

No.1/February 2011

**MEDIA  
PLANET**

# THE NUCLEAR RENAISSANCE



## SOLVING THE ENERGY DEMANDS OF TOMORROW, TODAY

**Dr. Patrick Moore**, co-founder and former leader of Greenpeace, speaks out about his choice to go pro-nuclear energy

PHOTO: NUCLEAR ENERGY INSTITUTE/CASE ENERGY COALITION



**WHAT YOU NEED  
TO KNOW ABOUT  
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Job and education resources  
How to get started in the industry



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Engaging Youths  
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## CHALLENGES

FACT

1

JOBS ARE  
AVAILABLE AND  
MANY SKILL  
SETS CAN BE  
ADAPTED TO  
THE INDUSTRY

PHOTO: NUCLEAR ENERGY INSTITUTE

**Americans have become accustomed to electricity** availability at the flip of a switch. Our daily lives are powered by electricity more than ever, yet we no longer are tethered to the power lines that provide that energy.

## The value of nuclear energy

**T**hough we may be concerned about the rising price of gasoline, our real challenge is preparing now for an energy future that reduces our reliance on foreign energy and invests in long-term, environmentally friendly options.

President Obama, in his State of the Union address in January, pinpointed this challenge with his call for breakthroughs and innovations that will enable the United States to shift the bulk of its electricity supply to clean-energy sources, with an added goal of having one million electric vehicles on U.S. roads by 2015.

While our electricity system must be founded on a portfolio of fuels and diversified technologies, the President once again identified nuclear energy as a technology that can help the nation rise to the challenge. It is not an overstatement to say that his remarks both reflect and advance nuclear energy's growing appeal around the globe. China alone has 27 reactors under construction, Russia has 11, and India another six.

In the United States, 3,500 workers are completing a nuclear energy facility in eastern Tennessee. Another 2,600 workers are engaged in construction activities in Georgia and South Carolina to add four reactors (two at each site) that are expected to come into service in 2016-17.

**Why nuclear power is a desired option**

It is no secret that nuclear power plants have high capital costs, particularly in comparison to natural gas-fired power plants. Still, they are an increasingly desired energy option for several reasons, including:

- They have a high degree of pri-

ce stability over the long-term and their electricity price decreases over time (average production costs of 2.03 cents/per kilowatt-hour in 2009), making them especially attractive to industrial users of large amounts of electricity;

- They provide a hedge against price volatility in fossil fuels, all the more so as the competition for energy resources intensifies globally (China and India are expected to have a combined population of three billion in 2030);

- They provide a hedge against growing environmental requirements, such as the Environmental Protection Agency's plan to propose greenhouse gas emissions standards for fossil-fueled power plants in July.

Although the bulk of new nuclear plant construction is occurring outside of our borders, the United States has the largest nuclear energy program in the world—currently larger than Japan and France combined. Though we have ceded leadership in many industrial and manufacturing sectors to our international competitors, American nuclear energy technology is widely regarded as the most advanced in the global marketplace.

One hundred and four reactors in 31 states operate reliably around the clock, producing 20 percent of total electricity even though they constitute just 10 percent of the nation's installed electricity-generation capacity. At this point 61 of those plants have been relicensed for an additional 20 years of operation. Another 21 reactors are in the license renewal process and it is expected that most, if not all, plants will be operating beyond their original 40-year term.

**Nuclear power and employment opportunities**

Over the next five years, 38 percent

“Although the bulk of new nuclear plant construction is occurring outside of our borders, the United States has the largest nuclear energy program in the world—currently larger than Japan and France combined.”



**Marvin Fertel**  
President and Chief Executive Officer  
Nuclear Energy Institute

of the workers currently employed at the nation's nuclear power stations will be eligible for retirement, creating a need for as many as 25,000 skilled workers. Each new nuclear plant will create up to 3,500 jobs during construction, and as many as 800 permanent career opportunities. Filling these jobs is a formidable challenge but one the industry is capable of meeting.

As part of a comprehensive infrastructure program established by NEI several years ago, the industry is keeping close track of job openings and student enrollments to ensure that the pipeline of new workers fits the number of careers available. The industry has set up partnerships with 43 two-year education institutions across the country and implemented a “uniform curriculum” program to ensure that the education and training of the next generation of nuclear industry workers is done in a cohesive manner. Last May, the first graduates of this program at Chattanooga State in Tennessee and Salem Community College in New Jersey moved into careers with average salaries ranging from \$66,000 to \$72,000 a year. Rising enrollments at the 30 universities with nuclear engineering programs also means that the United States is graduating young professionals with bachelor, master's and doctorate degrees in numbers not seen in a generation.

It is highly gratifying to see programs like this take root, because time is of the essence. Business leaders and policymakers, Democrats and Republicans alike, believe that nuclear energy must play a role in our future energy policy. Advanced reactor technologies, a diverse and growing work force and a commitment to safety will ensure that it will be a vital part of our global energy future.

## Generating energy and jobs

■ **Question:** How can the U.S. get serious about job creation?

■ **Answer:** By getting serious about nuclear power.

Whatever your position on nuclear power, one fact is indisputable: while they are generating energy, they are also generating jobs—lots of them.

**And these are not just any jobs; they are:**

- Good-paying: average annual starting salaries range from \$65,000 to \$80,000.

- Secure: 75-90 percent of a new plant's parts and labor are from the US.

- Safe: Numerous studies have shown that working in nuclear power plants is safe. In fact, the average nuclear plant worker is exposed to less cosmic radiation than are airline pilots and cabin crews who regularly fly high-altitude inter-country routes.

**The ripple effect across American industry**

Because each nuclear plant requires vast amounts of concrete, steel, piping, wiring, components, etc., as new plants are built, the ripple effect quickly spreads across American manufacturing, resulting in 14,360 man-years per gigawatt installed, according to an analysis by the National Commission on Energy Policy. These jobs include skilled crafts such as welders, pipefitters, masons, carpenters, millwrights, sheet metal workers, electricians, ironworkers, heavy equipment operators and insulators, as well as engineers, project managers and construction supervisors. Then there are jobs in the surrounding community: typically 400-700 additional jobs at car dealers, dry cleaners, food service providers, etc.

“When you look closely at the combination of clean energy with

safe, secure jobs it's a powerful argument for changing our attitudes toward nuclear power in the U.S.,” said Christine Todd Whitman, the former New Jersey Governor who was also Administrator of the United States Environmental Protection Agency in the Bush Administration and is now a Co-Chair of the Clean and Safe Energy (CASEnergy) Coalition. “If we are serious about job creation we need to get serious about nuclear power.”

The construction of between 20 and 25 new nuclear units by 2030—necessary for nuclear energy to continue to provide 20 percent of the nation's electricity supply—will require between 287,200 and 359,000 man-years of labor. Once built, these plants would require 8,000 to 17,500 permanent full-time workers to operate the plants and additional supplemental labor for maintenance and outages.

**“A big win-win”**

And it's not just new construction that will drive the surge in employment. Nuclear power plants now employ a disproportionate number of Baby Boomers (nearly 40 percent of the industry workforce) who will be eligible to retire over the next five years. That has put the industry in hiring mode right now to find more than 20,000 workers.

It has also led to a major push at colleges and universities across the country to develop degree programs. And in contrast to a historically white labor force, the new job recruitment and training efforts are also focusing on minority communities through the pursuit of workforce training and feeder programs.

“We are looking at a big win-win situation for employment and the environment,” said Whitman.

**JOSEPH KELLY**

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## WE RECOMMEND



**Dr. Patrick Moore,** CASEnergy Coalition Co-Chair, shares his thoughts on the benefits of nuclear energy.

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“Nuclear power is demonstrably safer than a lot of things we take for granted like driving cars, or operating chemical factories or drilling for oil. We need it.”

**Innovation in safety** p. 4

What is the industry doing to keep our workers safe?

**A young woman's path to success** p. 5

Amy Buu shares her story and why more women should consider careers in nuclear.

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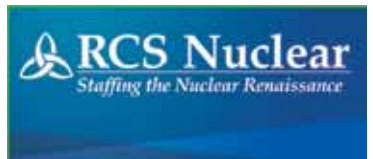
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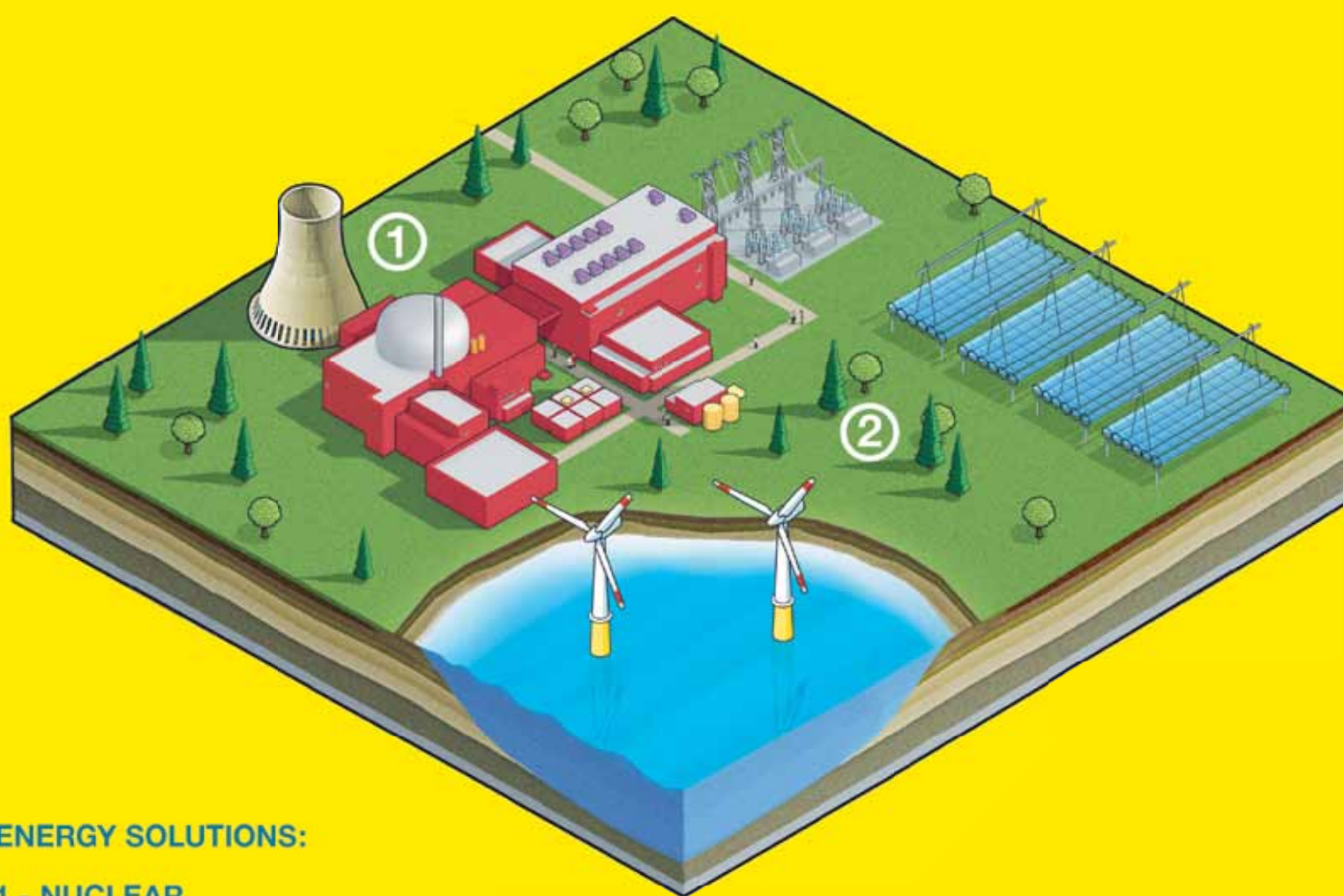
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## INSPIRATION

## → MYTH VS. FACT

■ **Myth:** Nuclear energy isn't safe.

■ **Fact:** After more than a half-century of commercial nuclear energy production in the United States, including more than 3,500 reactor years of operation, there have been no radiation-related health effects linked to their operation. Studies by the National Cancer Institute, The United Nations Scientific Committee of the Effects of Atomic Radiation, the National Research Council's BEIR VII study group and the National Council on Radiation Protection and Measurements all show that U.S. nuclear power plants effectively protect the public's health and safety. Nuclear plants also are safe for workers. According to the U.S. Bureau of Labor Statistics, it is safer to work at a nuclear plant than at a fast food restaurant or a grocery store or in real estate.

■ **Myth:** The radiation from nuclear plants causes cancer and other harmful effects.

■ **Fact:** After more than a half-century of radiological monitoring and medical research, there is no evidence linking U.S. nuclear energy plants to negative effects on the health of the public or workers. Claims that radioactivity from nuclear plants has caused negative health effects have been refuted by the United Nations Scientific Committee of the Effects of Atomic Radiation, National Research Council's BEIR VII study group, National Cancer Institute, American Cancer Society, the American Academy of Pediatrics, numerous state departments of health and other independent studies.

Source: CASEnergy Coalition,  
<http://casenergy.org/>

**A strong culture of safety** has made having a job in the nuclear industry one of the least dangerous professions in the United States.

# Work in the nuclear industry

## Misconceptions about the safety of the nuclear industry, from radiation to explosions to meltdowns.

Since the general public is so uneducated about this topic, there is often strong resistance to using nuclear power and to pursuing a career in nuclear technology. But this resistance is unfounded, and as the U.S. Bureau of Labor Statistics tells us: working at a nuclear power plant is safer than working at a grocery store or in real estate.

Most of the information people have about radiation has come from the high profile disasters, not from the actual safety mechanisms that are in place. From a basic level, the U.S. Nuclear Regulatory Commission (NRC) points out that nuclear power plants are designed with multiple barriers to minimize the potential impact to the public, even during worst-case scenarios. What's more, radiation is all around us from both natural and manmade sources. Members of the public receive substantially more radiation from natural sources than they receive from nuclear



PHOTO: NUCLEAR REGULATORY COMMISSION

power plant operations, according to the NRC.

### The safety of the facilities

With the public protected, attention can be turned to the safety of the nuclear technicians that actually run the facilities. Nuclear reactor operators are responsible for the operation of the plant, most of the time from the control room, controlling pumps and valves, fission rates, and power generation. Nuclear plants operate like most other power plants, creating heat to turn water to steam which powers a generator.

Nuclear power plants are extremely sophisticated operations. Radiation exposure to workers at nuclear

power plants is managed through adherence to safe exposure limits established by the NRC. This is accomplished with shielding throughout the plant, radiation monitors worn by workers, plants having to report radiation exposures to the NRC that are made public, and taking action to correct any problems. Nuclear plants are required to further limit worker exposure using practices that keep exposure as low as reasonably achievable.

### Trained experts

The technicians who work here are highly-trained specialists who have undergone education about radiation detection, nuclear theory,

and industrial systems. Before ever setting their hands on the actual controls, candidates complete two to three years of hands-on training and simulation. The simulator is an exact replica of the actual computer system used in control rooms, and during training they practice every single possible scenario. Once they are ready they must become licensed, which involves a series of tests, one general and one that is site specific. The license is good for only six years, and only for one specific site, so continuing education plays a vital role in keeping technicians knowledgeable, capable, and licensed.

The NRC has been working to encourage the nuclear industry to further focus on a strong safety culture that can contribute to secure and efficient operations. Nuclear safety culture is the core values and behaviors resulting from a collective commitment by leaders, managers and workers to emphasize safety over all other goals to ensure protection of people and the environment.

TONY HYMES  
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## NEWS

# Women have a vital role in the future of nuclear energy

**As a young girl, Amy Buu never dreamed she would help make energy for 10 percent of all Americans, but that is just what she does today.**

She works at Westinghouse Electric Company in Columbia, SC, a plant that manufactures nuclear fuel for the USA and world. This nuclear fuel is the key ingredient in generating electricity at nuclear utilities.

"I've held multiple roles in the company, from serving utility customers to managing risks across the supply chain," says Buu.

Women have big opportunities in the nuclear energy industry, a discipline traditionally populated by men. Demographics are one reason. "By 2015, 46 percent of today's skilled energy technician workforce may retire or change jobs. Fifty-one percent of energy engineering professionals may go," says Ann Randazzo, executive director of the Center for Energy Workforce Development near Washington.

Buu, a first generation university grad in her family, found welcoming arms with nuclear energy professionals. "My biggest surprise was how people-oriented this technical industry is. Our workplace has the ultimate team orientation."

Nuclear plants team-up varied disciplines. Most of the engineers have mechanical engineering degrees, followed by electrical or civil engineering. Few actual nuclear engineers are required.



**WOMEN IN NUCLEAR ENERGY.** Amy Buu at a station that inspects guide thimble tubes, a component of a fuel assembly.

PHOTO: WESTINGHOUSE

Buu says, "People think of nuclear as lab coats and hard hats. There's much more, such as purchasing, safety, manufacturing, planning, transportation, law or human resources."

## Versatility and continuous education—keys to success

Buu has a psychology degree which she supplemented on the job with specialized training in Six Sigma, lean manufacturing, human performance and behavioral differentiation, supply chain and knowledge management. "And I just completed a leadership program held by the 44 organizations in the Carolinas Nuclear Cluster," Buu says.

It is critical to get women interested in nuclear energy workforce early on. "The foundation for a STEM career (science, technology, engineering, mathematics) is laid early in life,



**Amy Buu**  
Westinghouse  
Knowledge Management  
Team Leader, member  
of the Carolinas'  
Nuclear Cluster

but scientists and engineers are made in colleges and universities," says an American Association of University Women report.

An online Energy Competency Model at [www.cewd.org](http://www.cewd.org) lays-out a cutting-edge energy foundation. "We mapped different competencies for energy jobs and created logical career pathways for our next generation of workers. Energy jobs are really about putting STEM to work," says Randazzo.

A combination of will, curiosity, reasoning and problem-solving skills can instill a spark for a good technical career. Home environments and great teachers can introduce those values early.

For young people Buu recommends the [GetIntoEnergy.com](http://GetIntoEnergy.com) website. The link has video plant tours and resources for education.

"Here at work I learned as fast as I could. It was energizing," says Buu, who did lots of networking. "I got involved in technical societies and volunteered for national meetings and task forces." At 31 she became the national president of North American Young Generation in Nuclear, a 6,000 member professional association.

There's a place for women in the nuclear energy workforce. Says Buu, "This is more than 'going to work' for me. I love my career; it appeals to my sense of serving humanity in a corporate environment. My teammates around the world make sure we enjoy the convenience of electricity. I think of it every time I flip a switch or use a computer."

**SCOTT CARLBERG, MANAGER,  
CAROLINAS' NUCLEAR CLUSTER**

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## NEWS IN BRIEF

### VEX Robotics get youth interested in STEM

In today's high-tech, global economy, it is critical that America's youth continue to innovate and pursue careers in Science, Technology, Engineering and Math (STEM), including careers in the nuclear industry. By helping students develop critical thinking and problem-solving skills and encouraging imagination and productivity, we can create our nation's next generation of innovators.

In an effort to provide students with a cutting-edge, hands-on introduction to the critical STEM fields, VEX Robotics, Inc., a leading provider of educational robotics products to middle schools, high schools and colleges around the world, has partnered with non-profit organization Project Lead The Way (PLTW), the nation's leading provider of STEM education, to offer America's youth more advanced solutions both inside and outside the classroom.

This new partnership brings VEX Robotics inside PLTW classrooms to show students the real-world relevancy of what they are learning. It aims to excite students about solving the world's biggest challenges, and provides them with the opportunity to design their projects using the same tools that industry leaders use in the workplace. Approximately 350,000 students are currently enrolled in PLTW courses. For more information about how to get involved with PLTW, visit [www.pltw.org](http://www.pltw.org). For more information about VEX Robotics, visit [www.vexrobotics.com](http://www.vexrobotics.com).

**LINDSEY CARLIN**

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## NEWS



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www.nei.org/careersandeducation/educationandresources/education
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### + EVENTS CALENDAR

- **Discover Engineering Family Day**  
National Building Museum, Washington, D.C.—February 19, 2011 • Visit: www.eweekdcfamilyday.org
- **U.S. Nuclear Regulatory Commission's Regulatory Information Conference**  
Bethesda North Marriott Hotel and Conference Center, Maryland—March 8-10, 2011 • Visit: http://www.nrc.gov
- **Carnegie International Nuclear Policy Conference**  
Willard InterContinental Hotel, Washington, D.C.—March 28-March, 2011 • Visit: http://carnegieendowment.org/events/nppCon2011
- **North American Young Generation in Nuclear**  
Ronald Reagan Building & International Trade Center, Washington, D.C.—May 8-10, 2011 • http://www.nei.org/newsandevents/conferencesandmeetings
- **Annual Nuclear Industry Conference and Nuclear Supplier Expo: Nuclear Energy Assembly**  
Grand Hyatt Washington, Washington, D.C.—May 9-11, 2011 • Visit: http://www.nei.org/newsandevents/conferencesandmeetings
- **ANS Winter Meeting and Nuclear Technology Expo**  
Omni Shoreham Hotel, Washington, D.C.—October 30th-November 3rd, 2011 • Visit: www.new.ans.org
- **NUCLEAR POWER International**  
Las Vegas Convention Center, Nevada—December 13th-15th, 2011 • Visit: www.nuclearpowerinternational.com



**Question:** What turns an anti-nuke protestor into a supporter?  
**Answer:** Getting a grip on his irrational side.

# Nuclear opponent turned advocate

**Traveling east from Atlanta on Route 20 through a cold, overcast mid-January day, Dr. Patrick Moore muses that, "riding in this car might be the riskiest thing I do all day."**

No small statement from a man who in a few hours will be donning a hard hat to get a close-up look at the construction progress of America's newest nuclear power plant.

But Moore, an ecologist by training (Ph.D., University of British Columbia) and an early leader of Greenpeace (serving as president and an international director) revels in making provocative comparisons, particularly when they nettle his former colleagues in the environmental movement. Ask Moore about nuclear power—which he once opposed but now enthusiastically supports—and he offers up a quick mental balance sheet of risks and rewards.

"The International Energy Agency is predicting a 40 percent increase in worldwide energy demand by 2030. Conservation and other alternatives have absolutely no chance of meeting that demand. Nuclear power is

demonstrably safer than a lot of things we take for granted like driving cars, or operating chemical factories or drilling for oil. We need it."

#### Two very different uses

Moore, who is also a co-chair of the Clean and Safe Energy (CASEnergy) Coalition, sees his once fierce opposition as understandable, but irrational. "It came out of the peace movement and a legitimate fear of radiation and the destruction caused by nuclear bombs. But the use of nuclear power in weapons and the use of it for peaceful purposes are two different things. I didn't make that distinction at the time and many people still don't."

The facility Moore is visiting—Plant Vogtle in sparsely populated Burke County—is the site of the first new nuclear reactor in the U.S. in over 30 years, backed by \$8.3 billion in loan guarantees announced in February by President Barack Obama and slated to be ready in 2017.

Moore sees the new Vogtle plant as a showcase for the enhanced safety techniques that are now common in the industry: better construction, fewer computers and more reliance on passive safety techniques—



**Dr. Patrick Moore**  
CASEnergy Coalition Co-Chair



"Not one person has died from a radiation-related accident in any of the 104 reactors now operating in the U.S."

in the event of a problem, new plants are designed to be flooded by gravity instead of relying on pumps. "The basic design problems in nuclear power plants have been solved," Moore says flatly. He dismisses fears of a Chernobyl-style explosion: "All of the Chernobyl-class reactors were shut down before the Berlin Wall fell. An explosion of that kind is a physical impossibility. Not one person has died from a radiation-related accident in any of the 104 reactors now operating in the U.S."

Moore is not the only former anti-nuke to turn advocate. Stewart Brand, creator of the Whole Earth Catalog is another, as is the British environmental and Gaia theorist James Lovelock. Moore believes support will grow as people understand the risks and rewards, including the impact on employment. "Here in Georgia we are looking at 3,500 jobs during construction and as many as 800 jobs to manage the plant," says Moore. "That's not going to be lost on anyone."

**JOSEPH KELLY**  
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**Robert W. Kemple, Jr.**  
Executive Vice President, Sales &  
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**Question 1:**  
What is the #1 misconcep-  
tion about careers in  
nuclear? What is the reality?

**One common misconception** is that nuclear jobs exist only in nuclear power plants. Vendors such as AREVA employ thousands of people in mining, enrichment, recycling, maintenance, engineering, construction, as well as corporate professions such as finance and procurement. As energy demands continue to increase, many jobs will be created and those who enter the industry as a career will find a safe, challenging, and rewarding work environment.

**The number one misconception about careers in nuclear** is that only nuclear engineers work in the industry. In fact, a relatively small fraction of engineers in the industry are nuclear engineers. The overwhelming majority of engineers come from different disciplines including electrical, mechanical, civil and chemical. But nuclear careers also encompass many different professionals working in the industry including reactor operators, technicians, security officers and those who recruit, train and educate others for key roles in the industry. It's a safe bet that at the beginning of their careers just about all of them would never have envisioned themselves as playing an important role in the nuclear industry.

**A primary misconception** is that nuclear is an aging or dying industry with little career opportunities. Nothing could be further from the truth. The nuclear energy industry is vibrant, with a great deal of innovation in the works. Nuclear is growing rapidly, with next-generation products being developed in the United States and being deployed globally, especially in Asia.

**Question 2:**  
For those looking to change  
careers, how can they  
begin to enter the nuclear  
energy field?

**Most career changes** are the result of networking. Those seeking to work in nuclear energy should reach out to those already in the industry. They should explore what skills will be in demand (NEI is a great source). They can take nuclear specific courses to adapt their skills and experience to the industry. For example, transferable engineering professions include: civil/structural/seismic, mechanical, electrical, manufacturing, quality, and trades include welding, piping, construction, manufacturing, and radiation tech.

**Experienced engineers, operators and mechanics** can immediately apply for nuclear positions. The industry has a robust training program that can help professionals and skilled technicians transition into the nuclear energy industry. If an individual is looking to make a significant career change, the United States has a comprehensive educational system for retraining individuals for nuclear energy careers. There are 30+ nuclear engineering and 40+ nuclear technology programs across the country. These programs can provide an individual with the skills and knowledge that will make him or her highly coveted by the nuclear energy industry.

The industry has a robust training program that can help professionals and skilled technicians transition...

**We would recommend** leveraging your existing expertise because all disciplines are needed in nuclear. Research nuclear careers and projects on the Internet so that you are familiar with the basic industry terms. Talk to people who work in the industry, and attend a nuclear exhibition. You will find that people who work in nuclear are very open and willing to help with career counsel.

**Question 3:**  
What can individuals do to  
help support the growth of  
the nuclear energy industry?

**Learn more!** If people take the time to learn about the benefits of nuclear energy, they will be more supportive. As someone relatively new to the industry, I was surprised to learn about the excellent safety records and small environmental impacts of America's nuclear plants. I also discovered that nuclear power plants are by far America's largest source of electricity without greenhouse gases. And taken over a plant's lifetime, electricity from nuclear is relatively inexpensive.

**Educating the public** is a high priority for the industry, and studies show that as people learn about nuclear, they become strong supporters. Nuclear industry workers see their jobs as having far greater ramifications than just a paycheck, and for good reason. Nuclear energy benefits the environment as the largest single source of electricity that doesn't emit greenhouse gases, and nuclear plants provide both direct and indirect economic benefits to their local community and beyond.

**What's most important is** to be knowledgeable and up-to-date on the nuclear energy industry in terms of its latest innovations and technologies, safety history, safeguards, and regulations. There has not been much recent education on nuclear power. By being more personally familiar with the industry, you can make better decisions about how to personally support nuclear energy initiatives and programs.

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The nuclear energy renaissance has already created thousands of new jobs. By providing reliable and affordable electricity, nuclear energy helps keep business competitive and powers future worldwide job growth.

Westinghouse and its more than 15,000 global employees are proud of our leadership position in this important industry. Our technology is the design basis for well over 40 percent of the world's operating nuclear power plants, including 60 percent in the United States.

Our newest design, the Westinghouse AP1000 nuclear power plant, is the most advanced of its kind currently available in the global marketplace with more than 40 countries having expressed an interest. Four units are under construction in China along with four in the United States — two in South Carolina and two in Georgia. The AP1000 design has also been announced as the technology of choice for 14 new plants in the United States.

Today, nuclear energy provides 16 percent of total global electricity generation and 20 percent in the United States. Additionally, nuclear energy accounts for more than 70 percent of the carbon-free electricity in the United States.

Be a part of the solution to global growth in demand for clean electricity. Become a member of a company that is committed to customer success and providing future generations with safe, clean and reliable electricity.

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