major projects in transportation, water management, port, and other infrastructures, were immediately necessary.

The peculiarity of Ispa is that it can issue bonds which are guaranteed by the state. As Monorchio illustrated, in the case of a high-speed rail project: "It means, for the purchaser, that an Ispa bond is not only guaranteed by the cash flow coming from the high-speed line, once it is finished, but also by the state guarantee. A person is therefore motivated to buy a bond, which has an annual yield and whose capital is guaranteed."

Italy's Role in International Development

Echoing LaRouche's recent statements in Italy, Monorchio explained the importance of national infrastructure for the role Italy must play as a European extension towards the Middle East, the crossroads of Africa and Eurasia. The high-speed railway line, now reaching southward to Naples, will be further extended, Monorchio said. "The government decision to build the Messina Bridge [to Sicily] makes high-speed railway indispensable there also. See, beyond all polemics, the Messina Bridge is, from an economic standpoint, a step forward, from Europe towards the African coast and Eastern Mediterranean. . . . Its validity lies not in the unification of Sicily with the rest of Italy, which is already relevant, but in what this could represent for Italy in its relationship with Europe and the rest of the world. If we are requested, we will finance the bridge, too."

Of vital importance for Italy is European Corridor #5, a transportation project connecting the Iberian peninsula through France, south of the Alps and across the highly industrialized northern Italian regions of Piedmont, Lombardy, and Veneto, with Eastern and Southeastern Europe. This is a project included in the list of EU priorities, in terms of financing, but has so far been neglected, in favor of a corridor north of the Alps, that would cut Italy off.

The Rome government is aware that previous delays by Italy have played a role sending the project into a stall, and is now committed to making up for lost time. The main bottlenecks in this corridor are the tunnels beneath the mountains between France and Italy, and the highway around Venice, where trucks are forced to wait in queues for as long as five hours.

In this region, the planned doubling of the transport capacities will increase productivity directly by 50%, Monorchio said. Italy can face what he called the international recession, he explained, "because, since we lack infrastructure and have a concrete possibility to push economic growth through such works, Italy can grow better and more quickly than others. Infrastructure is the most important thing we have for the recovery.

"As a Southern Italian, I have had a dream: That our country, and in particular its southern part, could become what California has been for the Americans. Italy must be the California of the Europeans."

The Present and Future Of Nuclear Knowledge

by Dr. Chang-kun Lee

Dr. Chang-kun Lee

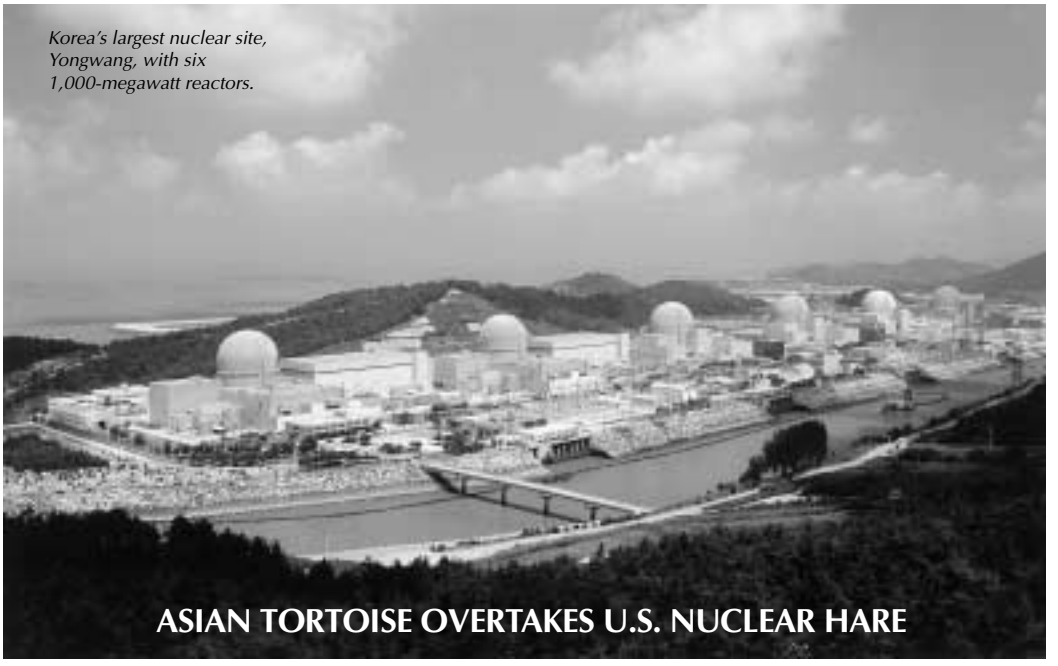
An internationally known specialist calls on the nuclear community to "take up the gauntlet" and move nuclear technology forward for the benefit of mankind—from desalinating water, to transmuting waste, and new methods of steelmaking.

Dr. Chang is a Commissioner on the Atomic Energy Commission of South Korea and former chairman of the International Nuclear Societies Council. This is an edited version of the keynote speech he delivered in Vienna in June 2002, to a meeting of senior officials on "Managing Nuclear Knowledge," hosted by the UN International Atomic Energy Agency (IAEA).

Over millennia, man has developed technology, and this technology has made possible a rapid and unprecedented increase in population. The ever-expanding population has found technology more and more indispensable, and is further dependent on it. Both population and technology being pushed to the limits means that we, *Homo sapiens*, are now for the first time in history confronted with a dire global crisis, as our intensive harvesting from technology has resulted in natural resource depletion and pollution at significant levels.

Justifiably then, many people are anxious about environmental destruction from pollution. With the foul stench of pollution now creeping into every corner of our fair Earth, are we digging our own grave with our errant ways? they ask. And how long can this go on? Under such circumstances, nuclear energy can play a critical role in mitigating the discharge of pollution into the environment and in slowing down the depletion of natural resources. As we know, nuclear energy is mined more from the human brain than from the crust of the Earth. Nuclear energy represents our thinking response, our knowledge-based strategy for combatting the scourge of global pollution. Thus, knowledge management will be key to managing our survival in this contemporary age. . . .

Scientists and engineers are, therefore, charged with the supreme accountability to manage or at least mitigate this chronic phenomenon, and foremost among them, of course,



South Korea's 17 nuclear reactors supply 39.3% of the nation's electricity demand, and 11 more units are planned by 2015. Here, Korea's largest nuclear site, Yongwang, with six 1,000 megawatt reactors.

ASIAN TORTOISE OVERTAKES U.S. NUCLEAR HARE

ought to be nuclear professionals. Indeed that is why we are assembled here in response to the SOS signal activated by the International Atomic Energy Agency (IAEA). . . .

In the years since Enrico Fermi's first nuclear reactor of 1942, we have seen a significant amount of nuclear knowledge develop and accumulate. Much of it is well documented, in the form of design guides, modus operandi, technical specifications, various manuals, and so on, and all these are fit and ready for immediate use.

However, when this knowledge does not belong to the public domain, the bill for acquiring it can be substantial, especially when it is categorized as proprietary information of a for-profit company.

The most economical and efficient way to acquire needed knowledge, I think, is to come to the exchange already equipped with a pool of well-trained manpower. Certainly the Korean experience with its many nuclear projects has proved this to be the case. If a recipient in a technology transfer comes to the table already fairly knowledgeable in the subject, he can better dictate favorable terms, and he can have a more powerful negotiating position.

South Korea has been blessed to have steadily pursued a peaceful nuclear path, and the success of Korea's nuclear program is in large part due to deployment of good nuclear professionals, who not only are devoted to their mission, but receive well-regimented training and constant re-training. The tangible assets of Korea's nuclear sector are a fleet of well-performing machines that are backed up by a reliable industrial and engineering infrastructure, itself buttressed by experienced manpower.

The intangible assets are the technical competence, the accumulated experience, and around-the-clock devotion of this skilled manpower.

The training of a top-notch Korean nuclear professional can cost an amount equivalent to his body weight in gold, when reactor simulators and other training facilities are all taken into account, and if my rule-of-thumb calculations are correct. So I tend to call each one of them "Mr. Gold." If my ball-park figure is right, each Korean power reactor is staffed with and supported by about 15 of these "Mr. Golds" for the planning, design, manufacture, installation, testing, operation and maintenance, inspection, as well as related R&D, safety analysis, and regulatory work. And these Mr. Golds are backed up by some 70 to 80 "Mr. Semi-Golds," plus many more "Mr. Silvers" in the support wings.

A key to the success of nuclear projects is to keep these Mr. Golds and Silvers under the nuclear sector's umbrella through the years. Stability being key, boom-and-bust cycles must decidedly be avoided. In this regard, the experience of France, Japan, and Korea has been exemplary. Not having any oil, gas, or much coal, these nations did not have much of a choice really. It is the thirsty who dig a deep well in a hurry.

A slow-but-steady approach or, if you will, a turtle's pace is preferable to mushrooming growth or a hare's dash. Or to use another metaphor, a steady precipitation is better for vegetation than random showers. Moreover, a turtle enjoys far greater longevity than a rabbit.

At any rate, it is the continual ongoing project, whether it is research or engineering oriented, that keeps the manpower intact and allows the accumulation of technical expertise to take place. In contrast, instability and insecurity in industry

lead to breakup, demoralization, and even brain drain of the workforce. In short, practical work acts like an electromagnetic force to attract and retain necessary manpower and to draw in technical know-how from various sources.

Knowledge-Based Energy

Nuclear is a knowledge-based energy, and planners and implementers must give top priority to research and development in all phases so as to foment innovation and knowledge generation. Investment in research and development, when properly directed, pays top dividends.

We see this time and time again in the marketplace, and especially in the technology sector. A Korean newspaper carried an article on May 30, 2002, which reported that Samsung Electronics, which already has 30% of its 48,000 employees engaged in the R&D area, plans to triple its annual R&D staff recruiting so that it can bring in top personnel from all around the world and maintain its leading edge in technology. The nuclear community will do well to adopt this type of attitude toward R&D. . . .

Another action item for the nuclear community is to mobilize competent retirees for the training of youngsters. So much knowledge resides in these retirees, and we must put it to good use wherever possible. Of course, refresher courses must be offered to these potential trainers, so that they stay current on the latest technological breakthroughs and advances. We see such constant upgrading of capability not only in the military reserve forces but also in the medical community, where intensive workshops and seminars are a regular feature for medical professionals. We in the nuclear community can adopt similar practices.

In this context, the proposal by the Korean government to establish an International Nuclear University must be considered definitely as being future-oriented. The specialized university will seek to disseminate and expand the boundaries of existing nuclear knowledge. It will seek, too, to train a cadre of nuclear workforce for the future, one that will be capable of working across borders. Your active support and participa-

A Nuclear Perspective From Asia

These are excerpts from a speech Dr. Chang-kun Lee delivered in Washington, D.C., on Nov. 20, 2002 at the American Nuclear Society's meeting commemorating the 60th anniversary of man's first controlled nuclear chain reaction. The full speech appears in the Winter 2002-2003 issue of 21st Century Science & Technology *magazine.*

It will not be a large exaggeration to say that the history of mankind in the last century has been mainly a nuclear one.

The continent of Asia embraces the biggest land-mass in the world and is home to more than 60% of the world population. . . . A late starter in terms of modern economic development, Asia is awaking finally from a long hibernation and currently enjoys a rapid rate of economic growth. The affluent life-style pursued by Asians can only come into fruition with the timely supply of infrastructure necessities, including, importantly, electricity. According to the International Energy Agency's *World Energy Outlook,* the Asian share in world energy demand will increase from 31% in 1997 to 41% in 2020. The energy demand increase in China *alone* will match the expected increase in OECD countries. . . .

Material wealth and technical capability, coupled with public morality, can work synergistically to drive the wheels of human civilization and achievement, and enhance societal well-being. Abuse, however, can lead us quickly to ruin.

The Roman Empire, for example, enjoyed a continued preeminence and prosperity in the Classical world so long as its affluent ruling class fulfilled its moral obligations and led a life of *noblesse oblige.* The great empire, however, fell into disarray and ruin with the corruption of the wealthy upper classes whose abuse of their power and prerogatives spelled the end of the Classical era.

The Forthcoming Renaissance

Asian nuclear experts are convinced that the nuclear community should employ its effort all the more for the development of next-generation reactors plus associated optimal fuel cycles, in addition to concretizing viable nuclear systems for the production of cheap and abundant hydrogen to replace oil and gas, and also for desalination. . . .

As far as power reactor deployment is concerned, the advanced nations bounded out of the starting line and hopped [in sprightly fashion] along at the pace of a rabbit, while we Asian countries plodded along at the slow crawl of a turtle. At the moment, however, the Western nuclear rabbit is taking a nap under a roadside tree (hung with limp moratorium banners) while the Asian nuclear turtle is still toddling along on the road carrying the nuclear seed.

You could say that Asia is keeping alive a "nuclear technology shelter," keeping the flame burning and know-how alive for the forthcoming nuclear Renaissance. Surely, some day (when the rabbit finally awakes from its Rip Van Winkle-like snooze), these former students of nuclear technology in Asia will be ready to pay back their previous teachers in the West with state-of-the-art technical know-how and new or next-generation hardware.

The Ulchin site, which has the first two Korean standard nuclear plants in operation, and two units under construction.

tion in this endeavor will be much needed and welcome.

With the second nuclear renaissance looming on the horizon, the nuclear community must take up the gauntlet and face the challenges head on, being fully prepared in areas of knowledge, manpower, and infrastructure.

Fresh Water and Hydrogen

We believe that we nuclear professionals can play the role of Mr. Noah. Just as Noah's Ark saved humanity and the animal kingdom from the great deluge, nuclear power can similarly come to the rescue of our verdant planet now afflicted with the scourge of pollution. By applying nuclear knowledge, we can with confidence replace fossil fuels with forms of energy which are environmentally friendly. . . . Given the dire state of the world, we, nuclear professionals, must come to the fore, and commit ourselves to bringing back ecological health to this Earth of ours.

One of the short-term missions we in the nuclear community are charged with is supplying fresh water to the world's water-thirsty regions using nuclear energy-based desalination. The demand for fresh water is far outstripping available supply, and this imbalance is becoming pronounced in many parts of the world. IAEA is actively supporting the water desalination reactor development program in which the Korean research organ is working on the project in conjunction with relevant industries.

Another exciting area for us is developing a high-temperature gas-cooled reactor for iron and steel production, for other smelters, and for petro-chemical industries. Eventually we hope to produce cheap and abundant hydrogen to replace the hydrocarbon in all industrial sectors. We urge nuclear scientists and engineers to redouble their efforts in these areas and, if need be, move Heaven and Earth to leap over the engineering hurdles that might exist.

As for mid-term objectives for the nuclear sector, we will continue to work to maximize the utilization of radiation and radioisotopes in the service of furthering the welfare of people and improving their quality of life. The same goes for the development of a newly conceived reactor type and optimal fuel cycle that are more efficient, technically reliable, and proliferation resistant. In this regard, the entire world is keeping a close eye on the progress of IAEA's INPRO concept (International Projects on Nuclear Reactors and Fuel Cycles) and U.S.-led Generation IV project.

And as for our long-term target, we should be focussed on commercializing a transmutation reactor to incinerate long-lived radioactive nuclides.

Recognizing that technology often advances in small steps and not by leaps and bounds, the world nuclear community must be consistent in its efforts to try to make our dreams come true.

A frog leaps forward after a pause or even after taking a leap backward. So far the nuclear frog in the world arena has taken enough of a pause—it's time now for the next jump forward. Nuclear Spring seems just around the corner in this pollution-contaminated era, and we must pool together all our perspiration, aspirations, and inspiration and move forward. We will need these "multi-spirations" more than ever.