

15 March 2016 “Preface” (lead story) in *Energy Review* (Beijing), which retitled it 向清洁转型的好时机来 and posted it at www.tanpaifang.com/qingjienergyuan/2016/0315/51431.html

Energy in the Year of the Monkey

盧安武 博士 (Prof. Amory B Lovins), 联合创始人、首席科学家、落基山研究所

盧安武 is an American physicist and energy expert who since 1973 has advised government and business leaders in more than 60 countries, including China, and briefed more than 40 heads of state. He has written 31 books and 570 papers, received many of the world's top energy and environmental awards, and taught at 10 universities including Beida. His books in Chinese include 自然资本论, 石油博弈解困之道, and 重塑能源. Time named him one of the world's 100 most influential people, and Foreign Policy, one of the 100 top global thinkers.

I'm a banana farmer at 2200m elevation, near snowy Aspen, where temperatures have dropped down to -44°C . Banana crop #61 is ripening comfortably inside my superinsulated house inspired by ancient north Chinese passive-solar architecture, built with no furnace and lower construction cost. (Similar principles save 90% of air-conditioning energy in Bangkok.) Saved energy paid for the whole building, and I sell back surplus electricity because my rooftop photovoltaics (PVs) produce more electricity than my house and car use.

Those tasty bananas hold another lesson: Monkeys eat them more cleverly than we do. People break the stem end—the strongest part. Monkeys hold the banana by that convenient handle and pinch the button at the *other* end. Button splits. Banana unpeels. Works better. Happy monkey.

This Year of the Monkey can inspire us to start at the easy end: Before supplying more energy, use it many-fold more efficiently. Works better. Happy people.

As each country strives to fulfill its commitments at last December's COP21 Paris Climate Agreement, practitioners like us (www.rmi.org) bring good news: Saving energy and avoiding emissions can be profitable rather than costly. Energy efficiency keeps getting bigger and cheaper. America's still-uncaptured energy efficiency opportunity just doubled while its cost fell by two-thirds. Beyond better technologies, in the past five years just smarter *design* has doubled the efficiency of today's best office buildings, both new and retrofitted.

Near my banana farm, our new all-passive, net-energy-exporting office building is the most efficient in America's two coldest climate zones. It needs no furnaces, boilers, or chillers. Tiny fans and heaters in its Hyperchairs[®] use a few watts to sustain comfort even if extreme weather sends indoor temperatures below 18 or above 30°C .

Optimizing our building as a whole system increased its efficiency more than 300%. Its four-year payback should drop to about zero with experience, as Europe's 40,000 passive buildings proved. The three floors of Germany's most efficient office use just 21 kWh/m²y (including 8 for heating), but the rooftop PVs make nearly five times more—103 kWh/m²y.

Just as in buildings, “integrative design” of factories, equipment, and vehicles can save money, cut emissions, and stretch renewable energy supplies. For example, pumps and fans are the world's largest users of electricity. Making their pipes and ducts long, fat, and straight—not short, thin, and crooked—cuts their friction by about 80–90%, repaying the cost instantly in new construction or under a year in retrofits. This could save half the world's coal-fired electricity. It's too simple to be in any textbook, official study, or industry forecast, so my team is writing “How-To” guides for Chinese building and factory managers.

China can save vast energy by using existing assets smarter. Start at the easy end. A location-services-enabled smartphone freight logistics system could halve (to EU and US norms) the 40% of truck-km carrying only air. This could avoid up to 100 megatons of carbon dioxide emissions annually. Higher-quality steel and cement would yield the same services from fewer tons, saving more transport energy and emissions. And China can avoid building pre-stranded assets, like 200 GW of coal plants authorized but no longer needed if cheaper demand-side resources are fully deployed.

China could build a stronger economy with far *less* energy, cost, carbon, and air pollution. A rigorous 2½-year China-US collaboration by 50+ experts roadmapped the efficiency-and-renewables revolution that China's top leaders have called for. Their just-released [重塑能源：中国 面向 2050 年能源消费和生产革命路线图研究](#) found that by 2050 China could grow its energy productivity six times and its carbon productivity 11 times, cut coal-burning by four-fifths and carbon emissions by two-fifths, yet pay ¥22 trillion *less* in net present value.

China's lower coal burn in 2014 and 2015 signals an exciting transition to clean energy—harvesting the breath and radiance of heaven. While building two-fifths of the world's new nuclear reactors, China has produced more windpower than nuclear power since 2012, and at lower cost. In 2013 alone, China added more solar capacity than the US added since developing it in 1954. In 2014, China invested nine times more in renewables than in nuclear energy. Renewables now add over half the world's new generating capacity, with China in the vanguard, and widely outcompete fossil-fueled or nuclear power—often beating just its *operating* cost.

Monkeys already live efficiently on renewable energy. They eat diverse fruits, nuts, and other tidbits. Our electricity diet too needs diverse and distributed supply.

Monkeys are curious, ingenious, innovative, communicative; they quickly learn and spread best practices. So must we.

“Monkey mind” flits to every shiny object, but monkeys’ wiser kin, the great apes, are farsighted and strategic. Orangutans, bonobos, chimpanzees, and gorillas are all endangered, but we humans are the only *self*-endangered species, so how smart are we?

If we’re as smart, agile, and confident as monkeys, perhaps combining their quick intelligence with great apes’ thoughtfulness can turn our self-inflicted energy, air, and climate crisis into a durable base for the China dream. This Year of the Monkey is the time to start.

Works better. 捉到老鼠。自然。[Catches mice. Natural.]