

August 30, 2013

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PILGRIM WATCH'S 2.206 PETITION TO MODIFY, SUSPEND, OR TAKE ANY OTHER ACTION TO THE OPERATING LICENSE OF PILGRIM STATION UNTIL THE NRC CAN ASSURE EMERGENCY PREPAREDNESS PLANS ARE IN PLACE TO PROVIDE REASONABLE ASSURANCE PUBLIC HEALTH & SAFETY ARE PROTECTED IN THE EVENT OF A RADIOLOGICAL EMERGENCY

I. INTRODUCTION

Pursuant to §2.206 of Title 10 in the Code of Federal Regulations, Pilgrim Watch (Hereinafter "PW") on behalf of its members and members of the Pilgrim Coalition, Project for Entergy Accountability, Cape Cod Bay Watch, EcoLaw, Beyond Nuclear, Greenpeace, and others request that the Nuclear Regulatory Commission (NRC) to institute a proceeding to modify, suspend or take any other action¹ as may be proper to the operating license of Pilgrim Station in order that the NRC can assure Pilgrim's Radiological Emergency Plan and Standard Operating Procedures/Guidelines are based on accurate and credible Evacuation Time Estimates (ETEs).

ETEs provide information for use in the formulation of a licensee's protective action recommendation and the ORO's protective action decisions. It is important that the time required

¹ NRC Enforcement actions include: notices of violation, civil penalties, orders, notice of nonconformance, confirmatory action letters, letters of reprimand, and demand for action.

to evacuate the public is both clearly understood and reliable to ensure appropriate protective action is implemented.

Because Pilgrim's ETE underestimates evacuation times there is no reasonable assurance "to ensure appropriate protective action is implemented;" the population will achieve a timely evacuation; that public health and safety will be protected in the event of a radiological emergency; or that the NRC can satisfy its statutory requirement to protect public health and safety.

The primary basis for this petition is two recent documents prepared by KLD for Entergy: The *KLD Pilgrim Evacuation Estimate December 12, 2012 Final Report KLD-TR-510*² (Hereinafter, "ETE") and the attached *KLD MEMO to John Giarrusso (MEMA) from Chris Chaffee (KLD) Regarding the Cape Cod Telephone Survey Results*, July 25, 2013, attached (Hereinafter, "Cape Survey"); and the attached August 16, 2013 Letter from Senator Markey and Senator Warren regarding Pilgrim's ETE and Cape Telephone Survey to Leo Denault (Entergy) and forwarded to Chairman MacFarlane's Office.

These documents show that Entergy's Evacuation Time Estimates (ETEs) for Pilgrim Station are based on inaccurate assumptions and simply are not credible. The ETE's fundamental flawed assumptions and data explain the ETE's absurd conclusion that even in the worst case scenario everyone in the EPZ will be evacuated in about six hours.

² NRC Electronic Library, Accession Number ML13023A031

Inaccurate Assumptions Underestimate Demand - Total Number People & Vehicles Evacuating

1. ETE, unlike the Cape Survey, relied on a Telephone Survey that did not inform survey respondents that the questions related to a nuclear emergency, and thus significantly underestimated how many would evacuate.
2. The ETE's Shadow Evacuation assumptions incorrectly assume that only 20% of those instructed not to evacuate will voluntarily evacuate anyway.
3. The ETE incorrectly assumes that those in the EPZ will follow a staged keyhole evacuation. (ETE, 7.2)
4. The KLD ETE underestimated demand by failing to take proper account of the Summer Transient Population.
5. The ETE Study underestimated employees, thus Lowering Demand Estimates
6. Evacuation of the school population & transportation dependent at nursing/group homes were underestimated.

Inaccurate Assumption/Estimates Regarding Road Capacity

7. The ETE fails to account for chronically heavy traffic over Summer weekends & special events that significantly increases travel times.
8. ETE assumptions about traffic flow during inclement weather & peak commuter/holiday traffic are not credible.
9. The ETE's estimates for specific roadway capacity are not credible
10. Emergency Personnel: The ETE assumes, absent factual support, that emergency personnel will be available in sufficient number to assure timely traffic flow.

Inaccurate Assumptions Regarding Trip Generation Times

11. Trip generation time relied on flawed telephone survey & assumptions.
12. The ETE incorrectly assumed a rapidly escalating accident, and that mobilization of the general population will commence within 15 minutes after siren notification.
13. KLD failed to consider the impact of delayed staffing traffic control points on the ETE.
14. The ETE incorrectly assumed that 25% of the EPZ households will await the return of a commuter prior to evacuating underestimating vehicles.
15. The ETE incorrectly assumes that 50% of the transportation dependent population will rideshare.
16. The ETE incorrectly assumes timely evacuation of transportation dependent.
17. The ETE assumptions about mobilization times for school population & special facilities are not credible.
18. The ETE assumptions about trip generation for populations on boats are not credible.
19. The ETE ignores the impact of voluntary evacuations from Cape Cod that would have a large impact on traffic in the EPZ; and ignores the effect of voluntary evacuations within the EPZ and shadow evacuation that would slow EPZ evacuation times.

II. FACTUAL BASIS

The ETE covers demand estimation, estimation of roadway capacity, and development of evacuation time estimates for various subgroups – estimation of trip mobilization time and trip generation time, and evacuation time estimates. Every section of the ETE is flawed and accounts for the absurd conclusion that an evacuation in a radiological emergency at Pilgrim will be accomplished in six hours.

A. DEMAND ESTIMATES UNDERESTIMATED

The assessment of demand estimation provides the total number of people and vehicles to be evacuated for each of the population groups. Both the ETEs and the Cape Survey underestimated demand.

1. ETE, Unlike the Cape Survey, Relied On a Telephone Survey That Did Not Inform Survey Respondents That the Questions Related to a Nuclear Emergency thusSignificantly Underestimating How Many Would Evacuate

The EPZ Telephone Survey sampled only those within the EPZ. By design, its questions never used the words "nuclear" or "radiological." They simply refer to "an emergency."

The ETE (ETE Attachment A, F-14) interviewer instructions refers to "emergency planning," not to a nuclear or radiological emergency.

<u>Telephone Survey Instrument</u>	
Hello, my name is _____ and I'm conducting a survey for the Emergency Management Agencies of Carver, Duxbury, Kingston, Marshfield and Plymouth municipalities. The information you provide will be used for emergency planning to enhance local response plans. Emergency planning for some hazards may require evacuation. Your answers to my questions will greatly contribute to this effort. I will not ask for your name.	<u>COL 1</u> Unused
	<u>COL 2</u> Unused
	<u>COL 3</u> Unused
	<u>COL 4</u> Unused
	<u>COL 5</u> Unused
	<u>Sex</u> <u>COL 8</u>
	1 Male
	2 Female

The only ETE questions relating to this Petition are Questions 13A and 13 B (ETE Attachment A, F-21) and likewise they do not refer to a radiological or nuclear emergency, simply an emergency.

13A.	Emergency officials advise you to take shelter at home in an emergency. Would you: (READ ANSWERS)	COL. 52
	A. SHELTER; or	1 A
	B. EVACUATE	2 B
		X DON'T KNOW/REFUSED
13B.	Emergency officials advise you to take shelter at home now in an emergency and possibly evacuate later while people in other areas are advised to evacuate now. Would you: (READ ANSWERS)	COL. 53
	A. SHELTER; or	1 A
	B. EVACUATE	2 B
		X DON'T KNOW/REFUSED

The Cape Telephone Survey sampled residents throughout the Cape, not simply those in the 10-15 mile zone. Unlike the ETE, the Cape Telephone Survey asked the respondent what s/he would do if there was "an incident at the Pilgrim Nuclear Power Station, " rather than saying nothing about the type of "emergency" involved.

The difference in the results of the two telephone surveys clearly demonstrated that any telephone survey designed to obtain reliable information from respondents must tell the respondent upfront that the survey is for an accident at the nuclear power plant.

The EPZ Telephone Survey failure to tell respondents that the survey was for a nuclear accident, was designed to confirm KLD's and federal guidance assumption that only 20% of the population would self evacuate and they would follow a segmented evacuation. Question 13A (EPZ Survey F-10) asked:

"Emergency officials advise you to take shelter at home in an emergency. Would you?" This question is designed to elicit information regarding compliance with instructions to shelter in place. The results indicate that 81 percent of households who are advised to shelter in place would do so; the remaining 19 percent would choose to evacuate the area. Note the baseline ETE study assumes 20 percent of households will not comply with the shelter advisory, as per Section 2.5.2 of NUREG/CR-7002. Thus, the data obtained above is in good agreement with the federal guidance.

The Cape Cod Telephone Survey could not more clearly show that if potentially affected respondents were asked "would you evacuate" "if they were an incident at the Pilgrim Nuclear Power Station," 70% (not the 20% assumed by the NRC or the 19% of the ETE) would do so.

"Suppose there were an incident at the Pilgrim Nuclear Power Station (PNPS) and you were informed that people in the Emergency Planning Zone were advised to evacuate, would you evacuate?" Approximately 70% percent of Cape Cod residents indicated they would evacuate due to a nuclear incident at PNPS.

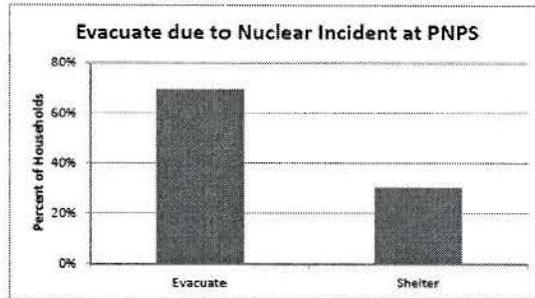


Figure 2. Evacuation Due to an Incident at PNPS

Cape Cod
Traffic Study

3

KLD Engineering, P.C.
Rev. 0

"If you were told that Cape Cod is not in the Emergency Planning Zone for the Pilgrim Nuclear Power Station, would you still evacuate?" Approximately 50% percent of Cape Cod residents indicated they would evacuate due to a nuclear incident at PNPS, even knowing they are not in the Emergency Planning Zone (EPZ).

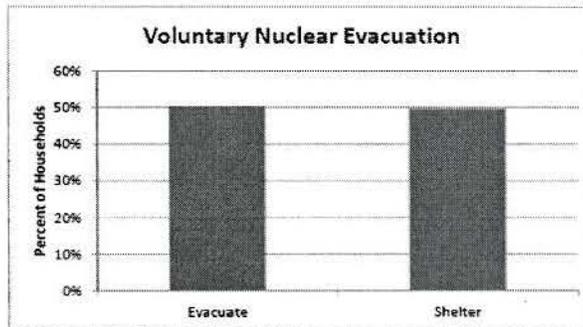


Figure 3. Voluntary Evacuation Due to an Incident at PNPS

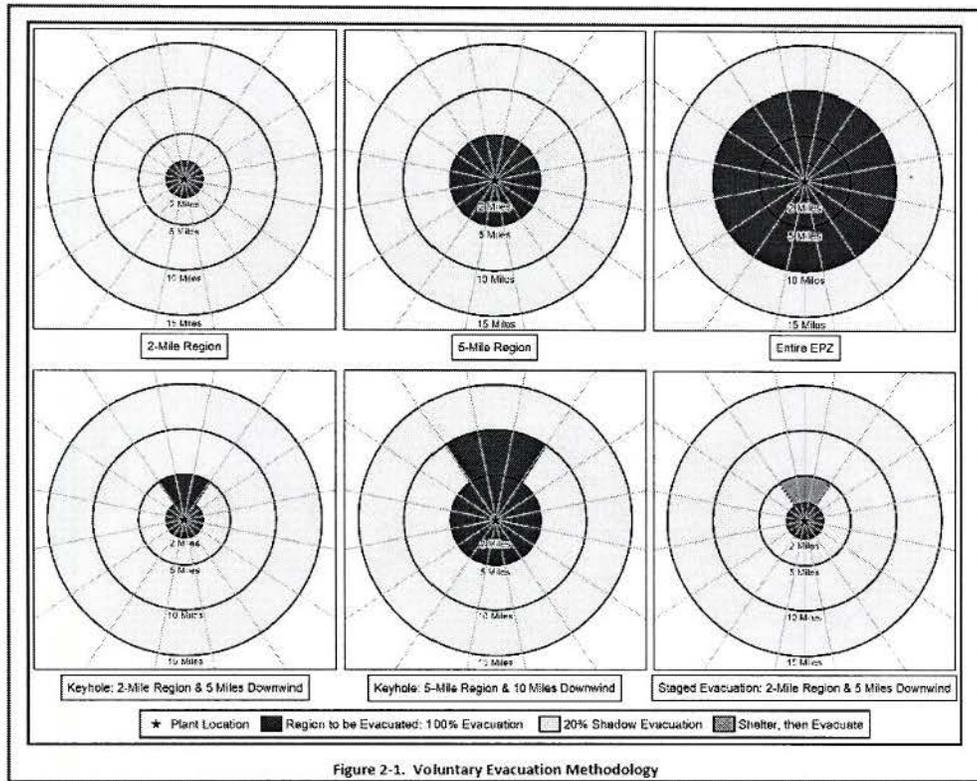
It is hardly surprising that many more respondents said they would evacuate when they were told that there had been a nuclear incident at Pilgrim than if neither Pilgrim, nor nuclear, nor radiological were even mentioned. The Cape Telephone Survey clearly demonstrates that the ETE Telephone Survey, that intentionally did not tell respondents upfront that the question refers to what they would do if there was an accident at the nuclear power plant, is not credible and cannot provide any basis for Pilgrim's evacuation time estimates.

This indisputable conclusion is completely consistent with the previous experience and studies³ that equally clearly show that people view a nuclear accident very differently than a weather-related evacuation order; and they evacuate in far greater numbers and with less regard for official instructions.

2. The ETE's Shadow Evacuation Assumption is Wrong. It incorrectly assumes that only 20% of those not instructed to evacuate will voluntarily evacuate anyway.

The ETE's Study Methodological Assumption 5 says: "As indicated in Figure 2-2 of NUREG/CR-7002, 100% of the people in the impacted keyhole evacuate. 20% of those within the EPZ, not within the impacted keyhole, will voluntarily evacuate. 20% of those people within the Shadow Evacuation will voluntarily evacuate." (ETE, 2-2)

³ Studies regarding "shadow evacuation" inside and outside the EPZ indicate that the public will respond once they become aware. Examples: Three Mile Island: the Pennsylvania Governor issued an evacuation advisory (note, it was not an order). It was expected to have precipitated the flight of only 3,400 people (pregnant women and pre-school children within five miles of the plant); instead, a total of 144,000 people (a government figure) evacuated the surrounding region. Subsequent surveys in New York by Dr. Zeigler indicated that the public outside the 10-mile EPZ would evacuate once they heard there was a nuclear emergency. Recognizing that the public has a greater fear of radiation than natural disasters, a shadow evacuation occurred during Hurricane Floyd in 1999 and Hurricanes Katrina and Rita. Again in a chemical accident, the shadow evacuation was studied and documented in the Graniteville South Carolina chlorine spill in 2005. (Zeigler, Donald, Johnson, James, Jr., "Evacuation Behavior In Response To Nuclear Power Plant Accidents," The Professional Geographer, May, 1984; Zeigler, Donald, Testimony Prepared for Westchester County Legislature, Dec 13, 2001, http://www.closeindianpoint.org/evacuation_testimonial.htm; Witt, James Associates, "Review of Emergency Preparedness of Areas Adjacent to Indian Point and Millstone," James Lee Witt Associates, March 2002, <http://www.wittassociates.com/index.xml> <http://www.nirs.org/reactorwatch/emergency/epwitttrpt2003.pdf>; Seminole County Division of Emergency Management, Evacuation Plans, http://www.seminolecountyfl.gov/dps/em/emprep_evacuation.asp; Duhe, Duke, Evacuation Behavior in Response to the Graniteville, South Carolina, Chlorine Spill, Hazards Research Lab, University South Carolina, 2005, <http://www.colorado.edu/hazards/research/qr/qr1178/qr1178.html>) Third, it is essential for planning that the public trust the authorities in order for there to be some assurance that the public will follow directions. If the authorities only inform some of the population, irrespective of intentions, they will lose all credibility, increasing the likelihood of a chaotic response.



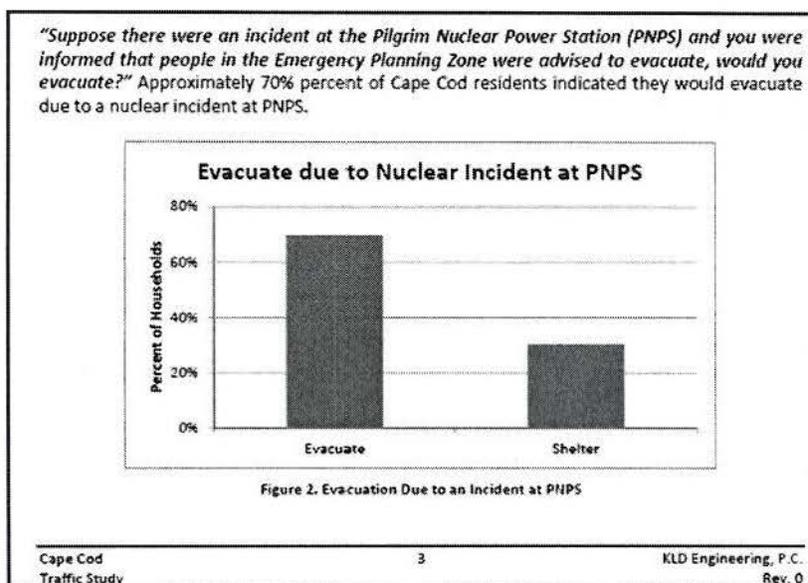
ETE's assumption is based on NRC's NUREG/CR-7002; and was confirmed by the ETE Telephone Survey only when that survey never told respondents the questions pertained to a nuclear incident at Pilgrim.

In the ETE Telephone Survey relatively few respondents said they would not follow "emergency officials" advice "to shelter" when they were told nothing about what the supposed emergency involved. ETE, F-10:

"Emergency officials advise you to take shelter at home in an emergency. Would you?" This question is designed to elicit information regarding compliance with instructions to shelter in place. The results indicate that 81 percent of households who are advised to shelter in place would do so; the remaining 19 percent would choose to evacuate the area. Note the baseline ETE study assumes 20 percent of households will not comply with the shelter advisory, as per Section 2.5.2 of NUREG/CR-7002. Thus, the data obtained above is in good agreement with the federal guidance.

"Emergency officials advise you to take shelter at home now in an emergency and possibly evacuate later while people in other areas are advised to evacuate now. Would you?" This question is designed to elicit information specifically related to the possibility of a staged evacuation. That is, asking a population to shelter in place now and then to evacuate after a specified period of time. Results indicate that 71 percent of households would follow instructions and delay the start of evacuation until so advised, while the balance of 29 percent would choose to begin evacuating immediately.

The Cape Survey, in stark contrast, told respondents the purpose of the survey and because it did the shadow evacuation estimates were very large. The Cape Survey specifically asked respondents, “If you were told that Cape Cod is not in the Emergency Planning Zone for the Pilgrim Nuclear Power Station, would you still evacuate? (Cape Survey Question 3B), “Approximately 50 percent of the Cape Cod residents indicated that they would evacuate due to a nuclear incident at PNPS, even knowing they were not in the Emergency Planning Zone (EPZ (Cape Survey, 4)



The results of the Cape Survey show, at a 95% confidence level, that the ETE's assumption that no more than 20% will evacuate is not just wrong; it is ludicrous. It cannot properly be used to determine Pilgrim's evacuation time estimates.

The Cape Survey also showed that the ETE's assumption that the “shadow evacuation” includes only the 10-15 mile region is incorrect. The Cape survey included resident respondents throughout the Cape, out to 25 miles. It showed at the 95% confidence level that approximately half of those within 25 miles of Pilgrim would evacuate, even if they knew that they were not in Pilgrim's Emergency Planning Zone.

The Cape Survey demonstrates that, in determining evacuation demand and evacuation time estimates, those living more than 15 miles from Pilgrim cannot be ignored. Those living up to 25 miles away must be expected to evacuate. And, consistent with the previous studies and experience cited above, the percentage of those in the “shadow region” that must be expected to evacuate is at least 2.5 times that assumed by KLD’s ETE, the NRC, and the current evacuation time estimates. Half, not “20 percent,” “of households will not comply with the shelter advisory.”

Comparing the Cape Telephone Survey (and experience and studies) with the ETE Telephone Survey (and NUREG/CR-7200) proves that none of the ETE’s 20% estimates of how many would evacuate, and none of Pilgrim’s evacuation demand or evacuation time estimates are valid. They also show that the NUREG and ETE estimates of how many would evacuate in the event of a nuclear incident or emergency are indisputably wrong - and they are wrong because they are based on surveys that were intentionally designed to not to tell any respondent what type of emergency was really at issue, and to provide the answer that the industry wanted, rather than any real answer. At a 95% confidence level and with essentially identical possible sampling errors, the Cape Telephone Survey shows that any honest and realistic time estimates must assume that that the number of people who will evacuate within the EPZ is more than three (3) times what the NRC and ETE assumed, and that "shadow evacuation" outside the EPZ will be more than two and a half times the NRC's and ETE's unrealistic assumptions.

There can be no doubt that a 250% to 300% increase in the number of evacuees from within the EPZ will have a dramatic increase in traffic density and speed, and itself will dramatically increase the time necessary to evacuate. There also can be no doubt that a large scale evacuation from Cape Cod will also dramatically increase KLD’s faulty evacuation time estimates; traffic

from Cape Code has nowhere to go except onto the evacuation routes for the EPZ. (See 19, below)

3. The ETE Incorrectly Assumes That Those In The EPZ Will Follow A Staged Keyhole Evacuation (ETE, 7.2)

A Staged Evacuation is where one area is told to evacuate and other areas are told to shelter-in-place until directed to evacuate. (NUREG/CR-70002, 1.31) The ETE study (ETE, 7.6) showed that “the staged evacuation option provides no benefits and adversely impacts many evacuees located beyond 2 miles from PNPS.”

7.6 Staged Evacuation Results

Table 7-3 and Table 7-4 present a comparison of the ETE compiled for the concurrent (un-staged) and staged evacuation studies. Note that Regions R22 through R27 are the same geographic areas as Regions R02 and R04 through R08, respectively.

To determine whether the staged evacuation strategy is worthy of consideration, one must show that the ETE for the 2 Mile region can be reduced without significantly affecting the region between 2 miles and 5 miles. In all cases, as shown in these tables, the ETE for the 2 mile region is unchanged when a staged evacuation is implemented. The reason for this is that the congestion within the 5-mile area does not extend upstream to the extent that it penetrates to

within 2 miles of the PNPS. Consequently, the impedance, due to this congestion within the 5-mile area, to evacuees from within the 2-mile area is not sufficient to materially influence the 90th percentile ETE for the 2-mile area. Therefore, staging the evacuation to sharply reduce congestion within the 5-mile area, provides no benefits to evacuees from within the 2 mile region and unnecessarily delays the evacuation of those beyond 2 miles.

While failing to provide assistance to evacuees from within 2 miles of the PNPS, staging produces a negative impact on the ETE for those evacuating from within the 5-mile area. A comparison of ETE between Regions, R22 and R02; R23 and R04; R24 and R05; R25 and R06; R26 and R07; and R27 and R08 reveals that staging retards the 90th percentile evacuation time for those in the 2 to 5-mile area by up to 40 minutes for non-snow scenarios and 1 hour and 20 minutes for snow scenarios (see Table 7-1). This extending of ETE is due to the delay in beginning the evacuation trip, experienced by those who shelter, plus the effect of the trip-generation “spike” (significant volume of traffic beginning the evacuation trip at the same time) that follows their eventual ATE, in creating congestion within the EPZ area beyond 2 miles.

In summary, the staged evacuation option provides no benefits and adversely impacts many evacuees located beyond 2 miles from the PNPS.

The Cape Telephone Survey’s finding that 50% of the population would self-evacuate even if they were told that they were not in the EPZ shows that the population will not follow a staged evacuation; far larger numbers will evacuate and traffic estimates considerably slowed.

The ETE's findings have broad significance for emergency planning. The Staged Evacuation concept appears to be NRC's and the licensee's solution to the problem that population has dramatically increased since Pilgrim was licensed in 1972 and the infrastructure is inadequate to support a large evacuation in a timely manner. For example, Plymouth's population has increased three-fold since Pilgrim was constructed – from 18,606 into 56,132 in 2012⁴.

4. The KLD ETE Underestimated Demand by Failing to Take Proper Account of the Summer Transient Population

In estimating how many summer transients would evacuate, the KLD ETE inaccurately estimated the size of the summer transient population, and incorrectly assumed that the percentage of summer transients that would choose to self evacuate would be the same as the percentage of year-round residents.

a. The ETE Underestimates Summer Transient Population:

The EPZ ETE section 3.3.1 Seasonal Transient Population explains that: “It is assumed that seasonal residents will be renting homes near the shoreline. Using only those Census blocks that are within half a mile of the waterways, the number of seasonal homes was calculated by determining the percentage of vacant households and subtracting out the average vacant household percentages (24%) within the EPZ. An average household size of 2.5 persons per household is used to determine the seasonal transient population, and the 1.37 transient vehicles. These numbers are adapted from the telephone survey results.” (see Appendix F)

The methodology significantly underestimates the transient population. It ignored for example, that summer rentals are not limited to ½ mile from the shore where rental rates are highest and that many summer transients are home owners that want to use their property, not rent it, during the summer.

⁴ www.mass.gov/dhcd/ipofile/239.pdf

Research shows that transients have high levels of spontaneous evacuation and will prepare to evacuate more quickly than residents⁵. The New Jersey Hurricane Evacuation Study, for example, found that “it is reasonable to assume that 90% to 95% of vacationers will evacuate their accommodations if evacuation orders are issued ... “90% of vacationers will return home when they evacuate ... (and) more than 95% of vacationers....drive from homes (and) [t]hey will use their own vehicles when evacuating.”

The 2004 KLD estimated transients within the EPZ at 42,215; the 2012 KLD inexplicably estimated only 20,745. (ETE, 1-10) The overall population has increased in Massachusetts, as have the number of visitors. Neither has decreased by more than half. And, Marshfield’s population data alone shows that KLD’s estimates are less than half what they should be. KLD estimated Marshfield summer transient population to be 6,102 (ETE, Table 3-4, pg., 3-11); the Boston Globe reported that Marshfield’s summer transient population was 12,000,⁶ twice KLD’s estimate.

b. The Cape Telephone Survey was limited to residents and ignored the large number of transients on Cape Cod and its effect on the ETE

Senators Markey and Warren’s letter pointed out that “Cape Cod is a unique geographical area, with over 200,000 permanent residents and as many as 300,000 vacationers in the summer.” (Letter at 1-2) In other words, the KLD ignores 60% of the summer population. The only routes off the Cape cross the Sagamore and Bourne bridges, which consequently take evacuees onto roadways used by evacuating residents of the Emergency Planning Zone.

⁵ New Jersey Hurricane Evacuation Study Transportation Analysis, Technical Memoranda, Prepared for US Army Corps of Engineers Philadelphia District, by PBS&J Tallahassee FLA, June 2007 (http://www.ready.nj.gov/plan/pdf/maps/hurrevacution_study.pdf)

⁶ Boston Globe, Globe South, *Don’t Love that Dirty Water*, Jessica Bartlett, August 15, 2013, pg., 6

Based on the telephone Survey of Cape residents, it is safe to predict over 70% of the vacationers will evacuate if they leave in a Pilgrim emergency and more than 50% will evacuate even if told not to do so. The reason that their numbers are likely to be higher than residents is that transients away from their residence are likely to elect to evacuate to their home on the mainland. Home is associated with safety.

5. The ETE Study Underestimated Employees, thus Lowering Demand Estimates

The ETE only accounts for non-residents who work in the EPZ for larger employers (15 employers and the schools); that resulted in only 1,146 employees and 1,092 vehicles.⁷ The estimate fails to account for the many smaller employers in the EPZ who employ non-EPZ residents. While each business may only employ a few non-EPZ residents, there are many small businesses and these potential evacuees add up and need to be accounted for. The numbers are largest in the summer months to service the tourism industry and those employees are likely to commute in their own vehicles adding to demand data and traffic congestion.

The Cape Survey also does not include non-resident employees, a number that increases dramatically over the summer months to service the tourism industry. Larger numbers of evacuees will slow evacuation of the EPZ sharing and slowing the same mainland evacuation routes.

Many of the seasonal and low-wage jobs are filled by students and temporary foreign workers, who migrate to the Cape during the tourism season, specifically for temporary employment (<http://www.sustaincapecod.org/indicators/Business>)

⁷ ETE, Table 3-5, pg., 3-15, *Summary of Non-EPZ resident Employees and Employee Vehicles total EPZ*

6 Evacuation of School Population & Transportation Dependent at Nursing/Group Homes - Underestimated

The ETE incorrectly assumes that parents will not attempt to pick up their children from schools, and that students will be evacuated by bus in an obvious effort to lower the number of vehicles evacuating. It ignores that high school students with cars will self evacuate, with younger siblings. It ignores that family members are likely to go to elderly housing complexes, nursing homes, and group homes to gather their loved ones. As a consequence, a far larger number of vehicles will be on roadways than modeled.

For example, the Town of Duxbury recognized that parents will go to schools in the event of an emergency and before a general emergency to pick up. Therefore a protocol for picking up students is in the School Department's Standard Operating Procedure (SOP).⁸

B. INACCURATE ASSUMPTIONS /ESTIMATES ROAD CAPACITY (ETE, Ch., 4)

Roadway capacity is defined as the maximum rate at which vehicles can be expected to traverse a section of roadway during a given time period under prevailing roadway traffic and control conditions. Roadway capacity influences evacuation travel time particularly as traffic demand approaches or exceeds capacity-such as in a nuclear disaster. Capacity is impacted by, for example: structural characteristics of the roads, adverse weather, and intersection control. (NUREG/CR-70002)

7. The ETE Fails To Account For Chronically Bad Traffic over Summer Week- Ends & Special Events that increases travel times

The ETE fails to consider the truly bad traffic jams that occur in the region. During the 2013 July 4th week-end, for example, traffic backed up on Cape Cod for 25 miles ahead of the Sagamore Bridge, and it took as long as eight hours to drive from the Cape to Boston, traveling

⁸ http://www.town.duxbury.ma.us/Public_Documents/DuxburyMA_EMA/Dux-06%20School%20Department_July2010.pdf

over the major evacuation routes for the EPZ.⁹ If a nuclear accident occurred during such traffic congestion, all the traffic would need to be rerouted over alternative roads that are not included in the current estimate of evacuation times. During July and August of 2012, inbound traffic over the Sagamore and Bourne Bridges on Friday, Saturday and Sundays averaged 230,000 vehicles on a typical summer week-end and 255,000 on the July 4th weekend¹⁰. Those same vehicles exit the Cape over evacuation routes for the EPZ. The ETE simply modeled one special event, Plymouth's 4th of July celebration. Even there, the ETE underestimated demand by assuming most family members would drive together to the celebration in one car; it is more likely that teenage and young adult family members would drive in separate cars, adding to traffic volume.

8. ETE Assumptions about Traffic Flow during Inclement Weather & Peak Commuter/Holiday Traffic Are Not Credible

The ETE Evacuation Scenarios included:

Table 6-2. Evacuation Scenario Definitions

Scenario	Season ¹	Day of Week	Time of Day	Weather	Special
1	Summer	Midweek	Midday	Good	None
2	Summer	Midweek	Midday	Rain	None
3	Summer	Weekend	Midday	Good	None
4	Summer	Weekend	Midday	Rain	None
5	Summer	Midweek, Weekend	Evening	Good	None
6	Winter	Midweek	Midday	Good	None
7	Winter	Midweek	Midday	Rain	None
8	Winter	Midweek	Midday	Snow	None
9	Winter	Weekend	Midday	Good	None
10	Winter	Weekend	Midday	Rain	None
11	Winter	Weekend	Midday	Snow	None
12	Winter	Midweek, Weekend	Evening	Good	None
13	Summer	Weekend	Evening	Good	Plymouth 4 th of July Fireworks
14	Summer	Midweek	Midday	Good	Roadway Impact – Lane Closure on Rt. 3 NB

¹ Winter assumes that school is in session (also applies to spring and autumn). Summer assumes that school is not in session.

⁹ <http://www.bostonglobe.com/metro/2013/07/08/cape-going-nowhere-holiday-traffic-nightmare-spills-over-into-monday/gRG9bQkdv0h7B4E8Chs13N/story.html>

¹⁰ <http://www.capecodtransit.org/downloads/CapeFLYER.pdf>

a. Inclement Weather: The EPZ ETE assumes that roads are passable and that “appropriate agencies are plowing roads as they would normally” (ETE, 2.2) so that area roads used in an evacuation would be able to handle 80% of the good weather highway capacity in the event of snow and 90% in the event of rain. The report claims that, “it is reasonable to assume that the highway system will remain passable - albeit at a lower capacity-under the vast majority of snow conditions;” and that snow plow crews would be avialable and the clearing efforts would be highly effective. In the February 8-9, 2013 blizzard road conditions were so severe that the Massachusetts Governor placed a ban on driving.¹¹ During that storm Duxbury Beach was overtopped and the beach road used for evacuation by Gurnet-Saquish and Duxbury beach residences were impassable. During Hurricane Sandy in late 2012, storm surge overtopped Plymouth Beach and led to the closure of 3A, one of the evacuation routes from Plymouth.¹² Severe weather conditions are one of the triggers of a nuclear accident. Last, it is very likely that snow operators will not appear for duty, but instead will evacuate with their family. They have not been surveyed to determine their response. It should be done, and anonomously.

Further, as Table 6-2 shows, evacuation scenarios modeled traffic flow during rain and snow midday. KLD avoided peak traffic periods and chose a time period when it is more likely that snow plow crews were at work and best able to clear roads. Also, the ETE failed to account for fog in Pilgrim’s coastal region.

b. Peak Travel Times Avoided:

The ETE fails to precisely define “Time of day.” From the general description, it is clear that peak travel times for commuters and summer travelers are avoided in its estimates. The Pilgrim area is a tourist magnet for visitors to its beaches, ponds/lakes, forests and historic sites.

¹¹ <http://www.gazettenet.com/home/4359892-95/ban-inches-road-snow>

¹² <http://www.wickedlocal.com!plymouth/topstories/x1272748828/HURRICANE-SANDY-Dodged-that-bullet#axzz2MKf6CMsI>

Summer visitors get an early morning start. Midday traffic is the lightest and that is precisely when the ETE estimates were made. Summer evening traffic is at its peak in early evening, before or very shortly after an early dinner; but the ETE fails to say when in the evening they modeled traffic. In “Winter” or non-summer seasons, midday is modeled, avoiding peak commuter traffic; and again “evening” is not defined by providing the hour.

9. The ETE’s Estimates For Specific Roadway Capacity Are Not Credible

The ability of the road network to service the demand is a major factor in determining how rapidly the population can evacuate. The ETE estimates are not credible. For example:

a. Two-Lane Roads: The ETE assumption that on rural roads, narrow lanes and shoulders will not interrupt the free flow of traffic is absurd. It overlooks that rural 2-lane roads have numerous smaller roads and driveways feeding into them that will slow traffic.

b. Multi-Lane Highways: Route 3 North is the main evacuation route for Duxbury Beach, Saquish Neck, Gurnet Point, Clark’s Island (sub-area 4); Duxbury (sub-area 9) and Marshfield, subarea 10. Route 3 south is the major evacuation route for Plymouth subareas 1,2,3,5 and 6. When route 3 was completed in 1963 it was designed to carry 76,000 cars daily; it is way over capacity now.¹³ The population evacuating over that route in a nuclear disaster will far exceed the design capacity.

c. Choke Points, Not Established: Roadways have choke points under a variety of conditions. The ETE fails to establish and record the specific choke point capacity for each roadway used in a radiological emergency at Pilgrim Station.

¹³ *Route 3 widening project is back on track: Weymouth-Duxbury stretch in Romney's transportation plan*, Patriot Ledger, Tom Benner, March 11, 2005

10. Emergency Personnel: The ETE Assumes, Absent Factual Support That Emergency Personnel Will be Available In Sufficient Number To Assure Timely Traffic Flow

Availability of emergency personnel are important for intersection control and in general to assure traffic flow. The ETE provides no basis to support that emergency personnel will be available in sufficient number to assure the timely movement of traffic in an evacuation during a radiological disaster at Pilgrim Station. An anonymous survey of respondents is required to provide reasonable assurance that sufficient personnel would be available. Recognizing the effect of federal, state and local budget cuts on personnel, it also is necessary to see an actual list, a real total count, of emergency personnel available in the pertinent departments.

C. INACCURATE ASSUMPTIONS TRIP GENERATION TIMES (ETE, 5)

Development of ETEs (NUREG/CR-70003, Ch. 4) includes trip generation time, evacuation modeling, and estimates of evacuation times. Pilgrim's ETE underestimated each.

11. Trip Generation Time Relied On Flawed Telephone Survey & Assumptions

The ETE followed Federal Guidelines (NUREG/CR-70002) to estimate the elapsed time the public will take to get ready to evacuate. ETE's estimates are not credible because: KLD based its data on the telephone survey of only EPZ residents, and failed to tell even resident respondents that the questions were for a nuclear emergency at Pilgrim, and made a number of incorrect assumptions. Incorrect assumptions and data artificially resulted in the not credible conclusion that a complete evacuation of the EPZ would occur in six hours.

12. The KLD incorrectly assumed a rapidly escalating accident and that mobilization of the general population will commence within 15 minutes after siren notification. (ETE, 2-5, 5-1)

This ignores provisions in the EPZ Radiological Emergency Plan and Standard Operating Procedures that notifies segments of the general public at the Alert and/or Site Area stage of the

emergency, prior to the General Emergency. See, for example, the duties of the Harbormaster at the Alert in the Town of Duxbury's procedures where beaches are closed and boaters advised to come ashore.¹⁴ It is highly probable that information from these advisories will spread to other members of the public with today's readily available rapid communication systems, and that mobilization will begin earlier than the General Emergency. Unplanned early mobilization of the population is likely to lead to a chaotic and unplanned evacuation of the population resulting in accidents and overall time delays, acerbated by unmanned traffic control points until after a General Emergency called.

13. The ETE Failed to Consider Impact Delayed Staffing Traffic Control Points on ETE

"Traffic Control Points (TCP) within the EPZ will be staffed over time, beginning at the Advisory to Evacuate." (ETE, 2-5) Therefore TCPs are assumed to be not in place when actual evacuations begin prior to the advisory to evacuate, which will not be until a General Emergency. The function of the TCPs is to "facilitate the movement of all (mostly evacuating) vehicles at the location." Their absence when mobilization occurs before the General Emergency is assured to delay evacuation times.

14. The ETE Incorrectly Assumed That 25% Of The EPZ Households Will Await The Return Of A Commuter Prior To Evacuating Underestimating Vehicles

Flawed data on mobilization times that resulted from the telephone survey included, for example, assumptions about commuters. "The ETE assumed that 65% of the households in the EPZ have at least (1) commuter; 38% of those households with commuters will await the return of a commuter, prior to beginning their evacuation trip. Therefore 25% of EPZ households will await the return of a commuter, prior to beginning their evacuation trip." (2-5) It should have been obvious to KLD that in a radiological emergency households with commuters are not going to delay evacuation, until a parent gets home, especially considering the lengthy commute times many workers experience daily under normal traffic conditions. It defies reason, for example, to assume a husband or wife would drive more than 35 miles back to Duxbury from Boston towards the "eye of the storm" to evacuate together with the family. Reception Centers, outside the EPZ,

¹⁴ http://www.town.duxbury.ma.us/Public_Documents/DuxburyMA_EMA/Dux-11%20Harbormaster_July2010.pdf

function in part is to reunite family members. This ludicrous assumption incorrectly reduces vehicle use, spreads out the number of vehicles on the evacuation routes at one time to make the ETEs appear timely.

15. The ETE Incorrectly Assumes That 50% of the Transportation Dependent Population Will Rideshare (ETE, 2-6)

Based on the telephone survey that did not tell respondent that it was about a nuclear disaster, the ETE incorrectly concluded that 50% of the transportation dependent (those without vehicles at the time of the evacuation) would rideshare, again underestimating traffic load. It is not realistic to assume 50% will rideshare because that 50% figure does not account for the facts that neighbors may not be at home in the event of an emergency to be able to offer a ride; it does not consider that evacuees will fill their vehicle with family, pets and some household items so that there would not be space for others. It does not consider the population's natural motivation is a radiological disaster, especially post Fukushima, is to get out as soon as possible without surveying neighbors in need of assistance; and it does not consider an overloaded phone system where it would not be possible to call a neighbor for a ride. There will be more traffic, congestion, on the roads because fewer than 50% are likely to rideshare. Those needing a ride will have to wait for busses to arrive from outside the EPZ increasing the overall ETE.

16. The ETE Incorrectly Assumes Timely Evacuation of Transportation Dependent

The ETE acknowledges that a second wave of bus drivers will be required to transport the schools and special facilities. The model for the second-wave for Duxbury; for example, assumes that the bus heads back from the Reception Center after 15 minutes, returns to the EPZ, and completes the second trip in 79 minutes (ETE, pg., 8-38) The times underestimate what will occur in reality. They ignore the time required to decontaminate the driver and bus; time to find

substitute drivers, if even possible in a nuclear disaster; time to find substitute busses and their mobilization times; and the willingness of driver to return to a contaminated area in a nuclear disaster. Bus drivers, like snow plow and tow truck operators and emergency workers should be anonymously surveyed to determine what fraction who will choose to stay with their families in a nuclear disaster and thus not be available in an emergency. Absent such a survey, there is no reasonable basis to assume that all will show up and will go back for a second trip in a nuclear emergency.

17. The ETE Assumptions About Mobilization Times for School Population & Special Facilities are Not Credible

School Population

(1) The ETE incorrectly assumes that parents will not attempt to pick up children from schools and that instead the student population will be transported by busses and met by family/guardians at the Host Facilities. The assumption is not supported by Pilgrim's Radiological Emergency Procedures. Those procedures recognize that parents will in fact try to pick up their children and students with vehicles will evacuate themselves with siblings, if appropriate. The Duxbury School Standard Operating Procedure, for example, provides explicit procedures for parent pick-up in a radiological emergency. More vehicles than estimated will be on the roadways, slowing ETEs.

(2) The estimation of trip generation for the School population is ludicrous. The ETE for Duxbury assumes that the average speed of school buses from the EPZ to the Reception Center is 40:35 in the rain, and 30 minutes in the snow assuming that 40 mph is the speed limit on state roads. It is absurd to suggest that in a radiological disaster the speed limit would be achievable; KLD arrives at these times by making a host of equally ridiculous assumptions reviewed in this petition.

(3) The ETE acknowledges that a second wave of bus drivers will be required to transport the schools and special facilities, discussed above at 11, e.

Special facility populations- hospitals, nursing homes, group homes (ETE, 8-10)

(1) The estimation of trip generation for these populations are equally ludicrous. In the ETE's Duxbury data for medical facilities, for example, the assumed load time for patients is *one* minute per patient; and the estimated travel time is only to the EPZ boundary, quite unlike the school population that estimates travel time to the host facility/reception center. If the time were modeled to the host medical facility, as it should, ETEs would escalate.

(2) The analysis for the second wave of drivers is flawed as discussed above at 16.

18. The EPZ ETE Assumptions About Trip Generation For Populations On Boats Are Not Credible (ETE, 5-18)

The ETE incorrectly assumes that boaters will return to marinas within the mobilization time for transients in the EPZ (15 minutes). This ignores the time required for sail boats without motors to get back to their moorings and ashore and the effect of low tides. KLD 2004 (section 5-11) in contrast found at 15 minutes only 15% of those on boats were notified; and at 15 minutes only 17% of the boaters were ready to evacuate. It took 60 minutes for 100% to be ready to evacuate. The boating population has increased substantially since 2004; it makes no sense that the times to evacuate gone down.

19. The ETE ignores the impact of voluntary evacuations from Cape Cod that would have a large impact on traffic in the EPZ; and ignores the effect of voluntary evacuations within the EPZ and shadow evacuation that would slow EPZ evacuation times.

The ETE assumes a rapidly escalating emergency, where a General Emergency evacuation order is the first advisory issued. The ETE acknowledges that in a more slowly

developing emergency many residents may voluntarily choose to evacuate earlier at the Alert or Site Area emergency. This is likely because at the Alert or Site Area stage, public parks and beaches are closed at the Site Area and boaters advised to get off the water. This will result in the public knowing about serious problems at Pilgrim and likely to choose to “Get out of Dodge.”

The ETE fails to consider the impact of residents on Cape Cod evacuating voluntarily in that situation. Such an early shadow evacuation that necessarily must use the Sagamore or Bourne Bridge to exit the Cape and would add to the congestion faced by residents evacuating from the EPZ. Portions of Plymouth (Subareas 1,2,3, or 5) evacuation route crosses where Cape traffic arrives on the mainland from the Sagamore and Bourne Bridges¹⁵. Likewise an early voluntary and shadow evacuation of residents inside the EPZ and a larger percent of the population outside the EPZ will clog the evacuation routes upstream meaning that those downstream or most at risk will experience delays in evacuation times – much like a cork placed in a bottle.

III. CONCLUSION

Faulty assumptions in KLD’s ETE for Pilgrim Station show that it is not credible and that there would be much higher levels of congestion, and much longer evacuation times due to far larger voluntary and shadow evacuations, higher transient and worker population,; poorer road conditions in inclement weather than modeled, slower trip generation estimates; and likely fewer emergency workers than KLD estimated. These would lead to a significant lengthening of the time required for the EPZ to evacuate. Absent an honest and credible ETE, the population does

¹⁵ <http://www.mass.gov/eopss/docs/mema/nuclear/2013-pilgrim-nuclear-calendar.pdf>

not have reasonable assurance. Pilgrim should not be operating until a new ETE with realistic evacuation time estimates based on credible assumptions, including a telephone survey informing respondents that it is for a radiological emergency at Pilgrim Station, is developed and reviewed by the EPZ Emergency Management Agencies, MEMA and the public.

Several months ago, Judge Rosenthal of the ASLB accurately said that, with one possible exception, the NRC had not granted a section 2.206 petitioner the substantive relief it sought for at least 37 years. Judge Rosenthal concluded that, “where truly substantive relief is being sought (i.e., some affirmative administrative action taken with respect to the licensee or license), there should be no room for a belief on the requester’s part that the pursuit of such a course is either being encouraged by Commission officialdom or has a fair chance of success.”¹⁶

We truly hope that Judge Rosenthal will be proven wrong and this petition will be granted.

Respectfully submitted on behalf of the Petitioners,

Mary Lampert
Pilgrim Watch, Director
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Email: mary.lampert@comcast.net
August 30, 2013

¹⁶ Memorandum And Order (Denying Petitions For Hearing), LBP-12-14, July 10, 2012, Additional Comments of Judge Rosenthal (See NRC’s EHD Docket EA-12-05-/12-51)

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APPENDICES

Memo

To: John Giarrusso
From: Chris Chaffee
CC: Jack Priest, Mike Slobodien, Kevin Weinisch
Date: July 25, 2013
Re: Cape Cod Telephone Survey Results

TELEPHONE SURVEY

1. Introduction

At the request of the Massachusetts Emergency Management Agency and Entergy, KLD has conducted a telephone survey to obtain demographic information about Cape Cod residents regarding emergency planning. This memo documents the telephone survey results.

The survey was designed to elicit information from the public concerning household demographics and reactions during emergencies. Information will be included in the Cape Cod Traffic Study final report and is encouraged to be used by emergency planners.

2. Survey Instrument and Sampling Plan

A draft of the survey instrument was submitted to stakeholders. After receiving comments, it was modified accordingly prior to conducting the survey. Attachment A presents the final survey instrument used in this study.

The survey sampling plan was developed by taking representative samples from each zip code in Cape Cod, proportional to the zip code's population. The population estimate and number of households in each area were determined by overlaying Census data and Cape Cod's boundary using GIS software. The proportional number of desired completed survey interviews for each area was identified, as shown in Table 1. The sample size of 500 **completed** survey forms yields results with a sampling error of approximately $\pm 4.4\%$ at the 95% confidence level.

The completed survey adhered to the sampling plan.

EDWARD J. MARKEY
SENATOR

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August 16, 2015

Leo P. Denault
Chief Executive Officer
Entergy Corp.
639 Loyola Avenue
New Orleans, LA 70112

Dear Mr. Denault:

We are writing to raise serious concerns regarding Entergy's draft estimate of the time it would take to evacuate residents around Plymouth, Mass. in the event of a nuclear accident at the Pilgrim Nuclear Power Station, and to urge you to direct that all necessary revisions be made before finalizing this document. We are also concerned that the current draft completely ignores the potential need for residents of Cape Cod to evacuate and makes highly unrealistic assumptions about how quickly people living nearest the reactor could evacuate. Entergy's document, as it is currently drafted, is simply non-credible and inadequate, and fails to sufficiently protect those living near the reactor or those located on Cape Cod, who could find themselves trapped and unable to evacuate at all for hours or longer by traffic congestion and/or bridge closures. Entergy should go back to the drawing board and create a plan that properly takes into account the realities of weather, traffic, human behavior and other factors into account. Right now, such a real-world plan does not appear to exist.

In the event of a nuclear accident, it is critical to quickly evacuate people in the immediate vicinity of the nuclear power plant who could potentially be exposed to radiological materials in the air they breathe. Accordingly, the Nuclear Regulatory Commission (NRC) requires detailed evacuation plans be established for the Emergency Planning Zone (EPZ), which extends ten miles from the nuclear power plant. It may also be necessary to evacuate people from a larger area to prevent their exposure to radiological materials that have settled onto the ground or are present in food and water. This larger area is typically estimated as up to 50 miles from the nuclear plant, depending on wind, the severity of the accident, and other factors. After the nuclear melt-downs at the Fukushima Daiichi Nuclear Power Plant in Japan, the NRC recommended American citizens located within 50 miles of the plant evacuate¹.

Cape Cod is a unique geographical area, with over 200,000 permanent residents and as many as 300,000 vacationers in the summer. While none of the Cape falls within the 10 mile

¹ http://articles.washingtonpost.com/2011-03-16/national/35207282_1_fukushima-daiichi-nuclear-plant-nuclear-plant