

# NUCLEAR MONITOR

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Dear readers of the WISE/NIRS Nuclear Monitor,

In this issue of the Monitor:

- Francisco Castejón writes about a hard-won victory for the anti-nuclear movement in Spain: the government has decided not to renew the operating licence for the Garoña nuclear power reactor; it will instead be decommissioned.
- Detailed reports on the latest chapter of the Toshiba/Westinghouse crisis: the bombshell announcement that the owners of the V.C. Summer plant in South Carolina have given up on two partially-built AP1000 reactors even though around US\$10 billion has already been spent on the project. We also consider the fate of the only other reactors under construction in the US: two AP1000 reactors at the Vogtle plant in Georgia.
- Mary Olson – from the Nuclear Information and Resource Service and the Gender and Radiation Impact Project – writes about the radiation and gender “siren”.
- A report on the pitiful state of the global uranium market.

Feel free to contact us if you have feedback on this issue of the Monitor, or if there are topics you would like to see covered in future issues.

Regards from the editorial team.

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## Stop German support for Belgium's Tihange and Doel nuclear plants!

Germany is stepping out of nuclear. Even if the Christian-Democrats of current Prime Minister Angela Merkel win the elections in September there is no way back; Germany is phasing out and closing all their nuclear power stations. This firmly undertaken path to a more safe, sustainable and just energy future gives the country more authority to put pressure on neighboring countries to do the same.

So the German Government calls on Belgium to close down the Tihange 2 and Doel 3 reactors, considered the most dangerous as they are plagued with cracks in the containment vessels. But at the same time Germany still has facilities which are not yet part of the phaseout policy: for instance the uranium enrichment facility in Gronau and the nuclear fuel rod fabrication facility in Lingen.

They have dozens of clients (nuclear power stations) all over the globe, including ... Tihange 2 and Doel 3!

The German environment minister Barbara Hendricks keeps saying that the Belgium reactors pose great danger, but she claims that it is not possible to stop sending the fuel rods to keep them running. According to the analysis of German NGOs, supported by legal advisers, German law offers opportunities to prohibit the export of nuclear material if it can cause danger to Germany and its citizens.

On September 9, there will be a demonstration in Lingen, where thousands of people will demand the closure of the fuel rod plant.

*More information: <http://weltweit.nirgendwo.info/demo/stop-german-support/>*

# Spain: Garoña nuclear plant to be decommissioned

*Author: Francisco Castejón – Ecologistas en Acción and Iberian Antinuclear Movement*

**NM848.4664** Santa María de Garoña is the oldest Spanish nuclear power plant, having begun commercial operation in 1971. It is located in the north of Burgos, very close to the Basque Country, and it is in the beginning of Ebro river, one of the most important Spanish rivers. The Garoña reactor is a 466 MW boiling water reactor, identical to reactor #1 at Fukushima-Daiichi. The nuclear plant is operated by NUCLENOR, which is owned by the main Spanish electricity enterprises ENDESA and IBERDROLA.

Garoña was stopped unilaterally by NUCLENOR in December 2012 to pressure the government for more favorable tax arrangements. This was a real advantage for the anti-nuclear side since it demonstrated that Garoña is not necessary at all. Since that date, a strong debate has ensued between the companies, the government, and anti-nuclear NGOs.

Garoña is affected by serious safety problems as described in reports by the Spanish regulator, the Consejo de Seguridad Nuclear (Nuclear Safety Council). In spite of this, this regulator issued a positive report in February 2017 for the continuation of Garoña. This was a scandal, but not new, since the regulator has been issuing positive reports since 2009 despite Garoña's safety problems.

The report issued in 2017 allowed for the continuation of Garoña provided a large number of refurbishments are performed. The cost of this work could be more than

€300 million ... and it would still be an aging plant that could fail again at any time. Given these economic and technical uncertainties, IBERDROLA announced that it did not want to continue with Garoña, but ENDESA was in favour of restarting the reactor.

On top of that, Spanish society is demanding more transparency, more democracy and a fair distribution of benefits and risks. Therefore, social pressure increased and became political pressure: the Spanish Parliament voted for the closure of Garoña after the regional parliaments of Basque Country, La Rioja and Aragon called for its closure.

Finally, under the weight of all these social and political pressures, the Spanish government took the decision to definitively stop Garoña. Energy Minister Álvaro Nadal announced on August 1 that the government had decided not to approve the renewal of Garoña's operating licence after studying 17 opinions submitted by institutions, associations and companies involved in the process, including Ecologistas en Acción and the Iberian Antinuclear Movement, and also taking into account the government's energy and climate plans.

It is a clear victory for the anti-nuclear movement that brings energy and enthusiasm to the ongoing fight to end nuclear power in Spain, in Europe, and all over the world. Spain's seven operating power reactors all date from the 1980s and the operating licences of all seven reactors expire between June 2020 and November 2024.



# South Carolina abandons partially-built AP1000 reactors

Author: Jim Green – Nuclear Monitor editor

**NM848.4665** SCANA Corp. and state-owned Santee Cooper pulled the plug on the two partially-built AP1000 reactors at the V.C. Summer nuclear plant in South Carolina on July 31.<sup>1</sup> Construction stopped immediately and the dismissal of around 5,000 workers is well underway.

South Carolina Electric & Gas (SCE&G), a subsidiary of SCANA Corp., announced its decision to abandon the reactors shortly after Santee Cooper board members unanimously decided to do so. SCE&G said completion of both reactors would be “prohibitively expensive” while completion of one reactor was a “potentially achievable path” – but abandoned consideration of that option once Santee Cooper’s board voted to abandon both reactors.<sup>2</sup>

Construction of the reactors began in March and November 2013.<sup>3</sup> Completion of the reactors was anticipated in 2016 and 2019. But Santee Cooper said that its latest analysis found that the reactors would not be completed until 2022 and 2024.<sup>3</sup>

SCANA CEO Kevin Marsh blamed rising costs, falling demand for electricity, construction delays and the bankruptcy of lead contractor Westinghouse for the failure of the project.<sup>4</sup> He noted that “the bankruptcy of our primary construction contractor, Westinghouse, eliminated the benefits of the fixed-price contract to our customers, investors, and other stakeholders.”<sup>3</sup>

Marsh said SCANA had “reached out to other potential partners and pursued governmental support”, without success.<sup>3,5</sup> He said of the company’s efforts in Washington: “We delivered our message very directly, very clearly, in terms of what we were looking for to support the projects. I believe they made an effort to evaluate options they had available, where they thought they could help us. We went as high as Rick Perry, Secretary of Energy, in the last meeting we had up there, and we’ve not gotten a response. We did hear from the Department of Energy. They called and offered us a DOE loan, which we had evaluated earlier, but that doesn’t help the situation we’re in.”<sup>6</sup>

What SCANA was asking of the federal government – pursuing “as hard as it could” in Marsh’s words – was a non-repayable grant of US\$1–3 billion.<sup>7</sup> But the request was rejected.

Marsh said he was not optimistic that the cancellation of the V.C. Summer project would spur Washington to act, and that SCANA has not heard from Washington since the July 31 announcement.<sup>5</sup>

SCANA has searched for new partners to join the project in recent months, Marsh said, and talked with “a couple of utilities” – but there were no takers.<sup>5</sup>

## Spiraling costs

The cost of the two reactors was estimated at US\$9.8 billion in 2008.<sup>8</sup> More recently, the official estimate was US\$14 billion.<sup>9</sup> And the latest estimate – provided after the decision to abandon the project – was around US\$25 billion.<sup>9,10</sup> Thus the cost estimate has more than doubled – as have the estimates for the French EPR reactors under construction in the France and Finland.

About US\$10.4 billion has already been spent on the two V.C. Summer reactors.<sup>11</sup>

The World Nuclear Industry Status Report said: “Some commentators have termed the decision to abandon V.C. Summer as the equivalent of throwing “billions down the drain”, but the construction-completion option was akin to throwing additional billions into a barrel without a bottom.”<sup>12</sup>

## Ratepayers on the hook

South Carolina ratepayers have already paid US\$1.4 billion towards the construction of the two reactors through surcharges on their monthly power bills.<sup>13</sup> SCE&G has implemented nine rate increases while Santee Cooper ratepayers have had five rate increases with two more pending approval.<sup>14</sup>

There is some pressure for the US\$1.4 billion to be returned to ratepayers.<sup>15</sup> But as things stand, ratepayers will never see any of the money they have contributed to the abandoned nuclear project. As *Associated Press* noted, neither SCE&G or Santee Cooper “plans to refund a dime”.<sup>16</sup> Worse still, they plan to continue to charge ratepayers to recoup as much as possible of the billions they have spent. South Carolina’s Base Load Review Act gave SCE&G and Santee Cooper the ability to collect money from customers to finance V.C. Summer during construction and also to recoup costs even if plant never operates, provided state regulators approve.

SCANA and Santee Cooper said they will not use a US\$2.2 billion contract settlement payment from Westinghouse’s parent company Toshiba to directly reimburse customers, but that the payment will be used to keep rates down. Attorney Bob Guild, representing the state Sierra Club, responded by saying: “This is just a cheap sales ploy to try and make this deal look somehow more digestible. It is not. It is terrible.”<sup>17</sup>

SCANA told regulators on August 1 that it wants permission to recover around US\$5 billion in costs spent on V.C. Summer over the next 60 years.<sup>16,18</sup> SCANA executives also want to charge customers interest – or carrying costs – for stretching the payments for the plants over the next six decades instead of a shorter period.<sup>19</sup>

## Energy Caucus

A new, bipartisan state Energy Caucus, with around 27 members, wants change. Some of these lawmakers were responsible for the fiasco of the Base Load Review Act and its demon child, the V.C. Summer boondoggle, and now they are trying to make amends.

Republican Rep. Kirkman Finlay said the Act “basically allowed the utilities a blank check at the ratepayers’ expense. There was no incentive to move quickly, efficiently and to control costs. Zero.”<sup>20</sup>

Energy Caucus members said changes could include firing state regulators who are elected by the legislature. By law, the Public Service Commission – which approved the V.C. Summer project in 2009 as well as numerous rate hikes since – must approve SCE&G’s abandonment plans.<sup>16</sup> Republican Rep. Micah Caskey, a member of the Energy Caucus, called it the “Puppet Service Commission” and said that “people need to be fired.”<sup>21</sup>

Other Energy Caucus members were equally scathing. Democrat Russell Ott said: “We should go back to the way our rates were nine years ago, before this entire debacle started. Whatever has to be paid for going forward, should be paid for out of the pockets of the utilities that ultimately got us into this mess.”<sup>17</sup>

Democrat Sen. Vincent Sheheen said: “The stockholders have been making out like bandits while the people who were supposed to be protected, the ratepayers, were suffering.”<sup>17</sup>

Democrat Rep. James Smith said the “catastrophic” end of the project at V.C. Summer project shows the current regulatory process doesn’t adequately protect residents or the state as a whole.<sup>16</sup>

South Carolina Governor Henry McMaster’s office issued a call for state lawmakers to hold “exhaustive hearings” on the project’s failure.<sup>22</sup>

Two South Carolina state senators – Republican Shane Massey and Democrat Nikki Setzler – are calling for a special session of the General Assembly to debate a resolution suspending the authority of Santee Cooper or the Public Service Commission to authorize electricity rate increases until the legislature has a chance to act in the 2018 session.<sup>23</sup> Massey and Setzler noted that a joint state Senate and House committee has already announced plans for a review of the V.C. Summer project. However they say they are “concerned that Santee Cooper and/or the Public Service Commission, at SCANA’s request, might increase power bills yet again before the review committee has completed its work.”<sup>23</sup> However it seems the proposal for a special session has insufficient political support to get up.<sup>24</sup>

Meanwhile, state Attorney General Alan Wilson announced that he would open an investigation into the V.C. Summer project.<sup>24</sup>

## Environment groups

The only hope for long-suffering ratepayers in South Carolina is if it can be proven to state regulators or a court that SCE&G knowingly made unwise management decisions as the project progressed.<sup>25</sup>

Lawmakers from the Energy Caucus said they expect to find “glaring examples” of improper management practices.<sup>19</sup>

Bob Guild, an attorney representing the Sierra Club and Friends of the Earth, said the groups would continue their fight to prevent customers from being charged any more for a project that should have been abandoned long ago. “We will seek to claw back the ill-gotten gains of SCE&G and its shareholders,” he said. “We will strongly fight any efforts to pass abandonment costs to the rate payers. There is going to be lots of bloodletting in the courts.”<sup>26</sup>

Friends of the Earth and the Sierra Club will appear at a hearing of the South Carolina Public Service Commission in October to argue the case for ratepayers to be protected.<sup>27</sup> The groups – involved since the start of the AP1000 projects in South Carolina and Georgia more than a decade ago – have repeatedly warned about the risks of cost overruns and delays and are calling for decision-makers to be held accountable for ignoring warning signs.<sup>28</sup>

## Ecomodernists lose the plot

The pro-nuclear ‘Environmental Progress’ group has launched a disinformation campaign in response to the cancellation of the V.C. Summer reactors, in the hope of breathing some life into the project’s corpse. A July 31 Environmental Progress article states that the utilities were “caving into pressure from Sierra Club and Friends of the Earth” (FoE) by abandoning the project.<sup>29</sup>

But Environmental Progress ‘ecomodernists’ know as well as anyone else that the project was doomed regardless of the work of environment groups. *Houston Chronicle* business columnist Chris Tomlinson said: “Let it be written that environmentalists didn’t kill the nuclear power industry, economics did. South Carolina Electric and Gas Co. and partner Santee Cooper abandoned work on two new nuclear reactors this week, not because of public protests, but because the only way to pay for them was to overcharge customers or bankrupt both companies.”<sup>30</sup>

The Environmental Progress article asserts that the Sierra Club and FoE “argued that burning natural gas was a better investment for consumers than finishing the plant.” Another falsehood. In support of that assertion, Environmental Progress references a paper which wasn’t even written by Sierra Club and FoE – it was written for the groups by Dr Mark Cooper from the Institute for Energy and the Environment at Vermont Law School.<sup>31</sup> And Cooper’s paper doesn’t argue that “burning natural gas was a better investment for consumers than finishing the plant.” It argues for extensive demand-side management and greater use of renewable energy sources, and it includes a passing mention of natural gas “to the extent it is needed”.

According to the Environmental Progress article, the Sierra Club and FoE argue that “coal generation in South Carolina can be adequately managed by following EPA emissions regulations”. No reference is provided in support of that unlikely claim. And since the Sierra Club and FoE support coal (they don’t), the Environmental Progress article continues, “these groups imply that carbon emissions and climate change just doesn’t matter as long as nuclear plants can be stopped.”

The Environmental Progress article asserts that if the V.C. Summer reactors were completed, they would replace 86% of South Carolina's electricity from coal. That's another fabrication. Energy demand growth has fallen well short of expectations in South Carolina. If the reactors went ahead, Santee Cooper would have reserve capacity as high as 44% – about three times the amount it requires.<sup>32</sup>

In all likelihood, the abandoned 2.2 gigawatts of nuclear capacity will be replaced to a large extent by nothing – by a reduction in the excessive reserve generation capacity that would have arisen if the reactors were completed.

That the reduction in energy demand below earlier projections influenced the decision to abandon V.C. Summer is not in doubt. SCANA CEO Kevin Marsh noted that co-owner Santee Cooper “did their evaluation and determined that because of lower customer growth that they were experiencing and some slowing in their demand for new generation, they felt like the additional cost to their customers was too great for them to proceed.”<sup>33</sup>

If the reactors were completed, it's possible that the excessive reserve capacity could be used to reduce reliance on coal – Santee Cooper has suggested using excess capacity for that purpose as well as attempts to recruit industry into the state.<sup>32</sup> But Environmental Progress's assumption that the entire nuclear capacity would be used to retire an equivalent amount of coal-fired generating capacity is make-believe.

All of the above falsehoods and fabrications are embedded in this quote from Michael Shellenberger, president of Environmental Progress: “The fact that the Summer nuclear plant would replace 86 percent of South Carolina's coal generation belies the claims by Sierra Club and FoE that nuclear energy is not needed. The episode is yet more evidence that anti-nuclear groups are willing to increase dangerous air pollution and risk catastrophic climate change in service of an ideological agenda that rests upon pseudo-science.”<sup>29</sup>

An article by Nick Gallucci and Michael Shellenberger from Environmental Progress runs hard on the ‘national security’ memes – building nuclear power plants is a national security issue for reasons that aren't at all apparent – and warns of “global nuclear domination by Russia”.<sup>34</sup> The authors argue the case for massive, multifaceted taxpayer subsidies for the nuclear industry and for a taxpayer-funded bailout of bankrupt Westinghouse. They argue that such a course will mitigate the threat of nuclear proliferation. The Nuclear Energy Institute has been promoting the opposite argument recently, trying to convince politicians in Washington that if the AP1000 reactor construction projects in South Carolina and Georgia aren't completed, it would stunt development of the nation's nuclear weapons complex because the engineering expertise on the energy side helps the weapons side.<sup>35</sup>

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## Reactions to the cancellation of the South Carolina reactors

**NM848.4666** The decision to abandon the two VC Summer reactors will have a chilling effect on regulators, consumers and potential nuclear customers in the US and abroad, noted Paul Murphy from multinational law firm Gowling WLG.<sup>1</sup> "If you can't build plants in your own country, that's not a great story for nuclear in that country and it's not a great story for the ability to export," he said.

The South Carolina decision amounted to a "crippling setback" to the long quest to revive the US nuclear power industry according to the *Washington Post*.<sup>2</sup> It was a "major blow to the future of nuclear power in the United States" according to *Bloomberg*.<sup>3</sup>

*Reuters* noted that the South Carolina decision "adds to the long list of reactors power companies have canceled over the past 40 years."<sup>4</sup> Forty-eight reactors have been canceled after construction began in the US according to the Reuters list.

Josh Freed from the pro-nuclear 'Third Way' group noted that the V.C. Summer problems stem in part from the fact that the US lacks the workforce and supply chain to support new nuclear plants after a three-decade construction hiatus.<sup>5</sup> That hinders not only plants like V.C. Summer but also efforts to deploy technologies like small modular reactors, he said.

Rich Powell, executive director of the ClearPath Foundation, said: "In any industry, if it's not growing it's dying. If we can't keep some construction going, our already pretty challenged nuclear renaissance will become fully challenged."<sup>6</sup>

John Quiggin, Professor of Economics at the University of Queensland, wrote: "Almost everywhere, however, the vision of safe, cheap nuclear power has proved unattainable. ... But the dream dies hard. Despite decades of evidence to the contrary, the idea that nuclear fission offers a cheap, safe and reliable source of electricity, obstructed only by the irrational fears of environmentalists, remains strong. What the shareholders of Toshiba, Westinghouse and SCANA, and the electricity consumers of South Carolina have learned, like others before them, is that this is a costly illusion."<sup>7</sup>

The Beyond Nuclear NGO paid tribute to the environmental groups that led the fight against the V.C. Summer project – Friends of the Earth, the Sierra Club, and the Southern Alliance for Safe Energy. Beyond Nuclear reminded readers of the 1985 *Forbes* magazine cover story 'Nuclear Follies' that described the development of commercial atomic power as "the largest managerial disaster in U.S. business history where only the blind and the biased can say the money was well spent."<sup>8</sup>

Tom Clements, an advisor to Friends of the Earth, said:<sup>9</sup>

*"The decision to abandon the V.C. Summer project is of monumental proportion and is a full admission that pursuit of the project was a fool's mission right from the start. The damage that this bungled project has caused to ratepayers and the state's economy must be promptly addressed by SCE&G, Santee Cooper and regulators and all effort must be made to minimize that damage. SCE&G and Santee Cooper must now take on a large part of the project's cost."*



The V.C. Summer reactor construction site in South Carolina.

*“To reduce the on-going blow to SCE&G ratepayers already paying 18 percent of the bill just to pay for project financing, it’s time for money to be refunded as it was collected from them under the false pretense that advance payment for the nuclear project was sound. In proceedings before the South Carolina Public Service Commission, we pledge to be a steward of the public interest and to determine who must be held accountable for this boondoggle and to fight for monetary reparations to customers.”*

*“Warnings about potential problems with the project were raised in 2008 and repeatedly since then by Friends of the Earth and the Sierra Club but they were blindly ignored by both SCE&G and Santee Cooper as well as regulators. There was ample warning about the pitfalls that the project would face so it appears that regulators may have simply bowed to the will of SCE&G and rubber stamped decisions at every step of the way without proper review.*

*“Regulators have so far not attempted to make a case that they provided proper oversight and the pressure is now on them to explain their actions that have led to this debacle. Agencies charged with looking out for the public interest – the South Carolina Public Service Commission and the Office of Regulatory Staff – failed the citizens of the state by not performing due diligence of the unsubstantiated claims made by SCE&G about the project’s cost, schedule and ease of construction.”*

Cindi Ross Scoppe, associate editor at *The State* newspaper, wrote: “IF SCE&G AND Santee Cooper were free-market businesses, they’d probably be out of business in the wake of South Carolina’s nuclear meltdown. Or they’d have new management. Or they would have abandoned their nuclear reactors years ago – if they had ever started building them. If SCE&G were even just a regular regulated monopoly – one that didn’t have the Legislature’s blessing to charge ratepayers \$1.4 billion, and keep charging us even more, for electricity we will never receive – it probably would have walked away from the project much sooner. Or, like every other regulated monopoly in the nation without such legislative protection, never started it. But state law reduced SCE&G’s risk

and made it financially and psychologically easier for the company to pursue a high-risk plan to build the nation’s first new nuclear reactors in decades. And state law allowed Santee Cooper to join the venture without even the modicum of oversight that SCE&G had.”<sup>10</sup>

Brett Bursey, executive director of the S.C. Progressive Network, wrote: “Gov. Henry McMaster has called for legislative hearings into what may be the biggest theft in state history: a multi-billion-dollar nuclear disaster. I witnessed the crime first-hand and know who pulled off the heist. Those blaming SCE&G for shaking down consumers are chasing the wrong culprit. SCE&G is an investor-owned monopoly whose mission is to make money for its stockholders. It was no surprise, then, that it took advantage of an opportunity to socialize the risk and privatize the profit of building nuclear reactors. That’s what profit-driven corporations do. ... The villain in this billion-dollar theft isn’t the for-profit corporation. It’s legislators who pass laws that restrict the regulators who could prevent the theft. The Legislature needs to do no more than look in the mirror to see who’s guilty.”<sup>11</sup>

Edward Davis, a former President of the American Nuclear Energy Council and now with the Nuclear Infrastructure Council, said: “For the nuclear industry over the last year, the news has not been encouraging ... But the news this week coming out of South Carolina announcing the cancellation of the Summer Nuclear Units 2 and 3 project was much more ominous. ... What was most telling about the cancellation of the Summer Nuclear Project was the virtual silence from around the nuclear industry as the industry was surely witnessing a cataclysmic event, one which is no doubt maybe signaling its demise, at least as we know it. ... In the bygone days of the industry, industry leaders ... would have certainly reacted to the news of the cancellation by swiftly issuing a clarion call to action to put in place a rescue and recovery plan working in conjunction with the Federal and State government officials as well as labor leaders and other stakeholders. Today’s industry silence signals shows how fundamentally the industry structure has changed where the industry has now evolved to a much more competitive state with significantly diversified interests.”<sup>12</sup>

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# Will the AP1000 reactors under construction in Georgia be completed?

**Author:** *Jim Green – Nuclear Monitor editor*

**NM848.4667** Only three power reactors have been connected to the grid in the US in the past 25 years, and no power reactor in the US has both begun construction and been completed since the Three Mile Island accident in 1979.<sup>1</sup> With the cancellation of the V.C. Summer project in South Carolina, only two reactors are under construction in the US: the AP1000 reactors at the Vogtle plant in Georgia. Will the Vogtle project break the streak of no reactors being ordered, built and completed since Three Mile Island? Or will the project be cancelled – in which case there will be a grand total of zero reactors under construction in the US?

A decision will probably be announced by the end of the month by the project owners, then the Georgia Public Service Commission will have to decide whether or not to accept their proposal – a process that could take several months.<sup>2</sup>

Comments by Southern CEO Tom Fanning on August 2 suggested that he is leaning towards recommending that construction keep going.<sup>3</sup> Fanning said the company had costed the option of building one of the Vogtle reactors and a gas-fired plant at the same site, but preferred to either keep or abandon the nuclear project as a whole.<sup>4</sup> "We would need to build a rather lengthy [gas] pipeline, and maybe other sites around Georgia are maybe more suitable for that," Fanning said.<sup>4</sup>

In some respects, the Vogtle project in Georgia has better prospects than the abandoned V.C. Summer project in South Carolina:

- Energy demand is growing more rapidly in Georgia.<sup>5</sup>
- The Vogtle project is closer to completion than V.C. Summer. According to the *Augusta Chronicle*, the Vogtle project is 66% complete overall, with almost all

of the engineering and most of the procurement done, and construction 44% complete.<sup>6</sup> The current timeline for completion of the reactors is between Feb. 2021 and March 2022 for Vogtle #3 and between Feb. 2022 and March 2023 for Vogtle #4.<sup>7</sup>

- Toshiba's settlement payment for the Georgia AP1000 project is US\$3.68 billion, well above the US\$2.2 billion to be paid to the South Carolina utilities.
- The rate impact is spread across a bigger customer base – Georgia Power has about three times more customers than SCE&G.<sup>7</sup>

But there are important similarities between the South Carolina and Georgia projects. Westinghouse is exiting from both projects. Both projects are long-delayed and billions over-budget. Ratepayers in both states are sick of paying in advance for the AP1000 reactors that may never be completed – Georgia Power had collected almost US\$1.2 billion from ratepayers by the end of 2016 to pay for Vogtle.<sup>8</sup>

Another vulnerability for the Vogtle project is that it has more owners – Georgia Power (45.7%), Oglethorpe Power Corp. (30%), the Municipal Electric Authority of Georgia (22.7%) and Dalton Utilities (1.6%) – and the project might collapse if just one of the owners calls for its termination.<sup>9</sup> Georgia Public Service Commissioner Stan Wise said: "I would question whether the commission would have the appetite to go forward without a unanimous decision from the owners."<sup>9</sup>

In 2008, the cost estimate for the two Vogtle reactors was US\$14 billion. Southern Co. said on August 2 that its current estimate is a total cost of at least US\$25 billion.<sup>3,10</sup>

Georgia Power estimates net additional capital costs of US\$1.0-1.7 billion to complete the two AP1000s under



construction at Vogtle.<sup>7</sup> Costs for other owners – who own slightly over 50% of the project – would presumably be slightly larger.

Of course, that US\$25 billion figure could prove to be an underestimate, as with all previous estimates. The Southern Alliance for Clean Energy (SACE) estimates that the cost could reach US\$29 billion.<sup>11</sup> SACE based its estimate on a June 2017 report by two utility consultants to the Georgia Public Service Commission. The consultants' report is based on a scenario in which the project comes online in 2022, and Westinghouse's bankruptcy adds further costs.

Will Vogtle go ahead? "It might be a close call," said Kit Konolige, a New York-based utility analyst for Bloomberg Intelligence. "The biggest issue is, what's your level of confidence that if you do go ahead, it's going to be done on time and on budget."<sup>10</sup>

Few people on the outside looking in have much confidence that Vogtle could be completed without significant additional cost overruns and delays. But there is more confidence among the Vogtle project partners and state 'regulators' that the project can be completed.

Southern Co. recently noted that the project has fallen further behind schedule since Westinghouse filed for bankruptcy protection in March 2017.<sup>3</sup>

Matt Kempner commented in the *Atlanta Journal-Constitution*:<sup>12</sup>

*"Continuing to fund the only remaining nuclear power plant under construction in the U.S. relies largely on decision-makers convincing themselves that the companies can accurately revise cost and schedule estimates for Plant Vogtle's expansion. It's a dicey proposition. Accuracy hasn't been a strong suit of the power giants in recent years."*



*"Southern is one of the biggest power companies in the country and the parent of Georgia Power. It has embarked on exactly two mega construction projects in the last decade or so. Both – the expansion of Plant Vogtle and the Kemper clean coal/gas plant in Mississippi – have gone billions of dollars over budget and faced years of delays. As each project struggled, Southern and its subsidiaries continued to underestimate the magnitude of the overruns. Independent monitors for the Georgia Public Service Commission regularly warned about rising Vogtle costs that were more accurate than Georgia Power's reassurances about stability."*

Georgia Power estimates it would cost it a total of US\$6.3 billion to cancel the project, comprising its share of expenditure on the project to date; financing costs; and other costs connected with cancellation, including terminating contracts for construction and other services, and securing the construction site.<sup>7</sup>

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# Females exposed to nuclear radiation are far likelier than males to suffer harm

**Author:** *Mary Olson – staff biologist at the Nuclear Information and Resource Service and acting director of the Gender and Radiation Impact Project.*

**NM848.4668** The nuclear weapons ban treaty recently adopted by the UN General Assembly arises from hope for our future. The negotiations for the treaty have elevated new information about the damage from ionizing radiation to the world stage. That is exactly where it needs to be heard.

More cancers are derived from radiation than national regulators now report. They may not be aware that both age-at-exposure and one's sex determine how much harm we suffer from radiation.

Women exposed to ionizing radiation during childhood suffer from cancer at a rate 10 times higher than predicted by traditional models used by the US Nuclear Regulatory Commission.

The models assume that "Reference Man" represents us all. Invented to simplify calculations, Reference Man is 25 to 30 years old, weighs 154 pounds, is 5 feet 6 inches tall, "Caucasian and has a Western European or North American" lifestyle.

There has never been a pause as more than 2,000 atomic tests since 1945 have been spreading radioactivity worldwide and hundreds of nuclear factories have proliferated. No one asked if Reference Man is an appropriate stand-in for all of humanity and radiation harm.

It turns out that adult males are hurt by radiation, but they are significantly more resistant than their mothers, sisters, wives or daughters. Use of Reference Man masks gendered impacts and therefore systematically underreports radiation harm.

My first paper on radiation, published in 2011, "Atomic Radiation Is More Harmful to Women," answers a simple question from a woman who raised her hand at one of my public lectures in North Carolina a year earlier, asking, "Does radiation exposure harm me more than a man?" She did not mean in pregnancy; she meant her own body.

I was shocked. That was 2010; in decades of work on radioactive waste policy, I had never heard of gender as a factor in radiation harm. I could not even attempt an answer. When the literature yielded nothing, my mentor, Rosalie Bertell, suggested I look at the numbers myself. Bertell was a mathematician and a recipient of a Right Livelihood Award, which is called an alternative to the Nobel prizes. Bertell devoted her life to communities hurt by radiation, including the ones she pointed me to in order to examine the data.

Only one large data set includes all ages and both genders exposed together to a single flash of gamma and neutron radiation: the survivors of the US nuclear

attacks on Hiroshima and Nagasaki in 1945. They survived in shelters or other shielding amid the first horrific years. Sixty years of data on cancer incidences and fatality among the survivors – called the Hibakusha – was published by the US National Academy of Science in 2006.

I regret that this data even exists – it was my government that used the first nuclear bombs on cities full of people, and I certainly wish they had not. I nonetheless use the numbers. They hold a message for humanity: gender matters in the atomic age. That does not make it right.

The highest incidence of cancer, looking across 60 years, was among those who were children when they were exposed. This is not news. The surprise is that in this group, females suffered twice as much cancer across their lives than did males.

The difference between male and female, with males more resistant to radiation harm, is measurable in all the age-of-exposure cohorts, even into old age – the difference between genders is smaller when adults are exposed rather than when they are children.

For every two men exposed in adulthood who died of cancer, three women died of cancer. A 50% difference in the rate of cancer death from radiation exposure in adulthood is not insignificant to most female readers! Indeed, this finding is changing my own behavior in fieldwork.

The question, Why is gender a factor?, is waiting for researchers to tackle. A team lead by David Richardson in the Department of Epidemiology at the University of North Carolina, Chapel Hill, in 2016 showed that the A-bomb cancer data mirrors the outcomes of many smaller radiation exposures over time, adding up to the same exposure level as the Japanese survivors.

We are all getting these smaller radiation exposures.

The 10-females-to-1-male ratio cited here is the comparison of cancer outcomes from the youngest female survivors versus the 25- to 30-year-old males: the group that underpins Reference Man. This dramatic order-of-magnitude difference in biological research is like a siren blaring: pay attention!

It is time to retire Reference Man. Any level that is set for public exposure to radiation should be based on little girls. When we protect them, everyone is better protected. Unless we protect girls, our collective future is at stake.

The radiation and gender "siren" has not been heard widely, but it has been heard. In 2014, I was honored to present my findings at the Vienna Conference on the Humanitarian Consequences of Nuclear Weapons and

exhilarated to read the draft treaty on the prohibition of nuclear weapons, where one basis for the need for the new treaty is the disproportionate harm to women and girls from ionizing radiation.

The treaty falls within the jurisdiction of humanitarian law, which includes the most human activity of all: making babies, from which flow future generations.

For these countless people to come, I celebrate that the news on radiation has been heard at the UN as it takes the next vital step of voting on a new nuclear-ban treaty.

It is a sturdy seedling of hope.

*Reprinted from [www.passblue.com/2017/07/05/females-exposed-to-nuclear-radiation-are-far-likelier-than-males-to-suffer-harm/](http://www.passblue.com/2017/07/05/females-exposed-to-nuclear-radiation-are-far-likelier-than-males-to-suffer-harm/)*

## Nuclear power's death spiral and the demise of uranium miners

**Author:** *Jim Green – Nuclear Monitor editor*

**NM848.4669** *Seeking Alpha*, a publication for stock investors, has published an article on 'the death spiral of nuclear energy and the demise of uranium miners', written by 'independent professional value investor' Caiman Valores.<sup>1</sup> It's rare for such publications to carry such an analysis. Typically, in the upside-down, glass-half-full universe that stock investors live in, bad news is good news: the further the uranium market slumps, the further a particular company slumps, the closer the turnaround and the upwards swing.

Valores points to data showing that uranium production increased by 50% from 2007 to 2016<sup>2</sup> despite the failure of the nuclear 'renaissance' to materialize and generally stagnant demand. Hence the large and growing stockpiles of yellowcake and further downward pressure on already very low prices. "Despite claims of a looming supply cliff and higher demand which will support higher prices," he writes, "demand for uranium is set to weaken in an environment where supplies are growing."

Valores is much more bullish about renewables: "The desire to limit global warming as well as the dangers posed by nuclear energy in the wake of Fukushima sparked a significant uptick in investment and research into cleaner more sustainable and less dangerous sources of energy. That culminated in renewables receiving a record level of investment totaling \$349 billion in 2015. While investment declined in 2016 by 18% compared to 2015 it was still a very respectable \$287 billion.

Valores concludes: "Despite claims that uranium prices will receive a leg up from greater demand and constrained supplies, it is clear that the tide has turned against nuclear power and the radioactive metal. Not only has sentiment turned against nuclear energy after Fukushima but cleaner safer renewable forms of energy are increasingly becoming cheaper and more efficient. The surge in investment in renewables now sees the vast majority being competitive with or even cheaper than nuclear power as well as fossil fuels. For those reasons alone it is difficult to see the substantial demand growth required to lift uranium prices significantly higher, particularly when global uranium supplies will keep growing weighing further on prices. That means primary uranium miners remain value traps despite their attractive valuations."

Credit Suisse's Robert Reynolds and Anita Soni estimate that some 40% of operating reactors will

be decommissioned by 2035, with fewer new units brought online to replace them.<sup>3</sup> They write: "We estimate an average of ~9 reactors per year will need to be constructed from 2017-2035 just to keep uranium demand steady at 2016 levels. In 2016, 11 new reactors were brought on-line. However, this includes seven reactors in China where we see nuclear capacity growth slowing due to power market oversupply and a decline in the relative economic competitiveness of nuclear."

### If the uranium market recovers, it will be a long time coming

Then Paladin Energy chief executive John Borshoff said in 2013 that the uranium industry "is definitely in crisis ... and is showing all the symptoms of a mid-term paralysis".<sup>4</sup> His prediction was accurate. Long-term contract prices and spot prices are much lower in 2017 than they were in 2013.<sup>5</sup>

Former World Nuclear Association executive Steve Kidd said in May 2014 that "the case made by the uranium bulls is in reality full of holes" and he predicted "a long period of relatively low prices, in which uranium producers will find it hard to make a living".<sup>6</sup> So far, Kidd's prediction has proven to be accurate. Long-term contract prices and spot prices are much lower in 2017 than they were in 2014.<sup>5</sup>

An October 2015 report in *Nuclear Engineering International* noted that "there may not be much upward pressure on market prices until the next decade" as "excess supply is expected to persist."<sup>7</sup>

Nick Carter from Ux Consulting said in April 2016 that the spot uranium price could stay in the low \$30s/lb "for quite some time" because supply is expected to exceed demand by 25–30 million pounds U3O8 each year from 2016 to 2019.<sup>8</sup> Carter said he did not see a supply deficit in the market until "the late 2020s".<sup>8</sup>

UBS analysts noted in July 2016 that a turnaround in the market could be years off due to the slow reactor restart process in Japan and the slow pace of global nuclear expansion.<sup>9</sup>

The *Wall Street Journal* reported in September 2016: "There is too much of nearly every commodity in the world today. Then there is uranium. The outlook for the element that powers nuclear reactors may be worse than for any other, and there is almost no prospect

for improvement soon. Unlike other commodities, low prices won't stimulate demand. No commodity faces the unique pressure that uranium and nuclear fuel do and there is little prospect of a near-term recovery."<sup>10</sup>

Expectations that the uranium price would rise have repeatedly been foiled:

- Reactor restarts in Japan were meant to stimulate the uranium industry – but only five reactors are operating as of August 2017.
- The December 2013 end of the US–Russia 'Megatons to Megawatts' program (converting highly enriched uranium from weapons into fuel for power reactors) was meant to stimulate the industry – but it had no effect.
- The global nuclear power 'renaissance' was meant to stimulate the uranium industry – but it didn't materialize.
- The industry hoped that the drawing down of inventories would lead to increased prices – but inventories are massive and still growing (as discussed below).

The industry is getting increasingly desperate, looking for a bounce from political conflicts upsetting existing production and supply networks (e.g. the Russia / Ukraine conflict) or from further mine failures and closures. According to an April 2015 *Mineweb.com* article: "What could bring a major price surge forward though remains major supply interruptions – either for geopolitical reasons, or for debilitating technical problems at one or more of the key producers."<sup>11</sup> Yet long-term contract prices and spot prices have fallen since April 2015 – indeed they have fallen sharply.<sup>5</sup>

### Explaining the uranium market's malaise

There are numerous reasons why the uranium market is likely to remain depressed for the foreseeable future. The most important are as follows:

1. Nuclear power is unlikely to expand. Stagnation or slow decline are the most likely scenarios over the next 20 years, and if there is any growth it will be slight.

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2. Uranium is plentiful. At the 2016 level of uranium requirements (63,404 tonnes of uranium<sup>12</sup>), identified resources<sup>13</sup> are sufficient for 121 years of supply of the global nuclear power fleet (at its current capacity of 392 gigawatts). From 2012 to 2014, uranium was produced in no less than 21 countries.<sup>13</sup>
3. Stockpiles (inventories) are massive and still growing. Global stockpiles have grown sharply since the Fukushima disaster and now amount to more than 1.4 billion pounds U3O8 according to Ux Consulting<sup>14</sup> or 1.2 billion pounds according to the OECD's 2016 Red Book.<sup>13</sup> Thus stockpiles alone would suffice to keep the entire global reactor fleet operating for around eight years. And stockpiles continue to grow – supply from mines and secondary sources currently exceeds demand by about 30 million pounds U3O8 per year or 18%.<sup>14,15</sup>
4. Secondary sources – i.e. sources other than newly-mined uranium – continue to contribute significantly to oversupply. Secondary sources include government and commercial inventories, reprocessed uranium, underfeeding at enrichment plants (extracting more U-235 per given volume of feedstock), uranium produced by the re-enrichment of depleted uranium tails, and low-enriched uranium produced by blending down highly enriched uranium (typically from military sources).
5. Enrichment oversupply. The overcapacity and low cost of uranium enrichment services has emerged as a significant factor undermining the uranium industry. Cheap, abundant enrichment capacity can substitute for newly mined uranium, either by extracting more uranium-235 during uranium enrichment, or re-enriching tails. This has and will continue to keep uranium prices down.<sup>6,16</sup> *Platts* noted in April 2016 that enrichment companies are using their excess enrichment capacity to bring an estimated 15 million lb U3O8 equivalent to the market annually<sup>8</sup> – that equates to almost 10% of annual demand.

# Nuclear-Free Future Awards

The winners of the 2017 Nuclear-Free Future Awards were announced in July. Presented since 1998 in the categories of Resistance, Education, and Solutions, the annual awards are made by the Munich-based Nuclear Free Future Foundation. The ceremony honoring this year's winners takes place in cooperation with the international congress 'Human Rights, Future Generations, and Crimes in the Nuclear Age', September 14–17 at the University of Basel.

The 2017 winners are:

**Resistance:** *Almoustapha Alhacen, Niger*

Almoustapha Alhacen, a Tuareg, worked until recently at the French-owned Areva uranium mine in Arlit, Niger. When he saw how his sick and dying co-workers were ignored by the company, and how the environment was affected, he founded the NGO, Aghirin'man, ("Protection of the Soul," in the language of the Tuareg). Alhacen has courageously spoken out, both in Niger and on international stages, against human rights abuses and the negative health impacts caused by uranium mining, and continues to do so even after losing his job and livelihood in 2015.

**Education:** *Janine Allis-Smith and Martin Forwood, Great Britain*

Janine Allis-Smith and Martin Forwood are the two-person heart of Cumbrians Opposed to a Radioactive Environment (CORE). For several decades, the pair have unmasked, publicized and challenged the often

secret operations at the Cumbria-based Sellafield nuclear reprocessing plant in northwest England and its short-lived and failed MOX fuel fabrication plant there. Today, they are also helping lead opposition to proposed new nuclear reactors at Moorside, adjacent to Sellafield. CORE is an indispensable pillar of the British anti-nuclear movement.

**Solutions:** *Hikomichi Umabayashi, Japan*

In 1980, physicist Dr. Hikomichi Umabayashi left his teaching post at the Tokyo Metropolitan Technical College in order to dedicate himself to achieving world peace and to eliminating nuclear weapons. His vision: a Northeast Asia Nuclear Weapons-Free Zone; no atomic missiles stationed on the ground in Japan, North Korea, or South Korea; and a guarantee from Russia, China, and the United States that no nuclear weapons would be deployed or used within the zone. He is the founder of Peace Depot Inc., a non-profit initiative that focuses on peace research and education and promotes ideas for national defense systems not reliant on atomic deterrence or outright military supremacy.

Special recognitions:

– Jochen Stay, Germany, for his effective campaigning for over 30 years.

– Switzerland's anti-nuclear movement.

[www.nuclear-free-future.com/en/home/news/311-laureates-2017/](http://www.nuclear-free-future.com/en/home/news/311-laureates-2017/)

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The Nuclear Information & Resource Service (NIRS) was set up in the same year and is based in Washington D.C., US.

WISE and NIRS joined forces in the year 2000, creating a worldwide network of information and resource centers for citizens and environmental organizations concerned about nuclear power, radioactive waste, proliferation, uranium, and sustainable energy issues.

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