Bill Gates' quixotic quest to revive nuclear power | GreenBiz

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My name is Gary Duarte, Director of the US Nuclear Energy Foundation, Sparks, Nevada. I am going to critique this biased article written by Mr. Kats. Let's learn a little about him. Greg Kats is president of Capital E, a clean energy investor and leader in the transition to a low carbon economy. He was the first recipient of the U.S. Green Building Council Lifetime Achievement Award. My comments will be posted in **BLUE** within the text of his article for ease of identification.

Greg Kats, GreenBiz Thursday, February 7, 2019

Bill Gates has been lobbying Congress to secure federal financial support for nuclear power and for a nuclear company in which he is a large investor. This plea for federal largesse from a decabillionaire illustrates why further nuclear subsidies make no sense. Well, this is certainely biased coming from a "clean energy investor? Oh, ironically, nuclear IS clean and renewable energy, just not accepted by the, so called "green" establishment mostly because they cannot survive the competition.

Nuclear power is already a heavily subsidized 60-year-old industry with over half a trillion dollars invested in several hundred large operating nuclear plants, including 99 in the United States. The cost of nuclear power has soared while the cost for other low-carbon power options — including wind, solar, batteries and energy efficiency — have plunged. This is why no U.S. utilities want to build nuclear plants unless they can get large additional subsidies. This is BS. 60 years ago, nuclear was opposed by the coal & oil industries for fear of elimination. Today, it is solar & wind, for the same reason. When Eisenhower proposed Atoms for Peace, they were considering 400 U.S. nuclear plants, (do you think that would have amortized plant costs?) That set off the coal & oil "politics" AND again, today, solar & wind. When it comes to "energy production" physics dictates that nothing can beat nuclear. At some point in time, common sense has to kick in.

Gates' rationale for nuclear power can be summarized as follows: Given the reality and gravity of climate change, nuclear provides the only large-scale, very-low- carbon electricity source that cost-effectively can provide power at scale when needed. Other very-low-carbon options, such as wind and solar power, batteries and energy efficiency, cannot reliably provide power when needed — especially on hot summer afternoons when air conditioning loads are large.

This same argument was made by nuclear advocates 30 years ago and is even less true today.

Well Mr. Kat's you got this wrong also. Canadian Nuclear Association:
NUCLEAR CHEAPER THAN SOLAR NOW AND IN THE FUTURE: December 2014

They found that while solar appears cheaper than nuclear, intermittency (the sun doesn't shine 24 hours a day)

means solar plants operate at 20 to 30 per cent of capacity. This is lower than the 90 per cent average for a nuclear plant. ... “By that measure, nuclear is more than competitive,” the link.

https://cna.ca/news/nuclear-cheaper-than-solar-now-and-in-the-future/

They estimated a 1 GW nuclear plant could produce 7,889 gigawatt-hours of electricity annually. But you would need a 3.6 GW solar plant to produce the same amount of power. “In 2014, one of the cheapest utility scale solar plants in the US had an expected installed price of $2,000 per kilowatt. But since US solar plants operate at only about 25 per cent capacity factor, the cost per capacity-adjusted kilowatt is $8,000.”

Looking at the cost of the four US nuclear reactors under construction today in Georgia and South Carolina. Their initial capital costs are $6,700 per kilowatt and $4,900 per kilowatt respectively for an average of $6,500 per capacity-adjusted kilowatt factoring 90 per cent operation capacity. That’s 20 per cent less than solar.

At the time, I co-authored a widely referenced study comparing nuclear power and energy efficiency as alternative ways to slow global warming. Our work showed that because nuclear is far more expensive than energy efficiency, given limited energy investment capital, if investments in costly nuclear power displace cheaper energy-efficiency investments, (? a cheaper way to make insulation?) it would have the net effect of increasing global warming. Nuclear remains a large and important source of very-low-carbon electricity but energy efficiency has delivered far more CO2 reduction at far lower cost. ??? This makes no sense. Energy efficiency, is the goal to reduce the amount of energy required to provide products and services. For example, insulating a home allows a building to use less heating and cooling energy to achieve and maintain a comfortable temperature. Energy efficiency harnesses technology to help avoid or reduce energy waste. How does this logic apply to a solar capacity output of 25%?

Gates' argument for nuclear power was made 30 years ago and is even less true today.

Energy efficiency has cut electricity demand by half over the last 30 years and can cut growth in electricity use by half again by 2050. Gates has said his dream is clean energy at half the price of coal. Contrary to your opinion, Mr. Gates is correct. Nuclear plants are designed for 90% output for 60 to 80 years. Nothing can touch that output arithmic. Again, with all of the fluff of solar, why do we never see the “costs” of silicon panel disposal to include the entire life-cycle? Energy efficiency is now about half the price of coal. And large-scale solar contracts are being signed at close to half the price of coal, so Gates’s dream already is coming true. Forbes, in a 2018 article titled "Plunging Prices Mean Building New Renewable Energy Is Cheaper Than Running Existing Coal," noted, "Across the U.S., renewable energy is beating coal on cost," and that new solar is commonly less expensive than existing, already-built coal plants.

Perhaps as importantly, U.S. industry and buildings are rapidly adopting the capacity to rapidly reduce or shift (PDF) their power demand as needed, a phenomenon I have described as "buildings as batteries." PJM, the largest power market in the United States, already secures more than half its 15 percent standby capacity from contracts for on-demand energy efficiency at a fraction of the price of nuclear power.

And a proliferation of innovative firms such as NEST, Tendril, AtSite and Ohm are making energy efficiency an increasingly flexible resource. California-based Ohm, for example, enables and connects more than 50,000 smart devices to balance the grid, including Teslas, smart home thermostats and smart plugs. It is close to a zero-capital-cost equivalent of batteries, and is enabling greater grid reliability and expanded reliance on renewable energy while reducing consumer cost of power.

Resilient and secure?

In effect, power demand, once static, is increasingly flexible and responsive to utility price signals, making the grid more resilient and secure and reducing the need for continuously operating nuclear or coal plants.

Wind and solar made up more than half of all new generating capacity in the United States and Europe over

the last four years, adding more generation capacity than all other power sources combined. And with costs declining, wind and solar are generally projected to continue to be the dominant source of new power generation. Meanwhile, America's most valuable corporations — including Apple, Google, Facebook and even Gates's Microsoft — are shifting to 100 percent renewable energy (PDF) to power their companies and data centers, both to save money and to enhance their brand by cutting greenhouse gas emissions. Clearly wind and solar can — and do — provide power at scale.

This leaves us with Gates's most complicated argument: that baseload power such as nuclear is almost always on and so can be relied on to provide power that other low-carbon energy solutions cannot.

But unlike energy efficiency, which is always working, nuclear plants experience accidents that cause abrupt plant shutdowns that have been very expensive for states ranging from California to Louisiana. When a huge nuclear power plant has an unplanned shutdown, it is far more disruptive than small plants going offline. More false narritive. Go research the nuclear production output arithmic compared to plant shutdowns. And, you again demonstrate your bias not mentioning the new development of nuclear SMRs (Small Modular Reactors) the size of a large refregerator. This and nuclear plants' highly radioactive materials is why security analysts and the military worry about the vulnerability of nuclear plants to accidents or to terrorism. The projected cost of cleanup for military and civilian nuclear waste is over $490 billion, according to a 2018 study by KPMG for the U.S. Department of Energy. Oh, this is our highly efficient nuclear powered military ships, which every other nuclear country in the world have adapted? And, no mention of the Kenneth Kok, PE ASME report on the reprocessed value of nuclear waste, (the U.S. inventory valued at $14-trillion dollars.)

And we still have not figured out a long-term strategy for storing highly radioactive spent fuel from nuclear power plants. The issue of nuclear waste disposal remains unsolved, with huge costs pushed down the road, and until these problems are solved a nuclear expansion does not make much sense. Incorrect, it is SOLVED, but being delayed by Nevada's unfounded NIMBY politics rather than following Congressional law of the DOE science & engineering for the construction of Yucca Mountain.

Gates is right that nuclear plants usually operate more reliably and predictably than wind or solar plants. A single solar or wind installation has unpredictable power availability, but as solar and wind resources are added across the country's grid, their combined predictability and reliability rises because if it is not windy or sunny in one place, it is windy or sunny elsewhere. And you think it is cost effective to "move" solar power from Arizona to New England on a rainy day?

As wind and solar generation continues to expand, their combined reliability and availability keeps rising and may exceed that of nuclear power plants. This also applies to nuclear, more full scale plants = amortized construction costs. SMRs will provide the remote and hundreds of installatins nationwide for distribution. They will also become available for private power ownership for large university systems, and business investments.

As wind and solar generation continues to expand, their combined reliability and availability keeps rising and may exceed that of nuclear power plants. Not going to happen, again, you have to run the arithmic. Further, the growth of inexpensive natural gas power generation has expanded the amount of power generation than can be started up and shut down relatively quickly and efficiently (which nuclear and coal plants cannot do), making natural gas a natural complement to wind and solar — which, unlike natural gas plants, have zero fuel costs.

In much of the United States, batteries are already a cost-effective way to shift up to two hours of electric load — for example, from the middle of the day when there is a lot of sun to later in the afternoon when solar power generation drops but air conditioning use peaks. Batteries, particularly lithium-ion batteries, are scaling very rapidly, driven mainly by electric cars, and that is reducing battery costs by about 10 percent (PDF) per year. And electric car batteries are increasingly being plugged into the grid to allow car owners to profit from buying power when it is cheap and not needed — and selling back to the grid when it is needed and expensive — reshaping load around demand and availability of wind and solar power. All of this will be complimented by nu-

clear, again: available for private power ownership for large university systems, and business investments.

Consumers, businesses and utilities all win with this new distributed clean utility because renewables plus efficiency and batteries is available as a very resilient, near-zero carbon solution to providing power when and where it's needed at the lowest cost. As these technologies continue to scale, they continue to experience steep cost declines, making the idea of a nuclear alternative vanishingly unrealistic.

Even with enormous government subsidies and guarantees, corporations and utilities do not want to invest in nuclear power. This is flat out wrong, they do want to invest, but, they want a level playing field. It is solar & wind which have had enormous government subsidies and abused them. The majority of nuclear assistance has been utilized for loan guarantees which have been honored. In the Solynda solar panel case, the haunting is in the form of a report from the Inspector General's Office, which after more than four years of investigation, concluded that Solyndra officials used inaccurate information to mislead the Department of Energy in its application for a $535 million loan guarantee. The report also found that there were shortcomings with the DOE's managing and approving the loan guarantee to Solyndra. Nuclear projects are doubly scrutinized by the NRC.

Tens of billions of dollars have been spent developing different nuclear power plant designs, and even with enormous government subsidies and guarantees, corporations and utilities do not want to invest in nuclear power. Gates is a large investor in a nuclear firm, Terrapower, which hopes to build a prototype by 2030. If this target is achieved and a prototype is demonstrated by 2030, it could move toward commercial deployment in the 2030s. But we cannot afford to wait 15 or 20 years to scale very-low-carbon energy — and, fortunately, we don't need to.

Renewable energy has more than doubled in the last decade to provide 20 percent of U.S. electricity, as much as nuclear. And while nuclear power in the U.S. (and Europe) is declining (although expanding in China), Oops, you forgot to mention, Russia, India and Japan. Nuclear power plants in South Korea are generating 20.5 GWe from 23 reactors. This is 22% of South Korea's total electrical generation capacity and 29% of total electrical consumption. You might also notice that nuclear is used in a majority of these industrialized nations. wind and solar continue to expand at double-digit rates as their large cost advantage over nuclear grows. Wind power costs a tenth of what it did 30 years while the cost of solar PV has dropped by over 95 percent. The Wall Street bank Lazard in November noted that the cost of solar and wind had dropped 13 percent and 7 percent, respectively, just over the past year, while the cost of nuclear is now more than three times the cost of wind or solar.

Nuclear's competition with efficiency, renewable energy and batteries is over, (Maybe you think so, but when the next generation of nuclear engineering comes online, you will have to re-write this statement.) and we should be glad of it. And why would you be glad of it? nuclear produces the largest percentage of carbon free power in the U.S. After all, renewables and efficiency provide about five times as many jobs per dollar invested as nuclear power and don't impose nuclear power's risks of long-term radiation, accidents, unresolved and vastly expensive nuclear waste disposal challenges or the potential to provide materials for nuclear bombs — issues that most citizens are or should be concerned about.

Nuclear energy has played an important if expensive role in providing low-carbon power, and these plants should operate as long as they are safe. But America, including corporate America, has moved on to safer, cleaner, faster and more secure options that are proving to be a resilient and low-cost path to a very-low-carbon grid. There is no way solar & wind can replace the volume of energy produced by carbon free nuclear.

Gates should do the same and shift his formidable skills and capital to accelerating this current and essential clean-energy transition. He is with nuclear, the undeniable arithmic path.