



ALTERNATE FUEL TECHNOLOGY

Global Oil Peaking... Are We There Yet?

Editor's note: In this article author Bob Rodriguez brings us up to date on the issues being discussed in Congress and around the world about the controversial topic of Global Oil Peaking and its potential impact. Views expressed are those of the author and cited experts.

Representative Roscoe Bartlett (R-Md.) recently stated, "[T]he need to address global peak oil is growing rapidly." In a recent speech to the Brookings Institution Leadership Forum, Senator Richard Lugar (R-Ind.) said, "Within 25 years, the world will need 50% more energy than it does now," and added, "...in the absence of a major reorientation in the way we get our energy, life in America is going to be much more difficult in the coming decades."¹

If these Congressmen are concerned about our energy future, perhaps it's time we take a closer look. The social, economic and political impacts associated with oil peaking are formidable. Oil peaking occurs when approximately half the total recoverable oil reserves are used.



This Dodge Sprinter Plug-in hybrid van, being tested in the U.S., is one answer to conserve petroleum and reduce imports from overseas. Plug-in hybrids can be recharged in standard electric sockets with 70 cents per gallon (gasoline equivalent) of electrical energy and then be driven 20 to 60 miles without using gasoline.

Mounting Evidence

Are we really running out of oil? Some say we're already entering the second half of the oil age, but others disagree. The evidence is mounting. Rep. Bartlett, referring to Shell Oil geologist Dr. Marion King Hubbert, notes, "Hubbert predicted in 1956 that the United States would peak in oil production in 1970 and he was right on. Oil production in the United States has declined every year since then." Regarding global oil supply, Bartlett adds, "Thirty-three of 48 major oil producing nations have now peaked. Experts only differ on the timing of global peak oil, but many predict it's imminent." In a widely circulated U.S. Dept. of Energy sponsored study known as the Hirsch Report, one reads, "The earth's endowment of oil is finite and demand for oil continues to in-

crease with time. Accordingly, geologists know that at some future date, conventional oil supply will no longer be capable of satisfying world demand. ... World oil peaking is going to happen...[and] at that point world conventional oil production...will begin to decline." Hirsch also observes, "...The world has never faced a problem like this."

Not If, but When?

When will global oil peak? The answer depends on who you ask. Some say it's happening now; others optimistically say within 20 years. Oil executives say we have plenty of heavy-oil in tar sands, in oil shale, in deep offshore areas – oil that can be extracted using improved oil recovery methods. But exploration, drilling and production are risky and increasingly expensive. Predicting how much "sweet" oil remains is as much an art as a science; and the facts are muddled by political and economic interests. (See graph.) Investors get nervous about untried technology, environmental issues, weather and geological disruptions, political upheavals (sabotage) and so forth. When speculators get nervous, oil prices go up.

Until now pump prices have remained (relatively) low partly because oil companies (and even governments) have issued optimistic reports (see Kuwait oil graph) about extensive oil reserves. But in a post-Enron environment, investors are more skeptical and question such reports. A. M. Samsam Bakhtiari, an acknowledged authority on Middle East oil says, "It is now common knowledge that the lion's share of remaining conventional oil reserves is concentrated in the Middle East. All major reserves' assessors agree on this crucial point..."³ And it seems even the extent of Middle East reserves are in question.

What Happens when Peaking Occurs?

If the U.S. continues to increase consumption by about two percent

per year and import two thirds of its oil, we're on a collision course with dwindling supply. Hirsch

"The earth's endowment of oil is finite and demand for oil continues to increase with time."

— U.S. Dept. of Energy sponsored report

states "Peaking will result in dramatically higher oil prices, which will cause protracted economic hardship in the United States and the world."⁴

Unlike the artificial shortage created by the Arab oil embargos of the 1970s, or markets made nervous by today's threatened disruptions, the problems associated with oil peaking will not be temporary, nor will they be easily and quickly overcome. Because virtually our entire U.S. economy runs on oil, all economic sectors will be affected by oil peaking. The world's economic, political and social landscape will likewise be affected. Some predict oil wars will happen between nations, states, towns and neighbors.

Even now, developing countries are increasingly competing with the U.S. for the world's remaining sources of oil. China's oil consumption reportedly went up 15% last year, and 25% of their oil was imported; pipelines are being laid to the Middle East. This increased consumption and resulting tightening of reserves of refined oil is behind recent price spikes.

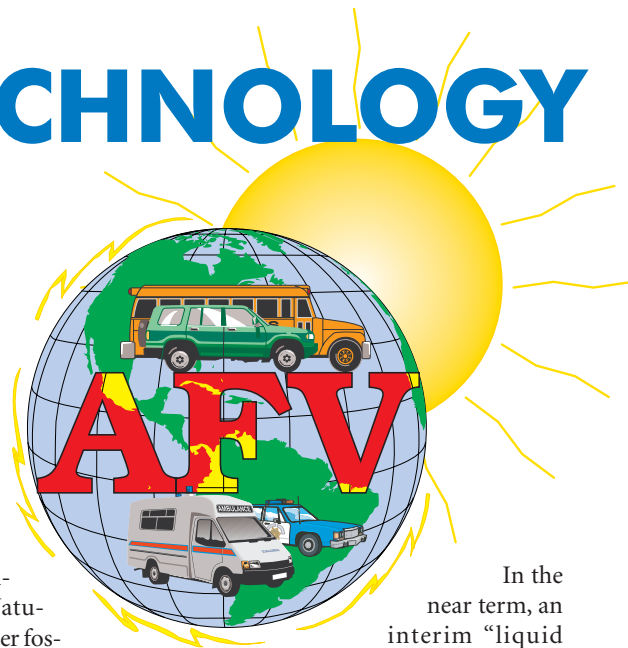
What's the Next Step?

"Withdrawal from oil dependency will be an immense challenge that will require cooperation and compromise on everyone's part. Efforts will be needed both to create supplies of alternative fuels and to reduce the demand for oil."⁵ Geologists, economists and increasingly politicians who study the issues say action is long overdue; we're told we need to address oil peaking with an "Apollo Mission" sense of urgency by greatly reducing consumption through conservation and developing sustainable energy alternatives. President Bush has already noted, "The storms [hurricanes] have shown how fragile the balance is between supply and demand [of oil] in America. ... We can all pitch in by being better conservers of energy..."⁶ (See "Reduce the Use" in the previous ASE TechNews). Again, Hirsch: "While greater end-use efficiency is essential, increased efficiency alone will be neither sufficient nor timely enough to solve the problem. Production of large amounts of substitute liquid fuels will be required."

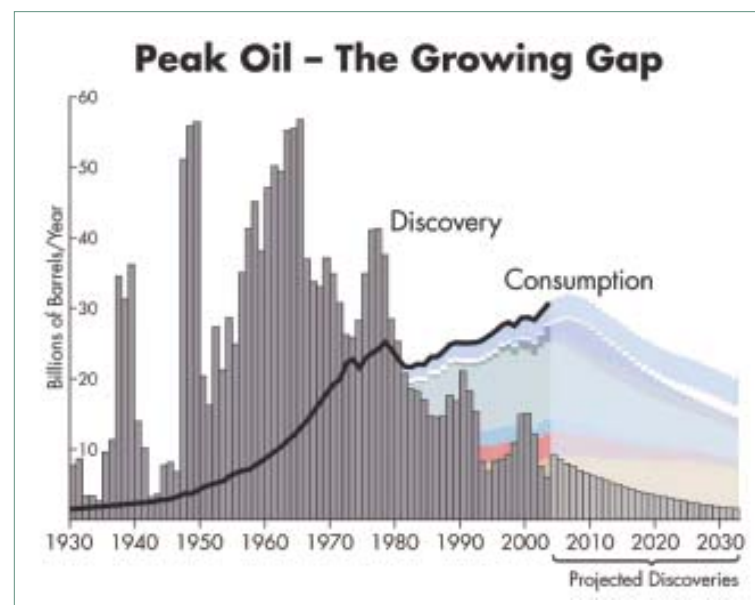
The Race for Alternatives Is On

Alternative fuels can help displace oil imports and consumption. Natural gas (another fossil fuel) has long been thought of as a less expensive alternative. But it too has gone up in price as availability has tightened; we're told that natural gas production will also peak within the foreseeable future.

Hydrogen, supported by our country's Administration, may well



In the near term, an interim "liquid hydrogen carrier"—some say methanol, others say ethanol—is needed to pave the way to a hydrogen economy. For now, liquid alternatives like ethanol and biodiesel hold promise for reducing petroleum use, and some states have already passed statutes requiring that a percentage of these sustain-



Peak Oil – The Growing Gap. As seen here, world oil peaking has occurred. Oil consumption continues to go up as discoveries of new reserves goes down. (Source: Rep. Roscoe Bartlett: Congressional Record, "The Peaking of World Oil," Feb 8, 2006. Page H207.) www.peakoil.net/Publications/PeakOilSpclOrder%2315TextCharts020806Low.pdf

be the long-range answer for world energy (indeed, hydrogen fuel cell vehicles are already on the road), but large-scale hydrogen production and local H₂ refueling sites are still some 20 years away, say industry leaders. What's more, hydrogen production is energy intense; the cost to produce, transport and store hydrogen is very high, and fuel cell costs must still come way down.⁷

able biofuels be blended into petroleum sold at the pump—to both help reduce consumption and help agriculture.

But there are environmental and cost concerns associated with a shift to biofuels. For one, debate rages over the "net energy balance" (NEB) of how much petroleum is needed to plant and harvest such crops as

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Some Thoughts...

While not a popular notion, we can all conserve precious energy by being energy wise and cutting back on consumption with less driving, and shorter commutes coupled with mass transit, where available.

Energy can also be saved by reclaiming and recycling. In Europe, virtually all materials used in the making of automobiles (including plastics) must by law be identified, reclaimed and recycled. Reclaiming materials from scrapped autos means expending far less energy to produce raw materials (aluminum, steel, plastic etc.) Materials reclamation is a thriving industry. According to the holding group SDH, "The global market for reclamation products, services and technologies is estimated to be in the tens of billions of dollars."^a

Conservation can be achieved in other ways as well. Transportation consumes much of the world's petroleum, some to move consumer goods (to "big box" stores) across the globe. In order to mitigate such petroleum use, some advocate an alternative to a global economy through "relocalization" efforts; that is, to produce goods locally as much as possible.^b

And changes in land use policies could encourage denser housing closer to employment centers, but at what cost and changes to Americans' way of life?

Much remains uncertain.

^a Go to [www.sdhgroup.net/AutoEvolve,%20LLC/AutoEvolve main.html](http://www.sdhgroup.net/AutoEvolve,%20LLC/AutoEvolve%20main.html)

^b Visit www.postcarbon.org/groups

Global Oil Peaking... Are We There Yet? (continued from previous page)

compared to comparative heat energy of biofuels. According to the DOE's National Renewable Energy Lab (NREL), biofuels have potential for a very favorable NEB.⁸ But others argue that the amount of land required to grow dedicated energy crops for transportation fuels could be staggering, and point out that it still requires petroleum to plant, fertilize, harvest such crops and to transport the end-product.

(GGE) basis, but continued research and economies of scale are bringing costs down. Landfill gas, cow manure and similar feedstock release methane gas sometimes used for power generation, and trash is burned to produce electricity at some power stations. But for now, all such energy alternatives will need financial incentives to help make them competitive with oil.

The disadvantage of electricity is that it's not readily stored or transported as is a liquid energy carrier. Battery technology has made great strides, but companies making lithium-ion batteries for deep-cycle applications need financial incentives to scale up for mass production.⁹ Hybrid-electric vehicles (HEVs), plug-in hybrids (PHEVs), and "pure" battery-electric vehicles (BEVs) are ideal for conserving fuel. Some so-called hybrids have 42-volt start-stop features; "mild" hybrid vehicles use an electric motor to assist the gasoline engine; "full" hybrids run on batteries alone for short distances. Sustained public interest in hybrids caught many auto manufacturers by surprise, but OEMs are feverishly designing and selling HEVs for reasons of economy or for added power. Mid- and heavy-duty fleet vehicles (buses, delivery, refuse hauling, etc.) are especially taking advantage of the quick launch, lower fuel cost (40–60% according to International Truck & Engine Corp.) and tax advantages of using electric- and even hydraulic-hybrid drives. Some European OEs are combining the economy of diesel engines with hybrid drives for added fuel savings.

Plug-in Hybrids?

Where earlier battery electric vehicles (BEVs) failed to deliver the promised range desired by most of the motoring public, in Europe and Japan "plug-in" hybrid electric vehicles are cruising on battery power alone at one third the "fuel" cost. OEMs like Toyota are said to be considering the possibility of plug-ins for the U.S. as well. Unlike pure (battery-only) EVs, a plug-in hybrid is charged up overnight from the electrical grid. Once on the road, batteries alone may run the vehicle for 20 or more miles; then, the gasoline, diesel, or biofuel engine starts up and recharges. DaimlerChrysler's

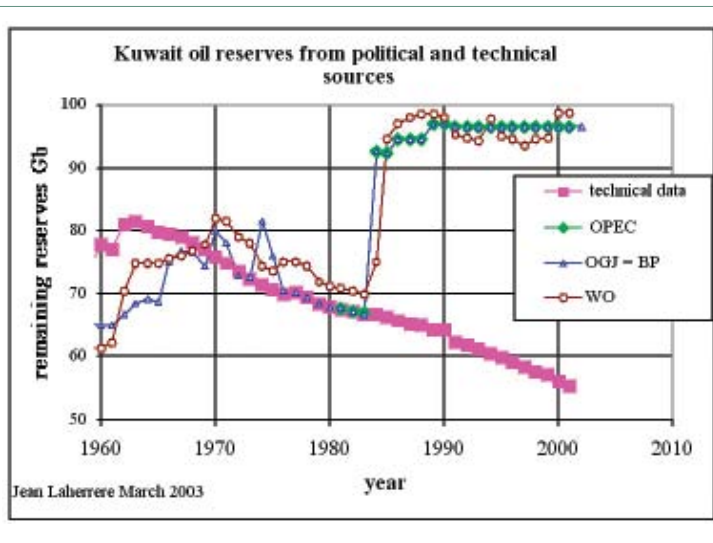
Sprinter plug-in hybrid delivery vans are being tested here in the U.S., and other companies are promoting conversion of the Prius to a plug-in.¹⁰ But such conversions are expensive. Then, too, not everyone may be ready or willing to "plug in" his or her car. Still, plug-ins hold promise for commuters and local fleets. Further advances in battery design, longevity and cost will help commercialize PHEVs. In the meantime, market interest may be kindled as motorists realize they can plug into the grid for one-third the energy cost and "be green" in the process. As we approach global oil peaking, flex-fuel plug-in hybrids

will likely become part of our everyday landscape.

In summary, narrator Frank Sesno pointed out in CNN's Cable TV special *We Were Warned* that Americans are so accustomed to cheap and plentiful oil that they consider it a birthright.¹¹ We could indeed take warning: according to Peter Cooper of *Kuwaittimes.net*, "The natural world has an uncanny ability to hit back at the arrogance of man, and perhaps a reassessment of reality at this point is called for, rather than a reliance on oil statistics that may owe more to political manoeuvring than geological facts."¹²

Afterword:

For technicians, these are exciting and stressful times, as new technologies and solutions emerge. But just as service repair professionals have met the challenges of ABS, computerized engine controls, OBDII, airbags and the like during the past decades, technicians will rise to tomorrow's challenges. The key will be adaptability—a willingness to learn new techniques and new technologies. One thing is certain in all this flux: Vehicles, regardless of powertrain or fuel-source, will be a part of the landscape for years to come, and they will need service and repair to keep Americans moving.



Kuwait Oil Reserves from Political and Technical Sources. OPEC and oil companies say there's plenty of oil in Kuwait (green line), while technical data (pink line) tells a different story. The Kuwait Oil Company says the world's second largest oil field (Burgan) is "exhausted and past its peak output." Investment banker and geologist Matthew Simmons in his book *Twilight in the Desert* says that Saudi oil fields face a similar fate. (Source: ASPO "Kuwait and Oil Reserves." Report at www.peakoil.net/Kuwait.html)

Another alternative under consideration is the conversion of trash and waste products into liquid or gaseous fuels. Ethanol is being made from waste starch, cellulose or sugar based biomass, and waste materials. Such feedstocks seem to offer a higher net energy balance than corn. Biodiesel is being made from waste cooking oil and grease, animal fats, etc. and has an even better NEB. Costs to bring these to market are still high on a gasoline-gallon equivalent

Electricity has the edge as a clean and relatively inexpensive energy source (see below), and ever increasing projects with solar, wind, tidal, and geothermal power are getting an added incentive thanks in part to the Energy Bill passed by Congress late 2005. Even coal and nuclear power is getting a boost (future generations will have to deal with the waste). Still, electrical energy for vehicles is cheaper and cleaner than oil (lower stack emissions compared to tailpipe

Footnotes:

1. Go to www.bartlett.house.gov and www.lugar.senate.gov/pressapp/record.cfm?id=252838
2. Robert Hirsch et al; *Peaking of World Oil Production: Impacts, Mitigation & Risk Management*. Feb. 2005, Hirsch, Bezdek, Wendling. www.hilltoplancers.org/stories/hirsch0502.pdf
3. Go to www.peakoil.ie/downloads/newsletters/newsletter63_200603.pdf for more information.
4. Robert Hirsch (ibid).
5. See <http://museletter.com/archive/160.html>
6. Go to www.energy.gov/news/766.htm
7. See ASE TechNews article, *Hydrogen: the Ultimate Alternate?*
8. Do a web search for various papers by NREL's Michael Wang, or contact the author.
9. See *Energy Storage Research and Development; Freedom CAR and Vehicle Technology Program 2004 Annual Progress Report*.
10. Go to www.energycs.com/Edrive-FAQ.html and www.valence.com/readnews.asp?page=PR_032905.htm
11. *We Were Warned*, CNN Cable TV, March 18–19, 2006.
12. Go to www.kuwaittimes.net/localnews.asp?dismode=article&artid=37595069