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United States Nuclear Regulatory Commissioners
Washington, DC

Commissioners,
Thank you for the opportunity to share my views, representing the Tennessee Environmental Council, regarding the Watts Bar 2 operating license review. I look forward to presenting a summary of the issues brought up in this statement and answering your questions on October 30th at your meeting in Washington.

The Tennessee Environmental Council
The Tennessee Environmental Council (The Council) is a 44-year old non-profit, non-governmental organization. We are based in Nashville, with a regional office in Chattanooga. Our website is www.tectn.org. I am not a paid staff member; rather, I was Chairman of the Board of Directors of The Council from 2004 until early 2014 and I remain on the Board and engaged in energy policy. Our mission is "educating and advocating for the conservation and improvement of Tennessee's environment, communities, and public health." Our vision is "a Tennessee that embraces natural resources as the backbone of our communities, economy and quality of life for all present and future generations." A key aspect of our work is building a sustainable Tennessee. The following definition is from The Council's "2013 Sustainable Tennessee Agenda":

> *Sustainability is most often defined in economic, environmental and social contexts. Sustainable communities are those meeting the economic, environmental and social needs of the present generations without compromising the ability of future generations to meet their own needs. More simply, the concept of sustainability can be defined as "zero waste". Waste is a measure of economic efficiency, and also represents a major source of degradation to Tennessee's natural resource wealth; thus degrading the availability of clean water to drink and air to breathe.*

Relevant Biographical Information
I am a 43 year resident of Tennessee. I am a member of TVA's Community Advisory Panel for Watts Bar 2. I am also the Nuclear Power Committee Chair for the Tennessee Chapter of the Sierra Club. I graduated from Vanderbilt University in 1970 with a BA degree in Cultural Anthropology and Sociology. I was a working partner in a pioneering natural foods store in Nashville from 1972 until 1998. I learned about the connection between the environment, our diet and our health from extensive study of the topic and our customers.

I first heard details about nuclear power plants when Drs. John Goffman, Arthur Tamplin, and Helen Caldicott came to Nashville in the late 1970's to make us aware of The Tennessee Valley Authority's (TVA) construction of 4 reactors at Hartsville, Tennessee which is upstream and within 50 miles of Nashville. At that time I became active in raising concerns about the risks

and lack of wisdom in TVA's building the 17 reactors it was planning. After TVA abandoned many of these projects (including Hartsville) and slowed others down, I turned my attention to raising my children and building my business. Safety concerns raised by the accidents at Browns Ferry, Three Mile Island and Chernobyl and enormous cost overruns had stopped the headlong expansion of nuclear power.

Fast forward to 2006-7, I had sold my business and my kids were young adults. I became a Board member and then Board Chairman of The Council because of general environmental concerns. I had not really followed nuclear power or TVA issues for over 20 years. In my role with The Council I became aware of TVA's once again expanding nuclear power program. I decided to revisit the subject to see if I still agreed with my earlier positions. I studied the question in far greater depth than I ever had before and concluded that I still find commercial nuclear power reactors to be a mistake. The development and lowered cost of renewable energy sources and advances in energy efficiency and conservation make nuclear power an unnecessary risk, environmental burden and nuclear weapons proliferation pathway.

I have often heard nuclear industry insiders say, "if only opponents would learn more about the technology they would no longer have irrational fears about it." For me the opposite is true: the more I know, the more I oppose fissioning uranium, plutonium or thorium to boil water to generate electricity.

Background on TVA

It is important to recognize that the Tennessee Valley Authority (TVA) has no local or state oversight. Its unique Federal status makes it only answerable to the U.S. Congress and its own Board, which the President of the United States appoints. The people of the Tennessee Valley have very limited impact on TVA policy and generation decisions.

While TVA does make an effort to engage the public, its decisions on important issues such as the power mix are made internally. I have doubts that the current Integrated Resource Planning (IRP) process truly is the unbiased study that TVA has said it will be. I do not believe the 2011 IRP was unbiased. I do appreciate the inclusion of several representatives from environmental groups on the stakeholder working group. Likewise, I appreciate the opportunity to participate in the Watts Bar 2 Community Action Panel. I have found those meetings to be cordial, informative and useful.

TVA's unique Federal ownership gives it the potential to lead the way into the sustainable energy paradigm of the future. This would be consistent with TVA's founding mission and its early history of heroic accomplishments in electrifying the Valley, flood control and improving agricultural and environmental practices.

Unfortunately TVA has a history of abandoning visionary energy policy in favor of polluting policies and practices. Far from being a leader in clean energy policy, it has become a steadfast supporter of the status quo. TVA spent decades fighting the EPA on reducing the pollution coming out of its coal fired plants. In the last few years it has decided to reduce its reliance on coal, but wrongly decided to turn to more nuclear generation. If or when Watts Bar 2 comes on line, TVA will be generating 40% of its electricity with nuclear.

TVA is responsible for the largest coal ash spill in U.S. history at Kingston, TN in December of 2008. A coal ash dam failed, spilling 5.4 million cubic yards of coal ash into the Emory River and over 300 acres of lakefront property. It was enough toxic ash to cover a football field almost ½ mile high. It has cost TVA ratepayers $1.2 billion to mitigate the mess. That dam had shown clear signs of serious problems for several years prior to the disaster.

The early history of TVA's nuclear program is replete with clashes with the NRC, safety lapses, incredible cost overruns, and construction problems: from the notorious "candle fire" at Browns Ferry Unit 1 to the complete shut down of the utility's nuclear program in 1985. Incredibly, according to a 2012 Government Accounting Office (GAO) report, the Browns Ferry Reactors were still not in compliance with fire safety regulations that were developed after the 1975 Unit 1 fire caused by a candle in the control room. It is my understanding that the plant is still not in compliance.

The NRC is well aware of TVA's continuing questionable safety culture. The recent multi-year (2011– 2014) Red safety finding of Browns Ferry was caused by a stubbornly deficient safety culture resulting in serious performance problems: a blocked low-pressure cooling line, a cooling pump with bearings installed backwards, the high pressure core spray installed incorrectly, and widespread lapses in preventative maintenance. Unit 1 operated for years with overlapping, malfunctioning emergency cooling systems. Though the Nuclear Regulatory Commission staff just returned all three reactors at Browns Ferry to normal levels of inspection and oversight for the first time in more than four years,[1] the track record has been abysmal for far too long.

TVA's history of nuclear whistleblower harassment, discrimination, and retaliation is another serious concern. Watts Bar and Sequoyah were in the top 5 for 2012 NRC whistleblower complaints. Watts Bar had 21, Sequoyah 19, and Browns Ferry 16.

In a post-Fukushima world, these serious, long-term lapses in the safety culture at TVA cannot be tolerated.

A large issue of concern in the Valley is the long-term health of our water resources, particularly the Tennessee River. Nuclear power is incredibly water-intensive and lacks the resiliency that other energy options provide, especially energy efficiency and renewables, including wind and solar. Nuclear reactors in the Southeast and across the country have proven themselves vulnerable to the growing impacts of climate change - drought, severe weather events and changes to needed water resources in terms of both quality and supply, among others.[2]

Several times over the years at its three-reactor Browns Ferry nuclear plant in Alabama on the Tennessee River downstream of Watts Bar and Sequoyah nuclear plants TVA had to reduce electricity generation in order to prevent dumping too hot water back into the river to avoid violating state environmental permit regulations. This energy-water collision has also had

[1] See NRC press release from 10/20/2014 at http://pbadupws.nrc.gov/docs/ML1429/ML14293A315.pdf.
[2] See the Union of Concerned Scientist's recent report, "*Power Failure: How Climate Change Puts Our Electricity at Risk -- and What We Can Do*." Available at http://www.ucsusa.org/assets/documents/Power-Failure-How-Climate-Change-Puts-Our-Electricity-at-Risk-and-What-We-Can-Do.pdf.

financial impacts. In 2010 this reduction and subsequent need for TVA to replace the lost power cost ratepayers $50 million.[3] TVA has also invested hundreds of millions of dollars in a new cooling tower[4] to help prevent this from happening in the future.

But unfortunately, this situation may occur again, not only at Browns Ferry but potentially also at other existing power plants or the yet to be licensed Watts Bar Unit 2. A study published in Nature Climate Change highlighted the Browns Ferry problems and determined that, "The likelihood of extreme drops in power generation from total or partial plant shutdowns will triple in the next 50 years."[5]

Concerns with TVA's Additional Nuclear Aspirations

Bellefonte: The TVA Board has stated that the utility will complete Watts Bar 2 before the utility attempts to resurrect the long-abandoned Bellefonte Unit 1 reactor in Alabama. Once again, the utility misleadingly claims that building an antiquated reactor that's been cannibalized represents "new nuclear generation." Residents and businesses in the Valley cannot be put at further risk both economically and in terms of our health and safety; Bellefonte is a bad bet as the Southern Alliance for Clean Energy has described in their extensive report, one that would cost billions more than it already has – and is something we in the Valley can ill-afford.[6] TVA is wasting millions of dollars per year just to keep the license open.

Small Modular Reactors (SMRs): If you ask the non-profit, non-partisan taxpayer watchdog group, Taxpayers for Common Sense, small modular reactors or "SMRs" are a taxpayer boondoggle. There are concerns that SMRs will represent yet another nuclear boondoggle for TVA customers too. In February 2013 Taxpayers for Common Sense awarded "The Golden Fleece" to the Department of Energy for federal spending on small modular reactors.[7] It is our understanding that TVA intends to file an early site permit (ESP) application with the NRC for an unspecified SMR design at yet another abandoned nuclear power plant site (previously for a breeder reactor) – TVA's Clinch River Site in Tennessee, also along the Tennessee River. This is despite the fact that there are no design certification applications even filed with the NRC. There is clearly no assurance that SMRs will ever materialize and currently there are no affordable cost estimates.

TVA Limits the Growth of Renewables and Energy Efficiency

The high cost of building and decommissioning reactors leaves very little money for building a sustainable energy infrastructure relying on more and more wind and solar power and less on nuclear, gas, and coal.

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[3] Energy & Water in a Warming World Initiative, "*Freshwater Use by U.S. Power Plants: Electricity's Thirst for a Precious Resource*," November 2011. Available at: http://www.ucsusa.org/clean_energy/our-energy-choices/energy-and-water-use/freshwater-use-by-us-power-plants.html#.VEVqWIvF-4o.

[4] See http://blog.al.com/breaking/2012/06/hot_weather_hot_water_pose_cha.html.

[5] See http://www.eurekalert.org/pub_releases/2012-06/uow-nac053112.php.

[6] See Southern Alliance for Clean Energy's report, "*TVA's Bad Nuclear Bet: Gambling Billion$ on Bellefonte Reactors*." Available at: http://www.cleanenergy.org/wp-content/uploads/F_SACE_Bellefonte_Rpt_080911.pdf. Also, a video supporting this report from Fairewinds' nuclear engineer, Arnie Gundersen: https://www.youtube.com/watch?v=F2_sslGmecY&feature=youtu.be.

[7] See http://www.taxpayer.net/library/article/golden-fleece-award-goes-to-department-of-energy-for-federal-spending-on-sm.

TVA is currently scaling back energy efficiency and renewable energy programs. In photovoltaic (pv) solar capacity TVA is falling behind its regional peers. By 2016 Georgia Power is projected to have 370kW of solar capacity per capita; Duke Energy 190 kW per capita while TVA falls far behind at 50kW per capita. TVA's policies have crippled what was an emerging solar installation industry in the Valley. TVA has shown limited enthusiasm for the proposed Green Line 3500mW capacity wind power proposal. At the August 21st TVA Board meeting a 25% reduction in its energy efficiency program budget was approved despite great success in the program.

TVA's anemic renewable energy program is in sharp contrast to those in many parts of the world. Wind power and solar power are expanding rapidly around the world as their cost continues to decline.

- In 2013 in the U.S. 4751 megawatts of solar was installed.
- From 2001 to 2012 U.S. wind capacity went from 4000 megawatts to over 60,000 megawatts
- According to the Worldwatch Institute, 2013 global wind capacity was 320 GW and global solar capacity 140 GW. With both experiencing extremely rapid growth.

Watts Bar Concerns

The Watts Bar reactors are antiquated, ice-condenser designs from the 1960's. Construction started over 40 years ago. It is the height of public relations over-reach to call Unit 2 a "new" reactor. ***It is not the first new reactor of the 21st century; it is the last old reactor of the 20th century.***

Dangerous, Old Design

The very design itself compromises public safety in favor of lower construction cost. The idea of surrounding the reactor core with baskets of ice to allow smaller, weaker, cheaper containment would not be considered reasonable today; it is a relic of early nuclear reactor design. Ice condenser reactors have been plagued with many problems over the years at the nine operating units in the U.S. Watts Bar Unit 2 is being licensed under the old 10 CFR Part 50 rules, not the Part 51 and 52 rules for new reactors.

There is a long history of opposition to the completion of Watts Bar Unit 2 by a number of environmental and clean energy advocacy groups including the Southern Alliance for Clean Energy (SACE) and Blue Ridge Environmental Defense League (BREDL). The concerns about specific aspects of and problems with ice condenser designs have been brought to the NRC's attention on many occasions.

The following comments by Lou Zeller of the Blue Ridge Environmental Defense League were submitted to the NRC in October of 2009 on the Unit 2 supplemental environmental impact statement:[8]

> *The problems with ice condenser reactors were identified a decade ago but the NRC has failed to require and TVA has failed to take the steps necessary to protect the public.*

[8] Find the full document at: http://www.bredl.org/pdf2/091006FSEISscopingcommentsLZ.pdf

David Lochbaum, a nuclear engineer now working with the Union of Concerned Scientists, detailed the history of inaction following a nuclear plant worker's warning:

> *Amazingly little was done by the NRC and the industry in response to the ice condenser containment problems at DC Cook. These problems surfaced when a worker at the Watts Bar nuclear power plant in Tennessee found the problems and contacted colleagues at other ice condenser plants, including DC Cook. Watts Bar's problems were reported to the NRC by the whistleblower who noted that, by the way, DC Cook had similar problems. Very little was done to determine whether the ice condenser containments at Watts Bar, Sequoyah Units 1 and 2, McGuire Units 1 and 2, and Catawba Units 1 and 2 had the problems or not.*

Ice condenser reactors are more vulnerable to build-ups of hydrogen gas than dry containment structures. Following the near melt down at Three Mile Island, NRC required ice condenser plants to install hydrogen igniters, electric devices designed to burn hydrogen at a controlled rate during an accident. Sandia National Laboratories evaluated the reactor containment structures of ice condenser reactors and found that if an accident involving hydrogen ignition occurs, the concrete containment will almost certainly fail. The inherent weakness of ice condenser reactors is the containment structure which has only half the volume and failure pressure of larger, heavier dry containment structures. This is done as a cost-cutting measure: less concrete and steel reduces construction costs. But the back-fitting of hydrogen igniters still leaves them vulnerable to hydrogen gas explosions. Dr. Edwin Lyman of the Nuclear Control Institute made extensive studies of the problem and found the following:

> *However, even if the ice condensers do work as they are supposed to (which in itself is a questionable proposition), containment failure can still occur as a result of the combustion of hydrogen gas, which would be generated in large quantities during severe accidents when the metal cladding on fuel rods reacts with coolant water. During the Three Mile Island 2 (TMI-2) accident in 1979, a large amount of hydrogen was released to the containment and burned, although the pressure increase did not lead to rupture of TMI-2's large dry containment. The ice condensers not only cannot reduce the risk of hydrogen combustion but also can actually increase it, because they divide the containment volume into small compartments where hydrogen gas can more readily reach explosive concentrations. The seriousness of this issue is clear from the following data on the strength of containment buildings. The pressure that can be generated in the containment from hydrogen combustion can typically reach a value of about 110 pounds per square inch (psi). The average failure pressure of U.S. large dry containments is around 113 psi, whereas for ice condenser containments it is around 63 psi. Therefore, hydrogen burns can easily overpressurize and rupture ice condenser containments.*

Nuclear power plants using the ice condenser system are more dangerous than reactors which rely on more robust containment. Such systems are particularly vulnerable to reactor sump clogging and numerous problems have been identified during the last two decades of operation. Sandia's findings concluded: "Ice condenser plants are at least two orders of magnitude more vulnerable to early containment failure than other types of PWRs."

> *The most complete and recent probabilistic risk assessments suggest core melt frequencies in the range of [one in one thousand] per reactor year to [one in ten thousand] per reactor year. A typical value is [three in ten thousand]. Were this the industry average, then in a population of 100 reactors operating over a period of 20 years, the crude cumulative probability of [a severe reactor] accident would be 45%.*
>
> *Combining their two orders of magnitude—100 times—greater vulnerability with the standard risk inherent in nuclear reactors leads to an unacceptable chance of accident.*

Below are excerpts from nuclear engineer Arnold Gundersen's expert witness report of May 6, 2013 on the Sequoyah ice condenser reactors relicensing application:[9]

- From page 4: "actual operational experience has shown that some of the original design assumptions are faulty, the ice condenser is subjected to significant maintenance and operational challenges."
- From page 5: "The design is not single-failure proof. For a design basis LOCA accident, industry data appears to show that there would be insufficient time available for the operators to respond to a loss of containment spray before the ice melted and could no longer cool the reactor."
- From page 6: "the IC Containment design has a long history of repeated containment inspection failures associated with its unique design."

Construction Quality Concerns

The age and the quality of the work done in the 1970's and 1980's is another potential problem area. TVA's poor construction quality control in that era is well documented. Issues were so serious that the NRC delayed issuing the operating license on WB Unit 1 for eleven years while known deficiencies were addressed. The problems were so pervasive that TVA shut down all of its operating reactors for significant remediation. TVA claims, and the NRC has apparently agreed, that these issues have been resolved for Unit 2. The possibility of construction defects deteriorating over time to create unknown serious problems is a troubling uncertainty. Components from the 1970's will be pushing 100 years old if WB 2 is allowed to operate for 60 years.

Fukushima Lessons Learned Ignored

The lessons of Fukushima have come at a very high price for the citizens of Japan: over 150,000 people forced to leave their homes and workplaces, up to $500 billion (if not more) in financial costs, widespread contamination of land and sea, and unknown victims of future cancers, deaths, and illnesses.

The National Academy of Sciences (NAS) presented on its Fukushima lessons study at the July 31, 2014 Commissioners meeting. The NAS warned to beware the unanticipated scenario, false assumptions, and faulty risk assessments. The report: "Emphasizes the need for strengthening capabilities for identifying, evaluating and managing risks from beyond design basis events and better estimating the broad range of offsite health, environmental, economic, and social

[9] Available at: http://pbadupws.nrc.gov/docs/ML1312/ML13126A406.pdf.

consequences." It further "Emphasizes the inadequacy of the design-basis accident as a paradigm for preventing core melt accidents and mitigating their consequences."

The following excerpt from the May 2013 Final Environmental Impact Statement for Unit 2 indicates a need to revisit the licensing documents and methodologies in order to incorporate the Fukushima lessons in the Unit 2 license:

> Section 6.2.4 Summary of Severe Accident Impacts
> The NRC staff conducted an independent review of the severe accident analysis presented by TVA in its ER for completion of WBN Unit 2. . . . and concludes that the environmental consequences of severe accidents are SMALL.

That statement would appear to be exactly what the NAS is talking about.

The issue of dam safety, both from heavy rain events and earthquakes, is critical. TVA has just completed its updated hydrology safety studies with probable maximum flood revisions. I understand the seismic data being relied on dates from the 1980's despite new data being available and used at other reactor sites under construction. Clearly, the supposedly "new" operating license for Watts Bar 2 should use the most up-to-date data to provide the highest safety margins. The numerous upstream dams and the reactor itself should be able to withstand much more than the biggest floods and earthquakes that could occur because as we saw at Fukushima, the seemingly largest imaginable events can be exceeded. The NRC should allow adequate time to analyze the new hydrology study and for independent analysis. Using outdated seismic data is a serious flaw in methodology and is another example of ignoring the lessons of Fukushima.

No Solution to the Nuclear Waste Problem

When the original construction license was issued the possibility that all the high level radioactive fuel rod waste could be stored on-site for an indefinite period which could extend for hundreds of years or more was not considered. The recent NRC decision to allow "Continued Storage" would make that a reality. That ruling is in conflict with Federal regulations that prohibit new licenses from being issued without plans for a geologic repository in place. The granting of the operating license to Watts Bar 2 should be delayed until there is a credible plan.

Long-term on-site storage is complicated and made more dangerous by the issues and unanswered questions around high burnup fuel. Higher radioactivity, temperature and stress on the metal cladding of fuel rated above 45 gigawatt-days per metric ton of uranium weaken the cladding and create heightened storage problems. Only certain dry casks are approved for storing this waste and only for up to 20 or 40 years. There is much that is not known about safely storing high burnup nuclear fuel waste so studies are now being conducted. This predicament seems like closing the barn door after the cows have gotten out.

Deficient Decommissioning Funds

TVA's reactor decommissioning fund is grossly underfunded with about one billion dollars. Estimates for decommissioning the most recently shut-down reactors (San Onofre) are $2.2 billion per reactor. TVA currently has 6 operating reactors: 6 X 2.2 = 13.2 billion. The NRC should not let TVA create another radioactive reactor to decommission given this shortfall. TVA

does not have enough money to decommission even one reactor after over 40 years of nuclear operation.

Nuclear Irresponsibility in Tennessee

At Oak Ridge, the slow pace of mitigating the serious environmental problems from the legacy waste created by government agencies is an ongoing concern. The Department of Energy finds money for new projects but only provides enough money for Environmental Management to proceed at a very slow pace. Latest estimates are for the work to continue for several decades while there are acknowledged plumes of contaminated water migrating off-site.

In Erwin, TN enriched uranium has been found downstream in the Nolichucky River. Many local citizens are concerned about the health effects of activities at Nuclear Fuel Services and the radioactive waste processing factory located next door.

Tennessee has become the destination for the bulk of the nation's low level radioactive waste processing. In the absence of a coherent, comprehensive national low level radioactive waste policy the default solution is to send it to Tennessee. The NRC has delegated responsibility to the State of Tennessee. The under-funded Department of Conservation's Division of Radiological Health (DRH) is the responsible authority. Tennessee waste processing companies receive around 50 million pounds of radioactive waste a year. About 5 million pounds of that ends up in four Tennessee Class 1 landfills under a program called Bulk Survey for Release (BSFR). Tennessee is home to radioactive waste incinerators, radioactive metal melters, mixed waste boilers, the THOR process for radioactive resins, disassembly of steam generators and a pending proposal to bring waste oil from nuclear power reactors to survey and release into the commercial oil recycling stream. These waste processors operate largely on the honor system, DRH does not have enough staff to closely monitor or in many cases even spot-check on-site activities and determinations

General Concerns about Fission Nuclear Power

Nuclear power reactors are not a sustainable source of electricity. The radioactive wastes created, both high and low-level, are a uniquely problematic, harmful material. The effects of a major accident are of a magnitude unseen in any other human activity short of war. Should a major accident like Chernobyl or Fukushima occur in the Valley, it could displace tens of thousands to hundreds of thousands of residents. The health effects on the human and animal populations would be serious with the economic cost ranging into hundreds of billions of dollars.

The safe, long term disposition of high level radioactive nuclear fuel waste, much of which is of high burn-up level, is still very much unresolved even after six decades of production at nuclear plants across the country. This is a man-made material that must be kept out of the biosphere essentially forever in human time frames. The nuclear industry must stop making it.

It is fundamentally unfair to future generations to continue to create these materials knowing the genetic threat they present and that there is no safe dose of radiation. Biologically available isotopes are a singular threat to our health and that of our descendants.

The whole nuclear enterprise both demands and assumes a higher level of societal, economic, and political stability than has ever been achieved in human history. Safe disposal of highly radioactive nuclear fuel waste requires a timeframe of geologic stability that is simply impossible.

For example, today, just 28 years after the Chernobyl explosion and fire, political and economic changes in Ukraine have left them unable to adequately fund the necessary repairs to the casing around the ruined reactor, renewing the risk of higher levels of radiation leakage.

The fact that the private insurance industry, experts on risk, will not provide insurance for commercial nuclear power plants here in the U.S. is a market assessment that undermines the Nuclear Regulatory Commission and industry claims of nuclear safety. The Price Anderson Act of 1957 was intended as a temporary jump-start for the industry, not as long-term inadequate liability coverage. The $12 billion in coverage provided under the Act could be exceeded by 10, 20, 30 times or more in a Fukushima scale accident.

It is troubling that the most recent national U.S. study (from the National Cancer Institute) on the health of people living near nuclear power plants was completed in 1990 using data collected from 1950 to 1984. Some have criticized that study for using counties as the area studied because the large size of some of the counties can mask effects closer to the reactors. I appreciate that the NRC is funding a National Academy of Science study at this time.

Official studies of the health effects on the people exposed to radiation from Chernobyl have raised concerns of cover-ups, transparency and bias favorable toward the nuclear industry. Official studies acknowledge around 4,000 deaths, while independent studies estimate from 100,000 to 1,000,000 deaths. There are now concerns being raised about the health data coming from Japan related to the Fukushima triple meltdown.

Another understudied topic is the effects of the accidents at Chernobyl and Fukushima on wildlife. Dr. Timothy Mousseau of the University of South Carolina has found troubling abnormalities and population declines in birds and other wildlife around Chernobyl and Fukushima.

Radiation monitoring and warning systems in the United States are inadequate, antiquated and seemingly intentionally inaccessible to the public. This is absolutely unacceptable especially to the one in three Americans who live within 50 miles of a nuclear power plant or other nuclear facility including uranium mines, both active and abandoned.

Building a transparent, uncensored comprehensive nationwide on-line, real-time radiation monitoring system should have the highest priority for the NRC. The current system, which averages radiation release data on a quarterly basis, are not protective of the public health. Averaging masks spikes of released radiation and are useless for timely information and warnings to the public. In Tennessee the data is not easily accessed. A web-based system would provide far better information to the public. Having this in place before reactors come online, such as Watts Bar 2, is of particular importance.

The NRC should also require licensees to post public health alerts widely when radiation releases are scheduled or detected.

In order to provide the most protection and information to those living close to possible harmful levels of accidental, emergency radiation releases the NRC should also require licensees to release visible dye markers along with the radiation. For more information refer to the article, "Monitoring Matters" by Susan Shapiro and Gretel Johnston available at www.MakeRadiationVisible.org.

Recommendations

- The NRC must consider not only the serious water issues facing the entire Tennessee River of today, but of the river that future populations will rely on many, many decades from now, given the Watts Bar reactors are proposed to operate for 60 years or more. Currently, the cooling technologies proposed for Watts Bar are insufficient and essentially TVA is doing it "on the cheap" despite clear examples experienced by other power plants on the river. At the very least, a more efficient cooling system is needed to lessen impacts to the environment decades into the future.
- The approval of the Watts Bar 2 operating license should be delayed until the hydrological and seismic issues can be thoroughly analyzed.
- The seismic data should be updated to the most current and accurate available. The license should not be approved using outdated, under-stated seismic data.
- Federal regulations should be followed and the license not be granted until there is a credible plan for a geologic repository for the high-level radioactive fuel waste.
- If the license is granted it should limit the burnup level of the fuel to 35 gigawatt-days per metric ton of uranium until adequate study of high burnup fuel storage and transportation has been completed.
- The license should not be granted until it is certain that TVA will have adequate funds for decommissioning Watts Bar 2 and all its other reactors.
- Current radiation monitoring and public disclosure of released radiation is wholly inadequate. Every effort should be made to "Make Radiation Visible" with real-time, on-line comprehensive radiation monitoring at Watts Bar and all nuclear facilities.
- The license should not be granted without adequate insurance coverage for the people of the Tennessee Valley and beyond who are at risk of catastrophic losses from a major accident. The Price Anderson Act does not provide adequate indemnity.
- The NRC must carefully scrutinize any proposals by TVA to re-initiate construction and eventual operation of the abandoned Bellefonte reactors (Units 1 and 2).
- The NRC must reign in TVA's nuclear aspirations and closely scrutinize the nuclear industry's continued use of TVA to push "their" agenda at the expense of not only TVA's utility customers, but also U.S. taxpayers. We are concerned that the utility is overextending itself and that the nuclear industry is unfairly, and greedily feeding from the "trough" that is TVA. The early site permit (ESP) licensing process is extremely problematic for the public – not having a design to study during the comment period is unfair at best.
    - The NRC should "slow down" TVA's Small Modular Reactor early site permit (ESP) application process until the technology is further along – this would save limited financial resources that could be better spent by TVA on real-world technologies such as energy efficiency and renewables including wind and solar.

Thank you for your consideration of my views and please put peoples' health and safety first in your role in regulating nuclear power. I also thank Sara Barczak of the Southern Alliance for Clean Energy for her invaluable help in preparing this document.