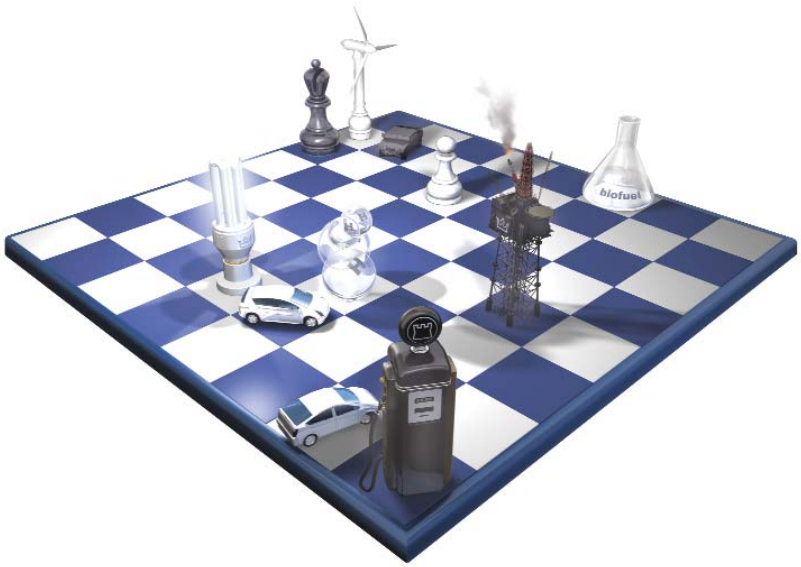
Winning the Oil Endgame

Innovation for Profits, Jobs, and Security

Executive Summary



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Executive Summary

Winning the Oil Endgame offers a coherent strategy for ending oil dependence, starting with the United States but applicable worldwide. There are many analyses of the oil problem. This synthesis is the first roadmap of the oil *solution*—one led by business for profit, not dictated by government for reasons of ideology. This roadmap is independent, peer-reviewed, written for business and military leaders, and co-funded by the Pentagon. It combines innovative technologies and new business models with uncommon public policies: market-oriented without taxes, innovation-driven without mandates, not dependent on major (if any) national legislation, and designed to support, not distort, business logic.

Two centuries ago, the first industrial revolution made people a hundred times more productive, harnessed fossil energy for transport and production, and nurtured the young U.S. economy. Then, over the past 145 years, the Age of Oil brought unprecedented mobility, globe-spanning military power, and amazing synthetic products.

But at what cost? Oil, which created the sinews of our strength, is now becoming an even greater source of weakness: its volatile price erodes prosperity; its vulnerabilities undermine security; its emissions destabilize climate. Moreover the quest to attain oil creates dangerous new rivalries and tarnishes America's moral standing. All these costs are rising. And their root causes—most of all, inefficient light trucks and cars—also threaten the competitiveness of U.S. automaking and other key industrial sectors.

The cornerstone of the next industrial revolution is therefore winning the Oil Endgame. And surprisingly, it will cost *less* to displace all of the oil that the United States now uses than it will cost to *buy* that oil. Oil's current market price leaves out its true costs to the economy, national security, and the environment. But even without including these now "externalized" costs, it would still be profitable to displace oil completely over the next few decades. In fact, by 2025, the *annual* economic benefit of that displacement would be $130 billion gross (or $70 billion net of the displacement's costs). To achieve this does not require a revolution, but merely consolidating and accelerating trends already in place: the amount of oil the economy uses for each dollar of GDP produced, and the fuel efficiency of light vehicles, would need only to improve about three-fifths as quickly as they did in response to previous oil shocks.

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Saving half the oil America uses, and substituting cheaper alternatives for the other half, 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; with the latest proven efficiency technologies, it can double oil efficiency all over again. The investments needed to save *each* barrel of oil will cost only $12 (in 2000 $), less than half the officially forecast $26 price of that barrel in the world oil market. The most important enabling technology is ultralight vehicle design. Advanced composite or lightweight-steel materials can nearly double the efficiency of today's popular hybrid-electric cars and light trucks while improving safety and performance. The vehicle's total extra cost is repaid from fuel savings in about three years; the ultralighting is approximately free. Through emerging manufacturing techniques, such vehicles are becoming practical and profitable; the factories to produce them will also be cheaper and smaller.

- **Apply creative business models and public policies** to speed the profitable adoption of superefficient light vehicles, heavy trucks, and airplanes. Combined with more efficient buildings and factories, these efficient vehicles can cut the official forecast of oil use by 29% in 2025 and another 23% soon thereafter—52% in all. Enabled by a new industrial cluster focusing on lightweight materials, such as carbon-fiber composites, such advanced-technology vehicles can revitalize these three strategic sectors and create important new industries.

- **Provide another one-fourth of U.S. oil needs by a major domestic biofuels industry**. Recent advances in biotechnology and cellulose-to-ethanol conversion can double previous techniques' yield, yet cost less in both capital and energy. Replacing fossil-fuel hydrocarbons with plant-derived carbohydrates will strengthen rural America, boost net farm income by tens of billions of dollars a year, and create more than 750,000 new jobs. Convergence between the energy, chemical, and agricultural value chains will also let versatile new classes of biomaterials replace petrochemicals.

- Use well established, highly profitable efficiency techniques to **save half the projected 2025 use of natural gas**, making it again abundant and affordable, then substitute part of the saved gas for oil. If desired, the leftover saved natural gas could be used even more profitably and effectively by converting it to hydrogen, displacing most of the remaining oil use—and all of the oil use if modestly augmented by competitive renewable energy.

These four shifts are fundamentally disruptive to current business models. They are what economist Joseph Schumpeter called "creative destruction," where innovations destroy obsolete technologies, only to be overthrown in turn by ever newer, more efficient rivals. In *The Innovator's Dilemma*, Harvard Business School professor Clayton Christensen explained why industry leaders often get blindsided by disruptive innovations—technological gamechangers—because they focus too much on today's most profitable customers and businesses, ignoring the needs of the future. Firms that are quick to adopt innovative technologies and business models will be the winners of the 21st century; those that deny and resist change will join the dead from the last millennium. In the 108-year history of the Dow Jones Industrial Average, only one of 12 original companies remains a corporate entity today—General Electric. The others perished or became fodder for their competitors.

What policies are needed? American companies can be among the quick leaders in the 21st century, but it will take a cohesive strategy-based transformation, bold business and military leadership, and supportive government policies at a federal or at least a state level. *Winning the Oil Endgame* charts these practical steppingstones to an oil-free America:

- Most importantly, revenue- and size-neutral "feebates" can shift customer choice by combining fees on inefficient vehicles with rebates to efficient vehicles. The feebates apply separately within each vehicle-size class, so freedom of choice is unaffected. Indeed, choice is enhanced as customers start to count fuel savings over the vehicle's life, not just the first few years, and this new pattern of demand pulls superefficient but uncompromised vehicles from the drawing-board into the showroom.

- A scrap-and-replace program can lease or sell super-efficient cars to low-income Americans—on terms and with fuel bills they can afford—while scrapping clunkers. This makes personal mobility affordable to all, creates a new million-car-a-year market for the new efficiency technologies, and helps clean our cities' air.

- Military needs for agility, rapid deployment, and streamlined logistics can drive Pentagon leadership in developing key technologies.

- Implementing smart government procurement and targeted technology acquisition (the "Golden Carrot") for aggregated buyers will accelerate manufacturers' conversion, while a government-sponsored $1-billion prize for success in the marketplace, the "Platinum Carrot," will speed development of even more advanced vehicles.

- To support U.S. automakers' and suppliers' need to invest about $70 billion to make advanced technology vehicles, federal loan guarantees can help finance initial retooling where needed; the investments should earn a handsome return, with big spin-off benefits.

- Similar but simpler policies—loan guarantees for buying efficient new airplanes (while scrapping inefficient parked ones), and better information for heavy truck buyers to spur market demand for doubled-efficiency trucks—can speed these oil-saving innovations from concept to market.

- Other policies can hasten competitive evolution of next-generation biofuels and biomaterials industries, substituting durable revenues for dwindling agricultural subsidies, and encouraging practices that protect both topsoil and climate.

What happens to the oil industry? The transition beyond oil is already starting to transform oil companies like Shell and BP into energy companies. Done right, this shift can profitably redeploy their skills and assets rather than lose market share. Biofuels are already becoming a new product line that leverages existing retail and distribution infrastructure and can attract another $90 billion in biofuels and biorefining investments. By following this roadmap, the U.S. would set the stage by 2025 for the checkmate move in the Oil Endgame—the optional but advantageous transition to a hydrogen economy and the complete and permanent displacement of oil as a direct fuel. Oil may, however, retain or even gain value as one of the competing sources of hydrogen.

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How big is the prize? Investing $180 billion over the next decade to eliminate oil dependence and revitalize strategic industries can save $130 billion gross, or $70 billion net, *every year* by 2025. This saving, equivalent to a large tax cut, can replace today's $10-billion-a-month oil imports with reinvestments in ourselves: $40 billion would pay farmers for biofuels, while the rest could return to our communities, businesses, and children. Several million automotive and other transportation-equipment jobs now at risk can be saved, and one million net new jobs can be added across all sectors. U.S. automotive, trucking, and aircraft production can again lead the world, underpinned by 21st century advanced-materials and fuel-cell industries. A more efficient and deployable military could refocus on its core mission—protecting American citizens rather than foreign supply lines—while supporting and deploying the innovations that eliminate oil as a cause of conflict. Carbon dioxide emissions will shrink by one-fourth with no additional cost or effort. The rich-poor divide can be drastically narrowed at home by increased access to affordable personal mobility, shrinking the welfare rolls, and abroad by leapfrogging over oil-dependent development patterns. The U.S. could treat oil-rich countries the same as countries with no oil. Being no longer suspected of seeking oil in all that it does in the world would help to restore U.S. moral leadership and clarity of purpose.

While the $180-billion investment needed is significant, the United States' economy already pays that much, with zero return, every time the oil price spikes up as it has done in 2004. (And that money goes into OPEC's coffers instead of building infrastructure at home.) Just by 2015, the early steps in this proposed transition will have saved as much oil as the U.S. gets from the Persian Gulf. By 2040, oil imports could be gone. By 2050, the U.S. economy should be flourishing with no oil at all.

How do we get started? Every sector of society can contribute to this national project. Astute business leaders will align their corporate strategies and reorganize their firms and processes to turn innovation from a threat to a friend. Military leaders will speed military transformation by promptly laying its foundation in superefficient platforms and lean logistics. Political leaders will craft policies that stimulate demand for efficient vehicles, reduce R&D and manufacturing investment risks, support the creation of secure domestic fuel supplies, and eliminate perverse subsidies and regulatory obstacles. Lastly, we, the people, must play a role—a big role—because our individual choices guide the markets, enforce accountability, and create social innovation.

Our energy future is choice, not fate. Oil dependence is a problem we need no longer have—and it's cheaper not to. U.S. oil dependence can be eliminated by proven and attractive technologies that create wealth, enhance choice, and strengthen common security. This could be achieved only about as far in the future as the 1973 Arab oil embargo is in the past. When the U.S. last paid attention to oil, in 1977–85, it cut its oil use 17% while GDP grew 27%. Oil imports fell 50%, and imports from the Persian Gulf by 87%, in just eight years. That exercise of dominant market power—from the demand side—broke OPEC's ability to set world oil prices for a decade. Today we can rerun that play, only better. The obstacles are less important than the opportunities if we replace ignorance with insight, inattention with foresight, and inaction with mobilization. American business can lead the nation and the world into the post-petroleum era, a vibrant economy, and lasting security—if we just realize that we are the people we have been waiting for.

Together we can end oil dependence forever.

Quotations about *Winning the Oil Endgame*

"This exciting synthesis of how to eliminate America's oil dependence could be the most important step in many years toward secure and affordable energy. Its novel but persuasive ideas, which hold promise of revitalizing American industry and agriculture, should appeal to conservatives and liberals alike."

— President Jimmy Carter

"We can, as Amory Lovins and his colleagues show vividly, win the oil endgame….[A]n intriguing case that is important enough to merit careful attention by all of us, private citizens and business and political leaders alike."

— George P. Shultz, Distinguished Fellow
at the Hoover Institution, Stanford University;
former Secretary of State, the Treasury, and Labor

"[T]his compelling synthesis…demonstrates that innovative technologies can achieve spectacular [oil] savings…with no loss of utility, convenience and function. It makes the business case for how a profitable transition for the automotive, truck, aviation, and oil sectors can be achieved.…The refreshingly creative government policies suggested…merit serious attention,…and I suspect they could win support across the political spectrum.…This report will help to launch, inspire, and inform a new and necessary conversation about energy and security, economy and environment. Its outcome is vital for us all."

— Sir Mark Moody-Stuart, Chairman, AngloAmerican plc;
former Chairman, Royal Dutch/Shell Group

"Amory Lovins has had more impact on our energy use than any single person in the world. Now his team has produced one of the most important energy studies in decades. It merits careful examination as a profitable strategy for achieving energy security, economic prosperity, and environmental quality through smart business strategies accelerated by efficient government policy."

— William Martin, Chairman, Council on Foreign Relations
Energy Security Group

"One of the best analyses of energy policy yet produced."

— *Time* magazine

"Perhaps the most rigorous...analysis of what it will take to wean us from foreign oil was tasked by the Pentagon and carried out by…Rocky Mountain Institute, a respected center of hard-headed, market-based research.…[T]he book's powerful summary…argues persuasively that by 2035 we can be entirely independent of imported oil and that 'it will cost less to displace all of the oil that the United States now uses than it will cost to buy that oil.'"

— Robert C. McFarlane (National Security Advisor to President Reagan),
Wall Street Journal, 20 Dec. 2004

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