Nuclear power isn't the problem.

The problem is with the reactors we've been using to make it. If the reactors at Fukushima had been Molten Salt Reactors (MSRs) they wouldn't have a mess on their hands.

- Molten salt reactor technology was developed at Oak Ridge National Labs in the 1960s. Although the test reactor worked flawlessly, the project was shelved, a victim of political considerations and Cold War strategy. But MSRs have been gathering a lot of new attention since the events in Japan.

- An MSR is a completely different kind of reactor, as different as an electric motor from a gasoline engine. It can't melt down, and automatically adjusts its output to meet changing workload demands. It requires no active cooling system and can be installed anywhere on earth, even an underground vault. A tsunami or tornado would roll over it, like a truck over a manhole cover.

- MSRs use liquid fuel—nuclear material dissolved in molten fluoride salt. While modern solid-fuel reactors are far safer than the ones at Fukushima, the possibility of a meltdown and the steam ejection of radioactive material will always exist. MSRs don't use water, and operate at ambient pressure.

- An MSR can deliver 750ºC heat for industrial processes, or spin a high-temperature gas turbine to generate power. If disaster strikes and an MSR springs a leak, the spill cools to an inert lump of rock, chemically locking the nuclear material inside. The fuel can all be recovered and used again.

- MSRs burn Thorium, a mildly radioactive material more common than tin and found all over the world. America has already mined enough Thorium to power the entire country for 400 years. It's found by the ton in the tailings of our abandoned Rare Earth Element mines.

- MSRs are highly resistant to proliferation. Thorium is bred into ^{233}Uranium inside the reactor, but only enough to keep the MSR running, so no stockpiling occurs. While ^{233}U is an excellent fuel, its harsh radiation makes it nearly impossible to steal, and extremely difficult to use in a weapon.

- Liquid fuel can be continuously cleaned of the contaminants that spoil solid fuel. This unique feature enables MSRs to consume fuel so thoroughly that they can even use the spent fuel from other reactors, cleaning up our legacy of nuclear waste while producing a miniscule amount of waste themselves.

- A 1-gigawatt MSR, big enough to power a city of one million, will run on one ton of Thorium per year, or about 2 teaspoons per hour. The long-term waste will be the size of a basketball, and virtually harmless in just 300 years.

A national rollout of Molten Salt Reactors will create thousands of good jobs in every region of America, by launching a new paradigm of safe, cheap, and abundant carbon-free energy. A national Thorium infrastructure was visualized by the Kennedy administration as far back as 1962. Sadly, the molten salt program at Oak Ridge was shut down ten years later, even though the test reactor ran without a hitch for nearly 20,000 hours.

While a lot of useful R&D has been performed since then, the MSR is still on the drawing board. But with sufficient R&D funding (probably less than $2 billion), five years to commercialization is entirely realistic, and another five years for a national rollout is eminently feasible. Some technical issues still need to be addressed, but nothing insurmountable. Remember, we shot for the moon before we came up with Velcro, Teflon, and Tang. That's how we roll.

We geared up overnight to build thousands of Liberty ships, tanks, and bombers (not to mention the Manhattan Project) and we did it all without the aid of a single computer or cell phone. There is no reason to think we can't do it again, because this isn't rocket science—it's just a chemical plant, with high-temperature, low-pressure plumbing.

In the fall of 2010, a Chinese delegation toured Oak Ridge. Several subsequent meetings ensued, including the sharing of MSRE data and reports from the 1960s and 1970s. (To be fair, it was all in the public domain. But still…) On Chinese New Year in 2011, the Chinese Academy of Sciences announced that they would be embarking on a Thorium Molten Salt Reactor program, and patenting every advance they make.

So far, they've dedicated $500 Million to the enterprise, and there's a lot more yuan where that came from. The head of the program is Dr. Jiang Mianheng, a PhD in electrical engineering from Drexel University and the son of Jiang Zemin, the former president of China. It's safe to assume that the guy knows what he's doing; he certainly has the financing and the connections.

While the MSR continues to languish on America's drawing boards, realize that it's now on China's drawing boards as well. And they mean business. So if we don't wrap up our R&D and start building some MSRs around here, we'll soon be forced to buy our own invention from China.

If this isn't a Sputnik Moment, then I don't know what is.

Michael Sean Conley
Los Angeles, CA
(213) 359-4969
mikeconley99@sbcglobal.net