WORLD ENERGY CONGRESS 2010

Lofty Goals Bogged Down in Green Idiocy

by Robert Hux

The 21st World Energy Congress brought together 2,100 delegates from 137 countries, in Montreal, Sept. 12-16, to discuss how the nations of the world can collaborate to meet the urgent energy requirements of the 3.5 billion people who have little, or no access to electricity. Yet, many of the political, government, and industry leaders who addressed the conference seemed to be on an opposing or, at best, contradictory track, supporting policies that can only keep people in the dark.

Many speakers, for example, acknowledged the dominant role that fossil fuels play in meeting the world's energy requirements, now and probably for more than a few decades to come, at the same time that they promoted onerous economic policies based on the fantasy that the carbon dioxide (CO_2) resulting from burning these fuels must be prevented from entering the Earth's atmosphere, lest it cause a runaway global warming, melt the ice caps, and destroy human life on the planet.

Ilko Dimov

A panel discussion chaired by Christian Paradis, Canada's Minister of Natural Resources. Paradis advocates privatizing Atomic Energy of Canada and its CANDU reactors.

Another common refrain was that we must use "all available energy sources." Thus, many speakers described the efforts of their nations to generate significant amounts of electricity from very low energy flux density sources, such as solar radiation or wind. Excluded from these unrealistic presentations, however, was any mention of the energy and labor investment to manufacture and maintain solar and wind installations, to build the back-up power plants needed to compensate for the intermittent performance of solar and wind, to increase the capacity of the transmission grid to accommodate intermittent sources, to acquire the necessary large land areas—the total of which vastly exceeds the amount of electricity that solar and wind might generate. In other words, the net energy generation from solar and wind is *negative*.

These contradictions did not go unchallenged. A small group of organizers associated with the Lyndon LaRouche political movement and *21st Century Science & Technology* were on hand to shake up the otherwise green-business-as-usual conference.

The Green Dead End

The green agenda skewed the discussions away from the aim of bringing electricity to the entire world, starting at the beginning of the week-long conference. At the Sunday evening opening ceremonies, Quebec Premier Jean Charest welcomed the delegates, noting that Quebec is an appropriate place to hold such a conference because not only is 95 percent of all the electric power here generated from a renewable source [hydro power], but Quebec is also second in installed windmill power in North America!

Then, the head of the European Parliament, Jerzy Buzek, spoke about the Lisbon Treaty's requirement for "solidarity in energy supply," "the need to adapt public thinking," and "the benefit of building huge 10,000-megawatt wind farms to take advantage of economies of scale."

Buzek even expressed concern that some countries seem to be distancing themselves from the Copenhagen meeting on climate change. "If you want to keep temperature low, you must reduce carbon emissions.... There are two linked problems: fighting climate change, and growing energy demands."

Ban Ki-Moon, Secretary General of the United Nations, then informed us that the energy required for everyday life has yet to reach the undeveloped countries, and called for a 40 percent increase in energy efficiency by 2040. In other

IISD

Quebec Premier Jean Charest is proud of Quebec's wind power.

European Parliament

European Parliament head Jerzy Buzek advocates more wind farms.

Pierre Gadonniex, chairman of the World Energy Congress, stressed the need for climate protection.

words, no increase in energy production, just more efficient use of the already inadequate supply.

Finally, Pierre Gadonniex, chairman of the World Energy Congress, and honorary chairman of Électricité de France, laid out for the conference delegates what he considered the agenda: "economic growth," "climate protection," and "social issues."

Concern for "global warming" shaped even the better presentations: Although the chairman of the Canadian Space Agency, Steve MacLean, had some fascinating observations on human activities in space, his concluding remarks focussed on the application of satellite technologies to accurately monitor changes on the Earth, including their application to monitoring carbon dioxide emissions.

Economic Reality

Our interventions as the Congress progressed were directed at bringing economic reality into the vacuous agenda elaborated by the Congress chairman.

In a session on African development, for example, *21st Century* correspondent Ilko Dimov told the World Bank Africa representative, "I am surprised at the pessimistic tone of the conference, and that there is no clear objective of fighting poverty."

Dimov gave two examples of how things could be changed positively. When the United States was collapsed in the Great Depression in 1929, he said, Franklin Roosevelt, as soon as he was elected to the Presidency, took swift action, by introducing the Glass-Steagall Act, to reorganize the banking sector and make credit available for the Tennessee Valley Authority and other projects that created employment and gave hope to the country.

"Within three weeks, Franklin Roosevelt reorganized the entire global system," Dimov said, cancelling the debts from the Versailles Treaty, creating a new currency. The second example, Dimov posed was the economic miracle in Europe, in Japan, South Korea, and Germany. "I want to hear your opinion," he asked the World Bank representative. "Today we have $1.4 quadrillion in financial derivatives. The biggest elephant in the room is the economic crisis. It will not end without swift reform. We have a fight in the U.S. Senate. I would like to see the representative of the World Bank address this. I would like to see what he thinks about these two examples."

But the World Bank representative ignored Dimov's question.

The Sept. 12 press conference of African Development Bank President Donald Kaberuka, was to define the focus of the conference about to begin, by looking at the case of the continent where a "child can go from birth to death without ever seeing [electric] light." He described

Africa Development Bank President Donald Kaberuka: Africa is a continent where a child can go from birth to death without ever seeing electric light, as the night map of the continent shows.

royaldutchshellplc.com

Peter Voser, chief executive officer of Royal Dutch Shell plc, promoted natural gas from shale.

the largely untapped potential of the Congo River which could generate 40,000 megawatts with the construction of Grand Inga Dam, which is projected to cost $40 billion.

In response to a question from a journalist on the role of nuclear energy in the development of Africa, Kaberuka asked why Africa should be an exception.

This author then pointed to the fight in the United States to re-enact Franklin Roosevelt's Glass-Steagall banking act, which would make possible large amounts of government-generated credit to finance great infrastructure projects, such as the North American Water and Power Alliance (NAWAPA). "What are the great projects in Africa that would become possible, if it did not have to depend upon private financing and the markets? What about, for example, the project to divert the Congo River to replenish Lake Chad?"

Mr. Kaberuka replied: "if such legislation exists [Glass-Steagall], I would be very interested in seeing it. Lake Chad is a small proportion of what it used to be, but we have to be careful, we don't want to make a mistake."

Energy Flux Density

The keynote speakers on the first day, continued the green agenda of the conference, avoiding mention of advanced energy flux dense sources of power. Khalid Al-Falih, president and chief executive officer of the Saudi Arabian Oil Company, noted that for the foreseeable future the world will continue to rely upon traditional fossil fuels, and while the share of fossil fuels may decline over the longer term, the absolute quantities of energy from these sources will continue to rise because total energy demand will expand significantly.

Over the next five years, he said, Saudi Aramco will concentrate capital investment in the gas and downstream oil sectors with the objective of developing cleaner fuels from refineries, and a CO_2-enhanced oil recovery demonstration project, that boosts oil production by injecting CO_2 that otherwise would have been emitted into the atmosphere back into the reservoir.

Peter Voser, chief executive officer, Royal Dutch Shell, plc (the Netherlands), pointed to the increasing role natural gas will play, in part because it produces less carbon dioxide when burned, but also, he claimed, because of improvements in the production of natural gas from shale.

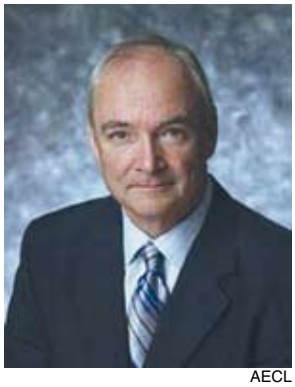
Voser noted that natural gas reserves in North America, which a few years ago were thought to be declining, are now known to be sufficient to last more than a century. There also has been a diversification of natural gas involving liquefied natural gas (LNG) and gas-to-liquid (GTL) technologies. Voser talked of the need for commitment to develop demonstration plants, especially those involving carbon capture.

We intervened here by noting the foolishness of the "19th Century dependence on chemical combustion," which the British empire, as indicated by these two keynote presentations, had stressed, instead of giving nations the power to develop with nuclear fission and fusion. In fact, we discovered that fission and fusion were what people attending the conference were interested in hearing, as indicated by the standing-room-only crowds at the presentations on nuclear energy.

Nuclear Highlights

Some highlights of the nuclear presentations:

- Hugh MacDiarmid, president of Atomic Energy of Canada Ltd., reported that "We are in the middle of a resurgence of nuclear technology, with nearly 60 reactors currently under construction."
- The former Energy Minister of Korea, Ssang-Su Kim, proudly described how Korea had transformed itself from a third world nation, to a modern industrial power by mastering the principles of nuclear energy (see box, p. 43).
- A representative from China proudly stated that his nation intends to build 28 nuclear plants.
- The Deputy Director General of Russia's State Atomic Energy Corporation (ROSATOM), Peter Shchedrovitskiy, reported that Russia currently has 27 nuclear reactors which produce 163 terawatt/hours per year of electricity, and they plan to double this in the next 5 years. He said Russia is developing a new fast nuclear reactor which has a closed fuel cycle reprocessing the spent fuel. In addition, a new small transportable nuclear reactor of 1 megawatt capacity is being developed (see interview).
- P. Uma Shankar, the Power Secretary for India, reported that 20 percent of the regions of India do not have access to electricity, as of 2005. "If you look at energy consumption," he said, "India has



AECL

Hugh MacDiarmid: president and CEO of Atomic Energy of Canada: We are in the middle of a resurgence of nuclear technology.

Ilko Dimov

Sushilkumar Shinde, Union Minister of Power: India must use the clean power of nuclear.

17 percent of the world's population, but consumes only 4 percent of the world's energy. India must increase its energy use, he said, and plans to increase its energy consumption by a factor of six by the year 2035."

Shankar noted that, with "clean coal" technologies, the increase in carbon dioxide emissions would not exceed a factor of three.

• India's Union Minister of Power, Sushilkumer Shinde, referred to nuclear energy as a source of "clean power" which India must use.

Develop the Biosphere!

We found tremendous interest in LaRouche's development policies among the people with scientific and engineering backgrounds, as some of the interviews indicate.

A few delegates to the conference stopped to talk to our organizers outside the conference, to protest the reliance on fossil fuels and support of fission. They were acting upon their recognition of a fundamental principle of economics, whereby the power to accomplish work increases with the increase of energy flux density. As our organizers reminded them, the weight of the fuel required to produce a given quantity of energy, dramatically decreases as you progress from coal, to oil, to natural gas, to uranium (nuclear fission) to deuterium (for nuclear fusion). We stressed that by going to higher energy flux densities, we can accomplish something which would otherwise be impossible.

One organizer posed the following question to people he met: "What do you think about the plan to starve out the green plants, by taking away their carbon dioxide?" This allowed people to begin to consider that there is something going on inside green plants, a process called photosynthesis, which reflects this principle. As a result of a complex process centered around the chlorophyll molecule, visible light is able to split water into its components, hydrogen and oxygen, something that does not happen outside of living photosynthetic organisms.

In addition, carbon dioxide is combined with the hydrogen released from water to build sugars, and more complex carbohydrates. "You don't have to pay $100/ton to get rid of carbon dioxide! The plants will do it for free!"

Telling people, that "we are not interested in simply bringing electricity to people who don't have it, we have to develop the biosphere!", we introduced people to LaRouche's revival of the North American Water and Power Alliance (NAWAPA). We described how NAWAPA, by diverting about 20 percent of the freshwater runoff of the Yukon and Mackenzie river systems of Alaska and the Yukon, into a system of reservoirs, canals, tunnels, and pumping stations makes available 160 million acre feet of fresh water for distribution across Canada, the western United States, and northern Mexico.

Many of the conference delegates and others, including the directors of energy and engineering companies, were struck by the idea that covering large parts of the desert or arid regions of North America with trees or other green plants, would not only require large amounts of carbon dioxide, but that this would give man the power to deliberately change the climate by significantly increasing rainfall.

Over the week-long conference, it was clear that there was a great divide between the nations going with solar and wind, premised on global warming, vs. those nations going with nuclear fission, breeder reactors, and research on thermonuclear fusion. And in between are the many less-developed nations which want to develop more advanced technologies but are pressured to waste resources going with the so-called green alternatives.

Videograb from physicsworld1

Fusion was on the agenda for the WEC. Sir Chris Llewellyn Smith, former chairman of the ITER Council, called for an "Apollo-style" approach to fusion, in his talk, "Fusion—Will It Ever Be a Reliable and Competitive Source of Energy?" "We must pursue this option as soon as possible," he said. "We should start building the demonstration reactor in parallel with ITER. There is nothing like learning by building. Get on with it and show the world that we can produce energy." For a short video from the conference, see http://www.iter.org/newsline/148/438.

Ilko Dimov

Fatih Birol (left), Chief Economist of the International Energy Agency, told the conference that "whatever energy policy China, with its 1.3 billion people, follows will have a crucial impact on the global development." With Birol on the podium are Vinay Kumar Singh (center) and Thierry Vandal.

INTERVIEW: DR. KUNMO CHUNG

Korea's Bold Plans for Nuclear Power and Space

IEC

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.

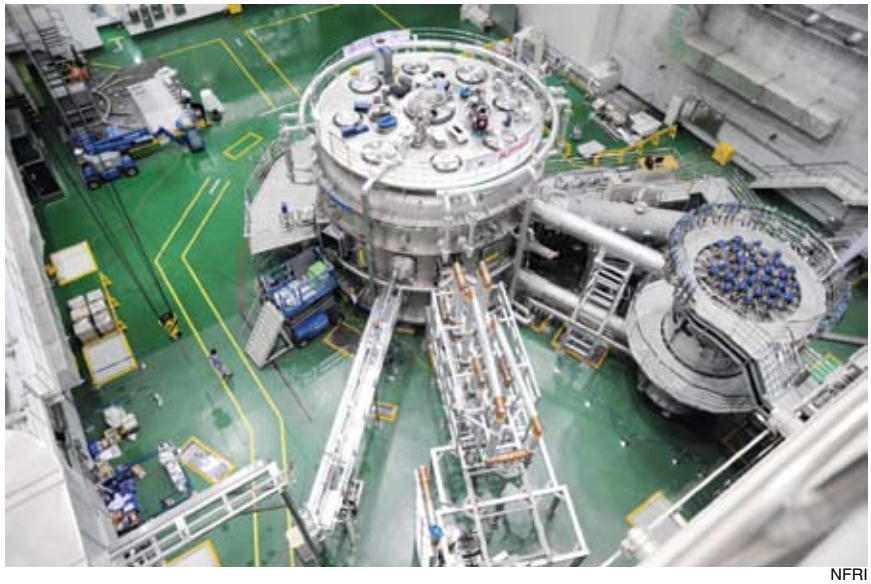
Yes. I read the article you gave me [Interview with Dr. Gyung-Su Lee, "Fusion in Korea: Energy for the Next Generation," Winter 2009/2010]. Among Koreans, I am the first fusion scientist! I did my experimental work at the Princeton Plasma Physics Laboratory in 1963. At that time, the leading machine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

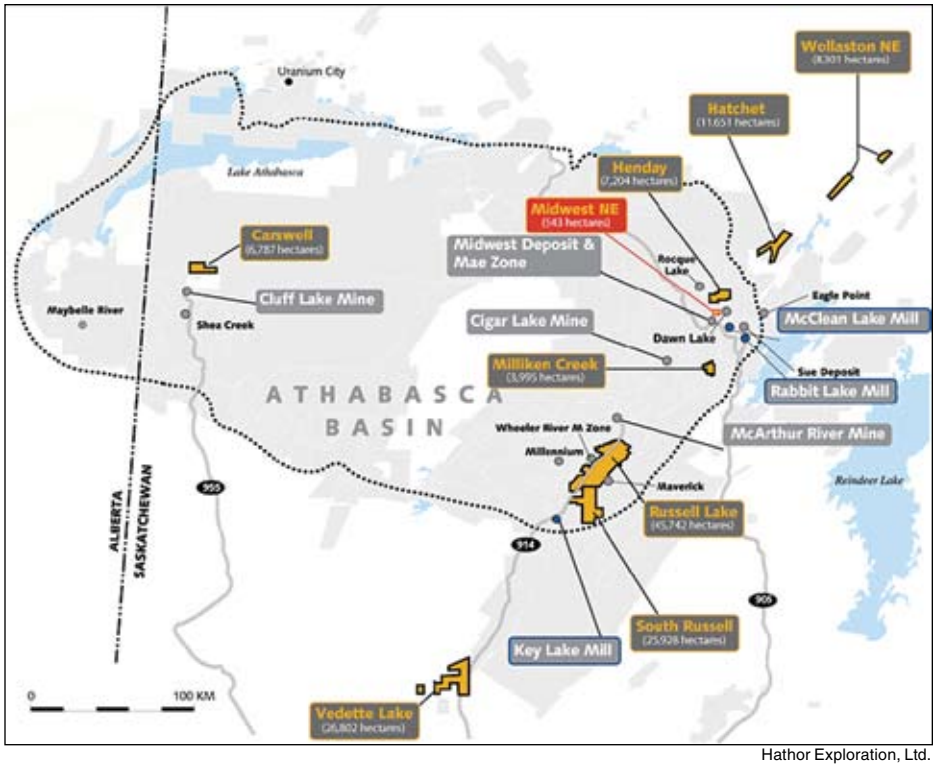
Ilko Dimov

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...."



Hathor Exploration, Ltd.

Map of the Athabasca basin in Saskatchewan, Canada, where Hathor Exploration, Ltd. has found the highest grade (24 percent) of uranium in the world. Above, Saskatchewan Province in Canada.

INTERVIEW: TONY NUNZIATA

World's Richest Uranium Ores Found in Northern Canada

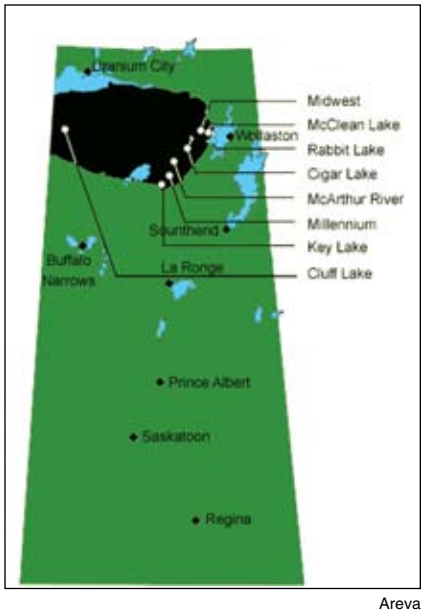
Tony Nunziata represents the uranium mining company Hathor Exploration, Ltd., in its Working Capital Corporation division. He was interviewed by Ilko Dimov, 21st Century *correspondent.*

Question: Please tell us about Canada's uranium production.

We are responsible for almost a quarter of the world's production of uranium. And it all comes from this one area in northern Saskatchewan, called the Athabascan basin. So it is right next to Alberta, and almost right next to the oil sands.

This Athabascan basin encompasses a number of high-grade discoveries and results. The biggest deposit is by Cameco. Cameco, as a single company, is the biggest producer of uranium in the world, through a property called the McArthur River Mine.

We are excited that Hathor, which is located just north of McArthur River, has what we deem is the best discovery in the last 20 years. And why we are excited is that we have found uranium on our original zone, the Roughrider zone, where two years ago, we found that our initial discovery hole, of 12 meters, had just over 5 percentage by weight of uranium oxide—U_3O_8.



Areva

The Athabasca basin in northern Saskatchewan.

Question: Wow!

Since then we have expanded, and advanced that zone to a 200-meter strike length. And, we have come up with some phenomenal grades of uranium, including 23 meters of 24 percent U_3O_8—which is obviously a world class intersection.

Question: Canada is now the largest exporter of uranium in the world, in mining and exporting, right?

Kazakstan has actually taken over as number one. The bottom line is: you've got Kazakstan, Australia, and Africa: Niger and Namibia. They all produce uranium at less than 0.5 percent U_3O_8. But Kazakstan has superseded Canada as overall the biggest producer.

But, the highest grade ore bodies, definitely in the world, the only place you can find high grade, is in Saskatchewan.

Question: Are there other provinces in Canada where we have uranium?

Yes, there are other provinces. Labrador has uranium to a small degree. There have been some issues, against the government, and local governments there have put a moratorium on any uranium exploration.

The only other main area would be

Areva/IAEA

Cigar Lake uranium mine, owned by Cameco, Areva Resources Canada, Idemitsu Canada Resources, and Tepco Resources has run into water problems in its mine shaft.

Quebec, obviously, which is resource rich. They have not only uranium, but quite a host of other mineral resources.

Quebec does have a number of mining companies that are also exploring for uranium. Now. the big key with Quebec, is that they haven't produced uranium for quite a long time. As a matter of fact, there would be an issue there, because economically, there is no infrastructure in place.

In Saskatchewan, in the Athabascan basin, for example, where we are located, we have major infrastructure in place. We actually have a couple of mills within a close distance to where our major project is. The McClean Lake Mill, for example, is a billion-dollar, most modern mill producing facility in the world, for uranium.

So, here in Saskatchewan, all the infrastructure, logistics, and environmental, all the areas of concern, have been in place. Quebec has low-grade uranium there, but in order to fulfill any potential production of uranium, there has to be a major resource, which would make it economically viable to build out infrastructure—which would take a long time.

Here [pointing to map] is an outline of the Athabascan basin, on this eastern side of the Athabascan basin, this corridor here, is a geological trend.

Question: Is that like a fault line?

Yes. For whatever reason, this geological trend hosts all the main discoveries and deposits. That's where Hathor has concentrated and accumulated all our properties and concessions. But if you look at the map, the biggest mine in the world is McArthur River.

There is also Cameco at Cigar Lake, which has water problems; they have been trying to rectify that. There's Midwest Lake Deposit, right next to our discovery, which is AREVA's project. And then down here you have the Wheeler zone of Denniston, and then the Key Lake Mine, which is now depleted, but which also has a mill there. You can see that it's almost a direct trend, within this geological belt that we are exploring for the uranium.

Question: Canada is not enriching uranium, just mining it, unlike France, which is producing nuclear fuel and exporting it to the international market?

Oh, no, we are exporting. A good portion of the uranium from the world's richest mine . . . goes to places like Japan. We do export to other foreign countries.

Question: How many months will you need to get the production of this new discovery going full scale in this area?

It will take time. Right now, because we are in the process of exploring, we still have a lot of drilling to perform to find out the potential size of our discovered area, to make it into a world-class deposit.

After that, obviously for a small company like us, we are talking to major companies that will potentially partner with us, or who knows, maybe even buy us out in due time, in regards to fulfilling their requirements. We are talking to the big majors in the world. We are talking to big power utility companies, out of the Far East where the nuclear renaissance is occurring. Namely, China, India, Korea, Japan.

That's where a lot of the reactors are being built—you know there are 60 nuclear reactors that are being built currently, and most of them are in that neck of the world. Mind you, almost every country in the world is taking some initiative towards nuclear as part of their power.

Question: What does the Canadian government have to say? Because, actually, if you are doing this job, you need support from the Canadian government—a partnership between the governments, the public, the population of Canada—that when you develop these resources, the benefits will stay in Canada. One of the problems we have, with the privatization of major Canadian companies, is that right now, we are becoming a banana republic. A former colony!

I know. Prime Minister Harper just announced recently, that a foreign entity can actually purchase more than 50 percent of a uranium mine in Canada. The Parliament just passed that. You're seeing that happen. Look, last month China just put a billion dollars into Penn West. China is making a major thrust worldwide for resources.

In Canada, you know, we are a resource-rich country and, fortunately (or unfortunately) China is getting involved in all kinds of commodities here in Canada. Is that good or is that bad? Are we looking after our future generations, or are we selling out our resources? We do have a lot of resources.... But, that is a concern.

Question: Can you say something about modernization, efficiency, the new technologies going into the industry?

Here in Canada, we are leading edge when it comes to high grade ore.... We have the best technologies in the world, because of the mill facilities in this area, to be able to properly produce, with efficiency and safety, this high-grade uranium. This is the only place in the world that you can find high-grade uranium. So the logistics are there to be able to properly produce it. It's leading edge.

China, though on the nuclear power front, is building super-reactors. These are amazing next-generation super-generator nuclear power plants that are leading edge. And they are getting a lot of the technology from companies like AREVA and Westinghouse, which are advancing all their technologies.

Fine-Tuning Russia's Floating Nuclear Plants

Peter Shchedrovitskiy is the Deputy Director General of Russia's State Atomic Energy Corporation, Rosatom. He was interviewed by 21st Century *correspondent Ilko Dimov. Shchedrovitsky's comments were translated from the Russian by Rachel Douglas.*

Question: Please tell me about your projects for developing floating nuclear plants. How many of them can you build in the next decade? What are your plans for developing them?

You know, first of all, for some period of time we need to operate the one which was launched in July of this year. We are working on improving the economic efficiency of this type of unit, because it is a prototype, and, as with any prototype unit, there are certain problems related to fine-tuning the technology, to cost, etc.

We are thinking about possibly switching from one type of power plant to another, with different characteristics. Therefore I would not say that we are ready yet to move to large-scale, mass production. But we believe this is one of the projects that aims to shape the global power industry of the future, which needs to be more mobile and more diversified, and needs to be more sensitive to the way consumption is organized at the micro level and to what I called, in my report [to the conference], new paradigms.

Question: What kind of cooperation

On Increased Energy Density with Fission, Fusion

Peter Shchedrovitskiy responded to a question asked at a plenary session by Executive Intelligence Review *correspondent Robert Hux. His comments were translated by Rachel Douglas.*

Hux: I want to get your comments, Mr. Shchedrovitskiy. I was quite stunned, in the previous panel, when the representative from India, the Power Secretary, after describing the reliance in India on coal (I don't know the exact figure, but it was maybe half of the rail grid in India being involved in transporting coal), saying that they are concerned with replacing the old coal plants with these modern coal plants that will lessen carbon dioxide emissions, but saying not a word about the fact of nuclear energy in general, and, in particular, the vast thorium reserves that exist.

Perhaps you can tell us about the relations between Russia and India along the lines of creating small, modular nuclear reactors that can exist over long time frames, perhaps 30 years, and can be used in rural areas, to provide electricity for areas off the power grid.

But, more generally, I was quite stunned, also, not just from him, but the general conference, at the reliance on what I think has to be regarded as a 19th Century dependence on chemical combustion, when we have nuclear technologies available. Could you comment on this concept of energy flux density: What is the difference between reliance on chemical combustion of coal and natural gas, to say nothing of solar or wind, compared to having orders of magnitude, millions-fold increase of energy density, to having something like nuclear fission, and what's our potential with fusion?

Shchedrovitskiy: I heard several questions, and it's a thankless task to answer on behalf of my colleagues, but I'll try to respond to the first question.

Indeed, we cooperate with India on building thermal reactors. We have agreement in principle on building up to 16 nuclear power plant units.

At the same time, India has a powerful, well-developed strategy for the development of nuclear power, which provides for creating alongside the ongoing construction of thermal reactors a set of breeder reactors. The first of them is slated to come on line in 2011. And then, they plan to move to the thorium cycle.

That's what I can say about our Indian colleagues, but of course it would be better to ask them directly.

As for increasing efficiency, yes, it is our view that thermal reactors are more efficient, with respect to fuel supplies, than using coal—as measured in electricity output per standard unit of fuel.

Fast breeder reactors are even more efficient than thermal reactors. Something like 100 times more efficient.

As for thermonuclear fusion, the increased efficiency indeed can be expressed by factors of hundreds of thousands, or even millions, compared with breeder reactors. But, I would like to say that fusion is definitely something for the more remote future, because in the ITER project, the first plasma is supposed to be in 2018, and the full cycle in 2028, which means we will unlikely be able to move to designing an industrial unit of this type, even with international cooperation, any earlier than 2030.

Those are the existing plans for the growth of efficiency per standard unit of fuel, through a sequence of changing technological approaches.

would you like to have with the United States?

With the United States, we are currently negotiating in the area of general infrastructure projects, i. e., on global support for nuclear power through elements of infrastructure which provide developing countries access to these technologies, without violating the non-proliferation system. And, second, I think we will arrive at a certain cooperation in science, particularly as related to breeder reactors.

Rosatom

Rosatom's design for its first floating nuclear power plant.

Question: Lyndon LaRouche has proposed economic cooperation among Russia, the United States, India, and China to create a new financial system with fixed exchange rates. Because we have problems—speculation on energy prices is a factor that wrecks development. Can you say something about the potential for stabilizing the international financial system?

I am not a specialist on the financial system. I have read LaRouche's books, but, frankly speaking, I prefer to speak about things in my area of competence.

INTERVIEW: JOHANNES PENZKOFER

On Joint Russian Development Projects: 'We Are Sitting in One Boat'

Johannes Penzkofer, a vice president of the Russian engineering company, GCE Energy Consulting Group, was interviewed by 21st Century *correspondent Ilko Dimov. This is an abridged transcript of the interview.*

Question: Since October of last year, the Chinese and Russian governments signed a strategic agreement for collaboration in the development of the Far East, including access to raw materials, building high speed rail, and development of nuclear energy. And Russia is building a breeder reactor right now in China. What is your long-term view? What do you see as areas where you need collaboration with Canada or the United States? What are the areas where we can design joint projects to work together?

I think, as we are here at the World Energy Congress, this is a very important topic. We can collaborate with all, or let's say, with the four countries that you have talked about: China, Russia, the U.S., and Canada. Especially on the technical and the equipment side, there is very much knowledge in Canada, and the U.S., and in Canada, especially with hydro energy and hydroelectric. This is what we really have to share, and use, to create a more efficient use of energy in the industry.

Question: One of the traditional problems in the Soviet Union, and in Russia, has been that things move slowly. You start building something, and it takes centuries to be accomplished. Now, there is a very surprising speedup: the modernization of the rail system. Prime Minister Putin said in a recent report, "We just doubled the rail system in Russia!" Wow, that's impressive! How were you able to achieve this success?

It's typical for Russia, that, if they make a commitment, they really do everything to fulfill this. And when the government said, "this is our strategy, our plan," the whole country was trying to follow this, and this is how it was was achieved.

Question: One of the projects which has existed since the strategic collaboration between Czar Alexander II and Abraham Lincoln, is the development of Siberia and of Alaska. Now we have the potential of building the Bering Strait link. We are working in the United States towards this project, and we would like to make it a reality in the visible future, in 10 years. Is there the political will in the Russian government, the friendly hands, to get people on the ground to start moving in this direction?

I think, frankly speaking about Putin and [President] Medvedev, that both of them are, let's say, practical people. So, they are realistic people. And I think they are very open to all kinds of alliances and partnerships, which will bring us forward. So, I think this can be taken for granted that, the hand is open.

Question: With the development of fusion energy over the next 20 to 25 years, the fuel for our economies will be helium-3, the isotope of helium, which will be mined from the surface of the Moon. And without collaboration in the life sciences, this will be very difficult. Because, we know that Russia, with its long-term space exploration, has had the longest stays in space.

And with the ISS, the International Space Station.

Question: Yes, your experience is maybe 10 or 15 years ahead of us in the life sciences, and we are looking into areas where we can collaborate with this. . . .

This collaboration, I agree with you, only can be on, really a global basis. Let's say, the big nations have to work on this together, because it's one of the big future questions of mankind. And I agree, neither Americans, Chinese, or Russians can fulfill this question themselves, or alone. . . .

Question: I have a couple of economic questions. Since 2007, when the economic derivatives market exploded, we have had decision by the Bush Administration, and a commitment by the Obama Administration as well, to commit the U.S. government and the Federal Reserve to a bailout of the U.S. banks—already $26 trillion. And I know this is a concern of the Russian government as well, because if the dollar collapses you will lose your savings. So, the belief that you are rich because you have "money," will disappear; you are going to discover that you don't have anything.

It could be a real implosion!

Question: We have had serious economic crises since the Versailles treaty. . . . We had a successful solution by the Bretton Woods conference, which established a fixed-exchange rate system, capital controls, exchange controls, stable raw material prices, which, until 1974, were determined by governments. We are organizing now internationally, to reestablish a fixed exchange rate. And Russia is an essential player—

Of course.

Question: What do you think about the prospect for a conference, as we have proposed, to deal with these economic questions?

I think, it is a need, and I think that Russia will play an active role in this conference, and will collaborate in this discussion. Because, as you said before, it is in our common interest. And, it's about keeping the world going. I mean, we are all in the same boat in that. That's another side of globalization. You can't divide from the rest, or say: "It's not my ball game." It's the same for the Chinese, for the Russians, the Europeans, and the Americans. So, we are sitting in one boat.

INTERVIEW: BERNARD BIGOT

We Need International Cooperation for Nuclear Power


CEA

Bernard Bigot, is Chairman of the French Atomic Energy Commission (Commissariat à l'Energie Atomique), CEA. He was interviewed by 21st Century *correspondent Ilko Dimov, and this is an abridged transcript. The interview was translated from the French by Matthew Ehret-Kump.*

Question: In France, we are associated with Jacques Cheminade, who has just announced his candidacy for the next Presidential elections.

I know him well.

Question: One of Mr. Cheminade's programs is based upon nuclear development, using the expertise of France with nuclear and great projects in making the nation a motor for global development, and returning France to de Gaulle's vision, with nations collaborating together, not competing. . . . But there is an absence of credit for the development of industry and, in particular, science. What are your thoughts about what is necessary for providing the financing and vision required to accomplish the necessary miracle of rebuilding the world?

Listen, I think that with the problems which are occupying us today, here, in Montreal, that is to say, energy, there are no solutions if we do not develop solidarity. Resources are, as we know, limited. They are not necessarily equally distributed. There isn't one legitimate reason why a country which has easy access to one or another resource, should not share it with the rest of the world. Otherwise, we will move towards tension, we will move towards conflicts, without anyone benefiting globally. No one will win.

Thus, we should try to build mechanisms which maximize solidarity. So, the first point which you bring up, is the access to financing. *Voilà*: It's clear as we saw earlier with the speaker from the Congo, and we see it in many other countries. One of the major handicaps to the development of energy production to the scale many countries need, is the obstacle of financing, that is to say, the power to obtain financial channels, to obtain loans at reasonable rates. This is the chief obstacle.

For me, this is a first priority. It is absurd, for example, in the domain of nuclear, that the World Bank cannot contribute anything to a country which

desires to go in that direction. On the other hand, the World Bank would contribute if there is an installation that will consume coal.

That runs contrary to the global interest. We should respect this possibility to diversify. I'm not saying that loans should not be offered for coal as well, if we develop it alongside of carbon-sequestering technologies. But why exclude one or another technologies? That is the first point.

The second point involves access to technology. It is clear that many countries do not have the capacity to conduct what we call research and development, in order to make their own demonstrations. We must, therefore, try to develop large international programs with access to intellectual property.

CEA

CEA chairman Bernard Bigot: It's absurd that the World Bank doesn't fund nuclear projects.

The challenge in energy, is not that an industry will lose its power to sell and produce a technology, simply because a demonstration is created which proves that this or that technology is feasible. There is a step which is an industrial competence, which is not in the R&D. Thus, in everything we call research and development upstream, up to the point of demonstration, we should move more towards international cooperation.

The last stage is training. It is clear that all of these systems are complex. It can't work if you don't have people who are well trained, who have access to knowledge, and the experience of working with this sort of large-scale equipment.

Thus, these are the three stages which for me, are necessary, and I see no obstacles which should stop us from going in this direction, and which France in her place may take favorable initiatives for this process.

Question: Can you give us a sense of the international collaboration in which France is involved today, in terms of promoting and constructing nuclear reactors?

We are engaged, in particular, in what is called the Gen4Forum. That is, the Generation 4 Forum, in which a dozen large countries are re-uniting today and in which we have made common programs for researching materials, designs, and security, in order to effectively advance the development of nuclear energy.

So, there are Japan, Korea, Argentina, Brazil—there is an assembly of countries, some very advanced, and others much less so, who are sharing knowledge. Honestly, I think that it's a good example of what it is possible to accomplish. Simply, it must be done with continuity, and it is true that some countries, such as the United States, which were once a very active driver in this process, today, are a little behind.

World Nuclear Association

Training of younger nuclear workers is essential, Bigot said. Here, participants in the 2009 World Nuclear University Summer Institute which trains promising young nuclear professionals from around the world.

Question: In reality, the United States does not have the capacity to produce nuclear reactors today.

There you go. But that does not diminish the competence which they have developed. It is the greatest park in the world and at one moment or another, they will be obliged to return to it.

Question: Our publication is widely read by young people who are looking for leaders who represent these solutions and who will transform these dreams into reality. What can you say to these youth between the ages of 20-30, who have lived through the last 15 years in pessimism?

I think that we must share with these youth, the following idea: The last 50 years have seen some technical and economic advances, but we have not overcome many challenges which are still ahead of us. And my vision is that these youth must invest themselves in science, in technology, because my deep conviction is that this is the most common language on the planet.

There isn't a boundary for science. Science reproduces results, in conducting the same demonstration. It is to lift ourselves to that level, that will perhaps be the determining factor for economic development. I believe that the idea of contributing in this way, will fuel their enthusiasm and their conviction, and we need these youth to invest themselves in order to help us.

Question: Dr. G.S. Lee has made the prediction that we would have fusion by July 2036 [See interview, *21st Century*, Winter 2009-2010.] What is your prognosis, your vision?

I am not as precise as Dr. G.S. Lee, who is a very formidable man. For me, I think that accord-

D. Calma/IAEA

"There isn't a boundary for science." Here international flags at the International Atomic Energy Agency headquarters in Vienna.

ing to the program which we have, in 2026-2027, we will have the first experiment which demonstrates that we are capable of producing a balance of positive fusion energy through heated plasma.

If this stage is realized, in 2026-2027, I think effectively at that moment, we will need a decade to explore superior conditions, to optimize the process as well as the massive production of fusion energy which will benefit the planet. That is to say, the first reactors of several thousand megawatts could be installed by 2075.

This might seem far, but it isn't really, if you reflect on the development of energy from our use of coal, to petrol, to gas. We are dealing with scales of time in this magnitude. It could accelerate a bit if nations worked all together, but I don't believe that we can take shortcuts, and it would be formidable, if we achieve this demonstration, and then find that it will give us abundant resources not just for 100 years, 1,000 years, but rather hundreds of thousands of years.

There will be a limited impact on the environment, on the climate, on the limitation of resources, and even on the danger that this could represent. It is a challenge that merits this investment, but don't be impatient. There is a step still to go, but we are on the right track. Progress is moving in the right direction. In my view, it can't be solved in the blink of an eye, so I don't know if it will be in July 2036, but why not?