December 6, 2022

Before the Secretary United States of America
Nuclear Regulatory Commission Before the Commission

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| In the Matter of | ) | |
| OTMI-2 Solutions, LLC | ) | |
| | ) | Docket Nos. 50-320-LA-2 |
| (License Amendment Request | ) | |
| for Three Mile Island Nuclear | ) | |
| Station, Unit 2) | ) | |

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Reply of Eric Joseph Epstein to TMI-2 Solutions, LLC and the Nuclear Regulatory Commission's Answer Opposing the Petition of Eric Joseph Epstein Leave to Intervene and for A Hearing

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## I. Introduction

Pursuant to 10 C.F.R. § 2.309, Eric J. Epstein on behalf of himself ("Epstein," "Mr. Epstein," and "the Petitioner") submits this Reply to TMI-2 Solutions, LLC ("the Applicant" or "TMI-2 Solutions") and the Nuclear Regulatory Commission's ("NRC" or "the Staff") Answers opposing the Petition for Leave to Intervene and for a Hearing ("Petition") filed by Eric J. Epstein on November 4, 2022.

The Petitioner requested a hearing and sought to intervene in the proceeding associated with TM-2 Solutions ("Applicant") License Amendment Request ("LAR") submitted to the U.S. Nuclear Regulatory Commission ("the Commission" or "the NRC") published in the Federal Register on August 22, 2022. Mr. Epstein filed a timely Petition for Leave to Intervene and Hearing request which contained two contentions. Each contention satisfies all six admissibility criteria in 10 C.F.R. § 2.309(f)(1). Accordingly, pursuant to 10 C.F.R. § 2.309(a), the Commission must accept the Petition.

The Applicant's and the Staff's Answers Opposing the Petition of Eric Joseph Epstein for Leave to Intervene and for a Hearing was filed on November 28, 2022. Mr. Epstein filed a timely Reply to TMI-2 Solutions, LLC and the NRC staff's Answer Opposing the Petition of Eric Joseph Epstein for Leave to Intervene. As explained in the Petition, both of the Petitioner's contentions are admissible because they satisfy the six elements in 10 C.F.R. § 2.309(f)(1).

The Petitioner supported his contentions with factual information and reasoned explanations, and clearly demonstrated a genuine dispute with specific portions of the LAR. The Petitioner submitted four admissible contentions. The Petition must be accepted. The Petitioner has also demonstrated standing. Mr. Epstein is entitled to standing as an individual, and he also demonstrated "traditional" standing. Mr. Epstein also requests the Commission to grant him discretionary intervention.

Both Answers in Opposition track like carbon copies. Thet are a generic rehashing of a lifelong resident and citizen, who is most publicly identified with Three Mile Island, is somehow disconnected from where he lives, works, and raisesda family. Perhaps those traditional connections to community are different for residents of a newly arrived private equity fund based in Salt Lake City, Utah. Mr. Epstein is well aware of the NRC's laissez faire approach to maintaining a physical presence at Three Mile Island after Post-Defueling Monitored Storage (1993), which became more acute after the implementation of the Reactor Oversight Process (1998). During COVID, the NRC maintained a "virtual presence" including remote inspections.

Please note that the Applicant and Staff can not simultaneously argue that it is irrelevant that the NRC conferred standing to Mr. Epstein in past proceedings, yet when the Commission denied Mr. Epstein standing, this is somehow based on precedent. Either past precedent is prejudicial and not material to standing, or prior standing rulings must be given consideration regardless if they were affirmative or negative. If prior standing is not relevant, than the Applicant and Staff's arguments regarding standing should be discarded. Mr. Epstein's standing status should be judged based solely on the merits of the Petition filed on November 4, 2022.

Mr. Epstein will respond throughout the Reply to the Applicant and Staff's recycled opposition to standing and both contentions. However, what is particularly striking is that both parties completely ignored the legal staple of Mr. Epstein's argument relating to the "uniqueness" of Three Mile Island. In fact, the term "unique" was absent from both Answers. The Applicant continues to ignore TMI-2's "unique" history which is on the precipice of being whitewashed.

Instead, the Applicant and NRC staff refused to acknowledge, address, or respond to Mr. Epstein's contentions based on what the Applicant believe sto be "entirely speculative" and "unsupported by evidence or analysis" (TMI-2 Solutions, p. 20 and p, 22). Ignoring Epstein's cogent argument is more reminiscent of pre-Accident hubris than rigorous scientific investigation. Thus, according to the Applicant, Designed Based Accidents "were not applicable" based on prior postulated accident scenarios that were not studied and are not possible based on TMI-2 Solutions projections. (Applicant, p. 62.) Both the Applicant and the NRC Staff believed a Design Based Loss of Coolant accident was not credible, and speculative prior to March 28, 1979.

Mr. Epstein lived in the area when Three Mile Island was built, and remembers when the community was told that an accident at "Three Mile Island was as likely as a meteor falling from the sky." The Applicants and Staff are devoted to TMI-Solutions new untested theories , and claim a DBA is not possible, as it is not hard science. This is precisely the type of arrogance that led to the TMI meltdown, and the Tokai-Mura criticality accident in Japan. The root causes and lessons learned from both incidents should apply to TMI-2 in this licensing action.

The Applicant and the NRC staff believe that only one percent of the fuel remains based on theoretical calculations attached to drone footage that was not confirmed by peer review, or reaffirmed by examining the amount of damaged fuel located in Idaho.(Epstein Petition, pp. 8-9). Neither the Applicant or Staff or able to determine how much damaged fuel is in TMI-2 .Though Mr. Epstein provided two studies reviewed by the NRC . (1) The Distenfeld Study that the NRC reviewed in no longer publicly available. The Rasmussan Report is part of the institutional knowledge transferred from FirstEnergy to TMI-2 Solutions, unless the Applicant destroyed the files per the issuance of the exemptions ordered by the .NRC on October 31, 2022.

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1 Enclosure 1: Dr. Kaku's Study, 1987..

Previous fuel studies which TMI-2 Solutions are "bound" to include credible estimates of possible safety challenges during the cleanup of TMI-2 (2)

**Video estimate of remaining fuel at TMI-2** GPU initially underestimated that the amount of damaged fuel on site was **850 kilograms**.

**GPU Defueling Completion Report:** GPU's video camera and visual inspection of the amount of fuel remaining in TMI-2 was underestimated at **608 kilograms;**

**Safety Evaluation (NRC)** - The NRC staff approves GPU's fuel estimate based on their own visual analyses.

**Distenfeld Study (GPU):** As part of the fuel storage agreement with the Department of Energy (DOE), GPU predicted there was **1,322 kilograms** of fuel remaining in TMI-2. GPU tried to determine how much fuel was left at, and around, the reactor vessel by subtracting the amount of fuel used when TMI-2 began operation from the amount of fuel remaining at TMI-2. The difference was supposed to be in DOE's possession.This approach, with updated data, was available but not used by TMI-2 Solutions. Distenfeld's figures raised "concern" for GPU and the NRC and both entities recognized there was a "potential for more fuel." However, Dr. Masnik noted "Quite frankly we had some questions on Distenfeld's [criticality analyses study.] " **When Dr. Michio Kaku asked Lee Tonus (NRC site staff) for a copy of Distenfeld's study he was told it was available in the Public Document Room.** Then Tonus admitted he didn't know where it was published. In fact the document is obscure and the only record of its contents is a conference proceeding of the Institute for Nuclear Material Management.

**Rasmussen Study (GPU) -** GPU commissioned Norman Rasmussen to critique Distenfeld's study; however, nowhere in Rassmussen's study is Distenfeld name's found. Rasmussen concluded there was **935 kilograms** of fuel remaining at the bottom of TMI-2. According to Dr. Masnik, Rasmussen's study is the "best estimate." This study concedes that **super-criticality** could result with the removal of the neutron "poison" (borated water.) This scenario is unlikely but possible during an explosion, fire or crash.

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2 TMI-2 Solutions committed to be "bound" to he Programmatic Environmental Impact, "NRC's Plan for Cleanup Operations at Three Mile Island Unit-2, "(NUREG-0698), and Post-Defueling Monitored Storage on three separate occasions during their public presentation to the Nuclear Regulatory Commission, February 20, 2022

**Kaku's Study (TMI-Alert/TMI-Legal Fund):** After evaluating the above mentioned studies, Dr. Kaku noted: "It appears that every few months, since 1990, a new estimate is made of the core debris, often with little relationship to the previous estimate...estimates range from **608.8 kg to 1322 kg**...This is rather unsettling, because there is significantly more than enough uranium debris to give critical mass. The still **unanswered questions** are therefore: precisely how much uranium is left in the core, and how much uranium can collect in the bottom of the reactor to initiate re-criticality."

**TMI-2 Solutions**. The Applicant estimates that the amount of remaining fuel is between 1,200 kilograms and 1,500 kilograms, but the dose calculations are based on the site boundary and internal radiation levels.

It is the Applicant and the Staff that "lack credible support" that the new, revised calculations are unimpeachable. Mr. Epstein is operating off of time-tested historical data that are available and peer reviewed. This same data was ignored by the Applicant and Staff as were the DOE fuel studies in Idaho. (Epstein Petition, p.31)

What is truly remarkable is that Mr. Epstein and the owner of TMI-2 worked collaboratively to demonstrate radiation releases during defueling and PDMS through GPU' Nuclear's Reuter Stokes gamma monitoring system, (listed under "Newsletters"), and EFMR's Low Volume Remote Air Samples (listed under "EFMR Biennial Report") under the supervision of the Dickinson School of Astronomy and Physics. This information is – and has been publicly available at the EFMR web site for over twenty years. https://www.efmr.org/readings/index.html

Mr. Epstein noted that criticality is unlikely, but not impossible (Epstein, p. 21), as did Dr. Kaku ("Danger of Criticlaity at TMI," Kaku, p.5). Mr Epstein offered the Tokai-Mura criticality accident, and the NRC's review as a cautionary tale of the value of prudency and conservative estimates. There was a time when "safety in depth," and erring on the side of conservatism was the cornerstone of the nuclear industry.

In their Answer, TMI-2 Solutions and the NRC effectively concede that Three Mile Island Unit is a "unique" and hazardous decommissioning site. Neither the Applicant or NRC disputed that the facts on the ground concerning the "unique condition" of TMI-2 are indisputable, as established in the initial PEIS in 1981. The Applicant dismisses, ignores, and plays down: 1) TMI-2 is treacherous terrain inhabited by numerous radioactive hot spots; 2) The Applicants' are "bound," to past in-depth studies, on-site surveys, and visual imaging; 3) The lack of contemporary dedicated site studies can not be supplanted by drones; and, 4) The Applicant will encounter unforeseen conditions that could overwhelm, impede, and delay the cleanup, which has been well documented during the defueling stage.

Moreover, it is not surprising that an absentee landlord and a remote regulator are unaware of the recent airplane crash near Three Mile Island in 2019 (2) , or last week's derailment of a Norfolk Southern train in Marysville. (3) The derailment took place close to where Al Qaeda had a training camp just 30 miles from TMI. Men associated with terrorist Ramzi Yousef practiced a night- time mock assault on an electrical power substation as if planning to attack a nuclear plant. The amount of fuel remaining and its condition at TMI is speculative, plane and train accidents and terrorist training have occurred near Three Mile Island, well within the emergency preparedness zone.

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3 "Crashed plane remains in Susquehanna River near Three Mile Island a week after going down," "While it's unusual, this isn't the first time a plane went down in the Susquehanna River. There were at least four other occasions in the 1990s, according to the Patriot-News archives. (October 12, 2019)

4 "Norfolk Southern train derails, car falls off bridge onto road below in Marysville, Perry County," WGAL news. December 2, 2022.

## III. The Petitioner Has Demonstrated Standing.

Eric Joseph Epstein ("Epstein" or "Mr. Epstein") has standing to intervene as an individual in this proceeding, in a representational capacity. The Petitioner should also be granted discretionary intervention under 10 C.F.R. § 2.309(e), and has met the required criteria by submitting four admissible contentions.

Mr. Epstein has established standing to intervene in this proceeding as a matter of right under 10 C.F.R. § 2.309(d). The Petitioner clearly has the ability to "assist in developing a sound record," and offer extensive perspective based on his historic relationship. The Petitioner has also established Proximity-Based Standing.

This License Amendment Request is entirely about changed circumstances brought about by speculative capital. The Petitioner has made his case. The Applicant is the party making unsubstantiated conclusions while submitting a dearth of evidence.

The NRC can not selectively distance itself from its statutory mission "to protect public health and safety," erase history, and fail to "protect the environment." Not only does Mr. Epstein provide the only connective tissue to the body of nuclear power operations at Three Mile island Unit-2 , but his presence and active litigation predates the creation of FirstEnergy and TMI-2 Solutions

The Applicant's selective desire to vacuum out people, places and events, is an effort to rewrite history and minimize Three Mile Island's inglorious past. The Applicant's whitewashing of the core melt down at TMI in 1979 won't magically make the radiation go away. Folks who don't live and work proximate to these reactors, are not in a position to pass judgment from the safety of their COVID bunkers. The facts on the ground are that Mr. Epstein's experiences predate the creation of the Applicant, and the Petitioner possesses a unique and indispensable lens to view this proposed License Amendment Request.

## IV. Contentions.

There are specific contentions which the Petitioner seeks to have litigated in the proceeding. Each contention must consist of a specific statement of the issue of law or fact to be raised or controverted. In addition, the Petitioner must provide a brief explanation of the basis for the contention and a concise statement of the alleged facts which support the contention on which the petitioner intends to rely in proving the contention at the hearing. The Petitioner must also provide references to the specific sources and documents which will support the Petitioner's position. The Petition must include sufficient information to show that a genuine dispute exists with the applicant or licensee on a material issue of law or fact. Contentions must be limited to matters within the scope of the proceeding. The contention must be one which, if proven, would entitle the Petitioner to relief .

In order to bring a contention before the Commission, Mr. Epstein must "[p]provide a specific statement of the issue of law or fact to be raised or controverted. 10 C.F.R. Section 2.309(f)(1)(i). At this preliminary stage, Mr. Epstein need not submit admissible evidence to support his contention, rather he has to "[p]provide a brief explanation of the basis for the contention," 10 C.F.R. Section 2.309(f)(1)(ii), and "a concise statement of the alleged facts which support the...petitioner's position." 10 C.F.R. Section 2.309(f)(1)(v).

Mr. Epstein has established standing, and cleared all six hurdles in his two contentions in the Petition to Intervene. The concrete harms that Mr. Epstein would experience as a result of criticality and another nuclear accident is not conjecture. The Applicant has not examined the scenarios postulated by Mr. Epstein. Moreover, based on TMI-2 Solutions, the plant has a cursory Emergency Preparedness plan, no stockpiles of potassium iodide, and transportation routes and regular trainings have been abbreviated or completely eliminated.

**Contention 1 is Admissible:**

**The Applicants License Amendment Request Fails to Consider the Potential Harm to the Surrounding Area from Airplane Crashes, Explosions and Fires or Terrorist Attacks.**

Mr. Epstein discussed this contention at length in his Petition- as well as the risks and health and safety consequences from pages 22 -27.

**Contention 2: is Admissible:**

**The Applicants License Amendment Request Report Fails to Consider the Potential Harm to the Surrounding Area from Recritcality Due to Airplane Crashes, Explosions and Fires or Terrorist Attack.**

Mr. Epstein discussed this contention at length in his Petition - as well as the risks and health and safety consequences from pages 23 -34.

**V. Conclusion.**

The standing requirements for NRC hearings derive from the Atomic Energy Act, which requires the NRC to provide a hearing "upon the request of any person whose interest may be affected by the proceeding." 42 U.S.C. § 2239(a)(1)(A). *See also Yankee Atomic Elec. Co.* (Yankee Nuclear Power Station), 48 N.R.C. 185, 195 (1998). In determining whether a petitioner has established the "necessary 'interest'" under the statute, the NRC "has long looked for guidance to judicial concepts of standing." *Id.* (Citing *Quivira Mining Co.* (Ambrosia Lake Facility, Grants, New Mexico), CLI-98- 11, 48 N.R.C. 1, 5-6 (1998); *Georgia Institute of Technology* (Georgia Tech Research Reactor, Atlanta, Georgia), CLI-95-12, 42 N.R.C. 111, 115 (1995).

The Commission has indicated that where Petitioners make technically meritorious contentions based upon diligent research, and supported by valid information, the requirement for an adequate basis is more than satisfied. Mr. Epstein has met this standard. For the reasons stated, the Commission should grant Eric Joseph Epstein's Petition to Intervene and grant his associated request for a Hearing.

Respectfully submitted,

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Enclosure

United States Nuclear Regulatory Commission

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| In the Matter of | ) | |
| | ) | |
| TMI-2 Solutions, LLC | ) | |
| Docket No. 50-320-LA-2 | ) | |
| | ) | Docket No. 50—320-LA-2 |
| (Licensing Amendment Request | ) | |
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| Station, Unit 2) | ) | |

Certificate of Service

I hereby certify that copies of Eric Joseph Epstein's Petition for Leave to Intervene and Hearing have been served upon the following persons by Electronic Information Exchange.

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Eric Joseph Epstein

Dated at Harrisburg, Pennsylvania
this 6th day of December, 2022

# Enclosure 1

# DANGER OF CRITICALITY AT TMI

By Dr. Michio Kaku

Prof. of Nuclear Physics

City Univ. of New York

Since the accident at Three Mile Island in 1979, most of the damaged uranium core has been removed by the GPU utility, and the general public widely believes that the last remnants of danger from the reactor have been successfully removed.

However, it is not widely known that the removal of the core was more difficult than expected, and that the utility was forced to leave several tons of uranium debris inside the reactor vessel. Because the core removal operation was incomplete, the question remains: can the remaining uranium create another accident, i.e. can it "go critical?" This is not an idle question, because the uranium in the core is the form of large quantities of loose debris which might, under certain circumstances, come together to reach critical mass.

The utility, of course, has issued press reports suggesting that there is no cause for alarm, that the remaining uranium debris cannot start another accident at TMI. These reassuring, calming statements, however, are quite different from the picture revealed by the official technical documents submitted to the NRC. Instead of projecting the image of a utility that has responsibly and skillfully removed all possibility of an accident,

a careful reading of these technical documents shows that the utility has cut corners, made sloppy analyses, and made clumsy mistakes, which had to be corrected by the NRC. Worse, it also admits, in effect, that a criticality accident is indeed possible.

In fact, the very reason why the NRC asked the GPU in the first place to prepare these lengthy reports is precisely because a criticality accident is theoretically possible. (If a criticality accident were impossible, as they publicly claim, then the large volume of reports generated by the utility would have been completely unnecessary.)

The utility admits that not only is criticality possible, but it calculates the amount of uranium necessary to reach critical mass: about 200 pounds of uranium debris (a fraction of the total amount of uranium left in the core). In other words, if an accident were to somehow to rearrange the debris inside the core and bring 200 pounds of loose uranium together within the damaged reactor vessel, the core would go critical, and the accident at TMI would start all over again.

In its defense, the utility admits that a criticality accident, although theoretically possible, is in practice not likely because of the safeguards that they have taken. Their "maximum credible accident," however, is only a very slight rearrangement of the uranium debris in the core which brings less than 200 pounds of uranium together. Much like the optimistic reasoning that went on before the accident in 1979, the utility fondly

believes that the "maximum credible accident" is a minor nuisance that will not disturb the sleeping core.

Surprisingly, a detailed reading of the technical documents prepared by the GPU shows large inconsistencies and gaps in their reasoning. In effect, the utility has tried to hide behind a mountain of jargon and technical reports to conceal from the public the truth about criticality. Not only is their calculation of critical mass probably too high, they have also ignored serious accident scenarios which can bring together enough uranium debris to initiate a criticality accident.

## Dangers of a Criticality Accident

To understand the grave importance of a criticality accident, it is important to understand that the word "critical" refers to the population of neutrons within the core. The word "subcritical" means that the population of neutrons decreases with time, so that the number of fissions, and hence the amount of energy released by the core, diminishes. The debris in the reactor core, at present, is subcritical. This means that a quantity called "k-effective" is less than one.

The danger, however, is when the core becomes critical, or even supercritical. The word "supercritical" means that the number of neutrons grows with time. This means that the number of fissions also increases, and hence the amount of energy released by the core increases. k-effective is greater than one. Supercriticality can be reached, for example, in a reactor accident or in an atomic bomb.

A damaged core that is critical or even supercritical poses a potential grave danger. The problem is not that the core will detonate like an atomic bomb (this is impossible, since k-effective is much smaller than that necessary to create a bomb). However, the real danger is that a criticality accident will cause the temperature within the core to rise, causing the water to boil and perhaps explode in a steam explosion.

For example, in Jan., 1961, an experimental U.S. Naval reactor in Idaho, called the SL-1 (stationary low power reactor), accidentally went supercritical when workers inadvertently removed the central control rod from the reactor. The temperature within the core soared dramatically within milliseconds, vaporizing the water in the core, and the resulting steam explosion blew the reactor apart, killing three workers.

Similarly, the accident at Chernobyl was also caused by supercriticality. The official report states that (like the SL-1 accident) workers manually removed the safety mechanisms of the reactor. The reactor went supercritical, and the sudden burst of energy created a steam and hydrogen explosion which blew the roof off the reactor, creating the worst reactor accident in history.

Other types of criticality accidents of the past have happened with subcritical pieces of uranium or plutonium (which by themselves do not pose a danger) are brought together, creating a supercritical mass. For example, in 1945 and in 1946, two fatal criticality accidents happened at Los Alamos when Harry Daglian and Louis Slotin brought subcritical hemispheres of plutonium

(from the atomic bomb project) together manually. The configuration rapidly changed from subcriticality to supercriticality, and the resulting flash of light released vast amounts of neutrons, which in turn destroyed much of the cells within the workers' bodies.

## What Can Go Wrong

Given the surprisingly long and dangerous history of criticality accidents in the U.S. and Russia, it is important to give a careful analysis of the GPU reports, which downplay the importance of criticality accidents.

There are several problems with the GPU reports which can lead to a criticality accident.

1) estimates of critical mass may be too low
2) chemical explosions, fires, power loss, etc. are not analyzed
3) human error is neglected

### Critical Mass

Only with the gravest reluctance has the utility given to the public the documents relating to the calculation of k-effective and the estimate of critical mass. Only after repeated requests has the utility released documents showing how the calculations were performed. This certainly does not increase the public's confidence in the utility.

A careful reading of the documents, however, shows some glaring inadequacies. The key calculation of k-effective and critical mass, in fact, was not performed by the utility at all (it involves solving a time-dependent, second-order partial

differential equation in three dimensions). The calculation, in fact, was performed at the Oak Ridge National Laboratory.

Unfortunately, the utility has stonewalled all attempts at obtaining the key ORNL report. However, the brief description of the ORNL study in the GPU reports allows one to reconstruct how the calculation was performed. There are several key flaws in the study. Because the precise shape of all the core fragments in the vessel is unknown, the ORNL report simply assumed a perfect, two-dimensional geometrical configuration of uranium for its calculation. Then they used this rather dubious assumption to calculate the neutron population within this highly symmetrical geometric shape. Then they proudly concluded that this idealized model accurately describes the type of accident that can happen with random debris.

However, reality is often more complicated than simple-minded computer models. As we often say in the business, "Garbage in, garbage out," (i.e. if your assumptions and inputs are false and unrealistic, then the computer calculations, no matter how elaborate, will also be worthless). In reality, photographs of the bottom and sides of the reactor vessel (taken by small cameras that were sent into the radioactive core) show that the debris is in highly irregular shapes and sizes, with no regularity, making a realistic calculation of the neutron population quite difficult.

The solution to the problem, of course, is to release the ORNL computer codes to the public and let independent scientific

groups rerun the calculation and make improvements. (For example, it would be simple for me to reproduce the ORNL calculation on the VAX computer at the CUNY, or the supercomputer at Cornell.)

However, the fact that GPU stubbornly refuses to make the ORNL calculation available leads one to suspect, until proven otherwise, that they are hiding something.

Catastrophic Accident

Under normal, routine operations, the utility is correct in stating that it is unlikely that 200 pounds of uranium debris will come together and create a criticality accident. However, this is not the point. Over a period of many years, the probability of unexpected accidents increases greatly. For example, a fire in the reactor containment, a chemical explosion (e.g. initiated by the presence of hydrogen gas), a sudden loss of power due to a failure in power systems, etc. have all taken place at reactors around the country. At the Brown's Ferry accident of 1970 in Alabama, a fire was accidentally set off by workers using a candle to inspect the reactor. The candle fire set off the insulation, which created a fire which raged for several hours out of control, gutted the reactor, disabled the safety systems, and almost caused the core to be uncovered, which would have initiated a meltdown. The reactor crew was completely overwhelmed, and the local fire department had to be called in, which successfully put out the fire.

Similarly, hydrogen gas explosions are rather common at reactors. Because hydrogen gas is generated in the normal

operation of a reactor, special care must be taken to insure that the hydrogen gas does not come in contact with a spark or flame. (In fact, a hydrogen gas explosion took place during the TMI accident of 1979, which shook the reactor, overpressurized the containment, but fortunately did not damage key pipes or cables.) Furthermore, crucial power systems have suddenly been lost due to lightning bolts and other unforeseen incidents.

The point is that all these serious accidents have, indeed, happened at reactor sides around the country and that they can, under certain circumstances, cause a rearrangement of the uranium debris beyond critical mass.

Human Error

Most of the accidents in the past were caused by a combination of design flaws and human error. Although design errors can be technically eliminated, human error cannot. As a result, it is not surprising that human error figured prominently in all previous reactor accidents. From the SL-1 accident of 1961, the Fermi I accident of 1965, the TMI accident of 1979, and the more recent Chernobyl accident, human error was the trigger that initiated the accidents. Human error can trigger an accident at TMI as well. For example, the neutron and heat levels of the core must be carefully monitored at all times. Over the years, workers may neglect these monitors or, like in the SL-1 or Chernobyl accidents, be tempted to tamper with the reactor and make unauthorized changes.

Summary

In summary, both the utility and its critics agree that a critical accident at TMI is possible. This is not in dispute. Although GPU in public maintains that a criticality accident is not possible, its own technical reports state otherwise.

What is in dispute are two issues:

a) how accurate is the estimate of critical mass (200 pounds)

b) given that 200 pounds is much less than the total amount of debris in the core, what catastrophic accidents can cause this amount of uranium to come together?

The utility stands behind the ORNL report, which they refuse to release. However, the report is simple-minded to the point of being incorrect. Because they cannot make a realistic calculation of the uranium debris, they make unrealistic assumptions in their computer model. This, in turn, may lower the actual critical mass estimate down from 200 pounds.

Furthermore, the utility believes that the maximum credible accident is a rather mild jostling of the core. However, the actual history of accidents at reactor sites (including crippling fires, hydrogen explosions, human error, etc.) shows that it is possible that the core may experience a large disturbance which might rearrange the loose debris inside the core and restart the accident at TMI.