

50-247/286

Before the
UNITED STATES NUCLEAR REGULATORY COMMISSION
Washington, D.C. 20555

In the Matter of: :
: :
ENTERGY NUCLEAR OPERATIONS, :
INC. :
(Indian Point Nuclear Generating Unit, :
Units No. 2 and 3) :
: :
: :
: :

DOCKET No. _____

Licenses DPR-5, DPR-26
and DPR-64

June 3, 2003

RICHARD BLUMENTHAL, ATTORNEY GENERAL
OF THE STATE OF CONNECTICUT,
Petitioner

SUPPLEMENT TO SECTION 2.206 REQUEST FOR REVIEW OF
INDIAN POINT ENERGY CENTER UNITS 2 AND 3

On April 24, 2003, the Petitioner, Richard Blumenthal, Attorney General of Connecticut, filed a petition pursuant to 10 CFR §§ 2.206 and 2.202 (the "Petition"), urging the United States Nuclear Regulatory Commission take immediate action with regard to certain security and other emergency preparedness issues at the Indian Point Energy Center, a multi-reactor nuclear power station in Buchanan, New York. The Petition identifies several specific interests that the State of Connecticut has with regard to emergency planning at Indian Point, including the impact on the already overburdened transportation infrastructure in southwestern Connecticut of the evacuation of large numbers of people from New York. Additionally, Connecticut has a stake in emergency

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response issues at Indian Point because it appears virtually certain that, in the event of an attack or accident at the facility, large numbers of Connecticut residents in cities and towns near the New York border would voluntarily relocate. Finally, the Petition demonstrates that, in the event of a deliberate attack on Indian Point, significantly greater amounts of radioactive material could be released than current plans account for and that this material has the potential to follow prevailing air currents into Connecticut.

Since the Petition was filed, certain new information has become available which directly addresses issues raised therein. Specifically, one of the issues of great importance to the State of Connecticut is the likelihood of a significant "shadow evacuation," *i.e.*, the voluntary evacuation of people not ordered to leave by government officials. This problem has been extensively considered in a careful and independent analysis of the largest evacuation in U.S. history, the evacuation associated with Hurricane Floyd. The Kennedy School of Government at Harvard University has recently published "Safe But Annoyed: The Hurricane Floyd Evacuation in Florida." ("KSG Report," attached hereto as Exhibit 1.) This study is important because it is the most direct, pertinent study available evaluating the effects of mass evacuations. Furthermore, the study clearly shows that many of the basic assumptions underlying the Indian Point evacuation plan are simply not correct.

As the study notes, governmental authorities in Florida have had extensive experience in hurricane evacuation (approximately 150 hurricanes between 1884 and 1999). KSG Report, p.4. Based on this deep reservoir of experience, officials issued timely notification before Floyd was to strike and expected 1.5 million people to evacuate. KSG Report, p.2. In reality, "at least a

million more” did so. *Id.* A subsequent federal study found that large numbers of people not ordered to evacuate did so, specifically, up to “23 percent of households in non-surge zones near the coast and 22 percent in non-coastal areas – nonetheless evacuated. In the emergency management business, this non-mandated level of departure is known as a ‘shadow evacuation.’” KSG Report, p. 10.

This issue is of obvious importance with respect to Indian Point. As with the Indian Point plan, the Florida officials “had gone so far as to prepare statistical samples, based on surveys, to determine what percentage of those asked to evacuate would actually do so.” KSG Report, p.4. This step was, in fact, a critical element of the plan because “estimating compliance levels with evacuation orders” is related to official “estimates of ‘clearance’ times – the time it would take for evacuation traffic to clear and residents to reach safety.” *Id.* Even though officials had their years of experience, statistical studies and several days warning of Floyd’s approach, the result was “huge traffic jams” due to pervasive congestion and extensive delays. KSG Report, p. 10.

The Hurricane Floyd experience is of direct relevance to the emergency evacuation plan at Indian Point for the obvious reason that a release of nuclear material at a power station in a densely populated area will, without doubt, initiate a voluntary evacuation of at least the order of magnitude as that caused by a hurricane, if not more, particularly if the release is due to a terrorist attack. This additional mass of evacuees is not accounted for in existing emergency plans and poses a material risk of jamming the southwestern Connecticut road system that cannot safely and efficiently transport even normal daily traffic. Further, prevailing winds, which move

from New York to Connecticut, threaten to push any released radioactive material directly over these very same roads. Existing emergency plans, therefore, direct people onto an inadequate road system which may be contaminated and fail to account for the actual number of people who will probably evacuate and clog precisely those roads.

Beyond the issue of shadow evacuation, the KSG Report is also helpful as direct evidence relating to the issue of family separation. As noted in the Petition, existing plans at Indian Point assume that parents living in the affected areas will evacuate out of the EPZ when ordered and trust county government to take care of their minor children still at school. Not only is this absurd, but the KSG Report clearly demonstrates the contrary. In the case of Hurricane Floyd, even the emergency workers who were supposed to stay and assist with the evacuation effort while their families left for safety, chose to abandon their duties and leave with them:

It was a problem for us with the people that staff the shelters and for people that might maybe do something else. Maybe they're highway workers. They live in manufactured homes and they say "I gotta go." It turns out that you cannot expect families to split up, for one to stay and work while the rest of the family takes off somewhere.

KSG Report, p. 12. Emphasis added.

Finally, regarding the issue of the design basis threat ("DBT") governing evaluation of security at nuclear power stations, a recent published news report attached as Exhibit 2 hereto states: "Before the 9/11 attacks, plant owners were required to provide personnel capable of repulsing an attack by no more than three armed intruders." *U.S. News & World Report*, April 28, 2003, p. 47. Perhaps in acknowledgement that such a DBT is hardly robust, NRC did, in fact, order additional strengthening of security at nuclear plants. However, as the same article

points out, since these new requirements went into effect, at "a plant in Nebraska, 150 rounds of ammunition passed through an X-ray machine undetected; in Alabama, a guard failed to check vital access doors and then lied about it." *Id.*

Consequently, in order to provide the NRC with the most complete information available in order to process the Petition, the Attorney General respectfully files the aforementioned documents as supplements to Petition filed April 24, 2003.

PETITIONER



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Safe But Annoyed: The Hurricane Floyd Evacuation in Florida

On Monday, September 13, 1999, a hurricane as large as any in the state's history approached the Florida peninsula. As Hurricane Floyd threatened to make landfall, officials at the state's Division of Emergency Management believed they had devised a practical, if extensive, plan for a large-scale evacuation of those areas at risk of severe damage from the storm. Because the hurricane seemed likely to effect different parts of the state at different times and, it was thought, in different ways, the massive evacuation was envisioned to occur in stages. Limited evacuation from the southeastern part of the state would be followed by more extensive evacuation in the central and northern parts of Florida's East Coast. This staged evacuation, along with early warning, would, it was thought, allow enough time to achieve the emergency planners' crucial goal: to ensure efficient "clearance, or the complete movement of all those in harm's away from their homes, off the highways and into sheltered locations, before the storm hit." Protection could take the form of public shelters, hotels, motels, or the homes of friends and relatives outside the "impacted" area.

Four days later, the evacuation and return of 2.5 million Floridians had been completed. It was part of a four-state (Florida, Georgia, North and South Carolina) evacuation that was, in terms of the number of people involved, the largest in US history. There had been no storm-related casualties in Florida. Hurricane Floyd had, as it turned out, virtually bypassed the state completely, its 140-mile per hour winds skirting the peninsula, just off the coastline. (The storm—particularly, storm-related rain—did cause flooding in other states, particularly North Carolina.) Yet far from being hailed as a prudent step that had turned out for the best, the Hurricane Floyd evacuation provoked sharp public outcry. Instead of a smooth "clearance", mammoth traffic jams had left motorists stuck, in many instances, on bumper-to-bumper interstate highways for 10 hours

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or more, in order to complete drives to safety they expected would last two to three hours. As ABC News would put it, many evacuees were "safe but annoyed." Many expressed or implied doubt that the evacuation was really necessary, or that it was handled well. "After five hurricanes in three years," complained one representative radio talk show caller, "you think they'd have a clue about getting people out of danger." Such pique stemmed from the fact that in general, clearance times had proven to be far higher than officials anticipated. For their part, however, officials were less concerned about public annoyance than the possibility that traffic jams could have proven deadly; they were cognizant of the fact that, had the storm tracked inland, thousands of Florida residents might have been exposed to its impact with nothing more than the flimsy protection of their cars, as they crawled along the interstates.

Even before the evacuation was over, some local elected officials had begun to respond to public outcry by calling for more efficient evacuation procedures—in particular, the "reverse-laning" of interstate highways such that lanes on both sides of the road could be used by evacuating traffic. At the same time, emergency management officials were well aware of the fact that, although they had issued orders expected to lead 1.5 million people to evacuate their home, at least a million more had done so. Officials were left to figure out what had caused an evacuation far more extensive than the one they had anticipated and how they should respond to calls for change.

Emergency Management in Florida

In part because of the regular threat of hurricanes and their impact on a state surrounded on three sides by water, the emergency management system in Florida was well developed. In some ways, it was a decentralized system. Each of the state's 67 counties had its own director of emergency management. Although Florida law gives the authority to issue evacuation orders only to the state's Governor, an executive order had, in 1988, delegated that authority to the chief elected officials of counties and municipalities (mayors and the chairs of county commissions.) But local officials worked closely with officials in the state capital of Tallahassee. No evacuation could be ordered anywhere in the state absent an Executive Order, issued by the Governor, formally declaring the existence of a state of emergency. Absent such an order, no county could begin its disaster response—whether that response was to order an evacuation, to open public shelters, or to order the closing of schools or businesses. As a practical matter, the key decisions about how to respond to disasters were made by local directors of emergency management. Says one county emergency management director: "It's a rare elected leader that would go against that recommendation."

The big picture planning for disasters, however—undertaken to prepare for disasters, not in response to one that was looming—was the responsibility of the state Division of Emergency Management in the Department of Community Affairs. The Division was set up to prepare and to

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coordinate response to a wide range of potential disasters. Its work was divided amongst three major divisions. Each could be seen as corresponding to a different stage of a potential disaster.

The Office of Policy and Planning had the big-picture "before" responsibilities—envisioning, long before any specific threat loomed, what sorts of potential natural or manmade disasters Florida faced and then developing general plans for coping with those threats. If planners determined, for instance, that the best potential response to severe weather was a marked increase in the number of public shelters in the state, the office would include proposals for the funding of such shelters in a plan it would develop and submit to the Governor's office. If such funds were ultimately included in the state budget, counties would apply for grants for the actual construction or improvement. Notably, the Bureau extensively distributed information designed to help households decide whether or not to evacuate in the event of a major storm and what sorts of provisions to stock in order to remain safely at home, rather than evacuating. "Which path should you take?" the literature asked. "Do you live in a vulnerable area? Have you been asked to evacuate? Every Floridian should develop a family preparedness plan well in advance of a storm threat," the Bureau urged. Such a plan would not only provide for a supply of drinking water and non-perishable foods but encourage efforts to storm-proof existing homes and to purchase new homes built to withstand high winds.

The Bureau of Recovery and Mitigation was the "after" portion of the state response, the vehicle through which post-disaster relief funds were to be channeled to counties and individuals, as well as the bureau responsible for developing new approaches designed to reduce the potential impact of future disasters. Inevitably, some of this bureau's activities in response to the last storm began to take the form of a "before" response to the next storm. For instance, Recovery and Mitigation offered technical training for county building officials as to how to evaluate and improve structures that might be pressed into service as public emergency shelters, such that they could withstand high winds or water.

But it was the Bureau of Preparedness and Response which stood most clearly on the front lines of the state's reaction to an imminent disaster, through the coordination of response to actual emergencies, as they arose, through what was known as the Regional Evacuation Procedure. From its base operations in the state's ECC—its Emergency Command Center—in the state capital, the Bureau alerted county emergency management directors that a formal state of emergency was imminent and initiated a series of statewide (and even inter-state) conference calls in which dozens of county officials would discuss the nature of the appropriate response. What's more, Preparedness and Response would direct state agencies—ranging from law enforcement to transportation—to take actions to support the plans implemented by county officials. It was here that lay the heart of response to an actual emergency, particularly the approach to evacuation.

In the case of hurricanes, the Bureau had studied a wide range of scenarios, in order to provide advice to local officials. Specifically, the Bureau had estimated how many households

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would be affected by storms of various magnitudes—ranging from the weakest so-called Category 1 storm, to the strongest, so-called Category 5 storm (as measured on the Saffir-Simpson hurricane rating scale). The estimates considered potential damage from severe flooding and water damage, known as storm surge and largely confined to immediate coastal areas, as well as wind damage, which could reach far inland. The potential impact of various types of storms had led the Bureau to estimate how many people would have to be ordered to evacuate, depending on the strength of the storm. Those estimates were tempered by the knowledge that, historically, some number of Floridians had chosen not to evacuate, despite orders that they do so. To take such behavior into account in its models, the Bureau had gone so far as to prepare statistical samples, based on surveys, to determine what percentage of those asked to evacuate would actually do so. The combination of estimating the impact of a storm, and estimating compliance levels with evacuation orders, had led state officials to their estimates of “clearance” times—the time it would take for evacuation traffic to clear and residents to reach safety—and thus how much in advance of a storm’s potential impact an evacuation would have to start.

More broadly, the Bureau divided the response to major disasters such as hurricanes into four parts: decision-making (whether or not to declare an emergency, whether to order an evacuation and a determination of the extent of the evacuation); traffic management; sheltering; and emergency public information. Notwithstanding the resources available at the state level, it would, in the face of an actual emergency, always fall to county emergency management officials—each of whom had his own staff and emergency command center—to make the difficult call as to when, and to what extent, an evacuation should be called for and, significantly, to make sure the right information got to the public as a hurricane approached.

Floyd Approaches

Hurricanes have, historically, posed a threat to Florida. Between 1884 and 1999, the state was struck by an estimated 150 hurricanes of all types, as well as 260 tropical storms. Hurricanes which strike Florida, moreover, bring with them not only winds as high as 150 miles per hour but extremely high storm surge of ocean water—surges of a magnitude, by some estimates, exceeded only by the impact of cyclones from the Indian Ocean on Bangladesh. Such surges threatened to inundate low-lying areas, which had, in recent years, been heavily built up with resorts, marinas, and new homes. Construction had extended even to highly exposed coastal barrier islands. The fact that so many Florida residents (7 million of 11.5 million) lived so close to either the state’s east or west coast, combined with the fact that the Florida peninsula was narrow meant there were a limited number of sheltered inland locations in the state. Thus, the National Hurricane Center (in Miami) had concluded that Florida was the state in the US most vulnerable to hurricanes.

Such longstanding vulnerability notwithstanding, the perception of hurricane threat in Florida in the 1990s was profoundly reinforced by one storm. Hurricane Andrew, which struck

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south Florida in 1992, was, by any measure, a disaster of major proportions—leaving in its wake 26 dead, 160,000 homeless, and some \$25 billion in property damage. Although Andrew spared the central and northern parts of the state, its virtually unprecedented devastation¹ affected attitudes toward hurricanes statewide. Andrew had, in fact, precipitated aspects of the high-level storm preparation which was in place with the approach of Floyd.

Soon after it was being tracked as a tropical storm, at the start of the second week of September, 1999, Floyd was being specifically compared with Andrew—and judged to be larger and potentially more dangerous. As early as September 9, five days before Floyd was ultimately predicted to reach Florida, the Miami Herald characterized the storm as “large and likely to grow more potent.” By the 11th, the Herald was reporting predictions that Floyd would “turn sharply toward Florida.” By the 12th, already classified as a Category 3 hurricane, Floyd was said to be marching “relentlessly toward the Florida coast.” And on Monday morning, September 13, readers of the Herald throughout southeast Florida awoke to read that “forecasters were poised to post hurricane watches in Florida before dawn today as Hurricane Floyd developed the same catastrophic power as Hurricane Andrew—but grew much larger and prowled ever closer to the state. Floyd expanded to monstrous proportions Sunday night—a Category 4 storm—virtually as big in area as the entire state of Florida, with winds of 145 miles per hour. With nothing to inhibit it, Floyd could become that rare, top-of-the-scale Category 5 hurricane tonight, wind winds exceeding 155 mph.” A decision was “near”, the Herald reported, “on possible evacuations.” There was little doubt, however, that evacuations were in the offing when Governor Jeb Bush, as he issued an executive order declaring a state of emergency on Monday, September 13, observed publicly, “It’s scary. It’s very scary. Andrew hit Miami in the middle of the night and it was haunting. This is as strong and three times bigger.”

State Planning

The decision-making process on the specific form of evacuation to recommend was centered in Tallahassee, at the Division of Emergency Management’s Response and Preparation bureau. There, recalls the Division’s deputy director Robert Collins, state officials were applying all the techniques at their disposal to their effort to align recommendations about evacuation with their best estimate of the size, track and intensity of the storm.

“With Floyd, it was all happening,” laughs Collins. Fundamental to the state’s effort was its use of the Hurricane Evacuation, or HRVAC, computer imaging program, which drew on the information provided by the National Hurricane Information Center in Miami. Says Collins: “The program takes the four separate components of the advisory package from the National Hurricane

¹ Andrew was a Category 4 hurricane. In Florida history, its impact was second only to a Category 5 storm that struck the Florida Keys on Labor Day, 1935, killing 423 people. The only other Category 5 storm to hit the United States since hurricane records had been kept was Hurricane Camille, which struck the Mississippi Gulf Coast in 1969, killing 256.

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Center and puts them into a graphical output that allows you, for instance, to look at the 72-hour forecast track, to look at the actual location of where the storm is for a specific advisory, and every previous advisory. So you can look at the entire course of the storm up to the advisory that you're using the program for." Based on forecasted storm tracks, the Bureau could turn to its statistical models and decide whether and when to suggest to county officials that evacuations should begin—and who should be told to evacuate. "With a 72-hour forecast period," observes Collins, "we can do things like factor in clearance times, how long we'll need to get people on and off the roads and when they'd have to leave their houses." And, he adds, state officials can estimate when they have to order other state officials to do their part of make evacuation possible. For instance, construction projects and toll collection on major highways must be halted and law enforcement personnel (e.g., the Florida Highway Patrol) be deployed to help direct traffic and deal with accidents and breakdowns, with their potential for significant delay.

On the morning of Monday, September 13, 1999, the decision-making process at the state Division of Emergency Management was moving rapidly toward a conclusion to recommend evacuations. In their conference calls, state officials included officials from 57 of Florida's 67 counties, including many more than those at risk from Floyd's direct impact. They felt it crucial to advise not just officials who might have to order evacuations but also emergency officials from potential "host" counties—areas in the central and western part of the state, and adjoining southeastern states, to which evacuees would head, looking for room at motels and public shelters. Such conference calls—such as the one held to discuss Floyd, at 9:00 a.m., Monday, September 13—were designed to serve as a forum through which a consensus about the specifics of the evacuation plan would be hammered out. Officials did not regard the response to Floyd as a straightforward call. Observes Bob Collins: "There's a conundrum we face every time we discuss evacuation. If we make a decision that's very catholic, we stand a chance of putting more people on the roads than the roads can process and we leave them stranded out on that roadway. But, if we're very conservative, we run the risk of leaving people in area that might be impacted by storm surge.' In the case of Floyd, the stakes in the evacuation planning were raised by the sheer size of the storm. Should officials base their planning on a storm track that portended limited impact, thousands could be at risk should the storm actually follow a different track—and evacuation orders were relatively limited.

Central to the evacuation planning was officials' belief, based on 72-hour forecasting capacity, that the storm would not strike Florida directly. Instead, they expected that it would track northeast, avoiding landfall but coming as close as 25 miles off the state's east coast. Such a track still posed grave peril for coastal areas. Storm surge could affect those on the immediate coast, while high winds threatened structures not able to withstand them—particularly tens of thousands of mobile homes that would be within reach of the storm's 140-plus mile per hour winds. Mobile homes were at risk of being blown off their foundations and into the air. Thus, the fact that the storm might not come ashore did not mean there was no need for evacuations. It did, however, mean those evacuations could be at least somewhat limited. Crucially, the storm was expected to

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affect southeast Florida in a significantly different way than it was expected to affect the central and northeast coastal areas. Specifically, even though Floyd was, by Monday the 13th, classified as a Category 4 storm, its track was expected to mean that southeast Florida would experience it as only a Category 1 storm—with a relatively limited need for evacuation. The need for evacuation, says Bob Collins appeared not to be “terribly extensive, given the angle of approach that we were looking at for the particular storm and its proximity. And that’s why we just made the determination that even though this storm was almost a Category 5 event, that for that southeastern tier of counties, we were only going to evacuate to a Category 1 level.”

Thus it appeared that the evacuations which needed to occur first, as Floyd affected the southern part of the state, would be the most limited. Emergency officials did, however, expect that Floyd would have a more powerful effect on central and northeast Florida coastal areas—that winds would be higher there, and the potential for storm surge greater. They believed, however, that, because the first stage of evacuation—were it to begin on Monday, September 13 in south Florida—would not put that many cars on the road; there would still be enough capacity on the highways to accommodate the second wave of evacuees and enough room at motels and shelters for them at the end of their journey. The one wild card, as always when the subject was hurricanes, was the possibility that the storm could follow a different, more inland track. Should it do so, the risks were great. Even standard homes built on foundations and in full compliance with housing codes, might not be able to withstand winds of more than 125 miles per hour.

Such threats notwithstanding, by the end of the 57-county conference call on September 13, a staged evacuation strategy had taken shape: an evacuation to a Category 1 level for coastal counties in the southern quarter of the state, and evacuation to a Category 4 level—including structures within 20 miles of the coast and mobile homes farther inland—for the northern, three-quarters of the Florida east coast, roughly from Indian River to the Georgia border (See map Exhibit 1). It was expected that the evacuation orders would mean that 1.3 million people would leave their homes and head north and/or west.

This mass exodus would begin on Monday in the southeast, in counties including Dade County (metro Miami) and, 50 miles farther north, Palm Beach County.

Southeast Florida: Palm Beach County

Located 60 miles north of Miami, Palm Beach County’s 47 miles of beaches and luxury high-rise beachfront apartment buildings, looked to be at risk from Hurricane Floyd. However, the danger to this sprawling county—the single largest in land area east of the Mississippi River—was thought to be limited to the coastline. This was a locale in which the storm would be an effective Category 1 event. Thus, recalls County Director of Emergency Management William O’Brien, officials believed evacuation should be limited—and that, for the most part, it would mean relatively short drives. “We needed people to get off the beaches and drive west of Interstate 95,”

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says O'Brien, referring to the north-south highway which runs through the county, only a few miles inland from the coast. Says O'Brien: "The National Hurricane Center was very confident the storm was going to turn. We ordered a Category 1 evacuation just to get people off the beach. There was no question in their minds it was going to turn."

He had reason to hope, too, that those at risk would know who they were. Like other Florida coastal counties, Palm Beach had sought to educate members of the public as to whether they lived in a storm surge area, which would have to evacuate, even for a Category 1 hurricane. Says O'Brien: "We distribute brochures which have evacuation zones clearly identified. People should be aware of whether they're in an evacuation zone or not." The county had sought to reach every household, distributing the evacuation zone brochures with utility bills, for instance. In addition, O'Brien, through extensive public speaking, had encouraged Palm Beach residents not to think of evacuation as a first option. Instead, he had urged that they take steps to reinforce their homes, as the best means of protection from most storms. At the same time, he had reason to believe that this education attempt had not penetrated all that deeply—at least in part because of the large number of newcomers arriving regularly in Palm Beach County. Says O'Brien: "We have an awful lot of new folks moving in. We're always trying to keep up public education to reach those folks. But it's hard; you find yourself thinking after several talks and the same speech that maybe you've reached everybody. But you know you haven't."

If the evacuation went as planned—and if only those at risk in a Category 1 storm evacuated—the event for Palm Beach County should have been a relatively small one. Says O'Brien: "As far as numbers, we were looking at something in the mid to low thousands." With the storm scheduled to begin to affect Palm Beach during the day on Tuesday the 14th, evacuation was officially ordered at 7 p.m. the day before. According to the official county press release, it was to be "ordered effective for residents of barrier islands, mobile homes and those areas subject to severe flooding." Officials believed, however, that even that description of who was in danger was likely an overstatement, in part because of the difficulty in describing the exact locations of those at risk. Says Bob Collins of the state Division of Emergency Management:

"Instead of trying to say, 'OK, everyone eastward or seaward of this very complicated line has to evacuate,' what we say is look, let's just generalize the evacuation zone and say we'll just evacuate everyone seaward of some major route. Because it's a lot easier to say everyone east of US 1 has to evacuate, rather than show them a map with a very complicated line and say, well, if you live in this blue area, you have to evacuate. They go, well, how in the hell do I know if I live east or west of this blue area?"

If officials regarded the Palm Beach County evacuation as a minor one, it was not portrayed to the public that way, largely because of the sheer size of the storm. "The media," says

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Bill O'Brien, "made sure that everybody knew that this storm was Andrew's big brother." Indeed, the emphasis in television coverage of the storm—on key stations such as WPBF, a Fox network affiliate in the city of West Palm Beach—centered on three themes: the size of the storm, the question of the direction it would take, and the extent to which people were complying with the evacuation order which was issued late on the morning of Monday the 13th to be effective that evening. The clear underlying concern centered on the question of whether the full fury of Floyd might hit Palm Beach County. There was more discussion of what to do with pets if evacuating to a motel which might not accept them than there was about who should evacuate and who should not. Says the state Division of Emergency Management's Bob Collins: "Especially in those large media markets like, say, down in southeastern Florida, they're all competing, they're all scrapping for that scoop. Some of them have achieved a certain degree of notoriety based on reporting from previous hurricane events. And so unfortunately there is a large sort of tendency for sensationalism in the way that the meteorologists and certainly the news is reporting the hurricane situation. And so here we are, trying to say, well, if you live west of US 1, really you shouldn't evacuate. Meanwhile, you've got some wild-eyed meteorologist out there saying basically this storm is Andrew's bigger brother. You know, who do you think is actually going to hold sway in people's mind?"

One south Florida meteorologist, Steve Lyons of WPBF-TV, disagrees—saying that it was the sheer size of the storm, coupled with the inherent uncertainty of predictions, that led to widespread concern, rather than media hype. "You're always conscious of your responsibility to inform, not alarm," he says "But I'll be honest. When you looked at that satellite photograph of Floyd and compared its size to the size of the entire state of Florida, it scared the pants off you. It wouldn't have taken much for it to take a dodge to the west and we'd have been up to our ankles in all sorts of problems. If Floyd had hit where Andrew hit, we'd still be picking up the pieces. And so you had people evacuating who would never ordinarily evacuate. People weren't listening to the emergency operations folks. They were looking at the image of the storm and making the decision to get out of Dodge."

In fact, it was difficult to tell from the television coverage that officials had only ordered a limited evacuation. On WPBF, there were but passing references to the need for residents to determine if they were in a storm surge area or not. News anchors mentioned that residents who wanted to be sure could consult maps posted at branches of the local Publix supermarket chain. Nor was it made clear that, although Floyd was a Category 4 storm, Palm Beach County was under a Category 1 evacuation order. WPBF did not address the question of who should evacuate but, rather, where it was best to go—noting that there was limited public shelter space and that shelters should be considered a last resort, after seeking safe harbor with friends or family, or at motels. (See Video exhibit.)

There was, in fact, special reason to stress the limits of designated public shelters. A recent American Red Cross report had found that many Florida public buildings designated as hurricane

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shelters were not up to the required high-wind standards. But, rather than acting as a deterrent for those considering whether to evacuate or not, the limits of shelter space appeared to reinforce plans by evacuating residents to leave the county altogether—heading north and west.

So it was that the evacuation from Palm Beach County turned out not to be a minor event at all. "I'm sure," says WPBF meteorologist Steve Lyons, "there were many who evacuated who shouldn't have." In fact, a federal study² of the Floyd evacuation later found that significant percentages of households who were not supposed to be affected by the evacuation order—including, for instance, 23 percent of households in non-surge zones near the coast and 22 percent in non-coastal areas—nonetheless evacuated. In the emergency management business, this non-mandated level of departure is known as a "shadow evacuation."

Evacuation-related congestion was made worse by the routes followed by drivers. Most chose to take main routes, such as Interstate 95 and the Florida Turnpike (another north-south limited access highway, see map) rather than parallel secondary roads where congestion was less. Although the state effectively implemented its plan to halt construction work and stop toll collection, huge traffic jams nonetheless ensued. Clearance time for Palm Beach County evacuation traffic had been estimated at 22.5 hours; instead, actual clearance took 30 hours. Significant percentages of drivers took five to ten hours to reach their destinations. Says Bob Collins: "When we issued the evacuation order for southeastern Florida, we were expecting that most of those folks would pretty much stay in their own counties, that for the most part they wouldn't get in the car and drive all the way over to the other end of the state or way up north. But they did."

By late Monday and early Tuesday, evacuees from areas further north were hitting the road and beginning their own search for shelter. Those evacuating areas such as Brevard County, in the central portion of Florida's East Coast, would encounter the mounting wave of evacuees coming from the southeast.

Central Florida: Brevard County

Hurricane Floyd looked, on September 13th, to be a more important event for the central Florida coastline than for the areas farther south. Not only was Floyd expected to bring Category 4 winds to Brevard County, centered around the city of Melbourne, but much of the county's population clearly lived in high-risk areas. Of a population of just under 400,000, centered around Melbourne, no less than 185,000 lived on its barrier islands, connected to the mainland by a series of seven causeways. That population was at risk both because of storm surge on the islands and the possibility that the bridges could be inundated and access to mainland escape routes cut off. In

² *Hurricane Floyd Assessment: Review of Hurricane Evacuation Studies Utilization and Information Dissemination*, US Army Corps of Engineers, National Oceanic and Atmospheric Administration and Federal Emergency Management Agency, May, 2000.

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addition, large colonies of mobile home parks, although lying inland along the Indian River, were under a mandatory evacuation order in the event of a storm of Floyd's magnitude.

The risk to Brevard was such that by Sunday, September 12, county emergency management director Robert Lay was already leaning strongly toward an early evacuation order. He knew that the evacuation of identified special needs residents—including the handicapped and elderly—could take up to 30 hours and involved several thousand vulnerable residents and their "caregivers." (Special needs evacuation planning had been instituted statewide, in the aftermath of Hurricane Andrew.) And he knew that early warning might reinforce the seriousness of the storm in an area which had been spared the impact of Hurricane Andrew and had, in recent years, never been affected by any storm more powerful than a Category 1 hurricane which had passed some 60 miles south. With the Category 4 Floyd bearing down on the county, officials decided to issue a mandatory evacuation order for our barrier islands and manufactured home parks, effective at 4:00 p.m. Monday afternoon, September 13. In order to get information out as early as possible, director Lay briefed the press that day, just after 11 in the morning—warning of the 4:00 p.m. evacuation order.

Lay was acting on the belief that an early announcement would give people who wanted to get a head start the chance to do so. And that would help spread out the traffic." Thus, Lay was, in effect, ordering an evacuation at roughly the same time as that of Palm Beach County, although the closer proximity of the storm to the more southerly areas meant that many households there had begun their evacuation earlier, during the morning of the 13th. (Lay ordered Brevard's evacuation a day earlier than other central coast counties to the north.)

His announcement—coming in the context of the intense media coverage of the storm—had the desired effect. Brevard County responded to Floyd with the utmost seriousness. For the first time in its history, virtually all of the 12,500 employees of the Kennedy Space Center at Cape Canaveral were evacuated. (A skeleton crew of 109 remained behind.) Traffic began to fill the roads well before the four o'clock deadline for mandatory evacuation. Some evacuees took more than one car; others took larger vehicles, stocked with possessions. An account in a Tampa newspaper told the story of Steve Carver of Brevard's Satellite Beach who "packed a 22-foot rental truck with half his household goods. 'I couldn't get it all, but better something than nothing.'" Others, such as Shannon Bellinger of Melbourne, "had little more than a carton of cigarettes and a six-pack of Coke in his car. But Bellinger was concerned only with getting out of town. 'You'd have to be crazy to stay.'"

Lay believes the resulting levels of evacuation were, in contrast to those of Palm Beach County, appropriate: about 140,000 of the county's 400,000 residents left their homes. No one could be sure, says Lay, that even standard homes could withstand winds of 140 mph. He adds:

"If I lived in a home that was built in 1965 and the building code said that home was built to withstand 90

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mile an hour winds and I'm watching TV and you tell me that storm is going to hit here with 125 mile an hour winds, am I staying in that house? No, I ain't staying in that house. That's what people said. And even though we tried to educate people, and I think we did a fairly good job of in terms of protecting their windows, protecting their doors, their garage doors, so that they can maintain the complete sealed envelope of that home, in many cases I think people had not actually done those kind of things."

An important complication in Brevard County, however, involved its system of public sheltering. Despite the size of the evacuation, a smaller-than-anticipated number of Brevard residents chose to use area shelters. Some 84 percent of those who evacuated, in fact, left the county entirely, while only 7,000 of an expected 8500 residents used county shelters. This may have been the result of warnings by county officials that shelters should be viewed as a last resort—and offered few amenities. Officials were concerned that, if the general population sought protection in the shelter, those with no other options might have no place to go. Thus, those who had other options—including relatives or access to motel rooms—were encouraged to choose them. Low use of shelters was, however, also a result of the fact that the county could not open all its shelter locations. County employees and volunteers expected to provide staffing chose, in many cases, to evacuate themselves, says Bob Lay:

"It was a problem for us with the people that staff the shelters and for people that might maybe do something else. Maybe they're highway workers. They lived in manufactured homes and they say 'I gotta go.' It turns out that you cannot expect families to split up, for one to stay and work while the rest of the family takes off somewhere."

The effect of there being large numbers of evacuees, along with their overwhelming preference to leave the county, heading north and west, set the stage for complications. The first was that of long traffic delays. While 70 percent of those evacuating expected they'd be able to reach their destinations in less than two hours, fewer than half were able to do so; residents of some "surge zones" took as long as 15 to 20 hours to reach their destinations. Although the actual numbers of cars on the road for that long was relatively small, such delays meant that hundreds were on the roads at a time when the brunt of the storm could possibly have hit. The traffic jams were caused both by the sheer number of evacuees from Brevard and other central Florida counties and by what was, in effect, their collision with the first wave of evacuees, coming up from the south along the main north-south interstate and limited-access highways, Interstate 95 and the Florida Turnpike. Bob Lay recalls wishing, once it became clear how large the south Florida

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evacuation was and the impact it would have on areas farther north, that he could communicate with drivers to tell them to take alternate, secondary routes. But he could not do so. Says Lay: "We could talk to people over TV and we could talk to them over the radio but the minute they got in their car then we'd effectively lost them. Unless they were tuned to the right station at the right time, then they're not going to get the right information." Lay was aware of the potential of so-called variable messaging technology—electronic signs whose messages could be quickly updated to divert drivers to alternate routes, but the county lacked sufficient numbers of such signs for them to play a major role.

Had Floyd moved inland, the results of such traffic snafus could have been devastating. The number of drivers in such peril was relatively limited, says Bob Lay, only because the county ordered its evacuation relatively early. "I'll be honest with you, had we waited until Tuesday morning to order that evacuation, we would have waited until too late. We would have put people on the road and they would not have been able to get out where they needed to go and would have been on the road at a time of potentially high winds." (Actual overall clearance time for the county was 24 hours—some four hours more the county projected.) Residents who delayed faced the longest time on the road. Noted one newspaper account: "George and Marianne Hamilton packed up their son Joey, 9, and dog, Riley, grabbed important papers and left Melbourne Beach at 9:30 a.m. Tuesday. Their trip to Tampa, which normally takes 3 ½ hours, took almost 7."

All this had occurred even before the last, most northern stage of the planned evacuation had even gotten started. Bob Collins of Florida's Division of Emergency Management recalls that by the time evacuation from Florida's most northern major coastal city, Jacksonville, was set to start, virtually all the hotel rooms in the central and western parts of the state to which evacuees were likely to head, were already filled.

North Florida: Jacksonville

Like their counterparts in southeast Florida, emergency management officials in and around Jacksonville—the major city on the northeast Florida coast—would have liked to limit the Hurricane Floyd evacuation, focusing on those homes in coastal storm surge areas. Moreover, as it became clear, late Tuesday night, that Floyd might not be the punishing storm some feared—that, in fact, the track forecasted for it by the National Hurricane Center was correct (Category 4, likely to move parallel with the coast)—the case for a limited evacuation became stronger. If Floyd was to hit Jacksonville at all, it would be the immediate coast that would be most affected. However, as in southeastern Florida, limiting the evacuation proved to be easier said than done. Public concern about the storm track of the monster storm continued to run high. President Bill Clinton had, by Wednesday morning, September 15, gone so far as to issue a pre-emptive disaster declaration for the state of Florida. The Florida Times-Union, published in Jacksonville, described Floyd as "the strongest storm to threaten Jacksonville in the 20th century." The city's mayor, John Delaney, was

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quoted as saying, "This could very well be a storm that could flatten hundreds of homes out at the beach."

Chip Patterson, director of emergency management for Duval County, the major northeastern Florida County (population, 778,000), found he faced a special problem. The fact that the St. Johns River met the Atlantic at Jacksonville complicated the contours of the storm surge zone. The hurricane, observed the Florida Times-Union, "could push ocean water into the St. Johns, causing the river to back up and flood." The county, says Patterson, had tried to conduct extensive "preparedness-type education" -- including newspaper inserts designed to help residents learn whether they lived in an area at risk of storm surge. But, he says, "most people tune these things out, until the local media starts pumping the latest storm." Adds Patterson. "I'm constantly amazed at how little people know about where they live, even to the point of not knowing whether they're within 100 yards of a marsh or a river." Such information is important in determining the risk of storm surge.

The time when a storm is imminent, says Patterson, is no easier for communicating detailed information. "By the time the storm is coming, we've missed our window of opportunity," he says. "Now we're communicating in 15-second sound bites. And you can't communicate detailed information about storm surge zones under those circumstances. I think it's reasonable to say that we did not have ways to dampen the shadow evacuation." In other words, almost inevitably, an announcement instructing those at risk of storm surge to evacuate, would lead to a larger evacuation than necessary -- although Patterson, like other county emergency management directors, also saw Floyd's high winds as a factor which could lead those not at risk from water to decide to leave, as well. Nor did he feel secure in telling them not to do so. "The capacity to issue a dampening message, to discourage evacuation, has everything to do with how you've been doing with mitigation and preparation. If I had felt confident that homeowners had been taking wind seriously and really had gone in and retrofitted their homes to withstand it, then I would have felt we had some immunity from the storm as a county. But we hadn't pushed retrofitting as energetically as we should have. So, although I did feel confident telling individuals that I knew -- and whose homes I was familiar with -- that they didn't have to leave, as far as making a public announcement, that was different. At the same time, we knew people could be at risk out on the highway."

That risk stemmed, in part from the fact that, like their counterparts elsewhere, northeast Florida residents chose to drive not only away from the coast but also out of the county and out of the state. The Associated Press reported that the "Vitkauskas family took 13 hours to drive from Edgewater in northeast Florida to south Georgia, a trip that usually takes four hours. The family of six traveled in a caravan of five cars with two cats, four dogs, family friends and two boats." Jacksonville evacuee Vicki Drake told the Tampa Tribune her experience traveling in a four-car caravan that included a pet bird restrained by a seat belt was "insane." Drake laughed when asked where she was heading. "We're not sure. Just west somewhere." Bob Collins of the state Division

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of Emergency Management was struck by the number of families from inland areas—with no evident reason to evacuate—who nonetheless did so.

Notwithstanding such shadow evacuation, the northeast Florida clearance time was actually 7.5 hours less than that which officials had projected. For state and county officials, this was something of a triumph, reflecting not only early departures by some households but adept deployment of a wide range of services provided by state agencies. Tow trucks were deployed to prevent lanes being blocked by breakdowns. Tanker trucks filled with gasoline were deployed to prevent cars from running out of fuel, despite the long waits in slow traffic. Extra portable restrooms were put out at rest stops. But, from the point of view of evacuating households, it still took far longer than normal to reach such destinations as Tallahassee—where evacuees found no motel rooms were available.

More, says Chip Patterson, might have been able to take advantage of available space in public shelters. But the heavy traffic had had another side effect, he says: the county was not able to open all its shelters. In the Jacksonville area, unlike central Florida, this was not the result of emergency personnel choosing to evacuate rather than showing up for work. Rather, it was, says Patterson, the result of a plan to open shelters on a "as needed basis"—as one filled up, another would be opened. "This usually makes wonderful sense," he observes. "But it did not serve us well during the Hurricane Floyd evacuation." The problem was this: once it became clear that more shelters, particularly in the western part of the county, were needed, traffic had reached the point of such gridlock that emergency personnel simply could not reach the shelters in order to operate them. (Patterson later changed the policy to open all primary shelters—which are dispersed geographically throughout the county—at the same time.)

Perhaps because it became clear soon after the Jacksonville area evacuated that Floyd would not make landfall in Florida after all, public annoyance surfaced most notably here. Mary Ann Vitkauskas—of the family which traveled in a car caravan to rural Georgia, where they ended up spending the night parked on farmland—told the Florida Times-Union that any future evacuation "is going to have to be real mandatory for us to do what we did again." Observes Chip Patterson, tartly, "There are a lot of people for whom any inconvenience is deemed to be intolerable." Local elected officials defended the evacuation: "I don't think anyone that lives at the beach questions the decision," said Jacksonville Mayor John Delaney. "There was no way you could have taken the chance of that thing not turning and (then) tried to move those people." A similar tone of implicit defensiveness about the evacuation was struck by many local officials. A Wednesday, September 15 article in the Miami Herald was headlined, "Dade officials say they don't regret evacuation." The Herald went on to say, "Uprooted 24 hours earlier under orders of evacuation, thousands of coastal Miami-Dade residents went home Tuesday evening after weathering the storm that did not come ... Top county officials said if they had to do it again, they would order similar evacuations."

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Aftermath

Hurricane Floyd caused only the most minor property damage and no fatalities as it skirted the state of Florida. Nonetheless, as hundreds of thousands of households slowly filtered back to their homes, there was a widespread sense in the state that the evacuation, if not a fiasco, could have been handled far more efficiently. Editorial writers throughout the US took notice of the fact that the Floyd evacuation routes had been, as the Columbus (Ohio) Dispatch had put it, "reduced to parking lots." Opined the Dispatch: "Fortunately the scene was not one of desperation. But many are asking, what if the threat had prompted the hysteria of an imminent Cold War attack? Would the highway system have been worst than just jammed? Might it not have become a death trap?"

By September 18, less than a week after the frenzy of public concern which surrounded the approach of Floyd, Florida Governor Jeb Bush ordered a special study of evacuation policies. As the Miami Herald wrote, "Governor Jeb Bush wants to know what worked and what didn't when more than a million Floridians had to flee their homes in advance of Hurricane Floyd earlier this week." A central part of the study was to be examination of what appeared to be a simple, commonsense step to cut down on evacuation-related traffic jams. So-called "reverse laning" would turn selected interstate highways into one-way roads, headed in the direction of the evacuation wave. It was a step which, on the surface, promised to be an easy way to increase highway capacity in an emergency, ostensibly doubling road capacity, temporarily, in a state in which road construction had not kept up with the growth in auto or total population. The idea was buttressed, in Floyd's wake, by the decision of South Carolina Governor Jim Hodges to reverse lane Interstate 26 for evacuees returning to Charleston, whose Mayor Joseph Riley had been an outspoken advocate of such a policy. (The St. Petersburg Times wrote that Hodges had made his decision only after "thousands of his constituents spent hours stuck in traffic, using their cell phones to blister him on radio talk shows.") The return appeared to go more smoothly than the evacuation, Mayor Riley observed. In addition, federal officials expressed the view that reverse-laning could be selectively employed to good effect. Said Federal Emergency Management Agency spokesman Marc Wolfson, "We'll look at the hurricane routes (to determine) where it's feasible to make major interstate move all in one direction."

Even as there was public clamor for such a policy, Florida emergency management officials themselves were not jumping unreservedly on the bandwagon. Major Kevin Guidry, in charge of evacuation issues for the Florida Highway Patrol, told the St. Petersburg Times, in effect, that in an evacuation traffic jams were inevitable. "There's just not enough road to handle that flow. From our standpoint, if the traffic keeps moving, that's about the best that people could expect." Guidry noted that, in order to ensure that traffic did not enter a reverse-laned highway and head in the prohibited direction, the state would need "enormous staffing and a lot of equipment. You have to have people at all the entrance ramps and you have to have backups to

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relieve those people." Barriers alone would not prevent drivers from using closed entrance ramps, said Guidry. "I've seen people drive around wooden and concrete barriers. Cones certainly won't stop them." He noted, too, that, at some point the one-way designation must end. "What happens then? You are sending a whole lot of people from populated areas where there is law enforcement to unpopulated areas where there is almost no law enforcement." State emergency officials stressed, too, the need for evacuees to consider using secondary routes, instead of main highways, and to be made aware, perhaps through electronic messaging signs or through faxes sent to gas stations and restaurants, of places they could go—whether shelters or motels—so that traffic would gradually decrease as cars peeled off to destinations along the way.

But officials, in the weeks after the Hurricane Floyd evacuation and thereafter, most liked to emphasize their hope that somehow the magnitude of future evacuations could be decreased. Said Steve Selbert, Secretary of the Florida Department of Community Affairs, "If you live in an area not subject to storm surge, keep your family safe at home."

Hurricane Floyd had left in its wake little damage but, nonetheless, a new challenge for emergency management officials: devising ways to convince residents not to evacuate unnecessarily. "We've done a good job at telling people the sky is falling," says Bob Collins of the state's Division of Emergency Management. "We have to do a little better on the subtleties."

Epilogue

In February 2000, the Governor's Hurricane Evacuation Task Force Report—meant to recommend changes in Florida's emergency management system as a result of the Hurricane Floyd evacuation—was issued. It included 22 recommendations (see exhibit). It focused much of its attention on the possibility of "reverse-laning" major highways in order to increase their evacuation capacity. The Task Force concluded, however, that the safety and logistical problems posed by reverse-laning dictated that it "must only be used as a last resort when conditions are dire. The use of paved highway shoulders as a third lane of traffic was deemed to be more widely practical. And, although seven specific highways were identified for potential reverse-laning but, continued the report: "there are many less drastic steps which can be taken." Most broadly, the task force observed that "the state must focus more attention on finding alternatives to evacuation as one of our primary means of providing protective actions to its citizens." The report emphasized the need for efforts to encourage residents to retrofit their homes to become hurricane-proof, and the need for emergency management officials to encourage the use of neighborhood shelters—in order to "leave room on critical evacuation routes for those who truly need to leave and seek safety." The task force went so far as to call for the possible use of "military assets" as shelters, in order to augment the state's limited shelter capacity.

The report led to the use of the state's network of public radio stations be identified as the place to which drivers could reliably turn for information about traffic congestion and alternative

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routes during a large-scale evacuation. It led, as well, to the expanded use of electronic variable message signage -which had been limited by a simple lack of such signs during the Floyd evacuation. The Task Force did not, however, offer a simple answer to the problem of shadow evacuation. Rather, it placed its faith in the potential for better public information dissemination and, particularly, the use of the internet to "improve the amount and availability of emergency information."



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Assessing threats

At the nation's nuclear plants, problems persist, but some push for more time to fix them

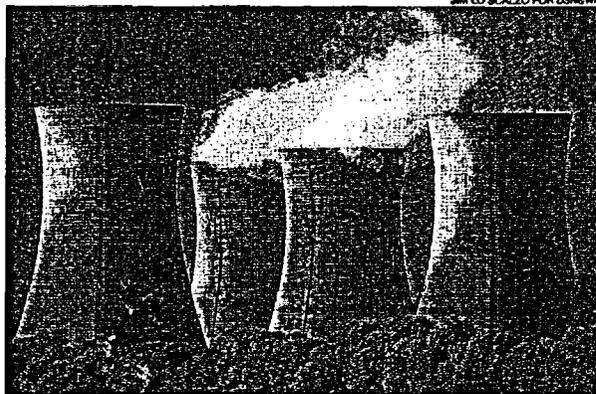
BY DOUGLAS PASTERNAK

Despite promises from the White House on down to beef up security after the terrorist attacks on New York and the Pentagon, some of the nation's 104 civilian nuclear power plants continue to operate with major security flaws, and the Nuclear Regulatory Commission has yet to issue a formal assessment of potential terrorist threats that would require permanent upgrades at the facilities. Meanwhile, three Republican senators have been quietly lobbying the NRC to take even more time implementing tighter

provide personnel capable of repulsing an attack by no more than three armed intruders. After the attacks, the NRC issued interim measures requiring additional security posts and increased armed patrols.

Security remains a major concern. Last September, the Project on Government Oversight, a Washington, D.C.-based watchdog group, issued a report based on interviews with more than 20 security guards at 13 plants. The inquiry found that many security forces were overworked and underpaid, and lacked sufficient training. Danielle Brian, the group's executive director, says the industry wants to delay security upgrades.

Oversights. The industry disputes those charges. The Nuclear Energy Institute says the industry already has spent \$370 million on staffing and capital improvements since 9/11. Steve Kerkes, a spokesman, says the institute has consulted with the NRC and Congress on the new threat assessment. Senators



Cooling towers at Three Mile Island in Pennsylvania

procedures, suggesting that security is already good enough.

In a letter to the NRC last month, Sen. Jeff Sessions of Alabama argued that security personnel at nuclear plants "are providing the maximum level of protection that is practical for civilian security forces." In a separate letter, Sen. Chuck Hagel of Nebraska worried that new safety measures might prove too costly. The government, he said, should not undermine the industry's "ability to provide low-cost power for [its] customers." A South Carolina senator, Lindsey Graham, also weighed in.

The lobbying campaign comes as the NRC is preparing to issue a new Design Basis Threat, or assessment of what new security measures are needed to protect the sites. Before the 9/11 attacks, plant owners were required to

Hagel, Sessions, and Graham have all received campaign contributions from the institute.

In the past year, nuclear plants in the senators' states have experienced serious security lapses. At a plant in Nebraska, 150 rounds of ammunition passed through an X-ray machine undetected; in Alabama, a guard failed to check vital access doors and then lied about it.

The new threat assessment is certain to require tougher regulations for defending against terrorist attacks. Some worry, however, that they won't be tough enough. "If one of our nuclear plants is attacked tomorrow," says David Lochbaum, a nuclear safety engineer at the Union of Concerned Scientists, "our government ought to be able to say we did everything we could have done to prevent this." ●



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