EXHIBIT A

UNITED STATES
NUCLEAR REGULATORY COMMISSION

In the matter of
DOMINION NUCLEAR CONNECTICUT INC.)
MILLSTONE POWER STATION UNIT 3) Docket No. 50-423
LICENSE AMENDMENT REQUEST)
STRETCH POWER UPRATE)

DECLARATION OF ARNOLD GUNDERSEN SUPPORTING CONNECTICUT COALITION AGAINST MILLSTONE IN ITS PETITION FOR LEAVE TO INTERVENE, REQUEST FOR HEARING, AND CONTENTIONS

I, Arnold Gundersen, declare as follows:

1. My name is Arnold Gundersen. I am sui juris. I am over the age of 18-years-old. I have personal knowledge of the facts contained in this Declaration.

2. I reside at 376 Appletree Point Road, Burlington, Vermont.

3. The Connecticut Coalition Against Millstone has retained me as an expert witness in the above captioned matter.

4. I have a Bachelor's and a Master's Degree in Nuclear Engineering from Rensselaer Polytechnic Institute (RPI) cum laude.

5. I began my career as a reactor operator and instructor at RPI in 1971 and progressed to the position of Senior Vice President for a nuclear licensee. I ama vetted expert witness on nuclear safety and engineering issues. My more than 37-years of professional nuclear experience include and are not limited to: nuclear

safety expert witness testimony; nuclear engineering management and nuclear engineering management assessment; prudency assessment; nuclear power plant licensing, licensing and permitting assessment, and review; nuclear safety assessments, public communications, contract administration, assessment and review; systems engineering, structural engineering assessments, cooling tower operation, cooling tower plumes, nuclear fuel rack design and manufacturing, nuclear equipment design and manufacturing, in-service inspection, criticality analysis, thermohydraulics, radioactive waste processes and storage issue assessment, decommissioning, waste disposal, source term reconstructions, thermal discharge assessment, reliability engineering and aging plant management assessments, archival storage and document control technical patents, federal and congressional hearing testimony, and employee awareness programs.

6. My Curriculum Vitae delineating my qualifications is attached.

7. My Declaration is intended to support Connecticut Coalition Against Millstone's Petition For Leave To Intervene, Request For Hearing, and Contentions.

8. The Five Contentions my Declaration supports are:

   A. The proposed power level for which Dominion Nuclear has applied to uprate Millstone Power Station Unit 3 exceeds the NRC Stretch Power Uprate (SPU) regulatory criteria.

B. The design margins for the Millstone Unit 3 Containment, which help to protect public health and safety, have been significantly reduced by license amendments granted in 1991, and Dominion's proposed power increase, if granted, will further reduce Containment margins designed for safety.

C. When compared to all other Westinghouse Reactors, Millstone Unit 3 is an outlier or anomaly. Dominion's proposed uprate is the largest percent power increase for a Westinghouse reactor. Additionally, Millstone Unit 3 also has the smallest Containment for any Westinghouse reactor of roughly comparable output.

D. Construction problems due to the unique Sub-Atmospheric Containment Design, coupled with the impact upon the Containment concrete by the operation of the Containment Building at very low pressure, very high pressure and very low specific humidity, place the calculations used to predict the stress on that concrete Containment in uncharted analytical areas.

E. The impact of flow-accelerated corrosion at Dominion Nuclear's proposed higher power level for Millstone Unit 3 have not been adequately analyzed and addressed.

9. As an expert witness, who happens to hold both a Bachelor's and Master's degree in Nuclear Engineering, have more than 35-years of nuclear industry engineering experience, and as a former Northeast Utilities employee worked on Millstone Nuclear Power Station Unit 3, in my professional opinion the Dominion Nuclear application fails to satisfy *any of the NRC criteria* to be accepted as a Stretched Power Uprate. A thorough review of the evidence presented by Dominion Nuclear and compared and contrasted with NRC Stretched Power Uprate requirements clearly shows that the Dominion Nuclear Stretched Power Uprate application should in fact be treated as an Extended Power Uprate (EPU) application.

10. According to the NRC, there are two criteria[1] that must be met for a licensee to be considered for a Stretch Power Uprate (SPU):

    A. An increase in the reactor power that is "**up to 7 percent**" and
    B. "… **are within the design capacity of the plant**"
    C. Furthermore, the NRC states that achieving a Stretch Power Uprate "**depends on the operating margins included in the design of a particular plant**". [Emphasis added]

11. In my opinion, the magnitude of Dominion Nuclear's proposed power increase, the uniqueness of the initial Millstone 3 Power Plant Containment design, the Containment's unusually small size, and the fact that the design margins of the Containment have already been dramatically reduced by changes made to

[1] www.nrc.gov/reactors/operating/licensing/power-uprates

Millstone 3 in 1990 by Northeast Utilities, makes it necessary for the NRC to conduct the more thorough and intensive Extended Power Uprate review.

12. Dominion Nuclear has characterized this proposed increase in power at Millstone Unit 3 (Millstone Power Station Unit 3) as a Stretch Power Uprate (SPU), and Dominion Nuclear claims that Millstone 3 meets all the criteria for a Stretched Power Uprate. According to Dominion's letter filing for the power increase:

> "DNC developed this LAR utilizing the guidelines in NRC Review Standard, RS- 001, "Review Standard for Extended Power Uprates." In addition, requests for additional information (RAIs) regarding SPU and Extended Power Uprate (EPU) applications for other nuclear units were reviewed for applicability. Information that addresses many of those RAIs is included in this MPS3 SPU LAR. RS-001 states that a SPU is **characterized by power level increases up to 7 percent and does not generally involve major modifications**. Plant modifications are addressed in Section 1.0 of the License Report (LR) (Attachment 5) and are not considered to be major. Since the requested uprate is 7 percent and does not involve major plant modifications, it is considered to be a Stretched Power Uprate."[2] [emphasis added]

13. Contention 1: To begin with, the Dominion Nuclear application fails to satisfy the first NRC criteria[3] that the NRC has set the power limit for SPU's at "**… up to 7% …**". Yet Dominion Nuclear notifies its acceptance of the NRC's specific criteria in stating "**…a SPU is characterized by power level increases up to 7 percent** …". Most importantly, Dominion's proposed power increase at Millstone Unit 3 in fact exceeds the seven percent limit established by the NRC and accepted by Dominion Nuclear.

[2] Letter, Dominion Nuclear to NRC, SPU Filing, February 2007
[3] www.nrc.gov/reactors/operating/licensing/power-uprates

14. Millstone Power Station Unit 3 is currently licensed to operate at 3411 thermal megawatts (MWt). This number signifies how much heat the reactor is generating and is accurate to four significant figures (numbers).

- The proposed power level of 3650, for which Dominion Nuclear has applied, exceeds the NRC 7% limit that would qualify the power uprate for the less rigorous review of a Stretched Power Uprate.

- Dominion Nuclear has applied for a power increase to 3650 MWt, which is a full 300 KW above what is allowable by the NRC regulations for a Stretch Power Uprate.

- Let's look at the math. Multiply the current licensed power by the NRC's maximum allowable 7% SPU increase. The calculation total equals 3649.7 MWt, which is below the reactor power level of 3650 MWt for which Dominion Nuclear has applied. 3411 x 1.07 < 3650

- The 7% NRC limit is accurate to two significant figures. When multiplying a two significant figure number by a four significant figure number *mathematical methodology demands the calculation be rounded down not up* as Dominion Nuclear has done in its application.

- By rounding its proposed reactor power level to a higher power level the requested Dominion Nuclear reactor power increase exceeds the regulatory limit for a Stretched Power Uprate (SPU). Thus, this unscientific rounding up of the thermal megawatt power to a higher power

level causes the reactor power to exceed the legal Stretched Power Uprate limit of "up to 7 %" by a full 300 KW.

15. The mathematical evidence shows that Dominion Nuclear proposed power level increase for its Millstone Power Station Unit 3 exceeds the 7% regulatory limit clearly established by the NRC. Therefore, it is my opinion that the Dominion Nuclear's Millstone Unit 3 *is disqualified* for a Stretched Power Uprate.

16. Moreover, while on the face, this mathematical discrepancy may not appear to be a huge number, the 300 KW discrepancy between the NRC 7% limit and Dominion Nuclear's application for a 3650 megawatt thermal increase at Millstone 3 is a significant number that will yield approximately an additional $1 Million in profit for each additional electric megawatt produced per year.

- In other words, industry data[4] shows that the profit from each megawatt of electricity generated from uprated power increases the profit yield to each electric generating corporation by approximately $1,000,000 per year.
- Therefore the data show us that by rounding up the power level increase at Millstone 3 in excess of 7%, Dominion Nuclear's Millstone Power Station Unit 3 will earn additional profits of approximately $330,000 each year until 2045.
- Stated in total dollars, the round up to a power increase in excess of 7% will yield Dominion Nuclear an extra $10,000,000 during the

[4] *Condenser Long Term Plan*, Enrico Betti, Vermont Yankee, Memo FILE UND2002-042 07; MSD 2002/002.

uprated license extension to 2045.

17. In the first place, according to the NRC document *Approved Applications for Power Uprates*[5], the NRC has never allowed a Westinghouse reactor to be licensed for a Stretched Power Uprate with a power level increase as great as that proposed for Millstone Unit 3 by Dominion Nuclear. In the second place, no other Dry Containment[6] Westinghouse reactor with a reactor power level greater than 2000 MWt has been granted a Stretched Power Uprate beyond 6.9 percent.

18. Table 1, inserted below, which is entitled Westinghouse Uprates Ranked in Ascending Order, is a list of all Westinghouse Dry Containment reactors whose thermal power exceeds 2000 MWt.

19. Table 1 ranks the Stretched Power Uprate from smallest to largest, and the NRC data provided in Table 1 shows that no other reactor of this type has ever been granted a Stretched Power Uprate in excess of seven percent like Dominion Nuclear has proposed for Millstone Power Station Unit 3.

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[5] NRC *Approved Applications for Power Uprates* http://www.nrc.gov/reactors/operating/licensing/power-uprates/approved-applications.html

[6] A Dry Containment is a cylindrical structure with a hemispherical dome that relies solely on its large volume to contain the initial release of radioactive steam after an accident, and to reduce the peak accident pressure. It is a robust passive structure without any additional active mechanical means by which to mitigate immediate post accident pressure. Dry Containment does not rely upon ice or water suppression, nor is it maintained at a large sub-atmospheric pressure in order to reduce the peak accident pressure.

Westinghouse Uprates Ranked in Ascending Order

Name	Initial power	Power Uprate %	Current Power
Indian Point 2	2758	1.4	2797
Commanche Peak 1	3425	1.4	3473
Commanche Peak 2	3425	1.4	3473
STP 1	3800	1.4	3853
STP 2	3800	1.4	3853
Diablo Canyon 1	3338	2	3405
Diablo Canyon 2	3338	2	3405
Salem 1	3411	3.4	3527
Salem 2	3411	3.4	3527
Robinson 2	2300	4.5	2403
Shearon Harris	2775	4.5	2900
Vogtle 1	3411	4.5	3564
Vogtle 2	3411	4.5	3564
Wolf Creek	3411	4.5	3564
Turkey Point 3	2200	4.5	2300
Turkey Point 4	2200	4.5	2300
Callaway	3565	4.5	3725
Braidwood 1	3411	5	3581
Braidwood 2	3411	5	3581
Byron 1	3411	5	3581
Byron 2	3411	5	3581
Farley 1	2652	5	2785
Farley 2	2652	5	2785
Indian Point 3	3025	6.2	3213
Seabrook	3411	6.9	3646
Millstone 3	3411	7.01	3650

Table 1

20. Contention 2: The current application by Dominion Nuclear fails to meet the NRC's second criteria for a Stretched Power Uprate application, because the Millstone Power Station Unit 3 already had its design margins dramatically reduced.

21. According to the NRC, achieving a Stretch Power Uprate "…**depends on the operating margins included in the design of a particular plant**."[7] [emphasis added] Dominion has stated that since the Millstone Power Station Unit 3 application "…does not involve major plant modifications, it is considered to be a SPU". Dominion has erroneously neglected to consider the significant reduction in structural **operating margins** already in place at Millstone Unit 3 prior to its application for a power uprate.

22. The Millstone Power Station Unit 3 Containment structure and its requisite systems have already been "stretched" by previous changes to its design basis when the Containment was converted from Sub-Atmospheric Containment to Dry Containment more than a decade ago. I believe that the proposed changes to Containment systems and structures that have already been reanalyzed and fine tuned once over a decade ago constitutes a dramatic decrease in "…the **operating margins** included in the design of a particular plant."

23. The Containment is the safety related building, which houses the nuclear reactor. As such, it "contains", or in other words collects, the steam and

[7] NRC *Approved Applications for Power Uprates* http://www.nrc.gov/reactors/operating/licensing/power-uprates/approved-applications.html

radioactive material that may be released from the reactor after an accident. Please see the photo below of the inside of the Millstone Power Station Unit 3 Containment during initial fuel load in 1986.

24. As the Northeast Utilities lead licensing engineer on Millstone Power Station Unit 3 during the 1970s, I was responsible for coordinating all of the analysis for the PSAR (Preliminary Safety Analysis Report), which formed the original design basis of the Millstone Power Station Unit 3 including its Containment. This interface was among Millstone's structural mechanical, electrical, construction, and operations personnel as well as the architect Stone & Webster and the NSSS vendor Westinghouse. Millstone Power Station Unit 3 was originally designed to be "Sub-Atmospheric Containment." [In this instance my testimony is that of a fact witness[8] in addition to my overall testimony as an expert witness in this Declaration.]

25. The unique design approach of the Sub-Atmospheric Containment maintained the pressure inside the Containment at a "negative pressure" with respect to the atmosphere. Thus the difference between the pressure outside the Containment and inside the Containment (pressure differential) was approximately four pounds. Speaking as an expert witness nuclear engineer, this pressure

[8] According to the Department of Justice United States Attorneys' Manual Title 3, Chapter 3-19.111 An expert witness qualifies as an expert by knowledge, skill, experience, training or education, and may testify in the form of an opinion or otherwise. (See Federal Rules of Evidence, Rules 702 and 703). The testimony must cover more than a mere recitation of facts. It should involve opinions on hypothetical situations, diagnoses, analyses of facts, drawing of conclusions, etc., all which involve technical thought or effort independent of mere facts. And according to Chapter 3-19.112 Fact Witness A fact witness is a person whose testimony consists of the recitation of facts and/or events, as opposed to an expert witness, whose testimony consists of the presentation of an opinion, a diagnosis, etc http://www.usdoj.gov/usao/eousa/foia_reading_room/usam/title3/19musa.htm#3-19.111

differential is quite dramatic for a structure of this size. According to the NRC Sourcebook[9], page 4-26,paragraph B, Sub-atmospheric Containment, Millstone Unit 3 was the only Westinghouse four-loop plant in the nation to have Sub-Atmospheric Containment.

26. Due to critical engineering and operations concerns during my employment as

[9] NRC Sourcebook, page 4-26, paragraph B

the lead licensing engineer for Northeast Utilities on Millstone Power Station Unit 3, both the engineering and operations staff at Northeast Utilities (NU) expressed sincere regret as early as 1975 regarding NU's decision to design and build this unique Sub-Atmospheric Containment.

27. Critical issues of concern to both the engineering and operations staff regarding the Sub-Atmospheric Containment were:

A. The operations staff working within the Containment was repeatedly subjected to the adverse effects of the high temperature and low oxygen.

B. The small size of the Containment Building severely limited space for equipment and also complicated accident analysis.

C. Significant construction problems relating to the placement of concrete and rebar were caused by the Containment's small size.

D. Minimal analytical data regarding the long-term strength of the building's concrete and its continual exposure to the combination of high temperatures, low pressure, and low specific humidity within the sub-atmospheric Containment as it aged lead to doubts and questions regarding the strength of this critical safety-related structure in the event of a nuclear accident.

28. Despite these major concerns, NU decided in 1976 to continue with the licensing process for Millstone Unit 3 as a Sub-atmospheric Containment rather than risk delaying the license by changing the design. At the same time, the company made the strategic decision to modify Millstone Unit 3's license to

operate, by converting the Containment to a standard "Dry" Containment, but only after the nuclear power plant became operational because it is easier to amend a power plant license after a plant is operational.

29. Millstone Power Station Unit 3 began generating power in 1986, and at that time had Sub-Atmospheric Containment. However, Millstone Unit 3's original design basis with its one-of-a-kind four loop Sub-Atmospheric Containment was modified after it became operational in 1986.

30. The purpose of this one-of-a-kind four loop Sub-Atmospheric Containment was to lower peak design pressure[10] in case of a nuclear accident and to rapidly reduce out-leakage[11] after an accident.

A. More specifically, the Containment Building is designed to capture steam, energy, and radiation after an accident. In order to capture this post-accident energy, the Containment pressure increases. Thus, Containment Buildings are designed to specific pressure levels that must be considered during all power level design changes.

B. At Millstone Unit 3 the 1975 initial peak Containment design pressure was 39.4 psig[12].

C. However, prior to Millstone Unit 3's start-up[13], NU reanalyzed the peak pressure and dropped it to 36.1 psig.

D. Then on February 26, 1990, NU applied to modify the Millstone Power

[10] Maximum pressure inside the Containment after a design basis accident
[11] Leakage out of the Containment
[12] psig - pounds per square inch, gauge
[13] Amendment 17 to FSAR

Station Unit 3 license by changing the design basis pressure of the Containment from 9.8 psia to 14.0 psia[14].

31. When NU applied for the 1990 license change, it claimed that the sole basis for the change was to reduce the risk of injury to operations personnel who struggled to work at the reduced pressures inside this unique Containment. Such an environment is roughly equivalent to working at the top of the Grand Teton Mountains in temperatures in excess of 100 degrees.

    A. On page 2 of the initial application, NU stated, "… very little is known about the health effects of people working in high-temperature, low pressure environments."

    B. While it is true that this was indeed a staff concern dating back to 1975, it was only ONE of other equally important concerns.

    C. Another major staff concern was the fact that the Containment concrete is being exposed to these very same conditions and there is no data to review regarding the ability of concrete to withstand such a unique high-temperature low-pressure environment. Disturbingly, NU was silent on this major concern throughout its application to modify its license and convert the Sub-Atmospheric Containment to Dry Containment.

32. These changes to the design of Millstone Unit 3's one-of-a-kind Containment actually changed the design basis for the plant.

    A. From the time the initial PSAR was filed with the NRC, the peak accident pressure of Millstone Unit 3 was repeatedly *fine tuned* by NU.

[14] psia - pounds per square inch, absolute

B. From a nuclear engineering standpoint, the critical concern in my mind is that each time a new Containment pressure analysis was derived, NU applied less conservative assumptions in order to achieve more operational flexibility and decidedly increasing public exposure to radiation if there were an accident.

C. In order to accomplish the 1990 modification of Millstone Unit 3, NU changed numerous design criteria and further reduced design margins by taking further credits for systems that were in the original accident scenario design basis.

33. On page 5 of the application to increase Millstone Unit 3's Containment pressure, Northeast Utilities acknowledged that these modifications to the original design "…constitute an Unreviewed Safety Question."[15]

A. In this February 26, 1990 application to the NRC, NU requested to increase the design basis for the normal pressure inside the Containment from 9.8 psia to 14.0 psia, which resulted in the increase of the post-accident peak Containment pressure from 36.0 to 38.57 psig.

B. Since Millstone Unit 3 was originally designed with this unique Sub-Atmospheric Containment Design, in the event of an accident the Containment was designed to leak radiation to the environment for only an hour until it was able to drop the pressure back down and once again

[15] An unreviewed safety question means a change which involves any of the following: (1) The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report may be increased; (2) A possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report may be created; or (3) The margin of safety as defined in the basis for any technical safety requirement is reduced. *http://www.nuclearglossary.com*

contain any radiation releases inside the Containment Building.

C. The 1990 modifications changed the ability of the Containment Building to release radiation for only an hour and instead allowed the Containment to leak at 0.65 weight percent per day after an accident.

D. Bypass leakage was also increased from 0.01 to 0.042 weight percent per day as a result of the change, and the modification to the Containment pressure increased the calculated exposure to a person at the Exclusion Area Boundary from 16.8 rem to 19.5 rem.

34. Contention 3: Earlier in this Declaration, I also mentioned that the Millstone Power Station Unit 3 Containment has what is considered a *small* Containment. To illustrate the fact that Millstone Unit 3's Containment is small in comparison to other Westinghouse designed nuclear reactors, I evaluated data from the publicly available "NRC Sourcebook" and compiled information regarding 25 Westinghouse Reactors, which all have "Dry" Atmospheric Containment[16].

35. Table 2, inserted below, shows, in ascending order by size, the free Containment volume (in millions of cubic feet) of these 25 Westinghouse Reactors.

A. The Containment for Millstone Unit 3 clearly stands out as one of the smallest such Containment Buildings in the country.

[16] Since they are not comparable with Dominion Nuclear's Millstone Power Station Unit 3, I have not included the Westinghouse Reactors with Ice Containments, or several three-loop Reactors with Sub-Atmospheric Containment in the compilation. Also, not included for the same reason are decommissioned reactors and reactors whose thermal power is less than 2000 MWt.

B. For that matter, the only nuclear power plants with a Reactor Containment that is smaller than Millstone Power Station Unit 3 have power outputs that are 800 to 1200 MWt less than the power output of Millstone Unit 3 *prior to the Dominion's proposed uprate.*

C. Moreover, of the 11 identical 3411 MWt Westinghouse four-loop Reactors, Millstone is smaller by as much as half a million cubic feet.

36. The ratio of the initial licensed power level to the Containment Volume at each of the same 25 nuclear reactors is clearly shown in Table 3. This ratio comparison is the real indicator of Millstone Unit 3's small Containment. By applying these ratio criteria in comparison with all 25 reactors, Table 3 clearly shows that Millstone Power Station Unit 3 has the smallest Power to Volume ratio of any Dry Containment Westinghouse reactor in the nation.

37. Dominion Nuclear's proposed 7+% power increase to Millstone Power Station Unit 3 widens even further the size gap between Millstone Unit 3 and the other reactors, thus making Millstone Power Station Unit 3's Containment even "smaller" in comparison to every other Dry Containment Westinghouse reactor in the country.

38. Table 4 shows how the initial licensed power levels of all 25 reactors adjusted as a result of NRC approved "stretch" increases.

A. Accordingly, I have adjusted the power level number for Millstone Unit 3 in order to reflect the amount proposed by Dominion Nuclear's application to uprate Millstone 3's power.

Ascending Comparison of Containment Volumes

Name	Volume xE6	Initial power
Turkey Point 3	1.55	2200
Turkey Point 4	1.55	2200
Farley 1	2.03	2652
Farley 2	2.03	2652
Robinson 2	2.1	2300
Millstone 3	2.35	3411
Shearon Harris	2.5	2775
Wolf Creek	2.5	3411
Callaway	2.5	3565
Indian Point 2	2.6	2758
Indian Point 3	2.6	3025
Salem 1	2.6	3411
Salem 2	2.6	3411
Vogtle 1	2.7	3411
Vogtle 2	2.7	3411
Seabrook	2.7	3411
Diablo Canyon 1	2.83	3338
Diablo Canyon 2	2.83	3338
Braidwood 1	2.9	3411
Braidwood 2	2.9	3411
Byron 1	2.9	3411
Byron 2	2.9	3411
Commanche Peak 1	2.98	3425
Commanche Peak 2	2.98	3425
STP 1	3.3	3800
STP 2	3.3	3800

Table 2

Containment Volume Compared to Initial Power

Name	Volume xE6	Initial power	Initial Power/ Volume
Indian Point 2	2.6	2758	1,060.8
Robinson 2	2.1	2300	1,095.2
Shearon Harris	2.5	2775	1,110
Commanche Peak 1	2.98	3425	1,149.3
Commanche Peak 2	2.98	3425	1,149.3
STP 1	3.3	3800	1,151.5
STP 2	3.3	3800	1,151.5
Indian Point 3	2.6	3025	1,163.5
Braidwood 1	2.9	3411	1,176.2
Braidwood 2	2.9	3411	1,176.2
Byron 1	2.9	3411	1,176.2
Byron 2	2.9	3411	1,176.2
Diablo Canyon 1	2.83	3338	1,179.5
Diablo Canyon 2	2.83	3338	1,179.5
Vogtle 1	2.7	3411	1,263.3
Vogtle 2	2.7	3411	1,263.3
Seabrook	2.7	3411	1,263.3
Farley 1	2.03	2652	1,306.4
Farley 2	2.03	2652	1,306.4
Salem 1	2.6	3411	1,311.9
Salem 2	2.6	3411	1,311.9
Wolf Creek	2.5	3411	1,364.4
Turkey Point 3	1.55	2200	1,419.4
Turkey Point 4	1.55	2200	1,419.4
Callaway	2.5	3565	1426
Millstone 3	2.38	3411	1,433.2

Table 3

Containment Volume Compared to Uprate License Power

Name	Volume xE6	Initial power	Power Uprate %	Current Power	Current Power/V
Indian Point 2	2.6	2758	1.4	2797	1,075.76923
Robinson 2	2.1	2300	4.5	2403	1,144.28571
Shearon Harris	2.5	2775	4.5	2900	1,160
Commanche Peak 1	2.98	3425	1.4	3473	1,165.43624
Commanche Peak 2	2.98	3425	1.4	3473	1,165.43624
STP 1	3.3	3800	1.4	3853	1,167.57576
STP 2	3.3	3800	1.4	3853	1,167.57576
Diablo Canyon 1	2.83	3338	2	3405	1,203.18021
Diablo Canyon 2	2.83	3338	2	3405	1,203.18021
Braidwood 1	2.9	3411	5	3581	1,234.82759
Braidwood 2	2.9	3411	5	3581	1,234.82759
Byron 1	2.9	3411	5	3581	1,234.82759
Byron 2	2.9	3411	5	3581	1,234.82759
Indian Point 3	2.6	3025	6.2	3213	1,235.76923
Vogtle 1	2.7	3411	6.2	3564	1,320
Vogtle 2	2.7	3411	6.2	3564	1,320
Seabrook	2.7	3411	6.9	3646	1,350.37037
Salem 1	2.6	3411	3.4	3527	1,356.53846
Salem 2	2.6	3411	3.4	3527	1,356.53846
Farley 1	2.03	2652	5	2785	1,371.92118
Farley 2	2.03	2652	5	2785	1,371.92118
Wolf Creek	2.5	3411	4.5	3564	1,425.6
Turkey Point 3	1.55	2200	4.5	2300	1,483.87097
Turkey Point 4	1.55	2200	4.5	2300	1,483.87097
Callaway	2.5	3565	4.5	3725	1,490
Millstone 3	2.35	3411	7.01	3650	1,553.19149

Table 4

39. An examination of Table 4, inserted above, shows that the new Power to Volume ratio created by the proposed uprate indicates that Millstone Unit 3's Containment would be even "smaller" if Dominion's proposed power increase is approved.

40. A smaller Containment does not mean that the physical Containment has shrunk in size, but rather that more reactor power, and, in the case of an accident, more radioactive releases are being squeezed by volume into the same small Containment Building as a result of this proposed power increase.

41. If approved, Dominion's power increase to Millstone Unit 3 would be the largest ever power uprate approved to Millstone 3's unique Containment with the "smallest" volume ever licensed as discussed above.

42. What is the net effect of increasing the reactor power in this unique very small Sub-Atmospheric designed Containment? I believe that the proposed power increase at Millstone Power Station Unit 3 means that in the event of a nuclear accident at Unit 3, more than 7% additional energy must be absorbed into this one-of-a-kind Containment.

43. I believe that Core samples from within the Containment should be analyzed to assure that the Containment's integrity has not been jeopardized by operating Millstone Unit 3 under these conditions during the first four years of its operational life during the time period while concrete curing shrinkage is

known to occur.

44. In addition to my concerns regarding Millstone Unit 3's operation beyond its design basis due to the analytical tweaking of its one-of-a-kind Sub-Atmospheric Containment, I am also concerned about the reactor power level Dominion has applied in its new analysis in order to support the proposed increase application.

A. Specifically, Dominion Nuclear used a 7.01 percent increase as the basis for energy added to the Containment during an accident. As I have already shown in this Declaration, that 7.01 percent exceeds the NRC limits for consideration for a Stretched Power Uprate.

B. More importantly, Millstone Power Station Unit 3 already has a history of exceeding its licensed reactor power. According to the NRC Integrated Inspection Report on Millstone[17], Dominion Nuclear was cited for:

> "failure to maintain reactor core thermal power less than or equal to 3411 megawatts thermal (MGTH). Specifically, during performance of turbine overspeed protection system testing, the Unit 3 reactor's four minute power average exceeded 3479 MWTH." [Unit 3's license limit is 3411 MGTH also written MWt]

C. This higher power level, for which Dominion Nuclear was cited, is a full 2% higher than level of power Millstone Unit 3 is licensed to produce.

[17] Inspection Report on Millstone, ML 080380599, February 7, 2008 for the period 10/012007 to 12/31/2007, Pages 4, 5, 21, and 22

D. Such a power level increase would also increase the energy available in an accident scenario by the same additional two percent.

E. Given Dominion's history of exceeding its licensed power level, it is my opinion that any analysis of Millstone Unit 3's Containment should use a 9% additional power level in order to most accurately reflect the condition of this one-of-a-kind Containment to withstand any additional pressures during an accident.

45. Contention 4: In its 1990 licensing application to change its Containment pressure, NU never mentioned its staffs' previous concerns about possible stress to the Containment's concrete due to the impact of its operation at high temperatures, low pressures, and low specific humidity. While it is a well known fact throughout the industry that concrete continues to shrink for up to 30-years as it matures after being poured, I was unable to uncover any NU or Dominion studies the long term impact Millstone Unit 3's concrete Containment due to its unique high temperature, low pressure, and low specific humidity environment.

46. Since nothing about this proposed change is either simple or standard, it is therefore my professional opinion that an Extended Power Uprate (EPU) review is more appropriate than a Stretched Power Uprate (SPU) review.

47. Furthermore, the Containment analysis for Millstone Unit 3 is further complicated by the fact that for the first four years of its operation, Millstone Power Station Unit 3 operated at the high, temperature, low pressure, low specific humidity unique to its Sub-Atmospheric Containment and therefore which may have compromised the structural integrity of the concrete.

48. In addition to being the lead licensing engineer at for NU at its Millstone Unit 3 nuclear plant during the 1970s, I have also been both a vice president and the senior vice president of a company that provided goods and services to Millstone 3 during the 1980s.

A. In my capacity as an officer of the firm contracted to conduct structural analytical support to Millstone Unit 3 during its construction phase, I oversaw a group of sixty structural engineers at the Millstone Unit 3 site in 1984.

B. Engineers reported to me during the construction phase informed me of other structural problems involving Millstone Unit 3's unique Containment.

C. Due to the design of this Containment, the size and amount of rebar near major Containment penetrations created strategic geometry problems in the ability of the construction contractors to pour adequate amounts of concrete around the rebar in this tight configuration.

D. This unique Containment design placed an enormous amount of rebar in

several different directions around the Containment penetrations[18], making it extraordinarily difficult for concrete to slip by the rebar. Concrete voids between the rebar were a major concern. To "solve" this problem, NU qualified a procedure for the construction workers to apply long vibrating shafts into the rebar to get the concrete to slide around the rebar and create a heterogeneous block without voids.

E. This vibration method caused the sand to separate from the concrete if applied too long, and would create voids if applied for too short of a time.

F. While the procedure was qualified and construction workers were trained in how to operate the vibrating rods, my structural engineers were concerned that there was no way to test the Containment penetrations after the concrete had hardened to assure there where no voids.

G. The complex geometry at penetrations and the presence of concrete and steel intertwined made any ultrasonic exam impossible.

H. Core drilling was, of course, impossible, as it would weaken the Containment.

I. Given the structural limitations of the original design, and given that licensing changes in 1990 modified the Containment, it is imperative that this license modification be given a more thorough investigation than what is normally provided during a *Stretch* Power Uprate approval

[18] Containment penetrations - Locations through the Containment wall where pipes like steam lines and feedwater lines enter and exit the Containment.

process.

49. Contention 5: Flow Accelerated Corrosion is another critical issue that should be considered the review of Dominion's proposed power increase application.

A. Dominion's proposed power uprate will change Millstone Power Station Unit 3's reactor coolant flow by approximately 7%.

B. It will impact the flow in and out of the reactor and the steam and condensate/feedwater flow on the secondary side of the plant will also be increased by 7%.

C. These flow increases in turn increase "Flow Accelerated Corrosion" thus causing pipes to wear out much faster.

D. This Flow Accelerated Corrosion is a non-linear phenomenon, and in my opinion is a significant risk due to the application of a 7% power increase on a plant that is already in the second-half of its engineered design life.

E. Disturbingly, in its application, Dominion did not propose hiring any new personnel at Millstone Power Station Unit 3 to deal with *flow accelerated corrosion* following the unit's proposed power uprate. This despite the fact that components will require more inspections because an uprate will cause those components to wear out much faster.

F. In general, Flow Accelerated Corrosion increases the likelihood of pipe failure.

G. Equally important, given Millstone Power Station Unit 3 exceeded licensed power less than a year ago, is the concern that pipe already worn thin by the seven percent power increase might break when power is increased further.

H. I saw no evidence that the Containment has been analyzed to withstand this increased energy.

50. I believe that Millstone Unit 3's program for assessing Flow Accelerated Corrosion in Dominion's proposed uprate of the plant fails to comply with 10 CFR50 Appendix B, XVI which states:

10 CFR Appendix B to Part 50 – Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants, XVI. Corrective Action that reads:

> **"**Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall be documented and reported to appropriate levels of management."

51. The power increase at Millstone Power Station Unit 3 will be accomplished by increasing the flow of water through both the primary and secondary sides of

the power plant. This increased flow through the pipes causes pipes to wear out faster by a phenomenon called Flow Accelerated Corrosion (FAC).

52. The basic two causes of FAC are erosion-corrosion of the pipe walls and cavitation- corrosion of the pipe wall. Electrolytic attack may also occur. Wall thinning from FAC is non-linear and is a local issue, caused by local geometry like Elbows and flow restrictions, local turbulence, and local metallurgical conditions (welds and impurities) in the pipe. Once local corrosion has started, changes in turbulence in the local area can intensify the corrosive attack. This localized nature of the corrosion is evident in a FAC pipe failure at the Surry plant in 1986. There a feed-water elbow had holes in one area, yet the nearby pipe wall was much less worn. Similar FAC piping failures have occurred at San Onofre in 1991 and 1993, Fort Calhoun in 1997, and Mihama in Japan in 2004. While this is an *old issue*, it has not been resolved, and instead has continued to plague the nuclear industry for more than three decades.

53. Due to the localized nature of the FAC, it is difficult to predict where and when a piping component might fail. The difficulty in developing accurate predictive models for FAC is the reason why, as recently as 2004, several workers were killed at Japan's Mihama I nuclear power plant. While prediction of what might fail is difficult, it is certain, however, to say that the rate at which piping components will wear out as a result of the proposed increase in power at Millstone 3 will exceed the 7 percent power increase due to the non-linear nature of FAC.

54. In my opinion, Dominion's application does not adequately address the guidance of NRC NUREG-1800, which requires that a FAC program address the scope, analytical tools, benchmarking of the computer model, preventative activities, what is monitored, what is inspected, trend analysis, acceptance criteria, operating experience, inspection techniques as well as data collection.

55. Furthermore, I believe Dominion's proposed License amendment for Millstone Power Station Unit provides inadequate information to determine if Millstone Nuclear Power Station Unit 3 has the management systems and staff in place to properly evaluate FAC if NRC approves Dominion's proposed power increase to the plant.

    A. The application did not discuss the increases in staff necessitated in order to maintain the plant in a safe condition if the proposed power increase is approved.

    B. Clearly the increase in the increased corrosion rates caused by the proposed 7% power level increase will require extra analysis, extra inspection, and extra maintenance, yet the application is silent on the need to increase Millstone Unit 3's inspection and maintenance staff.

56. Without such programmatic and staffing information, I am unable to further assess the adequacy of any actions Dominion Nuclear might have to mitigate

the consequences of Flow Accelerated Corrosion caused by the proposed power uprate at Millstone Nuclear Power Station Unit 3.

57. In conclusion: following a complete review of the evidence presented and by relying upon my nuclear safety and nuclear engineering experience in my review of the documents referenced herein above, it is my professional opinion that the issues discussed above are serious safety considerations germane to the subject of the license application in this case. Similarly after reviewing all the evidence presented, it is my professional opinion that Dominion Nuclear is ill prepared to increase the power at Millstone Nuclear Power Station Unit 3. Finally, since Dominion's proposed power increase is above NRC regulatory criteria and given the new stresses upon the one-of-a-kind formerly Sub-Atmospheric Containment, I believe that the evidence clearly shows the entire application should be given the more rigorous review of the Extended Power Uprate License Evaluation.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this day, March 15, 2008 at Burlington, Vermont.

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Arnold Gundersen, MSNE