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Industry Is Rebuilding Its Nuclear Manufacturing Capacity

by Marsha Freeman

It has become clear to at least one company planning to build new nuclear power plants in the United States, that the industrial and manufacturing infrastructure that existed in the 1970s, and has been dismantled, must be rebuilt. The majority of the hundreds of facilities that then produced nuclear components disappeared after the halt in new plant orders and cancellation of more than 100 existing orders under the Synarchist bankers/anti-nuclear "greenie" assault that started 30 years ago.

With more than a dozen electric utilities now taking the first, tentative steps toward ordering new, next-generation light water nuclear reactors, suppliers are faced with having to import major heavy nuclear components from abroad. But some are mobilizing the resources to start the process of resurrecting the nuclear plant manufacturing industry in the United States.

At the National Press Club on Aug. 1, executives of European-based nuclear supplier, Areva Inc., electric utility Constellation Energy, and heavy component supplier BWXT announced their goal to manufacture Areva's new Evolutionary Pressurized Reactor (EPR) in the United States, with 80% of the materials and manpower supplied domestically. Toward this goal, BWXT will start to produce pressure vessels and other heavy components for nuclear power plants, for the first time in two decades.

But to manufacture more than a handful of plants, and to get ready for the hundreds that are needed in the U.S. alone in the next two decades, a nationally directed effort will be required. The enactment of Lyndon LaRouche's Economic Recovery Act, which would make new nuclear plants a matter of national economic security, and direct low-interest credit into an industry that barely exists today, is the pathway to a nuclear renaissance.

That a massive upgrading of the U.S. electric grid, including the construction of baseload nuclear power plants and expansion and technology upgrades of the transmission system, is needed immediately, was noted by Mike Wallace of Constellation Energy. "It is going to be over 100 degrees today and, as the temperature soars, so does the demand for electricity," he stated at the press conference. "Without sufficient baseload power, the rolling blackouts of 2003 could be a continuing challenge."

Wallace pointed out that there are "already shortages, along the whole East Coast/New England/Mid-Atlantic, the West Coast, to some degree, areas of the Midwest, and Texas." He noted that the question from utilities to the nuclear industry is, "how fast can you get it here? and why can't you go quicker?"

Tom Christopher, CEO of Areva, Inc., reported that growth of electricity demand in the United States last year was forecast, on average, to be about 1.8%. The actual growth of electricity demand was 3.4%. "This creates a shortfall within two or three years of between 20-30,000 megawatts a year. It creates the distinct possibility of brownouts in the United States within 3-4 years. This is not a hypothetical 'what if?' "

Last Fall, Constellation Energy and Areva formed UniStar, to put together teams that will design and build new plants, and train personnel to operate the new plants. On Aug. 1, they announced that the manufacturer BWXT will join their consortium.

Christopher explained that "with the promise of new nuclear construction, questions emerged regarding the capacity and the industry's infrastructure to meet demand." They realized it was necessary to "bring manufacturing back to life." John Fees of BWXT added that "for more than three decades, the domestic commercial nuclear infrastructure has faded, but now the reemergence of nuclear power is taking shape." BWXT is "the only remaining company in the U.S. with the capability and the infrastructure to manufacture reactor vessels, closure heads, steam generators, and pressurizers, and all of the major heavy components that go into building a reactor." They will be building these components for Areva's fleet of new advanced EPRs.

This reporter asked if these companies had looked further down the supply chain for nuclear plant components, and had considered a role for the increasingly idle capacity in the U.S. auto industry, with its reservoir of highly skilled manpower and production facilities, for the production of modular components for new nuclear plants.

Christopher said they are surveying all of industry to see what capabilities can be mobilized. "We have the auto industry and its subcontractors on our list of vendors to talk with, as well as the nuclear shipyards and others. But I don't think that dialogue will get very detailed until some time next year [when they've come closer to completing the final EPR reactor design].

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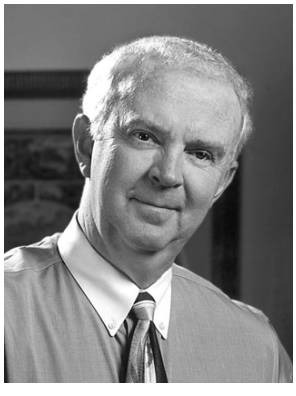
He added, with optimism, that if this new venture is successful, "within five or six years the scale of this facility would approach that of Areva's Chalon St. Marcel Heavy Equipment Manufacturing Facility," which today can manufacture 20-24 steam generators and some reactor vessel heads.

Asked by *EIR* what problems his factories could face in securing needed materials, if there were a serious new nuclear plant build-up, John Fees of BWXT, pointed to the "need to overcome problems with long-lead materials, Inconel [a nickel-base alloy with chromium and iron], in addition to forgings and tubing. There are going to be places in the future where there is going to be limited capacity in many areas. Beyond one EPR per year, we may need machine tools, we may need fabrication and other manufacturing capability," Fees stated.

While a good start in the right direction has been made to bring back a nuclear power plant manufacturing industry, mass producing nuclear plants, surpassing the 100 or more under design or construction in 1973, requires a national mobilization, similar to that President Franklin Roosevelt carried out , to bring the U.S. economy back from the grave during athe first Great Depression.

Interview: Tom Christopher

Tom Christopher, CEO of Areva, Inc., the U.S. subsidiary of Areva, was interviewed by Marsha Freeman on Aug. 1.



EIR: We have been working on a project to look at what it will take to rebuild the manufacturing infrastructure of the U.S. nuclear industry. What background and experience do you bring to bear on the effort to revive the production of new nuclear plants?

Christopher: I went into the naval nuclear submarine program in 1967, and left in 1973 as a qualified engineer on a Navy nuclear plant. I then joined Westinghouse's nuclear organization, and in 1973 I was involved in the construction of several of the nuclear units at that time—Salem, etc. For the last ten years I was there, until 1995, I was the Vice President and General Manager of Nuclear Engineering, Nuclear Service worldwide for Westinghouse Nuclear.

In 1996, I was assigned to Orlando, Florida, to the Westinghouse Power Generation Divison in charge of the service side of their business. I was there for 5 years, and in 2000 was moved back to this joint venture between Framatome and Siemens. Siemens purchased us in Orlando at that time. I headed this joint venture in the nuclear business in the United States for Framatome and Siemens [now Areva]. So since 2000, I've been the head of that nuclear program in the United States.

Except for that five years in Orlando, I have more than 30 years of experience in commercial nuclear power. I have the dubious distinction of having been to every nuclear plant in the free world, and every one in the United States at least ten times.

EIR: You were involved in the industry when it was going full bore. Can you describe what the industry was capable of doing in the 1970s?

Christopher: The benchmark I have used, is the data from our files. They indicate that the heyday for nuclear power in the United States, for construction, was 1973. At that time, there were 162 nuclear plants on order: a significant portion of those were under construction, the others were under design. At that time, there were four large facilities making nuclear components. You had the Chattanooga facility, the Mount Vernon facility, the Tampa facility, and the Pensacola facility. The last of those facilities operated into the early 1990s, when the Pensacola facility stopped manufacturing nuclear components.

EIR: One of the first capabilities that we shut down was the facilities that made the largest components, such as pressure vessels, for nuclear power plants. Today we cannot manufacture them in the United States. Recently BWTX reapplied for and received nuclear certification to produce pressure vessels. What other components would be a problem in terms of domestic manufacturing?

Christopher: One part of our announcement today, is that we now have a joint venture with BWTX to reestablish the Mount Vernon, Indiana facility as a large nuclear component manufacturer. There you can make reactor vessels, steam generators, pressurizers—the large nuclear components.

To clarify—when you talk about manufacturing large nuclear components, the first step in that process is what they call forgings. So, for example, picture a reactor vessel head, which is like the closure piece, or top hat, for a reactor vessel. You need a manufacturer who can pour a hot ingot of steel and press that into a rough shape of that closure head, and give you this roughly machined forging, roughly in the shape of a head. Then that head is shipped to a manufacturing facility that does the precision machining, cladding, surface finish, and welds on any attachments, such as the control rod drive mechanisms, etc., and then it ships it. So what we are talking about [at the BWXT Mount Vernon plant] is the manufacturing side, not the forging side.

EIR: Where would BWXT get the forgings?

Christopher: We got our first order last week for replacement reactor vessel heads for the Diablo Canyon nuclear

Courtesy of Areva, Inc.

The U.S. nuclear manufacturing capability has declined greatly over the last 30 years, but the super-sized 1,650-megawatt-electric generator for the Evolutionary Pressurized Reactor nuclear plant that Areva is building in Finland (shown here), is being made in the Siemens facility in Charlotte, N.C.

plant, for two units. Those forgings will be supplied by Japan Steel Works, JSW, and be shipped to the Mount Vernon facility in Indiana where all the rest of the work will be done.

EIR: Is Japan the only country that can produce the forgings? What is their manufacturing capacity?
Christopher: For these super-large forgings, JSW is currently the only one. My associates in France have just announced that they are in the final stages of acquisition negotiations with Creusot Forge to acquire that for Areva and set it up as a second large forging supplier. We continue dialogue and examinations in the United States to see if we can re-qualify a U.S. company for large forgings for commercial nuclear plants.

EIR: What companies used to manufacture forgings used by the U.S. nuclear industry in the 1970s?
Christopher: You had Creusot which made forging throughout Europe, and Japan Steel Works. In the U.S., I think Bethlehem Steel was making large forgings.

EIR: Is there interest in reestablishing the capacity to do the forgings here?
Christopher: There is still a company left in the Lehigh Valley in Pennsylvania that makes nuclear-grade forgings for the military. It is not qualified to make them for commercial nuclear, and we are looking at what it would take to get them qualified, and to expand their facility.

EIR: Can you gives us an idea of what the global capacity is for manufacturing new nuclear plants worldwide?
Christopher: The numbers vary. What you hear people say is that with just the critical forgings coming out of JSW, we would be limited to probably no more than eight nuclear plants a year around the world. JSW also makes forgings for industrial components like petrochemical plants, so 100% of their facility is not dedicated to nuclear, so there is some variability in those numbers. But very clearly, JSW cannot support a global market of more than 15 or 20 plants per year.

EIR: What is the purpose of the announcement that will be made later this morning, concerning the rebuilding of the nuclear industry?
Christopher: This first venture is just to reestablish Mount Vernon as a commercial nuclear manufacturing facility, and we are providing the engineering and the latest manufacturing technology from our facility in France, because the process of getting them up to speed to these techniques, getting their personnel qualified, that's a process of a year to a year and a half. We're commited to go down this road with them.

As part of our studies as UniStar we're examining a variety of other vendors in the United States to see what we do about rebuilding U.S. infrastructure. In some cases it's fairly robust, in other cases, it's not. This is a process we're going to be at for the next two years. A good example is the Finland nuclear plant. The electric generator for that plant, the super-sized generator that is 1,650 megawatts-electric, is being made in the Siemens facility in Charlotte, North Carolina; not in Europe, but in the United States.

EIR: What is the major function of UniStar?
Christopher: Unistar will develop a complete portfolio for

nuclear plants, in order to offer to a customer a one-stop-shop for new nuclear plants. Let me explain.

When you look at the 1970s and the '80s and the struggles that the industry had in building nuclear plants, utilities found themselves in the mode of a single utility with its project team negotiating and continually managing separate contracts: one with the nuclear company that was supplying the components, another for the architect engineer who was doing the design, another for the contractor who was building the site, another for the civil works, another to train the operators, etc. Their ability to manage those multiple contracts under intense activity levels to support nuclear really strained them and caused a lot of re-work.

We're saying we're going to develop this advanced prospectus for a standardized plant, where basically by the time they're ready to build, we will have completed 95-100% of the engineering. With Constellation, we will have formed an operating company that can operate the unit for them, with them as part owner, and do this on a standardized basis. We are developing the standard plant model that they can buy into if they choose. Instead of just being the nuclear vendor, we're working with Bechtel as our subcontractor and with Constellation, to develop a seamless contract, so utilities that are small, and don't have large nuclear engineering organizations, have a potential solution for new nuclear plants.

EIR: What has been the effect on the operation of nuclear plants, of the consolidation of the industry, where only a handful of companies operate the U.S. nuclear fleet?

Christopher: When you look at the statistics for the operating fleet, the units that are running the best and have the lowest operating and maintenance costs are those units that have fleet operations. And while there are single-unit nuclear plants that are doing fairly well, the majority of the units in the top quartile of the U.S. are the fleet operators. There's a fairly clear message that the economies of scale, the depth of resources that a multi-unit operator can provide, give you better performance.

EIR: What is the manpower challenge for the rebuilding of the industry and operation of new plants?

Christopher: The manpower challenge is fairly severe, due to attrition and the age of the existing industry. It is fairly significant in terms of size. For example, Areva's nuclear organizations in the United States employ 3,300 people, working solely on commercial nuclear power plants. However, when you look at our age profile, and that of the utilities, and nuclear-related vendors, like architect engineers, you've got an industry that is aging rapidly; whose median age is probably over 50 years old. When you factor in retirements, it's an industry that is going to require 10-20,000 new people over the next four to five years.

EIR: Is the industry taking any steps to increase the educational pipeline?

Christopher: Yes. If you talk to the colleges that have nuclear programs, the amount of scholarships and the support of those colleges has increased ten-fold in the last three years. The recruiting is aggressive, and the number of students has almost doubled in size in the last three years. The message is getting through to the student population about a career in nuclear. That will take a while, so you have vendors like us who are taking people who came to us from high school, that we're putting through training programs, getting certifications, so we are developing supplemental pipelines, of people of all age groups that we are training, who are getting their engineering degrees while they're working with us.

EIR: It has been recently reported that the new nuclear plant that Areva is building in Finland is now behind schedule. It is the first Generation 3+ Areva design, the Evolutionary Pressurized Reactor. What are the challenges in building this first-of-a-kind?

Christopher: The challenge is due to the demand of the utility, and when they wanted it. That plant was sold with the final design [only] about 25-30% complete. Therefore, we are in a mode of where we're constructing the unit, completing the licensing in parallel, and completing the design, with a utility that requires rigorous review and approval of every design aspect—literally tens of thousands of documents have to be reviewed and approved by the utility. The logistics of that process have proved to be more than the resources of people there to support it, and has bogged down all of the work. That's the bad news.

The good news is that based on the learning curve they're going through, we're able to use that information, complete that design in the U.S., and with the current one-step U.S. licensing process, put ourselves in the mode where we will have completed the licensing and the design *before* we break ground, which would be in about three years. The message out of Finland is: Don't start construction or get a contract on a plant, if you haven't completed the design. And the fact that we're the one vendor that will have completed this design in the next two years, gives us a tremendous leg up.

EIR: You mentioned breaking ground in three years. Have you received any orders for Areva's EPR in the U.S.?

Christopher: A new order is a three-step process. The first step is to make a commitment to file a combined construction and operating license. That process can cost the utility between $40-80 million. The license is good for 40 years. You have a series of utilities now that are making a commitment for this licensing process, and that's all. They will see how this goes along. For example, Constellation Energy has given us an order for this licensing process, and we've begun to submit the documents to the Nuclear Regulatory Commission.

The second phase is some time into the licensing process,

when you would order the long-lead major components, like the reactor vessel and steam generator, because you need to order them about 7-8 years in advance of when you want the plant on line. In the second phase, you can commit from $50-200 million for these long-lead components.

Then, when you get the COL granted [by the Nuclear Regulatory Commission], which can be three, four, or five years, you have your license, and you break ground, and do the construction in 44 months. The construction contract would cost between $2-2.5 billion depending upon the type of plant you build. There is no customer in the United States that has authorized all three phases.

EIR: How would you accelerate the schedule and reduce the lead time for the components that you stated would take seven or eight years?

Christopher: You have to increase the pipeline on forgings, which we've talked about, because a lot of this delay is caused by the fact that it is just JSW [that is producing the forgings]. So over the next two to three years if we can get three major manufacturers going in terms of forgings, we could shorten that lead time by a year and a half to two years. Even so, if you wanted a plant [operating] in 2015, and you wanted the major components on site by 2013 or late 2012, you're going to have to order them in 2008.

It's theoretically possible if you had plenty of room to do the entire cycle for a nuclear component in 36-40 months, but we're not there yet.

EIR: How long would it take to get there, to ramp up the industry to work on many more long-lead-time components at the same time?

Christopher: I think we're three or four years away, depending upon how much money the industry is willing to put into it.

EIR: The Energy Act that became law one year ago provided financial incentives, in the form of loan guarantees and production tax credits, to encourage the building of new nuclear plants. How important are the financial incentives to the industry?

Christopher: It is *the* key issue, because while the law was passed, the Act has not been written, so the customers are waiting to see what the final words will be, for example, on the loan guarantees. Because if you look at a new nuclear plant, the loan guarantees are a $20-25 per megawatt-hour difference. When you look at the financing costs of a nuclear plant, if the plant costs you $2.5 billion, or $3 billion, if you have the loan guarantees, in 2006 dollars, this is a unit that can produce power for $35/megawatt/hour. If you don't have the loan guarantees, it's going to cost you $57-58/MW/hr.

EIR: Is that difference due to the fact that the financing cost would increase because financial institutions see a greater risk without the government loan guarantees, and interest rates would be higher?

Christopher: Yes. And the difference is huge. You're not going to see any customers get into an aggressive phase 2 or 3 of these nuclear plants in terms of major commitments until they see the exact wording of the loan guarantees. We're probably six months away from getting the approved legislation. There are informal drafts being circulated. We're told there is a set of loan guarantee guidelines to come out in the next month.

EIR: I know that Areva in France provides reprocessing services for the back-end of the fuel cycle, or the spent nuclear fuel. The U.S. has no capacity to reprocess spent fuel from commercial power plants. The Bush Administration has a proposal to create a Global Nuclear Energy Partnership (GNEP), one goal of which would be to develop reprocessing technologies. Where does Areva in France fit into that program?

Christopher: We hope to support it. The biggest practitioner in the world for reprocessing is Areva, both with the facility in France and the facility Areva has built for the Japanese in Japan. To us, there is a place for recycling as part of the GNEP process. We are helping the Department of Energy make decisions by giving them access to our technology. Right now GNEP has such a long-term focus, all of us are wondering what near-term benefits it can have.

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