UNITED STATES

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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In re:	Docket Nos. 50-247-LR; 50-286-LR
License Renewal Application Submitted by	ASLBP No. 07-858-03-LR-BD01
Entergy Nuclear Indian Point 2, LLC,	DPR-26, DPR-64
Entergy Nuclear Indian Point 3, LLC, and	
Entergy Nuclear Operations, Inc.	December 16, 2011

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PRE-FILED WRITTEN TESTIMONY OF

DR. DAVID J. DUQUETTE, Ph.D

REGARDING CONTENTION NYS-5

On behalf of the State of New York ("NYS" or "the State"), the Office of the Attorney General hereby submits the following testimony by Dr. David J. Duquette, Ph.D, regarding Contention NYS-5.

Q. Please state your name and address.

A. David J. Duquette, Materials Engineering Consulting Services, 4 North Lane, Loudonville, New York 12211.

Q. What is your educational background?

A. My educational and professional experience is detailed in the attached curriculum vitae (CV)(Exhibit NYS000166); also attached is a list of my publications, awards, and other professional activities. I am a graduate of the United States Coast Guard Academy and the Massachusetts Institute of Technology. I performed my graduate work at the Corrosion Laboratory at the Massachusetts Institute of Technology (MIT), spent two years as a Research Associate at the Advanced Materials Research and Development Laboratory at Pratt and Whitney Aircraft prior to joining the faculty at Rensselaer Polytechnic Institute.

Q. What is your professional experience, particularly as it relates to corrosion prevention?

A. My research is primarily in the area of corrosion science and engineering. I have supervised more than 50 graduate research dissertations in corrosion and related sciences. I am the author or co-author of more than 230 publications and 20 book chapters. I present invited lectures internationally 20 to 25 times per year. I just completed nine years of service on the United States Nuclear Waste Technical Review Board, having been appointed to the Board by President Bush in 2002. I also maintain an active consulting practice, primarily in the area of corrosion and mechanical failures. A list of my publications is attached at Exhibit NYS000166.

Q. Can you cite specific examples of recognition by the scientific community?

A. I have been elected a Fellow of three learned societies, ASMI (formerly the American Society of Metals), NACE (formerly known as the National Association of Corrosion Engineers) and ECS (the Electrochemical Society). I have received the Whitney Award of NACE for outstanding corrosion research, an A. v. Humboldt Senior Scientist Award from the German government, as well as other awards from the scientific community.

Q. What materials have you reviewed in preparation for your testimony?

A. Among the materials I have reviewed are Entergy's buried and underground piping-related disclosures and NRC documents and technical data as disclosed in this proceeding.

Q. I show you NYS Exhibits NYS00147A-NYS00147D, NYS000151, NYS000152, NYS000154, NYS000160, and NYS000166 through NYS000203. Do you recognize these documents?

A. Yes. These are true and accurate copies of each of the documents that I referred to, used and/or relied upon in preparing my report and this testimony. In some cases, where the document was extremely long and only a small portion is relevant to my testimony, an excerpt of the document is provided. If it is only an excerpt, that is noted on the first page of the Exhibit.

Q. Did you review anything else in preparing your report or this testimony?

A. Yes, I reviewed other documents Entergy produced in this proceeding, including previous iterations of Entergy's corporate documents, and concluded that they were not relevant in preparing my report and this testimony. I reviewed lists of the documents the State of New York, Entergy and NRC Staff produced in this proceeding, using the descriptions provided on the logs provided, and determined that there were none other than the ones I attach as Exhibits that I needed to rely on.

Q. I show you what has been marked as Exhibit NYS000165. Do you recognize that document?

A. Yes. It is a copy of the report that I prepared for the State of New York in this proceeding. The report reflects my analysis and opinions.

Q. What is the purpose of your testimony?

A. My testimony critiques Entergy's aging management program (AMP) for buried and underground pipes and tanks.

Q. What is the difference between buried and underground pipes?

A. Entergy indicates that underground pipes include those that are, and are not, in direct contact with soil, and uses the term buried to refer to pipes which are in direct contact with soil. My report deals primarily with underground systems that are in direct contact with soil so I use the term “buried”.

Q. What, in general terms, does this report consist of?

A. This report contains a discussion of factors influencing corrosion of buried pipes, how to prevent corrosion using coatings and cathodic protection, briefly discusses corroding and leaking pipes at Indian Point and other nuclear power plants, and explains my understanding and critique of Entergy’s AMP for buried pipes.

Q. What is corrosion?

A. Corrosion of metals and alloys in underground piping systems occurs when water comes into contact with the metal. Corrosion rates of metals can be very slow in pure deaerated water, but the presence of oxygen, which is admitted to the water from air in most engineering cases, greatly increases the corrosion rates. The corrosion reaction occurs because the metal is oxidized by the oxygen with the production of hydroxyl ions because of the combination of water and oxygen. The metal is oxidized to a positive ion with the surrender of one or more electrons. The site on which this reaction occurs is called the anode. The electrons that are released from the anode participate in the reduction of dissolved oxygen, to produce hydroxide, on local sites called cathodes. In neutral solutions 4<pH<10, the positively charged metal ions combine with the hydroxide, which has a negative charge, to form a nearly insoluble compound. When the metal is iron, the metal hydroxide that is formed is generically called "rust"- $Fe(OH)_3$. In general, if rust is deposited on the surface of an iron based material, it will have a protective role, reducing the rate of oxygen arrival to the metal surface and accordingly reducing the general corrosion rate.

Q. What factors affect corrosion?

A. Factors that affect the corrosivity of water to iron based surfaces include the aforementioned levels of oxygen, the conductivity of the water, the specific ion concentration of the water, and the pH of the water. The conductivity of the water is important because the local anodic sites on a surface can only react with equivalent cathodic sites. If water has a low conductivity the distance between anodes and cathodes is limited. In high conductivity solutions anodes and cathodes can be widely spaced allowing more interaction between surface sites.

Q. What types of pipes are affected by corrosion?

A. The vast majority of piping systems are constructed from either low carbon steel (sometimes called mild steel), or cast iron. Both of these materials are iron based. In near neutral environments the specific structure of the steel or cast iron does not have a strong effect on the corrosion behavior. There are, of course many miles of pipe that are constructed of stainless steel, copper alloys or, in rare cases titanium alloys, as well as non-metallic materials such as HDPE or PVC. However, those materials will show appreciable corrosion only under rather severe conditions and accordingly I have not devoted much time to these in my report, as I do not believe them to be present, or present in high numbers, at Indian Point. Steel and cast iron pipes can suffer from internal corrosion, but 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.

Q. What factors affect external corrosion?

A. Soils can be considered to be a kind of poultice, or sponge, when they are in contact with underground piping systems. Accordingly they will hold water against a pipe surface for extended periods of time even after the external environment has changed from wet to dry. Thus, rain at the surface of the ground will provide water to the soil, but the soil may stay saturated with water for long periods after precipitation ceases. Soils may also contain soluble species such as nitrates, sulfates, chlorides, organic compounds, etc. Each of these species, alone or in combination can dramatically affect corrosion rates of buried metals. The effects may range from simply increasing the conductivity of the soil or by reducing the effectiveness of otherwise protective corrosion products such as the effects of chlorides or the possibility of adding weak acid that may either deleteriously affect the protective properties of corrosion product films or may make soluble corrosion products (for example, chlorides or the addition of weak acids that may deleteriously affect the protective properties of corrosion product films or may even make soluble corrosion products). The ability of a soil to retain water and the chemical make-up of soil are paramount in affecting the corrosion behavior of buried metals such as the iron based alloys used for piping systems.

Q. What steps can be taken to prevent corrosion?

A. Primarily, corrosion is prevented by applying coatings to the piping systems, and by cathodically protecting the pipes.

Q. What types of coatings are you referring to?

A. Most steel and cast iron pipes that are intended for long service and are buried use some form of protection from corrosion by soils. Usually some level of protection is afforded by the application of surface coatings. These coatings range from simple painted surfaces, e.g., conventional or epoxy paints to the use of sacrificial coatings such as galvanizing. In some cases enamels are used while in other cases bituminous coatings such as coal tar are utilized. Other types of coatings include tape wraps that may range from paper to polymer based tapes. In many cases, if wrapping is used, a second layer of coating may be applied over the wrapping. Even with coated pipes, however, there is always a concern about breaks in the coatings (holidays), either introduced during the coating process, installation of the pipes or damage induced after installation. When breaks in the coating occur the corrosion damage, in some cases, can be more severe than if the there is no coating at all. At breaks in the coating all of the corrosion damage may be concentrated in a single location so that a deep pit may perforate the pipe. Another possibility is that the interface between the coating and the pipe surface may introduce an effective crevice. Crevice corrosion can be especially damaging because the electrolyte chemistry in a crevice tends to be much more aggressive than the bulk electrolyte. In order to prevent localized corrosion at holidays in the coatings, cathodic protection is often used.

Q. What is cathodic protection?

A. Cathodic protection effectively lowers the electrochemical potential of steel to a potential that is below that required to oxidize the steel. Another way of expressing that is in the electrochemical couple between a sacrificial coating such as zinc and steel, the steel becomes the cathode while the zinc becomes the anode. The zinc then corrodes in a “sacrificial” manner to protect the steel. If the zinc coats the steel the steel is said to be ”galvanized”. In many cases the zinc anodes can also be placed in the same electrolyte as the steel (in the case of IPEC, in water saturated soil). As long as there is electrical contact between the zinc and the steel the zinc will preferentially corrode. There are distinct disadvantages to using zinc coatings or zinc anodes to protect steel from corrosion. In the first instance (coatings) the lifetime of zinc coatings is rather limited, and once the zinc coating has corroded away the underlying steel is subject to corrosion. In the second instance (replaceable anodes) the zinc anodes also have a limited lifetime and must be monitored, retrieved and replaced on a regular basis. For many buried structures the maintenance period is on the order of a year. From an operating plant point of view the most efficient method for protecting buried structures from corrosion is an impressed current system. When metals corrode the metal becomes a positively charged ion with the release of one or more electrons. It is those electrons that are available to reduce some dissolved species in the environment. In near neutral environments such as water in most soils, dissolved oxygen in the aqueous environment is often the species reduced to produce hydroxide. The hydroxide is then available to combine with the positively charged ions produced by the corrosion reaction to produce a sparingly soluble metal hydroxide, or hydrated metal oxide; rust in the case of iron alloys. If electrons can be provided to the metal surface from an external source, the metal will not become oxidized (become positively charged), and corrosion will effectively be reduced or stifled altogether. The application of current in this manner is known as an impressed current system and requires a DC power supply to deliver electrons from an anode to the metal surface. The anodes in this case are usually conducting but inert materials. For example graphite is often used as an anode. From a thermodynamic point of view the application of current to the metal lowers the electrochemical potential of the metal to a level where corrosion cannot occur. The method for measuring the effectiveness of impressed cathodic protection systems, especially for buried steel structures, is to measure the potential of the steel vs. an electrode that has a standard potential. The most commonly used standard electrode is a copper/copper sulfate electrode that has a standard or reference potential of +0.314 volts. For most impressed current systems used to protect steel from corrosion, the measured potential that will provide complete protection is considered to be -0.85 volts vs. the standard copper-copper sulfate electrode.

A potential disadvantage of impressed current systems for buried structures is that the amount of current required to "polarize" the steel to the protection potential criterion is proportional to the surface area of the steel to be protected. For "bare" pipes this can require a significant amount of power. However, for pipes that are wrapped or coated, the cathodic protection system need only protect the "holidays" and the power requirements are greatly reduced. A further important consideration is that the conductivity of the soil becomes very important because of current-resistance losses in the soil. Thus spacing of the anodes becomes an important aspect of any impressed current cathodic protection system. Nevertheless, design criteria are readily available for installation of anodes if soil conductivities are known. The amount of current that is required to control corrosion of buried steel structures, especially pipelines, is generally controlled by applying coatings to the steel. Accordingly the current is only required to protect the areas exposed by the holidays in the coatings. The holidays may be incorporated into the coatings during application, or may be induced by damage or deterioration of the coatings after emplacement of the structures.

Q. Turning back to aging management programs, has the industry issued any guidance concerning aging management of buried pipes that you are aware of?

A. Yes. Both the Nuclear Energy Institute (NEI) and the Electric Power Research Institute (EPRI) have issued guidance documents addressing utilities’ approaches to managing aging of buried pipes. I have reviewed NEI’s Industry Guidance for the Development of Inspection Plans for Buried Piping and Guideline for the Management of Underground Piping and Tank Integrity, also identified as NEI 09-14, and EPRI’s Recommendations for an Effective Program to Control the Degradation of Buried Pipe. I discuss both in greater detail in my report. There may be additional industry guidance documents in existence also but I have not focused on those.

Q. What are the main points made in the NEI and EPRI reports?

A. Primarily, NEI’s Industry Guidance for the Development of Inspection Plans for Buried Piping and Guideline for the Management of Underground Piping and Tank Integrity, states that the specific inspections and examinations that are performed will be based on degradation observed or expected, the susceptibility of the pipe to leakage, the consequences of the leak, and the location of the pipe. The document further details the number of inspections that should be required, especially for those lines that carry Licensed Material.

The Buried Pipe Integrity Task Force, which is affiliated with NEI, released a report which cites criteria for inspection including that depending on pipe length, two, or in some cases three "direct examinations of the highest susceptible locations, with acceptable results, may be sufficient to demonstrate reasonable assurance". The phraseology "highest susceptible locations" is critical since susceptibility of buried pipes to corrosion is determined by the characteristics of the soil/water combination at all locations at a given site. Accordingly it is paramount that, as a minimum, soil conductivity, chemistry, drainage, and water retention are characterized to determine the best locations for direct measurements.

The EPRI program contains six elements: (1) developing a corporate program including training, implementing procedures, documentation, and performance indicators; (2) prioritizing buried pipe systems and locations to be inspected based on risk of failure (including likelihood and consequence of failure);

(3) performing direct inspections to quantify the degree of degradation and damage; (4) evaluating the fitness-for-service of degraded buried pipes; (5) selecting the appropriate repair technique where required, including both non-welded and welded repairs; and (6) taking preventive actions to reduce the risk (likelihood and consequence) of future leaks or failures. The EPRI report recommends that specify not only periodic and opportunistic inspections, but inspections based on local conditions of the piping. Both the NEI and EPRI documents recommend cathodic protection for critical piping systems.

Q. Do you believe an aging management program is necessary to manage the aging of buried pipes at Indian Point?

A. Yes. The fact that Indian Point has already experienced leaks, detailed in my report, indicates to me that there are already corrosion problems at the facility and that appropriate measures must be taken to prevent such piping failures in the future.

Q. Has Entergy agreed that it needs an aging management plan to address aging of buried pipes and tanks?

A. Yes. I also note that Entergy has endorsed the EPRI report and I believe Entergy took part in drafting the NEI initiative also.

Q. What is your understanding of what constitutes

Entergy's AMP?

A. As I understand it, Entergy's AMP is contained in its License Renewal Application (LRA), section B.1.6, as well as subsequent commitments and/or license renewal amendments. The LRA at Section B.1.6 said only that Entergy would take preventive measures to mitigate corrosion and perform inspections to manage the effects of corrosion and provided for only opportunistic inspections. The AMP states that the inspection program will be consistent with program attributes described in NUREG-1801, Section XI.M34, but offers no details. This is a version of the GALL Report which has since been superseded. Obviously, these bare statements are insufficient to provide an understanding of what exactly Entergy would be doing to manage aging of buried pipes.

Subsequently, Entergy revised its LRA to include a new commitment, in which Entergy said it would:

> include in the Buried Piping and Tanks Inspection Program described in LRA Section B.1.6 a risk assessment of in-scope buried piping and tanks that includes consideration of the impacts of buried piping or tank leakage and of conditions affecting the risk for corrosion. Classify pipe segments and tanks as having a high, medium, or low impact of leakage on reliable plant operation. Determine corrosion risk through consideration of piping or tank material, soil resistivity, drainage, the presence of cathodic protection and the type of coating. 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.

This commitment was made in 2009 in a document identified as NL-09-111, Attachment 2. No information is provided concerning what factors Entergy will take into account in performing a risk assessment or to classify its pipes, or how frequently Entergy will inspect pipes according to their priority, among other things. Moreover, Entergy makes no commitment to taking any mitigative measures if problems are found.

Q. Has Entergy provided other information that is related to its AMP?

A. Yes. Entergy has produced a number of documents which are not explicitly part of its LRA, AMP. These include CEP-UPT-0100 “Underground Piping and Tanks Inspection and Monitoring”, issued 31 October 2011; EN-DC-343 (Rev. 4), “Underground Piping and Tanks Inspection and Monitoring Program”, an inclusion in the IPEC Nuclear Management Manual, issued May 16, 2011; and SEP-UIP-IPEC, “Indian Point 2 & 3 Underground Components Inspection Plan” approved April 29, 2011. I do not understand these to be part of Entergy’s LRA but have addressed them in my report.

Q. What, generally, is your conclusion about the adequacy of Entergy's AMP for buried pipes and tanks?

A. There is nothing in the AMP at all to determine what Entergy is committing to doing except a conceptual framework. It is wholly deficient. Even if these other documents (which are not part of the LRA) were adopted, Entergy still would not have an adequate AMP, for numerous reasons.

Q. What are the specific reasons you believe Entergy's AMP for buried pipes is deficient?

A. There are many reasons. First, Entergy's AMP, as I described it above, contains very few actual commitments. It is conceptual and aspirational in nature, stating only that it will "will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls" without including those monitoring techniques, acceptance criteria, corrective actions, or administrative controls. Likewise, the newest revised commitment, in the attachment to NL-11-090, states that Entergy will classify pipe segments, determine corrosion risk through consideration of piping or tank material, soil resistivity, drainage, the presence of cathodic protection and the type of coating, establish inspection priority and frequency for periodic inspections of the in-scope piping and tanks based on the results of the risk assessment, and perform inspections using inspection techniques with demonstrated effectiveness – but Entergy offers no pipe classification, determination of corrosion risk, inspection priority or frequency list, or specific inspection techniques it will use. Without seeing the actual program, including acceptance criteria and commitments to undertake repairs that Entergy intends to adopt, it is not possible to determine at this time whether the inspection program will meet the requirements for an adequate AMP.

Q. Do the corporate documents Entergy provided shed light on these missing details?

A. Yes, Entergy has offered more detail in corporate documents it disclosed (of primary relevance EN-DC-343 (Rev. 4), CEP-UPT-0100, and SEP-UIP-IPEC), but these internal documents are not included in the commitment from Entergy or made a part of the LRA. They are presumably subject to modification by Entergy without NRC approval and would not be obligations imposed on Entergy by a renewed license. The procedures and oversight section of EN-DC-343 refers to Entergy's document CEP-UPT-0100 as the requirement associated with the scope, risk ranking and examination techniques to be followed. In the risk ranking section, an assemblage of a set of as-built drawings is required. It is not clear if such a set actually exists or if it was or will be provided for review in the LRA licensing process.

Q. You said that even if Entergy's corporate documents were adopted into the LRA, Entergy's AMP would still fall short. What do you mean by that?

A. For example, the procedures and oversight section of EN-DC-343 refers to Entergy's document CEP-UPT-0100 as the requirement associated with the scope, risk ranking and examination techniques to be followed. In the risk ranking section, an assemblage of a set of as-built drawings is required. It is not clear if such a set actually exists or if it was or will be provided for review in the LRA licensing process.

Additionally, EN-DC-343 calls for each plant to develop its own site-specific Underground Piping and Tanks Inspection and Monitoring Program. However, I have not been provided with an Indian Point-specific Program, and have reviewed only Entergy's fleetwide program. Nor am I aware that one exists. Thus, I cannot assess what Indian Point's specific program will entail.

With regard to repairs, EN-DC-343 says only that

“Contingency planning should be in place for prompt implementation in case an underground segment fails to meet acceptance criteria.” (EN-DC-343, Rev. 4 at 16.) But Entergy has not provided its acceptance criteria, making it impossible to assess its effectiveness.

EN-DC-343 calls for newly installed piping to be coated, that proper use of fill should be used when excavating and re-burying components, and that baseline inspections should be performed prior to piping installation. However, this is not an aging management program. These are simply best practices for any underground pipes, and do not indicate any efforts that will be taken to manage already-aging pipes such as those present at Indian Point.

Q. What is the second reason you believe Entergy’s AMP is deficient?

A. Second, an inspection program, *per se,* is not adequate to ensure the safe operation of engineering systems. The acceptability of the results of the inspection program, including the criteria to be applied to continued operation, remediation, or replacement, should be specified. Entergy has not identified when it will take mitigative measures if problems are found, or what those mitigative measures will be. Also, although Entergy says it will conduct many pre-period of extended operation inspections, it is not clear how many inspections, if any, have already taken place that Entergy is counting against this requirement but that were not conducted to the standards to which Entergy's new program would dictate they should be conducted.

Q. Are there other reasons why you believe Entergy's AMP is deficient?

A. Yes. Entergy has not committed to reinstalling cathodic protection at Indian Point, despite NEI, EPRI, Entergy's own corporate guidance documents and consultants' reports, and NRC Staff in the new GALL Report revision stressing the importance of cathodic protection. Apart from the industry-wide focus on cathodic protection in general, Entergy's own studies show that the soils at Indian Point are mildly to moderately corrosive, warranting cathodic protection as an objective matter. Entergy's consultant PCA Engineers, issued a report called which assessed the status of cathodic protection at Indian Point, and found a "latent organization weakness in that the risk associated with the lack of a CP system was not clearly understood by personnel approving resource allocation to complete the modification process". PCA Engineers found that nearly all cathodic protection systems at Indian Point were out of service, and recommended reinstallation. Entergy did not take PCA Engineers' recommendation and neither Entergy's AMP nor its corporate documents even reference the PCA study.

This is another example of where Entergy's corporate documents do not say the same thing as their AMP. EN-DC-343 says that for plants with installed cathodic protection systems for underground piping and tanks, Entergy should ensure that the proper operation of the systems is verified semi-annually. EN-DC-343 calls for cathodic protection degradation affecting safety-related structures, systems, and components (SSCs) to be repaired with "the Work Week T-process", which I presume to be an expeditious schedule (as compared with the non-safety-related SSCs, which are to be repaired within only six months of detection of a problem). CEP-UPT-0100 states that "existing [cathodic protection] systems may be upgraded or a new [cathodic protection] system installed" and requires that plants with installed cathodic protection systems verify proper operation of these systems, periodically test them, ensure the system is evaluated in accordance with EN-DC-343, put an individual in charge of the cathodic protection system, and verify that cathodic protection systems are corrected on a schedule commensurate with the safety significance of the system or component being protected. But Entergy knows there is widespread cathodic protection system degradation of both safety and non-safety-related SSCs at Indian Point, and has not committed to repairing these systems. Given that Entergy has chosen to follow an outdated version of NUREG 1801 specifically because it does not require cathodic protection, it does not appear that Entergy is proposing to implement EN-DC-343 or CEP-UPT-0100 at Indian Point.

Q. Did PCA Engineers find the soils at Indian Point to be corrosive?

A. Yes. Soil resistivity measurements conducted by PCA at a limited number of locations indicated that the resistivity ranged from approximately 8,000 ohms/cm to approximately 63,000 ohm/cm. Eight of the locations indicated resistivities in the 10,000 ohm/cm to 30,000 ohm/cm range. Soils with resistivities in that range are considered to be mildly corrosive. One location that measured a resistivity of approximately 8,000 ohm/cm is considered to be moderately corrosive.

Q. Are there other reasons you believe Entergy's AMP for buried pipes is insufficient?

A. Yes. I find that Entergy has made a number of inconsistent statements concerning what exactly it plans to do. In addition to the above example about cathodic protection, for example, Entergy says its inspection intervals are determined by using inspection priority. For buried sections with a high/high, high/medium, or medium/high impact-corrosion risk (which would include the piping systems within the scope of this contention, since Entergy has designated all radioactive fluid-containing piping systems "high priority" in CEP-UPT-0100), inspections are supposed to be done every ten years. As an initial matter, such a long period between inspections is questionable, especially for the highest risk piping systems. But in its response to NRC's most recent RAI on buried pipes, Entergy stated it would perform more than 80 inspections. It is not clear how Entergy's response to the RAI squares with the information in Entergy's corporate documents setting inspection priority and scheduling every ten years. It bears repeating here again that Entergy has not committed to either of these inspection schedule, as neither appears in the AMP or in a regulatory commitment, and that the only thing Entergy has committed to in its AMP is creating an unspecified plan that will manage aging.

Q. In your opinion, is Entergy's AMP for buried pipes and tanks adequate to manage aging even though it does not require cathodic protection?

A. No.

Q. Are you aware that NRC Staff, in its Supplemental Safety Evaluation Report, found that the AMP was sufficient even though it does not require cathodic protection?

A. Yes. I do not agree with that conclusion.

Q. What do you recommend Entergy do in order to create a sufficient AMP for buried pipes?

A. I recommend that Entergy adopt the recommendations of the NEI and EPRI reports, including cathodic protection of buried pipes, follow the dictates of NUREG-1801, Revision 2, Section XI.M41, clearly identify acceptance criteria for corrosion damage to buried pipes, and clearly state the repair and remediation procedures to be followed if the corrosion damage lies outside of the acceptance criteria.

Q. Why do you believe cathodic protection is important at Indian Point?

A. Plant conditions at IPEC indicate that the soil is corrosive. As I discuss in my report, Entergy's inspections indicate that in at least one location, piping degradation has reduced pipe wall thickness by 85% (that is, to only 15%). IPEC has experienced through-wall failures in the condensate storage line, and Entergy's own consultants have issued a report indicating that the soils are corrosive.

Q. Did you see any mention of Unit 1's buried piping systems in the documents you reference above?

A. No.

Q. Have you now completed your initial testimony regarding the contention?

A. Yes.

I have reviewed all the exhibits referenced herein. True and accurate copies are attached.

UNITED STATES

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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In re:	Docket Nos. 50-247-LR; 50-286-LR
License Renewal Application Submitted by	ASLBP No. 07-858-03-LR-BD01
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Entergy Nuclear Operations, Inc.	December 16, 2011

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DECLARATION OF DAVID J. DUQUETTE

I, David J. Duquette, do hereby declare under penalty of perjury that my statements in the foregoing testimony and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

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

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December 16, 2011

Pre-filed Written Testimony of David J. Duquette Contention NYS-5