Testimony by Michael Shellenberger, energy policy analyst, *Time Magazine* "Hero of the Environment," and President of Environmental Progress

May 1, 2019

Dear Chairpersons, and members of the committee, thank you for accepting my testimony. I am honored to provide it.

As background, I am a *Time Magazine* "Hero of the Environment," Green Book of the Year winner, and president of Environmental Progress, an independent nonprofit research organization. I was one of the architects and advocates of $150 billion in spending for renewables between 2009 and 2015.

I am here as one of a growing number of environmentalists who recognize the importance of nuclear to reducing air pollution and combating climate change. Over the last three years I have worked with climate scientists including James Hansen, to save nuclear plants in Illinois, New York, Connecticut, and New Jersey.

In early April, the world's leading climate scientists including James Hansen wrote an open letter to Governor Wolf and members of the legislature to urge a solution to save the state's nuclear plants.

Every time nuclear plants are closed, whether in California, Vermont, Germany or Japan, emissions *and* electricity prices rise. It may be tempting to think that Pennsylvania will be different but that is unlikely, for physical and technological reasons.

Solar and wind cannot make up for lost nuclear. Pennsylvania nuclear plants generated 20 times more electricity than the state's solar and wind combined in 2018.[1] Because they are intermittent, solar and wind require 100 percent back-up in the form of natural gas plants, hydro-electric dams, batteries, or something else.

Once a nuclear plant is closed, it is closed forever. While they are privately owned, nuclear plants are what economists call "public goods," given their role in preventing air pollution and increases in electricity rates.

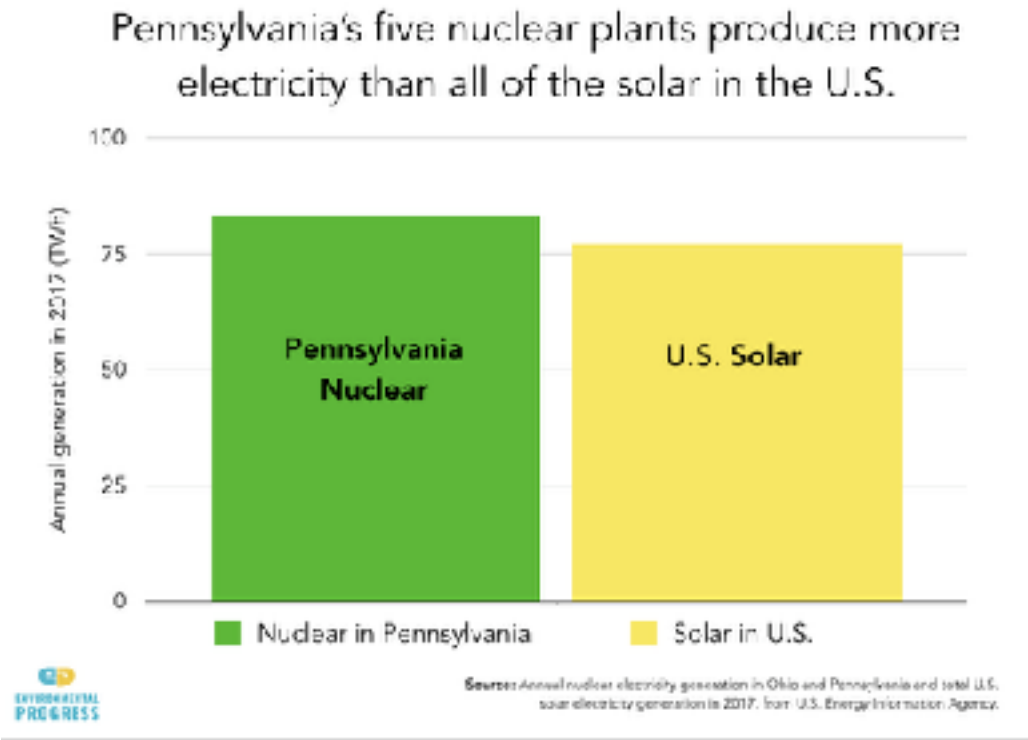
If natural gas is allowed to replace both coal and nuclear, Pennsylvania will thus become dangerously dependent on a single, notoriously price-volatile fuel. While natural gas prices are low today, they will not remain low forever. Letting nuclear plants close would deprive Pennsylvania's citizens a necessary condition for keeping electricity prices low.

[1] Energy Information Administration, 2019.

To the extent there is a market for electricity, it isn't free. Electricity, like running water and cable television, is what's called a "natural monopoly." We don't want many firms competing to string up copper wire so we allow monopolies to exist. In exchange, we regulate them to make sure they don't sacrifice long-term supply and price stability for short-term profits.

Electricity is not a market like the grocery store. If you go to the grocery store and there are no apples, you can go next door. But if you are totally dependent on natural gas, and price start going up and up, you can't just go next door and buy a nuclear plant.

Nuclear plants thus have a high "option value." It's much more expensive to build a new one than to simply keep operating the ones you already have.

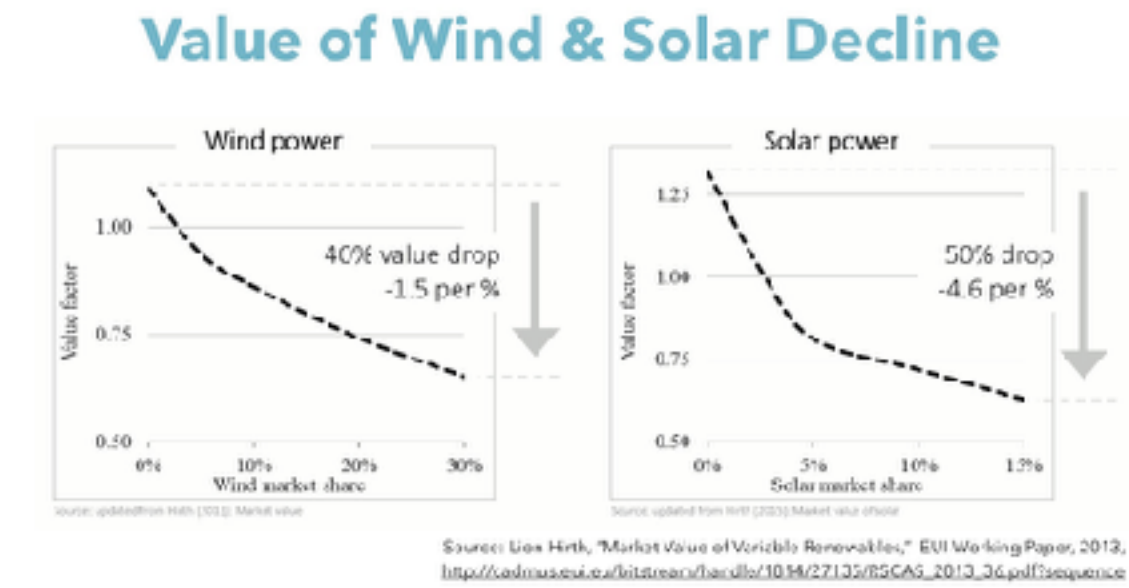


It's true that solar panels and wind turbines are cheaper than they were ten years ago, benefitting from a one-time reduction in price, thanks to their manufacture by underpaid workers in large, coal-powered, and subsidized Chinese factories.

And yet solar and wind are making electricity expensive. Germany has seen its electricity prices rise 50 percent during the same period it deployed significant renewables. In California we saw our electricity rates rise five times more than the national average over the last ten years.

This was predicted by a German economist, Leon Hirth. He predicted the value of wind would decline 40 percent as it reached 30 percent of electricity, and that the value of solar would decline 50 percent when it reached just 15 percent of electricity.[2]

The reason is their unreliability. Last week, a team of economists from the University of Chicago, including one who worked for President Obama, confirmed solar and wind are making electricity expensive, due to "the costs that renewables impose on the generation system… including those associated with their intermittency, higher transmission costs, and any stranded asset costs assigned to ratepayers."[3]



Do we need to spend more on electricity to deal with climate change? Not necessarily. France spends a little more than half as much for electricity that produces one-tenth the carbon emissions of Germany. Why? Because French electricity is 75 percent nuclear and Germany is replacing nuclear with fossil fuels and renewables.

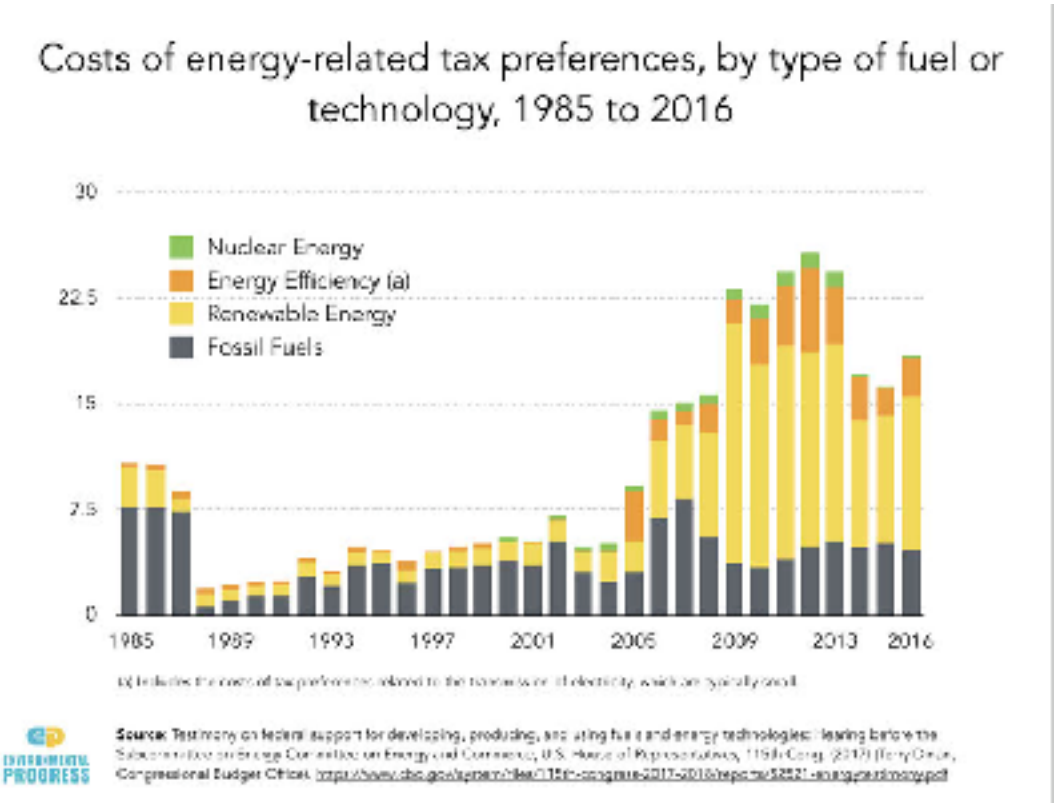
People are rightly concerned about subsidies, but the greatest recipients in subsidies are renewables, not nuclear. A 2017 analysis by the federal Congressional Budget Office finds that renewables received $10.7 billion more or 55 times what was given to nuclear in 2016. On a unit of energy

[2] Hirth, Lion (2013): "The Market Value of Variable Renewables", Energy Policy 38, 218-236. doi: 10.1016/j.eneco.2013.02.004.

[3] Michael Greenstone and Ishan Nath, "Do Renewable Portfolio Standards Deliver?" University of Chicago, April 21, 2019.

basis, renewables received over 100 times what was given to nuclear. And the CBO data show no subsidies for nuclear between 1985 and 2000, and comparatively small subsidies between 2000 and 2005.

What about natural gas? It turns out that fracking received federal subsidies, too. In 2011, I was lead author of a history of the hidden government involvement in the fracking revolution. Between 1978 and 2007, the Energy Department spent $24 billion on fossil energy research that led to the fracking revolution – including $10 billion in tax credit (US Code Section 29) for unconventional oil and gas drilling.



As such, Pennsylvania's electricity prices are determined by extensive market regulation occurring at state and federal levels, and tighter supplies will allow more manipulation, not more competition. The American Petroleum Institute knows this, which is why it is spending millions to kill nuclear plants in Pennsylvania.

Pennsylvania lawmakers need not sit by while outside energy, financial and technology interests intervene in your electricity markets in ways that could kill 90 percent of your clean power, and leave ratepayers vulnerable to market manipulators.

Including nuclear in the state's Alternative Energy Portfolio Standards is similar to sound and effective legislation enacted by lawmakers in Illinois, New Jersey, and Connecticut, which prevented the closure of nuclear plants.

I encourage you to protect your nuclear assets as clean-air hedges against market power and manipulation.

Thank you.