Sustainable Energy Independence for New York City

Preparing for fuel volatility and depletion, slowing climate change, and accelerating PlaNYC

Dan Miner
Sierra Club NYC Group
www.beyondoilnyc.org

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Dan Miner
Sierra Club NYC Group, Chair

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SUMMARY

Everyone now recognizes that to reverse climate change, we must reduce CO_2 emissions and rapidly end our dependence on fossil fuels. We have to comprehensively retrofit our entire economy around energy conservation, energy efficiency, and renewable energy. In the short term, expanding capacity margins through energy conservation will make the City more resilient to volatility. In the long term, we need to push discussion far past PlaNYC's current goals, and start building a post-petroleum economy now. The magnitude of required change is enormous.

Unfortunately, increasing public discussion of global warming and scientific evidence of accelerating climate change have not led to urgently needed action. According to social scientists, many Americans don't understand climate change to be an urgent risk because the impacts are perceived as remote, far in the future or far away. Also, understanding the climate crisis involves sophisticated scientific knowledge that can be easily muddled by parties with agendas other than the truth.[1] In addition, current business and consumer practices are heavily entrenched and defended by powerful business interests. Government sustainability initiatives may have greater success when framed as responses to energy volatility – reducing dependence on foreign fuels and protection from higher energy prices – than to climate change.[2]

We must also respond to the parallel challenge of increasing energy price volatility, as the fundamentals of energy have changed. World oil demand keeps rising, and now exceeds world oil production, which will soon peak and go into permanent decline. That guarantees greater volatility in the price and supply of oil. Even though its extensive public transit system makes NYC less vulnerable to oil price spikes than other cities,[3] short-term consequences of higher prices may not be immediately obvious. How would a prolonged increase in oil prices affect trucks bringing groceries to supermarkets? Winter heating fuel prices? The earnings of restaurants and theaters dependent on tourists? Budgets for fire, police, and sanitation services? Would commuters still choose to drive into Manhattan, or would they flock to mass transit?

Transportation accounts for much of our fossil fuel use. Congestion pricing can fund more mass transit capacity and encourage its use, while

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[1] "Americans believe global warming is real, want action, but not as a priority," *Science Daily*, Feb. 23, 2007, http://www.sciencedaily.com/releases/2007/02/070218140838.htm; "Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change," ed. Susanne Moser, Feb. 2007, introduction, http://www.cambridge.org/us/catalogue/catalogue.asp?isbn=9780521869232&ss=exc.

[2] "Energy Attitudes Summer 2007: Rising Public Demand for Government Action on Energy Independence Even as Global Warming Remains a Low Priority for Voters," *Nathan Cummings Foundation & American Environics*, June 2007, http://www.americanenvironics.com/PDF/EnergyAttitudesSummer2007.pdf; *Breakthrough Institute*, http://www.thebreakthrough.org.

[3] **"**NYC less vulnerable to oil price spike," *Crain's NY Business*, Nov. 7, 2007, http://www.crainsnewyork.com/apps/pbcs.dll/article?AID=/20071107/FREE/71107010/1047.

decreasing reliance on combustion engine cars and trucks. One of the strongest arguments in its favor is that it will make the City more resilient to much higher future fuel prices. We should also maximize use of regional rail networks, build a robust national rail system, and turn to electric-powered transit. Sensible planning, such as limiting urban sprawl, and encouraging new development along mass transit corridors, will minimize future transit needs. Encouraging regional and local agriculture and manufacturing will minimize fuel costs while strengthening local economies.

PlaNYC aims to cut fossil fuel use and costs by increasing energy efficiency in many new buildings, while recognizing the need to retrofit the vast stock of older buildings. Simple acts such as caulking cracks, replacing old refrigerators, switching to high-efficiency lights, tuning up boilers and installing solar water heaters can lead to significant fuel savings. However, more City incentives and mandates will be needed to make these voluntary actions standard practice.

The fastest and least expensive responses to increased electricity use are conservation and efficiency, while scaling up distributed renewable power, currently only a tiny fraction of our electricity production. Most of our electricity is provided by climate-damaging fossil fuels such as coal and natural gas. Nuclear power, with its high economic, social and environmental costs, is entirely dependent on Federal subsidies and is not a viable solution. Many small solar electric and thermal power systems on top of houses and buildings, and larger solar and wind systems outside the City, can support and strengthen our overstretched electric grid.

This report will lay out a roadmap of pragmatic steps, which will enhance current PlaNYC initiatives to move NYC toward sustainable and secure energy independence. **Primarily, we encourage City officials to form a task force to study potential local impacts and mitigations of energy volatility, and to require consideration of energy volatility in all City agency budgeting and planning decisions,** as has been done already in Portland, Oregon and San Francisco. Portland's group has generated a municipal report. Civic, community and business groups need not wait for the City to begin their own explorations. Report recommendations also address transportation, regionalizing agriculture and manufacturing, energy efficiency in buildings, electricity generation, and guiding principles and models for national policy.

While individual responses are valuable and necessary, they are not sufficient. If such actions don't lead to the greater awareness and action needed to effect comprehensive change, they can create a false sense of security and promote denial. Accelerating government action is crucial. We need to generate public support for Federal measures much bolder than those proposed so far.

The good news is that a national project to make clean energy cheap can restore domestic manufacturing, create millions of jobs that can't be outsourced, and stimulate the economy, while improving our quality of life and mitigating

climate change. New York City's leadership can help make such policy actions a reality, while ensuring a better future for our citizens.

Report recommendations:

Transportation:

- implement congestion pricing
- remove hidden subsidies for driving and parking cars
- increase regular and express bus services
- increase alternative fuel and electric vehicle fleets
- implement electric streetcar and light rail systems, as in Vision 42
- implement Auto Free NY plan to maximize use of subway and rail
- build more intercity passenger and freight train capacity
- restrict suburban sprawl
- encourage urban infill development around mass transit access points
- support and expand use of bicycles and pedicabs

Regional production:

- include energy volatility and fuel depletion in New York City and State economic development policy
- encourage production and procurement of regional farm products
- support agricultural production within cities and suburbs
- enable residents to find farming and gardening jobs
- encourage schools to establish gardens on their facilities
- open additional retail farmers markets, a wholesale farmers market, year-round public markets, and a regional product distribution center
- explore entrepreneurial ways to make private land available to new agricultural workers

Energy efficient building:

- increase mandates and incentives for energy efficiency retrofits
- mandate energy efficiency standards for equipment
- encourage solar heating systems
- design buildings for maximum cost-efficient energy performance
- discourage acceptance of relentless growth in personal electricity consumption

New York City and State Energy Policy:

- set timetables for PlaNYC's many good energy initiatives, especially the formation of an Energy Planning Board
- expand net metering to 2 megawatts per site for all customer classes
- distribute smart meters / time-of-use meters, which enable users to choose less costly off-hours electricity
- raise the New York State Energy Efficiency Portfolio Standard to 30% reduction of 2006 electric and gas usage rates by 2015
- update the State Energy Plan to account for energy volatility

PART I.
Preparing for Energy Volatility

PlaNYC is an excellent start, but there is more to be done. Carbon emission reduction goals must be adjusted to match the accelerating pace of global warming, so that world carbon dioxide emissions are reduced 80% by 2020, not 2050.[4] Also, PlaNYC must address energy volatility. World oil demand is surpassing supply, and world oil production will peak and begin decline within a few years, making sharp price increases unavoidable. Economic impacts will motivate change more effectively than the often abstract threat of climate change and will strengthen PlaNYC implementation. Both individual actions and massive municipal and national efforts are necessary. Portland, Oregon has assembled an energy volatility task force to prepare responses to sudden changes in energy price and supply.

<u>Recommendation</u>: NYC officials and civic networks should begin discussing energy volatility now, and incorporate responses into PlaNYC.

1. Achievements so far

The forward-thinking Mayor Bloomberg and the NYC Council have established New York as one of the nation's greenest cities.[5] PlaNYC 2030, a work of extraordinary value and importance, will be the foundation for all future discussions of sustainability in NYC. As a work in progress, it will need to address new issues as they arise.[6]

2. Energy volatility increasingly likely

It's widely agreed that rising demand from China and India is a key factor driving unprecedented energy price volatility.[7] Less widely discussed is that daily world oil demand now exceeds supply,[8] spare production capacity is nearly

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[4] "Plan B.3: Mobilizing to Save Civilization," *EPI*, http://www.earth-policy.org/Books/PB3/index.htm.

[5] "Working Towards a Sustainable City," *NYC Council*, Sept. 2005, http://www.nyccouncil.info/pdf_files/reports/sustainable.pdf; "Mayor Bloomberg Announces Creation of Office of Long-Term Planning and Sustainability," *Office of Mayor Bloomberg*, NYC.gov, Sept. 21, 2006, http://www.nyc.gov/portal/site/nycgov/menuitem.c0935b9a57bb4ef3daf2f1c701c789a0/index.jsp?pageID=mayor_press_release&catID=1194&doc_name=http%3A%2F%2Fwww.nyc.gov%2fhtml%2Fom%2Fhtml%2F2006b%2Fpr335-06.html&cc=unused1978&rc=1194&ndi=1.

[6] PlaNYC 2030, http://www.nyc.gov/html/planyc2030/html/home/home.shtml.

[7] "Rising demand for oil provokes new energy crisis," *NY Times*, Nov. 9, 2007, http://www.nytimes.com/2007/11/09/business/worldbusiness/09oil.html.

[8] "Oil Market Report," *IEA*, http://omrpublic.iea.org.

gone,[9] and even slight disruptions to our oil imports can rapidly raise gasoline prices to over $5 per gallon.[10] Possible triggers include an attack on Iran followed by a blockade of the Straits of Hormuz, the shipping channel for over a third of the world's oil, turmoil in Nigeria or Venezuela, terrorist attacks on Saudi oil infrastructure, or Gulf Coast hurricanes.[11]

Government and military analysts are taking these possibilities very seriously. The US Government Accountability Office (GAO) reported that energy markets will be increasingly volatile, making supply disruptions more likely.[12] The International Energy Agency (IEA) is concerned that the growing gap between rising world oil demand and lagging production will lead to global oil shortages by 2012.[13] Reports from the Pentagon and the Army Corps of Engineers urge the US military to transition to alternative fuels, or rising oil costs will make global response capacity "unsustainable in the long term."[14]

When half the world's oil reserves have been consumed, worldwide oil production is expected to begin permanent decline. Oil is, after all, a finite natural resource. The remaining oil will tend to be increasingly difficult and expensive to extract. In the past, rising demand for fuel was always met by rising production capacity. When this is no longer possible, prices will tend to go up, perhaps abruptly. The US Energy Information Agency (EIA) has predicted that world oil production will peak in 2037,[15] but the GAO expects peak "between now

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[9] "World Economic Outlook," *International Monetary Fund*, Sept. 2006, chart 1.16, http://www.imf.org/external/pubs/ft/weo/2006/02/chp1pdf/FIG1_16.pdf.

[10] "Oil Shockwave: Oil Crisis Executive Simulation,"*Securing America's Future Energy*, 2005, http://www.secureenergy.org/reports/oil_shock_report_master.pdf; "Effects of High Oil Prices on the World Economy," *Securing America's Future Energy*, 2006, http://www.secureenergy.org/reports/westcott_report.pdf.

[11] "Terror's next target," Gal Luft and Ann Korin, *Journal of International Security Affairs*, Dec. 2003, www.iags.org/n0111041.htm; "The breaking point," Peter Maass, *NY Times*, Aug. 21, 2005, http://www.petermaass.com/core.cfm?p=1&mag=124&magtype=1; http://www.energybulletin.net/8112/html.

[12] "Oil output has stalled," Eugene Linden, *Business Week*, June 25, 2007, http://www.businessweek.com/magazine/content/07_26/b4040074.htm?campaign_id=rss_magzn; "Crude Oil: Uncertainty about Future Oil Supply Makes It Important to Develop a Strategy for Addressing the Peak and Decline of Oil Production," *GAO*-07-283, Feb. 2007, http://www.gao.gov/new.items/d07283.pdf.

[13] "IEA sees oil supply crunch looming," *Reuters*, July 9, 2007, http://www.washingtonpost.com/wp-dyn/content/article/2007/07/09/AR2007070900432.html; "Oil supplies 'face more pressure,' *BBC News*, July 9, 2007, http://news.bbc.co.uk/2/hi/business/6283992.stm; "Medium-Term Oil Market Report – July 2007," *IEA*, http://omrpublic.iea.org/mtomr.htm.

[14] "Pentagon study says oil reliance strains military," *Boston Globe*, May 1, 2007, http://www.boston.com/news/nation/washington/articles/2007/05/01/pentagon_study_says_oil_reliance_strains_military; "Energy Trends and their Implications for US Army Installations," Donald Fournier and Eileen Westervelt, *US Army Corps of Engineers Energy Research & Development Center*, Sept. 2005, http://stinet.dtic.mil/cgi-bin/GetTRDoc?AD=A440265&Location=U2&doc=GetTRDoc.pdf; "Transforming the way DoD Looks at Energy," *Office of Force Transformation, US Dept. of Defense*, April 2007, http://www.oft.osd.mil/library/library_files/document_404_FT602T1_Transforming%20the%20Way%20DoD%20Looks%20at%20Energy_Final%20Report.pdf.

[15] "Long Term World Oil Supply Scenarios," *US EIA*, Aug. 2004, www.eia.doe.gov/pub/oil_gas/petroleum/feature_articles/2004/worldoilsupply/oilsupply04.html.

and 2040."[16] As CNN and the Wall Street Journal report, a growing number of petroleum analysts say the peak will arrive before 2015, and some say it might have been passed already.[17] As a US Department of Energy study explains, we must immediately begin a planned transition beyond oil. Market forces alone will be insufficient, and strong government action will be required.[18]

3. Reinforcing PlaNYC and City sustainability initiatives

Preparations for energy volatility will overlap and reinforce other City energy efficiency and conservation initiatives. For instance, **congestion pricing, a central component of PlaNYC's transportation strategy, could fund the expanded mass transit services needed when gasoline is much more expensive.** This consideration was not addressed in PlaNYC, but reinforces its conclusions and makes its implementation even more vital.[19]

4. Encouraging both individual and national action

There's not really a choice between promoting individual actions, such as the list of ten recommended by PlaNYC, or national legislation. Both are necessary. Individual choices must lead to cascading action on other levels if we are to succeed.[20] Also, "top down strategies must be concurrent with and redundant to bottom up strategies."[21]

Social scientists tell us that individual and policy actions reinforce each other. Individual behaviors build up and have significant environmental impacts, and research shows that people voluntarily taking pro-environmental actions justify those behaviors to themselves and others, creating more social pressure for environmentally sound choices at all levels. People taking many small actions are more likely to take bigger similar actions. Building individual, organizational, and community momentum for change is needed to get action at city, state, national and international levels.

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16 "Crude Oil: Uncertainty about Future Oil Supply Makes It Important to Develop a Strategy for Addressing the Peak and Decline of Oil Production," *GAO*-07-283, Feb. 2007, http://www.gao.gov/new.items/d07283.pdf.

17 "Oil Officials See Limit Looming on Production," *WSJ*, Nov. 17, 2007, http://online.wsj.com/article/SB119543677899797558.html?mod=googlenews_wsj; full article archived at http://www.energybulletin.net/37382.html; "Report: 'world at peak output,'" *CNN*, Oct. 24, 2007, http://edition.cnn.com/2007/BUSINESS/10/24/oil.decline/index.html.

18 Dr. Robert Hirsch, biographical notes, http://www.d-n-i.net/fcs/hirsch_bio.htm; "Peaking of World Oil Production: Impacts, Mitigation, & Risk Management," Hirsch, et al., *Science Applications International Corporation (SAIC)*, Feb. 2005, http://www.bartlett.house.gov/UploadedFiles/the_hirsch_report.pdf.

19 "PlaNYC 2030," http://www.nyc.gov/html/planyc2030/downloads/pdf/tech_report_transportation.pdf.

20 "PlaNYC 2030: Green Tips," http://www.nyc.gov/html/planyc2030/html/greenyc/greenyc.shtml.

21 "Strategizing on the transition to organic agriculture," Sharon Astyk, *Energy Bulletin*, Dec. 5, 2007, http://www.energybulletin.net/38234.html.

Depicting worst-case outcomes as inevitable promotes fear, and leads to powerlessness and apathy. Informing people about the real risks of avoidable scenarios, along with ways to bring about better outcomes, may lead to uncomfortable realizations but can motivate action.[22] Many environmentalists criticized Al Gore for sugar-coating climate change by recommending small personal actions, but his mild-mannered presentation raised public awareness of the issue and a desire to take action.

In World War II, mandatory policies were combined with publicity campaigns encouraging voluntary actions. Enacting policies requires convincing people of the magnitude and urgency of the problem. Giving a menu of action options, starting with immediate, easy steps to fight climate change, may make people more willing to acknowledge the problem and cease denial.[23]

Individual actions can include:

- NYSERDA Energy Smart tips[24]
- 100 tips from Con Edison[25]
- 100 tips from *Our Victory at Home*, including re-creating 1940s Victory Gardens[26]
- 10 tips from the Sierra Club[27]

5. Plans in other places

San Francisco[28] and Portland, Oregon[29] are already preparing municipal energy volatility responses. Portland's City Council created a Task Force to identify short- and long-term energy vulnerabilities, based on a briefing book prepared by City agencies.[30] The Portland Task Force identified impacts of

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22 "Can we use fear as a motivator for change?," Rob Hopkins, *Transition Culture*, March 28, 2006, http://www.energybulletin.net/14442.html.

23 "The power of voluntary actions," essay signed by social scientists and psychologists," *Gristmill*, http://gristmill.grist.org/story/2007/9/11/13338/9554.

24 *NYSERDA*, http://www.getenergysmart.org/FallCampaign/PledgeOverview.aspx.

25 *Con Edison*, http://www.coned.com/go_green/100tips.asp.

26 *Our Victory at Home*, http://www.ourvictoryathome.com/thingsyoucando.html.

27 "Ten things you can do to help curb global warming," *Sierra Club*, http://sierraclub.org/globalwarming/tenthings.

28 "Resolution: Peak Oil Plan of Response and Preparation," *Board of Supervisors, City of San Francisco*, http://www.energybulletin.net/15086.html.

29 "City of Portland establishes Peak Oil Task Force," *City of Portland Office of Sustainable Development*, July 6, 2006, http://www.portlandonline.com/osd/index.cfm?a=122243&c=41625.

30 "Peak Oil Task Force Briefing Book," *City of Portland Office of Sustainable Development*, July 25, 2006, http://www.portlandonline.com/osd/index.cfm?c=edach.

different scenarios on particular sectors and city operations.[31] Its recommendations included reducing total oil and natural gas consumption by 50% over the next 25 years, informing citizens about energy volatility, and preparing emergency energy shortage plans.[32] Locally, citizens in Tompkins County, NY drafted a similar plan[33] and a coalition of Connecticut lawmakers have issued an initial report about statewide oil shortage planning.[34]

6. Beyond traditional emergency management scenarios

New York City has prepared for hurricanes, extreme heat and cold, utility disruptions and terrorist attacks.[35] Fuel price increases lasting for weeks or months are not included in existing Office of Emergency Management scenarios.

After the Northeast regional power outage of August, 2003, the City Council briefly considered an energy shortage contingency plan. The Council's Environmental Committee staff reported in 2004 on the City's growing demand for electricity and vulnerability to energy disruptions.[36] Intro. 374, *Creating an Energy Shortage Plan*, would have determined the vulnerabilities of City operations to energy volatility, compiled ways to cut energy use quickly, and set stages for emergency responses.[37] There was a hearing on the plan but no further action. (An upgraded version of the bill is available at www.beyondoilnyc.org.)

Measures to reduce fuel use during periods of higher fuel prices are outlined in a pair of International Energy Agency reports. *Saving Oil in a Hurry* suggests highway speed limits, increased fuel taxes, reduced fees for public transit, car pooling, driving bans, telecommuting, and compressed work weeks of fewer but longer days.[38]

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[31] Daniel Lerch, *Post Carbon Cities*, 2007, pp. 73-78, www.postcarboncities.net; "White Paper: Future Oil Price Uncertainty and Metro," Daniel Lerch, *Office of the Chief Operating Office, Metro, Portland, Oregon*, April 18, 2006, http://www.metro-region.org/index.cfm/go/by.web/id=18966.

[32] "Descending the Oil Peak: Navigating the Transition from Oil and Natural Gas," *City of Portland*, Feb. 2007, http://www.portlandonline.com/osd/index.cfm?c=42894; Executive summary, http://www.portlandonline.com/shared/cfm/image.cfm?id=150016.

[33] "Tompkins County Relocalization Plan," *Tompkins County Relocalization Project*, March 2006, http://www.ibiblio.org/tcrp/doc/project.htm; http://tclocal.org.

[34] **"**Peak oil production and implications to the State of Connecticut," Nov. 2007, http://www.terrybacker.com/Peak%20oil%20and%20Natural%20Gas%20Report%20final%20111607-1.pdf.

[35] *NYC Office of Emergency Management*, http://www.nyc.gov/html/oem/html/home/home.shtml; *US Dept. of Homeland Security*, http://www.ready.gov.

[36] "Environmental Protection Committee Report to NYC Council on Intro. 374," *NYC Council*, June 23, 2004, http://webdocs.nyccouncil.info/attachments/61517.htm.

[37] Text of Intro. No. 374, *NYC Council*, http://webdocs.nyccouncil.info/textfiles/Int%200374-2004.htm?CFID=42808&CFTOKEN=77756073.

[38] "Saving Oil in a Hurry," *IEA*, 2005, http://www.iea.org/Textbase/publications/free_new_Desc.asp?PUBS_ID=1474; "IEA Response System for Oil Supply Emergencies," *IEA*, 2007, http://www.iea.org/textbase/nppdf/free/2007/fs_response_system.pdf.

Lessons learned from previous fuel supply disruptions are recommended in a report from the engineering firm Parsons Brinkerhoff, including transportation demand management strategies which quickly reduce fuel and oil consumption. The report uses the Seattle, Washington region as a case study.[39]

Higher energy prices could increase demand for non-emergency services at other City agencies, community groups and social services organizations. Officials distributing federal assistance to low-income households say that New Yorkers are paying more than ever to heat their homes.[40] The City's Community Emergency Response Team program trains neighborhood-based volunteers in emergency preparedness.[41] Perhaps this model could be applied to non-emergency community impacts of higher energy prices.

7. Considerations for a NYC volatility task force

Post Carbon Cities: Planning for Energy and Climate Uncertainty offers detailed guidance for task forces.[42] New Yorkers might ask:

- *What challenges would the City face if oil gradually rose to $120 per barrel over the coming year?*
- *How would those challenges be different if oil prices jumped erratically between $50 and $200 over the next ten years?*
- *How would those challenges affect the City's ability to provide essential services such as police, fire and emergency health care?*
- *How would this affect fee-based services like buses and subways? When should constituents be alerted to possible service cutbacks and price increases? Will those price increases be affordable?*
- *How long would it take for price hikes to impact City operations?*
- *When would some services need to be cut? And which ones?*

Government agencies and organizations assessing internal vulnerabilities can inventory energy use by department for the previous fiscal year to determine:

- fuel use, by amount (in kilowatt hours, gallons or therms) and cost
- cost, as percentage of each department's budget
- energy mix of departments with highest percentage use and cost[43]

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[39] "Implementing the Most Effective Transportation Demand Management (TDM) Strategies to Quickly Reduce Oil Consumption," Kathy Leotta, *Parsons Brinkerhoff*, Jan. 2007, http://postcarboncities.net/files/Leotta_ImplementingTDMtoQuicklyReduceOilConsumption.pdf.

[40] "New Yorkers pay more to keep their homes warm," *NY Times*, Jan. 11, 2008, http://www.nytimes.com/2008/01/11/nyregion/11homeheat.html.

[41] *NYC Office of Emergency Management*, http://www.nyc.gov/html/oem/html/cert/cert.shtml.

[42] *Post Carbon Cities*, Daniel Lerch, *Post Carbon Institute*, 2007, http://postcarboncities.net.

[43] "White Paper," David Room, *Energy Preparedness*, April 25, 2006, http://energypreparedness.net/resources/whitepaper/1.

Then the effectiveness of contingency plans can be assessed by:

- evaluating future energy use and price by:
  - examining current assumptions
  - projecting scenarios of escalating volatile and increasing prices
- performing a sensitivity analysis of impact of alternative scenarios
- determining how long existing plans will keep systems running

8. Stimulating civic and business leadership

Interactive NYC community planning forums have successfully involved many stakeholders. After the events of September 11, 2001, the Municipal Arts Society coordinated 400 groups, involving over 3,000 people in 230 workshops about rebuilding downtown, creating a report with 49 vision statements.[44] More recently, there have been many forums connected with PlaNYC. Social scientists recommend the World Café process for community planning efforts.[45]

Businesses should prepare for fuel volatility with both short- and long-term energy and efficiency investments. Those most at risk from higher energy costs will have the greatest incentive to prepare in advance. Industry task forces would be especially valuable in offering expertise and experience to other community planning efforts.

9. Economic development opportunities

Major investments will be needed for new green building, for energy efficiency retrofits, for renewable power infrastructure, and for mass transit infrastructure. Morgan Stanley has estimated that global sales from sustainable energy sources could grow to as much as $1 trillion a year by 2030.[46] Former President Clinton says that fighting global warming is the biggest economic opportunity for the US since mobilization for World War II.[47] McKinsey & Company has found that a nationwide effort could stimulate business at low net costs.[48]

To date the investment and entrepreneurial activity in these vigorously growing sectors has been concentrated in Massachusetts and California. These

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[44] *Imagine NY*, http://imagineny.org/; *Civic Alliance*, http://www.civic-alliance.org.

[45] "Energy Descent Pathways," Rob Hopkins, MSc dissertation, University of Plymouth, 2006, http://transitionculture.org/?page_id=508; *World Café*, http://www.theworldcafe.com/; *Open Space Technology*, http://www.openspaceworld.org/cgi/wiki.cgi?AboutOpenSpace.

[46] "$1 trillion green market seen by 2030," *Environmental News Network*, Oct. 19, 2007, http://www.enn.com/business/article/23958.

[47] "Clinton sees global warming fight as a way to create jobs, opportunity," *Seattlepi.com*, Nov. 2, 2007, http://seattlepi.nwsource.com/local/337769_climate02.html.

[48] "Reducing US Greenhouse Gas Emissions: how much at what cost?," *McKinsey & Company*, Dec. 2007, http://www.mckinsey.com/clientservice/ccsi/greenhousegas.asp.

industries could bring economic benefits to both upstate and downstate New York. State policy should expand from increasing use of clean technologies to supporting growth of such companies already in the state and attracting new ones.[49] Locally, the building energy efficiency sector offers excellent opportunities to create good jobs that cannot be outsourced.[50]

Much of our manufacturing, agriculture and food processing occurs thousands of miles from the consumer. Expanding regional and local production will spur local economies and reduce the fuel needs embedded in our long-distance economy. Building public support for energy volatility preparation and efficiency will grow all these markets.

10. Local leaders in organizational sustainability

One large institution making significant efforts to become more sustainable is New York University. In 2006 NYU made the largest ever purchase of wind power by an American university, hired full-time sustainability staff, and created a 45-member Sustainability Task Force, which set out a sweeping Green Action Plan affecting many campus operational areas.[51]

NYU and eight other City universities have agreed to accelerate PlaNYC goals by achieving 30% carbon dioxide emission reductions by 2017 instead of 2030. The Mayor and university officials have challenged other city institutions and other government entities to match their commitment.[52] Large organizations should gear up now to follow their example, as a pragmatic adaptation to the 21st century.

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[49] "Cleantech: A New Engine of Economic Growth for New York State," Jan. 2007, *Partnership for New York City and NYC Investment Fund*, http://www.nycp.org/publications/CleantechReport.pdf.

[50] "Growing Green Collar Jobs: Energy Efficiency," *Urban Agenda*, 2007, http://www.urbanagenda.org/pdf07/GGCJenergyefficiency5.pdf.

[51] *NY University*, http://www.nyu.edu/about/sustainability/; "NYU Green Action Plan Annual Report," June, 2007, http://www.nyu.edu/about/earth.week/stf_annual_report_07.pdf; *CUNY Institute for Sustainable Cities*, http://www.cunysustainablecities.org.

[52] *Office of Mayor Bloomberg*, June, 2007, http://www.nyc.gov/portal/site/nycgov/menuitem.c0935b9a57bb4ef3daf2f1c701c789a0/index.jsp?pageID=mayor_press_release&catID=1194&doc_name=http%3A%2F%2Fwww.nyc.gov%2Fhtml%2Fom%2Fhtml%2F2007a%2Fpr176-07.html&cc=unused1978&rc=1194&ndi=1.

PART II.
Making Transportation More Efficient

To reduce our dependence on increasingly costly fossil fuels, we must make transportation more efficient, not only through higher automobile mileage standards, but by shifting from individual cars and trucks to mass transit. We can minimize future transportation requirements by making smart planning decisions today. Neither biofuels nor unconventional fossil fuels can fill the gap, and we must increasingly power transportation with electricity generated with renewable sources.

Recommended transportation initiatives for New York City:

- ***implement congestion pricing***
- ***remove hidden subsidies for driving and parking cars***
- ***increase regular and express bus services***
- ***increase alternative fuel and electric vehicle fleets***
- ***implement electric streetcar and light rail systems, as in Vision 42***
- ***implement Auto Free NY plan to maximize use of subway and rail***
- ***build more intercity passenger and freight train capacity***
- ***restrict suburban sprawl***
- ***encourage urban infill development around existing mass transit access points***
- ***support and expand use of bicycles and pedicabs***

The US consumes 20.6 mbd of crude oil and petroleum products, 24% of the world total. We produce 6.9 mbd domestically, and import 12.3 mbd (60%); 68% of those fuels go towards transportation.[53] Some of the widely discussed alternatives to oil are, on closer examination, deeply flawed. Alternative liquid fossil fuels can partly replace gasoline demand, but will accelerate global warming. Corn ethanol requires more energy to produce than it yields;[54] large-scale production of cellulosic ethanol is not yet commercially feasible; and biodiesel replaces most of the nation's agricultural capacity for a fraction of gasoline substitution. (Limited, local biodiesel production is more promising.) Although profitable to special interests, these strategies waste limited time and investment capital that should be directed to more promising approaches.

The conventional wisdom that our transportation needs can only be met by our present system of cars and trucks just isn't so. Other technologies and energy sources, along with changes in consumer behavior and government planning, can create functional transportation systems. While increasing vehicle

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[53] "Energy INFOcard," *US EIA*, Oct. 2007, http://www.eia.doe.gov/neic/brochure/infocard01.htm.

[54] "Biomass for biofuel isn't worth it," *Cornell University News Service*, July 5, 2005, http://www.news.cornell.edu/stories/July05/ethanol.toocostly.ssl.html.

efficiency, we should also expand use of mass transit and rail and make sound planning decisions to begin switching to a post-petroleum transportation system.

1. Changing fuels and vehicles

Alternative liquid fossil fuels. Even promoters of producing liquid fuels from coal and oil shale admit that any realistic implementation will barely start to address future fuel demand.[55] The National Energy Technology Laboratory found that lessening US dependence on foreign oil by simultaneous national crash programs of increased vehicle fuel efficiency, coal liquefication (also known as coal to liquids or CTL), oil shale and enhanced oil recovery would take over 20 years and more than $2.6 trillion investment to achieve full results.

Biofuels. Biofuels include ethanol made from corn and other plants, biodiesel made from soybeans and other oil seeds, and biodiesel processed from used cooking oil. Efforts to reprocess waste vegetable oil in New York City and to produce biofuel feedstock in upstate New York are underway.[56]

But how far can biofuels take us? To make sustainable biofuels with a net gain of energy, soy, switchgrass or other inedible woody plants are better than corn, and mixtures of native perennial prairie grasses may be better than soy.[57] To replace only 5% of US gasoline consumption with corn ethanol would require the corn production from 117 million acres (roughly the size of Oregon and Idaho combined), and cellulosic ethanol from switchgrass is not yet commercially available.[58] The 2007 energy bill calls for doubling production of corn ethanol from the current 7 billion gallons a year, with still more from cellulosic ethanol. Even ethanol industry leaders are unsure if they can meet those goals.[59] According to U.N. officials, rising demand for biofuels is a factor behind dwindling

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[55] "Economic Impacts of Liquid Fuel Mitigation Options," Roger Bedzek, et al., *National Energy Technology Laboratory*, May 2006, http://media.globalpublicmedia.com/RM/2006/05/hirsch2.pdf.

[56] "Biodiesel – petroleum with vegetable oil," *Gotham Gazette*, Dec. 2005, http://www.gothamgazette.com/article/environment/20051214/7/1679; "Turning grease into green gas: Red Hook refinery to make fuel from fries," *Metro NY*, Sept. 28, 2006, http://ny.metro.us/metro/local/article/Turning_grease_into_green_gas/4749.html; "Statewide Feasibility Study for a Potential New York State Biodiesel Industry," *NYSERDA*, June 2003, http://www.nyserda.org/publications/biodieselreport.pdf.

[57] "Corn dog," *Slate*, July 19, 2005, http://slate.com/id/2122961; "Study finds mixed prairie grasses better source of biofuel," *Renewable Energy Access*, Dec. 13, 2006, http://www.renewableenergyaccess.com/rea/news/story?id=46825.

[58] "Bio-hope, bio-hype," biofuel comparison chart, *Sierra Magazine*, Sept. 2007, http://www.sierraclub.org/sierra/200709/biofuelschart.pdf.

[59] "As ethanol takes its first steps, Congress proposes a giant leap," *NY Times*, Dec. 18, 2007, http://www.nytimes.com/2007/12/18/washington/18ethanol.html.

world food supplies and historic high prices.[60] Biofuels cannot replace gasoline as used today.[61]

High-efficiency vehicles. While increasing vehicle efficiency is an obvious way to reduce fuel dependence, it has been staunchly resisted. In December 2007, the Senate passed an increase in fuel economy standards – for the first time since 1975 – from about 25 miles per gallon now to 35 mpg by 2020. By comparison, other nations have established much stricter fuel economy standards including the European Union and Japan (41 mpg in 2006), Canada (34 mpg in 2010), and even China (36 mpg in 2010).[62] In what the New York Times calls a political payoff to the auto industry,[63] the EPA is blocking California's law to reduce automobile carbon emissions with a 43 mpg standard, to be phased in by 2016.

All City taxis must use gas/electric hybrid engines by 2012, doubling their mileage, and many are already switching over.[64] The City operates over 400 compressed natural gas buses and 550 hybrid-electric buses,[65] and has ordered another 850 hybrid buses for delivery in 2009.[66] The NYPD is now testing all-electric scooters.[67]

Plug-in hybrids can run partly on biodiesel, and could serve as storage batteries for electricity produced by solar or wind power systems. A study produced by the Department of Energy found that off-peak electricity from renewable sources could power 84% of the country's 220 million vehicles if they

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[60] "World food stocks dwindling rapidly, UN warns," *International Herald Tribune*, Dec. 17, 2007, http://iht.com/articles/2007/12/17/europe/food.php.

[61] "Ethanol won't solve energy problems," *Associated Press*, July 10, 2006, http://www.usatoday.com/tech/news/2006-07-10-ethanol-study_x.htm?POE=TECISVA; *Energy Farms Network*, http://www.energyfarms.net; "Biodiesel beats ethanol in biofuel battle," *New Scientist*, July 10, 2006, http://www.newscientisttech.com/article/dn9519-biodiesel-beats-ethanol-in-biofuel-battle; "Can't see the future for the trees," Adam Fenderson, *Energy Bulletin*, Aug. 2, 2006, http://www.energybulletin.net/20171/html.

[62] "A new day for CAFÉ in Congress," *Center for American Progress*, Dec. 4, 2007, http://www.americanprogress.org/issues/2007/12/cafe_increase.html.

[63] "Arrogance and warming," *NY Times* editorial, Dec. 21, 2007, http://www.nytimes.com/2007/12/21/opinion/21fri1.html.

[64] "Mayor Bloomberg orders taxis to be hybrid by 2012," *Bloomberg*, May 22, 2007, http://www.bloomberg.com/apps/news?pid=20601103&sid=a4A1ocK4g1dE&refer=us; *Toyota*, http://www.toyota.com/prius; "Soaring gasoline prices inflict pain on cabbies, drivers, city budget," *NY Sun*, Aug. 16, 2005, http://www.nysun.com/article/18634; "Hybrid vehicles," *Gotham Gazette*, July 2005, http://www.gothamgazette.com/article/environment/20050720/7/1486.

[65] "DOT's Alternative Fuels Program," *NYC Dept. of Transportation*, http://www.nyc.gov/html/dot/html/motorist/alternativefuel.shtml; "The Clean Fuel Bus Program," http://www.mta.info/nyct/facts/ffenvironment.htm#clean_bus.

[66] "New greener city buses en route to boro in '09," *Times Ledger*, Nov. 15, 2007, http://www.timesledger.com/site/news.cfm?newsid=19027281&BRD=2676&PAG=461&dept_id=542415&rfi=6.

[67] "NYPD to road test electric scooters," *CNN*, Dec. 26, 2007, http://www.cnn.com/2007/TECH/12/26/nypd.green.ap/index.html.

had plug-in hybrid technology.[68] Using lightweight steels or carbon composite parts in future vehicles could raise mileage to as much as 66 miles per gallon for light trucks and 92 miles per gallon for cars. The massive investment to re-tool US car, truck and plane industries would be paid back in fuel savings.[69]

Bicycles and pedicabs should be strongly encouraged. Bicycle initiatives include expansion of bicycle lanes, indoor and outdoor parking, bridge and mass transit access, and safety improvements, including enforcement of car bans in bicycle lanes.[70] The current artificial cap on the number of pedicabs in NYC should be removed to let the market allow for industry expansion. Bans on pedicab travel between boroughs and on electric motor-assisted pedicabs should be lifted.[71]

2. Making transportation more efficient

Congestion pricing. Traffic congestion continues to worsen in American cities of all sizes, costing the US economy $78 billion annually, in 4.2 billion lost hours and 2.9 billion gallons of wasted fuel.[72] NYC metro area costs are estimated at over $13 billion annually.[73] Congestion pricing, in which an E-ZPass system automatically bills daytime drivers in certain areas, has been implemented in London, Singapore, Toronto, and San Diego.[74]

Bringing this system to NYC is the centerpiece of PlaNYC's transportation agenda. Contrary to opponent claims that it hurts working class outer-borough commuters, the City's Independent Budget Office found that drivers most affected come from outside the City and have substantially higher incomes than other motorists.[75] Neither side of the debate acknowledges that rising gasoline prices will lead to increased mass transit demand, and that congestion pricing will fund service expansions vital to the functioning of the City. Proponents should look to next steps in transportation as well.

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[68] "The plug in hybrid for sustainability without oil," Andrew Frank, *ASPO-USA*, Oct. 2006, http://www.aspo-usa.com/fall2006/presentations/pdf/Frank_A_Boston_2006.pdf; "Mileage from megawatts," *Science Daily*, Dec. 14, 2006, http://www.sciencedaily.com/releases/2006/12/061211221149.htm.

[69] "Securing America: Solving Our Oil Dependence through Innovation," *NRDC*, Feb. 2007, http://www.nrdc.org/air/transportation/oilsecurity/plan.pdf; "How to live without oil," Amory Lovins, *Newsweek*, Aug. 8, 2005, http://www.energybulletin.net/7753.html; http://www.oilendgame.com.

[70] "Growing Bicycling," *Transportation Alternatives*, http://www.transalt.org/campaigns/bike/index.html.

[71] *Pedicab News*, www.pedicabnews.com.

[72] "2007 Urban Mobility Report," *Texas Transportation Institute*, http://mobility.tamu.edu/ums/media_information/press_release.stm.

[73] "Growth or Gridlock: The Economic Case for Traffic Relief and Transit Improvement for a Greater New York," *Partnership for NYC*, Dec. 2006, http://www.pfnyc.org/publications/Growth%20or%20Gridlock.pdf.

[74] "An Exploration of Motor Vehicle Congestion Pricing in New York," Jeffrey Zupan & Alexis Perotta, *Regional Plan Association*, Nov. 2003, http://www.rpa.org/pdf/eno_summary.pdf.

[75] "New report fuels congestion pricing debate," *NY Times*, Dec. 11, 2007, http://cityroom.blogs.nytimes.com/2007/12/11/new-report-fuels-congestion-pricing-debate/

Ride sharing. Several ride sharing systems already allow New York area residents to share cars and find carpool and van pool partners. The proposed Smart Jitney program would create a new nationwide transport system, using cell phones to match drivers with riders via a tracking and scheduling database to be modeled after the nation's airline and automobile reservation systems.[76]

3. Out of cars and onto mass transit

Although many New York do not own cars, and the City has one of the world's best public transit systems, "New York's approach to transportation – like most cities – … first mak[es] sure that 'all the cars are happy.' That should change."[77]

Support is growing for getting people out of cars by improving pedestrian and bicycle routes, calming traffic, and pricing congestion.[78] The 90% of driving commuters choosing not to use public transportation and the midtown traffic composition of 14% trucks and 60% cars might shift if hidden car parking subsidies were removed.[79]

Buses. Getting commuters onto high-occupancy buses reaps much more conservation per dollar than shifts to different fuels or the like, and bus service improvements are the low-hanging fruit.[80] NYC buses average only 7.5 miles per hour, spending only 54% of their time in motion. When dedicated lanes for express buses were introduced in Los Angeles, bus service sped up by about 30%. Now, 28 Bus Rapid Transit corridors are being set up in Los Angeles, and NYC is studying where to set up routes.[81]

A four-year plan to maximize use of subway and rail. Light rail, subway and trains are much more energy efficient than cars and buses, so making the best use of existing rail assets can do a lot to reduce our fuel use.[82]

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[76] *Zipcar*, http://www.zipcar.com; *Commuter Link*, http://www.commuterlink.com; *Long Island Transportation Management*, http://litm.org; *Smart Jitney*, http://www.communitysolution.org/transport.html.

[77] "How New York (and other big cities) should solve the traffic problem," Carolyn Curiel, *NY Times*, Sept. 13, 2006, http://www.transalt.org/press/media/2006/559.html.

[78] "Putting cars behind," Enrique Peñalosa, *Gotham Gazette*, Oct. 16, 2006, http://www.gothamgazette.com/article/fea/20061016/202/2000; *Citywide Coalition for Traffic Relief*, http://www.trafficrelief.org.

[79] "East River Bridge Tolls: Revenue, Traffic, Mobility & Equity Impacts," Shaller Consulting, for *Transportation Alternatives*, Sept. 17, 2003, http://www.schallerconsult.com/pub/tollrpt.pdf; "The High Cost of Free Parking," Ryan McGreal, April 14, 2005, http://www.raisethehammer.org/index.asp?id=072.

[80] "Bus Systems for the Future," *IEA*, 2000, http://www.iea.org/Textbase/publications/free_new_Desc.asp?PUBS_ID=1091; "Mode Shift in the 1990s," *Schaller Consulting*, August 2001, http://www.schallerconsult.com/pub/modeshft.htm.

[81] "Riders, pols, call for more express service," *Queens Chronicle*, Dec. 14, 2006, http://www.zwire.com/site/news.cfm?newsid=17591642&BRD=2731&PAG=461&dept_id=575596&rfi=; NYC Bus Rapid Transit Study in process, http://www.mta.info/mta/planning/brt/index.html; "Faster Buses?," Bruce Schaller, *Gotham Gazette*, June 2006, http://www.gothamgazette.com/article/transportation/200060614/16/1884.

[82] Richard Heinberg, *The Oil Depletion Protocol*, New Society Publishers, 2006, pp. 46-47.

Auto-Free NY lists 15 transit strategies that could be implemented in four years to lower car use 20% in Manhattan and 5% citywide:

- lower transit fares
- upgrade bus service in neighborhoods far from subway stations
- increase service and integrate fares among Metro North, NJ Transit, LIRR and NYC subway systems, using Penn Station as a regional hub
- replace existing toll booths with automated nonstop tolling systems
- price congestion
- raise parking prices and reduce amount of street parking
- designate a network of streets for walking and cycling only
- close Manhattan's busiest pedestrian streets to motor vehicles and supply with streetcars (5% of borough's mileage, about 30 miles of streets), including Broadway, 42nd Street, and a grid in Lower Manhattan[83]

The risk of truck dependence. Nearly 99% of good shipped to the City arrive by truck, and the Federal Highway Administration expects regional truck traffic to rise 50% by 2020.[84] Anything interfering with the stream of trucks carrying food and other goods into the City would cause major problems. Diverting some of this transportation load to freight trains would not only reduce pollution and congestion, but would reduce vulnerability to fuel shocks.

Implications for air travel. While rising fuel costs affect aviation directly, the greater impact may be indirect, as those costs lower gross domestic product, hence lowering demand. Projected growth in air travel, air freight, airport and airline infrastructure, and tourism industries do not take into account either direct or indirect effects of fuel depletion.[85]

The future of transport: electric trains, streetcars and light rail. In 2002 two-thirds of US oil consumption was used for transportation. Railroads are perhaps 8 times more energy efficient than heavy trucks. Electric trains are cheaper to operate than liquid fuel-powered vehicles and can carry more freight because they can accelerate and break faster and have no delays for refueling. The switch from railroad to trucking, facilitated by cheap oil prices, will probably reverse as oil becomes more expensive. Electric streetcar systems have been

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[83] "Livable City Plan," *Auto-Free NY*, http://www.auto-free.org/4yrplan.html; *Vision42: an auto-free light rail boulevard for 42nd Street*, http://www.vision42.org.

[84] "Truck Route Management and Community Impact Reduction Study," executive summary, *NYC Dept. of Transportation*, May, 2006, p. 1, http://www.nyc.gov/html/dot/downloads/pdf/execsum.pdf; "Green freight," *Tri-State Transportation Campaign*, http://www.tstc.org/issues/freight.html.

[85] "Aviation and Peak Oil," Roger Bedzek, Ph.D., *ASPO-USA Conference*, Oct. 2007, http://www.aspousa.org/proceedings/houston/presentations/Roger_Bezdek_Houston_Slides_10-19-07.pdf; *SAFE, Inc. (Sane Aviation For Everyone)*, http://www.metronyaviation.org; "Welcome to Fantasy Air," Kurt Cobb, *Energy Bulletin,* Dec. 16, 2007, http://www.energybulletin.net/38464.html; *SAVIA Associates International: Sustainable AVIAtion*, www.susaviation.com.

launched in many US cities.[86] Grid-powered rail may replace internal combustion-powered individual cars and trucks as our main form of transportation – if we begin building those systems now.[87]

Centering urban design around transit, not cars. Sprawling suburbs have a built-in dependence on cars. The alternative is transit-oriented development which encourages growth of compact, mixed-use, pedestrian-oriented communities near public transportation access.[88] Sprawl is discouraged; cities and towns are surrounded by green space and agricultural areas.[89] Instead of building more highways, Federal and State transportation funds should be re-directed to build and enhance more fuel-efficient bus, light rail, and inter-city rail networks.[90]

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[86] "Streetcars: Getting the most bang for the buck," *Rail-Volution Conference 2006*, http://www.railvolution.com/rv2006_pdfs/rv2006_205a.pdf; "This is Light Rail Transit," *Reconnecting America*, http://www.reconnectingamerica.org/public/download/bestpractice132.

[87] *Transport Revolutions: Moving People & Freight Without Oil*, Richard Gilbert & Anthony Perl, Dec. 2007, http://www.transportrevolutions.info; "A 10% reduction in America's Oil Use in Ten to Twelve Years," Alan Drake, *Light Rail Now*, May 2006, http://www.lightrailnow.org/features/f_lrt_2006-05a.htm.

[88] "Transit Resource Guide," *American Public Transportation Association*, http://www.apta.com/research/info/briefings/briefing_8.cfm; *Congress for the New Urbanism*, http://www.cnu.org; "Governor Spitzer creates smart growth cabinet," Dec. 10, 2007, *www.ny.gov.governor*, http://www.ny.gov/governor/press/1210073.html.

[89] *Ecocity Builders*, http://www.ecocitybuilders.org; "Cities can save the earth," Richard Register, *Energy Bulletin*, Sept. 2006, http://www.energybulletin.net/20364.html.

[90] *Rail-Volution: Building Livable Communities with Transit*, http://www.railvolution.com.

PART III.
Regional Production

Our manufactured and agricultural goods are shipped from great distances. As transportation costs increase, regionalizing manufacturing and agriculture will become increasingly viable – and important.

Recommendations:

- ***include energy volatility and fuel depletion in New York City and State economic development policy***
- ***encourage production and procurement of regional farm products***
- ***support agricultural production within cities and suburbs***
- ***enable residents to find farming and gardening jobs***
- ***encourage schools to establish gardens on their facilities***
- ***open additional retail farmers markets, a wholesale farmers market, year-round public markets, and a regional product distribution center***
- ***explore entrepreneurial ways to make private land available to new agricultural workers***

1. Manufacturing

Proximity to clients in Manhattan's central business district benefits food manufacturers, commercial laundries, building contractors and specialty garment and printing businesses, outweighing higher costs of prime locations.[91]

Low fuel costs enable long-distance transportation. As energy costs rise, business practices will change to minimize the energy demand of buildings and transportation. Manufacturing and food production will tend to become more regionalized and localized.[92]

Bill Reinhardt, a senior project manager at the New York State Energy Research and Development Authority (NYSERDA), thinks that NYS economic development policy must take energy volatility and fuel depletion into account. He expects expansion of recycling and remanufacturing industries, energy efficiency and alternative energy services, local tourism and recreation, and manufacturers in close proximity to their raw materials and markets.

> I have already begun to see foreign producers look to New York as the place to produce their goods for Northeastern US and Eastern Canadian markets.

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[91] *The Mayor's Office of Industrial & Manufacturing Businesses*, http://nyc.gov/html/imb/html/home/home.shtml.

[92] "Think globally, manufacture locally," *The Age*, July 2, 2007, http://www.theage.com.au/news/business/think-globally-manufacture-locally/2007/07/01/1183228957827.html?page=fullpage#contentSwap2.

> Much higher energy prices will raise the incentive to remanufacture used products and components so as to recover the energy embodied in their original material acquisition and manufacture. Used manufactured products will become the natural resource base for these new industries, which will tend to locate near their sources of raw materials, which in this case will also be their markets.[93]

2. Agriculture

Food in the US usually travels 1,500 to 2,500 miles from farm to table, losing nutritional value, sending dollars out of the region and contributing to global warming along the way.[94] Large amounts of fossil fuels are used in pumping water, producing fertilizers and pesticides, and processing, refrigerating and transporting food,[95] so rising energy costs will affect large-scale agribusiness products.[96] Livestock production, a central part of that system, is a massive contributor to climate change.[97] Consuming fewer or no animal products is an important way for individuals to reduce their carbon footprint.[98] Reducing energy use in agriculture will have many benefits: decentralized regional agriculture, less dependent on fossil fuels, will become more competitive and more affordable, while addressing community food security, green space, and social justice issues.[99]

City residents buy directly from farmers through the Greenmarket's 85 farmers markets[100] and 40 community-supported agriculture groups.[101] Members of Food Systems Network NYC recommend:[102]

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93 Personal communication, Bill Reinhardt, *NYSERDA*, Oct. 2007.

94 "Do food miles make a difference to global warming?," *Reuters*, Oct. 17, 2007, http://www.reuters.com/article/environmentNews/idUSPAR74562220071017?sp=true;; *Cornell University Cooperative Extension*, http://nyc.cce.cornell.edu//urbanfood; "Home grown: the case for local food in a global market," Brian Halweil, Nov. 2002,*Worldwatch Institute*, http://www.worldwatch.org/node/827; *Just Food*, http://www.justfood.org/jf/index.html.

95 "Oil and Food: A Rising Security Challenge," Danielle Murray, *EPI*, May 9, 2005, http://www.earth-policy.org/Updates/2005/Update48.htm.

96 "New solutions for food, feed & fuel," *Community Solution*, July 2007, http://www.communitysolution.org/pdfs/NS13.pdf.

97 "Livestock's long shadow," *UN Food and Agriculture Organization*, 2006, http://www.virtualcentre.org/en/library/key_pub/longshad/A0701E00.htm.

98 "Rethinking the meat guzzler," *NY Times*, Jan. 27, 2008, http://www.nytimes.com/2008/01/27/weekinreview/27bittman.html.

99 "Farming the concrete jungle," *In These Times*, Aug. 24, 2007, http://www.inthesetimes.com/article/3297/farming_the_concrete_jungle.

100 *Council on the Environment of NYC*, http://www.cenyc.org/site.

101 *Just Food*, http://www.justfood.org/csa.

102 *Food Systems Network NYC*, http://www.foodsystemsnyc.org.

- encouraging procurement of regional farm products by city agencies, private institutions, non-profit community organizations, schools and businesses. Entrenched systems and regulations make this difficult.[103]
- encouraging schools to establish gardens on their facilities
- enabling residents to find farming and gardening jobs
- recovering food waste citywide for composting and return to farms
- continuing support for the NYC Watershed Agreement, which preserves family farms and protects City drinking water
- opening additional retail farmers markets, a wholesale farmers market, year-round public markets, and a regional product distribution center[104]

Urban and suburban agriculture have great potential. Raising fruits and vegetables directly within cities and suburbs was common during both World Wars, when Americans planted Victory Gardens, at one point producing roughly 40% of America's vegetables.[105] This practice is growing in popularity. There are over 500 community gardens in NYC, and many resources for local gardeners.[106]

Oakland, California recently adopted a food policy which mandates that by 2015, 40% of the vegetables consumed in the city will be grown within a fifty-mile radius of its city center. For the NYC metropolitan area to move in this direction, governments will have to provide incentives and training to area residents willing to work in agriculture.[107] Entrepreneurial ways to make private land available to new agricultural workers should be explored.

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[103] *SchoolFoodPlus Initiative*, http://www.foodchange.org/nutrition/schoolfood.html; "Local carrots with a side of red tape," *NY Times*, Oct. 17, 2007, http://www.nytimes.com/2007/10/17/dining/17carr.html.

[104] "When planning for the future, keep food at the table," Hilary Baum, *Baum Forum*, April 2007, http://pubadvocate.nyc.gov/policy/documents/Gotbaum_2030_response_000.pdf; *Food Systems Network NYC*, http://www.foodsystemsnyc.org.

[105] "Fifty million farmers," Richard Heinberg, *Energy Bulletin*, Nov. 17, 2006, http://www.energybulletin.net/22584.html.

[106] *TriState Food Not Lawns*, http://www.tristatefoodnotlawns.org; "Community Garden Resources," *NYC Oasis*, http://www.oasisnyc.net/resources/comm_gardens/default.asp.

[107] "What will we eat as the oil runs out," Richard Heinberg, *Museletter*, Nov. 2007, http://globalpublicmedia.com/richard_heinbergs_museletter_what_will_we_eat_as_the_oil_runs_out.

PART IV.
Energy Efficient Buildings

Heating, cooling, lighting and powering buildings efficiently is easiest with new green buildings, but efficiency must also be increased for the larger stock of existing buildings.

Recommendations:

- ***increase mandates and incentives for energy efficiency retrofits***
- ***mandate energy efficiency standards for equipment***
- ***encourage solar heating systems***
- ***design buildings for maximum cost-efficient energy performance***
- ***reduce unnecessary outdoor lighting***
- ***discourage acceptance of relentless growth in personal electricity consumption***

Buildings account for 71% of electricity and 39% of all energy use in the US. In NYC, 79% of carbon emissions come from its 750,000 residential, commercial and government buildings, mostly from the power plants that supply them with electricity.[108] Over 20% comes from transportation.[109]

Densely packed apartment buildings are inherently more energy efficient than individual houses. PlaNYC relies on that for much of its projected carbon emission reductions, estimating the energy savings from housing 900,000 new residents within the City instead of housing them in less efficient sprawling communities. The plan aims to reduce energy use by improving efficiency of existing buildings, setting higher efficiency standards for new buildings and appliances, and greening building and energy codes.[110]

The City's Local Law 86 will ensure that many new buildings built or owned by the City will meet higher standards of energy efficiency,[111] but the vast majority of existing buildings chronically waste energy. Although many energy efficiency retrofits can pay for themselves in a few years through energy savings, they are still comparatively rare. Our electricity use is growing rapidly. PlaNYC says that between 2000 and 2005, NYC's greenhouse gas emissions increased almost 5%.

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[108] *NYC Dept. of Buildings*, http://www.nyc.gov/html/dob/html/guides/conserve_energy.shtml.

[109] "Emissions Data," *PlaNYC 2030*, http://www.nyc.gov/html/planyc2030/html/plan/emissions_ourdata.shtml; "Cleaning up New York's buildings," *Gotham Gazette*, Oct. 15, 2007, http://www.gothamgazette.com/article/issueoftheweek/20071015/200/2319.

[110] *PlaNYC 2030*, p. 134, http://www.nyc.gov/html/planyc2030/downloads/pdf/report_climate_change.pdf; *NYC Dept. of Buildings*, http://www.nyc.gov/html/dob/html/guides/conserve_energy.shtml; http://www.nyc.gov/html/dob/html/guides/green_buildings.shtml.

[111] *NYC Dept. of Design & Construction*, http://www.nyc.gov/html/ddc/html/ddcgreen/ll86.html.

> Almost half of that growth can be traced to the rising energy consumption of every New Yorker in the form of cell phones, computers, and air conditioners; the rest is due to new construction. If these trends continue, by 2030, the city's CO_2 production will increase 27% over our 2005 emissions.[112]

Given that gap, there must be still more ambitious incentives and mandates to reduce energy use. Urban Agenda recommends requiring cost-effective residential energy improvements at point of sale or significant renovation, as well as disclosure of energy costs at point of sale. NY Climate Rescue recommended:

- requiring energy retrofits for owners of all buildings over 10,000 square feet, with incentives for owners of smaller buildings
- providing financial incentives for landlords and tenants to work together to improve energy efficiency and install renewable power, following the Pay as You Save initiative
- increasing lightbulb efficiency and phasing out conventional incandescent lightbulbs, as will Australia, European Union countries, and China, maker of 70% of the world's light bulbs[113]
- banning sale and installation of non-EPA EnergyStar-rated air conditioners and refrigerators

Also, improving building energy efficiency presents one of the most promising local opportunities for developing good jobs that cannot be outsourced. An Urban Agenda report provides an excellent overview of New York's existing energy efficiency sector.[114]

1. Energy audits and efficiency upgrades

The first step to greening a building is definitely *not* installing solar panels on the roof. Building owners should start with an energy audit to review lighting, heating, ventilation and air conditioning systems, and then carry out recommended repairs and upgrades, install insulation and plug leaks that waste the energy of heated or cooled air. Ways of saving energy in buildings are laid out in the Feasibility Study for Greening a Block. This proposal to bring state-of-the-art energy efficiency improvements to a concentrated area in the Lower East

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[112] *PlaNYC 2030*, p. 135, http://www.nyc.gov/html/planyc2030/downloads/pdf/report_climate_change.pdf.

[113] "China to phase out incandescent light bulbs," *Environmental Leader*, Oct. 3, 2007, http://www.environmentalleader.com/2007/10/03/china-to-phase-out-incandescent-light-bulbs; *NY Climate Rescue*, April 2007, http://pubadvocate.nyc.gov/policy/documents/Gotbaum_2030_response_000.pdf; *PAYSamerica*, www.paysamerica.org.

[114] "Growing Green Collar Jobs: Energy Efficiency," *Urban Agenda*, 2007, http://www.urbanagenda.org/pdf07/GGCJenergyefficiency5.pdf.

Side is expected to cut both heating fuel and electricity use an average of 30%.[115] Unfortunately, the project has been mired in red tape for years.

Guidance and resources for energy efficiency in buildings is available from GreenHomeNYC, New York Energy $mart Communities, and Apollo Alliance.[116] The Association for Energy Affordability, NYC College of Technology, and NYC Department of Housing Preservation and Development offer courses.[117]

Reducing electricity consumption. First, change light bulbs from incandescent to fluorescent, replace older fluorescent T12 or T10 tubes with T5s, and then upgrade to energy efficient appliances. Next, calculate the energy needs of the space to size the most efficient pumps, fans and elevators. Photocells, occupancy sensors, daylight sensors and dimmable ballasts for lighting can save even more energy. Turning off appliances not in use, including computers, and putting appliances on power strips that can be turned off when not in use can also save energy.

Tuning boilers and heating systems. While becoming more comfortable and easy to adjust to resident needs, most NYC residential buildings can save 40% of their heating fuel through proper configuration and tuning of their existing heating system.[118] Boiler maintenance training for building owners, managers, superintendents and porters is a great investment. A typical 15 to 30 unit walk-up building on the Lower East Side can save 200 to 300 gallons of fuel per apartment per year.[119]

2. Solar heating systems

Rooftop solar thermal systems can supply 25 to 55% of a small residential building's water heating needs and some of its heating load. They convert about 70% of solar energy into heat, compared to the 18 to19% efficiency of solar panels, so slight roof shading is less of a problem. Residential solar water heating systems cost about 10 times as much as established but less efficient electric and natural gas water heaters, pay for themselves in 4 to 8 years through fuel savings, and last 15 to 40 years. For solar thermal retrofits to become standard practice on flat-roofed City buildings, overall building and labor costs, as

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[115] *Greening A Block*, http://www.greeningablock.org.

[116] *GreenHomeNYC*, http://www.greenhomenyc.org; *NYSERDA*, http://www.getenergysmart.org; "New Energy for Cities: Energy Saving and Job Creation Policies for Local Governments," *Apollo Alliance*, http://www.apolloalliance.org/downloads/resources_new_energy_cities.pdf.

[117] *The Association for Energy Affordability*, http://www.aeanyc.org; *NYC College of Technology*, http://www.citytech.cuny.edu; *NYC Dept. of Housing Preservation and Development*, http://www.nyc.gov/hpd.

[118] "Notes on oil conservation", *Superintendents Technical Association*, http://www.nycsta.org/oilconservation.htm; http://www.nysupersclub.org.

[119] "Feasibility Study," *Greening A Block*, http://www.greeningablock.org.

well as burdensome building regulations, must be reduced.[120] At this time, most solar water heating systems in the US are used to heat swimming pools.[121] All new homes built in Germany after 2008 will be required to install renewable energy heating systems, and after 2010 the remaining houses will have to add them as retrofits.[122]

3. Efficient design

Architecture 2030 has challenged architects and builders to halve greenhouse gas emissions and energy consumption in designs for new buildings and major renovations, with all new buildings carbon neutral by 2030 – that is, requiring no fossil fuels to operate.[123] This sounds ambitious, but NYC architect and building science advocate Chris Benedict currently achieves energy savings of around 50% in her renovations, and her new buildings are 85% more fuel efficient for heat and hot water than typical buildings of the same size – at no extra cost.[124]

The Leadership in Energy and Environmental Design green building rating system (LEED) ranks buildings on a number of factors.[125] Industry critics say LEED doesn't adequately prioritize energy performance, and a costly, bureaucratic process contributes to the very small number of buildings that have actually been LEED certified.[126] Building science practitioners focus mainly on performance, using hyper-efficient design to sharply reduce energy use at about the cost of regular building.[127] Through innovative architectural design and mechanical engineering, buildings of all sizes can be made more energy efficient, safe, healthy, and comfortable. The best results come from a new building where everything is done right at the outset; a small remodeling job on an inefficient building may do little good. An existing single-family house may benefit most from improvements to the building enclosure, such as air sealing, additional insulation, sun shading, or building a completely new air barrier. The

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[120] Personal communication, solar energy designer and installer Richard Klein, Quixotic Sytems, Inc., http://www.quixotic-systems.com/solarfaq/index.html.

[121] "American Energy: The Renewable Path to Energy Security," *Worldwatch Institute / Center for American Progress*, Sept. 2006, p. 31, www.americanenergynow.org.

[122] "Germany to require renewables for new homes in 2009," *Renewable Energy Access*, Dec. 10, 2007, http://www.renewableenergyaccess.com/rea/news/story?id=50746.

[123] *Architecture2030*, http://www.architecture2030.org/2030_challenge/index.html.

[124] "Cleaning up New York's buildings," *Gotham Gazette*, Oct. 15, 2007, http://www.gothamgazette.com/article/issueoftheweek/20071015/200/2319; "Third Street: on one block in New York City, good design and readily-available materials trump fancy technology," Henry Gifford, *Home Energy*, Sept. 2005, http://www.homeenergy.org/article_preview.php?id=31&article_title=Third_Street.

[125] *US Green Building Council*, http://www.usgbc.org/DisplayPage.aspx?CategoryID=19.

[126] "What's wrong with LEED?," Steven Del Percio, *The Next American City*, Spring 2007, http://americancity.org/article.php?id_article=243.

[127] "Section 1: the building connection," *Building Science*, http://www.buildingscience.com/documents/primers/plonearticlemultipage.2006-12-05.5229931729/section-1-the-building-connection.

most economical strategies for larger buildings, whether existing or new, are ensuring correct mechanical system design, overall system controls, and providing room-by-room temperature control for heating and cooling. By doing all the work right at the start, energy use in four new apartment buildings on the Lower East Side is **only 15% of average use for heat and hot water and 50% for common area electricity**.[128]

[128] Personal communication, architect Chris Benedict; Chris Benedict, R.A., *GreenHomeGuide*, http://nystate.greenhomeguide.com/index.php/service_detail/857/C155.

PART V.
Electricity

Much of our electricity is provided by climate-damaging fossil fuels such as coal and natural gas. Also, with increasingly constrained natural gas supplies, reliance on imported liquefied natural gas poses security risks. There are high economic, social and environmental costs to nuclear power. While increasing conservation and efficiency, we must scale up distributed renewable power, currently providing only a tiny fraction of our electricity needs.

Recommendations for NYC include:

- ***set timetables for PlaNYC's many good energy initiatives, especially the formation of an Energy Planning Board***

Recommendations for New York State include:

- ***expand net metering to 2 megawatts per site, as in New Jersey***
- ***distribute smart meters / time-of-use meters, which enable users to choose less costly off-hours electricity***
- ***raise the New York State Energy Efficiency Portfolio Standard to 30% reduction of 2006 electric and gas usage rates by 2015***
- ***update the State Energy Plan to account for energy volatility***

Recommendation for national policy:

- ***generate public support for measures bolder than proposed so far***

Nationally, 49% of our electricity is generated by coal, 20% by natural gas, and 19% by nuclear power.[129] One estimate is that 7% of NYC's electricity is produced by burning oil.[130] Oil can serve as the back-up fuel for natural gas turbines for up to 30 days per year.[131] Natural gas, oil, and coal contribute to climate change directly, and nuclear power has major drawbacks.[132]

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[129] *US EIA*, http://www.eia.doe.gov/neic/brochure/infocard01.htm; Energy Flow Chart, *Lawrence Livermore National Laboratory*, https://eed.llnl.gov/flow/images/LLNL_Energy_Chart300.jpg; US Electric Power Industry Net Generation, *US EIA*, Oct. 2007, http://www.eia.doe.gov/cneaf/electricity/epa/figes1.html.

[130] David Manning, Keyspan EVP, *Regional Plan Association*, May 2007, p. 4, http://www.rpa.org/pdf/Manning_Landscape.pdf.

[131] NYC Energy Policy, *NYC Energy Policy Task Force*, Jan. 2004, p. 16, http://www.nyc.gov/html/om/pdf/energy_task_force.pdf.

[132] "Nuclear Power: No solution to climate change," *NIRS / WISE International*, Feb. 2005, http://www.nirs.org/mononline/nukesclimatechangereport.pdf.

1. Current production

Natural Gas. Since PlaNYC anticipates increased reliance on natural gas for in-city electricity generation, it should also consider potential volatility in natural gas supplies. In the 1990s, North American gas supplies were believed to be abundant, leading to natural gas becoming the fuel of choice for new power plants.[133] Now, many experts contend that North American natural gas supplies have already peaked[134] and the Geological Survey of Canada says that Canada will not be able to meet US natural gas shortfalls.[135] If the price of natural goes up, so will the price of electricity. The International Energy Agency expects the worldwide natural gas market to become considerably tighter.[136]

With little public debate, NYC and the US are moving towards increased reliance on imported liquefied natural gas (LNG). Additional LNG will be imported from extremely expensive facilities that have not yet been built, that will be more vulnerable to supply disruption than domestic facilities, will be controlled by foreign governments, and subject to outbidding by other countries.[137]

Coal. The current national push toward more coal-fired power plants will be environmentally devastating. Coal-fired power plants account for almost 40% of annual US carbon dioxide emissions.[138] There are plans to build 150 new coal-fired power plants, all without any mechanism to control carbon dioxide emissions. If only half of these plants are allowed to go forward, their emissions will negate all of the reductions the rest of the world has committed to under the Kyoto Treaty. Building those plants would lock us into decades of dirty coal power while eliminating market share for energy efficiency and non-polluting renewable energy sources. Coal has become increasingly harder to access and mine, leading to the increased use of destructive techniques like mountaintop

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[133] "If winter is bitter, brace for a natural gas crunch," Mark Clayton, *Christian Science Monitor*, Nov. 29, 2005, http://www.csmonitor.com/2005/1129/p01s02-usec.html; "New England power outages possible," *MSNBC*, Dec. 6, 2005, http://www.msnbc.msn.com/id/10355379.

[134] "Natural Gas: It Is Not a Pretty Picture!," Dr. Robert Hirsch, *The Annapolis Center for Science-Based Public Policy*, http://www.rggi.org/docs/ceed_report_4_6_05.pdf; "A Case Study on Peak Energy: The US's Natural Gas Disaster," Matthew Simmons, *Simmons & Co. International*, May 25, 2004, http://www.simmonsco-intl.com/files/ASPO%20B&W%202004.pdf; "High Noon for Natural Gas," Julian Darley, http://www.highnoon.ws; *The Post Carbon Institute*, http://www.postcarbon.org.

[135] "Natural Gas in North America: Should We Be Worried?," David Hughes, Geological Survey of Canada, *ASPO World Oil Conference*, Oct. 26, 2006, http://www.aspo-usa.com/fall2006/presentations/pdf/Hughes_D_NatGas_Boston_2006.pdf.

[136] "IEA gives warning of global gas shortage," *The Independent*, May 4, 2007, http://news.independent.co.uk/business/news/article2510922.ece.

[137] "The critical need to examine more carefully the role of liquefied natural gas (LNG) in meeting future US energy needs – part 1," Andrew Weissman, publisher, *EnergyBusinessWatch.com*, May 17, 2005, http://www.energypulse.net/centers/article/article_display.cfm?a_id=1008; part 2, http://www.energypulse.net/centers/article/article_display.cfm?a_id=1009.

[138] "US Carbon Emissions from Energy Consumption," *Energy and Environment at Lawrence Livermore National Laboratory*, https://eed.llnl.gov/flow/carbon02.php; "Coal FAQs," *Sierra Club*, http://www.sierraclub.org/coal/questions.

removal mining and very deep, dangerous mines.[139] Contrary to the conventional wisdom about the abundance of coal, one study concludes that US coal production has already peaked, with world coal production to peak around 2025.[140] The recently cancelled FutureGen project, sponsored by a consortium of energy companies and the US DOE, touted new coal power plants using experimental coal gasification and sequestration technologies.[141] However, an MIT study casts doubt on whether turning coal into a gas before burning it will make it easier to capture carbon and recommends against government support of Integrated Gasification Combined Cycle (IGCC) technology. It calls for more research into effective ways to sequester and store massive quantities of CO_2 from coal – which have not yet been demonstrated to work.[142] Even if large-scale functional carbon sequestration technology is developed, history does not suggest that coal companies will give up profits to use them.[143]

Oil. Petroleum products are one of the top sources of carbon dioxide emissions.[144] They are subject to increasing volatility in price and supply.

Nuclear. Nuclear power still poses too many unsolved problems to fill our electric generation needs, including the need to store the waste for thousands of years. According to reports from MIT, between 1,000 and 2,000 new nuclear reactors would have to be built around the world by mid-century just to achieve a noticeable reduction in the expected increase in CO_2 emissions. Given the long construction time and great expense of building nuclear plants, that's not feasible, and would take the limited amount of money to be spent on climate change responses away from faster, cheaper and cleaner solutions. Nuclear power is completely dependent on taxpayer subsidies, having received over $115 billion from 1947 to 1999. This doesn't include the hidden costs of pollution from uranium mining, risks from nuclear weapons proliferation, the dangers of reactor accidents, and the unsolved problem of nuclear waste disposal – not to mention the risk of terrorism. Also, nuclear reactors are unreliable and because of their daily need for billions of gallons of cooling water often must reduce output or shut down during heat waves and during droughts when electricity demand is highest.[145]

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139 *Coal Moratorium Now!*, http://www.cmnow.org/; *700Mountains.org*, http://www.700mountains.org/; *End Mountaintop Removal*, http://ilovemountains.org.

140 "Coal: Resources and Future Production," *Energy Watch Group*, March 2007, http://www.energybulletin.net/28287.html; "Burning the furniture," Richard Heinberg, *Museletter*, March 2007, http://globalpublicmedia.com/richard_heinbergs_museletter_179_burning_the_furniture.

141 *FutureGen Alliance*, http://www.futuregenalliance.org.

142 "The Precarious Future of Coal," *MIT Technology Review*, March 14, 2007, http://www.technologyreview.com/read_article.aspx?id=18389&ch=energy.

143 "Coal FAQs," *Sierra Club*, http://www.sierraclub.org/coal/questions.

144 "US Carbon Emissions from Energy Consumption," *Energy and Environment at Lawrence Livermore National Laboratory*," https://eed.llnl.gov/flow/carbon02.php.

145 "Nuclear power can't stand the heat," *Public Citizen*, Aug. 2007, http://www.citizen.org/documents/HotNukesFactsheet.pdf; The Future of Nuclear Power, summary report, p. 13, Aug. 2003, http://web.mit.edu/nuclearpower; *Public Citizen Energy Program*,

The Indian Point nuclear power facility, 35 miles north of Times Square, provides approximately 1,900 megawatts of electric capacity. One report found that 60% of the Indian Point's capacity can largely be replaced by energy efficiency and conservation measures.[146] Another study found that the permanent retirement of both Indian Point units would not lead to any reliability problems in either NYC or Westchester County. There would still be enough power available from generating units located within the City and through import over existing transmission lines to serve expected peak loads while providing adequate capacity reserves.[147]

2. Renewable potential: solar, wind and water

Fortunately, there is a better way. Many studies show that the US can achieve a zero-CO_2 economy without nuclear power, using present or foreseeable technologies. If the US leads by example, it can convince other countries to follow in reducing their greenhouse gas emissions. If we don't turn away from coal, neither will China or India.[148]

US renewable energy resources are vast and practically untapped, and domestic solar or wind resources could meet all our electricity needs. Solar photovoltaic (PV) panels on rooftops and parking lots and wind turbines in windy valleys, coastal plains and mountains could supply all US electricity and transportation needs. Desert solar power plants on 3.4% of the land of New Mexico or solar panels on half the nation's rooftops and facades could generate 30% of our current electricity. Wind resources in Kansas, North Dakota and Texas could provide 100% of the nation's electricity.[149] According to a German Aerospace Centre report it is economically feasible to cut US CO_2 emissions by almost 75% within the next 43 years through a massive increase in renewable energy and efficiency improvements and without nuclear power, while almost

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http://www.citizen.org/cmep/energy_enviro_nuclear/nuclear_power_plants/cost; "Energy Demands on Water Resources," *US Dept. of Energy*, Dec. 2006, http://www.sandia.gov/energy-water/docs/121-RptToCongress-EWwEIAcomments-FINAL.pdf.

[146] "Securing Power through Energy Efficiency and Conservation in New York," Charles Komanoff, for *Riverkeeper, Pace Law School Energy Project, & NRDC*, May 2002, http://riverkeeper.org/document.php/39/2002_May__Koman.pdf.

[147] "Revised Indian Point Retirement Reliability Assessment," *Synapse Energy Economics, Inc.*, Feb. 2003, http://www.synapse-energy.com/Downloads/SynapseReport.2003-02.Riverkeeper.Revised-Indian-Point-Retirement-Reliability-Impacts.02-05.pdf.

[148] "Carbon-Free and Nuclear-Free: A Roadmap for U.S. Energy Policy," Arjun Makhijani, Ph.D., *Nuclear Policy Research Institute and the Institute for Energy and Environmental Research*, Aug. 2007, http://www.ieer.org/carbonfree.

[149] "American Energy: The Renewable Path to Energy Security," *Worldwatch Institute*, Sept. 2006, pp. 20, 26, 31, http://www.americanenergynow.org.

ending dependence on coal.[150] An American Solar Energy Society report comes to a similar conclusion.[151]

Renewable power can be generated at either centralized plants or distributed (on-site) systems. Distributed generation is less vulnerable to disruption and benefits both urban revitalization and economic growth.[152] Wind and solar energy are intermittent, but integrating them into the grid, as wind is often more plentiful at night, with more constant micro-hydropower, tidal, and geothermal power helps with that issue. Plug-in hybrid electric vehicles can provide system-wide electricity storage, charging their batteries at night with surplus power, and during the day, discharging back into the grid.[153]

Small wind systems are well suited for rural backyards but are unlikely within New York City because of inadequate wind, engineering risk and insurance liability.[154] Wind power can be generated by large wind farms upstate or offshore, where wind resources are very good but often face community opposition, skeptical local officials, uncertain federal subsidies and transmission problems.[155] Wind power can currently be bought by Con Ed customers.[156]

Installation of tidal turbines, essentially underwater versions of wind turbines, has begun off Roosevelt Island in the East River. The complete project would provide up to 10 megawatts, and another 40 megawatts could be installed elsewhere in the harbor.[157]

Solar PV systems are the largest potential source of renewable energy within the City. Both New York City and State have very good access to sunlight.[158] Most productive during peak electric use on hot summer days, PV systems can help stabilize a strained power grid. As of November, 2005 PV supplied only 0.002% of the City's power needs. With the proper policies, PV

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[150] "Energy [R]evolution: A Sustainable World Energy Outlook," *European Renewable Energy Council and Greenpeace International*, Jan. 2007, http://www.energyblueprint.info/fileadmin/media/documents/energy_revolution.pdf.

[151] "Tackling Climate Change in the US," *ASES*, Jan. 2007, http://www.ases.org/climatechange.

[152] "Rethinking the Grid: Distributed Generation and Urban Development, Jeff Perlman, *American City*, April 2005, http://www.americancity.org/article.php?id_article=117; "Energizing the Future: The Benefits of Renewable Energy for New York State," *Office of New York State Comptroller Alan Hevesi*, March 2005, http://www.osc.state.ny.us/osdc/renewableenergy.pdf.

[153] "The plug in hybrid for sustainability without oil," Andrew Frank, *ASPO-USA*, Oct. 2006, http://www.aspo-usa.com/fall2006/presentations/pdf/Frank_A_Boston_2006.pdf; "Carbon-Free and Nuclear-Free: A Roadmap for a Sustainable U.S. Energy Policy," Arjun Makhijani, Ph.D., *Nuclear Policy Research Institute and Institute for Energy and Environmental Research*, 2007, http://www.ieer.org/carbonfree.

[154] "Small Wind Electric Systems: A New York Consumer's Guide," *US Dept. of Energy*, Feb. 2005, http://www.nrel.gov/docs/fy05osti/37499.pdf.

[155] *Support Long Island Offshore Wind Power*, http://www.lioffshorewindenergy.org.

[156] *Con Ed Solutions*, http://www.conedsolutions.com/gp/default.asp.

[157] *Verdant Power*, http://www.verdantpower.com.

[158] *NY Solar Energy Industries Association*, http://nyseia.org; "Meeting Peak Demand with Photovoltaics," Professor Richard Perez, *Atmospheric Sciences Research Center*, *SUNY*, 2001, http://www.asrc.cestm.albany.edu/perez/peak-ny/meeting-peak-loads-with-pv.pdf.

could provide 18% of the City's needs by 2022.[159] A roadmap created by a coalition of solar industry leaders and policy analysts shows how we can increase the State's solar capacity from today's 12 MW to over 2,000 MW by 2017.[160]

Decentralized and resilient. We enjoy technological and business systems that are faster and better linked than our ancestors could possibly imagine. The pressure to make production and distribution as fast as possible increases the risk of sudden breakdown**.** Damage in one part of a tightly interconnected system can cascade more readily to other parts.[161]

> How can we reduce the dangers? The answers will vary from system to system, but some general principles are clear. First, we need to encourage distributed and decentralized production of vital goods like energy and food. The more power we produce with solar panels on our rooftops, the less vulnerable we'll be to energy disruptions far away.[162]
>
> A renewable-energy economy could be a decentralized free-market paradise. Imagine a network of small power producers, ranging from the family that invests in some extra solar panels to the city that owns a fleet of wind turbines – all feeding electricity into a robust electric grid, sharing electrons with Internet-like intelligence and resilience.[163]

3. Recommendations for New York City

Considering our present fuel mix, City efforts to reduce greenhouse gas emissions and fossil fuel dependence start with a heavy burden. In 2005, over half of the electricity used in the State was generated by fossil fuels.[164] Ensuring

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[159] "NYC's Solar Energy Future," *Center for Sustainable Energy at Bronx Community College*, Jan. 2006, http://www.bcc.cuny.edu/institutionalDevelopment/cse/Documents/CUNY%20MSR%20-%20Market%20for%20PV%20in%20NYC.pdf; "Energy Efficiency and Renewable Energy Resource Development Potential in New York State: Vol. 4: Renewable Supply Technology Report," J. Plunkett, A. Shipley, D. Hill and C. Donovan (2003b), http://www.dps.state.ny.us/rps/Volume_4_Final_082803.pdf.

[160] "NY's Solar Roadmap: A plan for energy reliability, security, environmental responsibility and economic development in NY State," May 2007, *Solar Initiative of NY*, http://www.neny.org/download.cfm/Solar_Roadmap_5_07.pdf?AssetID=225.

[161] Thomas Homer-Dixon, *The Upside of Down*, 2006, http://www.homerdixon.com.

[162] "Caught up in our own connections," Thomas Homer-Dixon, *NY Times*, Aug. 13, 2005, http://www.homerdixon.com/articles/20050813-nytimes-connections.html.

[163] "Where is the energy for freedom?," Kelpie Wilson, *Truthout*, Jan. 18, 2007, http://www.truthout.org/docs_2006/011807L.shtml.

[164] "NYPIRG's Consumer Guide: Buying Clean & Green Electricity for Your Home," *NYPIRG*, http://www.nypirg.org/energy/green_electricity/green.html; http://www.nypirg.org/energy/renewable.html.

stable delivery of electric power over an aging transmission grid, further strained by rising consumer demand, is already a high priority for officials.[165]

New York State
Electricity Production

fuel	%
coal	14.0
oil	16.4
natural gas	21.7
nuclear	28.9
hydroelectric	17.6
renewable: biomass and wind	1.4

The City is required by State law to produce 80% of its power within its borders. City power plants run mostly on natural gas, with oil backup.[166] PlaNYC says, "reducing our demand while absorbing growth will not only be difficult – it has never been done before."[167] PlaNYC proposes to:

- modernize the City's aging electric grid by accelerating reliability improvements and upgrades
- form a City Energy Planning Board and Energy Efficiency Authority
- reduce energy consumption by City government
- strengthen energy and building codes
- reduce demand among the City's largest consumers
- expand peak load management
- launch an energy awareness campaign

The Plan includes initiatives to stabilize the electric grid, facilitate repowering, (which increases capacity and reduces pollution), construct power plants and transmission lines, expand clean distributed generation and natural gas infrastructure, and foster the market for renewable energy. These are good recommendations, but they lack timetables for implementation. We recommend such timelines be set, especially to form the Energy Planning Board. More effort will be needed on behalf of energy conservation, efficiency and renewable power.

Recommendations to increase green power capacity include:

- stable and consistent tax credits
- long-term power purchase agreements with renewable power producers

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[165] PlaNYC 2030, http://www.nyc.gov/html/planyc2030/downloads/pdf/report_energy.pdf; "Global electricity grids strained," *BBC News*, June 9, 2005, http://news.bbc.co.uk/2/hi/business/4076938.stm.

[166] *NYC Energy Task Force Report*, pp. 9, 16, Jan. 2004, http://www.nyc.gov/html/om/pdf/energy_task_force.pdf.

[167] *PlaNYC 2030*, p. 102.

- mandating increased renewable power purchases by utilities
- mandating renewable energy purchasing by City agencies and large private users[168]
- government supports, incentives and tax credits to lower the price of renewable energy and level the playing field with heavily subsidized fossil and nuclear power
- removing subsidies for fossil and nuclear power
- carbon tax
- expanding net metering to allow on-site renewable energy producers in all customer classes (residential, commercial and industrial) to sell surplus to the grid and to make profitable PV installations on large commercial roofs

New Jersey standards and practices for renewable power are widely considered the national model. A 2007 report from the Bronx Community College Center for Sustainable Energy recommends City and State policies to encourage continued growth of solar power within the City, including:

- increasing PV funding under the State Renewable Portfolio Standard
- creating a NYC-specific fund for PV system installation
- substantial incentives scheduled to decline over time
- mandating dialogue between Con Ed and system installers on technical barriers
- removing redundant or unnecessary interconnection and code requirements
- removing or raising current caps on PV system size
- requiring PV through City green building mandates[169]

The NYC Apollo Alliance also recommends:

- creating incentives for greater energy efficiency in City housing and schools
- decentralizing NYSERDA outreach
- improving NYSERDA renter programs
- updating the State Environmental Quality Review Act (SEQRA) to include project contribution to global warming as main topic for review
- unbundling electricity by separating utility bills from rent[170]

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[168] "Powering the Big Apple: Policy and System Factors Affecting the Deployment and Use of Renewable Power in New York City," Stephen Hammer, *London School of Economics*, 2004, http://www.bcc.cuny.edu/InstitutionalDevelopment/CSE/Solar_Power_oct-1.cfm; "Transatlantic Energy," Stephen Hammer, *Sallan Foundation*, Feb. 27, 2006, http://www.sallan.org/newviews/archives/2006/02/000055.php.

[169] "NYC's Solar Energy Future, Part II: Solar Energy Policies and Barriers in NYC," Jan. 2007, *The Center for Sustainable Energy at Bronx Community College*, http://www.mtpc.org/renewableenergy/public_policy/DG/resources/2007-01-CUNY-PV-policy-barriers-NYC.pdf.

[170] "Repowering Gotham: State Action to Build NYC's New Energy Economy," *NYC Apollo Alliance*, Dec. 2006, http://www.urbanagenda.org/pdf/repoweringgotham.pdf.

4. Recommendations for New York State

Energy Efficiency Portfolio Standard. The recently implemented New York Energy Efficiency Portfolio Standard has a goal of reducing electricity and natural gas use by 15% by 2015. To realize the greater potential for efficiency, the goals can be raised to reduce power use at least 30% by 2015.[171]

Net metering. Net metering should be expanded, from the current maximum of 10 kilowatts to 2 megawatts per system for all customer classes, as in New Jersey. This would encourage solar PV and other renewable power systems to be profitably installed at medium- to large-sized businesses, schools, and factories, as well as by residences and farms.[172]

Smart metering / time of use metering. Giving people the means to closely monitor and adjust their electricity use lowers their monthly bills and could significantly reduce the need to build new power plants, according to a yearlong government study.[173] New meters with this capacity will allow customers to schedule activities to take advantage of lower off-hours rates.[174] In 2006, California approved the installation of smart meters which report hourly electricity consumption to 9 million gas and electric household customers. This enables the utility to set pricing that varies by season and time of day and to reward customers who shift energy use to off-peak periods.[175]

State Energy Plan. We encourage the State Assembly to re-instate a comprehensive State Energy Plan process that explicitly addresses the possibility of oil supply disruptions due to either geological limits or geopolitical events. The Plan should require that energy efficiency, conservation and renewable power be considered as an alternative to new polluting power generation, and that no new coal and nuclear power generating facilities will be permitted.[176] The State Energy Plan sunset in 2002.

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171 "Case 07-M-0548, Energy Efficiency Portfolio Standard," *NY State Public Service Commission*, http://www.dps.state.ny.us/Case_07-M-0548.htm.

172 *Environmental Advocates of NY*, http://www.eany.org/issues/topics/NetMetering_brochure.pdf; *NY Solar Energy Industries Association*, http://nyseia.org/page2.html.

173 "Digital tools help users save energy, study finds," *NY Times*, Jan. 10, 2008, http://www.nytimes.com/2008/01/10/technology/10energy.html.

174 "Smart Metering," *NYSERDA*, Fall 2003, http://www.nyserda.org/programs/pdfs/meteringprimer.pdf.

175 "Pacific Gas and Electric Company's Smart Meter™ Proposal Approved by California Public Utlities Company," news release, *Pacific Gas and Electric Commission*, July 20, 2006, http://www.pge.com/news/news_releases/q3_2006/060720a.html.

176 Personal communication, Bill Reinhardt, *NYSERDA*, Oct. 2007; "State Energy Planning," *NYSERDA,* http://www.nyserda.org/Energy_Information/energy_state_plan.asp.

PART VI.
Changing National Energy Policy

The Bush Administration and its Congressional allies have focused on expanding fossil fuel supplies. In the last few years, US energy prices and dependence on foreign oil have risen, along with oil company profits.[177] Federal spending on energy research and development is microscopic compared to costs of the war in Iraq.[178] Sensible energy initiatives are being developed in some cities and states.[179]

1. Congressional global warming bills

World Resources Institute, Natural Resources Defense Council and Sierra Club have evaluated the effectiveness of proposed global warming bills in stabilizing atmospheric carbon emissions at levels that avoid permanent climate destruction.[180] The Sanders-Boxer Global Warming Pollution Reduction Act, which would reduce greenhouse gas emissions 80% below 1990 levels by 2050, has been endorsed by many environmental groups. However, as global warming has accelerated, national policies bolder than this are needed. The Earth Policy Institute explains why and how world carbon dioxide emissions must by cut by 80%, **not by 2050 but by 2020.**[181]

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[177] "Bush energy plan whacks conservation," *Christian Science Monitor*, May 31, 2006, http://www.csmonitor.com/2006/0531/p02s01-uspo.html; "Secrets of Cheney's Energy Task Force Come to Light," *Project Censored*, http://www.projectcensored.org/publications/2005/8.html; "Senators to push for $100 gas rebate checks," *CNN*, April 27, 2006, http://www.cnn.com/2006/POLITICS/04/27/gas.rebate; "Report of the National Energy Policy Development Group," *Office of the President*, May 2001, http://www.whitehouse.gov/energy/2001/Forward.pdf; "Energy Task Force," *Halliburton Watch*, http://www.halliburtonwatch.org/about_hal/energytf.html; "Oil and Gas: Long Term Contribution Trends," *Center for Responsive Politics*, 2006, http://www.opensecrets.org/industries/indus.asp?Ind=E01&cycle=All.

[178] "US research and development investments in different types of energy compared to the cost of the war in Iraq," graph source: US Dept. of Energy, *Solar Power Rocks.com*, http://www.solarpowerrocks.com/solar-trends/a-sick-graph-2.

[179] "Energy & Environment Best Practices," *US Council of Mayors*, May 2006, http://usmayors.org/uscm/best_practices/EnergySummitBP06.pdf; "Democratic Energy – Renewable Portfolio Standards," *The New Rules Project*, http://www.newrules.org/electricity/rps.html; *Regional Greenhouse Gas Initiative*, http://www.rggi.org; *ICLEI USA*, http://www.iclei.org/index.php?id=391; http://www.kyotousa.org; http://www.seattle.gov/mayor/climate.

[180] "Global warming legislation in the 110th Congress," *World Resources Institute*, Dec. 2007, http://www.wri.org/publication/usclimatetargets#; "Solving Global Warming: Your Guide to Legislation," *NRDC*, March 2007, http://www.nrdc.org/legislation/factsheets/leg_07032601A.pdf; "Global warming and energy: Sierra Club Energy Policy," http://www.sierraclub.org/globalwarming/energy_policy.asp#carbon.

[181] "Plan B.3: Mobilizing to Save Civilization," *EPI*, http://www.earth-policy.org/Books/PB3/index.htm.

2. Guiding principles for government action

(1) **Changes needed**. Fundamental changes are needed to respond to climate change and fossil fuel dependence, which must be addressed simultaneously.

(2) **Simultaneous solutions**. Massive investment in efficiency and renewable energy will mitigate both fuel depletion and climate change. The clean energy technologies we have now can scale up to meet all our power needs.[182]

(3) **Efficiency first**. The best and least expensive sources of energy are conservation and efficiency. Start with them before considering new generation.

(4) **Acting quickly**. Being able to conserve a lot of energy quickly will help with long-term efforts.

(5) **Resource depletion and price volatility**. Depletion of world oil supplies is driving the current volatility in oil prices, as well as rising demand. Prices may fluctuate but will tend to increase, permanently. Transportation costs will go up, and if we don't prepare for it, the effects will be extremely severe. Depletion is also affecting natural gas, the burning of which generates much of our electricity, and will eventually limit coal and uranium supplies.

(6) **System changes necessary**. While it is important to improve efficiency of individual cars and houses, the returns will be even greater from modifying infrastructure systems: concentrating development around existing urban areas and mass transit lines, avoiding the construction of sprawling suburbs, and localizing manufacturing and agriculture.[183]

(7) **Changing behavior**. Climate change effects are often indirect and may become more evident later – long past when major changes should have taken place. Volatility in energy prices or supply disruptions will be evident sooner, can take place any time, and is more likely to inspire immediate behavior change.

(8) **Good electricity investments**. For electricity, invest in energy sources that are sustainable over the long term and have a positive return on energy investment, including capital, social and environmental costs. Poorly chosen investments could waste

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[182] "Unified Green Field Theory," David Roberts, *Tom Paine.common sense*, Jan. 11, 2007, http://www.tompaine.com/articles/2007/01/11/unified_green_field_theory.php.

[183] *Post Carbon Institute*, http://www.postcarbon.org.

billions of dollars and cause trillions of dollars in climate change destruction.[184]

(9) **Poor electricity investments**. Investing in coal, oil shale or tar sands will give us a few years of electricity but will speed up global warming with catastrophic results. We can't afford the number of nuclear reactors needed to replace fossil fuel-generated electricity, and that's not counting additional costs in terms of tax subsidies, terrorism risks, social and environmental costs, and wastes that will be lethal for thousands of years.

(10) **System security**. Centralized systems are vulnerable to disruption. Distributed, decentralized systems are resilient and secure.

(11) **New Manhattan Project**. With WWII-scale investment and R&D efforts, we can make clean energy cheap, while restoring US manufacturing, creating millions of jobs, increasing national security, and breaking our dependence on oil.[185]

(12) **Leveraging markets**. The transition to an efficient and renewable energy society requires legislation, incentives and taxes that leverage the financial power of markets. Technologies and power sources that are not immediately cost-competitive with oil are not getting the investments they need to grow quickly, while nuclear and fossil fuel energy still enjoy vast Federal handouts in the form of subsidies.[186] A likely component of future bills is a carbon tax. Supporters now include Rep. John Dingell (D-Michigan) and Mayor Bloomberg.[187]

(13) **Necessary action**. Scaling up renewable power and building energy efficient communities will require massive political, financial and public support over decades. Pragmatic responses may be unpopular. President Carter responded to the oil shocks of the 1970s by starting the strategic petroleum reserve, incubating solar power industries, promoting efficiency standards for cars,

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[184] "World Energy Modeling," Dick Lawrence, *ASPO-USA*, Oct. 2006, http://www.aspo-usa.com/fall2006/presentations/pdf/Lawrence_D_Boston_2006.pdf.

[185] *The Breakthrough Institute*, http://www.thebreakthrough.org.

[186] "Making Nuclear Pass the Market Test," *Earth Track*, Aug. 2007, http://earthtrack.net/earthtrack/admin/edit.asp?page_id_fk=220#LETTER.BLOCK6; "Nuclear power in the US: still not viable without subsidies," *Earth Track*, 2005, http://www.earthtrack.net/earthtrack/library/NuclearSubsidies2005.pdf.

[187] *Carbon Tax Center*, http://www.carbontax.org; "Dingell opens the door with a hybrid carbon tax," Sept. 26, 2007, http://www.carbontax.org/blogarchives/2007/09/26/dingell-opens-the-door-with-a-hybrid-carbon-tax; "Bloomberg calls for tax on carbon emissions," *NY Times*, Nov. 2, 2007, http://cityroom.blogs.nytimes.com/2007/11/02/bloomberg-calls-for-tax-on-carbon-emissions; "Fuel tax magic," June 24, 2006, *Gristmill*, http://www.energybulletin.net/17574.html.

encouraging energy conservation and efficiency, and pledging to stop the growth of oil imports. Many initiatives were reversed in the 1980s.[188]

3. Thinking much bigger

National Economic Stimulus Package. A growing list of organizations call for economic stimulus measures that build short- and long-term economic stability through clean energy and provide employment opportunities for hundreds of thousands of poor and working class Americans.[189]

The Oil Depletion Protocol. The Oil Depletion Protocol would enable nations to cooperatively reduce their oil dependence in an orderly manner. It was proposed by Dr. Colin Campbell, a prominent petroleum geologist who founded the Association for the Study of Peak Oil and Gas (ASPO) in 1996. Signatory nations would agree to reduce oil imports and exports by a specified amount each year, about 2.6%. Oil importing nations would agree to reduce their imports by an agreed-upon yearly percentage, referred to as the World Oil Depletion Rate, while oil-producing nations would agree to reduce their rate of production by their National Depletion Rate. This formula will produce, in effect, a global rationing system.[190]

The One Sky Campaign. Affiliated with writer Bill McKibben and the Step It Up movement, One Sky leaves out the details but sets the bar high:

- creating 5 million green jobs
- conserving 20% of our energy by 2015
- freezing climate pollution now
- cutting climate pollution 30% by 2020
- cutting climate pollution by at least 80% by 2050
- siting no new coal plants until they can safely dispose of CO_2[191]

Energize America 2020: a new Manhattan Project. Congressman Roscoe Bartlett (R-Maryland), a conservative Republican and former research scientist, calls for a national effort to reduce energy dependence, an effort equivalent to the Manhattan Project of World War II.[192] To date the proposal that

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[188] "Carter Tried to Stop Bush's Energy Disasters – 28 Years Ago," Thom Hartmann, *Common Dreams*, May 3, 2005, http://www.commondreams.org/views05/0503-22.htm.

[189] "Letter to President Bush, Speaker Pelosi, and Senator Reid," *1Sky*, Jan. 21, 2008, http://admin.1sky.org/wp-content/uploads/stimulus_letter.pdf.

[190] Richard Heinberg, *The Oil Depletion Protocol*, New Society Publishers, 2006, http://www.oildepletionprotocol.org.

[191] *1Sky*, http://www.1skycampaign.org/; *Step It Up*, http://www.stepitup2007.org.

[192] "Peak oil is coming and we must prepare," Congressman Roscoe Bartlett, *Legal Times*, June 12, 2006, http://www.bartlett.house.gov/UploadedFiles/Legal%20Times%206-12-06.pdf; "Energy," Representative Roscoe Bartlett, US House of Representatives, http://www.bartlett.house.gov/Issues/Issue/?IssueID=2033.

best outlines what is needed is *Energize America 2020*, a suite of proposed Federal acts collaboratively built by thousands of experts and citizen activists at the Daily Kos website, an online political community with roughly 500,000 daily visitors. The plan's 20 proposed Federal acts aspire by 2020 to:

- provide the US with energy security
- reduce oil imports and greenhouse gas emissions by 50%
- generate 25% of US electricity from renewable sources
- create 2 million new energy-related jobs
- save 1 million auto jobs

The plan addresses:

- passenger vehicle fuel efficiency
- transportation industry efficiency
- vehicle fleet conversion
- restoration of passenger rail
- wind energy production tax credits
- solar roofs
- home energy efficiency
- renewable portfolio standards
- net metering[193]

National and international context. We must jump-start a global transition, says climate change author Ross Gelbspan, by transferring carbon-free energy technology to poor countries. The expected funding of about $300 billion a year for a decade is expensive, but quite pragmatic. The costs of developing countries accelerating their fossil fuel use or falling into chaos will be even higher.[194]

We need to think big. Clearly, massive public pressure will be needed to push government officials into implementing programs like these. As Al Gore says, political will is a renewable resource.[195] Take a closer look at climate change and fuel depletion in the following appendices. Then, consider how you can get involved. Citizens can contact their elected representatives. Government officials can form or join an energy volatility task force, and implement proposals set out in this report.

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[193] *Energize America*, http://www.ea2020.org.

[194] "Beyond the point of no return," Ross Gelbspan, *Gristmill*, Dec. 11, 2007, http://gristmill.grist.org/story/2007/12/10/165845/92#_ednref1.

[195] "Political will is a renewable resource," *Sierra Club*, 2005, http://www.sierraclub.org/sierrasummit/coverage/r016.asp.

Appendix A

Climate Change Is Accelerating

Coal, oil and natural gas were formed over millions of years by heating and compressing organic materials. Burning these fuels releases their stored carbon as carbon dioxide, a greenhouse gas which traps heat in the atmosphere. Since the start of the Industrial Revolution, atmospheric concentrations of carbon dioxide have risen sharply. Antarctic ice cores of the past 900,000 years show that current carbon dioxide and methane concentrations are 30% and 130% higher, respectively, and the rate of increase 200 times higher than previously recorded.[196] Hundreds of scientists collaborating on the UN Intergovernmental Panel on Climate Change (IPCC) have concluded that humans are responsible for climate change and that its effects will be increasingly severe.[197]

Climate change will cause more variable, erratic and violent weather, including more and stronger hurricanes, such as the record 28 tropical storms and Atlantic hurricanes of 2005, including three Category 5 hurricanes. The damage to Gulf Coast oil and natural gas infrastructure will likely be repeated.[198] Rising sea levels, flooding, storms and droughts could displace hundreds of millions of people and according to a British government study, will annually cost between 5 and 20% of global gross domestic product.[199]

New York City is vulnerable to temporary flooding from storm surges, which will be worsened by rising sea levels as glaciers melt.[200] It is second to

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[196] "Surface Temperature Reconstructions for the Last 2,000 Years," *Committee on Surface Temperature Reconstructions for the Last 2,000 Years, National Research Council,* 2006, http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=11676; "CO_2 'highest for 650,000 years,'" *BBC*, Nov. 24, 2005, http://news.bbc.co.uk/1/hi/sci/tech/4467420.stm.

[197] *Intergovernmental Panel on Climate Change*, http://www.ipcc.ch; "Global warming and energy," *Sierra Club*, http://www.sierraclub.org/globalwarming.

[198] "Is global warming affecting hurricanes?," *University Corporation for Atmospheric Research*, http://www.ucar.edu/news/backgrounders/hurricanes.jsp; "Global warming, not just heat wave," *InterPress Service*, July 21, 2006, http://www.commondreams.org/headlines06/0721-06.htm.

[199] "Stern Review Report on the Economics of Climate Change," Oct. 2006, *HM Treasury*, http://www.hm-treasury.gov.uk./independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm; "UK report: warming will damage economy," Oct. 30, 2006, *Washington Post*, http://www.washingtonpost.com/wp-dyn/content/article/2006/10/30/AR2006103000361.html.

[200] "NASA looks at sea level rise, hurricane risks to NYC," *NASA*, Oct. 24, 2006, http://www.nasa.gov/mission_pages/hurricanes/archives/2006/sealevel_nyc.html.

Miami as the US city most vulnerable to economic damage from hurricanes.[201] Online animations depict projected flooding in New York and other cities.[202]

Debate now centers on when a tipping point of irreparable harm will be reached and how deeply emissions must be cut. Until recently, many scientists thought that 450 parts per million (ppm) of carbon dioxide was the limit for avoiding catastrophic climate change. Before the Industrial Revolution, atmospheric carbon was about 275 ppm, and we're now at about 383 ppm.[203]

The IPCC conservatively assumes linear progression of climate change and does not include potential acceleration due to feedback loops. Current evidence shows that climate change is happening much faster than originally predicted, and many climate scientists say the IPCC recommendations are too cautious.

> The IPCC suffers from a scientific reticence and in many key areas the IPCC process has been so deficient as to be an unreliable and dangerously misleading basis for policy-making.[204]

Between 1979 and 2005, the rate of Arctic ice retreat had averaged 7% per decade; in the last two years that rate increased to more than 20%. This year Arctic ice shrank to a minimum of 4.13 million square kilometers, compared to the previous record low in 2005 of 5.32 million square kilometers – an expanse of ice roughly the size of Texas and California combined. In spring 2007, the IPCC report estimated the Arctic ice might disappear in the summers as early as 2050 but more likely towards the very end of this century. Just months later, glaciologists were saying it could be as early as 2013 – *nearly a century ahead of those IPCC predictions.*

To limit global warming to 2 degrees, many environmental and climate change organizations advocate for reduction of 60 to 80% of our current carbon emissions by 2050.[205] This is an important initial goal. However, America's leading climatologist, Professor James Hansen, Director of the NASA-Goddard Institute of Space Science, says that CO_2 levels are already in the danger zone. He estimates that the CO_2 tipping point for many parts of the climate is around 300 to 350 ppm – well below current levels – so we need to not only eliminate

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[201] "Powerful Hurricanes and Northeasters: Threat to the Big Apple," *The Climate Institute*, http://www.climate.org/topics/weather/new_york_severe_storm_threat.shtml.

[202] "Climate Change Information Resources, New York Metropolitan Region," *Columbia University*, http://ccir.ciesin.columbia.edu/nyc/index.html; *An Inconvenient Truth*, http://www.climatecrisis.net; Global warming animation - NYC, *The Pew Charitable Trusts*, http://www.pewtrusts.org/news_room_ektid29644.aspx.

[203] "Remember this: 350 parts per million," Bill McKibben, *Washington Post*, Dec. 28, 2007, http://www.washingtonpost.com/wp-dyn/content/article/2007/12/27/AR2007122701942.html.

[204] "The Big Melt: Lessons from the Arctic Summer of 2007," *Carbon Equity*, Oct. 2007, http://www.carbonequity.info/docs/arctic.html.

[205] *US Climate Action Network*, http://usclimatenetwork.org; *The Heat Is On*, http://www.heatisonline.org/main.cfm; *Focus the Nation*, http://www.focusthenation.org.

current greenhouse gas emissions, but to remove CO_2 from the atmosphere to cool down the planet.[206]

Carbon Equity also disputes the widely promoted 2ºC target cap as too high, saying that degree of increase initiates feedbacks that would take the earth past significant tipping points. The proposed 60% cut on 1990 levels by 2050 in the developed world implies a 3°C temperature increase. The last time temperatures were that high, the northern hemisphere was free of glaciers and ice sheets and sea levels were 25 meters higher. A safer target would be a rise of only 0.5ºC and a greenhouse gas level of 320 ppm CO_2 equivalent. "There is no ideal achievement timetable other than as fast as possible."[207] The Earth Policy Institute says that the 80% reduction in carbon emissions must take place by 2020, not by 2050.[208]

The IPCC's final report says the world must reverse growth of greenhouse gas emissions by 2015 to avert global climate disaster. Said IPCC head Rajendra Pachauri:

> If there's no action before 2012, that's too late. What we do in the next two to three years will determine our future. This is the defining moment.[209]

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[206] "Remember this: 350 parts per million," Bill McKibben, *Washington Post*, Dec. 28, 2007, http://www.washingtonpost.com/wp-dyn/content/article/2007/12/27/AR2007122701942.html; "James Hansen: significant climate tipping points have been passed," http://www.carbonequity.info/docs/hansen.html.

[207] "Target practice: where should we aim to prevent dangerous climate change?," *Carbon Equity*, Nov. 2007, http://www.carbonequity.info/docs/targets.html; "Climate Code Red," *Carbon Equity*, Feb. 2008, http://www.carbonequity.info/climatecodered/summary.html.

[208] "Plan B 3.0: Mobilizing to Save Civilization," *EPI*, http://www.earth-policy.org/Books/PB3/Contents.htm.

[209] "Climate panel says immediate changes are necessary," *NY Times*, Nov. 17, 2007, http://www.nytimes.com/2007/11/18/science/earth/18climatenew.html.

Appendix B

Fuel Depletion and Peak Oil Guarantee Volatility

In the near term, the International Energy Agency (IEA) expects demand to keep accelerating past supply, which has leveled since 2005 at about 86 million barrels per day (mbd). It projects demand to rise toward 90 mbd in 2008.[210] The IEA now admits that significant shortfalls are likely within the next 5 years,[211] and that "a supply side crunch in the period to 2015, involving an abrupt escalation in oil prices, cannot be ruled out."[212]

Over the longer term, IEA optimistically expects that world oil resources will be able to meet projected world demand of 116 mbd in 2030, with most of the increase coming from OPEC countries. James Mulva, CEO of ConocoPhillips, doubts that supply will ever exceed 100 mbd.[213] The CEO of French oil company Total doubts it would even get that high.[214]

The most important reason for stagnant oil production is a simple one which until recently was not widely discussed: fossil fuels are finite, and we are encountering supply limits. We are moving from 150 years of steadily increasing oil supply to a future of decreasing oil supply. While there is debate as to when this will occur, there is no dispute that it will be some time within the next 30 years.[215] When half the oil in a field has been removed, the remaining oil becomes more difficult and expensive to extract and refine, thus raising the price.

Long-term world oil production forecasts vary based on geological estimates of the total amount of the world's recoverable oil reserves. Estimates

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[210] *Oil Market Report, IEA*, Aug. 2007, http://omrpublic.iea.org.

[211] "Medium-Term Oil Market Report – July 2007," *IEA*, http://omrpublic.iea.org/mtomr.htm; "Oil supplies 'face more pressure,' *BBC News*, July 9, 2007, http://news.bbc.co.uk/2/hi/business/6283992.stm; "Entering the tough oil era: the new oil pessimism," Prof. Michael Klare, Aug. 16, 2007, *TomDispatch.com*, http://www.tomdispatch.com/post/174829/michael_klare_tough_oil_on_tap; "IEA sees oil supply crunch looming," *Reuters*, July 9, 2007, http://www.washingtonpost.com/wp-dyn/content/article/2007/07/09/AR2007070900432.html.

[212] "World Energy Outlook 2007," *IEA*, http://www.iea.org/Textbase/npsum/WEO2007SUM.pdf.

[213] "Big Oil CEOs point to constraints on supply growth," *European Tribune*, Nov. 10, 2007, http://www.eurotrib.com/story/2007/11/10/71327/177.

[214] "Total chief warns on oil output," *Financial Times*, Nov. 4, 2007, http://www.ft.com/cms/s/0/b0d83bfa-87df-11dc-9464-0000779fd2ac.html?nclick_check=1.

[215] "The Debate over Hubbert's Peak: A Review," Moujahed Al-Husseini, Gulf PetroLink, Bahrain, vol. 11, no. 2, *GeoArabia*, 2006, p. 22, http://www.gulfpetrolink.net/Peak_AlHusseini.pdf; *ASPO*, http://www.peakoil.net, http://www.aspousa.org; "Long-Term World Oil Supply Scenarios," *US EIA*, Aug. 18, 2004, http://www.eia.doe.gov/pub/oil_gas/petroleum/feature_articles/2004/worldoilsupply/oilsupply04.html; "Megaprojects: new capacity fails to boost 2006 production," Chris Skrebowski, Editor, *Petroleum Review*, Feb. 2007, http://beta.odac-info.org/sites/odac.postcarbon.org/files/pdf/MegaProjects_Feb2007.pdf

fall into one of three positions: 2, 3 or 4 trillion barrels. By 2005, the world had consumed about 1 trillion barrels. Analysts at the US Geological Survey say the total is around 3 trillion barrels. The US Energy Information Agency (EIA) predicts that world oil production will peak in 2037, followed by a permanent decline.[216] ASPO, an international group of petroleum geologists and other scientists, dismisses EIA projections as overly optimistic.[217] The Sierra Club's official energy policy statement recognizes imminent peak oil.[218]

Commercial oil extraction began in the US in 1859, and discovery of new oil fields peaked in the 1930s. For a long time, the US not only produced all the oil it needed but was a leading exporter as well. Domestic production grew steadily until it peaked in 1970, about 40 years after the discovery peak. Since then, US production has declined.[219] Today we produce one-third of the oil we consume, with the rest coming from imports, primarily from Canada, Saudi Arabia, Mexico, Nigeria and Venezuela.[220]

Production is in decline in 33 of the 48 largest oil-producing countries.[221] Oil production from all countries outside the former Soviet Union and OPEC remains flat; new production has not been enough to offset annual supply declines of 4 to 7%.[222] There are indications that Saudi oil production is beginning to decline.[223] EIA, IEA and OPEC data suggest that Saudi production fell 8% in 2006,[224] even though forecasts of rising world oil production from EIA and IEA are premised on the ability of Saudi Arabia, the world's leading oil producer, to raise output. The CEO of Mexican oil company Pemex announced that production from Mexico's giant Cantarell oil field is expected to decline 14% annually from 2007 to 2015.[225] 95% of Canada's proven reserves are oil sand

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216 "Long-Term World Oil Supply Scenarios," *US EIA*, Aug. 2004, www.eia.doe.gov/pub/oil_gas/petroleum/feature_articles/2004/worldoilsupply/oilsupply04.html.

217 "The Debate over Hubbert's Peak: a Review," by Moujahed Al-Husseini, Gulf PetroLink, Bahrain, p. 22, vol. 11, no. 2, *GeoArabia*, 2006, http://www.gulfpetrolink.net/Peak_AlHusseini.pdf.

218 "2006 Energy Resources Policy," *Sierra Club*, p. 3, http://www.sierraclub.org/policy/conservation/energy.pdf.

219 "Crude oil production and crude oil well productivity, 1954-2006", graph, *US EIA*, http://www.eia.doe.gov/emeu/aer/pdf/pages/sec5_6.pdf.

220 "Crude oil and total petroleum imports top 15 countries," *US EIA*, Oct. 2007, http://www.eia.doe.gov/pub/oil_gas/petroleum/data_publications/company_level_imports/current/import.html.

221 Will you join us.com, *Chevron*, http://www.willyoujoinus.com/energy-issues/supply/default.aspx.

222 "Recent Trends in Exploration Results and the Implications for Future Liquid Petroleum Supply," pp. 8, 9, 15, Michael Rodgers, PFC Energy, *ASPO-USA Conference*, Oct. 26, 2006, http://www.aspo-usa.com/fall2006/presentations/pdf/Rodgers_M_Boston_2006.pdf.

223 "The Energy Crisis Has Arrived," Matthew Simmons, presentation to US Dept. of Defense, June 20, 2006, http://www.simmonsco-intl.com/files/Energy%20Conversation.pdf; "The breaking point," Peter Maass, *NY Times*, Aug. 21, 2005, http://www.petermaass.com/core.cfm?p=1&mag=124&magtype=1; http://www.energybulletin.net/8112.html.

224 "Saudi Arabian oil declines 8% in 2006," Stuart Staniford, *The Oil Drum*, March 2, 2007, http://www.theoildrum.com/node/2325.

225 *International Herald Tribune*, Nov. 22, 2006, http://www.iht.com/articles/ap/2006/11/22/business/LA_FIN_Mexico_Oil.php.

deposits in the province of Alberta, which are much more difficult to extract and process than conventional crude oil.[226]

Also, there is doubt about OPEC claimed reserves, which account for about two-thirds of the world's oil reserves. In the 1980s, many OPEC countries increased their claimed proven reserves by 50 to 100%, which enabled them to increase their production quotas. Their claimed reserves have not diminished over time. We cannot verify reserves of OPEC countries, because they do not allow independent audits.[227]

Recent government studies about oil depletion

The Hirsch report, commissioned by the US Department of Energy and whose lead author is the former director of the US nuclear fusion program, recommends Federal responses to the rising fuel prices expected with peak production.

> The peaking of world oil production presents the U.S. and the world with an unprecedented risk management problem. As peaking is approached, liquid fuel prices and price volatility will increase dramatically, and, without timely mitigation, the economic, social, and political costs will be unprecedented. Viable mitigation options exist on both the supply and demand sides, but to have substantial impact, they must be initiated more than a decade in advance of peaking.[228]

The US Governmental Accountability Office (GAO) issued a report on peak oil in February, 2007. Citing studies predicting that oil production will peak "between now and 2040," the GAO found no coordinated federal strategy for reducing the uncertainty about the peak's timing or mitigating its consequences.[229] A poster explaining peak oil is now available on the US Department of Energy website.[230] The National Petroleum Council went so far

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[226] "Canada oil overview," *US EIA*, http://www.eia.doe.gov/emeu/cabs/Canada/Oil.html.

[227] "Why peak oil is probably about now," Stuart Staniford, *The Oil Drum*, March 1, 2006, http://www.theoildrum.com/story/2006/3/1/3402/63420; http://www.eia.doe.gov/cabs/opec.html.

[228] Dr. Robert Hirsch, biographical notes, http://www.d-n-i.net/fcs/hirsch_bio.htm; "Peaking of World Oil Production: Impacts, Mitigation, & Risk Management," Hirsch, et al., *Science Applications International Corporation (SAIC)*, Feb. 2005, http://www.mnforsustain.org/oil_peaking_of_world_oil_production_study_hirsch.htm; http://www.bartlett.house.gov/UploadedFiles/the_hirsch_report.pdf.

[229] "Crude Oil: Uncertainty about Future Oil Supply Makes It Important to Develop a Strategy for Addressing the Peak and Decline of Oil Production," *GAO*-07-283, Feb. 2007, http://www.gao.gov/new.items/d07283.pdf.

[230] http://www.fe.doe.gov/programs/reserves/npr/publications/Peak_Oil_-_the_Turning_Point.pdf.

as to admit that the US and the world "face hard truths about the global energy future."[231]

Banking on oil production depleting gradually would be unwise. Dr. Hirsch reviewed a number of regions and countries that peaked and found that "the onset of peaking can occur quite suddenly, peaks can be very sharp, and post-peak production declines can be comparatively steep (3-13%)."[232]

Compared to climate change, fuel depletion and peak oil have been nearly absent from the mainstream media, but that's changing as evidence for fuel depletion becomes impossible to ignore. Peak oil has recently been covered by CNN, the Wall Street Journal, and Time Magazine.[233] (News about fuel depletion is archived online at Energy Bulletin.)[234] This is a positive sign, because government officials will only act when a critical mass of constituents become strongly concerned about a problem and mainstream media coverage is essential for increased awareness. Also essential, as former government analyst Tom Whipple said:

> In the case of the U.S. it will take prolonged shortages at the pumps. The uproar will lead to a universal understanding of peak oil and useful policies.[235]

The current climate crisis makes getting off oil necessary, and fuel depletion makes it inevitable. Whether we manage the transition equitably or have it forced upon us is ours to choose.

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[231] "'Hard truths' about global energy detailed in new NPC study," report on press release from National Petroleum Council, *Energy Bulletin*, July 18, 2007, http://www.energybulletin.net/32208.html.

[232] "The Shape of World Oil Peaking: Learning from Experience," Robert L. Hirsch, *National Energy Technology Laboratory*, http://www.netl.doe.gov/energy-analyses/pubs/Peak_Shape_Study.pdf.

[233] "In a world short of oil, provisions must be made," *WSJ*, Jan. 26, 2008, http://online.wsj.com/article/SB120128939885117541.html?mod=todays_us_nonsub_page_one; "Oil officials see limit looming on production," *WSJ*, Nov. 19, 2007, http://online.wsj.com/article/SB119543677899797558.html?mod=googlenews_wsj; "Peak possibilities," *Time*, Nov. 21, 2007, http://www.time.com/time/magazine/article/0,9171,1686824,00.html; "The end of oil," *CNN*, Sept. 14, 2007, http://money.cnn.com/2007/09/14/news/economy/peak_oil/index.htm.

[234] *Energy Bulletin*, http://www.energybulletin.net.

[235] "Peak oil and the media," Tom Whipple, *ASPO-USA*, Oct. 2007, http://www.aspousa.org/proceedings/houston/presentations/Peak%20Oil%20and%20the%20Media%20Tom%20Whipple.pdf.

Acknowledgments:

Reviewed by Annie Wilson, Sierra Club, Atlantic Chapter Energy Chair
Edited by Lois Sturm, Neighborhood Energy Network

Cover photo: courtesy of Solar Energy Systems, www.solarEsystems.com

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Abbreviations:

ASES:	American Solar Energy Society
ASPO:	Association for the Study of Peak Oil
EIA:	US Energy Information Agency
EPI:	Earth Policy Institute
IEA:	International Energy Agency
NRDC:	Natural Resources Defense Council
WSJ:	Wall Street Journal