

THE VIEW FROM OIL'S PEAK



RICHARD
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Total \$

Litres

15.16

Taxes Included
in Gasoline Prices
in Alberta

5% GST

10¢ per litre
Federal Excise Tax

9¢ per litre
Provincial Gasoline Tax

VOLUME CORRECTED TO 15° C.
VOLUME CORRIGÉ À 15° C.

Out of GAS

Sorry For Inconvenience

English
Français

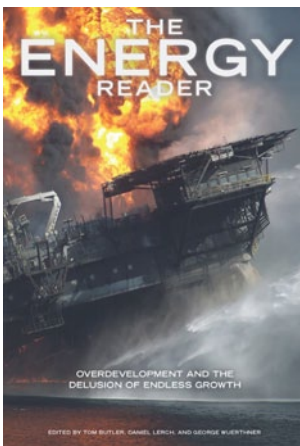
Speedpass



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ABOUT THE AUTHOR

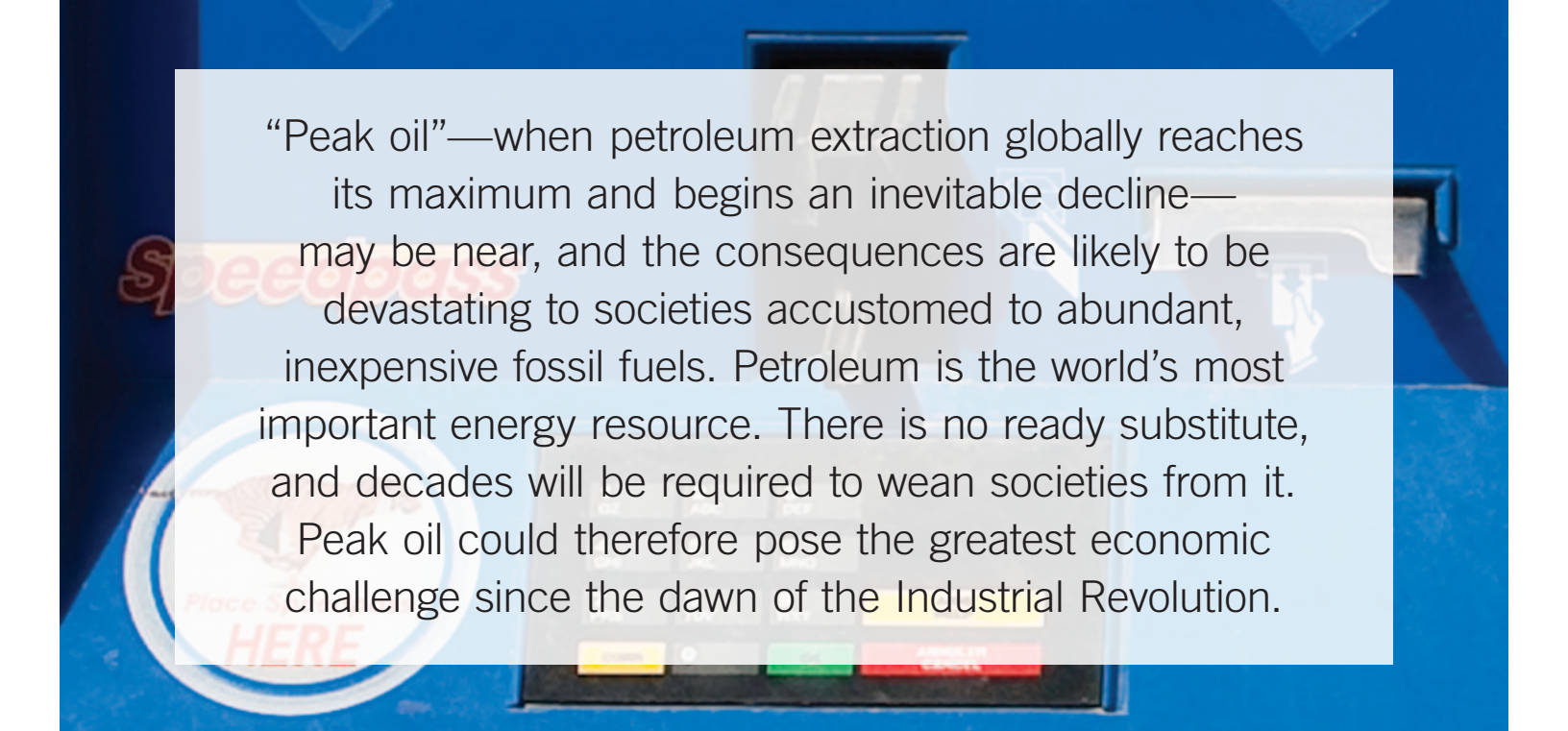
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“Peak oil”—when petroleum extraction globally reaches its maximum and begins an inevitable decline—may be near, and the consequences are likely to be devastating to societies accustomed to abundant, inexpensive fossil fuels. Petroleum is the world’s most important energy resource. There is no ready substitute, and decades will be required to wean societies from it. Peak oil could therefore pose the greatest economic challenge since the dawn of the Industrial Revolution.

During the past decade a growing chorus of energy analysts has warned of the approach of “peak oil,” when the global rate of petroleum extraction will reach its maximum and begin its inevitable decline. While there is some dispute among experts as to *when* this will occur, there is none as to *whether*. The global peak is merely the cumulative result of production peaks in individual oil fields and in oil-producing nations. The most important national peak occurred in the United States in 1970. At that time America produced 9.5 million barrels per day (mbd) of oil; the current figure is less than 6 mbd. While at one time the United States was the world’s top oil-exporting nation, it is today the world’s top importer.

The U.S. example helps in evaluating the prospects for delaying the global peak. After 1970, exploration efforts succeeded in identifying two enormous new American oil provinces—the North Slope of Alaska and the Gulf of Mexico. Meanwhile biofuels (principally ethanol) began to supplement crude. Also, improvements in oil recovery technology helped to increase the proportion of the oil in existing fields able to be extracted. These are the strategies (exploration, substitution, and technological improvements) that the energy industry is relying on either to delay the global production peak or to mitigate its impact. In the United States, each of these strategies made a difference—but not enough to reverse, for more than a few years now and then, a

forty-year trend of declining production. The situation for the world as a whole is likely to be similar.

How near is the global peak? Today most oil-producing nations are seeing reduced output. In some instances, these declines are occurring because of lack of investment in exploration and production, or domestic political problems. But in most instances the decline results from factors of geology: While older oil fields continue to yield crude, beyond a certain point it becomes impossible to maintain maximum flow rates. Meanwhile, global rates of discovery of new oil fields have been declining since 1964.

These two trends—a growing preponderance of past-peak producers and a declining success rate for exploration—suggest that the world peak may be near. The consequences of peak oil are likely to be devastating. Petroleum is the world’s most important energy resource. There is no ready substitute, and decades will be required to wean societies from it. Peak oil could therefore pose the greatest economic challenge since the dawn of the Industrial Revolution. For policy makers, five questions seem paramount:

1. How are the forecasts holding up?

While warnings about the end of oil were voiced in the 1920s and even earlier, the scientific study of petroleum

depletion began with the work of geophysicist M. King Hubbert, who in 1956 forecast that U.S. production would peak within a few years of 1970 (in fact, that was the exact peak year), and who went on to predict that world production would peak close to the year 2000.

Shortly after Hubbert's death in 1989, other scientists issued their own forecasts for the global peak. Foremost among these were petroleum geologists Colin J. Campbell and Jean Laherrère, whose article "The End of Cheap Oil," published in *Scientific American* in March 1998, sparked the contemporary peak oil discussion. In the following decade, publications proliferated, including dozens of books, many peer-reviewed articles, websites, and film documentaries.

Most of the global peaking dates forecast by energy experts in the past few years have fallen within the decade from 2005 to 2015.¹ Running counter to these forecasts, IHS CERA, a prominent energy consulting firm, has issued reports foreseeing no peak before 2030.²

Are events unfolding in such a way as to support near-peak or the far-peak forecasts? According to the International Energy Agency, the past seven years have seen essentially flat production levels. These years have also seen extremely high oil prices, which should have provided a powerful incentive to increase production. The fact that actual crude oil production has not substantially increased during this period strongly suggests that the oil industry is near or has reached its capacity limits. It will be impossible to say with certainty that global oil production has peaked until several years after the fact. But the notion that it may already have reached its effective maximum must be taken seriously by policy makers.

2. *What about other hydrocarbon energy sources?*

If oil is becoming more scarce and less affordable, it would make sense to replace it with other energy sources, starting with those with similar characteristics—such as alternative hydrocarbons. There are very large amounts of total hydrocarbon resources; however, each is constrained by limits of various kinds. Bitumen

(often called "oil sands" or "tar sands"), kerogen (sometimes referred to as "oil shale"), and shale oil (oil in low-porosity rocks that requires horizontal drilling and hydraulic fracturing for recovery) do not have the economic characteristics of regular crude oil, being more expensive to produce, delivering much lower energy return on investment, and entailing heavier environmental risks. Production from these sources may increase, but is not likely to offset declines in conventional crude over time.

Coal is commonly assumed to exist in nearly inexhaustible quantities. It could be used to produce large new amounts of electricity (with electric transport replacing oil-fueled cars, trucks, and trains), and it can be made into a liquid fuel. However, recent studies have shown that world coal reserves have been severely overestimated. Meanwhile, China's spectacular coal consumption growth virtually guarantees higher coal prices globally, making coal-to-liquids projects impractical.

Natural gas is often touted as a potential replacement for both oil and coal. However, conventional gas production in the United States is in decline. Unconventional gas production via hydraulic fracturing ("fracking") is increasing supplies over the short term, but this new production method is expensive and entails serious environmental risks; also, fracked gas wells deplete quickly, necessitating very high drilling rates.

Thus, while in principle there are several alternative hydrocarbon sources capable of substituting for conventional crude oil, all suffer from problems of quality and/or cost.

3. *What might happen in the next decades absent policies to address peak oil?*

The likely consequences of peak oil were analyzed at some length in the report, "Peaking of World Oil Production: Impacts, Mitigation, and Risk Management" (also known as the Hirsch Report), commissioned for the U.S. Department of Energy and published in 2005.³ That report forecast "unprecedented" social, economic, and political impacts if efforts are not undertaken, at a

“crash program” scale, and beginning at least a decade in advance of the peak, to reduce demand for oil and initiate the large-scale production of alternative fuels.

Clearly, the level of impact will depend partly on factors that can be influenced by policy. One factor that may *not* be susceptible to policy influence is the rapidity of the post-peak *rate of decline* in global oil production. The Hirsch Report simply assumed a 2 percent per year decline. In the first few years after peak, the actual decline may be smaller. That rate may increase as declines from existing fields accumulate and accelerate.

However, for some nations the situation may be much worse, since available oil export capacity will almost certainly contract faster than total oil production. Every oil-exporting nation also consumes oil, and domestic demand is typically satisfied before oil is exported. Domestic oil demand is growing in most oil-producing nations; thus the net amount available for export is declining even in some countries with steady overall production. Nations that are major oil importers, such as the United States, China, and many European nations, will feel strongly the effects of sharp declines in the amount of oil available on the export market.

High prices and actual shortages will dramatically impact national economies in several ways. The global transport system is almost entirely dependent on oil—not just private passenger automobiles, but trucks, ships, diesel locomotives, and the entire passenger and freight airline industry. High fuel prices will thus affect entire economies as travel becomes more expensive and manufacturers and retailers are forced to absorb higher transport costs.

Conventional industrial agriculture is also overwhelmingly dependent on oil, as modern farm machinery runs on petroleum products and oil is needed for the transport of farm inputs and outputs. Oil also provides the feedstock for making pesticides. According to one study, approximately seven calories of fossil fuel energy are needed to produce each delivered calorie of food energy in modern industrial food systems.⁴ With the global proliferation of the industrial-chemical agricul-

ture system, the products of that system are now also traded globally, enabling regions to host human populations larger than local resources alone could support. Those systems of global distribution and trade also rely on oil. Within the United States, the mean distance for food transport is now estimated at 1,546 miles.⁵ High fuel prices and fuel shortages therefore translate to increasing food prices and potential food shortages.

A small but crucial portion of oil consumed globally goes into the making of plastics and chemicals. Some of the more common petrochemical building blocks of our industrial world are ethylene, propylene, and butadiene. Further processing of just these three chemicals produces products as common and diverse as disinfectants, solvents, antifreezes, coolants, lubricants, heat transfer fluids, and of course plastics, which are used in everything from building materials to packaging, clothing, and toys. Future oil supply problems will affect the entire chain of industrial products that incorporates petrochemicals.

Economic impacts to transport, trade, manufacturing, and agriculture will in turn lead to internal social tensions within importing countries. In exporting countries the increasing value of remaining oil reserves will exacerbate rivalries between political factions vying to control this source of wealth. Increased competition between consuming nations for control of export flows, and between importing nations and exporters over contracts and pipelines, may lead to international conflict. None of these effects is likely to be transitory. The crisis of peak oil will not be solved in months, or even years. Decades will be required to reengineer modern economies to function with a perpetually declining supply of oil.

4. How is the world responding?

In 1998, policy makers had virtually no awareness of peak oil as an issue. Now there are peak oil groups within the U.S. Congress and the British Parliament, and individual members of government in many other countries are keenly aware of the situation. Government reports have been issued in several nations.⁶ Some cities have

undertaken assessments of petroleum supply vulnerabilities and begun efforts to reduce their exposure.⁷ A few nongovernmental organizations (NGOs) have been formed for the purpose of alerting government at all levels to the problem and helping develop sensible policy responses—notably, the Association for the Study of Peak Oil and Gas (ASPO) and the Post Carbon Institute. And grassroots efforts in several countries have organized “Transition Initiatives” wherein citizens participate in the development of local strategies to deal with the likely consequences of peak oil.

Unfortunately, this response is woefully insufficient given the scale of the challenge. Moreover, policies that are being undertaken are often ineffectual. Efforts to develop renewable sources of electricity are necessary to deal with climate change; however, they will do little to address the peak oil crisis, since very little of the transport sector currently relies on electricity that could be supplied from solar, wind, or other new electricity sources. Biofuels are the subject of increasing controversy having to do with ecological problems, the displacement of food production, and low energy efficiency; even in the best instance, they are unlikely to offset more than a small percentage of current oil consumption.

5. *What would be an effective response?*

One way to avert or ameliorate the impacts of peak oil would be to implement a global agreement to proactively reduce the use of oil (effectively, a reduction in *demand*) ahead of actual scarcity. Setting a bold but realistic mandatory target for demand restraint would reduce price volatility, aid with preparation and planning, and reduce international competition for remaining supplies. A proposal along these lines was put forward by physicist Albert Bartlett in 1986, and a similar one by petroleum geologist Colin Campbell in 1998; Campbell's proposal was the subject of the book *The Oil Depletion Protocol: A Plan to Avert Oil Wars, Terrorism and Economic Collapse*.⁸ In order to enlist public support for such efforts, governments would need to devote significant resources to education campaigns. In addition, planning and public investment would be needed in transportation, agriculture, and chemicals-materials

industries. For each of these there are two main strategic pathways.

TRANSPORTATION

- Design communities to reduce the need for transportation (localize production and distribution of goods including food, while designing or redesigning urban areas for density and diversity);
- Promote alternatives to the private automobile and to air- and truck-based freight transport (by broadening public transport options, creating incentives for use of public transportation, and creating disincentives for automobile use). First priority should go to electrified transport options, as these are most efficient, then to alternative-fueled transport options, and finally to more-efficient petroleum-fueled transport options.

AGRICULTURE

- Maximize local production of food in order to reduce the vulnerability implied by a fossil fuel-based food delivery system;
- Promote forms of agriculture that rely on fewer fossil fuel inputs.

MATERIALS AND CHEMICALS

- Identify alternative materials from renewable sources to replace petrochemical-based materials;
- Devise ways to reduce the amount of materials consumed.

Oil depletion presents a unique set of vulnerabilities and risks. If policy makers fail to understand these, nations will be mired in both internal economic turmoil and external conflict caused by fuel shortages. Policy makers may assume that, in addressing the dilemma of global climate change via carbon caps and trades, they would also be doing what is needed to deal with the problem of dependence on depleting petroleum. This could be a dangerously misleading assumption.

Fossil fuels have delivered enormous economic benefits to modern societies, but we are now becoming aware of the burgeoning costs of our dependence on these fuels. Humanity's central task for the coming decades must be the undoing of its dependence on oil, coal, and natural gas in order to deal with the twin crises of resource depletion and climate change. It is surely fair to say that fossil fuel dependency constitutes a systemic problem of a kind and scale that no society has ever had to address before. If we are to deal with this challenge successfully, we must engage in systemic thinking that leads to sustained, bold action.

ENDNOTES

- 1 See the author's discussion of peaking date forecasts in Richard Heinberg, *The Party's Over: Oil, War and the Fate of Industrial Societies* (Gabriola Island, BC: New Society Publishers, 2005, 2nd ed.), 111–118.
- 2 See, for example, Peter Jackson, *The Future of Global Oil Supply: Understanding the Building Blocks* (Englewood, CO: IHS CERA, 2009), <http://www.scribd.com/doc/22666201/The-Future-of-Global-Oil-Supply>.
- 3 Robert Hirsch, Roger Bezdek, and Robert Wendling, *Peaking of World Oil Production: Impacts, Mitigation, & Risk Management* (McLean, VA: SAIC, 2005), http://www.netl.doe.gov/publications/others/pdf/oil_peaking_netl.pdf.
- 4 David Pimentel and Marcia Pimentel, “The Future of American Agriculture,” in *Sustainable Food Systems*, ed. Dietrich Knorr (Roslyn, NY: AVI Publishing Co., 1983).
- 5 Rich Pirog and Andrew Benjamin, *Calculating Food Miles for a Multiple Ingredient Food Product* (Ames, IA: Leopold Center for Sustainable Agriculture, 2005).
- 6 See, for example, *Crude Oil: Uncertainty about Future Oil Supply Makes It Important to Develop a Strategy for Addressing a Peak and Decline in Oil Production* (Washington, DC: US Government Accountability Office, February 2007), <http://www.gao.gov/new.items/d07283.pdf>.
- 7 See, for example, Daniel Lerch, *Post Carbon Cities: Planning for Energy and Climate Uncertainty* (Sebastopol, CA: Post Carbon Institute, 2007).
- 8 Richard Heinberg, *The Oil Depletion Protocol: A Plan to Avert Oil Wars, Terrorism and Economic Collapse* (Gabriola Island, BC: New Society Publishers, 2006).