Why nuclear is an environmentalist's story

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The nuclear industry must act to end the decades-long demonisation of the most environmentally friendly form of energy and the world's only viable hope against climate change and poverty. This was the message of Michael Shellenberger - the president of research and policy organisation Environmental Progress - to delegates at the *XI International Forum Atomexpo 2019* held in Sochi, Russia, last week.

Michael Shellenberger at Atomexpo (Image: World Nuclear Association/J Cobb)

Shellenberger described the public perception of nuclear power as being like the fairy tale *Cinderella*; that it had been maligned and taken for granted, when in fact it was a precious resource and ought to be celebrated. The 'glass slipper' in he story of nuclear power, he said, is its remarkable energy density.

"In California, one of the sunniest places in the world, it still takes 450 times more land to produce the same amount of electricity from solar as it does from nuclear," he said. "Why do solar panels require 17 times more material, 17 times more land chewed up for mining than what uranium requires? The answer is energy density, which is what makes nuclear power an environmentalist's story."

Referring to the Ivanpah solar farm in the Californian desert and how it compared with the "dystopian" image that the film *Blade Runner 2049* opens with, he said it is myth that renewable energy has a beneficial impact on the environment and wildlife.

He described the need for industry to dispel the myths about nuclear power, and also about renewable energy, in the public consciousness in order for it to address urgently poverty and climate change. He compared the environmental credentials of various countries in terms of their energy mix and the policy errors of some, including Germany which aims to phase out its use of nuclear power.

Poverty

One billion people still lack any access to electricity and over two billion lack access to running water for sanitation and for drinking, Shellenberger noted. "The relationship between prosperity and energy is absolute," he said. "There is no rich country in the world that depends primarily on burning wood and dung for energy and there is no poor country that enjoys a high energy lifestyle. You can see that as you consume more energy, the rates of extreme poverty decline."

Breathing smoke from burning wood and biomass kills three million people a year, he said, adding that the time required for this way of subsisting also robs people of time they could better spend on education and improving their lives. Burning charcoal requires less time but creates other problems, he said. He highlighted the plight of non-humans, too. The parents of Maisha, a young gorilla, were killed by the "charcoal mafia" that was operating from within the Virunga National Park, which is in the Albertine Rift Valley in the eastern part of the Democratic Republic of the Congo.

"They were killed not for any material reason," he said, "but because of a dispute between the local charcoal makers, the mafia, and the corrupt director of the park. When we liberate humans from relying on wood fuel, we also allow the natural environment to return to the non-human animals that occupy this planet, including endangered mountain gorillas of the Congo."

Climate change

Not only air pollution, but climate change threatens to radically alter natural environments and undo all of the good work that conservationists have done over the last hundred years, he said.

"Nuclear produces abundant low-carbon energy. According to the International Panel on Climate Change, nuclear actually produces one-quarter of the emissions of solar farms. The IPCC wrote: 'Achieving deep cuts in emissions is going to require more intensive use of low greenhouse gas technologies, including renewables, nuclear and carbon capture and storage.'"

He compared the carbon-dependence of the electricity supply of Australia (85%), Belgium (40%), France (11%), Germany (66%), Sweden (9%), Switzerland (14%), the UK (63%) and the USA (66%). Those with the majority of their power from non-fossil sources - Belgium, Switzerland, France and Sweden - all have something in common, he said, which is that they use a lot of nuclear power.

"Everybody looks at Germany as a climate leader, but it gets less than half of its electricity from zero-emissions sources than France does; in fact, Germany produces 10 times more carbon emissions per unit of electricity as France does," he said.
A misconception, he said, is that dealing with climate change will mean paying a lot more for energy, and that the answer lies in the falling cost of renewable energy technology. "France spends a little bit more than half as much for its electricity as Germany and yet it's so much cleaner," he said.

And although it's true that solar panels and wind turbines are, respectively, 75% and 50% cheaper than they were 10 years ago, the price of German electricity keeps going up, he said. Data produced by German economist Leon Hirth showed that, because solar and wind produce so much electricity when you don't need it, and not enough electricity when you do need it, their economic value falls, Shellenberger said.
"What he found is that the economic value of wind declines by 40% when wind reaches 30% of your electricity; that the value of solar declines by 50% when it reaches just 15% of your electricity. You just have to do a whole set of things to manage all of that unreliable electricity. Germany ends up paying its neighbours to take its electricity so it doesn't blow out its grids and we in California, which is sort of the Germany of the United States, must pay Arizona to take our excess solar electricity when we have too much of it."

It is a fallacy that it takes too long to build nuclear plants for them to address climate change as urgently as is required, he said. "Nuclear is the fastest way to scale up low-carbon electricity by far. You can see the famous examples are France and Sweden, but it's true all over the world. Sure, it can take five, maybe 10, years to build a nuclear plant, but once it comes online, it's going to displace 5%, 10%, 15% or more of your electricity from fossil fuels."

Just as there has been a "natural experiment" over the last decade or so between Germany and France, he said, there's been another one over the last half century between different forms of low-carbon electricity, he said. In order of capacity size, these are hydro, nuclear, wind and solar power. The evidence shows that nuclear has produced twice as much electricity for slightly less than solar and wind combined.

"Had Germany invested USD580 billion in nuclear rather than renewables, it would already be getting 100% of its energy for electricity and transportation from clean, zero-emission sources. That's a pretty remarkable finding when you consider just how much of our energy, around one-third, that we use for transportation," he said.

"I know it's popular to say that we need all of our clean sources of energy to deal with climate change, but France offers a cautionary tale which suggests that this may not be the case. France over the last decade has spent USD33 billion on solar and wind and the related infrastructure and it saw the carbon intensity of its electricity actually go up. Why is that? By incorporating all of that solar and wind onto the grid, France had to repress the amount of nuclear it gets from its nuclear plants and increase the amount of electricity it gets from natural gas. So, the consequence wasn't just an increase in the carbon intensity of electricity, but it was also a significant increase in the cost of French electricity."

Popularity

In spite of such evidence, nuclear power remains "pretty unpopular" - only slightly more favoured than coal, he noted, but "the best available scientific research", including from the British medical journal *The Lancet*, finds that nuclear is already the safest way to make reliable electricity.

Of the seven million deaths every year from air pollution, four million are from burning fossil fuels and the other three million from burning wood and dung. This means that the use of nuclear power has saved almost two million lives to date, according to research by James Hansen, an American adjunct professor directing the Program on Climate Science, Awareness and Solutions of the Earth Institute at Columbia University. Fear of nuclear power because of the accidents at Fukushima, Chernobyl and Three Mile Island, is baseless, Shellenberger said.

The United Nations Scientific Committee on the Effects of Atomic Radiation found there had been no deaths from radiation that escaped from Fukushima and yet 2000 people will have died from a panicked over-evacuation of the area, he said.

"They were pulling people out of nursing homes and out of hospitals and just staying away for a long time. What we know is that the levels of radiation that escaped from that plant aren't going to be high enough to cause any thyroid cancer increase, but enough fear that was inculcated to cause pretty significant psychological stress." Reports by the United Nations and the World Health Organisation show that the Chernobyl accident led to the deaths of 28 firefighters, another 15 from thyroid cancer up to 25 years later. To put these figures in perspective, Shellenberger said there were about 80 firefighter deaths in the USA last year, and the death rate predicted from thyroid cancer is about 1%. Thyroid cancer, he added, is the easiest form of cancer to treat - by removing the thyroid gland and using the synthetic substitute levothyroxine. The suggestion that Chernobyl led to birth defects, or that Fukushima led to mutant daisies, is erroneous, he said. "People have been born with birth defects for as long as we've been humans and there are always mutant daisies growing in the world. So, we misattribute various strange things to radiation," he said.

Media reports of Fukushima turned video coverage of a building and a small amount of smoke from a hydrogen gas explosion into something dramatic, he said. Few people saw, however, footage in the Netherlands in 2013 of the fate of two mechanics stood on top of a wind turbine that had caught fire; they embraced before one of them jumped to his death and the other one was engulfed in flames. Few people realise that the death rate from wind energy is higher than the death rate from nuclear power, he said.

Fear of radiation still persists, he said, even though the vast majority of the radiation we are exposed to is from natural sources and in particular radon, which is the decayed gas from uranium, and radiology in hospitals, to which we "voluntarily expose ourselves". There is also radiation in soil and food, and cosmic radiation.

"If it's radiation that scares us, then we should be scared to go into our basements. In fact when you look at the exposures, what you find is just living in a big city, breathing the air, or living with someone who smokes cigarettes is more dangerous than having been one of the people that cleaned up Chernobyl," he said.

When doctors said their son needed to drink the radioactive liquid barium and receive an x-ray, Shellenberger and his wife "trusted complete strangers". He said: "We didn't go online to investigate the hospital; we hadn't been to public hearings to talk about whether that was a safe hospital; we didn't read the peer reviewed scientific journals; we had trust for that institution." That trust is lacking for thenuclear industry. "You just want to change a steam generator, upgrade a turbine, and it's a major public drama. Why?"

Waste

Like radiation, nuclear waste is often misrepresented as a problem, he said. "I used to think that nuclear waste was green and liquid because I got all of my information from *The Simpsons*, but now we know it's solid, it's metal," he said.

"Nuclear waste is the only waste from energy production that is safely stored. I don't agree with the nuclear industry on this point. Why in the world do we need to bury this? That's a kind of psychological or spiritual effort to put the evil spirits back into the Earth where they belong."

All of the nuclear waste in the USA "can fit on a single football field stacked 50 feet high", he said. "As an environmentalist, this is what we were taught to want. We have gigantic islands of plastic waste floating in the ocean. We have seven million people getting killed every year by the waste products from fossil fuels and burning biomass in the atmosphere and we're worried about some cans of the waste that no terrorist could do anything with.

"In the 20-25 years after they started producing very much electricity, what my fellow residents of California and Germany will do is 'benevolently' send them to poorer countries than ours, like ones in Africa or Asia; they'll join the electronic waste stream with our flat-screen TVs and our i-Phones and many of those communities will do what they've always done with electronics waste - they'll smash them open, they'll pull out any materials that are valuable, including the copper, and then the heavy toxic metals will be pulverised into dust and inhaled," he said.

The radioactivity of nuclear waste declines, but heavy toxic metals never decline in toxicity, he said, and there is 200-300 times more waste from solar power per unit of energy than there is from nuclear.

Humanise nuclear

The nuclear industry makes the mistake of portraying itself only in terms of technology and typically publishes photographs of nuclear facilities that exclude personnel.

"Apparently the control rooms operate without human beings," he said, while showing the audience a photograph of Mothers for Nuclear co-founder Heather Matteson working at the Diablo Canyon nuclear power plant.

"Diablo Canyon is the most beautiful nuclear power plant in the world," he said, while showing a picture of a humpback whale breaching in the ocean in front of the plant.

"The tidal pools around the plant are some of the most pristine on the West Coast. It's a spectacular testament to the importance of nuclear energy."

The original 'mother' of nuclear energy, Marie Curie, was the first person to win two Nobel prizes and the first woman to win one, Shellenberger said. "An incredible humanitarian and not just an incredible scientist, Curie said: 'Nothing in life is to be feared, only to be understood. Now is the time to understand more so that we might fear less.' Did she know how much we would need to remember this almost a hundred years in the future?"

In 2016, Shellenberger and others established *Nuclear Pride Fest*, an annual peaceful pro-nuclear protest. The next event takes place in Belgium on 28 April.

No one in the industry has done more than Rosatom to showcase nuclear power's environmental benefits, Shellenberger said, with its documentary series *Wild Edens*. Alexey Likhachov, director general of the Russian state nuclear corporation, told delegates that communication about energy is "shamefully silencing" the benefits of nuclear power technology in the green energy debate. In response, Rosatom produced the documentaries which have been viewed by more than one billion people so far.

He thanked activists like Shellenberger for their conviction in helping to turn the topic of nuclear energy into *demand* for nuclear energy, and called for mass media to report on their work.

"This is a question for us all - how to make ourselves heard and Rosatom pledges to invest multi-fold efforts into this very significant agenda," he said.

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