require more funding in the near term. In FY2007, the Lab states, funding for design work would need to be increased from $23 million, the Administration request submitted to Congress, to $100 million. The Department of Energy's response was that although the current design work could support doubling the department's FY07 request of $23 million ... DOE has limited funding for nuclear energy R&D and has given other projects ... priority over the Next Generation Nuclear Plant."

Congress was not satisfied with this response.

In a June 11, 2007 report on the FY2008 Department of Energy budget, the House Committee on Appropriations states that its bill includes an increase to $70 million for the Next-Generation program. The money for the increase was taken from the ill-conceived GNEP program. The Committee directed the Department of Energy to make the Next-Generation program a higher priority than GNEP.

Highest priority and sufficient resources would put the next-generation nuclear reactor on the right pathway.

INTERVIEW: PHIL HILDEBRANDT

INL Plans to Put Next-Generation Nuclear Plant Online by 2018

Phil Hildebrandt is the project director for Idaho National Laboratory's Next-Generation Nuclear Plant, and is Special Assistant to the Laboratory Director for Prototype Reactors and Major Projects. He has more than 39 years of experience in the nuclear and power industries, including in the Naval Nuclear Propulsion Program.

Hildebrandt was interviewed by Marsha Freeman on Aug. 2, 2007.

Question: In June, the House Appropriations Committee increased the budget for the Next-Generation Nuclear Plant to $70 million, and urged that it become a priority for the Department of Energy.... How far does the $70 million the Appropriations Committee voted on go toward reducing the schedule?

I think it's a very important starting point. The amount of money in the budget that you'd like to have in FY|08, to keep on the schedule that we'd like to stay on, would be considerably more than that—a factor of three to four more than the $70 million. However, the $70 million makes a very important first step in putting the Next-Generation Nuclear Plant, and the demonstration plant for high temperature reactor gas technology, on the road. Let me give you the context for that.

The Next-Generation Nuclear Plant and the commercialization of the gas reactor is, in practical fact, going to be driven by private industry, not by government. We are putting together a commercial alliance. It will have members including end-users and vendors, and will be a partnership with government to help share costs.

That commercial alliance is pressing very heavily toward completing, and making operational, the Next-Generation Nuclear Plant as a demonstration plant, by 2018. That is the press of the private sector. That is a different schedule than what comes out of the Energy Policy Act [passed by Congress in 2005].

Question: Is the drive to get industry involved due to the fact that you don't see the government putting the level of funding into it that it requires?

That's correct. The government would start it off the ground, but as it's practically starting to occur, the private sector will be the driving force behind this.

Question: What industries do you see participating in the commercial alliance?

The private sector membership for the commercial alliance has end users that are considerably different than the traditional nuclear industry. In this case, they are the broader energy industry—the petroleum industry, the petrochemical industry. This involves the use of process heat; process heat, and hydrogen being one of the energy carriers from that process heat, is the primary focus here. Industry wants the capability to exist as soon as possible, but no more than a decade out.

With what has been provided by the Congress, we still could achieve a 2018 start-up, with the House Appropriations Committee budget mark. It just means we're pushing a bow wave of funding ahead of us.

Question: What level of contribution will be required from the private sector?

I would expect that by the end of the project, the government and industry would share it about equally. There would be 20/80 split early on, when we're in the developmental aspects of the program, and it flips around the other way as you get into construction of the demonstration unit.

Question: What kind of interest have you had from industry?

The broader end-users in the petroleum and petrochemical industry are beginning to be interested, based on the prices of premium fuel, like natural gas and oil. In the petroleum industry, they use a large amount of hydrogen, and depending upon which company it is, they use a tremendous amount of natural gas. Natural gas is used as a source to make heat, and they're looking at what their options are.

There is some interest in the traditional nuclear industry in this technology. A couple of utilities are showing interest in the high-temperature gas reactor. Some of that interest is in producing hydrogen and selling it into the pipeline that exists along the Gulf coast. Other interest is in being the owner-operator of the nuclear facility that supplies process heat to industry. The company that has been most vocal about that is Entergy.

Question: There is quite a bit of international interest in this technology—in South Africa, and General Atomics has worked with the Russians. It has been proposed that the U.S. program could advance more quickly by taking advantage of this work.

The Westinghouse interests and the South Africa Pebble Bed Modular Reactor (PBMR) people participate in this emerging commercial alliance. There's an ongoing conversation as to how we can achieve the benefits from the work that has already been done in South Africa. You have a competitive marketplace, and other vendors have interests in this. There are three teams: the Westinghouse team, which includes the PBMR group; an Areva team; and a General Atomics team. About 26 international companies are involved, and we are discussing how we use work that has already been done—by the South Africans and also the Russians, in their plutonium burner work with General Atomics—how we bring in the experience that goes back decades, and also the current work, that has been done.

Question: One of the suggestions to accelerate the program was to start with a smaller reactor, at a lower temperature, which is not so challenging from a materials standpoint.

In fact, irrespective of the size, we will start at a lower temperature, because technically we need to step our way up. We are starting at a lower temperature than originally conceived of for the very-high-temperature reactor, which was in excess of 1,000˚C. In the range of 950-1,000˚, you get to the point where conventional metals will not work. The review group said to get below that temperature, and we have taken that step.

The second step in that discussion is, what temperature do we need for the process applications? The third step, is, at what temperature should we start the demonstration activity, so we are technologically successful, and to what extent can that reduce the time required? This is a very active conversation. I would not be surprised that when that is complete, in about a year, that we'll be lower than 950˚C, in the range of 850-900˚, which makes a big difference.

The three teams of companies will have their pre-conceptual design reports done in the September time frame, with opinions and recommendations. But temperature alone is not the only issue. The other is licensing time by the Nuclear Regulatory Commission, also being actively discussed.

Figure 1
ARTIST'S ILLUSTRATION OF A PBMR PLANT
The first prototype PBMR is expected to be online by 2013, and a plant to fabricate the fuel pebbles is now under construction. The first reactor will be built at Koeberg, near Cape Town, and the pilot fuel plant is being built at Pelindaba, near Pretoria. South Africa has an ambitious program planned for the mass production of PBMRs for domestic use and export.
Source: Courtesy of PBMR

Fourth-Generation Reactors Are Key to World's Nuclear Future

by Marjorie Mazel Hecht

By 2050, the world will need 6,000 more nuclear reactors in order to keep up with population growth and electricity demand. We will need all kinds of reactors: large advanced reactors for industrialized nations, fast reactors (breeders) that can create more new fuel than they burn, floating nuclear plants, thorium-fueled reactors, and other innovative designs. But the workhorse of the next generation of nuclear reactors will be the modular high-temperature gas-cooled reactor, both the Pebble Bed Modular Reactor (PBMR) and the Gas-Turbine High Temperature Reactor (GT-MHR), because of their inherent safety and versatility.

The PBMR, originally a German design (a 30-megawatt prototype operated there from 1967-1989), is being built in South Africa (Figure 1). The GT-MHR, designed by San Diego-based General Atomics, is being engineered in prototype in Russia, with the aim of burning excess plutonium from decommissioned weapons. Also, China has had a small (10 megawatt)