

The Paradox Holding Back the Clean Energy Revolution

Feb. 22, 2024



Charles Desmarais

[Share full article](#) [Share](#) [Bookmark](#) [518](#)

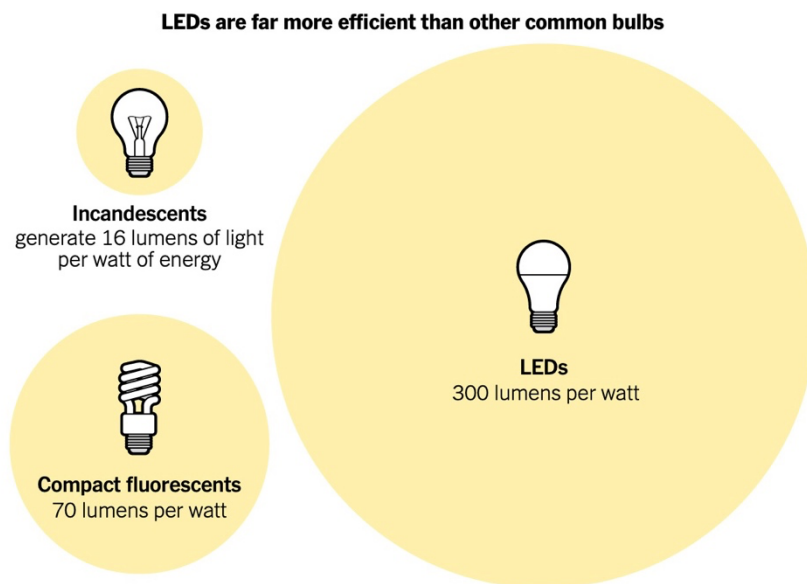
By Ed Conway

Mr. Conway is the economics and data editor of Sky News in London.

With its 1.2 million LED lights shining brightly against the Las Vegas night, the Sphere may well be the ultimate symbol of 2020s excess. But that gigantic entertainment venue — which doubles as the world’s biggest screen — is also something else: a symbol of the coming collision between our climate goals and our seemingly insatiable appetite for stuff.

In the 1990s, when multicolor LED lights were invented by Japanese scientists after decades of research, the hope was that they would help to avert climate catastrophe by greatly reducing the amount of electricity we use. It seemed perfectly intuitive. After all, LED lights use 90 percent less energy and last around 18 times longer than incandescent bulbs.

Circle chart comparing the efficiencies of common light bulbs. Incandescents generate 16 lumens per watt of energy, compact fluorescents generate 70, and LEDs generate 300 lumens per watt.

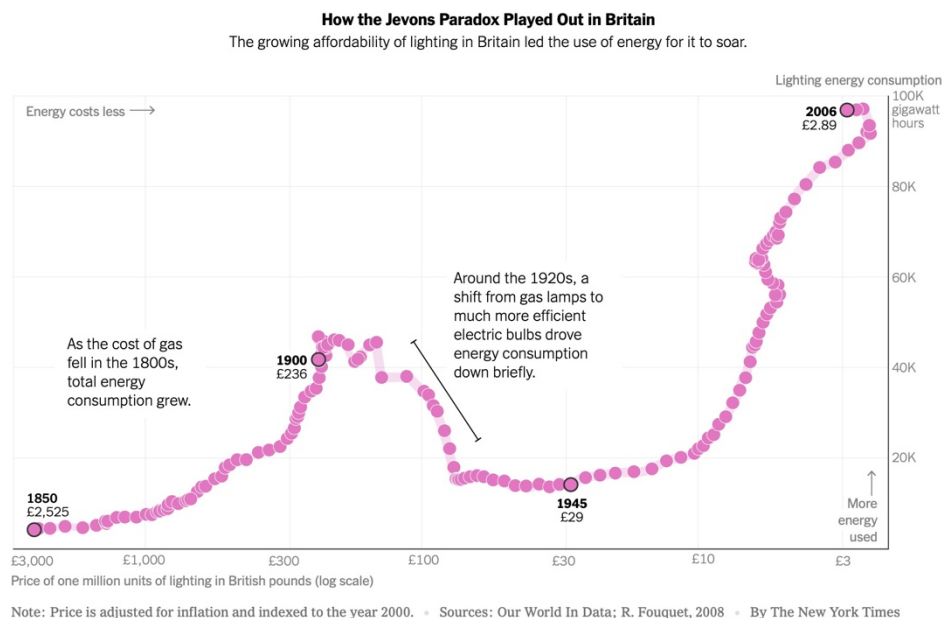


Sources: “The Economics of New Goods”; The Nobel Prize • By The New York Times

Yet the amount of electricity we consume for light globally is roughly the [same](#) today as it was in 2010. That’s partly because of population and economic growth in the developing world. But another big reason is there on the Las Vegas Strip: Instead of merely replacing our existing bulbs with LED alternatives, we have come up with ever more extravagant uses for these ever-cheaper lights, from immersive LED [art installations](#) and carpets that [glow](#) to [basketball courts that can play video](#). As technology has advanced, we’ve only grown more wasteful.

There's an economic term for this: the Jevons Paradox, named for the 19th-century English economist William Stanley Jevons, who noticed that as steam engines became ever more efficient, Britain's appetite for coal increased rather than decreased.

Chart showing how the growing affordability of lighting in Britain led consumption to skyrocket, causing Jevon's paradox.



We've known about the Jevons Paradox for years, but it's becoming a more troubling problem now that governments have pledged to eliminate their net carbon emissions to slow global warming. A significant part of that carbon reduction is expected to come from using more efficient products, be they electric motors instead of internal combustion engines, or LED lights instead of traditional bulbs. But the logic of Jevons is that instead of banking the efficiency savings we make as technology advances, we go out and spend it.

A changing climate, a changing world

Climate change around the world: In "[Postcards From a World on Fire](#)," 193 stories from individual countries show how climate change is reshaping reality everywhere, from dying coral reefs in Fiji to disappearing oases in Morocco and far, far beyond.

The role of our leaders: Writing at the end of 2020, Al Gore, the 45th vice president of the United States, [found reasons for optimism](#) in the Biden presidency, a feeling perhaps borne out by the passing of [major climate legislation](#). That doesn't mean there haven't been criticisms. For example, Charles Harvey and Kurt House argue that [subsidies for climate capture technology](#) will ultimately be a waste.

The worst climate risks, mapped: In this feature, [select a country](#), and we'll break down the climate hazards it faces. In [the case of America](#), our maps, developed with experts, show where extreme heat is causing the most deaths.

What people can do: Justin Gillis and Hal Harvey describe [the types of local activism](#) that might be needed, while Saul Griffith points to how [Australia shows the way on rooftop solar](#). Meanwhile, small [changes at the office](#) might be one good way to cut significant emissions, writes Carlos Gamarra.

Climate activists are dismayed by the Jevons Paradox, since fossil fuel companies invoke it as an excuse to carry on digging and drilling. But we are unlikely to achieve our climate goals until we acknowledge, and work with, this feature of human nature.

Today, you can see examples of the paradox everywhere. The servers running the internet have become less power-hungry but our use of them has [skyrocketed](#). Refrigerators have become astoundingly efficient in recent years (thanks mostly to clever compressors) — so much so that total energy consumption from refrigeration has halved since the early 1980s, even as consumers installed ever bigger coolers. Yet those same clever, efficient compressors are also used in air- conditioning, and energy demand from air- conditioning in homes, cars, offices and server farms has ratcheted up over that period. The upshot is that total energy consumption for cooling, more broadly defined, stayed flat.

A few years ago economists at Cambridge University [found](#) that when residents in England and Wales installed home insulation, their overall heating energy demand soon rebounded, ending up at about the same level it was before: The residents had apparently chosen to turn up their thermostats and live in warmer homes.

The good news is that in some cases the efficiency gains are so great that even our insatiable appetite for new stuff cannot completely negate them. LEDs are improving at such a rate that despite structures like the Sphere, commercial lighting demand in the United States remains lower than it was a decade ago. Today's car engines require so little fuel compared to their predecessors that although Americans on average now drive longer distances in heavier cars, their gasoline consumption has fallen.

In other words, consuming more doesn't always offset all those technology improvements, as was the case in Jevons's time. Indeed, there's [evidence](#) that as countries become wealthier, you see less of this "rebound effect," as economists sometimes call these leaps in consumption. Take the steel and

copper surrounding us, in the cars we drive and the wires in our buildings. For centuries, our appetite for these metals rose rapidly, but in recent years, the per capita use of [steel](#) and [copper](#) in most rich countries seems to have plateaued as we became better at recycling and less hungry for expansion. At some point, “enough” really is enough — or nearly enough.

The bad news is that the Jevons Paradox seems to be hard-wired into us. There are few examples throughout history of people willingly consuming less energy, either for moral or environmental reasons.

This brings us to the biggest problem of all. Nearly every pathway for combating climate change and reducing global carbon emissions assumes not only that we shift to cleaner fuels but — and this is the critical part — that global energy demand actually falls. This is not just incredibly ambitious; it’s unprecedented.

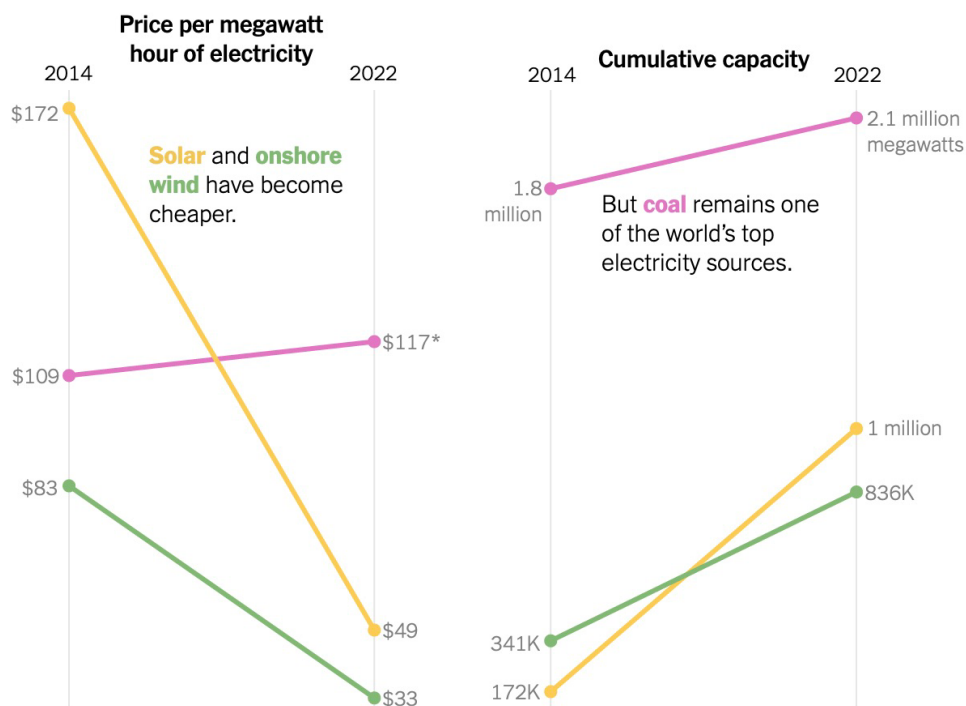
For some, the solution is obvious: Governments must do more to constrain our energy use, perhaps through regulations or taxes. A global carbon tax would help — though the chances of establishing one remain slim.

A more ingenious answer comes courtesy of Rob West, founder and chief executive of an independent energy consultancy, Thunder Said Energy. Having spent years documenting the Jevons paradox and finding it far more prevalent than economists predicted, he thinks the best hope we have is to fight Jevons with Jevons, he told me.

That means applying the idea that consumption increases as goods become cheaper and more efficient to our production of energy. In other words, the future lies not in rationing energy and hoping humans suddenly change their behavior, but in ensuring any energy we use is as green and attractive as possible.

Two charts comparing the price and cumulative energy capacity of solar, wind, and coal between 2014 to 2022. Wind and solar are cheaper than coal but more coal is used.

Wind and Solar Still Have a Ways to Go



We can do that by improving the production of renewables, from solar panels and wind turbines to batteries, so they become genuinely price competitive with the dirty stuff, including natural gas. Contrary to what some climate optimists claim, we're not there yet. (Solar and wind look cheaper than fossil fuels only when you ignore the fact that you can't always rely on them generating power.) But the gap is narrowing fast.

Somewhere out there — maybe at a university in the United States, Japan or, more likely, China — someone is working on the semiconductor technology that could make solar panels or carbon capture far more efficient than it now is. Like the scientists who invented the LED after years of false starts, eventually they will succeed. In them lies our best hope of defeating the Jevons Paradox, and eliminating our emissions altogether.

Ed Conway is the economics and data editor of Sky News and the author of "Material World: The Six Raw Materials That Shape Modern Civilization."

Graphics by Taylor Maggiacomo.

<https://www.nytimes.com/2024/02/22/opinion/vegas-sphere-energy-efficiency.html>