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Plant Licensing Branch 11-2
Division of Operating Reactor Licensing
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
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RE: § 2.206 Request for Action to Suspend GE Mark I Boiling Water Reactors Operating Licenses due to Flawed Primary Containment and Unreliable Back-up Electric Power Systems for Cooling Spent Fuel Pools

Pursuant to 10 CFR § 2.206, the Blue Ridge Environmental Defense League (ñBREDLò or ñPetitionerò) hereby submits written testimony regarding our June 7, 2011 joint petition request to the Nuclear Regulatory Commission for emergency enforcement action. The purpose of this request is to have NRC protect public health and safety through the prompt and thorough evaluation of safety problems at the Browns Ferry Nuclear Plant operated by the Tennessee Valley Authority near Athens, Alabama. BREDL is one of the co-petitioners (ñPetitionersò) to the Beyond Nuclear petition (ñPetitionò) submitted on April 13, 2011. These remarks identify the enforcement action requested and the facts that BREDL believes are sufficient grounds for NRC to take enforcement action at Browns Ferry.

The Petitioners request that the NRC immediately suspend the operating licenses of General Electric (GE) boiling-water reactor (BWR) Mark I units to ensure that public health and safety is not unduly jeopardized. The Petition focuses on the unreliability of the GE BWR Mark I containment system to mitigate a severe accident and the lack of emergency power systems to cool high density storage pools and radioactive reactor fuel assemblies.

Two items recommended by the NRC for further review; specifically, the possible overheating of radioactive fuel pools during an emergency and the loss of power such as the recent tornado-caused black outs. The GE Mark I irradiated fuel pools are located at the top of the reactor building and currently do not have backup power if offsite and on-site electrical power were lost simultaneously. Other petition items accepted by the NRC for review are: 1) the failure of the Mark I to prevent radioactive contamination of the atmosphere and ocean, 2) failure of the hardened vent system to cope with a severe accident and 3) the threats posed by rising river water at reactors located in flood plains.

Background

On April 13, 2011, Beyond Nuclear filed a petition for an enforcement action under 10 CFR 2.206. On April 19, 2011, the Petition Review Board denied the request for immediate action only. On or about June 7 BREDL and others submitted co-petitioners requests. The PRB held a public meeting June 8. Over 3,000 co-petitioner requests were received by the NRC following the June 8 public meeting. On August 16, 2011, the Petitioners were informed of the Petition Review Boardôs decision to accept in part the petition for review.

Enforcement action requested

The Petition seeks to suspend the operation of the General Electric Mark I Boiling Water Reactors, which are almost identical to the Fukushima reactors that melted down in Japan. Petitioners ask that the Mark I reactors cease operations until several emergency actions are taken including: 1) that the NRC revoke the 1989 prior approval for all GE Mark I operators to voluntarily install the same experimental hardened vent systems on flawed containment structures that the Fukushima catastrophe demonstrates to

have a 100% failure rate and; 2) that the agency immediately issue Orders requiring all U.S. Mark I operators to promptly install dedicated emergency back-up electrical power to ensure reliable cooling systems for the densely packed spent fuel pools. The GE BWR fuel pools are located at the top of the reactor building and currently do not have backup power if offsite and on-site electrical power were lost simultaneously.

Further, BREDL seeks the following specific actions: 1) NRC should order TVA to evaluate pressure suppression containment venting to determine whether the Browns Ferry Nuclear Plant should be allowed to continue operation. 2) NRC should issue an order to TVA to inspect control rod blades at Browns Ferry and not merely rely on the suggestion in an Information Notice; and 3) The NRC should order TVA to eliminate the existing unsafe irradiated fuel storage system at Browns Ferry and move the fuel to hardened storage in concrete structures.

In accordance with 10 CFR 2.202(e)(1), these orders would involve the modification of a part 50 license and are backfits; therefore, the requirements of § 50.109(a)(5) are to be followed; i.e., ñThe Commission shall always require the backfitting of a facility if it determines that such regulatory action is necessary to ensure that the facility provides adequate protection to the health and safety of the public and is in accord with the common defense and security.ò TVA is subject to the Commission's jurisdiction.

Facts Supporting Enforcement Action

- ***Reactor Containment***

The GE Mark I reactor was badly designed. To correct a fundamental flaw, pressure suppression containments systems were added to these plants in order to prevent high

pressures inside the reactor containment building during an accident. To do this, the direct torus vent system was designed to release steamð unfiltered and radioactiveð directly to the atmosphere. Banning such dangerous pressure suppression methods and substituting safer dry containments was proposed by a few principled nuclear engineers, but their advice fell on deaf ears because it would, ñ[M]ake unlicensable the GE and Westinghouse plants now in review.ò[1] Today, some principled engineers persist in this quest to turn the NRC back from the dark side of promoting nuclear power to regulating it. This year, Arnold Gundersen stated the case most eloquently to the Advisory Committee on Reactor Safeguards:

> Everyone sitting on the ACRS today knows that the pressure suppression containments on General Electric BWRçs were inadequate when they were first designed. As a result of that design inadequacy, boiling water reactor containment vents were added in 1989 to prevent containment overpressurization. Currently there are 23 Mark 1 containment systems in operation. All 23 Mark 1çs have vents that were added as a Band-Aid fix. It is time for the ACRS to evaluate containment venting to determine whether or not it any of these reactors be allowed to continue operation.[2]

The nuclear disaster at Fukushima Dai-ichi lends an urgency to the immediate question: What will it take to convince the NRC to prevents a similar disaster in the United States? Germany, when faced with the issue of providing energy with adequate protection to the health and safety of the public and in accord with the common defense and security said *no* to the nuclear power program in its entirety.

Further, it is just plain wrong to posit, as the NRC does, that no radioactive leaks are associated with the GE Mark I reactor pressure suppression containments systems. To avoid exceeding the primary containment pressure limit, that is what they are designed to

[1] Note from Joseph M. Hendrie to John F. OðLeary, September 25, 1972.
[2] Statement of Arnold Gundersen, Advisory Committee on Reactor Safeguards Subcommittee on Fukushima, Official Transcript of meeting of May 26, 2011, NRC HQ, Rockville, MD, ADAMS Accession No. ML11147A075

do in an accident. Based on his post-Fukushima findings, Gundersen served up crow to the committee:

> In December of 2010 I wrote to you again notifying you of a significant amount of additional information about containment failures and flaws because at the October 2010 ACRS meeting, the NRC staff informed the ACRS that the NRCõs calculations assume that there is zero leakage in the Mark 1 design. Each time I have contacted you, the containment integrity data has been rebuffed and ignored. The accidents at the Fukushima Mark 1 BWR reactors have confirmed my belief that leakage of a nuclear containment cannot be based upon the assumption of a leakage rate of zero used by the NRC. This week, Tokyo Electric Power Company (TEPCO) has finally acknowledged that all three of the Fukushima Mark 1 containment systems are leaking significant radiation into the environment, and at least Units 1 and 2 began leaking on the first day of the accident. Unfortunately, the possibility of such containment failures, to which I have alerted you for the past six years, have been proven correct.[3]

If indeed United States were unable to license nuclear plants without pressure suppression containment Band-Aids, then perhaps Germanyõs example is correct. The NRC should order TVA to evaluate pressure suppression containment venting to determine whether the Browns Ferry Nuclear Plant should be allowed to continue operation.

- ***Control Rod Cracks***

Plant inspections done by the manufacturer indicate that the Browns Ferry Nuclear Plant suffers from cracking of the control rods necessary for shutting down the reactor. Based on this information, the manufacturer predicts that the control rods will fail sooner. An NRC Information Notice (IN) issued in June 2011 states:

> The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to inform addressees that GE Hitachi Nuclear Energy (GEH) has discovered severe cracking in Marathon control rod blades (CRBs) near the end of their nuclear lifetime limits in an international BWR/6. As a result of investigations into the cracking, GEH has determined that the design life of

[3] Statement of Arnold Gundersen, Advisory Committee on Reactor Safeguards Subcommittee on Fukushima, Official Transcript of meeting of May 26, 2011, NRC HQ, Rockville, MD, ADAMS Accession No. ML11147A075

> certain Marathon CRBs may be less than previously stated and is revising the end-of-life depletion limits of these CRBs. The NRC expects that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems.[4]

Not only did 100% of the control rods inspected suffer from cracking, the damage was more widespread and more serious than previously known. The Information Notice continued:

> In August 2010, GEH, as part of its surveillance program to monitor Marathon CRB performance, visually inspected four discharged CRBs at an international BWR/6 and found cracks on all four CRBs. The cracks were much more numerous and had more material distortion than those observed in previous inspections of Marathon CRBs. The cracks were also more severe in that they resulted in missing boron-carbide capsule tube fragments from two of the inspected CRBs.[5]

The list of suspect plants includes Browns Ferry 1, 2 and 3 and sixteen more GE Mark I BWRs: Cooper, Dresden 2 and 3, Duane Arnold, Fitzpatrick, Hatch 1 and 2, Monticello, Nine Mile Point 1, Oyster Creek, Peach Bottom 2 and 3, Pilgrim, Quad Cities 1 and 2, and Vermont Yankee.[6] Based on this evidence, 83% of the GE Mark I reactors in the United States are likely operating with cracked control rod blades.

Analysis of the missing fragments found in two of the four control rods inspected uncovered no negative effects on plant performance; however, to make this finding at Browns Ferry or the other affected plants would require individual reactor testing.

Browns Ferry was TVAôs first nuclear power plant. The initial design life-span of nuclear plants is 30 to 40 years. All three Browns Ferry units are approaching the forty-year mark: Unit 1 began commercial operation on August 1, 1974, Unit 2 on March 1, 1975 and Unit 3 on March 1, 1977. NRC renewed the operating licenses for all three

[4] NRC Information Notice 2011-13: Control Rod Blade Cracking Resulting in Reduced Design Lifetime, June 29, 2011, ADAMS Accession No. ML111380019
[5] *Id.*
[6] The other four listed in the IN are Clinton, Grand Gulf, Perry and River Bend.

Browns Ferry reactors in May 2006, allowing TVA to continue operating them until 2033, 2034, and 2036, respectively. The new information regarding control rod cracks came after the renewal.

Control rod mismanagement was involved in at least two major nuclear accidents, at the Argonne Low Power Reactor and Chernobyl. The history of Chernobyl is familiar; less well known are events at Argonne, where the improper withdrawal of the control rod mechanism at the Armyôs experimental reactor in Idaho caused an explosion which killed three operators and released 1100 curies of fission products into the atmosphere.[7] In four milliseconds this small reactor went from 200 kilowatts power to 20 million kilowatts.[8] Although the NRC Information Notice includes no specific enforcement, it does point to the NRCôs expectation that plant operators will act to avoid control rod problems caused by these flaws. NRC should issue an order to TVA to check these components and not merely rely on the IN suggestion.

- ***Irradiated Fuel Pool Danger***

TVA stores Browns Ferryôs radioactive fuel rods in pools on upper levels of the plant. Over 1,415 metric tons of irradiated fuel in three pools is covered by a heavy metal sheet buildings on a concrete pad above the plant. As with most plants, water in the fuel pools is circulated by electric pumps. If the plant is scrammed and off-site power and electric back-ups fail, the fuel would heat the water, turning it to steam.

The area above the spent fuel pool is not designed to withstand high winds from tornadoes and hurricanes. As stated by an NRC spokesman, ñThe design of the Browns

[7] Horan, J. R., and J. B. Braun, 1993, *Occupational Radiation Exposure History of Idaho Field Office Operations at the INEL*, EGG-CS-11143, EG&G Idaho, Inc., October, Idaho Falls, Idaho (retrieved 10/6/11 from Wikipedia).
[8] Steve Wander (editor) (February 2007) ñSupercriticalò *System Failure Case Studies* (NASA) **1** (4). http://pbma.nasa.gov/docs/public/pbma/general/sl1_sfcs.pdf (retrieved 10/6/11 from Wikipedia)

Ferry spent fuel pool has blowout panels. In case of a tornado where you have differential pressure across the wall, the panels would blow off and minimize any damage.ò[9]

On April 27, 2011 tornadoes knocked out TVAôs electric power transmission lines in Mississippi and northern Alabama, causing an emergency and automatic cold shutdown of the Browns Ferry Nuclear Plant. The plant was forced to rely on diesel backup power for seven days.

> One NRC inspector told the audience that those containments were upgraded for assaults such as that on the heels of the Sept. 11, 2001, terrorist attacks. But David Lochbaum, a former TVA nuclear engineer and a former NRC training instructor, took that answer to task. ñThat's not accurate,ò said Lochbaum, a Chattanoogan who now works for the Union of Concerned Scientists. ñIt may be reassuring, but itôs not accurate.ò The 9/11 changes ñwere only about airplanes,ò not multiple problems such as what the tornadoes caused or could have caused if one had made a direct hit on the plant, he said.[10]

The NRC should order TVA to eliminate the existing unsafe irradiated fuel storage system and move the fuel to hardened storage in concrete structures.

- ***Need for Action Indicated by Record of Violations***

During the last few years, TVA has compiled an unenviable record of compliance at Browns Ferry.

On May 9, 2011, the NRC issued to TVA a violation (EA-11-018) for failure to implement an In-Service Training program for its engineers at Browns Ferry. More than a training exercise, this management failure led to an operational failure in which the RHR loop II subsystem was unable to fulfill its safety function due to a failure of LPCI

[9] NRC Region II Administrator Victor McCee, ñTornado Concerns Raised At Browns Ferry Nuclear Plantò WHNT-TV, Huntsville, AL, May 31, 2011, retrieved 10/6/11 from http://www.whnt.com/news/whnt-tornado-concerns-raised-at-browns-ferry...

[10] ñRegulators say TVA's Browns Ferry Nuclear Plant safe to operateò *Times-Free Press* October 4th, 2011

Outboard Injection Valve. The malfunctioning valve was not discovered for a year and a half. The violation was of Red Significance. The system is necessary for reactor core cooling during accidents and the valve failure left that system inoperable, potentially leading to core damage had an accident involving a certain series of events occurred.

On April 19, 2010, NRC issued Notice of Violations (EA-09-307) to TVA at Browns Ferry for failure to meet the requirements of 10 CFR 50, Appendix R, III.G, fire protection of safe shutdown capability. The violations were of Yellow and White Significance. There were multiple examples of TVA not providing fire protection capable of limiting damage to the plant. In 1974 a worker using a candle to check for air leaks started a fire that disabled safety systems at Browns Ferry Nuclear Plant.

On May 12, 2004, NRC issued to TVA a Notice of Violation (EA-04-063) for Severity Level III violations at Browns Ferry. Numerous problems in the Long-Term Torus Integrity Program were cited for failures to perform numerous weld repairs; omission of welds requiring repair; and failure to verify the location of repaired welds.

These violations support our request that regulatory action by the NRC is necessary to ensure that operations at Browns Ferry provide adequate protection to the health and safety of the public and are in accord with the common defense and security.

Respectfully submitted,

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