

NOTES

1. Canadian Association of Petroleum Producers, *Crude Oil: Forecast, Markets & Pipeline Expansions*, June 2009, <http://www.capp.ca/>.
2. International Energy Association, *World Energy Outlook 2008*, <http://www.worldenergyoutlook.org/>.
3. Bengt Soderberg et al., "A Crash Program Scenario for the Canadian Oil Sands Industry," *Energy Policy* 35, no. 3 (March 2007), 1931–1947.
4. U.S. Energy Information Administration, *Annual Energy Outlook 2008 (First Release)*, DOE/EIA-0383 (2008), January 2008. Note that subsequent revisions of *Annual Energy Outlook 2008* changed the cited figures for gasoline demand.
5. Robert L. Hirsch, Roger Bezdek, and Robert Wendling, *Peaking of World Oil Production: Impacts, Mitigation, & Risk Management*, U.S. Department of Energy report, February 2005, http://www.netl.doe.gov/publications/others/pdf/oil_peaking_netl.pdf.
6. John Whims, "Pipeline Considerations for Ethanol," Agricultural Marketing Resource Center, http://www.agmrc.org/media/cms/ksupipelineethl_8BA5CDF1FD179.pdf.
7. David Cohen, "Earth's Natural Wealth: An Audit," *New Scientist* 23 (May 2007), 34–41.
8. A megajoule equals 239 food calories; a typical adult male requires 10 MJ of food energy per day.
9. As coined by user HeIsSoFly, comment on "Drumbeat," The Oil Drum, March 7, 2007, <http://www.theoil Drum.com/node/2344>.
10. For a more in-depth discussion of energy return on investment, see Richard Heinberg, *Searching for a Miracle: "Net Energy" Limits & the Fate of Industrial Society* (San Francisco: Post Carbon Institute/International Forum on Globalization, 2009). Note that EROI is sometimes also referred to as "energy returned on energy invested" (EROEI).
11. Charles A. S. Hall, Robert Powers, and William Schoenberg, "Peak Oil, EROI, Investments and the Economy in an Uncertain Future," in *Biofuels, Solar and Wind as Renewable Energy Systems: Benefits and Risks*, David Pimentel, ed. (New York: Springer, 2008), 109–132.
12. The often-cited 8:1 return on Brazilian ethanol and the high return estimated for cellulosic ethanol are not energy calculations; in these studies, the energy provided from biomass combustion is ignored. See, for example, Suani Teixeira Coelho et al., "Brazilian Sugarcane Ethanol: Lessons Learned," *Energy for Sustainable Development* 10, no. 2 (June 2006), 26–39.

2.6.4 STABILIZING CLIMATE: AN ENERGY EFFICIENCY REVOLUTION

LESTER BROWN

We end this book with a selection from the work of Lester R. Brown, noted author and environmentalist and founder of both the Worldwatch Institute and the Earth Policy Institute. Dr. Brown is the author of more than fifty books on global environmental issues and is the recipient of numerous prizes and honors, including twenty-six honorary degrees and a MacArthur "genius" award.

This chapter, from his 2009 book *Plan B 4.0: Mobilizing to Save Civilization*, provides an overview of how new technologies that promote energy savings can help to reduce dependence on fossil fuels, stabilize the level of CO₂ in the atmosphere, and save money. Brown is a "techno-optimist" who believes that a rapid transition to energy-efficient technologies and renewable energy sources is both feasible and

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