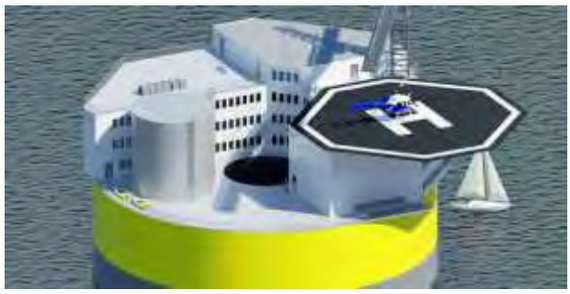
A Solution to Global Warming and Clean Energy Needs

Jim Dougherty
October 12, 2016



Today, global warming is both a threat to our shared human environment, and, if responded to wisely, it is an opportunity to improve living conditions for people worldwide.

Over the last 250 years, the average global temperature has increased approximately 1.5 degrees Celsius. This average incremental increase in temperature corresponds almost exactly to the increase in atmospheric carbon dioxide, the primary greenhouse gas of concern, because it is emitted on such a huge scale by modern industrial civilization.

To put this in what is perhaps an unfortunate perspective, the planet-wide impact of human-caused global warming is estimated to be the equivalent of detonating about 400,000 Hiroshima-sized atomic bombs each day or 4.6 atomic bombs per second.

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That heat has to go somewhere, and scientists don't fully understand how the earth is dealing with all the extra heat. Global temperature will continue to increase if nothing is done — but it's hard to predict how bad or what the consequences will be.

The key is not the problem but the *solutions* — none of the ones being proposed currently have any realistic chance of succeeding.

Despite 40 years of concerted effort, conventional clean energy technologies, while making impressive gains, do not yet have the capacity or efficiency to fully address global warming and energy needs worldwide.

In the United States, renewable energy sources account for 11.09% of U.S. energy consumption. Half of the renewables include biomass (organic) (5.5%) which is not emissions free. The remainder is made up of hydroelectric (2.83%), wind (1.98%), solar (.48%), and geothermal (.25%).

Under the best case scenario, solar would add 1% capacity per year and is still expensive at around 21 cents per kilowatt-hour. Though falling, its cost far exceeds that of natural gas which has a cost of around 5.7 cents per kilowatt hour.

More important, no matter what we in the developed world do to limit our energy consumption and convert to greener energy technologies, it will have almost no impact on the overall problem due to the growth of energy consumption — and greenhouse gas emissions — in the developing world, where expensive technologies we might be able to afford are harder to deploy on anything but the smallest scale.

Wealthy nations can follow sound environmental instincts, but on the larger issue of global warming, it makes almost no difference at all. Every 10% cut in U.S. emissions is wiped out by 6 months of China's emissions growth. As physicist Richard A. Muller put it, "Expensive efforts to reduce Western emission may set an example, but it's a *worthless* example if the developing world can't afford to follow."

In the developing world, it's not just the cost of energy, but its very availability that is a matter literally of life and death. In every quality of life category, people's well-being and very survival correlates directly with energy availability

One study notes that 44% of the world's population lacks access to even 1 kW of energy which can ensure access to drinking water, low infant mortality and raised life expectancy. The same study indicates that 85% of the world's population lacks access to 5 kW of energy needed to reach the highest levels of quality of life.

Energy is the difference between a decent and a miserable life for most of the world's population. It is crucially important, therefore, to have cost-efficient solutions for the developing world, not only for the planet's sake, but as we've seen, for the wellbeing of the people themselves.

The world needs a clean, carbon-free energy source that can meet the demands of modern industrial society and the growing demands of a modernizing world, and nuclear is the known, available technology

with the capacity to meet those needs on the scale required.

Why not then investigate who, if anyone, has been safely using nuclear power for decades — actually 5,700 reactor-years?

The answer is the U.S. Navy. It is one of, if not the largest, operator of nuclear power plants in the world, and has a remarkable safety record.

One common sense approach to solve the problem of energy and global warming is to understand what those with a successful track record have been doing, and consider whether their methods and technology can be applied on a larger and more efficient scale, in this case to provide safe, clean, affordable, and abundant energy.

Perhaps that's why, despite Chernobyl and Fukushima and the understandable safety concerns about nuclear power, people are beginning to reconsider it.

Current applications have been more expensive, harder and longer to build than anyone ever anticipated. For example, the most recent nuclear plant, Watts Bar II at TVA, just went online after 43 years under construction. Nevertheless, the fundamentals of nuclear power — very low fuel cost and virtually no air pollution of any kind — are so favorable that it makes sense to give it a second look, and ask, if the safety issues can be dealt with, could this be the solution to global warming and energy abundance we've been looking for?

Fukushima illustrates among other things the inherent safety risk of all land-based nuclear reactors: overheating and meltdown from loss of coolant. All land-based reactors have the same problem: they are dependent on mechanical cooling and a water source to keep them from overheating. Perhaps that's why the Russians, Chinese and MIT are all looking at offshore reactor placements.

Even though it's mostly military discipline that keeps Navy reactors so safe, there may also be an inherent safety advantage that all Navy reactors have in common: they're surrounded by millions upon millions of gallons of *water* — an infinite heat sink. While it doesn't replace good engineering and best safety practices, offshore placements make just enough difference so that the best practices of human beings — operating with inherently dangerous technology — do not result in catastrophic failures, as the Navy's 5,700 reactor-year safety records attests.

Offshore nuclear has been proposed before, in the form of the 1970's-era Atlantic Generating station, which would have been the largest ocean construction project ever. That very size and scale may have been part of its undoing. However, the project was cancelled when the 1972 oil embargo reduced the demand for electricity from oil refineries.

Many of the requirements contributing to the high costs of the Atlantic Generating station, such as a gigantic artificial reef to protect it from collisions and weather, are still factors today. This is why one alternative, that admittedly has its own special costs, is underwater placement which immediately reduces the risks from weather, collision or terrorist attack. It also dramatically increases the number of available locations, from a handful of carefully selected ones to just about anywhere power is needed.

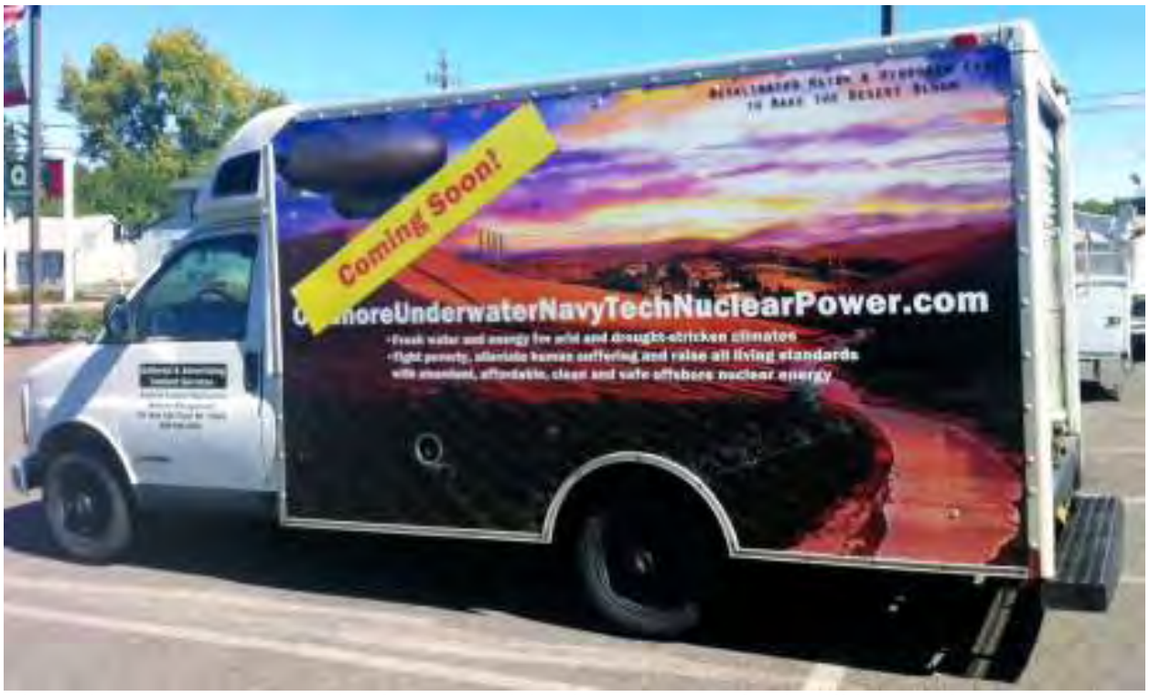
This approach would allow placement offshore of developing countries, making affordable and clean energy available to people for whom it is vital. It would also overcome one of largest barriers to investment in the developing world: fear of stranded costs and asset seizure by any third world dictator or tribal chief who decides to occupy your power plant. Operated under a Merchant Marine model with private ownership, operation and competition combined with military supervision for safety, security and the absolute protection of public interests — those assets would be inherently safe.

The companies that bid for and win the right to build these stations and operate them will pay hefty license fees to the federal government while still undoubtedly earning staggering profits for their investors: a bonanza of revenue for both economic growth, and important public endeavors as well, like education, healthcare, infrastructure, and the environment.

Surplus energy could power our transportation network, hugely simplify automation of vehicles, and overcome the biggest problem with electric cars: the batteries. Between automation removing the risk of collision and highway electrification removing the fuel, vehicles can be smaller, lighter and cleaner, creating a revolution in transportation.

Ship-like construction would also mean all the benefits of mass production would apply as well as port or dry dock maintenance for optimal conditions for servicing and repair of stations. There's been substantial discussion of the benefit of small modular reactors over the last two decades. This takes the concept one step further and makes the entire power station modular — no gigantic, heroic, record-breaking, fantastically expensive construction projects in the field — just quiet, efficient, standardized manufacture

and maintenance in a controlled, optimized facility with the right tools and the people who know how to use them in the same place.



The author's EA Content mobile education and development center for the offshore nuclear project.

There's much more we need to consider such as advanced nuclear fuel cycles that use the normally unusable 99% of naturally occurring uranium to allow thousands of years of clean energy, even with current technology; safety, security, what-if disaster scenarios, public perception and education, and the somewhat ambiguous but healthy competitive/collaborate relationship among different clean energy technologies. All that is also fertile ground for the research still to be done.

Offshore nuclear power has the potential to be not only an economically and environmentally, but a morally transformative technology, allowing us to both be good stewards of the earth, and to foster the prosperity and happiness of our fellow human beings. Safe, abundant, clean energy is not just a convenience but an essential and practical tool to substantially build the ideal world sought by Unificationists and many of our greatest spiritual leaders.

Protecting the global environment while improving living conditions for billions of people worldwide are goals supported by Unificationist teaching on the second and third blessings given by God to Adam and Eve in the biblical account of creation. To have dominion is not only to master our environment, but having loving and protective stewardship of it, and to preserve it for future generations. It is therefore noteworthy that Mrs. Hak Ja Han Moon stresses the importance of protecting the environment and intends to revive the very successful International Conference on the Unity of the Sciences.

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Graphic at top: *An MIT-designed concept of a floating nuclear power plant eight or more miles offshore (courtesy of MIT/NSE).*