UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD
OR
THE COMMISSION

In the Matter of Docket # 50-293-LR
Entergy Corporation

Pilgrim Nuclear Power Station

License Renewal Application August 11, 2011

DECLARATION OF GORDON R. THOMPSON ADDRESSING NEW AND SIGNIFICANT INFORMATION PROVIDED BY THE NRC'S NEAR-TERM TASK FORCE REPORT ON THE FUKUSHIMA ACCIDENT

I, Gordon R. Thompson, declare as follows:

I. INTRODUCTION

I-1. In the course of this proceeding I prepared a declaration dated June 2, 2011, which supported a contention and related petitions and motions by the Commonwealth of Massachusetts. That declaration set forth my affiliations, qualifications, and experience.[1] It also described reports that I have prepared in the context of this proceeding. One such report, dated June 1, 2011, and entitled "New and Significant Information From the Fukushima Daiichi Accident in the Context of Future Operation of the Pilgrim Nuclear Power Plant", is described here as the "Thompson 2011 report".

I-2. Subsequently, I prepared a declaration dated July 5, 2011, which replied to two submissions in this proceeding. One submission, dated June 27, 2011, was by Entergy. The other submission, dated June 27, 2011, was by the Nuclear Regulatory Commission (NRC) Staff.

I-3. The present declaration ("this declaration") addresses information that is new and significant in the context of this proceeding, and that is contained in a report published by the NRC on July 12, 2011. That report is entitled "Recommendations for Enhancing Reactor Safety in the 21st Century: The Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident", and is described here as the "Task Force report".

I-4. This declaration addresses selected points in the Task Force report, and is not a comprehensive review of that report. Lack of discussion here of a finding or

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[1] On June 13, 2011, the Commonwealth of Massachusetts submitted a supplemental attachment to my declaration of June 2, 2011, containing an updated version of my CV.

recommendation in the Task Force report does not imply my agreement or disagreement with that finding or recommendation.

I-5. The Task Force report acknowledges limitations in currently-available information about the Fukushima accident. At page 1, the report states that detailed information in each of the issue areas investigated by the Task Force "was, in many cases, unavailable, unreliable, or ambiguous". Thus, the potential exists for emergence, during coming months and years, of new information that could significantly alter findings in the Task Force report.

I-6. The Task Force report contains a substantial body of information that is new and significant in the context of the Pilgrim license extension proceeding. The breadth of that body of information is evident from the twelve overarching recommendations of the Task Force, which are summarized at page ix of the report and again at pages 69-70. Each of those recommendations calls for action that is new and significant in the context of future operation of the Pilgrim plant. For example, Recommendation #7 (see page 46 of the Task Force report) calls for enhanced instrumentation and water makeup capability for the spent-fuel pool of each nuclear power plant (NPP) licensed by the NRC. These capabilities do not now exist at the Pilgrim plant, and have the potential to reduce the risk of a spent-fuel-pool fire at the plant. In the Thompson 2011 report, and in my previous reports incorporated therein by reference, I have drawn attention to this risk and discussed measures for reducing the risk.

I-7. The Task Force report proposes, in its Appendix A, a five-part process for implementing its recommendations. The five parts are: (i) issuance of a Commission policy statement; (ii) initiation of rulemaking in seven issue areas; (iii) issuance of orders requiring licensees to take near-term actions in twelve issue areas; (iv) initiation of NRC Staff action in five issue areas; and (v) Staff pursuit of longer-term review in ten issue areas.

I-8. There are at least two technical reasons why the Task Force recommendations should be considered in the Pilgrim license extension proceeding. First, many of the actions recommended in the Task Force report have plant-specific features, and therefore require plant-specific regulatory attention.[2] Second, as shown in this declaration, the findings in the Task Force report call for substantial revision of the Pilgrim-specific supplement to the NRC's generic environmental impact statement (GEIS) for license renewal of nuclear power plants, especially Appendix G of that supplement.[3] It is my understanding that completion of an accurate, plant-specific supplement to the GEIS is required before a license extension is granted. It is my further understanding that severe

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[2] In illustration of this point, at a June 15, 2011, public briefing to NRC Commissioners on the progress of the Task Force review, the Task Force leader discussed the installation of hardened wetwell vents by licensees of BWR plants. He said that "each licensee installed a specific configuration", and described substantial differences in these configurations. See the briefing transcript, page 17, lines 4-15. It follows that upgrading of the venting systems would involve plant-specific design changes.

[3] US Nuclear Regulatory Commission, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 29, Regarding Pilgrim Nuclear Power Station, NUREG-1437, Supplement 29, July 2007.

accident mitigation alternatives (SAMAs) that are determined in that supplement to be cost-effective must be implemented as a condition of license extension.

I-9. The Thompson 2011 report set forth general findings together with findings on six specific issues. The general findings address design weaknesses in US nuclear power plants, including the Pilgrim plant, and related weaknesses in the NRC regulatory arena. The findings on specific issues are directly relevant to license extension for the Pilgrim plant. The Task Force report provides information that supports both sets of findings, as explained below.

II. THE TASK FORCE REPORT AND GENERAL FINDINGS IN THE THOMPSON 2011 REPORT

II-1. The Thompson 2011 report set forth, in its Section V and elsewhere, general findings regarding design weaknesses in the Pilgrim plant and other NPPs, and related weaknesses in the NRC regulatory arena. Information provided in the Task Force report supports these findings, as shown in the following paragraphs.

II-2. As mentioned in paragraph I-6, above, the Task Force report sets forth twelve overarching recommendations. Six of the recommendations directly involve re-evaluation or upgrading of the designs of currently-licensed NPPs.[4] Those recommendations directly respond to design weaknesses. Four of the recommendations pertain to emergency preparedness.[5] Those recommendations seek to compensate for design weaknesses. Two of the recommendations pertain to the NRC regulatory framework and regulatory practice.[6] Those recommendations seek to strengthen NRC regulation so that design weaknesses are more readily identified and related actions are taken. Thus, all of the Task Force recommendations respond, in varying ways, to clearly-evident weaknesses in the design of NRC-licensed NPPs.

II-3. The Task Force report states, at page 18, that "the Commission [NRC] has come to rely on design-basis requirements and a patchwork of beyond-design-basis requirements and voluntary [licensee] initiatives for maintaining safety". That statement confirms general findings in the Thompson 2011 report, set forth in its Section V and elsewhere, about weaknesses in NRC regulation of NPPs. These regulatory weaknesses share common roots with fundamental deficiencies in NPP design. When NPPs such as Pilgrim were designed, nuclear safety regulation was founded on the principle that abnormal situations, such as accidents, would occur within a plant's design basis. Over time, analysis and operating experience revealed that the design basis originally adopted was inadequate, resulting in a significant risk of fuel damage and radioactive release to the environment. Piecemeal efforts to address this basic problem have led to the "patchwork of beyond-design-basis requirements and voluntary initiatives" described in the Task Force report. Overarching Recommendation #1 in that report (see its page ix) is to establish a "logical, systematic, and coherent regulatory framework" to replace the present patchwork.

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[4] Recommendations in this category are numbers 2, 3, 4, 5, 6, and 7.

[5] Recommendations in this category are numbers 8, 9, 10, and 11.

[6] Recommendations in this category are numbers 1, and 12.

III. THE TASK FORCE REPORT AND FINDINGS IN THE THOMPSON 2011 REPORT REGARDING SIX SPECIFIC ISSUES

III-1. The Thompson 2011 report set forth, in its Sections VI and VII, findings on six specific issues that are directly relevant to license extension for the Pilgrim plant. Information provided in the Task Force report supports these findings, as shown in the following paragraphs.

III-2. The first specific issue discussed in the Thompson 2011 report (in its Section VI.1 and Conclusion C4) was the probability of reactor core damage and radioactive release, accounting for cumulative direct experience. The Thompson 2011 report found that, for the purposes of SAMA analysis, direct experience provides an estimate of probability that is more appropriate than licensee estimates derived from the use of probabilistic risk assessment (PRA) techniques.

III-3. The Task Force report does not directly discuss the appropriateness of PRA estimates for the purposes of SAMA analysis. It does, however, show a clear preference for direct experience as the primary basis for its recommendations. As discussed in paragraphs I-6 and II-2, above, the Task Force report sets forth a wide-ranging set of recommendations. A number of the actions it recommends would, in the Pilgrim licensing context, be categorized as SAMAs. Yet, the Task Force report does not justify its recommendations by any SAMA-type analysis or any resort to PRA estimates. Clearly, the authors rely instead on their concept of prudent engineering principles, informed by cumulative, direct experience of NPP accidents and accident precursors. Indeed, their report entirely bypasses the question of probability. In that respect, the Task Force report goes beyond the Thompson 2011 report, which offers an alternative probability estimate for use in SAMA analysis.

III-4. The second specific issue discussed in the Thompson 2011 report (in its Section VI.2 and Conclusion C5) was the operators' capability to mitigate an accident, and the effect of that capability on the conditional probability of a spent-fuel-pool fire during a reactor accident. The Thompson 2011 report set forth three findings on this issue. First, the operators' capability to mitigate an accident at the Pilgrim NPP can be severely degraded in the local environment created by a reactor accident. Second, the nuclear industry's recently-disclosed extensive damage mitigation guidelines (EDMGs) are inadequate to address the range of core-damage and spent-fuel-damage events that could occur at Pilgrim. Third, there is a substantial conditional probability of a spent-fuel-pool fire during a reactor accident at Pilgrim.

III-5. The Task Force report does not directly address the findings set forth in the preceding paragraph. However, Task Force recommendations effectively endorse these findings. For example, implicit endorsement of these findings is clearly evident in Task Force Recommendation #7. As discussed in paragraph I-6, above, Recommendation #7 calls for enhanced instrumentation and water makeup capability for the spent-fuel pool of each nuclear power plant licensed by the NRC. Pages 43-46 of the Task Force report provide details. The recommended capabilities do not now exist at the Pilgrim plant. Indeed, these new capabilities would replace ad hoc, crude EDMGs now on the books at

Pilgrim. The recommended capabilities would be substantially more effective than the EDMGs. For example, one of the aspects of Recommendation #7 is that licensees should be ordered to install seismically qualified means (i.e., robust, pre-installed pipes, nozzles, etc.) to spray water into each spent fuel pool, with a supply connection at grade outside the building. That arrangement would be substantially more robust and reliable than the jury-rigged spray arrangement now envisioned in the Pilgrim EDMGs, as discussed in Section VI.2 of the Thompson 2011 report. In recommending such upgrades of instrumentation and water makeup capability, the Task Force report effectively acknowledges that, under present arrangements, there is a substantial conditional probability of a spent-fuel-pool fire during a reactor accident at Pilgrim. It should be noted, as discussed in paragraph III-11, below, that re-equipment of the Pilgrim spent-fuel pool with low-density, open-frame racks would yield risk reduction beyond that arising from implementation of Task Force Recommendation #7.

III-6. The third specific issue discussed in the Thompson 2011 report (in its Section VI.3 and Conclusion C6) was secrecy regarding accident-mitigating measures. The Thompson 2011 report found that NRC's excessive secrecy degrades the licensee's capability to mitigate an accident at the Pilgrim NPP.

III-7. The Task Force report does not directly address the debilitating effects of secrecy. However, its recommendations implicitly acknowledge those effects. This acknowledgement is evident, for example, in Appendix A of the Task Force report. As described in paragraph I-7, above, Appendix A sets forth a five-part process for implementing the report's recommendations. There is no mention of secrecy in Appendix A, even though some of the actions recommended by the Task Force would replace measures – such as EDMGs – that have been or are now secret. One can reasonably infer that the Task Force report is recommending a reduction in the NRC's use of secrecy.

III-8. The fourth specific issue discussed in the Thompson 2011 report (in its Section VI.4 and Conclusion C7) was hydrogen control. The Thompson 2011 report found that hydrogen explosions similar to those experienced at Fukushima could occur at the Pilgrim NPP.

III-9. Recommendations #5 and #6 in the Task Force report clearly support the finding of the Thompson 2011 report on hydrogen control. Recommendation #5, described at pages 39-41 of the Task Force report, calls for requirement of reliable, hardened venting of the containment at each boiling-water-reactor (BWR) plant with a Mark I or Mark II containment. The Pilgrim plant is a BWR with a Mark I containment. Hydrogen control would be one of the major functions of the recommended venting system. It should be noted, as discussed in paragraph I-8, above, that hardened venting systems at BWR plants have a variety of plant-specific design features. Recommendation #6, described at pages 41-43 of the Task Force report, calls for further investigation of hydrogen control as part of a longer-term review of the Fukushima accident.

III-10. The fifth specific issue discussed in the Thompson 2011 report (in its Section VI.5 and Conclusion C8) was the probability of a spent-fuel-pool fire and radioactive release, accounting for Fukushima direct experience. This issue overlaps the issue

discussed in paragraph III-4, above. The Thompson 2011 report found that there is a substantial conditional probability of a spent-fuel-pool fire during a reactor accident at Pilgrim. The same finding, reached through a different approach, is discussed in paragraph III-4.

III-11. As discussed in paragraph III-5, above, the Task Force report effectively acknowledges that, under present arrangements, there is a substantial conditional probability of a spent-fuel-pool fire during a reactor accident at the Pilgrim NPP. That acknowledgement is evident, for example, from Task Force Recommendation #7. It should be noted that Task Force Recommendation #7 does not exhaust the potential for reduction of the risk of a spent-fuel-pool fire. A greater reduction of risk could be achieved by re-equipment of the Pilgrim spent-fuel pool with low-density, open-frame racks.[7] The Thompson 2011 report found (see its Conclusion C8) that such re-equipment is indicated by SAMA analysis and, separately, by prudent engineering principles.

III-12. The sixth specific issue discussed in the Thompson 2011 report (in its Section VI.6 and Conclusion C9) was filtered venting of reactor containment. The Thompson 2011 report found that filtered venting of the Pilgrim reactor containment could substantially reduce the atmospheric release of radioactive material from an accident at the Pilgrim NPP.

III-13. The Task Force report does not specifically discuss filtered venting of reactor containment. However, its Recommendation #5, as discussed in paragraph III-9, above, calls for requirement of reliable, hardened venting of the Pilgrim reactor containment. It follows that the Task Force envisions situations in which the containment would be deliberately vented to the atmosphere during an accident involving reactor core damage. As discussed in Section VI.6 of the Thompson 2011 report, adding a filter to the vent pathway could substantially reduce the amount of radioactive material released to the atmosphere during the venting process. Indeed, installation of a filtered venting system is normal practice in some countries. Thus, Task Force Recommendation #5 implies that filtered venting of containment should be considered in a re-done SAMA analysis for Pilgrim. Moreover, the Thompson 2011 report determined (see its Conclusion C9) that prudent engineering principles, separate from SAMA analysis, call for the Pilgrim containment to be equipped with a filtered venting system that uses passive mechanisms. It should be noted that the option of deliberate venting of the containment reflects fundamental deficiencies in the design of the Pilgrim plant, as discussed in paragraphs II-1 through II-3, above. Additional of a filter to the vent pathway could partially offset some of those deficiencies.

IV. Conclusions

IV-1. The Thompson 2011 report set forth general findings together with findings on six specific issues. The general findings address design weaknesses in NRC-licensed NPPs, including the Pilgrim plant, and related weaknesses in the NRC regulatory arena. The findings on the six specific issues are directly relevant to license extension for the Pilgrim

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[7] See, for example, Table 8-1 of the Thompson 2006 report; that report is incorporated by reference at page 8 of the Thompson 2011 report.

NPP. As shown in this declaration, the Task Force report provides new and significant information that supports both sets of findings in the Thompson 2011 report. The support is indirect in each instance but is, nevertheless, substantial.

IV-2. The Thompson 2011 report's findings on six, Pilgrim-specific issues show that the existing SAMA analysis for the Pilgrim plant should be entirely re-done. It follows, as discussed in paragraph I-8, above, that the Pilgrim-specific supplement to the GEIS for license renewal of nuclear power plants should be re-done. As shown in paragraph IV-1, above, the Task Force report supports that conclusion.

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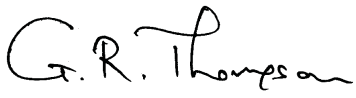
I declare, under penalty of perjury, that the foregoing facts provided in my Declaration are true and correct to the best of my knowledge and belief, and that the opinions expressed herein are based on my best professional judgment.

Executed on August 11, 2011.



Gordon R. Thompson

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety And Licensing Board

In the Matter of	)	
Entergy Nuclear Generation Co.	)	Docket No. 50-293-LR
And Entergy Nuclear Operations, Inc.	)	
(Pilgrim Nuclear Power Station)	)	August 11, 2011

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing **Declaration of Gordon R. Thompson Addressing New and Significant Information Provided by the NRC's Near-Term Task Force Report on the Fukushima Accident**, dated August 11, 2011, were provided to the Electronic Information Exchange (EIE) for service on the individuals below:

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