INTERVIEW: DR. KUNMO CHUNG

Korea's Bold Plans for Nuclear Power and Space

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Dr. KunMo Chung: Koreans are optimistic!

Dr. KunMo Chung, former South Korean Minister of Science and Technology, was interviewed by 21st Century *correspondent Ilko Dimov, on Sept. 15, 2010.*

Dr. Chung is an internationally known energy engineer and science and technology educator. In addition to serving as Minister twice, he is former chairman and CEO of the Korea Science and Engineering Foundation, and former President of the Korean Academy of Science and Technology. Internationally, Dr. Chung held posts as President of the General Conference of International Atomic Energy Agency of the United Nations, Vice Chairman of the World Energy Council, and Chairman of the International Nuclear Energy Academy.

Dr. Chung is internationally known for his innovations in the design of electric power plants and science policy studies. The Korea Power Engineering Company, which he headed in the 1980s, has become one of the leading engineering companies in the world. The Korea Standardized Nuclear Power Plant Design was initiated, developed, and implemented under his leadership.

Question: One of the interesting things you mentioned in your presentation is team work. You're building teams and doing large-scale training for nuclear power plants of young people in Korea, and also foreigners.

We welcome qualified young engineers to come to our school, because, as in the United States, the average age of professionals working in our nuclear power plants is 59 years old. They are looking for retirement, and you actually have a manpower crisis.

We invite promising young engineers to come to our school to become leadership professionals. And I am making this very clear: Our school is really an international school, taught jointly by Koreans and overseas people.

We have a bilateral agreement with Mid-Atlantic Nuclear Power Educational Consortium. Those mid-Atlantic states are, as you know, Virginia, Maryland, and North Carolina. Duke Power has seven pressurized water reactors, Virginia Dominion Energy has four pressurized water reactors, and Maryland's Constellation Energy has two plants and is building more.

This is the center for U.S. PWRs, and so we are going to have exchanges with this new mid-Atlantic group and our Korean school.

Question: I would like to know more about your frontiers of science. What are the biggest challenges right now for the Korean nuclear industry?

Right now, the most important human resources in nuclear power plants are systems engineers. In my view, the current nuclear reactors, although they are called "generation 1, 2, or 3," have much ground still unexplored for optimizing the design. We need to really optimize it, so that we can save construction time and money.

So far, we have steadily shortened the construction time. Now it takes 48 months for standardized nuclear power plants, but in the future, we think we can cut this to below 36 months. In planning the time for any plant, you cannot take 10 years. Nobody wants to deal with that. So I believe there will be a revolution coming in the design of nuclear power plants. There will be no more custom designed and custom constructed nuclear power plants. They will be very much standardized and built in a factory-like environment.

Korea Nuclear Energy Foundation

Korea's Uljin Nuclear Power Plant has six units, two reactors of 950 megawatts and four at 1,000 megawatts. Reactors 3 and 4 at the site set up Korea's standard light water reactor model.

Then we can have, as I mentioned yesterday, modularization in design and manufacturing construction. This is on the way.

Question: Great! One of the things you mentioned in your presentation was the specialization in modular construction.

Yes, that is what we are pushing for now. Because, emerging nations don't have enough people. What they need is electricity—they don't want to become nuclear exporters.

Question: Many countries from the developing world—Africa, Asia, the

Ilko Dimov

Dr. Chung has patented a design for barge-mounted nuclear plants that can be constructed in 30 months.

Middle East—recently announced plans to construct nuclear power plants.

That is correct: 70 nations in all.

Question: Your country achieved excellence in a very short period of time. What advice do you have for these countries? What do they have to do? What is the model for the Korean miracle you achieved? As a Third World nation coming out of a terrible experience after World War II, how were you able to achieve this excellence?

Well, in our time, we followed the traditional approach. We set up nuclear energy research institutes, and we went through our first nuclear power plant on a turn-key basis, with the entire plant supplied. Then we switched to a component basis with just the components supplied, and from there we went on to have our own standardized design, and so on.

It took a long time for technological self-reliance and this kind of optimization process—it took 50 years. Some people say 30 years from the first commercial operation, but from the start of our first experimental reactor it took 50 years.

I don't think many nations are that patient anymore. They need electricity for their people. So this requires a new approach: in my view, a kind of alliance with a country like Korea, which would be a compassionate partner for these countries. For example: I am an advisor to Kenya, a national advisor on the Social and Economic Council, and I have given talks on nuclear energy—How Kenya can do it.

For that I suggest initially, let's put the emphasis on how to get nuclear electricity in the shortest time, safely, and with security. And for that we need a global cooperation alliance.

I suggested a transportable barge-mounted nuclear power plant, constructed at a shipyard and moved over to the site, and then connected with the grid. I have a basic patent for this. For its transportation, we don't need any nuclear fuel, just the barge. And once you prepare the site, we can cut down the construction time easily to 30 months.

Question: Thirty months, that's wonderful!

I also wanted to ask you about fusion. Under your ministry, you said that you initiated the fusion program. And right now, you have a great achievement in the KSTAR tokamak reactor, which is a smaller version of the ITER tokamak they are constructing in Europe right now. And many of the scientists who will be working in Europe were trained in Korea. Dr. Gyung-Su Lee, the head of the Korean fusion program, has a very optimistic view about achieving controlled fusion.

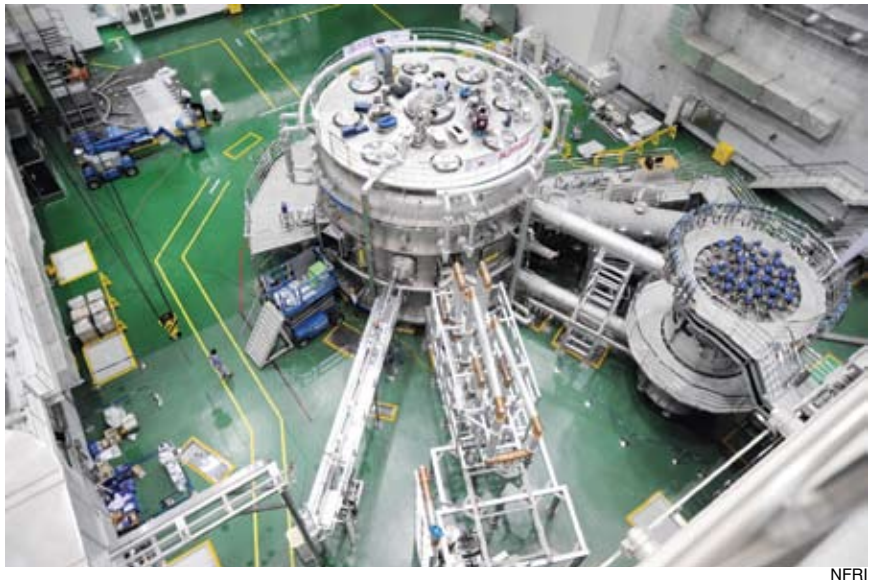
Yes. I read the article you gave me [Interview with Dr. Gyung-Su Lee, "Fusion in Korea: Energy for the Next Generation," Winter 2009/2010]. Among Koreans, I am the first fusion scientist! I did my experimental work at the Princeton Plasma Physics Laboratory in 1963. At that time, the leading machine was a stellarator. I devised an ion heating device on that machine, which was very successful.

Now, of course, Dr. Lee is in charge of the program. Back then, fusion research was carried out with a university-based experiment, a very small tokamak, employed by Seoul National University. Then we discussed how to make a real tokamak, and so on. When I became Science Minister—I served twice in the government, the first time in 1990 and the second time in 1994—during my first ministry, I provided funding for plasma scientists to bring in a tandem mirror reactor.

Then, in 1995, I thought there should be a basic research device. The best basic research device was a plasma machine, because it requires a high vacuum and also a super high magnetic tube and a microwave heating system—a combination of high technologies. So I began the construction of the fusion device. At that time we had good people like Dr. Gyung-Su Lee, and other associates available. During my time, earlier, I was the only one.

Question: During our interview with Dr. Lee, he was very optimistic. He said that Korea could achieve controlled fusion by July 2036. You know, it's really amazing, talking with Koreans, because you are such optimistic people.

We are. We have been optimistic. That is how we are now exporting nuclear power plants, and also building a fusion reactor.



NFRI

Inside the KSTAR tokamak, during its construction in 2007. Dr. Chung credits a U.S.-Korean alliance with improving the successful design for the Korea Superconducting Tokamak Advanced Research.

You know, when we joined this fusion group, people laughed at us, that we didn't have enough expertise. At that time, Hazel O'Leary was the U.S. Department of Energy head, and I was Science Minister of Korea, and we reached an agreement. At that time, the Princeton Plasma Physics Lab had a new design study done. It was called the Tokamak Plasma Experiment, TPX, and I asked: Since the DOE scrapped that plan, whether they could give us the design so that we could improve on it and build a really advanced tokamak machine. So, they agreed, and that's why, for example, David Montgomery, who is an expert on superconducting magnets, came out to Korea to hear what's happening with our superconducting magnet systems.

So it was not, in my opinion, our own work, as much as it was through a U.S.-Korea alliance. And we improved the design, by the way, so it's much better than the TPX. And KSTAR, the Korea Superconducting Tokamak Advanced Research, was the biggest project at the time, in 1995. I had a lot of potshots from the scientific community, that it was a crazy thing we were doing. But our engineers were able to do it, because, for example, we had high vacuum systems. We had other industries which used high vacuum systems, so we borrowed them.

And then we had all kinds of providers of technical services and engineering companies. So together we improved them. That's how KSTAR became the first successful device, and in my opinion, our general technology-based industrialists are ready to tackle KSTAR.

Question: My last question is about space exploration. To achieve a long, stable energy development, the mining of helium-3 (as fusion fuel) from the Moon's surface is necessary. Right now, India and China have space exploration programs, and they are committed to send probes to the Moon, to get samples, and they are developing equipment to mine the Moon. What is their collaboration with the Korean space program?

We do have collaboration. When I was minister in 1995, we had an integrated space research program set up. And the key was, communication satellites plus launching technology. Well, I envisioned a completely Korean effort in propelling this, but in the meantime, the program changed to have Russian technology, so we are having difficulties now.

But we will overcome those difficulties, and we will become actors in space research. I think going to the Moon—there are so many applications of a space visit. That's what we are looking for now....

I am over 70 years old now, and retired. But I am conducting this international nuclear graduate school as a consultant for KEPCO, the Korea Electric Power Corporation.

Question: This is commendable at your age. Lyndon LaRouche, a founding editor of *21st Century* and *Executive Intelligence Review* has put together a team in the United States looking at the challenges of achieving plasma propulsion, the challenges of going to Mars....

You know, I have heard about him. Is he still very active?

Question: He is 88, and will be giving a webcast in the United States....

Ssang-Su Kim: Nuclear Best Solution for the Future

Ssang-Su Kim, President and Chief Executive Officer of the Korea Electric Power Corporation, who spoke at a plenary session of the conference, was asked: "Korea is one of the very active players in the nuclear renaissance. What are your views of the future of nuclear?"

Kim replied:

"Currently the world is confronting the Chinese because of their CO_2 emissions, but renewable energy is not a total solution for that. For CO_2 reduction, nuclear will be one of the best solutions for the future.

"About 20 years ago, we were facing the crisis of the Chernobyl accident. But, after that era, lots of people have developed the technological improvements and advancement of the safety of nuclear. In Korea, we have had no problem in safely operating nuclear power for 30 years. And for Korean safety, the capacity of nuclear power plants for total electricity generation will be increased from 28 percent to more than 40 percent by 2030.

Ilko Dimov

Ssang-Su Kim, President and Chief Executive Officer, Korea Electric Power Corporation (KEPCO): Nuclear is one of the best solutions for the future.

"The world is facing the new adjustment of the nuclear-implementing countries, such as the Middle Eastern countries, which are the world's largest oil exporters, and also South Africa. And in my point of view, the challenging problem we are facing now is that of constructing and operating and managing nuclear power plants safely. To increase and have enough manpower to do that, KEPCO is now starting a nuclear training school, which is one of the first operating schools for nuclear technology and management.

"This particular school is fostering masters degree students with the concept of operating and making nuclear better, from the technological point of view. And we are planning to accept students, 50 percent from Korea, and 50 percent international....

"I sincerely hope that the world-renowned energy companies will have a similar program for fostering the engineers and technological manpower to contribute to the safety of nuclear power plants for the future...."