Oconee Nuclear will be first in US to go digital

Eyes of the nuclear industry wait to see how plant performs

BY JEFFREY COLLINS
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SENECA — Sometime in the next few weeks, technicians will finish installing digital controls for the operating and safety systems at Oconee Nuclear Station, a move being closely watched by other nuclear complexes.

In a nation where a digital blender can be bought for about $30 at Walmart, Oconee Nuclear will have the first reactors in the United States not controlled with the same analog technology that brought the world cassette tapes and slide rules.

It has taken nuclear power plants so long to go digital because regulators wanted assurances the new control systems were as reliable as the old ones and could not be compromised by hackers.

"The systems in the plants right now, they are doing an excellent job. The plants are very safe — they've been doing their jobs for years," said Joe Naser, technical executive with the Electric Power Research Institute.

The goal of going digital is to save money. Most systems in a nuclear power plant are monitors with four sensors. If two of them have out-of-whack readings, engineers often have to "trip" the plant, or shut it down, until the problem is resolved. If a nuclear plant sits idle for a day, it can cost a utility company more than $2 million. That isn't spare change, even for a company like Duke Energy, which earned $1.3 billion in 2010.

Unlike a human engineer, who can only take in one measurement at a time from one instrument, the digital system takes in thousands of readings at any moment. The computer can instantly figure out if a sensor is broken and ignore it.

The nuclear plant digital systems will provide operators with much more data about plant operations and a level of precision impossible with an analog system, which often requires the movement of components to get things done.

Other utilities are closely watching. The youngest nuclear plant in the U.S. went online with analog controls in 1996, the same year DVDs were introduced in Japan. More than half of the nation's nuclear power plants are at least 30 years old, and only three have come on since 1990.

"It's to the point where you can't replace that equipment anymore," said Jere Jenkins, director of Radiation Labs at Purdue University.

Other nuclear power plants will likely follow Oconee's lead as soon as they can afford it if the conversion goes well, said David Lochbaum, director of the Nuclear Safety Project for the Union of Concerned Scientists.

"There are a lot of eyes on that. If it goes well, you'll probably see many people in the queue making it happen. If it doesn't go well, they are going to wait for Duke Energy to iron out the kinks," Lochbaum said.

The operators at Oconee Nuclear Station will likely encounter a few unexpected glitches as the new system is put in place, but they should all be minor because of extensive testing, Lochbaum said.

Also, Duke Energy said it made sure its engineers can manually take over all digital processes in case there are any problems.

The new control system at Reactor 1 is part of $2 billion in upgrades that Duke Energy is making to keep its three reactors at the station, which opened in the early 1970s, running safely for the next 30 years. The control panel installation coincides with a planned refueling outage. Reactor 2 will get its new digital panel during next year's refueling, and an upgrade at Reactor 3 is scheduled for 2013. The new panels alone for all three reactors cost $250 million.

Oconee Nuclear Station's reactor operators have spent months training on an exact replica of what the new control panel will look like. And it looks a lot like the old system.

"One of the goals is to make operators' lives, I won't say easy, but to make operators more focused on the primary aspects of the job. Just like an airline pilot, you want him to focus on flying the airplane — you don't want him spending all day trying to get the cabin pressure right," said Jeff Hekking, a senior reactor operator who helped test the new system.

Reactor operators work on 12-hour shifts. At least three are in the control room of each reactor at all times, even eating their lunches at the gray desks behind flat-screen monitors. Others are doing maintenance, checking components or other tasks, but can be brought into the room if needed.

"Nuclear is a really interesting world," Hekking said. "We have both the oldest and the newest and coolest."

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> director of the Nuclear Safety Project



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In this March 30 photo, nuclear reactor operators Chris Heinz, left, and Roger Patterson check steps that need to be taken as they practice an emergency scenario on a simulator of a digital control panel at Oconee Nuclear Station.



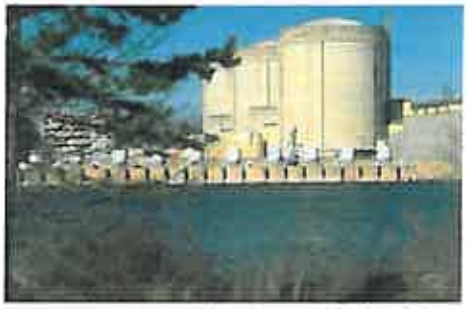
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In this March 30 photo, senior nuclear reactor operator Jeff Hekking poses in front of a simulator of new digital control panels being installed at Oconee Nuclear Station.





Science U.S. Receives First Digital Nuclear Power Plant
Tiffany Kaiser - **May 30, 2011** 11:08 AM



The Oconee Nuclear Station (Source: suite101.com)



The Oconee Nuclear Station will receive digital upgrades on Reactor 1 within the next few weeks

Ever since the 9.0-magnitude earthquake damaged the Fukushima Daiichi power plant in Japan on March 11, nuclear power has been a popular topic. The tragic event has caused U.S. senators and French President Nicolas Sarkozy to question it, while avid nuclear supporters defended its clean, reliable, and cheap benefits.

In addition, the Browns Ferry nuclear power plant in Alabama failed an inspection earlier this month, Fukushima Daiichi suffered a nuclear meltdown and studies related to nuclear radiation's effect on humans are popping up everywhere.

But the negative nuclear reviews don't stop there. Germany announced recently that it is "scrapping" nuclear power due to the problems in Japan, and plans to begin phasing out nuclear power by 2022.

Nuclear power has received a bad reputation after the disaster in Japan, but regulators and nuclear plants are working to make systems more safe and reliable, and one plant in particular is doing so by becoming the first to go digital.

The Oconee Nuclear Station reactor, which is located on Lake Keowee near Seneca, South Carolina, will be the first of 104 reactors in the U.S. to go digital. The plant has an energy output capacity of over 2,500 megawatts, and will be kicking old analog technology to the curb in an effort to save money and increase reliability.

Most power plant systems today consist of monitors with four sensors, and if two of the sensors start to have crazy readings, the plant has to be shut down until the sensors are fixed. This process can sometimes last a day or longer, which can cost a utility company over $2 million. With a digital system, these issues can be fixed more quickly, saving time and money.

A digital system can measure thousands of readings at any time, and will provide operators with more data about plants operations. Its measurements will be more precise than those of an analog system, and can alert operators when something is wrong quickly.

"One of the goals is to make the operator's life, I won't say easy, but to make operator's more focused on the primary aspects of the job," said Jeff Hekking, a senior reactor operator. "Just like an airline pilot, you want him to focus on flying the airplane -- you don't want him spending all day trying to get the cabin pressure right."

Digital systems have already been implemented in Europe and Asia; it has been slow going in the U.S. mainly because of the fear of hackers breaking into the system. But in Oconee's case, the software was designed with no external network connections, and any communication between the system and reactor operators is "heavily restricted."

Jere Jenkins, director of Radiation Labs at Purdue University, also noted that over half of the United States' power plants are at least 30 years old, and that "it's to the point where you can't replace that equipment anymore," which means a digital conversion is the safest bet for updating old systems.

Oconee's new system, which will be implemented at Reactor 1 and is part of a $2 billion upgrade effort by Duke Energy, was tested recently to see if it was a good fit. Hekking participated in a simulation where there was an issue with the water that cools the reactor. In the simulation, bells began to ring, signaling that something is wrong within the plant, and operators allowed the situation to worsen before taking action. At this time, warning sirens went off and the control rods of nuclear material were removed from the reactor core, and as this process was accomplished, the system turned several tiny red rectangle lights green. Then the engineers stepped in to help control the situation, and make sure that everything is back on track.

The new digital control panels will be put in place at Oconee's Reactor 1 within the next few weeks, while Reactor 2 will receive the same upgrades during next year's refueling and Reactor 3 will get the digital conversion in 2013. The new panels for all three reactors will cost $250 million, and is expected to keep the reactors running safely for another 30 years.

"This is from the DailyTech.com. It's a science website." -- Rush Limbaugh

