the components. And do you have confidence that in the overall cost, the PBMR will be competitive with the conventional light water reactor or even with coal generation?

Matzner: Of course, you have to compare like with like. We cannot compete with a large coal-fired station located directly at the coal field. We have very cheap coal. So we must compare ourselves with power-generation options on the coastline, which is far away from our coal fields. There we can say that we are definitely competitive with combined-cycle baseload gas. There is no question about it—in fact, we are cheaper than that.

But I would expect that our technology is more expensive than the large light-water reactors. That is because the new generation of light water reactors, going up to 1,600 megawatts, are very large machines, and they have achieved economy-of-scale benefits by their larger size.

We have a definite disadvantage because of the small size, but it is for that reason that we picture ourselves not in the areas where large-scale power requirements are, but rather in the areas where you have 600 megawatts and less for power requirements. There are many countries, specifically in the developing world and most notably in Africa, which need only 200 or 400 or 600 megawatts of power for the country's grid. They would never be able to afford to buy a large 1,600-MW light water reactor.

Even South Africa, with its distribution grid, it would not be considered viable to have one large machine put onto the coast line, for the simple reason that if that machine goes offline for maintenance, or whatever, then you have no power. So you still have to install the spinning reserves in the transmission grid in order to be able to compensate for the loss of such a machine.

And benefits of size, in terms of power-generation, also bring financing risks. Because the financing risks of such a large power station are substantial, the utilization risk that it would not be utilized from day one, and the disruption factor of not being able to feed an area where a large machine goes off-line—these extract a premium in the price.

EIR: How big a market do you envision developing countries to be for the PBMR, and where would the staffing come from?

Matzner: The most important challenge with respect to the deployment of this technology in Third World countries, at the moment, is that most of these countries do not have the nuclear regulatory frameworks and regimes. And, therefore, we would have to find a way to be able to deploy these systems in these countries. I believe it is quite likely that in Africa, specifically sub-Saharan Africa, one could probably find a way where the South African licensing regimes, also with Eskom which is a major regional utility, would provide the operational support, within the regulatory framework from South Africa, under which these reactors could be licensed in these countries.

What is certainly true is, that we see it as one of the operational benefits that the costs of power generation, are less from a staffing point of view. We expect to have less staff on a station like this, because it is a simple station. Also because it is such a foregiving technology. In other words, this is probably one of the big advantages: If anything goes wrong, you have days, not minutes, before something happens. Even in the worst case, with this technology you will not have a catastrophic accident. You might lose your investment, but you will certainly not have a core melt. This is, of course, totally different from the other reactor technologies.

So from that perspective, I don't want to say that you can get away with unskilled and untrained personnel, but the severity of an accident, is much less, even if the plant doesn't have the most highly trained persons there. So this is exactly the technology of the future that can be deployed in the developing countries, where there is a shortage of skills and where the large power requirements are just not there.

EIR: In terms of the plant construction, what are the requirements for the nuclear-quality components?

Matzner: About 40% of the cost of the plant is in good-quality industrial equipment, like that you would find in any country, on the electrical side and chemical auxiliaries, civil structures, and so on. Of course, the reactor itself and the turbo machinery are high-quality components, and those always have to be imported or manufactured in factories which can make them according very stringent quality control. That's already a requirement in order to have not only safe operation but reliable operation. And that is the intent of any utility.

Interview: Dr. Regis Matzie

How the U.S. Plans To Use the PBMR

Dr. Regis Matzie is Senior Vice President and Chief Technical Officer, Westinghouse Electric Company. He was interviewed by Jonathan Tennenbaum on Jan. 30 at the London conference on the PBMR.

EIR: How do you see the situation with PBMR applications in the U.S.A.?

Matzie: We have started the early phases of licensing in the Nuclear Regulatory Commission (NRC) of the pebble-bed reactor, the so-called pre-application review. Pre-application means before the official design certification application, which is our process in the United States.

We're going to take about two years to complete pre-application review, and what we do in those two years is, first of all, educate the regulator about the design and the safety case. Second, we address a handful—six, seven, eight issues—that you need to get agreement on how to resolve them, before you submit a licensing report, a safety analysis report. We are picking issues that are very fundamental: What are the classifications of the systems and components, the safety classification? What are the codes and standards that you would use? What is the requirement for fuel qualification, and so on? So there's about six or seven of those that we are addressing, and we're resolving those while we're licensing this plant in South Africa.

So the current intention is, that once the South Africans are finished licensing the plant, so that they can start construction there, then we'll be ready to submit a similar application in the United States.

EIR: Would you be building essentially the same design in the United States as the South African PBMR?
Matzie: That is the current intention. The question is, I don't think we will be building what you would call a single unit, one module. Probably they'll come in four-packs, which is about 660-700 megawatts-electric. Another question, however, at this time, is, do we go ahead, and make the application for the electric plant, which would be a multi-module (probably four), or do we go ahead and license the process heat plant?

Now the process-heat plant is behind the electric plant in terms of the engineering, but we're working on that right now. The other aspect is, that we haven't quite figured out how to approach the subject with the U.S. Nuclear Regulatory Commission. Can we license the basic safety case for one module, and then have just certain types of interface requirements, so that we can have a two-pack, four-pack, and eight-pack [of modules]?

You don't want to have to license each individual configuration on a modular reactor. You want to get a basic safety case. They have never done that before, so we are going to work through that issue with them.

EIR: There has been discussion in the United States—including, for example, from Bill Ford, the head of the Ford Motor Company—of launching major government-supported programs to bring in hydrogen and other synthetic fuels, and new types of automobiles using hydrogen-based fuels. How are you thinking about these issues?
Matzie: When I say the process-heat plant, there are specific types of applications. One of them is to generate syngas, another is to convert coal to liquid. Now South Africa SASOL is a major company that produces about one-third of all the petroleum products in South Africa; gasoline, diesel are converted from coal; these are all coal-based. SASOL does a coal-based conversion to liquid, that puts it into the transportation sector.

EIR: And they also burn some of the coal to get energy for those processes?
Matzie: Exactly right. There are a lot of emissions, as they are burning fossil fuels to do that conversion. What we want to do is develop the processes with the process-heat plant as a heat source, and also to generate hydrogen. Then hydrogen goes into the conversion process, and you can convert all the carbon to liquid petroleum. Right now, a significant percentage of the carbon goes up the stack when you're doing the current conversion process.

EIR: What do you mean by liquid petroleum?
Matzie: Diesel, gasoline, the whole set. And so we are looking at that with people like SASOL, British Petroleum, and so on. We have had preliminary discussions with many of them, and the question is, can we bring them along? It is a big step for people in the fossil industry to get involved in nuclear; it's kind of a psychological hurdle. So you have to bring them along. And of course today we do not have a product, where you can sort of show them the entire product.

We're designing the electric plant, and we're going to build that. So we'll prove the nuclear technology. We need to finish the design work on the process-heat plant plus the process side: How do you integrate the heat into, say, a coal-to-liquid or a syngas process, with the reformers and all the things that are on that side. Because there are different designs of those components, too.

We are going down that road. For the early stages, we're working with a process-heat company that does this for these types of companies, and we're getting there slowly.

EIR: Will this also include hydrogen production?
Matzie: Thermo-chemical water-splitting is what we think is the most economical way to generate the hydrogen.

EIR: I think that the inherent safety of the PBMR will be helpful in incorporating the industrial companies into the project.
Matzie: It should be helpful in convincing them that this is not a technology they have to worry about. It should be helpful in allowing siting of the nuclear plant close to these chemical plants; what is the stand-off distance you need from the reactor—all this has to play together.

EIR: What about the cost of the process-heat plants?
Matzie: Right now, if you look at electricity, it's probably competitive with natural gas at around $6 per million BTU. Hydrogen production is in the same range, because most hydrogen today is done by steam methane reforming, where they're now using natural gas. So electricity and hydrogen are in the same general range, and of course natural gas prices are above that today, and they will probably stay above that.