

May 15, 2011, YES! Magazine, Peak Oil: A Chance to Change the World, Richard Heinberg, senior fellow at the Post Carbon Institute, author of *The Party's Over: Oil, War, and the Fate of Industrial Societies*, *Peak Everything: Waking Up to the Century of Declines*, and *The End of Growth: Adapting to Our New Economic Reality*.

ExxonMobil is inviting you to take your place in a fossil-fueled twenty-first century. But I would argue that Exxon's vision of the future is actually just a forward projection from our collective rear-view mirror. Despite its high-tech gadgetry, the oil industry is a relic of the days of the Beverly Hillbillies. The fossil-fueled sitcom of a world that we all find ourselves still trapped within may, on the surface, appear to be characterized by smiley-faced happy motoring, but at its core it is monstrous and grotesque. It is a zombie energy economy.

Of course, we all use petroleum and natural gas in countless ways and on a daily basis. These are amazing substances—they are energy-dense and chemically useful, and they yield enormous economic benefit. America started out with vast reserves of oil and gas, and these fuels helped make our nation the richest and most powerful in the world.

The End of the Cheap Oil Economy

But oil and gas are finite resources, so it was clear from the start that, as we extracted and burned them, we were in effect stealing from the future. In the early days, the quantities of fuel available seemed so enormous that depletion posed only a theoretical limit to consumption. We knew we would eventually empty the tanks of Earth's hydrocarbon reserves, but that was a problem for our great-great-grandkids to worry about.

Yet U.S. oil production has been declining since 1970, even with huge discoveries in Alaska and the Gulf of Mexico. Other countries are also seeing falling rates of discovery and extraction, and world crude oil production has been flat-lined for the past six years, even as oil prices have soared. According to the International Energy Agency, world crude oil production peaked in 2006 and will taper off from now on.

ExxonMobil says this is nothing we should worry about, as there are still vast untapped hydrocarbon reserves all over the world. That's true. But we have already harvested the low-hanging fruit of our oil and gas endowment. The resources that remain are of lower quality and are located in places that are harder to access than was the case for oil and gas in decades past. Oil and gas companies are increasingly operating in ultra-deep water, or in arctic regions, and need to use sophisticated technologies like hydrofracturing, horizontal drilling, and water or nitroge injection. We have entered the era of extreme hydrocarbons.

This means that production costs will continue to escalate year after year. Even if we get rid of oil market speculators, the price of oil will keep ratcheting up anyway. And we know from recent economic history that soaring energy prices cause the economy to wither: when consumers have to spend much more on gasoline, they have less to spend on everything else.

But if investment costs for oil and gas exploration and extraction are increasing rapidly, the environmental costs of these fuels are ballooning just as quickly. With the industry operating at the limits of its technical know-how, mistakes can and will happen. As we saw in the Gulf of Mexico in the summer of 2010, mistakes that occur under a mile or two of ocean water can have devastating consequences for an entire ecosystem, and for people who depend on ecosystem services. The citizens of the Gulf coast are showing a brave face to the world and understandably want to believe their seafood industry is safe and recovering, but biologists who work there tell us that oil from the Deepwater Horizon disaster is still working its way up the food chain. Never mind starving polar bears—we're facing the prospect of starving people.

Of course the biggest environmental cost from burning fossil fuels comes from our chemical alteration of the planetary atmosphere. Carbon dioxide from oil, gas, and coal combustion is changing Earth's climate and causing our oceans to acidify. The likely consequences are truly horrifying: rising seas, extreme weather, falling agricultural output, and collapsing oceanic food chains. Never mind starving polar bears—we're facing the prospect of starving people.

The Misinformation Machine

But wait: Is this even happening? A total of nearly half of all Americans tell pollsters they think either the planet isn't warming at all, or, if it is, it's not because of fossil fuels. After all, how can the world really be getting hotter when we're seeing record snowfalls in many places? And even if it is warming, how do we know that's not because of volcanoes, or natural climate variation, or cow farts, or because the Sun is getting hotter? Americans are understandably confused by questions like these, which they hear repeated again and again on radio and television.

Now of course, if you apply the critical thinking skills that you've learned here at WPI to an examination of the relevant data, you'll probably come to the same conclusion as has been reached by the overwhelming majority of scientists who have studied all of these questions in great depth. Indeed, the scientific community is nearly unanimous in assessing that the Earth is warming, and that the only credible explanation for this is rising levels of CO₂ from the burning of fossil fuels. That kind of consensus is hard to achieve among scientists except in situations where a conclusion is overwhelmingly supported by evidence.

I'm not out to demonize ExxonMobil, but some things have to be said. That company plays a pivotal role in shaping our national conversation about climate change. A 2007 report from the Union of Concerned Scientists described how ExxonMobil adopted the tobacco industry's disinformation tactics, and funded some of the same organizations that led campaigns against tobacco regulation in the 1980s—but this time to cloud public understanding of climate change science and delay action on the issue. According to the report, between 1998 and 2005 ExxonMobil funneled almost \$16 million to a network of 43 advocacy organizations that misrepresented peer-reviewed scientific findings about global warming science. Exxon raised doubts about even the most indisputable scientific evidence, attempted to portray its opposition to action as a positive quest for "sound science" rather than business self-interest, and used its access to the Bush administration to block federal policies and shape government communications on global warming. All of this is well-documented.

This is a big victory for ExxonMobil, but it is a disaster for democracy, for the Earth, and for your generation.

And it worked. Over the course of the past few years one of our nation's two main political parties has made climate change denial a litmus test for its candidates, which means that climate legislation is effectively unachievable in this country for the foreseeable future. This is a big victory for ExxonMobil. Its paltry \$16 million investment will likely translate to many times that amount in unregulated profits. But it is a disaster for democracy, for the Earth, and for your generation.

But here's the thing. Everyone knows that America and the world will have to transition off of fossil fuels during this century anyway. Mr. Tillerson knows it as well as anyone. Some people evidently want to delay that transition as long as possible, but it cannot be put off indefinitely. My colleagues at Post Carbon Institute and I believe that delaying this transition is extremely dangerous for a number of reasons. Obviously, it prolongs the environmental impacts from fossil

fuel production and combustion. But also, the process of building a renewable energy economy will take decades and require a tremendous amount of investment. If we don't start soon enough, society will get caught in a trap of skyrocketing fuel prices and a collapsing economy, and won't be in a position to fund needed work on alternative energy development....

Even in the best case, though, the fact that we have waited so long to address our addiction to oil will still present us with tremendous challenges. But this is not a problem for ExxonMobil, at least not anytime soon. When the price of oil goes up, we feel the pain while Exxon reaps the profits. Even though Exxon's actual oil production is falling due to the depletion of its oilfields, corporate revenues are flush: Exxon made almost \$11 billion in profits in just the past three months. This translates to jobs in the oil industry. But how about the renewable energy industry, which everyone agrees is the key to our future?

For the past forty years, every U.S. president, without exception, has said we must reduce our country's dependence on imported petroleum. Addiction to oil has become our nation's single greatest point of geopolitical, economic, and environmental vulnerability. Yet here we are in 2011, still driving a fleet of 200 million gasoline-guzzling cars, trucks, and SUVs. The inability of our elected officials to tackle such an obvious problem is not simply the result of ineptitude. In addition to funding climate denial, fossil fuel companies like Exxon have contributed to politicians' election campaigns in order to gain perks for their industry and to put off higher efficiency standards and environmental protections. Denying looming fuel supply problems, discouraging a transition to renewable energy, distorting climate science—these are all understandable tactics from the standpoint of corporate self-interest. Exxon is just doing what corporations do. But once again, it is society as a whole that suffers, and the consequences will fall especially on your generation.

Mr. Tillerson may have informed you about his company's Global Climate and Energy Project at Stanford University. Exxon is now funding research into lowering the cost and increasing the efficiency of solar photovoltaic devices, increasing the efficiency of fuel cells, increasing the energy capacity of lithium-ion batteries for electric cars, designing higher-efficiency engines that produce lower emissions, making biodiesel fuel from bacteria, and improving carbon capture and storage. This is all admirable, if it is genuine and not just window-dressing.

Here's a reality check in that regard: Exxon is investing about \$10 million a year in the Global Climate and Energy Project—an amount that almost exactly equals Mr. Tillerson's personal compensation in 2010. Ten million dollars also equals about three hours' worth of Exxon profits from last year. You tell me if you think that is a sensibly proportionate response to the problems of climate change and oil depletion from the world's largest energy company.

Even if Exxon's investments in a sustainable energy future were of an appropriate scale, they come late in the game. We are still in a bind. That's because there is no magic-bullet energy source out there that will enable world energy supplies to continue to grow as fossil fuels dwindle.

Renewable energy is viable and necessary, and we should be doing far more to develop it. But solar, wind, geothermal, tidal, and wave power each have limits and drawbacks that will keep them from supplying energy as cheaply and as abundantly as we would like. Our bind is that we have built our existing transport infrastructure and food systems around energy sources that are becoming more problematic with every passing year, and we have no Plan B in place. This means we will probably have less energy in the future, rather than more.

A Chance to Change the World

Again, I am addressing my words especially to you students. This will be the defining reality

of your lives. Whatever field you go into—business, finance, engineering, transportation, agriculture, education, or entertainment—your experience will be shaped by the energy transition that is now under way. The better you understand this, the more effectively you will be able to contribute to society and make your way in the world.

You will have the opportunity to participate in the redesign of the basic systems that support our society—our energy system, food system, transport system, and financial system.

We are at one of history's great turning points. During your lifetime you will see world changes more significant in scope than human beings have ever witnessed before. You will have the opportunity to participate in the redesign of the basic systems that support our society—our energy system, food system, transport system, and financial system.

I say this with some confidence, because our existing energy, food, transport, and financial systems can't be maintained under the circumstances that are developing—circumstances of fossil fuel depletion and an unstable climate. As a result, what you choose to do in life could have far greater implications than you may currently realize.

Over the course of your lifetime society will need to solve some basic problems:

How to grow food sustainably without fossil fuel inputs and without eroding topsoil or drawing down increasingly scarce supplies of fresh water;

How to support 7 billion people without depleting natural resources—including forests and fish, as well as finite stocks of minerals and metals; and

How to reorganize our financial system so that it can continue to perform its essential functions—reinvesting savings into socially beneficial projects—in the context of an economy that is stable or maybe even shrinking due to declining energy supplies, rather than continually growing....

In a few years we will look back on late 20th century America as time and place of advertising-stoked consumption that was completely out of proportion to what Nature can sustainably provide. I suspect we will think of those times—with a combination of longing and regret—as a lost golden age of abundance, but also a time of foolishness and greed that put the entire world at risk....

Making the best of our new circumstances will mean finding happiness in designing higher-quality products that can be re-used, repaired, and recycled almost endlessly; and finding fulfillment in human relationships and cultural activities rather than mindless shopping. Fortunately, we know from recent cross-cultural psychological studies that there is little correlation between levels of consumption and happiness. That tells us that life can in fact be better without fossil fuels.

... As I travel, I meet young people in every part of this country who are taking up the challenge of building a post-petroleum future: a 25-year-old farmer in New Jersey who plows with horses and uses no chemicals; the operator of a biodiesel co-op in Northampton; a solar installer in Oakland, California. The energy transition will require new thinking in every field you can imagine, from fine arts to banking. Companies everywhere are hiring sustainability officers to help guide them through the challenges and opportunities. At the same time, many young people are joining energy and climate activist organizations like 350.org and Transition Initiatives.