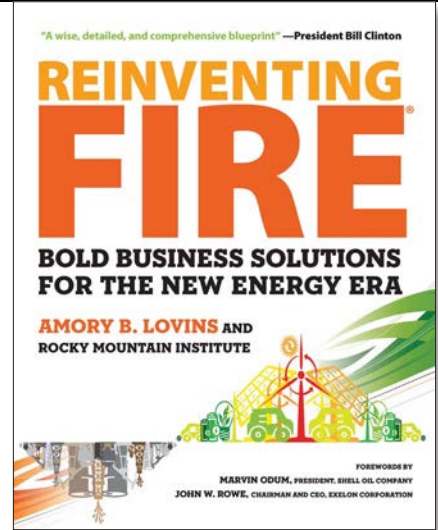


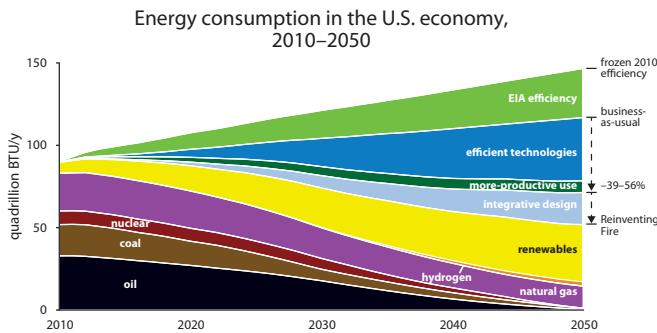
Reinventing Fire

Reinventing Fire: Bold Business Solutions for the New Energy Era by Amory Lovins and the Rocky Mountain Institute (2011, Chelsea Green Publishing Co.)

Many public policy books contain brilliant and insightful analyses of a problem and then totally fail by offering solutions that call upon us collectively to try merely harder, delay or forgo gratification, and/or fundamentally behave in ways contrary to human nature. But energy guru Amory Lovins of the Rocky Mountain Institute (RMI) and 12 coauthors have written a self-help book to break this country's addiction to fossil fuel. Their roadmap would end all coal, oil, and nuclear energy consumption by 2050. By that time, wind, solar, and other renewable sources would provide 43% of the country's energy with much of the rest coming from non-cropland biofuel, hydrogen, and hydro-electric. Natural gas would fill out the energy mix, but at a level of between 14% and 36% less than what was consumed in 2010.



Courtesy ChelseaGreen.com ©



The path charted in *Reinventing Fire* could phase out oil, coal, and nuclear energy by 2050. Natural gas use would be from 14% to 36% below the 2010 level.

RMI doesn't appeal to our better natures as much as to our pocketbooks. The authors project that the "twin transition" to energy efficiency and renewables—a \$4.5 trillion investment—would result in a \$5 trillion net profit to society—if we spend the money to wisely transition from fossil fuels to energy efficiency and renewable technologies.

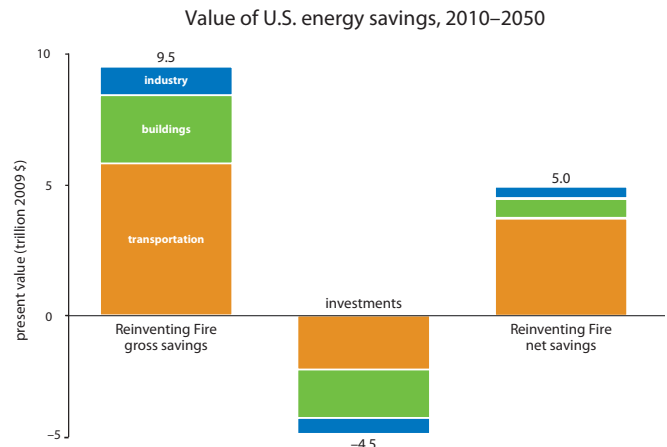
RMI boldly claims that society doesn't need carbon taxes; Congressional action; or any new "national" taxes, subsidies, or mandates to achieve its multifaceted energy plan. "There is obviously no silver bullet—but there is a lot of silver buckshot and birdshot," notes RMI.

The 759 detailed endnotes and many charts, graphs, and illustrations illustrate some of that buckshot and birdshot. The book is full of examples that are enlightening and compelling:

- We could cut our gasoline use by 1% to 3% if all our vehicles' tires were properly inflated.

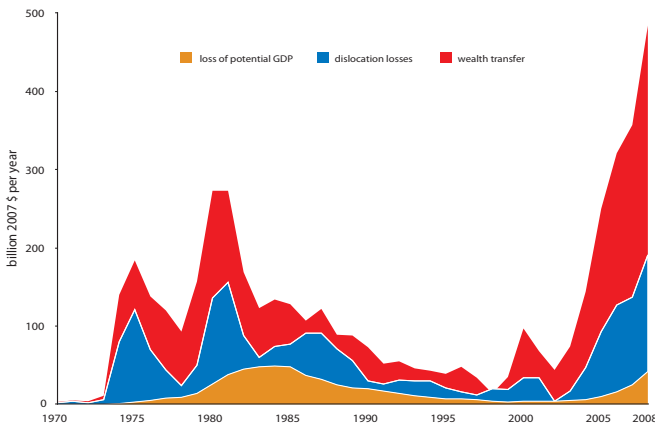
- The wire gauge for a lighting circuit is specified to prevent fires. If it were one gauge larger, the investment in the more expensive wire would yield a 169% savings after the tax return on the investment in saved energy.
- Compressing air to run our tools and factories uses 9% of all U.S. industrial electricity. Fixing leaking compressors can cut energy consumption in half and have a six-month payback.
- Using smaller pumps to convey materials through larger pipes with fewer and less-angled bends drastically reduces friction that must be overcome by using energy. Right-angled connections are common primarily because they are easier to draw on the plans.

The book admits that freeing ourselves from fossil fuels won't be pain-free, but the multitude of pleasures—from healthier people to enhanced national security—are a huge net gain. Yes, we can have 125 to 140 mpg-equivalent cars, but also trucks that run on 30% less fuel (none of it diesel) and planes that use several-fold less fuel (none of it kerosene).



Discounted to 2010 present value at a 3% per year real discount rate, the *Reinventing Fire* strategy would require \$4.5 trillion of cumulative extra investment (beyond business-as-usual practices) but return \$9.5 trillion in fuel savings, creating \$5 trillion of cumulative net wealth.

Costs of oil dependence to the U.S. economy, 1970–2008

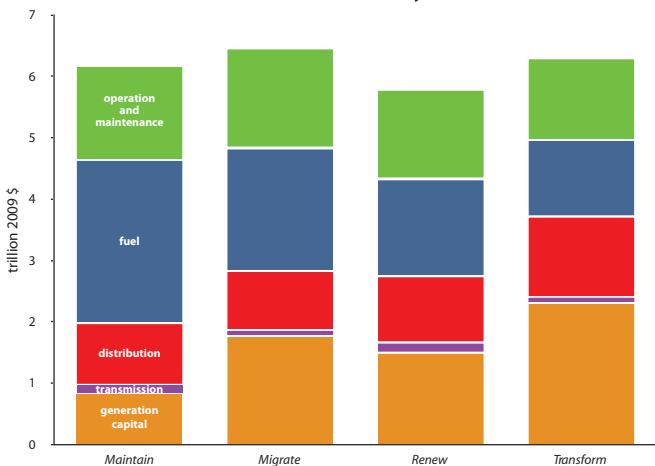


Reinventing Fire notes: “In total, U.S. oil dependence’s economic cost just in 2008 was on the order of a trillion dollars beyond the cost of the oil itself. The only escape is to stop using oil.”

How? RMI says that “the logical goal, therefore, is achieving vehicle ‘fitness’—designing out weight, aerodynamic drag, and rolling resistance.” Once autos are extremely light and efficient, then you can focus on the power train and change how autos are propelled and fueled.” Of course, Detroit and Tokyo are doing the opposite.

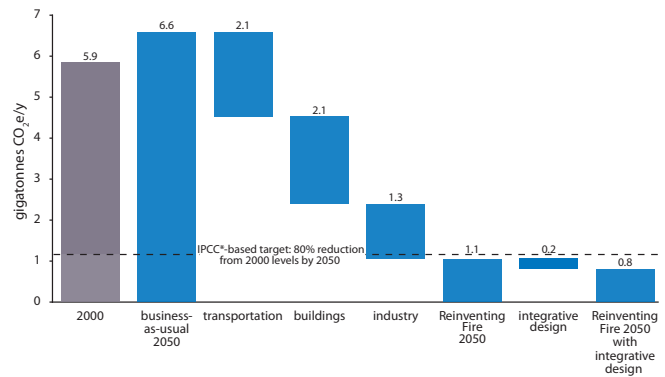
RMI’s examination of electricity considers four scenarios: We can *maintain* what we have, replacing existing generation sources as they wear out with cleaner coal and nuclear plants; we can *migrate* to low- and no-carbon fuels in a gradual transition; we can aggressively *renew* our energy away from non-renewable fuels; or we can go all-in and *transform* our electricity system by greatly increasing distributed generators such as rooftop solar,

Present value cost by case



The total 2010 present value of electrical system costs varies by up to 12% across cases, but all forecasts are by nature wrong, and these estimates have substantial uncertainties. *Reinventing Fire* says that “choices between such figures should rest much less on costs, which are roughly similar and all uncertain, than on risks, whose nature, gravity, and management differ profoundly.” Choosing “Transform” means spending more money up front, but less on fuel in the future. It also means fewer vulnerable transmission lines and more rooftop solar-electric systems.

Reinventing Fire fossil-fuel carbon dioxide emission reductions



Reinventing Fire’s energy savings and supply shifts can reduce U.S. fossil-fuel carbon emissions by more than 80% from 2000 levels—the minimum reduction needed to hold atmospheric CO₂ below 450 ppm.

small-scale wind, combined heat and power systems, and fuel cells. After examining the costs and benefits of each, RMI finds that the present value costs of each case are very similar. With the costs being the same, they argue, why not go for the scenario that makes us the most secure, healthy, and wealthy?

Lovins embraces capitalism, arguing that it can efficiently provide society with goods and services—as long as the market is sending and receiving the right signals. RMI also says that the concepts in its roadmap, “beyond opportunities for profit...include correcting structural weaknesses in our economy and threats to our health and our way of life.” It claims persuasively that following its roadmap will create wealth, manage risk, increase innovation, and create jobs.

But no book is perfect, and I have nits to pick. First, the natural environment should be given more consideration. Hydropower is considered renewable energy but it does not renew salmon. While a portion of forest and agricultural residues can be sustainably converted into energy, let’s remember to leave enough to replenish nature and natural processes.

Second, while natural gas (aka methane) is an inevitable bridge fuel to a fossil fuel-free future, RMI needs to come down harder on methane’s disadvantages, acknowledging that fracking (injecting chemicals under high pressure to release gas in shale rock) is a big problem, as are leaking pipelines (methane has 25 times greater global warming potential than carbon dioxide). RMI’s path can decrease U.S. carbon dioxide (CO₂) emissions by 80% from 2000 levels, but that’s still a lot of carbon. The Intergovernmental Panel on Climate Change (IPCC) says that to stabilize at 450 parts per million (ppm) of atmospheric CO₂, an 80% to 95% reduction in CO₂ emissions from 2000 levels will be necessary. IPCC has also concluded that its earlier worst-case scenario is the actual case now. Many scientists now say that 350 ppm must be the target number (350.org). We’re presently at 393.09 ppm (co2now.org) and rising.

Nitpicking aside, *Reinventing Fire* shows us that we neither need to freeze in the dark, nor go back to the Stone Age, to ensure a healthy, habitable planet for ourselves and our descendants.

—reviewed by Andy Kerr