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As one of the nation’s fastest-growing states, Florida’s energy needs are ballooning. Policymakers estimate the state must boost electric generating capacity 58 percent by the year 2020.

A decade ago, public officials and utility leaders might have sought to address that looming demand primarily with new power plants fueled by natural gas or coal. But given soaring prices for natural gas and increasing concerns about fossil fuel emissions, a third option — new nuclear plants — appears more likely than at any time since the industry’s heyday from the 1950s through the ’70s. Across the nation, utilities are pursuing at least 20 new nuclear plants, including Progress Energy’s new facility planned on the west coast of Florida in Levy County.

“We’re using the word ‘renaissance’ a lot with regard to nuclear power,” says University of Florida Professor Jim Tulenko, an expert in nuclear fuels, former chairman of UF’s nuclear and radiological...
“We will have an advanced, modern reactor that will be an excellent resource both within and outside the university,” says department Chair Alireza Haghighat.

Not long ago, nuclear energy carried a black mark, the result of the 1979 and 1986 accidents at Three Mile Island and Chernobyl. The industry was moribund: No new plants have been ordered since 1978, and the last reactor to be completed was in 1996. And while other nations depend heavily on nuclear power — France, for example, gets 80 percent of its electricity from nuclear plants — the industry contributes only 19 percent of U.S. power. Coal, by contrast, provides 50 percent.

For skeptics with continued concerns about nuclear waste and the high cost of building nuclear plants, nuclear energy remains a poor choice. But others, including some former opponents, are concluding that it deserves another try.

That’s partly the result of a looming national energy shortage. From 2005 to 2030, electricity demand is expected to soar 39 percent for homes, 63 percent for commercial real estate and 17 percent for factories and other industry, according to the government Energy Information Administration. Florida’s electricity consumption, meanwhile, is expected to grow 30 percent in the next 10 years alone, according to state figures.

Many point to renewable technologies such as solar and wind power — as well as future renewable technologies such as carbon capture and sequestration. Renewed interest in nuclear power has sparked a renaissance, too, in the Sunshine State’s only academic unit devoted to nuclear research. UF’s College of Engineering has seen a surge in students electing to major in nuclear engineering. Private as well as government research funding has soared. Administrators also have embarked on a makeover of the department’s nuclear research reactor, the only such educational reactor in the Southeast. They want to widen access to the reactor not only to utilities, but also to medical researchers, nuclear security researchers, even anthropologists.

“We’re using the word ‘renaissance’ a lot with regard to nuclear power.”
— Jim Tulenko

This map illustrates the location of the 104 nuclear power reactors currently operating in the United States. Some locations have more than one reactor.
as biomass — as offering hope for solutions. Indeed, Flori-
da’s 2006 energy plan emphasizes such renewable sources.

But today, renewable energies contribute only around
9 percent of total U.S. electricity, the bulk of that from
hydroelectric plants, according to Energy Information
Administration figures. With the exception of hydro, most
renewable energies cannot provide a constant and unin-
terrupted power supply, say nuclear proponents such as
Haghighat. That might be okay for solar-
equipped homes or even neigh-
borhoods. But a constant,
large and reliable power
supply is essential for
large factories or
facilities like air-
ports, which require
large amounts of
power day and
night no matter the
weather.

“For the base load,
really, today the only
choices we have are nuclear
and coal. Gas is out of the
picture because it’s too
expensive and its supply is
unreliable,” Haghighat says.

Coal-fired plants have a
major shortcoming: They
are huge emitters of car-
bon dioxide, the leading
global warming gas. With
the recent U.S. Supreme
Court decision pushing
the Environmental Protection Agency toward regulating
carbon dioxide output, a pollution clampdown could make coal more
difficult and expensive.

“Ther e is no carbon release. There is no harm to the cli-
mate,” Haghighat says.

Opponents counter that carbon emissions from uranium
mining, not to mention the resource-intensive process
of building nuclear plants, offset gains realized from the
plants’ emission-free operations. The argument is one of
many bound to be heard more often as the momentum for
new plants builds.

A national survey by the Nuclear
Energy Institute, an industry orga-
nization, found that 64 percent of
respondents strongly favor or some-
what favor the use of nuclear power
to provide electricity, compared to
31 percent who strongly or some-
what oppose it.

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Florida’s energy plan
urges fuel diversity, fuel
supply reliability and energy
security.

The state currently has
five nuclear plants that pro-
duce about 13 percent of its
power. In its promotional material for the new Levy County
plant, Progress Energy, Florida’s second-largest utility, calls
nuclear energy a necessary part of a “balanced approach” to
meeting the state’s future energy needs.

Not only are those needs growing, but Florida’s air qual-
ity is worsening. Global warming aside, coal-fired plants
contribute to the state’s high ranking in carbon monoxide,
sulfur dioxide and nitrogen oxide emissions, all of which
can have a health impact.

Whether the energy and pollution concerns will add up
to new plants remains an open question. New plants remain
incredibly expensive, with construction costs easily reach-
ing $2 billion for large ones. But there’s no question that
the timing appears to be right. Contrasting the chilly, if not
angry, reception it might have received in years past, Prog-
ress Energy’s plant announcement was met with enthusiasm
by local officials and most residents. In Florida generally,
says Tulenko, “the population is very pro-nuclear.”
we can basically simulate the whole plant,” Haghighat says.

As for nuclear fuel, as with other power plants, the most efficient nuclear plants burn the most possible fuel while drawing out the maximum usable energy. Over the years, Tulenko’s research has led to major improvements in the so-called “burn up” rate of nuclear fuel. Several of his more than one dozen research projects focus on the next generation of plants as well as “Generation IV” plants several decades in the future.

“Those reactors will use plutonium that we now consider nuclear waste,” Tulenko says. “Down the road, when we process this fuel, rather than put the plutonium into Yucca Mountain, we’ll use it to produce energy for us.”

Nuclear and radiological engineering faculty and other researchers at UF and beyond have a major resource at their disposal: a nuclear research reactor.

Built in 1959, the reactor was the first in Florida and is the only one in the Southeast, with its nearest counterpart at North Carolina State University in Raleigh. Last year, its fuel was converted from highly enriched uranium to low enriched uranium under the Department of Energy’s Global Threat Reduction Initiative, a program aimed at reducing the presence of harmful nuclear material. Nearly all of the analysis, benchmarking and licensing that went into the project was done by NRE faculty and graduate students in a record time of 15 months. Haghighat led the project, with Associate Professor Glenn Sjoden, Assistant Professor Jim Baciak, 10 graduate students and numerous staff contributing.

Haghighat says that although the reactor was heavily used in its early decades, it has not reached its full potential in recent years. One of his main goals is to revamp it into a central statewide research facility.

With that in mind, he recently persuaded Progress Energy to donate $425,000 — money that will be matched...
by the state — to renovate the reactor’s control room. His goal is to make the control system the first in the country to be completely digital, which would make it a good testing facility for new nuclear power plants seeking digital control systems, he says.

Haghighat also wants to broaden the reactor’s capabilities to make it quickly and easily available to a wide range of researchers and other, sometimes surprising users, such as anthropologists and law enforcement authorities. That’s because samples bombarded with neutrons in the reactor give off unique signatures that can shed light on their origins. In past years, for example, anthropologists have used the reactor to determine where native pottery was made, enabling them to trace ancient trade routes.

Law enforcement officers, meanwhile, have convicted at least one person based on information on the origins of marijuana that was gleaned from using the reactor. The revamped reactor, says Haghighat, will make these and other applications much easier.

“The goal we have is to build different types of experimental stations at each access port of the reactor,” he says. For Haghighat, the reactor’s broad applications are indicative of the power of nuclear technology in many areas, from energy to security to medicine.

“Nuclear engineering appears to be critical to solving major problems facing mankind in the next 50 years,” he says. “Our goal is to play a major role in helping to make that happen.”

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— Alireza Haghighat  
outside the reactor containment building at the Crystal River Nuclear Plant.