UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE SECRETARY

In the Matter of

ENTERGY NUCLEAR OPERATIONS, INC.; ENTERGY NUCLEAR INDIAN POINT 2, LLC; ENTERGY NUCLEAR INDIAN POINT 3, LLC; HOLTEC INTERNATIONAL; and HOLTEC DECOMMISSIONING INTERNATIONAL, LLC; APPLICATION FOR ORDER CONSENTING TO TRANSFERS OF CONTROL OF LICENSES AND APPROVING CONFORMING LICENSE AMENDMENTS	Docket Nos.: 50-3 50-247 50-286 72-051

(Indian Point Nuclear Generating Station)

DECLARATION OF WARREN K. BREWER

I, Warren K. Brewer, declare and state as follows:

1. I am an Executive Consultant for Four Points Group, Incorporated, an engineering consulting firm providing services related to the nuclear industry, including decommissioning cost estimating and planning, and cost analysis with respect to spent fuel management and disposition. I have over 40 years of experience in the nuclear industry and have been involved in decommissioning cost estimating and planning since 1989. I submit this declaration in support of the State of New York's petition for leave to intervene and hearing request in this matter.

2. I have a B.S. in electrical engineering from Louisiana Tech University and an M.S. in nuclear engineering from the Massachusetts Institute of Technology.

I completed a graduate-level course of study in areas related to nuclear power and power plant design at the Bettis Reactor Engineering School. After obtaining my master's degree, I worked for ten years at the Division of Naval Reactors, the joint United States Department of Defense and Department of Energy organization responsible for all aspects of design, construction, maintenance, and operation of nuclear reactors in U.S. Navy ships and training facilities. I left the Division of Naval Reactors in 1986 and accepted a position with Pickard, Lowe and Garrick, a nuclear industry engineering consulting company. In late 1986, two colleagues and I formed ABZ, Inc. I now work with both ABZ and Four Points Group. I have previously provided expert witness testimony related to engineering and the nuclear industry before state regulatory bodies, the United States Tax Court, the United States Court of Federal Claims (numerous cases), and in an international arbitration proceeding. Additional information about my background and experience is included in my curriculum vitae, which I have attached to this declaration as Exhibit A.

3. I have reviewed filings related to the transfer of the Indian Point Unit 1 (Unit 1), Indian Point Unit 2 (Unit 2) and Indian Point Unit 3 (Unit 3)—collectively the Indian Point Energy Center (Indian Point)—from Entergy to Holtec, including the license transfer application (LTA) (ML19326B953) and the post-shutdown decommissioning activities report (PSDAR) and site-specific decommissioning cost estimate (DCE) submitted to the NRC on December 19, 2019 (ML19354A698).[1]

[1] Throughout this declaration, I use the term "Entergy" to identify any of the Entergy entities, including Entergy Nuclear Operations, Inc.; Entergy Nuclear Indian Point 2, LLC; and Entergy Nuclear Indian Point 3, LLC. Similarly, I use the term "Holtec" to refer to any of the Holtec entities, including Holtec International; Nuclear Asset Management Company, LLC;

4. My testimony below is based on my experience in this field, and on information that is currently publicly available.

5. The cost analysis presented in the LTA and DCE is dependent on exemptions to NRC requirements that have not yet been requested. The cost analysis is dependent on an exemption to allow use of funds from the Unit 1, Unit 2, and Unit 3 nuclear decommissioning trusts (NDTs) for spent fuel management and site restoration activities as well as for radiological decommissioning. Absent a request for this exemption and presentation of the basis for the exemption, the cost analysis presented in the LTA is not accurate.

6. The cost analysis also appears to assume, without regulatory basis, the commingling of the Unit 1, Unit 2, and Unit 3 NDTs into one NDT with the intention of using the NDTs to fund activities beyond the designated unit. As will be discussed in this declaration, there would be concerns about the allocation of costs among the three units and questions as to whether costs for one unit are to be paid from the NDT of a different unit. As the regulations do not allow this commingling, there remain unanswered questions about the validity of the cost analysis provided in the LTA and DCE.

7. The costs provided for each unit are not consistent with the scheduled activities for that unit. For example, the only work scheduled for 2031 is Unit 1 demolition (*see* PSDAR Figure 3-1) yet DCE Table 3-4c shows twenty-two full-time-equivalents of craft labor for Unit 3. Given that Unit 3 demolition is scheduled to be

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Holtec Decommissioning International, LLC (HDI), Holtec Indian Point 2, LLC; and Holtec Indian Point 3, LLC.

completed in 2027, there is no indication as to what this labor would be supporting. Similarly, site restoration activities on Figure 3-1 are scheduled for 2032 through 2033 yet the decommissioning cash flows in Tables 5-1a, 5-1b, and 5-1c show substantial expenditures for site restoration throughout most of the decommissioning. Also, if in fact the costs being attributed to Unit 3 in the example above are actually supporting work at Unit 2, then money from the Unit 3 trust fund is being used to support work at Unit 2. There is currently no regulatory basis for using trust fund dollars from one unit to decommission another unit.[2]

8. There are various factors and risks that could lead to a shortfall in the amount of funding available to fully and safely decommission and radiologically decontaminate Indian Point (license termination), restore the site (site restoration), and manage the spent nuclear fuel on site (spent fuel management) if the LTA is approved without understanding how these factors and risks are to be mitigated. Any such shortfall could place public health, safety, and the environment at risk. Such a shortfall would also contradict Entergy's position that Holtec is financially qualified to hold the licenses for the three Indian Point units because the decommissioning trust funds are sufficient to pay for post-shutdown activities. While the cash flow analysis provided in the LTA shows a positive balance in all three NDTs at the end of the decommissioning process, there are factors and risks that could result in costs exceeding the funding available from the NDTs. There has been no showing that the Holtec subsidiaries that will be the Indian Point licensees if the requested license transfer

[2] See 10 C.F.R. § 50.75 (describing funding requirements per reactor).

is allowed have the financial capability to handle any shortfall in license termination, site restoration, and/or spent fuel management funding.

9. The LTA states that the costs presented are conservative because no credit is taken for recoveries from U.S. Department of Energy (DOE) through litigation or settlement of claims for the spent fuel management costs Holtec will incur as a result of the DOE's breach of its obligations to dispose of Indian Point's spent nuclear fuel. However, there is no commitment in the LTA for Holtec to retain and designate any such recoveries for use if needed to fund decommissioning or site restoration activities at the facility. In the absence of such commitment, the potential DOE recoveries do not provide any conservatism in Holtec's cost analysis and are not a form of financial assurance.

10. In reviewing the requested transfer of the Pilgrim Nuclear Power Station (Pilgrim) license to Holtec, NRC staff asked Holtec about its ability to manage concurrent decommissioning of two nuclear power plant sites, Pilgrim and Oyster Creek Nuclear Generating Station (Oyster Creek).[3] In response, Holtec attempted to support its management capability by relying largely on retaining current senior plant leadership and operating experts who had been responsible for maintaining the plant during operation as well as post shutdown.[4] These senior plant leaders and operating experts are to be supplemented, according to Holtec, by additional existing plant staff to provide experienced teams at each site.[5] The LTA for Indian Point if

[3] *See* NRC Staff Request for Additional Information (March 21, 2019) (ML19086A349).
[4] *See* Holtec Response to NRC Staff Request for Additional Information (April 17, 2019) (ML19109A177).
[5] *See id.*

approved would result in Holtec being responsible for decommissioning as many as six reactors at four nuclear power stations: Pilgrim, Oyster Creek, Palisades Nuclear Generating Station (Palisades),[6] and the three Indian Point reactors effectively all at the same time while also managing spent nuclear fuel at each of these facilities for an indefinite period. There are limited resources in terms of trained and experienced personnel for performing specialty tasks such as segmentation of reactor vessel internals and reactor vessels. As a result, delay in such activities at one reactor can cause delay in the work at other reactors. Similarly, with common management for multiple projects a problem with one project or at one site can limit the ability of this common management to remain fully engaged with other projects or sites. This can ultimately result in delays of work at other projects or sites. With decommissioning of several plants at multiple sites the possibility exists that a delay in a project can result from events at one of the other projects or sites.

11. To date, Holtec has not been responsible for the successful decommissioning of even one commercial nuclear power reactor in the United States. Holtec has not provided specific information that would allow the NRC to evaluate its ability to act as owner, licensee, and decommissioning agent for the largely concurrent work at six commercial nuclear reactors on schedule and within budget.

12. The LTA provides no specific information to demonstrate Holtec's ability to acquire adequate staffing to decommission six reactors at the same time, particularly for specialized tasks such as reactor vessel and internal segmentation where

[6] *See* Entergy Nuclear Operations, Inc. (Pilgrim Nuclear Power Station), CLI-19-11, 2019 WL 7585273, at *6 (2019).

there are a limited number of qualified and experienced vendors available, and to simultaneously manage the other decommissioning activities such as radioactive and hazardous waste shipments from multiple sites all while adequately controlling the schedule and budget for all of the parallel projects.

13. In its PSDAR Holtec states that the staffing after the license transfer is estimated between 300 and 350 personnel excluding subcontractors with a peak staffing level of 450 personnel including subcontractors; however, Holtec's DCE includes costs for a maximum of about 300 personnel in 2022, which decreases substantially in subsequent years.[7] It is not clear sufficient costs have been included for the staffing that Holtec assumes will provide expertise during the decommissioning.

14. Indian Point has a feature that is not common to commercial nuclear power plant sites. Specifically, there are two large natural gas transmission lines traversing the site adjacent to Unit 3. Neither the LTA nor the PSDAR includes any discussion of this unique feature. During decommissioning extensive demolition will be taking place, large amounts of debris will be moved around the site, significant quantities of material will be stored on site in preparation for transport off site, and ultimately significant movement of equipment on the site will be needed to transport the debris off site. In addition, explosives are often used to reduce the effort to remove reinforced concrete. Damage to the two on-site gas transmission lines could seriously threaten the safety of personnel on site, damage the environment, and disrupt programs, policies and activities necessary to prevent release of radioactive

[7] *See* PSDAR, encl. 1, IPEC DECON Site-Specific Decommissioning Cost Estimate, tables 3-4a, 3-4b and 3-4c.

contamination. Neither the LTA nor the PSDAR includes any discussion of the actions that will be taken, programs or policies that will be put in place, or physical barrier or structures that will be installed to prevent the decommissioning demolition, waste management and equipment movement on the site from damaging the gas transmission lines. The limited cost information and discussion in the LTA and DCE do not allow evaluation if sufficient costs are included to support the necessary efforts to adequately protect the gas transmission lines.

15. As explained in detail below, there are at least seven ways Holtec could experience significant, unaccounted-for cost overruns that could lead to a shortfall in funding and place public health, safety, and the environment at risk:

a. Delays in the work schedule leading to increased costs for overhead and project management, including delays at Indian Point caused by actions or activities at other Holtec projects;

b. The discovery of previously unknown radiological or non-radiological contamination;

c. State requirements beyond those assumed by Holtec or unanticipated site conditions could require greater expenditures for site restoration work, thus decreasing the amount of funds available for the completion of license termination work. This is true because the Holtec plan includes spending funds on site restoration activities prior to the completion of license termination activities;

d. A radiological incident at the site (for instance, during the transfer of spent nuclear fuel into dry casks);

e. Absent a change to the Standard Contract, Holtec will have to re-package spent nuclear fuel into new, DOE-approved containers prior to transportation to an off-site storage facility or repository;

f. A successful effort by DOE to recover all or some of the costs for the packaging of spent nuclear fuel into dry casks if DOE removes the spent fuel without prior repackaging; and/or

g. Holtec's obligation to maintain spent nuclear fuel onsite and to re-package the spent fuel one or more times as well as perform other NRC required maintenance activities if DOE fails to remove all spent nuclear fuel by 2062 consistent with its cost analysis.

The risk that one or more of these project management scenarios could come to pass, with attendant delays and additional unplanned costs, cannot be dismissed.

16. *Delays in the work schedule leading to increased costs for overhead and project management*. The Holtec cost estimate includes an eighteen percent contingency allowance.[8] The average percentage of contingency included in Entergy's prior estimates for Indian Point was about 16.9 percent.[9] As a general practice, decommissioning cost estimates, including prior Entergy estimates for Indian Point, include

[8] *See* PSDAR at 94.

[9] *See* Preliminary Decommissioning Cost Analysis for the Indian Point Energy Center, Unit 3, at 6–7 (Dec. 22, 2010) (ML103550608); Entergy Letter Submission NL-08-144 (Oct. 23, 2008), encl. 1, at 7–8; Entergy Letter Submission NL-08-144 (Oct. 23, 2008), encl. 2, at 6–7 (ML083040378).

contingency only for the types of routine events that are expected to happen in any project but cannot be attributed in advance to those events, such as equipment failures or weather. As such, the contingency in prior Entergy cost estimates were not intended to account for changes in scope from discrete events or uncertainties in scope or regulations. Entergy defined these other risks under the broad label of financial risk, and no allowance was included in Entergy's estimates for such risks. By way of contrast, the eighteen percent contingency allowance included in the Holtec cost estimate is described as accounting for traditional contingency as well as increased costs for discrete events and project uncertainties, including changes in scope. There is no explanation in the LTA, PSDAR or DCE that would explain why an additional one percent contingency is sufficient to account for these other risks. Further, if the Entergy estimates were to be adjusted by excluding the SAFSTOR costs and to account for the extra fourteen years of spent fuel storage in the Holtec estimate, Entergy's total estimate for all three units is almost $300 million larger than the Holtec estimate. As a result, the eighteen percent contingency in the Holtec estimate is less in total dollars than the 16.9 percent contingency in Entergy's 2010 estimates. While Holtec is certainly not bound to follow the approach taken by Entergy's historic cost assessments, they fail to provide justification for this sub-adequate cost projection here. There is simply no analysis or explanation in the Holtec LTA or DCE as to why this lesser amount of contingency is sufficient to cover the additional risks Holtec claims to cover with the eighteen percent contingency.

17. Similarly, the presently available information in Holtec's analysis does not quantify the amount included in the Holtec estimate to account for the types of risk not addressed in the Entergy estimate. Further, the presently available information in Holtec's analysis does not provide detail on how its risk analysis was performed or how its confidence level was calculated. For example, Holtec's PSDAR does not describe how the eighteen percent contingency allowance was applied in the cost estimate (e.g., whether it was applied to some or all of the line items or to the total cost estimate) or why the eighteen percent allowance was deemed reasonable across all activities to which it was applied (assuming it was applied to specific line-items, something again that cannot be ascertained from Holtec's analysis). As such, the reasonableness of Holtec's analysis cannot be assessed, just as it could not be assessed in Pilgrim. Holtec purported to have performed an analysis to arrive at the contingency amount needed to include costs for indirect work delays and added overhead costs. That is, if a specific activity takes longer than anticipated, then, even without any added direct costs for that activity, the overall decommissioning schedule would likely be delayed. Such delay would lead to increased and currently unaccounted for costs for overhead and project staffing and management. Similar delays have resulted in cost overruns at other decommissioning facilities; at the Humboldt Bay facility, original estimated staff costs of $107.6 million in 2010 dollars[10] increased to $177 million in 2010 dollars once work began.[11] Finally, the presently

[10] *See* Enclosure 3, Decommissioning Funding Report for Humboldt Bay Power Plant Unit 3 (ML050950368).
[11] *See* Enclosure 3, Decommissioning Funding Report for Humboldt Bay Power Plant Unit 3 (ML110910149).

available information in Holtec's analysis does not explain the basis for Holtec's decision to use an eighty-five percent confidence level or the cost impact of basing the estimate on a higher confidence level. The simple understanding of this confidence level is that there is a fifteen percent or about a 1-in-6 chance that the contingency included will be insufficient. Together, these factors receive inadequate treatment in the LTA and its supporting documentation in the PSDAR and DCE.

18. Not only does the risk of schedule delay exist in all decommissioning projects but for at least one Holtec decommissioning project, substantial schedule delay has become a reality. Holtec obtained NRC approval to acquire Pilgrim on August 22, 2019 based on an LTA that included a decommissioning schedule for license termination and site restoration of about 5.5 years. Holtec closed on the acquisition of Pilgrim on August 26, 2019 and only two and a half months later, in a presentation dated November 14, 2019, identified a delay that would increase the Pilgrim decommissioning schedule by two and a half to three years, resulting in a schedule length of about eight years.[12] Thus, in about eighty days from the acquisition of Pilgrim, Holtec had identified a schedule increase of about fifty percent. Holtec did not identify the reasons for the dramatic schedule delay or the anticipated cost impact. However, based on cost information provided in the Pilgrim LTA the increase in overhead and project management arising from the delay can be estimated to be as much as

[12] *See* HDI/CDI presentation to the Pilgrim Decommissioning Citizen's Advisory Panel, Nov. 14, 2019) (ML19347D415).

$100 million.[13] The schedule presented in the Indian Point LTA allots six to seven years per unit for license termination and site restoration. [14]

19. Information in the Holtec DCE can be used to evaluate the potential increase in program management costs arising from delay in the Indian Point decommissioning costs. The cost impact of the delay would depend on where during the overall schedule the delay occurred. Using the delineated annual management and support costs in the Holtec DCE, the total annual management and support cost for all three IP units can be calculated at any point during the decommissioning schedule.[15] If the delay occurred at the beginning of the schedule, the cost impact could be as much as $110 million per year in program management costs. If the delay were encountered near the end of the schedule, the impact could be a low as $12 million per year. In the middle of the schedule, where the program management costs are relatively constant over several years, the cost impact would be about $27 million per year. A three-year delay could add between $36 million and $330 million to the project costs.

20. Holtec asserts that while its cost estimate is based on a twelve-year combined schedule, its goal is to complete the project within fifteen years, and the cost estimate for the twelve-year schedule bounds a potential fifteen-year schedule. No basis is provided to support this assertion and no analysis of costs for a fifteen-year schedule has been provided by Holtec. Given that some of the costs are attributable

[13] *See* Pilgrim Revised PSDAR, figure 3-1 and tables 3-3 and 5-1 (November 16, 2018), (ML1935A698)
[14] *See* LTA, attach. D., at unnumb. p. 14.
[15] *See* PSDAR at 78–80, tables 3-2a, 3-2b and 3-2c.

to calendar time rather than activities (such as NRC fees and annual property taxes), the assertion appears false on its face. These costs are not negligible. At Indian Point, property taxes alone account for $61 million, or about $5 million per year.

21. The Holtec estimated one year schedule for reactor vessel internals and reactor vessel segmentation for each Indian Point unit is overly optimistic. Holtec's plan for decommissioning the Pilgrim plant estimates a duration of a close to two years.[16] The Holtec estimated duration for reactor vessel internals and reactor vessel segmentation at the Oyster Creek plant is about three years.[17] Additionally, both Pilgrim and Oyster Creek are boiling water reactors whereas the Indian Point units are pressurized water reactors. Generally, the segmentation of the reactor vessel internals and reactor vessel for a boiling water reactor is less time-consuming than for a pressurized water reactor. Thus, it would be expected that the segmentation work for each of the Indian Point units would take longer than either Pilgrim or Oyster Creek. Holtec has provided no explanation as to why the segmentation work at the Indian Point units is estimated to take substantially less time than the corresponding work at Pilgrim or Oyster Creek.

22. There have been substantial delays in reactor vessel internals and reactor vessel segmentation at other plants. In the case of the Connecticut Yankee plant decommissioning, the reactor vessel internals and reactor vessel segmentation was originally estimated to take one year but ultimately took nearly four years.[18] I had

[16] *See* Pilgrim Revised PSDAR at 17 (Nov. 16, 2018) (ML19354A698).
[17] *See* Oyster Creek Revised PSDAR at 17 (Sept. 28, 2018) (ML18275A116).
[18] *See* PNNL, Assessment of the Adequacy of the 10 C.F.R. § 50.75(c) Minimum Decommissioning Formula, at 4-4 to 4-5 (Nov. 2011) (ML13063A190).

involvement in an oversight capacity for decommissioning of the two Zion plant units. The reactor vessel internals and reactor vessel segmentation work at Zion ultimately took about two to three years for each unit or about twice the time originally estimated.

23. Delay in the reactor vessel internals and reactor vessel segmentation work could have substantial cost impacts at Indian Point. In the worst case, if the delay affects the critical path of the project, the delay can result in increased costs ranging from $12 to $110 million per year in additional management and support costs as discussed above. In addition the delay can also complicate the logistics of personnel, equipment and waste by requiring more extensive parallel work activities. However, Holtec has not provided sufficient schedule and staffing detail to allow evaluation of the effect of delay in segmentation work on the critical path and cost of Indian Point decommissioning activities.

24. *The discovery of previously unknown radiological or non-radiological contamination.* In any project where the status of the plant is altered, as will be the case during decommissioning, there is the possibility of finding unknown radiological and/or non-radiological contamination. For example, during the site preparation work associated with construction of the dry fuel storage facility at Indian Point, abandoned diesel fuel oil tanks were discovered. There is unexpected work and cost for dealing with any currently unknown contamination. The limited information in the LTA and PSDAR does not identify the specific plans for performing site characterization activities to identify, categorize, and quantify radiological and non-

radiological contamination. The level of such physical characterization previously performed is not identified nor is the extent and timing of physical characterization yet to be performed. Complete site characterization is necessary to determine the extent of radiological and non-radiological contamination and to establish the work needed for decommissioning and restoring Indian Point. Some characterization cannot be completed until some dismantlement is performed. As a result, even if all the characterization work currently possible has been completed, there will still remain the possibility of finding unexpected contamination later in the decommissioning process. Unexpected radiological or non-radiological contamination could significantly increase the cost of decommissioning, including staffing, overhead, and waste disposal. The limited information in the LTA, PSDAR, and DCE does not identify any allowance or provision for dealing with the finding of unexpected contamination or contamination greater than currently being assumed Holtec. As noted above, the common application of contingency in cost estimates is not intended to account for changes in work scope such as additional work required to deal with unexpected contamination.

25. In decommissioning of the Yankee Rowe, Connecticut Yankee and Maine Yankee plants the amount of waste increased as the plant was remediated.[19] As one example, the amount of identification at Yankee Rowe of greater than

[19] *See* Decommissioning of Three U.S. Commercial Nuclear Power Plants, Wayne A. Norton, President/CEO: Connecticut Yankee Atomic Power Company, Yankee Atomic Electric Company, presented at Conference on Lessons Learned from the Decommissioning of Nuclear Facilities and the Safe Termination of Nuclear Activities in 2006; Decommissioning Lessons Learned at Yankee Rowe, M. S. Terrell, D. McGee, Duke Engineering and Services (USA) presented at WM'01 Conference Feb 25–Mar 1, 2001.

expected contamination of concrete as well as other conditions resulting in increased amount of waste and effort needed for removal of this contamination resulted in increased costs of about $24.5 million. The total estimated costs for decommissioning at Yankee Rowe increased by about $46.2 million between 1995 and 1999 due to changes in scope, schedule and assumptions concerning regulatory requirements. The estimated cost for decommissioning Yankee Rowe in 1995 was $453.1 million but the total cost reported in 2006 was $750 million.[20]

26. The initial estimate of the amount of asbestos requiring remediation at Maine Yankee was 28,500 cubic feet. Contrary to this initial estimate, ultimately 80,000 cubic feet of asbestos containing material was removed from Maine Yankee.[21] A similar increase at Indian Point would increase remediation, transport, and disposal costs over those projected in the DCE which form the basis for Holtec's assertion that it can meet NRC financial assurance regulations.

27. *State-law requirements beyond those assumed by Holtec for site restoration decreasing the amount of funds available to pay for license termination.* Based on the cash flow analysis in the DCE, Holtec plans to use NDT funds for site restoration prior to the completion of license termination and thus, site restoration activities will be performed in parallel with license termination. New York site restoration requirements requiring efforts beyond those assumed in the Holtec estimated costs would result in a reduction of the of funds for radiological decontamination. Further,

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[20] *See id.*

[21] *See* EPRI, Maine Yankee Decommissioning Experience Report, Detailed Experiences 1997–2004 at 3–4, *available at* http://www.maineyankee.com/public/pdfs/epri/my%20epri%20report-2005.pdf.

state requirements for site restoration may impact the duration or scheduling of license termination activities given that site restoration activities are planned to be performed prior to completion of license termination work. As a result, there could be increased costs for overhead and staffing. The limited information in the LTA, PSDAR, and DCE does not identify the assumed requirements for site restoration or any provision for contingency or allowances to account for their ultimately being requirements beyond those assumed.

28. *A radiological incident at the site (for instance, during the transfer of spent nuclear fuel into dry casks).* Although the likelihood of a radiological incident decreases once fuel is removed from the reactor, there is still a risk of such an incident even at a decommissioning nuclear power plant. For instance, there is a risk of an incident during the transfer of spent fuel to the spent fuel pool and then from the spent fuel pool to dry casks. If such an incident were to occur, it would increase the costs of decommissioning and depending on the extent of such an incident it could greatly increase the costs of decommissioning. The effect on cost would be both direct and indirect by causing substantial delay in the decommissioning efforts. Although there was no radiological consequence, in August 2018 there was an incident at the Southern California Edison (SCE) San Onofre facility during the transfer of spent fuel to dry storage, which was being managed by Holtec. This incident involved a situation where a loaded spent fuel canister was nearly dropped. SCE spent almost one year and considerable resources evaluating this incident and taking actions to ensure that the transfer of spent fuel to dry storage could be completed safely. In

addition to the substantial cost for resolving issues arising from such an incident, there will be delay costs for the fuel transfer personnel as well as added overhead and project management costs.

29. In addition, it should be noted that the transfer of fuel from Unit 3 to dry storage is more complicated than the transfer at other plants and thus presents greater possibility of an incident or concerns that would require resolution and delay the process. However, it is now my understanding that Holtec intends to pursue replacing the Unit 3 cask-handling crane with a single-failure-proof crane in order to eliminate the complications in fuel transfer Unit 3.[22] I have seen nothing in the LTA, PSDAR or DCE to indicate that this is Holtec's plan and I have not seen any discussion in those documents as to the cost and schedule for making such a change. A similar crane replacement was completed at Unit 2 in or about 2007. The cost for the work to replace the Unit 2 crane was about $20 million. There is no reason to assume the crane replacement at Unit 3 would be cheaper. Addition of the crane replacement costs would be a substantial change to the Holtec DCE if the crane were to be constructed and utilized with decommissioning trust fund dollars.

30. *Absent a change to the Standard Contract, Holtec will have to repackage spent nuclear fuel into new DOE approved containers prior to transportation to an off-site storage facility or repository.* The decommissioning costs presented in the

[22] *See* Ron Gaston letter to NRC, NL-20-008 (Jan. 6, 2020), attach. 1 (ML20008D393); NRC meeting notice dated January 2, 2020, Partially Closed Meeting with Entergy Operations, Inc. and Holtec International to Discuss License Amendment Request to Replace the Indian Point Nuclear Generating Unit No. 3 Fuel Handling Building Crane with a New Holtec High-Lift Crane (ML20015A007).

and DCE appear to be consistent with assuming that DOE will accept the canisters in the casks in use at Indian Point at the time of DOE performance in the as-packaged-for-dry-storage condition and will not require repackaging for transportation. Entergy (and many other licensees) have argued in testimony and briefs before the U.S. Court of Claims and the U.S. Court of Appeals for the Federal Circuit that DOE has the authority to mandate licensees to repackage spent fuel into DOE-approved transportation casks.[23] If Entergy is correct and DOE were to mandate fuel repacking, this could cause Holtec to incur significant and apparently unaccounted-for expenses. The cost overrun for repackaging would be exacerbated by the fact that this would occur *after* the Indian Point spent fuel pools have been dismantled. Without a spent fuel pool onsite, repackaging spent fuel might involve first transporting the fuel to another plant site, or building an onsite dry transfer station (none of which currently exist in the United States). This could lead to cost overruns on the order of hundreds of millions of dollars as indicated by the Government Accountability Office estimate of $150 to $450 million for construction of a fuel transfer station.[24] There would be operating costs to remove the fuel from the current casks and then to package that fuel into DOE-provided transportation casks. There is no indication in the limited information in the LTA that indicates the assessment of funding adequacy accounts for these potential costs.

[23] *See, e.g.*, System Fuels, Inc. v. United States, 818 F.3d 1302, 1306–07 (Fed. Cir. 2016).
[24] *See* U.S. Government Accountability Office, GAO-10-48, Nuclear Waste Management: Key Attributes, Challenges, and Costs for the Yucca Mountain Repository and Two Potential Alternatives, at 55 (Nov. 2009), available at https://www.gao.gov/assets/300/298028.pdf.

31. *A successful effort by DOE to recover all or some of its past payments for the packaging of spent nuclear fuel into dry casks if DOE removes the spent fuel without prior repackaging.* Even if DOE accepts the spent nuclear fuel for transportation without repackaging, as the Federal Court of Claims has observed in a similar matter, DOE may then pursue recovery from Holtec for some or all of the past payments that DOE made for the original packaging of Indian Point dry casks.[25] In litigation in which I advised the federal government defendant, Entergy has recovered those costs to date on the theory that DOE has as of yet been unwilling to agree to acceptance of the fuel without repackaging. If DOE pursues such recovery and is successful, this could lead to significant unaccounted for costs. To date, Entergy has recovered about $31.3 million dollars for complete loading 26 dry storage casks at Indian Point. About 108 additional dry storage casks will have to be loaded to accommodate all of the spent fuel at Indian Point. It is unclear from the limited information currently available if any type of risk allowance has been included in the estimated costs to account for costs that might be recovered by DOE or how Holtec otherwise would compensate for the substantial cost increase from such a recovery by DOE.

32. *Holtec's obligation to maintain spent nuclear fuel onsite and to repackage the spent fuel one or more times as well as perform other NRC required maintenance activities if DOE fails to remove all spent nuclear fuel by 2061, as Holtec assumes in*

[25] *See* Carolina Power & Light Co. v. United States, 573 F.3d 1271, 1277 (Fed. Cir. 2009). In this sense, the term "past" refers to the past relative to the time at which DOE begins accepting spent fuel from Indian Point. Given current expectations about DOE performance, all the spent fuel at Indian Point will have been loaded into dry storage casks before DOE begins accepting spent fuel.

its DCE. The DCE assumes that all fuel will be removed from Indian Point by about 2061. There is no certainty for such an assumption since DOE has not yet started accepting spent fuel and the ability to meet any date for DOE to start is dependent of actions beyond DOE's control. Decommissioning cost estimates for Indian Point performed in 2007 and 2010 assumed that the fuel would be removed by 2047.[26] Thus, in only nine years the assumed date for complete fuel acceptance by DOE is fourteen years later. If DOE fails to pick up all of the spent fuel by the end of 2061, then Holtec will begin incurring significant and ongoing cost overruns for spent fuel management. Generally speaking, these annual costs would be the approximately $12 million per year spent fuel management costs included in the LTA cash flow analysis for 2034 and later. In my experience however, licensees have often underestimated their annual expenditures for spent fuel management. Such costs could go on for many decades, if not indefinitely. This raises a significant risk of much greater cost overruns, on the order of hundreds of millions of dollars. The NRC's Continued Storage Rule (NUREG-2157), referenced by Holtec in its PSDAR but then essentially ignored, explicitly recognizes that spent fuel may be stored indefinitely at each reactor site. In that indefinite storage scenario, the NRC assumes that each reactor operator will need a dry fuel transfer station to move spent fuel into new dry casks every 100 years. This is because, at sites like Indian Point, there would no longer be a spent fuel pool to effectuate the repackaging once the fuel is moved to dry storage and the plants are decommissioned. It is unknown how Holtec would provide for the very possible

[26] *See* n.9 above.

contingency of indefinite onsite storage, including all safety and environmental concerns regarding transferring fuel into new dry casks every 100 years. It is unclear what funding source Holtec would use for:

a. construction of a dry fuel transfer station;

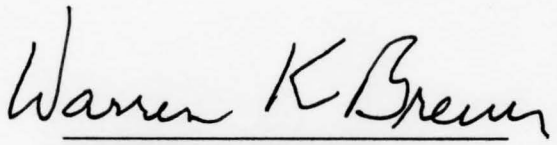
b. purchase of 134 new casks and all the labor and material costs for transferring the fuel every 100 years; and

c. costs of maintaining security at the site indefinitely.

These costs could easily total hundreds of millions of dollars.

33. Each of the cost overruns listed above could lead to a significant cost beyond the estimated costs in the LTA and could result in shortfall in Indian Point decommissioning trust funds, particularly if more than one of the above cost overruns occurs, or if Holtec encounters other cost overruns not listed above. The only source of funding for decommissioning (license termination, spent fuel management and site restoration) identified in the LTA is the money in the Indian Point decommissioning trust funds. Because of this and the fact that the three categories of activities will be performed, at least in part, in parallel, a cost overrun or delay in any of these three categories has the potential to jeopardize funding for the other areas.

34. I, Warren K. Brewer, have read the above statement consisting of twenty-three pages, and I certify under penalty of perjury that the foregoing is true and correct. Executed on this 11th day of February, 2020.



WARREN K. BREWER
Executive Consultant
Four Points Group, Inc.

DECLARATION OF WARREN K. BREWER
LIST OF EXHIBITS

Exhibit A Curriculum Vitae of Warren K. Brewer

WARREN K. BREWER

EDUCATION

Bettis Reactor Engineering School, 1976

M.S., Nuclear Engineering, Massachusetts Institute of Technology, 1976

B.S., Electrical Engineering, Louisiana Tech University, 1974

EXPERIENCE

1986 - Present - ABZ, Incorporated and Four Points Group, Incorporated starting 2017

Executive Consultant specializing in nuclear power plant operations, decommissioning cost estimating and planning and severe accident analysis. This experience has included work related to regulatory compliance, inservice inspection and testing (ISI/IST), configuration management, procedure and technical specification reviews and design basis documentation.

More specifically, the experience in these areas has included:

Provided engineering and management services as part of an integrated team to validate and update the Southern California Edison San Onofre nuclear plant design basis documentation.

Managed the development of advanced computer systems for assisting nuclear plant staff in compliance with regulatory requirements. These systems assisted in scheduling of NRC required plant condition dependent surveillance testing, collecting and evaluating test data, managing of system operability information and plant license limiting conditions for operation, compliance with nuclear plant operator scheduling and overtime regulations, and compliance with NRC event reportability regulations. The surveillance test scheduling system was used by one utility for almost 20 years with no failures.

Developed methods for verification and validation of expert system computer codes based on industry guidelines and accepted criteria for conventional codes. Presented lecture to the NRC on methods of verification and validation as part of a lecture series on software quality assurance

Provided expert assistance to the programmers in developing a state-of-the-art desktop nuclear power plant simulator for training operators to learn and understand event-based Emergency Operating Procedures (EOPs).

Over 20 years experience in preparation and review of decommissioning plans and cost estimates. Participated in conferences and workshops on decommissioning costs and funding adequacy. Provided on-site monitoring of decommissioning activities.

Provided assistance concerning decommissioning costs, planning and progress as part of process to negotiate sale of a nuclear plant.

Conducted specific studies relative to projected costs of low-level waste disposal and spent fuel management providing the results to state agencies and companies in the nuclear industry.

Prepared reports for state regulators evaluating cost estimates for decommissioning, low-level waste disposal, and extended spent fuel storage. Provided training to state regulators on decommissioning technology and methodology of decommissioning cost estimating.

Developed methodology for evaluating costs for recovery from severe reactor accidents. This methodology has been used by the majority of the US nuclear industry, foreign utilities and nuclear insurers to advise them on potential losses and insurance recoveries as well as to assist risk managers in determining the coverage levels to obtain.

Performed evaluations of the liability claims that could arise from transportation of nuclear material. These evaluations included assessment of the technical conditions that might result from such events, the probability of such events, and all liability costs that might be incurred (cleanup, property damage, health effect, business interruption or losses, etc.).

Performed reviews of maintenance, operations, and quality assurance programs. Such reviews included comparison of the program elements with the regulations, evaluation of specific work packages and implementation of work in the field.

Provided DOE with expert assistance in evaluating the generic environmental impact statements for the New Production Reactor. This included verification and validation of offsite releases, environmental impacts, and the technical aspects of operation.

Managed and participated in the development of computer program for fluid flow analysis. The program is applicable to a wide range of facilities and industries. The program has been marketed world-wide since 1992 with an estimated 25,000 users.

Extensive experience in providing litigation support and expert witness services related to nuclear plant operation, decommissioning planning and costs, spent fuel management and general engineering. Expert testimony has been provided before the US Court of Federal Claims, US Tax Court, state regulatory agencies and arbitration tribunals.

This litigation support and expert witness experience has included:

Over 12 years experience in evaluation of claims resulting from the US Department of Energy's (DOE) breach of the contract with nuclear plant operators for the disposal of spent nuclear fuel. This has included evaluation of spent fuel storage options, dry storage facilities and cask designs, specific plant decisions, equipment, incurred costs and spent fuel transportation options. Prepared expert witness reports and provided expert testimony.

Provided rate case support in proceedings before state and federal regulators. Issues addressed included the adequacy of decommissioning cost estimates, as well as

prudence of operational actions, management effectiveness, technical soundness of operation, technical design basis and details, and regulatory compliance and adherence to industry standards. Work included testimony, as well as assisting in preparing data and information for testimony by others. Prepared reports for state regulators evaluating cost estimates for decommissioning, low-level waste disposal, and extended spent fuel storage. Provided training to state regulators on decommissioning technology and methodology of decommissioning cost estimating.

1986 - Pickard, Lowe and Garrick, Inc.

Consulting Engineer.

Conducted detailed review of technical specification surveillance test requirements for a nuclear power plant. This included detailed review of the implementing programs and procedures, and providing detailed comments for procedure revisions to ensure regulatory compliance.

Conducted detailed review of technical specification requirements, technical specification basis, regulatory background, industry practice, and implementing procedures at a nuclear power plant for required logic system functional testing and simulated automatic actuation testing of emergency core cooling systems and primary containment isolation.

Reviewed plant-specific probabilistic risk assessment (PRA). Along with general evaluation, provided assessment of operational considerations and/or lessons resulting from the PRA.

Participated in procedure review and upgrade project.

1982 - 1986 - United States Navy, Division of Naval Reactors

Head, Reactor Plant Systems - New Design Submarine.

Lead responsibility for reactor plant performance, safety, and quality.

Conducted various trade-off studies to establish overall design criteria for new design reactor and propulsion plant. This included evaluation of possible performance maintainability, survivability, constructability, and cost. Established general design characteristics for further development.

Evaluated various proposed core designs to determine optimum design to fit overall propulsion plant design goals. This included evaluation of thermal hydraulic performance, safety evaluation, normal plant response analysis, and reactor structural design assessment, including response under shock loading.

Reviewed and approved conceptual system designs, performance criteria, and detailed design bases. As design progressed, this included increasing levels of detail to system design descriptions, design calculations, component sizing, system schematics, and construction details.

Participated in design of major plant components to ensure structural soundness, compliance with overall design goals, and ability to interface with other systems and propulsion plant arrangement.

Reviewed and approved design of reactor plant structures, such as component foundations.

Reviewed and approved plant equipment and system arrangements.

Reviewed reactor and plant control system designs for compatibility with mechanical system designs and core performance and capabilities.

Reviewed and approved operating transient response predictions to be used in life-cycle evaluations of plant.

Developed life-cycle plant operating profile based on mission requirements and data from previous submarine classes.

Had lead responsibility for design initiatives to mitigate the consequences of complete loss of AC power and to ensure safety of surrounding population if this type event occurred near port.

Participated in extensive effort to reduce plant weight. Potential weight reduction concepts were each evaluated for its total effect on capability, constructability, life-cycle cost, and maintainability.

Participated in Naval Reactors crew quizzes for crews of operating submarines to test knowledge and ability of ship crew to safely and efficiently operate the propulsion plant. Responsibility was mainly for testing in the area of reactor plant mechanical system operation.

1980 - 1982 - United States Navy, Division of Naval Reactors

Head, Reactor Plant Systems - TRIDENT Submarines.

Supervised engineering group. Directed efforts concerning design, construction, operation, maintenance, testing, and configuration control of reactor plant fluid systems and structures for TRIDENT submarine. Similar duties in connection with land-based TRIDENT reactor plant prototype.

Responsible for shock design of shipboard reactor plant components and structures. Similarly, responsible for seismic design of structures, systems, and components unique to land-based prototype. Seismic design was done to the same criteria imposed on commercial nuclear power plants.

Developed IST/ISI program for land-based prototype conforming to ASME Code, Section XI. These programs were in compliance with the requirements imposed on commercial nuclear power plants.

Responsible for design, acceptance testing, operation and maintenance procedure for emergency core cooling system for the land-based prototype. This system was

designed to comply with NRC requirements imposed on commercial power plants for similar systems.

Responsible for preparation of reactor plant operating, maintenance, and test procedures.

Evaluated operation incidents and established corrective actions based on these evaluations.

Evaluated and resolved construction deviations from specified requirements.

Participated in examination of prototype operating crews to evaluate level of knowledge and capability to safely operate the reactor plant.

Responsible for design, construction, operation, and maintenance of support systems, such as process cooling water and associated cooling tower to support prototype operation.

1976 - 1980 - United States Navy, Division of Naval Reactors

Project Engineer, TRIDENT Class submarine propulsion plant design.

Coordinated government laboratory and shipyard work in all phases of design, construction, operation, testing, and maintenance of steam plant fluid systems for TRIDENT submarines and land-based TRIDENT submarine prototype.

Responsible for design of shipboard structures and piping systems in accordance with shock design criteria.

Responsible for preparation of verbatim compliance operating and maintenance procedures. This included performance of procedure verification and validation.

Responsible for design of safety systems unique to the land-based prototype, including compliance with NRC requirements for similar systems in commercial power plants.

Evaluated and resolved shipyard construction deviations for structures and systems.

Participated in the evaluation, analysis, and resolution of large-scale shipyard error resulting in unapproved material substitutions. This involved tracking and identifying where incorrect materials had been used, evaluating and testing the acceptability of the material as-built, and approving the as-built condition or specifying the required rework.

Testimony

State of New Hampshire Decommissioning Finance Committee hearing on the Seabrook Nuclear Power Plant decommissioning funding, 1994.

Mitsubishi Heavy Industries, Ltd (Japan) v. Finmeccanica S.p.A., Azienda Ansaldo (Italy), as successor in interest to Ansaldo S.p.A., International Court of Arbitration, Case Number 10269/OL/ESRT/TE, June 2001.

Tennessee Valley Authority v. United States of America, Case No. 01-249C, July 2005.

SFI Mississippi v. United States of America, Case No. 03-2624C, September 2006.

Boston Edison v. United States of America, Case No. 99-447C and 03-2626C, June 2007.

Wisconsin Electric v. United States of America, Case No. 00-697C, September 2007.

Dairyland Power Cooperative v. United States of America, Case No. 04-0106C, July 2008.

Entergy Corporation and Affiliated Subsidiary Companies v. Commissioner of Internal Revenue, Docket No. 10557-08, June 2008.

Consolidated Edison Company of New York, Inc. v. United States of America, Case No. 04-33C, June 2009.

Entergy Nuclear Indian Point 2, LLC v. United States of America, Case No. 03-2622C, June 2009.

Entergy Nuclear Generation Company v. United States of America, Case No. 03-2626C, September and October 2009.

Entergy Nuclear Vermont Yankee, LLC v. United States of America, Case No. 02-898C, March and April 2010.

Portland General Electric, the City of Eugene Oregon, and Pacificorp v. United States of America, Case No. 04-0009C, November 2011.

System Fuels, Inc. and Entergy Arkansas, Inc. v. United States, Case No. 03-2623C, October and November, 2012.

State of Vermont Public Service Board, Docket No. 7862, Petition for Amendment of Certificate of Public Good for Vermont Yankee Nuclear Power Station.

System Fuels, Inc. and Entergy Arkansas, Inc. v. United States, Case No. 12-389C, July 2014.

System Fuels Inc., System Energy Resources, Inc., and South Mississippi Electric Power Association v. United States, Case No. 11-511C, October 2014.

Entergy Gulf States, Inc. and Entergy Gulf States Louisiana, LLC. V. United States, Case No. 03-2625C, May 2015.

Entergy Nuclear FitzPatrick, LLC., Entergy Nuclear Indian Point 3, LLC., and Entergy Nuclear Operations, Inc. v. United States, Case No. 03-2627C, August 2015.

Entergy Nuclear Indian Point 2, LLC v. United States, Case No. 13-19C, April 2016.

Sacramento Utility District v. United States, Case No. 15-577C, October 2016.

State of Vermont Public Utilities Commission, Docket No. 8880, Joint Petition to Transfer Ownership of Entergy Nuclear Vermont Yankee, May 2018.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE SECRETARY

In the Matter of

ENTERGY NUCLEAR OPERATIONS, INC.; ENTERGY NUCLEAR INDIAN POINT 2, LLC; ENTERGY NUCLEAR INDIAN POINT 3, LLC; HOLTEC INTERNATIONAL; and HOLTEC DECOMMISSIONING INTERNATIONAL, LLC; APPLICATION FOR ORDER CONSENTING TO TRANSFERS OF CONTROL OF LICENSES AND APPROVING CONFORMING LICENSE AMENDMENTS	Docket Nos.: 50-3 50-247 50-286 72-051

(Indian Point Nuclear Generating Station)

CERTIFICATION OF SERVICE

Pursuant to 10 C.F.R. § 2.305, I certify that I served the foregoing Declaration of Warren K. Brewer via the NRC's Electronic Information Exchange on this 12th day of February, 2020.

Signed (electronically) by

Joshua M. Tallent
Assistant Attorney General
Environmental Protection Bureau
The Capitol
Albany, NY 12224
(518) 776-2456
Joshua.Tallent@ag.ny.gov