

Ground Broken for New  
Nuclear in United States



ENGINEERING  
ENERGY

Czech Republic: New Kid  
in the Bloc has Power

Westinghouse:  
New Capital in BWRs  
New Expansion –  
Cranes, I&C, Fuel



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Breaking from its historical role under various foreign rules and taking control of its own destiny, the Czech Republic has emerged with a fierce independence and an exceptionally strong energy sector. Energy independence is one of the three main pillars of its State Energy Policy and as a current energy exporter and future new nuclear builder, the small country continues to prove its own political and economic stature.

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A topical report based on comprehensive steam dryer analysis technology acquired by Westinghouse should result in NRC approval of the methodology and a safety evaluation report. Utilities can then apply the methodology to test, and if necessary, mitigate load of the steam dryers prior to submitting license amendment requests for power uprates.

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An acquisition of CS Innovations Inc. complements a Westinghouse core business expansion initiative to meet the instrumentation and control upgrade needs of operating nuclear power plants, enhance new plant construction and support Westinghouse localization goals for the western U.S. Groundwork has been laid for these efforts with the successful application of the NRC-approved advanced logic system platform.

### 24 ASSEMBLING TO FUEL THE MARKET

Westinghouse expands its global position in the nuclear fuel market by acquiring a 52 percent share of Nuclear Fuel Industries Ltd., Japan's sole producer of nuclear fuel for both pressurized and boiling water reactors.

### 26 IMPROVING PRODUCTIVITY FOR FUEL ASSEMBLIES

Among the capitol improvements resulting from the \$19 million Westinghouse and Toshiba are investing in new equipment to accommodate new build is the addition of two new, high-speed, continuous-operation cold mill pilgers, which are used to process seamless zirconium tubing – a key component of fuel assemblies and critical component to fuel performance.

*Please email comments and suggestions to:  
[e2@westinghouse.com](mailto:e2@westinghouse.com).*

## Perspective

In my introduction to the spring/summer edition of *e<sup>2</sup>*, I discussed at length the sometimes misinformed, sometimes malicious rumors being circulated about nuclear energy and its potential as a solution to the energy challenges facing many parts of the world today.

I am happy to report that during the last six months, our industry has provided even more compelling proof that the rumors are unfounded, that the nuclear new build renaissance is real, and that nuclear energy will play a leading role in the global effort to reduce greenhouse gas emissions while securing energy independence for regions of the world that are now overly reliant on coal or imported oil and natural gas.

Just this past August, for example, Westinghouse announced the successful placement of the largest module for the first of two AP1000™ nuclear power plants now under construction at the Sanmen site in Zhejiang Province, China. One month later, we announced the on-time and on-budget completion of basemat foundation concrete for the first of two additional AP1000s under construction at the Haiyang site in Shandong Province. In December, we poured first concrete on time at Sanmen 2. Simply stated, these milestones keep us well on track to bring the first AP1000 online in China in 2013, with the remaining three plants currently under contract to come online during the following three years.

I am also happy to report that in the United States, site preparation work is underway at both Southern Nuclear Operating Company's Vogtle site in Georgia and South Carolina Electric and Gas Company's V.C. Summer site in South Carolina.

Also in the United States, Westinghouse is working closely with the Nuclear Regulatory Commission (NRC) to earn approval of design amendments to the AP1000's Design Certification Document, for which we received final design certification rule in early 2006. These amendments, which affect less than 10 percent of the total plant design, are driven primarily by changes in NRC requirements and are viewed by Westinghouse as a normal part of the licensing process. We remain confident that we will bring the first new plants online in the United States, as planned, in the 2016 timeframe.



While we are certainly proud of the new build progress we are making in China and the United States, Westinghouse continues to make investments to expand the range of services we provide with the overall goal of making the operating fleet even more efficient and cost competitive. Toward that end, Westinghouse has:

- Installed new pilgers at our zirconium tube manufacturing facility in Blairsville, Pennsylvania (USA)
- Opened a new BWR service center and welding school in Chattanooga, Tennessee (USA)
- Formed a joint venture company in Hutchinson, Minnesota (USA) to build and test specialty cranes for a wide range of uses in nuclear power plants
- Announced the acquisition of CS Innovations LLC, a leading digital instrumentation and control nuclear product supplier to the safety system market based in Scottsdale, Arizona (USA)

More details on these milestones, and about our previously announced acquisition of Nuclear Fuel Industries Ltd. (NFI) in Japan, can be found in this issue. Additionally, I am sure that you will take interest in our feature story on the Czech Republic and its plans to expand its nuclear generating capacity to reduce carbon emissions and further foster energy independence.

Aris Candris  
President and CEO, Westinghouse Electric Company

# A New Dawn for Nuclear New Build in the United States

*After the 30 Plus Years' Hiatus, U.S. Ground is Being Broken for New Nuclear*

*By Sarah Barczyk, Westinghouse Technical Communications*



Plant Vogtle Construction/Units 3 & 4/October 7, 2009

© Southern Nuclear

*With a combined operating license in NRC review and an early site permit in hand, Southern Nuclear has given the green light for Plant Vogtle construction for Units 3 and 4 to begin. The Westinghouse and Shaw AP1000™ Consortium will build two AP1000 plants – the first Generation III+ plants and the first new nuclear plants of any kind to be built on U.S. soil in more than 30 years.*

As the U.S. seeks to reduce its dependence on foreign sources and carbon-emitting fossil fuels, nuclear power is at the forefront of the energy debate. The International Atomic Energy Agency (IAEA) forecasts that nuclear energy will double by 2030 worldwide to meet growing demands for clean, base-load energy.<sup>1</sup> And the United States is on board. Plans to build 30 new nuclear power plants in the U.S. are under consideration.<sup>2</sup>

Westinghouse, along with a number of utilities, is at the vanguard of this U.S. nuclear new build effort. In its consortium with The Shaw Group Inc., the company is on target to design, construct and deliver the first four new nuclear power plants to be built in the U.S. in the last 32 years. They will be built at the Alvin W. Vogtle Electric Generating Plant in Waynesboro, Georgia, and the V.C. Summer Nuclear Station in Jenkinsville, South Carolina. With the licensed Westinghouse Generation III+ AP1000™ nuclear power plant, “We are on the leading edge of the nuclear renaissance,” says Fred

Hughes, Westinghouse vice president AP1000 projects for V.C. Summer. “With that distinction comes the obligation to deliver these first few projects [in U.S. at V.C. Summer and Vogtle] on schedule and on budget. The world is watching how we perform on these projects.”

## **CONTRACTS SIGNED, APPROVALS GAINED ... AND EARLY SITE PERMIT WORK AT VOGTLE**

Georgia Power, subsidiary of Vogtle plant owner Southern Nuclear Operating Company, signed an Engineering, Procurement and Construction contract with the AP1000 Consortium (Westinghouse Electric Company and The Shaw Group Inc.) to build the two 1,102 MW AP1000 reactors – to be designated Vogtle Units 3 and 4 – in April of 2008. The contract marks the first agreement for new nuclear development in the U.S. since the Three Mile Island incident in 1979, and signifies the first two of 14 AP1000 reactors currently planned by U.S. utilities.

1. *Energy, Electricity and Nuclear Power Estimates for the Period up to 2030*, International Atomic Energy Agency, 2008 Edition

2. *Making the nuclear renaissance a reality*, Nuclear News, March 2008

A month prior to the contract signing, Southern Nuclear applied for a combined (construction and operation) operating license (COL) with the Nuclear Regulatory Commission (NRC) for the two new AP1000 units. The NRC is currently reviewing this application and is expected to issue the COL in 2011. Unit 3 is projected to come online in 2016 and Unit 4 in 2017.

Southern also applied for an early site permit (ESP), and its issuance by the NRC is perhaps the most significant realization of these domestic new build efforts to date. By completing the ESP process, many site-related safety and environmental issues (real or potential) have been resolved. Receipt of the ESP means that the NRC has determined the site is suitable for possible future construction of a new nuclear power plant.

“Receiving this ESP on behalf of Plant Vogtle co-owners is a significant accomplishment for Southern Nuclear and for the nuclear industry,” said Buzz Miller, executive vice president of Nuclear Development for Georgia Power and Southern Nuclear, in a statement issued by Southern on Aug. 26, 2009. “Southern Nuclear’s ESP is the first one in the industry based on a specific technology, the Westinghouse AP1000. It is also the first ESP that includes a Limited Work Authorization (LWA), which allows for certain safety-related activities to begin prior to receiving a COL from the NRC.”

The LWA allows Southern Nuclear to backfill more than four million cubic yards of qualified soil, and to install retaining walls and the waterproof membrane, all associated with the Nuclear Island. In short, it readies the site for “vertical construction,” which is the heavy-duty construction that will take place once the COL is issued.

According to Norm Boyter, Westinghouse vice president for AP1000 projects for Vogtle Units 3 and 4, “We have established the interim security, access roads, warehouses and trailer offices needed to support initial site construction activities. We are installing site utilities and excavating land for all required semi-permanent construction facilities to support their completion this year. We also have the excavation of the plant sites for Units 3 and 4 underway; and, having received the LWA, we will begin the backfill early this year.”

More than 400 workers are currently onsite. Peak construction efforts at Vogtle “will provide approximately 4,000 skilled worker positions, as well as 400 non-manual staff positions,” reports Boyter. Once online, the new reactors will approximately double the Vogtle plant’s current 850-person workforce to nearly 1,700, providing much-needed jobs to the area.<sup>3</sup> And much needed power: Miller comments, “With the addition of the two new AP1000 units, Plant Vogtle will be the largest producer of power in the U.S. in terms of generation and the second largest in terms of capacity. When Vogtle Units 3 and 4 come online, electricity capacity will be approximately 4,500 MW, second [in the U.S.] only to Grand Coulee’s hydroelectric dam, which, at full capacity, produces roughly 7,000 MW of electricity.”

“The demand for electricity in the southeast, and particularly in Georgia, will continue to grow,” said Mike Garrett, president and CEO of Georgia Power, in a press release issued by Southern on Aug. 26, 2009.

*Pre-construction work has begun at the V.C. Summer site in South Carolina (USA), where, during peak construction, there will be approximately 3,000 workers.*



3. Land Being Excavated for New Vogtle Reactors, AugustaChronicle.com, Sept. 30, 2009

“The new Vogtle units will help meet our growing energy needs by providing safe, reliable and economical electricity with a zero-emission technology.” He expressed that the project represents a multi-billion dollar capital investment in Georgia that will create thousands of construction jobs and 800 additional permanent jobs once the units are operational.

### V.C. SUMMER AND STATE OF SOUTH CAROLINA ANXIOUS TO KEEP NEW BUILD EFFORTS MOVING – SITE PREPARATION WORK IS UNDERWAY

On the heels of the Vogtle new build effort, Westinghouse and Shaw will construct two AP1000 reactors at V.C. Summer. Plant owner South Carolina Electric and Gas Company (SCE&G) (principal subsidiary of SCANA Corporation) and Santee Cooper (South Carolina’s state-owned utility) entered into an Engineering, Procurement and Construction contract with Westinghouse and Shaw in May 2008, one month following their Georgia neighbors. SCE&G currently has a COL pending before the NRC for the two new reactors, which are scheduled to be completed in April 2016 and January 2019, respectively; a milestone subject to a 2011 COL approval by the NRC.

With NRC COL authorization pending, the Public Service Commission of South Carolina (PSC) unanimously approved SCE&G’s plans to build the two new Westinghouse AP1000 plants at the V.C. Summer site. This approval by PSC allows limited site preparation work to begin at the plant. While not able to conduct the safety-related work that Vogtle is performing (SCE&G did not apply for an ESP), site preparation coordinated by Shaw is already underway, according to Fred Hughes, who also acts as the consortium director for the V.C. Summer project. “Pre-construction activities are focused in two areas. The first is preparing the infrastructure to support construction, such as installing the main plant and construction access roads. The second focuses on preparing for and completing the power block excavations for Units 2 and 3.”

Like its immediate predecessor on the U.S. new build front, the V.C. Summer project is providing much-needed employment to hundreds of people. Hughes indicates that there are approximately 500 workers onsite who are involved in the pre-construction activities. There are an additional 150 to 200 employees in the home offices of Shaw and Westinghouse, preparing project plans, tracking progress with the project schedule, completing and monitoring site-specific design activities, and performing other project management

activities. Onsite, at the peak of construction there will be approximately 3,000 workers. To fill the construction positions, Shaw has opened a local recruiting office. Westinghouse will fill its positions separately through existing workforce and new hires. Once the new units go online, V.C. Summer will be seeking to employ at least 500 additional permanent employees.

Hughes is quick to applaud the “excellent” support the state of South Carolina has given to the nuclear industry. “Experience is showing us that, for the engineering packages submitted to obtain state permits, as long as the packages are complete and detailed, state approval is very efficient.”

It’s no surprise that South Carolina has recognized the benefits of nuclear power. The existing reactor at the V.C. Summer site currently provides 18 percent of South Carolina’s power. By 2019, with the three units online, this amount will jump to 53 percent and will reduce the amount of carbon emissions from 21 million tons to 17.5 million tons by year 2020. Generation of the equivalent amount of power with wind would require wind mills three quarters of a mile deep the entire length of the South Carolina coastline.<sup>4</sup>

### WESTINGHOUSE ...

#### PROUD AND PRIVILEGED TO BE A PART OF NEW BUILD

Both Hughes and Boyter echo the same sentiment when it comes to the work they are performing.

Boyter declares, “The Westinghouse, Shaw, and Southern Company team recognizes the vital importance of the success of the Vogtle Units 3 and 4 project to not only these three companies, but also to the Georgia rate payers, the nuclear industry and long-term U.S. energy production.”

And Hughes concurs. “My entire project team is excited to be on the leading edge of the nuclear renaissance in the U.S. and be the pioneers developing/executing the processes and plans to deliver these new AP1000 plants. The challenge is to deliver the project in a cost-efficient manner such that we build these two units on time and on budget in a high-quality manner.”

Indeed, these first U.S. nuclear new build projects will be scrutinized perhaps like no others. Neither the U.S. public nor the industry will tolerate mishap. Yet, the safety record of the nuclear industry has outshined all others for decades now. The future looks bright for the new, larger role of nuclear power in the U.S. energy mix.

4. SCE&G presentation to Italy’s Economic Development Minister Claudio Scajola, Sept. 30, 2009

# Westinghouse: Initiating an Evolution from Within

By Lynnann Reid,  
Corporate and GG&I Communications



*Westinghouse has begun a transformational journey. The medium is our Global Growth & Innovation (GG&I) change initiative.*

*The GG&I efforts, begun in 2008, are focused on making dramatic changes in several key areas of the company to help us serve our customers better as “one Westinghouse.” Here, Westinghouse Global Growth & Innovation Senior Vice President Dan Lipman shares his thoughts on priorities for the GG&I initiative, our vision for change, what we will look like in the future once we have successfully transformed the company and, most importantly, how it will benefit our customers.*

**“IT IS NOT THE STRONGEST OF THE SPECIES THAT SURVIVE, NOR THE MOST INTELLIGENT, BUT THE ONE MOST RESPONSIVE TO CHANGE.”**

**-Charles Darwin 1809-1882, English biologist and father of the evolution theory**

## **Q: WHY IS WESTINGHOUSE CHANGING, AND HOW WILL THAT BENEFIT WESTINGHOUSE CUSTOMERS?**

The premise behind this change is growth – how do we run our company to capture the future? The rebirth of nuclear power in many parts of the world has caused us to challenge our traditional business practices so that we may continue offering our customers the cutting-edge products and services they expect. Through the GG&I efforts, Westinghouse is changing to ensure that our performance remains high for the existing fleet of nuclear plants, while we help build the future fleet of plants. Our objective is to demonstrate seamless, excellent performance on all projects that support our current fleet despite the growth of the industry ... while making our internal processes invisible.

## **Q: WESTINGHOUSE HAS ALREADY MADE CHANGES THROUGH THE CUSTOMER 1<sup>ST</sup> INITIATIVES. WHAT IS DIFFERENT ABOUT GG&I?**

Customer 1<sup>st</sup> has been a way of life at Westinghouse for six years now, and it will remain the continuous company-wide improvement initiative. Global Growth & Innovation is a temporary enterprise designed to change and restructure Westinghouse from the inside out to position ourselves in new markets, operate more effectively and serve customers even more responsively.

## **Q: SO WHAT SPECIFIC CHANGES ARE YOU MAKING THROUGH GG&I?**

First and foremost, we’re looking to reshape our decision-making process by decentralizing certain commercial decisions, moving its nexus closer to our customers. We have several pilot programs underway in the United Kingdom, France and Japan to test our belief that this new operating model will improve our performance and responsiveness.



*Westinghouse Global Growth & Innovation Senior Vice President Dan Lipman and world-renowned change management guru Dr. John Kotter meet at Harvard University, Cambridge, Massachusetts (USA) to discuss Westinghouse's GG&I initiatives.*

To support this new operating model, we will make improvements in our core processes and infrastructure. We will establish center-led leadership for quality and continuous improvement, for global supply chain management and for infrastructure functions like information systems, finance, strategy, human resources, etc. We expect this to enable better standardization of key processes, and to improve our ability to move decision-making beyond the boundaries of our headquarters in the U.S., while creating scalability and efficiency for future expansion.

We also expect these changes to improve the working environment for our employees – less frustration, greater collaboration, better transparency, and improved computer systems and technologies. The bottom line is we're working very hard to change some fundamentals that will help us become "one Westinghouse."

#### **Q: WHERE DOES WESTINGHOUSE TECHNOLOGY FIT INTO THOSE CHANGES?**

Through GG&I, Westinghouse's goal is to positively differentiate ourselves to customers with a renewed focus on our demonstrated leadership in technology. We plan to increase emphasis on developing revolutionary, breakthrough technologies – redoubling our efforts to help customers improve their operations and value. Advanced technology has always been a defining characteristic of Westinghouse. We intend to greatly re-strengthen our efforts to make sure this remains true. Customers can expect to see some truly exciting developments as we improve our internal processes for identifying and funding revolutionary technology.

#### **Q: LARGE ORGANIZATIONS DO NOT TYPICALLY MANAGE CHANGE WELL. WHAT ARE YOU DOING DIFFERENTLY TO POSITIVELY EFFECT THESE CHANGES?**

We've created a partnership with change leadership expert, Dr. John Kotter. He and his team at Sage | Kotter LLC are helping us install a disciplined change leadership process built around the eight steps of change leadership (see sidebar). Also, for the first time ever, we have formed a globally diverse and collaborative body called a Guiding Coalition. This group of volunteers has been assembled from 18 different sites in eight countries to help lead Westinghouse's change implementation and help the teams remove barriers that prevent us from realizing our change vision. Our intention is to build a new core competency within Westinghouse for change leadership. This will help our performance on a day-to-day basis and manage a lot of the risk that comes with future growth.

#### **Q: HOW WILL CUSTOMERS KNOW WHEN WESTINGHOUSE HAS BEEN SUCCESSFUL WITH IMPLEMENTING ITS CHANGE INITIATIVES?**

Today's multi-business-unit operating model at Westinghouse creates mixed messages for our customers and limits Westinghouse's ability to offer the customized solutions and strategies customers want for their plants. When we are finished with the GG&I initiatives, our customers will be working with Westinghouse in a dramatically different way than they do today. They will have a much more local Westinghouse experience that enables close-to-customer decision-making and incorporates local norms and regulations while also leveraging the power of global, standardized processes. In short, it will be much easier and more rewarding for our customers to do business with us.

## CHANGING WESTINGHOUSE ONE STAGE AT A TIME

John P. Kotter is a world-renowned expert on leadership at the Harvard Business School in Cambridge, Massachusetts (USA). He is the author of many books, including the best-seller, *Leading Change*. His Eight-Stage Process of Creating Major Change is based on his work with hundreds of global companies that have undergone dramatic change. Westinghouse has been working with Dr. Kotter and his associates to apply his change leadership principles to the transformative changes the company is undertaking through the GG&I efforts.

### THE EIGHT-STAGE PROCESS OF CREATING MAJOR CHANGE<sup>1</sup>

1. Establish a sense of urgency
  - Examine the market and competitive realities
  - Identify and discuss crises, potential crises or major opportunities
2. Create the Guiding Coalition
  - Compile a group with enough power to help lead the change
  - Get the group to work together as a team
3. Develop a vision and strategy
  - Create a vision to help direct the change effort
  - Develop strategies to achieve that vision
4. Communicate the change vision
  - Constantly communicate the new vision and strategies
  - Have the Guiding Coalition model the behaviors expected of employees
5. Empower broad-based action
  - Remove obstacles and change systems or structures that undermine the change vision
  - Encourage risk-taking and non-traditional ideas, activities and actions
6. Generate short-term wins
  - Plan for and create visible improvements in performance, or “wins”
  - Visibly reward and recognize people who made the wins possible
7. Consolidate gains and produce more change
  - Use increased credibility to change all systems, structures and policies that don’t fit the transformation vision
  - Hire, promote and develop people who can implement the change vision
  - Reinvigorate the process with new projects, ideas and change leaders
8. Anchor new approaches in the culture
  - Create better performance through customer- and productivity-oriented behavior, more and better leadership and more effective management
  - Articulate the connections between new behaviors and organizational success
  - Develop means to ensure leadership development and succession

1. *Leading Change*, Dr. John P. Kotter, 1996, Harvard Business School Press

# Crane Joint Venture

## *Will Provide a Lift to Nuclear Plants Around the World*

*By Meghan Young, Westinghouse Nuclear Services Communications*



*Hutchinson Manufacturing Inc. (HMI) is a second-generation, family-owned, job-shop metal fabricator specializing in medium-to-heavy steel fabrications requiring a more specialized approach to welding, machining and coatings.*

*Westinghouse subsidiary PaR Nuclear provides fuel-handling equipment, outage-critical cranes, and service and support for commercial nuclear power plants worldwide.*

*The two have joined forces in the joint venture company NuCrane Manufacturing Inc. to fabricate, assemble and test specialty cranes for nuclear power plants.*

*PaR Nuclear's polar crane is used in nuclear power plants to lift a variety of heavy and expensive loads safely.*

Westinghouse subsidiary PaR Nuclear recently formed a joint venture with Hutchinson Manufacturing Inc. (HMI). The joint venture company – NuCrane Manufacturing – will fabricate, assemble and test specialty cranes for nuclear power plants. Specialty cranes are either single-failure proof, meaning that any single failure in the hoisting system will not cause a load to be dropped; extremely large; custom-engineered for unusual applications or access; or a combination of some or all of the above.

NuCrane Manufacturing is good news for the growing nuclear power industry since a typical nuclear plant uses 40 cranes in various applications. The new company will produce cranes for the Westinghouse-designed AP1000™ nuclear power plants under construction in China, and for those planned for future construction in the United States. NuCrane also will support other new nuclear power plants.

NuCrane complements PaR Nuclear's capabilities to provide fuel-handling equipment, outage-critical cranes, and service and support for commercial nuclear power plants worldwide. The joint venture will foster synergies between the two companies to achieve shorter plant outage durations.

Bill Burns, president of PaR Nuclear, said, "This partnership will provide Westinghouse the opportunity to manufacture cranes and specialty hoists in support of its AP1000 nuclear plant construction worldwide. It will also provide the capabilities to deliver modification and replacements for the current nuclear fleet – both PWRs [pressurized water reactors] and BWRs [boiling water reactors]."

Nick Liparulo, senior vice president of Westinghouse Nuclear Services, said, "The venture allows Westinghouse to maintain ownership and participation in the entire lifecycle of the crane technology, from engineering design through manufacture, installation and operational service and upgrades."

*Estimates suggest that it took between 20,000 and 30,000 laborers to build the Great Pyramid at Giza by pulling the massive blocks up earthen ramps. The ancient Greeks had a better idea: the construction crane. But even the first construction cranes relied on the physical exertion of men or animals. Over the years, cranes have been improved – specialty cranes today can lift more than 100 tons with just one operator.*

#### DIGGING IN

NuCrane Manufacturing broke ground on a 51,000-square-foot, 56-foot-high factory near HMI's existing site in Hutchinson, Minnesota (USA), on Oct. 8, 2009. When the doors open on April 1, 2010, NuCrane employees will be manufacturing cranes that weigh as much as 1.3 million pounds and measure as high as 43 feet. The first manufactured cranes are scheduled to ship in mid-2011.

Sixteen different types of cranes and hoists will be built for each new nuclear facility, including polar cranes, cask-handling cranes and Turbine Building cranes, as well as hatch, personnel and baffle hoists. In addition to providing lifting capabilities to new plants, NuCrane Manufacturing will provide equipment to several U.S. nuclear power plants that are facing recertification.

“The new facility will be equipped with four 75-ton cranes to produce the new cranes,” said Tom Daggett, president of HMI. “There is no other facility in North America that will support this type of manufacturing on this magnitude.”

“We’re pleased to be bringing additional jobs to the Hutchinson area,” said David Howell, vice president of Westinghouse Field Services. “We hope to eventually have as many as 50 employees working at the new site. And, as with all of our team members, these new employees will be onboarded and will understand that they are important contributors to the supply of safe, clean and reliable nuclear energy ... that human performance tool use is required ... and that in our industry, safety and operational excellence are everything.”

## CRANES AND HOISTS TO BE BUILT BY NUCRANE FOR THE AP1000 NUCLEAR POWER PLANT

### CRANES

- Polar Crane
  - Rides on circular rails and is used to lift reactor heads, reactor internals, and a multitude of lighter loads during refueling outages
  - Rated capacity – 300/25 tons (main hoist/auxiliary hoist), both hoists – single-failure proof
  - 124 feet long, 44 feet wide, 37 feet tall, weighs more than 1 million pounds
- Cask-handling Crane
  - Operates in the Auxiliary (Fuel) Building – primarily used to handle spent fuel transfer or storage casks that remove spent fuel from the plant and new fuel assemblies delivered to the plant
  - Rated capacity – 150/10 tons, both hoists – single-failure proof
  - 62 feet long; 26 feet wide; and 14 feet, 4 inches tall
- Turbine Building Crane
  - Handles the main components of the turbine-generators for installation and maintenance
  - Rated capacity – 220/25 tons
  - Bridge spans in the range of 120 feet
- 15-ton Turbine Building Crane
- Rail Car Bay Crane in the Auxiliary Building
- Annex Building Staging Area Crane
- Annex Building Hot Machine Shop Crane
- Mobile Systems Facility (Radwaste) Crane
- Two Steam Generator Jib Cranes

### HOISTS

- Two Single-failure-proof Hatch Hoists in the Containment Building
- Two Personnel Hoists (in the annulus – the space between steel containment vessel and Concrete Shield Building)
- Two Baffle Hoists (also in the annulus)

*For more information, contact  
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# The Czech Republic

## Central Europe's Dominant Force in Energy

Perhaps as a result of its landlocked position and former status through history under various rulers, combined with its intensive industrialization, the relatively recently independent Czech Republic has placed energy security at the center of government policy. Shedding its most recent cocoon of Russian satellite status to gain its independence in 1989, the country has done very well.

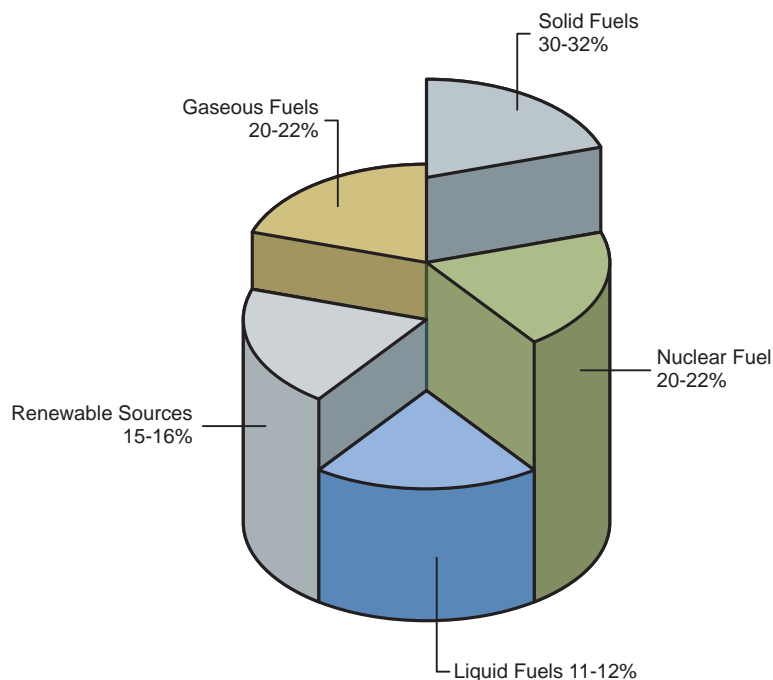
### A STRONG ECONOMY SUPPORTED BY A STRONG ENERGY SECTOR

The country has enjoyed unique success since independence in terms of gross domestic product (GDP) growth, financial stability, employment, inward investment and quality of life. It has a remarkable industrial endowment; today, the manufacturing industry accounts for 35 percent of GDP and 29 percent of labor force employment. More than 75 percent of the population is urbanized, with 12 percent living in the capital, Prague.

Fueling the industry and urban lifestyle is an exceptionally strong energy sector, which has changed substantially since the country's break with the previous regime. Energy efficiency for supply and consumption have improved, emissions have fallen and the government has made various gas and electricity sector reforms that come in line with relevant European Union (EU) directives. The Energy Regulatory Office was established in January 2001. And in 2003, when the new Temelín nuclear power plant was brought online, it helped the small Czech Republic turn its landlocked centralized geographic location into a strategic advantage, allowing the country to become a major exporter of electricity (*Energy Policies with IEA Countries, The Czech Republic 2005 Review*, International Energy Agency, 2005).

*Westinghouse hired Adrian Wheeler of Agincourt Communications to contribute significant content to this article. He works in London, England, and lives in Prague, Czech Republic.*





*Czech Republic State Energy Policy Goal for Consumption of Primary Power Sources by 2030*

(State Energy Policy of the Czech Republic, Ministry of Industry and Trade of Czech Republic, Prague 2004)

### THE CZECH REPUBLIC'S ENERGY POLICY

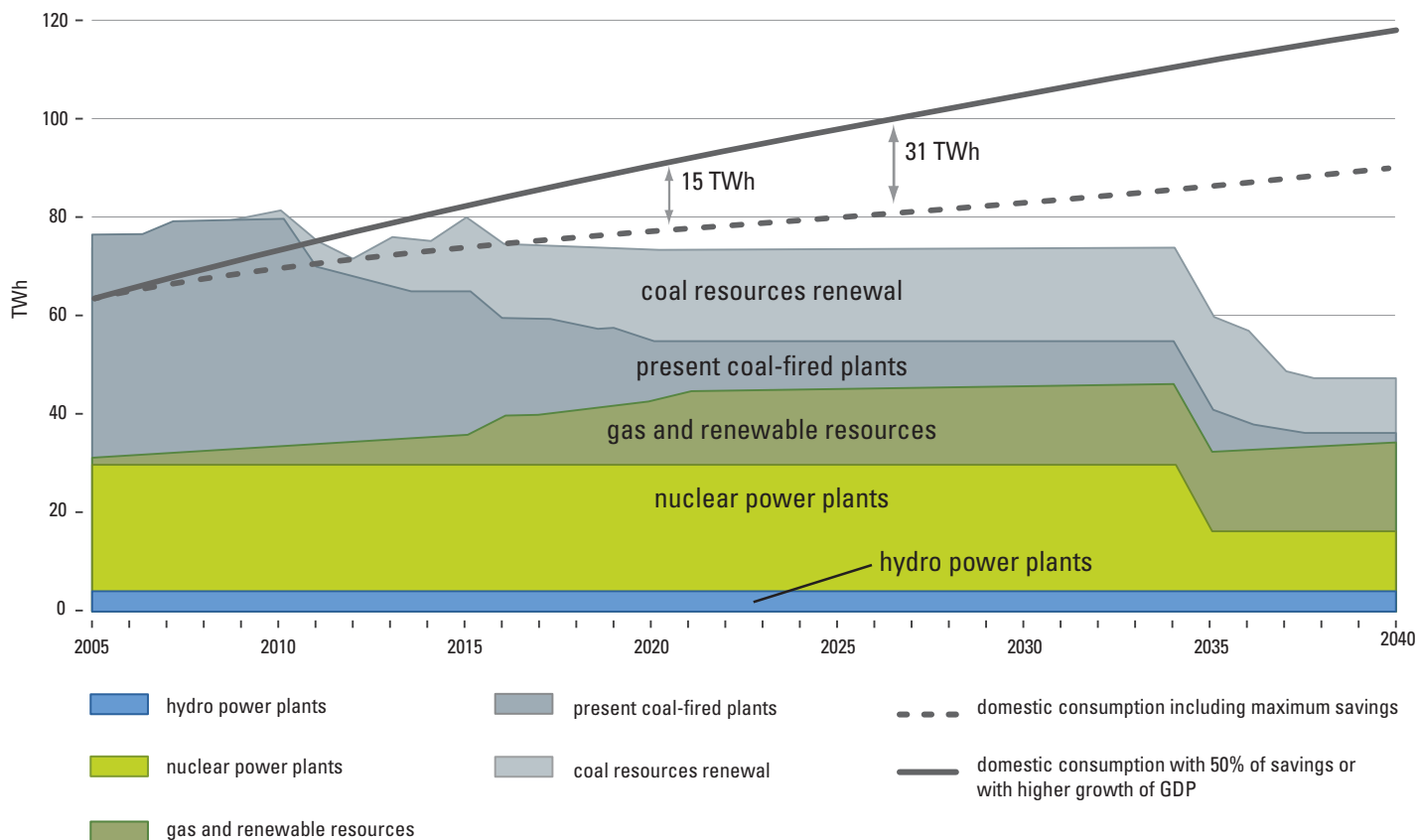
The Czech Government's current energy strategy was developed in 2000, shortly after the country regained its freedom, and was formalized in March 2004. As delineated in *The State Energy Policy of the Czech Republic*, it stands on three main pillars: independence, energy security and sustainable generation. This is in line with the policies adopted by the European Union (which the Czech Republic joined in that year) and in line with the International Energy Agency's *Shared Goals* to achieve what it has dubbed the three Es of energy policy: energy security, economic growth and environmental sustainability. Within its state energy policy, the Czech Republic prioritized objectives to support policy goals. Those objectives given very high priority are:

- Maximizing energy utilization – aimed at improving one of the country's most serious problems – the current high energy and electricity intensity of GDP creation
- Maximizing efficiency in acquiring and converting energy sources
- Promoting electricity and heat production from renewable energy sources
- Optimizing the use of indigenous energy sources

While it has entered the world stage, becoming a member of the North Atlantic Treaty Organization in 1999 and of the European Union (EU) in 2004, the Czech Republic's now 20-year independence is not without some difficulties. Following a no-confidence vote in March 2009, the Czech Republic installed a 'caretaker' government led by Prime Minister Jan Fischer until the next elections, which are due in May or June 2010. Dubbed a Euroskeptic, President Vaclav Klaus has been the subject of global media attention for his declared intention of holding out against the Lisbon Treaty, thereby blocking Europe's further integration. But President Klaus signed the Lisbon Treaty, hours after the Czech Republic's high court ruled it compatible with the country's constitution on Nov. 3, 2009. The move means the Treaty, already ratified by the other 26 members of the bloc, could be put into force. ("Klaus Signs Lisbon Treaty," *The Wall Street Journal*, Nov. 3, 2009)

The treaty will create a new, full-time president of the EU and a foreign minister intended to boost the union's position in international affairs. Delaying ratification of the treaty is, perhaps, more understandable of a country that has experienced long years of outside rule, as now internal changes to the EU's system of lawmaking mean individual countries will have a more difficult time blocking EU legislation. Independence hard sought, worked for and won is not easily compromised.

Donna Ruff,  
Managing and Senior Editor



*Expected Electricity Generation versus Evolution of Consumption in the Czech Republic – as of end of 2007: Current forecasts show the Czech Republic will begin facing an electrical deficit between 2015 and 2025.*

Supporting these priorities and that of Czech energy planning to maintain affordable energy, Czech electricity supplies are among the 10 cheapest in the EU 27 for consumers and among the 12 cheapest for commercial customers. Holding prices down, however, while also moving toward a target set at eight percent energy generation using renewables by 2010, presents planners with a problem.

While named as a very high priority objective, progress in the renewables sector has been slower than intended: The Ministry of the Environment of the Czech Republic admitted in 2008 that the eight percent target set for 2010 would not be reached. Incentives for wind, solar and biomass generation increased by just one percent between 2005 and 2008. However, improvement is being pursued. In 2009, the Ministry launched a

€341 million (euro) or \$500 million (U.S. dollar<sup>1</sup>) program to encourage householders to install solar, biomass and underground heating. For long-term targets set forth in the policy, the only two primary energy sources for which consumption is predicted to increase following the state's plans are nuclear and renewables.

#### ENERGY RESOURCES

The Czech Republic has an abundance of natural energy resources. Its landscape explains the country's fortunate energy position: undulating plains and hills surrounded by a ring of mountains. Its sedimentary geology has given it substantial reserves of coal, both hard and lignite, while the numerous rivers flowing down from the mountains supply a network of hydro-generating plants.

1. All currency amounts are based on a 0.6811 to 1 euro to dollar conversion ratio.

And the resources are being carefully scrutinized as the Czechs are critical of their emissions footprint – the Green Party is a significant political force, with several members serving as government ministers in recent years – and are eager to reduce it. This is a country where 69 percent of the population sort their household waste and that leads the EU in plastic packaging recycling.

## COAL

Still, like most Central and Eastern European countries, the Czech Republic relies heavily on coal for electricity generation. Coal is plentiful – the country has large enough reserves to allow exports – but is also environmentally harmful: 75 percent of the coal produced is of the brown or lignite variety, with a high content of sulphur and other impurities. Coal currently accounts for 43.6 percent of the country's indigenous energy (IEA, 2007) and the Czech Republic produces 68 million tons annually, with recoverable reserves estimated at 6.2 billion tons.

Coal consumption declined by 26 percent between 1993 and 2006, mainly due to the commissioning of the Temelín nuclear power station. Yet the Czech Republic is a net exporter of coal, and, as described in the *State Energy Policy of the Czech Republic*, government envisages coal remaining as the country's primary energy source, still accounting for 30.5 percent of consumption in 2030.

## HYDROELECTRICITY

Hydro was sourced for 2.9 percent of electricity production in 2007. ČEZ (pronounced chez), the country's pre-eminent energy company, operates 37 hydroelectric generation plants, of which the most important is the Vltava Cascade, a string of dams and reservoirs on the river running north to Prague. According to ČEZ, its hydro resources are equivalent to 17 percent of the company's installed generating capacity. Hydro plays an important though minor role in helping the Czech Republic meet its ambitious renewables targets.

## OIL & GAS

Oil and gas deposits in the Czech Republic are minimal. Production in 2005 totalled 445,000 cubic yards of crude and 129 million cubic yards of natural gas.

Business Monitor estimates that Czech consumption of oil will rise 18.4 percent by 2018, with negligible domestic contribution, and that gas imports will rise from 12 billion cubic yards in 2008 to 15 billion cubic yards in 2013, again with almost no contribution from domestic resources. The Czechs have long-term gas supply contracts with both Norway and Russia, and store enough gas (which is mainly used for domestic heating) to provide 35 percent of annual consumption; this amount will increase to cover half a year's domestic consumption by 2013 (statement by RWE<sup>2</sup>, Prague Daily Monitor, Jan. 16, 2009).

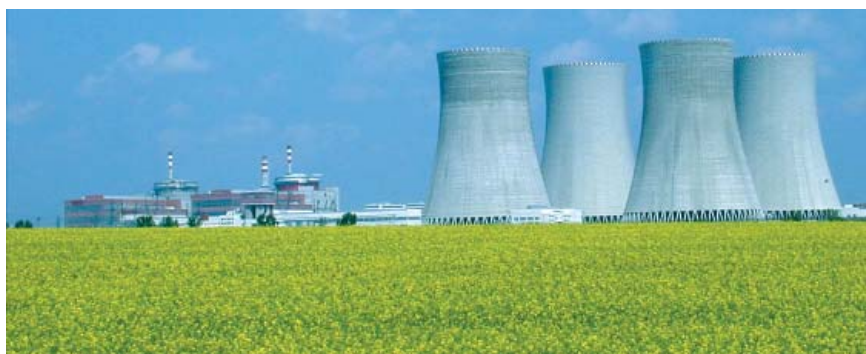
## URANIUM

Although it is not a statistically significant contributor to the Czech energy industry today, Czech uranium mining has played a notable role in the development of the nuclear industry over the last 50 years. Mining began at Jachymov in the 1890s; this Czech site was the world's first, and for some years only, source of radium. From 1947, the 64 Czech uranium deposits were exploited to supply the needs of the Soviet nuclear program, delivering 113,000 tons until 1992. After independence, the industry was scaled down and today Rožná is the Czech Republic's, and Europe's, only operating uranium mine. It produces 331 tons a year and its reserves are estimated to last until 2015. In recent years, investors have also shown interest in the re-opening of other Czech uranium mines.

## WIND & BIOMASS

Sustainable alternatives such as wind and biomass currently make a minimal contribution to the country's overall energy mix. The country's topography and climate mean that wind power will always remain a minor source. Biomass is under intensive investigation and is a favorite candidate of the Greens, but the statistics show that while biomass is predicted to grow in generation more

*The Temelín site contains the infrastructure for the originally planned four reactor units. The two units currently operating produce 2,000 MW electricity – already making the site the largest electricity producer in the country. An invitation for tender should eventually result in the site's completion to four units.*



2. RWE is a German power producer that sells and trades gas and oil, among other commodities. The utility stores gas underground, which is used to cover shortfalls in supply to its European gas consumption market.



*The Czech Republic is a country of 10 million people. Energy security is high priority in this landlocked country. The geopolitical issues are complicated and sensitive. The Czechs' 40 years as a Soviet satellite created not only significant relationships between the Czech and Russian establishments, but also a national disinclination to be dependent on any single larger country for critical energy supplies. As of today, the Czech Republic performs well in the EU's energy dependency league table, where it appears at number 25 out of 27, with only 12.9 of its total supplies depending on imports.*

**"NUCLEAR ENERGY IS THE ONLY POSSIBILITY FOR THE CZECH REPUBLIC TO MEET THE OBJECTIVES OF THE EUROPEAN UNION IN THE SPHERE OF CLIMATE PROTECTION. THE NUCLEAR ENERGY INDUSTRY HAS THE FULL SUPPORT OF THE PUBLIC AND POLITICIANS. I AM CONVINCED THAT THE ADVANTAGES OF NUCLEAR ENERGY FROM THE POINT OF VIEW OF SECURITY AND CLIMATE PROTECTION ARE ABSOLUTELY OBVIOUS."**

*... from a speech given by Czech Prime Minister Jan Fischer to the European Nuclear Energy Forum May 22-23, 2009*

than any other renewable per the state's energy policy, the Czech Republic does not have enough available agricultural land to make it a significant alternative. By 2030, it is predicted to generate 10.96 TWh.

#### **NUCLEAR**

Czechs are overwhelmingly in favor of nuclear power generation, with 77 percent of citizens – and 56 percent of Green Party voters – declaring support for the enlargement of the nuclear power station at Temelín. Nuclear already provides over 30 percent of the Czech Republic's electricity; the EU average is 14 percent. The Czech Republic currently has six nuclear reactors. The first was built at Dukovany, 100 miles southeast of Prague, where construction began on four 440 MW reactors in 1978, with all four units being in commercial operation by 1987. All four units were then uprated to 456 MW gross each from 2005 through 2008 and decommissioning is planned to begin in the 2015 to 2018 time frame.

Meanwhile, in 1982 work began on the second site, Temelín, near Ceske Budejovice, where the original design intended four units, but original construction for two of the four Soviet-design reactors was stalled. When construction resumed on two of the units in the mid-1990s, Westinghouse supplied and installed the instrumentation and control systems. The two units came online in 2000 and 2003, respectively. Westinghouse supplied the nuclear fuel. Currently, these two reactors produce 2,000 MW, making Temelín the largest single electricity generating plant in the country. The plants are all owned and operated by ČEZ.

In August 2009, ČEZ issued a request for qualification documentation to support an invitation to tender for the construction of the two never-built reactor units at the Temelín site, where the infrastructure for the units is already in place. ČEZ specified third-generation PWR technology as a requirement for the design. The request for qualification documentation refers to an option for three additional reactors that ČEZ plans to build. According to Reuters, one or two of these will be at the existing nuclear power plant at Bohunice in western Slovakia, where expansion was announced in May 2009 as a joint venture between ČEZ and the Slovak Nuclear Decommissioning Company, while the third may be intended for Dukovany.



There are three known candidates that have responded to the request: Atomstroyexport (Russia) with its Modernized International Reactor, the MIR-1200; Aрева (France) with its Evolutionary Power Reactor™; and Westinghouse (U.S.) with its AP1000™. ČEZ expects to issue the formal tender request at the end of 2010, with a decision being announced in late 2011. The new construction work at Temelín is planned to start in 2013 to meet a 2019 commercial operation date. However, at the All for Power conference held in Prague Nov. 12-13, 2009, Dana Drábová, chairwoman of the Office of Nuclear Safety, stated, “The legal framework for licensing a nuclear reactor is very intricate.” She said, “All parties involved in the tender should be happy if construction begins in 2014.” (*Three Finalists vie for Temelín Tender*, The Prague Post, Nov. 18, 2009)

#### ENERGY INDEPENDENCE AND THE ROLE OF ČEZ

ČEZ was established in its present form in 2003 when the Czech national electricity generator merged with a number of regional distribution companies. Since then it has become one of the 10 largest electricity producers in Europe and the second largest exporter of electricity after France’s EDF (Électricité de France). This remarkable growth has been accompanied by employee productivity gains of over 50 percent in four years.

ČEZ is 70 percent owned by the Czech government and is viewed as a strategic national asset, as well as a substantial contributor to the state treasury. It has 3.5 million domestic customers and an additional 3.5 million in other countries. Along with the two nuclear power stations, it operates 15 coal-fired plants, 37 hydro installations, two wind-power sites and one solar power plant. It uses co-combustion in four of its plants and has agreements to build a further 50 wind-power plants. ČEZ generates 60,000 GWh a year.

ČEZ emerged as the world’s most profitable energy company in a Boston Consulting Group study published

at the end of October 2009. Petr Novak, energy sector analyst at Atlantik FT, told The Prague Post that a major key to ČEZ’s success is its ability to provide its own integrated set of power sources (*ČEZ is World’s Most Profitable Energy Company*, The Prague Post, Nov. 4, 2009).

Because of its dominant market position, ČEZ plays a major role in reducing the Czech Republic’s emissions in line with the EU’s targets. The company is investing €4.1 billion (\$6 billion) in refurbishing its coal-fired plants to lower emissions by 50 percent. ČEZ is also committed to a significant increase in nuclear capacity, stating that its published plans for enhanced nuclear generation capacity, both in the Czech Republic and elsewhere, represent an investment of €20.4 billion (\$30 billion).

#### THE CZECH REPUBLIC – A CENTRAL EUROPEAN LEADER WITH A BALANCED ENERGY STRATEGY

The Czech economy has grown steadily since independence. The global recession has put a brake on growth but less so than in neighboring Central and Eastern European nations.

The strength of the Czech manufacturing and services sectors is due in large part to the skill with which the government and ČEZ have managed a balanced national energy strategy. Affordability is key in an economy so dependent on manufacturing and exports. ČEZ has performed well in matching competitively priced energy supplies in the domestic Czech market with an aggressive drive towards its stated objective of being the leading producer of electricity in Central and Eastern Europe.

With its energy policy firmly in place, assertive strategy and nuclear new build on the horizon, the unfolding of the Czech Republic’s energy future and the country’s ability to meet its goals in this area, especially energy independence and security, will be quite an interesting story to follow.

# Gaining Through Training

## *U.S. BWR Service Center Augments BWR Training, Service Portfolio*

*By Kathy Szlis, Westinghouse Nuclear Services Communications*



While Westinghouse Electric Company has been a long-standing leader with more than 50 years designing, building and maintaining pressurized water reactors (PWRs), the company has provided services for boiling water reactors (BWRs) for some years as well.

### **AN ONGOING COMMITMENT TO A DIVERSE MARKET**

This year, Westinghouse demonstrated its continued commitment to providing BWR services by investing \$21 million in a new U.S. BWR Service Center in Chattanooga, Tennessee, a one-of-a-kind training facility in the United States. This new center leverages Toshiba's BWR training capabilities in Yokohama, Japan, and augments similar services provided in Västerås, Sweden. The new BWR Service Center provides services comparable to that of the company's PWR services provided at the Waltz Mill site near Pittsburgh, Pennsylvania (USA).

The new U.S. BWR Service Center features a full-size BWR vessel with mobile mockups, a refueling bridge and a spent fuel pool. It will be used to train field crews to perform BWR nuclear steam supply system modifications; and refueling, under-vessel, inspection, repair and specialty services. Specific services will include in-vessel visual inspections, in-service inspections, control rod drive exchange, and instrument and control and hydraulic control unit tooling services.

On Aug. 20, 2009, more than 250 employees and invited guests, including elected officials, attended the grand opening of the U.S. BWR Service Center. Nick Liparulo, senior vice president, Westinghouse Nuclear Services, officially opened the facility by cutting a ribbon while standing on the refueling bridge over the facility's full-scale BWR mock-up. "Our investment here in Chattanooga is reflective of ... our ongoing commitment to meet the diverse needs of our growing customer base. This facility represents a significant investment," Liparulo said, "but it will enable us to provide the highest quality reactor refueling, servicing and inspection training possible. And the new WEC Welding Institute here will provide hundreds of jobs to support our industry's growth."

The new WEC Welding Institute – the company's second in the U.S. – is also located within the facility. The institutes have been established to train welders to work in both nuclear and non-nuclear plants. Students receive four to six months of training at no cost, and then work for Westinghouse for 2,000 hours following welding certification. With 48 welding booths, the WEC Welding Institute in Chattanooga can certify 228 welders a year. The first WEC Welding Institute is located in Rock Hill, South Carolina (USA). Together, these institutes have the capacity to graduate more than 700 welders a year. See *Fusing the Gap*, e<sup>2</sup>, December 2008 issue.

*This \$21 million investment by Westinghouse is composed of a full-scale BWR cavity with vessel, internals, spent fuel pool, refueling bridge, two 33-ton cranes, under-vessel mock-up and 65,000 square feet of shop floor.*

*For the first time in the U.S., Westinghouse is capable of providing comprehensive BWR tool qualification and testing, mockups, wet training and reactor modifications.*



Underscoring Toshiba's dedication to the Chattanooga Service Center investment, Shigenori Shiga, senior vice president and chief coordination officer, Toshiba/Westinghouse Coordination Office, said, "The establishment of this facility is very meaningful. Its architectural design and many of the processes and technologies that will be deployed from here are based on those of the Toshiba BWR training center in Japan. This means that this facility, while offering all of the advantages of a new building, will also be able to make use of the decades of BWR experience acquired in Japan."

Additionally, Westinghouse is constructing a 25,200 square foot office building next to the new BWR Service Center to house approximately 165 employees and contractors. The completion of the building in March 2010 will create a complete complex for BWR training and welding services in the U.S.

#### **A DEDICATION TO A GROWING MARKET**

Meanwhile, Westinghouse's investment in supporting BWR customers is paying off. The company recently won a contract from Xcel Energy to design, fabricate, deliver and install a replacement steam dryer at Monticello Nuclear Power Plant, a BWR plant located near Monticello, Minnesota (USA). See *Solving the Steam Dryer Degradation Problem*, this issue e<sup>2</sup>.

Additionally, FirstEnergy Nuclear Operating Company (FENOC) awarded Westinghouse a contract to provide services and support for the Perry Nuclear Power Plant's spring 2011 refueling outage. The contract is part of

a comprehensive 10-year alliance agreement FENOC signed with Westinghouse in October 2008. Among the services Westinghouse will perform are:

- Fuel movement
- In-vessel visual inspections
- Bottom-head inspection and cleaning
- Control rod drive and low-power-range monitor exchanges
- Balance-of-plant in-service inspection work
- Other refuel floor and under-vessel activities

Westinghouse is committed to expanding its BWR capabilities within the U.S to support global BWR growth. The new U.S. BWR Service Center, housing capabilities to provide the highest-quality reactor refueling, servicing and inspection training possible, promises to play a key role in meeting these and other commitments for Westinghouse BWR customers for years to come.

*For additional information concerning the U.S. BWR Service Center, contact Bruce Phares, director, BWR Reactor Services at +1 423.697.5157 or [pharesrb@westinghouse.com](mailto:pharesrb@westinghouse.com).*

*For additional information concerning the WEC Welding Institute, contact Richard Frisbey, manager, WEC Welding Institute at +1 803.412.3231 or [frisberc@westinghouse.com](mailto:frisberc@westinghouse.com).*

# Solving the Steam Dryer Degradation Problem

## *Innovative Technology Solution for Power Upgrades Enhances Westinghouse's Global BWR Engineering Services*

By David Forsyth and Gianluca Longoni, Westinghouse Nuclear Services Acoustics and Structural Analysis

A power uprate of a boiling water reactor (BWR) plant results in higher steam velocities in the steam delivery system. When plants apply for a license from the U.S. Nuclear Regulatory Commission (NRC) to perform a power uprate project, analyses must be performed to show the impact of the higher steam flow on plant components. For steam dryers, NRC Regulatory Guide 1.20 requires a rigorous structural integrity analysis for power increases greater than two percent.

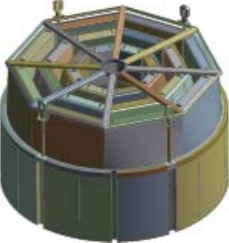
In recent years, uprated BWR plants have experienced severe fatigue degradation of their steam dryers due to the higher steam flows generated under power uprate conditions. The degradation has driven the need for the development of proven and robust methods to ensure steam dryer structural integrity prior to performing a power uprate.

The purpose of BWRVIP-194 is to delineate the methodology in a single document to allow generic NRC approval. This will permit plants using the methodology to experience faster acceptance times for power uprate applications.

The technology encompasses acoustic and structural analyses. It is a combination of analytical and experimental methods that provides the basis for evaluating the loading and response of the steam dryer at power uprate conditions, without the need for operating the plant above current licensed thermal power.

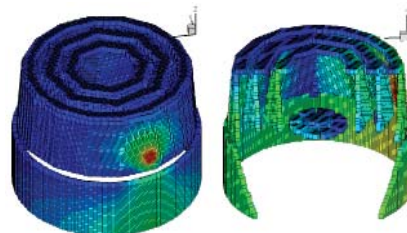
### TECHNOLOGICAL BENEFITS

“The benefits of using this technology are threefold,” says David Forsyth, product manager for the Acoustics and Structural Analysis group at the Westinghouse Energy Center in Monroeville, Pennsylvania (USA). “There is no need to instrument the steam dryer directly in order to monitor loads. It provides a more detailed and complete mapping of the acoustic loads and stresses on the steam dryer as compared to an instrumentation-only based program. Finally, the technology includes a complete power-ascension plan to monitor steam dryer stresses, in real time, which allows for a rapid ascension to uprated conditions.”



**WHAT IT DOES**  
*A steam dryer removes moisture from the steam before it reaches the turbine. The low-moisture steam boosts plant efficiency and power generation and reduces moisture-related degradation of the turbine blades.*

The Electric Power Research Institute's BWR Vessel and Internals Project (BWRVIP) – the industry users' group that focuses on BWR vessel internals – has authored a topical report, BWRVIP-194: *Methodologies for Demonstrating Steam Dryer Integrity for Power Uprate*. The report is based on Westinghouse technology that was acquired in 2007 from Continuum Dynamics Inc. (CDI) of Ewing, New Jersey (USA). It was submitted to the NRC on Oct. 31, 2008, and is currently under NRC staff review.



*Acoustic analysis technology provides a detailed map of the loads and stresses affecting steam dryer structural integrity under power uprate conditions. Additionally, real-time monitoring of the stresses allows rapid ascension to extended power uprate conditions.*



*BWR steam dryer qualification for power uprates includes acoustic load predictions, evaluation of structural responses to various combinations of loads, and real-time power ascension analysis and monitoring, among other items. In these photos, a scale model of the the steam dryer and the entire steam delivery system are used to predict acoustic vibrations at extended power uprate conditions.*

Gianluca Longoni, a principal engineer in the Acoustics and Structural Analysis group, offered this technology overview: “Westinghouse’s proprietary technology provides an integrated solution for potential acoustic excitation affecting BWR steam dryers.” He said, “Based on this technology, which provides a detailed acoustic load definition, the structural integrity of the steam dryer is evaluated at the desired power level. Prior to submitting an application for a power uprate, you can effectively predict the acoustic loads the dryer will experience at uprated conditions using a combination of analytical and experimental methods. If required, you can make a decision to perform load mitigation activities before you actually implement these conditions in the plant.”

#### THE ACOUSTIC METHODOLOGY ...

The Westinghouse steam dryer technology consists of a suite of methodologies that can be applied to any BWR to demonstrate the structural integrity of the steam dryer under power uprate conditions. The steam dryer pressure-load prediction methods have been validated with data from in-plant instrumented dryer tests and the structural modeling approach has been validated by a series of separate effects tests. All steam dryer acoustic loads calculated for U.S. BWR plants in support of extended power uprates (EPUs) have been developed using the Westinghouse technology. Using the plant design data, scale-model tests and acoustic analyses, the acoustic pressure loads on the steam dryer can be defined. This data is then used to calculate the steam dryer loads and maximum stress intensity values at uprate conditions.

#### ... IN ACTION

Westinghouse recently applied its acoustic load definition methodology as part of a contract with Xcel Energy to design, fabricate and install a replacement steam dryer at Monticello Nuclear Generating Plant, a BWR plant located near Monticello, Minnesota (USA).

Exelon Nuclear has recently awarded Westinghouse a multi-plant steam dryer qualification contract for power uprate projects at BWR plants in the Exelon fleet.

“Exelon is investigating power uprates for its entire fleet,” said Jim Brennan, vice president of Engineering Services Systems, Safety and BWR. “Exelon chose the Westinghouse steam dryer analysis methodology based on its prior successful experience with it at Dresden and Quad Cities, including gaining NRC approval of the application of the methodology at these plants.”

#### CONCLUSIONS

The steam dryer analysis and associated technology acquired from CDI, coupled with Westinghouse’s and Toshiba’s existing expertise in BWR steam dryer analysis, repair and design, allows Westinghouse to provide a complete portfolio of mitigation, repair and replacement options for BWRs. The Westinghouse methodology is the only steam dryer acoustic load methodology that has been approved by the NRC for plant-specific BWR power uprate license amendment requests.

*For additional information, please contact David Forsyth, product manager, Acoustics and Structural Analysis at +1 412.374.6638 or [forsytdr@westinghouse.com](mailto:forsytdr@westinghouse.com).*

# Talk About Good Logic

## *Westinghouse Acquires CS Innovations LLC – A Pioneer in Nuclear Power I&C Safety Systems*

*By Rebecca Jung, Westinghouse Technical Communications*



In August 2009, Westinghouse Electric Company LLC acquired CS Innovations LLC, a leading instrumentation and control (I&C) nuclear product supplier to the digital safety system market in the United States. The new subsidiary, which is headquartered in Scottsdale, Arizona (USA), is a complete electronics system design house, specializing in hardware and system development. CS Innovations offers a broad range of design services from complete turnkey through partial designs, and verification and support of customer-owned designs.

John McInerney, vice president of Westinghouse Repair, Replacement and Automation Services (RRAS), noted that there is an increasing demand for the brand of technology CS Innovations offers. “The acquisition of CS Innovations complements a core Westinghouse business expansion initiative to effectively meet the I&C upgrade needs of operating nuclear plants,” he said. “CS Innovations’ capabilities will also enhance our new plant construction efforts and help our customers address the ever-growing demand for clean, efficient nuclear power production.”

In addition to supporting upgrade and new build objectives, retaining the company’s presence in the western U.S. supports Westinghouse’s localization strategy. Now, Westinghouse has an entity closer to customers such as Arizona Public Service Company, Southern California Edison Company and Pacific Gas and Electric Company, and should be able to enhance its customer service as a result.

### **PIONEERING I&C TECHNOLOGY FOR TOMORROW**

CS Innovations is pioneering the use of new technologies in nuclear power I&C safety systems, specializing in hardware and system development. It primarily offers field-programmable gate array, application-specific integrated circuit and printed circuit board design services for control and signal processing applications, and the relevant engineering support services and verification.

“The success of CS Innovations engineering is based on a project philosophy that combines meticulous engineering, solid planning, precise project execution, an experienced design team and a robust in-house

quality assurance program,” said Steen Sorenson, president of CS Innovations.

### ADVANCED LOGIC SYSTEM

Of primary interest is CS Innovations’ advanced logic system (ALS) platform, which is the only hardware-based safety system solution that meets current requirements for digital safety systems, and is approved by the U.S. Nuclear Regulatory Commission (NRC). The ALS is a universal platform that targets safety-critical control systems, where reliability and integrity are of paramount importance. It is designed to have diagnostic and testing capabilities to provide a systematic approach for maintaining and testing the system.

Another attractive feature of the platform, according to Larry Erin, director of Westinghouse Safety Systems Engineering and Services, is that, “The ALS is also scalable from a single-system replacement to a full safety I&C replacement ...,” making it flexible enough so that it can be customized to meet different customers’ needs and expectations.

### APPLYING ADVANCED ALS I&C TECHNOLOGY TODAY

The fall 2009 refueling outage marks the first installed application of the ALS. As a result of this effort, the Wolf Creek Nuclear Operating Corporation’s Wolf Creek Generating Station near Burlington, Kansas (USA), now has a licensed safety platform and a well-defined development process, providing them with highly predictable cost and schedule estimates for future applications.

This milestone is the culmination of a five-year development process, providing many lessons learned as well as good practices – valuable experience that will benefit the market. The work done at Wolf Creek has laid the groundwork for I&C upgrades and new plant construction for nuclear power plants in the U.S. and around the world.

*For additional information, contact Larry Erin, director, Safety Systems Engineering and Services at +1 412.374.6456 or [erinle@westinghouse.com](mailto:erinle@westinghouse.com).*

### SOME OF THE BENEFITS OF THE ALS PLATFORM INCLUDE:

- Advanced diagnostics and test features that are capable of detecting failures while the system is in operation
- Increased integrity by identifying failures within the system and performing the necessary corrective actions upon detection
- Increased reliability of the system due to the simplicity of the ALS architecture
- Resolution of future obsolescence issues by using a simplified board-level design and maintaining proven logic, thereby eliminating the need to start from scratch should the underlying hardware need to be updated
- Reduced plant personnel training requirements because of the simplicity of implementation and the ability to use the platform on multiple safety systems within the plant
- Qualification based on the guidance in Electric Power Research Institute (EPRI) TR-102323, *Guidelines for Electromagnetic Interference Testing in Power Plants*, Revision 2, and the requirements listed in NRC Regulatory Guideline 1.180, *Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems*, Revision 1

### Advanced Logic System Applications

The ALS can be used for a variety of applications, including:

- Reactor protection systems
- Reactor trip systems
- Engineered safety features actuation systems
- Emergency load shed and load sequencers
- Main steam and feedwater isolation system
- Diesel sequencers

# Assembling to Fuel the Market

## *Westinghouse Acquires Majority Share of Nuclear Fuel Industries Ltd. of Japan to Extend Global Reach to Nuclear Fuel Customers*

*By Rosemary Peta, Westinghouse Nuclear Fuel Communications*

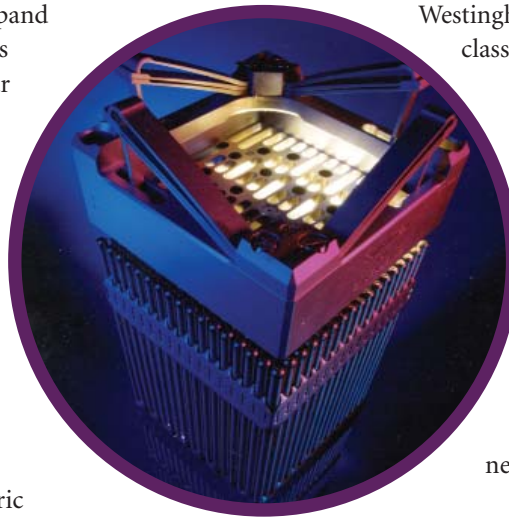
As Westinghouse continues to expand its global position and enhance its commitment to the global nuclear market, the company this past May acquired a 52 percent stake in Nuclear Fuel Industries Ltd. (NFI), Japan's sole producer of nuclear fuel for both boiling water reactors (BWRs) and pressurized water reactors (PWRs).

In this acquisition, Westinghouse executed a Share Purchase Agreement with Sumitomo Electric Industries Ltd. and Furukawa Electric Company Ltd. at a cost of approximately \$100 million.

Established in 1972, NFI supplies safe, high-quality fuel with advanced technology to nuclear power plants in Japan. The company develops, designs and produces nuclear fuel for the Japanese BWR and PWR reactors, including fuel for high burnup operations, fuel containing reprocessed uranium and fuel for high-temperature gas reactors and fast-breeder reactors.

In addition to nuclear fuel design, NFI has made significant technological developments related to the nuclear fuel cycle as the designer of the Japanese mixed oxide (plutonium and uranium oxide) fuel fabrication plant in Rokkasho-mura. NFI also provides fuel and plant-related services, including fuel inspection and maintenance operations, and provides nuclear core design analyses and safety evaluations to its customers.

"Our vision for the Westinghouse/NFI acquisition is to become the global nuclear fuel leader," said Joe Belechak, senior vice president of the Nuclear Fuel business unit. "For nearly 37 years, NFI has exemplified the role of a high-quality, reliable supplier of nuclear fuel and services with an outstanding record for safety that complements



Westinghouse's commitment to best-in-class operational excellence."

Westinghouse will also bring to the acquisition an efficient utilization of test resources such as test loops FRIGG, ODEN and VIPER; a seismic test bench; mechanical strength testing and a hot cell – as well as new product developments such as improved alloys for higher fuel duty (Optimized ZIRLO™) and next-generation alloys and pellets.

By combining forces, Westinghouse and NFI can shorten refueling outage durations, extend the operating cycle, and deliver fuel to support higher burnup operations and plant upratings, not only in the United States and Europe, but also for Japanese utility customers.

"There are various opportunities available to the new combination of NFI and Westinghouse," said Vinny Esposito, vice president, Asia Fuel. "We look forward to extending the ability to provide additional technology and experience that goes both ways between these two world leading nuclear fuel companies."

From the perspective of achieving best-in-class manufacturing technology, the integration of practices is expected to result in leaner operations and increased process capability, resulting in outstanding product quality and performance.

With the combination of NFI's excellent and unique fuel technology and products, and Westinghouse's position as a global PWR/BWR technology leader, together the two can become the premier supplier of PWR and BWR fuel products to Japan. By achieving best-in-class capability, Westinghouse and NFI will together achieve a position of expanded global leadership.

## BENEFITS OF ACQUISITION

The acquisition of NFI enhances the capabilities of Westinghouse and will benefit its customers – globally, and in Japan in particular – from the following perspectives:

### GLOBAL POSITIONING

NFI complements Westinghouse global positioning with a strong implantation in Japan. Serving Japanese utilities requires a local infrastructure, which is provided by NFI.

### “BEST-IN-CLASS” TECHNOLOGY

The cooperation between the Westinghouse and NFI engineers and access to the NFI development programs will further Westinghouse’s continuous efforts to develop “best-in-class” technologies and the most advanced products and services.

### INTEGRATED GLOBAL SUPPLY CHAIN

In this agreement, both companies will have access to the Westinghouse integrated component supply chain for zirconium products, cladding, powder (re-conversion service) and to the NFI fuel assembly components.

### SYNERGIES AND GROWTH

The combined knowledge of Westinghouse and NFI will improve joint fuel manufacturing capabilities while maintaining a competitive market in Japan and growing NFI’s global market share.

*For additional information, contact Jean Patrick Ducruet, senior executive vice president and chief coordination officer, Nuclear Fuel Industries Ltd. at +81 3.5440.1269 or [ducruetjp@westinghouse.com](mailto:ducruetjp@westinghouse.com).*



*NFI has the capacity to annually manufacture 313 tons uranium – PWR fuel at its 291,000 square foot Kumatori Works in Kumatori, Japan.*



*NFI has the capacity to annually manufacture 276 tons uranium – BWR fuel and 882 pounds uranium – high-temperature gas-cooled reactor fuel at its 1.6 million square foot Tokai Works site in Tokai, Japan.*



*Jeff Taylor, manager of Technical Services, at the Westinghouse Specialty Metals Plant in Blairsville, Pennsylvania (USA) (far right) provides NFI representatives (left to right) Zensuke Iwata, president, NFI; Shuichi Abe, executive officer, NFI; and Hidekazu Ida, BWR fuel manager, NFI; a look at the final fuel tubing.*

# Improving Productivity for Fuel Assemblies

## *New Pilgers Installed in Blairsville Specialty Metals Plant*

By Kelly Conroy, Westinghouse Nuclear Fuel Communications



*Beginning as a metal foundry in 1954, ground was broken for the Westinghouse Blairsville Metals Plant in Blairsville, Pennsylvania (USA), where production began in 1955. By 1960, the plant's 18,000-pound steam forge hammer, one of the largest in the country, was helping to create 44-inch stainless steel blades for Westinghouse turbines. In 1964, the site was renamed the Materials Manufacturing Division and served as a pilot facility to cast and forge bar and strip products.*

With the installation of the first pilger mill in 1967, the manufacturing of zircaloy tubing began at what is today the Westinghouse Specialty Metals Plant (SMP).

Pilgering quickly became the backbone of the Specialty Metals Plant business and has remained so for more than 40 years. Today, there are 21 pilger mills in operation at SMP. They are used in the manufacturing of seamless zirconium alloy tubing from extruded raw material that is sourced from the Westinghouse Western Zirconium plant in Ogden, Utah (USA).

The Blairsville plant's zircaloy tubing is a key component of fuel assemblies and a critical component in fuel performance. The tubing serves as the first line of defense in the nuclear reactor against a radiological release. Over the last several years, Westinghouse Electric Company and its majority owner Toshiba Corporation, announced that the Specialty Metals Plant would be fitted with over \$19 million in new equipment to accommodate the company's new nuclear projects in China and the pending new build activity slated for the United States. Among the capital improvements is the addition of two new, high-speed, continuous-operation cold pilger mills.

"The investments we are making to expand our manufacturing capabilities will position Westinghouse for continued success in the worldwide nuclear renaissance," said Westinghouse President and CEO Aris Candris. This will allow Westinghouse to continue to serve its fuel customers and support their success in this growing nuclear energy market.

Over the past 22 months, the Specialty Metals Plant has been alive with activity. New equipment is being installed and upgrades are being made throughout every stage of the tube manufacturing process from pilgering (see caption opposite page), to pickling and annealing,<sup>1</sup> through the tube finishing process and inspection of the final product.

Prior to purchasing and installing the new pilger mills, the youngest pilger mill in operation at the Blairsville facility was 25 years old, with the average overall service age of the existing cold pilger mills at more than 30 years. These mills require routine care and preventative and predictive maintenance programs to extend their useful life.

Preparation for the arrival of the two new, German-made pilgers began in February 2008. This included civil engineering work to design and construct the pilger foundations and basement (which houses all the

1. The pickling and annealing processes are used to remove any surface anomalies formed during manufacturing and remove internal stresses to make the metal less brittle.

machines' utilities); design and installation of a new cooling water system; and performance of upgrades to the plant's electrical system. Actual installation of the pilger mills and auxiliary equipment took four months, from June 2009 to September 2009. After the equipment qualification effort was completed to allow the machines to be used in the manufacturing process, the operators were educated on the new equipment and began several weeks of processing test material. On Nov. 2, 2009, the first production tube was manufactured using the new mills.

"Witnessing the installation of these two new machines is an incredible milestone for this facility and for our fuel customers," said project lead Mike McClarren. "The new high-speed pilgers are capable of running continuously with one mill responsible for producing an output nearly equal to two of our existing mills."

The benefits that the new equipment will bring to Westinghouse and its customers are immediate and significant. The new mills provide state-of-the-art technology and allow process parameters to be electronically adjusted. Ray Leith, a pilger operator for the past 16 years, was one of the first operators to train on the new mills. After spending the prior three months working to get the machines qualified and online, he commented, "The biggest change that I have noticed is that the controls are far superior to the touch screens of old, functioning with ease and automation. It has made my job more enjoyable." The pilger operator will also experience a noticeable difference with an ergonomically friendly work environment and a reduction in noise levels produced by the pilger mill operation. This step change in the technology will improve productivity

with the automatic feed mechanism and reduce material that is rejected. Operator Brandon Gyenes was thrilled to be one of the first employees to work on the new mills. "The investment that Westinghouse has made in our facility has enhanced our ability to prepare for the growth that our business will experience," he said.

Over the past 42 years, the employees of the Westinghouse Specialty Metals Plant have continuously demonstrated the ability to meet the needs of the highly regulated nuclear industry. With the installation of the two new pilger mills, SMP will enhance its overall service to the final customer in sync with Westinghouse's efforts to support the Institute of Nuclear Power Operation's mission to achieve zero leakers by 2010.

As we look ahead and focus on this new era in nuclear power, Westinghouse SMP will maintain meeting the stringent standards and demanding tolerances of highest quality nuclear grade tubing for all Westinghouse fuel customers.

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*The two new, high-speed, continuous-operation pilger mills process tubing up to approximately 12 feet long. The pilgering process begins with a tube-reduced extrusion (TREX) or solid-wall raw material, that is thick-walled with an outside diameter (OD) of 2.5 inches. In three pilgering steps, these machines reduce the diameter and wall thickness of the tubing to its final size, which can be as small as 0.360 inch OD.*



# Westinghouse

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