From: Patrick Baranowsky, RES
To: Gary Demoss
Date: 10/15/02 10:37AM
Subject: Fwd: UCS Letter on Davis Besse

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From: C. E. (Gene) Carpenter, RES
To: Anthony Hsia; Ashok Thadani; Charles Ader; Cheryl Trottier; Daniel Dorman; Edwin Hackett; Farouk Eltawila; Jack Rosenthal; Jack Strosnider; John Flack; Jose Ibarra; Karen Fitch; Mabel Lee; Mark Cunningham; Michael Cheok; Michael Mayfield; Nilesh Chokshi; Patrick Baranowsky; Rosemary Hogan; Scott Newberry; W. Ott
Date: 10/15/02 10:04AM
Subject: UCS Letter on Davis Besse

FYI - as requested in today's RES Staff Meeting

CC: Christopher Jackson; Frank Cherny; Paul Norian

Anatomy of a Flawed Decision: NRC Has a Brain, But No Spine

Union of Concerned Scientists

Citizens and Scientists for Environmental Solutions

"After considerable deliberation and increased management attention, it is the staff's judgement that sufficient information is available to justify operation of the Davis-Besse facility until February 16, 2002." [1]

With these words, the Nuclear Regulatory Commission (NRC) staff reported a compromise with FirstEnergy Nuclear Operating Company regarding the Davis-Besse Nuclear Power Station near Toledo, Ohio. This decision reversed an earlier determination, reached after considerably more deliberation, by the NRC staff that numerous safety regulation violations at Davis-Besse created a potentially hazardous condition. That determination prompted the NRC to prepare an Order requiring the reactor to be shut down by December 31, 2001, to inspect control rod drive mechanism (CRDM) nozzles for cracks — cracks that had already been found at every other nuclear plant like Davis-Besse in the United States. FirstEnergy resisted the Order, claiming that it could safely operate until its scheduled refueling outage at the end of March 2002. The NRC shelved the Order and safety concerns built upon the studied judgement of its staff and allowed Davis-Besse to operate until its rescheduled outage date of February 16, 2002. [A more complete timeline is provided in the Appendix to this report.]

When FirstEnergy finally conducted the overdue inspections of the Davis-Besse reactor vessel head, the findings validated the overruled safety concerns of the NRC staff and its senior managers. Not only did the company find cracked CRDM nozzles and reactor coolant leakage that NRC staff forecast as safety regulation violations, but to everyone's dismay, FirstEnergy also discovered that boric acid ate an unprecedented cavity through 6¾-inches of carbon steel of the reactor vessel head. The only thing preventing a major accident was a 3/16-inch stainless steel inner liner that bulged but luckily held against the 2,000-plus pounds per square inch pressure inside the reactor vessel.

A careful analysis of voluminous internal NRC records and e-mail messages between the NRC and FirstEnergy confirm there truly was a compromise — safety was compromised by a regulator wanting more but accepting far less. The documents reveal concerns by many NRC staffers and managers about degraded safety levels at Davis-Besse and their anguish over being unable to resolve those concerns. But the records clearly show that the NRC knowingly and deliberately violated its own safety policies and procedures to allow Davis-Besse to continue operating. The American public and the US Congress should be extremely alarmed by this regulatory malpractice.

The governing safety policies and procedures have been clearly established by the NRC and were repeatedly cited by NRC staffers throughout the decision-making process. The safety policy is articulated as:

> "In implementing risk-informed decisionmaking, LB [licensing basis] changes are expected to meet a set of key principles. Some of these principles are written in terms typically used in traditional engineering decisions (e.g., defense in depth). While written in these terms, it should be understood that risk analysis techniques can be, and are encouraged to be, used to help ensure and show that these principles are met. These principles are:

[1] NRC Report dated November 30, 2001, "Daily Status Report Re: Unresolved Responses to the Bulletin 2001-01 for High Susceptibility Plants and Those Plants That Have Experienced VHP Nozzle Cracking."

1. The proposed change meets the current regulations unless it is explicitly related to a requested exemption or rule change, i.e., a "specific exemption" under 10 CFR 50.12 or a "petition for rulemaking" under 10 CFR 2.802.

2. The proposed change is consistent with the defense-in-depth philosophy.

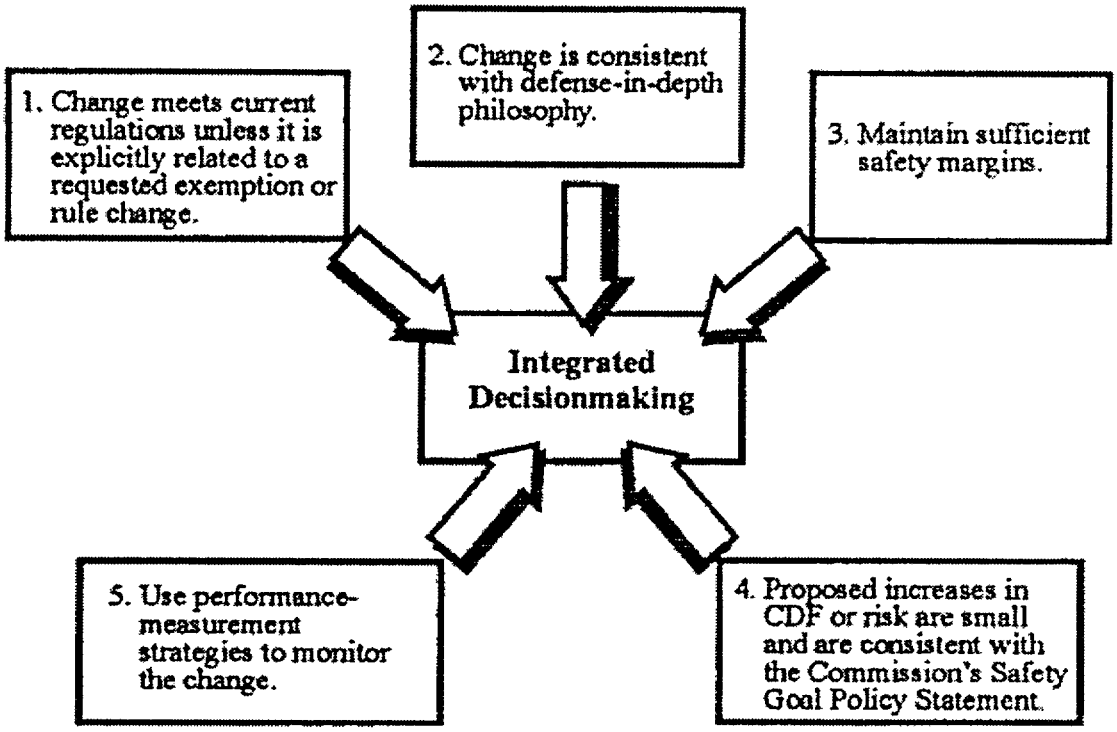
3. The proposed change maintains sufficient safety margins.

4. When proposed changes result in an increase in core damage frequency or risk, the increases should be small and consistent with the intent of the Commission's Safety Goal Policy Statement.

5. The impact of the proposed change should be monitored using performance measurement strategies.

The acceptability of proposed changes should be evaluated by the licensee in an integrated fashion that ensures that all principles are met."[2] [emphasis added]

The NRC's procedures include illustrate how the five principles factor into the decisionmaking process:



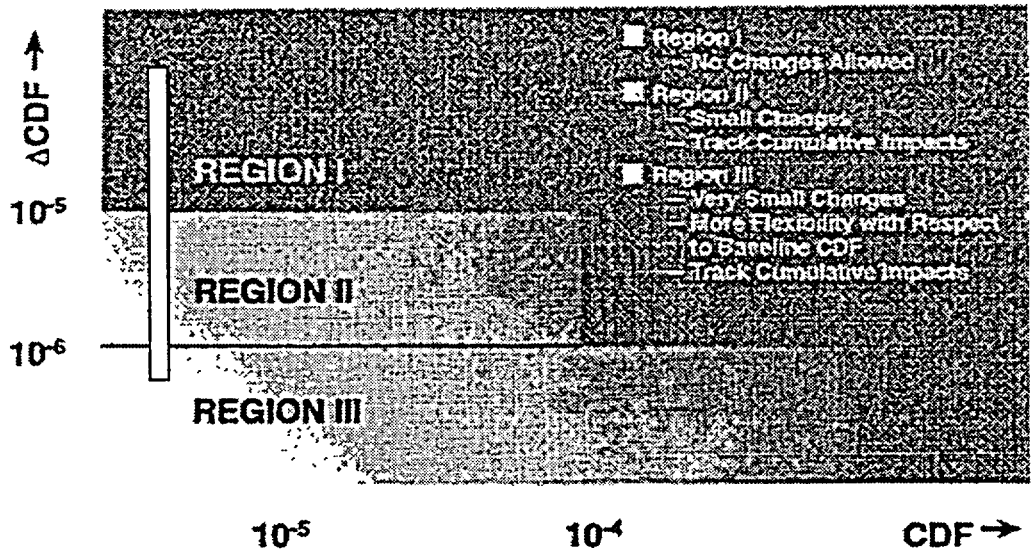
After making the compromise, the NRC staff briefed the NRC Commissioners's Technical Assistants about the decision. Their concluding presentation slide unequivolcally showed that four of the five safety principles were <u>not</u> met:

[2] Nuclear Regulatory Commission, Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment In Risk-Informed Decisions On Plant-Specific Changes to the Licensing Basis," July 1998.

- Current Regulations are met
  - It is likely that, if inspections were performed today, **current regulations are not met** with respect to TS [technical specification] requirements and GDC [general design criterion in the Code of Federal Regulations]
- Defense-in-depth philosophy maintained
  - **It is likely that one of 3 barriers is degraded**
  - However, Davis-Besse has large dry containment (conditional LERP [large early release probability] is 1.5E-03)
- Sufficient safety margins are maintained
  - **It is likely that safety margins are reduced**
- Only a small increase in CDF [core damage frequency] results
  - Incremental **ΔCDF (no comp measures) is 1.1E-06/ry to 1.3E-04/ry**
  - Baseline **CDF is 6.6E-05/ry** (not including external events)
- The basis of risk measurement is monitored using performance measurement strategies
  - **Will not occur** until inspection is performed [3] [emphasis added]

So, the NRC knew that four of its five safety principles were NOT met. Actually, they knew that NONE of the principles was met:

> **"Although operation in this condition could result in ΔCDF and ICDP values that are above the normally accepted guidelines of RG 1.174 and RG 1.182,** the analyses also indicate that the consequences of such an event would not constitute undue risk to the health and safety of the public." [4] [emphasis added]



The above chart, also from NRC's own procedures, has the risk number range associated with the deferred inspections superimposed on it as the white rectangular on the upper left portion. The NRC could not preclude Davis-Besse being in Region I where activities are not allowed. Unable to preclude it, they simply ignored it.

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[3] Nuclear Regulatory Commission Report dated November 30, 2001, "Status of NRC Staff Review of FENOC' s Bulletin 2001-01 Response for Davis-Besse - Brief for Commissioners' TAs."

[4] NRC Report dated November 30, 2001, "Daily Status Report Re: Unresolved Responses to the Bulletin 2001-01 for High Susceptibility Plants and Those Plants That Have Experienced VHP Nozzle Cracking."

What "concessions" did the NRC wrangle from FirstEnergy to balance ignoring its five safety principles? FirstEnergy moved Davis-Besse's refueling outage up six weeks from March 30, 2002, to February 16, 2002, and committed to the following compensatory measures:[5]

Compensatory Action	Impact of Compensatory Action	Core Damage Frequency Reduction (percent)
Deferral of Maintenance on High Pressure Injection and Low Pressure Injection for remainder of operating cycle to 13 RFO	Conditional Core Damage Probability for CRDM Nozzle Crack	17%
	Baseline Core Damage Frequency	6%
Dedicated Operator for Initiation of Low Pressure Recirculation	Conditional Core Damage Probability for CRDM Nozzle Crack	17%
	Baseline Core Damage Frequency	1%
Reduction in Hot Leg Temperature	Conditional Core Damage Probability for CRDM Nozzle Crack	16%

It appears NRC accepted three compensatory actions that significantly reduced the risk that reactor core damage would result if a CRDM nozzle cracked, triggering a loss of coolant accident. However, the risk reduction numbers claimed by FirstEnergy have little basis in reality. They appear to have been manufactured to "sell" the NRC a bill of goods, which the NRC quickly bought.

Working backwards through the three alleged compensatory actions, FirstEnergy asserted that reducing the hot leg temperature reduced the risk of core damage by 16%. The hot leg temperature is the temperature of the hot water flowing out of the reactor vessel in pipes towards the steam generators. This temperature corresponds to the metal temperature of the reactor vessel head. The working theory is that lowering the reactor vessel head's temperature reduces the thermal stresses on the CRDM nozzles. Any cracks in the CRDM nozzles grow larger at a slower rate when the thermal stresses are lowered. But FirstEnergy committed to reduce the hot leg temperature merely 7°F for only two months. According to the NRC:

> "The effects of the proposed Davis-Besse change in operating temperature (from 605 F to 598 F) would provide a reduction in crack growth rate equivalent to ~0.8 degrees per month (assuming growth of two ends of the through-wall crack and using the NRC 95/50 CGR). Therefore, a temperature change for a period of 2 months would indicate a reduction in crack growth of <2 degrees over that time period."[6]

The outer surface of each CRDM nozzle spans 360 degrees. A crack extending halfway around the nozzle would measure 180 degrees. Some of the CRDM nozzle cracks found at the Oconee nuclear plant measured approximately 165 degrees. The magic point where a cracked CRDM nozzles fails and causes a loss of coolant accident is not known with precision. The actual extent of CRDM nozzle cracking at Davis-Besse last year was not known with precision. Thus, FirstEnergy did not know either endpoint of a crack growth rate problem, but did know that restricting the crack growth to less than two degrees reduced the risk of core damage by 16%. No, they did not. They essentially made up a number that sounded good.

Speaking of made-up numbers that sound good, FirstEnergy claimed that dedicating an operator for low pressure recirculation reduced the risk of core damage by 17%. Had a failed CRDM nozzle triggered a loss of coolant accident at Davis-Besse, the plant's design called for emergency

[5] Letter dated November 30, 2001, from Guy G. Campbell, Vice President - Nuclear, FirstEnergy, to Nuclear Regulatory Commission, "Supplemental Information in Response to the November 28, 2001 Meeting Regarding the Davis-Besse Nuclear Power Station Response to NRC Bulletin 2001-01."

[6] E-mail dated November 26, 2001, from Allen Hiser, NRC, to Stephen Sands, NRC, "Fwd. Davis-Besse Operating Temperature Change."

safety systems to automatically start to replace the water spilling from the broken reactor vessel with water drawn from a large outdoor tank. Before that tank emptied, the emergency pumps had to be manually re-aligned to draw water from the containment sump. This re-alignment was termed low pressure recirculation. The plant's risk studies estimated that failure to achieve low pressure recirculation comprised 80% of the risk of reactor core damage.[7]

The NRC apparently thought that FirstEnergy committed to have a licensed operator dedicated to ensuring that the switchover to low pressure recirculation was successful. The NRC Resident Inspectors at Davis-Besse soon learned otherwise:

> 'Based on my review of the Davis-Besse commitments, one item stands out a bit: the dedicated operator. Doug Simpkins and I have found out that this is not an additional operator or even a "staged" operator. The way this will be implemented is that one of the non-licensed operators each day will be assigned and briefed that he/she is the "dedicated operator" for low pressure recirc. This operator will still have other duties and will go on rounds, etc." [8]

Concerned that FirstEnergy's reliance on an unlicensed operator for the switchover function rather than a licensed operator might undermine the purported safety gain from this compensatory action, the NRC asked one of its risk analysts to evaluate the matter:

> "There's little here to indicate what the expectations are for the "dedicated operator." ... From talking to operating crews in the past, the switchover to recirculation is such a critical action that the whole control room crew is focused on it when it occurs. It seems the most the "dedicated operator" could add is another pair of eyes to watch the RWST level and other indications. **I can't imagine that this would result in a significant increase in safety.**" [9] [emphasis added]

Thus, the extra pair of eyes, whether licensed or not, does not result in a significant increase in safety. But that fact proved unsettling to the NRC staff. After all, they'd already compromised five safety principles for three alleged compensatory actions. Their deal needed all three compensatory actions to resemble something valuable. So they asserted:

> 'The NRC staff believes that the pre-briefing, familiarization with the procedure, and the check list would minimize potential human error and delay in the injection-to-recirculation switch over." [10]

This statement by the NRC is astounding. Prior to negotiating this alleged compensatory action at Davis-Besse, the NRC relied solely on highly-trained control room operators that it licensed to perform the switchover to low pressure recirculation. These operators received many months of intensive classroom and control room simulator training. They received licenses from the NRC only after demonstrating proficiency on written examinations and during test scenarios on the control room simulator. They received 8 to 10 weeks of continuing training, replete with re-qualification examinations, each year since initial licensing. Yet FirstEnergy asserted and the NRC accepted the fact that an unlicensed individual, who may have recently been working at McDonalds, is more reliable—to the tune of a 17% reduction in core damage—of making the switchover happen at the right time. It would be laughable if the stakes were not so high. If FirstEnergy and the NRC truly believed their

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[7] E-mail dated December 13, 2001, from Jin Chung, NRC, to Stephen Sands, NRC, "Davis Besse Inspections."
[8] E-mail dated December 7, 2001, from Christine Lipa, NRC, to Douglas Pickett and Stephen Sands, NRC, "Fwd: Re: Inspections of Davis-Besse' s Commitments."
[9] E-mail dated December 13, 2001, from Gareth Parry, NRC, to Steven Long, "Fwd. Re: Inspections of Davis-Besse' s commitments."
[10] E-mail dated December 19, 2001, from Jin Chung, NRC, to Lawrence Burkhart and Stephen Sands, NRC, "Davis Besse CRDM Inspections."

hogwash, then they need to make serious improvements to the operating licensing and re-qualification programs as soon as possible.

Finally, FirstEnergy also claimed that deferring maintenance and testing of key safety equipment until the refueling outage would reduce the risk of core damage by 17%. It seems odd considering that companies like FirstEnergy justify doing online maintenance (i.e., performing maintenance and testing of key safety equipment when the reactor is operating instead of when it is shut down), they claim that core damage risk is reduced through greater reliability. The NRC itself has granted numerous license amendments allowing plant owners to conduct more online maintenance, claiming each time that safety is not reduced. If safety is not reduced by performing maintenance and testing online, how can safety be increased by simply undoing that process? The NRC needs to pick a story and stick to it.

NRC Builds A Strong Case For Immediate Shutdown To Inspect Davis-Besse

There is a clear and concise record documenting that NRC, at both the technical staff and management level, recognized an uncertain but growing risk to public safety from Davis-Besse's continued operation without a qualified inspection. Following its review of FirstEnergy's September 4, 2001, response to NRC Bulletin 2001-01, NRC staff held a series of briefings with their senior managers. The NRC staff spelled out the reasons why CRDM nozzle inspections were absolutely necessary at Davis-Besse. On September 28, 2001, NRC senior managers called FirstEnergy and stated that the company's response did not provide sufficient basis for delaying the CRDM nozzle inspections beyond the end of the year.

As part of its basis for delaying the inspections beyond December 31st, FirstEnergy cited visual examinations of the reactor vessel head conducted in 1996, 1998 and 2000. The NRC staff discounted these inspections by pointing out that of 96 total control rod drive mechanism nozzles penetrating the Davis-Besse reactor vessel head, the 1996 inspection examined only 94% of them (leaving out four nozzles at the top of the head). In 1998, 72% of the nozzles were examined (nineteen were not inspected including the same four nozzles unexamined in 1996). In 2000, 65% of the nozzles were examined (24 were not examined including the same four nozzle now established as never examined.) FirstEnergy's responses did little to assuage staff concerns when they claimed the nozzles were not examined because they were obscured by boric acid deposits caused by reactor coolant leakage 'from other sources."

NRC focused on the fact that every other nuclear power plant designed by Davis-Besse's reactor supplier, Babcox & Wilcox (B&W), already experienced CRDM nozzle cracking. Of the seven licensed B&W pressurized water reactors, all six of the other plants identified leaking and cracked nozzles. Three out of the six reactors experienced circumferential cracking of control rod penetration nozzles, the most serious type of cracking potentially leading to a loss of coolant accident. Only Davis-Besse had not yet inspected 100% of its nozzles. The NRC staff concluded that one or more CRDM nozzles at Davis-Besse would also be leaking and cracked, if only the inspections would be performed to find them.

Davis-Besse's Technical Specifications Section 3.4.4.6, as part of its operating license, clearly states 'Pressure boundary leakage of any magnitude is unacceptable since it may be indicative of an impending gross failure of the pressure boundary."[11] In this case, the gross failure of the pressure boundary could occur by a complete break of a circumferential crack in one or more control rod drive mechanisms leading to rod ejection and small to medium size loss of coolant accident. NRC staff and

[11] Memorandum dated November 16, 2001, from Samuel J. Collins, Director - Office of Nuclear Reactor Regulation, to William D. Travers, Executive Director for Operations, Nuclear Regulatory Commission, "Issuance of Orders Regarding Responses to Nuclear Regulatory Commission (NRC) Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles."" ADAMS Accession No. ML013170422

management logically determined that since all other B&W plants had identified leakage, it was highly probable that Davis-Besse was also leaking in violation of its technical specifications and creating a potentially hazardous condition. 'It is reasonable to assume that the reactor coolant pressure boundary is compromised" said one NRC staffer in support of prompt shutdown and inspection. [12]

NRC Abandons It Strong Case For Immediate Shutdown To Inspect Davis-Besse

The die was cast for the Davis-Besse inspection deferral on October 31, 2001. NRC managers decided to prepare an order requiring FirstEnergy to shut down Davis-Besse by December 31, 2001, for inspection of the reactor vessel head penetrations (i.e., CRDM nozzles). Their option was to prepare an order requiring immediate shut down of the plant. The evidentiary record is clear that NRC had sufficient basis to order an immediate shut down. FirstEnergy's Vice President Guy G. Campbell conceded to NRC staff last year that one or more CRDM nozzles was cracked and leaking. The plant's operating license prohibited reactor coolant pressure boundary leakage and required immediate shut down. In fact, the evidence is abundantly clear that the NRC staff knew it lacked a technical basis to support acceptable operation of the plant until December 31, 2001, but chose that date for political reasons. The NRC staff wanted to avoid economically penalizing FirstEnergy by requiring Davis-Besse to be immediately shut down before the company had time to stage the personnel and equipment needed to conduct the vessel head inspections.

Once the NRC proposed December 31st as the shut down date without a technical basis for that date being critical, they were completely unable to defend that position. It was no more or less arbitrary and capricious than any other date —February 16, 2002, for example. Having voluntarily retreated from high ground and taken up a position in swampy lowlands, the NRC was unable to force any one to do anything. In that helpless situation, the NRC was indeed fortunate that FirstEnergy volunteered to move its refueling outage up to February 16th and provide the NRC with the token appearance of having reached a compromise.

The NRC's Role is Enforcer, Not Encourager

In this instance, as in many prior instances, the NRC adopted the role of Encourager of Regulations rather than Enforcer of Regulations. In essence, the NRC bluffed and hoped that plant owners would blink first:

> 'The [NRC] staff continues to engage the licensees regarding this issue and is open to reviewing any new and relevant information that would justify operation beyond December 31, 2001. Nuclear Reactor Regulation (NRR) staff and management have been engaged with appropriate licensee management to ensure the sensitivity and awareness of potential safety concerns. **NRR will continue to provide feedback to licensee management regarding the chosen regulatory path and allow the licensees the opportunity to commit to shutdown the facility and perform the recommended inspections by December 31, 2001, which would preclude the need for an Order."**[13] [emphasis added]

The threat of an order did cause one plant owner to blink. Dominion Energy owned the Surry Unit 2 and North Anna Unit 2 reactors, which were slated to be included in the order. But Dominion voluntarily shut down both of these reactors and conducted the vessel head inspections before December 31, 2001. On the other hand, FirstEnergy called the NRC's bluff and won. The NRC successfully encouraged Dominion Energy to do the right thing at Surry and North Anna. The NRC

[12] E-mail dated November 14, 2001, from Allen Hiser, NRC, to Andrea Lee, NRC, 'Slide for TA Brief" [Commissioners' Technical Assistants].

[13] Memorandum dated November 16, 2001, from Samuel J. Collins, Director - Office of Nuclear Reactor Regulation, to William D. Travers, Executive Director for Operations, Nuclear Regulatory Commission, "Issuance of Orders Regarding Responses to Nuclear Regulatory Commission (NRC) Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles." ADAMS Accession No. ML013170422

was unable to encourage FirstEnergy to do the right thing and then backed up that failure with a failure to enforce safety regulations that would have made FirstEnergy do the right thing.

As long as NRC remains an Encourager rather than an Enforcer, it will continue to enjoy mixed success. Some companies will respond to gentle reminders and do the right thing. Other companies will resist even not-so-gentle reminders. Because the NRC was unable to shut down Davis-Besse despite genuine safety concerns, it is questionable that the agency will ever be able to shut down any plant for any reason.

The Davis-Besse near-miss demonstrated that the NRC has a brain. The agency singled Davis-Besse out as a vulnerable plant and went as far as drafting a shut down order. The near-miss also demonstrated that the NRC lacks a spine. Instead of enforcing safety regulations when FirstEnergy resisted, the agency instead chose to violate four out of five of its applicable safety principles.

The US Congress chartered NRC to enforce safety regulations. The American public expects NRC to enforce safety regulations. Now would be a splendid time for the NRC to fulfill its charter and expectations by consistently enforcing safety regulations.

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NIRS and UCS recognize and commend the commitment of the NRC staff to safety. The document trail shows that many NRC staffers, particularly Allen Hiser, Steven Long, Jin Chung, Christine Lipa, and Lawrence Burkhart, expended considerable effort in an ultimately futile attempt to adequately protect public health and safety. We hope their palpable frustration over the Davis-Besse fiasco will not prevent them from trying again next time. We hope their future efforts will garner a headline on a regulatory success story rather than a footnote to a report on a regulatory failure.

Appendix: Timeline

Date	Event	Significance
March 2001	Circumferential cracking from the outside diameter to the inside diameter of three control rod drive mechanisms (CRDMs) discovered at Oconee Unit 3.	First time that circumferential cracks had been identified at a US nuclear plant. Oconee is a sister plant to Davis-Besse
March 2001	Through-wall cracking of CRDM nozzle identified at Arkansas Nuclear One Unit 1.	Arkansas Nuclear One Unit 1 is a sister plant to Davis-Besse.
April 2001	Circumferential cracking from the outside diameter to the inside diameter of a control rod drive mechanism (CRDM) discovered at Oconee Unit 2.	Circumferential cracks at Oconee found during repairs. They were not found during inspections.
April 12, 2001	NRC conducted public meeting with industry about CRDM circumferential cracking problems	
May 18, 2001	EPRI's Materials Reliability Program task force submitted technical report on CRDM cracking to NRC.	All 69 operating pressurized water reactors ranked in terms of CRDM circumferential cracking vulnerability. Reactors within three (3) effective full power years (EFPYs) of Oconee Unit 3 are labeled as particularly susceptible to the cracking problem.
August 3, 2001	NRC issued Bulletin 2001-01 to all PWR plant owners	NRC required all nuclear plants within five (5) effective full power years (EFPYs) of Oconee Unit 3, which includes Davis-Besse, to inspect their reactor vessel head penetrations by December 31, 2001, or provide technical justification for later inspections.
September 4, 2001	FirstEnergy responded to NRC Bulletin 2001-01 with schedule for inspecting CRDM nozzles on 03/30/02.	FirstEnergy challenged the December 31, 2001, inspection deadline.
September 28, 2001	NRC's Brian Sheron called owners of H B Robinson, Davis-Besse, Surry Unit 2, and North Anna Unit 2 with concerns about the schedule and scope of their reactor vessel head inspections.	NRC expressed dissatisfaction with the responses received from these plants.
October 1, 2001	FirstEnergy questioned NRC's selection of 12/31/01 date for vessel head inspections via e-mail to NRC Project Manager	
October 2, 2001	NRC staff briefed EDO on need for further regulatory action at North Anna Unit 1, North Anna Unit 2, Surry Unit 2, Davis-Besse, and H B Robinson.	
October 3, 2001	NRC staff briefed Commissioners' Technical Assistants on need for further regulatory action at North Anna Unit 1, North Anna Unit 2, Surry Unit 2, Davis-Besse, and H B Robinson.	
October 3, 2001	FirstEnergy e-mailed NRC Project Manager questioning why NRC drew line at 5 EFPYs from Oconee Unit 3 after EPRI's MRP drew the line at only 3 EFPYs. FirstEnergy pointed out that Davis-Besse was 3.1 EFPYs away from	Even if Davis-Besse was at 3.1 EFPYs in March 2001, Davis-Besse was clearly less than 3 EFPYs on October 3, 2001 so what' s the point?

Date	Event	Significance
	Oconee Unit 3 in March 2001. FirstEnergy informed NRC that recent review of videotape inspections of reactor vessel head in 1996, 1998, and 2000, showed no signs of CRDM nozzle leakage.	
October 3, 2001	NRC staffer participating in telephone conference noted that FirstEnergy informed the NRC that past inspections examined 100% of reactor head.	FirstEnergy did not examine 100% of reactor head in past inspections.
October 11, 2001	FirstEnergy briefed the Commissioners' Technical Assistants about Davis-Besse. FirstEnergy informs the NRC:	
	"All CRDM penetrations were verified to be free from the characteristic boron deposits using video recordings from the previous 2 refueling outages. These videos were made before and after cleaning the head "	Not true.
	and	
	'Davis-Besse has a better as-built record of their head and the interference fits than other plants. As such, Davis-Besse has done more and better quality inspections than other plants."	Not true.
	and	
	'The [FirstEnergy] management stated their intent to take whatever action is necessary. Therefore, they considered it imperative that NRC provide the basis for their conclusions."	FirstEnergy will send in the lawyers if necessary.
October 12, 2001	NRC staffer Allen Hiser e-mailed NRC manager Bill Bateman news that all five B&W nuclear plants that had looked for CRDM nozzle leaks had found them and that Davis-Besse was the only B&W plant yet to even look for nozzle leaks.	Every plant like Davis-Besse that had looked for CRDM nozzle cracks had found them. Davis-Besse had not found cracks because Davis-Besse had not looked for them.
October 17, 2001	NRC status report listed four plants with unacceptable Bulletin 2001-01 responses: D C Cook Unit 2, Surry Unit 2, Davis-Besse and North Anna Unit 2	
October 18, 2001	NRC status report listed three plants with unacceptable Bulletin 2001-01 responses: D C Cook Unit 2, Surry Unit 2, and Davis-Besse	Owners of North Anna Unit 2 volunteered to shut down plant before 12/31/01 for reactor head inspection.
October 24, 2001	NRC manager directed staff to finish draft shutdown Order by 11/02/01.	FirstEnergy still had not provided NRC with reason not to shut down Davis-Besse.
October 31, 2001	NRC managers Brian Sheron and Jack Strosnider decided, based on direction from Bill Kane, to make shutdown orders effective December 31, 2001, instead of immediately.	**THE FUNDAMENTAL MISTAKE**
October 2001	Through-wall cracking of CRDM nozzle identified at Crystal River Unit 3.	Crystal River Unit 3 is a sister plant to Davis-Besse

Date	Event	Significance
November 2, 2001	Dominion Energy informed NRC that it will shut down Surry Unit 2 before 12/31/01 for reactor vessel head inspections	
November 5, 2001	NRC status report listed one plant with unacceptable Bulletin 2001-01 response· Davis-Besse	Owners of Surry Unit 2 volunteered to shut down plant before 12/31/01 for reactor head inspection. Owners of D C Cook Unit 2 provided NRC staff with detailed data from past reactor head inspections to justify continued operation until 01/19/02.
November 8, 2001	NRC staff informed FirstEnergy during a public meeting that there is 'Insufficient information to conclude there is reasonable assurance of adequate protection"	Why is Davis-Besse operating without reasonable assurance of adequate protection?
November 8, 2001	After public meeting, FirstEnergy Vice President Guy Campbell agreed with NRC staffer Steve Long that CRDM nozzle(s) at Davis-Besse are leaking	Why is FirstEnergy knowingly and deliberately violating operating license that prohibits any reactor coolant pressure boundary leakage?
November 14, 2001	NRC staff briefed Commissioners' Technical Assistants on the proposed shutdown Order for D C Cook Unit 2 and Davis-Besse.	
November 14, 2001	NRC staff conducted teleconference with FirstEnergy and 'Informed the licensee that we believe there is a reasonable likelihood that DB currently has multiple cracks in the VHP nozzles and that one or more may be circumferential."	Why is NRC knowingly and deliberately allowing Davis-Besse to operate in violation of its operating license that prohibits any reactor coolant pressure boundary leakage?
November 15, 2001	NRC' s BrianSheron e-mailed Commissioner' s Technical Assistant and EDO staffer: "As Larry Chandler and Sam [Collins] also said, we could have made an argument for immediate shutdown, but we are exercising discretion in allowing them to go to December 31st, but not beyond."	Oh, that' s why.
November 16, 2001	Memo from Sam Collins to Bill Travers notified EDO of intent to issue 12/31/01 shutdown orders to Davis-Besse and D C Cook Unit 2.	
November 16, 2001	NRC' s JohnZwolinski e-mailed NRC subordinate that he' d been visited by a staffer from the EDO' s office questioning the 12/31/01 date. Zwolinski reported he informed the staffer that 'we can justify today to shut these plants down however we are exercising discretion nothing it would clearly be punitive to immediately shut a plant down and they sit there for a month waiting to obtain the correct inspection equipment etc."	The NRC is placing the American public in undue harm' s way to avoid costing the company a few dollars.
November 19, 2001	EDO's office questioned 12/31/01 shutdown date	

Date	Event	Significance
November 20, 2001	NRC status report stated: 'It is reasonable to conclude that DB may have cracks that could challenge the integrity of the reactor coolant pressure boundary." and 'Regarding prior inspections, the licensee has stated that four nozzles cannot be inspected using a qualified visual inspection due to an inadequate leakage path for these nozzles; one of these four nozzle locations has exhibited circumferential cracking on the nozzle outside diameter at Oconee Unit 3 in within the last week."	Why is NRC knowingly and deliberately allowing Davis-Besse to operate in violation of its operating license that prohibits any reactor coolant pressure boundary leakage?
November 21, 2001	Memo from Sam Collins to Bill Travers transmitted draft shutdown order for Davis-Besse to EDO.	
November 27, 2001	NRC' s RicBarrett e-mailed NRC staffers: 'Davis- Besse claims that the temperature reductions would result in a 16% reduction in growth rate. So, if our Dec. 31 date would allow one unit of crack growth (one month at 605 degrees) and their original March 31 date would allow 4 units of crack growth (four months at 605 degrees), then their new proposal of Feb 16 at the reduced temperature would allow 2.1 units of crack growth (2.5 months at .84 times the growth rate). That' s a pretty good compromise."	An immediate shut down, as required by safety regulations, would have resulted in less than one unit of crack growth That' s no safety compromise.
November 28, 2001	NRC staff conducted public meeting with FirstEnergy about Davis-Besse	
November 29, 2001	NRC staff briefed EDO that decision to shutdown Davis-Besse had been reversed despite 4 of 5 safety principles not being met.	In less than 24 hours, NRC reversed itself. How deep and deliberate could a 24-hour review possibly have been? NRC did not even confirm the risk reduction numbers floated by FirstEnergy.
November 30, 2001	NRC staff briefed Commissioners' Technical Assistants that decision to shutdown Davis-Besse had been reversed despite 4 of 5 safety principles not being met.	What' s the real use of having regulations that you don' t enforce and principles that you don' t follow?
November 30, 2001	FirstEnergy formally committed to compensatory measures proposed during 11/28/01 meetiing.	
December 4, 2001	NRC formally accepts compromise.	How many statues to Neville Chamberlain were constructed in England and Europe?