

**UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION**

**BEFORE THE ATOMIC SAFETY AND LICENSING BOARD**

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In the Matter of	)	Docket Nos. 50-247-LR and
	)	50-286-LR
ENTERGY NUCLEAR OPERATIONS, INC.	)	
	)	March 30, 2012
(Indian Point Nuclear Generating Units 2 and 3)	)	
_____	)	

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**ENTERGY'S STATEMENT OF POSITION REGARDING  
CONTENTION NYS-5 (BURIED PIPING AND TANKS)**

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Pursuant to 10 C.F.R. § 2.1207(a)(1) and the Atomic Safety and Licensing Board’s (“Board”) Order Granting NRC Staff’s Unopposed Time Extension Motion and Directing Filing of Status Updates,<sup>1</sup> Entergy Nuclear Operations, Inc. (“Entergy”) submits this Statement of Position (“Statement”) on New York State (“NYS”) contention NYS-5 concerning aging management of Indian Point Energy Center (“IPEC”) buried piping and tanks that contain or may contain radioactive fluids. This Statement is supported by the Prefiled Testimony of Applicant Witnesses Alan Cox, Ted Ivy, Nelson Azevedo, Robert Lee, Stephen Biagiotti, and Jon Cavallo Concerning Contention NYS-5 (Buried Piping and Tanks) (“Entergy Test.”) (ENT000373), and the exhibits thereto (ENT00015A-B, ENT000031, ENT000032, ENT000098, ENT000251, ENT000252, ENT000322, and ENT000374 to ENT000446). As discussed below, NYS-5 lacks merit and should be resolved in Entergy’s favor.

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<sup>1</sup> Licensing Board Order Granting NRC Staff’s Unopposed Time Extension Motion and Directing Filing of Status Updates at 1 (Feb. 16, 2012) (unpublished).

## **I. PRELIMINARY STATEMENT**

As admitted by the Board and pursued by NYS at hearing, contention NYS-5 alleges that Entergy lacks an adequate aging management program (“AMP”) for managing potential aging effects caused by external corrosion of in-scope buried piping that contains radioactive fluids.<sup>2</sup> In admitting this contention, the Board stated that NYS-5 concerns whether Entergy’s AMP achieves the desired goal of providing reasonable assurance that the intended functions of in-scope buried piping will be maintained for the license renewal period.<sup>3</sup> This limitation on the scope of the admitted contention is fully consistent with the Commission’s recent ruling in the *Pilgrim* license renewal proceeding on a similar contention. In CLI-10-14, the Commission affirmed another Board’s dismissal of a buried piping contention after an evidentiary hearing and, in doing so, made clear that key *safety* functions are the focus of the license renewal safety review under Part 54—not the adequacy of ongoing NRC regulatory actions to address leakage incidents.<sup>4</sup>

To meet its burden of proof here, Entergy proffers the testimony of a diverse and highly-qualified six-member expert panel that collectively includes nearly 200-years of directly relevant technical experience. That panel includes individuals who are well-versed in NRC license renewal requirements, nuclear and non-nuclear industry buried piping initiatives, relevant Entergy and IPEC-specific programs and procedures, buried piping corrosion science and engineering, and buried pipe coating practices. As summarized below, Entergy’s testimony demonstrates that the AMP in question—the IPEC Buried Piping and Tanks Inspection Program (“BPTIP”)—provides

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<sup>2</sup> See *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 and 3), LBP-08-13, 68 NRC 43, 81 (2008).

<sup>3</sup> *Id.*

<sup>4</sup> *Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), CLI-10-14, slip op. at 15 (June 17, 2010) (stating that NRC “measures to improve the ability [of licensees] to timely detect and correct inadvertent leaks to assure compliance with public dose limits ... is an ongoing operational issue involving existing facilities regardless of whether those facilities are seeking or will seek license renewal”).

reasonable assurance that IPEC buried piping (including piping containing radioactive fluids) will adequately perform its intended function of maintaining plant pressure boundaries during the period of extended operation.

But Entergy's experts do more than explain why Entergy's BPTIP meets the NRC's reasonable assurance standard. They also fully refute the numerous (unfounded) allegations of NYS's sole expert, Dr. David Duquette. In particular, they explain that:

- Contrary to NYS's claims, Entergy has a comprehensive understanding of those IPEC systems containing buried piping components, including those components that perform license renewal intended functions and may contain radiological constituents. That understanding includes significant insights into the condition of IPEC buried piping and its coatings, as acquired through numerous direct and indirect inspections performed to date.
- Since the IPEC LRA was submitted, Entergy has substantially augmented the BPTIP in response to industry and site-specific operating experience and additional regulatory guidance to include numerous direct visual inspections of buried piping as well as indirect inspections of buried piping before and during the period of extended operation. Thus, the program is not lacking in detail or "conceptual and aspirational in nature."<sup>5</sup>
- NYS's claim that the BPTIP relies on ambiguous and insufficient commitments is inaccurate.<sup>6</sup> Entergy's implementation of the BPTIP, including its performance of docketed commitments and adherence to applicable Entergy procedures, will be verified and enforced by the NRC through 10 C.F.R. Part 50 processes. Further, the BPTIP implementation is closely linked to implementation of IPEC's 10 C.F.R. Part 50 underground piping program, the Underground Piping and Tanks Inspection and Monitoring Program ("UPTIMP"), which addresses the requirements of the industry underground piping initiative, NEI 09-14.<sup>7</sup>
- Entergy's program does not lack appropriate acceptance criteria or corrective actions. Any identified degradation of buried pipe coatings or metal surfaces is required to be reported and evaluated according to IPEC corrective action procedures. The applicable acceptance criteria are specified in Entergy's UPTIMP and BPTIP implementing procedures.
- The Nuclear Energy Institute ("NEI") and Electric Power Research Institute ("EPRI") guidance documents cited by NYS do not recommend that cathodic protection ("CP") be

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<sup>5</sup> Pre-Filed Written Testimony of Dr. David J. Duquette, Ph.D Regarding Contention NYS-5 at 18:12 ("Duquette Testimony") (NYS000164).

<sup>6</sup> See New York State Initial Statement of Position, Contention NYS-5 at 1 (Dec. 16, 2011) (NYS000163).

<sup>7</sup> NEI 09-14, Rev. 0, Guideline for the Management of Buried Piping Integrity (Jan. 2010) (ENT000378); NEI 09-14, Rev.1, Guideline for the Management of Underground Piping and Tank Integrity (Dec. 2010) (NYS00168).

installed for critical piping systems.<sup>8</sup> Rather, both documents recommend that if a CP system exists, then it should be properly tested and maintained. NRC guidance does not indicate that new CP must or should be installed and, in fact, provides that an increased number of inspections—as is included in the IPEC BPTIP—is a satisfactory approach for managing the effects of aging on buried piping.

- Entergy has not disregarded vendor recommendations as claimed by NYS and its expert.<sup>9</sup> As part of current plant operations, Entergy has undertaken preventive maintenance of existing IPEC CP systems, and recently installed several new CP systems on buried piping that is within the scope of the BPTIP in plant regions recommended by vendors. Under the UPTIMP and BPTIP, Entergy will continue to evaluate the need for further CP based on inspection results and operating experience.
- Available soil testing and other data do not indicate that soil corrosivity is a significant concern at IPEC, or that soil corrosivity, by itself, warrants cathodic protection.<sup>10</sup>

In sum, Entergy's expert testimony and supporting exhibits demonstrate that the IPEC BPTIP readily meets (and even exceeds) Dr. Duquette's own recommendations for an adequate AMP because it: (1) adopts NEI and EPRI recommendations; (2) is consistent with NUREG-1801, Rev. 1, Section XI.M34 and meets the intent of NUREG-1801, Rev. 2, Section XI.M41;<sup>11</sup> (3) identifies appropriate acceptance criteria for inspections of buried pipes; and (4) states the repair and remediation procedures to be followed if corrosion damage exceeds the acceptance criteria.<sup>12</sup> Accordingly, NYS-5 lacks merit and should be resolved in Entergy's favor.

## **II. PROCEDURAL HISTORY OF CONTENTION NYS-5**

On April 23, 2007, Entergy filed its application to renew the operating licenses for IP2 and IP3 for 20 years beyond their current expiration dates of September 28, 2013, and December 12,

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<sup>8</sup> See NEI 09-14, Rev. 1, Guideline for the Management of Underground Piping and Tank Integrity, Section 6.2.3 (Dec. 2010) (NYS000168); EPRI Report 1016456, Recommendations for an Effective Program to Control the Degradation of Buried Pipe, Sections 2.4.1.2, A.2.6 (Dec. 2008) (NYS000167).

<sup>9</sup> See NYS Statement of Position at 52-53 (NYS000163); Duquette Testimony at 22:6-24:6 (NYS000164).

<sup>10</sup> Duquette Testimony at 22:15-16 (NYS000164).

<sup>11</sup> NUREG-1801, Vol. 1, Rev. 1, Generic Aging Lessons Learned (GALL) Report (Sept. 2005) ("NUREG-1801" or "GALL Report") (NYS00146A-C); NUREG-1801, Rev. 2, Generic Aging Lessons Learned (GALL) Report (Dec. 2010) (NYS000147A-D).

<sup>12</sup> Duquette Testimony at 26:5-11 (NYS000164).

2015, respectively. After a notice of opportunity for hearing was published in the *Federal Register* on August 1, 2007,<sup>13</sup> NYS filed a petition to intervene, proposing a number of contentions, including NYS-5.<sup>14</sup>

As proffered, NYS-5 alleged that Entergy's AMP (*i.e.*, BPTIP) fails to comply with 10 C.F.R. §§ 54.21(a) and 54.29 because:

(1) it does not provide for adequate inspection of all systems, structures, and components that may contain or convey water, radioactively-contaminated water, and/or other fluids; (2) there is no adequate leak prevention program designed to replace such systems, structures, and components [SSCs] before leaks occur; and (3) there is no adequate monitoring to determine if and when leakage from these systems, structures, and components occurs. These [SSCs] include underground pipes, tanks, and transfer canals.<sup>15</sup>

NYS-5 also stated that the contention “also applies to IP1 to the extent that Unit 2 and Unit 3 use Unit 1’s buried systems, structures, and components that may contain or convey water, radioactively-contaminated water, and/or other fluids.”<sup>16</sup>

On July 31, 2008, the Board admitted NYS-5 to the extent that it pertains to the adequacy of Entergy's AMP for buried pipes, tanks, and transfer canals that contain radioactive fluid [and] which meet 10 C.F.R. § 54.4(a) criteria.<sup>17</sup> According to the Board, the questions to be addressed at hearing include, *inter alia*, whether, and to what extent, inspections of *buried SSCs containing*

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<sup>13</sup> Notice of Acceptance for Docketing of the Application and Notice of Opportunity for Hearing Regarding Renewal of Facility Operating License Nos. DPR-26 and DPR-64 for an Additional 20-Year Period, 72 Fed. Reg. 42,134 (Aug. 1, 2007).

<sup>14</sup> See New York State Notice of Intention to Participate and Petition to Intervene (Nov. 30, 2007) (“NYS Petition”), available at ADAMS Accession No. ML073400187.

<sup>15</sup> *Id.* at 80.

<sup>16</sup> *Id.* at 80-81.

<sup>17</sup> See *Indian Point*, LBP-08-13, 68 NRC at 81.



*radioactive fluids*, a leak prevention program, and monitoring to detect future excursions, are needed as part of Entergy's AMP for these components.<sup>18</sup> The Board stated that:

As it relates to this contention, discussion of proposed inspection and monitoring details will come before this Board only as they are needed to demonstrate that the Applicant's AMP does or does not achieve the desired goal of *providing assurance that the intended function of relevant SSCs discussed herein will be maintained for the license renewal period*, and specifically, to detect, prevent, or mitigate the effects of future inadvertent radiological releases as they might affect the *safety function* of the buried SSCs and potentially impact public health.<sup>19</sup>

The Board also found that there is a material dispute as to the existence and adequacy of the AMP for IP1-buried SSCs that may be used by IP2 and IP3 during the period of extended operation.<sup>20</sup>

On December 16, 2011, NYS filed its initial statement of position, the prefiled testimony of Dr. David J. Duquette, and numerous exhibits related to NYS-5, including a report prepared by Dr. Duquette.<sup>21</sup> Dr. Duquette is a Professor of Engineering at Rensselaer Polytechnic Institute, and his research has been focused primarily on the area of corrosion science and engineering. From 2002 to 2009, Dr. Duquette served on the Nuclear Waste Technical Review Board. Aside from that experience, however, Dr. Duquette's *curriculum vitae* indicates no experience specific to the nuclear power industry or nuclear regulation, including the NRC's regulations in 10 C.F.R. Parts 50 and 54.<sup>22</sup> Dr. Duquette appears to have no prior experience with respect to the aging management of buried piping at a nuclear power plant.

After reviewing NYS's testimony and other submissions, Entergy initiated consultations with the other parties regarding the scope of NYS-5 as pursued by NYS at hearing. Those

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<sup>18</sup> *Id.*

<sup>19</sup> *Id.* (emphasis added).

<sup>20</sup> *Id.* at 82.

<sup>21</sup> See NYS Statement of Position (NYS000163); Duquette Testimony (NYS000164); Report of David J. Duquette, Ph.D in Support of Contention NYS-5 ("Duquette Report") (NYS000165); *Curriculum Vitae* of Dr. David J. Duquette (NYS000166); see also Exhs. NYS000167 through NYS000205.

<sup>22</sup> See *Curriculum Vitae* of Dr. David J. Duquette (NYS000166).

consultations culminated in the filing of a Joint Stipulation by NYS, Entergy, and the NRC Staff on January 23, 2012.<sup>23</sup> The Joint Stipulation states that the NYS's previously-expressed concerns regarding (1) *internal* corrosion of buried pipes and tanks and (2) the spent fuel pool transfer canals are no longer at issue in this contention.<sup>24</sup>

Thus, in its current form, NYS-5 focuses on the management of potential aging effects caused by external corrosion of buried piping that is within the scope of license renewal and contains or may contain radioactive fluids.<sup>25</sup> NYS and Dr. Duquette claim, in principal part, that: (1) Entergy does not know the current state or condition of IPEC buried piping; (2) Entergy's buried piping AMP lacks sufficient detail; (3) Entergy's LRA contains ambiguous and insufficient commitments; (4) the acceptability of inspection program results, including the criteria to be applied to continued operation, remediation, or replacement, must be specified; (5) both NEI and EPRI documents recommend cathodic protection for critical piping systems; (6) Entergy's AMP does not commit to any corrosion mitigation measures, such as re-activating inoperative cathodic protection systems or installing new cathodic protection systems; and (7) Entergy's own data show that IPEC soils are mildly to moderately corrosive, "objectively" warranting cathodic protection.<sup>26</sup>

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<sup>23</sup> State of New York, Entergy Nuclear Operations, Inc., and NRC Staff Joint Stipulation (Jan. 23, 2012).

<sup>24</sup> *Id.* at 1-2. As stated in the Joint Stipulation, aging management of spent fuel pool transfer canals is within the scope of the Structures Monitoring Program (LRA Section B.1.36) and not the Buried Piping and Tanks Inspection Program (LRA Section B.1.6).

<sup>25</sup> *See* Duquette Test. at 7:12-15 (NYS000164) (stating that "my report focuses on a discussion of external corrosion of pipes, specifically those in contact with soils: the factors that affect external corrosion, and the steps that may be taken to mitigate external corrosion of underground pipe").

<sup>26</sup> *See generally* NYS Statement of Position (NYS000163); Duquette Test. (NYS000164); Duquette Report (NYS000165).

### **III. APPLICABLE LEGAL AND REGULATORY STANDARDS**

#### **A. 10 C.F.R. Part 54 Requirements**

##### **1. Regulatory Requirements**

Under the governing regulations in Part 54, the review of license renewal applications is confined to matters relevant to the period of extended operation requested by the applicant.<sup>27</sup> The Commission has stated that “[a]djudicatory hearings in individual license renewal proceedings will share the same scope of issues as our NRC Staff review, for our hearing process (like our Staff’s review) necessarily examines only the questions our safety rules make pertinent.”<sup>28</sup> The Commission has specifically limited its license renewal safety review to the matters specified in 10 C.F.R. §§ 54.21 and 54.29(a)(2), which focus on the management of aging of certain systems, structures, and components (“SSCs”), and the review of time-limited aging analyses (“TLAAs”).<sup>29</sup>

##### **2. NRC Guidance**

The NRC Staff evaluates license renewal applications in accordance with the requirements in 10 C.F.R. Part 54, as well as Staff guidance contained in NUREG-1800.<sup>30</sup> NUREG-1801, or the GALL Report, describes AMPs that the Staff has accepted for meeting 10 C.F.R. Part 54 requirements based on its evaluations of existing programs at operating plants during the initial license period.<sup>31</sup> NUREG-1801 is treated in the same manner as an NRC-approved topical report

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<sup>27</sup> See *Fla. Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 and 4), CLI-01-17, 54 NRC 3, 7-10 (2001).

<sup>28</sup> *Id.* at 10; see also 1995 License Renewal SOC at 22,482 n.2 (NYS000016).

<sup>29</sup> See *Turkey Point*, CLI-01-17, 54 NRC at 7-8; *Duke Energy Corp.* (McGuire Nuclear Station, Units I and 2), CLI-02-26, 56 NRC 358, 363 (2002). As explained in Section III.A.2, below, NRC guidance for the license renewal process is set forth in the General Aging Lessons Learned Report, Rev. 1 (NUREG-1801) (“NUREG-1801, Revision 1”), NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” Rev. 1 (Sept. 2005) (“SRP-LR”) (NYS000195), and Regulatory Guide (“RG”) 1.188, Standard Format and Content for Applications to Renew Nuclear Power Plant Operating License.

<sup>30</sup> NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” Rev. 1 (Sept. 2005) (“NUREG-1800” or “SRP-LR”) (NYS000195).

<sup>31</sup> NUREG-1801, Vol. 1, Rev. 1, Generic Aging Lessons Learned (GALL) Report at 1 (Dec. 2010) (NYS00146A).

that is generically applicable.<sup>32</sup> An applicant may reference NUREG-1801 in an LRA to demonstrate that the programs at its facility correspond to those reviewed and approved by the NRC Staff in NUREG-1801.<sup>33</sup> Compliance with NUREG-1801 guidance thus constitutes one acceptable way to manage aging effects for license renewal.<sup>34</sup>

A license renewal applicant's use of the guidance in NUREG-1801, Revision 1 satisfies regulatory requirements under 10 C.F.R. Part 54.<sup>35</sup> As the Commission very recently reiterated, "Where the NRC develops a guidance document to assist in compliance with applicable regulations, it is entitled to special weight."<sup>36</sup> In particular, for license renewal safety issues, a "license renewal applicant's use of an aging management program identified in the GALL Report *constitutes reasonable assurance* that it will manage the targeted aging effect during the renewal period."<sup>37</sup> The Commission has further stated that "a commitment to implement an AMP that the NRC finds is consistent with the GALL Report constitutes one acceptable method for compliance with 10 C.F.R. § 54.21(c)(1)(iii)."<sup>38</sup>

In December 2010, the NRC Staff issued NUREG-1801, Revision 2.<sup>39</sup> This revision was issued more than three years after the IPEC LRA was submitted, and more than a year after the

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<sup>32</sup> *Id.* at 3.

<sup>33</sup> *Id.*

<sup>34</sup> *Id.* at 4.

<sup>35</sup> *See, e.g., AmerGen Energy Co., LLC* (Oyster Creek Nuclear Generating Station), CLI-08-23, 68 NRC 461, 468 (2008).

<sup>36</sup> *NextEra Energy Seabrook, LLC* (Seabrook Station, Unit 1), CLI-12-05, \_\_NRC \_\_ (slip op. at 16 n.78) (Mar. 8, 2012) (*quoting Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-01-22, 54 NRC 255, 264 (2001); *see also id.* ("We recognize, of course, that guidance documents do not have the force and effect of law. Nonetheless, guidance is at least implicitly endorsed by the Commission and therefore is entitled to correspondingly special weight") (*quoting Yankee Atomic Electric Co.* (Yankee Nuclear Power Station), CLI-05-15, 61 NRC 365, 375 n.26 (2005)).

<sup>37</sup> *See Oyster Creek*, CLI-08-23, 68 NRC at 468 (emphasis added).

<sup>38</sup> *Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc.* (Vermont Yankee Nuclear Power Station), CLI-10-17, 72 NRC \_\_ (slip op. at 44) (July 8, 2010).

<sup>39</sup> NUREG-1801, Rev. 2, Generic Aging Lessons Learned (GALL) Report (Dec. 2010) (NYS00147A-D).

NRC Staff issued its original Safety Evaluation Report (“SER”) on the IPEC LRA in August 2009. The IPEC LRA was prepared consistent with the guidance in NUREG-1801, Revision 1. However, as discussed below and in Entergy’s testimony, Entergy has substantially augmented the LRA in view of site-specific and industry operating experience that precipitated the Staff’s development of the new buried piping AMP that now appears in NUREG-1801, Rev. 2.

NUREG-1801, Rev. 2 includes a new program, Section XI.M41, Buried and Underground Piping and Tanks.<sup>40</sup> The new AMP described in Section XI.M41 increases the number of piping materials covered by the program and calls for both preventive measures and inspections that were not in the NUREG-1801, Rev. 1 buried piping program.<sup>41</sup> Section XI.M41 more specifically defines inspection and monitoring activities based on plant-specific factors, such as piping construction material and function, quality of backfill, and the existence of cathodic protection.<sup>42</sup> As Entergy’s testimony explains, key aspects of the new program are reflected in Entergy’s revised BPTIP and program implementing procedures.

## **B. Burden of Proof**

An applicant has the burden of proof in a licensing proceeding.<sup>43</sup> But intervenors have the initial “burden of going forward”; that is, they must provide sufficient evidence to support the claims made in the admitted contention.<sup>44</sup> This burden of going forward applies at hearing, even

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<sup>40</sup> See NUREG-1801, Rev. 2, Generic Aging Lessons Learned (GALL) Report at XI M41-1 to XI M41-14 (Dec. 2010) (NYS00147D).

<sup>41</sup> See *id.* at XI M41-1.

<sup>42</sup> See *id.* at XI M41-1 to XI M41-3.

<sup>43</sup> See 10 C.F.R. § 2.325.

<sup>44</sup> *Oyster Creek*, CLI-09-07, 69 NRC at 269 (quoting *Consumers Power Co.* (Midland Plant, Units 1 & 2), ALAB-123, 6 AEC 331, 345 (1973) (“The ultimate burden of proof on the question of whether the permit or license should be issued is, of course, upon the applicant. But where, as here, one of the other parties contends that, for a specific reason . . . the permit or license should be denied, that party has the *burden of going forward* with evidence to buttress that contention. Once he has introduced sufficient evidence to establish a *prima facie* case, the burden then shifts to the applicant who, as part of his overall burden of proof, must provide a sufficient rebuttal to satisfy the Board that it should reject the contention as a basis for denial of the permit or license.”)); see also *Vt.*

after a contention is admitted.<sup>45</sup> For example, in the *Oyster Creek* license renewal proceeding, the Commission upheld a Board ruling that the intervenors had not met their burden at the hearing stage because their claims were unsupported allegations and mere speculation.<sup>46</sup> If the intervenors do carry their burden of going forward with a *prima facie* case on particular issues, then the applicant has the burden of satisfying the Board that it should reject the contention on its merits.<sup>47</sup> To prevail, the applicant's position must be supported by a preponderance of the evidence.<sup>48</sup>

### C. **The Reasonable Assurance Standard**

For safety issues, pursuant to Section 54.29(a), the NRC will issue a renewed license if it finds that actions have been identified and have been or will be taken by the applicant, such that there is *reasonable assurance* that the activities authorized by the renewed license will continue to be conducted in accordance with the CLB.<sup>49</sup>

Longstanding Commission and judicial precedent makes clear that the reasonable assurance standard does not require an applicant to meet an “absolute” or “beyond a reasonable doubt”

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*Yankee Nuclear Power Corp. v. NRDC*, 435 U.S. 519, 554 (1978) (upholding this threshold test for intervenor participation in licensing proceedings); *Phila. Elec. Co.* (Limerick Generating Station, Units 1 & 2), ALAB-262, 1 NRC 163, 191 (1975) (holding that the intervenors had the burden of introducing evidence to demonstrate that the basis for their contention was more than theoretical).

<sup>45</sup> See *Oyster Creek*, CLI-09-07, 69 NRC at 268-70.

<sup>46</sup> See *id.* at 269; *La. Power & Light Co.* (Waterford Steam Electric Station, Unit 3), ALAB-732, 17 NRC 1076, 1093 (1983) (citing *Midland*, ALAB-123, 6 AEC at 345).

<sup>47</sup> See, e.g., *La. Power & Light Co.* (Waterford Steam Electric Station, Unit 3), ALAB-732, 17 NRC 1076, 1093 (1983) (citing *Midland*, ALAB-123, 6 AEC at 345).

<sup>48</sup> *Pac. Gas & Elec. Co.* (Diablo Canyon Nuclear Power Plant, Units 1 & 2), ALAB-763, 19 NRC 571, 577 (1984).

<sup>49</sup> 10 C.F.R. § 54.29(a).

standard.<sup>50</sup> Rather, the Commission takes a case-by-case approach, applying sound technical judgment and verifying the applicant's compliance with Commission regulations.<sup>51</sup>

#### **D. Applicant Commitments**

Licensee commitments are a well-established mechanism for ensuring that licensees implement their AMPs in a timely and effective manner.<sup>52</sup> Part 54 specifically authorizes licensees to demonstrate compliance with its requirements via prospective actions to be taken after the NRC issues the renewed license.<sup>53</sup> This method of compliance is a well-established part of NRC regulatory practice.<sup>54</sup> This principle dates back to the original license renewal rule in 1991, when the Commission accepted the use of new commitments to monitor, manage, and correct age-related degradation unique to license renewal. It stated:

The licensing basis for a nuclear power plant during the renewal term will consist of the current licensing basis and *new commitments* to monitor, manage, and correct age-related degradation unique to license renewal, as appropriate. The current licensing basis includes all applicable NRC requirements and licensee commitments, as defined in the rule.<sup>55</sup>

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<sup>50</sup> *AmerGen Energy Co. LLC* (License Renewal for Oyster Creek Generating Station), CLI-09-07, 69 NRC 235, 263-64 (2009), *aff'd sub nom. NJEF v. NRC*, 645 F.3d 220 (3d Cir. 2011); *Commonwealth Edison Co.* (Zion Station, Units 1 & 2), ALAB-616, 12 NRC 419, 421 (1980); *N. Anna Env'tl. Coal. v. NRC*, 533 F.2d 655, 667-68 (D.C. Cir. 1976) (rejecting the argument that reasonable assurance requires proof beyond a reasonable doubt and noting that the licensing board equated "reasonable assurance" with "a clear preponderance of the evidence").

<sup>51</sup> *See Oyster Creek*, CLI-09-07, 69 NRC at 263; *Entergy Nuclear Generation Co.* (Pilgrim Nuclear Power Station), CLI-10-14, 71 NRC \_\_\_, slip op. at 21 (June 17, 2010).

<sup>52</sup> *See Entergy Nuclear Vt. Yankee, LLC* (Vt. Yankee Nuclear Power Station), CLI-10-17, 72 NRC \_\_ (slip op. at 45 (July 8, 2010) ("An applicant may commit to implement an AMP that is consistent with [NUREG-1801] and that will adequately manage aging.")).

<sup>53</sup> *See* 10 C.F.R. § 54.29(a).

<sup>54</sup> *See, e.g.*, 10 C.F.R. § 54.29 (stating "actions have been identified and have been *or will be taken*" with respect to managing the effects of aging and TLAAs) (emphasis supplied); *see also Turkey Point*, CLI-01-17, 54 NRC at 8 ("Part 54 requires renewal applicants to demonstrate how their programs *will be effective in managing the effects of aging during the proposed period of extended operation*. . . . Applicants must identify any *additional actions*, *i.e.*, maintenance, replacement of parts, etc., *that will need to be taken* to manage adequately the detrimental effects of aging.") (internal citations omitted) (emphasis added).

<sup>55</sup> Final Rule: Nuclear Power Plant License Renewal, 56 Fed. Reg. 64,943, 64,946 (Dec. 13, 1991) (emphasis added).

In its 1995 revised rule, the Commission reiterated that such commitments are acceptable.<sup>56</sup>

More recently, the Commission again affirmed these important principles in the *Vermont Yankee* license renewal proceeding. In CLI-10-17, the Commission held:

[I]n Oyster Creek, we expressly interpreted section 54.21(c)(1) to permit a demonstration after the issuance of a renewed license: “an applicant’s use of an aging management program identified in the GALL Report [*i.e.* NUREG-1801] constitutes reasonable assurance that it will manage the targeted aging effect during the renewal period.” We reiterate here that a commitment to implement an AMP that the NRC finds is consistent with the GALL Report constitutes one acceptable method for compliance with 10 C.F.R. § 54.21(c)(1)(iii).<sup>57</sup>

Accordingly, it is permissible for an applicant to incorporate commitments in its LRA, and for the Staff to review and rely on such commitments in making its reasonable assurance determination under Section 54.29(a).

Importantly, the NRC Staff reviews these implementation activities as part of its ongoing regulatory oversight process—“separate and apart” from its review of the LRA.<sup>58</sup> The adequacy of Entergy’s ongoing AMP implementation and commitment-fulfillment activities should not be within the scope of this hearing. Instead, the focus of this hearing is for the purpose of adjudicating the adequacy of Entergy’s LRA, including the AMPs and commitments contained therein, as evaluated under 10 C.F.R. Part 54.

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<sup>56</sup> Final Rule: Nuclear Power Plant License Renewal; Revisions, 60 Fed. Reg. at 22,473 (stating that, for the license renewal review, consideration of *written commitments* only need encompass those commitments that concern the capability of systems structures and components, identified in § 54.21(a), integrated plant assessment and §54.21(c) time-limited aging analyses, to perform their intended functions, as delineated in § 54.4(b)).

<sup>57</sup> *Vt. Yankee*, CLI-10-17, slip op. at 44 (*citing Oyster Creek*, CLI-08-23, 68 NRC at 468).

<sup>58</sup> *Oyster Creek*, CLI-09-07, 69 NRC at 248-49 (holding that that review of the applicant’s compliance with a commitment to perform a finite element structural analysis of the drywell was not a precondition for granting the renewed operating license); *see also id.* at 284 (“review and enforcement of license conditions is a normal part of the Staff’s oversight function rather than an adjudicatory matter”); NRC Inspection Manual, Temporary Instruction 2516/001, Review of License Renewal Activities (Mar. 30, 2011), *available at* ADAMS Accession No. ML110620255 (governing NRC Staff inspections on the “implementation of license renewal commitments, license conditions, and selected aging management programs”).



#### **IV. ARGUMENT**

##### **A. Entergy's Witnesses**

Entergy's testimony on NYS-5 is sponsored by the witnesses identified below. The testimony, opinions, and evidence presented by these Entergy witnesses are based on their technical and regulatory expertise, professional experience, and personal knowledge of the issues raised in NYS-5. Collectively, these witnesses demonstrate that NYS-5 lacks merit.

##### **1. Mr. Alan B. Cox**

Mr. Cox is Entergy's Technical Manager, License Renewal. As summarized in his *curriculum vitae* (ENT000031), Mr. Cox has more than 34 years of experience in the nuclear power industry, having served in various positions related to engineering and operations of nuclear power plants. For example, from 1993 to 1996, he was employed as a Senior Staff Engineer at ANO. From 1996 to 2001, he served as the Supervisor, Design Engineering, at ANO. Mr. Cox was licensed by the NRC in 1981 as a reactor operator and in 1984 as a senior reactor operator for ANO, Unit 1. Mr. Cox holds a Bachelor of Science ("B.S.") degree in Nuclear Engineering from the University of Oklahoma and a Masters of Business Administration ("M.B.A.") from the University of Arkansas at Little Rock.

As Technical Manager, Mr. Cox was directly involved in preparing the LRA and developing or reviewing AMPs for IP2 and IP3. Those programs include the Buried Piping and Tanks Inspection Program ("BPTIP"), the AMP for buried metallic piping and tanks that may be susceptible to external corrosion. Mr. Cox has been directly involved in developing or reviewing Entergy responses to NRC Staff requests for additional information ("RAIs") concerning the LRA and various amendments or revisions to the application (principally as they relate to aging management issues). Mr. Cox also supported Entergy at the related Advisory Committee on Reactor Safeguards ("ACRS") Subcommittee and Full Committee meetings for the IPEC LRA held

in March 2009, and in September 2009, respectively. Accordingly, Mr. Cox has personal knowledge of the development and subsequent revision of the LRA, including the BPTIP.

## **2. Mr. Ted S. Ivy**

Mr. Ivy is Entergy's Manager, License Renewal. As summarized in his *curriculum vitae* (ENT000374), Mr. Ivy has more than 25 years of experience in the nuclear industry and is a licensed Professional Engineer in the States of Arkansas and Louisiana. Mr. Ivy is a member of the American Society of Mechanical Engineers ("ASME"), the National Association for Corrosion Engineers ("NACE International"), and the Electric Power Research Institute EPRI Buried Piping Integrity Group. Additionally, he is Entergy's representative on the NEI License Renewal Mechanical Working Group and served as Vice Chairman (2009-2010) and Chairman (2010) of that organization. Mr. Ivy holds a B.S. degree in Mechanical Engineering from the University of Arkansas and an M.B.A. from the University of Arkansas at Little Rock.

As a member of the Entergy License Renewal Services team, Mr. Ivy has been directly involved in seven license renewal projects, including the IPEC project. His principal responsibilities with respect to the IPEC LRA have included: (1) preparation and review of license renewal project guidelines on scoping, screening, mechanical aging management reviews ("AMRs"), and TLAAs; (2) preparation and review of Class 1 and Non-Class 1 mechanical AMR and AMP evaluation reports; and (3) review of Class 1 and Non-Class 1 mechanical portions of the LRA and preparation of related responses to NRC Staff RAIs. These responsibilities have encompassed review of the BPTIP and revisions to that program. Accordingly, Mr. Ivy has personal knowledge of the development and subsequent revision of the LRA, including the BPTIP.

## **3. Mr. Nelson F. Azevedo**

Mr. Azevedo is Entergy's Supervisor of Code Programs at IPEC. As summarized in his *curriculum vitae* (ENT000032), he has 30 years of professional experience in the nuclear power

industry. He holds a Bachelor of Science degree in Mechanical and Materials Engineering from the University of Connecticut, and a Master of Science in Mechanical Engineering and Master of Business Administration (M.B.A.) degrees from the Rensselaer Polytechnic Institute (“RPI”) in Troy, New York. In his current position, he oversees the IPEC engineering section responsible for implementing American Society of Mechanical Engineers (“ASME”) Code programs, including the buried piping, fatigue monitoring, inservice inspection, inservice testing, flow-accelerated corrosion, snubber testing, boric acid corrosion control, non-destructive examination, steam generators, alloy 600 cracking, reactor vessel embrittlement, reactor vessel internals, welding, and 10 C.F.R. Part 50, Appendix J containment leakrate programs. In addition to those duties he is responsible for ensuring compliance with the ASME Code, Section XI requirements for repair and replacement activities at IPEC and represents IPEC before industry organizations, including the pressurized water reactor (“PWR”) Owners Group Management Committee. Accordingly, Mr. Azevedo is qualified through knowledge, skill, directly-relevant experience, training, and education to provide expert witness testimony on the Entergy BPTIP.

#### **4. Mr. Robert C. Lee**

Mr. Lee is employed by Entergy as a Senior Engineer in the Code Programs at IPEC. As summarized in his *curriculum vitae* (ENT000375), Mr. Lee is a licensed Professional Engineer in the State of New York and has approximately 30 years of experience in the nuclear power industry. His nuclear experience principally has been in the Design/Analysis groups within Combustion Engineering, the New York Power Authority, and Entergy. Mr. Lee’s current position is in the IPEC Code Programs group, where he is the lead for the following programs: inservice testing, Appendix J containment leakrate, pressure testing and the Underground Piping and Tanks Inspection and Monitoring Program (“UPTIMP”). Mr. Lee holds a B.S. degree in Mechanical Engineering from the City College of New York.

In his capacity as the program engineer for the IPEC UPTIMP, Entergy's current, Part 50-based program for managing IPEC buried piping and tanks, Mr. Lee has been responsible for developing and implementing that program, which Entergy also is using to implement its license renewal AMP (*i.e.*, the BPTIP). Accordingly, Mr. Lee is qualified through knowledge, skill, directly-relevant experience, training, and education to provide expert witness testimony on the Entergy BPTIP.

**5. Mr. Stephen F. Biagiotti, Jr.**

As summarized in his *curriculum vitae* (ENT000376), Mr. Biagiotti is a Senior Associate with Structural Integrity Associates, Inc. ("SIA") in Centennial, Colorado. SIA is an international consulting firm that provides expert inspection, assessment, and engineering services to the nuclear, fossil, and pipeline industries, with particular focus on analyzing, preventing, and controlling structural and component failures. Mr. Biagiotti has over 25 years of work experience focusing on corrosion control at pipeline, production, and refinery operations in the oil and gas industry and at operating nuclear power plants. Over the past six years at SIA, he has been the technical lead in the development of corrosion engineering solutions, databases, and computer models for the assessment of buried piping to detect the degradation mechanisms of internal and external corrosion. During that time, he developed for EPRI the new nuclear industry buried piping data model and software application for Version 2 of BPWorks™, and the companion Microsoft Windows-based software application, MAPPro®, which provide risk-based ranking of buried piping systems. Entergy is deploying the MAPPro® software program at its nuclear units, including IP2 and IP3, to assist in managing aging effects on buried piping and tanks.

Mr. Biagiotti has been a member of NACE International (formerly the National Association for Corrosion Engineers) for over 20 years, and during the past five years, he has served as the Chairman of a NACE Task Group 357, which created Standard Practice 0507, External Corrosion

Direct Assessment Integrity Data Exchange Format, and he is an active leader in Task Group 404 on Nuclear Buried Piping. More recently, Mr. Biagiotti served as chairman of Special Technology Group 35, “Pipelines, Tanks and Well Casings,” which is responsible for overseeing all standard development and reaffirmations on these topics. Currently, he is the Associate Technology Coordinator for the NACE Cross-Industry Technology C2 group, “Corrosion Prevention and Control for Pipelines and Tanks, Industrial Water Treating and Building Systems and Cathodic Protection Technology.” Mr. Biagiotti holds B.S. and M.S. degrees in Metallurgical Engineering from the Colorado School of Mines and is a Registered Professional Engineer in Colorado. Thus, Mr. Biagiotti is qualified through knowledge, skill, directly-relevant experience, training, and education to provide expert witness testimony on buried piping issues.

#### **6. Jon R. Cavallo**

Mr. Cavallo is a Senior Consultant with Enercon Services, Inc., specializing in corrosion mitigation and protective coatings, based in Portsmouth, New Hampshire. Mr. Cavallo has 40 years of work experience related to corrosion mitigation and protective coatings in the nuclear industry. Mr. Cavallo is a NACE-certified Level 3 Coating Inspector (the top certification offered by the NACE International Coating Inspector Program), with Nuclear Facilities Endorsement, and a certified SSPC (The Society for Protective Coatings) Protective Coatings Specialist. Mr. Cavallo holds a B.S. degree in Engineering Technology from Northeastern University in Boston, Massachusetts and is a Registered Professional Engineer in three states. He also holds registrations as a Certified Nuclear Coatings Engineer from the National Board of Registration for Nuclear Safety Related Coating Engineers and Specialists and Senior Nuclear Coatings Specialist from the Board of International Registration for Nuclear Coatings Specialists. In 2010, Mr. Cavallo received the ASTM International Award of Merit and the designation of Fellow.

Mr. Cavallo was elected Chairman of the ASTM Technical Committee D-33 on Protective Coating and Lining Work for Power Generation Facilities for the periods 2003 through 2005, 2006 through 2007, and 2008 through 2009. In addition, he served as Chairman of the Industry Coating Phenomena Identification and Ranking Table (“PIRT”) Panel reviewing the work of Savannah River Technical Center on the NRC Containment Coatings Research Project (NRC Generic Safety Issue 191). In 2001, Mr. Cavallo served as Editor of EPRI Technical Report (“TR”) 1003120 (formerly TR-109937), Revision 1, *Guideline on Nuclear Safety-Related Coatings*. He also assisted in the development of, and continues to teach, an EPRI Comprehensive Coatings Course. Mr. Cavallo is also the Principal Investigator for Revision 2 to *Guideline on Nuclear Safety-Related Coatings*, which EPRI published as a final report in December 2009. Thus, Mr. Cavallo is qualified through knowledge, skill, directly-relevant experience, training, and education to provide expert witness testimony on buried piping issues.

**B. Entergy’s Evidence**

In their testimony, Entergy’s experts will demonstrate that Entergy’s AMP for buried piping, the BPTIP, meets all applicable NRC requirements, is consistent with current NRC and industry guidance, and provides reasonable assurance that buried pipes addressed by the BPTIP, including those that contain or may contain radioactive fluids (the sole focus of NYS-5), will perform their intended functions during the period of extended operation. They also will show that NYS’s position, as supported by Dr. Duquette, lacks a reliable technical and factual foundation.

**1. Entergy Has a Comprehensive Understanding of IPEC Buried Piping**

NYS’s assertion that Entergy does not know the current state of buried piping at IPEC is incorrect.<sup>59</sup> As its testimony and supporting exhibits demonstrate, Entergy has a comprehensive

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<sup>59</sup> NYS Statement of Position at 41 (NYS000163).

understanding of: (1) those IPEC systems containing buried piping components; (2) those buried components which support systems performing license renewal intended functions; (3) those systems containing, or potentially containing, radioactive fluids; and (4) the specifications that governed installation of IPEC buried piping, including its protective coatings.<sup>60</sup> Additionally, in accordance with Entergy fleet procedure EN-DC-343,<sup>61</sup> Entergy has developed “as-built” drawings of in-scope buried piping systems (ENT000409 to ENT000422) that show the routes of buried pipes at IPEC, including their location relative to other buried pipes and aboveground structures.<sup>62</sup>

a. *Buried Piping Within the Scope of the License Renewal BPTIP and Within the Scope of Admitted Contention NYS-5*

Entergy’s testimony identifies the specific portions of IP2 and IP3 buried piping that are subject to AMR and included within the scope of the license renewal BPTIP.<sup>63</sup> That buried piping includes portions of the following IPEC systems:

- Safety injection (IP3 only): Approximately 700 feet of stainless steel piping running from the refueling water storage tank (“RWST”) to the auxiliary building that supplies borated water to the suction of the safety injection and containment spray pumps.
- Service water: A total of approximately 3800 feet of IP2 and IP3 carbon steel piping that carries service water to and from safety-related cooling loads in two separate parallel trains.
- Fire protection: Approximately 5,000 feet of IP2 and IP3 ductile iron or carbon steel piping that runs from fire water pumps through the fire protection loop that circles the main plant buildings. (The loop design and associated sectional isolation valves allow isolation of a leak in any segment of piping without disabling the remainder of the fire protection water system.)
- Fuel oil: Approximately 160 feet of carbon steel piping that carries fuel oil from fuel oil storage tanks to associated diesel engines. Buried piping and tanks provide fuel oil for emergency diesel generators, as well as, the Appendix R diesel generator (IP3 only) and security diesel generator (IP2 only).

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<sup>60</sup> See Entergy Test. at A86-87 (ENT000373).

<sup>61</sup> EN-DC-343, Rev. 4 at 13 (NYS000172).

<sup>62</sup> See Entergy Test. at A86 (ENT000373).

<sup>63</sup> See *id.* at A46.

- Security generator: Approximately 50 feet of carbon steel piping that provides the propane fuel to operate the IP3 security generator.
- City water: Greater than 4,000 feet of IP2 and IP3 carbon steel and gray cast iron piping that provides a backup source of water for auxiliary feedwater and fire protection systems.
- Plant drains: Greater than 1,000 feet of IP2 and IP3 carbon steel piping that provides a drainage path from floor drains in the lower elevations of certain plant structures to waste holdup tanks.
- Auxiliary feedwater: Approximately 1200 feet of carbon steel piping that serves as the suction line and recirculation line between the auxiliary feedwater pumps and the condensate storage tanks (“CSTs”) for each unit. About 1,000 feet of this piping is for IP2, with the remainder of the piping serving IP3.
- Containment isolation support: Approximately 150 feet of carbon steel piping that provides pressurized air to support containment integrity for IP2.<sup>64</sup>

More detailed descriptions of these systems and their intended functions are provided in Entergy’s testimony and the LRA sections cited therein.<sup>65</sup> The locations of this in-scope piping are shown in Figure 1 of Entergy’s testimony and Exhibits ENT000409 through ENT000422. The only IP1 buried piping within the scope of the BPTIP is a portion of the IP1 river water system from the pump discharge to the intertie to the IP2 service water system.<sup>66</sup>

Of the systems identified above, only the IP3 safety injection system contains radioactive fluids during normal operations, because it contains borated water with radioactive constituents from the RWST.<sup>67</sup> Significantly, safety injection system buried components are made of stainless steel, which has low susceptibility to corrosion.

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<sup>64</sup> See *id.*; NL-09-106, Letter from F. Dacimo, Entergy to NRC Document Control Desk, Attach. 1 at 1 (July 27, 2009) (“NL-09-106”) (NYS000203).

<sup>65</sup> See Entergy Test. at A46 (ENT000373).

<sup>66</sup> See *id.* at A48; NL-12-032, Letter from F. Dacimo, Entergy to NRC, “Correction to Previous Response Regarding Unit 1 Buried Piping” at 1-2 (Jan. 30, 2012) (ENT000381).

<sup>67</sup> See Entergy Test. at A50 (ENT000373); LRA at 2.3-55 to 2.3-56 (ENT00015A).



Buried piping in the auxiliary feedwater (“AFW”), service water, and floor drain systems for IP2 and IP3 has the *potential* to contain radioactivity, but generally is not expected to contain radioactive fluids under normal operations. The IP1 river water piping that is within the scope of the BPTIP does not have the potential to contain radioactive fluids. Thus, as illustrated in Figures 1 and 2 of Entergy’s testimony, the piping at issue in NYS-5—piping that contains or potentially contains radioactive fluids—is a relatively small subset of the piping managed under the BPTIP.<sup>68</sup>

*b. IPEC Engineering Specifications Required that All Buried Piping Within the Scope of the License Renewal BPTIP and Within the Scope of Admitted Contention NYS-5 Be Coated in Accordance With Industry Standards*

As an initial matter, NYS’s assertion that “Entergy can assume pipes were defectively coated and that all pipes were improperly backfilled,” such that all in-scope buried piping must be excavated, is unfounded and impractical.<sup>69</sup> Although Entergy has detected some degradation of, or damage to, buried piping coatings, it has not been widespread, and only limited evidence of actual piping corrosion has been observed. In fact, buried piping inspections performed to date have generally found buried piping coatings, backfill, and base metal to meet applicable acceptance criteria.<sup>70</sup> In those instances in which acceptance criteria were not met, Entergy promptly took appropriate corrective actions (*e.g.*, repair/replacement of coating or piping) in accordance with its Corrective Action Program.<sup>71</sup>

Importantly, engineering specifications in place at the time of plant construction contained procedures for installing and inspecting coatings applied by the piping manufacturer and for

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<sup>68</sup> As discussed in Answers 47 and 52 of Entergy’s Testimony (ENT000373), although there are a number of buried tanks that are within the scope of the BPTIP, those tanks are used only to store hydrocarbon fuels (fuel oil, diesel fuel, propane) and are not connected to systems that contain radioactive materials or fluids. Thus, they are not within the scope of NYS-5.

<sup>69</sup> NYS Statement of Position at 43 (NYS000163).

<sup>70</sup> See Entergy Test. at A87 (ENT000373).

<sup>71</sup> See *id.* at A110-A111, A113-A114, A118.

coatings applied in the field (*e.g.*, at pipe joints).<sup>72</sup> As Entergy's witnesses explain, those specifications required that *all* buried piping within the scope of NYS-5 be coated and wrapped in accordance with AWWA Standard C-203-62, *Standard for Coal Tar Enamel Protective Coatings for Steel Water Pipes* (ENT000393). AWWA Standard C-203-62 required a coal tar coating covered with a fiber-based wrap saturated with coal tar. This is consistent with nuclear and industry standards for buried piping at the time of construction of IP2 and IP3. Overall industry experience (including non-nuclear applications) demonstrates that coal tar coatings of the type specified for IPEC buried piping continue to adequately protect buried steel piping from corrosion even after having been in service for periods exceeding 75 years.<sup>73</sup> In fact, buried piping coating standards based on this industry experience have been in existence for many decades with only minor changes due to their proven overall effectiveness in protecting buried piping.<sup>74</sup>

Entergy's experts agree that it is reasonable to assume that no coating is perfect and that some holidays (*i.e.*, defects) will exist in coatings.<sup>75</sup> However, they explain that it is *not* reasonable to assume that this condition applies to all pipes, or that all buried piping has been improperly backfilled, as suggested by Dr. Duquette.<sup>76</sup> As they further explain, Entergy has gained significant insights into the condition of IPEC buried pipes and their coatings through direct visual examinations of excavated piping and indirect (*e.g.*, APEC, guided-wave testing) examinations performed to date.<sup>77</sup> These insights also are based on the results of field surveys of underground

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<sup>72</sup> See *id.* at A68.

<sup>73</sup> See *id.* at A71.

<sup>74</sup> See *id.*

<sup>75</sup> See *id.* at A87.

<sup>76</sup> See *id.*

<sup>77</sup> See *id.* at A86.

structures and other information, including soil resistivity tests.<sup>78</sup> The available data do not indicate that degradation of in-scope buried piping or its coatings is common or widespread at IPEC nor call into question the adequacy of the BPTIP.<sup>79</sup> Indeed, more recent visual inspections of in-scope IPEC buried piping have found the backfill, coatings, and wall thicknesses associated with the inspected piping to be acceptable as evaluated in accordance with industry guidelines and Entergy procedures.<sup>80</sup>

The fact that imperfections in buried piping coatings and backfill may exist is the reason Entergy developed the BPTIP described in LRA Section B.1.6, and is implementing that program through EN-DC-343 and other Entergy procedures.<sup>81</sup> If the protective coatings on buried piping could be assumed or demonstrated to remain 100% intact, then there would be no need to implement an AMP like the BPTIP. That said, such coatings have been shown to be effective long-term barriers against externally initiated corrosion. As Entergy's experts demonstrate, the BPTIP constitutes an adequate and effective AMP for identifying and addressing degradation of buried pipe coatings and surfaces, such that there is reasonable assurance that the piping will remain capable of performing its intended function during the period of extended operation.

## **2. The BPTIP Complies with Current NRC and Industry Guidelines and Meets 10 C.F.R. Part 54 Requirements for an AMP**

Contrary to NYS's claims, Entergy's AMP for buried piping is not "conceptual and aspirational in nature."<sup>82</sup> As an initial matter, Entergy's original AMP referenced NUREG-1801,

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<sup>78</sup> See *id.* at A86, A119.

<sup>79</sup> See *id.* at A86-A87, A113, A119, A133.

<sup>80</sup> See *id.* at A116-A117.

<sup>81</sup> See *id.* at A87.

<sup>82</sup> Duquette Testimony at 18:12 (NYS000164).

Rev. 1.<sup>83</sup> Therefore, the details of the ten-element NUREG-1801 program XI.M34 description were incorporated by reference into the IPEC LRA and do not need to be repeated therein.<sup>84</sup>

Furthermore, in response to industry and IPEC operating experience since it submitted its LRA nearly five years ago, Entergy has substantially increased the number of buried piping inspections that it will perform.<sup>85</sup> As described in revised LRA Section B.1.6 and the Staff's Supplemental SER, Entergy has committed to perform 20 direct visual examinations for IP2 and 14 direct visual examinations for IP3 *before* the period of extended operation, and 14 direct visual examinations for IP2 and 16 direct visual examinations for IP3 *during each 10-year interval* of the period of extended operation.<sup>86</sup> This equates to 34 and 30 direct visual examinations of IPEC buried piping before and during extended operations, at IP2 and IP3, respectively.<sup>87</sup> Importantly, these examinations are based on Entergy's risk ranking of buried piping systems to identify those areas that are most susceptible to corrosion. These direct visual examinations are in addition to numerous indirect (*e.g.*, guided wave) examinations that will be performed during the same periods.<sup>88</sup>

Entergy's experts demonstrate that the revised BPTIP far exceeds the recommendations of NUREG-1801, Rev. 1, and meets the intent of the new AMP described in Section XI.M41 of NUREG-1801, Rev. 2, as issued in December 2010 given the significant number of direct visual examinations that Entergy will perform both before and during the 20-year period of extended

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<sup>83</sup> See Entergy Test. at A88.

<sup>84</sup> See *id.*

<sup>85</sup> See *id.* at A80-85, 88.

<sup>86</sup> See *id.* at A81-A82, A102; NUREG-1930, Supp. 1, Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3 at 3-1 to 3-3 (NYS000160).

<sup>87</sup> See Entergy Test. at A102 (ENT000373).

<sup>88</sup> See *id.*

operation.<sup>89</sup> Additionally, the program is operational, already having been implemented in significant part at IPEC through Entergy procedures that are based on current NEI and EPRI guidelines.<sup>90</sup> Entergy already has completed 24 total inspections (including 13 excavated direct visual examinations) of piping within the scope of the BPTIP.<sup>91</sup>

In addition, although available data have not indicated the presence of corrosive soil conditions in the vicinity of in-scope buried piping at IPEC, Entergy has committed to collect and analyze additional soil samples before the period of extended operation and at least once every 10 years thereafter to confirm that the soil conditions in the vicinity of in-scope buried pipes are non-aggressive.<sup>92</sup> Under the BPTIP, soil samples will be taken at a minimum of two locations near in-scope piping to obtain representative soil conditions for each system.<sup>93</sup> The items monitored will include soil moisture, pH, chlorides, sulfates, and resistivity.<sup>94</sup> If this required soil testing identifies corrosive conditions, then Entergy will increase the number of direct examinations as specified in the revised BPTIP.<sup>95</sup>

Entergy's experts demonstrate that the significant number of inspections to which Entergy has committed in the BPTIP, and the focus of those inspections on the most susceptible buried piping at IPEC, provides the reasonable assurance that Entergy will adequately manage the effects of aging on buried piping as required by 10 C.F.R. Part 54.<sup>96</sup>

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<sup>89</sup> See *id.* at A88, A122, A128, A134.

<sup>90</sup> See *id.* at A78.

<sup>91</sup> See *id.* at A81.

<sup>92</sup> See *id.* at A83, A129; NUREG-1930, Supp. 1, Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3 at 3-1 to 3-3 (NYS000160); NL-11-032, Letter from F. Dacimo, Entergy to NRC Document Control Desk, Attach. 1 at 4-6 (Mar. 28, 2011) ("NL-11-032") (NYS000151).

<sup>93</sup> See Entergy Test. at A83 (ENT000373).

<sup>94</sup> See *id.*

<sup>95</sup> See *id.*

<sup>96</sup> See *id.* at A84.

This is the same conclusion reached by the NRC Staff, which performed a detailed review of the IPEC LRA, as supplemented by additional information provided by Entergy in response to RAIs.<sup>97</sup> The Staff also performed onsite audits and inspections to review onsite documentation supporting the application and to address any issues identified during the Staff's review of the application, and to verify Entergy's claim of consistency with the corresponding NUREG-1801 program.<sup>98</sup> The Staff found that there is reasonable assurance that buried piping within the scope of license renewal will continue to meet its design function because: (1) recent inspections have generally found the piping's coating to be in acceptable condition, (2) soil resistivity measurements have shown the soil to be non-aggressive, (3) risk ranking of inspection locations has been and will be used to identify those areas most susceptible to corrosion, (4) further soil samples will be obtained with the number of inspections being increased if the soil is corrosive, and (5) an adequate number of inspections have been conducted to date and are planned.<sup>99</sup>

### **3. The BPTIP Is Not Based on "Ambiguous or Insufficient" Commitments**

Entergy's experts demonstrate that NYS's assertion that the enforceability of BPTIP implementation is in question because the program is based on "ambiguous and insufficient commitments,"<sup>100</sup> is incorrect.<sup>101</sup> IPEC has committed to implement the BPTIP in license renewal

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<sup>97</sup> See *id.* at A80, A85; NUREG-1930, Supp. 1, Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3 at 3-1 to 3-5 (NYS000160).

<sup>98</sup> See NUREG-1930, Vol. 2, Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3 (Nov. 2009) at 3-13 to 3-18 (NYS000326D); NUREG-1930, Supp. 1 at 3-1 to 3-5.

<sup>99</sup> Entergy Test. at A85 (ENT000373); NUREG-1930, Supp. 1, Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3 at 3-1 to 3-5 (NYS000160).

<sup>100</sup> Duquette Testimony at 18 (NYS000164).

<sup>101</sup> See Entergy Test. at A80 (ENT000373).

Commitment 3, which the NRC Staff found to be acceptable in its Supplemental SER.<sup>102</sup> That commitment is neither ambiguous nor insufficient.<sup>103</sup> It states, in part, that IPEC will:

Implement the Buried Piping and Tanks Inspection Program for IP2 and IP3 as described in LRA Section B.1.6.

...

Establish inspection priority and frequency for periodic inspections of the in-scope piping and tanks based on the results of the risk assessment. Perform inspections using inspection techniques with demonstrated effectiveness.<sup>104</sup>

Commitments like the one above are documented in the Staff's SER (and, in this case, in the Staff's Supplemental SER).<sup>105</sup> Such commitments, in turn, are incorporated into periodic updates to the FSAR in accordance with 10 C.F.R. §§ 50.59 and 50.71(e) and are considered part of the plant's current licensing basis.<sup>106</sup>

NYS erroneously contends that the specific details Entergy has offered regarding the number of inspections "have come in the form of documents which will not become part of the license and are unenforceable."<sup>107</sup> Specifically, NYS refers to the fact that Entergy originally revised the number of planned inspections in an RAI response.<sup>108</sup> But this is irrelevant. As Entergy's regulatory experts explain, NYS does not acknowledge the regulatory processes that govern commitments made in an LRA and an applicant's related docketed submittals.

Commitments made to the NRC by applicant/licensee as part of docketed licensing correspondence, including an LRA, become part of a facility's licensing basis as described in the associated NRC

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<sup>102</sup> NUREG-1930, Supp. 1, Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3, at 3-2 to 3-3; App. A at A-2 (ENT000160).

<sup>103</sup> See Entergy Test. at A89 (ENT000373).

<sup>104</sup> *Id.*; NUREG-1930, Supp. 1, Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3, at 3-2 to 3-3; App. A at A-2 (ENT000160).

<sup>105</sup> See Entergy Test. at A100 (ENT000373).

<sup>106</sup> See *id.* at A100, A101.

<sup>107</sup> NYS Statement of Position at 2 (NYS000163)

<sup>108</sup> NYS Statement of Position at 44-46, 55 (NYS000163)

safety evaluation report.<sup>109</sup> In this instance, the NRC Staff's Supplemental SER explicitly documents Entergy's representations regarding the revised number of planned buried piping inspections.<sup>110</sup> Licensee activities to manage such commitments, including modification of commitments, are subject to the NRC's inspection program. The failure to meet such commitments can lead to NRC enforcement action.<sup>111</sup> The same process applies to plants operating under initial and renewed operating licenses.

Importantly, in July 2011, Entergy revised the UFSAR supplement (LRA Sections A.2.1.5 and A.3.1.5) to reflect the increased numbers of buried piping inspections.<sup>112</sup> This fact further undercuts NYS's of lack of enforceability claim.<sup>113</sup> As the Staff's Supplemental SER states:

[B]y letter dated June 15, 2011, the staff issued RAI 3.0.3.1.2-3 requesting that the applicant revise the UFSAR supplement to reflect the number and frequency of inspections and soil testing planned for all buried pipe within the scope of license renewal.

In its response dated July 14, 2011, and amended by letter dated July 27, re, the number and frequency of piping inspections and soil testing.

*The staff finds the applicant's response acceptable because the UFSAR supplement establishes the number and frequency of piping inspections*

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<sup>109</sup> See Entergy Test. at A99 (ENT000373) (citing 10 C.F.R. § 54.3 (definition of "current licensing basis")).

<sup>110</sup> NUREG-1930, Supp. 1, Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3, at 3-2 to 3-3 (NYS000160).

<sup>111</sup> *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-01-09, 53 NRC 232, 235-236 (2001) (rejecting the premise that "promises and representations made to NRC Staff and NRC hearing boards are meaningless if they are not reiterated in the license, and stating that if an applicant receives NRC approval of its proposed licensing action, it "will be expected to meet all NRC rules and all safety commitments, subject to Commission oversight and enforcement").

<sup>112</sup> See NL-11-074, Letter from Fred Dacimo, Vice President, IPEC, to NRC Document Control Desk, "Response to Request for Additional Information (RAI) Aging Management Programs," Attach. 1 at 3-4 ((NYS000152); NL-11-090, Letter from Fred Dacimo, Vice President, IPEC, to NRC Document Control Desk, "Clarification for Request for Additional Information (RAI) Aging Management Programs," Attach. 1 at 2-3 (July 27, 2011) (NYS000153).

<sup>113</sup> In its Statement of Position (NYS000163), NYS states that Entergy's statements regarding the newly-increased number and frequency of buried piping inspections do "not appear in Entergy's most recent updated UFSAR," but NYS cites Revision 22 of the FSAR, which is dated June 2011. NYS overlooks the fact that, in its July 14, 2011 letter (NL-11-074), Entergy revised LRA Sections A.2.1.5 and A.3.1.5 (*i.e.*, the UFSAR supplements). Thus, the increased number of buried piping inspections is now part of the UFSAR for each unit.



*and soil testing licensing basis for the program.* The staff's concern described in RAI 3.0.3.1.2-3 is resolved.<sup>114</sup>

Thus, Entergy's planned buried piping inspections clearly are enforceable and part of the IPEC licensing basis by virtue of their inclusion in the UFSAR Supplement.<sup>115</sup>

Furthermore, like other licensees, Entergy is subject to the NRC Staff's post-license renewal inspection and verification processes.<sup>116</sup> For example, after a renewed operating license is issued, and before extended operation begins, NRC regional inspectors will perform a focused inspection in accordance with NRC Inspection Manual Chapter 71003.<sup>117</sup> As part of this process, the NRC will review current and new program documents, instructions, or procedures that the licensee has committed to follow in implementing its AMPs to verify proper program implementation.<sup>118</sup> Thus, actual implementation is not a matter of licensee discretion.

Finally, Entergy's implementation of the IPEC BPTIP is closely linked to implementation of IPEC's Part 50 underground piping program, the Underground Piping and Tanks Inspection and Monitoring Program (UPTIMP), and the nuclear industry's underground piping initiative (NEI 09-14, Rev. 1).<sup>119</sup> In fact, Entergy developed a program document, fleet procedures, and an IPEC-

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<sup>114</sup> NUREG-1930, Supp. 1, Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3 at 3-5 (emphasis added) (NYS000160).

<sup>115</sup> See *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-03-8, 58 NRC 11, 21 (2003) (rejecting the intervenor's assertion that the Board should have combined the applicant's various commitments regarding soil-cement testing into a set of license conditions, stating that "those commitments are set forth in [the applicant's] Safety Analysis Report and are therefore already part of the licensing basis of the facility").

<sup>116</sup> See Entergy Test. at A99 (ENT000373).

<sup>117</sup> Inspection Manual Chapter 71003, Post-Approval Site Inspection for License Renewal (Oct. 31, 2008) (ENT000251).

<sup>118</sup> See Entergy Test. at A98 (ENT000373). The NRC Staff issued Temporary Instruction 2516/001 (ENT000252) to allow NRC inspectors to assess Entergy's progress in implementing its license renewal AMPs and commitments for IP2 during the pendency of the license renewal approval process. See *id.* NRC Region I inspectors completed an inspection at IP2 under Temporary Instruction 2516/001 during the week of March 5 to 9, 2012. See *id.*

<sup>119</sup> See Entergy Test. at A78-79, A90 (ENT000373).

specific inspection plan to implement the UPTIMP and meet the industry initiative in NEI 09-14, Revision 1 at IPEC.<sup>120</sup> Key documents include the following:

- EN-DC-343, Underground Piping and Tanks Inspection and Monitoring Program, Rev. 4 (May 16, 2011) (“EN-DC-343” (NYS000172)
- CEP-UPT-0100, Rev. 0, Underground Piping and Tanks Inspection and Monitoring Program (Oct. 31, 2011) (“CEP-UPT-0100”) (NYS000173)
- SEP-UIP-IPEC, Rev. 0, Underground Components Inspection Plan (Apr. 29, 2011) (“SEP-UIP-IPEC”) (NYS000174)
- EN-EP-S-002-MULTI, Rev. 0, Buried Piping and Tanks General Visual Inspection (Oct. 30, 2009) (ENT000408)

These same documents, which are discussed at length in Entergy’s expert testimony, are being used to implement the IPEC BPTIP.<sup>121</sup> NEI 09-14 activities, while voluntary, are subject to CNO-level oversight, and compliance with the initiative milestones are reviewed by EPRI, the Institute for Nuclear Power Operations (“INPO”), and NEI.<sup>122</sup> The NRC also is monitoring licensees’ implementation of the NEI 09-14 initiatives.<sup>123</sup>

For the foregoing reasons, there is no legal or factual basis for NYS’s claims that the IPEC BPTIP is based on “ambiguous and insufficient commitments” or otherwise unenforceable.

#### **4. The IPEC Buried Piping Inspection Program Provides for Sufficient Inspections, Acceptance Criteria, and Corrective Actions**

Dr. Duquette argues that “an inspection program, *per se*, is not adequate to ensure the safe operation of engineering systems.”<sup>124</sup> He cites two bases in support of this claim. First, he asserts that Entergy has not specified the criteria to be applied to continued operation, remediation, or

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<sup>120</sup> See *id.* at A90.

<sup>121</sup> See *id.* at A88.

<sup>122</sup> See *id.* at A90.

<sup>123</sup> See *id.*

<sup>124</sup> Duquette Testimony at 21:16-17 (NYS000164).

replacement of in-scope buried piping.<sup>125</sup> Second, he claims that Entergy has made “inconsistent statements” concerning the number and timing of inspections and applicable criteria.<sup>126</sup>

*a. BPTIP Acceptance Criteria and Corrective Actions*

Entergy’s experts fully refute these claims in their prefiled testimony. As they explain, any visually confirmed buried pipe coating and wrapping degradation is required to be reported and evaluated according to IPEC corrective action procedures—the same procedures that govern ongoing plant operations under 10 C.F.R. Part 50.<sup>127</sup> If degradation of the coatings is identified, then further analysis and evaluation is required, potentially resulting in repair or replacement of the coating/piping or additional, or more frequent inspections of the buried piping.<sup>128</sup>

To visually assess the condition of pipe coatings and pipe base metal surfaces for indications of degradation that may affect structural and leakage integrity, Entergy inspectors apply the criteria in Entergy Engineering Standard EN-EP-S-002-MULTI, “Buried Piping and Tanks General Visual Inspection” (ENT000408).<sup>129</sup> With respect to the piping base metal, that document requires initiation of a corrective action document (condition report) if any of the following conditions are observed: cracking in the base metal; discoloration resulting from age, heat, or corrosion; discernible wear; pits, dents, or gouges in the base metal; excessive external corrosion; corrosion which results in discernible base metal loss; discernible bulges; arc strikes; or any other conditions causing discernible degradation of the base metal.<sup>130</sup> With respect to coatings, that procedure requires additional review of the condition and initiation of a condition report as required if there is

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<sup>125</sup> See *id.* at 21:17-22.

<sup>126</sup> *Id.* at 24:19-20.

<sup>127</sup> See Entergy Test. at A34 (ENT000373).

<sup>128</sup> See *id.* at A73.

<sup>129</sup> See *id.* at A107.

<sup>130</sup> EN-EP-S-002-MULTI at 8, 11 (ENT000409).

any indication of coating degradation (*e.g.*, discoloration, discontinuities, bubbling, blistering, flaking, peeling, separation from pipe, embrittlement).<sup>131</sup> For UT inspections, which are performed after an excavated pipe's coating is removed to measure pipe wall thickness, the acceptance criterion is a wall thickness greater than 87.5% of the nominal wall thickness (allowing for manufacturer's allowance tolerance).<sup>132</sup>

If Entergy detects any corrosion of a buried component through visual inspections or UT examination, then that component is evaluated against the system design requirements to ensure that it does not reduce the system structural capabilities below those required to maintain structural integrity during and after design basis accidents.<sup>133</sup> This approach is fully consistent with current NRC requirements, standard industry practices, and IPEC-specific procedures.<sup>134</sup>

Any coating or pipe degradation detected during buried piping inspections is entered into the IPEC Corrective Action Program and evaluated for extent of condition.<sup>135</sup> Entergy takes any necessary corrective actions in accordance with the requirements of 10 C.F.R. Part 50 and Entergy procedure EN-LI-102, "Corrective Action Process," Rev. 17 (Dec. 8, 2011) (ENT000400).<sup>136</sup> As Entergy's witnesses further explain, if test or inspection acceptance criteria are not met, then the affected locations will be repaired or replaced as appropriate. Entergy also will evaluate the significance of the test or inspection results and then, depending on the significance of the condition, evaluate the component's operability, the reportability of the event, the extent of the condition, the potential causes of the degradation and failure to meet the test or inspection

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<sup>131</sup> *Id.*

<sup>132</sup> CEP-UPT-0100 at 16 (NYS000173).

<sup>133</sup> *See* Entergy Test. at A104 (ENT000373).

<sup>134</sup> *See id.*

<sup>135</sup> *See id.*

<sup>136</sup> *See id.*

acceptance criteria, the corrective actions required, and the likelihood of recurrence. As part of the extent of significant condition evaluation, other systems or components found susceptible to the same conditions are evaluated for additional corrective actions, including mitigative actions, such as the installation of cathodic protection. Again, this is the same corrective action process that is applied during current plant operations.

*b. BPTIP Inspections*

Contrary to Dr. Duquette’s claim, Entergy has not made “inconsistent statements”<sup>137</sup> concerning the number and timing of required inspections under the BPTIP or how those inspections will be credited.<sup>138</sup> As described in Entergy RAI responses and the Staff’s Supplemental SER, Entergy has committed to perform 20 direct visual examinations for IP2 and 14 direct visual examinations for IP3 *before* the beginning of the period of extended operation, and 14 direct visual examinations for IP2 and 16 direct visual examinations for IP3 *during each 10-year interval* of the period of extended operation.<sup>139</sup> These inspections are in addition to numerous UT examinations that will be performed during the same periods. Moreover, if planned soil testing identifies corrosive conditions, then Entergy will increase the number of direct inspections.<sup>140</sup>

The period-of-extended-operation buried piping inspections are required to be performed over the course of each 10-year period—not once every ten years—with each round of inspections building upon prior inspection results and other available operating experience.<sup>141</sup> Accordingly, the buried piping AMP is built on a continuous improvement cycle, in which new data and lessons

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<sup>137</sup> Duquette Testimony at 24:19-20 (NYS000164).

<sup>138</sup> See Entergy Test. at A102 (ENT000373).

<sup>139</sup> See *id.*

<sup>140</sup> See *id.* at A80-83, A102 (ENT000373).

<sup>141</sup> See *id.* at A102.

learned are continually fed into the site-specific risk model to inform future inspection planning.<sup>142</sup> This approach is reflected in the IPEC program documentation and the EPRI guidance on which it is based.<sup>143</sup>

To date, Entergy has excavated and visually inspected portions of buried piping associated with the following in-scope systems: (1) auxiliary feedwater, which includes the CST lines (in 2008, 2009, and 2011); (2) city water (in 2009); (3) fire protection (in 2009 and 2011); and (4) service water (in 2011).<sup>144</sup> Specifically, Entergy has completed 24 total inspections (direct and indirect) of IP2 and IP3 Code/Safety-Related carbon steel piping, including 13 direct visual examinations of excavated piping, as part of its license renewal BPTIP.<sup>145</sup> These inspections are described further in Entergy's testimony.

In addition to the targeted inspections of buried piping, Entergy has conducted site surveys of buried piping within the scope of the BPTIP. Specifically, Entergy has conducted a corrosion/CP survey in October 2008, and an area potential earth current ("APEC") survey of the IPEC site in November 2010.<sup>146</sup> The APEC survey evaluates the corrosion potential and cathodic protection effectiveness on buried piping systems and provides information on the condition of multiple buried pipes in an area.<sup>147</sup> The results of these inspections and surveys also are described in Entergy's testimony and supporting exhibits.<sup>148</sup> In short, these inspections and surveys support the conclusion that degradation of buried piping coatings and base metal is not widespread at IPEC.<sup>149</sup> Where

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<sup>142</sup> See *id.*

<sup>143</sup> See *id.*

<sup>144</sup> See *id.* at A114-A118.

<sup>145</sup> See *id.* at A106.

<sup>146</sup> See *id.* at A119.

<sup>147</sup> See *id.*

<sup>148</sup> See *id.*

<sup>149</sup> See *id.* at A87, A119.

Entergy has encountered coating or piping degradation, as in the case of the IP2 CST return and condensate storage lines, it has taken appropriate corrective action in accordance with Entergy procedures.<sup>150</sup> These corrective actions have included repair/replacement of coatings and piping as well as the very recent installation cathodic protection for portions of the IP2/IP3 auxiliary feedwater/condensate buried piping most susceptible to corrosion.<sup>151</sup>

For the foregoing reasons, there is no legal or factual basis for NYS's claims that "an inspection program, *per se*, is not adequate to ensure the safe operation of engineering systems" or that Entergy has made "inconsistent statements."

##### **5. NYS Incorrectly Characterizes Industry and NRC Guidance on Cathodic Protection**

Dr. Duquette incorrectly claims that industry guidance dictates the installation of cathodic protection at IPEC.<sup>152</sup> Moreover, in so asserting, he does not accurately characterize the relevant guidance. The documents cited by Dr. Duquette—NEI 09-14 and EPRI 101645—recommend that if a cathodic protection system exists, then it should be properly tested and maintained.<sup>153</sup> However, neither document requires that cathodic protection be newly installed.<sup>154</sup> In fact, both the NEI and EPRI documents acknowledge that CP systems may or may not be installed at a site and provide guidelines for a program that manages buried piping with or without cathodic protection.<sup>155</sup>

Dr. Duquette further alleges that the IPEC BPTIP is inadequate because it purportedly is based on an outdated version of NUREG-1801 that does not require cathodic protection.<sup>156</sup> That

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<sup>150</sup> See *id.* at A111, A113-A114.

<sup>151</sup> See *id.* at A111, A123.

<sup>152</sup> See Duquette Testimony at 15 (NYS000164).

<sup>153</sup> See NEI 09-14, Rev. 1, Sections 6.2.3 (NYS000168); EPRI 1016456, Sections 2.4.1.2 & A.2.6 (NYS000167).

<sup>154</sup> See Entergy Test. at A121 (ENT000373).

<sup>155</sup> See *id.*; see also NEI 09-14, Rev. 1, App. B (NYS000168); EPRI 1016456, App. A (NYS000167).

<sup>156</sup> See Duquette Testimony at 24:2-4 (NYS000164).

assertion also is incorrect.<sup>157</sup> As Entergy's witnesses show, the IPEC BPTIP is not inconsistent with Rev. 2 of NUREG-1801, which in any event does not require the installation of new CP systems. Rather, NUREG-1801, Rev. 2 focuses on the effectiveness of existing systems, and permits the use of an appropriate number of direct visual inspections (which Entergy has proposed and the Staff has approved for IPEC) as an alternative to cathodic protection.<sup>158</sup> The NRC Staff's recently-issued Draft License Renewal Interim Staff Guidance (LR-ISG-2011-03) further clarifies that CP is not a requirement for license renewal.<sup>159</sup>

Further, maintenance of existing CP systems and phased installation of new CP systems are ongoing and will continue, as appropriate, during the period of extended operation at IPEC, as discussed in Entergy's testimony.<sup>160</sup> Entergy is implementing the UPTIMP and BPTIP at IPEC in accordance with fleet procedures EN-DC-343 and CEP-UPT-0100 and, will assess any future CP needs consistent with those procedures.<sup>161</sup>

#### **6. Entergy Has Acted Consistent with Industry and NRC Guidance Relevant to Cathodic Protection of Buried Piping**

NYS incorrectly asserts that Entergy has not committed to taking certain actions identified in fleet procedure EN-DC-343 at IPEC "despite knowing for years that its cathodic protection systems had fallen into disrepair, and has not committed to repairing them now."<sup>162</sup> IPEC has committed to all of the provisions of EN-DC-343, which include the maintenance and/or upgrading

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<sup>157</sup> See Entergy Test. at A88, A122 (ENT000373).

<sup>158</sup> See NUREG-1801, Rev. 2, at XI M41-5 to XI M41-6 (Table 4a. Inspections of Buried Pipe) (NYS000147).

<sup>159</sup> See Entergy Test. at A122 (ENT000373); Draft License Renewal Interim Staff Guidance (LR-ISG), LR-ISG-2011-03, "Changes to GALL Report Revision 2 Aging Management Program (AMP) XI.M41, 'Buried and Underground Piping and Tanks.'" (Mar. 2012) (ENT000379).

<sup>160</sup> See Entergy Test. at A122 (ENT000373).

<sup>161</sup> See *id.*

<sup>162</sup> NYS Statement of Position at 36 (NYS000163).



of CP systems.<sup>163</sup> As such, corrective actions to repair, maintain, and operate existing CP systems have been implemented in accordance with the IPEC Correction Action Program.<sup>164</sup> For example, annual CP equipment checks and/or adjustments are conducted annually by NACE-qualified inspectors.<sup>165</sup> These practices are consistent with EPRI guidelines.

Furthermore, Entergy installed new CP in November 2009 to protect portions of the IP2 and IP3 city water lines based on the recommendations of a vendor (*i.e.*, PCA).<sup>166</sup> Based on the results of the September 2009 guided wave inspections, Entergy also recently installed CP for portions of the IP2/IP3 auxiliary feedwater/condensate buried piping; *i.e.*, the Unit 2 Condensate Storage Tank Line #1505 and #1509 (12-inch to AFW and 8-inch return to the CST, respectively), and the Unit 3 Condensate Storage Tank Line #1070 and #1080 (12" to AFW and 8-inch return to AFW, respectively).<sup>167</sup> Other candidates identified for future installation of new CP systems are the Unit 2 Service Water Line #408 (24-inch main supply headers) and the Unit 3 Dock Sheet Piling just south of the Intake Structure.<sup>168</sup> An engineering modification has been initiated for the IP2 service water line CP modification, which is expected to be installed before or shortly after the period of extended operation begins.<sup>169</sup> Thus, Dr. Duquette's allegations, including his claim that CP exists for no safety-related buried piping, are unfounded.

Further contrary to Dr. Duquette's claims,<sup>170</sup> Entergy has not disregarded the recommendations of its own vendors, including those of PCA in particular.<sup>171</sup> The PCA Report

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<sup>163</sup> See Entergy Test. at A121 (ENT000373).

<sup>164</sup> See *id.*

<sup>165</sup> See *id.*

<sup>166</sup> See *id.*

<sup>167</sup> See *id.*

<sup>168</sup> See *id.*

<sup>169</sup> See *id.*

<sup>170</sup> See NYS Statement of Position at 52-53 (NYS000163); Duquette Testimony at 22:6-24:6 (NYS000164).

cited by Dr. Duquette recommended that IPEC: (1) install CP to eliminate/minimize stray current to the city water piping at the location that crosses the Algonquin gas pipeline; (2) provide a “progressive evaluation” of CP needs for high-priority piping services on a zone basis; and (3) implement an inspection program that can identify high priority zones by excavating and inspecting buried pipes and their coatings and performing UT measurements of the pipe walls.<sup>172</sup> As detailed in Entergy’s testimony, Entergy has implemented these recommendations at IPEC.

**7. The Available Data Do Not Indicate That Soil Corrosivity Is a Significant Concern at IPEC That By Itself Warrants Cathodic Protection**

Dr. Duquette further claims that Entergy’s own studies show that the soils at Indian Point are mildly to moderately corrosive, “warranting cathodic protection as an objective matter.”<sup>173</sup> The available data, including the soil resistivity and corrosion potential data obtained from the 2008 cathodic protection/corrosion and 2009 APEC surveys, respectively, do not support that claim.<sup>174</sup> Available soil resistivity data show a majority of the readings being above 10,000 ohm-cm, meaning that the soil has a negligible degree of corrosivity.<sup>175</sup> The APEC survey results did not reveal conditions (corrosion cells or localized earth currents) indicative of external corrosion of in-scope buried piping in the absence of cathodic protection.<sup>176</sup> Entergy’s experts conclude that, given that IPEC buried piping has been installed underground for approximately 40 years, and only

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<sup>171</sup> See Entergy Test. at A128 (ENT000373).

<sup>172</sup> PCA Report at 16-18 (NYS000178).

<sup>173</sup> Duquette Testimony at 22:13-16 (NYS000164).

<sup>174</sup> See Entergy Test. at A133 (ENT000373).

<sup>175</sup> See *id.* at A129.

<sup>176</sup> See *id.* at A119.

limited evidence of corrosion has been observed, the soil surrounding that piping is generally *non-corrosive* and any degradation of potentially exposed pipe surfaces is progressing at a slow rate.<sup>177</sup>

In summary, Entergy has performed activities such as soil testing and site area corrosion potential mapping to identify potential areas of concern. It also has committed to collect and analyze additional soil samples before the period of extended operation and at least once every 10 years thereafter to confirm that the soil conditions in the vicinity of in-scope buried pipes remain non-aggressive. If any areas of concern are identified during future inspections or testing, then they will be input into the corrective action program for evaluation of extent of condition and appropriate corrective action and preventive measures.

**C. NYS Has Not Met Its Evidentiary Burden**

1. Entergy Has Provided an Appropriate and Acceptable Aging Management Program for IPEC Buried Piping

NYS has not carried its burden of providing sufficient evidence to support its claims that Entergy lacks an adequate AMP for buried pipes that contain radioactive fluids which meet 10 C.F.R. § 54.4(a) criteria. Entergy has proffered more than sufficient evidence to show that the license renewal BPTIP meets all regulatory requirements and NUREG-1801 guidelines, includes the requisite level of detail, and is being implemented in accordance with Entergy's regulatory commitments and fleet procedures.

2. The NRC Staff's Review of Entergy's AMPs Supports a Finding of Reasonable Assurance that Entergy Will Manage Aging Effects on In-Scope Buried Piping, Including That Buried Piping Within the Scope of Contention NYS-5

As documented in its Safety Evaluation Report ("SER") and Supplemental SER for IPEC, the NRC Staff performed a detailed review of Entergy's BPTIP.<sup>178</sup> Specifically, the Staff found that

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<sup>177</sup> See *id.* at A133.

the program was consistent with Section XI.M34 of NUREG-1801, Rev. 1, in addition to current industry operating experience and NRC recommendations.<sup>179</sup> Based on its findings, the Staff concluded that Entergy had demonstrated that it will adequately manage the pertinent aging effects on in-scope buried piping so that its intended function(s) will be maintained consistent with the current licensing basis during extended operations, as required by 10 C.F.R. § 54.21(a)(3).<sup>180</sup>

Based on its audit and review of that program, the Staff also found all BPTIP program elements to be consistent with NUREG-1801 program elements.<sup>181</sup> With respect to this program, the Staff concluded that Entergy has demonstrated that the effects of aging will be adequately managed so that its intended functions will be maintained consistent with the IP2 and IP3 CLBs for the period of extended operation, as required by 10 C.F.R. § 54.21(a)(3).<sup>182</sup>

As discussed above, the applicable standard for safety issues such as those raised in NYS-5, is *reasonable assurance* – i.e., the NRC Staff will issue a renewed license if it finds that actions have been identified and have been or will be taken by the applicant, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the CLB.<sup>183</sup> According to the Commission, a “license renewal applicant’s use of an aging management program identified in the GALL Report *constitutes reasonable assurance* that it will manage the targeted aging effect during the renewal period.”<sup>184</sup> Accordingly, Entergy’s use

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<sup>178</sup> NUREG-1930, Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generation Units Nos. 2 and 3, Vol. 2 at 3-31 to 3-33 (Nov. 2009) (“SER”) (NYS00326B); NUREG-1930, “Supplement 1 to Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3” at 3-5 to 3-9 (Aug. 2011) (“Supplemental SER”) (NYS000160).

<sup>179</sup> Supplemental SER at 3-9 (NYS000160).

<sup>180</sup> *Id.*

<sup>181</sup> SER, Vol. 2 at 3-38 (NYS00326B).

<sup>182</sup> *Id.*

<sup>183</sup> 10 C.F.R. § 54.29(a).

<sup>184</sup> See *AmerGen Energy Co., LLC* (Oyster Creek Nuclear Generating Station), CLI-08-23, 68 NRC 461, 468 (2008) (emphasis added).

of AMPs consistent with NUREG-1801—as confirmed by the NRC Staff—constitutes reasonable assurance that it will manage aging effects on buried piping during the renewal period.

## V. CONCLUSION

As summarized above, Entergy’s testimony demonstrates that IPEC’s AMP for buried piping and tanks meets all applicable regulatory requirements and provides reasonable assurance that the effects of aging due on buried piping will be adequately managed throughout the period of extended operation. NYS has not carried its burden of providing sufficient evidence to support the claims made in NYS-5. Accordingly, NYS-5 should be resolved in Entergy’s favor.

Respectfully submitted,

*Executed in Accord with 10 C.F.R. § 2.304(d)*

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