From: "Richard Rothstein" <rrothstein@pinehills.net>
To: <RLE@NRC.GOV>
Date: 01/26/2007 6:31:19 PM
Subject: Meteorology/Modeling Considerations for Various NRC Regulatory Licensing Programs

Mr. Richard L. Emch, Jr.
Senior Project Manager
Office of Nuclear Reactor Regulation
USNRC
Mail Stop: O-11-F-1
Washington, DC 20555-0001

Dear Richard:

It was good meeting you, Chip Cameron, and Robert Palla at last Wednesday's USNRC public meeting in Plymouth, MA held to receive public comments on the December 2006 Pilgrim Supplemental DEIS. I had decided to provide oral comment (on behalf of myself in this instance, and not directly representing the Plymouth Nuclear Matters Committee of which I am a member) during the evening NRC session. I commented on the adequacy of the DEIS's offsite consequence analysis with respect to the air quality dispersion modeling/meteorological assumptions used for the Section 5 Environmental Impacts of Postulated Accidents. I also mentioned that this is now an opportune time for the NRC to get up to date (like the EPA has done in recent years) with its regulatory meteorological/air quality dispersion modeling approaches to address a variety of nuclear power plant regulatory licensing program objectives nationwide in a more realistic and accurate manner. Such improved modeling methodologies can be applied to performing postulated accident analysis studies for site-specific EIS relicensing applications (such as for Pilgrim), performing postulated accident and routine release studies as part of regulatory licensing studies pertaining to the upcoming new generation of nuclear power plant reactor technologies (i.e, NRC's combined construction and operating license program to streamline the regulatory approval process), and supporting current ongoing nuclear emergency preparedness/evacuation planning programs.

Based on our conversation, you expressed interest in receiving some of my recent written comments (please refer to attached documents) regarding meteorology/modeling issues provided to representatives from the Town of Plymouth. These documents have also been available to the public (and some excerpts may have been used by other individuals this past year in commenting to the NRC about Pilgrim). These documents also are a follow-up to the January 2006 NMC Final Relicensing Recommendations Report to the Town of Plymouth (also attached). The SCAN001.PDF document was Entergy's response to that Final Relicensing Recommendations Report with respect to meteorology/modeling. And, the two other attachments are my further comments addressing the meteorology/modeling topic. Although the focus of my comments in these documents primarily pertained to emergency preparedness planning (which I understand is not a formal part of NRC's relicensing regulatory program), the meteorological/air quality dispersion modeling issues raised therein also apply to the other nuclear power plant licensing program objectives that I described above. These modeling issues are also particularly important for nuclear facilities sited in coastal areas where complex, non-steady state wind flow patterns frequently exist, i.e., simplistic straight-line Gaussian dispersion models using just onsite meteorological data are inadequate in these circumstances. Last February, Dr. Bruce Egan gave a presentation at our NMC meeting discussing advances made in meteorological and air quality dispersion modeling capabilities over the past several years, and how those advances could support emergency planning and other NRC regulatory licensing programs for coastal-sited nuclear power plants, in essence, he confirmed what was said in the Final Relicensing Recommendations Report.

If you and others at NRC agree with some of the points that I have been raising, I had also spoken with Chip Cameron last Wednesday about the possibility of the NRC considering hosting a one day workshop in the Boston region (Plymouth Radisson Hotel where you've been convening?) that would include invited meteorological/air quality modeling professionals to discuss the need for, and best ways, to "overhaul" and update the air quality modeling systems currently in use at the NRC. The public has been looking for more realism in the meteorological/modeling analyses performed by NRC/licensees. Such variable

trajectory dispersion modeling applications (using both onsite and offsite meteorological data and meteorological wind-field models) can now be applied more readily and cost-effectively in a PC environment as compared to the cumbersome modeling systems that were only available 25 years ago! Dr. Bruce Egan and I could also help the NRC identify the list of professionals that should be invited to such a workshop (e.g., people who have worked in nuclear power plant licensing, meteorological monitoring, and emergency preparedness planning programs; people who have developed and applied some of the current, publically available state-of-the-art air quality dispersion models currently in use by EPA and others; agency staff from the MADPH, MADEP, and EPA Region I; regulatory/radiological staff from Entergy; nationally-recognized atmospheric/health professionals from Boston-area universities; etc.) I would view such a regional workshop as a first step in providing an opportunity for interested individuals to present and brainstorm in a non-confrontational professional atmosphere so that the NRC could then determine where it might want to go from here.

I look forward to hearing back from you (my home contact info is provided below).

- Rich

Richard Rothstein, CCM, QEP
[redacted]

CC: <msylvia@townhall.plymouth.ma.us>, "Sowdon, Thomas" <tsowdon@entergy.com>, <Eganenvir@aol.com>, "Bruce Egan" <bruce@eganenvironmental.com>, <sshollis@duanemorris.com>

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MESSAGE	5569	01/26/2007 6:29:35 PM
TEXT.htm	7513	
Evacuation (Met-Modeling) Intro for 5-9-06 BOS Mtg.doc	32256	
RAR Response to Entergy's 2-7-06 Letter.doc	67584	

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Final Relicensing Recommendations.pdf		66323
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Priority:	Standard
ReplyRequested:	No
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ISSUE NO. 1: EVACUATION / SHELTERING-IN-PLACE

(R. Rothstein Discussion (prepared for 5/9/06 BOS meeting)):

In our committee's January 2006 Recommendations Report to the Board of Selectmen, there were a number of comments pertaining to meteorology and air quality modeling for emergency preparedness and evacuation planning purposes. I trust that the Board of Selectmen recently had the opportunity to also review Entergy's February 7, 2006 letter to our NMC Chair, Mr. Jeff Berger, which responded to our Recommendations Report, and my April 24, 2006 letter to Mr. Berger, in which I commented on Entergy's response. Prior to addressing any questions that you may have, I would first like to summarize where I feel things currently stand on this topic.

First, over the past year from my extensive review of applicable USNRC regulatory guides, my several visits to the Pilgrim Station and Emergency Operations Facility, and my numerous discussions held with cognizant Entergy technical and management staff pertaining to meteorological monitoring and modeling matters, I am satisfied that Entergy appears to have been properly following applicable USNRC's regulatory protocols and guidance. However, considering the existing and rapidly growing regional population that could be adversely affected in the unlikely event of a nuclear plant accident, more can and should be done in this area as discussed in our Recommendations Report. Our recommendations do go beyond what the USNRC has currently required licensees to implement at operating nuclear power plants, and they do apply to other similarly sited coastal nuclear power plants in the United States.

Second, with respect to evacuation, our committee had recommended that as soon as practicable, Entergy should design, develop, and deploy adequate and appropriate meteorological monitoring equipment and improved air quality dispersion models to help enhance offsite airborne effluent plume tracking capability, and enhance the ability to make and assess reliable dose predictions. The minimum system improvements needed were also conceptualized in our Recommendations Report. Such improvements would help our involved nuclear emergency management officials have access to the best meteorological, air quality modeling, and dose assessment information to help them

perform their emergency preparedness and evacuation planning functions as effectively as possible.

Third, as just mentioned, the system and procedures that Entergy currently has in place complies with the minimum applicable USNRC regulatory requirements. However, while USNRC regulatory guidance does identify the circumstances for when coastal-sited nuclear power plants might need to expand their regional meteorological monitoring network beyond just onsite, they do not tell the affected licensees how to accomplish that, and to the best of my knowledge, such enhanced offsite meteorological monitoring requirements have never been enforced anywhere by the USNRC. The same applies to the USNRC not enforcing licensees to use more sophisticated variable trajectory air quality dispersion modeling techniques that were identified following the Three Mile Island nuclear plant accident in 1979. The USNRC regulatory guidance does suggest that changes in the existing onsite meteorological monitoring systems could be warranted if they have not provided a reliable indication of meteorological conditions that are representative within the 10 mile plume exposure emergency planning zone.

Fourth, the Pilgrim Station's onsite meteorological tower data, by themselves, may not always adequately and properly represent the variable wind flow conditions throughout southern Plymouth County, especially during the spring and summer months such as when sea breeze conditions are prevalent. In the event of a fast-breaking incident requiring immediate protective actions for the public, a situation should not be created where the public is being advised to evacuate, and they inadvertently end up driving right into the path of the radioactive plume (I look at this situation as being akin to inadvertently driving right into the right-front semi-circle of a hurricane's projected path after being told by emergency officials to simply evacuate a region, but not provide sufficient guidance as to where not to drive!)

Fifth, in lieu of using more sophisticated state-of-the-art modeling techniques currently available, with the simplistic (straight-line) air quality models that Entergy continues to use for concentration and dose predictions, conservative model over-predictions could

lead to evacuation recommendations when shelter-in-place recommendations would be more appropriate, and non-conservative model under-predictions could lead to shelter-in-place recommendations when evacuation would be more appropriate. Realistic modeling assumptions and predictions are the key to the forecasting and implementation of appropriate and effective emergency response and evacuation plans.

And finally, to implement the meteorological monitoring and modeling improvements to the current set-up used by Entergy could require considerable time and resources to quantify, develop, and implement, and such improvements would then need to be integrated with other components of the existing emergency planning program. Since my current understanding is that Entergy is not planning to augment its current set-up unless required to do so by the USNRC, this may be something that the Town's retained law firm negotiating team will want to discuss further with Entergy.

Thank you, and do you have any questions at this time that I can try to answer?

April 24, 2006

Mr. Jeffrey Berger
Chairman, Plymouth Nuclear Matters Committee
Plymouth Town Hall
11 Lincoln Street
Plymouth, MA 02360

Subject: Entergy's February 7, 2006 Letter Response to the NMC's January 3, 2006 Pilgrim Relicensing Recommendations Report Regarding Meteorological Monitoring/Modeling Issues

Dear Mr. Berger:

As you requested, this correspondence is in response to Mr. Jack Alexander's February 7, 2006 letter (Entergy's Letter), attached herewith, that was also provided to you by Mr. David Tarantino at our February 16, 2006 Nuclear Matters Committee (NMC) meeting. The February 16th meeting focused on meteorological monitoring/modeling considerations for the Pilgrim Station. While I did have an opportunity to quickly skim Entergy's Letter at our February 16th meeting, I wanted to hold off formally responding to that letter until such time that I received a copy for additional review, and had the opportunity to visit the Emergency Operations Facility (EOF). I did receive a copy of Entergy's Letter, courtesy of Dr. Thomas Sowdon, following our NMC meeting last Thursday.

Background and Introduction

In the NMC's January 3, 2006 Pilgrim Relicensing Recommendations Report (NMC Report) to the Board of Selectmen, there were a number of comments pertaining to meteorology and air quality modeling for emergency preparedness and evacuation planning purposes. Considering the existing (and rapidly growing) regional population, concerns were expressed in the NMC Report about the adequacy of the existing meteorological/modeling systems in place with respect to airborne effluent plume tracking capability and ability to make and assess reliable radiological dose predictions. In that regard, I had invited a nationally-recognized professional colleague, Dr. Bruce Egan, to our February 16th NMC meeting to discuss about some advances made in meteorological and air quality dispersion modeling capabilities over the past several years, and how those advances could support emergency planning for Pilgrim (and at other similarly sited coastal nuclear power plants for that matter). Dr. Egan's case study examples graphically illustrated the points raised in the NMC Report with respect to meteorology and air quality modeling, and the presentation and ensuing discussions were also observed by Mr. Tarantino and Dr. Sowdon. (I can provide you with a CD copy of that presentation under separate cover if you would like, since the file is too large to transmit electronically with this letter.)

In reviewing Entergy's Letter and applicable USNRC documentation pertaining to these meteorological monitoring/modeling issues, and based on my recent "fact-finding" visits to the Pilgrim Station and the EOF, I am satisfied that Entergy appears to have been properly following USNRC's regulatory protocols and guidance with respect to its existing operations, and with respect to its intention to have the Pilgrim Station relicensed by the USNRC. To date, Entergy staff have been very cooperative and forthcoming in attempting to respond to my questions and issues. However, in responding to Entergy's Letter, my comments and concerns, as reflected by our NMC Report, go beyond what the USNRC has currently required licensees to implement at operating nuclear power plants. So, my comments and concerns are also directed to the USNRC. And as noted above, they also do apply to other similarly sited coastal nuclear power plants in the United States, particularly for those areas that have already have significant or rapidly growing regional populations.

Discussison

In the USNRC's website fact sheet "Backgrounder on Emergency Preparedness at Nuclear Power Plants," there are some discussions and graphics that illustrate USNRC's 2 to 5 mile "keyhole" evacuation versus sheltering-in-place protocol (the same type of protocol that Dr. Sowdon had explained to me during my December 7, 2005 plant visit, and as discussed in Entergy's Letter). This USNRC protocol relies upon straight-line wind direction assumptions for each time interval step being evaluated (e.g., 15 minutes and 1-hour averages for the air quality modeling/dose assessment calculations that would likewise be generated at the Pilgrim Station and the EOF from what Dr. Sowdon had described to me), i.e., the so-called "Class A" model concept mentioned in Entergy's Letter. The graphics illustrate USNRC's assumption of steady-state straight-line plume transport both in time and space in the modeled region.

These USNRC assumptions are clearly inappropriate to assume when complex inhomogeneous wind flow patterns happen to be prevailing in the affected region (e.g., sea breezes - also see USEPA modeling guideline discussion below). The USNRC's graphics also illustrate a revised key hole if a wind direction shift takes place over the time interval step being evaluated *based on using just the onsite meteorological tower data.* But any shifting wind patterns away from the plant (including temporary stagnations, recirculations, and wind flow reversals) can also produce a different plume trajectory (and resultant concentrations and radiological doses at specific locations) than what is being depicted from the USNRC's graphics. USNRC's keyhole pattern does try to help account for potential wind shifts and fluctuations in the release path, but USNRC's assumption of using just the two adjacent 22.5 degree wind sectors to account for this, while simplistic, may be too crude in some instances. Hence, there may be some potential meteorological/modeling deficiencies in USNRC's current "key hole" regulatory assumptions evacuation approach due to potential variations in wind fields and resultant concentrations/doses in time and space, the concept that was also graphically depicted in Dr. Egan's February 16th presentation to the NMC.

Entergy's Letter correctly indicates that the USNRC, to date, has not historically required licensees to implement variable trajectory "Class B" air quality dispersion modeling techniques along with straight-line Class A air quality dispersion modeling techniques. Interestingly, while the USNRC reference cited in Entergy's Letter did allow for a Class A model to be used in lieu of a Class B model by July 1, 1982, the same reference did go on to say that a fully operational Class B model was required by June 1, 1983. What is most surprising and particularly bothersome about all of this is that since the 1970s, the USNRC has historically documented all of these advanced modeling technique concepts and potential need for multiple meteorological towers especially in coastal site regions (also see Attachment 1 below for more details). But, the USNRC has not required licensees (including Pilgrim) to have to do anything more than just the onsite primary and backup meteorological towers and Class A model use. In fact, Dr. Egan's modeling work is referenced in some of the historical USNRC's regulatory guides issued during the 1970s that pertain to air quality dispersion modeling for routine and accident release conditions.

Moreover, in the USEPA's latest (Federal Register November 9, 2005) Guideline on Air Quality Models, it is stated in Section 7.2.8 *Inhomogeneous Local Winds* that "In many parts of the United States, the ground is neither flat nor is the ground cover (or land use) uniform. These geographical variations can generate local winds and circulations, and modify the prevailing ambient winds and circulations. Geographic effects are most apparent when the ambient winds are light or calm. In general these geographicallly induced wind circulation effects are named after the source location of the winds, e.g., lake and sea breezes, and mountain and valley winds. In very rugged hilly or mountainous terrain, along coastlines, or near large land use variations, the characterization of the

winds is a balance of various forces, *such that the assumptions of steady-state straight-line transport both in time and space are inappropriate (itallics added)."* The USEPA goes on to say that In the special cases described, refined variable trajectory air quality models can be applied on a case-by-case basis for air quality estimates for such complex non-steady-state meteorological conditions. This USEPA Guideline also references a USEPA 2000 report entitled "Meteorological Monitoring Guidance for Regulatory Model Applications, EPA-454/R-99-005, February 2000." Section 3.4 of this guidance for Coastal Locations, discusses the need for multiple inland meteorological monitoring sites, with the monitored parameters dictated by the data input needs of particular air quality models. Interestingly the USEPA concludes that a report prepared for the USNRC (Raynor, G.S.P. Michael, and S. SethuRaman, 1979. "Recommendations for Meteorological Measurement Programs and Atmospheric Diffusion Prediction Methods for Use at Coastal Nuclear Reactor Sites." NUREG/CR-0936. U.S. Nuclear Regulatory Commission, Washington, DC.) provides a detailed discussion of considerations for conducting meteorological measurement programs at coastal sites. Unfortunately, I was unable to locate this seemingly important document on the USNRC's website if it is even still available to the public.

In the 1970s and early 1980s, the USNRC was at the forefront of all federal regulatory agencies in promoting the use of advanced variable trajectory modeling techniques in their regulatory guides, and that was something they should still be proud of. I was even then involved with the former Atomic Industrial Forum participating on a Task Force dealing with NUREG-0654 Class A and B dispersion modeling issues for emergency preparedness planning. Since that time, the ability to technically deal with complex atmospheric modeling concepts has improved considerably, and the associated costs and difficulty of applying such variable trajectory models have been reduced. Seeing what the USEPA is now saying about use of refined variable trajectory modeling techniques to provide for more realistic, accurate modeling predictions, did something fall into a crack here with the USNRC?

The USNRC "key hole" document referenced above also identifies an USEPA URL for protective action guides (PAG) that are used by emergency planners ("Manual of Protective Action Guides and Protective Actions for Nuclear Incidents"). The NMC Report focused mainly on the 10 mile plume exposure EPZ (Class A model distance). However, one should not lose sight of the 50 mile ingestion exposure EPZ distance whereby ingestion, resuspension of radioactive particulate matter (inhalation pathway), and radiation shine to skin and whole body from airborne or deposited radionuclides could also pose some potential health consequences, and hence require additional evacuation (and post-accident clean-up) to take place per EPA's Manual. (That is also where USNRC's so-defined Class B type modeling techniques could also come into play for both the 10 mile and 50 mile distances.) There is justification for more robust meteorological/modeling techniques to be used not just close in to the Pilgrim Station, but also at much further distances away.

It appears from this USEPA Manual that the emergency planners would be making evacuation vs sheltering recommendations on not just the plume trajectory, but also on the resultant concentration/deposition/dose predictions. Depending upon the radiological source term definition and meteorological assumptions used with straight-line models, conservative model over-predictions could lead to evacuation recommendations when shelter-in-place would be more appropriate, and non-conservative model under-predictions could lead to shelter-in place recommendations when evacuation would be more appropriate. ***Realistic modeling assumptions and predictions are the key to the forecasting and implementation of appropriate and effective emergency response/evacuation plans.***

Page II-I-4 of the Town of Plymouth's Radiological Emergency Response Plan for the Pilgrim Station (Rev. 16, October 2005) states that aerial support for tracking the centerline of the plume will be provided by the federal government, upon request by MDPH. However, in the event of a fast-breaking

incident requiring immediate protective actions, such aerial support may not be feasible in the short-term. I do commend Entergy for deploying real-time offsite (site boundary) sensitive gamma radiation monitors in all overland directions, having field monitoring teams available to locate the plume moving offsite, and having its network of 125 thermoluminescent dosimeters (TLDs) located at distances out to 20 miles from the Pilgrim Station. But, as discussed at past NMC meetings, significant new affected populations may be located well-beyond the site boundary area (for example, the Pinehills will have 3,000 households concentrated approximately 4 miles south of the Pilgrim Station when full build-out is achieved in the coming years, and there is extensive commercial development currently taking place between the Exit 5 and 7 areas just west of Route 3, which will bring in larger populations into those areas). Moreover, any mobile teams dispatched from the Pilgrim Station may not always have complete access to where they want and need to go due to weather, congested road conditions, etc., and the TLDs do not provide real-time information about plume transport. Depending upon how and where the TLDs were sited, and notwithstanding the growing/changing population density in southern Plymouth County, certain meteorological conditions could cause the plume to be relatively narrow even at further distances from the Pilgrim Station and not be readily detectable by the deployed TLDs. I am not suggesting here that Entergy should deploy a lot more TLDs in the future. There are potential costs and impracticalities associated with implementing and maintaining an extensive grid of TLDs further away from the Pilgrim Station. That is another reason why air quality models have also been historically and traditionally required by regulatory agencies to predict airborne emission impacts over the entire receptor grid (e.g., out to a 10 and 50 mile radius per the USNRC). And, as reflected by our NMC Report, an upgraded regional meteorological monitoring and air quality dispersion/deposition modeling system could be used to improve forecasting for emergency preparedness/evacuation planning purposes, as well as reliable nowcasting, and hindcasting (what radiological doses did actually occur at various geographic locations in the unlikely event of an accident. Hindcasting may also be a very important tool for evaluating potential adverse health effects for those individuals who didn't or couldn't' evacuate, and for property insurance claim recovery/damage/clean-up purposes.

Entergy's Letter also discusses an excerpt from the NMC Report regarding not needing to conduct a detailed meteorological investigation of collected weather records over a multi-year period (also from a statistical standpoint) to determine the exact frequency of occurrence of variable wind conditions including abrupt wind shifts that are associated with either large-scale weather systems, or more localized regional weather patterns (e.g., sea breezes), and their associated causes from year to year. Entergy's Letter may have taken that excerpt out of context since it pertained to if one were trying to quantitatively determine (as opposed to qualitatively determine) how often such critical weather conditions occurred in the southern Plymouth County region. However, such studies could also prove to be useful in an air quality dispersion modeling forecast system as discussed conceptually during Dr. Egan's February 16th presentation.

Entergy's Letter also indicates that the Pilgrim Station is in compliance with current applicable USNRC regulations and guidance documents by having just its two onsite meteorological towers (primary and backup towers). However, from my review of the USNRC website regarding historical and updated NUREG-0654, and other cross-referenced USNRC regulatory guides and guidance documents, the USNRC guidance suggest that changes in the existing onsite meteorological monitoring systems could be warranted if they have not provided a reliable indication of meteorological conditions that are representative within the 10 mile plume exposure EPZ (see Attachment 1 below).

Conclusion

In closing, Entergy's Letter indicates that the Pilgrim Station is in compliance with applicable USNRC regulations and guidance documents, but would be willing to upgrade it's systems as discussed in the NMC Report if ever required by the USNRC. While that thought is commendable to

acknowledge by Entergy, it is interesting to note that on P. 25 of the 1979 President's Commission Report on the TMI accident, the Commission stated "we are convinced that, unless portions of the industry and its regulatory agency undergo fundamental changes, they will over time totally destroy public confidence and, hence they will be responsible for the elimination of nuclear power as a viable source of energy." That is interesting foresight that, in hindsight, may still apply to this day in that the USNRC still does not include emergency preparedness as a formal part of its relicensing regulatory protocol. Nor has the USNRC formally required the implementation of the kinds of meteorological/modeling systems recommended in the NMC Report and addressed in this letter, particularly for coastal-sited nuclear power plants, to help improve the accuracy and reliability of radiological dose predictions for both accident and routine plant releases. Such implementation could help serve to better satisfy a variety of USNRC regulatory program objectives which could then be applied to the relicensing of older existing nuclear power plants.

Sincerely,

Richard A. Rothstein

Richard A. Rothstein, CCM, QEP
Member, Plymouth Nuclear Matters Committee

Attachment 1

The attachment/excerpts below contain findings from my review of NUREG-0654 and the related cross-referenced NRC documents with respect to the meteorological monitoring/modeling considerations discussed in this letter. There appears to be some USNRC regulatory justification here that pertains to the possible need for expansion of Entergy's regional meteorological monitoring network (also in conjunction with an enhanced modeling analysis system). This USNRC regulatory guidance does not explicitly tell the licensee how to design such a regional meteorological monitoring network; the guidance simply identifies (in a general sense) the circumstances that could justify this needing to be done (either for the original plant license and/or for nuclear emergency preparedness planning and implementation purposes). As discussed at our NMC meetings, the onsite meteorological data, by themselves, may not always adequately represent the wind flow conditions throughout the 10 mile plume exposure EPZ. Those data may have sufficed in the past when the regional population was significantly less, but may now need to be expanded, also in light of the post-9/11 era we now live in with the growing amount of spent fuel stored on the premises.

USNRC Regulatory Excerpts:

Excerpts from NRC Regulatory Guide 1.23 (Safety Guide 23) Onsite Meteorological Programs - 1972

....."The number of locations on a site at which meteorological measurements are necessary will depend largely on the complexity of the terrain in the vicinity of the site. For example, the study of a hill-valley complex, or a site near a large body of water would require a larger number of measuring points to determine airflow patterns and spatial variations of atmospheric stability." ....Section 7. "Special Considerations" states that "at some sites, due to complex flow ptterns in nonuniform terrain, additional wind and temperature instrumentation and more comprehensive programs may be necessary. Also, measurements of precipitation and/or solar radiation may be desireable at some locations. Occasionally the unique diffusion characteristics of a particular site may warrant ue of special

meteorological instrumentation and/or studies. Proposed studies of this nature should be described in the application for a construction permit."

Appendix 2 "Meteorological Criteria for Emergency Preparedness at Operating Nuclear Power Plants" Excerpt from NUREG-0654 FEMA-REP-1 Rev. 1 November 1980 (document handed out at August Nuclear Matters Committee Meeting)

....."Each site with an operating nuclear power plant shall have a primary meteorological measurement system.....produce current and record historical local meteorological data.....data will provide a means to estimate the dispersion of radioactive material due to accidental radioactive releases to the atmosphere by the plant. The acceptance criteria for meteorological measurements are described in the proposed Revision 1 to U.S.NRC Regulatory Guide 1.23." ....."Near real-time, site-specific atmospheric transport and diffusion models shall be used when accidental airborne radioactive releases occur. Two classes of models are appropriate. The first, Class A, is a model and calculational capability which can produce initial transport and diffusion estimates for the plume exposure EPZ (Rothstein note: the plume exposure EPZ generally 10 mile radius from the plant) within 15 minutes following the classification of an incident. The second, Class B, is a numerical model which represents the actual spatial and temporal variations of plume distribution and can provide estimates of deposition and relative concentration of radioactivity within the plume expoure and ingestion EPZs for the duration of the release." (Rothstein note: the ingestion EPZ generally 50 mile radius from the plant. The Class A model is historically a simplistic "straight-line" model that uses the onsite meteorological data. The Class B model, depending upon its sophistication, could even rely upon multiple meteorological monitoring sites (both onsite and offsite) to account for wind field variations within the modeled region.

NUREG-0654 FEMA-REP-1 Rev. 1 Addenda, March 2002 (on USNRC Website)

....."The following citations replace the outdated citations referred to in Revision 1 to NUREG-0654 FEMA-REP 1".....

"Appendix 2, page 2-2 refers to "proposed Revision 1 to NRC Regulatory Guide 1.23" for acceptance criteria for meteorological measurements.....Supplement 1 to NUREG-0737 "Clarification of TMI Action Plan Requirements," January 1983, supersedes this citation."

Supplement 1 to NUREG-0737 "Clarification of TMI Action Plan Requirements," January 1983 (applicable excerpt follows):

" 6. Regulatory Guide 1.97 - Application to Emergency Response Facilities

6.1 Requirements

b. Control Room

.....Provide reliable indication of the meteorological variables (wind direction, wind speed, and atmospheric stability) specified in Regulatory Guide 1.97 (Rev. 2) for site meteorology. No changes in existing meteorological monitoring systems are necessary if they have historically provided reliable indication of these variables that are representative of meteorological conditions in the vicinity (up to about 10 miles) of the plant site. Information on meteorological conditions for the region in which the site is located shall be available via communication with the National Weather Service. These requirements supersede the clarification of NUREG-0737, Item III.A.2.2."

(Rothstein note: the above USNRC guidance would suggest that changes in the existing onsite meteorological monitoring systems could be warranted if they have not provided a reliable indication of meteorological conditions that are representative within the 10 mile plume exposure EPZ. These onsite meteorological data are also used in the emergency response Class A and B atmospheric transport and diffusion models referred to previously. Rothstein has been discussing the possible need for expansion of Entergy's regional meteorological monitoring network and enhanced modeling analyses at our NMC meetings since the onsite meteorological data, by themselves, may not always adequately represent the wind flow conditions throughout the 10 mile plume exposure EPZ

Entergy

Manager of Government Relations
Entergy/Pilgrim Station
600 Rocky Hill Road
Plymouth, MA 02360

February 7, 2005

Mr. Jeffrey Berger
Chairman, Plymouth Nuclear Matters Committee
Plymouth Town Hall
11 Lincoln Street
Plymouth, MA 02360

Subject: Nuclear Matters Committee Discussion of Pilgrim Meteorological Program

Dear Mr. Berger,

As a result of the Committee's discussions on the subject of the adequacy of the Pilgrim Station Meteorological monitoring/modeling program, I would like to offer the attached information summary for your use and consideration. Additional documents such as those referenced in the attachment either have been provided to the committee or will be provided to the committee upon request.

Sincerely,

Jack Alexander
Manager, Government Affairs

Attachment

cc: Mr. Ken Tavares, Chairman, Board of Selectmen
Mr. Mark Sylvia, Plymouth Town Manager

Response to the NMC on the Issue of Meteorological Monitoring

The Pilgrim Station Meteorological Monitoring System currently meets applicable NRC requirements. Two meteorological monitoring towers are available onsite and additional meteorological information is available through communication with the National Weather Service and from other offsite sources. A "Class A" meteorological model known as a Straight Line Gaussian Dispersion Model is presently available for use in estimating offsite dose rates and total doses in the event of a plant event which releases airborne radioactive material. This model uses information available from the on-site meteorological towers. However, meteorological monitoring and modeling is only an intermediate step in the process of assessing and projecting offsite dose. The parameter of interest is not the wind speed or direction, but the actual dose impact on the general public at any location of interest regardless of the meteorological model used. For this reason, actual field measurements of offsite dose rates and airborne concentrations of radioactive materials are also performed to provide definitive information on the location and magnitude of any offsite impact.

The Meteorological Monitoring Program proposed by the Nuclear Matters Committee (commonly referred to as a Class B model) was considered many years ago by the NRC but never became a requirement for Pilgrim or any other Nuclear Power Plant of which we are aware. In fact, the defining reference document on Radiological Emergency Response Plans for Nuclear Power Plants (NUREG-0654/FEMA REP-1, Rev 1) clearly states on page 2-9:

> "The Class A model designed to be used out to the plume exposure EPZ" (as used by Pilgrim Station) "may be used in lieu of a Class B model " (as proposed by the NMC) "out to the ingestion EPZ." This requires certain compensating actions which Pilgrim meets. (Parenthetical notations added for clarification.)

It is important to note that the operator of a nuclear power plant does not make any final protective action decisions for the general public. Nuclear power plants are required to make recommendations to the Governor for offsite protective actions under certain plant conditions and at projected offsite doses far below levels at which any adverse health effects have ever been demonstrated. Offsite Protective Action Recommendations are required to be made based on emergency plant conditions which are, in most cases, recognized prior to the start of any release of radioactive material. This process helps ensure that protective actions are initiated as quickly as possible and, in most cases, before any significant exposure occurs to the general public. Because of this, an elaborate system of meteorological monitoring stations is not required to determine the potentially affected population. In fact, in such cases, meteorological monitoring and modeling serve only as a secondary verification process that the plant-condition-based protective action recommendations are appropriate. The recommendation from the NMC to perform a "detailed meteorological investigation of weather records over a multi-year period" would add nothing to this process. However, a multi-year meteorological monitoring program was conducted prior to unit startup, and studies of wind patterns including wind roses and joint wind frequency distributions have been generated and submitted to the NRC for their review.

Offsite Protective Action Recommendations may also be made based on measured releases of airborne radioactive material from the plant under emergency conditions. In such cases, the magnitude and direction of such releases are determined from on-site meteorological measurements. However, due to the uncertainty of plume trajectory under any modeling assumptions, Protective Action Recommendations are made which include a circle (360 degrees – all directions) around the plant out to a certain distance and a wide wedge-shaped downwind area that encompasses the primary and adjacent compass sectors out to a much greater distance from the plant. This approach is known as the "keyhole" concept and provides reasonable assurance that appropriate population groups are protected even in the event of deviations of the plume from the initially indicated wind direction. The

meteorological system proposed by the NMC would not change this protective action methodology and would add little to its implementation.

However, methods for plume tracking and assessment of offsite doses are not limited to the meteorological monitoring systems and modeling software.

Real-time offsite radiation levels are measured at the site boundary in all overland directions by very sensitive gamma radiation detections systems which read out at the Emergency Operations Facility and also at the central office of the MDPH.

In addition, in the event of an actual or suspected release of radioactive material, field monitoring teams are promptly dispatched to locate the plume (regardless of the location and direction indicated by meteorological instruments) and make actual measurements in and around the plume centerline.

Finally, there is a network of over 125 thermoluminescent dosimeters (TLD) located at distances from 0 to 20 miles from Pilgrim Station that continuously monitor and accumulate background radiation levels. TLDs are widely considered the gold standard for measuring both shallow and penetrating dose to living tissue, and can be used to reconstruct dose profiles and distribution if warranted after an event.

The information obtained from any and all of these systems/equipment/methods is available to personnel from the Massachusetts Emergency Management Agency, Massachusetts Department of Public Health, Federal Emergency Management Agency, and NRC and may be used by technically qualified and responsible individuals to determine the extent and impact of any emergency releases from the site, and to support the determination of protective action directives by the Governor if required.

We believe that the meteorological monitoring and modeling program presently required by NRC regulations provides reasonable assurance that appropriate and timely protective actions can be made for the general public in the event of an emergency at Pilgrim Station. If, in the future, the NRC determines that a program similar to that proposed by NMC should become a regulatory requirement for all licensees, then Entergy will comply with that regulation.

Recommendations

to the

Board of Selectmen, Town of Plymouth

Regarding the Relicensing of the
Entergy Pilgrim Station Nuclear Plant
from the
Nuclear Matters Committee

Bill Bilodeau
Tim Devik
Art Gast
Joseph Keating
Dr. Sid Nirenberg
Mike Rocchi
Rich Rothstein
Russ Shirley
Paul Smith

Jeff Berger, Chairman
Mike Farraher, Vice Chairman

Plymouth, Massachusetts
January, 2006
Updated 3:00 p.m., 12/29/2005

Table of Contents

Title Page	Page 1
Table of Contents	Page 2
Introduction	Page 3
1. Issue: Evacuation / Sheltering-in-Place	Page 4
2. Issue: Spent Fuel Pool Conversion to Dry Cask Storage	Page 6
3. Issue: Risk Analysis / Insurance	Page 7
4. Issue: Environmental Impact	Page 8
5. Issue: Taxation (Spent Fuel et al)	Page 8
6. Issue: Health Impacts	Page 8
7. Issue: Alarms and Other Warning Technology	Page 9
8. Issue: Aging Components	Page 10
9. Issue: Economics	Page 10
10. Issue: National Alliance / Host Community Agreements	Page 10
11. Issue: Security	Page 11
12. Issue: Communications	Page 12
13. Issue: Negotiations	Page 12
Appendix A: Meteorology	Page 13
Appendix B: Nuclear Power Data	Page 15

Introduction.

When the Pilgrim Nuclear Station was built in Manomet in the 1970s, Plymouth was a quiet rural community with a small population that grew seasonally through tourism.

Today, Plymouth's year-round population has more than tripled and it has become a year-round "city" in fact if not by charter.

Entergy's Pilgrim Nuclear Power Plant affects Plymouth in many ways. It contributes in a small way (by historical comparison) to Town revenues. It employs hundreds of people, many of whom live here and spend their salaries at least in part within Plymouth's borders. It may well help the country and the world by eliminating the need to burn fossil fuel to generate electricity. (See *Appendix B* for more on the contribution of Pilgrim from a power generation standpoint.)

As advisors to the Board of Selectmen, we believe it is incumbent upon us to recommend a course of action for the Town in response to the relicensing process that meets five objectives:

- It must ensure the protection both of the people of Plymouth and of residents of nearby communities from any activities or events at Pilgrim that could otherwise endanger the health, lives, and property of area residents;
- It must protect the land, sea, and air from environmental harm;
- It must protect the people of Plymouth and residents of surrounding communities from the results of any attack on the plant;
- It must ensure that Entergy, like every other business located within the Town of Plymouth, pay its fair share of taxes to the Town; and
- It must ensure that the Town is justly compensated for the risks the Town continues to assume by the plant's storage of high- and low-level radioactive waste on-site, including the previously unanticipated amount of spent fuel.

The Town should also maintain an awareness of the $400-million "Reserve Fund" Entergy holds for decommissioning the plant. In our view, the Town should seek to hold or to control a portion of this approximately $400-million decommissioning fund, or at least share the interest income partly in lieu of taxes; more on taxes appears in section 5. If the plant is shut down, for whatever reason, Entergy could profit by an estimated $150-million over likely decommissioning costs -- in effect realizing a windfall if license extension is not obtained....

The Nuclear Matters Committee can <u>not</u>, in good conscience, recommend that the Board of Selectmen go on record as being "in favor" of relicensing Pilgrim unless the recommendations presented here are

addressed by Entergy, the Nuclear Regulatory Commission, and other relevant parties to the satisfaction of the Board of Selectmen.

The recommendations in this proposal can be elaborated upon by the NMC at the direction of the Board. Most recommendations may require additional work on the part of the NMC toward their implementation.

--- Nuclear Matters Committee

1. Issue: Evacuation / Sheltering-in-Place.

From many perspectives, it is clear that current evacuation plans, well-conceived and well-intended as they are, stand little chance of working in case of a rapidly evolving event.

The experience of New Orleans in the evacuation and sheltering for Hurricane Katrina, the experience of Houston in the attempted evacuation for Hurricane Rita (with advance warning), and our own experience with local truck tip-overs, the recent Friday afternoon whiteout, and gridlock following July 4 observances lead to the conclusion that *current evacuation plans do not pass any reasonable reality check.*

It is our collective opinion that in preparing for prospective disasters requiring evacuation, one should always prepare for worst-case scenarios.

It is "assumed" in current plans that teachers / administrators will retain up-to-date parent permission slips regarding Potassium Iodide distribution and that such data will be immediately available (along with KI doses) *at the time a disaster strikes*, so doses can be given instantly to everyone except those whose parents have opted out.

It is also assumed that school bus drivers (and other first responders) will stay in Plymouth (and not evacuate with their families), that they will be able to get to their buses quickly, that the buses will have clear sailing to schools to pick up students, and that the buses will deliver the students to host schools.

These may well be faulty assumptions, and all assumptions used in emergency planning must be reviewed in light of Katrina and Rita. In an age of telephones, cell phones, email, instant messaging, and talk radio, news of a nuclear problem at Pilgrim will travel at the speed of light. Consequently, it seems almost inevitable to us that:

- Bus drivers will be caught in gridlock attempting to get to their buses, if indeed they remain in Plymouth at all;
- There will be confusion in recordkeeping and dispensing of KI;
- School evacuations will be delayed – possibly by several hours;
- A number of parents will likely leave home to pick up their kids, exacerbating gridlock and promoting incremental confusion;

- Many kids will be left off at host schools, but their parents will be caught in gridlock – or, worse, waiting in Boston for P&B buses or trains to take them home from work, without any guarantee that either mode of transportation will continue operating to Plymouth and surrounding Towns.

The Pilgrim plant's sirens meet Federal requirements. Unfortunately those requirements stipulate that the sirens cannot be so loud as to endanger the hearing of those in close proximity. Consequently, sirens are often *not* heard inside homes, businesses, and automobiles, which means that many of the people the sirens exist to "warn" will never hear the warnings. Please see section 7 for more on alarms and other warning technology.

One of our members has expressed concerns about methodologies used to determine wind speed and direction during plant events. See *Appendix A* for details.

Here are our **recommendations** regarding evacuation and sheltering-in-place:

First: Require Entergy to fund the selection and hiring of a nationally recognized company of experts in evacuation to develop a plan that will work regardless of weather, compromises in infrastructure, transportation breakdowns, etc. The expert would be selected by the Board of Selectmen based upon recommendations by the NMC, and its work will be supervised by and under the management authority of the NMC and MEMA. Entergy's only involvement would be to pay the bills for the consultant, the development of the plan, and all its implementation costs. *Congress should compel an update of NRC regulations to require nuclear plant owner/operators to fund such plans including revisits every five years.* The lobbying effort (see #10, the *National Alliance* recommendation) should have that as a key objective.

Second: Plymouth's disaster plans must provide the Town, as well as surrounding Towns and MEMA, with advice and counsel from MEMA and Entergy and other appropriate agencies, sufficient to decide whether evacuation is appropriate or whether sheltering-in-place is a better alternative.

Third: *Plymouth must educate its people and its visitors that it is sometimes safer to shelter-in-place than to evacuate.* The Town has 36 shelters that can accommodate 44,685 people in need, and we believe that most Plymouth homes have basements that can be used for sheltering-in-place. Since "Sheltering-in-Place" requires homes to have on hand certain supplies, ensuring that those requirements are known to residents must be a component of any workable evacuation / sheltering plan.

Fourth: The Emergency Information Calendar mailed to all residences includes sheltering instructions, but our sense is that most residents look at the pictures but largely ignore the printed content. We feel the look of the Calendar should be changed radically (and immediately) so it truly *appears to be* the **Nuclear Emergency Information Calendar** that it is, and not primarily a nice collection of vintage Plymouth photography. People should want to retain it because of the potentially life-saving information it provides -- not for its photography. Please see item six in this section.

The CDC [Centers for Disease Control] also offers instructions for sheltering-in-place which we are told will soon be added to the Town's website.

Fifth: Once updated Evacuation Routes have been established, the Town in concert with its neighbors should post signs clearly defining the routes so when evacuation is required, there is no question about where/how – only when.

Sixth: "Evacuation Centers" must be revisited to ensure that they are adequately provisioned to care for all the individuals they may be required to host, for an extended period. See also section 7 regarding *disaster communications plans* and section 10 re: the *National Alliance.*

Seventh: As soon as practicable (see many details in *Appendix A*), Entergy must be required to work with the NMC and with Entergy's to-be-retained environmental consultants to design, develop, and deploy adequate and appropriate meteorological monitoring equipment and improved air quality dispersion models for implementation by January 1, 2007. This would be in addition to what is currently used at the Pilgrim Plant per NRC requirements. Objective: to help enhance the Town's airborne effluent plume tracking capability and to help make and assess reliable dose predictions.

Regardless of power losses or other interference, the enhanced system must have the capability to feed the Pilgrim plant, the EOC, MEMA, and Town officials 15-minute average encrypted data regarding meteorological and air quality conditions in sixteen 22.5-degree sectors or "cones" (N, NNE, NE, etc.) extending outward from the plant, a minimum of 10 miles in all directions.

Such an enhanced system must also provide a computerized, color-coded visual display of the airborne effluent plume location and potential radiological doses in real time, updated every 15 minutes to account for any changing meteorological conditions within at least 10 miles of the Pilgrim Plant.

The Plant effluent release scenarios built into the enhanced modeling system must be capable of accounting for both postulated NRC design-basis nuclear accident conditions, and other credible Plant effluent release conditions that could conceivably occur due to other circumstances (e.g., terrorist actions).

Lastly, the additional alarm towers recommended in section 7 could also possibly be used to gather meteorological data.

2. Issue: Spent Fuel Pool Conversion to Dry Cask Storage.

Every ounce of spent fuel ever used at Pilgrim is still housed here in Plymouth. This amounts to an unanticipated long-term risk to the Town.

Although Pilgrim has long maintained that its storage of spent nuclear fuel in pools of water is as safe as dry cask storage, Pilgrim (along with other plants) was recently directed by the NRC to disperse the "hottest"

rods throughout the spent fuel pool to reduce the pool's vulnerability in case of attack or other flaw that would damage the plant's ability to keep the rods submerged and properly cooled.

Pilgrim says it will run out of space in its spent fuel pool and be forced to start using dry cask storage after 2012, at the end of its current license.

For background purposes . . . spent fuel cannot be stored in dry cask containers until it is at least five years old. Consequently, just as is the case today, a certain amount of "hot" spent fuel will *always* be in the spent fuel pool. Critics of dry cask storage cite that heat loading is a function of isotopic decay . . . for example putting all spent fuel more than five years old in dry casks will put 90% of the plant's spent fuel bundles "outside," but only 10% of the *significant* radioactive material goes with it. The significant material is in a "significantly" structured building, shielded under water, with multiple cooling sources.

Here are our **recommendations** regarding spent fuel:

First: Leverage the formal National Alliance proposed in section 10, along with our Congressional contacts, to greatly intensify lobbying for a national solution to spent fuel storage, whether that solution is in Yucca Mountain, Nevada, or elsewhere.

Second: Require as a condition of relicensing that Pilgrim commit to implementing a plan for the movement of spent fuel (five years old or older) into dry cask storage by the end of its current license.

Third: Require that Entergy's program and technical plans for dry cask storage shall be made available to the NMC and be discussed, in closed session if necessary, and reviewed prior to implementation.

Dry cask storage is above-ground technology.

3. Issue: Risk Analysis / Insurance.

Most (if not all) homeowners insurance policies explicitly exclude radiation hazards as a covered risk, regardless of cause.

Any accident or event that releases significant amounts of radiation into the environment runs the risk of making homes and properties unusable and essentially valueless. The desirability of Plymouth as a place to live and work would be depreciated. In most cases financial devastation would follow the loss of this property even if the evacuation was successful and there was no loss of life.

Although the Price-Anderson Act purports to address this matter, limits exist and the reliability of the program has yet to be tested.

Here is our **recommendation** concerning risk analysis / insurance:

The Town should obtain expert risk assessment / analyses, perhaps by using people recommended by The Society of Registered Professional Adjusters (the professional association of insurance claims adjusters), so it can successfully address the question of how these risks may be adequately insured, how fair and rapid

indemnification would be accomplished, and how effective government response might be. The people of Plymouth and surrounding communities must be protected against such financial disasters.

4. Issue: Environmental Impact.

Cooling water and atmospheric vent discharges from Pilgrim station shall comply with the requirements of the EPA and any other governmental authority having jurisdiction.

5. Issue: Taxation (Spent Fuel et al).

Due to deregulation, Entergy pays greatly reduced local taxes. The valuation of Pilgrim for tax purposes must be revisited, as must its tax status, as a direct consequence of the plant's decision to seek relicensing. As a prospectively going concern until the year 2032, Pilgrim is worth far more than its assessed valuation of $128-million.

Here are our **recommendations** regarding taxation:

First: Leveraging the capabilities of the office of the chair of Senate Ways and Means (Sen. Therese Murray of Plymouth), Town Counsel, and other political/municipal entities as directed by the Board of Selectmen, we feel the Board of Selectmen should orchestrate the investigation of legal avenues under which the Town could draft, enact, and enforce updated taxation of the Plant as a business – taxed equitably with other businesses in Town.

Second: At the direction of the Board of Selectmen, the NMC could tap the *National Alliance* referred to in section 10 to see what other communities are doing in this subject area.

Third: The Town of Plymouth assumes substantial liabilities by virtue of the presence of tons of spent fuel rods within its borders. It was never the Town's intent to become such a storage location for this amount of spent fuel, which is the *de facto* case today. It must be equitably compensated for this liability, in addition to other forms of taxation / compensation noted in this section. See also section 9 on *Economics*.

6. Issue: Health Impacts.

The Nuclear Matters Committee recognizes public concern about cancer rates in Plymouth and surrounding Towns. An attempt was made to obtain up-to-date incidence rates for various cancer types from the Massachusetts Department of Health Cancer Registry. The statistics obtained have not been totally reassuring in that they did show what appear to be *increases in the incidence rates for a few cancer types over the expected averages*. Although the pattern and distribution of elevated diseases does not appear to be consistent with the hypothesis that radiation is the causative agent, the significance of this data is, at this point, quite unclear. Also, there is no demonstrable causative relationship of any of these findings to the power plant at this time.

Here is our **recommendation** regarding cancer and other health issues:

At the request of the Board of Selectmen, the NMC can request further and more detailed study of the incidence figures to determine their significance and possible cause. Further assistance can be had from the Massachusetts Bureau of Health Assessment and the Massachusetts Cancer Prevention and Control Program.

7. Issue: Alarms and Other Warning Technology.

As noted in section 1, although the Pilgrim plant's sirens meet Federal requirements, unfortunately those requirements stipulate that the sirens cannot be so loud as to endanger the hearing of those in close proximity. Consequently, sirens are often *not* heard inside homes, businesses, and automobiles, which means that many of the people the sirens exist to "warn" can and will never hear the warnings.

Sirens represent a warning system that is both inadequate and ineffective – but one which must be retained to get the message through to those who *can* hear. It's clear to us that additional warning technology must be utilized if warnings are to have any desired effects.

Our **recommendations** regarding alarms and other warning technologies are:

First: The Town already is working on a "reverse 911" system as a result of the recommendations of the Plymouth Homeland Security Working Group. The system is GIS- [Geographic Information System] operated through the Plymouth County Sheriff's department, and would be capable of alerting one street, one Town block, or one whole sub area to shelter or to evacuate. We feel this system should be implemented as quickly as possible and that it should have the capability of notifying everyone in Plymouth within no more than three or four hours – preferably less. This system should be capable of making phased[1] multilanguage calls (English, Spanish, Portuguese) to *all* evacuation areas (see section #1, *Evacuation*) throughout Town *and beyond*, in cooperation with the Sheriff's department. And it should be capable of TDD data transmission to alert the hearing impaired.

Second: We would like to see an "Amber Alert"-style broadcast system on all radio and cable TV stations broadcasting to Plymouth subscribers, which would not only broadcast evacuation warnings but also advice for sheltering-in-place.

Third: Based upon anecdotal evidence from many residents and upon comments made at our recent hearing, we believe that the early warning siren system needs additional towers throughout the Town. It seems to us that towers are too far apart to provide adequate warning to most Town residents.

Fourth: By law, all businesses and places of public accommodation (restaurants, offices, hotels, etc.) throughout the mandated evacuation areas must *conspicuously* post notices regarding what the nuclear alarms mean, and what people should do if/when they hear nuclear warning sirens. Malls must use PA systems to

[1] "Phased" is used here to mean within a specific geographical "cone" targeted for evacuation.

accomplish notification. The NMC, acting at the direction of the Board, could prepare copy for such notices / announcements and make it available to businesses via the Town website.

Fifth: Plymouth and surrounding Towns must ensure interoperability of radio communications for the purposes of command responsibility and overall coordination.

Sixth: Develop and deploy *disaster communications plans* which can be used by police and public works agencies to help ensure orderly evacuations or sheltering. Disaster plans always work better if they are created before disasters happen, rather than on-the-spot when they are urgently needed. "Disaster Communications" are the things officials will say and the instructions they will provide when disaster strikes.

8. Issue: Aging Components.

Industry standard practice in the nuclear power industry is to monitor for failures and to take appropriate action when they happen. We are concerned, however, about what happens in case of *catastrophic* failures (for example, to the shroud or reactor vessel) that may be age-related, which can yield severe results in the unlikely event that they occur.

Our **recommendations** regarding aging components are:

First: As part of the relicensing process, Entergy must submit for NRC review its aging components analysis. The NMC should provide an independent review of this analysis and advise the Board of Selectmen on it.

Second: It is our sense that as an integral part of relicensing, the NRC must require Entergy to adopt and pursue a vigorous *accelerated program of inspection* of all critical components.

9. Issue: Economics.

Industry experience in Waterford Connecticut and Wiscasset Maine indicates that host communities have had to go to court to compel nuclear power companies to pay their fair share of revenue to host communities. We should be prepared to follow that course, if necessary.

10. Issue: National Alliance / Host Community Agreements.

A "Host Community Agreement" is simply the name for an agreement entered into by a power plant and the community where it is located. Although we found "Host Community Agreements" with other businesses, we found none specifically for nuclear plants. Our sole suggestion here is that any agreement entered into between Entergy and the Town of Plymouth be called a "Host Community Agreement." Moving forward, we may have additional recommendations regarding the full context of such an agreement.

Here is our **recommendation** concerning the "National Alliance of Nuclear-Impacted Communities":

First: The Nuclear Matters Committee should be authorized to access and leverage the power of senior Massachusetts office holders in the United States Senate and the House, as well as our own state legislators, to develop formal alliances with every community in the nation that "hosts" a nuclear power plant. Objective: *as a block, formally lobby Congress to compel the Nuclear Regulatory Commission to require truly workable evacuation plans as a prerequisite to licensing or relicensing all nuclear power plants nationwide.*

The NRC says it "constantly" checks the adequacy of local evacuation plans and therefore need not make them part of the relicensing process. Its actual refusal to consider evacuation, however, as part of the relicensing process in our opinion clearly endangers millions of American lives from coast to coast should a series of terrorist-induced "events" occur simultaneously at several facilities around the country, which is the established terrorist pattern. Evacuation is an essential, life-saving option. We feel that today, the NRC ignores it at the peril of millions of American citizens.

11. Issue: Security

It's clearly the case that Pilgrim Station is critical infrastructure. "Critical infrastructure" consists of more than simply the plant itself. Anything which if compromised by either terrorism or accidents or an Act of God could cause harm either to the plant or to the surrounding area constitutes critical infrastructure. *Entergy must be compelled to protect all its critical infrastructure from the possibility of accidents or terrorism.*

Massachusetts law allows for critical infrastructure information to be communicated in closed session, since it deals with security issues. The Nuclear Matters Committee would certainly maintain the confidentiality of this information.

When the plant held a drill last Summer, its Wackenhut security forces were "attacked" (tested) by other Wackenhut security forces. Further, the exercise was graded by *Wackenhut.*

Wackenhut is a private security company. Despite the fact that plant security is in contact with the Department of Homeland Security and NORAD either on a regular or on an as-needed basis, it is our distinct impression that plant protection is ineffectively evaluated: self-evaluation is an inherently flawed system.

Moreover, plant security is based upon the Nuclear Regulatory Commission's so-called design basis threat. Terrorists, however, have no "design basis". They take a blue sky approach to terrorism planning and could do anything at any time -- by land, sea, or air.

Here are our **recommendations** regarding security:

First: The security of all nuclear power plants throughout the United States should be the responsibility of the Department of Homeland Security, which is on record as opposing taking on that responsibility. We feel that the Town of Plymouth should endeavor to leverage the National Alliance mentioned earlier to enlist the aid

of Congress to *require* the Nuclear Regulatory Commission and the Department of Homeland Security to make DHS responsible for the security of nuclear power plants throughout the United States.

Second: We believe strongly that self-evaluated drills of the type held last summer at Pilgrim are inherently flawed from a security measurement perspective. Again, we believe that the Nuclear Regulatory Commission should be compelled by Congress, perhaps through the lobbying of the aforementioned National Alliance, to prohibit this particular type of drill. *Attacking forces challenging the security teams of nuclear power plants in the United States should be organized and orchestrated by the military to ensure that the challenge is something other than perfunctory.*

Again, the Nuclear Matters Committee, despite the fact that it has expertise in a wide range of areas, is not expert in security. Nonetheless, should the Board of Selectmen desire, we would be pleased to work to develop a National Alliance (see section 10) and to contact members of our Congressional delegation on your behalf in an effort to ultimately compel the Nuclear Regulatory Commission to enhance the design basis threat, and to improve the level of security at Pilgrim and at all other nuclear plants nationwide.

12. Issue: Communications.

Since early 2005, our communications with the plant have been productive. Questions have been answered with negligible obfuscation, and subject matter experts have been brought in to address specific questions. We hope this trend continues since it is essential to a productive relationship between the Town and the plant.

13. Issue: Negotiations

Many of the objectives expressed in this document require close cooperation between the Town and Entergy. Accomplishing those objectives requires seasoned negotiating skills and (preferably) in-depth experience in the nuclear power field. With your agreement, we could search for and recommend a skilled, seasoned nuclear negotiator.

We expect this negotiating process, like many other negotiations, will not be quick or easy. In fact, last May, according to the *Rutland Herald*, Entergy said of taxing spent fuel stored at Vermont Yankee:

"Any significant tax which has never been contemplated and never been discussed will place a severe financial burden on this plant ... and will call into question its viability to the end of its current license," Entergy regional executive Ken Theobalds told the House Natural Resources Committee. The clear message was that if Entergy does not get authority to store spent fuel in Vermont through 2012, it would close Vermont Yankee, which employs 600 people in Windham County.

Entergy clearly wants to keep Pilgrim open. We need a skilled negotiator to ensure that the Town is properly protected and adequately compensated if it successfully relicenses this plant.

Appendix A: Meteorology

A Certified Consulting Meteorologist who is a member of our committee has expressed concern about the adequacy of meteorological monitoring as it is currently employed at Pilgrim.

One of the ways through which emergency authorities determine what areas should be evacuated in case of an emergency is by measuring wind direction and speed. However, the only two places where Entergy currently measures these are on its property -- at the plant.

Consequently, Entergy today receives clearly inadequate regional data regarding wind speed and direction, making virtually useless its judgements concerning the movement of prospectively lethal clouds based upon input from just its current onsite meteorological data. Objective: valid data in, valid data out (as opposed to garbage in, garbage out).

For reasons discussed below, our Committee's meteorologist has consistently maintained that variable wind conditions over time and space, likely in this coastal, hilly terrain area, makes resultant predictions of the movement of lethal airborne materials based on just onsite meteorological data (with simplistic "straight-line" air quality dispersion models) *absolutely unreliable for evacuation planning purposes.*

On the one hand, during moderate to strong wind conditions such as those associated with coastal storms, approaching warm fronts, or after the passage of cold fronts, the wind direction throughout the region should be fairly uniform as would be depicted from one or more meteorological towers, e.g., the one at Plymouth Airport or at the Pilgrim Plant site. *However, abrupt wind direction shifts and wind speed changes can occur during the passage of such large-scale ("synoptic scale" in meteorological terms) weather systems throughout the region.* When wind speeds start to get lighter (e.g., below 5-10 mph), and depending upon the time of day and season, the terrain will also affect regional wind patterns in a more pronounced manner. During the spring and summer months whenever day-to-day large-scale regional weather influences are absent (storms and fronts), strong temperature contrasts between the warmer land and colder Cape Cod Bay can result in sea breeze conditions on sunny, fair weather days. At times, sea breeze influences can penetrate miles inland. Weaker land breezes can also occur during other times, particularly at night, when the land surface is colder than the water body surface. Shifting wind patterns (including temporary stagnations, recirculations, and wind flow reversals) can occur during these daily sea and land breeze conditions, and can persist for several hours.

The exact *frequency of occurrence of variable wind conditions* including abrupt wind shifts that are associated with either large-scale weather systems, or more localized regional weather patterns (e.g, sea breezes), and their associated causes from year to year would require a detailed meteorological investigation of collected weather records over a multi-year period (also from a statistical standpoint).

On a qualitative basis, however, our Committee meteorologist (who also serves as a volunteer storm spotter for the National Weather Service in Taunton, MA) believes that variable wind conditions including abrupt wind shifts that he has described above can occur several times each week on average in the southern Plymouth County region.

Additional Background Considerations re: Meteorology from Committee Member, Richard A. Rothstein, CCM, QEP:

The Pilgrim Plant's onsite meteorological tower data, by themselves, may not always adequately represent the wind flow conditions throughout southern Plymouth County. Geographic variations in wind fields can have a profound effect on the location and magnitude of predicted radionuclide concentrations and resultant doses received from a postulated nuclear plant accident. Considering the rapidly growing regional population, it should be determined if there is a potential need for additional regional meteorological monitoring stations to be installed and included as part of Entergy's emergency planning program. It should also be determined if there is a potential need for Entergy to upgrade their "straight-line" air quality models that have been used in the past with more advanced variable trajectory models that can use either single station or multiple station meteorological data. Such advanced modeling systems currently exist in the scientific and regulatory community and can be applied, if necessary, regardless of what current USNRC regulations require permit applicants/existing licensees to use as a minimum. Understanding and planning for potential consequences of postulated (and realistic) accident release scenarios in a technically accurate and reliable manner can serve as a useful emergency planning forecasting tool, as well as a "hindcasting" tool, that is, what radiological doses did actually occur at various geographic locations in the unlikely event of an accident.

Committee members recently attended a "fact-finding" meeting with cognizant Entergy staff at the Pilgrim plant to try to gain a better understanding of what models and meteorological databases Entergy currently uses for emergency preparedness/evacuation planning purposes. The Committee is trying to be in a better position to advise the Town Board of Selectmen on the adequacy of the current set-up.

The Committee has just started to evaluate its findings from this recent meeting with Entergy, and a follow-on meeting at the EOF to continue this fact-finding is anticipated in the near future. However, the following preliminary recommendations can be made at this time:

If improvements to the current set-up are warranted, it could require considerable time and resources to quantify, develop, and implement the specific meteorological data acquisition/air quality modeling program upgrades that would then also need to be integrated with other components of the emergency planning program. Such actions may also require Entergy to retain an outside independent specialized environmental consulting firm to support such study efforts, with Commttee members potentially serving in an advisory/review capacity. Moreover, if program improvements are warranted, the Town should recommend that as a condition to the

relicensing process (and, with USNRC concurrence, if possible) following the appropriate regulatory protocols, or via other binding agreements reached with Entergy outside of the relicensing process.

Appendix B: Nuclear Power Data

Operating Plants, Percent of Electrical Capacity
(Source: New York Times Almanac 2002, pg 366)
U.S. 104 Operating reactors
754 Gigawatt Hours - 20% of total electrical power
France 59 reactors (80%) Japan 53 reactors

Local (NStar) Power Sources
(*Source: September 2005 Residual Billing Insert)*

Natural Gas	34%
Nuclear	29%
Coal	15%
Oil	12%
Hydro	5%
Miscellaneous	5%

U.S. Power Generation

Coal*	54%
Nuclear	20%
Gas*	16%
Hydro	7%
Oil*	3%

*CO2 "Greenhouse Gas" Emitting, 73%

{END}