



The Real New Deal

**Energy Scarcity
and the Path to
Energy, Economic, and
Environmental Recovery**

**Post Carbon Institute
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Executive Summary

Our continued national dependence on fossil fuels is creating a dangerous vulnerability to both long-term fuel scarcity and catastrophic climate change.

The current economic crisis requires substantial national policy shifts and enormous new government injections of capital into the economy. This provides an opportunity for a project whose scope would otherwise be inconceivable: a large-scale, fast-track transition from fossil fuels to renewable energy.

This project must happen immediately; indeed, it may already be too late. We have already left behind the era of cheap fossil fuels, with a permanent decline of global oil production likely underway within three years.^{1,2} Moreover, the latest research suggests we have less than eight years to bring carbon emissions under control if we hope to avoid catastrophic climate change.³ Lacking this understanding of the urgency of fossil fuel depletion and climate change, a mere shift away from foreign oil dependence will fail to meet the challenges at hand.

The energy transition must not be limited to building wind turbines and solar panels. It must include the thorough redesign of our economic and societal infrastructure, which today is utterly dependent on cheap fossil fuels. It must address not only our transportation system and electricity grid, but also our food system and building stock.

Our 21st century nation's dependence on 20th century fossil fuels is the root of the economic and environmental threats we face. A coordinated, comprehensive transition to an economy that is no longer dependent on hydrocarbon fuels and no longer emits climate-changing levels of carbon – *a Real New Deal for a post-carbon world* – will be the Obama Administration's greatest opportunity to lead the nation on a path toward economic, energy and environmental recovery.



“Our 21st century nation’s dependence on 20th century fossil fuels is the root of the economic and environmental threats we face.”

¹ Gold, R. & Davis, A. (2007, November 19). Oil Officials. See Limit Looming on Production *The Wall Street Journal*. New York.

² Lerch, D. (2007) *Post Carbon Cities: Planning for Energy and Climate Uncertainty*. Sebastopol: Post Carbon Press. Page 12.

³ Hansen, J. (2006, July 13). The Threat to the Planet. *New York Review of Books*. New York.



Overview: Need & Scope

As a new Administration prepares to take the reins of power, America's economy is descending into a recession or, quite possibly, a depression. Deepening economic turmoil is generating an assortment of urgent priorities for the national leadership. Among economists there is widespread discussion of the need for an economic stimulus package of historic proportions to create jobs and spur more production and consumption.

Meanwhile, a more profound crisis has been silently gathering for decades, and is now reaching a point of no return. This crisis issues from our reliance on fossil fuels, and it manifests as the twin challenges of global fossil fuel depletion and global climate change.

Fossil fuels define the modern era. Their concentrated, inexpensive energy has generated unprecedented economic benefits, enabling Americans to enjoy cheap food, cheap travel, and cheap manufactured goods made from and with petrochemicals. But our unbridled consumption of fossil fuels has brought us to the current crisis, where we face both the imminent decline of our most important energy source and the very real possibility of catastrophic climate change.

Fossil fuel depletion and climate change highlight the hidden costs of our still-growing dependence on oil, coal, and natural gas. If we do not break this dependence, we will soon face far greater challenges than mere economic decline.

Moreover, the impacts we face are not decades away; they are immediately threatening. It is no overstatement to say that if we in this nation – and soon, the entire human family – cannot agree upon and undertake a deliberate, proactive transition away from fossil fuels, we may forfeit our last realistic opportunity to avoid global economic and environmental collapse.

As the world's top oil consumer and economic power, it is incumbent upon the United States to lead the way out of this crisis. A wide range of far-reaching policies and initiatives – touching every aspect of modern society from transportation and electricity to food and housing – is needed worldwide to ensure a peaceful and equitable energy transition. This global effort must begin here and now with a national plan to reduce energy consumption, develop renewable energy sources, and reconfigure our fossil fuel-dependent infrastructure.

“Fossil fuel depletion and climate change highlight the hidden costs of our still-growing dependence on oil, coal, and natural gas. If we do not break this dependence, we will soon face far greater challenges than mere economic decline.”

Overview: Need & Scope (Cont.)

By taking up a de-carbonized renewal of America's transportation system, electricity system, food system, and housing stock, the new Administration can address a number of problems simultaneously: climate change, economic contraction and unemployment, environmental destruction, resource depletion, geopolitical competition for control of energy, balance of trade deficits, the threat of hunger, and more.

The energy transition plan must not be merely a wish list of good ideas, but a prioritized, staged program with robust funding and hard yet realistic targets. Further, it must be presented to the American people in a compelling way: public education on a massive scale will be required to help ordinary citizens understand what is at stake and how sacrifices undertaken now can build a better world tomorrow.

Despite the need for public buy-in, the purpose of this document is not to outline a program that will be an easy "sell" from a political standpoint. Rather, its intent is to set forth what is actually needed in order to save America and the world from economic and environmental collapse – and what is needed may not be easy or palatable. Somehow the necessary must be reconciled with the possible, but it is the empirical requirements for survival that are ultimately decisive. It will be the task of leaders at all levels of government to mold political realities to fit those requirements.

The current financial calamity is appearing at perhaps the last historic moment when action to avert a climate catastrophe has a chance of succeeding. Crisis is nearly always an opportunity for someone or something. In the current instance, economic crisis affords the opportunity for bold action of a kind and on a scale that would otherwise seem unacceptable.



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The Problem

The fossil-fueled economy

Something both wonderful and terrible has happened in the past two centuries. As a people, we have become more mobile. We now spend only a small portion of our incomes on food, and only a tiny proportion of us need to bother ourselves with growing it. Our shopping malls have become filled with a dizzying array of products, many of them imported from around the world.

These are just some of the gifts of fossil fuels – concentrated energy sources that have proven both cheap and abundant.

But claiming these gifts has led us to build a societal infrastructure that is designed for, and utterly dependent on, plentiful oil, coal, and natural gas.

We have built cars and trucks, and an extensive network of highways on which they travel. We have built passenger aircraft that are swift and safe, and airports in practically all our cities.

We have configured our food system to take advantage of fossil fuels by mechanizing production, by using petrochemicals to fertilize crops and kill weeds and pests – and then by transporting food ever further distances to centralized processing and storage centers and finally to giant supermarkets intended to be accessed almost exclusively by private automobile.

We heat most of our homes with fossil fuels, and we have designed our homes around automobiles, setting aside a large portion of interior space to enclose them in garages.

We have built countless neighborhoods through and to which no one is expected to travel by any mode other than by car. We define the functionality of our cities by the highways that connect their neighborhoods and suburbs.

“We have become systemically dependent on cheap fossil fuels. And in this systemic dependency lie acute vulnerabilities.”

We have built an electric grid system to supply power for every aspect of commerce and daily life – from communication to entertainment to food refrigeration. This essential system depends on fossil fuels for two-thirds of its energy.

In short, we have become *systemically* dependent on cheap fossil fuels. And in this systemic dependency lie acute vulnerabilities.

Fossil fuel depletion

It may be too soon to speak of the end of fossil fuels altogether, but we have unquestionably reached the end of an era.

It is increasingly clear that global oil production growth is stalling, with permanent decline likely underway by 2012.⁴ The petroleum price spike of 2008, in which the cost of a barrel of oil rose to \$147, was a warning of what is to come. The International Energy Agency (IEA) World Energy Outlook 2008 report⁵ released in November concluded:

“Current global trends in energy supply and consumption are patently unsustainable,...the sources of oil to meet rising demand, the cost of producing it and the prices that consumers will need to pay for it...[are all now] extremely uncertain.”

⁴ Lerch, op cit. Gold & Davis, op cit.

⁵ International Energy Agency. (2008) *World Energy Outlook 2008*. Paris

The Problem (Cont.)

The report's Executive Summary points out that nearly all future world oil production growth depends on supplies from OPEC, and ends with the unequivocal judgment that "the era of cheap oil is over," warning member nations that, "the time to act is now."

We have tended to think of coal as being so abundant that supply constraints will not appear for many decades or even centuries. Yet a 2007 report⁶ by the National Academy of Sciences concluded:

"Present [official US] estimates of coal reserves are based upon methods that have not been reviewed or revised since their inception in 1974, and much of the input data were compiled in the early 1970s. Recent programs to assess reserves in limited areas using updated methods indicate that only a small fraction of previously estimated reserves are actually minable reserves."

A 2007 report⁷ from an energy research body established by members of the German Parliament suggests that production of coal in the US may reach its maximum level as early as 2030, after which it will decline as high-quality resources are exhausted. With such limited supplies, and in the absence of commercially viable "clean coal" carbon capture and sequestration technology – which is many decades away and has its own set of challenges regarding energy efficiency and scalability^{8,9} – coal is neither an economically nor environmentally sustainable solution for our future energy needs.

Production of conventional natural gas in North America is declining, but recent technical advances have enabled the industry to extract substantial new quantities of this fuel from low-porosity reservoirs. We are now hearing assurances from some of the companies producing such "unconventional" gas that the nation has over a hundred years' worth of the resource. However, rapid depletion rates in new gas wells have forced the industry to pursue ever-higher drilling rates, which today are three times what they were a decade ago. This suggests natural gas may be a much more short-lived national resources than is currently assumed.



"...In the absence of commercially viable "clean coal" carbon capture and sequestration technology... coal is neither an economically nor environmentally sustainable solution for our future energy needs."

⁶ National Academy of Science. (2007) *Coal: Research and Development to Support National Energy Policy*. Washington, D.C.: National Academies Press.

⁷ Zittel, W. & Schindler, J. (2007) *Coal: Resources and Future Production*. Ottobrun: Energy Watch Group.

⁸ Bell, R. (2007, April 16) Wanna Bet the Farm on Carbon Capture and Sequestration? *Global Public Media*. Retrieved from <http://globalpublicmedia.com/node/2481>. Bell reported from a Senate Energy and Natural Resources Committee hearing on carbon sequestration: "[T]he director of the U.S. Geological Survey, Dr. Mark Myers, laid out his timeline for commercialization: workable sequestration after 2012, the first commercial deployment by 2020, and widespread use of CCS in the '2045 time frame.' "

⁹ Smil, V. (2008, May 8) Correspondence: Long-range energy forecasts are no more than fairy tales. *Nature*, 453(154). "...[T]o sequester just 25% of CO₂ emitted in 2005 by large stationary sources of the gas...we would have to create a system whose annual throughput (by volume) would be slightly more than twice that of the world's crude-oil industry, an undertaking that would take many decades to accomplish."



The Problem (Cont.)

There are also economic problems with shifting to natural gas. The low amount of energy returned on the energy invested in producing unconventional gas suggests that further production growth will be achievable only with very high natural gas prices, and that much of the resource theoretically available will never be produced no matter how high the market price goes. Liquefied natural gas (LNG) imports are a poor long-term alternative given growing global demand for the fuel, significant gas import dependency in Europe, and reports of shipments being diverted en route to higher-bidding ports.¹⁰

Altogether, over the course of a few generations we have depleted what nature generated throughout tens of millions of years. We have picked the low-hanging fruit. We must plan and prepare for the end of fossil fuels now, while we still have a relative abundance of energy with which to build the alternative energy infrastructure that we will soon need.

Climate change

In the process of burning fossil fuels, we are releasing gases into the atmosphere that are changing the global climate, and thus reducing the survival prospects of future generations.

New data always seem to outdistance previous forecasts: the north polar icecap is melting much faster than projected, and thawing arctic permafrost is already releasing unexpectedly large quantities of methane¹¹, a greenhouse gas 20 times more powerful than carbon dioxide.

In other words, the level of greenhouse gases believed only a few years ago to be “safe” – in that it would not trigger catastrophic climate change – already seems to be making some of the predicted worst-case impacts a reality.

Leading climate scientist James Hansen of NASA, among others, is now advocating the adoption of 350 parts per million of atmospheric carbon dioxide as the global target for climate protection efforts.¹² The current level, however, is approximately 387 ppm. We are already beyond the threshold.

This means that, if humankind is to avoid catastrophic climate change, we must begin reducing fossil fuel carbon emissions immediately, and bring them virtually to zero before mid-century.

¹⁰ Pratley, N. (2008, May 1) Tide has turned for property prices. *The Guardian*. London. “There was a startling statistic in yesterday’s first-quarter figures from BG Group: 90% of its cargoes of liquefied natural gas (LNG) were diverted. In other words, 9 out of 10 of the group’s LNG tankers - many of which were heading from BG’s plant in Trinidad & Tobago to the US - were told to sail to other destinations because the cargoes had been sold to a higher bidder.”

¹¹ Connor, S. (2008, September 23) Exclusive: The methane time bomb. *The Independent*. London.

¹² Hansen, op cit.

“If humankind is to avoid catastrophic climate change, fossil fuel carbon emissions must be reduced virtually to zero before mid-century.”

The Problem (Cont.)

The financial crisis

Ostensibly, the ongoing credit crunch is the result of a subprime mortgage fiasco plus the leveraging of debt through financial instruments so sophisticated that virtually no one who purchased them understood their risk.

However, the fact that world oil production was essentially stagnant during the years 2005-2008 (leading up to price spike of 2008) should not be overlooked as a contributor to the economic meltdown. Previously, the growth of financial capital could be supported by the energy-based growth of the real national and global economy. But as energy prices soared – crippling the airline and auto industries and raising costs for farmers, manufacturers, and shippers – the financial balloon suddenly began to deflate.

Unfortunately, connections between energy and economic activity are often overlooked: energy is widely regarded as merely a component of the economy, whereas in fact the entire economy crucially depends upon energy. If energy supplies are cut off, economic activity halts; and without energy growth, economic growth becomes problematic if not impossible.

Paradoxically, now that the global economy is contracting, investment in future oil, coal, and gas production projects is dwindling. At the same time, investment in renewable energy projects is also falling away. This virtually guarantees future energy shortages.

The cruel result is that as soon as the economy begins to grow once again, energy supply limits and skyrocketing energy prices will nip recovery in the bud.

Therefore it would be self-defeating for the new Administration to put the energy transition on the back burner while giving full attention to the immediate financial crisis. *The financial crisis must be addressed by pursuing an energy transition.*

Similarities to, and differences from, the 1970s

The current energy and economic crises carry unmistakable and disturbing echoes of the 1970s. In 1977, President Carter addressed the nation with a stark message:

With the exception of preventing war, this is the greatest challenge our country will face during our lifetimes . . . We simply must balance our demand for energy with our rapidly shrinking resources. By acting now, we can control our future instead of letting the future control us... The most important thing about these proposals is that the alternative may be a national catastrophe. Further delay can affect our strength and our power as a nation... This difficult effort will be the "moral equivalent of war" – except that we will be uniting our efforts to build and not destroy.

In retrospect, his speeches were a courageous effort to prepare the nation for the inevitable decline in fossil fuel production, which now looms, and to avert geopolitical conflict over remaining supplies. Had we followed the course that President Carter recommended, America might not be so vulnerable today.

But Carter lost the 1980 election to Ronald Reagan, who promised a sacrifice-free return to prosperity. All politicians understandably regard this as a cautionary tale when considering any bold effort to reduce America's dependence on fossil fuels. Nevertheless, there are reasons that the situation today is different.

The Problem (Cont.)

First, the energy crisis isn't going away this time. In the 1980s, the nation could turn to recently discovered giant oilfields on Alaska's North Slope and the world had gained access to abundant, high-quality crude oil from the North Sea. Today there are few new frontiers available for exploration. Oil from the planet's polar regions (including ANWR) will be costly to produce and slow to arrive. Crucially, these new supplies will probably be insufficient to make up for worsening production declines from existing oilfields.¹³

Second, the economic crisis is worse this time. While the oil shocks of the 1970s and the costs of the Vietnam War forced the U.S. to repudiate the gold standard and resulted in several years of low or negative growth, the economic calamity currently engulfing the world is leading historians to look further back to the 1930s or the 19th century for precedents.

Many economists have concluded that interest rate adjustments and even \$1.5 trillion in bailout and stimulus packages will not be enough to forestall a depression. Something bold must be done – and it must involve government spending on a grand scale that has the effect of massive job creation. Today the question is not, Can our leaders afford to be bold? It is rather, Can they afford not to?

There simply is no longer a “business as usual” option for our energy future. According to the IEA, trillions of dollars of new investment will be needed for exploration and the implementation of new extraction technologies if fossil fuel production is to continue satisfying growing demand for the next two decades (for the world as a whole, over \$26 trillion will be required in year-2007 dollars for the period 2007-2030).¹⁴ On the other hand, trillions will also be needed to build a renewable energy infrastructure.

The difference is that the former solution would be temporary: fossil fuels are finite and depleting resources. We will still face scarcity even after paying the enormous cost of finding and developing the last of the world's oil and gas fields and coal mines. Renewables, on the other hand, can power society indefinitely. In either case most of the needed investment should come not from government, but from the private sector. However, government's role will be decisive in setting the course through leadership, coordination, regulation, and the provision of seed capital.

The current financial crisis forces the conclusion that America cannot have it both ways. Either we direct public investment toward developing expensive, low-grade fossil fuels (such as tar sands, oil shale, shale gas, and “clean coal”) in a vain effort to maintain growth in our fossil fuel dependent economy, or we direct investment toward building the renewable energy infrastructure of the future.

If the 1970s were an early warning, today is the moment for action. We will have no third chance at the energy transition.

¹³ This includes production declines in the North Sea and Alaska North Slope.

¹⁴ International Energy Agency op cit.

What are government agencies saying about fossil fuel depletion?

“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.”

Peaking of World Oil Production: Impacts, Mitigation, & Risk Management
prepared for U.S. Department of Energy by Hirsch, R. (SAIC) et al, February 2005

“The oil market will remain fairly stable in the very near term, but with steadily increasing prices as world production approaches its peak. The doubling of oil prices from 2003-2005 is not an anomaly, but a picture of the future. Oil production is approaching its peak; low growth in availability can be expected for the next 5 to 10 years... One can only speculate at the outcome from this scenario as world petroleum production declines.”

Energy Trends and Their Implications for U.S. Army Installations (ERDC/CERL TR-05-21),
U.S. Army Corps of Engineers, September 2005

“To better prepare for a peak in oil production, GAO recommends that the Secretary of Energy work with other agencies to establish a strategy to coordinate and prioritize federal agency efforts to reduce uncertainty about the likely timing of a peak and to advise Congress on how best to mitigate consequences.”

Crude Oil: Uncertainty about Future Oil Supply Makes It Important to Develop a Strategy for Addressing a Peak and Decline in Oil Production (GAO-07-283),
U.S. Government Accounting Office, February 28, 2007

“The world’s energy system is at a crossroads. Current global trends in energy supply and consumption are patently unsustainable – environmentally, economically, socially... [T]he sources of oil to meet rising demand, the cost of producing it and the prices that consumers will need to pay for it are extremely uncertain, perhaps more than ever.”

World Energy Outlook 2008,
International Energy Agency, November 2008.



“We need to reduce our overall energy consumption, and restructure our economy to run primarily on renewable energy.”

The Solution

The obvious answer to fossil fuel depletion and climate change is to simply substitute alternative energy sources for oil, natural gas, and coal.

However, this solution quickly bogs down on two fronts. First, there are no alternative energy sources (renewable or otherwise) capable of supplying energy as cheaply and in such abundance as fossil fuels currently yield in the time that we need them to come online. Second, we have designed and built the infrastructure of our transport, electricity, and food systems – as well as our national building stock – to suit the unique characteristics of oil, natural gas, and coal. Changing to different energy sources will require the redesign of many aspects of those systems.

The energy transition cannot be accomplished with a minor retrofit of existing energy infrastructure. Just as the fossil fuel economy of today systemically and comprehensively differs from the agrarian economy of 1800, the post-fossil fuel economy of 2050 will profoundly differ from all that we are familiar with now. This difference will be reflected in urban design and land use patterns, food systems, manufacturing and distribution networks, the job market, transportation systems, health care, tourism, and more.

It could be argued that these changes will occur in some fashion whether we plan for them or not, that it is only necessary to wait for the market price of fossil fuels to reflect scarcity, with higher costs forcing society to adapt. However, lack of government planning will result in a transition that is chaotic, painful, destructive, and possibly (if the worst climate forecasts are realized), unsurvivable. As a recent study for the U.S. Department of Energy showed, a passive approach to the fossil fuel depletion problem would lead to “social, economic, and political costs” of “unprecedented” scope.¹⁵ Once again: bold action is required.

We need to reduce our overall energy consumption, and restructure our economy to run primarily on renewable energy – and the federal government must lead the way. This energy transition should have five components: a massive shift to renewable energy, and a retrofitting of our transportation system, our electricity system, our food system, and our building stock.

¹⁵ Hirsch, R. et al. (2005) *Peaking of World Oil Production: Impacts, Mitigation, & Risk Management*. Washington, D.C.: U.S. Department of Energy.

The Solution (Cont.)

1. Make a massive and immediate shift to renewable energy

The development of alternative energy sources must be a cornerstone of any plan to reduce our national reliance on conventional fossil fuels. However, many alternatives being discussed – including nuclear power, industrial-scale biofuels, and low-grade fossil fuels such as oil shale and tar sands – suffer from serious drawbacks, including low energy profit ratios, high environmental impacts, or a limited resource base.

Renewable energy sources such as wind, solar, and advanced geothermal clearly are a long-term solution to the nation's and the world's energy problems. However, further research is needed into new energy storage technologies, as well as new photovoltaic materials and processes, and new geothermal and tidal power technologies. While much of this could be accomplished by the private sector, the economic crisis is likely to delay or undercut needed funding, increasing the need for government support.

The U.S. Department of Energy should be tasked with undertaking a rapid but thorough assessment of available alternative energy production technologies using a carefully mapped set of consistent criteria. This assessment should be formatted in a way that helps states and communities, as well as the federal government, make practical planning and investment decisions.

Given the immediacy of this need, Post Carbon Institute, in collaboration with the International Forum on Globalization, is conducting a preliminary

comparative review of alternative energy sources, using criteria including energy profit ratio, environmental impacts, scalability, and materials requirements. That publication will be available by February 2009.

2. Electrify the transportation system

America's existing investment in highways, airports, cars, buses, trucks, and aircraft is enormous. However, this is a transport system that is almost completely dependent on oil. It will be significantly handicapped by higher fuel prices, and devastated by actual fuel shortages.

The electrification of road-based vehicles will help; however, this strategy will require at least two decades to fully deploy, given that the average passenger vehicle has a useful

lifetime of 15 years.¹⁶ Meanwhile, road repair and tire manufacturing will continue to depend upon petroleum products, unless alternative materials can be found.

Even if it is electrified, a ground transport system consisting of trucks and private automobiles is inherently energy intensive compared to public transit alternatives like bus and rail, and non-motorized alternatives like bicycling and walking. The building and widening of highways must therefore come to a halt, and the bulk of federal transportation funding must be transferred to support electrified and non-motorized infrastructure and services. This overall shift of transport investments and priorities will require comprehensive planning and coordination at all levels of government.

¹⁶ Ibid.

The Solution (Cont.)

There are few if any good options for maintaining the airline and air freight industries without cheap fossil fuels. While some amount of air travel is likely to persist throughout the transition, its cost will inevitably and persistently rise, and the airline industry will contract accordingly. Increasingly, high-speed electric rail connections between major cities will become the lower-cost option, but the national high speed rail network is still in its infancy.

Meanwhile, the existing fleet of private automobiles must be put to use more efficiently through carpooling, car-sharing, and ride-sharing networks coordinated primarily at the local level, but supported by federal policy and funding.

3. Rebuild the electricity grid

Nearly all experts on the U.S. electricity grid agree that the system is approaching crisis and desperately needs a substantial overhaul.¹⁷ Electricity demand has been growing at over one percent per year due to rising population and an explosion in the numbers and types of electronic devices now considered essential, yet power generation capacity has not kept up. Meanwhile our transmission networks rely on 100-year-old technology and high-voltage trunk lines that were installed in the 1950s and '60s. It is a fragile and extremely inefficient infrastructure, and managers of the system anticipate widespread blackouts in the near future.

What is needed is not merely an enhancement of the existing system with more of the same technology. New generating capacity must come from renewable

sources, many of which are intermittent and are likely to be sited far from existing power lines. The transmission system must support distributed generation, as well as robust two-way communications, advanced sensors, and distributed computers to improve the efficiency, reliability, and safety of power delivery and use.

“The federal government must set goals and standards and provide public investment capital to rebuild our electricity grid.”

Regional utility companies are already beginning to invest in renewables and “smart grid” upgrades, but the work is going much too slowly to avert looming power supply problems. Moreover, the credit crunch will likely slow the work that is currently under way.

Therefore the federal government must step in to set goals and standards and to provide public investment capital. This effort must not favor commercial utilities over municipal power districts; indeed, the devolution of control over power systems to the community level should be encouraged, as decentralized power systems are likely to be more resilient in the face of now-inevitable power disruptions.

4. De-carbonize and relocalize the food system

Our national industrial food system performs spectacularly well at producing cheap, abundant food using minimal human labor. However, it is overwhelmingly dependent upon oil and natural gas for tractor fuel, fertilizer, pesticides, herbicides, and the transport of farm inputs and outputs. Additionally, the current food system is responsible for approximately 12% of all greenhouse gases introduced into the atmosphere from human activities in the U.S.¹⁸

¹⁷ Jelter, J. (2008, July 11) Commentary: The urgent need to upgrade the grid. *MarketWatch*. San Francisco.

¹⁸ Heller, M. & Keoleian, G. (2003, June) “Assessing the Sustainability of the US Food System: A Life Cycle Perspective,” *Agricultural Systems*, Volume 76, issue 3, 1007-1041

The Solution (Cont.)

This situation is patently unsustainable, as author Michael Pollan eloquently detailed in a recent open letter to President-elect Obama.¹⁹ As fuel prices rise, farmers will go bankrupt and food prices will skyrocket. As the global climate becomes destabilized, crops will wither. Unless America undertakes a planned redesign of its food system to eliminate dependence on fossil fuels, the future looks bleak. Famine, which formerly was an unwelcome but unavoidable fact of life in agrarian societies, could make a comeback even here in the wealthy U.S.

New farming methods, new farmers, and a re-localization of production and distribution are all needed.

These in turn will require land reform, educational and financial support for new farmers, and the creation of local food processing and storage centers.

Post Carbon Institute, in collaboration with the Soil Association of Great Britain, is producing a report (forthcoming in early 2009) on “The Food and Agriculture Transition,” highlighting the context, issues, and possible strategies in detail.

5. Retrofit the building stock for energy efficiency and energy production.

Most Americans live in homes that require heat during the winter months, and most of those homes are inadequately insulated by modern standards. Natural gas heats most of the nation’s homes, with a majority in the Northeast heated by oil. Buildings in the South and Southwest require air conditioning

during summer months. Fuel shortages, power outages, and energy price hikes could bring not just discomfort, but a massive increase in mortality from cold and heat.

The technology already exists to increase energy efficiency in both new and existing buildings.

Germany has successfully pioneered the “Passive

House” standard that dramatically reduces the energy required for heating and cooling; the European Union is considering adopting it as a building standard by 2012.

In this country, organizations like Affordable Comfort Incorporated (ACI) have been doing important work along similar lines for decades, and both the US Conference of

Mayors and the American Institute of Architects have adopted the 2030 Challenge²⁰ to set a nationwide carbon-neutral standard for all new buildings by 2030.

Throughout America, millions of buildings can and must be super-insulated and, in as many instances as possible, provided with alternative heat sources (passive solar, geothermal, or district heating).

The widespread deployment of existing knowledge and experience to retrofit millions of American homes and public buildings will require investment as well as trained workers. Once again, the potential exists for the creation of millions of jobs – as Van Jones has discussed in his proposals for a Clean Energy Corps²¹. But funding, new regulations, and education are needed.

“New farming methods, new farmers, and a re-localization of production and distribution are all needed.”

¹⁹ Pollan, M. (2008, October 9) Farmer in Chief. *The New York Times Magazine*. New York.

²⁰ See http://www.architecture2030.org/2030_challenge.

²¹ Jones, V. (2008) *Clean Energy Corps: Jobs, Service, and Equal Opportunity and America’s Clean Energy Economy*. Oakland: Green for All.



“Enormous amounts of investment capital will need to be mobilized to accomplish the energy transition.”

Requirements for an Energy Transition

1. Investment and capitalization

Clearly, enormous amounts of investment capital will need to be mobilized to accomplish the energy transition. The promise of \$150 billion to be spent on renewable energy over the next ten years is a welcome beginning, but it is a mere fraction of what is needed to fund the entire transition program.²² As noted, much of the needed investment can eventually come from the private sector, but since the private sector is currently contracting economically this puts the onus back on government.

How can enough capital be deployed? The current practice of deficit spending may not be sustainable in the context of a faltering global economy, as there may be limited demand for U.S. government IOUs.

Other options for creating the needed capital should be explored, such as direct money creation through government spending. While this practice might have adverse implications for the value of the dollar, it is constitutional and has historical precedents during the Kennedy and Lincoln presidencies.

2. Coordination

The energy transition will be complex and comprehensive, and its various strategies will be mutually impacting. For example, efforts to redirect transport away from highways and toward rail service will need to be coordinated with manufacturers, farmers, retailers, and employers.

Therefore, within every government department considerable effort will need to be spent coordinating that department’s overall efforts with the energy transition.

The coordination process could be aided substantially by the Obama Administration creating an Energy Transition Office, tied to no existing agency, specifically tasked with tracking and managing the transition and with helping existing agencies work together toward the common goal.

²² For example, Google has published a plan (see <http://preview.tinyurl.com/5fsrp3>) to transition to renewable energy in 20 years at a cost of \$4.4 trillion, which is about 30 times \$150 billion.

Requirements for an Energy Transition (Cont.)

3. Carbon and energy policy

Worldwide, there has already been much discussion of, and some experimentation with, policies to discourage fossil fuel use and encourage the transition to renewable energy sources. More exploration of such policy options is needed.

The carbon Cap-and-Trade scheme that was deployed in the European Union, in which fossil fuel companies were automatically awarded carbon credits, has tended merely to push high-polluting jobs to poorer nations, while enriching bankers with trading commissions and rewarding established polluters.²³

The auctioning of all carbon credits, so that existing polluters must buy them, would be a clear improvement on that system. Cap-and-Dividend²⁴ or Cap-and-Share²⁵ programs would go further still by promoting social equity, with the proceeds from carbon credit auctions going directly to the public to offset the impact of rising energy costs.

As Al Gore has suggested, carbon taxes could raise government revenue to pay for the energy transition and discourage fossil fuel consumption while replacing payroll taxes—thus adding minimally or not at all to the tax burden of citizens.²⁶

However, all such systems assume a market for fossil fuels in which severe resource scarcity plays little or no role. In fact, scarcity may partially undermine carbon trade, share, or dividend systems (no oil company would need to buy carbon credits if the supply of oil is shrinking as fast as yearly caps would otherwise mandate), while resulting in extreme price volatility that would overwhelm both individual consumers and entire industries. Under a carbon tax system, falling

oil production would translate to falling government tax revenues. One policy solution to the depletion-led scarcity dilemma might be a Tradable Energy Quotas (TEQs) rationing system, such as is being studied in Britain.

In a Tradable Energy Quota system, quotas of carbon or specific fossil fuels (e.g., gasoline) would be issued electronically to all adults yearly, with the information stored on a magnetic card swiped at the point of fuel purchase. Each year the total quantity of quotas would be reduced to conform either with carbon reduction targets or declining fuel availability. Consumers would sell extra quotas or purchase them as needed, with the market price reflecting aggregate supply and demand. Each consumer would thus have an immediate interest in conserving fuel. Allowances could be made for low-income citizens with temporary need for more quotas as they get rid of older cars and insulate homes.

Policy tools to directly support the development of renewable energy sources, such as Renewable Portfolio Standards (RPS) and Feed-in Tariffs, should also be reviewed for effectiveness. In general, Feed-in Tariffs, in which government guarantees a price for electricity generated from renewable sources, appear to succeed in harnessing entrepreneurial zeal to the energy transition. In November 2008, the British government passed an energy bill that included just such a provision.

State-level financing policies like California's AB 811 could help cities provide low-interest loans to homeowners for renewable energy.

²³ Goodstein, B. (2007, June 1) *Learning from Europe: Designing Cap-and-Trade Programs that Work*. Washington, D.C.: The Center for American Progress.

²⁴ See <http://www.capanddividend.org>.

²⁵ See <http://www.capandshare.org>.

²⁶ Gore, A. (2006) *An Inconvenient Truth: The Planetary Emergency of Global Warming and What We Can Do About It*. New York: Rodale.

Requirements for an Energy Transition (Cont.)

Meanwhile, laws and incentives affecting the food system (including food safety laws and farm subsidies) will need to be reconsidered so as to provide preferential support for small-scale, local, low-input producers.

4. EDUCATION

The energy transition will result in the creation of many millions of new jobs and careers. While President-elect Obama called for the creation of five million green-collar jobs, the energy transition will in fact demand something on the order of a ten-fold increase in that goal. However, these new jobs and careers will require skill sets largely different from those currently being imparted by our educational system.

Because they are inexpensive, numerous, and widely dispersed, community colleges could play a central role in preparing workers for new opportunities in sustainable food production, renewable energy installation, grid rebuilding, rail expansion, public transport construction, and home energy retrofiting.

In order for community colleges to fill this new role, teacher training and curriculum development on a grand scale will be needed, ideally organized and coordinated at the national level through the Department of Education.

This reorientation of curriculum should begin with gardening programs in all grade schools and increased course emphasis on topics related to energy and conservation.

5. PUBLIC MESSAGING

The successful management of a project of the scope outlined here will require public buy-in at every stage and level, and this in turn will depend upon the use of language and images to continually underscore what is at stake, to focus attention on immediate and long-range goals, and to foster a spirit of cooperation and willing sacrifice. This in itself is no small task in a nation that is politically divided and that has come to regard consumerism as patriotic.

As in the New Deal and World War II, business leaders, advertising agencies and even Hollywood must be enlisted in the effort. Indeed, this high-level cooperation should be seen as a quid pro quo for the Federal government's enormous efforts to salvage the economy by bailing out banks and corporations.

President-elect Obama built his campaign around grassroots organization and the empowerment of individuals to take ownership of a movement. The energy transition could similarly benefit from a sophisticated, interactive, web-based program to inspire individual and group action by providing tools and resources for reduction of fossil fuel dependence.

Tax breaks could be offered to businesses, churches, and other groups that develop personal action teams. Civic programs, such as a mayors' challenge, could also play a significant role. Grassroots initiatives, such as the international Transition Towns movement,²⁷ could lead the way toward voluntary community efforts to end fossil fuel dependency.

²⁷ See <http://www.transitiontowns.org>.

Requirements for an Energy Transition (Cont.)

6. PLANNED DECENTRALISM

During the Franklin Roosevelt Administration, advisors engaged in a healthy debate about whether the New Deal should consist solely of a top-down imposition of new bureaucratic programs, or whether it should also, or primarily, seek to build healthy local communities and regions with the autonomy to design their own development strategies. Arthur Morgan was perhaps the primary decentralist intellectual of the period, but the movement – which traces back to Thomas Jefferson – included southern agrarians as well.

In the present instance, decentralist ideas and strategies must be taken even more seriously than was the case in the 1930s, if only because the end of cheap energy will inevitably entail a reduction in Americans' mobility, and a re-localization of production and consumption.

This emphasis on decentralism could translate to the creation of programs designed at the sub-federal level that promote increasing regional self-sufficiency in food, manufacturing, and energy production.

7. CHALLENGING GOALS AND TARGETS

The energy transition cannot be accomplished in four years or eight: the construction of our existing fossil fuel-based societal infrastructure required a century, and its replacement will take three or four decades at a bare minimum. What can and must be accomplished in a single administration is the essential change of direction – the beginning of a process of renewal that can persist through other administrations to its ultimate fruition.

The Obama Administration can effect this change of direction by instilling in the nation a sense of collective struggle and of a long journey toward a clear goal. A series of challenging yet feasible annual and four-year targets should be set at the beginning of the transition process, with the ultimate goal – complete freedom from fossil fuel dependency – to be achieved by 2050. Future Administrations will be in positions to adjust strategies toward the realization of that goal, but the goal itself must remain irrevocable through bipartisan consensus.



“This emphasis on decentralism could translate to the creation of programs designed at the sub-federal level that promote increasing regional self-sufficiency in food, manufacturing, and energy production.”



Requirements for an Energy Transition (Cont.)

Targets should touch every sector of the economy, and include households, businesses, educational institutions, and government alike. They should aim to reduce carbon emissions, reduce fuel consumption, build renewable energy generation capacity, and retrofit our transportation system, electricity system, food system, and building stock for a world without cheap fossil fuels. The Federal government should take the lead by setting targets for all federal buildings, departments, and employees. Achievement of annual targets should be cause for public celebration, mutual congratulation, and a refocusing of effort on the long-term goal.

“The energy transition cannot be accomplished in four years or eight... What can and must be accomplished in a single administration is the essential change of direction.”

Conclusion

What is being suggested in this proposal is a project of enormous and unprecedented scope. The authors have not exaggerated the likely costs of inaction, nor have they overstated the critical need for comprehensive changes in interconnected societal systems that now depend upon an unmaintainable flow of cheap fossil fuels. The challenges America faces are real and urgent, and the road ahead will not be easy.

And yet, we stand to reap enormous benefits by pursuing this energy transition. By ending our national addiction to fossil fuels, we can eliminate the need to police energy-rich areas of the world and save hundreds of billions of dollars annually through reduced military budgets.

We can save hundreds of billions more by creating a food system that substantially reduces massive health problems such as obesity, cancer, and asthma. We can dramatically curtail environmental pollution, most of which results directly or indirectly from fossil fuel use.

We can help Americans become more skilled and self-reliant, and able to contribute meaningfully to building their own communities' resilience – and they

will be happier as a consequence. We can reduce our nation's political divisions by calling forth qualities of character prized by both liberals (concern for the welfare of others) and conservatives (local autonomy and self-sufficiency).

In the end, what will be accomplished by this enormous collective effort is not merely the reversal of a historic economic and environmental calamity but the revival of a civilization – and the creation of a sustainable foundation for the accomplishments of future generations.

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