (March 2006), pp. 15-17 [Tisch Library -- Electronic Journals].

Film viewing: Please watch the 1979 film "The China Syndrome," starring Jane Fonda, Jack Lemmon and Michael Douglas, before our class on Wed., July 28. A copy has been ordered by the Tisch Library video department, but may not arrive in time. However, this well-known movie -- which was nominated for four Academy Awards -- is available in video stores, from Netflix, and for purchase on line, and, in fact, for free viewing on line, at: www.crackle.com/c/The_China_Syndrome/The_China_Syndrome/2478664. If you have the disc or tape but nowhere to play it, you can watch it on the equipment at the library. (Note that the DVD version contains two extras about the production and background of the film, including its relation to some of the actors' anti-nuclear activities.)

Class #4:
Mon., July 19

Nuclear Plant Economics

- Introduction to nuclear economics
- Nuclear power in regulated and competitive settings
- Cost of nuclear plants over time
- Current cost estimates and variables
- Best and worst case scenarios

- 📖 Wald, Matthew L., "Can Nuclear Power Compete?" *Scientific American Earth 3.0*, 2008 [Blackboard].
- 📖 MIT Report, Ch. 5, pp. 37-45.
- 📖 MIT Report Update, pp. 6-8.
- 📖 Keystone Report, Ch. II, "Economics of Nuclear Power," pp. 29-46.
- 📖 Schlissel, David and Bruce Biewald, *Nuclear Power Construction Costs*, report by Synapse Energy Economics, Inc., Cambridge, Mass., July 2008 [Blackboard].
- 📖 Joskow, Paul L. and John E. Parsons, "The Economic Future of Nuclear Power," *Global Nuclear Future*, pp. 45-57.
- 📖 Mufson, Steven, "Nuclear Projects Face New Hurdle; With Financing of Plants a Concern, Utilities Turn to States for Help," *Washington Post*, Tues., Mar. 2, 2010, p. A1 [Blackboard].
- 📖 Wald, Matthew L., "Loan Program May Stir Dormant Nuclear Industry," *New York Times*, Thurs., Dec. 24, 2009, p. B1 [Blackboard].
- 📖 Sheppard, Kate, "Obama's Nuclear Giveaway," *Mother Jones*, Thurs., Feb. 4, 2010 [Blackboard].

Due by 11 p.m. today (emailed to Rusty.Russell@tufts.edu) -- a proposal of about a page in length describing the specific topic you plan to write about for your final analytic paper. For more detail, please refer to the Memorandum on course deliverables.

Class #5:
Wed., July 21

Greenhouse Gas Reduction

- Nuclear power as part of climate change policy
- Internalizing externalities: Impacts and uncertainties
- Alternative strategies

- 📖 Socolow, Robert H. and Stephen W. Pacala, "A Plan to Keep Carbon in Check," *Scientific American*, September 2006, pp. 50-57 [Blackboard].
- 📖 *Keystone Report*, Ch. I, "The Role of Nuclear Power in Mitigating Climate Change," pp. 21-28.
- 📖 Socolow, Robert H. and Alexander Glaser, "Nuclear Energy and Climate Change," *Global Nuclear Future*, pp. 31-44.
- 📖 Rowe, John W., "Nuclear Power in a Carbon-Constrained World," *Global Nuclear Future*, pp. 81-90.
- 📖 "A Reasonable Bet on Nuclear Power" (editorial), *New York Times*, Thurs., Feb. 18, 2010, p. A26 [Blackboard].
- 📖 Makhijani, Arjun, *Carbon-Free and Nuclear-Free: A Roadmap for U.S. Energy Policy* (Takoma Park, Md.: IEER Press, 2007), at: www.ieer.org/carbonfree/, pp. 170-171, 175, 190-192 [hereinafter, *Carbon-Free and Nuclear-Free*].

Class #6: Renewable Resources
Mon., July 26

- Renewable resources: Introduction
- Wind power: Case Study I
- Wood-fired combustion (biomass): Case Study II

- 📖 Komor, Paul, *Renewable Energy Policy* (New York: iUniverse, 2004), Ch. 10, "The Renewable Portfolio Standard," pp. 156-171 [Blackboard].
- 📖 *Carbon-Free and Nuclear-Free*, pp. 30-36.
- 📖 Snyder, Brian and Mark J. Kaiser, "Ecological and Economic Cost-Benefit Analysis of Offshore Wind Energy," *Renewable Energy*, vol. 34, Issue 6 (June 2009), pp. 1567-1578 [Blackboard].
- 📖 Phadke, Roopali, "Steel Forests or Smoke Stacks: The Politics of Visualization in the Cape Wind Controversy," *Environmental Politics*, vol. 19, No. 1 (February 2010), pp. 1-20 [Blackboard].
- 📖 *Carbon-Free and Nuclear-Free*, pp. 45-59.
- 📖 Manomet Center for Conservation Sciences, *Massachusetts Biomass Sustainability and Carbon Policy Study: Report to the Commonwealth of Massachusetts Department of Energy*, June 2010, Natural Capital Initiative Report NCI-2010-03 [Blackboard]. To read: pp. 6-29, 34-35 (sec. 3.1.2), 76-78 (sec. 4.5.2), 93, 126-129, 132-133, 177-182. To skim: pp. 54-55 (sec. 3.5), 95-125.

- 📖 Peters, Mike, "NRC Spokesman" (political cartoon), *Boston Globe*, Apr. 5, 2002 [Blackboard].
- 📖 Leonhardt, David, "The Way We Live Now; Underestimating Risk," *New York Times Magazine*, Sun., June 6, 2010, p. 13 [Blackboard].
- 📖 Voosen, Paul, "How Long Can a Nuclear Reactor Last?" *Scientific American*, Nov. 20, 2009 [Blackboard].
- 📖 *Megawatts & Megatons*, Ch. 7, pp. 170-205.
- 📖 *MIT Report*, Ch. 6, pp. 47-51.
- 📖 *MIT Report Update*, p. 10.
- 📖 *Keystone Report*, pp. 47-65.
- 📖 McPhee, John, *The Curve of Binding Energy* (New York: Farrar, Straus & Giroux, 1974), pp. 3-8, 189-194, 215-232 [Blackboard].
- 📖 Broad, William J., "Enriching Uranium Only Gets Easier," *New York Times*, Tues., Mar. 9, 2010, p. D1 [Blackboard].
- 📖 Rosenthal, John E., "A Recurring Nuclear Nightmare" (op-ed), *Boston Globe*, Sat., Feb. 27, 2010, p. A11 [Blackboard].
- 📖 *MIT Report*, Ch. 8, pp. 65-69.
- 📖 *Keystone Report*, pp. 85-91.

Class #8: Waste and Reprocessing
Mon., Aug. 2

- Radioactive decay, in brief
 - Status of waste issue in U.S. and elsewhere
 - Beyond Yucca Mountain
 - Reprocessing -- A French approach
 - Economics of once-through and reprocessing
- 📖 Wasserman, Dan, "The Atomizer" (political cartoon), *Boston Globe*, June 3, 2001 [Black board].
 - 📖 *MIT Report*, Ch. 7, pp. 53-63; Appendix to Ch. 7, pp. 157-160, 163-164.
 - 📖 *MIT Report Update*, pp. 11-14.
 - 📖 *Keystone Report*, pp. 67-84.
 - 📖 *Megawatts & Megatons*, Ch. 5, pp. 124-152.
 - 📖 Cala, Andrés, "Spanish Town's Bid to Welcome Nuclear Waste Site Divides Region," *New York Times*, Wed., Feb. 24, 2010 [Blackboard].

- 📖 Sang-Hun, Choe, "Dispute Over Nuclear Fuel in South Korea," *New York Times Asia on-line*, Tues., July 13, 2010 [Blackboard].
- 📖 Wald, Matthew L., "U.S. Panel Shifts Focus to Reusing Nuclear Fuel," *New York Times*, Thurs., Sept. 24, 2009 [Blackboard].
- 📖 Wald, Matthew L., "Nuclear Agency Weighs a Plan To Dilute Waste," *New York Times*, Fri., June 17, 2010 [Blackboard].

Due by 11 p.m. today (emailed to Rusty.Russell@tufts.edu) -- an outline of at least four pages for your final analytic paper. For more detail, please refer to the Memorandum on course deliverables.

Class #9: Energy Efficiency
Wed., Aug. 4

- Status of efficiency
- Estimated resource size
- Substitute for nuclear power?

Video viewing: We will watch a 56-minute video, "The Big Energy Gamble," written and produced in 2009 by Larry Klein for the PBS program Nova. It examines California's path-breaking program to dramatically reduce carbon dioxide emissions and other greenhouse gases by adopting energy efficiency programs and other measures across every sector of the state's massive economy.

- 📖 Granade, Hannah Choi, et al., *Unlocking Energy Efficiency in the U.S. Economy*, New York: McKinsey & Co., July 9, 2009 [Blackboard]. To read: pp. 1-27, 29-31, 55-57, 75-76. To skim: pp. iii-xiv, 91-109.
- 📖 Wald, Matthew L., "Energy Department Uses Too Much Energy, a Report Says," *New York Times*, Fri., July 8, 2010, p. A17 [Blackboard].

Class #10:
Mon., Aug. 9

Nuclear Power's Future

- New technologies
- Public attitudes
- The developing world
- Global planning (say what?)

- 📖 Chast, Roz, "A Master Plan" (political cartoon) [Blackboard].
- 📖 *Megawatts & Megatons*, Ch. 6, pp. 153-169; Ch. 14, pp. 376-383.
- 📖 Fortson, Danny, "A Nuclear Reactor that Could Fit in a Shed," *The Sunday Times* (London), Jan. 10, 2010, p. 9 (Business) [Blackboard].
- 📖 *MIT Report*, Ch. 9, pp. 71-73; Appendix to Ch. 9, pp. 167-170.
- 📖 Goldemberg, José, "Nuclear Energy in Developing Countries," *Global Nuclear Future*, pp. 71-80.
- 📖 Schelling, Thomas C., "A World Without Nuclear Weapons?" *Global Nuclear Future*, pp. 124-129.

Class #11:
Wed., Aug. 11

Presentations and Wrap-Up

- ✓ Presentations:
 - Class members will lead discussions drawing on their research papers, which are due before class today.
 - Total presentation time (including a minimum period for questions) will depend on course enrollment, but will likely be about 20 minutes each, with at least half of this reserved for discussion.
 - Audio-visual equipment, including a projector and laptop, will be available if needed. Other presentation materials can be provided on request.

Due by 6 p.m. today (emailed to Rusty.Russell@tufts.edu) -- your final analytic paper. For more detail, please refer to the Memorandum on course deliverables.