
The Path to a Sustainable Future

A CONVERSATION WITH AMORY LOVINS,
CHIEF SCIENTIST AND CHAIRMAN EMERITUS
OF ROCKY MOUNTAIN INSTITUTE

FLETCHER FORUM: *In “Reinventing Fire,” you speak of an economy that can grow by a factor of 2.6 over the next fifty years, without oil, coal, or nuclear energy. What does the path to this point look like?*

AMORY LOVINS: You triple the efficiency of using energy, and quintuple renewables from about 14 percent share in 2014 to 74 percent in 2050. To triple the efficiency by 2050, you need by 2030 to achieve the national average adoption of efficiency that the Pacific Northwest states already did ten years ago. And the renewables adoption is equally reasonable at historical rates—in fact we’re running a bit ahead of trajectory now.

FLETCHER FORUM: *So in the scientific and climate communities, this is entirely feasible, and you believe that we’re on track?*

LOVINS: Well, *who* is on track for what is the question. The United States is on track for 84 to 86 percent (roughly) carbon reduction at an extra cost of minus 5 trillion dollars. That’s not counting any carbon price or other externality value. This is, of course, not enough by itself to get the world on a safe climate track. The combination of the United States and China has an even bigger potential, which we’ve identified in a collaborative project

Amory Lovins is Cofounder, Chief Scientist and Chairman Emeritus of Rocky Mountain Institute. A 1993 MacArthur Fellow, Mr. Lovins has been active at the nexus of energy, resources, economy, environment, development, and security for more than forty years. He is widely considered among the world’s leading authorities on energy, particularly its efficient use and sustainable supply, and is an innovator in integrative design and superefficient buildings, factories, and vehicles.

with the Chinese top energy experts, and although it's still not enough, it's closer because together we emit over 40 percent of the world's carbon.

It would take a lot of other players, although the EU is making very good progress, particularly Germany, the world's fourth biggest economy, which cut its energy use 4 or 5 percent last year and is at a record low for carbon emission. Japan is in a policy bind right now, trying to suppress renewables to make room for a nuclear restart. They're in the process of blocking access to the grid of renewables that are a lot cheaper than burning imported fossil fuel in existing plants, so they're raising their prices and carbon emissions out of nuclear ideology. I don't think that will last forever, but it's certainly an embarrassment and an unnecessary cost to their society.

I think the leadership and progress in India on renewables and also the good beginnings there in moderate efficiency are very encouraging. A colleague of ours, Rohan Parikh, has been building a bunch of new office buildings using a fifth the normal amount of energy, costing 10 or 20 percent less to build, and getting much better results. He's been sharing that, with the blessing of his chairman, with businesses all over India.

FLETCHER FORUM: *What types of advice you would give to the heads of state in the run-up to the Paris climate negotiations?*

LOVINS: Well, I tend not to get into the Paris complexities—obviously I very much hope it will succeed, but you don't actually need a treaty to get countries to do what is in their economic self-interest.

China, for example, which is well ahead of the United States in efficiency and renewable progress, is the only country I know of that increased its energy productivity over 5 percent a year for a quarter century running, up until 2001, and then close to that pace after a five year gap. They didn't make that enormous efficiency gain because the treaty made them do it, but rather because leaders understood that if efficiency is not the foundation of the development process you can't afford to develop, because the supply side eats the budget. So although there's always scope for international progress through such agreements, I think national, sub-national, private sector, and civil society progress does not necessarily require such a treaty, and progress is increasingly being made at those other levels through other modalities and actors.

If you go back to the history of the modern climate debate, it was obvious to anybody paying attention in the 1960s that this was going to be a serious problem (and obvious to some in the 1860s actually—it was Svante Arrhenius who figured it out). In the 1960s it was already obvious, but it

didn't really get to much public prominence until the early 1980s. I put a pretty strong statement about it in my *Foreign Affairs* article in 1976, and it surprised a lot of people, but I'd been a protégé of the late Carroll Wilson, a professor at MIT who had run the Study of Man's Impact on Climate (SMIC). That was a very early convening of leading climate experts, who figured out most of what the big issues were going to be.

In the 1980s and even in more in the 1990s, the coal industry ginned up fake studies to show that solutions, while unnecessary, would be very costly. And I'm afraid the leading environmental groups fell right into the trap, and said, "Yes, it will cost more, but it's worth it, and it shouldn't cost as much as you say." What they should have said was, "No, you got the sign wrong." It's not costly, but profitable—because efficiency is cheaper than fuel, which was true even in those days and it's much more true now. And we've been on this wrong track ever since. It's reinforced by the way most governments' climate policy is dominated by theoretical economists, who were schooled in diminishing returns and who assume that markets are essentially perfect, so anything we haven't done already must cost more, or we would have done it.

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FLETCHER FORUM: *That's interesting. I know you mention in previous speeches that you don't think that there needs to be new inventions and new technologies, that we can actually reach this economy that you envision in your book through existing initiatives or existing technologies. Is that still true?*

LOVINS: Yes. It is still true, although innovation is accelerating and there will be many new technologies. You can now save, in the United States, about twice as much energy as even I thought—when I was considered extremely sanguine on the subject around 1980—and at only around a third the real cost that I thought then. That's just with innovations that have already happened. Many more will happen that will make it even cheaper and easier.

FLETCHER FORUM: *Where have we seen the biggest gains? Is it efficiency gains where we've made the biggest strides in combating climate change—for example, in things like building efficiencies or miles per gallon?*

LOVINS: Buildings, vehicles, transport systems, and, of course, also industrial processes—they all advance market rate. The United States last year

used 54 percent less primary energy per dollar of GDP than it did in 1975. Our use of gasoline and electricity has been drifting down since 2007 while the economy grows; in fact, that's a major driver of economic growth.

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The progress has been more widely publicized and even more dramatic in certain renewables—that technology is falling in price about fivefold in five years—but the efficiency gains are even more consequential. Both together are a winner, because the less energy you need, the easier it is to supply it sooner with a smaller amount.

FLETCHER FORUM: *You had mentioned in your 1976 Foreign Affairs article that if we didn't take decisive action, our options would slip away. Have our options slipped away?*

LOVINS: The idea there was what is now called “lock-in”, or path dependency. And I think it's worked out very clearly in countries with large nuclear establishments, like France or Japan, that come to so dominate policies, training and education, attitudes, investments, and trajectories. It's very hard to change course, because a superreactor doesn't turn easily.

The costlier energy we have today also gets embedded in the things we build. The earlier you can shift to a least cost strategy, the less you're stuck with having to retrofit more inefficient infrastructure you build, and strand more supply side assets that you wish you hadn't built. I mentioned earlier that China can improve energy productivity by 2050—about sixfold compared to threefold in the United States. That's partly because we were more efficient to start with, but more because China is building more infrastructure and it's a lot easier to build it right than fix it later, as we must do.

FLETCHER FORUM: *Over the next year, what are some of the innovations, advances, or events that you're most excited about in the field of eenergy, environment, or climate change, whether related to technology, policy, or consumer mindset?*

LOVINS: Well, we play a long game typically over fifty years...

FLETCHER FORUM: *What are you looking forward to in the next fifty years?*

LOVINS: Transformation, but I'd typically not try to forecast up a year ahead; that's noise. However, I think there will be wider recognition that big savings will be cheaper than small savings, if you optimize buildings, factories, and vehicles as whole systems, not bins of isolated components.

It will be obvious to even more people that renewables and distributed power generators generally are running away with the electricity market. What *The Economist* calls micro power, which is renewables minus big hydro plus cogeneration, is now a quarter of global power generation and half of new capacity. That's not a fringe activity anymore. Renewables other than big hydro have been adding, in each of the past four years, over 80 gigawatts a year and getting up to a quarter trillion dollars of private investment. Eighty gigawatts a year is more than the non-renewable additions. A quarter trillion dollars per year is more than the market cap in the coal industry. Every year we're investing more than that in renewables.

So the revolution is already happening—sorry if you missed it—but it's going to accelerate. Bloomberg New Energy Finance, which tracks all the market transactions and their economics, believes that, over the next fifteen years, new power generating capacity additions will be cut in half from fossil and nuclear plants (not counting their retirements) and will triple in renewables.

FLETCHER FORUM: *It's interesting that you mention that we've already missed the revolution. Is it a perception problem or a framing issue, in the sense of the pessimism that continues to permeate a lot of policymakers' thinking? It sounds like you're saying that we are making a lot of progress, but that people aren't seeing it.*

LOVINS: We are. And it's going to take a lot more hard work. It's not easy, it's just easy to not do it. But economics is on the side of climate protection.

Another thing that may happen in the next year is there will be more realization that if you don't buy the cheapest and fastest kinds of climate protection—if you buy slow, costly stuff instead—you are reducing and retarding climate protection compared to what you could have bought. It's an opportunity cost, and that is not currently counted in climate policy. If you're trying to displace coal-fired power plants, any carbon free alternative is considered equivalent regardless of their relative cost and speed, but obviously cheaper ones and faster ones will displace more carbon than costlier and slower ones. That ought to be counted in the decision about climate effectiveness. And the results we're getting in that regard are quite striking. *f*