Don’t believe the renewables myth. Wind and solar are not cheap

Sunshine and breeze are indeed free, but vast amounts of subsidised infrastructure are not

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Not a good moment for renewables. Luckily that fossil plant is there Credit: Michael Probst/AP

Politicians everywhere are repeating the mantra that renewable energy is cheap, and we need to use it instead of gas (currently expensive in and near Europe) to bring down energy costs for households.

As US President Joe Biden said of clean energy before signing the poetically named *Executive Actions on Tackling Climate Change, Creating Jobs, and Restoring Scientific Integrity* “it’s affordable; because it’s clean; because, in many cases, it’s cheaper… [clean technologies] will ultimately become cheaper than any other kind of energy, helping us dramatically expand our economy and create more jobs with a cleaner, cleaner environment”.

The Inflation Reduction Act has been designed to make this a reality. Lots of investment in lovely green energy and green jobs. This sounds wonderful.

Unfortunately, renewables are not cheap.

To demonstrate, let’s carry out a thought experiment…

Imagine you build a machine. It’s very expensive to build, but once it’s done, it makes Things. These Things are identical in every way to Things made by other people. Making Things is very

cheap: the machine runs on wind/sun/water and has no fuel costs, and no raw materials are required. Making Things is essentially free once you have built the machine. What will you charge to sell your Things?

Normally you would want to recover the cost of building the machine and make some profit. Ten years is reasonable to recover capital costs, so you work out how many Things you will make over ten years and spread the cost plus some profit between them. After ten years, you're happy to more or less give the Things away, selling them for a minimal amount.

But here's the rub. Down the road is another Thing factory that was built eleven years ago, whose upfront costs have already been recovered. Those Things are being sold for next to nothing. Who is going to buy your Things now unless you also charge next to nothing? But if you do that, you can't pay back the money invested in building your machine. That means that unless you can earn money from something other than selling Things, you will never build your factory in the first place.

In the electricity market, we get round that problem with subsidies. Originally, subsidies were paid because the technology for producing renewable electricity was immature meaning upfront costs were exceptionally high, but after more than 20 years of subsidies, this is no longer the case. Today, electricity prices are still determined for the most part by the cost of fossil fuels, so renewable electricity can be sold at much higher prices than the short term cost of production (which is next to nothing). But even then, renewables still require subsidies.

In fact, subsidies are growing. According to the Energy Information Administration, renewable subsidies in the US jumped to $15.6 billion in fiscal year 2022 from $7.4 billion in fiscal year 2016. In Britain, last year's subsidy round was hailed as the cheapest and best, but the projects which bid have for the most part stalled as developers ask for more money, despite the high market price of electricity. Only two projects have confirmed they will go ahead and begun construction, while Vattenfall cancelled its Boreas project in the North Sea and Ørsted has warned that Hornsea 3 could be at risk without Government action "to maintain the attractiveness of the investment environment", saying it is working "very hard" to make the project financially viable but that the electricity prices offered by the Government are not high enough to compensate for surging development costs.

If projects are not economic when electricity prices are at record highs, how will they work if a time comes when electricity prices are very low?

That's the dirty little secret of the renewables game. The very high upfront costs mean developers have to be paid lots of money, and if the money from selling electricity isn't enough then it has to come from elsewhere. But ultimately it comes out of consumers' pockets, whether directly through higher bills, or indirectly through higher taxes.

That's not all. Developed countries built their electricity grids decades ago when electricity came from a few large power stations. Renewable generation is built where it's windy/sunny or has good access to water at height or moving fast (for hydro). These places tend to be not where old power stations used to be or where consumers are. This means lots of new infrastructure is needed to connect it all up. Guess who has to pay for that?

Next is the issue of intermittency: wind and sun vary from moment to moment. Individual clouds make a measurable difference to generation, as do gusts of wind. This creates two additional challenges – one is that if there's no wind or sun, renewable output falls – the famous California

“duck curve” measures the way solar output changes through the day with a major drop at sunset, when gas power stations need to take over.

Other sources of generation (there is no at-scale energy storage solution) have to be on standby to run when renewable output falls. But no-one builds standby anything unless it’s worth their while – and that’s another big chunk of change consumers have to cough up.

The other problem with intermittency is that electricity grids need supply and demand to be finely balanced in real time. Grid equipment can be damaged if this balance is not maintained within narrow tolerances. If clouds and gusts of wind change supply from moment to moment, grid operators have to use a range of techniques such as discharging batteries, getting conventional power stations to vary output, or large users to vary consumption, over short timeframes. Unsurprisingly, nobody does any of this for free. Another cost to consumers.

The final sting in the tail is that the grid infrastructure, despite expansion to cope with renewables, often can’t use all the renewable electricity generated. This electricity is wasted, and the renewable generators have to be compensated through “curtailment” or “congestion” fees, again paid for by consumers. According to consulting firm Grid Strategies, costs to consumers from congestion on the US power grid jumped 56 per cent in 2022 to an estimated $20.8 billion from $13.3 billion the year before. In Britain, data from the UK Wind Curtailment Monitor show that consumers paid £125 million in 2022 to turn windfarms off and £717 million to buy replacement gas-fired generation.

Even if the wholesale price of electricity fell to zero to reflect the short-run marginal cost of producing renewable electricity, the price paid by consumers would simply be more disconnected from the wholesale price than it is today. Consumers pay the wholesale price, plus a network cost (including congestion costs), plus a balancing cost, plus a subsidy cost, plus the retailer/supplier operating costs, plus some profits for everyone in the chain from the generator to the network owner to the network operator to the retailer. And then some taxes on top.

And to hit net zero the whole electrical system – expanded renewables, expanded grid, backup fossil, balancing, subsidies, curtailment payments and all – will have to be expanded to multiple times its current size, as fossil fuels used directly in such things as heating and transport are replaced with electricity.

Anyone who thinks all this is going to mean cheaper energy is dreaming. With respect, Mr President.