April 10, 2009

**UNITED STATES OF AMERICA**
**NUCLEAR REGULATORY COMMISSION**
**Before the Atomic Safety and Licensing Board**

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| In the Matter of: | ) | Docket No. 52-033 |
| The Detroit Edison Company | ) | |
| (Fermi Nuclear Power Plant, Unit 3) | ) | |
| | ) | |

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**Combined Reply of Petitioners Beyond Nuclear, Citizens for Alternatives to Chemical Contamination, Citizens Environmental Alliance of Southwestern Ontario, Don't Waste Michigan, Sierra Club, Keith Gunter, Edward McArdle, Henry Newman, Derek Coronado, Sandra Bihn, Harold L. Stokes, Michael J. Keegan, Richard Coronado, George Steinman, Marilyn R. Timmer, Leonard Mandeville, Frank Mantei, Marcee Meyers, and Shirley Steinman to NRC Staff and DTE Answers to Petition for Leave to Intervene**

Now come Petitioners Beyond Nuclear, Citizens for Alternatives to Chemical Contamination, Citizens Environmental Alliance of Southwestern Ontario, Don't Waste Michigan, Sierra Club, Keith Gunter, Edward McArdle, Henry Newman, Derek Coronado, Sandra Bihn, Harold L. Stokes, Michael J. Keegan, Richard Coronado, George Steinman, Marilyn R. Timmer, Leonard Mandeville, Frank Mantei, Marcee Meyers, and Shirley Steinman and make their Combined Reply to the NRC Staff Answer and Applicant's Answer to their "Petition for Leave to Intervene." The NRC Staff's filing will be referred to as "Staff Answer", and the Applicant's as "DTE Answer".

***Reply to DTE's Objection to Standing of Organizations and Individual Petitioners***

DTE maintains in its Answer (pp. 13) that the Supreme Court's

recent decision of *Summers v. Earth Island Inst.*, __ U.S. __, 07–463, slip op. (U.S. Mar. 3, 2009) "directly undermines the basis for the proximity presumption" utilized in Commission proceedings - that domicile within 50 miles of a commercial nuclear power plant presumptively confers standing to intervene.

DTE's direct challenge to the 50-mile rule omits inconvenient distinguishing facts which motivated the Supreme Court's holding in *Summers*. The environmental plaintiffs in *Summers* challenged the failure of the Forest Service to apply to the Burnt Ridge Project §215.4(a) of its regulations implementing the Appeals Reform Act (requiring prior notice and comment). The district court granted a preliminary injunction against the Burnt Ridge salvage-timber sale. Soon thereafter, the parties settled their dispute over the Burnt Ridge Project and the district court concluded that "the Burnt Ridge timber sale is not at issue in this case." The Government then argued that, with the Burnt Ridge sale dispute settled, and with no other project before the court in which the plaintiffs were threatened with injury-in-fact, the plaintiffs lacked standing to challenge the regulations, but the trial court proceeded to adjudicate the merits of the challenges anyway. Its rulings were partially upheld on appeal, but then the Supreme Court reversed, concluding that the "actual or imminent harm" which the plaintiffs had demonstrated to obtain the preliminary injunction had disappeared with the settlement. *Id.* at 6, 8. The fact of settlement was key to the Court's determination that the challengers lacked standing, and is quite absent from the circumstances posed the Licensing Board here, where there is no foreseeable resolution.

DTE challenges the proximity presumption further, asserting that by relying on the presumption "[t]he Petitioners are doing nothing more than speculating about a hypothetical accident with some likelihood of impacting themselves" which, the Applicant asserts, does not demonstrate "concreteness". DTE Answer at 15. But as it attacks the presumption, DTE carefully avoids mentioning perhaps the most recent ASLB pronouncement on standing and the proximity rule, *Calvert Cliffs 3 Nuclear Project* (COLA for Calvert Cliffs Unit 3), LBP-09-04, __ NRC __, slip op. at 12-17 (March 24, 2009).[1] In *Calvert Cliffs,* the licensing board saw no conflict between the requirements of an actual or imminent concrete injury and the NRC's 50-mile presumption of standing:

> The presumption does not permit persons with no actual or imminent claim of injury to obtain a hearing. On the contrary, the common thread in the decisions applying the 50-mile presumption is a recognition of the potential effects at significant distances from the facility of the accidental release of fissionable materials. The NRC's regulations also recognize that an accidental release has potential effects within a 50-mile radius of a reactor. The Commission, rather than disregarding contemporaneous judicial concepts of standing, has applied its expertise and concluded that persons living within a 50-mile radius of a proposed new reactor face a realistic threat of harm if a release of radioactive material were to occur from the facility. For this reason, the Commission does not require such persons to make individual showings of injury, causation, and redressability. The presumption does not grant standing to persons with merely theoretical or generalized grievances, but only to those persons who live sufficiently close to a proposed new reactor that they face an increased risk of harm if a release of radioactive material were to occur. The non-trivial increased risk constitutes injury-in-fact, is traceable to the challenged action (the NRC's licensing of a new nuclear reactor), and is likely to be redressed by a favorable decision that either denies a license or mandates compliance with legal requirements that protect the interests of the petitioners. ([Footnote omitted].

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[1]Notably, DTE cites the 2009 *Calvert Cliffs* decision in opposition to Petitioners' First Contention, *see* DTE Answer at 22, fn. 19.

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[B]ecause we are bound by Commission and Appeal Board precedent, we are not at liberty to reject the 50-mile presumption. Applicant responds that the Commission has instructed licensing boards to apply contemporaneous judicial concepts of standing, that current judicial requirements for standing conflict with the presumption, and that therefore we are at liberty to disregard it. [Citation omitted]. In the absence of demonstrably compelling precedent, we doubt that the Commission intends for licensing boards to disregard its rulings based on their own interpretations of contemporaneous judicial concepts of standing. Otherwise, it is for the Commission, not licensing boards, to revise its rulings.

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In addition, various contemporaneous standing decisions find the "injury-in-fact" requirement satisfied without the type of quantitative proof of harm Applicant contends is required.[2] In these cases, it was sufficient that persons living in or using an area near the defendant's facility stated that they "feared" or were "concerned" they would be harmed by discharges from that facility, even though they did not attempt to quantify the risk of harm they might suffer. These contemporaneous standing decisions are consistent with the NRC's presumption finding petitioners to have standing based on the proximity of their residences to a proposed new reactor and their concern that the new facility may endanger their health and safety and the environment in which they live.

Furthermore, Applicant's argument fails to undermine the basis of the 50-mile presumption. As noted above, the presumption reflects the potential effect at significant distances from the facility of the accidental release of radioactive materials. Applicant here has provided no evidence to show that the effects of an accidental release from CCNPP-3 (much less nuclear reactors generally) would be limited to a shorter distance from the facility. The rationale for the 50-mile presumption does not depend upon the probability that a proposed reactor is likely to generate an accidental release of radioactive materials, but rather

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[2]Citing *Friends of the Earth, Inc. v. Laidlaw Envt'l Serv.*, 528 U.S. 167, 182-84 (2000) (Injury-in-fact was adequately documented by the affidavits and testimony of members of the plaintiff organizations asserting that the defendants pollutant discharges, and the affiants' reasonable concerns about the effects of those discharges, directly affected those affiants' recreational, aesthetic, and economic interests; plaintiffs did not have to show that the discharges actually harmed the environment); *Covington v. Jefferson County*, 358 F.3d 626, 638-41 (9th Cir. 2004) (sufficient to allege that defendant's actions "caused 'reasonable concern' of injury to" the plaintiff); *Sierra Club, Lone Star Chapter v. Cedar Point Oil Co. Inc.*, 73 F.3d 546, 556 (5th Cir. 1996) (affiants' "concern" that discharges would impair water quality is sufficient).

> the fact that, if such an accident were to occur, it could realistically impact the geographic area within which the petitioners reside.
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> We also note that, although we can easily determine whether petitioners reside within 50 miles of the facility, it would be far more difficult for a licensing board to determine reliably the risk of an accidental release at this early stage of the proceeding. An applicant's vendor will typically have prepared a probabilistic risk assessment for the reactor design. However, at this early stage 'there is not yet available either the Final Environmental [Impact] Statement or the Safety Evaluation Report and, thus, neither we nor the petitioners have the benefit even of the Staff's own ultimate appraisal respecting accident probabilities.' [Footnote omitted]. Thus, if we were to require proof of the likelihood of an accident at this stage in the proceeding, we could be forced to rely on the vendor's estimates, which should still be considered preliminary at this point. This would frustrate the public's opportunity to dispute and put to the test the applicant's claims concerning the safety of the proposed new reactor, which is the opportunity that AEA Section 189a was intended to provide.
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> Although the Commission has encouraged licensing boards to apply contemporaneous concepts of standing, the ultimate test is not whether the NRC's test for standing conforms to that applied by federal courts, but whether the NRC's test represents a reasonable construction of Section 189a.[3] Under Applicant's proposed new test, licensing boards would have to defer to the vendor's preliminary risk assessment except in the unusual instance in which the petition to intervene demonstrates that the risk of harm exceeds some (vaguely defined) numerical threshold. We doubt that placing such an onerous burden on petitioners would constitute a reasonable interpretation of the AEA. As long as the petitioners reside within an area that could realistically be impacted if an accidental release occurs, it is reasonable and consistent with Section 189a to find that they have standing to challenge Applicant's safety claims and its environmental analysis under NEPA. [Footnote omitted].

It is ludicrous for DTE to maintain that Petitioners are relying on a "theory" of harm; by doing so, DTE advances its belief in the infallibility of the incomplete, unproven ESBWR reactor design - surely a mere expression of DTE's belief in how the Commission should rule on design certification. The ultimate merits of the case have no bearing on the threshold question of standing. *Sequoyah Fuels Corp.* (Gore,

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[3] *Envirocare of Utah v. Nuclear Regulatory Comm'n,* 194 F.3d 72, 75-76 (D.C. Cir. 1999).

Oklahoma, Site Decommissioning), CLI-01-2, 53 NRC 2, 15 (2001).

The NRC Staff has acknowledged the standing of nearly all putative Intervenors, and has provided extensive discussion as to its conclusions why that is appropriate. Staff Answer at 9-26. Petitioners endorse the Staff's arguments and conclusions to the extent that they support the intervention of most of the Petitioners.

For all of the above reasons, DTE's objections to the organizations' and individuals' standing to intervene should be turned aside.

**REPLY IN SUPPORT OF CONTENTION NO. 1:** ***The Environmental Report is unacceptably deficient because it omits an adequate analysis of the significance of Fermi 3 environmental impacts and its contribution to cumulative and additive persistent toxic discharges into Lake Erie and the Great Lakes Basin from the nuclear industry***

Both the NRC Staff and the Applicant assert that the Petitioners have failed to provide adequate factual or expert support to indicate that further analysis is necessary.

The "Guidance on the Consideration of Past Actions in Cumulative Effects Analysis" by the President's Council on Environmental Quality (CEQ) advises federal agencies on the extent to which they are required to analyze the environmental impacts from past federal actions when they describe the cumulative environmental impact of a proposed action in accordance with Section 102 of NEPA. That advice is that while the environmental analysis is forward looking with a focus on the proposed action, the review of past actions is required to the extent that these actions can inform the agency on the proposed action. The NRC's past actions have included license renewals for reactor units at D.C. Cook Units 1 & 2, Point Beach Units 1 & 2, Ginna Unit 1, Palisades Unit 1, Fitzpatrick 1 and Nine Mile Point Units 1 &

2, wherein the NRC relicensed each application by segmenting and breaking down their cumulative and additive environmental impacts into smaller parts. Through this artifice, only the environmental impacts of the contiguous units to each site on local waters were considered, without analyzing their cumulative and additive impact on the Great Lakes Basin.

In *Kleppe v. Sierra Club*, 427 U.S. 390 (1976), the Supreme Court stated (at 410) that

> . . .[W]hen several proposals for coal-related actions that will have cumulative or synergistic environmental impact upon a region are pending concurrently before an agency, their environmental consequences must be considered together. [Footnote omitted]. Only through comprehensive consideration of pending proposals can the agency evaluate different courses of action.

Hence the Supreme Court has defined the tipping point for when the agency must consider the cumulative and synergistic environmental consequences upon a “region” at “several.” The Supreme Court does not delimit its definition to the narrow “immediate area” of the local water around Fermi 3, but uses more broadly-defined “region.”

Thus far in this case, there is effectively only an environmental assessment (though Petitioners argue that the Environmental Report is deficient for use for that purpose). Where an EA constitutes the only environmental review, the cumulative-impacts inquiry is quite broad. See, *e.g.*, *Citizens for Responsible Area Growth v. Adams*, 477 F.Supp. 994, 1002 (D.N.H.1979) ("different legal consequences flow from decisions to segment a project made prior to the threshold determination than the same decision made after the finding of significant effect"), vacated in part on other grounds, 680 F.2d 835 (1st Cir. 1982). This distinction is clearly recognized in the CEQ regulations.

40 C.F.R. §§ 1508.7 and 1508.27 require an analysis, when making the NEPA-threshold decision, whether it is "reasonable to anticipate cumulatively significant impacts" from the specific impacts of the proposed project when added to the impacts from "past, present and reasonably foreseeable future actions," which are "related" to the proposed project. The regulation does not limit the inquiry to the cumulative impacts that can be expected from proposed projects; rather, the inquiry also extends to the effects that can be anticipated from "reasonably foreseeable future actions." *Cf.* 40 C.F.R. § 1508.25(a)(2) (cumulative actions are "proposed actions ..."). The regulations clearly mandate consideration of the impacts from actions that are not yet proposals and from actions - past, present, or future - that are not themselves subject to the requirements of NEPA. See 40 C.F.R. § 1508.7 ("past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions"). This requirement, moreover, is entirely consistent with *Kleppe*. Said the court in *Adams*:

> Both ... footnote and *Kleppe* itself refer to cases in which an EIS is prepared. But contemplated actions which have not reached the proposal stage may certainly play a critical role in assessing the impacts of current proposals, and CEQ regulations require that they be considered.... The suggestion that those contemplated actions must also be the subject of assessments of their own 'environmental effects' - for which the plaintiffs in Kleppe argued - was rejected. Defendants read footnote 20 to opine that only another project which independently requires an EIS must be considered in determining possible cumulative effects of a current proposal. *Kleppe* does not suggest such a narrow restriction on EIS requirements, and the CEQ regulations clearly reject it.

477 F.Supp. at 1003 n. 19.

According to Nuclear Regulatory Commission public documents and posted schedules on the agency's website, there are, in fact, "sev-

eral" concurrent, formal proposals before the Commission within the "region" of the Fermi 3 project, *i.e.,* the Great Lakes Basin. There are formal letters of intent to apply for operating license renewals of First Energy Nuclear Corporation's Davis-Besse and Perry nuclear power stations, both situated on Lake Erie. Davis-Besse is admitted by DTE to be 31 miles from the proposed Fermi 3 site. The NRC License Renewal Schedule currently lists these license renewal applications on its website. Further, there is a new reactor license application for Nine Mile Point 3 in Oswego, New York in the Great Lakes Basin "region" on Lake Ontario. Upstream of Fermi 3, on Lake Michigan is Dominion Energy's Kewaunee nuclear power plant license renewal application submitted on August 14, 2008 and now pending before a NRC licensing board.[4] Kewaunee uses water from and discharges effluent into Lake Michigan and includes approximately two miles of continuous frontage on the lake's western shore.

The Staff and the Applicant contend that they have included an adequate environmental review for cumulative and additive impacts on the Great Lakes and that there is no omission. The Petitioners argue that the Applicant has omitted an adequate analysis of the surface water hydrology from its review by arbitrarily limiting the scope of definition of "region" to the "immediate vicinity" of the Fermi 2 and proposed Fermi 3 site, which excludes the referenced major federal actions from consideration in the Fermi 3 Environmental Report. The Applicant has omitted discussing these new license and license renewal

[4]Dominion Energy Kewanee Inc. application for license renewal, http://www.nrc.gov/reactors/operating/licensing/renewal/applications/kewaunee.html#appls

federal actions from its application. This omission has the result of breaking down the environmental assessment into smaller parts to circumvent or avoid the mandate of NEPA to take a “hard look” at an action’s cumulative and additive environmental impact.

The Petitioners provided in their initial filing URL links to the Canadian Nuclear Safety Commission website for status reports for 12 additional commercial nuclear electrical generators proposed on the Canadian side of the Great Lakes Basin “region.” The Darlington nuclear power plant construction application is anticipated by December 2009. The Nanticoke nuclear power plant construction application is anticipated by January 2010. The Bruce nuclear power plant construction application is anticipated by May 2009. While these “several” projected units are not within the jurisdiction of the US Nuclear Regulatory Commission, the Petitioners contend that joint environmental assessments are appropriate given the sharing of territorial water and these plants’ expected contributions of cumulative and additive environmental impacts.

The Petitioners contend that it is within NEPA’s “rule of reason” to include these “several” proposed federal actions scheduled before the NRC in the Fermi 3 application’s environmental review on the Great Lakes “region’s” surface water.

Detroit Edison’s review (ER at Chapter 3, Cumulative Impacts Related to Station Operations, 5-11) describes the cumulative impact of Fermi 3 by saying, “Potential cumulative impacts of operating an additional facility at the Fermi site were considered for this analysis. Past actions are limited to those related to the existing Fermi 2.” [5-197]. The scope of these cumulative impacts to the

region expressly omits the aforementioned major federal actions pending before the NRC which have been identified by the Petitioners. The Applicant goes on to state, “The geographical area over which past, present, and future actions could contribute to cumulative impacts depends on the resource area being analyzed and is discussed in each section of the ER.” ER, Chapter 3, 5-197. The Applicant thus has further narrowed or truncated the geographical scope of its ER to ignore these other major federal actions. The Applicant asserts that “[m]ost of the past environmental impacts that occurred at the Fermi site were associated with the construction and operation of the existing Fermi 2 and the decommissioned prototype Fermi 1. These actions include the construction and operation of the two nuclear reactors and associated facilities.” ER, Chapter 3, 5-197. In its own words, the Applicant identifies the smaller segment of the Lake Erie surface water to the exclusion of the identified “several” major federal actions in the region, without explaining or justifying the segmentation. In other words, the Applicant omits any analysis why it chose to limit its ER to the immediate surface waters around the Fermi site, to the exclusion of the Davis-Besse license extension action located in the region 31 miles away, on the south shore of Lake Erie. The Applicant completely ignores the Petitioners’ referenced major federal actions as if they were not occurring or unrelated to any consideration of cumulative and additive environmental impacts upon the Great Lakes Basin region, or even upon a region - the Western Basin - of Lake Erie.

The Staff argues that in the recent *Calvert Cliffs* decision, the ASLB held that, although the applicant’s description of existing water

quality conditions did not “separately evaluate the contributions of specific sources,” it formed “an environmental baseline against which to measure the cumulative impact of the proposed new reactor.” *Id*. at 39-40. The *Calvert Cliffs* board concluded that the environmental baseline reflected the effects of all currently existing pollution sources in the Chesapeake Bay watershed, including contributions of all nuclear power plants, and that the Petitioners had failed to provide information indicating that this “aggregate” analysis was insufficient under NEPA. *Id*. at 40-43. The Staff insists that the Fermi 3 situation is similar, acknowledging that the DTE ER contains no individual assessments of environmental impacts of existing pollution sources, including other operating nuclear plants, while asserting that the ER contains descriptions and data on hydrology, water use, and water quality for the Great Lakes Drainage Basin, Lake Erie, and other surficial water features in the region.

The Petitioners contend here that they have articulated facts pertaining to several specific concurrent major federal actions before this agency which must be considered and included in the Fermi 3 application’s cumulative and additive environmental review. Although baseline data can provide a picture of the environmental conditions prior to construction and operation of Fermi 3, it does not constitute an adequate analysis of the actual cumulative and additive impacts were the several contemplated federal actions on the Great Lakes Basin be granted operational - including the additive effects from Fermi 3 once it commences operation. This analysis is completely absent from the Environmental Report.

The Staff and DTE argue that the Petitioners do not provide any

facts or expert opinion to show that the DTE's analysis should have been broader. But Petitioners provided the Board in their initial filing the 1997 study "Inventory of Radionuclides for the Great Lakes" authored by prestigious experts through the International Joint Commission (IJC). Both the Staff and the Applicant attempt to trivialize the study as antiquated and its inclusion as irrelevant to this proceeding. The Staff trivializes the Petitioners' inclusion of the specific points and recommendations as if the Petitioners should be required to replicate the study for this licensing proceeding. The Petitioners' inclusion of the report's findings and conclusions, however, speak for themselves and are certainly not "unexplained." The report pointedly states and is incorporated by reference into the Petitioners' filing to make the point that persistent toxins are a growing problem of environmental harm to the Great Lakes Basin and identifies the nuclear industry as one source of those persistent toxins. The Petitioners argue that in fact DTE should include and respond to this report in its ER analysis precisely because of the findings which speak to the cumulative and additive problem of nuclear power operations on the Great Lakes Basin region.

The Petitioners included the report in this proceeding in the hope that its findings can be addressed within the context of a proposal to add yet another potential source of persistent toxins into a region where there are "several" other, similar proposed federal actions for the Great Lakes region. The Staff and the Applicant's answers do not address the Petitioners' assertion that tritium appears in both the ESBWR DCD and the IJC radioactive inventory report as one of the isotopes which requires further specific analysis. Neither the

Staff nor the Applicant respond to Petitioners' submission of the abstracts of clinic studies on the known toxicity of tritium. The Petitioners submit that the ER is inadequate and incomplete based upon the lack of an analytical reply which addresses these supporting documents.

Notably, the Staff and Applicant argue that the proposed ESBWR is intended as a zero discharge facility; yet there is no operational record for the ESBWR design anywhere in the world to substantiate such a claim. Additionally, the ESBWR is an uncertified design and may in fact never be certified by the agency.

The Staff contends that Petitioners do not dispute that Fermi's water discharges are subject to National Pollutant Discharge Elimination System (NPDES) permits and water quality regulations imposed by the Michigan Department of Environmental Quality (MDEQ) and the U.S. Environmental Protection Agency (EPA). This mischaracterizes the Petitioners' position: they assert that NEPA mandates that the environmental analysis take the "hard look" at individually insignificant, but cumulatively significant impacts (10 C.F.R. § 1508.27(b)(7)) so as to prevent the harm to an ecosystem by a thousand small cuts. They seek to prevent the Applicant from arbitrarily narrowing the scope of its ER to the "immediate vicinity" and the NPDES discharges of the operational unit and the proposed second unit, all the while ignoring the broader cumulative and additive impacts from other major federal actions.

The Staff argues that the Petitioners' assertions of "uncertainty" and "lack of confidence" in standards for tritium exposure are unfounded and without source citations. But the Petitioners specific-

ally provided citations documenting the broad range of uncertainty in dose standards between the NRC and EPA and the California goals for acceptable limits for tritium in drinking water.

Staff argues that the Petitioners' plea for an adequate environmental review of the cumulative and additive radionuclide contributions from Fermi 3 in context with other sources in the Great Lakes Basin region is not only unrelated to Contention 1 but also constitutes an impermissible attack on the Commission's regulations in 10 C.F.R. Part 20. The Petitioners rely upon the NEPA injunction that the environmental analysis must take a "hard look" at individually insignificant, but cumulatively significant, impacts. 10 C.F.R. 1508.27(b)(7).

**REPLY IN SUPPORT OF CONTENTION NO. 2:** ***There is no technical basis for a finding of 'reasonable confidence' that spent fuel can and will be safely disposed of at some time in the future***

Contention No. 2 continues a good faith effort by Petitioners to petition NRC for redress of grievances concerning its Nuclear Waste Confidence Decision, as well as to challenge Detroit Edison for proposing to generate (and store on the Great Lakes shoreline) yet more irradiated nuclear fuel for which it does not have a safe, sound long-term management plan. The contention is within the scope of this proceeding, for Fermi 3's radioactive waste byproduct would represent a hazard to public health, public safety, the environment, and the common defense for a million years, and longer. Petitioners have engaged, and will continue to do so, in NRC's Nuclear Waste Confidence Decision re-evaluation rulemaking, but are compelled to raise their concerns about high-level radioactive waste risks at Fermi 3 in this particular licensing proceeding. If Petitioners' contention is

contrary to NRC precedent, it remains that, 67 years after Enrico Fermi first split the atom, 52 years after the first commercial atomic reactor commenced operations, and 34 years after the establishment of the NRC itself (after the dissolution of the U.S. Atomic Energy Commission), there is still no permanent solution for the high-level radioactive waste dilemma in the United States, and there is no clear solution in sight. The contention is thus not an "impermissible attack on the Commission's regulations," (DTE Answer at 24; Staff Answer at 26) but instead is a good faith effort to address the obvious risks to the Great Lakes and all its residents and biota from one of the most hazardous substances ever created by human beings – irradiated nuclear fuel.

Petitioners fully intend to challenge the unacceptable Nuclear Waste Confidence Decision, and Temporary Storage Rule[5] at every opportunity - including in opposition to the ongoing lobbying activities of DTE and the NRC in Congress, where a waste confidence statute has been introduced. The U.S. Environmental Protection Agency, in its final Yucca Mountain radiation release regulations, recognizes a million years of hazard associated with high-level radioactive waste, several times longer than human beings have been a distinct species; but even that length of time does not account for such

[5]73 Fed. Reg. 59,551 (Oct. 9, 2008). The proposed Waste Confidence Decision would revise Findings 2 and 4 in the 1990 Waste Confidence Decision, which relate to storage of high-level waste in geological repositories (Finding 2) and storage of spent fuel onsite or offsite at independent spent fuel storage installations (ISFSIs) (Finding 4). 73 Fed. Reg. at 59,551; Consideration of Environmental Impacts of Temporary Storage of Spent Fuel After Cessation of Reactor Operation, 73 Fed. Reg. 59,547 (Oct. 9, 2008) (Temporary Storage Rule). The Temporary Storage Rule revises 10 C.F.R. § 51.23(a) to reflect the Commission's findings in the proposed Waste Confidence Decision. *Id*. at 59,547.

longer-lived radioactive hazards as the 15.7 million year half life, and thus 157 million year persistence, of Iodine-129). Complicating high-level radioactive management policy further, the Secretary of Energy has recently reaffirmed his lack of authority to undertake any steps to resolve the spent nuclear fuel repository problem, absent sweeping legislative changes, because high-level waste policy is keyed to milestones in the development of the now-terminated Yucca Mountain.[6]

Words on paper will not change this unfortunate and dangerous reality. Just as the NRC and Congress cannot suspend the law of gravity by writ, the unsolved risks of radioactive waste cannot be pencil-whipped out of existence.

At Staff Answer 26, the Staff states:

> In *Oconee*, the Commission also stated that 'a petitioner may not demand an adjudicatory hearing to attack generic NRC requirements or regulations or to express generalized grievances about NRC policies.'

But Petitioners do not attack generic NRC requirements or regulations, nor express generalized grievances about NRC policies. Contention No. 2 focuses on the lack of robust NRC requirements, regulations, and policies to protect public health and safety, and the environment from

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[6]From Executive Summary, "Report to Congress on the Demonstration of the Interim Storage of Spent Nuclear Fuel," DOE/RW-0596, December 2008:

"The Department has reviewed its authority to accept spent nuclear fuel from decommissioned commercial nuclear power reactor sites for interim storage and has concluded that it has no such currently exercisable authority. Legislation is required that would eliminate the limitations in the Nuclear Waste Policy Act of 1982, as amended, on taking commercial spent nuclear fuel for interim storage prior to the opening of the Yucca Mountain repository. In addition, in order to undertake interim storage in a timely manner, legislation would be needed: (1) to direct the Department to take spent nuclear fuel from decommissioned commercial nuclear power reactors as soon as possible; (2) to establish an expedited siting process; and (3) to authorize the Department to construct and operate the facility under its regulatory authority, or, if the facility were to be constructed and operated under a U.S. Nuclear Regulatory Commission license, to provide for an expedited siting and licensing process."

the long-term risks of high-level radioactive wastes that would be generated at Fermi 3. NRC's lack of adequate regulations would allow Detroit Edison to generate many hundreds of tons of irradiated nuclear fuel at Fermi 3, despite the lack of safe, sound short-, medium-, and long-term management plans. In this sense, Petitioners' grievances are very specific to the Lake Erie shore at Fermi nuclear power plant.

The Staff's injunction to Petitioners to avail themselves of the NRC rulemaking process (Answer at 27) is redundant, since Petitioners have commented at length, with the support of expert testimony, during the Nuclear Waste Confidence Rule re-evaluation public comment period, on February 6, 2009.

And despite the Staff's confidence about Waste Confidence (Answer at 25, fn. 20, "The proposed WCD does not alter the Commission's findings of reasonable assurance"), the fact of termination of the Yucca Mountain quest objectively defers the development of a centralized repository for decades, perhaps generations. Petitioners' suggestion that Contention No. 2 should be held in abeyance is a practical one. They agree that the issue of waste confidence and high-level waste "disposal" is generic; it is common to all operating nuclear reactors. But the result of that generic decision will inevitably have site-specific consequences for Fermi 3 and its surrounding environment: inevitably there will be site-specific storage of HLW required for many years to come. Petitioners do not seek to litigate the generic aspects of the waste confidence decision, but the site-specific implications. The Staff has mischaracterized Petitioners' position by maintaining that they "do not seek to litigate [the issues raised by this contention] in this individual proceeding." Staff

Answer at 27.

It is permissible for a generic issue to be litigated in a facility-specific proceeding. Before a contention presenting a generic issue can be admitted, the intervenor must demonstrate a specific nexus between each contention and the facility that is the subject of the proceeding. *Cleveland Electric Illuminating Co.* (Perry Nuclear Power Plant, Units 1 and 2), LBP-82-15, 15 NRC 555, 558-59 (1982); *Pacific Gas and Electric Co.* (Diablo Canyon Nuclear Power Plant, Units 1 and 2), LBP-87-24, 26 NRC 159, 165 (1987), aff'd on other grounds, ALAB-880, 26 NRC 449, 456-57 n.7 (1987), remanded on other grounds, *Sierra Club v. NRC*, 862 F.2d 222 (9th Cir. 1988). To establish such a nexus, it must be shown that (1) the generic issue has safety significance for the particular reactor under review, and (2) the fashion in which the application deals with the matter is unsatisfactory or the short term solution offered to the problem under study is inadequate. *Gulf States Utilities Co.* (River Bend Station, Units 1 & 2), ALAB-444, 6 NRC 760, 773 (1977); *Illinois Power Co.* (Clinton Power Station, Unit No. 1), LBP-82-103, 16 NRC 1603, 1608 (1982), citing *River Bend, supra*, 6 NRC at 773; *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), LBP-82-106, 16 NRC 1649, 1657 (1982); *Duquesne Light Co.* (Beaver Valley Power Station, Unit 2), LBP-84-6, 19 NRC 393, 418, 420 (1984), citing *River Bend, supra*, 6 NRC at 773; and *Virginia Electric and Power Co.* (North Anna Nuclear Power Station, Units 1 and 2), ALAB-491, NRC 245, 248 (1978). Petitioners accomplished this in the statement of Contention No. 2. The attempts by the Staff to declare the Waste Confidence and Temporary Storage Rule re-evaluation rulemakings “off limits” removes from

discussion one of the most significant potential environmental impacts to be expected from Fermi 3, one which could affect Lake Erie and its shores for decades, centuries, millennia, or, indeed, forever.

DTE argues, incorrectly (DTE Answer at 26) that Petitioners must seek a waiver pursuant to 10 C.F.R. § 2.335(b). But that regulation governs circumstances where a Nuclear Regulatory Commission rule is being "attacked." 10 C.F.R. § 2.335(a). Petitioners are not "attacking" the Waste Confidence and Temporary Storage rules by Contention No. 2; they are preparing to challenge the resulting waste storage problems those rule revisions will produce at Fermi 3. Therefore, 10 C.F.R. § 2.335(b) is inapposite. And in any event, adding to the present, significant risks associated with storing high-level radioactive wastes indefinitely on the Great Lakes by permitting that to happen at Fermi 3, which would sit immediately adjacent to 20% of the entire planet's fresh surface water supply, represents a "unique" and "special" circumstance such as should satisfy 10 C.F.R. § 2.335(b). Tens of millions draw upon the waters of the Great Lakes downstream of Fermi 3 for their drinking water; the western basin of Lake Erie, besides being shallow and vulnerable, is also the most biologically productive fishery in the entire Great Lakes; Native American tribes retain fishing rights to Lake Erie by treaty with the U.S. government. Each of those reasons, and many others, show how "unique" and "special" the shoreline of Lake Erie at Fermi 3 is, and deserving of protection from the risks of accidents, attacks, or eventual leakage causing catastrophic radioactivity releases from high-level radioactive waste stored on site.

The Staff maintains (Staff Answer 28) that:

> The Petitioners' challenges to the WCD and the Temporary Storage Rule do not assert deficiencies or omissions in the Application and therefore do not fall within the scope of the proceeding. The only mention of the Application or the EIS that NRC will prepare is in the Petitioners' claim that the proposed WCD and Temporary Storage Rule 'fail to provide adequate support for the Applicant's ER or for an EIS in this particular licensing case.' This claim clearly asserts a deficiency in the WCD and the Temporary Storage Rule. The Petitioners have not identified any deficiencies or omissions in the Environmental Report. Thus, because the issues raised in this contention are aimed solely at the NRC's actions, not the Application, the contention is outside the scope of the proceeding and is therefore inadmissible.

But the failure to "provide adequate support for the Applicant's ER or for an EIS in this particular licensing case" clearly brings the Contention within the scope of this proceeding. Petitioners are challenging the assumptions taken for granted by DTE and the Staff that radioactive waste can be safely generated at Fermi 3 and stored there indefinitely, until a final burial site can be found somewhere, someday. After 51 years of such false assurances, Petitioners have concluded that "Nuclear Waste Confidence" is an oxymoron.

Petitioners also question how they were supposed to submit NEPA-related contentions by March 9, 2009, when NRC's environmental scoping proceeding (in which petitioners extensively participated in good faith) had just ended on February 9, 2009. The schedule for the publication of NRC's draft EIS is still not even posted on NRC's website under Fermi 3's "Application Review Schedule" [http://www.nrc.gov/reactors/new-reactors/col/fermi.html, checked 4/9/2009]. How, then, were petitioners supposed to prepare intervention contentions on NRC's Draft EIS, when it was not even available by the March 9, 2009 COLA contention filing deadline? Once NRC's Draft EIS is made available, will petitioners – and others as well – be granted sixty days or more during which time to digest the Draft EIS and prepare intervention

contentions in the Fermi 3 licensing proceeding? Not likely.

At its Answer, page 31, the Staff points out, correctly, that Petitioners failed to attach certain documents in support of this Contention, namely "the facts, expert opinion, and documentary resources set forth in the attached IEER Comments and Thompson Report." Petitioners apologize for the oversight of not attaching the comments and expert testimony to their March 9, 2009 filing, owing to an oversight by Petitioners' counsel. However, since filing the Petition, counsel has received no requests from the Staff or DTE for those documents, probably because they are a matter of public record and were incorporated by reference into the Petition. The rulemaking proceeding remains open and pending with the same entity as employs the Staff, after all. To correct this problem ahead of the scheduled May 5, 2009 oral argument on this proposed Contention, the Petitioners will file the missing documents for the record.

**REPLY IN SUPPORT OF CONTENTION NO. 3:** ***The COLA violates NEPA by failing to address the environmental impacts of the 'low-level' radioactive waste that it will generate in the absence of licensed disposal facilities or capability to isolate the radioactive waste from the environment***

Contention 3 is a contention of omission challenging the lack of planning for very long term storage and management of potentially all of the Class B, C and Greater than C "low-level" radioactive waste generated by Fermi 3 nuclear reactor.

In CLI-09-03, the Commission confirmed that contentions such as Contention 3, which challenge the environmental impacts of onsite storage of so-called "low level" radioactive waste, are appropriate for consideration in licensing hearings. *Tennessee Valley Authority*

(Bellefonte Nuclear Power Plants, Units 3 and 4), CLI-09-03, slip op. at 11 (February 6, 2009).

While the NRC Staff and DTE make several arguments to the effect that the contentions are not admissible, these arguments lack merit.

**Greater than Class C (GTCC) Radioactive Waste**

Greater than Class C waste is the most highly concentrated so-called "low-level" radioactive waste. It is generally not suitable for shallow land burial disposal which NRC allows for Classes A, B and C radioactive wastes. Applicant argues (DTE Answer 27-28) that "other licensing boards have declined to admit the GTCC waste aspects of the proposed contentions" as its only justification for dismissing it, but does not explain how Fermi 3's GTCC waste will be managed in the long term. Disposal of Greater-than-Class-C (GTCC) so called "low-level" radioactive waste was designated a federal responsibility in the Low Level Radioactive Waste Policy Amendments Act (P.L. 99-240, § 3(b)(1)(D)) passed in 1985. To this day, more than 23 years later, the Department of Energy (DOE) does not have a disposal site for GTCC waste. Some GTCC has gone to so-called "low-level" radioactive waste sites on a case-by-case basis, but in the absence of access to such facilities, the waste could very well remain onsite. Although DOE supposedly began to consider its responsibility for this waste some time ago, it was not until a Congressional directive in 2005 that an Advance Notice Of Intent (ANOI) was filed, and DOE has still made no decision on how to proceed or whether to look for a site. It has been determined by the courts that DOE is responsible for the irradiated fuel (high-level) radioactive waste from nuclear power reactors. Tax-money is being given to utilities to store irradiated fuel, but no

disposal is available despite numerous efforts and enormous expenditures by DOE. DOE has not even made the determination to begin to seek disposal for GTCC, hence the likelihood of DOE finding such a place in time for the waste generated by Fermi 3 to leave the site is quite speculative. The long-term management of the GTCC waste on-site is not addressed in the COLA or generic ESBWR documents. The NRC's high-level radioactive waste confidence decision does not apply to or cover GTCC waste.

**Regarding Table S-3**

DTE (Answer at 29-30) and the NRC Staff (Answer at 32, 37) argue that Contention 3 is inadmissible to the extent it challenges Table S-3 (10 CFR § 51.51). But Table S-3 is only relevant to a limited extent, *i.e.,* to the extent that the Fermi 3 site becomes a *de facto* permanent "low-level" radioactive disposal site. Table S-3 does not govern the storage issues raised by Contention 3 or the health and safety consequences of 60 years' worth of accumulated radioactive waste on the shore of Lake Erie, which are the basis of contention. In any event, the contention is not challenging Table S-3 and should be admitted. To the extent that Table S-3 is involved, the decision should be held in abeyance pending the outcome of the Waste Confidence Rulemaking, in which Petitioners have challenged the adequacy of Table S-3 to support NRC licensing decisions. There is no need for Petitioners to request a waiver in this case.

NRC staff claims petitioners do not address Table S-3, 10 CFR § 51.51. But Petitioners are not challenging Table S-3, which "does not include health effects from the effluents described in the Table, or estimates of releases of Radon-222 from the uranium fuel cycle or

estimates of Technetium-99 released from waste management," as stated in footnote 1 of Table S-3. It is self-evident that "[t]hese issues may be the subject of litigation in the individual licensing proceedings." The footnote states that "there are. . . areas that are not addressed at all in the Table." It is some of those "unaddressed areas" which Petitioners contend must be addressed in the Application.

**Expert Opinion**

DTE's Answer (at 30) claims there were no facts or expert opinion provided but in fact the affidavit of Diane D'Arrigo, a national expert on so-called "low-level" radioactive waste and related issues, was supposed to be provided as part of the petition, but was omitted in error, and will be tendered forthwith. The Applicant incorrectly assumes there will be no extended storage of Class B, C and GTCC waste – that it will leave the site. The proposed Contention is precisely one of omission — that the Applicant did not provide any assessments on long-term management and storage of accumulated wastes.

DTE (Answer at 31) claims Petitioners did not cite regulatory requirements for the Contention. NEPA and NRC's own NEPA regulations (10 CFR § 51) require that major federal actions be undertaken in such a way as to protect the public. It is evident now that the waste generated could stay at Fermi 3 for a long time or forever and that prospect must be analyzed in the NEPA document and not after the waste is generated via "a separate licensing action at that time" (DTE Answer at 31). That would be an unnecessary segmentation of NEPA, since it is currently the case that the waste to be generated has no clear disposition pathway. DTE says it will meet 10 CFR parts 20 and 50 release limits, but the company provides information concerning its

6-month treatment and storage plans, not on the long-term management and storage of the B, C and GTCC waste for decades and beyond.

Applicant states (Answer at 31) that there is not a genuine dispute, but in fact, there is. Petitioners are challenging the capability for long-term isolation, management, disposition and disposal which the Applicant assumes does not need planning nor incorporation into the COL plans for managing the waste long-term.

**Regarding Long-Term On-site Storage**

DTE (Answer at 28) claims that the Petitioners "rely on an incorrect premise" that "the lack of a licensed disposal site for Class B and C wastes . . . means the waste will remain onsite indefinitely." Petitioners' concern that there could be no disposal available for Fermi 3's Class B, C and GTCC waste is well-documented by numerous entities, including the Government Accounting Office[7] and the NRC itself.[8] It is also common knowledge. It is now 2009, nearly 30 years since the passage of the 1980 Low Level Radioactive Waste Policy Act (Public Law 96-573) encouraging development of new "low-level" radioactive waste disposal facilities in the US. Not one new full service "low-level" radioactive waste disposal facility has opened in the US.

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[7]GAO: "If disposal conditions do not change, however, most states will not have a place to dispose of their class B and C wastes after 2008." GAO-04-604, June 2004, "Low-Level Radioactive Waste Disposal Availability Adequate in the Short Term, but Oversight Needed to Identify Any Future Shortfalls."

[8]NRC: NRC Regulatory Issue Summary 2008-12, "Considerations for Extended Interim Storage of Low-Level Radioactive Waste by Fuel Cycle and Materials Licensees," May 9, 2008, p. 2 : "After June 30, 2008, it is likely those LLRW generators and licensees in 36 States, the District of Columbia, the Commonwealth of Puerto Rico, and the U.S. Territories will lose access to the full-service LLRW (Classes A, B, and C LLRW as defined in section 61.55 of 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste") disposal facility in Barnwell, South Carolina. Consequently, many LLRW generators will likely need to store a portion of their LLRW for ***an indefinite period***." (Emphasis added)

Technical, economic and public policy concerns and problems have prevented both new waste disposal sites and other “creative” disposal “solutions” such as deregulating or redefining the waste as not radioactive so it can be sent to unlicensed facilities. Neither the NRC nor the Applicant can assume that new full service (including Class B and C) disposal or generic deregulation of radioactive waste will be available during the operating years of Fermi 3. Rather than address the likely possibility that DTE will have to manage its waste and plan for it, Applicant implies that it will be able to rely on radioactive waste vendors to take their waste. Historically the title and liability remains with the generator even when it goes to processors or vendors. Vendors are not licensed disposal sites and do not necessarily have access to disposal. The wastes for which there is no disposal have usually been returned to the generator. Until DTE achieves disposal, it is responsible for the waste (and is, even to some extent after disposal).

The issue of continued responsibility after processing was addressed in Contention 3 by the Petitioners. DTE, in an attachment to its response to this contention, provided a copy of a press release from a vendor claiming to have a contract with another nuclear utility (not DTE) to take ***that other utility’s*** Class B and C waste. DTE apparently wishes to lend the impression that vendors might be available to take the waste from Fermi 3, but provides no firm support for that impression. Further, the other utility’s agreement with the processor relies on an additional agreement with yet another company to take the waste for storage. The veil of multiple corporate contracts prevents full disclosure. Questions have been raised in the states in which

all the companies are located regarding the legality and/or acceptability of long term storage and/or lack of disposal. DTE states (Answer at 28) that "[t]he waste treatment facility would then be responsible for storing the waste prior to eventual disposal." It is speculative at best that the proposed scheme of physically and legally transferring waste and liability to a vendor or processor will succeed. This is especially true in a state that does not have access to a disposal site. Such a speculative scheme is not a reliable substitute for licensed disposal. It is uncertain that this approach will work for the companies referred to in the press release. DTE is showing this inadequately-defined plan to move waste offsite, but can provide no guarantee that Fermi 3's waste will be moved, either temporarily or permanently, from the reactor site.

**Regarding Standing**

Applicant (Answer at 32) has raised a standing objection to the admissibility of this contention, arguing Petitioners must prove standing for each contention. But inadequate "low-level" radioactive waste management program at Fermi 3 would likely lead to accidental radioactive releases and contamination of water resources. A resolution of this contention in favor of Petitioners would lead to a better radioactive waste management program and thus reduce the likelihood of accidental radioactive releases and contamination of water resources, which are the harms on which Petitioners base their assertions of standing.

**The Legal Basis for Contention 3**

DTE (Answer at 29) incorrectly states that Contention 3 "is directly solely at compliance with NEPA." In addition to NEPA consid-

erations, the contention also concerns the safety consequences, both public and worker exposures of accumulating long-lasting so-called "low-level" radioactive wastes. This includes compliance with NRC storage and disposal regulations at 10 CFR Parts 20, 30, 31, 40, 50, 51 and 61. Since the Application assumes offsite disposal after 6 months, it omits any assessment of these long-term environmental, safety and security related risks. Petitioners have concerns about site-specific consequences, routine and accidental, for the Lake, the communities downwind and downstream and for special communities such as Native Americans who, because of cultural ways could be more vulnerable to the environmental and health risks from the increased radioactive inventory at the site. In the case of an unforeseen accident onsite, especially one that might require evacuation of the site, the presence of thousands of curies in Class B, C and GTCC waste could have significant safety consequences.

The NRC Staff (Answer at 32) attempts to make a distinction between a contention of omission and a challenge to the adequacy of the on-site waste management plan for operational waste, as it is generated routinely. Petitioners have clearly identified the omission at the first page of Contention No. 3 as the "fail[ure] to address the environmental impacts of "low-level" radioactive waste [Fermi 3] will generate in the absence of licensed disposal facilities or capability to isolate the radioactive waste from the environment." At the fifth page of Contention No. 3, last paragraph, Petitioners assert that "waste will be generated from the operation of Fermi 3 but none [of the application documents COL, ER, FSAR] provide analysis of the safety and security of the Class B, C and GTCC wastes that will accu-

mulate at the site in the absence of final disposal."

Even the NRC Staff in its review of the COLA noted that the Fermi application documents are not adequate in the area of long-term storage of radioactive waste. This omission is the subject of 2 RAI questions. The information is necessary for compliance with 10 CFR § 50.34. In the March 9, 2009 Request for Additional Information Letter No. 4, two questions pertain to the "low level" radioactive waste capabilities at Fermi 3: RAI Nos. 2185 and 2184. In RAI No. 2184 and 2185 Revision 0, SRP Section 11.04 – Solid Waste Management System Application § 11.4, NRC asks DTE to:

> ... [D]escribe the facilities plan for long-term storage of low-level radioactive waste that could be projected to be generated during the operation of Fermi 3, and the operation program addressing the long-term management and storage of such wastes. . . .

The NRC staff itself has asked Detroit Edison to describe which parts of the ESBWR DCD Revision 5 it will incorporate at its site. But Revision 5 has very minimal suggestions for dealing with long-term storage. NRC recommends that DTE evaluate incorporating guidance from the Standard Review Plan (NUREG 0800) and Reg Guide § 1.206. This evidences the deficiency which Petitioners have alleged in the COLA.

The basis of Contention 3 is the omission of planning for "low-level" radioactive waste long-term management. However, NRC guidance documents do not constitute law, but are merely the Staff's opinion on how regulations may be satisfied. *Louisiana Energy Services, L.P.* (Claiborne Enrichment Center), LBP-96-7, 43 NRC 142, 147 (1996). An NRC Staff working paper or draft report neither adopted nor sanctioned by the Commission itself has no legal significance for any NRC regulatory purpose. *Duke Power Co.* (Catawba Nuclear Station, Units 1 & 2),

ALAB-355, 4 NRC 397 (1976); *Consolidated Edison Co.* (Indian Point, Unit 2), ALAB-209, 7 AEC 971, 973 (1974). Therefore, compliance with guidance documents may not be used as a basis for denying the admissibility of contentions. Revision 4 of the ESBWR DCD is incorporated into the COLA, but it does not provide long- term storage plans. The fact that there is no permanent disposal available for Class B and C and GTCC waste is addressed in the contention and the to-be-filed expert declaration of Diane D'Arrigo.

NRC Staff (Answer at 33) states that Petitioners cannot point to a legal requirement that DTE as the waste generator, provide "information concerning how waste storage over the durations they mention or permanent LLRW disposal will be accomplished." This requirement stems from NEPA and the NRC regulations implementing NEPA.

NRC Staff (Answer at 35) charges that the issue is not well-defined. As stated in the Contention, DTE's COLA documents and the generic licensing documents for the ESBWR fail to provide an assessment or plan for the likely possibility that the Class C and Class B and GTCC so-called "low-level" radioactive waste generated by the Fermi 3 reactor will have no place to go thus could remain onsite indefinitely. The Applicant fails, in its COLA and accompanying documents, to address this reality, nor does it address the environmental, safety and security effects for individuals, communities and the environment. The health effects, environmental exposures, impacts on the area, water, air, food chain, humans and other organisms and systems and the bioregion are not addressed with regard to the additional accumulation of significant amounts of nuclear waste at the site for an indefinite time. The assumption is made that all dose

limits in 10 CFR Parts 20 and 50 will be met for public releases and worker exposures, but there is no indication that those dose calculations were done including the full inventory of Class B, C and Greater-than-C radioactive waste that Petitioners contend could be present onsite. DTE's underlying assumption appears to be that all but about a year's worth, or one refueling cycle's worth, of waste will have been removed from the site. It is not clear that the calculations account for accumulated Class B, C and GTCC for all the years the reactors operate. This is indeed an omission which must be admitted for trial.

**REPLY IN SUPPORT OF CONTENTION 4:** ***The Commission must suspend the COL adjudication pending completion of the NRC review of the ESBWR reactor design and the obligatory design rulemaking***

DTE maintains that there is no "special circumstance" warranting admission of this contention, that the ESBWR reactor design is the subject of a pending rulemaking, and that NRC rules allow there to be a license adjudication contemporaneously to a reactor design rulemaking. DTE Answer 13.

But it is the Applicant which is creating "special circumstances" as a result of adapting the ESBWR design to DTE's generating needs. A glimpse into the site-specific Fermi 3 ESBWR is found in the NRC staff's March 9, 2009 request for additional information (RAI) letter from Jerry Hale, NRC Project Manager of ESBWR/ABWR Projects, Branch 1 within the Division of New Reactor Licensing, to Peter W. Smith, DTE's Director of Nuclear Development-Licensing.[9] In that letter, the NRC notes inconsistencies in the FSAR which require cost-benefit analysis

[9]ADAMS ML090680443.

by DTE; advises DTE to upgrade its ESBWR to conform with the latest Design Control Document (DCD); requests that where it departed from the DCD perquisites, DTE “describe the facilities plan for long-term storage of low-level radioactive wastes projected to be generated during the operation of Fermi Unit 3, and the operational program addressing the long-term management and storage of such wastes. . . ”; points out inconsistencies between the Fermi FSAR and the DCD concerning monitoring and sampling of water from various plant systems for the Fermi-specific Offsite Dose Calculation Manual; advises that a review of gaseous effluent release values for Fermi in the Fermi 3 COL FSAR source term for all radionuclides differs from the DCD “by the ratio of the Fermi Specific X/Q to the ESBWR DCD X/Q for each release point;” and orders reconciliation of the liquid effluent values provided in the DCD with the liquid effluent data provided in the Fermi 3 COL FSAR, a table of which (Table 12.2-20aR) identifies a different, much lower dilution flow rate from that used in the DCD. That portion of the letter requesting a facilities plan for long-term storage of LLRW is analogous to Petitioners’ Contention No. 3, which questions whether a COL can be issued without a long-term LLRW disposal solution which requires realistic preparations by DTE for long-term storage at the Fermi site.

A review of the NRC ESBWR design investigation docket for March 2009 reveals perhaps a dozen or more Staff requests for information on multiple issues, plus a March 25, 2009 Inspection Report and Notice of Violation from the NRC to GE-Hitachi, citing the ESBWR vendor for six

(6) quality assurance and regulation violations.[10]

The Staff (Answer at 39-40) and Applicant (DTE Answer 33-34) urge that this contention constitutes an impermissible challenge to a regulation, specifically that 10 C.F.R. § 52.55(c) allows: "An applicant for a construction permit or a combined license may, at its own risk, reference in its application a design for which a design certification application has been docketed but not granted." By the very wording of the cited regulation, however, the applicant is putting its combined license application "at ... risk" by specifying an unapproved reactor design. The "risk" is that a reactor design might be referenced which does not or cannot be properly addressed by an FSAR until it is at or near certification (which the ESBWR surely is not). 10 C.F.R. § 52.79(a)(2) requires the FSAR for a COLA to address:

> (2) A description snd analysis of the structures, systems, and components of the facility with emphasis upon performance requirements, the bases, with technical justification therefor, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished. It is expected that ***reactors will reflect through their design***, construction, and operation an extremely low probability for accidents that could result in the release of significant quantities of radioactive fission products. The descriptions shall be sufficient to permit understanding of the system designs and their relationship to safety evaluations. Items such as the reactor core, reactor coolant system, instrumentation and control systems, electrical systems, containment system, other engineered safety features, auxiliary and emergency systems, power conversion systems, radioactive waste handling systems, and fuel handling systems shall be discussed insofar as they are pertinent. ***The following power reactor design characteristics and proposed operation will be taken into consideration by the Commission:***
>
> (i) Intended use of the reactor including the proposed maximum power level and the nature and inventory of contained radioactive materials;

[10]ADAMS ML090790473.

> (ii) The extent to which generally accepted engineering standards are applied to the design of the reactor;
>
> (iii) The extent to which the reactor incorporates unique, unusual or enhanced safety features having a significant bearing on the probability or consequences of accidental release of radioactive materials;
>
> (iv) The safety features that are to be engineered into the facility and those barriers that must be breached as a result of an accident before a release of radioactive material to the environment can occur. Special attention must be directed to plant design features intended to mitigate the radiological consequences of accidents. In performing this assessment, an applicant shall assume a fission product release from the core into the containment assuming that the facility is operated at the ultimate power level contemplated;. . . . (Emphasis supplied)

DTE took on the risk that the chosen ESBWR design might have a rocky road to approval. DTE chose to time its application filing at a point well ahead of certification of the reactor design. The risk DTE assumed was that it was opening up the adjudicatory proceeding to a challenge to its incomplete reactor design as customized to DTE needs. Petitioners seek to have the ASLB apply the regulations, to let them put on proofs that the ESBWR is not ready for prime time and further consideration of issuing a license for Fermi 3 must be shelved until it is.

**REPLY IN SUPPORT OF CONTENTION NO. 5:** ***The Fermi site may have problematic hydrology likely to allow offsite transport of chemical and radiological contaminants***

Petitioners are thankful that NRC Staff “does not object to the admission of the portion of this contention which asserts that on-site measurements of distribution coefficients, retardation factors, and porosity are omitted from the Application.” (NRC Staff Answer 48-49). Petitioners request that, once DTE responds NRC Staff requests for additional information by September 1, 2009, that Petitioners be granted adequate time to prepare contentions, with expert witness assistance, in response to the newly-provided data. However, Peti-

tioners defend the remainder of their Contention Number 5 against the challenges from NRC Staff and Detroit Edison.

**Chelation and Radiation Transport**

The Staff (Answer 50) states "The Petitioners' claims regarding possible chelating agents is not related to the contention, lacks adequate support, and fails to demonstrate a genuine dispute with the Applicant." The Staff further argues (at 51) that "[t]he Petitioners have not provided a link between the assertion that chelating agents might accelerate transport of radioactive materials in groundwater and the proposed contention. . . ." Petitioners maintain that the "link between the assertion that chelating agents might accelerate transport of radioactive materials in groundwater and the proposed contention, which asserts that 'the Fermi site may have problematic hydrology,'" is clear on its face. Chelate-bound radioactivity will remain persistently soluble, and thus mobilized, over very long periods of time, allowing it to migrate widely throughout the environment. If such substances find their way into the groundwater or Lake Erie at the Fermi 3 site, it would lead to significant groundwater contamination, risking significant contamination of drinking water supplies as well as Lake Erie itself. Such radioactive contamination of drinking water supplies and the Great Lakes threatens public health and safety and the environment, and is thus deserving of a hearing in an NRC licensing proceeding. Such radioactive contamination of the Great Lakes also would violate the International Joint Commission's goal of virtual elimination of radio-toxic discharges into the Great Lakes.

**Hydrology**

Also at Staff Anser p. 50, fn. 46, the NRC Staff states that "The

Petitioners fail to explain how [the sole source aquifer, namely the Bass Islands Aquifer at Catawba Island, approximately 35 miles south-east of the Fermi 3 site] is 'downstream' from the Fermi 3 site, when, as explained in the FSAR, Lake Erie is a hydraulic boundary for regional groundwater flow to the east, and local flow at the site is away from the lake." This misstates the ER; at § 2.3.1.2.1.1, "Regional Aquifers, Formations, Sources, and Sinks," (pp. 2-71 to 2-72), it says:

> Lake Erie constitutes a hydraulic boundary to the east. ***Under pre-development conditions, the lake represented a discharge area for groundwater flow from the bedrock aquifer.*** In recent decades, however, bedrock water levels in Monroe County have declined to the point that in places they are tens of feet below lake level in the county, thereby inducing flow from beneath the lake to local discharge areas. It is assumed that water levels in the bedrock aquifer approach lake level at some point eastward beneath Lake Erie. [emphasis added]

Thus, Detroit Edison admits that significant interchanges between Lake Erie and Fermi nuclear power plant area aquifers are possible, as well as between Fermi area aquifers and aquifers beneath Lake Erie to the east. With the loss of institutional control over time, area quarries would no longer be de-watered, allowing regional groundwater flow to return to its previous, "pre-development," eastward direction, toward, and even into, Lake Erie. Thus, the Staff's argument that "Lake Erie is a hydraulic boundary for regional groundwater flow to the east, and local flow at the site is away from the lake" cannot be guaranteed to persist over time. Hydrological flow direction could change, such as due to loss of institutional control over quarry de-watering.

The ER continues:

> Regionally, the Surficial Aquifer System is the uppermost and most widespread aquifer in the area…This aquifer system consists primarily of glacial sediments… In areas where signi-

> ficant quantities of sand and gravel have been deposited, ***the aquifer may provide water supply for local wells… regionally these sediments are hydrologically significant due to the water they transmit over large areas to the underlying bedrock formations***. . . .[Emphasis added]

It follows that any interchange between the surface aquifer and the bedrock aquifers could contaminate human drinking water wells. Also, the glacial sediments closer to the surface and the bedrock sediments deeper down display communication of groundwater flows between them.

In fact, the ER's Figure 2.3-19, "Conceptual Cross-Section of Regional Aquifer System," (p. 2-281) shows that there is "potential ground water flow" between the bedrock units, including the Bass Islands group, and the glacial deposits overlaying them. So ***the ER admits that significant mixing of flows between various bedrock units and the glacial surface aquifer is entirely possible.*** Both the surface aquifer and the bedrock aquifers also directly interact with Lake Erie's waters as well.

Given that the surface aquifer, by definition, drains into the various area surface water bodies, such as creeks, that ultimately flow into Lake Erie, this hydrological mixing almost certainly carries a portion of groundwater into Lake Erie. There is no absolute hydrological barrier between area groundwater and Lake Erie. Lake Erie serves as the drinking water supply for many millions downstream, in both the U.S. and Canada, including Native American and First Nations. These assertions by Petitioners are supported by the ER's admission that:

> During times of elevated water surface elevations in Lake Erie, the shallow aquifer along the coast may be directly recharged from surface water features. Regional sinks, or areas of discharge, from the Surficial Aquifer System include discharge

> to wells, and discharge to streams, lakes, and other surface water features. . . . (ER p. 2-71)

Figure 2.3-18 of the ER, "Regional Aquifer System," reveals that the "Bass Island Group" is the uppermost Silurian System stratigraphic unit in the vicinity of Fermi nuclear power plant. The figure also shows that the Mackinac Breccia forms a connection between the Bass Island Group and the Silurian Salina Group below, as well as various Devonian System stratigraphic units. And the ER reports at p. 2-71:

> The glacial deposits are underlain by a series of Silurian-Devonian bedrock formations consisting primarily of limestone and dolomite, with some small sandstone layers locally… These formations reach thicknesses of thousands of feet and contain groundwater that ranges from fresh to brackish. ***Significant amounts of groundwater are withdrawn from the bedrock aquifer for industrial, municipal, and irrigation purposes.*** (emphasis added)

Thus, radioactive contamination of groundwater via fractured hydrology at Fermi 3 could harm local industry, drinking water, and agriculture, with adverse consequences for the economy, health, and safety.

The ER continues:

> The bedrock aquifer. . . composed of Silurian-Devonian aged carbonates, [is] subdivided into five permeable zones, vertically adjacent. . . there are no significant continuous confining units between them, leading to their consideration regionally as a single undifferentiated bedrock aquifer, in which groundwater occurs under artesian conditions beneath the surficial aquifer. Figure 2.3-19 presents a conceptual cross section of the aquifers trending NW-SE beneath Monroe County (Reference 2.3-76).

ER, pp. 2-71 to 2-72. But it is the Staff which directly contradicts the claim of this northwest-southeast flow trend (Staff Answer at 54), that "the regional water flow is generally from southwest to northeast for the bedrock aquifer in Monroe County…" The northwest-southeast flow trend mentioned in the ER would carry groundwater from the Fermi nuclear power plant in the direction of the Bass Islands Aquifer at Catawba Island, Ottawa County, Ohio, 35 miles to the southeast.

As described by the State of Ohio Environmental Protection Agency, the Bass Islands Aquifer located at Catawba Island is:

> [L]ocated in northwest Ohio within Lake Erie. The principal source of drinking water for the residents and tourists to Catawba Island is the Bass Island Aquifer. The Bass Island Aquifer is an unconfined to semi-confined aquifer that transmits water along joints and solution cavities. This aquifer is approximately 120 feet thick and is underlain by the anhydrite-rich Salenas Group.[sic] The recharge area of the aquifer includes the entire island. Surface water recharge is rapid due to the presence of sink holes, ponds and collapse features. The areas on Catawba Island above 580 msl are included in the sole source aquifer as designated October 2, 1987 in 52FR37009. . . .

Guidance Document #0693, State of Ohio Environmental Protection Agency Date: November 23, 2004, viewable at http://www.hcdoes.org/sw/solidwasteplan/OhioEPASitingCriteria.pdf

At page 2-72, the ER states:

> The primary source of recharge for the bedrock aquifer is a really extensive downward vertical groundwater flow from the overlying glacial sediments to the bedrock formations, where confining shales are not present. Regional sinks, or areas of discharge, include ***flow to wells and downward flow from upper bedrock units to those underlying.*** (Emphasis added)

This assessment indicates there would be additional risks to human health, via drinking water ingestion from wells contaminated with radioactivity emanating from Fermi 3. This should be considered alongside the fact that extensive vertical and horizontal groundwater exchanges for the region surrounding the Fermi 3 site have been admitted by DTE.

The ER continues (p. 2-72): “Regionally, the Ordovician or lower Silurian shales comprise the lower boundary to the bedrock aquifer system. The base of the Michigan Basin bedrock aquifer considered here is assumed to be the Salina Group Unit C Shale.” And the ER also reports (p. 2-84) that “. . . flow is downward from the Bass Islands

aquifer to the Salina Group. . . .” Thus, the geological layers of shale throughout the region that form the lower boundary to the bedrock aquifer system, including the Bass Islands Group, would facilitate contaminated groundwater flow over long regional distances, such as connecting the Bass Island Aquifer at Catawba Island, Ohio with the Fermi 3 site, despite the 35 mile distance.

As explained below, chelating agents binding with radioactive contaminants could serve to facilitate their migration over long distances, over relatively short periods of time. Given the contaminants’ long-term persistence in dissolved form in regional ground and surface waters, there would exacerbating bio-accumulation within biota, and implication of the human food chain.

For perspective on the daunting complexities of hydrology, it should be remembered that at the Yucca Mountain Project in Nevada, where many hundreds of millions of dollars have been spent directly on hydrological studies, it still cannot be determined for certain whether or not the groundwater beneath Yucca Mountain is connected to the various hot springs, such as Devil’s Hole, in Ash Meadows National Wildlife Area, just 20 miles or so to the south of Yucca Mountain.

The point is, if the most studied geological system on the planet has yet to divulge its hydrological secrets after armies of scientists have analyzed it for decades, then it should be candidly admitted that the hydrological dynamics of the Fermi nuclear power plant to Catawba Island, Ohio area may still have some surprises in store. DTE’s ER admits as much at p. 2-81:

> The Bass Islands aquifer is a distinct hydrogeologic unit; however, the varied zones monitored within the Bass Islands aquifer, coupled with the irregular nature of the fracture system

> introduce considerable local complexity to the data, including evidence of downward vertical flow (discussed in Subsection 2.3.1.2.2.3.2.4).

***Even DTE's minimal site investigation is causing significantly fluctuating groundwater flows:***

> The contours developed for June through August 2007 indicate a significantly different flow pattern than the contours developed for the ensuing months. This is likely due to effects from the geotechnical field program, which was being carried out simultaneously with the water level data collection for the summer month monitoring events. Several geotechnical borings in the Fermi 3 area were open during this time period, providing a hydraulic connection between the Bass Islands Group and the underlying Salina Group. Because the vertical gradient between these two units is downward, this provided a temporary local sink for groundwater flow in the Bass Islands aquifer. The flow pattern indicates that the groundwater appears to be flowing onto the active site area from the north, and converging towards the area of the geotechnical investigation at Fermi 3. The closed contours at Fermi 3 indicate that groundwater is converging on the area from all directions. ***Groundwater entering this sink in the Bass Islands aquifer is likely being conveyed downward into the Salina Group through the open geotechnical borings.*** (Emphasis supplied)

ER, pp. 2-81 to 2-82. The "observer effect" – a realization that the act of observation will itself change the phenomenon being observed – indisputably pertains at Fermi 3 hydrological study sites.

A study published in *Environmental Health Perspectives*, "Massive Microbiological Groundwater Contamination Associated with a Waterborne Outbreak in Lake Erie, South Bass Island, Ohio," further confirmed the potential for "very strong Lake Erie currents" and "a surge in water levels" to lead to a "rapid surface water–groundwater interchange throughout the island," which in the described 2004 incident led to a widespread outbreak of waterborne disease. Theng-Theng Fong, Linda S. Mansfield, David L. Wilson, David J. Schwab, Stephanie L. Molloy, and Joan B. Rose, 2007 June; 115(6): 856–864, viewable online at http://ww

w.pubmedcentral.nih.gov/articlerender.fcgi?artid=1892145.

This all compels the conclusion that the extensive interchange of waters between surface (including Lake Erie) and ground throughout the region, as described in the ER, coupled with chelate-accelerated dissolution of radioactive contaminants at the Fermi 3 site into adjacent underlying ground and surface waters, could feasibly put at risk the Bass Islands Aquifer, which is the sole source of drinking water for residents of and visitors to Catawba Island, Ohio. This is of special concern when account is taken of the persistent nature of dissolved, chelate-bound, long-lived, hazardous radioactive contaminants.

**Chelating Agents**

At its Answer pp. 51-52, the Staff states:

> The Petitioners' assertions about chelating agents are also inadmissible as an independent contention because they are not adequately supported and fail to raise a genuine dispute with the Applicant. With respect to substances that might be present in certain plant systems, the Petitioners support their claims with excerpts from several sections of the Application… However, these excerpts merely indicate that certain types of substances are likely to be present in particular plant systems, and, with the exception of phosphoric acid, do not even identify specific substances. The Petitioners provide no factual support or expert opinion for the proposition that these substances are chelating agents that could react with radioactive materials, or that these substances could mix with 'radioactive material leaked or spilled onto the soil.' The Application indicates that non-radioactive waste and radioactive waste are handled in two separate streams. . . and any concerns about chelating agents in non-radioactive waste would therefore be relevant only if the two streams were to mix. Similarly, the Petitioners have not provided any facts or expert opinion to support the claim that phosphoric acid from the circulating water system could mix with radioactive material leaked or spilled onto the soil.

Petitioners' dispute with the Applicant centers upon DTE's disdain, expressed in its Answer to this contention, about radioactivity binding with chelates, and thus quickly migrating into and contamin-

ating area aquifers, threatening area drinking water supplies, and Lake Erie's ecosystem. The reason that Petitioners did not specify the various chelates likely to be used in various Fermi plant systems is that Detroit Edison did not provide any more specificity than that in its ER. But besides specifically mentioning phosphoric acid, DTE also specifically mentioned C2H3OH(PO(OH)2)2 as a scale inhibitor in the "CIRC system," and Petitioners cited that admission it their Contention.

The Contention reads that:

> . . . At Table 3.6-1, 'Chemicals Added to Liquid Effluent Streams,' it is revealed that the corrosion inhibitor currently in use at Fermi 2, and assumed by Detroit Edison to also be used at Fermi 3, is phosphoric acid. Fermi 2's NPDES permit allows up to 2,500,000 pounds per year of phosphoric acid to be continuously used in the Fermi 2 'CIRC system' to inhibit corrosion.

Phosphoric acid is a chelating agent. Given that Fermi 2 is permitted to discharge 1,250 tons of phosphoric acid into Lake Erie each and every year, and that Fermi 3 would presumably add significantly to the quantity of phosphoric acid discharged into Lake Erie on an annual basis as well, it is a legitimate concern that Lake Erie's phosphoric acid contamination could seep back onto the Fermi site, such as via groundwater and Lake Erie communication, seiches, or other natural and artificial hydrological mixing phenomena. Not only leaks and spills onto the soil at Fermi, but also liquid discharges of radioactivity into Lake Erie from Fermi 3, could easily lead to the binding of radioactive substances with chelates such as phosphoric acid in the area environment. This in turn could lead to significant acceleration of the radioactive substances' mixing into groundwater, uptake into plants, *etc.*, with harmful consequences for human health via drinking

water ingestion, and food chain bio-accumulation. In short, chelates would accelerate radioactive contaminants' dissolution into area ground and surface waters, via which they would then migrate extensively over wide areas, persisting for a very long time due to the strong bonds with the chelating agents.

In preparing their contention arguments, Petitioners have relied upon the expertise of Kay Drey, a member of the American Nuclear Society residing in University City, Missouri. Ms. Drey is a board member of Beyond Nuclear, and has researched radioactivity risks for 35 years, including those specifically associated with chelating agents. She has communicated with NRC Staff for nearly three decades about the hazards of chelate-bound radioactive particles, which, due to their persistent, dissolved nature, represent a major risk for widespread contamination of ground and surface waters. Kay Drey's July 16, 1980 letter to NRC's Director, Division of Licensing, is attached to this Combined Reply. The key passage from pp. 6-7 is reproduced below:

> Scientists already know that chelating agents, such as those in Dow's NS-1, can cause the accelerated migration of radionuclides through the environment. The NRC staff says it does not have 'field or laboratory tests which quantify the migration potential of radionuclides associated with the Dow solvent. . .' (Draft EIS, Appendix, pp. 1-2). On the contrary, field data do exist which demonstrate that radionuclides bonded to EDTA, an ingredient of NS-1, have migrated through the environment at a rate far faster than that expected if the chelates were not present. The very qualities which make chelates effective as solvents – their ability to form clawlike multiple bonds with a metal ion, enabling them to dissolve normally insoluble metal oxides and to keep them in solution – are the same qualities that make them a persistent threat in the environment.

This point is supported by the abstract of a study by Means, Kucak and Crerar recently published in England:

> Multidentate chelating agents such as NTA, EDTA and DTPA are receiving widespread use in a variety of industrial applications and are entering natural water systems. The presence of these chelates in the environment can be undesirable because they solubilise toxic heavy metals. We have analysed the relative biodegradabilities of NTA, EDTA and DTPA in several different chemical environments. The objective was to determine whether any particular chelate is significantly more biodegradable than the others and therefore more desirable from an environmental point of view. . . Degradation rates of all three chelates are not rapid enough, even under ideal laboratory conditions, to preclude concern about their release to the environment.

J.L. Means, et al., “Relative Degradation Rates of NTA, EDTA and DTPA and Environmental Implications,” Environmental Pollution (Series B), Vol. 1 (1980), pp. 45-60.

From the body of the same paper, the primary hazards involved in the use of chelates includes the following:

> While chelates are used because of their powerful metal-binding properties, it is this same characteristic which may have undesirable environmental consequences. For example, EDTA, which is used in nuclear decontamination operations, is causing the migration of [Cobalt-60] from intermediate-level waste disposal pits and trenches in the Oak Ridge National Laboratory (ORNL) burial grounds. Because it forms extremely long complexes with rare earths and actinides, EDTA and similar chelates may also be contributing to the mobilization of these radionuclides from various terrestrial radioactive waste disposal sites in the USA. . . .Indeed, the presence of significant concentrations of EDTA in 12- to 15-year old radioactive waste at ORNL attests to its persistence. Therefore, wherever EDTA and similar compounds have been introduced into the natural environment, the aqueous transport of transition metals, rare earths and transuranics, which characteristically form the most stable complexes with chelates, will be expected to occur. . . .
>
> Also, chelates may degrade into compounds which still possess strong metal-binding properties, although probably weaker than the original complexing agent. . . .
>
> In addition to increasing the solubility of heavy metals, chelates can further increase the uptake of these metals by plants and consequently increase their ecological recycling rates and the possibility of their entering human food chains. If chelates are present in domestic wastes, they may dissolve copper, lead and iron from plumbing systems and sewage effluents and/or adversely affect sewage plant efficiency.

In an addendum to her letter entitled “Decontamination,” also

attached, Kay Drey wrote:

> The solution [to radioactive corrosion product and "CRUD" – Chalk River Unidentified Debris - build up in pipes at nuclear power plants] the nuclear industry has been proposing for years – and which has been used at least to some extent at all commercial and military reactors – is to use chemical decontaminants, or solvents, to dissolve the crud from within the pipes, and off of various parts that need to be repaired or replaced. It turns out, though, that three scientists at Princeton and Oak Ridge discovered that the very chemicals that have been used for decontamination and were to have been used for the first total-plant decontamination experiment at Dresden One back in 1978, are the ones that have caused radioactive wastes to migrate out of burial trenches [in such dumpsites as as Oak Ridge TN, Maxey Flats KY, Beatty NV, and West Valley NY]. They're called chelating agents. They bond onto and dissolve the corrosion products off of the pipes and parts so that the corrosion products can then be flushed away. The problem is that they stay bound, and keep the radioactive metal products in solution so that after burial they're able to migrate through the environment. It's been described as burying radioactive waste with roller skates on!

A report in Science entitled "Migration of Radioactive Wastes: Radionuclide Mobilization by Complexing Agents" (attached to this Reply) provided the following abstract:

> Ion exchange, gel filtration chromatography, and gas chromatography-mass spectrometry analyses have demonstrated that ethylenediaminetetraacetic acid (EDTA), an extremely strong complexing agent commonly used in decontamination operations at nuclear facilities, is causing the low-level migration of cobalt-60 from intermediate-level liquid waste disposal pits and trenches in the Oak Ridge National Laboratory burial grounds. Because it forms extremely strong complexes with rare earths and actinides, EDTA or similar chelates may also be contributing to the mobilization of these radionuclides from various terrestrial radioactive waste burial sites around the country.

Jeffrey L. Means and David A. Crerar, Department of Geological and Geophysical Sciences, Princeton University, Princeton, New Jersey 08540, and James O. Duguid, Energy and Environmental Systems Assessment Section, Battelle-Columbus Laboratory, Columbus, Ohio 43201, Science, Vol. 200, 30 June 1978, AAAS, pp. 1477-1481.

Petitioners mentioned EDTA by name in their contention as a

chelate of concern at the Fermi site, stating "[s]uch chelates could find their way into the waters of Lake Erie via water pollution, and thus could interact with radionuclides at the Fermi nuclear power plant site." Ironically, the Dow Chemical Company product discussed in Kay Drey's 1980 letter to NRC, Nuclear Solvent(NS)-1, was manufactured at Dow's Midland, Michigan facilities. Thus, like Dow's infamous dioxin contamination, persistent EDTA contamination from NS-1 manufacture has likely flowed down the Tittabawassee River and then downstream through the Great Lakes to the western basin of Lake Erie, where it would bond with radioactive contaminants at the Fermi nuclear power plant site and accelerate their migration throughout the environment, including towards the Bass Islands Sole Source Aquifer at Catawba Island, Ottawa County, Ohio 35 miles downstream.

At page 52, NRC Staff states:

> The Petitioners also fail to support their claim regarding natural and artificial chelating agents. The Petitioners do not identify any particular chelating agents that might be present at the Fermi 3 site or in the surrounding ecosystem, or how those chelating agents would mix with radioactive leaks or spills. Furthermore, although the Petitioners provide approximately two pages of discussion about chelating agents and their uses, they fail to cite the source of this information or to explain how this general discussion is relevant to the contention.

Petitioners' source of the two pages of information about chelating agents was the internet site Wikipedia. Whereas Detroit Edison questions the validity of the information provided about chelates, it is, to the contrary, basic, uncontested fact. The above documentation and discussion answers the NRC Staff's challenge.

The NRC Staff asserts (Answer at 52):

> Finally, the Petitioners' statements regarding use of chelating agents during decommissioning is speculative and outside the scope of the COL proceeding. Moreover, while the

> Petitioners have indicated that chelating agents were used in pipes at Big Rock Point reactor, they have not pointed to any deleterious effect of such use.

This is incorrect. Kay Drey's letter regarding the use of chelates during "decontamination" at Dresden 1 in 1980 shows that Big Rock Point's use of chelates in the late 1990s and earlier part of this decade during decommissioning "decontamination" of pipes and vessels was not a unique occurrence. The deleterious effect of such use is that wherever the chelate-bound radioactive contaminants are dumped, they will very likely leak into the groundwater and spread quickly, as has already happened at several so-called "low-level" radioactive waste dumps in the United States.

Given the risks associated with radioactive contaminants bound to chelates migrating throughout southeast Michigan and northwest Ohio ground and surface waters should Fermi 3 leak or discharge into the environment, the ASLBP should grant Contention No. 5 for adjudication in its entirety.

**REPLY IN SUPPORT OF CONTENTION NO. 6:** ***The COLA omits critical information disclosing environmental impacts to Lake Erie's Western Basin and Maumee River/Maumee Bay***

Even as DTE and the NRC Staff pretend that a Lake Erie-wide "dilution is the pollution solution" approach is scientifically satisfactory, the COLA states (ER p. 2-59:

> The western Lake Erie basin is a very shallow basin with an average depth of 24 feet. The western basin is partially restricted from the rest of Lake Erie by a chain of barrier beaches and islands.

The archipelago stretches from Point Pelee in Ontario, Canada southward to Catawba Island, Ottawa County, Ohio. This chain of

barrier beaches and islands already partially restricts water flow between the very shallow western basin, where Fermi 3 would be located, and the rest of Lake Erie, before considering the coming declining lake levels from climate change. It is inappropriate for Detroit Edison and NRC to "water down" Fermi 3's environmental impacts, thermal and radiological, and toxic chemical discharges, over the entirety of Lake Erie. The natural barriers will become more formidable as lake depth decreases and will cause the shallow Western Basin, containing just 5% of Lake Erie's water volume, to bear the brunt of the impacts. See USEPA map attached to this Reply, showing Western Lake Erie projected with 1-meter decline in water levels (IGLD 1985), showing areas that will uncover with a 1 meter decline and those that will be less than one meter in depth, and have the potential for establishing submerged aquatic macrophytes. Bathymetric 1-m contour intervals are shown (adapted from National Geophysical Data Center 1998), found at www.epa.gov/med/grosseile_site/indicators/waterlevels.html. The predicament of changed currents and flow patterns from the emerged land structures will have negative effects, as thermal and toxic pollution is increasingly “trapped” in the Western Basin by decreased east-west flow.

The predicted decreases in Lake Erie levels due to global warming could be as dramatic as a 3 foot to 6.5 foot lowering of current lake level over just the next several decades, corresponding to Fermi 3's projected operating life. The chain of barrier beaches and islands between the western basin and the rest of Lake Erie will incrementally restrict water flows past the impediments as levels drop from 12% to 25% below current depths, and the volume of water in the Western Basin

that must absorb Fermi 3's thermal, radiological, and toxic chemical discharges will be caught in a vicious cycle. Thermal discharges into the Basin from Fermi 3 and the previously-enumerated thermal electric coal burning and atom splitting power plants will become more concentrated, cause more water evaporation from Lake Erie and cause even more decrease in water flow and mixing with the rest of Lake Erie. The “dilution solution” will be at an end. There will be a growing risk that the western basin of Lake Erie could dramatically overheat to the point where it is inhospitable to a growing percentage of its indigenous aquatic species. And, given Fermi 2’s and Fermi 3’s projected ongoing large-scale discharges of phosphoric acid in addition to their thermal discharges, this heating up and nutrient loading of Lake Erie’s western basin could lead expanding dead zones due to algae population explosions.

In addition, Fermi 3's water intake pipe is designed to extend only 1,300 feet into Lake Erie. But global warming is predicted to cause a retreat in Lake Erie's shoreline by from thousands of feet to several miles in the coming decades. Thus, Fermi 3's 1,300 foot water intake pipeline could be left "high and dry," with the reactor cut off from its cooling water supply. Such an incident has actually already happened, at a nuclear power plant in Romania on the Danube River, due to lowered river level which left the reactor's cooling water intake pipe above the water line. And a continuous cycle of overheating in Lake Erie could well lead to long periods during warm summer months during which Lake Erie's average temperature, and the western basin's temperature in particular, is too warm to be useful or efficient at cooling Fermi 3, or condensing steam at its steam condensor. In such

cases, Fermi 3 would be forced to shut down for extended periods, affecting its capacity factor and reliability. Ironically, such shut downs would occur at times of peak demand - hot summer days, when air conditioning is in high demand. When electricity would be needed most, Fermi 3's shutdown would remove over 1,500 megawatts from the grid. Far from solving the climate crisis, nuclear reactors such as Fermi 3 could well become inoperable as a result of it.

Phosphorus coupled with thermal pollution will accelerate the eutrophication of Lake Erie by compounding algal blooms. This impact is cumulative. Consequently discharges from Fermi 2 and the Monroe Coal power plant must be investigated and considered together. From ER Table 3.6-1, "Chemicals Added to Liquid Effluent Streams," it is evident that the corrosion inhibitor currently in use at Fermi 2, and assumed by Detroit Edison to also be used at Fermi 3, is phosphoric acid. Fermi 2’s NPDES permit allows up to 2,500,000 pounds per year of phosphoric acid to be continuously used in the Fermi 2 "CIRC system" to inhibit corrosion. This translates into an average use of 6,849 pounds or 3.425 tons per day of Phosphoric acid.

Most phosphoric acid is used in the production of fertilizers. Phosphorus is one of the elements essential for plant growth. Organic phosphates are the compounds which provide the energy for most of the chemical reactions that occur in living cells. Therefore, enriching soils with phosphate fertilizers enhances plant growth. Increasing the phosphate concentration in surface waters also enhances the growth of aquatic plant life. Runoff from fertilized farm lands can stimulate plant growth in lakes and streams. Waste water that contains phosphates from detergents can have the same effect. Lakes that are rich

in plant nutrients suffer from accelerated eutrophication. When the lush aquatic plant growth in a nutrient-rich lake dies, the decomposition of the dead plant material consumes dissolved oxygen. This consumption reduces the level of dissolved oxygen to a point where it is insufficient to support animal life. To reduce the threat of lake eutrophication, many localities have banned the use of phosphates in detergents. In some cases, the phosphates have been replaced by carbonates. In others, new detergents have been developed that do not react with the Ca2+ and Mg2+ ions of hard water. See www.scifun.org, General Chemistry, Rev. 6, Feb. 2008.

According to ER § 3.4.2.2, dilution and dissipation of the discharge heat as well as other effluent constituents are affected by both the design of the discharge and the flow characteristics of the receiving water (Lake Erie). Normal plant effluent flow from all sources (cooling tower blowdown, and optional treated liquid radwaste) is approximately 17,000 gpm. The NPHS cooling tower blowdown is the major contributor to the total flow, and its maximum return temperature is estimated at 86 degrees F. ER § 5.3.2.

During other operating modes, heat dissipation to the environment is less than the bounding values for the normal full power operational mode for the NPHS, except when the Turbine Bypass System (TBS) is in operation. In this condition, it is possible for the temperature of the discharge to rise to 96 F. The discharge of average 3.425 tons per day of Phosphoric acid in the discharge of 24.48 million gallons per day (17,000 gpm) at temperatures up to 96 degrees calculates into approximately 72.35 acre feet/day of discharge water at temperatures up to 96 degrees Fahrenheit laced with phosphorus. These are the

conditions on which algal blooms thrive, and in particular the toxic species of blue-green algae known as *Lyngbya Wollei*.

At ER § 2.3.3.1, "Surface Water Quality," p. 2-102, DTE states that western Lake Erie water quality has improved and that phosphorous concentrations are decreasing. But this is untrue. The State of Ohio has a Phosphorous Task Force looking into the increasing nutrient levels in Lake Erie and its Western Basin. The problem now appears to be dissolved phosphorous (see pertinent studies from Heidelberg University), and the amount of algae and microcystis is on the rise (see studies by University of Toledo's Lake Erie Center). The greening of the Western Basin and its increasing "dead zones" are widely recognized as growing problems. The Fermi 3 application fails to address these facts. The 2004 Lake Erie LAMP study cited by DTE is old and outdated for current phosphorous, nutrient and algae issues facing Lake Erie. The new algae, *Lyngbya Wollei*, seems to be centered in "Warm Water Bay" at the Monroe DTE coal burning power plant. This concentration of *Lyngbya Wollei* is dislodging from "Warm Water Bay" and is multiplying in the western Lake Erie basin. Detroit Edison must address the anticipated impact of Fermi 3 on the proliferation of this new harmful form of algae in the Western Basin. It is an issue the Applicant has thus far omitted from its ER.

The cumulative thermal impacts of the proposed Fermi 3, the existing Fermi 2, Monroe Coal Plant, when combined with phosphoric acid, burdens Lake Erie and will accelerate the eutrophication process. The impact of the phosphoric acid (@ 3.425 tons/day) coupled with thermal pollution plume (@ approx. 72 acre feet/day) on algal blooms has not been adequately addressed in the ER.

Cumulative effects analysis requires the Environmental Impact Statement to analyze the impact of a proposed project in light of that project's interaction with the effects of past, current, and reasonably foreseeable future projects. See 40 C.F.R. § 1508.7. The general rule under NEPA is that, in assessing cumulative effects, the Environmental Impact Statement must give a sufficiently detailed catalogue of past, present, and future projects, and provide adequate analysis about how these projects, and differences between the projects, are thought to have impacted the environment. See *Neighbors of Cuddy Mountain v. United States Forest Serv.,* 137 F.3d 1372, 1379-80 (9th Cir. 1998); *City of Caramel-By-The-Sea v. United States Dept. of Transp.*, 123 F.3d 1142, 1160-61 (9th Cir. 1997).

When NEPA was passed the Senate and House conferees wrote "fullest extent possible" language into NEPA, stating that:

> . . . The purpose of the new language is to make it clear that each agency of the Federal Government shall comply with the directives set out in . . . [NEPA Section 102(2)] unless the existing law applicable to such agency's operations expressly prohibits or makes full compliance with one of the directives impossible. * * * Thus, it is the intent of the conferees that the provision `to the fullest extent possible' shall not be used by any Federal agency as a means of avoiding compliance with the directives set out in section 102.
>
> . . .[T]he language in section 102 is intended to assure that all agencies of the Federal Government shall comply with the directives set out in said section `to the fullest extent possible' under their statutory authorizations ***and that no agency shall utilize an excessively narrow construction of its existing statutory authorizations to avoid compliance.*** (Emphasis in original)
>
> Thus the Section 102 duties are not inherently flexible. They must be complied with to the fullest extent, unless there is a clear conflict of ***statutory*** authority. Considerations of administrative difficulty, delay or economic cost will not suffice to strip the section of its fundamental importance. (Emphasis in original)

*Calvert Cliffs Coordinating Committee, Inc. v. U.S. Atomic Energy Commission*, 449 F.2d 1109, 1115, (D.C. Cir. 1971), cert. denied, 404 U.S. 942 (1972). There being no conflict between NEPA and the Atomic Energy Act on the matter of cumulative analysis, it should be ordered.

**REPLY IN SUPPORT OF CONTENTION NO. 7:** ***Routine operations of Fermi 3 will endanger workers and the public with radionuclide emissions***

NRC Staff state (Answer p. 73) that "[r]adioactive releases from fossil fuel plants in the area are outside the scope of this proceeding." This represents a violation of the Staff's responsibilities under NEPA. Although the Staff mentions in passing that "the NRC does consider cumulative impacts when it prepares an EIS in connection with a license application," they next assert that "the Petitioners have not shown that the issue they mention is within the scope of this proceeding, nor that a genuine dispute exists on a material issue of fact or law."

Petitioners assert that the issue of protection of human health is within the scope of this proceeding under the Atomic Energy Act. Over the course of decades Petitioners and others have often expressed concerns in various forums (including official NRC meetings and hearings and other public events) about the radiological risks of nuclear power plants and radioactive waste storage and dumpsites in the Great Lakes Basin. Nuclear utility spokespersons, including from Detroit Edison and the Nuclear Energy Institute (of which Detroit Edison is a prominent, longtime member) have told Petitioners repeatedly that public concerns over radiological risks at nuclear facilities is misplaced, and they should instead address the much larger radioactivity releases from fossil fuel burning power plants.

These radioactivity releases, according to Detroit Edison and NEI spokespersons, result from uranium and its daughter products being embedded in coal and other fossil fuels, which is then emitted in the smoke when the fossil fuels are burned, to blow and disseminate radiation downwind.

But when the time comes to account for all that coal-fired radiation, the NRC Staff now states that “coal-fired power plants in Monroe County are not licensed by NRC, and their activities are not part of the Application currently under consideration.” This response raises doubts as to whether the Staff commitment to fulfill its responsibility under NEPA to account for cumulative environmental impacts in the Fermi 3 EIS proceeding is up to compliance with the law. Detroit Edison not only owns and operates the Fermi 2 atomic reactor and is proposing the Fermi 3 reactor that is the subject of this COLA proceeding, it also owns and operates the Monroe Power Plant which at 3,300 megawatts-electric is the fourth largest coal-fired power plant in all of North America. How can NRC even begin to accurately assess the radiological impacts of the Monroe Power Plant’s radiological and thermal emissions for area residents, workers, and biota, when Staff rejects the contention?

Petitioners insist, again, that radiation monitors should be deployed at Monroe’s coal burning power plants, including Consumers Energy’s Whiting Power Plant, in order to accurately measure radioactivity emissions. Petitioners have been remiss to not also call for radiation monitors to be installed at other area coal burning power plants, including Bay Shore Power Plant in Oregon, Ohio (mentioned in Contention No. 6). NRC should also analyze the radiological and

thermal effects of Ontario Power Generation's Nanticoke Generating Station, at over 4,000 megawatts-electric, reportedly the largest coal burning power plant in all of North America, located on the north-eastern shore of Lake Erie.

At page 55 of its Answer, Detroit Edison questions Petitioners' concerns about its gaseous venting "Departure" from ESBWR DCD Rev. 4 to Rev. 5. Petitioners' contention is that introducing multiple radiological gaseous venting release points, one each from the Reactor Building, Fuel Building, Turbine Building, and Radwaste Building, would put those releases in closer proximity to various subpopulations of the Fermi 3 workforce over time. Thus, Detroit Edison's statement that "The plant must still operate in accordance with NRC effluent limits" misses the point. Workers who work nearer any one of those multiple radioactive gas vents could be exposed to higher, more concentrated doses of radioactivity due to the change from DCD Rev. 4 to 5. DTE has failed to adequately analyze this risk in its ER, a significant omission given the implications to future workers' health.

Both NRC Staff and Detroit Edison Answers are inadequate when they rely on a small number of TLDs at the Fermi nuclear power plant site as assurance that Fermi 3 construction workers would be exposed to "permissible" gaseous radioactivity doses. DTE answers (p. 53) that "[g]iven that operating releases must remain within tight regulatory limits, such a contention must be rejected as an attack on the adequacy of the regulations themselves." By contrast, Contention No. 7 challenges DTE's and the Staff's reliance on a small number of fixed-in-place TLDs for assessing worker inhalation and ingestion doses of radioactivity. TLDs cannot inhale or ingest gaseous or particulate

radioactivity. They merely record external levels of radioactivity exposure. But workers at the Fermi site, and area residents, can inhale or ingest radioactivity. Once inhaled or ingested, radioactivity can deliver a concentrated dose, delivering a level of harm that Detroit Edison and the Staff's current methodology fails to account for. Thus, both the Applicant and the Regulator have failed to adequately model for, and protect against, inhaled and ingested radioactivity doses, based on their current inadequate measurement methodology, a significant omission worthy of the ASLB's attention at a hearing.

Similarly, TLD measurements of radioactive noble gases released from Fermi 2 and Fermi 3 would not necessarily account for the radioactivity doses delivered by radioactive decay daughter products that fall out over a short period of time when these radioactive noble gases undergo radioactive decay. For example, radioactive gases such as xenon and krypton decay into biologically active radioactive daughter products such as cesium and strontium isotopes.

The NRC Staff (Anwer p. 71) similarly states, "Nor do [Petitioners] argue that projected doses are calculated incorrectly." Although the Staff states (Answer p. 69) that "[n]either the Departures Report nor any of the FSAR subsections cited therein mention any increase in radioactive effluents in connection with this design change," it is incomprehensible that changing the location and increasing the number of vent locations would *not* increase the radioactivity doses suffered by Fermi 3 workers stationed at or frequenting certain areas of the facility over time. Doses could be increased not only for workers, but even for local residents, depending on the exact locations and

heights of the newly proposed vents, wind patterns in the area, proximity to worksites or residences, patterns of fallout and radioactivity deposition "hot spots," *etc.*, as compared to the single gaseous radioactivity vent proposed in ESBWR DCD Rev. 4. Such a proposed change could actually represent increased radiological risk for the workforce and general public, and is therefore worthy of a hearing on the merits.

Detroit Edison makes these odd statement in its Answer, p. 56: ". . . [T]he ER actually demonstrates that construction workers will not receive exposures above specified regulatory limits for members of the public," and that, "[a]lternatively, all workers could be treated as radiation workers, with individual monitoring. . . .As radiation workers, they would be subject to much higher regulatory dose limits, and equivalently safe." Besides appearing to suggest an increase in allowable radioactivity doses (and hence radiological health damage) to its own Fermi 3 workforce, the statement seems to be equating the health impacts of 100 millirem per year radiation doses ("100 mrem total effective does equivalent limit applicable to members of the general public under NRC regulations," Staff Answer p. 71) to 5 rem per year radiation doses permitted for nuclear power industry "radiation workers" (which is, it happens, 2.5 times the dose allowed nuclear workers under international regulations advised by the International Commission on Radiological Protection, and implemented by the IAEA, International Atomic Energy Agency). How Detroit Edison can maintain that a 50-fold increase in radiological exposure would not increase risks to human health is baffling to Petitioners.

Detroit Edison's Answer (p. 52) seems to attempt to downplay

Petitioners' citations in support of its Contention by referring to them as "some studies and opinions on the biological effects of radiation." It should be pointed out that Petitioners relied on the NAS BEIR VII report, regarded by many as the foremost such study and "opinion" currently available in the United States. In addition, Drs. Sherman and Mangano's cited study was published in the peer-reviewed European Journal of Cancer Care.

Detroit Edison mentions (Answer p. 55), "This departure was removed in COLA Rev. 1, which updates the COLA to reference DCD Rev. 5, and which was submitted by letter dated March 25, 2009." Petitioners object to the continually "moving target" nature of Detroit Edison's new reactor proposals, which burdens intervenor resources and misleads the public. If Detroit Edison's COLA was not fully ready, it should not have been filed on September 18, 2008. And certainly the regulatory agency should not be rushing the proceeding with short, strict deadlines and by rejecting Petitioners' wholly-reasonable requests for extensions to comment and filing deadlines, as the NRC has thus far. Prospectively, Petitioners hereby request adequate time to prepare additional contentions, with expert assistance, each and every occasion that Detroit Edison institutes changes to its incomplete reactor design and license application.

Detroit Edison (Answer at 56) argues, "Suffice it to say, the Applicant is not asserting that dilution of liquid radiological materials is the means to establish compliance; rather, the analysis is crediting realistic conditions." Petitioners are not so sure because they have seen what Detroit Edison tells the NRC underneath the public's radar, namely:

> The following ***commitment*** was made in this letter. Detroit Edison will perform laboratory testing to determine site specific values for distribution coefficients and retardation factors. Using these factors, coupled with ***relaxation of other conservatisms (for example, crediting dilution in the Radwaste Building prior to release), Detroit Edison expects the results to be less than the ECL.*** (Emphasis added)

Letter, Jack Davis, V-P Detroit Edison, to NRC, "Detroit Edison Company Response to NRC Request for Additional Information Letters No. 1 and No. 2", February 16, 2009.

Detroit Edison seems to be relying on such "relaxation of conservatism" to compensate for, in one case, exceeding an ECL value by a factor of 5,000. (FSAR § 2.4.13 Analysis).

Detroit Edison's assumption of a 2,080 hour work year (ER § 4.5.3.1) is also not conservative. It does not account for overtime work place exposures. Overtime is an oft-employed contingency at chronically-behind-schedule nuclear power plant construction projects. Another blatant non-conservatism in the ER is not accounting for local residents who are also employed at Fermi nuclear power plant. These individuals would suffer double jeopardy –– radioactivity exposures at work, at their nearby area home, and in their daily lives as they frequent locations contaminated with radioactivity from the Fermi nuclear power plant.

Yet another lack of conservatism is the ER's disregard of worker exposure to lingering radioactive contamination at the Fermi nuclear power plant, host to nearly a half century of atomic activity. For example, in 2007, the Fermi 1 decommissioning project spilled thousands of gallons of radioactively contaminated water, 35 years after the reactor's final shutdown. Hot spots (whether due to spills, leaks, accidents, or intentional discharges) not located near the small

number of TLDs relied upon by Detroit Edison and NRC could nonetheless deliver harmful radioactivity doses to workers, visitors, and area residents at the Fermi 3 site over time.

Yet another non-conservatism in the Detroit Edison ER, at § 4.5.4.1, is its indifference to the fact that so-called "low level" radioactive wastes will continue to pile up at the Fermi 3 site for up to 60 years of operations, perhaps even longer.

Finally, in response to Detroit Edison (Answer p. 56), Petitioners are equally concerned about, rather than confused by, radiological exposures to workers and the public resulting from both water-borne and air-borne radioactivity.

Petitioners urge the ASLB to grant a hearing on the merits for this Contention.

**REPLY IN SUPPORT OF CONTENTION NO. 9:** ***The Commission must require completion of an EIS and selection of a 'preferred alternative' prior to authorizing any construction activity of any sort***

Petitioners agree that there is no pending limited work authorization request, but their contention is directed at enjoining the performance of sub- or pre-LWA construction activities.

Under 10 C.F.R. § 50.10(a)(2), such activities as site exploration, procurement, logging/clearing of land and grading, excavation for any structure fabrication at other than the final onsite, in-place location (modules) are allowable in the absence of a LWA. Were DTE to undertake any of such activities, it arguably could be construed as the commission of resources to the preferred alternative prior to the time at which a decision about the preferred alternative can be rendered under NEPA.

Petitioners admit that they have no evidence as of this writing

that any of the construction activities in the above-mentioned categories are actually under way at the Fermi 3 site. There are few means by which public could learn, unequivocally, that unregulated construction activities were taking place. But there are references in the Application suggesting that unregulated preconstruction activities may commence soon. At ER § 4.1.1.1[11] it states:

> The planned removal of the structures formerly used for Fermi 1 will free approximately 7 acres for use during Fermi 3 construction. Note - Fermi 1 disassembly may be carried out independently or in conjunction with activities related to Fermi 3.

From DTE's 10-K form for 2007, "The decommissioning of Fermi 1 is expected to be complete by 2010."[12]

Thus between now and sometime in 2010, unregulated "activities related to Fermi 3" are likely to commence. DTE uses no limiting wording which suggests anything but an intention to begin to build Fermi 3 by 2010.

Petitioners move for an injunctive order which halts such activity if it is already ongoing, and which bars it from commencing if it is not. Construction activities in support of Fermi 3 would constitute commitment to DTE's preferred alternative of construction of a new nuclear power plant, well before the completion of a Final EIS, or indeed, before the end-point of this adjudicatory proceeding.

**REPLY IN SUPPORT OF CONTENTION NO. 11:** ***Spent fuel reprocessing is not an option***

Staff Answer at 86, "To the contrary, the Petitioners and the Applicant appear to be in broad agreement that spent fuel reprocessing

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[11]ER, Rev. 0, Ch. 4, p. 4, ADAMS No. ML082730652.

[12]COLA, Pt. 1, p. 110 (p. 96 of 10-K).

is not to be relied upon in the Fermi 3 COLA." DTE Answer at 65: "[T]he Fermi 3 ER (at page 5-141) acknowledges that the United States does not presently reprocess spent fuel."

It appears that DTE has, by counsel, uttered a judicial admission. A judicial admission is a formal concession in the pleadings or stipulations by a party or counsel that is binding on the party making them. Although a judicial admission is not itself evidence, it has the effect of withdrawing a fact from contention. A statement made by counsel during the course of trial may be considered a judicial admission if it was made intentionally as a waiver, releasing the opponent from proof of fact. *McCullough v. Odeco., Inc.*, No. CIV.A. 90-3868, 1991 WL 99413, at *2 (E.D. La. May 30, 1991).

By contrast, an ordinary evidentiary admission is "merely a statement of assertion or concession made for some independent purpose," and it may be controverted or explained by the party who made it. *McNamara v. Miller*, 269 F.2d 511, 515 (D.C. Cir. 1959). "A judicial admission is conclusive, unless the court allows it to be withdrawn; ordinary evidentiary admissions, in contrast, may be controverted or explained by the party." *Keller v. United States*, 58 F.3d 1194, 1199 n. 8 (7th Cir. 1995) (quoting John William Strong, *McCormick on Evidence*, § 254 at 142 (1992)).

**REPLY IN SUPPORT OF CONTENTION NO. 12:** ***The Emergency and Radiological Response Plan is deficient***

At the height of construction of Fermi 3 (ER, Evacuation Plan p. 3-17), a scenario is presented where there are up to an additional 1,450 construction workers on site. If this occurs during a refueling outage for Fermi 2, there would further be an additional 750 outage

workers, for a total estimated additional 2,160 workers, and perhaps nearly as many vehicles, above and beyond the regularly scheduled workforce.

These additional 2000+ vehicles, driven by the construction and refueling workers, along with the regularly scheduled workforce, will be the very first to evacuate in the event of a serious mishap with Fermi 2. This huge exodus of vehicles will force a scenario by which residents in the immediate area will be forced to compete for access to evacuation routes. In addition this exodus of worker vehicles will create a "shadow" by which those in the primary evacuation zone will be hampered and delayed in fleeing from the area.

At a radius ten miles out from the Fermi site, the "shadow region" begins. See attached Figure 7-2. That area will be saturated with the exodus of upwards of 3,000 Fermi-related employee vehicles. Residents of the area must not be forced into competing for the same evacuation route; instead, a separate evacuation route for workers should be implemented. The Radiological Emergency Response Plan acknowledges this scenario as having the potential for impeding evacuating vehicles from within the Evacuation Region. Figure 7-2 presents the area identified as the Shadow Evacuation Region. This region extends radially from the boundary of the EPZ to a distance of 15 miles from Fermi. Traffic generated within this Shadow Evacuation Region, traveling away from the plant, has the potential for impeding evacuating vehicles from within the Evacuation Region. Petitioners assume that the traffic volumes emitted within the Shadow Evacuation Region correspond to 30 percent of the residents, there plus a proportionate share of employees in that region.

In further support of this Contention, Petitioners attach a facsimile of a letter to the editor of the Monroe Evening News dated January 21, 2009, wherein a Monroe-area resident worries about the potential conjunction of a Michigan snowstorm and an evacuation from the vicinity of Fermi. Petitioners also tender for the record along with this Combined Reply a recent Monroe Evening News article about a public meeting where members of the community discussed optional means of snow removal in Monroe County.

**REPLY IN SUPPORT OF CONTENTION NO. 13:** ***The identification, characterization and analysis of need, alternatives to construction, and the mix of conservation and renewable energy sources is wholly inadequate and violates NEPA***

**Materiality of Grossly-Understated Cost of Plant**

The Staff (Answer at 93-94) contends that the lowball cost of Fermi 3 is immaterial because Petitioners have not identified an environmentally-preferable alternative.

Petitioners respond that until the preliminary matter of cost is more realistically addressed, there cannot be meaningful discussion of preferable alternatives. "The NEPA phrase 'alternatives to the proposed action' is understood to mean 'alternatives to achieve the underlying purpose and need for the action.' (See the remarks of Sen. Jackson in 115 Cong. Rec. 40,420, Dec. 20, 1969)." "Policy Issue Notation Vote," SECY-02-0175, 9/27/02. If, under NEPA, the Commission finds that environmentally preferable alternatives exist, then it must undertake a cost-benefit balancing to determine whether such alternatives should be implemented. *Florida Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 & 4), ALAB-660, 14 NRC 987, 1004 (1981), citing *Consumers Power Co.* (Midland Plant, Units 1 & 2), ALAB-

458, 7 NRC 155 (1978).

**NEPA Requirement That Alternatives Be Considered**

Pursuant to NEPA 102(2)(E), the Staff must analyze possible alternatives, even if it believes that such alternatives need not be considered because the proposed action does not significantly affect the environment. An ASLB must determine, on the basis of all the evidence presented during the hearing, whether other alternatives must be considered. "Some factual basis (usually in the form of the Staff's environmental analysis) is necessary to determine whether a proposal 'involves unresolved conflicts concerning alternative uses of available resources' - the statutory standard of Section 102(2)(E)." *Virginia Electric & Power Co.* (North Anna Power Station, Units 1 & 2), LBP-85-34, 22 NRC 481, 491 (1985), quoting *Consumers Power Co.* (Big Rock Point Nuclear Plant), ALAB-636, 13 NRC 312, 332 (1981). See also *Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), LBP-88-26, 28 NRC 440, 449-50 (1988), reconsidered, LBP-89-6, 29 NRC 127, 134-35 (1989), rev'd on other grounds, ALAB-919, 30 NRC 29 (1989).

While the parties do not have the benefit as yet of any Staff technical analysis of the ER, there certainly are unresolved conflicts concerning alternative uses of available resources which are exacerbated by the underestimate of the probable cost of Fermi 3 which has been articulated by DTE. Considered alongside new renewal portfolio regulatory goals, the ongoing economic crisis within Michigan and the Midwestern region, and posed with increasingly-efficient uses of electricity, there are serious conflicts respecting alternative means of allocating precious resources in the Michigan economy among

nuclear, solar, wind and energy efficiency. In determining the scope of alternatives to be considered, the emphasis is on what is "reasonable" rather than on whether the proponent or applicant likes or is itself capable of carrying out a particular alternative. Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of DTE. *CEQ 40 FAQs*, 2a.[13]

**<u>The ER Facts About Alternatives Are Dated And Obsolete</u>**

This is a contention of omission. Although the ER is not devoid of discussion of renewable energy, the factual discussion it presents is obsolete. Absent consideration of dramatic changes in public policy and the rapidly-moving economics of sustainable energy options and efficiency, the ER is not sufficiently complete and accurate to satisfy the requirements of 10 C.F.R. § 51.45. These changes are material to the findings the NRC must make because § 51.45(b)(3) requires a discussion of alternatives that is “sufficiently complete to aid the Commission in developing and exploring . . . ‘appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.’”

Daniel Patrick Moynihan once observed that “everyone is entitled to his own opinion, but not to his own facts.” The rapidly-changing facts on electrical sales in DTE’s jurisdiction are undermining DTE’s opinion that it must add a large baseload nuclear plant. It is becoming obvious that incremental deployment of wind, solar and energy

[13]http://ceq.hss.doe.gov/nepa/regs/40/1-10.htm

efficiency technologies can quickly fill the gap created by coal plant retirements. The facts also are suggesting unpredictability of electrical sales growth over the middle- and long-term. And the facts emerging about climate change are forcing a response to the question of how much the future need for power will be addressed on a more environmentally and economically sustainable basis, as a matter of global survival.

The principal benefit of constructing and operating a power reactor is the electric power. "Hence, absent some 'need for power,' justification for building a facility is problematical." *Duke Power Co.* (Catawba Nuclear Station, Units 1 and 2), ALAB-355, 4 NRC 397, 405 (1976). This Contention is one of omission: DTE's own forecasting reveals growing uncertainty about demand for power in Michigan over the better part of a decade. In September 2008, DTE forecast a 6% decline in peak demand from 2007 to 2013. Siefman testimony, MPSC Case U-15677, Exhibit A-8, September, 2008.[14] But in written testimony filed with the Michigan Public Service Commission in March 2009, the same DTE long-range planner predicted a more than 11% decline in annual demand peak for the period 2007 through 2015. Siefman testimony, MPSC Case 15806, March 2009, Exhibit A-25.[15] Siefman predicts "negative" growth scenarios even after 2010. *Id.* p. 16.

There has been significant change in the posture of applicants for nuclear operating licenses even in the short time since *Environmental Law and Policy Center v. NRC*, 470 F.3d 676 (7th Cir. 2006),

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[14]http://efile.mpsc.cis.state.mi.us/efile/docs/15677/0001.pdf

[15]http://efile.mpsc.cis.state.mi.us/efile/docs/15806/0030.pdf

cited by DTE, was decided. That case involved an early site permit, not a combined operating license, and as a result the Seventh Circuit allowed deferral of NEPA consideration of the need for power since plant construction might not commence for up to forty years. The environmentalist challengers contended that the licensing board's rejection of reasonable energy efficiency alternatives contradicted the "searching inquiry into alternatives" required by NEPA, *see Simmons v. U.S. Army Corps of Eng'rs,* 120 F.3d 664, 666 (7th Cir.1997) And urged the NRC to avoid the "losing proposition" of not considering the full range of alternatives, *id.* at 669. The utility and NRC staff defended the limited alternatives analysis on the ground that "Exelon dealt only in the sale of wholesale power and had neither the authority nor the incentive to implement energy efficiency measures."

In *ELPC*, the utility and Staff won in part because of the holding of *Citizens Against Burlington, Inc. v. Busey,* 938 F.2d 190, 199 (D.C. Cir. 1991), that an agency's evaluation of reasonable alternatives is "shaped by the application at issue." But "the application at issue" here is very much at issue. DTE claims need for a huge, baseload plant as straight replacement for coal plants slated for retirement. DTE is not an electricity wholesaler like Exelon, and must function in a considerably-changed market which includes changes such as recently-required net metering, mandatory plans incorporating power purchased from alternative energy sources, and a state public service commission which is charged with engrafting energy efficiency programs onto electric service supply contracts. Under Michigan's renewal portfolio standard, DTE can construct only 33% of the new generation capacity of needed to meet the requirements of the new law. DTE Energy Form 10-Q,

Quarter Ended June 30, 2008, COLA Pt. 1 p. 158. However, DTE is allowed by the new RPS law to collect a per-meter surcharge to fund the RPS requirements, limited to $3 for residential customers, $16.58 for commercial customers and $187.50 for industrial customers. DTE Energy Form 10-Q, Quarter Ended June 30, 2008, COLA Pt. 1 p. 157.

While as recently as 2006 it might have been acceptable, where a federal agency is not the sponsor of a nuclear plant, to accord "substantial weight [in the consideration of alternatives] to the preferences of the applicant and/or sponsor in the siting and design of the project," *City of Grapevine v. Dep't of Transp.,* 17 F.3d 1502, 1506 (D.C. Cir. 1994), the "preferences" of DTE respecting the generation mix are increasingly defined by statute and regulation. Consideration of a greater mix of alternatives and efficiency isn't just a NEPA aspiration, ***it is now the law.*** And nowadays there is a new, truly-public interest that must be accounted for in the decision as to whether a nuclear plant is built: Federal loan guarantees recently passed by Congress to underwrite as much as 100% of the cost of nuclear plant construction. The ESBWR design is being considered for these taxpayer subsidies; the perception that deference is owed to a private-sector "public" utility applicant's preferred alternative should properly be directly related to the size of the corporate welfare stipend; 100% public guarantees should dictate 100% public-interest-dictated alternatives.

The economic regulatory environment and the imperatives of climate change are forcing dramatic evolution of the business *milieu* in which DTE operates. Consequently, the baseload-plant preference blunderbuss must be re-examined under NEPA and, one expects, seriously

questioned. This is contemplated by NRC regulations. 10 C.F.R. § 51.45(b)(3) mandates that the discussion of alternatives shall be sufficiently complete to aid the Commission in developing and exploring, pursuant to § 102(2)(E) of NEPA, "'appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources' . . .[and to] the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form." The Environmental Report is also supposed to depict (at 10 C.F.R. § 51.45(b)(5)) "[a]ny irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented." The choice of a large baseload plant will irretrievably commit resources toward a larger generator than future need requires. To the extent that demand for electricity might be growing a decade from now, it can be mitigated by incremental and swift installation of alternatives. Clearly, NEPA's "hard look" is far more nuanced, and compels a much broader, enlightened alternatives discussion than in 2006. "Green" jobs has become the vernacular of these times, owing among other things to being memorialized in the 2009 Stimulus Package.

**Aggressive Efficiency Could Drastically Reduce Future Demand**

Petitioners have help from an unexpected corner: DTE's concession (ER § 8.2.2.2) that an aggressive energy efficiency deployment effort could reduce the projected growth rate in Michigan electric energy use by more than 50 percent over a 10 year period.[16] That critical decade

[16]Cited by Applicant (DTE Answer 78) to support its baseload proposal.

precedes the anticipated date of operation of Fermi 3; DTE raises the question of whether its “aggressive effort” for efficiency, in tandem with the plummeting costs of wind and solar during that period, might thoroughly vitiate the need for Fermi.

The conventional view that electric utilities are simply in the business of producing profit from large baseload generating facilities is being challenged by the need for more sophisticated planning than ever before, in a marketplace populated by growing numbers of smaller wholesale producers, and by entrepreneurs of energy efficiency. DTE’s 800-pound gorilla preference is becoming entrapped in the web of entrepreneurial sustainable-energy Lilliputians from a changed world where “alternatives” must be embraced as part of the generating project.

The ASLB cannot compel the choice of alternatives; but to the extent the Board might wish to defer to the Applicant’s choice of design of the project, that design must honestly account for the new electricity marketplace and corresponding regulatory realities. The new “hard look” NEPA demands is the hard reality.

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April 10, 2009

**UNITED STATES OF AMERICA**
**NUCLEAR REGULATORY COMMISSION**
**Before the Atomic Safety and Licensing Board**

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| In the Matter of: | ) | Docket No. 52-033 |
| The Detroit Edison Company | ) | |
| (Fermi Nuclear Power Plant, Unit 3) | ) | |
| | ) | |

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**CERTIFICATE OF SERVICE**

I hereby certify that a copy of the "Combined Reply of Petitioners Beyond Nuclear, Citizens for Alternatives to Chemical Contamination, Citizens Environmental Alliance of Southwestern Ontario, Don't Waste Michigan, Sierra Club, Keith Gunter, Edward McArdle, Henry Newman, Derek Coronado, Sandra Bihn, Harold L. Stokes, Michael J. Keegan, Richard Coronado, George Steinman, Marilyn R. Timmer, Leonard Mandeville, Frank Mantei, Marcee Meyers, and Shirley Steinman to NRC Staff and DTE Answers to Petition for Leave to Intervene" has been served on the following persons via Electronic Information Exchange this 10th day of April, 2009:

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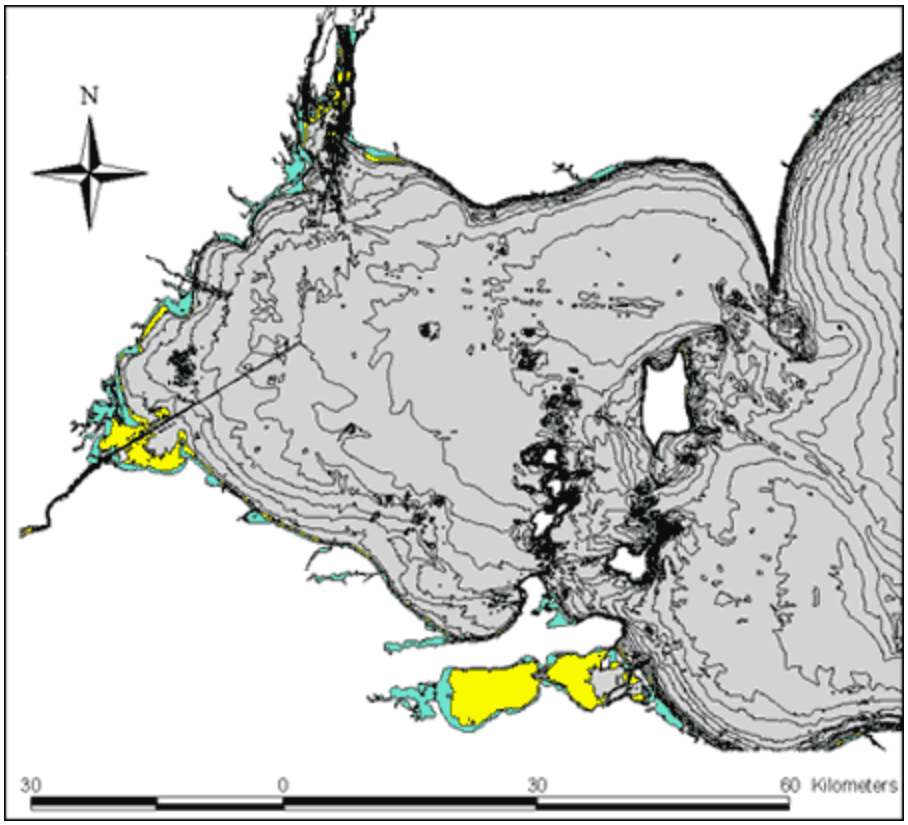
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# Reports

## Migration of Radioactive Wastes: Radionuclide Mobilization by Complexing Agents

Abstract. *Ion exchange, gel filtration chromatography, and gas chromatography-mass spectrometry analyses have demonstrated that ethylenediaminetetraacetic acid (EDTA), an extremely strong complexing agent commonly used in decontamination operations at nuclear facilities, is causing the low-level migration of cobalt-60 from intermediate-level liquid waste disposal pits and trenches in the Oak Ridge National Laboratory burial grounds. Because it forms extremely strong complexes with rare earths and actinides, EDTA or similar chelates may also be contributing to the mobilization of these radionuclides from various terrestrial radioactive waste burial sites around the country.*

From 1951 through 1965, intermediate-level radioactive liquid waste at Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee, was disposed of in seven different seepage pits and trenches (*1*). Since 1944, solid waste at ORNL has routinely been buried in shallow trenches in six different burial grounds (*2*). Ground burial of radioactive waste is an effective means of disposal if the radionuclide can be confined to the geologic column through geochemical processes. Although the Conasauga shale, the predominant bedrock of the ORNL burial grounds, has an extremely high adsorption capacity for most fission by-products, trace quantities of certain radionuclides are migrating from both solid and liquid waste disposal sites (*3*).

Several factors have contributed to the radionuclide mobilization. One is that the annual precipitation at ORNL, over 127 cm, is greater than at any other radioactive waste burial site in the country (*2*). As a result, water infiltrates into trenches at a faster rate than it can be dissipated and mixes with the waste. In addition, groundwater levels are comparatively shallow and a high-density surface drainage network is present. There is also an abundance of fractures in the underlying rock, which diminishes the rock's sorptive capacity because the exchange sites adjacent to the fissures are saturated with the exchangeable ions in the waste (*2*). Finally, the presence in the waste of complexing agents such as organic chelates used in decontamination operations and natural organic acids from the soil promotes the formation of strong complexes with certain radionuclides that reduce the adsorption capacity of the shale and soil for the radionuclide.

It is this last factor that is of principal concern in this report. The isotope $^{60}$Co has been found in concentrations up to $10^5$ dpm/g in the soil and up to $10^9$ dpm/ml (450 pCi/ml) in the water in areas adjacent to seepage trench 7 and in lesser concentrations in the vicinity of trench 5 and pit 4 (Fig. 1). Traces of various alpha-emitters such as isotopes of U, Pu, Cm, Th, and Ra have also been detected in water or soil from the area around trench 7 (*2–4*). We show here that $^{60}$Co is transported in the groundwater from the trenches and pits as organic complexes. A portion of the migrating $^{60}$Co is adsorbed by oxides of Mn in the shale and soil (*4–6*). Additional evidence suggests that some U is migrating by the same mechanism.

The following experimentally measured distribution coefficients ($K_d$) illustrate the pronounced effects that organic ligands have on the adsorption capacity of sediment for trace metals. We determined that the $K_d$ values for $^{60}$Co in weathered Conasauga shale at *p*H 6.7 and 12.0 were approximately $7.0 \times 10^4$ and $0.12 \times 10^4$, respectively. In the presence of $10^{-3}M$ ethylenediaminetetraacetic acid (EDTA) the $K_d$ values were reduced to 2.9 and 0.8 (*7*).

The actual $K_d$ values calculated from $^{60}$Co concentrations in soil and water from various wells in the ORNL burial grounds are similar (*8*). The $K_d$ values for $^{60}$Co from wells in the vicinity of trench 7 range from approximately 7 to 70, averaging about 35 (see Table 1). The *p*H of well water ranges from 6.0 to 8.5 (*4*), and the EDTA concentrations are approximately $3.4 \times 10^{-7}M$ (this study). Actual $K_d$ values for $^{60}$Co in burial ground waters are therefore significantly lower than the theoretical value for neutral systems containing no EDTA and are somewhat greater than the experimental value for neutral systems containing $10^{-5}M$ EDTA.

The importance of sediment sorption capacity (or $K_d$) on radionuclide migration rates within geologic substrates has been modeled by Marsily *et al.* (*9*). Using variables such as $K_d$, rock permeability, and hydraulic gradient, they calculated the migration rates of $^{239}$Pu buried at the bottom of geologic formations 500 m thick. The results show that $^{239}$Pu with a $K_d$ of $2 \times 10^3$, typical of a chemical setting devoid of complexing agents, rock fractures, and similar factors tending to reduce sediment adsorption, will not migrate to ground level until more than $10^6$ years after burial, the migration rates being slowest in those geologic formations with lowest permeability. With a half-life of 24,400 years, Pu would essentially be completely decayed by the time of contact with the surface environment. At the other extreme, in a chemical setting characterized by no sorption ($K_d = 0$), Pu would reach the environment in 6 to 14,500 years, depending on the permeability of the geologic formation (*9*). That is, in the most confining formation Pu would have decayed about only one-half of one half-life before it reached the surface. In formations of low to moderate permeability, migration of Pu over 500 m would have occurred in only tens to several hundreds of years, the movement being four to five orders of magnitude more rapid than in the situation $K_d = 2 \times 10^3$.

In the Oak Ridge setting, the adsorption capacity of the Conasauga shale for inorganic forms of Co is very high. Hence, mobilization of this radionuclide in the absence of strong complexing agents, rock fractures, and other factors tending to reduce sorption would be negligible. However, in the presence of strong chelates, rock fractures, and other factors tending to decrease sorption, the $K_d$ is drastically reduced and mobilization rates may be accelerated by several orders of magnitude.

A compilation of selected radionuclide analyses for filtered water, weathered Conasauga shale, and soil samples collected between June 1974 and June 1975 from wells in seeps adjacent to pit 4, trench 5, and trench 7 is given in Table 1 (*10*). Locations of pits, trenches, and sampling sites are shown in Fig. 1.

A surprising initial observation, first


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made by E. A. Bondietti, was that $^{60}Co$ in groundwater did not readily exchange with cation-exchange resins (Rexyn 101, $Na^+$-form). Data from several samples show that only about 5 to 10 percent of the $^{60}Co$ could be adsorbed by the resin, the other 90 to 95 percent being retained in solution as a tightly bonded complex. It seemed apparent that whatever agent was responsible for this effect was also preventing complete adsorption of certain radionuclides by the Conasauga shale and soil.

Subsequent ion-exchange analyses that we carried out demonstrated that the strength of $^{60}Co$ complexes with possible inorganic groundwater components such as sulfate, nitrate, bicarbonate, carbonate, chloride, orthophosphate, and even stronger ligands such as pyrophosphate and metaphosphate was insufficient to produce the ion-exchange elution behavior of $^{60}Co$ observed in the samples (*11*). However, in the presence of very low concentrations ($10^{-6}M$ and less) of multidentate chelating agents such as diethylenetriaminepentaacetic acid (DTPA), cyclohexanediaminetetraacetic acid (CDTA), EDTA, and also natural organics such as humic and fulvic acids, $^{60}Co$ resisted adsorption by the resin.

Table 1. Selected radionuclide analyses of weathered Conasauga shale and soil and filtered water samples (0.22 $\mu$m) and corresponding $K_d$ values from wells in the vicinity of pit 4, trench 5, and trench 7.

| Well code | Date | Aqueous $^3H$ (dpm/ml) | Aqueous $^{60}Co$ (dpm/ml) | Adsorbed $^{60}Co$ (dpm/ml) | $K_d$ ($^{60}Co$)* |
|---|---|---|---|---|---|
| RS3 | 24 June 1975 | 1280 | 90.0 | NA† | |
| RS5 | 25 June 1975 | 1290 | 39.0 | NA† | |
| RS7 | 26 June 1974 | 3050 | 669.0‡ | 43,700 | 65.3 |
| T7-11§ | 31 July 1974 | 3930 | 518.0 | 16,900 | 32.6 |
| T7-12 | 31 July 1974 | 3450 | 547.0 | 28,600 | 52.3 |
| T7-13 | 8 August 1974 | 3740 | 816.0 | 24,500 | 30.0 |
| T7-14 | 31 July 1974 | 1900 | 227.0 | 6,600 | 29.1 |
| T7-15 | 31 July 1974 | 2090 | 153.0 | 1,060 | 6.9 |
| RS9 | 24 June 1975 | 3130 | 80.9 | NA† | |

*See (*8*). †Not analyzed. ‡Water from RS7 also contains 7.5 parts per billion of U (99.3 percent $^{238}U$ and 0.7 percent $^{234}U$). §Wells T7-11 through T7-15 are not depicted in Fig. 1. These wells are located within approximately 30 feet (9 m) of well RS7 (*4, 5*).

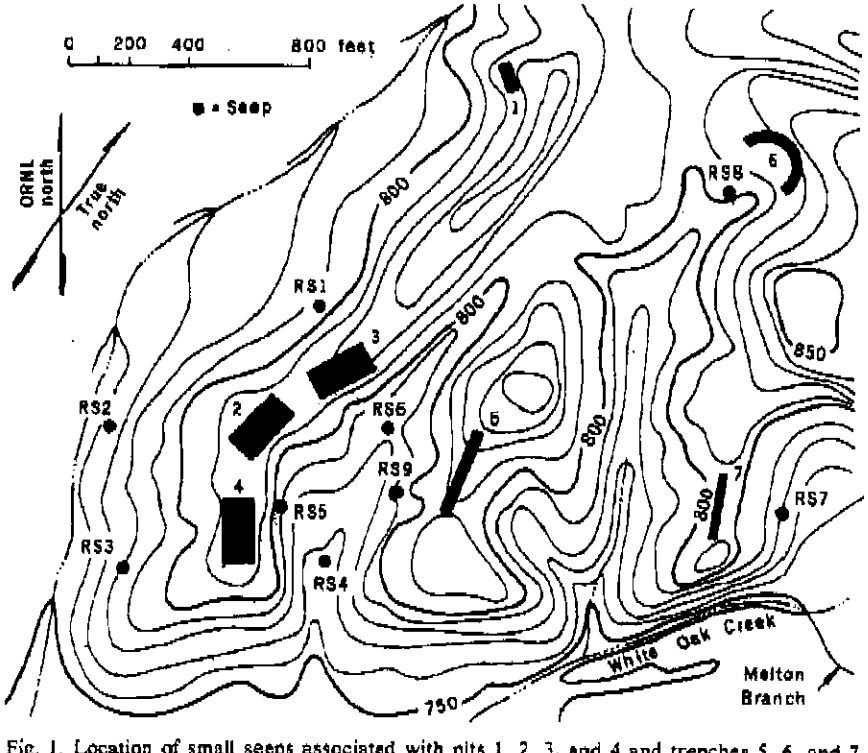


Fig. 1. Location of small seeps associated with pits 1, 2, 3, and 4 and trenches 5, 6, and 7. Contours are in feet (from (*4*)). [Courtesy of Oak Ridge National Laboratory, Oak Ridge, Tennessee]

In order to differentiate between the radionuclide-mobilizing effects of synthetic chelates of low molecular weight and those of humic substances of higher molecular weight, we fractionated groundwater samples, using gel filtration chromatography (GFC), a process which separates solutes according to size (*12*). Since most weak inorganic, metallic complexes are sorbed during the GFC process, the presence of trace metals in a given fraction of an elution profile demonstrates an association between the trace metal and a ligand in that fraction (*13, 14*).

Elution profiles of a concentrated groundwater sample from location RS7 near trench 7 for Sephadex gels G-10, G-15, and G-25 are illustrated in Fig. 2. Each of these elution profiles contains three fractions decreasing in molecular weight to the right. The blue dextran peak coincides with the fraction of the sample having molecular weights above 700. Between 90 and 95 percent of the $^{60}Co$ and 70 percent of the U present in the sample are correlated with the middle fraction, which represents a group of organics with molecular weights less than 700 plus the $Na^+$-salts of several polyvalent anions. Between 5 and 10 percent of the $^{60}Co$ and 30 percent of the U are associated with the fraction having molecular weights above 700, and no $^{60}Co$ or U are observed with the smallest molecular weight peak, which through infrared spectrophotometry was determined to be comprised principally of $NaNO_3$ and NaCl. Reliable Pu analyses of the GFC fractions could not be obtained.

Infrared spectrophotometric data indicate that the large molecular weight fractions associated with minor $^{60}Co$ and U transport are humic substances. Because groundwater in and very close to the trenches is typically low in humic content, we believe that humics are not major contributors to radionuclide transport from the trenches. On the contrary, we believe that humics become associated with radionuclides some distance from the trenches, particularly in the seeps, where groundwater humic concentrations are the greatest.

After we had completed the GFC fractionations, the identities of complexing agents in the major radionuclide-bearing fractions were still unknown. We suspected that these materials were synthetic chelates, but humic substances of lower molecular weight could not be completely ruled out, particularly in view of their greater acidity and metal-complexing capacity relative to the spe-

cies of higher molecular weight (*15*).

We extracted the middle GFC fraction, which contained the largest radionuclide concentrations, with chloroform to remove compounds that would interfere in the subsequent analysis. All the radionuclide remained in the aqueous phase after the chloroform extraction. The aqueous layers were then evaporated to dryness and methylated to facilitate gas chromatography–mass spectrometry (GC-MS) analysis (*16*).

The GC profile for the methylated fraction is illustrated in Fig. 3. We used MS to demonstrate that the dominant peak represents the tetramethyl ester of EDTA, an extremely strong chelate commonly used in decontamination operations at nuclear facilities (*17*). Through use of an internal CDTA standard, the EDTA concentration of this sample has been calculated to be approximately $3.4 \times 10^{-7} M$; EDTA has also been detected in samples RS3 obtained near pit 4 and RS9 near trench 5 (*18*).

Other constituents detected in trench leachates include palmitic acid, phthalic acid (*19*), and other mono- and dicarboxylic acids, which are much weaker complexing agents than EDTA. The concentrations of strong chelates similar to EDTA, such as nitrilotriacetic acid (NTA) and DTPA, are below the detection limit of this analysis, which is approximately $5.0 \times 10^{-9} M$. Because NTA is biodegradable, it would not be expected in significant concentrations in the groundwater even if it had been originally present in the waste (*20*). Both DTPA and other multidentate chelates were used only sparingly in decontamination at ORNL during the 1950's and 1960's and consequently do not appear to be significant in the radionuclide mobilization at this site.

We thus reasoned that EDTA is the dominant mobilizing agent in samples RS7, RS3, and RS9. A minor portion of the migrating $^{60}Co$ and U is associated with natural organics. Ligands such as phthalic, palmitic, and other carboxylic acids may also be contributing to $^{60}Co$ and U mobilization to a small extent.

The identification of EDTA as a radionuclide mobilizer in the ORNL disposal area raises a question about the suitability of this chelate in decontamination operations. Although EDTA is used in decontamination because of its powerful metal-binding properties, this same characteristic also leads to radionuclide mobilization. The radionuclide mobilization caused by EDTA in the ORNL burial grounds probably does not at present impose a health hazard. However, its con-

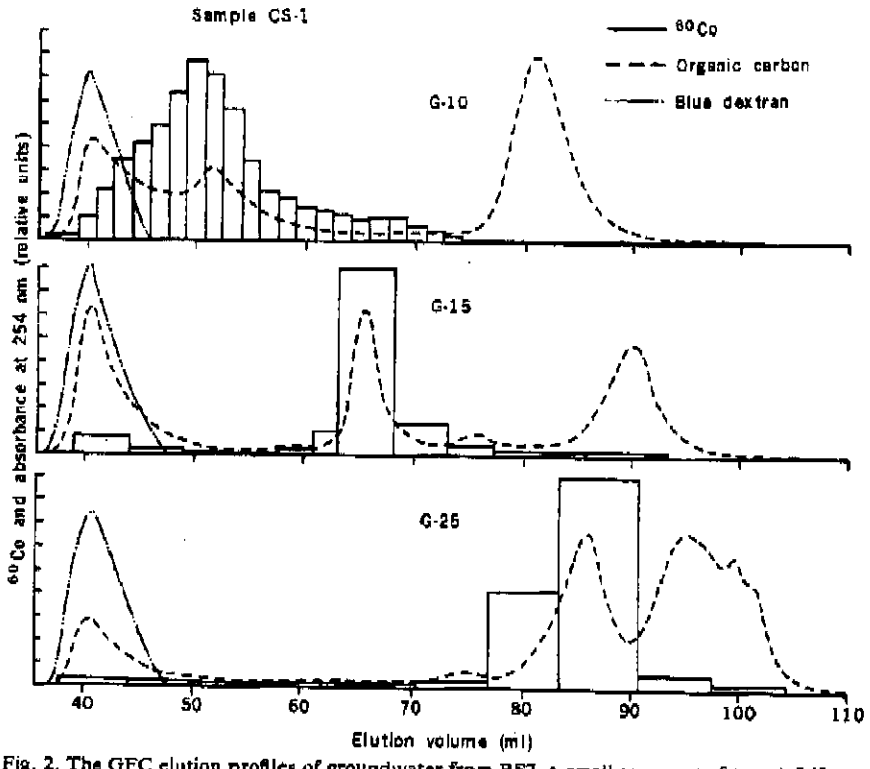


Fig. 2. The GFC elution profiles of groundwater from RS7, a small seep east of trench 7 [from (*13*)]. [Courtesy of *Limnology and Oceanography*, Seattle]

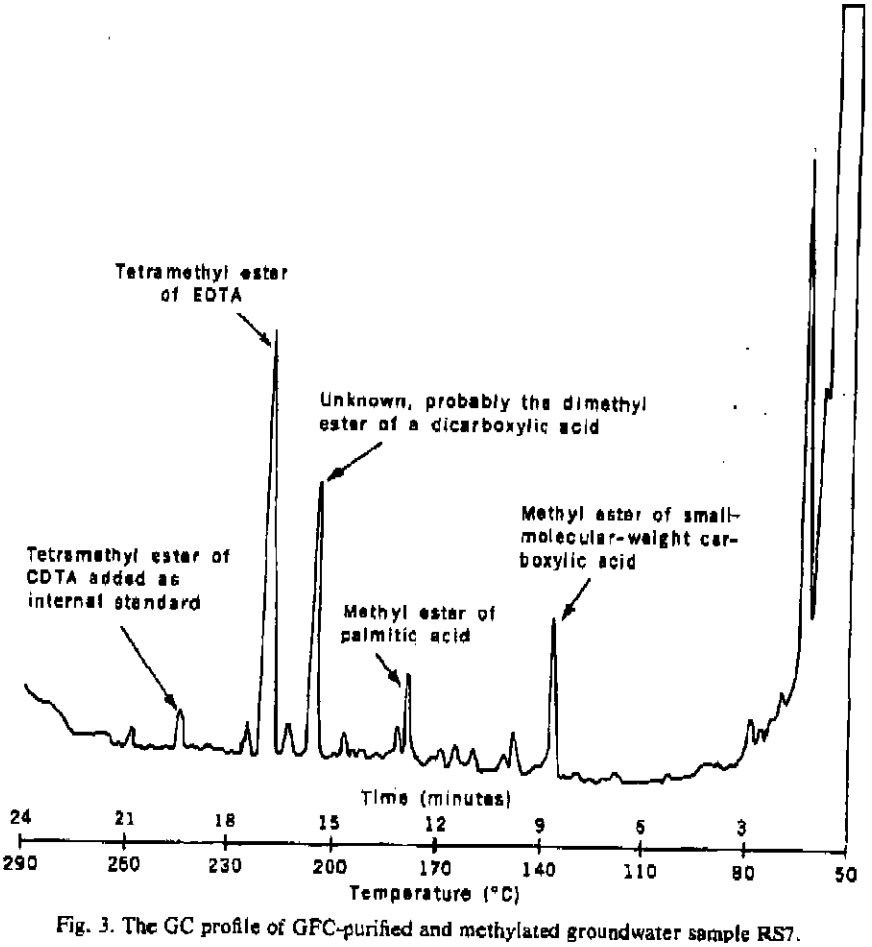


Fig. 3. The GC profile of GFC-purified and methylated groundwater sample RS7.

tinued use in decontamination operations around the country, and therefore its presence in low- and intermediate-level waste, constitutes a potential for the release of undesirable amounts of radionuclides. Because EDTA is resistant to decomposition by radiation (*21*), thermally very stable (*22*), and only slowly biodegradable (*23*), it is extremely persistent in the natural environment. Indeed, the presence of significant concentrations of EDTA in waste 12 to 15 years old attests to its persistence. Therefore, wherever EDTA and similar compounds have been introduced into terrestrial disposal sites, the aqueous transport of transition metals, rare earths, and transuranics, which characteristically form the most stable complexes with chelates, may be augmented.

There can be no question about the strong complexing capacity of EDTA and similar chelates for certain radionuclides including the rare earths and actinides. For example, all of the trivalent rare earths along with $Am^{3+}$, $Cm^{3+}$, $Pu^{3+}$, $Pu^{4+}$, $Pu^{6+}$, and $Th^{4+}$ possess at least as high or higher complexity constants, $K_1$, for EDTA as $Co^{2+}$ (*24*). Both EDTA and DTPA are used in the therapeutic removal of transuranics ingested by humans because of the strong complexes formed with these elements (*25*). Our evidence suggests but does not prove that EDTA is also contributing to the migration of trace levels of Pu, Am, Cm, Th, and Ra, which have been detected in the soil from seep RS7 approximately 100 yards (90 m) east of trench 7. For example, actinides were found in concentrations of 43 ± 8 dpm/g of $^{238}$Pu, 110 ± 7 dpm/g of $^{241}$Am, and 495 ± 20 dpm/g of $^{244}$Cm in a weathered shale sample collected at a depth of 71 cm in well T7-12, which is adjacent to well RS7 (*4*, *5*). In addition, chelates increase the uptake of numerous trace elements by plants. Consequently, the ecological recycling rates of certain radionuclides such as $^{238}$Pu and $^{241}$Am, and therefore the possibility of their entering human food chains, increases in the presence of complexing agents (*26*).

In the United States, there are six commercial and five Energy Research and Development Administration terrestrial radioactive waste burial sites which have in the past received or are currently receiving low- and intermediate-level radioactive wastes (*27*). Varying levels of radionuclide migration from original disposal sites have been observed at four of these waste burial sites other than ORNL, including the Savannah River Laboratory, South Carolina (*28*); the Hanford, Washington, facilities (*29*); West Valley, New York (*30*, *31*); and Maxey Flats, Kentucky (*31*). The Chalk River facility in Canada has experienced similar migration problems (*32*). Actual migration of Pu, the presence of Pu in the dissolved fraction of leachates, and the existence of mobile Pu-contaminated leachates in waste pits have been reported at the Hanford, West Valley, and Maxey Flats facilities, respectively (*29–31*). Complexing agents are either present or suspected to be present in waste at Chalk River, West Valley, and Maxey Flats (*31*, *32*).

The use of EDTA and similar compounds in decontamination operations, and therefore their presence in low- and intermediate-level waste in the United States and the rest of the world, is widespread (*21*). Throughout the world, low- and intermediate-level radioactive waste is being buried along with chemicals that are likely to cause the migration of hazardous isotopes such as Pu over the long term. Indeed, trace levels of radionuclides are being released by groundwater transport at many radioactive waste disposal sites in this country, and migration of radioactive transition metals, rare earths, and transuranics is probably being aided by chelates such as EDTA. Consequently, if the use of EDTA and similar compounds is to continue, waste solutions should be treated for the removal or destruction of the chelates prior to final disposal in the ground. Another alternative would be to use suitable substitutes, compounds that are effective in decontamination but do not facilitate radionuclide mobilization.

One such useful substitute may be NTA, which is a potential replacement for phosphates in detergents. This compound is rapidly biodegradable (*20*) and is a strong ligand, although slightly weaker in complexing capacity than EDTA.

The biodegradability of other chelates such as triethylenetetraaminehexaacetic acid (TTHA), hydroxyethylenediaminetriacetic acid (HEDTA), *N*-(2-hydroxyethyl)-ethylenediaminetriacetic acid (HEEDTA), ethylenediamine di-(*O*-hydroxyphenylacetate) (EDDHA), and DTPA is apparently not well known. Some of these compounds are stronger ligands than EDTA and therefore would be more effective in decontamination. However, the use of such compounds, if nonbiodegradable, could lead to even more migration from disposal sites than that caused by EDTA.

Numerous other alternatives to the use of EDTA and related compounds are available. Hot cells, nuclear equipment, and reactors have been decontaminated by means of a wide variety of reagents including strong acids, bases, or oxidizing agents, which can be neutralized before final burial, or relatively mild complexing agents such as citrate, tartrate, oxalate, gluconate, phosphate, bisulfate, and fluoride, which will contribute to radionuclide mobility in the environment to a much lesser extent than EDTA.

Excellent reviews of different decontamination solutions and techniques are available (*21*). Many of these reagents used either alone, in combination, or in successive treatments have been shown to be extremely effective alternatives to EDTA.

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12. The general OFC procedure is described elsewhere (*13*). In the present application, we mon-

itored the eluted fractions for radionuclide content and absorbance at 254 nm, using an in-line ultraviolet spectrophotometer. We analyzed $^{60}$Co using a multichannel analyzer, and U was determined by MS, with isotope dilution.
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8 December 1977; revised 8 March 1978

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515 West Point Avenue
University City, MO 63130
July 16, 1980

Director, Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Sir:

Thank you for giving citizens the opportunity to comment on the proposed NRC/DOE/Dow/Commonwealth Edison chemical decontamination demonstration project at Dresden Unit One, as described in the Draft Environmental Statement (Draft EIS), NUREG-0686, issued in May 1980. However, I must protest once again that the public is being asked to forego answers to questions affecting health and safety because of Dow's proprietary rights. The only scientists who know the ingredients of Dow's Nuclear Solvent-1 are those employed by Dow Chemical, Commonwealth Edison, DOE or the NRC -- and these are the very scientists who have been committed to the Dresden project and NS-1 for at least several years. I continue to believe that scientists without a financial or emotional commitment to this project should be given access to the data necessary to evaluate its potential impact.

My concerns about the Draft EIS and the proposed decontamination center around both facts that are known and those that are not.

A. How can anyone be sure an accident will not occur during the decontamination?

We know that, contrary to basic design and operating guidelines for nuclear power plants, some areas of the Dresden reactor coolant pressure boundary have not been inspected for seven years. Because of extremely high radiation fields at Dresden One, caused by the accumulation of crud, Commonwealth Edison "requested and was granted relief from some inservice inspection requirements in 1973." (Draft EIS, p. 2-5) That is, for five years prior to the shutdown in November 1978 for the proposed decontamination and NRC-mandated retrofitting, the NRC had "waive(d) inspection requirements for safety-related components in plant locations where significant radiation exposures could occur." ("Identification of Unresolved Safety Issues Relating to Nuclear Power Plants," NUREG-0610, January 1979, p. 44). As a result, critical nozzles, an estimated 40 to 50 primary coolant pipe welds, beltline welds on the reactor pressure vessel itself, and no doubt other safety-significant components have not been inspected for several years. (Draft EIS, pp. 4-1 and 5-2).

How, then, can anyone accurately predict the potential volume or locations of leakage during the proposed 100-hour flushing? Who knows what will happen when five or ten tons or more of a caustic, chelate-based solvent come in contact with an embrittled twenty-year-old vessel, corroded heat exchangers and pumps, five miles of convoluted piping, etc. -- with valves, welds and components fabricated out of literally countless different metals and alloys?

If this system-wide demonstration project is not an experiment, as the NRC claims on the first-page-four of the Appendix, why is the federal government helping to fund it? If it is not an experiment, why are there so many unknowns?

As "decontamination of reactors" was described by the NRC's Advisory Committee on Reactor Safeguards in its March 21, 1979, list of unresolved generic items of safety significance: "At this time the information on full scale decontamination (of primary reactor systems) is limited. Examples of potential problems include such items as handling of decontamination solutions, potential hideout of radioactive products, enhanced corrosion and crud formation following decontamination, and the possible incompatibility of the different alloys in the pressure boundary with the decontamination solutions."

B. In the event of an accident during the decontamination, what will be the effect upon

the workers and the public nearby?

Apparently no one has studied the synergistic effects of industrial solvents mixed with radiation. Although chelates are administered to workers who have accidentally swallowed plutonium or mercury, etc., essential trace elements normally found in biological tissues or cells are subsequently provided to replace those materials inadvertently removed. And the quantities involved in the therapeutic use of chelates are of course miniscule compared to this project.

No one has denied there will be leakage within the plant -- there always has been. Workers will therefore be exposed to unknown health risks, not only during the flushing, but during the evaporation, solidification, and shipment of the wastes, as well. Furthermore, if the chelates are broken down, as they should be to protect the public, this additional step will also increase the workers' risks. At this point I am absolutely unwilling to participate in the benefit/risk game. I firmly believe that neither the workers nor the public should be placed at risk!

C. What radioactive wastes and other toxic chemicals are apt to be released to the atmosphere during the evaporation, and in what quantities?

There seems to have been some debate among scientists at the EPA, NRC and ERDA about whether the presence of radionuclides in unexpected places at the Maxey Flats, Kentucky, radioactive waste burial site could be blamed on the ability of nuclides to migrate at subsurface levels (perhaps, it was hypothesized, because of the presence of chelates) or whether the evaporator plume from the solidification process was responsible for the dispersion. (EPA/ORP 520/3-75-021 and EPA-520/5-76/020)

D. Does anyone really know what it is inside the primary cooling system that you want to let out? Is this perhaps the ultimate Pandora's box? What is the composition of the crud?

Answers to these questions are important because they affect the reliability of the NRC's prediction that "the longest lived significant isotope that will be solidified after the decontamination is Co-60 with half-life of 5.2 years. Tests have been performed to demonstrate that the stability of the solid polymer will not substantially alter for over 50 years, corresponding to 10 half-lives of Co-60." (Appendix, second-page-five).

1. Fission products:

Although a few fission products are listed on page 2-2 among the radionuclides expected to be present in the Dresden crud -- namely, cerium-141 (half-life of 32 days), cerium-144 and protactinium-144 (290 days), and rubidium-103 (41 days), plus three additional curies of "MFP" or mixed fission products -- is it not highly probable that a far greater variety of isotopes is present, and a great deal more radioactivity? And is it not possible that some of the corrosion products, fission products, and actinides in the crud may have half-lives longer than cobalt-60's?

a. Assuming the amount of fission products deposited along the inner surfaces of the Dresden piping is dependent in large part upon the amount of fuel rod cladding failures, the prognosis for Dresden's crud is not good. In several publications cladding failures at Dresden One are specifically mentioned.

(1) In the first place, stainless steel cladding, used at least in the initial years at Dresden, is virtually obsolete. The only boiling water reactor still using stainless steel clad fuel is the tiny 47 MWe reactor at LaCrosse, Wisconsin.

"Stainless steel is no longer the preferred cladding material for most light water reactors because it absorbs more neutrons than does Zirca-

loy. ... In boiling water reactors, stress corrosion cracking of stainless steel during normal operation is an additional incentive to use Zircaloy which is not susceptible to this problem." (from a letter to me from Harold Denton, Director, Office of Nuclear Reactor Regulation, dated July 30, 1979; signed by Edson Case.)

(2) In an analysis in a GE report of iodine leakage rates at BWRs, the stainless-steel-clad fuel at Dresden One was cited as having experienced "severe" defects" in March 1965. (J. M. Skarpelos and R. S. Gilbert, "Technical Derivation of BWR 1971 Design Basis Radioactive Material Source Terms," NEDO-10871, General Electric, March 1973, p. 4-1) I do not know in what year the switch to Zircaloy cladding occurred, nor do I know what percent of the cladding has failed each year since.

(3) Dresden One is not unique in having cladding problems, of course. But why is this history of cladding failure and leakage not reflected in the NRC's projections of the composition of the crud?

As explained by B.C.J. Neil of Ontario Hydro at a conference on radiation shielding several years ago: "Volatile and gaseous fission products such as radioiodines will diffuse to and escape <u>from the minutest holes and cracks</u> in a fuel sheath (cladding). Water soluble fission products will dissolve in any water which enters the fuel sheath through a hole or crack especially when the fuel is temperature cycled (i.e., at power changes, shutdowns, or startups)." (from "The Contribution of Fission Products to Radiation Fields in a Pressurized Heavy Water Reactor," pp. 402-3. Although the title refers to a heavy water reactor, much of the paper deals with problems common to all water-cooled reactors.)

While much of the <u>escaped fission products</u>, as well as byproducts of <u>tramp uranium, solid daughters of noble gases</u>, etc., will stay suspended in the cooling water and will be <u>filtered out for burial</u> or will be released to the environment, some will settle out and become deposited as a part of the crud. According to Neil, at one plant which had experienced fuel rod cladding failures, the radiation fields during shutdown were increased in some parts of the reactor more because of the presence of fission products (such as zirconium-95 and its daughter, niobium-95, and Lanthanum-140, daughter of barium-140) than because of corrosion products

(4) Cladding failures during the first decade of operation at Dresden are also described in a Bureau of Radiological Health study: "At Dresden, much of the fission product activity in primary coolant water is attributed to uranium that had entered the primary coolant several years previously <u>from failed fuel elements</u>." (B. Kahn, <u>et al</u>., "Radiological Surveillance Studies at a Boiling Water Nuclear Power Reactor," EPA: BRH/DER 70-1, March 1970, p. 6)

b. Just as there are hundreds of isotopes within a fissioning uranium core at any one time, so may a great variety of these have escaped during the operating life of a reactor to seek refuge in the crud. And they are of all ages. Some examples:

(1) Cesium:

According to a private communication sent in June 1975 to the authors of an EPRI study on the buildup of radioactivity, about 10% of the radioactivity released from a specimen of nickel-iron spinel deposited in the stainless steel clean-up piping at Dresden One (found during a decontamination of the clean-up loop) was attributed to cesium-34 (with a half-life of 2 years) <u>and cesium-137 (30 years)</u>. The major portion of the radioac-

tivity came from cobalt-60. (S. G. Sawochka, et al., "Primary System Shutdown Radiation Levels at Nuclear Power Generating Stations," EPRI # 404-2, p. 18.4, based on communication from J. S. Scott.. Dec., 1975).

While attempting to extrapolate any meaningful projections from just one small specimen of crud at Dresden may seem grossly unscientific, apparently the few isotopic analyses available to the nuclear industry are not much more inclusive. One of the few primary loop crud deposits analyzed for isotopic information for the above EPRI study, for example, was retrieved from Indian Point One, and seems to be no larger than 4.5 square centimeters. By the way, the gamma dose rate of this small collection of mostly cobalt-60 measured one rem an hour! (EPRI # 404-2, p. 8.7)

Perhaps this paucity of data explains some of the EPRI authors' pessimism: "In summary, accurate prediction of radiation levels on out-of-core surfaces or assessment of the effects on shutdown radiation levels of plant operating practices or minor design variations in current generation BWRs and PWRs are not considered possible within the state-of-the-art." (Op. cit., p. 58)

(2) Iodine:

In an enclosure to an NRC memorandum from G. Knighton, Chief, Environmental Branch, to D. Ziemann, Chief, Operating Reactors Branch #2, dated February 13, 1975, the manner in which fission products may have become an integral part of the Dresden crud is described as follows: "Iodines and other volatile fission products which may have plated out on the primary system surfaces will have decayed to insignificant levels before the cleaning begins so that these isotopes are generally not present." (p. 7)

On page 4-7 of the Draft EIS a similar statement appears: "All radioactive iodine isotopes have been decayed to insignificant levels." What about iodine-129 which has a half-life of 17 million years?

(3) Zirconium:

While I have seen zirconium isotopes in lists of both corrosion products and fission products, zirconium clearly plays a role in helping to clog up a reactor, regardless of how it's labeled. And while I have not read specifically of Zircaloy cladding failures at Dresden One, there is no reason to think this reactor alone would have been spared.

Since zirconium-95 is listed as one of the isotopes expected to be present in the crud at Dresden, is it possible that zirconium-93 may be present, too? Zirconium-95 has a half-life of 63 days; zirconium-93 has a half-life of 900,000 years. Do you expect the radioactive zirconium to be present as the result of particles sloughed off of failed Zircaloy cladding, or as a fission product, or both?

(4) Transuranics:

While not technically fission products, transuranics are byproducts of the fissioning of uranium. (I am not meant to understand that sentence.)

The Bureau of Radiological Health's environmental surveillance report on Dresden One includes an especially important observation: Although the alpha-particle spectrometer used to study the Dresden primary coolant in 1968 was apparently only sophisticated enough to be able to identify one

group of transuranics in the primary coolant, the presence of one probably means others would have escaped into the coolant, too. Would this not also mean that transuranics could be in the crud as well? The BRH scientists attributed the group of alpha particles to curium-242. (BRH/DER 70-1, p. 7) Curium-242 has a half-life of 163 days, but many other transuranics will be around for a lot longer. Such as plutonium.

(2) Corrosion products:

a. Should there not have been a long list of corrosion products amid the predominant radionuclides expected to be present in the oxide layer at Dresden, on page 2-2, Table I, of the Draft EIS?

A list of the corrosion products activated (irradiated) by stray neutron bombardment within most nuclear reactors reads almost like the periodic table of elements. There's not much missing. In the Draft EIS, however, the only corrosion products listed are cobalt-57, 58 and 60; zirconium-95; and manganese-54. Perhaps because Dresden One has been shut down for a year and a half, some of the most common, shorter-lived corrosion products may have been expected to have decayed to insignificant levels -- though cobalt-58 is listed and it has a half-life of only 22 days.

If there is to be a thorough assessment of the risks of dissolving crud from the interior of a reactor, and bringing it out into the human (as supposedly distinct from the worker) environment, should it not include a far wider range of corrosion products?

(1) The following corrosion products have been specifically identified in various reports about Dresden One -- that is, over and above the few mentioned in the Draft EIS: iron-59 (half-life of 45 days), iron-55 (2.7 years), chromium-51 (28 days), copper-64 (13 hours), Manganese-56 (2.6 hours), nickel-65 (244 days), zinc-69 (13.7 hours), zinc-65 (2.55 hours; a corrosion product of Admiralty, for example, with which the Dresden One condenser was tubed until 1969), sodium-24 (15 hours), phosphorus-32 (14 days), silver-110m (253 days), cobalt-57 (271 days), tantalum-182 (115 days). (a compilation from EPRI # 404-2, December 1976; BRH/DER 70-1, March 1970; and General Electric # NEDO-10871, March 1973. Not included in these studies are coolant activation products, such as nitrogen-13, 16, and 17, oxgen-19, and fluorine-18.)

(2) In addition, the following elements were listed by the Atomic Energy Commission in WASH-1258 among "corrosion products released to the primary coolant" in boiling water reactors: silicon, carbon, vanadium, titanium, sulfur, lithium, tin, tungsten, and molybdenum. ("Final Environmental Statement Concerning Proposed Rule Making Action: Numerical Guides for ... the Criterion 'As Low As Practicable' ... in ... Effluents," July 1973, Volume 2, p. A-4)

b. And aren't many corrosion products long-lived? For example:

(1) Carbon-14:

Is it not possible that long-lived isotopes of some of the elements mentioned above would be found in the Dresden crud if it were isotopically analyzed, specifically testing for those components? Once again, my comments about the composition of the crud are aimed at two basic questions addressed in the Draft EIS: the amount of radioactivity in the crud, and the potential persistence of its hazard in the human environment.

Apparently cobalt-60 is so prevalent because it is the most common activation product of the natural cobalt that occurs to some extent in almost all iron and nickel alloys, as well as in stainless and carbon steels. Is

it possible that carbon-14 may be an activation product of carbon steel, a material no doubt present at Dresden, such as in the condenser? If so, might some of the carbon-14 have ended up in the oxide layer?

(2) Nickel-63:

According to the EPRI report mentioned above on the buildup of radioactivity, approximately 200 pounds per year of nickel is released into the Dresden One reactor as the result of the corrosion of Dresden's copper-nickel and Monel feedwater heaters, an amount "at least an order of magnitude greater than that at current generation BWRs with stainless steel feedwater heaters." (EPRI # 404-2, p. 18-4) The report explains that this causes the production of more cobalt-58 and 60.

Does it not also mean that nickel-63 may be produced, too? Nickel-63 has a half-life of 92 years. I first read of nickel-63 in lecture notes of health physicist Karl Z. Morgan. He listed cobalt-60, nickel-63 and iron-59 as the most common corrosion products. Apparently at least some NRC staff members expect nickel-63 to be present in the Dresden crud also. In the NRC memorandum mentioned above, dated February 13, 1979, George Knighton reports as follows:

> "By letter dated December 27, 1978, the licensee (Commonwealth Edison) has committed to analyzing the spent decontamination solvent to determine the transuranic nuclide content of the solidified waste. The licensee also committed to sampling the demineralizer discharge product for Fe-55 and Ni-63 at the beginning and end of the waste processing cycle to ensure that no Fe-55 or Ni-63 is transferred to Dresden 1 radwaste or Dresden Units 2 or 3."

While the processes involved in analyzing, ferreting out and keeping the transuranics, iron and nickel isolated are not at all clear, the fact that they may indeed be present surely is.

3. According to page 15 of the Appendix to the Draft EIS, the Electric Power Research Institute is presently sponsoring research by Battelle Northwest to develop "a weaker but more frequent decontamination process on line." (emphasis added). I would certainly hope that neither the NRC nor DOE would allow its licensees to use non-biodegradable chelates while a plant is on line -- or even during a routine refueling or maintenance shutdown -- unless the uranium core is removed in advance (though cores, too, become crud encrusted), and unless the decontamination effluent is kept isolated from the rest of the plant's liquid radwastes so that the chelates can be broken down before shipment and burial of the corrosion/fission products.

E. Is it really a good idea to bond chelates to the Dresden crud -- even if the pipe interiors get cleaner?

Scientists already know that chelating agents, such as those included in Dow's NS-1, can cause the accelerated migration of radionuclides through the environment. The NRC staff says it does not have "field or laboratory tests which quantify the migration potential of radionuclides associated with Dow solvent...." (Draft EIS, Appendix, first-page-two). On the contrary, field data do exist which demonstrate that radionuclides bonded to EDTA, an ingredient of NS-1, have migrated through the environment at a rate far faster than that expected if the chelates were not present. The very qualities which make chelates effective as solvents -- their ability to form clawlike multiple bonds with a metal ion, enabling them to dissolve normally insoluble metal oxides and to keep them in solution -- are the same qualities that make them a persistent threat in the environment.

To quote from the abstract of a study by Means, Kucak and Crerar recently published

in England:

"Multidentate chelating agents such as NTA, EDTA and DTPA are receiving widespread use in a variety of industrial applications and are entering natural water systems. The presence of these chelates in the environment can be undesirable because they solubilise toxic heavy metals. We have analysed the relative biodegradabilities of NTA, EDTA and DTPA in several different chemical environments. The objective was to determine whether any particular chelate is significantly more biodegradable than the others and therefore more desirable from an environmental point of view. ... Degradation rates of all three chelates are not rapid enough, even under ideal laboratory conditions, to preclude concern about their release to the environment." (J. L. Means, et al., "Relative Degradation Rates of NTA, EDTA and DTPA and Environmental Implications," Environmental Pollution (Series B), Vol. 1 (1980), pp. 45-60)

In the body of the paper a compendium of the primary hazards involved in the use of chelates includes the following:

"While chelates are used because of their powerful metal-binding properties, it is this same characteristic which may have undesirable environmental consequences. For example, EDTA, which is used in nuclear decontamination operations, is causing the migration of $^{60}$Co from intermediate-level waste disposal pits and trenches in the Oak Ridge National Laboratory (ORNL) burial grounds. Because it forms extremely strong complexes with rare earths and actinides, EDTA and similar chelates may also be contributing to the mobilisation of these radionuclides from various terrestrial radioactive waste disposal sites in the USA. ... Indeed, the presence of significant concentrations of EDTA in 12- to 15-year old radioactive waste at ORNL attests to its persistence. Therefore, wherever EDTA and similar compounds have been introduced into the natural environment, the aqueous transport of transition metals, rare earths and transuranics, which characteristically form the most stable complexes with chelates, will be expected to occur. ...

"Also, chelates may degrade into compounds which still possess strong metal-binding properties, although probably weaker than the original complexing agent. ...

"In addition to increasing the solubility of heavy metals, chelates can further increase the uptake of these metals by plants and consequently increase their ecological recycling rates and the possibility of their entering human food chains. If chelates are present in domestic wastes, they may dissolve copper, lead and iron from plumbing systems and sewage effluents and/or adversely affect sewage plant efficiency."

That last sentence might make one wonder about the wisdom of putting Dresden One back on line after the cleaning, though I have heard that Commonwealth Edison may not intend to take that action at any rate, decontamination or not. Apparently the cost of retrofitting much of the obsolete equipment to bring it into compliance with NRC requirements may be economically unjustifiable.

Although the full range of components of Dow's NS-1 is not available to the public, in a letter dated April 18, 1980, to U.S. Senator Howard Cannon from Nevada, the DOE in Washington, D.C. made the following statement, based on information provided from the DOE's Idaho Operations Office:

"The decontamination solvent and first water rinses will be collected and processed by evaporation. The resulting liquid waste is estimated to be 60,000 gallons, containing approximately 15 percent ethylenediaminetetra-

acetic acid (EDTA). This liquid waste will be solidified using a proprietary Dow process using polyester resins."

Whether that means 16% of the 60,000 gallon sludge (the Draft EIS estimates 20,000 gallons on page 4-6) or 16% of the Dow solvent, I do not know. Nevertheless, the remainder of the letter to Senator Cannon reveals many other important facts and opinions:

"In general, concerns about the disposal of decontaminating agents like EDTA by shallow land burial are appropriate and shared by the Department of Energy. The Department is currently sponsoring the following related research programs:

1. The quantitative effect of agents such as EDTA upon the mobility of radionuclides in the soil is being determined.

2. Techniques are being developed to stabilize old burial trenches.

3. Techniques are being developed to destroy organic compounds such as EDTA. One such method would result in a final product encased in glass.

"Disposing of the waste from the decontamination of Dresden I at the Beatty site, however, should not pose a significant hazard. The Dow resin is water repellent, and the lack of water at the Beatty site will severely limit any migration of radioactive waste. In addition, the predominate nuclide is cobalt-60, which has a 5.2 year half-life.

"The Dresden I decontamination process will probably not be used to decontaminate other reactors. The process is applicable only to boiling water reactors, and the proposed process is not economical. The sponsoring utility, Commonwealth Edison, is in fact considering a different process for Dresden II." (from Sheldon Meyers, Deputy Assistant Secretary for Nuclear Waste Management, DOE. Original signed by R. G. Romatowski)

Even just one or two of the above statements alone should provide reason enough for the Dresden One project to be postponed. Data unearthed (!) by the Department of Energy after the crud has been bonded to the chelates and brought into the environment may be too late.

P. Does anyone know for how long Dow's solidifying plastic resins will be able to keep chelated radioactive wastes "solidified"?

I don't know how to comment on the reports of laboratory tests performed by Dow of its own solidification agent other than cynically. Nevertheless, even without being able to unscramble which Dow and Brookhaven tests were which in the Draft EIS, it seems clear that some cobalt-60 can and did begin leaching out of the radioactive waste/Dow NS-1/Dow polymer matrix when immersed in pure distilled water in only one week! Although none of the solidification tests was trying to simulate burial ground conditions, do they not all indicate that the Dow matrix is indeed porous and that chelated cobalt-60 remains highly mobile?

If one adds to those laboratory studies the field data from Oak Ridge, Tennessee (Means et al., Science, Vol. 200, pp. 1477-1481), Maxey Flats, Kentucky (research in progress at the U. S. Geological Survey in Denver, Battelle - Columbus Laboratories, and Brookhaven National Laboratory), and West Valley, New York (research in progress at BNL), can anyone still be wondering whether it is wise to experiment in nature with huge quantities of Dow's plastic resins to see if they can really keep huge quantities of chelates from keeping huge quantities of radionuclides in solution -- as the chelates apparently are wont to do?

What is the expected lifetime of the Dow vinyl-ester-styrene solidifying agent itself

under burial conditions, and when subjected to radiation and chelates? As studies in California, South Dakota and Illinois have shown, data collected in Oklahoma also indicate that "low levels of many potentially undesirable organic compounds were being contributed to groundwater within and immediately under the Norman (Oklahoma) landfill by solid waste deposited in this landfill." (W. J. Dunlap et al., from a symposium on "Gas and Leachate from Landfills," EPA-600/9-76-004, March 1976, p. 105. Emphasis added.) As the Dow solidification agent breaks down, could it, too, release components that in themselves may bond onto the Dresden radionuclides and other wastes already at Hanford and Beatty, adding to the migration problem?

G. Can anyone be sure the Washington and Nevada sites will remain dry?

A U.S. General Accounting Office report lists characteristics identified by earth scientists about America's low-level waste dumps for which inadequate data have been collected, and "about which not enough is known to reasonably predict the migration direction and rate (of radioactivity movement) or to determine whether reasonable predictions can be made." Major information lacking about the Hanford site includes: "rate of infiltration (the amount of water that is not evaporated or transpired and is free to move downward), rate and direction of ground water movement, and interconnection between shallow and deep aquifers." The data needed for the Beatty site includes: "rate of infiltration, and direction and rate of ground water movement." ("Improvements Needed in the Land Disposal of Radioactive Wastes -- A Problem of Centuries," RED-76-54. January 12, 1976; pp. 13 and 45-46.)

The same report describes the following: "Through 1974 over 140 billion gallons of liquid waste containing about 5 million curies have been discharged into the ground at Savannah River, Idaho, and Hanford with the intention that the radioactivity would be trapped as it moved through the soil beyond the point of release and that the extent of migration would be limited by removing the driving force of further liquid releases. As soon as technically and economically practical, ERDA (DOE) plans to discontinue such practices." (Op. cit., pp. 5, 6)

Where are those Hanford liquid wastes now?

Because of the possibility that long-lived transuranics and fission products may be present in the crud at Dresden, as well as long-lived corrosion products; and because chelates in the proposed Nuclear Solvent-1 are known to cause the migration of radionuclides through the environment; and because neither the proposed polymer matrix nor the mild steel drums is capable of serving as a permanent barrier to keep the Dresden wastes segregated from other known and unknown, liquid and solid wastes already present at the Hanford and Beatty sites or apt to arrive in the future; and because Mother Nature -- who is in charge of 500-year rainfalls, the Columbia River and the Amargosa, groundwater and aquifers, the Cascade Mountains, earthquakes and climates -- refuses to be held accountable, I urge the Nuclear Regulatory Commission to withhold its permission for Commonwealth Edison to use chelates to flush its crud out into the human environment.

Sincerely,

Kay Drey

Mrs. Leo Drey (Kay)

page 10- addendum.

→ Decontamination

An addendum [not submitted]

In describing the measure of how radioactively hot an area is in which a worker may have to perform inspection, maintenance or repair tasks, the nuclear industry speaks of the "radiation field." As the plants in the country have gotten larger in electric output, particularly larger, for example, than a submarine reactor, the radiation fields have gotten hotter — which means, among other things, that an individual worker gets burned out — or gets his full quarter-year's annual dose — in a much shorter time. In some areas of some plants, for example, a worker or inspector may only be able to stay in a given area for a minute or a minute and a half. This makes repairs at nuclear plants expensive, of course. At Indian Point One, about 26 miles from Central Park in New York, it took 700 men 8 months to repair a thermal sleeve because everything was so radioactively hot. The same repair job at a coal-fired plant would have taken "about two weeks using 25 men." (Bernard Verns, Nuclear News, November 1975, p. 52). The high radiation fields also make things dangerous. At Dresden One near Joliet, Illinois, the radiation fields were so hot near the reactor, for example, that inspectors had not been able to examine some of the most critical welds in the plant for seven years — the welds could not even be inspected, let alone be repaired if need be. These were welds at the reactor coolant pressure boundary.

Even the NRC finally realized, apparently, that continuing to let Commonwealth Edison deviate from its technical specifications could prove disastrous. It had been discovered that one of the primary reasons that the radiation fields were so hot in certain places at Dresden One and at other plants was the buildup of radioactive corrosion products — in the primary cooling loop they call these products "crud"; in the secondary loop, they're called "the green grunge." Just as other pipes tend to corrode or rust over time — or accumulate metal oxides — those at nuclear plants do, too. A major difference, however, is that at a nuclear power plant the corrosion products themselves become radioactive as they're bombarded by neutrons — and the major component of the crud, it turns out, is cobalt-60 ... one of two isotopes most commonly used at hospitals in a sealed source for radiation therapy. A patient normally has his or her cancer cells exposed to the cobalt-60 or cesium-137 source for a matter of seconds to try to kill the cancer cells. Nearby healthy cells may also be destroyed, but there is no alternative. Well, to repeat, this same cobalt-60 is the primary component of the crud in nuclear power plants. And since cobalt-60 gives off powerful, penetrating gamma rays that are readily registered on a worker's film badge, or other monitoring equipment, an area with a heavy accumulation of crud is going to be undeniably hot. They speak of crud traps, places where a pipe may turn a corner, for example — where the crud or cobalt-60 and related corrosion products build up. To give you an example of how hot cobalt-60 can be: At Indian Point, one piece of crud measuring just 4½ square centimeters or about 2 inches square, gave off one rem an hour -- that's the equivalent of 87,600 times the amount of background radiation we are exposed to in one year. That was a 2" square piece, and yet Dresden One, one-fifth the size of Callaway, has 5 miles of piping. (Callaway will have 100 miles of piping !) This accumulation of crud, by the way, not only increases the radiation field for the workers, but it causes the pipes and other parts to clog up and become less efficient or even inoperable.

The solution the nuclear industry has been proposing for years — and which has been used at least to some extent at all commercial and military reactors — is to use chemical decontaminants, or solvents, to dissolve the crud from within the pipes, and off of various parts that need to be repaired or replaced. It turns out, though, that three scientists at Princeton and Oak Ridge discovered that the very chemicals that have been used for decontamination and were to have been used for the first total-plant decontamination experiment at Dresden One back in 1978, are the ones that have caused radioactive wastes to migrate out of burial trenches. They're called chelating agents. They bond onto and dissolve the corrosion products off of the pipes and parts so that the corrosion products can then be flushed away. The problem is that they stay bound, and keep the radioactive metal products in solution so that after burial they're able to migrate through the environment. It's been described as burying radioactive wastes with roller skates on!

#

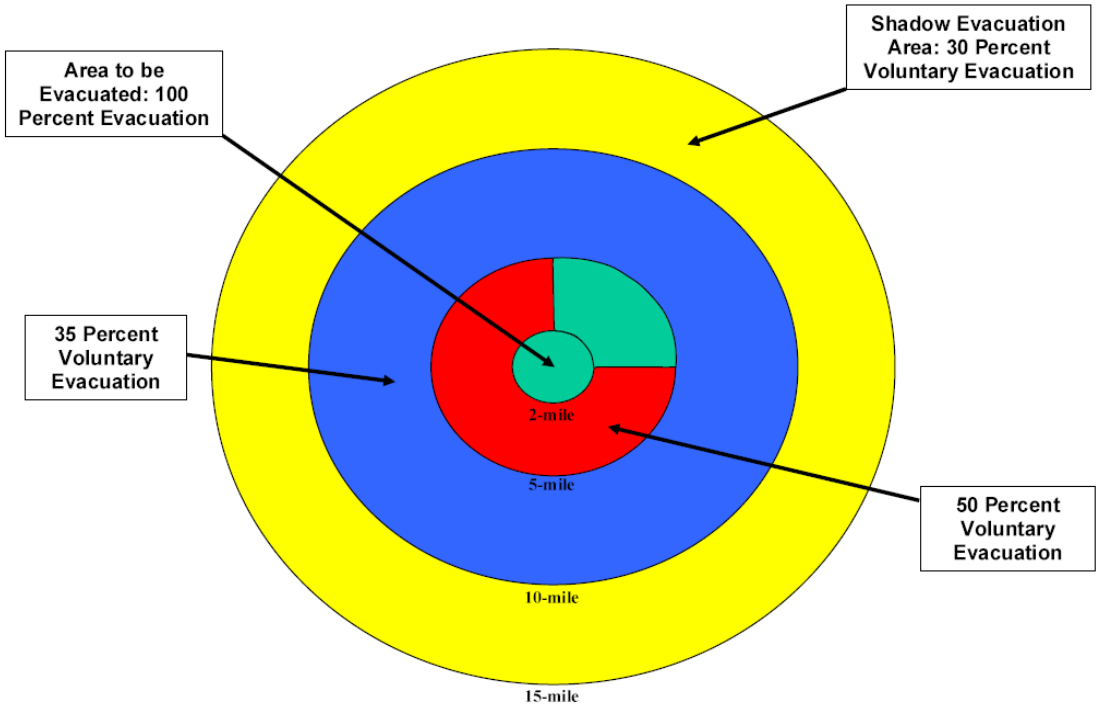
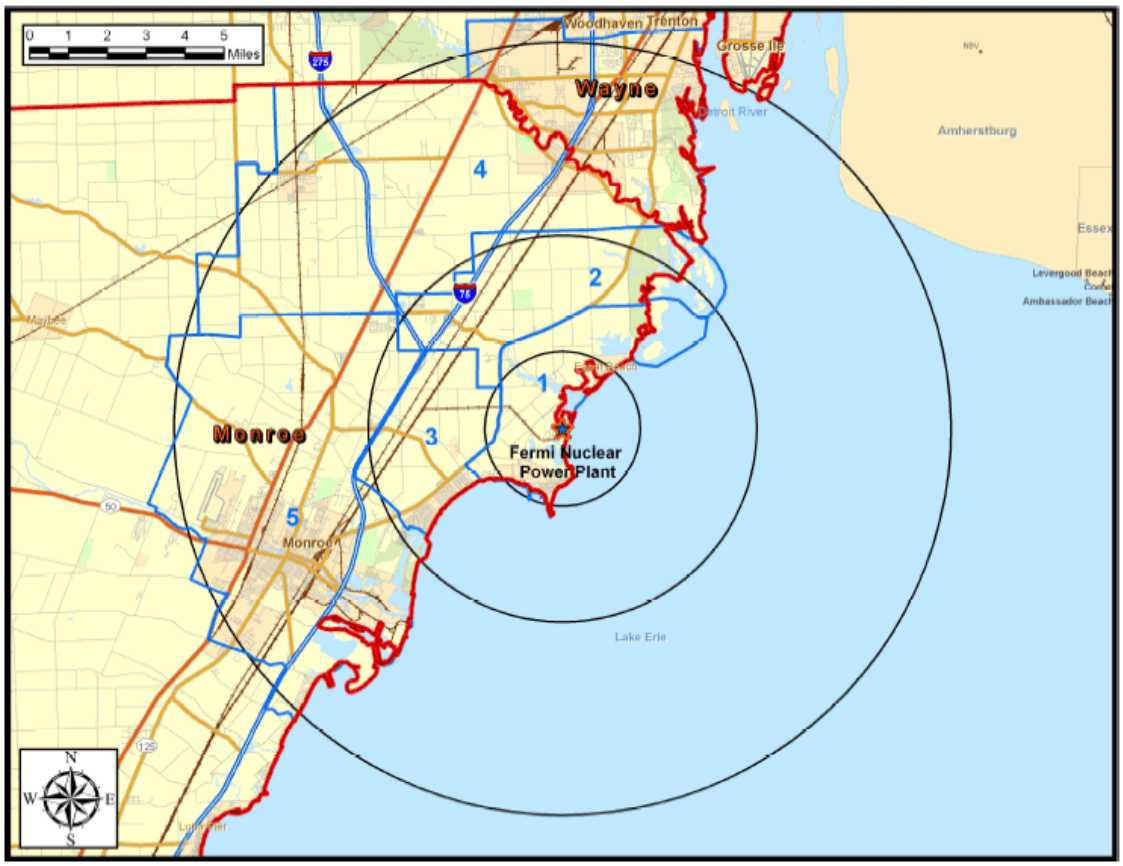



**Figure 2-1. Voluntary Evacuation Methodology**

# *Fermi Nuclear Power Plant*
# *Development of Evacuation Time Estimates*

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**May, 2008** **KLD TR – 426**

Monroe Evening News, January 21, 09

letter to the editor

What if nuclear and snow events coincide?

Snow removal from local roads is a current hot topic, but there is an important aspect no one has publicly mentioned. There is a shame that belongs to all of our local elected officials, county commissioners, city, village and township officials, school board members and state elected officials. There is a need to evacuate residents from a 10-mile zone around the nuclear plant should such a need occur.

Locally we benefit from the tax revenue from the nuclear plant. People of the State of Michigan decided that all school districts should share the benefits directly having a large nuclear power plant.

The probability of an event occurring that would require evacuation of residents is very small but it is not zero. If such an event could not occur, then the Nuclear Regulatory Commission would not require an evacuation plan. Whatever the probability with one unit, it will increase when a second unit is placed in operation.

The 10-mile evacuation zone is essentially a quasi-political number subject to many factors. If you live just outside the zone, you might decide that evacuation would be the safe action.

If the roads are cleared according to current policies, how many cars will be found in the ditches, how many more accidents would likely be expected in the event of a mass evacuation? I don't think it would be a neat, orderly exercise. If a loaded school bus slid off the road in the bitter weather we have recently experienced, would there be another bus available to evacuate the children in a timely manner?

In the past three years, the number of road commission trucks available to plow and salt has decreased by over 20 percent. Point: We don't have enough equipment to do the job we did three years ago. While drivers have been decreased, that problem could be resolved with temporary help. The issue is larger than just dollars, it needs operation and logistical support and continuing overview to incorporate changes.

My point is that while all political units are willing to accept the tax revenues and take credit for the jobs provided by a nuclear power plant, the political leaders are not standing together to assure that the needs of the local citizens are being met in the event of a real emergency situation. Where are the leaders?

John Pipis

Monroe

On the front page of the Monroe Evening News February 1, 2009 the following article ran which addresses road plowing concerns:

Article published at MonroeNews.com on Feb 1, 2009

**Road-plowing plan in works**

Township and school officials and local residents voiced their opinions Saturday about the lack of snow removal on rural roads to the Monroe County Road Commission.

About 100 concerned citizens, including many local community leaders, attended an emergency joint meeting of the Monroe County Board of Commissioners and the road commission held at the Monroe County Courthouse to find out why rural roads were not getting cleared.

Howard Penrod, managing director for the road commission, said the roads are not plowed as quickly as in the past due to budget cuts. The lack of money results in a lack of resources to plow all the county roads in a timely manner, he explained.

But those at the meeting offered suggestions to improve the situation — ideas that the county board now will consider. Commissioner Dale Zorn, vice chairman of the county board, made a motion for commissioners to review what was proposed at the meeting and develop a course of action that could help the road commission improve its clearing of secondary roads.

He said he hopes the board can give the list of possible changes to the road commission within two weeks.

"We can only make recommendations to the road commission, but we hope they look at any possible changes they can make so we can get rural roads cleared faster," he said after the meeting.

Many citizens and local officials took turns at the podium brainstorming ideas to make secondary roads safer, since they are considered third on the road commission's priority list. State and primary roads are top priorities.

Mr. Zorn asked road commission officials to clear the state and primary roads once then move on to the rural roads.

"Instead of doing two or three sweeps on the state and primary roads, just go over it once then move on to the other roads," he suggested. "Then you can go back and do the main roads a second time. One path on the (rural) roads is better than nothing."

"How about reorganizing the budget according to priority?" asked Herb Gabehart, interim superintendent at Whiteford Agricultural Schools. "Change it so there is less funding in the summer and more for winter work. I know that will cause another set of problems in the summer, but at least we would be safer in the winter."

One resident wondered why the Monroe County Library System gets funds from traffic tickets.

"We must have the richest library system in the world," he said while speaking at the podium. "That money should go to roads."

Many other citizens and school officials asked about specific roads not getting plowed at all, such as Sherman Rd. in Milan, and why they aren't seeing trucks out on secondary roads hours after a snowstorm hits the area.

School officials also asked for better communication with the road commission since they must make decisions on school closings by 5 a.m. In response, Mr. Penrod agreed to meet with school transportation directors soon.

Mr. Penrod said the root of all problems is lack of funding and layoffs. Eight employees were lost due to layoffs, and $1 million was cut from the 2009 budget. In a two-week period in December, the road commission spent $143,000 on overtime pay and another $208,000 on the purchase of salt.

Currently, 57 truck drivers run 34 plow trucks plus four motor graders on two 12-hour shifts. The drivers cover 910 miles of local roads, plus 428 miles of primary roads.

"We have the same amount of work but less people to do it," Mr. Penrod said. "We will get the job done, it's just takes a lot longer.

"The snowstorms we've had aren't helping either because the windy conditions blow the snow back on the roads. We work 24/7 to get all the roads plowed. We are out there until it is done."

It had been suggested that local contractors be hired to assist the road commission. Mr. Penrod said bids have been requested but the funds are not available.

"We have no additional funds to contract drivers unless the state declares an emergency," Mr. Penrod explained. "And local contractors back out once they find out that liability is involved."

Mr. Zorn would not take the lack of funds as an excuse for the road commission's performance.

"I don't think it's the lack of funds. I think it's a prioritizing issue," he said.

But Richard Turner, vice chairman of the road commission, disagreed with Mr. Zorn.

"It is a money issue. We are down in the amount of trucks and drivers, but we have the same amount of roads to cover. It's hard to keep up," he said.

He said the public should urge local state legislators to seek additional state funding.

"They control the purse strings to Monroe County," he said. "There is no place else to get funds other than the state. We have talked to them and asked them to help, and we're being let down."