UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

OFFICE OF NUCLEAR REACTOR REGULATION
HAROLD R. DENTON, DIRECTOR

In the Matter of	)	
	)	
TENNESSEE VALLEY AUTHORITY	)	Docket Nos. 50-259, 50-260,
(Browns Ferry Nuclear Plant,	)	and 50-296
Units 1, 2 and 3)	)	

DIRECTOR'S DECISION UNDER 10 CFR 2.206

In a letter dated October 28, 1980, Messrs. Thomas W. Paul, Stewart Horn and David Ely, on behalf of the Huntsville Chapter, Safe Energy Alliance of Alabama (SEAA), requested that NRC reconsider the issuance by the NRC of amendments Nos. 60, 55 and 32 to Facility Licenses Nos. DPR-33, DPR-52 and DPR-68 for the Browns Ferry Nuclear Plant, Unit Nos. 1, 2 and 3. These amendments were issued by the NRC on March 17, 1980 and authorized TVA to temporarily store low-level radioactive waste (LLRW) in an existing covered pavilion on the Browns Ferry site.

In their letter of October 28, 1980, the SEAA stated the reasons why we should reconsider the authorization and these are summarized below:

1. The area of northern Alabama where the BFNP is located is subject to frequent, destructive tornado activity.
2. On April 3-4, 1974, a series of tornadoes passed within 2 miles of the BFNP. Fifty-eight (58) 500 KV line transmission towers carrying power from BFNP were snapped. As a result of the loss of these power lines, one unit at BFNP was forced to shutdown since the plant was not able to distribute the total power capable of being generated by the plant.

3. During the April 3-4, 1974 outbreak of tornadoes, the rotational wind speed at some locations was estimated to be between 200 and 250 mph.
4. Despite this history of very recent serious tornado activity, TVA, in their application requesting authorization for temporary onsite storage of LLRW, had concluded - on a probabilistic basis - that design of the drum restraint and hold-down system for wind speeds of 95 mph was adequate, considering the relatively short period of time drums of LLRW might be stored in the building. Specifically, TVA concluded that the probability of a tornado with maximum wind speeds higher than the 95 miles per hour value striking the plant in any one year is 7×10^{-4}. TVA considered this small enough to be neglected.
5. Despite statements that temporary storage of LLRW in the building will comply with all applicable Commission regulations, the building and drum restraint system were not designed in accordance with 10 CFR 50, Appendix A, Criterion 2 - <u>Design bases for protection against natural phenomena</u>.

The NRC staff comments on the above points are summarized below:

1. The NRC staff, in conjunction with other government agencies, keeps track of all reported tornadoes. Alabama, along with most other southern, mideastern and midwestern states, is prone to be subject to frequent, severe tornadoes. Regulatory Guide 1.76 describes a design basis tornado acceptable to the Regulatory staff for each of three regions within the contiguous United States that structures, systems

and components in a nuclear plant important to safety (emphasis added) should be designed to withstand. All of the United States east of the Rocky Mountains is classified as Region I. The recommended set of properties defining a design basis tornado in this Region I is the strictest for any region of the country.

2. On April 3-4, 1974, there was an outbreak of 148 tornadoes within a 24 hour period in 13 states and Canada. This is by far the largest number of tornadoes within a 24 hour period on record. At the height of activity, 15 tornadoes were on the ground simultaneously. As SEAA pointed out, over 300 people were killed. The tornadoes ranged from Mississippi, Alabama and Georgia in the south to Illinois, Indiana, Ohio and Michigan in the north. There were two approximately parallel tornadoes that swept a path that extended from Mississippi, through northern Alabama and into Tennessee, both of which crossed the Tennessee River to the east of the BFNP in the general area between Athens, Alabama and Huntsville, Alabama. The first tornado was named First Tanner and the second tornado was dubbed Second Tanner. First Tanner touched down at 1820 hours CST and lifted off about 61 minutes later, traversing a path approximately 51 miles long, with a width of 1/8 to 1/4 mile on the average. Second Tanner touched down at 1930 hours, lasted for about 55 minutes and swept across a path approximately the same length and width as First Tanner. Tornadoes are generally rated on a scale of 1 to 5, based on windspeed, path length and path width, with a rating of "5" being the most severe. There was a short section

in the overall path of the First Tanner tornado north of Wheeler Reservoir and east of the BFNP assigned a damage category "5". As pointed out by SEAA, this tornado knocked-out the 500 KVa transmission system, causing a shutdown of Unit 1; Unit 2 was undergoing preoperational testing at the time and Unit 3 was still under construction. At no time did the loss of offsite transmission lines affect the capability to safely shutdown the reactor facility and maintain it in a safe shutdown condition. Browns Ferry Unit 1 resumed partial operation the next day when the 500 KVa West Point line was restored to service.

3. There is no question that the Browns Ferry site is located in an area occasionally traversed by tornado storms. Wind speeds in excess of 40 mph are occasionally reported but wind speeds in excess of 80 mph are rare. During the design of the Browns Ferry facility, we thoroughly evaluated the meteorological conditions at the site. We have rereviewed the straight-line winds and tornado winds that structures at the Browns Ferry site might possibly be subjected to.

A determination of the wind hazard probability for a given site consists of separate estimates of windspeed as a function of recurrence interval (or probability per year) for straight-line winds and tornado winds. The two sets of data are not from the same statistical population and, thus, cannot be combined into a single data set. Two curves arise: (1) determination of the expected value of the fastest mile per hour wind using the windspeed data collected at a given site; this curve is generally accepted to be of the extreme value type I distribution;

(2) determination of the expected value of windspeeds arising from tornadoes which involves tornado occurrence rates, path length and width, and some measure of the intensity (strength) of the individual tornadoes that comprise the data set for a given meteorologically and topographically homogeneous region. The two curves are not identical.

For low probabilities ($<1 \times 10^{-4}$/yr), tornado windspeeds are greater than those projected from the straight-line wind data; for high probabilities, the straight-line winds are greater than tornadic winds for a given probability. For a site such as Browns Ferry, Alabama, the straight-line winds dominate the probabilities through about 100 mph corresponding to 1×10^{-4}/yr. For a 95 mph windspeed, the probability for this to be from straight-line winds is as above, but for it to be from tornadoes the probability decreases to 5×10^{-5}/yr. Thus, the probability of-seeing 95 mph from straight-line winds is higher than seeing 95 mph in a tornado in this area. This is explained, in part, by the fact that tornadoes must occur first in order for 95 mph winds to exist from them; and the tornado occurrence rate in this area is about 1×10^{-4}/yr. In other words, the probability that a tornado will strike the facility is about once every 10,000 years. The probability of a structure at the Browns Ferry site being subjected to a wind speed of a certain velocity can be approximated from the following:

Mean Recurrence Interval	Expected Probability	Windspeed, mph	Type of Wind
10 years	10^{-1}	60	Straight wind
100 years	10^{-2}	70	Straight wind
1000 years	10^{-3}	85	Straight wind
10,000 years	10^{-4}	100	Straight wind
100,000 years	10^{-5}	150	Tornado wind
1,000,000 years	10^{-6}	210	Tornado wind
10,000,000 years	10^{-7}	260	Tornado wind

4. General Design Criterion 2 of Appendix A to 10 CFR Part 50, requires, in part, that structures, systems and components in a nuclear plant important to safety (emphasis added) be designed to withstand the effects of natural phenomena, such as tornadoes, without loss of capability to perform their safety function. For BFNP, and other nuclear plants, structures and equipment whose failure could cause significant release of radioactivity or which are vital to a safe shutdown of the facility and the removal of decay heat are classified as Class I structures. Class II structures and equipment are defined as those which are necessary for station operation but are not essential to a safe shutdown. The classification of structures and equipment - and the basis therefor - is discussed in TVA's Final Safety Analysis Report (FSAR) for the BFNP and in the Commission's Safety Evaluation Report dated June 26, 1972. We have concluded that the structures and equipment at BFNP are appropriately classified. Class I structures at BFNP are designed for normal dead and

live loads, 100 mph wind, 300 mph tornado wind and 3 psi pressure drop, operating and design basis earthquakes of 0.1g and 0.2g maximum ground accelerations, respectively. Soil, hydrostatic and missile loads have also been included. Facilities or structures that are used solely for the storage of LLRW are not classified as Class I structures and are not required to be designed to these loads. In light of the limited hazard involved with these wastes, see paragraph 6, we believe that the pavilion need not be designed for any particular loading.

5. The applicable regulatory standards for protection of waste systems are 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 60 and 61, which provide:

> "The nuclear power unit design shall include means to control suitably the release of radioactive materials in gaseous and liquid effluents and to handle radioactive solid wastes produced during normal reactor operation, including anticipated operational occurrences" and
>
> The...radioactive waste and other systems which may contain radioactivity shall be designed to assure adequate safety under normal and postulated accident conditions. These systems shall be designed...with suitable shielding for radiation protection and with appropriate containment, confinement and filtering systems.

Your petition does not raise any issue with respect to normal operations and for the reasons discussed in paragraph 6, below, we believe that the storage activity is adequately protected against postulated accidents, including those resulting from postulated tornados.

6. The possible reoccurrence of a tornado at BFNP was considered in TVA's application and the NRC's safety evaluation related to the amendments in question. Such consideration is reflected in the conditions associated with the temporary storage of LLRW in the pavilion.

(a) Only dry, compacted or noncompacted trash may be stored in the pavilion. Spent ion exchange resins or evaporator bottoms (which might contain liquids and which are the only wastes that usually contain any significant amount of radioactivity) are not authorized to be stored in the pavilion.

(b) The amount of radioactivity in any drum of waste stored in the pavilion is limited to 0.5 curies. The total amount of radioactivity that may be stored in the pavilion is limited to 1320 curies. The contact radiation dose rate at the surface of any drum must be less than 0.7 R/hour.

(c) All containers of trash placed in the temporary storage facility are to be held secure at all times by means of an installed restraint system. This system has been designed to hold all containers secure during all severe environmental conditions up to and including the design basis event. The design basis event used by TVA was a basic wind velocity of 95 miles per hour with a 100 year recurrence frequency.

As a prudent measure, TVA has adopted very low limits on the amount of radioactivity to be stored in each container and committed to installing a drum restraint system. The restraint system consists of heavy metal grates placed over a section of drums, with the grates anchored to the concrete slab. The restraint system would likely keep any drums from being carried offsite under all meteorological conditions except for the most severe postulated tornado.

The NRC staff had considered the potential impact if a drum (or drums) of LLRW stored temporarily in the pavilion were carried offsite by a tornado.

In this unlikely event, the radiological consequences of such an event are not likely to exceed the 10 CFR Part 20 annual exposure limit of 500 mrem. Even in the most conservative case with a member of the public in direct contact with the surface of a drum with the highest allowable dose rate of 700 mrem/hr, it is unlikely the duration of the exposure in such close contact would be sufficiently long to exceed the 500 mrem limit. In practice, most drums to be placed in the storage facility will not have the maximum 700 mrem/hr dose rate on contact. In addition, containers of waste are required to be labelled as containing radioactive material and such labelling, when seen by members of the public, is expected to cause a person to increase his (her) distance from the container. In the unlikely event a container or containers are carried offsite by a tornado, efforts to recover the container(s) will be initiated as quickly as possible by utility and local and state officials, limiting the time any member of the public might be exposed to radiation from the container(s).

If a container were to rupture, the possible exposure to a member of the public would likely be even less than the case where the container remained intact. The type of waste to be stored in the temporary facility is dry trash that is usually relatively uniformly contaminated with radioactive material. Thus, if the waste is scattered, the possible direct exposure from any one piece or several pieces of the waste is likely to be smaller than from a full container. Inhalation doses from a ruptured container would be small because of the small fraction of respirable sized particles of radioactive material released from the container and the dilution in air that would occur between the point of container rupture and the breathing zone of a downwind individual.

Based on the above, we have reevaluated the safety aspects of temporarily storing LLRW in the existing pavilion on the Browns Ferry site and particularly the effect on public health and safety from potential tornadoes striking the building. We have concluded that although the pavilion and drum restraint system are not designed to withstand the most severe potential tornadoes that might strike the temporary LLRW storage facility, the potential hazard to public health and safety from drums of waste being carried offsite and/or their contents being dispersed would be small. As discussed above, the storage of LLRW in the pavilion is intended to be a temporary measure until the waste can be shipped to a licensed disposal facility or stored onsite in NRC approved longer-term storage facilities.

Considering that the probability of a tornado with wind speeds greater than 95 mph striking the Browns Ferry site is in the order of once every 20,000 years, the restrictions on the type and activity levels of LLRW that can be stored in the pavilion, and our evaluation of the potential consequences to public health and safety if a tornado were to strike the temporary storage facility, I have concluded that the issuance of the amendments authorizing TVA to temporarily store LLRW in the onsite pavilion was a reasonable and safe action and that there are no safety reasons for modifying our previous determination.

Based on the foregoing discussion, I have determined that there exists no basis for reconsidering the issuance of Amendment Nos. 60, 55 and 32 to Facility Licenses Nos. DPR-33, DPR-52 and DPR-68. The request of Messrs. Thomas W. Paul, Stewart Horn and David Ely, on behalf of the Huntsville Chapter, Safe Energy Alliance of Alabama, is hereby denied.

A copy of this determination will be placed in the Commission's Public Document Room at 1717 H Street, NW., Washington, D. C. 20555, and at the Local Public Document Room for the Browns Ferry Nuclear Plant located at the Athens Public Library, South and Forrest, Athens, Alabama 35611. A copy of this document will also be filed with the Secretary of the Commission for its review in accordance with 10 CFR 2.206(c) of the Commission's regulations.

In accordance with 10 CFR 2.206(c) of the Commission's Rules of Practice, this decision will constitute the final action of the Commission 25 days after the date of issuance, unless the Commission on its own motion institutes the review of this decision within that time.

Harold R. Denton

Harold R. Denton, Director
Office of Nuclear Reactor Regulation

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October 28, 1980

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Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Denton;

This letter is a request for reconsideration of the issuance, by the NRC, of amendments No.'s. 60, 55 & 32 to Facility Licenses No's. DPR-33, DPR-52, and DPR-68 for the Browns Ferry Nuclear Plant, units No's. 1, 2, & 3 dated March 17, 1980. These amendments authorize the temporary storage of low-level radioactive waste in an existing covered pavilion situated on the site of BFNP.

This request for reconsideration is motivated by the fact that the approved temporary Low Level Waste Storage (LLWS) pavilion <u>is not</u> designed to withstand tornado winds of over 80 mph velocities.

BFNP is located in an area of North Alabama that has come to be known as "Tornado Alley". On April 3rd and 4th 1974 a series of tornadoes associated with a storm that caused 315 deaths and more than $600 million in damage passed within 2 miles of BFNP. Fifty-eight (58) 500 KV linetransmission towers carring power from BFNP were snapped causing over a million dollars worth of damage. As a result of the loss of these power lines unit one @ BFNP was forced to shut down due to the sudden drop in demand the tornadoe's destructive activity had brought about.

Despite this history of very recent serious tornado activity TVA, in the application for an amendment to BFNP's operating license which would allow the Agency to Store LLRW onsite, clearly states that the probability of a destructive tornado occuring at this facility was considered to be so small as to be negligable.

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Edward Epstein the associate administrator for Environmental Monitoring & Predication of National Oceanic & Atmospheric Administration on a field visit to North Alabama after the April 1974 tornadoes estimated that the rotational speed of such tornadoes was between 200 and 250 mph.

This dismissal of the need to design LLRW structures capable of withstanding tornado winds in an area that has recently suffered from a devasting tornado puts TVA in direct conflict with the Code of Federal Regulations Title 10 Chapter 1, Part 50, Appendix A., P. 361 Criterion 2 Design Basis for Protection Against Natural Phenomena which states:

> Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. The design bases for these structures, systems, and components shall reflect: (1) Appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated. (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena and (3) the importance of the safety functions to be performed.

Despite later claims to have adhered to the CFR noted above, TVA in its Plan for Temporary Onsite Storage of Low-Level Radioactive Waste @ BFNP Units 1, 2, 3 dated January 21, 1980 in Section 4 General Considerations Part G Sub 2 states: "The probability of a tornado with maximum wind speeds higher than the 95 mph value striking the plant in any one year is 7×10^{-4}. This is considered to be small enough to be neglected."

Mr. Harold R. Denton, Director October 28, 1980

In effect TVA has chosen to neglect the possibility of a tornado re-occurring in an area that has already suffered severe damage from a series of tornados with wind velocities more than twice those that TVA has planned for. TVA is gambling on the possibility that another severe storm will not strike BFNP or its environs. The people of North Alabama will suffer the consequences of such negligence and it is for this reason that we request the NRC to direct TVA to adhere to the CFR which calls on them to be prepared for the "most severe of the natural phenomena that have been historically reported for the site and surrounding area."

Sincerely yours,

Thomas W. Paul

Thomas W. Paul

Stewart Horn

Stewart Horn

David Ely

The Safe Energy Alliance of
Alabama, Huntsville Chapter