general election.

In an opinion article published in the daily paper Dagens Nyheter, Fredrick Federley, chairman of the Center Party's Youth League (CUF), said that Sweden needs to keep its nuclear reactors operating and said the Centrists should change their policy.

"I'm not racing out to hug every reactor around, and I am deeply concerned about what will happen with nuclear waste" Federley wrote. "But I'm even more worried about what will happen if we, through a political decision, shut more reactors."

Sources told Nucleonics Week that it is not uncommon for Swedish political parties to float trial balloons through their youth auxiliaries. Federley won immediate support from a member of the party's group in the Riksdag (parliament).

"Many Centrists are still living in the old days, with the old debate on nuclear power," said Staffan Danielsson, a member of the Riksdag group. "Today, we have to think differently. Climate issues have to be put ahead of nuclear decommissioning."

Per Ankersjoe, leader of the Centrists in Stockholm, praised Federley for having "the courage to raise the issue. Nuclear is an old sacred cow which has to be discussed." He added that he still thinks there should be a phase-out, but that reducing greenhouse gas emissions is more important.

If Sweden shuts its reactors, which produce about 50% of the country's electricity, gas-fired plants would be the primary replacement. Electricity imports from coal-fired plants in Denmark would also increase.

Ironically, it was Center Party Prime Minister Thorbjoern Faelldin who approved the greatest number of new reactors while in office during the 1970s, despite promising not to do so.—*Ariane Sains, Stockholm*

Kaeri nuclear hydrogen project based on $1-billion investment

The Korea Atomic Energy Research Institute (Kaeri) has set the goal of demonstrating nuclear hydrogen production in a five-phase development program that supporters hope will result in construction of a dedicated very-high temperature reactor (VHTR) by 2017 and the commercialization of hydrogen generation around 2020.

Following several decades of work in Japan and China, last year Kaeri launched its ambitious hydrogen plans from scratch and entered into a bilateral cooperation agreement with the Institute of Nuclear & New Energy Technology (INET) at Tsinghua University in China (NW, 25 March '04, 9). The Kaeri-INET project calls for setting up a joint research center for hydrogen production research, Korean officials said late last year.

According to officials in Japan, a cooperation has also been started between Kaeri and the Japan Atomic Energy Research Institute (Jaeri), but this agreement is in the initial stages of information sharing only.

In parallel with international cooperation efforts in China and Japan, Kaeri is also participating in the Generation IV International Forum (GIF) on the VHTR project. Jaeri experts are playing a leading role in that effort (NW, 27 Jan., 8).

When Kaeri launched its nuclear hydrogen program, it was given about 4-billion won (U.S.$2.5-million) in initial seed money by the Ministry of Science & Technology (MOST). But according to Kaeri officials late last year, funding of the entire hydrogen program through to onset of commercial generation will require a total investment of about $1-billion.

In Japan, Jaeri aims to secure government approval of a hydrogen demonstration project through about 2010 using sulfur-iodine (SI) technology. In Korea, Kaeri also is counting on using the SI process but the government has not made any firm commitment to fund Kaeri's development research. As in Japan, however, Seoul government research and development (R&D) bureaucrats generally favor the program's goals because of anticipated enormous demand for primary energy this century and Korea's current requirement that 97% of this energy be imported. By the 2020s, Kaeri hopes that nuclear-generated hydrogen will meet the demand for about 20% of the energy needs in the transportation sector. This target is consistent with a goal set by economic planners in Japan.

Right now, according to Kaeri experts, "pre-conceptual" design work at Kaeri is ongoing for pebble-bed and block-type high-temperature reactor (HTR) cores. When this work is finished, a decision will be made on the reactor type to be built beginning around 2013-2014.

In line with this work, Kaeri is developing a particle fuel based on the Triso process developed in Germany. A typical fuel particle has a diameter of 0.92 millimeters, and contains tiny kernels of UO2 and ammonium di-uranate fuel. This is wrapped in layers of porous and pyrolytic carbon with a layer of silicon carbite coating sandwiched in between the carbon layers. Current research on the fuel is focusing on optimizing gelation, drying, calcination, and sintering process steps for the kernels. In parallel, R&D is under way on development of process technology for applying the carbon and silicon layers to the fuel kernels.

As in Japan, Kaeri is planning on using both IS and high-temperature electrolysis for heat production. A laboratory-scale design study for the IS cycle, based on production of about 5 liters of hydrogen per hour, is now in progress. The IS design project includes experiments on the bunsen reaction unit process, work on hydrogen iodide (HI) decomposition, design of a test loop for sulfuric acid (H2SO4) decomposition, experimentation involving the membrane for hydrogen separation, and work on hydrogen production from HI using a vacuum distillation process.

Kaeri's study of the bunsen reaction, officials said, has confirmed results of experiments carried out at Jaeri to establish optimal reaction parameters.

Based on cooperation with Japanese industry, during the 1990s Jaeri built its high-temperature test reactor (HTTR) using Hastelloy XR, an advanced material resistant to high

heat and corrosion. Kaeri is in the preliminary selection stage for a material to be used for crucial components such as intermediate heat exchangers, and is now developing a materials data base. Rudimentary tests have been conducted so far on a few candidate materials, including Hastelloy X, Hynes-230, and Alloy 800H.

Target dates

Under Kaeri's long-term plan for hydrogen production, development work on a dedicated HTR will take place simultaneously with work on the SI cycle to be coupled to the HTR.

For the SI cycle, current thermal and chemical R&D activities should be concluded at the end of this year, and the program move into lab-scale efforts on the IS process technology, Kaeri officials said. It is hoped that a prototype SI production unit can be set up and demonstrated by 2011, with a pilot plant then built and performance-tested by around 2016. At that time, the hydrogen production plant is to be connected to an HTR, and viable economic production of hydrogen demonstrated by around 2020.

Kaeri aims to select an HTR reactor type by 2006, perform conceptual design by 2009 and basic design by 2011, when a siting decision would be made. Detailed engineering for the reactor would be carried out until around 2015, and the result subject to a final safety analysis and review before 2017. Construction would be carried out between around 2014 and 2017, in time for connecting up the hydrogen production circuit on time.

In parallel, Kaeri has targeted conclusion of fuel technology R&D by the end of 2008, construction of a fuel fabrication line by 2011, and operation of the fuel plant to produce the initial load of fuel between 2012 and 2017.

—Mark Hibbs, Daejeon and Seoul

Fellows selected for first World Nuclear University summer camp

Seventy-four young people from 33 countries, one-quarter of them women and half from developing countries, will participate in the World Nuclear University's (WNU) first Summer Institute this July to August, the World Nuclear Association (WNA) announced this week.

The WNU, inaugurated in September 2003, was founded by WNA, the World Association of Nuclear Operators (WANO), the IAEA and the OECD Nuclear Energy Agency, and has support from the nuclear industry and institutions of higher learning around the world. Its goal is to provide in-depth instruction about topics relevant to the future of nuclear technology to those identified by their governments and companies as future nuclear industry leaders.

The students—called WNU Fellows—will gather July 9-Aug. 20 at the Idaho National Laboratory for a curriculum featuring lectures covering the "global setting" (energy supply and demand, climate change), international regimes, technology innovation, and nuclear industry operations, according to the announcement. Among the speakers scheduled are WNU Chancellor Hans Blix, Areva group CEO Anne Lauvergeon, WNU Chairman Zack Pate, DOE nuclear energy chief William Magwood, and environmental scientist James Lovelock.

John Ritch, WNA director general, said that "virtually every major nuclear country" was represented in the group of students selected from among 133 nominees. He said there was "good representation" from China (four students nominated by Tsinghua University), India (four working in nuclear research and development centers and the nuclear utility), Brazil (two from academia and government), and South Africa (two from PBMR Ltd.). Half the Fellows already have doctoral degrees or are doctoral candidates.

The $9,500 Summer Institute fee will be covered for about half the WNU Fellows by financial support from government or industry. About half will receive aid from the IAEA technical cooperation program, according to the announcement on the WNA's Web site (http://www.world-nuclear.org). The names of the candidates will be posted on the Web in a few days, Ritch said.

Areva has nominated two people each from France and Germany, and Electricite de France will send one student, as will E.On, each of three Swedish utilities, Urenco and Cameco, among other industry sponsors. Given the location of the Summer Institute, Ritch said, there will be 10 Fellows from the U.S. They include representatives of Southern Nuclear Operating Co., the Electric Power Research Institute, and four universities.*—Ann MacLachlan, Paris*

Ukraine sells components from unfinished Crimea plant

Ukraine's State Property Fund said last week it has sold parts of the unfinished Crimea Nuclear Power Plant to an undisclosed buyer for $203-million.

The fund's office in the Autonomous Republic of Crimea said it had determined the buyer in a competition, but would not reveal its identity. The price was less than half the investment made in the equipment in the 1980s.

The components sold belonged to the nuclear island, and included pipes, valves, pumps, and wiring, but not the reactor vessel or steam generators. Also in the sales package were new equipment and other goods for the reactor coolant circuit. The pipes and parts are expected to be re-used by other industries, at least as metal.

The Soviet Union had invested an estimated 500- to 750-million rubles in 1984 prices in the Crimean reactor project, where at least two VVER-1000s were originally planned. The town of Shcholkino was built to serve the nuclear power plant. Materials and equipment worth 250-million rubles remained in warehouses of the unfinished nuclear plant.

The Crimea Nuclear Power Plant construction was launched in 1976 and suspended in 1989 because of the region's high seismic risk. Last year, the Ukrainian government transferred the property of the unfinished plant to