Union of Concerned Scientists

Citizens and Scientists for Environmental Solutions

Memorandum to: Gregory A. White, U.S. Attorney for the Northern District of Ohio

From: Diane Curran, counsel to the Union of Concerned Scientists
David Lochbaum, nuclear safety engineer for the Union of Concerned Scientists

Re: Legal And Factual Basis For Criminal Sanctions Against FirstEnergy Nuclear Operating Company For Material Misrepresentations to the U.S. Nuclear Regulatory Commission And Violations of NRC Regulations Regarding the Davis-Besse Nuclear Power Plant

Dated: April 15, 2003

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The Union of Concerned Scientists is a nonprofit partnership of scientists and citizens combining rigorous scientific analysis, innovative policy development and effective citizen advocacy to achieve practical environmental solutions.

Established in 1969, we seek to ensure that all people have clean air, energy and transportation, as well as food that is produced in a safe and sustainable manner. We strive for a future that is free from the threats of global warming and nuclear war, and a planet that supports a rich diversity of life. Sound science guides our efforts to secure changes in government policy, corporate practices and consumer choices that will protect and improve the health of our environment globally, nationally and in communities throughout the United States. In short, UCS seeks a great change in humanity's stewardship of the earth.

Introduction

This report sets forth the legal and factual basis for imposing criminal sanctions on FirstEnergy Nuclear Operating Company ("First Energy") and its upper management. Such sanctions are appropriate because the company, through its senior officials, made willful misrepresentations to the U.S. Nuclear Regulatory Commission ("NRC"), and deliberately violated NRC regulations and the terms of FirstEnergy's license to operate the Davis-Besse Nuclear Power Station.

FirstEnergy's false statements and regulatory violations involved the condition of one of the Davis-Besse reactor's most important safety components: the pressure vessel, which holds the reactor core. Failure of this component could lead to a meltdown of the reactor core and significant health and economic impacts for thousands of people.

FirstEnergy falsely represented the condition of the pressure vessel and associated piping in order to avoid an NRC-ordered shutdown, and knowingly and recklessly exposed the people of Ohio to a grave and preventable safety risk. These misdeeds require a forceful response that imposes criminal penalties on both the FirstEnergy corporation and its individual managers. Criminal prosecution is also consistent with the U.S. Attorney General's stated policy of sternly punishing corporate fraud, in order to make clear that such conduct is unacceptable and to deter any similar misconduct in the future.

While the NRC is now investigating whether criminal prosecution against FirstEnergy is appropriate, the investigation has been pending for nearly a year without any result. Although FirstEnergy plans to restart the reactor by May, there is no indication that the NRC plans to complete its investigation by then. Moreover, the NRC's own mismanagement of FirstEnergy's request to postpone an inspection of the pressure vessel may have compromised the rigor of its criminal investigation. Therefore, UCS requests that the U.S. Attorney make his own determination regarding the appropriateness of criminal prosecution of FirstEnergy and its managers.

This memorandum gives an overview regarding FirstEnergy's false statements, and a discussion of the legal and factual bases for criminal prosecution. In Appendix A, we provide a more detailed and annotated description of FirstEnergy's false statements. Appendix B provides a listing of FirstEnergy officials who are responsible for the false statements that were made in each submittal to or meeting with the NRC. Appendix C is an index to the exhibits that are attached to Exhibit A. Appendix D is a glossary of the acronyms and abbreviations used in the memorandum.

Importance of Maintaining Integrity of RPV Head and VHP Penetration Nozzles

The reactor fuel core at the Davis-Besse nuclear power plant is housed within the reactor pressure vessel ("RPV"), a massive steel structure approximately 41 feet tall and 14 feet in diameter, with a wall that is approximately six to eight inches thick. In pressurized water reactors ("PWRs") like Davis-Besse, the RPV is normally completely filled with water to keep the core covered, and is kept under pressure to prevent the cooling water from boiling at the high temperatures under which the reactor is operated.

Attached to the top or "head" of the RPV are various pipes, also known as vessel head penetrations ("VHPs"). Most of the VHPs consist of control rod drive mechanism ("CRDM")

nozzles for the control rods. The control rods are inserted in the reactor core to stop or slow the nuclear chain reaction, and withdrawn to increase the reaction or start up the reactor. Together, the RPV and the VHP nozzles form part of the reactor coolant pressure boundary ("RCPB"), which holds the reactor cooling water.

Reactor cooling water must cover the core at all times to prevent the core from overheating and melting. A core meltdown would release a large quantity of radioactivity into the reactor's containment. Since the containment building is not designed to withstand a meltdown, this would probably result in the release of lethal levels of radiation.

NRC Requirements for Maintaining Integrity of RCPB

Maintaining the integrity of the RCPB is a fundamental element of NRC's program for nuclear reactor regulation. Criterion 14 of the NRC's General Design Criteria ("GDC") requires that the RCPB must be "designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure and of gross rupture." [1]

In accordance with GDC 14, the RPV and associated VHP nozzles are designed and built for strength and resilience under the high temperature and pressure conditions they are exposed to during reactor operation. The outer 6.63 inches of the RPV head are composed of a carbon steel alloy, and the inner quarter-inch is composed of less-susceptible stainless steel.

Despite their strength and resilience, the materials that compose the RPV and VHP nozzles are susceptible to corrosion and cracking. Thus, the NRC also has strict requirements for detecting and correcting defects through inspections. Criterion XVI of Appendix B to 10 C.F.R. Part 50 requires that:

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

The technical specifications ("tech specs" or "TSs") in the Davis-Besse operating license implement the above regulatory requirements by strictly prohibiting any leakage from the RCPB. If leakage is detected, an immediate and drastic response is required: the plant must be placed in hot standby within six hours, and completely shut down within the following 30 hours. *See* TS 3.4.6.2.

False Statements by FirstEnergy to NRC

FirstEnergy made numerous misrepresentations to the NRC in the fall of 2001, in response to Bulletin 2001-01, a safety notice that NRC had sent to all PWR licensees in the summer of

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[1] 10 C.F.R. Part 50, Appendix A, Criterion 14.

2001.[2] Bulletin 2001-01 alerted PWR licensees to a potentially serious threat to the integrity of the RCPB. The Bulletin reported on several recent incidents where special inspections of the RPV head and nozzles revealed significant nozzle cracking that had not been discovered in the ordinary course of inspections. These cracks included large circumferential cracks that could lead to leakage of the RCPB or rupture of the nozzles, thus resulting in a loss of coolant accident. The discovery "raised concerns about the potential safety implications and prevalence of cracking in VHP nozzles in PWRs."[3]

Thus, Bulletin 2001-01 required licensees to submit, under oath, information regarding the condition of VHP nozzles. The requested information included the susceptibility of their plants' VHP nozzles to cracking, the condition of the VHP nozzles, any limitations to the accessibility of the bare metal of the reactor head that might impede inspections, and the nature and results of recent inspections.

For plants considered highly susceptible to nozzle cracking, including Davis-Besse, Bulletin 2001-01 also asked licensees to inspect the RPV head and nozzles by December 31, 2001.[4] Any licensee who did not intend to inspect the RPV head and nozzles by that date was required to provide its basis for concluding that NRC safety requirements would continue to be met until the inspection was performed.

The NRC's request to conduct an inspection before December 31 imposed a significant unplanned expense on some licensees. The RPV head and nozzles can only be inspected during refueling outages, which generally are scheduled every 18 months to two years. If a shutdown had not already been planned for the fall of 2001, a shutdown for a special inspection would require a licensee to make special arrangements to purchase replacement power during the shutdown period.

Despite the burden of a shutdown, virtually all of the 12 PWRs with highly susceptible nozzles were shut down and inspected before the end of 2001 or proved to the NRC that visual inspections of 100 percent of their nozzles had already been completed. The only exceptions were Davis-Besse and D.C. Cook Unit 2. The owner of D.C. Cook Unit 2 provided technical data to the NRC showing that its nozzles were highly unlikely to be degraded – and when inspections were performed in January 2002, no significant damage was found. Instead of agreeing to shut the plant down and conduct a special inspection, FirstEnergy undertook a campaign to persuade the NRC that the Davis Besse reactor was safe to operate until the next refueling outage ("RFO") in late March of 2002. FirstEnergy sought to delay the inspections for financial reasons. The company told the NRC that it would cost an additional $35 million if the inspections were not delayed until spring 2002.[5]

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[2] NRC Bulletin 2001-01: Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles (August 3, 2001). A copy of Bulletin 2001-01 is provided as Exhibit 2.

[3] *Id.* at 15.

[4] In Bulletin 2001-01, the NRC binned all the pressurized water reactors into three susceptibility categories (high, medium, and low) based upon age and operating temperature. Davis-Besse was classified as one of 12 highly susceptible reactors.

[5] *See* NRC e-mail from Douglas Pickett to Allen Hiser et al, re: Davis-Besse Shutdown Costs, (November 5, 2001). A copy is provided as Exhibit 24.

Between the beginning of September and the end of November 2001, FirstEnergy submitted four letters, under oath, to the NRC.[6] FirstEnergy also had four meetings with the NRC technical staff and/or technical assistants to the NRC Commissioners, at which it presented viewgraphs and handouts.[7] In these written submittals and meetings, FirstEnergy repeatedly told the NRC that:

(a) There are no structural impediments to the visibility of the RPV head.
(b) With the exception of four nozzles at the top of the RPV head, the entire head and all 69 CRDM nozzles had been inspected in 1996.
(c) Inspections in 1998 and 2000 were also relatively thorough and revealed no CRDM leakage.
(d) The RPV head was cleaned before each inspection in order to expose the bare metal of the RVP head for close visual examination.
(e) RPV head and VHP nozzle inspections were conducted regularly, and according to established procedures.

As documented in Appendix A, all of these representations were false:

(a) There are significant structural impediments to the visibility of the RPV head, such that only 50-60% of the head can be seen.
(b) During the 1996 inspection, only the periphery -- 50-60% -- of the RPV head was clearly visible.
(c) Inspections in 1998 and 2000 were poorly done, and visibility of the head was significantly obstructed by structural impediments and accumulated boric acid deposits.
(d) The RPV head was not thoroughly cleaned prior to any of the inspections in 1996, 1998, or 2000.
(e) FirstEnergy and its predecessors (Toledo Edison and Centerior Service Company)[8] had neither explicitly adopted nor fully applied procedures for inspection of the RPV head and VHP nozzles.

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[6] *See* Letter from Guy G. Campbell, FirstEnergy, to U.S. Nuclear Regulatory Commission, re: Response to NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles" (September 4, 2001); Letter from L.W. Worley, FirstEnergy, to NRC, re: Supplemental Information in Response to NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles" (October 17, 2001); Letter from Guy G. Campbell, FirstEnergy, to NRC, re: Transmittal of Reactor Pressure Vessel Head Control Rod Drive Mechanism Nozzle Penetration Visual Examinations for the Davis-Besse Nuclear Power Station (October 30, 2001); Letter from Guy G. Campbell, FirstEnergy, to NRC, re: Transmittal of Davis-Besse Nuclear Power Station Risk Assessment of Control Rod Drive Mechanism Nozzle Cracks (November 1, 2001). Copies of these documents are provided as exhibits 1, 3, 7, and 8, respectively.

[7] Viewgraphs and handouts were presented by FirstEnergy at meetings on October 11, October 24, November 14, and November 28, 2001. Copies of these documents are attached to Appendix A as Exhibits 10, 12, 13, and 14, respectively.

[8] Toledo Edison held the license for the Davis-Besse plant until September 25, 1995, when it was transferred to Centerior. On December 1, 1998, the license was transferred to FirstEnergy.

NRC internal memoranda, released through the Freedom of Information Act, show that the NRC technical staff placed little or no confidence in FirstEnergy's representations regarding the adequacy of its previous inspections of the RPV head and VHP nozzles. In October, they began preparing an order for shutdown of the plant by December 31st. However, the NRC technical staff ultimately was overruled by its management, which had more faith in FirstEnergy's representations. On November 28, 2001, NRC's Director of the Office of Nuclear Reactor Regulation, Samuel J. Collins, decided to allow FirstEnergy to continue to operate Davis-Besse until February 16, 2002.

The NRC waited for over a year before explaining its reasons for granting the extension.[9] The letter states that the decision to extend the deadline for shutting down Davis-Besse was based in part on "information provided by FENOC [FirstEnergy] regarding past inspections at Davis-Besse."[10] Thus, the NRC relied on FirstEnergy's misrepresentations in its decision to extend the deadline and defer the shut down.

Inspection Reveals Hole in RPV Head

When FirstEnergy finally conducted its inspection of the Davis-Besse RPV head in February of 2002, the condition of the RPV head was far worse than even the most skeptical of NRC reviewers had imagined. Not only did inspectors find cracked CRDM nozzles and a huge quantity – 900 pounds – of boric acid deposits on the RPV head, but they also discovered a large hole in the RPV head itself. The hole was 35 square inches in area and 6 inches deep. The carbon steel layer had completely worn away, leaving only a thin liner of stainless steel that was bulging outward from the 2,000-plus pounds-per-square inch pressure inside the reactor vessel.

FirstEnergy and the NRC later concluded that the hole was caused by boric acid corrosion of the RPV head, which had gone undetected during regular inspections of the plant. The team that prepared FirstEnergy's root cause analysis concluded that the hole had been caused by "CRDM nozzle leakage associated with through-wall cracking, followed by boric acid corrosion of the RPV low-alloy steel."[11] The root cause analysis team also concluded that the cracking initiated in Nozzle 3 in 1990 (plus or minus 3 years), and that the crack had propagated through-wall between 1994 and 1996.[12]

The inspection also showed a significant buildup of boric acid corrosion products on the RPV head and CRDM nozzles, thus demonstrating that FirstEnergy's claims to have adequately cleaned and inspected these components during the 1998 and 2000 refueling outages were false.

Significance of False Statements

The existence of the hole in the Davis-Besse RPV head constituted an extremely grave violation of NRC regulations and FirstEnergy's tech specs. An NRC Augmented Inspection Team

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[9] Letter from John A. Zwolinski, NRC, to Lew W. Myers, First Energy, re: Davis-Besse Nuclear Power station, NRC Augmented Inspection Team Follow-up Special Inspection Report No. 50-346/02-08 (December 3, 2002). A copy is provided as Exhibit 9.

[10] *Id.,* Attachment at 7.

[11] Memorandum from S. A. Loehlein, Root Cause Team Leader, to Howard Bergendahl, Vice President - Nuclear, Davis-Besse at 2 (March 22, 2002). A copy is provided as Exhibit 11.

[12] *Id.* at 4.

concluded that notwithstanding the fact that a thin layer of cladding remained, the hole in the RPV "represents an unacceptable reduction in the margin of safety of one of the three principal fission product barriers at the Davis-Besse Nuclear Power Station."[13]

The hole also put the general public at undue increased risk of a serious accident. Had the hole in the RPV given way, the loss of primary coolant from the reactor vessel could have caused a meltdown of the Davis-Besse core. In addition, the inspection revealed cracked CRDM nozzles that had leaked reactor coolant. Had these cracks given way, their rupture also could have led to a major reactor accident. Government studies have estimated that a worst-case reactor accident at Davis-Besse could kill 1,400 people within the first year and 10,000 people later due to radiation-induced causes, and would cost $84 billion – all based on 1980 dollars and census numbers.[14]

FirstEnergy's failure to fully inspect or clean the RVP head and VHP nozzles also constituted a serious safety violation that put public safety at undue risk. As the NRC summarized in an inspection report, FirstEnergy's "failure to properly address the recurrent accumulation of boric acid deposits on the reactor head, a significant condition adverse to quality, contributed to the corrosion of the reactor head."[15]

NRC Response to Violations Demonstrated by FirstEnergy Inspection

The NRC has taken several actions in response to the results of First Energy's inspection of the reactor vessel. In March of 2002, the NRC dispatched an Augmented Inspection Team ("AIT") to the Davis-Besse plant, to "determine the facts and circumstances related to the significant degradation of the reactor vessel head pressure boundary material."[16] On May 3, 2002, the Staff issued Inspection Report 02-03, which summarized the findings of the AIT inspection. On May 15, 2002, the AIT conducted a "special" inspection, this time focusing on FirstEnergy's compliance with NRC safety regulations. On October 2, 2002, the NRC published its findings in Inspection Report 02-08. Inspection Report 02-08 included a listing of "apparent violations."[17] The apparent violations included a four-page listing of inaccurate or incomplete representations by First Energy.[18] The NRC characterized the apparent violations as "unresolved, because the

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[13] Letter from J. E. Dyer, NRC Regional Administrator, to Howard Bergendahl, Vice President – Nuclear, FirstEnergy Nuclear Operating Company, re: NRC Augmented Inspection Team – Degradation of the Reactor Pressure Vessel Head – Report No. 50-346/02-03 (DRS) at 1 (May 3, 2002) (hereinafter "AIT Report"). A copy is provided as Exhibit 26.

[14] Summary Report by the United Sates House of Representatives Subcommittee on Oversight and Investigations, "Calculation of Reactor Accident Consequences (CRAC2) for U.S. Nuclear Power Plants (Health Effects and Costs) Conditional on an "SST1" Release" (November 1, 1982). A copy is provided as Exhibit 27.

[15] Letter from John A. Grobe, NRC, to Lew W. Myers, FirstEnergy, re: Davis-Besse Nuclear Power Station, NRC Augmented Inspection Team Follow-Up Special Inspection Report No. 50-346/02-08 (DRS), Report Details at 4 (October 2, 2002) (hereinafter "Inspection Report 02-08"). A copy is provided as Exhibit 6.

[16] AIT Report.

[17] Inspection Report 02-08, Summary of Findings at ii-iv.

[18] Inspection Report 02-08, Report Details at 16-19.

NRC's determination of the safety significance of the violations has not been finalized, and several of the apparent violations remain under review by the NRC.[19]

In addition, the NRC's Office of Investigations ("OI") is conducting a criminal investigation into whether FirstEnergy knowingly misrepresented the condition of the pressure vessel in its reports to the NRC Staff regarding the results of in-house inspections. While the NRC itself cannot impose criminal sanctions, it can make recommendations to the Justice Department for criminal prosecution. The OI investigation is still underway.

Finally, in December of 2002, the NRC's quasi-independent Inspector General ("IG") issued a report on its investigation into the Davis-Besse debacle. [20] The IG concluded, among other things, that the NRC technical staff had a "strong justification" for its decision to order Davis-Besse to shut down by December 31, 2001.[21] The IG also found that NRC management had reversed the technical staff's decision without a sufficient understanding of FirstEnergy's proposed compensatory measures, and without documenting its decision.[22] The IG concluded that the decision to allow FirstEnergy to continue operating until mid-February 2002 "was driven in large part by a desire to lessen the financial impact on FENOC that would result from an early shutdown."[23]

Legal Basis for Criminal Action Against FirstEnergy

As the NRC Commissioners have emphasized, they "cannot overstate the importance of a licensee's or an applicant's duty to provide the Commission with accurate information." *In the Matter of Randall C. Orem,* CLI-93-14, 37 NRC 423, 427 (1993). As the Commissioners explained in *Orem*:

> In order to fulfill its regulatory obligations, NRC is dependent upon all of its licensees for accurate and timely information. Since the licensees are directly in control of plant design, construction, operation, and maintenance, they are the first line of defense to ensure the safety of the public. NRC's role is one primarily of review and audit of licensee activities, recognizing that limited resources prevent 100 percent inspection.

The NRC's regulatory scheme provides for imposition of civil monetary penalties against licensees for material false statements. *See* 10 C.F.R. § 30.9, 10 C.F.R. Part 2, Subpart B. However, any matters for which criminal penalties are appropriate must be referred to the Justice Department for criminal prosecution. In this case, there is substantial evidence that FirstEnergy's false representations regarding the condition of the Davis-Besse RPV were made with knowing intent to deceive the NRC. FirstEnergy's managers gambled with the health and safety of the public in order to keep Davis-Besse running. A monetary penalty imposed on the company would be utterly insufficient to penalize FirstEnergy's managers for deceptions that placed the lives and health of other people in jeopardy.

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[19] *Id.* at 1.

[20] Memorandum from Hubert T. Bell, Inspector General, to NRC Chairman Meserve, re: NRC Regulation of Davis-Besse Regarding Damage to the Reactor Vessel Head (Case No. 02-03S) (December 30, 2002). A copy is provided as Exhibit 25.

[21] *Id.* at 24.

[22] *Id.*

[23] *Id.* at 23.

FirstEnergy and its individual managers may be held criminally liable for their false statements under Title 18 of the U.S. Code and the Atomic Energy Act. Under the Atomic Energy Act, FirstEnergy can also be held liable for its willful violations of NRC regulations and the Davis-Besse license terms which govern inspection and correction of defects in the plant.

Title 18 of the U.S. Code

The United States Code, 18 U.S.C. § 1001 provides for fines and imprisonment for any person who:

> (1) falsifies, conceals, or covers up by any trick scheme, or device a material fact;
> (2) makes any materially false, fictitious, or fraudulent statement; or
> (3) makes or uses any false writing or document knowing the same to contain any materially false, fictitious, or fraudulent statement or entry.

This law has been held to apply to false statements made to the Atomic Energy Commission, predecessor of the NRC. *Pitts v. U.S.,* 263 F.2d 353, *cert. denied,* 360 U.S. 935 (1959). In addition, Title 18 contains two other provisions that are applicable in this case: 18 U.S.C. § 1341 prohibits mail fraud, and 18 U.S.C. § 2071 prohibits conspiracy to defraud the federal government.

18 U.S.C. § 1001 has been applied to cases involving environmental protection, specifically the Clean Water Act. See United States v. Wright, 988 F.2d 1036 (10th Cir. 1993) (holding that it is a violation of § 1001 to submit a false turbidity report to a state agency) In general, § 1001 is applicable to both natural persons and corporations. See United States v. Daewoo Int'l (America) Corp., 696 F. Supp. 1534 (C.I.T. 1988) (holding that Dae Woo Corp. violated § 1001 by making false statements to United States Customs Service and the United States Department of Commerce).

Atomic Energy Act

Section 103 of the Atomic Energy limits the issuance of nuclear reactor licenses to persons:

> . . . (2) who are equipped to observe and who agree to observe such safety standards to protect health and to minimize danger to life or property as the Commission may be rule establish; and (3) who agree to make available to the Commission such technical information and data concerning activities under such licenses as the Commission may determine necessary to promote the common defense and security and to protect the health and safety of the public.

42 U.S.C. § 2133(b). Sections 222 and 223 of the Atomic Energy Act provide for civil and criminal penalties for willful violations or attempted violations of relevant provisions of the Atomic Energy Act. Section 222 [42 U.S.C. § 2272] allows the imposition of criminal penalties of up to $10,000 and imprisonment of up to 10 years for violations of the Act's requirement that no entity can operate a nuclear power plant, "except under and in accordance with a license issued by the Commission." Among other things, Section 223 [42 U.S.C. § 2273] allows the imposition of civil penalties up to $5,000 and imprisonment for up to two years for willful

violations or attempted violations of any other provision of the Act, or of safety regulations or orders issued by the NRC.[24]

Corporate and Individual Liability

The government may prosecute FirstEnergy, as well as its individual managers. Corporations are persons under 1 USC § 1. A corporation is capable of engaging in criminal activity; therefore it should be held liable for such activity. 1 USC § 1 (2002); U.S. Department of Justice Memorandum Regarding Federal Prosecution of Corporations, 1248 PLI/Corp 169 (1999) (hereinafter "DOJ Corporate Prosecution Guidelines"). Under the doctrine of respondent superior, a corporation may be held criminally liable for the illegal acts of its directors, officers, employees, and agents. To establish liability, the government must prove that the corporate agent's actions (1) were in the scope of his duties, and (2) were intended, at least in part, to benefit the corporation. See DOJ Corporate Prosecution Guidelines, Section I; Commonwealth v. Beneficial Finance Co., 275 N.E.2d (SC Mass. 1971). The agent does not have to act solely for the benefit of the corporation. He or she may have a mixed motive.

Further, the corporation does not have to actually benefit from the action; only some *intent* to benefit is required. United States v. Automated Medical Laboratories, 770 F.2d 399 (4th Cir. 1985). Although the NRC's December 3, 2002, letter indicates that the NRC relied on FirstEnergy's misrepresentations in granting an extension of the shutdown deadline, it would not be necessary to provide such reliance.[25] Instead, it is sufficient to show that FirstEnergy stood to benefit from its misrepresentations, by saving millions of dollars in replacement energy costs.

Corporate executives may be held criminally liable, just like any criminal defendant, for their own criminal behavior. As discussed in Appendix A, FirstEnergy's managers either knew or should have known, had they consulted the company's internal documents, that their representations were false.

Prosecution is appropriate under federal guidelines

The DOJ Guidelines lists eight factors that federal prosecutors should consider when deciding whether to indict a corporation. These are:

(1) the nature and seriousness of the offense, including the risk to the public;
(2) the pervasiveness of wrongdoing within the corporation;
(3) the corporation's history of similar conduct, including prior criminal, civil, or regulatory enforcement actions;
(4) the corporation's timely and voluntary disclosure of wrongdoing and its willingness to cooperate;

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[24] Section 186 of the Atomic Energy Act, 42 U.S.C. § 2236, also permits the NRC to revoke a license where the licensee has made a "material false statement" that would have warranted denial of the license had it been made in a license application.

[25] Similarly, in imposing civil penalties for material false statements under 42 U.S.C. 2236, the NRC does not require a showing that the agency relied on the false representations. *Virginia Electric and Power Co.* (North Anna Power Station, Units 1 and 2), ALAB-324, 3 NRC 347, 358 (1976), affirmed, CLI-76-22, 4 NRC 480, 487 (1976) (test is whether the statement has a "natural tendency or capability to influence – not whether it does so in fact").

(5) the existence and adequacy of the corporation's compliance program;
(6) the corporation's remedial actions;
(7) collateral consequences, including disproportionate harm to shareholders and employees not proven personally culpable; and
(8) the adequacy of non-criminal remedies, such as civil or regulatory enforcement actions.

While we do not have sufficient information to address criteria 3 and 5, the other factors weigh in favor of prosecution.[26]

First, as discussed above, FirstEnergy's misrepresentations related to extremely significant safety issues. Maintaining the integrity of the Reactor Coolant Pressure Boundary is a fundamentally important requirement of nuclear power plant regulations. A loss of coolant from the RCPB could lead to a very serious reactor accident, killing or injuring thousands of people and causing billions of dollars in health and environmental damage. Second, the wrongdoing appears to have been pervasive in the management of FirstEnergy. As demonstrated in Appendix B, FirstEnergy upper managers repeatedly engaged in misrepresentations to the NRC.

With respect to the fourth factor, the record shows that FirstEnergy has never taken the opportunity to identify or correct the various misrepresentations that it made to the NRC regarding the condition of the RCP boundary at Davis-Besse. For example, FirstEnergy conducted an extensive root cause evaluation.[27] The NRC also conducted an investigation into the problems at Davis-Besse.[28] These two efforts produced similar results, with the notable exception that the NRC documented numerous instances in which FirstEnergy had provided the agency with inaccurate and incomplete information. Whether by accident or design, FirstEnergy's own evaluation did not identify these instances of inaccurate and incomplete disclosure of information. Thus, the company did not volunteer information to the NRC and made the agency ferret out these problems on its own.

With respect to the sixth factor, FirstEnergy did not punish the managers who lied. Instead, some were transferred to other FirstEnergy nuclear plants or offices, where they continued to have good jobs.[29] In addition, FirstEnergy has not admitted to having provided inaccurate and incomplete information to the NRC, whether by accident or by design, despite overwhelming

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[26] Criterion 3 relates to the licensee's history of similar conduct. Time constraints have not permitted us to investigate this issue. Criterion 4 relates to the timely disclosure of information and cooperation with law enforcement officials. We do not have any information regarding the degree to which FirstEnergy has cooperated with the NRC in its own criminal investigation. Criterion 5 relates to the corporation's own compliance program. We do not have access to any of FirstEnergy's internal company programs.

[27] FirstEnergy, "Root Cause Analysis Report: Significant Degradation of the Reactor Pressure Vessel Head" (April 15, 2002). A copy is provided as Exhibit 5.

[28] Inspection Report 02-08, Report Details at 16-19.

[29] For instance, FirstEnergy Vice President Guy G. Campbell was transferred to FirstEnergy's Perry nuclear power plant in Ohio. From there he was transferred to the Three Mile Island nuclear power plant, which is owned by FirstEnergy's business partner, General Public Utilities. Howard Bergendahl, who succeeded Guy Campbell in mid-November of 2001, was transferred to FirstEnergy's administrative offices. *See The Plain Dealer* article "Davis-Besse plant loses third overseer," (August 7, 2002). A copy is provided as Exhibit 28.

evidence that it indeed happened. Seventh, by failing to maintain the RPV and nozzles over an extended period, FirstEnergy's corporate managers has cost the company millions of dollars, injuring the interests of both shareholders and ratepayers. Collateral consequences also include the fatal undermining of public confidence that FirstEnergy will place public safety above its financial interests. Finally, civil remedies are inadequate to penalize FirstEnergy and its managers for their reckless disregard of the law and to deter similar conduct by others who hold the safety of the public in their hands. Having placed the general public in grave danger, FirstEnergy and its managers should be made to pay a criminal penalty, including loss of liberty.

An additional factor, not listed by the DOJ Corporate Prosecution Guidelines, should also be considered: the degree to which the NRC, which is now considering whether to recommend criminal sanctions against FirstEnergy and its managers, has compromised or undermined the vigor of its recommendation. As discussed above, the Inspector General found that in several significant respects, NRC management mishandled FirstEnergy's request for an extension of the December 31, 2001, shutdown deadline. The IG found that in granting the extension, the Director of the Office of Nuclear Reactor Regulation had not adequately understood or considered all of the information with which he had been presented, and also was unduly influenced by FirstEnergy's arguments regarding the financial costs FirstEnergy would incur if it shut down by December 2001.[30]

NRC Chairman Richard Meserve strenuously disputed the findings of the IG's Report, and defended the decision by the Director of NRR to extend the shutdown deadline.[31] One of the Chairman's claims is that the decision to allow FirstEnergy to operate past the December 2001 shutdown deadline was "unanimous" among the NRC Staff. Transcripts of interviews by the IG staff with members of NRC's technical staff show that this was not the case. In fact, the vote was 11 to 3. The three NRC Staff members who voted in favor of shutdown were technical staffers with combined decades of regulatory experience. Thus, having taken the unsupported position that the decision to extend the shutdown deadline was unanimous and reasonable, the NRC may have a vested interest in minimizing the significance of FirstEnergy's wrongdoing.

Conclusion

In response to questions from the NRC regarding a matter of the highest importance to the safety of operating the Davis-Besse nuclear power plant, *i.e.,* the condition of the reactor pressure vessel and associated piping, FirstEnergy's managers repeatedly submitted false information under oath. These FirstEnergy managers knew or should have known that the information was false, and that in fact they were operating Davis-Besse in violation of NRC regulations. As a result, FirstEnergy willfully placed the health and safety of members of the public in the surrounding area in grave danger. FirstEnergy's apparent motive for these false statements was to postpone an NRC-mandated shutdown until the next refueling outage, and thereby save money for the corporation.

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[30] Ironically, the NRC's Director of NRR will be one of the primary officials responsible for deciding to act upon any findings of wrong-doing by FirstEnergy and its employees by the NRC's Office of Investigations.

[31] Letter from Richard A. Meserve, Chairman, NRC, to Hubert T. Bell, Inspector General, NRC, re: Report on NRC's Regulation of Davis-Besse Regarding Damage to the Reactor Vessel Head (Case No. 02-03S), (January 8, 2003). A copy is provided as Exhibit 16.

To violate NRC safety requirements, threatening members of the public with loss of life and health, is a grave offense that warrants imposition of severe penalties, including imprisonment. While the NRC is studying whether to recommend criminal sanctions against FirstEnergy and its managers, the agency may be compromised by its own mismanagement of FirstEnergy's request for an extension of the shutdown deadline. Thus, its recommendation cannot be relied upon to show the necessary vigor required by Attorney General Ashcroft in pursuing corporate fraud. Therefore, the U.S. Attorney's office should undertake an independent inquiry into the appropriateness of criminal prosecution against FirstEnergy and its managers.

APPENDIX A: FALSE STATEMENTS BY FIRSTENERGY TO NRC

A. FirstEnergy gave false and incomplete information to the NRC regarding the accessibility of the RPV head for inspection and cleaning.

- ***9/4/01 Initial Response to Bulletin 2001-01:***

> "*Metal reflective insulation is used on the RPV head. A gap exists between the RPV head and the insulation, the minimum gap being at the dome center of the RPV head where it is approximately 2 inches, and does not impede a qualified visual inspection.*"[32]
>
> * * *
>
> "*As stated previously, a gap exists between the RPV head and the insulation, the minimum gap being at the dome center of the RPV head where it is approximately 2 inches, and does not impede visual inspection. The service structure envelopes the DBNPS RPV head and has 18 openings (weep holes) at the bottom through which inspections are performed. There are 69 CRDM nozzles that penetrate the RPV head. The metal reflective insulation is located above the head and does not interfere with the visual inspection. The visual inspection is performed by the use of a small camera. This camera is inserted through the weep holes.*"[33]

1. Background: In Bulletin 2001-01, the NRC raised the concern that effective inspections of the RPV head and CRDM nozzles would be impeded by the insulation that generally sits above the pressure vessel:

> The cracking identified at ONS2 and ONS3 reinforces the importance of conducting effective examinations of the RPV upper head area (e.g., visual under-the-insulation examinations of the penetrations for evidence of borated water leakage, or volumetric examinations of the CRDM nozzles), and using appropriate NDE methods (such as PT, UT, and eddy-current testing) to adequately characterize cracks. Because of plant-specific design characteristics, there is no uniform way to perform effective visual examinations of the RPV head at PWR facilities. Some plants have the head insulations sufficiently offset from the RPV head to permit an effective visual examination. Other plants have the insulation offset from the head but in a contour matching that of the head, requiring special tooling and procedures to perform an effective visual examination. Still other plants have insulation directly adjacent to or attached to the RPV head, potentially requiring the removal of the insulation to permit an effective visual examination.[34]

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[32] Letter from Guy G. Campbell, FirstEnergy, to U.S. Nuclear Regulatory Commission, re: Response to NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," Attachment 1 at 2 (September 4, 2001) (emphasis added) (hereinafter "9/4/01 Initial Response to Bulletin 2001-01"). A copy is provided as Exhibit 1.

[33] *Id.*

[34] NRC Bulletin 2001-01: Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles at 5 (August 3, 2001). A copy is provided as Exhibit 2.

Thus, Bulletin 2001-01 included a request that licensees provide "a description of any limitations (insulation or other impediments) to accessibility of the bare metal of the RPV head for visual inspections."[35]

A diagram of the RPV head at Davis-Besse, supplied by FirstEnergy as an attachment to its October 17, 2001, supplemental response to Bulletin 2001-01, shows that the 18-foot tall service structure that surrounds the RPV head and houses the CRDMs, poses two potentially significant impediments to visibility of the RPV head.[36]

First, the service structure contains a horizontal layer of metallic, reflective insulation that lies approximately two inches above the center of the RPV head. Although the dome of the RPV head curves down and away from the insulation, the two-inch clearance at the top of the head leaves little room to maneuver a camera.[37]

Second, the only way for a video camera to gain access to the RPV is through the 18 small "weep holes" or "mouse holes" in the side of the service structure.[38] The camera must be maneuvered remotely from these weep holes, making it difficult to photograph the entire RPV.

2. FirstEnergy did not disclose the fact that due to structural characteristics, only about half of the RPV head is visible during inspections. In responding to Bulletin 2001-01's request that it identify any limitations to accessibility of the bare metal RPV head, FirstEnergy failed to disclose characteristics of the service structure that impede visibility of about half of the RPV head.

These structural impediments were well known to FirstEnergy. A 1996 FirstEnergy internal report, PCAQ [Potential Condition Adverse to Quality] 96-0551, states that the extent of the 1996 inspection was limited to only 50-60% of the RPV head area because of restrictions imposed by the location and size of weep holes in the surrounding service structure.[39]

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[35] *Id.,* Attachment 1 at 11.

[36] Letter from L.W. Worley, FirstEnergy, to NRC, re: Supplemental Information in Response to NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," Attachment 4 at 41 (October 17, 2001) (hereinafter "10/17/01 Supplemental Response to Bulletin 2001-01"). This letter was submitted under oath. A copy is provided as Exhibit 3.

[37] *Id.*

[38] *Id.*

[39] While the PCAQR is not publicly available, it is summarized in a report by the NRC's Lessons Learned Task Force that was chartered to investigate the Davis-Besse debacle:

> *Only the periphery of the RPV head could be viewed in detail.* The center part of the RPV head could not be viewed close-up. With respect to the ability to observe the RPV head center, little could be observed because of obstructions. *As a reference, in PCAQ 96-0551, an engineer stated that the extent of inspection was limited to approximately 50-60 percent of the RPV head area because of restrictions imposed by the location and size of weep holes.*

Moreover, FirstEnergy's internal documents show that for more than ten years, FirstEnergy continually made and then postponed plans to make the modifications necessary to permit more complete inspections of the RPV head. By 2002, FirstEnergy was the only licensee that had not made these structural changes. The pattern of making and breaking plans to modify the service structure is documented in FirstEnergy Root Cause Analysis report of April 15, 2002.[40] As summarized in the Root Cause Analysis Report, in 1990 and again in 1994, FirstEnergy made plans to modify the service structure in order to make the RPV head more accessible for inspections:

> RFA [Request for Action] 90-0510 (March 19, 1990): "RFA noted an inspection of the reactor vessel head revealed several areas where boric acid has leaked down from the CRD flanges and accumulated on the head (PCAQR 90-0120). The head is carbon steel and is therefore susceptible to degradation from the boric acid. *The RFA requests Design prepare a modification package to install access holes in the service structure to allow cleaning and subsequent inspection.*"[41]
>
> MOD [Modification] 90-0012 (March 21, 1990): "MOD 90-0012 initiated to install multiple access ports with closure plates in the closure head *to permit cleaning and inspection of the reactor head.* Boric acid has leaked from the CRD flanges and has accumulated on the reactor head. The reactor head is carbon steel and therefore is subject to degradation." [42]
>
> MOD 94-0025 (May 27, 1994): "Initiated MOD 94-0025 to install service structure inspection openings. Reasons for the modification include ongoing industry concern involving corrosion of the Inconel 600 reactor vessel nozzles. *There is no access to the reactor vessel head or the CRDM reactor vessel nozzles without the installation of the modification. Inspection of the reactor vessel head for boric acid corrosion following an operating cycle is difficult and not always adequate. Video inspections of the head for the CRDM nozzle issue and as follow-up to the CRDM flange inspection do not encompass a 100% inspection of the vessel head. Cleaning of excessive boric acid residue from the reactor vessel head also does not encompass 100%.* Installation of these inspection openings would allow a thorough inspection and cleaning of the head. All B&W plants with the exception of Davis-Besse and ANO-1 have installed this modification.[43]

The changes proposed in these documents were not implemented, however. Instead, they were continually cancelled or postponed. MOD 90-0012 was cancelled on June 19, 1992; September

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Memorandum from Arthur T. Howell III, NRC, to William F. Kane, NRC, re: Degradation of the Davis-Besse Nuclear Power Station Reactor Pressure Vessel Head Lessons-Learned Report, Attachment at 50 (September 30, 2002) (emphasis added) (hereinafter "NRC Lessons Learned Report"). A copy is provided as Exhibit 4.

[40] FirstEnergy, Root Cause Analysis Report re: Significant Degradation of the Reactor Pressure Vessel Head (April 15, 2002) (hereinafter "4/15/02 Root Cause Analysis Report"). A copy is provided as Exhibit 5.

[41] *Id.* at 138 (emphasis added)

[42] *Id.* (emphasis added)

[43] *Id.* at 142 (emphasis added).

10, 1992; and September 27, 1993.[44] MOD 94-0025 was postponed on March 7, 1995; February 9, 1997; and September 1, 1998.[45] The September 1, 1998, postponement pushed the modification to the 13th refueling outage in 2002. Ironically, in putting off the modification, FirstEnergy noted that "[t]here is less than 50% accessibility to the reactor vessel head, which does not allow for complete inspection or cleaning of potential boric acid deposits."[46] The fact that the modification kept getting proposed and postponed showed that workers and managers at Davis-Besse had a continuing awareness of the inspection limitations, and also of the failures to remedy those limitations.

3. In its initial response to Bulletin 2001-01, FirstEnergy falsely told the NRC that the insulation did not impede inspection of the RPV head. Although FirstEnergy subsequently provided information showing this to be untrue, FirstEnergy did not correct its original false statement. Moreover, the supplemental information was incomplete. In its September 4, 2001, response to Bulletin 2001-01, FirstEnergy falsely stated that the insulation above the RPV head did not impede a visual inspection.[47] In its October 17, 2001, supplemental response, FirstEnergy disclosed that in fact, four CRDM nozzles at the very top of the RPV head were not visible to inspectors during the 1996 inspection.[48] In its October 30, 2001, supplemental response, FirstEnergy disclosed that the four nozzles were not visible due to the small size of the gap between the insulation and the head at the top of the head.[49] An attached table also contains the footnote:

> In 1996 during 10 RFO, 100% of the nozzles were inspected by visual examination. Since the video was void of head orientation narration, each specific nozzle view could not be correlated by nozzle number. *Nozzles 1, 2, 3, and 4 which do not have sufficient interference gap were excluded.*[50]

However, FirstEnergy did not explicitly correct the false representation in its initial response. To the contrary, FirstEnergy continued misleadingly to characterize RPV head inspections as covering the "whole head."[51] The company essentially recast rather than correct its misleading statements.

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[44] *Id.* at 140-41.

[45] *Id.* at 144.

[46] *Id.*

[47] The NRC has cited this false statement as an "apparent violation" of NRC regulations. Letter from John A. Grobe, NRC, to Lew W. Myers, FirstEnergy, re: Davis-Besse Nuclear Power station, NRC Augmented Inspection Team Follow-up Special Inspection Report No. 50-346/02-08, Report Details at 18 (December 2, 2002) (hereinafter "Inspection Report 02-08"). A copy of Inspection Report 02-08 is provided as Exhibit 6.

[48] *Id.,* Attachment 1 at 2.

[49] Letter from Guy G. Campbell, FirstEnergy, to NRC, re: Transmittal of Reactor Pressure Vessel Head Control Rod Drive Mechanism Nozzle Penetration Visual Examinations for the Davis-Besse Nuclear Power Station (October 30, 2001) (hereinafter "10/30/01 Supplemental Response to Bulletin 2001-01"). A copy is provided as Exhibit 7.

[50] *Id.,* Attachment 1 at 3 (emphasis added).

[51] *See* 10/17/01Supplemental Response to Bulletin 2001-01, Attachment 1 at 2; 10/30/01 Supplemental Response to Bulletin 2001-01 at 2; Letter from Guy G. Campbell, FirstEnergy, to NRC, re: Transmittal of Davis-Besse Nuclear Power Station Risk Assessment of Control Rod

FirstEnergy's internal documents show that it was well aware of the limitations imposed by the insulation above the RPV. While these documents are not publicly available, they are summarized in an NRC Inspection Report as follows:

> The response to Item 1.c on page 2 of 19 contained the statement that 'the minimum gap being at the dome center of the RPV head where it is approximately 2 inches, and does not impede a qualified visual inspection.' This is contradicted by statements in several PCAQRs, most notably 94-0295, which prompted the reintroduction of the service structure modification, and 96-0551, which clearly stated that inspection capability at the top of the head was limited. The limitation was caused by the restrictive access to the area through the service structure 'weep holes,' the curvature of the reactor pressure vessel head, and by the limited space to manipulate a camera due to the insulation that creates the two-inch gap.[52]

4. Significance of the misrepresentations: FirstEnergy's false statement and omissions of information were calculated to give the impression that the service structure impeded visibility of no more than four nozzles at the top of the RPV head. In fact, as the NRC later observed, the only part of the RPV head that could be seen with any clarity was the "periphery."[53] This significant limitation on the visibility of the RPV head was not due to boric acid accumulation, but simply to the structural relationship of the insulation and the service structure to the RPV head.

By failing to disclose the structural limitation on inspections of the RPV head, FirstEnergy gave the false impression that boric acid accumulation was the only phenomenon that would prevent inspection of the head and CRDM nozzles. This in turn would have given the NRC a false sense of confidence in the inspections.

B. FirstEnergy falsely told the NRC that the RPV head had been inspected and cleaned in 1996 as follows:

- ***10/17/01 Supplemental Response to Bulletin 2001-01s:***

> "*In May 1996, during a refueling outage, the RPV head was inspected. No leakage was identified, and these results have been recently verified by a re-review of the video tapes obtained from that inspection. The RPV head was mechanically cleaned at the end of the outage.*"[54]
>
> "*The inspections performed during the 10th, 11th, and 12th Refueling Outages (10RFO, conducted April 8 to June 2, 1996; 11RFO, conducted April 10, to May*

Drive Mechanism Nozzle Cracks, Attachment 1 at 1-2 (November 1, 2001) (hereinafter "11/01/01 Supplemental Response to Bulletin 2001-01"). A copy is provided as Exhibit 8. Like the other supplemental bulletin responses, the November 1, 2001, letter was submitted under oath.

[52] NRC Inspection Report 02-08, Report Details at 18.

[53] NRC Lessons Learned Report at 50.

[54] *Id.* at 1. The same statement is repeated in Attachment 1 at page 1.

23, 1998; and 12RFO, conducted April 1 to May 18, 2000) consisted of a whole head visual inspection of the RPV head in accordance with the DBNP Boric Acid Control Program pursuant to Generic Letter 88-05, 'Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants.' The visual inspections were conducted by remote camera and included below insulation inspections of the RPV bare head such that the Control Rod Drive mechanism (CRDM) nozzle penetrations were viewed. During 10RFO, 65 of 69 nozzles were viewed . . ."[55]

- ***11/01/01 Supplemental Response to Bulletin 2001-01:***

"*During 10RFO, in the spring of 1996, the entire head was visible so 100% of the CRDM nozzles were inspected with the exception of four nozzles in the center of the head.*"[56]

1. Background: Bulletin 2001-01 asked licensees to provide "a description of the VHP nozzle and RPV head inspections (type, scope, qualification requirements, and acceptance criteria)" that had been performed for the last four years, i.e., 1997-2001.[57] In its initial response, FirstEnergy supplied information only about RPV inspections conducted in 1998 and 2000. However, in subsequent supplemental responses, FirstEnergy supplied information about the 1996 inspection.

2. FirstEnergy does not have a record of a 1996 "whole head" inspection, or that the head was cleaned. FirstEnergy's claim to have inspected the RPV head and 65 of the 69 CRDM nozzles in 1996 is contradicted by FirstEnergy's own internal written record of the 1996 inspection. Moreover, the videotape on which FirstEnergy relied does not support FirstEnergy's representation regarding the comprehensiveness of the inspection.[58] Finally, contrary to FirstEnergy's representation, cleaning of the head in 1996 was not completed.

a. No written record exists of a comprehensive inspection in 1996.

The only written record that FirstEnergy seems to have of the 1996 inspection consists of PAQC [Potential Condition Adverse to Quality] 96-0551. Although this document has not been made publicly available, its content is summarized in the NRC's "Lessons Learned" task force report as follows:

> The licensee allowed accumulation of boric acid to remain on the RPV head even though Procedure NG-EN-00324 directed their removal. For example, boric acid accumulation was documented in PCAQ 1996-0551 during RFO 10. This PCAQ identified rust or brown boric acid deposits at VHP Nozzle 67 and rust or brown boric acid deposit accumulation in the general vicinity. *The PCAQ stated that all boric acid was not*

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[55] *Id.,* Attachment 1 at 2.

[56] 11/01/01 Supplemental Response to Bulletin 2001-01, Attachment 1 at 1-2.

[57] Bulletin 2001-01 at 11.

[58] As discussed above in Section B, FirstEnergy's statement that only 4 of the 69 nozzles could be inspected also contradicts the statement in its 9/4/01 Response to Bulletin 2001-01 that the RPV head insulation does not interfere with inspections of the head.

> *removed from the RPV head and that it was difficult to distinguish whether the deposits were from the CRDM flanges or the leak was from a CRDM nozzle (i.e., a VHP nozzle). The evaluation of boric acid corrosion was focused on the boric acid that was identified at VHP Nozzle 67 (near the RPV head periphery). However, the PCAQ discussed that only 50-60 percent of the RPV head area could be inspected and the extent of any corrosion in the remaining area could not be assessed. The area that could not be inspected for corrosion was the center part of the RPV head, which had boric acid accumulation remaining*.[59]

Thus, the written record shows that (a) only about half the RPV head was inspected in 1996, (b) the head was not cleaned, and (c) it was not possible to rule out leakage from CRDM nozzle cracks.

b. Videotape record is poor. The Lessons Learned Task Force also reported on significant shortcomings in the videotape records, on which FirstEnergy relied heavily for its representations regarding the quality of its inspections in RFOs 10 (1996), 11 (1998), and 12 (2000). These videotapes have not been provided to the public for review. However, the Lessons Learned Task Force provides the following description of the videotapes:

> A review of the RPV head inspection and cleaning videotapes associated with RFO 10, 11, and 12 revealed multiple issues involving the adequacy of the inspections, as well as the nature and extent of boric acid deposits on the RPV head. In general, the following observations pertained to all the reviewed videotapes:
>
> - There appeared to be a lack of distinguishable reference points to orient personnel performing inspections, such that specific locations could not be determined. … On the basis of the audio discussions, there were a number of instances in which the personnel performing the inspection were uncertain about the orientation of the camera and the actual nozzle being viewed.
>
> - Only the periphery of the RPV head could be viewed in detail. The center part of the RPV head could not be viewed close-up. …As a reference, in PCAQ 96-0551, an engineer stated that the extent of inspection was limited to approximately 50-60 percent of the RPV head area because of restrictions imposed by the location and size of weep holes.[60]

FirstEnergy's inability to correlate specific CRDM nozzles with the videotape is further demonstrated by a table submitted as an attachment to FirstEnergy's 10/17/01 Supplemental Response to Bulletin 2001-01.[61] In the table, FirstEnergy purports to provide "inspection results" for the 1996, 1998, and 2000 inspections.[62] For each CRDM nozzle, its number, location in relation to the core, and quadrant on the RPV head are listed in the three left-hand

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[59] Lessons Learned Report at 52 (emphasis added).

[60] *Id.* at 50.

[61] 10/17/01 Supplemental Response to Bulletin 2001-01, Attachment 2. *See* Exhibit 3.

[62] The videotapes and photos of RPV head inspections during the 10th, 11th, and 12th refueling outages are not publicly available. Therefore, UCS must rely on descriptions provided in FirstEnergy and NRC documents.

columns. In the three right-hand columns, space is provided for "inspection results" from 1996, 1998, and 2000. For 1996, the inspection results column is completely blank. A footnote explains that:

> In 1996 during 10 RFO, the entire RPV head was inspected. Since the video was void [sic] of head orientation narration, each specific nozzle view could not be correlated."[63]

Thus, because FirstEnergy could not correlate the videotape with specific nozzles, its managers had no basis for asserting that 65 out of 69 CRDM nozzles were inspected in 1996.

c. Cleaning of the RPV head was not completed. The only contemporaneous document that is available regarding the 1996 inspection, PCAQ 96-0551, stated that the RPV head was not fully cleaned after the 10th refueling outage. Although the area around nozzle 67 (near the periphery of the RPV head) was cleaned, "there were still some boric acid deposits remaining at nozzles closer to the center of the RPV head."[64] Thus, FirstEnergy's representation that the RPV head was cleaned was false.

3. Significance of misrepresentations: FirstEnergy's misrepresentations regarding the extent of the 1996 inspection and cleaning of the RPV head and CRDM nozzles is significant, for several reasons.

While FirstEnergy's representations regarding the 1998 and 2000 inspections grossly overstate their completeness, the 1996 inspection is the only RPV inspection which FirstEnergy explicitly claimed to be comprehensive.

FirstEnergy used 1996 as a baseline for a "Risk Assessment" that predicted a very low likelihood of CRDM cracking.[65] FirstEnergy submitted the Risk Assessment to NRC on November 1, 2001, in support of its bid to extend the deadline for inspecting the reactor vessel. A key assumption of the Risk Assessment was that "[d]uring 10RFO, in spring of 1996, the entire head was visible so 100% of the CRDM nozzles were inspected with the exception of four nozzles in the center of the head."[66] Because no CRDM cracking was reported as a result of the allegedly comprehensive 1996 inspection, the Risk Analysis asserted that the appearance of a through-wall crack just after the 1996 inspection would constitute the "worst-case time for an axial crack to reach a through-wall condition."[67] Based upon findings of the B&W Owners Group ("B&WOG") that the minimum time for a crack to propagate completely through the wall of a CRDM nozzle was 6 years, FirstEnergy asserted that the worst-case allowable crack size could not be expected until 2003.[68]

The allegedly complete 1996 inspection was also apparently used by NRC to justify allowing FirstEnergy to operate beyond the December 31, 2001 deadline without inspecting the RPV head

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[63] *Id.,* Attachment at 3rd page.

[64] NRC Lessons Learned Report at 51.

[65] 11/1/01 Supplemental Response to Bulletin 2001-01, Attachment 1 at 1-2.

[66] *Id.*

[67] *Id.*

[68] 10/17/01 Supplemental Response to Bulletin 2001-01 at 2. See also 10/11/01 meeting handouts at page 7: "It is conservatively assumed that for these penetrations, an axial through weld flaw occurs immediately upon startup from 10 RFO (May 1996).

and CRDM nozzles. In a December 3, 2002, document that provided a *post hoc* rationale for the extension decision, the NRC concluded that the 1996 inspection "was a fairly complete visual inspection of the RPV head."[69]

C. FirstEnergy falsely told the NRC that the RPV head and CRDM nozzles had been inspected in 1998 and 2000, and that the head was cleaned both times.

- ***9/4/01 Initial response to Bulletin 2001-01:***

  "*The DBNPS has performed two inspections within the past four years, during the 11th Refueling Outage (RFO) in April 1998 and during the 12th RFO in April 2000. The scope of the visual inspection was to inspect the bare metal RPV head area that was accessible through the weep holes to identify any boric acid leaks/deposits.*"[70]

  In 1998: "*The visual inspection showed an uneven layer of boric acid deposits scattered over the head. There were some lumps of boron, with the color varying from brown to white. The outside diameter of the CRDM tubes showed white streaks, providing evidence of downward flow and attributable to CRDM flange leakage. The head was cleaned by use of a manual scrubber and vacuum through the weepholes. The head was videotaped after cleaning.*"[71]

  In 2000: "*Inspection of the RPV head/nozzle area indicated some accumulation of boric acid deposits. The boric acid deposits were located beneath the leaking flanges with clear evidence of downward flow. No visible evidence of nozzle leakage was detected. The RPV head area was cleaned with demineralized water to the greatest extent possible while maintaining the principles of As-Low-As-Reasonably-Achievable (ALARA) regarding the dose. Subsequent video inspection of the cleaned RPV head areas and nozzles was performed for future reference.*"[72]

- **Viewgraphs presented at October 11, 2001, meeting between FirstEnergy and NRC Staff**:

  "*Conducted and recorded video inspections of the head during 11 RFO (April 1998) and 12 RFO (April 2000)*"[73]

  "*No head penetration leakage was identified.*"[74]

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[69] Letter from John A. Zwolinski, NRC, to Lew W. Myers, FirstEnergy, re: Davis-Besse Nuclear Power Station, Unit No. 1 – Response to Nuclear Regulatory Commission (NRC) Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles (TAC No. MB2626) (December 3, 2002) (hereinafter "12/03/02 NRC Letter re Decision Rationale"). A copy is provided as Exhibit 9.

[70] 9/4/01 Response to Bulletin 2001-01, response to question 1.d.

[71] *Id.*

[72] *Id.*

[73] Viewgraphs presented by FirstEnergy at October 11, 2001, meeting with NRC Staff, page 6. A copy is provided as Exhibit 10.

"*Facts: All CRDM penetrations were verified to be free from 'popcorn' type boron deposits using video recordings from 11 RFO or 12 RFO.*"[75]

- ***10/17/01 Supplemental Response to Bulletin 2001-01 and 10/30/01 Supplemental Response to Bulletin 2001-01:***

  ". . . [D]*uring 11RFO, 50 of 69 nozzles were viewed, and during 12RFO, 45 of 69 nozzles were viewed. It should be noted that 19 of the obscured nozzles in 12RFO were also those obscured in 11RFO. Following 11 RFO, the RPV head was mechanically cleaned in localized areas as limited by the service structure design. Following 12RFO, the RPV head was cleaned with demineralized water to the extent possible to provide a clean head for evaluating future inspection results.*

  The affected areas of accumulated boric acid crystal deposits were video taped, and have subsequently been reviewed with specific focus on boric acid crystal deposits with reference to the CRDM nozzle penetration leakage as previously observed at the Oconee Nuclear Station, Unit 3 (ONS-3) and at Arkansas Nuclear On, Unit 1 (ANO-1). During the 12 RFO inspection, 24 of the 69 nozzles were obscured by boric acid crystal deposits that were clearly attributable to leaking motor tube flanges from the center CRDMs. A further subsequent review of the video tapes has been conducted and corroborates the previous statements and conclusions stated in letter Serial Number 2731 [9/4/01 Response to Bulletin 2001-01] that the results of this review did not identify any boric acid crystal deposits that would have been attributed to leakage from the CRDM nozzle penetrations, but were indicative of CRDM flange leakage. Included as Attachments 2 and 3 are the inspection results for 10RFO, 11RFO, and 12RFO, and a figure representing these nozzle locations, respectively."[76]

- ***Handouts for October 24, 2001, meeting between FirstEnergy and NRC Staff*:**

  "*DBNPS's evaluation is based on our visual inspections performed in 10, 11, and 12 RFO (May 1996, April 1998, and April 2000 respectively)*

  The inspection results afford us assurance that all but 4 nozzle penetrations were inspected in 1996. All but 19 penetrations were inspected in 1998. And all but 24 penetrations were inspected in 2000."[77]

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[74] *Id.*

[75] *Id.* at 7.

[76] 10/17/01 Supplemental Response to Bulletin 2001-01, Attachment at 2-3; 10/30/01 Supplemental Response to Bulletin 2001-01 at 2.

[77] FirstEnergy's handouts from 10/24/01 meeting with NRC Staff at page 7. The same statements were also made in handouts distributed by FirstEnergy at meetings with the NRC on November 14, 2001 (page 10) and November 28, 2001 (page 4). Copies of these handouts are provided as Exhibits 12, 13 and 14, respectively.

* * *

"*Clearly, operating to March 2002 is acceptable given that we have analyzed conservatively at each step of our evaluation.*"[78]

* * *

"*Facts: All CRDM penetrations were verified to be free from 'popcorn' type boron deposits using video records from 10 RFO, 11 RFO or 12RFO.*

***** *A review of visual recordings as well as eye-witness accounts served as the means of the inspection.*

* *The original VHS format was transferred to .avi file format to allow a frame by frame review.*"[79]

- ***11/01/01 Supplemental Response to Bulletin 2001-01:***

  "*During subsequent outages in 1998 and 2000 a number of nozzles could not be inspected due to boron leakage. Based on review of the 1998 and 2000 videotapes it was determined that 45 CRDMs were inspected in 2000 (12 RFO) and 50 in 1998 (11 RFO).*"[80]

- ***Handouts from November 14, 2001, briefing by FirstEnergy of NRC Commissioners' technical staff:***

  "*Davis-Besse believes that the 1998 and 2000 inspections provide a reasonable level of assurance for nozzles without masking boron deposits.*"[81]

- ***Handouts from November 28, 2001, meeting between FirstEnergy and NRC Staff:***

  "*Inspection Information – Davis-Besse inspections do not indicate evidence [sic] a nozzle leaks*[82]

  * * *

  Davis-Besse Specific Features and Actions:

  * *Record of inspection from last three outages*[83]

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78 *Id.* at 8.
79 *Id.* at 9.
80 11/01/01 Supplemental Response to Bulletin 2001-01, Attachment 1 at 2.
81 Handouts from 11/14/01 meeting between FirstEnergy and NRC Staff, page 5.
82 *Id.* at 18.
83 *Id.* at 21.

1. FirstEnergy misrepresented completeness of inspection and cleaning of the RPV head and nozzles, and falsely claimed it had kept records. The statements quoted above are false in a number of important respects.

(a) FirstEnergy claimed to have inspected the "bare metal" of the RPV that was accessible through the weep holes. However, as discussed above in Section C, contemporaneous internal Davis-Besse documents show that the RPV head was not completely cleaned after the 1996 refueling outage.

(b) FirstEnergy claimed that the videotapes give it "assurance" that all but 19 nozzles were inspected in 1998 and all but 24 nozzles were inspected in 2000. As discussed above in Section A.2**,** in 1996, only 50-60% of the RPV head could be inspected in 1996. The inspections only got more difficult in 1998 and 2000. At best, only 35 to 40 of the nozzles were visible in 1996, 1998, or 2000. Moreover, as discussed in paragraph (e) below, the videotape record of the inspections was poor.

(c) FirstEnergy claimed that the head was cleaned after the 11th RFO in 1998 and the 12th RFO in 2000. However, contemporaneous internal documents show that the head was not fully cleaned on either occasion.[84]

(d) FirstEnergy claims that the 1998 and 2000 inspections provide a reasonable level of assurance against leaking nozzles; and that all CRDM penetrations were verified to be free from "popcorn" type boron deposits using video recordings from 11 RFO or 12 RFO. Similarly, in the 11/14/01 briefing of the NRC Commissioners' technical staff, FirstEnergy managers claimed that the 1998 and 2000 inspections provided a reasonable level of assurance for nozzles "without masking boron deposits." However, contemporaneous internal documents show that boric acid leaking from CRDM nozzles had not been cleaned.[85] Thus, boric acid accumulation on the CRDM nozzles masked evidence of CRDM leakage from cracks in the nozzles, and thereby prevented any meaningful evaluation of whether there was leakage from cracks in the nozzles.[86]

(e) FirstEnergy claims to have a "record" of the inspections done in 1998 and 2000. As discussed above in Section C.2.b, however, the quality of the videotapes of all of the inspections was too poor to support any conclusions. The quality of the videotapes of the 1998 and 2000 was even worse than the videotape of the 1996 inspection. As described by the NRC Lessons Learned Task Force:

> The RFO 11 (1998) as-found videotape provided the least amount of actual RPV head coverage. The video camera appeared to be angled upward toward the insulation rather than on the RPV head surface. There was no video record of views of the center of the

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[84] 4/15/02 Root Cause Analysis Report at 29-30.

[85] Davis-Besse had a lengthy history of boric acid leaking from the CRDM flanges and dropping onto the reactor vessel head. FirstEnergy had committed to the NRC to clean up all boric acid and examine the underlying metal surfaces for signs of damage. By failing to honor this regulatory commitment, FirstEnergy was unable to determine if the boric acid fell down from leaking CRDM flanges or percolated up from leaking CRDM nozzles – precisely the objective of the inspections the company avoided. See 2/8/90 NRC Letter (Exhibit 19) Attachment at 4.

[86] 4/15/02 Root Cause Analysis Report at 29-30.

RPV head. There were areas which showed boric acid deposit build-up near some nozzles; however, the audio discussion indicated that the inspection was completed without any reference to the boric acid deposit accumulation. A high percentage of the boric acid deposits had a red-brown color as compared to RFO 10.[87] In the cleaning videotape, more of the center portion of the RPV head could be seen, with larger quantities of boric acid deposits remaining. Vacuuming was effective in removing boric acid deposits near the periphery, but there was some tightly adhered boric acid deposits which the vacuum could not remove even in these locations.

Analysis of the RFO 12 (2000) audio commentary for the as-found inspection videotape revealed that some of the individuals performing the inspection were astonished by the large quantities of boric acid deposits discovered on the RPV head (e.g., 'mountains," 'piles,' and 'cloud' of boron). At locations closer to the center of the RPV head, the boric acid accumulations concluded the gap between the top of the RPV head and the thermal insulation. The amount of red/brown boric acid deposits were considerably greater in RFO 12 than the amount observed in RFO 11. These boric acid deposits prevented the inspection of some nozzles because the deposits blocked the path of the video camera. During the inspection, there were instances in which the video camera became lodged in deposits. In one instance, when the video camera was dislodged from a boric acid deposit, residue fell out of a weep hole.[88]

(f) In its handouts for the November 28, 2001, meeting with the NRC, FirstEnergy claimed to have "analyzed conservatively." There is nothing conservative about an analysis that is based on inspection results that are fabricated.

D. FirstEnergy falsely told the NRC it followed established procedures for inspecting the RPV head.

- ***9/04/01 Initial Response to Bulletin 2001-01:***

  "Inspections of the RPV head are performed with the RPV head insulation installed in accordance with DBNPS procedure NG-EN-00342, "Boric Acid Corrosion Control Program, which was developed in response to Generic Letter 88-05."[89]

- ***10/17/01 Supplemental Response to Bulletin 2001-01:***

  "The inspections performed during the 10th, 11th, and 12th Refueling Outages (10RFO, conducted April 8 to June 2, 1996; 11RFO, conducted April 10, to May 23, 1998; and 12RFO, conducted April 1 to May 18, 2000) consisted of a whole head visual inspection of the RPV head in accordance with the DBNP Boric Acid

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[87] As FirstEnergy had learned from a boric acid corrosion problem in 1998, red-brown boric acid was indicative of corrosion – not the white boric acid crystals the company routinely found from leaking CRDM flanges. NRC Lessons Learned Report at 58.

[88] *Id.* at 52.

[89] 9/4/01 Response to Bulletin 2001-01, Attachment 1 at 2.

> Control Program pursuant to Generic Letter 88-05, 'Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants.' The visual inspections were conducted by remote camera and included below insulation inspections of the RPV bare head such that the Control Rod Drive mechanism (CRDM) nozzle penetrations were viewed."[90]

1. Background: FirstEnergy's claim to follow established procedures for inspecting the RPV head and the CRDM nozzles had its origins in the response provided by FirstEnergy's predecessor, Toledo Edison, to NRC Generic Letter 88-05. The NRC issued this letter in 1988, for the purpose of requesting information from PWR licensees regarding their programs for detecting boric acid degradation of reactor parts containing low-carbon alloy steel.[91] The letter cited a number of incidents in which reactor coolant leakage had caused boric acid corrosion of low alloy carbon steel components in the reactor coolant pressure boundary, and concluded that: "boric acid leaking potentially affecting the integrity of the reactor coolant pressure boundary should be procedurally controlled to ensure compliance with the licensing basis."[92] Therefore, the NRC requested each licensee to:

> Provide assurances that a program has been implemented consisting of systematic measures to ensure that boric acid corrosion does not lead to degradation of the assurance that the reactor coolant pressure boundary will have an extremely low probability of abnormal leakage, rapidly propagating failure, or gross rupture.[93]

The letter specified that the program should (1) determine the "principal locations" of small leaks, (2) provide procedures for locating small leaks and the leakage paths, (3) methods for examining and evaluating the impact of leakage on the reactor coolant pressure boundary when leakage is located, and (4) corrective actions to prevent recurrence.[94]

Toledo Edison submitted a response that identified several existing plant procedures that purportedly would satisfy the NRC's requirements.[95] These procedures included a "Plant Shutdown Procedure" calling for a "general walkdown of containment."[96] The procedures also called for visual inspection of Class 1, 2, and 3 components during a pressure test.[97] The

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[90] 10/17/01 Supplemental Response to Bulletin 2001-01, Attachment 4 at 41.

[91] Generic Letter 88-05, Boric Acid Corrosion of Carbon Steel Reactor pressure Boundary Components in PWR Plants (Generic Letter 88-05) (March 17, 1988). A copy is provided as Exhibit 15.

[92] *Id.*

[93] *Id.* at 2.

[94] *Id.* at 2-3.

[95] Letter from Donald C. Shelton, Toledo Edison, to U.S. NRC, re: Response to Generic Letter 88-05, Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants, dated March 17, 1988 (May 27, 1988). This letter was submitted under oath. A copy is provided as Exhibit 17.

[96] *Id.* at 2.

[97] The procedure incorporated ST5066.00, ASME Section XI Inservice Pressure Tests, which is used to verify the integrity of Class 1, 2, and 3 system components in accordance with Technical Specification 4.0.5a.2, ASME Section XII, 1977, Rules for Inservice Inspection of Nuclear Power Plant Components, Summer 1978 Addenda. Class 1, 2, and 3 system components include the reactor vessel and CRDM nozzles.

examination includes looking for discoloration which would indicate boric acid accumulation. Actions to be taken in the event boric acid residue is identified include: locating the source of leakage; determining the extent of degradation, if any; and repairing as required.[98]

The following year, Toledo Edison supplemented its response, committing to integrate and "enhance" these procedures in a new Boric Acid Corrosion Program that would be submitted later in the year. [99]

In February of 1990, the NRC conducted an audit of the Boric Acid Control program and found it acceptable.[100] An NRC "Trip Report" summarizes the contents of the Boric Acid Control program as including:

- a list of "principal leak locations" that are "most likely to case degradation of the primary pressure boundary by boric acid corrosion." These locations include CRDM flanges and the Reactor Vessel head gaskets.[101] While CRDM nozzles are not specifically listed, the procedure notes that: "[a]ll areas and components within the primary pressure boundary are capable of developing coolant leaks."[102]

- provision for "routine inspections for reactor coolant leaks;" that personnel checking for leaks must be "qualified to a V-2 criteria" and "familiar with the test boundaries to be visually examined."[103]

- a requirement for documentation of inspections and identified leakages on "VT-2" Examination Reports.[104]

The NRC found that these inspection procedures, "coupled with the training/certifications of inspectors comply with the intent of the generic letter." [105]

The NRC also reviewed a new procedure that had been developed for the Boric Acid Control Program, NG-EN-00324. NG-EN-00324 specifies steps to be taken *after* boric acid leakage is discovered. The procedures require that the licensee determine and document the size of the leak, amount of boric acid residue present, components affected, visible damage to the affected area, immediate safety concerns, leak path(s), identification of insulation or other interference which

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98 *Id.*

99 Letter from Donald C. Shelton, Toledo Edison, to U.S. NRC, re: Revised Response to Generic Letter 88-05, Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in Pressurized Water Reactor (PWR) Plants (TAC Number 68915) (June 26, 1989). A copy is provided as Exhibit 18.

100 Letter from Thomas V. Wambach, NRC, to Donald C. Shelton, Toledo Edison, re: Prevention of Boric Acid Corrosion at Davis-Besse Nuclear Power Plant (Generic Letter 88-05), (TAC No. 68915) (February 8, 1990) (hereinafter "2/8/90 NRC letter"). A copy is provided as Exhibit 19.

101 2/8/90 NRC Letter, attached Trip Report at 2.

102 *Id.*

103 *Id.* at 3.

104 *Id.*

105 *Id.*

must be removed to gain access to the leak, preliminary preparations necessary for subsequent inspections, temperature of affected components, and boric acid concentration in the reactor coolant. [106]

Based on the magnitude of the leak and extent of damage to the affected area, NG-EN-00324 requires Systems Engineering to write a Potential Condition Adverse to Quality (PCAQ) Report or a Work Request. [107]

The procedures also require that if boric acid is present, Systems Engineering must contact Radiological Controls for cleanup of the affected area, and also determine "whether additional inspections of the leak are necessary to fully assess the component damage and determine possible corrective action . . ." [108]

In 1993, on behalf of Toledo Edison and other B&W PWR licensees, the B&W Owners' Group ("BWOG") submitted a document to the NRC entitled "Safety Evaluation for B&W-Design Reactor Vessel Head CRD Mechanism Nozzle Cracking."[109] In a section entitled "B&WOG Utilities' Inspections," the Safety Evaluation stated that:

> The B&WOG Utilities have developed plans to visually inspect the CRDM nozzle area to determine if through-wall cracking has occurred. At each of the B&WOG Utilities' plants, a walkdown inspection of the RV head has been implemented in response to NRC Generic Letter 88-05. As mentioned earlier, CRDM gaskets have been known to leak; thus, the walkdown inspection includes visual inspection of the gasket area during every outage (12-24 months). *Enhanced visual inspection of the CRDM nozzle areas has also been incorporated. If any leak or boric acid crystal deposits are located during inspection of the RV head area, an evaluation of the source of the leak and the extent of any wastage will be completed.*[110]

The B&WOG Safety Evaluation concluded that it would take a minimum of six years before nozzle cracking propagated through the nozzle wall. It also concluded that corrosive wastage in the vicinity of the RPV head would not affect safe operation for at least six years. Both of these conclusions were based on the assumption that boric acid deposition would be detectable by "current GL 88-05 inspections."[111]

On November 19, 1993, the NRC Staff issued a Safety Evaluation for Potential Reactor Vessel Head Adaptor Tube Cracking, which concluded that there was no immediate safety concern for cracking of CRDM penetrations.[112] Like the B&WOG, the Staff relied in part for this conclusion

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106 *Id.* at 4.
107 *Id.*
108 *Id.* at 5.
109 BAW-10190 (June 1993). A copy is provided as Exhibit 20.
110 *Id.* at 40 (emphasis added). The term "enhanced inspections" is not defined in the Safety Evaluation.
111 *Id.* at 45-46. The B&WOG repeated the same conclusions in a revised version of the Safety Evaluation that was issued on December 14, 1993. BAW-10190P, Addendum 1.
112 Letter from William T. Russel, NRC, to William Rasin, Nuclear Management and and Resources Council, (November 19, 1993). A copy is provided as Exhibit 30**.**

on the assumption that visual inspection activities specified in response to Generic Letter 88-05 would detect damage to the RPV head before it became significant.[113]

On April 7, 1997, the NRC issued Generic Letter 97-01, Degradation of CRDM/CEDM Nozzle and other Vessel Closure Head Penetrations. The letter requested licensees to describe their programs for ensuring the timely inspection of PWR CRDM and other RPV head penetrations. In July of 1997, the B&WOG issued a response, which reiterated the conclusion of the B&WOG Safety Evaluation that "enhanced visual inspections," conducted in accordance with Generic Letter 88-05 responses, would provide for detection of nozzle cracking and RPV corrosion before they became serious.[114] By letter dated July 28, 1997, Toledo Edison responded to Generic Letter 97-01, by endorsing BAW-2301.[115]

Thus, in the 1990's, the NRC did not require improvements to the inspection regime for the RPV head at Davis-Besse or other PWRs, relying upon representations by the B&WOG, as endorsed by Toledo Edison and other PWR licensees, that licensees were conducting regular and adequate inspections of the RPV head, according to procedures specified in response to Generic Letter 88-05.

2. Failure to Adopt or Follow Procedures: Contrary to FirstEnergy's representations, procedures for inspection of the RPV head and CRDM nozzles were never specifically adopted or uniformly applied. The FirstEnergy managers who falsely represented to the NRC that the head inspections were carried out according to plant procedures had access to internal documents showing this to be untrue.

(a) Procedures not adopted. FirstEnergy's internal documents show that neither Toledo Edison nor FirstEnergy ever explicitly adopted the procedures in the Boric Acid Control program for inspection or cleaning of the RPV head or the CRDM nozzles. Neither FirstEnergy nor Toledo Edison ever listed CRDM nozzles or the RPV head as potential leakage areas, which would have ensured their inspection under the Boric Acid Control program.[116] The 4/15/02 Root Cause Analysis Report states that: "[t]he RPV head has not been specifically included in the Boric Acid Corrosion Control program."[117] This contradicts the representations in B&WOG's 1993 Safety Evaluation (which was later endorsed by Toledo Edison), that all licensees had included inspections of the RPV head and CRDM nozzles in their boric acid corrosion control programs.

(b) Procedures not followed. As summarized in the 4/15/01 Root Cause Analysis Report, as well as a Root Cause Analysis Report prepared by FirstEnergy for management issues

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113 *Id.*

114 BAW-2301, B&WOG Integrated Response to Generic Letter 97-01: Degradation of Control Rod Drive Mechanism Nozzle and other Vessel Closure Head Penetrations. A copy is provided as Exhibit 22.

115 Letter from John K. Wood, Centerior Energy, to NRC, re: Response to Generic Letter 97-01, Degradation of Control Rod Drive Mechanism Nozzle and Other Vessel Closure Head Penetrations (July 28, 1997) (hereinafter "GL 97-01 Response"). A copy is provided as Exhibit 29.

116 4/15/02 Root Cause Analysis Report at 43.

117 *Id.* at 45.

in August of 2002[118], the Boric Acid Control Program was not systematically applied to inspect or clean the RPV head:

- During the refueling outage that directly followed issuance of the B&WOG Safety Evaluation (RFO 9 in 1994), there is no documentation of any inspection of either the RPV head or the CRDM nozzles.[119]
- According to the 4/15/02 Root Cause Analysis Report, the "weep hold video inspection" that was conducted during RFO 10 in 1996 was not done under the Boric Acid Control program.[120]
- During each RFO between 1996 and 2000 (RFOs 10, 11, and 12), the licensee found boric acid on the RPV head at Davis-Besse.[121] Yet, in no case did the licensee follow the procedures of the Boric Acid Corrosion Control program, which required it to remove the boric acid and re-examine the RPV for the effects of leakage.
- According to the 8/13/2002 Root Cause Analysis Report, the engineers who conducted the inspections in 1996 and 1998 were not trained in the procedures of the Boric Acid Control program.[122]

3. Significance of the misrepresentation: By falsely stating that the RPV head and CRDM nozzles were inspected according to plant procedures, FirstEnergy gave the misleading impression that the inspections were systematic and complete, that the workers who conducted the inspections were competent and trained, and that the inspections were documented. Had the agency known that FirstEnergy had neither adopted nor applied its Boric Acid Control program procedures to inspections of the RPV head and CRDM nozzles, there would have been no basis to allow FirstEnergy to operate past the December 31, 2001 deadline established in Bulletin 2001-01.

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[118] FirstEnergy, Root Cause Analysis Report re: Failure to Identify Significant Degradation of the Reactor Pressure Vessel Head (August 13, 2002) (hereinafter "8/13/02 Root Cause Analysis Report"). A copy is provided as Exhibit 23.

[119] *See* 4/15/02 Root Cause Analysis Report at 142.

[120] 4/15/02 Root Cause Analysis Report at 143, 159.

[121] 4/15/02 Root Cause Analysis Report at 28-30.

[122] *Id.* at 31.

APPENDIX B: LISTING OF FIRSTENERGY CORPORATE OFFICIALS' CORRESPONDENCE, HANDOUTS AND VIEWGRAPHS IN WHICH FALSE REPRESENTATIONS WERE MADE

Document, viewgraph or handout	Signatory or presenter
Letter from Guy G. Campbell, FirstEnergy, to U.S. Nuclear Regulatory Commission, re: Response to NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles" (September 4, 2001)	Guy C. Campbell (Vice President)
Handouts or viewgraphs presented at briefing of NRC Commissioners' technical assistants (October 11, 2001)	Guy G. Campbell Steve P. Moffitt (Director of Technical Services) David C. Geisen (Manager of Design Basis Engineering) David H. Lockwood (Manager of Regulatory Affairs)
Letter from L.W. Worley, FirstEnergy, to NRC, re: Supplemental Information in Response to NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles" (October 17, 2001)	L.W. Worley (Director of Support Services)
Letter from Guy G. Campbell, FirstEnergy, to NRC, re: Transmittal of Reactor Pressure Vessel Head Control Rod Drive Mechanism Nozzle Penetration Visual Examinations for the Davis-Besse Nuclear Power Station (October 30, 2001)	Guy C. Campbell
Handouts or viewgraphs from meeting with NRC Staff (October 24, 2001)	Steven Moffitt David Geisen David Lockwood Kendall Byrd Gerald Wolf Mike Dowling
Letter from Guy G. Campbell, FirstEnergy, to NRC, re: Response to Requests for Additional Information Concerning NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles" (October 30, 2001)	Guy C. Campbell
Letter from Guy G. Campbell, FirstEnergy, to NRC, re: Transmittal of Davis-Besse Nuclear Power Station Risk Assessment of Control Rod Drive Mechanism Nozzle Cracks (November 1, 2001).	Signed by David H. Lockwood for Guy C. Campbell
Handouts or viewgraphs presented at briefing of Commissioners' technical assistants (November 14, 2001)	Steve Moffitt Dave Geisen Kendall Byrd David Lockwood Gerald Wolf Andrew Siemaszko
Handouts or viewgraphs presented at meeting with NRC Staff (November 28, 2001)	Steve Moffitt Dave Geisen Ken Byrd Mark McLaughlin

APPENDIX C: EXHIBITS

1*	09/04/01	Letter from Guy G. Campbell, FirstEnergy, to U.S. Nuclear Regulatory Commission, re: Response to NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles"
2*	08/03/01	NRC Bulletin 2001-01: Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles
3*	10/17/01	Letter from L.W. Worley, FirstEnergy, to NRC, re: Supplemental Information in Response to NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles"
4*	09/30/02	NRC Final Report, Degradation of the Davis-Besse Nuclear Power Station Reactor Pressure Vessel Head Lessons Learned Report
5*	04/15/02	FirstEnergy, Root Cause Analysis Report re: Significant Degradation of the Reactor Pressure Vessel Head
6*	10/02/02	Letter from John A. Grobe, NRC, to Lew W. Myers, FirstEnergy, re: Davis-Besse Nuclear Power station, NRC Augmented Inspection Team Follow-up Special Inspection Report No. 50-346/02-08
7*	10/30/01	Letter from Guy G. Campbell, FirstEnergy, to NRC, re: Transmittal of Reactor Pressure Vessel Head Control Rod Drive Mechanism Nozzle Penetration Visual Examinations for the Davis-Besse Nuclear Power Station
8*	11/01/01	Letter from Guy G. Campbell, FirstEnergy, to NRC, re: Transmittal of Davis-Besse Nuclear Power Station Risk Assessment of Control Rod Drive Mechanism Nozzle Cracks
9*	12/03/02	Letter from John A. Zwolinski, NRC, to Lew W. Myers, FirstEnergy, re: Davis-Besse Nuclear Power Station, Unit No. 1 – Response to Nuclear Regulatory Commission (NRC) Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles (TAC No. MB2626)
10*	10/11/01	FirstEnergy viewgraphs/handouts for meeting with NRC Staff
11*	03/22/02	Memorandum from S. A. Loehlein, Root Cause Team Leader, to Howard Bergendahl, Vice President - Nuclear, Davis-Besse, Probable Cause Summary Report for CR2002-0891, Significant Degradation of the Reactor Vessel Head Pressure Boundary
12*	10/24/01	FirstEnergy viewgraphs/handouts for meeting with NRC Staff
13*	11/14/01	FirstEnergy viewgraphs/handouts for meeting with NRC Staff, and Memorandum by Stephen P. Sands, Project Manager, NRC, Meeting Summary of November 14, 2001, to Discuss the Licensee's Response to Bulletin 2001-01
14*	11/28/01	FirstEnergy viewgraphs/handouts for meeting with NRC Staff
15*	03/17/88	Generic Letter 88-05, Boric Acid Corrosion of Carbon Steel Reactor pressure Boundary Components in PWR Plants
16*	01/08/03	Letter from Richard A. Meserve, Chairman, NRC, to Hubert T. Bell,

		Inspector General, NRC, re: Report on NRC's Regulation of Davis-Besse Regarding Damage to the Reactor Vessel Head (Case No. 02-03S)
17	05/27/88	Letter from Donald C. Shelton, Toledo Edison, to U.S. NRC, re: Response to Generic Letter 88-05, Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants
18	06/26/89	Letter from Donald C. Shelton, Toledo Edison, to U.S. NRC, re: Revised Response to Generic Letter 88-05, Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in Pressurized Water Reactor (PWR) Plants (TAC Number 68915)
19	02/08/90	Letter from Thomas V. Wambach, NRC, to Donald C. Shelton, Toledo Edison, re: Prevention of Boric Acid Corrosion at Davis-Besse Nuclear Power Plant (Generic Letter 88-05), (TAC No. 68915)
20	06/93	BAW-10190, Safety Evaluation for B&W-Design Reactor Vessel Head CRD Mechanism Nozzle Cracking.
21	11/19/93	NRC, Safety Evaluation for Potential Reactor Vessel Head Adaptor Tube Cracking
22	7/97	BAW-2301, B&WOG Integrated Response to Generic Letter 97-01: Degradation of Control Rod Drive Mechanism Nozzle and other Vessel Closure Head Penetrations
23*	08/13/02	FirstEnergy, Root Cause Analysis Report re: Failure to Identify Significant Degradation of the Reactor Pressure Vessel Head
24*	11/05/01	NRC e-mail from Douglas Pickett to Allen Hiser et al, "Davis-Besse Shutdown Costs."
25*	12/30/02	Memorandum from Hubert T. Bell, Inspector General, to NRC Chairman Meserve, re: NRC Regulation of Davis-Besse Regarding Damage to the Reactor Vessel Head (Case No. 02-03S)
26*	05/03/02	Letter from J. E. Dyer, NRC Regional Administrator, to Howard Bergendahl, Vice President – Nuclear, FirstEnergy Nuclear Operating Company, re: NRC Augmented Inspection Team – Degradation of the Reactor Pressure Vessel Head – Report No. 50-346/02-03 (DRS)
27*	11/01/82	Summary Report by the United Sates House of Representatives Subcommittee on Oversight and Investigations, Calculation of Reactor Accident Consequences (CRAC2) for U.S. Nuclear Power Plants (Health Effects and Costs) Conditional on an "SST1" Release
28*	08/07/02	*The Plain Dealer* article, Davis-Besse plant loses third overseer
29	07/28/97	Letter from John K. Wood, Centerior Energy, to NRC, re: Response to Generic Letter 97-01, Degradation of Control Rod Drive Mechanism Nozzle and Other Vessel Closure Head Penetrations

NOTE: Exhibits marked with an asterisk (*) are provided in electronic format on CD. The non-asterisked items are provided in hard copy format.

APPENDIX D: GLOSSARY

Acronym/Abbreviation	Meaning
AIT	Augmented Inspection Team – the team dispatched by NRC to examine the damage to the reactor pressure vessel head at Davis-Besse. The NRC has resident inspectors assigned permanently to Davis-Besse. When conditions warrant, these inspections are supplemented by specialists from the NRC's regional and headquarters offices. In this case, the AIT was chartered to find out what had happened and why.
ALARA	As-Low-As-Reasonably-Achievable – the NRC regulation that forces nuclear plant owners to not only strive to prevent workers from receiving radiation exposures in excess of federal limits, but also to take all reasonable steps to keep radiation exposures as close to zero as possible. "Reasonable" is defined economically – if the measures needed to avoid a unit of radiation dose is below a specified value, the owner is obligated to take those measures.
ANO-1	Arkansas Nuclear One, Unit 1 – one of two pressurized water reactors at the Arkansas Nuclear One nuclear power plant in Arkansas. ANO-1 is a B&W pressurized water reactor like Davis-Besse.
B&W	Babcock & Wilcox – the company that designed the pressurized water reactor built at the Davis-Besse Nuclear Power Station. B&W got out of the nuclear business. Much of the company's nuclear assets were acquired by the Framatome Technology company.
B&WOG	Babcock & Wilcox Owners Group – a coalition formed by the owners of pressurized water reactors designed by B&W and B&W itself to share operating experiences and fund joint solutions to common problems.
CEDM	Control Element Drive Mechanism – the control rod element mechanisms permit the control rods inside the reactor core to be withdrawn to start-up the nuclear chain reaction or inserted to shutdown the chain reaction. The CEDMs are housed within the service platform attached to the reactor vessel head.
CFR	Code of Federal Regulations – the compilation of regulations issued by federal agencies. The majority of NRC's regulations for nuclear power plants reside in Title 10 of the Code of Federal Regulations, specifically Part 50.
CRD	Control Rod Drive – the equipment attached to the control rods inside the reactor core that enable them to be inserted or withdrawn as needed to govern the nuclear chain reaction.
CRDM	Control Rod Drive Mechanism – the control rod drive mechanisms permit the control rods inside the reactor core to be withdrawn to start-up the nuclear chain reaction or inserted to shutdown the chain reaction. The CRDMs are housed within the service platform attached to the reactor vessel head.
DBNPS	Davis-Besse Nuclear Power Station – a nuclear power plant in Ohio featuring a single pressurized water reactor operated by FirstEnergy.

Acronym/Abbreviation	Meaning
DOJ	Department of Justice – the federal agency tasked with prosecuting criminal violations of federal regulations.
DRS	Division of Reactor Safety – one of two components of the NRC regional office staff overseeing nuclear power plants.
FENOC	FirstEnergy Nuclear Operating Company – the entity licensed by the NRC to operate the Davis-Besse Nuclear Power Station.
GDC	General Design Criteria (or Criterion) – the high-level fundamental design objectives for nuclear power plant codified in Appendix A to 10 CFR Part 50. The NRC (then called the Atomic Energy Commission) proposed the GDC in the mid 1960s and issued them in final form in the early 1970s.
IG	Inspector General – the Presidentially-appointed individual tasked with investigating possible wrong-doing on the part of the NRC and its employees.
MOD	Modification – a process used within FirstEnergy to make physical changes to the Davis-Besse nuclear power plant.
NDE	Non-Destructive Examination – a process used within the nuclear industry to evaluate the condition of equipment and structures without altering them. By comparison, CAT-scans provide non-destructive examination of the human body whereas exploratory surgery does not.
NRC	Nuclear Regulatory Commission – the federal agency chartered by the Atomic Energy Act as amended to govern nuclear power plants in the United States.
OI	Office of Investigations – the group within the NRC responsible for investigating possible wrong-doing on the part of the agency's licensees and their employees.
ONS2	Oconee Nuclear Station, Unit 2 – a sister plant to Davis-Besse located in South Carolina.
ONS3	Oconee Nuclear Station, Unit 3 – a sister plant to Davis-Besse located in South Carolina.
PCAQR	Potential Condition Adverse to Quality Report – a process used within FirstEnergy to identify, evaluate, and response potential problems at the Davis-Besse nuclear plant. PCAQRs could be initiated for hardware problems (e.g., a pump that won't start) or software problems (e.g., a procedure directing the control room operator to take some action that contradicts another procedural requiment).
PT	Penetrant Testing – a method of non-destructive examination where a dye is applied to the surface of the material being checked. If the surface is marred by small cracks or flaws, the dye will be drawn into them by capillary action and made more apparent during subsequent visual examination.
PWR	Pressurized Water Reactor – the type of nuclear power plant where three major water loops are used. The primary loop is water maintained at high pressure (about 2,200 pounds per square inch) to prevent it from boiling even though its temperature is over 600°F.

Acronym/Abbreviation	Meaning
	The primary loop circulates water between the reactor pressure vessel, where the reactor core heats it, and the steam generator, where it is cooled by the secondary loop. The secondary loop is maintained at lower pressure where the water boils to form steam used to spin a turbine/generator. The secondary loop circulates water between the steam generator, where it is heated by primary loop water, and the condenser, where it is cooled by the tertiary loop. The tertiary loop takes water from the nearby lake, river, or ocean to cool the steam of the secondary loop down until it turns back into water. About two-thirds of the nuclear power plants in the US, including Davis-Besse, have pressurized water reactors.
RCPB	Reactor Coolant Pressure Boundary – the equipment containing the primary loop of water within a PWR: the reactor pressure vessel, the steam generators, the pressurizer, along with connecting piping and pumps.
RFA	Request for Action – a process used within FirstEnergy to propose, review, and approve changes to Davis-Besse facility and its procedures.
RFO	Refueling Outage – a scheduled time when the nuclear power plant is shut down to remove expended fuel from its reactor core and replace it with fresh uranium fuel. During this time, maintenance, inspection, and testing are performed on equipment that cannot be done when the reactor is operating. FirstEnergy numbered the refueling outages at Davis-Besse sequentially (i.e., 10RFO or RFO 10, 11RFO, 12RFO, etc.). The refueling outage that began in February 2002 was 13RFO.
RPV	Reactor Pressure Vessel – the metal "pot" housing the reactor core and its cooling water.
TS	Technical Specifications – the NRC-approved set of minimum requirements for operating a nuclear power plant. The Technical Specifications are initially issued with the operating license with subsequent amendments as approved by the NRC. The Technical Specifications define the minimum complement of safety equipment that must be available when the reactor is operating and actions to be taken, up to and including shut down, when the minimum complement is not met.
UCS	Union of Concerned Scientists – the non-profit, public-interest group that has monitored nuclear power plant safety levels for nearly 30 years.
UT	Ultrasonic Testing – a method of non-destructive examination where sound pulses are sent through material to check for anomalies.
VHP	Vessel Head Penetrations – the holes through the reactor vessel head that permit the control rod inside the reactor core to be connected to their motors outside the reactor vessel and permit cabling for temperature probes inside the vessel to reach transmitters outside.