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Nuclear Needs to Be an Option



Nathan Myhrvold is the former chief technology officer of Microsoft, the founder and chief executive officer of Intellectual Ventures and vice chairman of the board of TerraPower, a company developing technologies for nuclear energy.

Updated November 15, 2013, 12:00 AM

The future of the planet depends on all the ways we address climate change, not either/or options. If we are serious about curtailing the warming of the Earth, we need a rapid transition to the lowest emitting energy technologies. That means conserving energy where we can, deploying solar and wind technology where feasible, but it also means reassessing nuclear power.

Nuclear energy technologies present a carbon-free option for electricity production that we can pursue immediately while we accelerate our pursuit of new technologies. The current state of the art nuclear plants have improvements in safety that make them safer in any rational measure than coal or gas plants. New designs minimize waste, incorporate inherent safety mechanisms and reduce proliferation risk. They are being pursued by private investments but their future is threatened by anti-nuclear fear mongering.

No single breakthrough will fix climate change. We need to look at all available forms of energy, with the help of investments in new technology.

Nuclear technology is scary to some people because they fear extremely improbable scenarios while ignoring the virtual certainty of climate issues. Ironically people who argue against nuclear on environmental grounds may contribute to a far greater environmental catastrophe. Unfortunately the physics of climate change makes the here and now danger too easy to ignore.

About half of the temperature increase due to greenhouse-gas concentrations occur within a decade of carbon dioxide emission. Another quarter will play out over a century, and another quarter of the impact will take somewhat longer. This means that if we wait until temperature change becomes an obvious and immediate problem, we'll only be half way through the warming caused by carbon dioxide that is already in the atmosphere. Even radical cutbacks at that point will not prevent another century of warming.

No single breakthrough will fix climate change. Instead, we need to look at all available forms of energy — nuclear included — and push into a cleaner future.

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Topics: Environment, climate change, nuclear power



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Nuclear Is Crucial to a Zero-Carbon Economy Mark Lynas

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Andy NYC

Nathan Myhrvold and Intellectual Ventures are patent trolls. Everything he says and does must be viewed through the prism of a man who says he is an inventor but makes most of his money from suing actual inventors.

NPR's "This American Life" did a great story about him: <http://www.npr.org/blogs/money/2011/07/26/138576167/when-patents-attack>

Nov. 15, 2013 at 3:23 p.m. REPLY RECOMMEND 3



Paul Birkeland Seattle, WA

Energy transition is a process, not a decision. Here's my suggestion:

PHASE 1. Immediate start of a three-pronged offensive against emissions. The three prongs are aggressive Energy Efficiency efforts, aggressive Renewable Energy Deployment (to include a National Grid), and ramping up conventional, BUT GOVERNMENT OWNED AND OPERATED, nuclear power plants (The same way the Government's Bonneville Power Administration and Tennessee Valley Authority sell electricity now.) Accelerate research & development of Thorium-based nuclear power, and place a definitive sunset to the use of the conventional nuclear power plants.

PHASE 2. Continue Energy Efficiency efforts and Renewable Energy Deployment. Transition nuclear power development to Thorium-based nuclear power. Thorium-based technology isn't quite ready for scaling up, but is close. It is less dangerous to operate and the waste product actually decays in a human lifetime.

PHASE 3. Continue Energy Efficiency and Renewable Energy efforts. Retire conventional nuclear power plants, and ramp down Thorium-based nuclear power plants as conditions allow.

We also need to consider in this transition how to deal with the horrid environmental destruction of mining uranium and what to do with the waste. These are not trivial questions. We should not sacrifice anyone's lives for everyone else's needs.

Nov. 15, 2013 at 3:23 p.m. [REPLY](#) [RECOMMEND](#)



Grace Adams Willimantic CT

I can see phasing out our fossil fuel generators first, and then the nuclear power plants. But in the United States it is so expensive and time-consuming to get a new nuclear power plant first approved and then into operation, that wind and solar with plenty of smart grid electronics and energy storage to integrate them into the system can be a little cheaper and quicker.

Nov. 15, 2013 at 3:23 p.m. [REPLY](#) [RECOMMEND](#)



bob sonora

Characterizing anyone who disagrees with you as unreasonable or emotionally unstable is a poor way to appeal to them.

Zhong suggests a carbon cap forcing the market to adjust I would included ending subsidies to carbon industries. Nuclear should also face the market if it's safe the insurance industry will insure it. If they won't touch it why should we. Every year warming is threaten new disasters and financial burden. Be careful what new problems we create for ourselves.

A nuclear power plant is a target for terror so even if the plant can be built with far less concrete today, the structure must still withstand attack.

Making concrete requires the burning of fossil fuels, mining and transportation costs. Likewise with fuel. In the 1960's those costs were so great it was questioned whether the plants never become energy positive.

Fuel storage isn't resolved, storage sites are rejected by citizens concerns about safety. With new weather patterns will a chosen site remain safe.

Today's economy is wealthy, we can build, and maintain plants while handling storage problems. But in 100 years will people be able to make the same financial commitments. Decommissioning plants, and storing waste while confronting major dislocations in the economy cause by warming. We are making financial commitments for them. Will the operators and maintenance crews remain committed in that uncertain world?

Perhaps, we should pay today for our mistakes giving the future room for their own.

Nov. 15, 2013 at 1:39 p.m. [REPLY](#) [RECOMMEND](#) 1



David Walters San Francisco

1. The article is good, albeit too brief. It needs more explanation.

2. Megatons to Megawatts is a great program. It sounds like people here would sooner keep these atomic BOMBS laying around Russia rather than turning them into cheap energy. We should have ALL nuclear WND turned into fuel for peaceful commercial nuclear energy. Nuclear Energy is, after all, the ONLY way in which to get rid of the U235 and Pu239 in A and H bombs.

3. Fish from the Pacific. I actually live in Pacifica, CA. Like *everyone* I still eat the fish. Fish from the Pacific was *always* radioactive and "increase" in some forms of tuna is statistically *irrelevant* to our health. I am much more afraid of the accumulated *mercury* in tuna than I am from the ultra-diluted water from Fukushima.

4. Insurance. First, unbeknownst to most, all U.S. nuclear plants ARE privately insured. The fund comes from a half penny per kWhr billed to all the rate payers. It pays for the first 300,000,000 or so in damages. This doesn't include all the other private insurance for various things like workmen's comp (it's low because working in a nuclear plant is so safe). Price-Anderson, as a gauge of safety of U.S. plants hasn't had to pay out one cent to anyone, full stop. Secondly, one can use private insurance so long as one knows the limits on the liability...*exactly* like passenger air lines enjoy.

Nov. 15, 2013 at 1:39 p.m. [REPLY](#) [RECOMMEND](#) 2



keko New York

With that kind of insurance, you could not begin to pay even for the real estate losses if , e.g., Manhattan were contaminated. Commercial losses, health expenses, tec. would come on top of that. This is like having health

insurance that will pay you 3,000 towards treatment when you get sick. I hope this was not meant to reassure anyone.

Nov. 15, 2013 at 6:18 p.m. RECOMMEND 1



Doug Norden Colorado Springs, CO

I'm surprised not one of the contributors mentioned liquid fluoride thorium reactors (LFTR)...

<http://www.youtube.com/user/gordonmcdowell>

Nov. 15, 2013 at 1:29 p.m. REPLY RECOMMEND 2



T Dubya Mi

Plese see www.energyfromthorium.com. MSR/LFTR technolgy has proven benefits from safety to scalability to providing help with the current nuclear waste problem. Why we ignore this homegrown design is a wonder to me.

Nov. 15, 2013 at 1:29 p.m. REPLY RECOMMEND 3



Ed from Philly Upper Darby, PA

Why is it that 4 knowledgeable people can have a discussion on a widely read paper like the Times, and not mention Thorium. Major research efforts on the subject are in place in India, Australia, Russia, Norway and elsewhere. Thorium itself is non fissile, twice as abundant as Uranium, and doesn't produce the long-lived nuclear waste that we are presently storing at reactor sites. As a matter of fact, that political football of Uranium sourced nuclear waste can be consumed in a Thorium reactor.

<http://www.extremetech.com/extreme/160131-thorium-nuclear-reactor-trial-...>

Nov. 15, 2013 at 1:27 p.m. REPLY RECOMMEND 3



KalamaMike Kalama, WA

I live downriver from Hanford Reservation. You can understand my concerns of nuclear waste with our inability to solve the past, much less the future stockpiles.

Can you address the issue of waste please?

Nov. 15, 2013 at 1:26 p.m. REPLY RECOMMEND 2



Spikethedog Marblehead

As far as Hanford goes the issue of waste is pretty simple: Don't store it in rusty drums that leak. Again.

Nov. 15, 2013 at 3:23 p.m. RECOMMEND



Chris Dudley Maryland

The problem with claiming scenarios are improbable if you want to increase the occasions for those scenarios to arise is that they become less improbable. By tripling nuclear power use, probably all that the uranium resource can support, you move from a major nuclear accident every thirty years to one every decade.

Just by continuing the use of nuclear power at its present level through the end of the century, we'll shift enough land into permanent exclusion zones like those surrounding Chernobyl and Fukushima that all the world's nuclear power could be replaced with solar power on the equivalent land area. Counting no-fishing zones associates with Fukushima in that area and you could so it now. Heavy use of nuclear power now means that the improbable scenarios that people worry about do occur. So, their worries are justified and would be even more justified if the use of nuclear power were to increase. There will be 30,000 to 60,000 excess cancer deaths across Europe owing to the Chernobyl accident. The math hasn't been done yet for Fukushima but US Navy personnel who approached the scene and were exposed are reporting ill health effects.

Improbable scenarios that have improbably large consequences can't be ignored just because they are rare. It is, rather, irrational not to worry about them.

Nov. 15, 2013 at 1:04 p.m. REPLY RECOMMEND 2



Glennmr Planet Earth

There will not be 30,000 to 60,000 excess cancer deaths across Europe due to Chernobyl. The WHO estimates approximately 4,000 deaths may occur to the people that lived nearby--who weren't evacuated and should have been--and to all the first responders working to stop the radiation leaks. Across Europe, no increase in cancer deaths are expected.

There is zero evidence of US navy personnel reporting ill health effects from approaching Fukushima.

<http://www.who.int/mediacentre/news/releases/2005/pr38/en/>

Nov. 15, 2013 at 6:18 p.m. RECOMMEND



DR New England

Improbable? How can anyone say that after Fukushima?

Nov. 15, 2013 at 1:03 p.m. REPLY RECOMMEND 2



coolidge8d Farmington

After about 25 years of an essentially linear increase, the measured global average atmospheric temperature has been in a 15 year long period of zero-growth. The cause of this plateau is not known, to my knowledge, nor has there been any suggestion of how long it may last. The net effect, it seems to me, is to render predictions of global temperatures to a realm somewhere between highly dubious and impossible. We need to own up to this fact while we continue to take temperature data, expand its taking with respect to oceans and try to account for the present plateau which renders our present model essentially useless for prediction making. Finally, is it not true that, according to the Milankovitch theory of climate change, we are in a inter-glacial era which is coming to a close? Is the the greenhouse effect our ally after all?

Nov. 15, 2013 at 1:03 p.m. [REPLY](#) [RECOMMEND](#)



Michael Spence E-L San Diego, CA

I find your observations and questions interesting and provocative and appreciate their calm, reasoned tone. I'm a well-educated layman and a pretty strong believer in human-caused global warming, but want to be open to different points of view. If you could supply some links to allow follow up I'd be interested to doing some further clicking and self-education.

Nov. 15, 2013 at 3:23 p.m. [RECOMMEND](#) 1



Mike Mulligan Hinsdale, NH

Well, I think the megatons to megawatt program are is one of the worst corruptions the world has ever seen. Russia is a black box and more than half the energy produced by our domestic nuclear plants has been produced in poorly institutionalized Russia. Anyone got a care in the world about workplace safety and health in black box Russia? People know some of this Russian uranium has been produced by or in their communist gulags.

Where does the fuel comes from and its vulnerability...to use in our domestic nuclear plants? This has been a national and nuclear industry state secret (sensitive and confidential information) for many years now. The industry has bragged half our electricity from our nuclear plants comes from Russia...but I think it is more 60% to 70%. There has been indication that greater than 90% of our nuclear electricity comes from producers (uranium) outside the USA.

Nov. 15, 2013 at 1:01 p.m. [REPLY](#) [RECOMMEND](#) 1



Rick Vermont

Find a place to put them so that when they fail (and they do fail, badly) they will do no damage to habitat, then we'll talk.

Nov. 15, 2013 at 1:00 p.m. [REPLY](#) [RECOMMEND](#) 2



Michael O'Neill Bandon, Oregon

Time and effort spent on nuclear power must come from a reduction in effort on some other front. Every engineering, technician or worker man-hour expended on mining, refining and reacting uranium or thorium is completely lost to all other efforts.

Considering the current cost of power produced by existing nuclear plants is higher than virtually any other it is probably hard for most to believe that we have not actually included all the costs in our calculations. In fact we none of us even know for certain how much it will eventually cost to clean up this mess.

Why in the world would we want to buy ever more of a low efficacy solution? Just to keep the nuclear industry alive?

We could probably achieve the CO2 reduction of building 400 nuclear plants just by spending one-tenth as much on energy efficiency projects. And not have to worry about safety at all.

Nov. 15, 2013 at 1:00 p.m. [REPLY](#) [RECOMMEND](#) 4



betsy Oakland

Please see the film "Pandora's Paradox" before you rule out nuclear power. The stark reality of climate change should make even the most ardent environmentalist consider the relative risks. Nuclear has lots of technical and social acceptance issues, but placing your hope on renewables to replace coal and petroleum is myopic at best. The sad fact is that Fukushima is a huge catastrophe, but coal kills tens of 1000s of people every year.

Yes, we can have a Manhattan style project to find the cleanest feasible energy technology, but it may be too late. And do you really expect the Republicans to support such an effort?

Nov. 15, 2013 at 1:00 p.m. [REPLY](#) [RECOMMEND](#) 3



Gianni New York

Until we can deal with nuclear waste, nuclear fission energy should be off the table. At some point we are going to have to worry about the fish that we eat because of the Japanese disaster as well as nuclear subs being sunk. Global warming is not the only disaster that awaits us.

There is a possibility in nuclear fusion. I am told that it has less waste and could be more efficient; but I'll wait for more discussion on that.

We shouldn't rush in to do something for the sake of doing something and come to regret it later on. But a Manhattan-like Project makes a lot of sense.

Nov. 15, 2013 at 1:00 p.m. [REPLY](#) [RECOMMEND](#)**Bev** New York

There has been some progress made in nuclear FUSION power. Fusion leaves no leftover radioactive waste. In the fifties my long-dead uncle used discuss this with me. He was a scientist and was sure we would be able to get nuclear fusion to work and it would supply energy to the world, cheaply and not create waste or warm the climate. He also said that the oil companies would not like it and probably slow down the research.

Nov. 15, 2013 at 12:57 p.m. [REPLY](#) [RECOMMEND](#) 1**Michael Owen Sartin** Fort Lauderdale, FL

Let's not forget that the we are committed to, indeed, have already begun paying for, the costs of nuclear waste storage. There are real economies of scale available here.

Nov. 15, 2013 at 12:57 p.m. [REPLY](#) [RECOMMEND](#)**Padfoot** People's Republic of Portland

According to Myhrvold, "Nuclear technology is scary to some people because they fear extremely improbable scenarios"

Improbable becomes probable when given sufficient time and insufficient safeguards. The accidents at Chernobyl and Fukushima were both improbable, but they both happened. So, I would like to modify the author's statement as follows"

"Nuclear technology is scary to some people because accidents happen"

Nov. 15, 2013 at 12:57 p.m. [REPLY](#) [RECOMMEND](#) 1**betsy** Oakland

Nuclear technology is scary for many reasons. But we really should look at the health outcomes and compare that to the well-documented health risks of coal burning. Estimates of premature deaths from coal burning in the US alone is 28,000 every year. In India the estimate is 100,000 premature deaths annually. Europe is 30,000 premature deaths. China no doubt is also way up there.

Now compare that Chernobyl. The estimates vary widely depending on the risk model used. But it ranges from 29 officially documented deaths from acute or short term exposures, to 4,000 premature deaths from cancers (thyroid & leukemia), to 93,000 using the most conservative assumptions (as advocated by Greenpeace).

The choices we face are indeed difficult, but let's start with a science-based comparison of risks to human health. While there is no risk-free energy source, let's agree that we need to do something big now -like carbon tax - to combat climate change.

Nov. 15, 2013 at 4:26 p.m. [RECOMMEND](#)**david willinger** New York, NY

Mr. Myhrvold tells us to "push into a cleaner future." But I'm faced with not eating fish since all the fish in the Pacific is now radiated thanks to Fukushima. It's remarkable how the nuclear advocates here make NO mention of Fukushima, but talk instead about "emotional responses." Were they sleeping when that happened? I would love for someone to convince me, but when he talks about improvements in reducing waste and we all know that there is NO solution yet to handling the waste, then I think he's selling me fish oil. Don't he and Mr. Lynas and their ilk understand that they'll never convince people until they have real answers to the waste disposal and safety issues WHICH ARE REAL -- NOT BASED ON IRRATIONAL FEARS! I put that in caps to get their attention - since they're obviously living in an echo chamber.

Nov. 15, 2013 at 12:57 p.m. [REPLY](#) [RECOMMEND](#) 2**Elsie** Seattle

Perhaps an echo chamber is required for gullible people as well. ALL FISH IN THE PACIFIC ARE NOT, REPEAT NOT, RADIATED THANKS TO FUKUSHIMA.

Nov. 15, 2013 at 3:23 p.m. [RECOMMEND](#) 1**Michael Spence E-L** San Diego, CA

Unfortunately, the fears you are expressing ("...I'm faced with not eating fish since all the fish in the Pacific is now radiated thanks to Fukushima.") are indeed irrational.

The findings of a peer reviewed article on this very issue, in the Proceedings of the National of Sciences (<http://www.pnas.org/content/early/2013/05/30/1221834110>) might help. The authors found that a usual restaurant-sized portion of Pacific bluefin tuna has about 5% of the naturally occurring radiation found in a single banana. Also, the amount of naturally occurring radioactive isotopes (pol-210 and pot-40) in tuna are tens of times greater than levels of isotopes from Fukushima (ces-134 and ces-137). Since, prior to Fukushima, radiation from tuna has never been associated with health problems, the additional radiation from Fukushima is really a non-issue. Also, even if you ate 3/4 of a lb. of bluefin tuna a day for a year, you'd still receive a little more than 10% of the radiation exposure you'd get from one cross-country flight from LA to New York.

Feelings, being real, do have policy and political consequences. Reasonable approaches to dealing with nuclear waste have been hampered for decades because of irrational fears. I hope the kind of info from the Proceedings article might help assuage your fears to the point that you become open to supporting currently available, but emotionally charged, options such as nuclear power.

Nov. 15, 2013 at 4:27 p.m. [RECOMMEND](#) 3



Captain Mandrake Delaware

I'm not sure how typhoons (perhaps made more powerful by global warming) kill "indirectly."

We obviously don't have a consensus solution for long term storage of nuclear waste yet. But we have to come up with one whether we build more nuclear power plants or not. Would adding the volume of waste from another ten or twenty modern plants (in the US) make that problem much worse? I don't see it.

The risk of human fatalities from nuclear power accidents (including accidents involving waste) is objectively much less than for coal. Probably less than for oil, natural gas and hydroelectric as well. Is there any risk in solar and wind? Certainly.

In my opinion, it makes sense to permit the construction of a reasonable number of state of the art nuclear plants in the US, perhaps one or two per year. These should be in safe locations and subject to continuous and stringent safety standards. The economics of nuclear power are questionable given cheap coal and natural gas so there will be no mad rush to this option anytime soon.

In the meantime, a safe waste storage solution has to be found - new plants or no.

Nov. 15, 2013 at 12:57 p.m. [REPLY](#) [RECOMMEND](#) 1



Tim Platt Stockholm, Sweden

Solar energy coming to the earth every one and a half hours is more than the world's annual energy consumption. We are just beginning to use a microscopic trickle of the giant river of renewable solar energy, which is clean, safe and extractable on a small scale. A solar house TODAY can have a net consumption of 0 watts. The awesome solar energy of ocean currents has not even begun to be tapped. Why are we even listening to the lobbyists from the big scale, dangerous (for many reasons) nuclear power industry ?

Nov. 15, 2013 at 12:57 p.m. [REPLY](#) [RECOMMEND](#) 3



Barry Reitman Blooming Grove, NY

In 1980, while I was working at the General Dynamics submarine facility in Groton, CT, one of my fellow nuclear installation machinists was saying goodbye. He had landed a job in his other credentialed trade, nuclear piping inspection, at the Shoreham civilian plant being constructed on Long Island. He'd been promised \$50,000 a year including overtime – a huge wage in 1980 dollars.

Three weeks later, he was back at General Dynamics. When I asked why he returned to a \$15,000 a year job, he told me that his employer, a sub-contractor, had two contracts: nuclear piping installation and nuclear piping inspection. To earn the princely sum he'd been promised, he would have to "inspect" and sign off on the piping jobs in the office, without ever having seen them. He ended his story with, "I couldn't sleep at night."

Fast forward to 2005. I had an opportunity to speak with Mario Cuomo and I told him that story. I remembered his closing the Shoreham plant before it ever went critical ("ignition on") and that it was very nearly a career-ender. He said that he had heard many such stories. Undercover state investigators tried to get evidence, but never had enough to prosecute.

"...anti-nuclear fear mongering?" Hardly. While all manufacturing and construction are subject to substandard quality and dishonesty, a nuclear power plant disaster in a major population center is more than a building collapse. It's the end of life as we know it. Instantly.

Nov. 15, 2013 at 12:57 p.m. [REPLY](#) [RECOMMEND](#) 2



Mike Mulligan Hinsdale, NH

So wink-wink...the Megaton to Megawatt has come to end. This 50% of our nuke plant electricity, so called coming from Russian nuclear weapons uranium, will now be coming from new sourced Russian uranium...new mining, refining and centrifuging. You get it, we are still playing Russian slave labor income against the middle class American Dream income (and health and safety). There are rumors higher percentages are going to be coming from Russia. Was the Megaton to Megawatt program just teaser rates?

So here is an honest question. Please list all the sources and percentage of uranium (in all its forms) used in our domestic nuclear reactors!

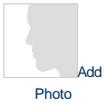
You get it, there is no credible information because of corporate and government secrets, it doesn't get reported in our weak news media.

Nov. 15, 2013 at 12:57 p.m. [REPLY](#) [RECOMMEND](#) 2

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Barry Reitman Blooming Grove, NY Not You?

1500

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Zhao Zhong, Pacific Environment

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Nathan Myhrvold, Intellectual Ventures

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