

## Press Release



# The End of Oil

by Paul Roberts

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"Fascinating . . . Roberts offers a stinging rebuke of America's myopic, do-nothing energy policy." — Joseph J. Romm, former acting assistant secretary of energy, author of *The Hype About Hydrogen*

## About the Book

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Even by conservative estimates, our oil reserves will begin to run out in the next thirty years, and recent disclosures by Shell and other oil companies, as well as rising gas prices, suggest that oil production has already peaked. What happens when the oil runs out? In *The End of Oil: On the Edge of a Perilous New World*, which Houghton Mifflin will publish in May, acclaimed journalist Paul Roberts travels to the front lines of the coming energy revolution — from Russia to Saudi Arabia, from Beijing to Washington — for the first complete exploration of the current world situation. He discusses

- the extent to which the war in Iraq is a war over oil and what global conflicts await us in the near future
- the economic vulnerability that comes with dependence on an increasingly scarce natural resource, one that is ever more susceptible to acts of terror
- how much time we have before it becomes impossible to reverse the damage done to the earth's atmosphere by oil-related gases
- the future of alternative fuels such as hydrogen and natural gas, and the promises and pitfalls of solar and wind power
- why the United States, the world's most powerful nation and the leading consumer of energy, has fallen behind in the transition to other forms of energy

For the past century, oil has dominated our economy, politics, and culture. Energy issues —

from the war in Iraq and the rise of China as the world's largest energy consumer to the increasingly visible effects of global warming and advances in alternative fuel sources — lead the headlines daily. The effects of our oil-based society on the environment, geopolitics, and the world economy make it clear that the transition from oil must begin now. But what will that transition entail, and how do we begin to move on from an oil-dependent energy economy?

Roberts answers those questions and many more. He points out that although we are on dangerous ground, we can take steps to avoid disaster, and he presents a solid, realistic plan for breaking our oil addiction. *The End of Oil* is a groundbreaking work that will prove essential to our understanding of, and survival in, this uncertain new world.

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## About the Author

Paul Roberts is a regular contributor to *Harper's Magazine*, for which he has written about the timber industry, the auto industry, and the destruction of the Florida Everglades. A longtime observer of both business and environmental issues, Roberts is an expert on the complex interplay of economics, technology, and the environment, and has written for such publications as the *New York Times Magazine*, the *New Republic*, *Newsweek*, and *Rolling Stone*. He was a finalist for the National Magazine Award in 1999. A graduate of the University of Washington, he lives in Leavenworth, Washington.

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## A Conversation with Paul Roberts

### Q) Are we really running out of oil?

**A)** We really are running out. This may seem improbable, with all the excitement over big oil projects in Russia, Nigeria, and the Caspian. We seem to be awash in oil. But this is a short-term phenomenon. Oil is a finite substance. Most of the oil we've been using for the last century was produced tens of millions of years ago, under geological conditions that aren't likely to recur anytime soon. So when it's gone, it's gone. And it's going.

Many of the experts I interviewed — including some fairly conservative analysts in some very big oil companies — believe that production of what we call "conventional oil," that is, oil that can easily be located and pumped out of the ground, will hit a peak in less than 30 years. This doesn't mean the oil will dry up suddenly. But it does mean that instead of being able to pump more barrels of oil every year, as we have for the last 125 years, we'll struggle simply to produce the *same* number of barrels as we did the year before. This is what happened in the United States in the mid-1970s, after a century of being the world's biggest oil producer and providing fuel for both world wars and for the postwar industrial boom. After America's famously huge oil fields — the gushers in Texas and Oklahoma — hit their peak, U.S. oil companies found it harder and harder to find new fields to replace the older, depleted fields.

This peak-and-decline pattern is inescapable. Sooner or later, the amount of oil you can get out of a given field drops off. You may drill a new well a few miles away, but then that well declines. So you move to a new field, and when that one peaks, you move to another, and

another. Eventually, most of your fields are in decline, and it's necessary to import oil to cover demand, which will be more than you can produce. This is what happened in the United States, and it will happen in Russia and eventually even in Saudi Arabia and the rest of the big oil states in the Middle East.

It will not be a happy occasion when global oil hits its peak and starts declining, because while oil production will certainly fall off, *demand* for oil, especially for gasoline and other transportation fuels, will continue to rise. As most of us know, when demand exceeds supply, prices rise, and that, for a civilization entirely dependent on cheap oil, will have catastrophic consequences. The last time oil prices rose significantly, during the Arab oil embargo of 1974, the world plunged into a deep recession. In fact, an oil price spike has preceded five of the last six global recessions. Price spikes are temporary. When oil production begins to taper off, and prices get high and stay high, we could see some pretty serious economic devastation.

### **Q) But why haven't we been told about this?**

**A)** A lot of people in authority simply don't believe it will happen. Over the last hundred years, every time it has looked as if oil supplies were falling off, oil companies have come up with new technologies that let them find more oil and get it out of the ground, even in tough environments like the Arctic and deep underwater. These successes have nurtured an optimism bordering on cockiness that pervades not just the energy industry but governments as well.

The official position of the U.S. government, for example, is that the world has at least forty years before we hit any kind of production peak, and in their view, that is more than enough time to find something else to put in our gas tanks. But this really is an elaborate fiction. Even if we do have forty years before oil production peaks — and many analysts I talked to regard that number as overly optimistic — that leaves out a rather important political fact: most of the remaining oil is owned and controlled by OPEC, an organization made up of countries like Iran and Saudi Arabia, which aren't known for their political stability or their sympathies for big Western importers.

Outside of OPEC, the so-called non-OPEC oil reserves, in places like Mexico, the U.S., Norway, and the North Sea, are much smaller, because the industry has been exploring and exploiting them for nearly a century. This was the oil that was found first, and we've had longer to work the fields. And because there is less of this non-OPEC oil, it will peak sooner — as early as 2015, by some estimates — which means America, Europe, Japan, and rapidly growing China will become even more dependent on the famously unstable and unfriendly Middle East. Western governments aren't particularly comforted by this imminent peak in non-OPEC oil and aren't happy to talk about it publicly, since it tends to highlight how vulnerable America's entire energy economy, and thus our economic and military power, has become. To even hint that non-OPEC oil may peak relatively soon, allowing OPEC even greater control over world oil prices, would send markets into a panic, something no Western politician is eager to do. So they keep up an optimistic front.

But this optimism is getting harder and harder to maintain. Oil discoveries — the amounts of new oil found each year — are declining, in part because we've already found most of the bigger fields and those that are left are smaller, with smaller yields. In fact, when you chart

the number of new barrels of oil discovered each year — not necessarily pumped out of the ground, but simply located and noted on some company's books — the peak years for world oil discoveries came in the 1960s. With few exceptions, oil companies have been finding less and less oil each year since then. Sooner or later a decline in discoveries must be followed by a decline in production. Even now, oil companies are struggling to find enough new oil to reach their production goals. They either have to buy up smaller companies with oil reserves or buy their way into countries like Russia, which actually have some oil left, but which will peak relatively soon. This is one reason oil companies are moving so aggressively into natural gas. Their marketing people will tell you that gas is cleaner and more efficient, which it is. But another big reason is that, for many oil companies, gas is becoming a lot easier to find than oil.

**Q) Does the Bush administration recognize the problem? What are they doing to try to solve it?**

**A)** The Bush administration isn't talking about depletion. The White House has never mentioned the possibility that non-OPEC oil production will peak. We do hear talk of "alternatives," like hydrogen fuel cells, which might replace oil someday. But these programs are so vague and so poorly funded that it's clear the administration doesn't regard oil as a limited commodity.

Like Clinton, and George Bush, Sr., and Reagan and most presidents before him, this president sees oil not as a geological issue but largely as a political problem. That is, we could get all the oil we need if only the environmentalists would let oil companies drill in the Arctic National Wildlife Refuge or if only the Saudis would let Western oil companies back in to their massive oil fields. The fact that the world will sooner or later run out of conventional oil simply isn't considered: for U.S. politicians, the problem isn't that we're eventually going to run out or that we're using too much. It's simply that we're not *producing* enough. This is a supply-side approach, and it's become the standard American strategy for all energy policy. The solution to all our energy problems is simply to produce more of it.

Thirty years ago, by contrast, we were much more conscious of demand-side approaches — that is, of using less. True, we had little choice: the Arab oil embargo forced America and other Western importers to use less oil. But we coped brilliantly. We tightened fuel-efficiency standards for cars and dropped our oil consumption so dramatically that we nearly put OPEC out of business. Since the late 1980s, though, U.S. policy has shifted from a demand-side focus back to supply. Reagan, for example, thought using less energy was a sissy's response: big industrialized nations like America do not use less energy; we go find more of it — by force, if necessary.

The current Bush administration has elevated this supply-side policy to ideology. The White House energy policy is focused almost entirely on increasing supply — more oil wells, more gas pipelines, and more power plants — while conservation is openly derided. This isn't too surprising, given the Bush administration's energy-industry background. Many upper-level officials, including the president, vice president, commerce secretary, and national security adviser, come from oil companies and other parts of the energy industry. And while the administration is quite right to focus on rebuilding and expanding America's obsolete energy infrastructure — especially our natural gas pipelines and power grids — the escalating emphasis on supply-side energy policy is leading to some disturbing political and diplomatic

initiatives.

Rather than focusing on aggressively improving energy efficiency in our new cars, for example, or on developing new energy sources to replace oil, the U.S. is desperately trying to secure access to new oil suppliers. This has the U.S. government cultivating relationships with all kinds of questionable energy regimes in Nigeria, Kazakhstan, Saudi Arabia, and Russia, places we might not otherwise have anything to do with, places we might be inclined to lean on to improve their human rights records or reform their economies but instead must coddle in order to get their oil.

And then there is Iraq. Whatever security threat Saddam posed, it's increasingly clear that the White House invaded Iraq in large part to "liberate" Iraqi oil from OPEC and make it available to America, Europe, and other big importers. So far, that plan hasn't worked very well. Iraqi oil, like the rest of the Iraqi political and economic system, is a shambles and will need a lot more than a few Western oil companies to set it right. But even if we liberate all Middle Eastern oil, which a lot of conservatives in Washington would like to do, sooner or later we'll need to find something else to burn. It's not just the West looking for oil now; India is importing oil, and the Chinese economy is growing so quickly — especially its transportation sector — that China will soon become the second biggest importer of oil, right behind the U.S. In fact, many experts see China as the new "center of gravity" in the global energy market. Already, China and Japan are competing for access to Arab and Russian oil — oil that the U.S. is also interested in. What happens when non-OPEC oil peaks, and Europe, America, Japan, and China are all competing for the last remaining oil in the Middle East? A lot of analysts I spoke to worry that unless these big importers begin to focus on using less oil, or on getting serious about alternatives, this emerging competition could turn into an actual conflict, an energy war.

**Q) President Bush has yet to seriously tackle climate change—or to really acknowledge the severity of the problem. What's the relationship between climate and moving away from oil?**

**A)** The Bush White House is in denial over climate. It's not that all conservatives dismiss climate change, although some right-wingers regard "climate change" as a leftist scam. It's that the White House is terrified of what a real climate policy might cost. Most of the change to our climate is caused by a buildup of man-made carbon dioxide, or CO<sub>2</sub>, in the atmosphere. And most manmade CO<sub>2</sub> comes from burning fossil fuels: oil, gas, and especially coal. So the only way to begin lowering CO<sub>2</sub> emissions, and thus slowing climate change, is either to lower our use of fossil fuels or change the way we use them — burn them more cleanly or "decarbonize" them, taking out the carbon dioxide before it gets into the atmosphere. The problem is, we don't yet have alternative fuels in sufficient volume, nor do we have cost-effective ways to decarbonize our oil and other fossil fuels.

We could develop alternatives, to be sure, and we are already working on some new ideas, but it's hugely expensive. The cost of replacing the entire fossil-fuel infrastructure — the pipelines, the tankers, the coal-fired power plants, not to mention all of the oil-powered cars, trucks, ships, and Humvees — would be astronomical, at least \$15 trillion. Entire industries, such as coal, might be put out of business. Coal releases the most CO<sub>2</sub>, and it's difficult and expensive to clean. It's hard right now to see how coal will fit into an energy

economy that protects the climate. That's why most coal companies, and power companies that burn coal to make electricity, are adamantly opposed to any serious U.S. climate policy.

Europe, which was already phasing out its coal industry, has been willing to adopt climate policies that reduce CO<sub>2</sub> emissions, but America has steadily refused to act. The Clinton administration made a big show of embracing the Kyoto treaty on climate change, but in fact Clinton undermined U.S. participation because he didn't want to alienate the coal states or the big automakers. Bush is taking that strategy of denial to the next level, not only withdrawing America from any kind of global climate policy, but actively lobbying other big polluters, like Russia, to withdraw their support as well. It's not that the Kyoto treaty was "the" solution: that treaty was and is hugely flawed, and the U.S. is right to demand significant changes. But it's absurd to withdraw completely from the climate debate or the process. When it comes to actually solving the climate problem, the U.S. is indispensable: not only does America produce more CO<sub>2</sub> than any other nation — 25 percent of all emissions — but no other country has the technological, economic, or political muscle to lead an effective global effort to cut CO<sub>2</sub> emissions. By withdrawing from the process completely, the Bush administration is making it that much harder to halt catastrophic change in climate.

**Q) Lots of attention is being given to the potential for hydrogen fuel cells. Does the potential match the hype? Could hydrogen be the solution to our oil problems?**

**A)** On paper, the hydrogen fuel cell is a brilliant solution to many of our energy problems. In practice, it's far less clear what's going to happen. Fuel cells work like batteries. They combine hydrogen and oxygen to generate electrical current, which can be used to run anything from a laptop computer to an office building to, of course, a car. The only "pollutant" is water vapor. In other words, hydrogen fuel cells offer the promise of clean power, which helps explain the excitement over fuel-cell cars and, more generally, an entire hydrogen economy.

But a few problems must be solved before that happens. First, although fuel cells work very well, they're still extremely expensive, especially when you make them small enough to fit into a car. Right now an automotive fuel cell is nearly one hundred times as expensive as a gasoline-powered internal combustion engine, which puts fuel cells out of reach of all but a tiny market of buyers. And even if we can bring costs down, we still have a fueling problem. You can't buy hydrogen at a gas station. Hydrogen is very expensive to make. It's extremely difficult to handle and store, especially compared to gasoline, which is cheap and, because it is a liquid, easy to store and dispense. Hydrogen is a vapor, and to make it easier to handle and pump into our cars, you first have to make it into a liquid, which requires expensive new machinery and fuel tanks and raises all kinds of safety issues.

The oil companies will eventually solve these problems; most are doing research right now. But they're not going to invest in a hydrogen fueling system and thousands of new hydrogen gas stations until they see a lot more fuel-cell cars on the road. And car companies aren't going to put a lot of fuel-cell cars on the road until the cost of fuel cells comes down substantially, which may be decades from now. It's a Catch-22. Meanwhile, car companies and oil companies see little reason not to keep investing in gasoline-powered cars and gasoline. You can see this same dynamic in all areas of alternative energy. Wind and solar power, for example, have lots of promise in the long term. But in the meantime, companies

are continuing to invest in the technologies and fuels they trust — coal, oil, and gas.

## **Q) What's the biggest obstacle to breaking this Catch-22 and moving rationally toward a more sustainable energy system?**

**A)** There are several obstacles. Money is a big one: it will be hugely expensive to develop and deploy a new energy infrastructure. The current infrastructure is worth trillions of dollars, and replacing it and adding new capacity to supply all the billions of additional people we expect to have on the planet will carry a planet-size price tag.

Worldwide, energy use is extremely uneven. Americans and Europeans, for example, use great amounts of energy, while most of the rest of the world uses very little. Some two billion people lack access to electricity, and hundreds of millions enjoy only modest energy services. If these people are to attain anything approaching a Western standard of living — and there is no reason to believe they won't try — world energy demand will soar far beyond the capacity of any current energy technology. Imagine China with two cars in every garage. Where will they get the fuel? And what will it mean for energy geopolitics, or for pollution, or climate?

To be sure, we can count on help from new fuels and new technologies. In fact, I expect that the next energy economy will actually be a hybrid of sorts — a broad portfolio of new energy technologies that will probably include wind power, solar, fuel cells, clean coal, and perhaps even nuclear energy, if safety and proliferation issues can be addressed, plus some energy technologies we can't even imagine right now. But despite such technological breakthroughs, we may well have to confront the fact that at some point innovation may not be enough. We may simply have to use less energy than we use now — and, perhaps, adjust our lifestyles accordingly. This would be a slap in the face for many Western countries, especially America, which for more than a century has been able to count on an ever-expanding supply of energy to meet its ever-expanding demand. I'm not discounting the possibility that we will find some new cheap source of energy — something that truly can replace oil and provide us with decades or even centuries of cheap, easy-to-use energy. But I also wonder whether future generations may look back at this period as a kind of golden era in energy.

## ***The End of Oil — Facts***

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- **The world oil well is running dry.** World oil supplies will peak in the next thirty years, largely because of growing global demand, led by China. Today, global demand is around 78 million barrels a day. By 2020, this will grow to as much as 140 million barrels a day.
- **The world's oil supplies are in the hands of unstable and anti-Western OPEC nations.** Today, three of every ten barrels of oil produced in the world come from OPEC. By 2020, more than half of all our oil will be OPEC-produced. In the future, China, not America, will be the world's most important consumer of oil and other energy, and China is already forming alliances with Saudi Arabia and other OPEC nations.

- **To stave off the most disastrous effects of global warming, we must stop burning fossil fuels in the next twenty to forty years.** By some estimates, doing that will reduce America's carbon dioxide emissions by 70 percent over the next century. Unless China, which by 2050 will get more than one-third of its energy from coal, can develop ways to burn that coal cleanly, the increased CO<sub>2</sub> emissions will make catastrophic global warming all but inevitable.
- **Small improvements can make a big difference.** Even a modest improvement in fuel-economy standards — 32 mpg for cars and 24 mpg for light trucks — would save more than two million barrels per day by 2010, or about two-thirds of what American officials hope to produce in Iraq and more than twice as much as could be produced from the Arctic National Wildlife Refuge.
- **The energy revolution begins with natural gas.** Gas will serve as the "bridge" fuel between the current coal- and oil-based energy system and the new energy systems of the future. Gas is more abundant and burns far cleaner than oil, but most of the world reserves will be very costly to access.
- **Alternative fuels and energy sources could form the core of a post-oil energy economy.** Hydrogen fuel cells could revolutionize transportation, producing a car that will get the equivalent of 81 mpg — more than three times as efficient as a car with a standard internal combustion engine. The market for alternative energy sources such as wind power and solar energy is growing as rapidly as the cell phone industry did in the 1990s, but without a fundamental change in the way governments invest in energy, these oil alternatives will remain marginalized.
- **We can change our habits and become more efficient — we've done it before.** After the oil crises of the 1970s, Americans became more energy efficient, which led to lower demand for oil and consequently lower prices. Ironically, as oil became cheaper we began to use more, and despite dramatic improvements in efficiency, modern societies use more energy per capita than has been used at any other time in human history. Increased efficiency will be imperative in the post-oil future: if you thought the gas station lines were long thirty years ago, imagine what they will be like when there is *no oil left*.
- **What is the solution?** There is no one perfect fix to the coming energy crisis. Rather, America will have to lead the charge on increased conservation and efficiency, decreased reliance on oil and coal, and increased development and use of clean energy sources such as natural gas, hydrogen fuel cells, and solar and wind power, which will define our global energy economy in the future. We need to start making these changes now, because the future of life as we know it depends on our actions.