Stanford eCorner

How Do We Reach Net Zero?

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Sarah Lamaison, co-founder and CEO of Dioxycle, observes that in addition to deploying existing technologies, the world needs technology still under development in order to meet carbon-reduction targets by 2050. New technologies can decarbonize hard-to-update sectors such as steel, she says, and carbon capture, utilization, and storage are part of the solution.

Transcript

- How do we reach net zero by 2050? 00:00:06,310 Well, I have good news, which is the fact that the first answer to climate change is sobriety.. And it's like each of us who can have an impact, you and me, by changing our daily behavior and, you know, reducing the frequency of our flights, eating less meat and doing different things like this.. And so this 5% is the projection of emission reduction we can target by 2050 by just sobriety.. And so just to give you a few order of magnitude, today, the average carbon footprint of an American is between 15 and 20 ton of CO2 per year.. And so we emit equally one ton of CO2 when we do one round-trip flight between New York City and San Francisco, when we eat twice a week beef steak, all of that for a year, or when we commute 15 miles per day to work for one year.. And so by changing any of these behavior, by cutting down any of these, we can actually already diminish by 6% our personal carbon footprint, and, of course, even more if we do all these different things.. The second path we have to reduce these emissions is through the massive deployment of existing technologies, like electrification for industrial usage, for example, the use of a heat pump in your house, or like the electrification, as you know that, sorry, the development of renewable energy, developing solar or windmill.. And so again, to give you a few order of magnitude, by upgrading your house with a heat pump, you can save up to eight ton of CO2.. So, quite significant, again, if you compare that to the carbon footprint of an American.. Or if we shift now to 100% renewable, our own electricity, personal electricity consumption, we can save up to four tons of CO2 per year..

And the last thing, and here is actually a picture of one of our lab.. We have two labs, one in France in Paris, and one in Menlo Park.. And the last one, the last option, is by using technologies that are currently still under development.. And so of course we need to deploy massive research to deploy these technologies so that they meet this 45% reduction target by 2050.. And so, as I said, these new technologies are gonna be needed to cut down the emission of what are called hard-to-abate sectors, which are the industries that are really difficult to decarbonize, that you cannot electrify easily, et cetera.. And so these hard-to-abate sectors include the following: cement, steel and aluminum, aviation, chemicals, heavy-road, and shipping.. And so, for example, the reason why steel is hard to decarbonize is because, in steel-making, the first step of the process is actually the conversion of iron ore into iron.. And so to do that, you basically need to pull out an oxygen from your iron ore.. And the way it's done right now, it's in big blast furnaces, where you have a reducing gas, such as carbon monoxide, that is produced from coal in situ, that is gonna pull out this oxygen from your iron ore to just leave behind the metal iron.. And so you're converting your iron ore into iron, but in turn, you are emitting one molecule of CO2..

And so it's very difficult to decarbonize, because now, I mean, you have to really change the full process if you want to stop emitting this CO2 molecule, which means reinvesting a lot of CapEx and really changing your infrastructure.. And so basically the way we are gonna decarbonize these different industries is either by developing completely new processes, and so it's done in steel right now, I mean, there are a lot of projects going on to replace this carbon monoxide reducing gas by hydrogen, or by deploying sort of ad hoc solutions, which is like, for example, carbon capture, utilization and storage, also referred to as CCUS.. And so in carbon capture, utilization and storage, what happens is that you have a first step of capture.. So you're gonna capture either your emission, on the point source.. So as I was talking about, like for steel you would capture the CO2 emissions, and it's very concentrated emissions, so it's kind of like energy efficient, or you have another path where you're now capturing CO2 directly from the air.. Of course, it's much more diluted as a stream, and so it's much harder to do, in terms of energy consumption.. Once you have your carbon emission, your CO2, you're gonna transport that, either through pipeline or through a ship.. And you have two options.. Either you're gonna store it underground in geological formation, onshore or offshore, or you can utilize it...