STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

APPLICATION OF DOMINION NUCLEAR CONNECTICUT, INC. TO MODIFY SITING COUNCIL CERTIFICATE (DOCKET NO. 265A) FOR THE EXISTING INDEPENDENT SPENT FUEL STORAGE INSTALLATION (DRY STORAGE SYSTEM) AT MILLSTONE [NUCLEAR] POWER STATION, ROPE FERRY ROAD, WATERFORD, CONNECTICUT	: **DECEMBER 12, 2012**

PRE-FILED TESTIMONY OF NANCY BURTON

1. My name is Nancy Burton. I own real property and seasonally reside at such property, located in Mystic, Connecticut, a location approximately 10 miles downwind of the Millstone Nuclear Power Station ("Millstone"). I am an intervenor in these proceedings pursuant to Connecticut General Statutes §22a-19(a).

2. I am familiar with the instant application as well as the previous application (265) presented to the Siting Council.

3. The said application involves conduct which has or is unreasonably likely to have the effect of unreasonably polluting, impairing or destroying the public trust in the air, water and other natural resources of the state.

4. The site of the Millstone Nuclear Power Station ("Millstone"), including the proposed modified spent nuclear fuel dry cask installation, is located directly on the coast of the Long Island Sound and, upon information and belief, is among the most vulnerable of nuclear power plants in the world to effects from major storm effects and climate change, given its proximity to the Long Island Sound.

5. The proposed modified dry cask storage facility is, at its lowest point, no more than 19 feet in elevation above sea level.

6. Recent tidal surges from Superstorm Sandy reached and exceeded 17 feet within coastal areas in the City of New York and may have reached higher surges elsewhere.

7. Upon information and belief, the owners and operators of the Millstone installed storm surge barriers on an emergency basis in anticipation of the potential effects of Superstorm Sandy.

8. Upon information and belief, worsening and accelerating changes to the climate threaten to create ever more frequent severe storm events such as Superstorm in the vicinity of the Millstone Nuclear Power Station.

9. The instant application contains no analysis of the potential effects of climate change on the Millstone Nuclear Power Plant site, nor, more particularly, on the site of the dry cask storage installation.

10. Upon information and belief, such effects could be severe, could lead to station blackout, disruption of service and calamity; such events have the strong potential to cause the release and dispersal to the air and water of dangerous quantities of toxic materials, including longlived carcinogen radioisotopes as well as toxic chemicals.

11. The instant application is incomplete insofar as it contains no information nor analysis concerning the site's vulnerability to flooding and extreme weather conditions attributable to climate change. Yet such conditions have direct potential to disrupt the production of electricity at the site and create unreliability to the grid as well as other potentially catastrophic consequences

12. The instant application is incomplete insofar as it contains no information nor analysis of the potential and likelihood for degradation of the concrete pad and other concrete and metal components of the proposed facility. This defect is the more critical for the fact that the application rests upon the applicant's intention to alter its operations to utilize "high burn-up" nuclear fuel. Indeed, the term "high burn-up nuclear fuel does not itself appear in the application.

13. The potential and likelihood of degradation of the concrete and metal components of a dry cask storage facility for spent nuclear fuel has recently been addressed by the U.S. Nuclear Waste Technical Review Board ("NWTRB") in a report issued in December 2010 entitled "Evaluation of the Technical Basis for Extended Dry Storage and Transportation of Used Nuclear Fuel." (http://www.nwtrb.gov/reports/eds_rpt.pdf).

14. The NWTRB report was prepared to inform Congress and the U.S. Department of Energy of the current state of the technical basis for extended dry storage of used nuclear fuel and its transportation following storage. Although the report speaks in terms of "long-term storage" (60-120 years) and "very long-term storage" (120 years and beyond), many of its findings and observations apply as well to the 0-60-year term. For example, the report notes at page 13: "There are already reported observations of visible metal and concrete degradation of dry-storage systems in areas near the sea."

15. The comment is particularly relevant to Millstone because of its low-lying location upon the coastal shoreline.

16. Indeed, Stanford University researchers recently identified Millstone as among the worst four nuclear plants in the nation (among 89 nuclear power plants surveyed worldwide) in terms of its vulnerability to flooding, given its low-lying location on the coastal shoreline. (See Washington Post Op-Ed, "Protecting Nuclear Plants from Nature's Worst," November 1, 2012," http://m.washingtonpost.com/opinions/protecting-nuclear-plants-from-natures-worst/2012/10/31/5af389ac-2374-11e2-8448-81b1ce7d6978_story.html?ggeviewmode=surf. (Full report under embargo pending publication.)

17. 10 CFR 72.122(2)(i) provides in pertinent part as follows: "Structures, systems and components important to safety must be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, lightning, hurricanes, floods, tsunamis and seiches, without impairing their capability to perform their intended design functions. The design bases for these structures, systems and components must reflect: (A) Appropriate consideration of the most severe of the natural phenomena reported for the site and surrounding area, with appropriate margins to take into account the limitations of the data and the period of time in which the data have accumulated, and (B) Appropriate combinations of the effects of normal and accident conditions and the effects of natural phenomena."

18. The NWTRB report further states that three performance criteria must be satisfied concurrently as among the requirements for dry storage and handling: fuel-rod integrity, fuel assembly geometric arrangement and canister integrity. "Canister integrity means neither metal canisters nor bare casks will be breached to allow the release of helium and air ingress. . . . if there is a credible likelihood that any one of the three criteria will not be met, then [the system] is considered damaged."

19. Greater risks of degradation are posed by the use of high burn-up fuel and the risks are little known, according to the NWTRB, whose report states in part: ". . .high burn-up fuels tend to swell and close the pellet-cladding gap, which increases the cladding stresses and can lead to creep and stress corrosion cracking of cladding in extended storage. . . . Only limited references were found [in the extensive literature surveyed by the NWTRB] on the inspection and characterization of fuel in dry storage and they all were performed on low burn-up fuel after only 15 years or less of dry storage. Insufficient information is available on high burn-up fuels to allow reliable predictions of degradation processes during extended dry storage, and no information was found on inspections conducted on high burn-up fuels to confirm the predictions that have been made. The introduction of

new cladding materials for use with high burn-up fuels has been studied primarily with respect to their reactor performance, and little information is available on the degradation of these materials that will occur during extended dry storage."

20. In considering the effects of the use of high burn-up fuel, the NWTRB report noted that high burn-up fuel has a greater initial enrichment, more radioactive decay heat and higher neutron and gamma sources than the lower burn-up variety. Accordingly, the report notes: "The increased irradiation and heat production that come with higher burnups can result in more initial-state fuel-pellet damage, more released fission-product gases into the plenum of the fuel rod and higher fuel and cladding stresses. The higher decay heat loading of used-fuel assembles will accelerate the rise-of-peak cladding temperature during drying. . . ."

21. The NWTRB report further states: "Increased burnup will increase the corrosion in zirconium alloy cladding because higher burn-up generally implies longer in-reactor residence time. PWR [pressurized water reactors, such as Millstone 2 and Millstone 3] cladding is likely to experience even more corrosion due to the higher temperatures that accelerate the corrosion rate (the BWR [boiling water reactor, such as Millstone 1] cladding corrosion rate is much less dependent on temperatures). With increased burn-up, more corrosion-produced hydrogen will lead to more hydrogen being absorbed by the cladding. More hydrogen pickup will lead to more hydride precipitation and possibly other effects such as more embrittlement, delayed hydride cracking and acceleration of the corrosion rate. Many of these factors may significantly affect the physical state of the used fuel and cladding during dry storage. EPRI is studying the maximum amount of hydrogen pickup that occurs for various types of cladding at various burnups and using this to model the amount of hydrides expected. Additional research is needed to better quantify and understand the long- and very long-term effects of switching to high burn-up fuel. . . . There is currently limited data available related to the effects of high burn-up fuel on the physical state of fuel and cladding over time, and effects on other dry-storage components. Dry casks are being loaded with much higher thermal loads and more used-fuel assembles. These cask systems need to meet the same storage criteria but they have not been analyzed for long-term storage and degradation mechanisms."

22. According to the NWTRB report: "The regulations concerning dry storage of used fuel do not currently address storage for extended periods. . . . [Sufficient information is lacking to demonstrate with high confidence that] used fuel can be stored in dry-storage facilities for extended periods. . . . the experience base for extended dry storage of used fuel is short and the credible degradation phenomena are several and not robustly predictable in a quantitative sense . . ."

23. .Based on its extensive review, the NWTRB concluded that "the findings of the technical literature suggest that active degradation mechanisms continue during the storage period on all aspects of the storage system that are not fully understood. Consequently, the condition of the used fuel upon transport cannot be reliably predicted. This is especially true for high burn-up fuels currently in use and the new cladding and fuel assembly structural materials now being introduced. . . ."

24. According to the NWTRB report, "one of the main deterrents to corrosion of the fuel cladding and the canister or metal cask internals during extended dry storage is the presence of helium. If the helium leaks and air is allowed to enter the canister or cask, this, together with the moisture in the air, can result in corrosion of the fuel cladding, the canister and the cask. However, although provision is made to monitor the pressure of the helium during extended storage in bolted canisters, there is presently no means of confirming the presence of helium during extended storage in bolted canisters, nor is there a requirement for periodically inspecting the integrity of the closure welds for defects. . . . Corrosion mechanisms will cause degradation of the metal components of dry-storage systems during extended dry-storage periods: for example, the outer surfaces of fuel canisters."

25. According to the NWTRB report, "Nuclear criticality (a self-sustaining nuclear chain reaction) control is provided by the basket (a lattice structure) that holds the used-fuel assemblies within individual compartments in the cask, by excluding moderator (water) from the storage system, and by the low reactivity of the used fuel. The basket may contain boron-doped metals to absorb neutrons.. . . Helium pressure between the [primary and secondary] lids is not monitored [after the initial post-welding test] after the canister-based system has been moved to its storage location . ."

26. According to the NWTRB report, "Specific off-normal conditions to be addressed at a particular licensed dry-storage are documented in a Safety Analysis Report for that dry-storage system. NUREG-1536 indicates that off-normal conditions that should be examined 'include . . .partial blockage of air vents . . ."

27. NUREG-1536 provides that air-flow blockage is an accident condition. NUREG-1536 lists several natural phenomena events that should be evaluated, including "flood, tornado, earthquake, burial under debris, , lightning strike, seiche."

28. According to the NWTRB report, a serious accident may lead to several "unacceptable situations. A breach of the main canister may allow the release of radioactive material. . . . A breach of the main canister will let helium out and air

in. If a breach allows water or humid air to enter the container, then the likelihood of degradation of the cladding, canister, cask and other components increased significantly. Possible effects of the humid atmosphere include radiolysis of the moisture to create highly oxidizing radicals, corrosion of the cladding and cask components, and enhanced hydrogen ingress into the cladding. Stress corrosion cracking, galvanic corrosion, pitting and other forms of localized corrosion may also occur.

29. The principal sources of radiation in used fuel are the beta decay of the fission products (e.g., Cs 137 and Sr90) and alpha decay of the actinide elements (e.g., U, Np, Pu, Am and Cm), according to the NWTRB report

29. According to the NWTRB report, atmospheric effects over time, corresponding with many of the same concerns including corrosion caused by production of nitric acid and other oxidizing chemical species by the irradiation of moist air, will apply to external concrete in dry-storage systems. "Both the exterior of the concrete cask that houses the metal CSNF canister and the concrete foundation pad are exposed to humidity, airborne salts, and the effects of wind-blown dust. . . .The production of nitric acid in moist air outside a 21-PWR waste package has been quantified." Such degradation of the concrete may cause cracks and leakage of water. Elevated temperature can cause "freeze-thaw cycles, leaching of calcium hydroxide in rainy areas, creep and shrinkage [within the first five years after installation]" and effects of irradiation by gamma rays. NUHOMS dry storage casks may fail after 80 years in cold climates, according to the report.

30. The report further states: Given a "normal operational scenario of a dry-storage system sited in a humid area of the U.S. near the ocean (conducive to a halide corrosive environment), it seems likely that one or more degradation conditions and mechanisms described in subsection 4.4.3.1 could eventually cause significant problems, and possibly a minor breach (hairline crack) of the canister. Of the two general types of storage systems, the thin-walled, concrete-shielded storage systems with welded lids seems the most likely to be breached by corrosion mechanisms.

31. The Millstone 1 spent fuel pool is elevated several floors above the ground and is not protected by a hardened containment structure. It is a mirror image of Fukushima nuclear reactors that suffered explosions and meltdowns in their spent fuel pools due to loss of coolant.

32. The applicant has maintained a practice of deliberately disabling its perimeter security system as a cost-cutting measure. Upon information and belief, the applicant was never penalized by the U.S. Nuclear Regulatory Commission for such deliberate violation of its licensing and security requirements.

33. Both Millstone Unit 2 and Unit 3 have suffered dangerous unplanned power spikes within the past year due in part to reckless conduct by poorly trained control room operators, according to NRC inspectors.

34. During the summer of 2012, Millstone Unit 2 had to be shut down because the temperature of the Long Island Sound exceeded its licensing conditions for withdrawal of intake water.

35. During the recent Superstorm Sandy, Millstone Unit 3 was required to reduce power to 74 per cent; Millstone Unit 2 was shut down at the time for refueling.

36. The NWTRB report further states: "Engineered features such as berms, drainage and shield walls that are designed and constructed to mitigate natural hazards are considered features important to safety and are part of the dry-storage system."

37. The instant applied should be denied without prejudice to submission of a complete application addressing the deficiencies identified herein, including those related to atmospheric corrosion of the concrete components.

38. In the alternative, the Siting Council should require re-siting of the storage facility upland on the site and protected with suitable berms and barriers.

CONNECTICUT COALITION AGAINST MILLSTONE

Nancy Burton, Director
147 Cross Highway
Redding Ridge CT 6876
Tel. 203-938-3952
NancyBurtonCT@aol.com

NANCY BURTON

Nancy Burton
147 Cross Highway
Redding Ridge CT 6876
Tel. 203-938-3952
NancyBurtonCT@aol.com

CERTIFICATION

This is to certify that a copy of the foregoing was sent via U.S. Mail, postage pre-paid, to the following on December 12, 2012:

Connecticut Siting Council (original + 15)
10 Franklin Square
New Britain CT 06051

Kenneth C. Baldwin, Esq.
Robinson & Cole LLP
280 Trumbull Street
Hartford CT 0613-3597
kbaldwin@rc.com

Robert A. Avena, Esq.
Kepple, Morgan & Avena P.C.
Box 3A Anguilla Park
20 South Anguilla Road
Pawcatuck CT 6379
raa@kccaz.com

James S. Butler, AICP
Executive Director
Southeastern Connecticut Council of Governments
5 Connecticut Avenue
Norwich CT 06360
jbutler@seccog.org

Robert D. Snook, Esq.
Assistant Attorney General
55 Elm Street
Hartford CT 6106
Robert.Snook@ct.gov