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**From:** Rich Andrews [mailto:Rich@zeoponix.com]
**Sent:** Friday, December 20, 2013 4:05 PM
**To:** RulemakingComments Resource
**Subject:** Comments to NRC's Proposed Waste Confidence Rule and Draft Generic EIS

Dec 20, 2013

Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attn: Rulemakings and Adjudications Staff

Docket ID NRC-2012-0246

I attach a pdf copy of my comments with attachments to NRC's regarding their Waste Confidence draft Generic EIS on spent nuclear fuel.

A hard paper copy has also been submitted by U.S. Mail including a CD with an electronic copy as a pdf format file.

Best wishes and have pleasant holidays.

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## Written comments to U.S. Nuclear Regulatory Commission

## December 19, 2013,

## Re: NRC Draft GEIS on Spent Nuclear Fuel (SNF) Waste Confidence

**Introduction** –

My name is Richard D. Andrews, US citizen of Boulder County, Colorado, founder and owner of Boulder Innovative Technologies, Inc. I am a registered professional chemical –environmental engineer for more than 40 years, having operated in the field of environmental engineering and regulatory affairs, including managing the environmental and health physics investigations and design, and licensing of two uranium mining and milling operations in the late 1970s. I quit that job after a few years when I fully came to the realization that the entire nuclear technology and industry was fatally and irretrievably flawed, inseparably linked to weapons proliferation, and not capable of being operated safely or even sanely given the extreme catastrophic consequences to human health and the environment. In subsequent years, my only involvement with nuclear technology has been to engage in efforts to discontinue it, and on occasion to technically support means to safely dispose of the wastes and to accelerate closure of facilities.

What follows are my written comments on the draft Waste Confidence Generic EIS. I have reviewed the document and while grateful that the courts have mandated this process, find that the NRC response to that mandate is not only insufficient in many technical areas but lacks in honesty and integrity. My first recommendation is to remove the misleading title of "Waste Confidence". Waste Confidence simply does not exist in the public, nor the nuclear industry, and probably not even at NRC. This title is merely a buzz word phrase, deceptive at best, and clearly designed to mislead the public...and perhaps even to get NRC and nuclear industry personnel to believe their own propaganda of misinformation, to create a false sense of security and safety, and to duck responsibility for proper management and prompt disposal of these very dangerous man-made materials.

The DGEIS simply fails to address reality of the dangers of SNF, in fact throughout the document the NRC continually denies and misrepresents by understating the dangers of inherent catastrophic consequences from any of many potential causes for system failures, failing to even legitimately or completely describe the consequences.

I will focus my comments on five major deficiencies and flaws of the DGEIS, specifically the:

(1) flawed methodology used by NRC to calculate and describe risk for high consequence events, and

(2) flawed assignment of low probability of potential terrorist attacks or inside sabotage on facilities handling and storing spent nuclear fuel, and

(3) flawed and understating misrepresentation of the catastrophic consequences of terrorist attacks and accidents involving pool storage of spent nuclear fuel, and

(4) unwarranted and unwise deference to the Blue Ribbon Commission by accepting the extreme delays in resolving the final deep geologic disposal of spent nuclear fuel and high level wastes, and

(5) unsuitability of and failed utility of a generic EIS for over 100 unique and site specific situations involving SNF.

Many other elements of the DGEIS are worthy of comment, but my statement will not cover all of the DGEIS deficiencies.

**TECHNICAL COMMENTS:**

**(1) NRC Risk Methodology Flawed -**

The NRC flawed methodology of determining risk is founded a formula of multiplying consequences times probability. NRC cannot with certainty define either of these multipliers, and consequently risk is not properly assessed. In many scenarios of accidents or intentional radiological or chemical releases from spent nuclear fuel, the consequences can be defined with more certainty than the probabilities of occurrence. NRC chooses to assign exceedingly low probability of occurrence to events that have very high consequences. They go on to assert low or very low risk without also assigning a relative probability of accuracy to the product, risk. While the NRC acknowledges that environmental and health and impact consequences may be very high, they state that the probabilities of accident or attack events are very low, and then simultaneously discredit their own methods when a few pages or paragraphs later state they event probability is not quantifiable. Using clear logic one must then conclude that the risk assessment is flawed and risk is also not quantifiable or is subject to extreme uncertainty.

I argue that with such circumstances of either unquantifiable impacts and consequences or unquantifiable probability that risk has to solely relate to the consequences alone as best they can be determined, not relying on unquantifiable probability multipliers. Instead the NRC bluntly asserts very low risk in text and tables throughout the DGEIS to numerous accident events, and notably for the next topic, events of terrorist attacks. Legitimate catastrophe theory and logic reveals this methodology flaw, no matter how entrenched these methods may be at NRC. NRC must correct its methods of risk assessment and more importantly revise appropriate responses, particularly to events with high consequence. Terrorist actions are simply not readily definable by probabilities, being random in nature, and unpredictable, particularly identifying emotional instability of potential actors. Statistical probability values of historical occurrences are not valid predictors for terrorist action, unlike probabilities of such things as home fires, football injuries, or auto accidents. There are very limited measurable factors that may help define probability are such things as terrorism: stimulations to hate and revenge from foreign interventions and wars and repression, and possibly opportunity analysis of means, time and place windows when terror actions will have the greatest impact on the intended target, or the resulting social and economic impacts. But overall, predictability of terrorism is nearly impossible.

Another major flaw with the risk analysis is the handling of duration of risk, the opportunity time interval for an event to occur. Specifically NRC does not accommodate the issue of delays in managing wastes, defined as 60 years post power operation in the short term case, stretching out to indeterminate. Does that instill any sense of "waste confidence"? NO. The longer the period of potential exposure to threats, be they natural or manmade or terror, the greater the likelihood that the catastrophe will happen over the extended interval. Time span is relevant and using only a probability per year factor is simply warping the true expression of risk. Furthermore, given the continued population growth of our country, nuclear power plants and ISFSIs that were once somewhat remote are being and will continue to be encroached upon by urbanization, particularly over the long periods in the three EIS cases of continued on-site storage of SNF (60 years, 160 years, indefinite periods).

**(2) NRC Erroneously Asserts Terrorist Attacks & Sabotage as Improbable –**

The EIS states that it has only reluctantly considered a terrorist attack threat because of the 9th Circuit court decision. This points to the arrogance or possible ignorance seemingly rampant at NRC to seek to deny the realities of our world where terrorist methods have heavily replaced conventional wars. There is no nuclear installation in the world that is truly secure from terrorists, and particularly not nuclear power plants, and spent fuel or radiological waste facilities. Had those who attacked multiple targets on the same day of September 11, 2001 chosen to hit spent fuel facilities at multiple nuclear plants with the same aircrafts, the losses of life would have measured in the hundreds of thousands, perhaps millions, the environmental destruction would have affected many thousands of square miles, the lands, lakes, and oceans that would be uninhabitable or otherwise unusable would be even larger due to permanent radioactive contamination, and enormous part of our nation's economic industrial of huge cities and agricultural lands could have been destroyed. Terrorists could have hit the spent fuel pools without any possibility of prevention, then or now. The tools of such possible attacks were readily available then, and remain so now. The 9/11 terrorists simply chose to make their statement elsewhere. Gordon R. Thompson provides a much more comprehensive analysis and elucidation of these threats than the NRC acknowledges (Gordon R. Thompson, comments on NRCs Draft Consequences Study, Aug 2013). You should heed his advise and comments.

The NRC claims in the DGEIS that security measures have improved since 9/11. But no remedial actions have been required to harden or fortify the structures housing SNF, to make them hardened and less penetrable...and that, quite frankly, is not possible to accomplish under a determined attack from terrorists or by sabotage from insiders. Scores of spent fuel pools exist in nothing more than a fragile shell of a building with little more than a thin metal roof, yet contain far higher levels and quantities of radioactive materials than the reactor cores themselves that are shrouded by containment buildings. Scenarios put forth by NRC and national lab publications regarding releases from spent fuel pools have not studied all of these potential modes of attack, and related failure modes of the spent fuel systems. Furthermore, I contest the statements by NRC that airspaces are or can be protected or defended. Hence, waste confidence security certainly does not exist.

The NRC assigns truly understated probabilities to terrorist attacks, simply denying the truth. In numerous tables and text in the DGEIS, the risks are stated as LOW. They apparently do this so they can argue that the risks are low using their flawed formula that risk is the product of consequences times probability. I believe this to be a deceitful representation of risk, and not applicable to high consequence risk. NRC admits in the DGEIS casually perhaps callously that a terror attack could be "significant and destabilizing". Is "destabilizing" a euphemism for immediate deaths and lingering slow deaths of huge numbers of people? Is "significant" NRC code speak for destroying the agricultural lands and businesses and making uninhabitable areas encompassing hundreds or thousands of square miles from a single terrorist attack or spent fuel accident. The NRC argues that nuclear power plants are ((generally) not located near major population centers....this is a flat out lie or gross misrepresentation. Just take a look at the map for these nuclear power plant locations, nearly all are very close to major metropolitan areas. Waste Confidence is not provided by the flawed and misleading arguments of the NRC in the DGEIS.

**(3) NRC Fails to Reveal the Magnitude of Consequences from a Spent Fuel Fire or Release**

Even partially loss of cooling water or pool level could create a disastrous radioactive plume, and a zirconium fuel rod cladding oxidation fire releasing far more radioactivity than exists in the reactor core. In NRC reports, as much as 100% of the Cs-`137 is estimated to be vulnerable to release from the inventory of SNF in a storage pool. These

are documented facts available in many NRC publications, and in independent studies, including one co-authored by the current chairperson Allison Madfarlane of the NRC (Alvarez et al, 2003). That analysis published in the journal of Science and Global Security included both MACCS2 and Wedge model dispersions of releases of Cs-137 from 10% (3.5 MCi) to 100% (35 MCi) of the then typical 400 ton inventory of SNF at a 1000 MWt USA PWR plant. In that generic case study the area of land contaminated greater than 100 Ci/km2 was found to 5 to 9 times larger than the Chernobyl event affected area for the 10% inventory release case, or 1350 to 2317 square miles (3500 to 6000 km2). For the 100% Cs-137 source term release, the contaminated area above 100 Ci/km2 was 17,375 to 19,305 square miles (45,000 to 50,000 km2). The estimated health impacts to persons living for 10 years in an area contaminated at these levels (>100 Ci/km2) were an added risk of death from cancer of 1 to 10 percent., as much as 30% overall lifetime risk of cancer death.

In a 1997 NRC study (as summarized in Alvarez 2003) , in a spent fuel fire that released 8 to 80 MCi of Cs-137, the authors described consequences at 54,000 to 143,000 excess cancer deaths, 772 to 2700 (2000 to 7000 km2) of agricultural land condemned, and other economic costs from mandatory evacuations of $117 to $566 billion. An estimated 1.6 to 7.6 million people would be permanently evacuated.

A subsequent report by Robert Alvarez (IPS, May 2011) published shortly after the Fukushima disaster began further supports the potentially disastrous consequences of a spent fuel fire. New modeling was not performed in this report but the reality of Fukushima catastrophe and the actual destruction of the SNF structures and buildings should serve as a lesson. Furthermore, the Fukushima radiation releases from SNF and damaged cores continues and has yet to be resolved, let alone any sense of control, or decontamination, and remediation deemed possible of the contaminated areas. Much like Chernobyl and the USSR, Japan is now exercising a virtual news black out. A factor to consider is that the damaged spent fuel pool inventories at Fukushima were far less than exist at almost all of the USA nuclear power reactor spent fuel pools. As an example, the Vermont Yankee BWR reactor spent fuel pool holds about 100 million Curies, three times the amount of spent fuel that was in the damaged pool of Fukushima Dai-Ichi Unit 4. And the Millstone units 1, 2 and 3 have more than 400 million Curies of spent fuel in storage. Clearly this disaster should be a wake up call to NRC of the potential disasters in waiting in the USA.

I have recently completed a RASCAL 4.3 modeling of a spent fuel pool release for the Indian Point Unit 2 spent fuel pool inventory under a drained-uncovered pool fuel scenario. This plant was chosen as representative of a plant in proximity to a major high population density urban setting. The current inventory of SNF at Unit #1, 2 and 3 of Indian Point is estimated to be approximately 234 million Curies (Alvarez, IPS 2011; Yucca Mtn DOE/EIS-0250), about 94 million Curies as Cesium-137, approximately 40% of the total radioactive source. My extrapolated estimate of Unit #2 Nov 2013 SNF inventory is about 1487 fuel assemblies, actually 113 more than original design pool capacity, increasing at the rate of about 38 assemblies per year. Status of non-operating Unit #1 spent fuel pool is not known, nor is amount of SNF that has moved to ISFSI dry cask. Total estimated Unit #2 pool radioactive source is approximately 133 million Curies total and 53 million Curies of Cs-137. The RASCAL 4.3 (Sept 2013) database and summary of activity released to the atmosphere by the model is 26 million Curies total and 15 million Curies of Cs-137, reflecting built in model assumptions of release factor reductions from an uncovered and drained pool fire event. In other words the RASCAL model does not assume 100% of the spent fuel radioactive inventory is released in a fire. According to the model documentation the release factor is assumed at 0.3 for Cs and Rb. The model also reduces effective inventory loss and radioactivity by age categories since off loading from the core. For the RASCAL model assumed wind speeds were ranging from 6 to 9 mph, predominantly from north +/- 15 degrees down the Hudson River. A fresh off-load of spent fuel from the core was assumed to have been made. The source term release was assumed to happen over an approximate 24 hour period, zirconium cladding fire and failure assumed to initiate 2 hours after drained pool condition occurred and fuel temperatures reach 1200 F.

Using EPA defined Protective Action Guide (PAG) dose action ranges for Total Effective Dose Equivalents (TEDE), the model impact zone areas were 2475 sq miles (> 2 rem), and 3300 sq miles for >0.2 rem, for 1st year phase. For the 2nd year phase, impact areas were 3,875 and 1,775 sq miles for > zero and >5 rem TEDEs, respectively. For Cs-137 surface contamination at levels greater than 15 uCi/m2 the impact area was 2850 sq miles. For Cs-137 surface contamination greater than 50 uCi/m2, the impacted area was 2,200 sq miles.

To put this in perspective, the Chernobyl permanent evacuation zone of the radiation control area was set at Cs-137 contamination of >15 uCi/m2, and encompassed a land area of approximately 3,860 sq miles (10,000 km2),; calculated out to a radius of 36 miles. For Chernobyl the zone at >50uCi/m2 is reported as an area with >0.7% chance of radiation caused cancer deaths from a lifetime external radiation exposure. For Chernobyl the area greater than 50 uCi/m2 was determined to be approximately 1,200 sq miles (3,100 km2). This is not understood to include other exposures such as internal ingestion of contaminated foods, or water, so the hazards are much higher. The Chernobyl disaster was actually much smaller in impact contamination and land areas than the possible impacts from a single spent nuclear fuel pool release from any of the U.S. nuclear power plant sites, particularly when one considers the conservative aspects of the RASCAL model regarding reduced magnitude of spent fuel source terms and other model assumptions.

Now consider that this area of CS-137 surface concentrations covers virtually all of New York City metropolitan area, major parts of Long Island, major parts of New Jersey, eastern Pennsylvania, and even Western parts of Connecticut, with significant fallout into the Atlantic seaboard oceans, estuaries, and bays. Slightly different meteorological conditions with more northeasterly winds could blanket contaminate nearly all of New Jersey and Philadelphia as well, or with westerly winds the contamination plume could cover nearly all of Connecticut, Rhode Island, Massachusetts, and the southern parts of Vermont and New Hampshire and Maine. In the present model the plume of greater than 100 uCi/m2 Cs-137 contamination actually goes well beyond the 100 mile radius from the Indian Point plant down into Delaware, but the model cuts off at 100 miles in its calculations. The impacts and consequences from such an event are simply hard to fathom they are so devastating to one of the most dense population areas of the United States. I have not made estimates of numbers of people impacted but it is likely 10s of millions, nor have I estimated the immediate deaths and lifelong health and fatality effects due to insufficient time in preparing this analysis and comments, but this could be done using U.S. census data and local land/property value, and land use data overlaid on the modeled plume contours. In effect, such an event would dwarf most displaced person and refugee events experienced in major wars experienced in the last half century. But the effects of a radiological land contamination event are much longer in duration, certainly many decades long until long half life isotopes decay such as Cs-137, to essentially permanent for some land and human occupancy uses, and for impacts on natural biological systems and agricultural lands.

The wind direction and meteorological conditions, coupled with the immediately fresh off load of spent fuel from the core do make this case study a near worst case scenario, but for an intelligent and committed terrorist, that person may just select his target and timing and weather conditions to do the most damage he can inflict. Due to certain conservative aspects of the RASCAL model on assumed percentage release of SNF inventory from a SNF fire, the actual contamination levels and doses may be much larger than calculated by the RASCAL model. Also the duration of the release from such a fire is considered to be relatively brief, measured in a few hours beyond the assumed initial 2 hours to reach zirconium cladding ignition temperatures, and consequently insufficient time to allow for an orderly mass evacuations to occur. The Fukushima disaster involving spent fuel pool at Unit 4 may however lead us to understand that the source material release duration could be much longer, and could involve conditions nearly impossible to bring under any control once initiated for very long time frames, also leading to greater total radioactive material releases to the atmosphere, soil, water, and general environment. As another conservative assumption, this RASCAL modeled case only involves Unit #2 SNF pool at Indian Point, not the SNF

stored in Unit #1 or Unit #3 pools, or materials in dry storage casks, nor any releases from the reactor cores. The status of Unit #1 pool is unknown to this author since that reactor discontinued power output in the 1970s.

To illustrate the radioactive dispersion impact areas attached are several of the map overlays of contamination plume patterns for the RASCAL 4.3 model of an Indian Point Unit 2 spent fuel pool fire event and associated radionuclide source term release. Included are maps of total effective dose equivalent (TEDE) zones at various concentration ranges and phases of exposure (immediate, 1 year, 2 year and 50 year), surface contamination (total and Cs-137), and thyroid committed dose equivalent. Please take the time to study these maps and visualize the land areas and people affected.

Had the 9/11 terrorist attackers chosen to fly aircraft into Indian Point, or Millstone or any of the many reactors near major cities such as around Chicago, Atlanta, Miami, Baltimore, or many other major cities, the near term fatalities and lifetime excess cancer death counts would be extremely high, likely in the hundreds of thousands for any single event, far greater than acknowledged by NRC in its undocumented risk and consequence analysis presented in the DGEIS.

Others have postulated and reviewed consequences of various modes of terrorist attacks on spent nuclear fuel facilities, including large and small aircraft, artillery with bunker penetrating shaped charges, truck delivery of explosives, and other scenarios. I will not review those in this paper, but encourage the NRC to heed these documents (see various papers of Gordon Thompson, Robert Alvarez et al, prior risk assessment NUREG documents, e.g. Sailor et al 1987 NUREG-4982 and Collins and Hubbard 2001 NUREG-1738, and the National Research Council report on spent fuel).

The NRC in the Waste Confidence DGEIS further ducks or obscures the reality and magnitude of these catastrophic events by failing to use plain honest language to describe the casualties/deaths and the huge essentially perpetual societal, financial, and environmental damages. Those failings must either be corrected of the DGEIS scrapped as inadequate.

### (4) NRC Fails to Provide Valued Policy Advice by Deferring to the Blue Ribbon Commission

The DGEIS, like the so called Blue Ribbon Commission on Nuclear Futures, simply puts off to a distant and uncertain future any solution to the problems of spent fuel. It is ludicrous for NRC to extend the definition of short term to be 60 years, more than 100 years beyond the dawn of the nuclear age. It is even more so with cases 160 years or indefinitely beyond the closure of nuclear plant operation. This posture of the Blue Ribbon Commission, and then repeated by NRC, instills no waste confidence, nor confidence in the NRC as a protector of the public interests, health and safety.

The NRC needs to confront this absurdity of the Blue Ribbon Commission and provide valuable and much needed advice to the administration and to Congress to chart a more aggressive path to properly handling and disposing of spent nuclear fuel and other radioactive wastes. To do anything else is putting at extreme risk millions of people of the USA, as well as our lands and economic systems. A single catastrophic SNF fire or major release event would be devastating.

### (5) Unsuitability of and Failed Utility of a Generic EIS for Unique and Site Specific Waste Confidence Management of SNF

The Waste Confidence Draft GEIS itself is overall a dishonest and inappropriate assessment of the environmental impacts of spent nuclear fuel. A broad brush generic assessment, even if done well, cannot deal with individual plant site specific issues. The time frames defined in alternatives of the DGEIS are totally unresponsive to the needs to protect the environment and human health. It is flawed in structuring the alternatives which avoid real solutions to the issues of the extreme hazards and consequences of spent nuclear fuel. Its purpose really seems to be (and was so stated by NRC in its public hearings) to grease and accelerate licensing and relicensing, and avoidance of site specific environmental analysis of SNF. This is subverting the purpose and utility of the NEPA process. Each of the more than 100 nuclear power facilities and ISFSIs is unique and this document cannot possible provide legitimate or accurate assessment of the site specific environments and impacts where these facilities occur.

The only legitimate reply to the courts should have been that NRC has no confidence that waste repositories will ever be available, and that continued on site storage of dangerous high level and spent fuel at reactor sites should be promptly eliminated to reduce the dangers to the public and the environment. The extreme time frames in the NRC identified alternatives are simply unacceptable due to these major risks to human health, safety and the environment. It is even questionable that an NRC agency will even exist within these long time intervals. Given NRC's flawed use of probabilities in risk assessment, the agency should also critically examine the probability of the very existence of a functional regulatory agency within the extended time frames described. This all points to the necessity and urgency for much more prompt solutions to the disposal of these wastes and the cessation of generation of additional nuclear wastes. The NRC should simply declare NO SNF WASTE CONFIDENCE and speak the truth about the extreme hazards from nuclear power and nuclear wastes. It should curtail any and all existing and new licensing, except licenses for prompt closure and final disposal of nuclear materials.

**Conclusions and Recommendations:**

Due to the above noted severe inadequacies and inaccuracies of the draft Waste Confidence Generic EIS major revisions must be made or the document abandoned with a report back to the courts that truthfully states these failures of the government to perform its duties to the citizenry. A totally different plan for the prompt and final disposal of all spent nuclear fuel and other radioactive wastes must be proposed that is accomplished in no more than ten years. I remind the NRC that the entire development and use of the first atomic weapons occurred in a shorter time frame, less than 4 to 5 years. Surely, with the political will and dedication, the NRC and associated federal agencies can perform within a similar time span.

Furthermore, the entire concept of a generic EIS is challenged as incompatible with the intent of the National Environmental Policy Act (NEPA). This issue of management of SNF is site specific to each reactor and ISFSI. The companion proposed rulemaking is consequently also seriously flawed both legally and technically, and is inappropriate as public policy and directives to the government and nuclear power industry.

I call on the NRC staff and commissioners to act immediately, taking the following steps with respect to spent nuclear fuel management, transport, disposal, and its regulation:

- Require all reactors to immediately harden all structures housing spent fuel pools since at a minimum SNF will have to stay in the pools for about five years for primary cooling, even after reactor cessation of power operations; and

- Move quickly to remove all possible spent fuel from cooling pools and place SNF into hardened dry casks of small enough size and designs to avoid secondary or subsequent repackaging and transfer for safe transport to remotely sited interim or final repositories; and

- Until final geologic repositories are established and operational, remove all dry casks to remote interim ISFSI facilities away from populated areas of our country, and placed in dispersed hardened and earthen covered or buried arrays to make them less vulnerable to terrorists attacks, and reducing the consequences if attacked; and

- Promptly work with all other involved agencies to promptly site, build and commission into operation final deep geologic repositories for SNF and other radioactive wastes, within a time frame not to exceed 10 years from the present; and

- Discontinue any new licensing or license renewals of any nuclear waste generating plant or facility, including all stages of the fuel cycle. In other words stop permitting additional nuclear waste generation.

- Finally, with full integrity NRC must inform Congress of the untenable hazards of the nuclear industry and advise Congress to authorize prompt cancelling all current nuclear power plant licenses and to accelerate the political and regulatory processes to as quickly as technically possible place all spent fuel and high level radioactive wastes in deep geologic repositories.

**Final Overall Comments:**

For my entire life, the federal government has been promising the benefits of nuclear technology, but all we really have to show is piles of studies, massive wastes of public funds, a legacy of broken and false promises, while laying all the radioactive waste problems on our children and grandchildren. When I grew up in Kansas in the 1950s the AEC was planning for nuclear waste disposal in Kansas salt mines. That never happened. Nor has anything to resolve this radioactive waste disposal since.

The Draft Waste Confidence GEIS is nothing more than distraction, denial and deception. It should be withdrawn and totally redirected using reality and honest commitment to prompt solutions for ultimate disposal as a guide toward a sane and safe future.

I personally call upon the Nuclear Regulatory Commission and NRC staff to restore the agency to its proper role as regulator of the nuclear industry, not promoter and protector; and to restore its proper role of protecting public health and safety. The AEC was intentionally split up decades ago, to avoid the conflict of being both protector-promoter and regulator of atomic energy and weapons. NRC's solitary role is serving the public interest, ensuring its security, health and safety. NRC is not the steward of nuclear power.

Thank you for the opportunity to provide these comments.

Richard D. Andrews, President/Founder

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19. State of New York, et al., Petitioners vs. Nuclear Regulatory Commission and United States of America, respondents, United States Court of Appeals for the District of Columbia, USCA Case #11-1045, Document #1377720, Filed 06/08/2012.
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21. Multiple authors and papers, Technical Workshop on the Impacts of Dry-Storage Canister Designs on the Future Handling, Storage, Transportation, and Geologic Disposal of Spent Nuclear Fuel in the United States, Nov 16-19, 2013, U.S. Nuclear Waste Technical Review Board, Washington, DC.

**Attachments:**

Computer dispersion model charts from Radiological Assessment System for Consequence Analysis (RASCAL 4.3) for Indian Point Unit #2 Spent Nuclear Fuel Pool fire case

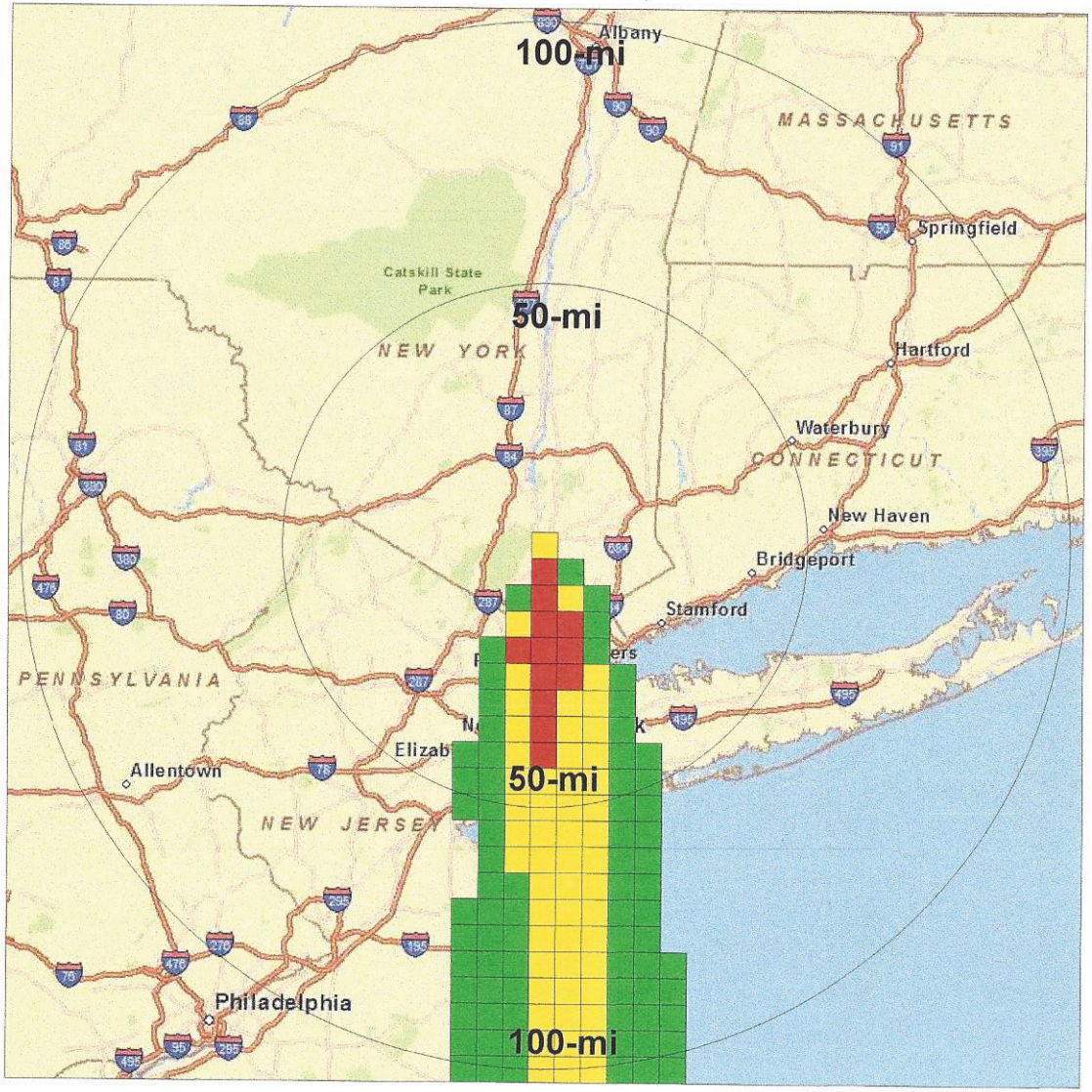
1. Total Effective Dose Equivalent (TEDE), rem, 0 to 100 mile
2. First Year – Intermediate Phase TEDE, rem, 0 to 100 mile
3. Second Year – Intermediate Phase TEDE, rem, 0 to 100 mile
4. 50 Year – Intermediate Phase TEDE, rem, 0 to 100 mile
5. Surface Concentration of Cs-137,uCi/m2, 0 to 100 mile
6. Surface Concentration, uCi/m2, 0 to 100 mile
7. Thyroid Committed Dose Equivalent, rem, 0 to 100 mile

## Total Effective Dose Equivalent

**Accumulated between 2013/12/18 02:00 and 2013/12/19 00:00**

**Indian Point Unit 2**

**Indian Point - Unit 2**




- 0.01 to 1 rem — Below EPA PAG Range
- 1 to 5 rem — EPA Early Phase PAG Range
- > 5 rem — Exceeds EPA PAG Range

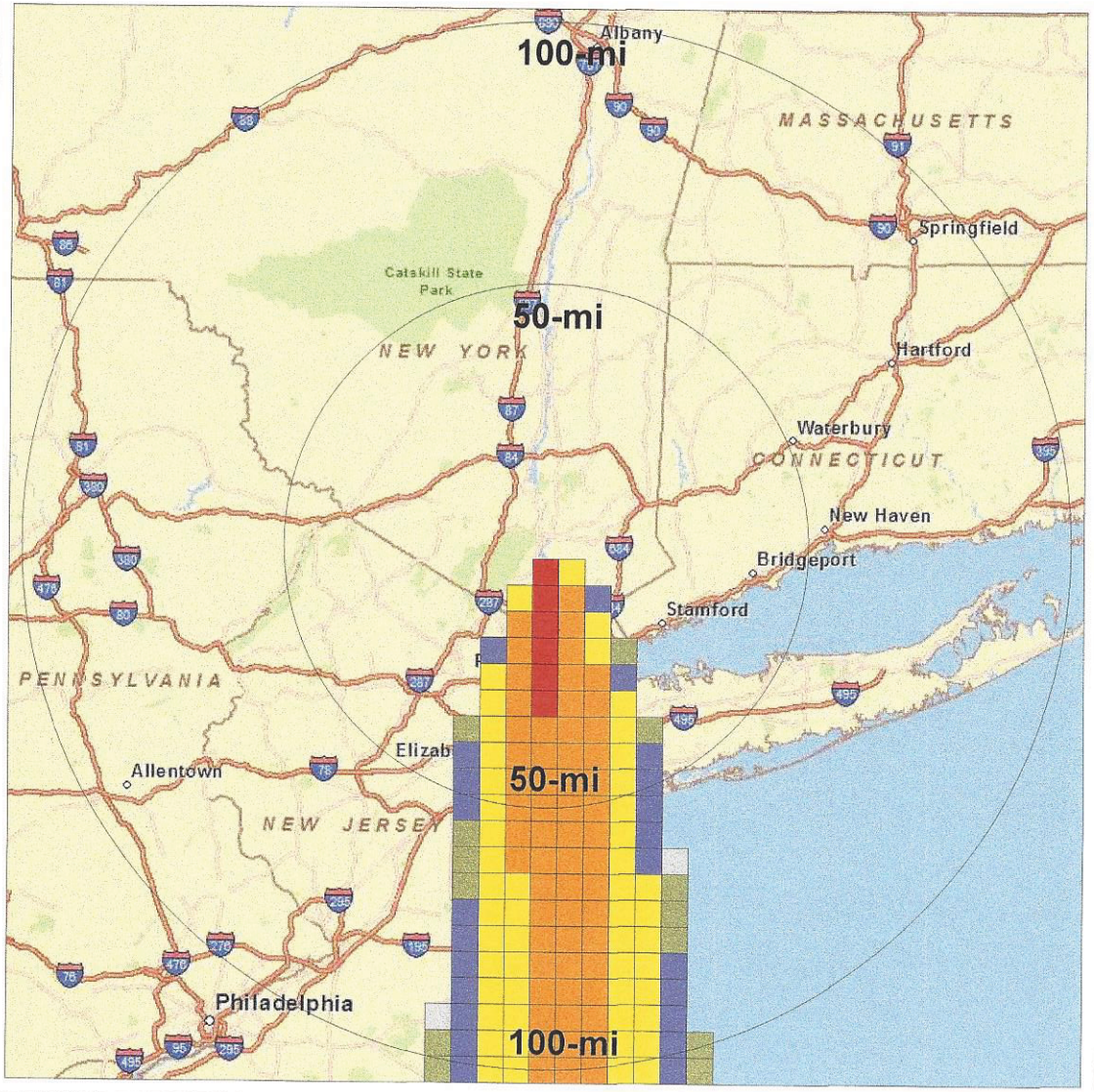
RASCAL v4.3

## Surface Concentration of Cs-137*

**Deposited between 2013/12/18 02:00 and 2013/12/19 00:00**

**Indian Point Unit 2**

**Indian Point - Unit 2**




- 0.01 to 0.1 μCi/m²
- 0.1 to 1 μCi/m²
- 1 to 10 μCi/m²
- 10 to 100 μCi/m²
- 100 to 1000 μCi/m²
- > 1000 μCi/m²

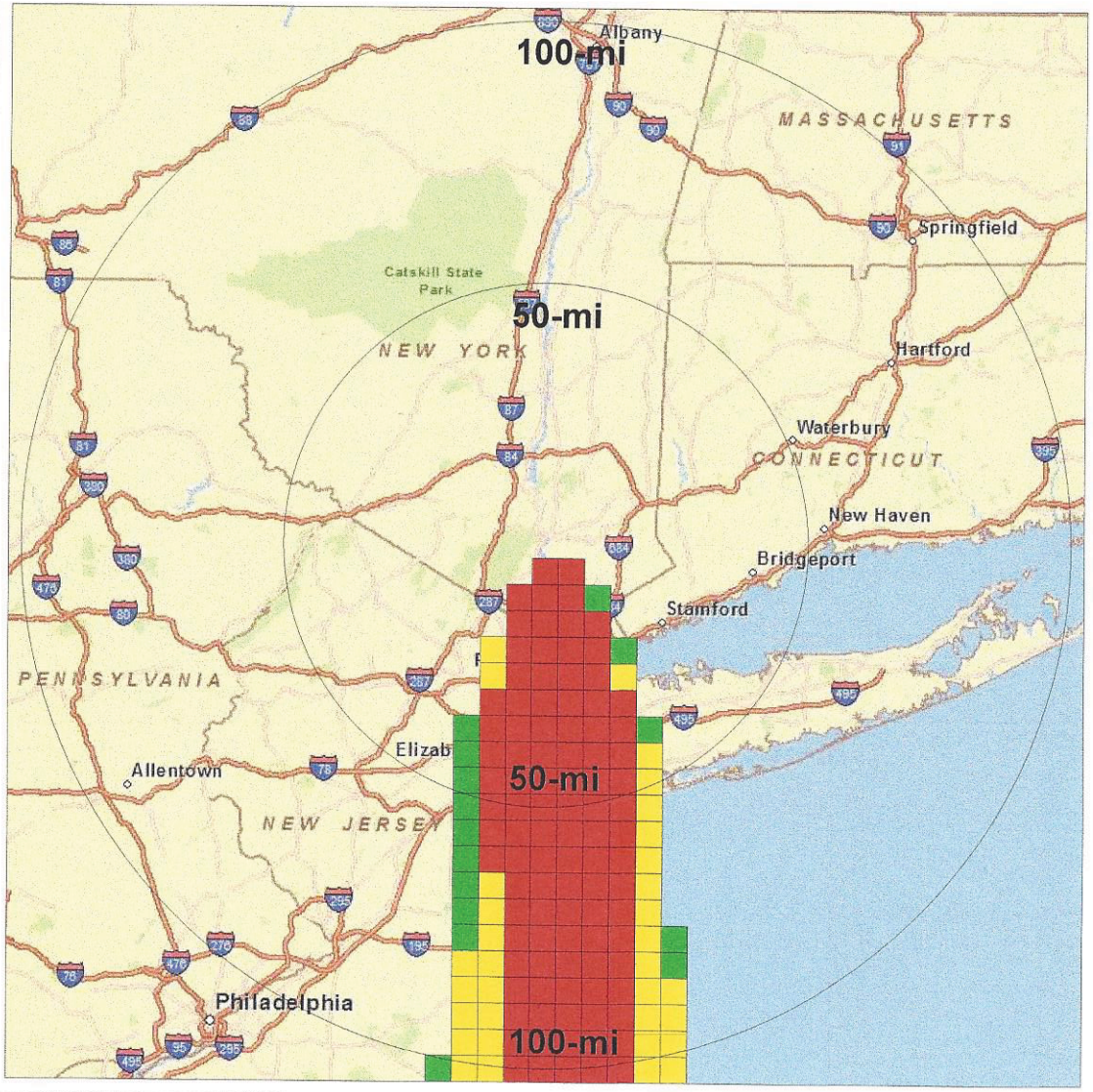
RASCAL v4.3

## First Year - Intermediate Phase TEDE

**From deposition between 2013/12/18 02:00 and 2013/12/19 00:00**

**Indian Point Unit 2**

**Indian Point - Unit 2**




N

- 0.02 to 0.2 rem
  1% to 10% of EPA PAG Range
- 0.2 to 2 rem
  10% to 100% of EPA PAG Range
- > 2 rem
  Exceeds 100% EPA PAG Range

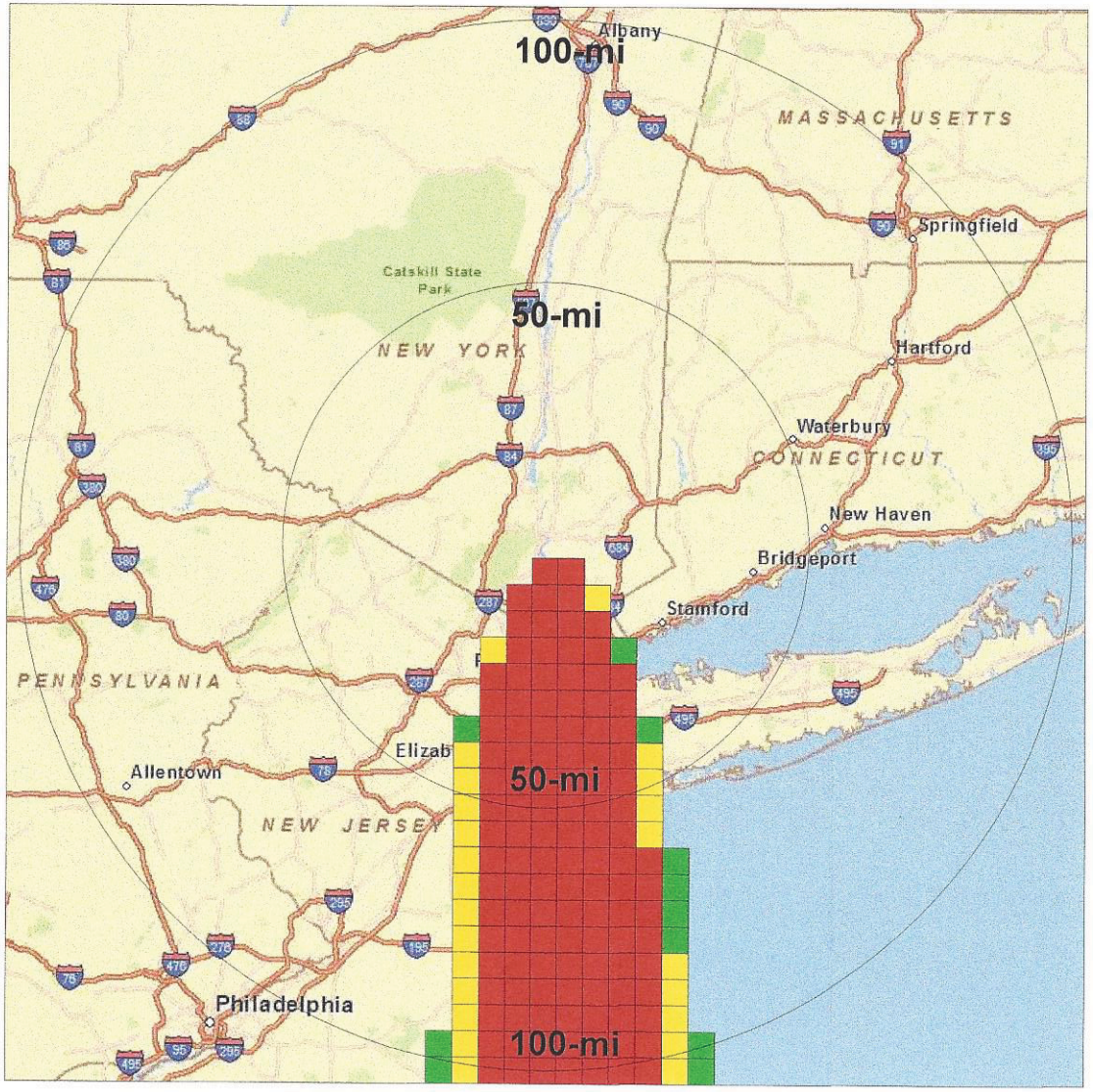
RASCAL v4.3

## Second Year - Intermediate Phase TEDE

**From deposition between 2013/12/18 02:00 and 2013/12/19 00:00**

**Indian Point Unit 2**

**Indian Point - Unit 2**




N

- 0.005 to 0.05 rem
  1% to 10% EPA Objective
- 0.05 to 0.5 rem
  10% to 100% EPA Objective
- > 0.5 rem
  Exceeds 100% EPA Objective

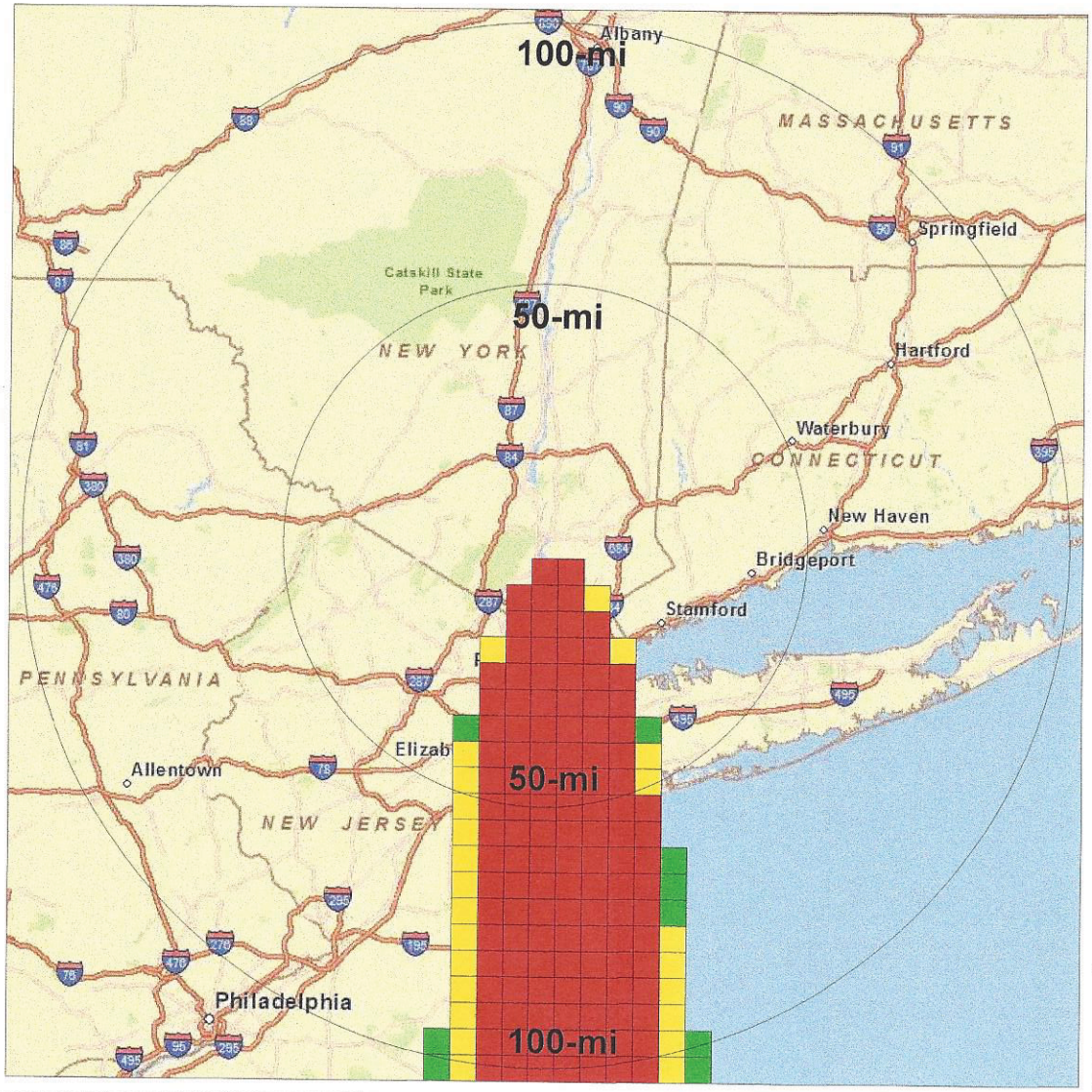
RASCAL v4.3

## 50-year - Intermediate Phase TEDE

**From deposition between 2013/12/18 02:00 and 2013/12/19 00:00**

**Indian Point Unit 2**

**Indian Point - Unit 2**




N

- 0.05 to 0.5 rem
  1% to 10% EPA Objective
- 0.5 to 5 rem
  10% to 100% EPA Objective
- > 5 rem
  Exceeds 100% EPA Objective

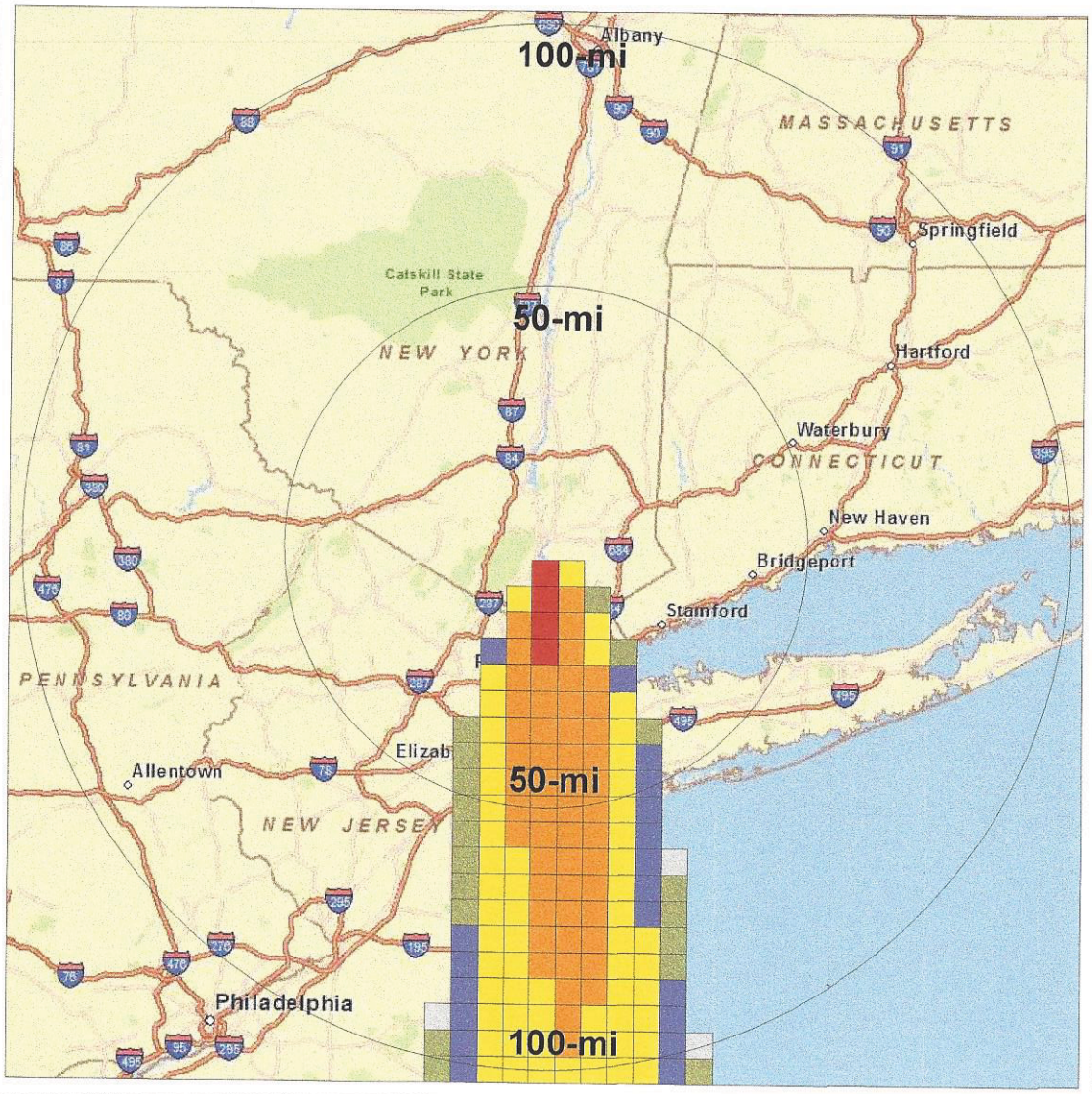
RASCAL v4.3

## Surface Concentration

**Deposited between 2013/12/18 02:00 and 2013/12/19 00:00**

**Indian Point Unit 2**

**Indian Point - Unit 2**




- 0.1 to 1 μCi/m²
- 1 to 10 μCi/m²
- 10 to 100 μCi/m²
- 100 to 1000 μCi/m²
- 1 to 10 mCi/m²
- > 10 mCi/m²

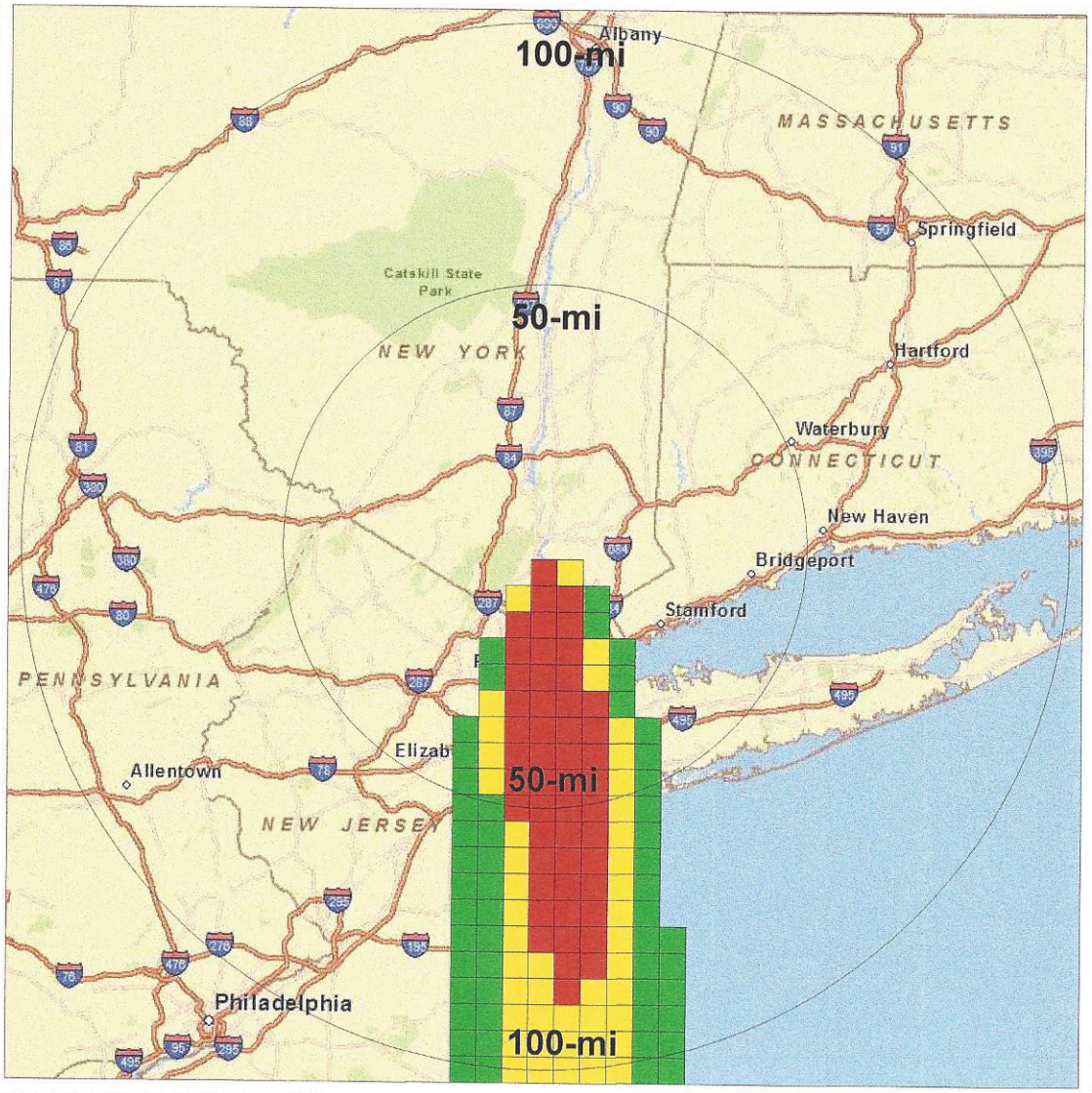
RASCAL v4.3

## Thyroid Committed Dose Equivalent

**Accumulated between 2013/12/18 02:00 and 2013/12/19 00:00**

**Indian Point Unit 2**

**Indian Point - Unit 2**




N

- 0.05 to 5 rem — Below EPA PAG Range
- 5 to 25 rem — EPA Early Phase PAG Range
- > 25 rem — Exceeds EPA PAG Range

RASCAL v4.3