Nuclear Power Needed In a Tumultuous World

Matthew Ehret-Kump and Liona Fan-Chiang report from the Pacific Basin Nuclear Conference in Vancouver. While many nuclear experts are hunkering down, great potential exists in the BRICS countries.

Sept. 1—The Biennial Pacific Basin Nuclear Conference was held this year in Vancouver, Canada the week of Aug. 25-29. More than 600 nuclear scientists, engineers, vendors, and regulators gathered to discuss the recent advances in the field, as well as challenges that have emerged. This year, the conference is especially opportune, as it is held in the wake of the recent BRICS (Brazil, Russia, India, China and South Africa) nations' economic agreements and related motions to create an entirely new world economic and strategic system. Although not explicitly discussed in the plenary sessions, as anyone who has looked at nuclear energy development over its history knows, nuclear energy has never been able to distance itself from the political environment, and this was no exception.

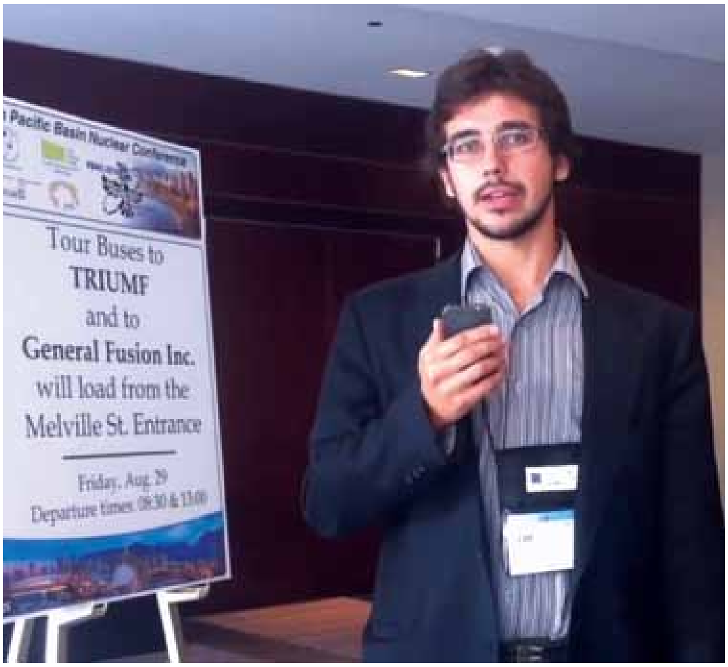
Fukushima was perhaps one of the most oft-repeated words throughout the conference. The general hysterical reactions, as well as those to the contrary, in the aftermath of the 2011 earthquake and tsunami in Japan,[1] corresponded very closely to the political split among the world's largest nations.

Many of the sessions dealt not only with safety, but also with the public perception of safety. Since the two are often starkly divergent, regulators and engineers have been caught between trying to provide maximum safety, and explaining to a very vocal "anti" lobby what "safety" means. Some, after having provided multiple layers of safety mechanisms, have come to realize that the issue of safety is being manipulated by some opponents of nuclear power, to permanently stall it, regardless of its merits.

Tim Gitzel, President and CEO of Cameco, America's largest uranium producer, called for the scientific community to develop "tougher skins" when taking on the irrational arguments of the environmentalist movement. He pointed to the German and Japanese nuclear systems, which were shut down *not* for scientific, but rather for political reasons, and that if the scientific community doesn't learn how to get more polemical and tackle this problem, then this industry will fail.

This point was accentuated in an interview with *EIR* by Juan Eibenschutz, Director General of Mexico's National Nuclear Regulatory Commission, who made the point that the scientific illiteracy of the population with respect to nuclear power was being driven by political forces that have embedded themselves into many regulatory institutions, creating a vast bureaucracy which has prevented the development of nuclear power in the West. Speaking to the fear of radiation which has swept the population since the Fukushima disaster, Eibenschutz said that an irrational double standard had ingrained itself in the regulatory

1. The 9.0 earthquake and ensuing tsunami damaged the Fukushima nuclear plant, and washed away large parts of Japan's coast, killing 15,889 (as of 2014), see data from the National Police Agency of Japan, http://www.npa.go.jp/archive/keibi/biki/higaijokyo_e.pdf).



Committee for the Republic of Canada

Matthew Ehret-Kump reports from the Pacific Basin Nuclear Conference in Vancouver, Canada, on Aug. 28, 2014.

institutions since Three Mile Island (March 1979), and is now being made worse by the media hype over Fukushima (from which not a single radiation fatality has yet been reported):

"In the case of nuclear, [the regulators] do things like stopping the same kinds of power plants in the world. Three Mile Island was very interesting from that point of view. The accident at Three Mile Island did no physical harm to anybody. In spite of that, the nuclear industry in the U.S. stopped. Period. Two weeks after Three Mile Island, there was this accident of a DC-10 that lost an engine and killed 230 people. The DC-10s stopped flying for one week. That was it—because it was not nuclear!"

Not only were there no fatalities at either Three Mile Island or Fukushima, but the fear that erupted created a monster which is at the heart of the current shutdown of all 48 nuclear reactors in Japan,[2] and all German reactors by 2022.

Selling Green

As a result of this environment, great engineering advances have been cloaked by a "small and green" advertising campaign, as though trying to trick the public into accepting nuclear power.

For example, the development of Small Modular Reactors (SMRs) was heralded by various speakers, including Jacques Plourde, President of the Canadian Nuclear Society, who proclaimed that the SMR is the future of nuclear technology in Canada and globally. The SMR is attractive since it can be used in remote regions such as the Arctic, or in developing countries, to provide efficient and reliable energy for small communities, as well as for powering mining operations in such regions, which no other source can accomplish. Although powerful in a top-down national strategy to develop remote areas, the primary problem with the SMR is that it is being advertised as a replacement for large reactors, tangent to a nation-building policy.[3]

New fuel sources, better designs, and other efficiency-improving innovations were presented by dozens of speakers. AREVA Canada Inc.'s Vice President Jean-François Béland gave an interesting presentation on the recycling of spent fuel, discussing the necessity of closing the fuel cycle, and demonstrating new techniques in reusing spent uranium and other "waste." Closing the fuel cycle is a real engineering issue. However, many in the nuclear community also hope that advertising the ability to clean up radioactive waste will finally squelch opposition to nuclear power. Unfortunately, in the example of the United States, that has not been the case. While other countries have been reprocessing spent fuel for decades, in the United States the fuel cycle is not closed, and spent fuel is wasted, entirely due to political barriers.

The extension of the operating lives of CANDU reactors (Canada) beyond their planned 30 years was showcased by senior engineers of Ontario Power Generation, Inc., with many innovative approaches to managing fuel channels better and slowing the aging pro-

2. This may perhaps explain why a very small delegation from Japan attended.

3. An example is that just about all of the designs involve preventing the receiving country from knowing anything about the reactor, bowing to non-proliferation concerns. SMRs are being proposed for non-nuclear countries to have a reactor, for example, buried underground. They receive a black box, never touch it, and it is refueled and serviced by the company that sold it to them. In contrast to China's aggressive education program, this results in *no* education of nuclear engineers, no integration into the economy, and no use for other applications—just a black box.

cess of reactors. This parallels advances in nuclear reactor designs, which have made them incredibly efficient, such that, for example, U.S. nuclear power plants, even though new power plants have not come on line for over 30 years, continue to supply 20% of the nation's growing electricity demand. Unfortunately, these advances are tainted with the feeling that these may be the only employment outlet for nuclear engineers who work in countries where there is a low chance that new large reactors will be approved, under the currently collapsing economic system.

BRICS Move Forward

Although the argument that the public has caused nuclear power to ground to a halt has been used to explain the sluggishness in the United States, Canada, Germany, and other formerly industrialized nations, the facts show otherwise.

Every country has an anti-nuclear lobby, even China. However, while the United States, after a four-decade dry spell, plans to have three new nuclear plants by 2017. As of Aug. 21, 2014, China has 27 new plants under construction, with a plan to triple the current capacity by 2020.[4] Although this would still only provide 3.6% of China's electricity use, the rate of progress, not only in nuclear power, but in rail construction, fusion research, education, and space development, is phenomenal.

Unlike the defensive posture taken by Canada, the United States, and others, China has launched an aggressive campaign to educate the population and integrate them into the new economy. As outlined by Deputy Secretary-General of the Chinese Nuclear Society Lixin Shen, such educational endeavors include Summer camp programs, tours of facilities, classroom programs, and a wide variety of media. For those who are older, this should remind you of the mobilization in the United States in the 1950s and '60s, which produced a series of educational videos on Atoms for Peace, Project Plowshare, advanced agriculture, etc., from which the skilled nuclear workforce of today emerged.

The necessity of a forward drive toward thermonuclear fusion is well recognized by China, although fusion was a very small part of this conference.

Dr. Michel Laberge, founder of General Fusion (the only fusion facility in Canada intending to eventually produce power), who titled his presentation "Nuclear Fusion: No Longer 30 Years Away," stressed the global developments in fusion power, and his own company's innovative approach to incorporating both inertial confinement (e.g., laser fusion) and magnetic confinement (e.g., the tokamak) into one single design. Two representatives from China, Dr. X.M. Shi (Institute of Applied Physics and Computational Mathematics, Beijing) and Z.C. Yu (Tsinghua University, Beijing) presented a design for a fission-fusion hybrid reactor. This was followed by a presentation by Prof. R. Fedosejevs (University of Alberta) on the advantages of spin-polarizing fusion fuel.

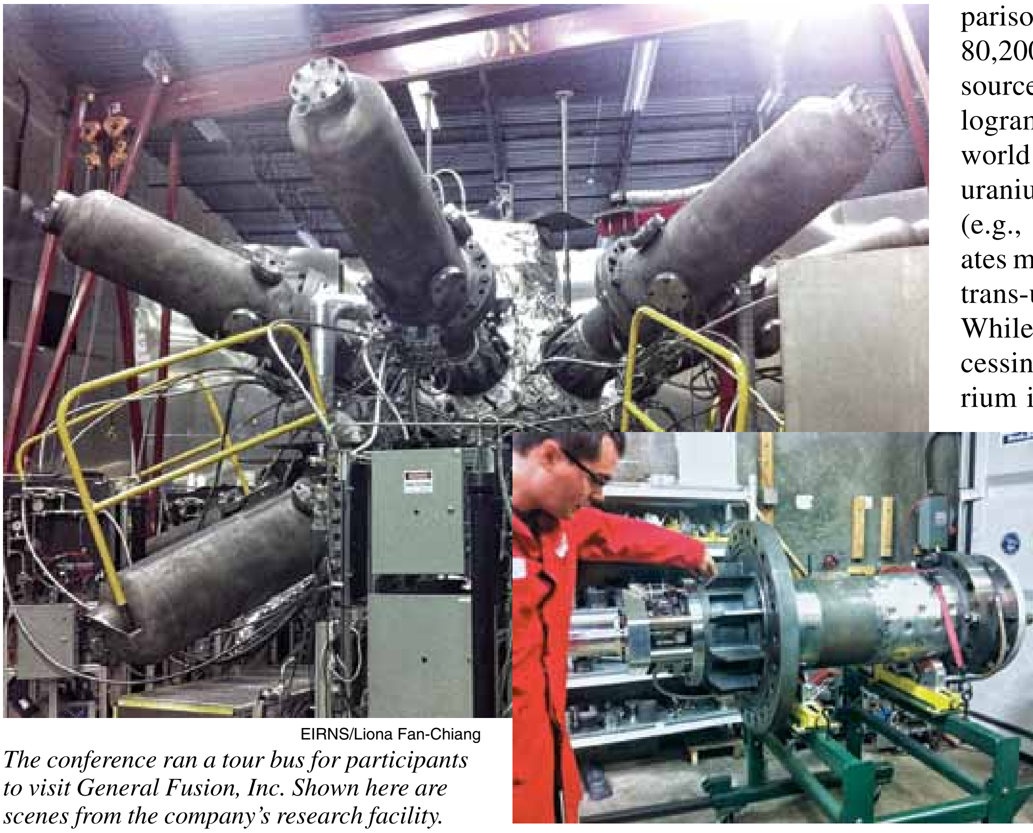
In general, while the United States and Germany have taken the lead on fusion research, China has taken some bold steps. While a partner in the International Tokamak Experimental Reactor (ITER), it also sustains a domestic fusion program, with one of the most advanced tokamaks in the world (one of the only two superconducting tokamaks); is well on the way to a laser fusion facility; and intends to graduate 2,000 fusion scientist by 2020. The vitality of the program is in stark contrast to the diminishing number of students and facilities in the United States.

Russia is currently the world's second-most active developer of nuclear power, behind China, with 10 units currently under construction. Of the 27 plants under construction in China, 3 are Russian reactors.

India's nuclear power strategy was outlined at the W.B. Lewis Lecture by Dr. Srikumar Banerjee, Homi Bhabha Chair Professor at Bhabha Atomic Research Center. Dr. Banerjee began with an historical overview of the collaboration between Canadian nuclear pioneer Dr. W.B. Lewis, the principal architect of the Pressurized Heavy Water Reactor (PHWR, or CANDU reactor), and Dr. Homi Bhabha, the father of India's nuclear program. Dr. Banerjee emphasized the importance of the PHWR technology for India's plans to assure the energy supply for a growing population by closing the fuel cycle, thereby reducing dependence on imported uranium; expanding the domestic supply of new fissile isotopes; and making the maximum use of every neutron, in what he dubbed "the neutron economy."

Dr. Banerjee laid out India's three-stage path for the development of nuclear power. First is to use PHWR systems to generate power from the fissile uranium-235

4. http://www.world-nuclear.org/info/Country-Profiles/Countries-A-F/China—Nuclear-Power/. It is not surprising that CANDU is building its prototype CANDU 6 in China.



EIRNS/Liona Fan-Chiang

The conference ran a tour bus for participants to visit General Fusion, Inc. Shown here are scenes from the company's research facility.

(0.7% natural abundance in uranium), while using the fission neutrons to transform the 99.3% of the uranium which is non-fissile, uranium-238, into fissile plutonium-239 (Pu-239). Second is to use the Pu-239 obtained from reprocessing the used fuel of the PHWR reactors in fast breeder reactors to breed additional Pu-239, as well as to convert non-fissile thorium-232 into fissile uranium-233 (U-233). India is building a Prototype Fast Breeder Reactor (PFBR) at Kalpakkam, which is scheduled to go into operation early next year. Third is use of both fissile isotopes, Pu-239 and U-233, for power generation in an Advanced Heavy Water Pressurized Reactor (AHPR), whose design has recently been completed.[5]

The importance of India's adoption of a thorium fuel strategy is multi-faceted. 1) Thorium is three to four times more abundant than uranium in the Earth's crust, with India possessing, in the monazite sands along its south and east coasts, an estimated 850,000 tons of thorium resources recoverable at $80/kilogram (the largest share, 13.7%, of the world total). In comparison, India's estimated 80,200 tons of uranium resources recoverable at $140/kilogram is only 1.5% of the world total. 2) Compared to uranium, in a thermal reactor (e.g., PHWR), thorium generates much less of the long-lived trans-uranic radioisotopes. 3) While this simplifies reprocessing of the irradiated thorium in some respects, the unavoidable presence of trace amounts of uranium-232 also poses technical challenges to provide shielding from some of its strongly gamma-radiation-emitting decay products.

Dr. Banerjee also highlighted the collaborative role that India is playing both with Russia in the development of its vital fast-breeder technology, and with China in regards to molten salt reactor technology. He also noted India's leading involvement in ITER. Most importantly, Dr. Banerjee reminded the audience that were it not for Canada's nuclear collaboration with India on the CANDU-PHWR system, which must continue to advance now more than ever, none of India's current dreams could succeed. This outlook provided a reminder to the attendees that Canada's only hope for a real nuclear future is found in collaboration with the BRICS.

The contrast of outlooks at this conference highlights the significance of the recent developments led by the BRICS nations, while showing the potential in the trans-Atlantic nations for a renaissance, were these governments to turn away from the currently dying Wall Street-based financial system, into the direction laid out by the BRICS, fueled by productive credit generated to increase the energy-flux density of mankind's power usage and production, throughout the Earth and beyond. Whether this contrast continues to brew toward existential conflict, or resolves in a new era, is an outcome that hangs on a decision we must make.

---

5. Ramtanu Maitra, "India Looks to New Energy Frontier: Fusion Power," *EIR*, June 6, 2014.