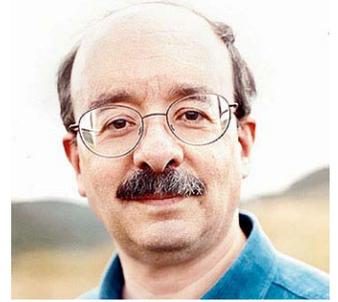


## Reinventing fire through corporate and social innovation

### An interview with Amory Lovins, Chairman and Chief Scientist, Rocky Mountain Institute; author of *Reinventing Fire: Bold Business Solutions for the New Energy Era*



Physicist Amory Lovins is Chairman and Chief Scientist of [Rocky Mountain Institute](#) and Chairman Emeritus of Fiberforge Corporation. His wide-ranging innovations in energy, security, environment, and development have been recognized in the form of numerous prestigious fellowships and awards. He advises governments and major firms worldwide on advanced energy and resource efficiency, has briefed 20 heads of state, and has led the technical redesign of more than \$30 billion worth of industrial facilities in 29 sectors to achieve very large energy savings at typically lower capital cost. A Harvard and Oxford dropout, he has published 29 books and hundreds of papers and has taught at eight universities, most recently as a 2007 visiting professor in Stanford University's School of Engineering. In 2009, Time named him one of the 100 most influential people in the world, and Foreign Policy, one of the 100 top global thinkers.

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**Interviewer: John Wiseman**

**John Wiseman:** In *Reinventing Fire*, you argue that it is both possible and desirable for the US economy to transition by 2050 to a prosperous economy without reliance on oil or coal or nuclear energy. Can you briefly summarise why you believe that's the case and what the actions are that would be needed to achieve that outcome?

**Amory Lovins:** Well, 61 of us at Rocky Mountain Institute, with a lot of help from industry on both content and peer review, over a year-and-a-half looked in depth into what a transition to efficiency and renewables could look like if you integrated all four energy-using sectors - transport, buildings, industry and electricity - and if you integrated innovations, not just in technology and public policy but also in design and strategy.

We found that the United States could indeed run a 2.6-fold bigger economy in 2050 in line with official projections, with no oil or coal or nuclear energy and a third less natural gas, and this would cost five trillion dollars less in net present value than "business as usual". It could be done without new inventions or any act of Congress, and it could be led by business, for profit - the motive of course being the five trillion dollars on the table.

The use of our most effective institutions - private enterprise co-evolving with civil society sped by military innovation - to go round our least effective institutions - notably Congress - is rather novel and the approach has a strong trans-ideological appeal. It makes sense whether you care most about profits, and jobs and competitive advantage, or about national security, or about environmental stewardship, climate protection and public health. So we focus on outcomes, not motives, and that cuts through a lot of the normal political noise.

Now, there are obviously obstacles to doing this and with relentless patience and meticulous attention to detail, each of these obstacles can be turned into a business opportunity, some of which are very large and very disruptive.

The two biggest policy changes needed to enable and speed the transition are to reward electricity and gas providers for cutting your bill - not selling you more energy; we have done that reform in 14 of the United States but it has yet to come to most places - and for new automobiles to use what are called "feebates" - that is fees on inefficient new cars paying for rebates on efficient ones in a revenue and size-neutral fashion, to bridge the gap in time value of money between private buyers and society.

Private buyers typically want their money back from efficiency investments in autos in one/two/at most three years, according to much of the literature - although some will go much further than that, some early adopters - whereas society is interested in the fuel and emissions saving over the whole life of the vehicle - typically over 15 years.

But "feebates" bridge that gap and allow private buyers to use societal investment criteria, and that would greatly speed the re-tooling of the auto industry to make ultra-light electrified autos, which have many breakthrough advantages for both the maker and the user because it would cover the up-front extra cost in the early days, before volume production brings down the cost to about normal levels.

There are many other kinds of policy changes needed as well - for example, transparent pricing and fairer access and competition on the electric grid. But it turns out that all of the policy changes needed can be done either administratively or at a state level. They don't have to be done by national legislation - and I think in Australia, where you have got fairly powerful states, this would be probably even more true.

**JW: Your work has first of all been in relation to the United States, but would you argue that it is relevant to other developed economies such as Europe or Australia?**

**AL:** Yes, and the technologies, the business strategies, the design innovations that can often make big savings cheaper than small ones, those are highly fungible; you could translate them to practically any society, and the public policy innovations will also be largely adaptable or adoptable. Some details will differ but I think the similarities are much more important than the differences. I have worked in 50-odd countries and I can't think of one to which this wouldn't apply broadly. So I think, as it gets worked out in other countries, we will see a family of strikingly similar results.

But I think it's not only for developed economies, and in fact countries like China and India that have the fastest growth in need for energy services also have the greatest need and the greatest opportunity for energy efficiency, it's much easier to build things right the first time than to fix them later. So if you're building most of your infrastructure, it's a lot easier than the fix-ups that we have to do in the West.

**JW: I'm interested in the reactions to *Reinventing Fire* - what have been the reactions and responses from different constituencies - business, media, governments?**

**AL:** We've had a minor ideological criticism from some environmental groups that felt it wasn't 'dirigiste' enough; it wasn't calling for enough mandatory policies, particularly on carbon pricing - because we actually found that wasn't necessary to achieve the result we were seeking, although it would be appropriate and certainly very helpful.

**JW: Can I just ask you what your view is on carbon pricing in general?**

**AL:** Oh, appropriate, helpful – not essential; not sufficient, certainly, because if you get the prices right but don't bust a lot of barriers, not much happens - and in the long run probably not as important as many suppose because in an efficient market, the carbon price will clear quite low because there is such a huge amount of unbought efficiency, and by then also renewables would be even cheaper and they're already often very competitive.

We have had, as far as I know, no criticism of the content of *Reinventing Fire* from industry - perhaps because we do most of our work with the private sector and I think are recognised for solid research. Perhaps because the forewords to the book were written by Marvin Odum, President of Shell Oil in the United States and by John Rowe, who was then Chair of Exelon, the largest nuclear and third largest coal utility in the country, and the Dean of the Utility Executive Community, so that perhaps immunised us a bit.

Of course they didn't say in their forewords that they agreed with everything in the book - you wouldn't expect that and I didn't - but they did say it was a valuable contribution to honest debate and you should read it, which is of course what a foreword would, one hopes, wish to say.

The reaction has been very good but the book has gone through three printings in nine months and more are on the way. It was summarised in the March/April issue 2012 of *Foreign Affairs* magazine - and it also is summarised in a TED Talk at ted.com - if you go to search on "Lovins" - it is called something like "Amory Lovins' energy plan for the next 50 years." That had 350,000 views in its first month and the word is spreading rather quickly.

I have given upwards of a hundred talks on this, mainly to business groups, and it has been very well received.

**JW: Can I put to you a question from the part of the environment movement, which is focused particularly on arguments from climate science about the speed of emissions reductions required: When people from that part of the world say to you, "Yes, but greenhouse gas emissions have to come down extremely urgently - perhaps it's already too late" - what is your response to that?**

**AL:** Well, I think that climate science does say it is extremely urgent, and in our scenario, the US carbon emissions would come down 82 to 86 per cent by 2050 with a 2.6-fold bigger economy and ultimately down by about 100 per cent from burning fuel. They didn't deal with the forest and agriculture bits or the other trace gases. Those are separate, but have similar arguments.

To do this, we simply assumed, for example, that the rates of efficiency adoption nationwide on average would take 20 years to ramp up to the levels already achieved in the most advanced states in recent years and would then stick at 85 per cent of full adoption, so we said there'd be another 15 per cent you could never reach for one reason or another. It seems to us perfectly reasonable.

We didn't couple that up to a climate model to see what good it would do because of course for that you would also want to know what happens in the rest of the world - we weren't ready to model the rest of the world! But I think it's quite possible that countries like China, for example, could continue to outpace the West in adopting such changes. They have their own way of doing it but they're very effective at it.

**JW:** That leads me to a to a backcasting question. Imagine we are sitting here in 2050 and the world has indeed shifted to the kind of economy you are talking about; a prosperous economy without reliance on oil, coal or nuclear power. Can you give me a narrative about how that transition occurred? Looking backwards – how did the change take place? What happened?

**AL:** Well, what happened is we started to take economics seriously; efficiency and renewables proved very potent competitors. Already by 2011, half the world's new electric generating capacity was renewable and had been for four years running. In that year, just the non-hydro renewables got 225 billion US dollars of global investment and they had an 84 billion loss. This was not a fringe activity anymore.

But as fuller and fairer competition was permitted, even before the subsidies were equalised or removed between renewable and non-renewable energy, the inherent economic merit of efficiency and renewables became unbearably obvious. Even by 2010, the orders for coal and nuclear stations worldwide had been rapidly drying up because there was too much cost risk to interest investors.

Also by that time, renewable investment of all sorts had reached half the level of upstream oil and gas investment so that started to get the attention of the petroleum companies and they became much more serious players because, with their geographic scope of action shrinking and their ability to satisfy the customer, or especially investor demands for risk and reward out of an increasingly risky geological portfolio, those kinds of constraints were closing in on them.

They started to get much more serious about diversifying their activities and applying their skills and assets to the new world - and they proved very good at it. But much of the running was made by smaller private firms, which quickly blew past the more cumbersome, say, Chinese state-owned enterprises.

The same then happened in India; this combined, of course, with the major reversal in the tenures of innovation which started to flow so noticeably from South to North because of course brains are evenly distributed - one per person - most of the brains are in the South.

Half the brains are in the heads of women, who started to gain much more of a voice as the emerging global nervous system, starting around 2000, started to hook us all up, the most powerful engine we know - six/seven/eight/nine billion minds wrapping round the problem - started to take on energy and many smart, resourceful people that one hadn't heard of before came up with very creative solutions.

So as we look back on this now from 2050, one wonders in a way what all the fuss was about - and I suppose we used to think that catastrophic climate change was a big problem because we supposed that it had to be solved by difficult treaties between sovereign and national governments. Simply because it was a problem of global reach, we supposed it had to be solved by global agreement.

But that assumed - quite wrongly - that the solutions would be costly and painful rather than attractive and profitable, for the simple reason - now so blindingly obvious in hindsight - that it was so much cheaper to save the fuel than to buy it in the first place, let alone burn it.

So as the economic logic gradually overcame the dogma that it must not have been cost-effective to save energy or we'd have done it already, we really unleashed the dynamism of individual choice and corporate and social innovation - and that turned out to be much more powerful and much faster than the public policy, which we had assumed was the only way to solve such problems. So the money on the table got people's

attention and millions of much smarter choices replaced the millions of uninformed or less intelligent choices that had got us into this mess in the first place.

**JW:** **Of all the many pieces of work – research, policy development, policy interventions – that could be undertaken in the future, what, in your view, are the one or two highest priorities to take the ideas in *Reinventing Fire* forward? What are the next pieces of work that need to be done?**

**AL:** Well, I think it would be very instructive for capable groups in each country or each region to say, "If you applied this portfolio of innovations and technologies in our society, what would it look like? What obstacles would we run into, given our unique conditions, and how, doing it the way our society does things, would we overcome those, and turn them into business opportunities?"

That sort of analysis is just starting to happen in a few countries, and as the word spreads, I think it will happen in a lot more. Of course, at Rocky Mountain Institute we are committed up-front to a completely transparent analysis; all of the results can be reproduced on a hand calculator or with a simple spreadsheet, with the exception of the electricity modelling, which uses a National Lab model that is much more elaborate.

All the materials are either posted on the website, [www.reinventingfire.com](http://www.reinventingfire.com) or in the book itself, or available on request. So there's some kind of an analytic kit we can provide to suitable groups to do such work.

I think I'd also suggest that to get this sort of result, it is important - indeed vital - to integrate all the energy-using sectors and all the four kinds of innovation: in technology, policy, design and strategy. The sum of the parts is a lot smaller than what you actually get, and there are some deeply disruptive business opportunities that emerge only when you look at that whole picture.

Remember also that many of the technologies and design innovations are driven by international markets. For example, China has been driving the world's plummeting cost and explosive growth in renewable electricity. China now leads in five renewable technologies: wind, photovoltaics, small hydro, biogas and solar thermal collectors. It aims to lead in all of them - and may well do - and many other countries are asserting leadership in specific areas.

So this is not simply a matter of what happens in a given country. We are all caught in the blast of this extraordinary international competition - and that is I think a good thing. So when Germany innovates with feed-in tariffs or China with one or another of its novel policies, that has global implications - not only regional - and the more competition, innovation, emulation we get, the faster it goes for everybody.

So I am very encouraged by the kinds of contacts we are getting from round the world; the translation is starting to come out of our *Reinventing Fire* book, and the parallel analyses that are emerging around the world. This sort of grand synthesis of what can be done with energy if we take economics seriously - not literally - It is also a lot of fun to do and I think can get many somewhat gloomy analysts out of their box!

**JW:** **Thinking of a country like Australia, a country with a very large reliance on fossil fuels for its current economic...**

**AL:** And the highest vulnerability to climate change and a long history of very high-quality analysts and innovators.

**JW: Indeed. What would be your comments, specifically in relation to an economy and a society like Australia, the opportunities as much as the risks?**

**AL:** Well, that you have more climate risk than probably anybody, except conceivably Bangladesh - their problem is too much water; yours will be not enough - and you are already seeing the effects of that. You also have a first-class educational, social, technical infrastructure, and so, regardless of the fractious national politics, there is a lot you can get on with at a state and local level to try a lot of experiments at once in different parts of the country and see what works.

Some of the innovative techniques that we describe in the book are actually Australian inventions. I think that you have some advantage also in being rather far from the very large markets. It has made you more innovative and self-reliant, and many of your engineers - like the Kiwi engineers - are wired differently and have very original ways of looking at things that the rest of us highly value. You've also of course got not just the individual centres of excellence like the CSIRO, but other networks that can do extremely well.

So I would urge you just to get on with it. Don't wait for anybody. You've got plenty of talent to do this yourselves and set an example for the rest of the world.

**JW: Last question...an “elevator pitch” question. If you have the proverbial minute or two with the key decision makers globally, what is the two - or three-sentence pitch that you would make about the highest priorities in relation to climate and energy challenges and opportunities?**

**AL:** The climate problem and many others - energy poverty, energy insecurity, nuclear proliferation and so on - are all artefacts of not using energy in a way that saves money. Most of the energy we use is wasted. The rest can be got with least cost and least risk from an integrated system of modern renewables supply. In order to do this, it would be extremely helpful to level the playing field; ideally to let all ways to save or produce energy compete fairly at honest prices, regardless of their size, type, technology, location or ownership.

That is pretty much the opposite of the national energy policies most of us have got - but it would give us a much more competitive economy and a richer, cooler, fairer and safer world.

**JW: Thankyou.**