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How America Can Free Itself of Oil—Profitably

It will cost less to replace the oil the U.S. will need than to buy it.

By Amory Lovins

Enough about the oil problem; now there's an oil solution. Within the next few decades the U.S. can end its oil dependence.

On Sept. 20, my team of scientists, engineers, economists, and consultants at Rocky Mountain Institute published a fully elaborated plan for an oil-free America—an independent peer-reviewed synthesis that the Pentagon co-sponsored. This is the first strategy for displacing the black stuff not incrementally but radically, not at a cost to the economy but at a net gain, and in ways that will appeal to diverse business and political leaders. If we use our heads to build the right playing field, the markets will do the rest. America's shift from oil can be led profitably by business at a net savings to the economy of $70 billion a year by 2025.

By applying the past two decades of often unnoticed technological progress, it will cost less to displace all the oil that the U.S. will need than to buy that oil. Oil's market price leaves out many of its true economic, military, and environmental costs, but even if those "externalized" burdens were zero, completely displacing oil would still be profitable for the U.S. economy (and other economies too) starting now.

How do we achieve it? The solution is to save half the oil America uses and substitute cheaper alternatives for the other half. Getting there requires four integrated steps:

• **Double the efficiency of using oil.** The U.S. today wrings twice as much work from each barrel of oil as it did in 1975. Proven techniques can redouble oil productivity. The U.S. Energy Administration forecasts that in 2025 oil will cost $26 a barrel (in 2000 dollars); but the investment needed to deliver the same or better services with just half the oil is far less: It averages $12 a barrel.

Inefficient light trucks and cars, which consume 40% of our oil, are at the center of our oil habit. And ultralight and ultrastrong materials for vehicles are the No. 1 enabling technology for changing that. Advanced composites like carbon fiber, backstopped by lightweight steels, can nearly double the efficiency of cars and light trucks and improve both safety and performance. The new materials will cost about the same per vehicle as today's metals, in part because manufacturing will become simpler and the system needed to propel the vehicle smaller and lighter.

If we use ultralight materials to engineer advanced versions of vehicles like today's Toyota *Prius* hybrid, we'll go a long way toward realizing the gains. A *Prius* costs a few thousand dollars more than a comparable nonhybrid but uses just half the gasoline. At the cost Toyota expects to reach

in 2007, the fuel savings will repay the added cost in about five years. Building an ultralight version of the Prius would save 71% of the fuel, cutting the payback time to three years.

• **Coordinate public policies and business strategies to speed the adoption not just of superefficient light vehicles, but also of superefficient heavy trucks and airplanes.** The necessary technologies exist here too—innovations like aircraft composites and wide-based single truck tires to replace double ones. Combined with more-efficient buildings and factories, efficient vehicles can cut the forecast total U.S. oil use by 29% by 2025 and another 23 percentage points soon thereafter—52% in all. At the same time, the shift can revitalize strategic industrial sectors that will make the key oil-saving technologies, including auto manufacturing, aerospace, advanced materials, and more.

• **Turn to modern biofuels to replace another 20% of U.S. oil needs.** New ways to convert woody plants like switchgrass and poplar into ethanol can yield twice as much fuel as today's corn-into-ethanol processes, yet cost less in both capital and energy. Replacing fossil fuels with these plant-derived carbohydrates will strengthen rural America too: It will boost net farm income by tens of billions of dollars a year and create 750,000 jobs.

• **Use established, highly profitable efficiency techniques to save half the projected 2025 use of natural gas.** Simply by using electricity efficiently, especially at periods of peak demand, the U.S. can save eight trillion cubic feet of gas a year. Gas efficiency will make this fuel abundant and affordable again, cut gas and power bills by $55 billion a year—and free 10 trillion cubic feet a year to substitute for oil. The most profitable option is to convert the saved gas into hydrogen, whose superefficient use can then displace most or all of the remaining oil.

I don't want to minimize the management challenge of what we propose. These four shifts are fundamentally disruptive to current business models. But companies quick to adopt new models will be the winners of the 21st century; those that deny and resist change will join the dead from the last millennium.

What policies are needed? Jump-starting the 21st-century energy economy will take a cohesive strategy, bold leadership, and federal, or at least state, action. If we don't move aggressively, we will face a costly, chaotic, 100-year transition in which change will be forced by the intolerable pressure of wars, shortages, and other awful events. But if we act, we can exchange this chaos for a profitable, orderly 30-year transition on our terms. Our report, Winning the Oil Endgame, charts practical policies—market-oriented without taxes, and innovation-driven without mandates, supporting rather than distorting business logic—to speed that transition.

The most important innovation is "feebates" for new cars and light trucks. Feebates combine fees on inefficient vehicles with rebates on efficient ones, to influence consumer choice. The rebates need be no bigger than automakers' current sales incentives, which range as high as $5,000. But rather than drain automakers' margins, the new rebates would be paid for by fees on inefficient models. Feebates would be much more consumer-friendly than gas-guzzler taxes; they'd apply separately within each vehicle size class. That way, you won't be penalized for buying an SUV; instead, you'll be rewarded for choosing an efficient one. By encouraging customers to invest as if they're counting fuel savings over the vehicle's whole life, feebates will pull superefficient vehicles from the drawing-board into the showroom more quickly, expanding choice.

America also needs to get its polluting, gas-guzzling junkers off the road. A far-sighted solution would be a national scrap-and-replace program. It would lease or sell superefficient cars to low-income people—with payments and fuel bills they can afford—while scrapping clunkers. That would quickly create a profitable million-car-a-year market for advanced-technology vehicles, and help clean our cities' air. As a bonus, it would boost job opportunity by helping breadwinners get to work reliably.

Smart government financing can also accelerate oil independence. Temporary federal loan guarantees can encourage automakers to retool and airlines to buy efficient airplanes while scrapping inefficient ones. Farm subsidies can be trimmed as profit-making biofuels and biomaterials supplant loss-

making crops. Within a few years farm net income could triple.

Oil industry giants like Shell and BP are already preparing to move beyond oil by transforming themselves into energy companies. Done right, this shift will enable them to redeploy their skills and assets profitably rather than lose market share. Biofuels are a major new product line that leverages existing distribution and retail infrastructure and that can, we estimate, attract $90 billion in new investment from the private sector.

The total investment needed for the moves I've outlined is $180 billion in industrial capacity over the next decade. The amount sounds massive, but consider: Every time the price of oil goes up $1 a barrel, Americans export $7 billion a year, with zero return at home. Ending dependency can save $133 billion every year by 2025, assuming $26 oil. This saving, equivalent to a large, permanent tax cut, can replace today's $120-billion-a-year oil imports with reinvestments in ourselves: $40 billion flows as revenue to farmers producing biofuels, while the rest returns to the nation's communities and businesses. By 2015 the early steps in the transition will have saved as much oil as the U.S. now gets each year from the Persian Gulf. By 2040, oil imports could be gone. By 2050, the U.S. economy could be flourishing with no oil at all.

In the process, more than a million high-wage automotive and related jobs can be saved, and a million net new jobs added. U.S. car, truck, and airplane makers can again lead the world. A more efficient and effective military can refocus on protecting American citizens, not foreign oil supplies. Carbon dioxide emissions will shrink by one-fourth. Federal deficits will decrease slightly, and trade deficits dramatically. Countries with oil will no longer require special treatment. The U.S., no longer suspected of having oil as a motive, could restore its world stature as a moral leader and regain its clarity of purpose.

How do we start? Astute business leaders can turn innovation from a threat to a friend. Military leaders can support advanced-materials R&D and procure superefficient platforms. Political leaders can craft policies that stimulate demand for efficient vehicles, reduce investment risks, and purge perverse incentives. Citizens must play a role too—a big role—because their choices guide the markets, enforce accountability, and spur social innovation. The surprise popularity of Toyota's *Prius*, Honda's *Civic hybrid*, and Ford's *Escape* hybrid SUV suggest that consumers welcome efficient designs if they're appealing.

America's energy future is choice, not fate. Oil dependence is a problem we needn't have, and it's cheaper not to. When the U.S. last paid attention to oil efficiency, between 1977 and 1985, oil use fell 17% while GDP grew 27%. During those eight years, oil imports fell 50% and imports from the Persian Gulf fell by 87%. That exercise of market muscle—from the demand side—broke OPEC's pricing power for a decade. Today we can rerun that play even more decisively, at a big profit. What are we waiting for? We can end oil dependence forever.

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