

Why climate change is so hard to tackle: Our stubborn energy system



To adequately address climate change on the level scientists say we must, the world would need to slash its use of oil, natural gas and coal within 30 years, a Herculean task given our deep dependence.

Driving the news: Democrats on the presidential campaign trail and international leaders preparing for a United Nations summit next month say urgent action is needed, but few

We are told that every state that has ocean or great-lakes shore available can actually double the amount of electricity their grid delivers to customers while shutting off all fossil generation.

We are also told that often a state can supply a combination of solar and wind to oversupply their grid and still be able to shut off their fossil generation.

So, one of the opportunities is to quickly green the grid. So, then the question is what can that do for us.

The key, both for stationary applications and for mobile applications is in energy storage. Clearly batteries are essential for most EVs. Though, remember that trains for people and materials can use third-rail techniques.

actually have viable plans for how and when to cut our fossil-fuel use.

- This column and [last week's edition](#) explore what makes this such a uniquely difficult problem.

The big picture: In 1987, 81% of our world's energy consumption came from oil, natural gas and coal. Thirty years later, it is still 81% – despite the incredible increase in wind and solar energy, according to the International Energy Agency.

Fossil fuels' staying power

Global fossil-fuel companies have built powerful political operations to lobby governments to maintain subsidies and oppose big climate policy.

- This is starting to change among some oil companies, but it's an uneven shift, and it's not(yet) fundamentally changing the system they helped build.

But a lot more is driving fossil fuels' dominance than just corporate influence on government. Oil, natural gas and coal provide immense benefits to society – even though they also have immense environmental costs.

- The chemical makeup of the fuels make them especially good at a lot of things, including industrial processes like making plastics. Renewables or other resources cannot easily replace that (even though big brands, like Legos, are trying).

I like this part of this big picture description.

The total market for energy grew. The

increase of green energy didn't prevent

fossil fuels from growing. I guess in 1987,

most of green energy was hydro.

I do not see any significant effort of fossil

companies to push non-fossil solutions.

Only trace amounts.

Below is a pie chart of energy uses in US. I

think it likely to be fair to use this as

estimate of other industrialized countries.

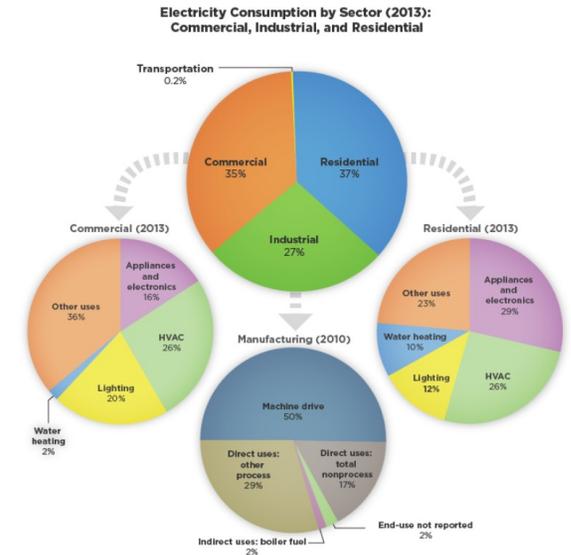
- "Some sectors, such as transportation and petrochemicals [plastics], almost completely rely on one single fuel, in this case oil," said Fatih Birol, IEA executive director. Nonetheless, Birol said fossil-fuel consumption subsidies that totaled \$400 billion in 2018 are providing an "unfair advantage" to those fuels.

Our dependence on fossil fuels is often likened to that of cigarette smoking, but the analogy doesn't hold up.

- Smoking is an unhealthy habit some people choose to engage in, and if they choose, they can try to kick that addiction without changing their life.
- Fossil fuels are the foundation of our global economy, and it's nearly impossible to go about our lives without using them in some form.

More addition, less transition

In the world of energy and climate change, people talk about the "energy transition," the concept that we are moving from fossil fuels to renewable energy. But for now and the next few decades, it's more of an energy addition.



Sources: The high-level sector breakdown and detailed commercial and residential breakdowns come from the U.S. Energy Information Administration's [Annual Energy Outlook 2014](#). These data reflect projections for 2013. Energy uses within the industrial sector are not available with the same breadth, precision, or timeliness, so the best available source was the U.S. Energy Information Administration's [Manufacturing Energy Consumption Survey](#), which was last conducted in 2010.

My perception is that electricity is easily greened, and that green electricity covers a lot of things. Sometimes with extra effort yet to come.

Air travel will be hardest to move to electricity, but even that is in progress. So, grids first, and then with batteries to transportation.

- Renewable electricity (which is the primary use for wind and solar) is often being added on top of instead of in lieu of fossil fuels, particularly in Asia's rapidly growing economies.
- Our energy system, particularly electricity, is built on multi-billion dollar infrastructure investments designed to last decades. Replacing them is like changing direction on a jetliner, not a jet ski.
- Because of this dynamic and because our global energy demand keeps rising, our emissions keep growing despite the skyrocketing use of wind and solar energy.

Flashback: History shows that energy transitions take many decades and overlap, as Reuters analyst John Kemp wrote in a [must-read column](#) late last year.

- “The United States was still using more fuel wood in the 1910s than it had in the 1840s — even though wood had been clearly overtaken by coal and to a lesser extent petroleum as an energy source.”

I believe this covers all HVAC, all lighting, all appliances and electronics, almost all transportation. Anything motor driven is more efficient from electricity than combustion. Water heating can take advantage of direct solar as well as electric/heat pump.

This excuse of a “willingness to pay more” holds only if you are unable to support the capital outlay for the green energy. But if you can get the funding, the lifetime costs are less.

Why are citizens sensitive to the price of gasoline? Because they already invested in fossil fuel vehicles and don't see the financing to support converting. This is in spite of the cost per mile of Tesla 3's being calculated to be less than cost per mile of a

- On the other hand, we think a lot about how we engage with our phones and whether to drink a Diet Coke or sparkling water.

What's (maybe) next: If a Democrat wins the White House in 2020, America will likely be a political and technical test case for policies drastically and swiftly reducing our deep fossil-fuel dependence. That's because most of the Democratic candidates are calling for such a move, with Sen. Bernie Sanders proposing the most aggressive plan just last week.

Go deeper: Why climate change is so hard to tackle: the global problem

Toyota Corolla. In the long haul, the capital investment in EV pays off. The solution for the yellow vesters?

Help them create EV retrofit companies, and retrofit their current vehicles. Help them establish the credit unions that understand how to support the appropriate loans.

Making this transition is clearly contrary to perceived profitability of fossil industry. That doesn't make it wrong.

Will there still be material purposes for fossil chemicals? I guess part of that depends on how much recycling we can do. It's better for the planet to recover and reuse that which is polluting the environment.

