H.R. 3980, NATIONAL WINDSTORM IMPACT REDUCTION ACT OF 2004

JOINT HEARING

BEFORE THE

SUBCOMMITTEE ON RESEARCH

AND THE

SUBCOMMITTEE ON ENVIRONMENT, TECHNOLOGY, AND STANDARDS

COMMITTEE ON SCIENCE

HOUSE OF REPRESENTATIVES

ONE HUNDRED EIGHTH CONGRESS

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H.R. 3980, NATIONAL WINDSTORM IMPACT REDUCTION ACT OF 2004

WEDNESDAY, MARCH 24, 2004

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON RESEARCH AND
SUBCOMMITTEE ON ENVIRONMENT, TECHNOLOGY, AND
STANDARDS,
COMMITTEE ON SCIENCE,
Washington, DC.

The Subcommittees met, pursuant to call, at 2:07 p.m., in Room 2318 of the Rayburn House Office Building, Hon. Nick Smith [Chairman of the Subcommittee on Research] presiding.

SUBCOMMITTEES ON RESEARCH AND ENVIRONMENT, TECHNOLOGY, AND STANDARDS
COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

H.R. 3980, The National Windstorm Impact Reduction Act of 2004

Wednesday, March 24, 2004
2:00 p.m. – 4:00 p.m.
2318 Rayburn House Office Building (WEBCAST)

Witness List

Dr. John Brighton
Assistant Director for Engineering
National Science Foundation

Mr. Anthony Lowe
Administrator, Federal Insurance Mitigation Administration
Emergency Preparedness and Response Directorate (EPR)
Department of Homeland Security
Accompanied by
Mr. Edward Laatsch
Chief, EPR Building Science and Technology Branch

Dr. Steven L. McCabe
Professor, Department of Civil, Environmental and Architectural Engineering
University of Kansas

Mr. Jeffrey Sciaudone
Director, Engineering and Technical Services
Institute for Business and Home Safety

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COMMITTEE ON SCIENCE

U.S. HOUSE OF REPRESENTATIVES

H.R. 3980, National Windstorm Impact Reduction Act of 2004

WEDNESDAY, MARCH 24, 2004
2:00 P.M.—4:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

1. Purpose

On Wednesday, March 24, 2004, at 2:00 p.m., the Subcommittee on Research and the Subcommittee on Environment, Technology, and Standards of the Committee on Science of the U.S. House of Representatives will hold a joint hearing to receive testimony on H.R. 3980, the *National Windstorm Impact Reduction Act of 2004,* and to consider the role of federal research and development in windstorm hazard reduction. The hearing will build upon discussions from a February 9, 2004, Science Committee field hearing in Lubbock, Texas, on windstorm hazards.

2. Witnesses

Dr. John Brighton is the Assistant Director for Engineering at the National Science Foundation (NSF). He previously served as Provost of National-Louis University, and before that was Executive Vice President and Provost at Pennsylvania State University.

Mr. Anthony Lowe is the Administrator of the Federal Insurance Mitigation Administration (FIMA), a division of the Emergency Preparedness and Response (EPR, formerly FEMA) Directorate of the Department of Homeland Security. He will be accompanied by Mr. Edward Laatsch, Chief of the EPR/FEMA Building Science and Technology Branch.

Dr. Steven L. McCabe is a professor in the Department of Civil, Environmental and Architectural Engineering at the University of Kansas. Dr. McCabe will be testifying on behalf of the American Society of Civil Engineers (ASCE), of which he is a member. He currently holds a temporary position at NSF as Program Director for the Structural Systems and Engineering Programs within the Division of Civil and Mechanical Systems.

Mr. Jeffrey Sciaudone is the Director of Engineering and Technical Services for the Institute for Business & Home Safety (IBHS). Mr. Sciaudone represents IBHS on various technical industry committees concerning natural disaster mitigation and oversees the development of products dealing with the public understanding of natural hazard mitigation. He also serves on the International Code Council's Industry Advisory Committee.

3. Overarching Questions

The hearing will address the following overarching questions:

1. How vulnerable is the built environment in the United States to windstorm hazards? What are some of the top opportunities for, and primary barriers to, reducing these vulnerabilities?
2. What are the size, structure, and focus of ongoing efforts to reduce the impact of windstorms in the United States, particularly with regard to research and development? How can non-federal entities such as the insurance industry and state and local governments contribute to, and benefit from, improved wind hazard mitigation?

3. What gaps in data exist with regard to our knowledge and understanding of windstorm hazards, and how could the overall wind hazard mitigation portfolio be refocused or otherwise strengthened to improve mitigation in the United States?
4. Will the program established by H.R. 3980 result in greater R&D breakthroughs and increased adoption of windstorm impact mitigation measures? How could H.R. 3980 be improved?

4. Brief Overview

- The United States currently sustains several billion dollars each year in property and economic losses due to windstorms. While estimates of annualized windstorm damages are highly variable and limited in scope, the National Weather Service estimates that between 1995 and 2002, hurricanes, tornadoes, and thunderstorm winds caused on average $4.5 billion in damage per year. The American Society of Civil Engineers has estimated windstorm damages to be in excess of $5 billion per year.
- The most powerful hurricane in the last century to hit the United States was Hurricane Andrew, in August of 1992. It caused 58 deaths and approximately $27 billion in damages. In addition, more than one million people were evacuated from Southern Florida because of the storm.
- A variety of cost-effective windstorm hazard mitigation measures exist, and many more are undergoing research and development. It is unclear to what extent these mitigation technologies have been adopted, but it is generally agreed that they have been under-utilized, and that significant improvements in the wind resistance of buildings and other structures will not be achieved without improved incentives at the local and individual level. This fact, combined with growing populations in coastal areas particularly susceptible to major windstorms, has led to substantial increases in the overall windstorm vulnerabilities.
- Federal windstorm hazard mitigation efforts span several agencies, including the Federal Emergency Management Agency (FEMA), National Institute of Standards and Technology (NIST), National Oceanographic and Atmospheric Administration (NOAA), and National Science Foundation (NSF). Evaluations of the size, scope, and effectiveness of these mitigation efforts have found significant room for improvement. For example, a 1999 report by the National Academy of Sciences found that: ". . .there is still a lack of leadership, focus, and coordination of wind-hazard mitigation activities across all agencies, and funding for research and development specifically targeting wind-hazard reduction issues is insufficient."
- On March 16, 2004, Representatives Neugebauer and Moore introduced H.R. 3980, the *National Windstorm Impact Reduction Act of 2004*. The bill authorizes a national wind hazard impact reduction program and a multi-agency working group to carry out activities that will improve understanding of windstorm impacts on structures and help develop and encourage implementation of mitigation measures to reduce those impacts.

5. Background

Hurricanes and Tornadoes

High winds can easily destroy poorly constructed buildings and mobile homes. Hurricanes can reach constant wind speeds greater than 155 mph and extend outward as far as 400 miles. While the National Weather Service is able to detect hurricanes days before they make landfall, predicting when, where, and with what force a hurricane will hit remains an inexact science.

Tornadoes generally occur near the trailing edge of a thunderstorm, though they are also often produced by hurricanes. Tornado winds can reach up to 300 mph and can be powerful enough to lift homes off foundations. Tornadoes are much more difficult to detect than hurricanes with an average lead-time for warnings of only 12 minutes. This makes evacuation nearly impossible, a factor that led to the development and implementation of in-residence tornado shelters.

Since 1950, tornadoes have claimed over 4,400 lives. On average, nearly 800 tornadoes occur each year in the United States—primarily in the South and Midwest, though they have been documented in all 50 states. During a 16-hour period that began on April 3, 1974, 148 tornadoes occurred in states from Michigan to Mississippi, killing 315 people and resulting in 6,142 injuries. This event is generally considered to be one of the most prolific tornado outbreaks of the 20th century.

While the Federal Government does not maintain a comprehensive windstorm loss database, the National Weather Service does compile damage estimates that demonstrate the tremendous costs of windstorms (Table 1). Also, the insurance industry maintains separate loss databases that measure damage to insured property. However, according to *"Disasters by Design: A Reassessment of Natural Hazards in the United States,"* a 1999 report by the National Academy of Sciences, insurance industry data may represent only a small percentage of total losses because many property owners do not buy coverage against hurricanes and other natural hazards.

Table 1. National Weather Service Estimates of Windstorm Impacts (1995-2002)

	Fatalities			Injuries			Total Damages (In millions of $)		
Year	Tornados	Hurricanes	T-storm Winds	Tornados	Hurricanes	T-storm Winds	Tornados	Hurricanes	T-Storm Winds
2002	55	51	17	968	346	287	802.1	1382.4	344.5
2001	40	24	17	743	7	341	637.5	5190.5	378.8
2000	41	0	25	882	1	296	430.5	8.2	304
1999	94	19	29	1842	10	325	1998.2	5068.8	388.7
1998	130	9	41	1868	77	860	1736.2	4127.9	1597.3
1997	67	1	37	1033	32	425	736.5	875.4	242.1
1996	25	37	23	705	22	335	732.1	1787	452.8
1995	30	17	38	650	112	473	410.8	5932.3	745.1

With more people than ever before living near coastlines, vulnerability to wind hazards in the U.S. is steadily increasing. Already, more than one in six Americans live in a county that lies on the Atlantic or Gulf of Mexico coast. In addition, the coastal population is growing rapidly, particularly from Texas through the Carolinas. In popular resort areas that are common along the coastline, numbers often swell even further when holiday, weekend, and vacation visitors arrive. These large and growing populations have resulted in substantial increases in buildings and infrastructure in high-risk coastal areas that are also vulnerable to windstorms.

Federal Windstorm Hazard Mitigation Efforts

The bulk of current windstorm hazard funding is directed toward fundamental research and development into the atmospheric and meteorological aspects of windstorms, contributing to a greater understanding of weather-related phenomena, but generally without specific mitigation applications in mind. A smaller portion of the windstorm hazard research and development effort is directed toward structural and engineering aspects of buildings and infrastructure impacted by windstorms. In a 2003 report, the RAND Corporation, in a study conducted for the Office of Science and Technology Policy, recommended that R&D distribution be reoriented toward longer-term loss reduction efforts: "This is especially relevant for weather-related hazards, for which R&D is primarily limited to procurements for short-term forecasting efforts.. . .the present emphasis on short time scales is clearly circumventing more-lasting solutions. In practice, much of climate change R&D is focused on short-term forecasts, which do not result in significant loss reduction. A shift to longer-term and less prediction-oriented efforts, with a focus on investigations and technologies to make the built environment and infrastructures more resilient, holds great promise. Such R&D promises to save lives, protect property, and dramatically reduce the costs of rebuilding after a disaster."

The size and scope of federal investments in R&D focused on reducing structural vulnerability to windstorm impacts is generally agreed to be in the range of a few million dollars, though specific numbers are not readily available, in part because of the fragmented and uncoordinated nature of these efforts. In a 1999 report, the National Academy of Sciences recommended, "The Federal Government should coordinate existing federal activities and develop, in conjunction with State and local governments, private industry, the research community, and other interested stakeholder groups, a national wind-hazard reduction program. Congress should consider designating sufficient funds to establish and support a national program of this nature."

Non-R&D Related Barriers to Greater Implementation of Mitigation Techniques

Unfortunately, simply developing technical solutions will not reduce vulnerability to wind hazards. FEMA and the insurance industry have both determined that improving the wind resistance of buildings will only be achieved when there is a demand for wind-resistant construction by homeowners. Solving the windstorm vulnerability problem will not only require coordinated work in scientific research and

technology development, but education, public policy, the behavioral sciences, and technology transfer as well.

The immense amount of damage that windstorms cause each year and the existence of proven building and construction techniques for limiting that damage, have led only to very limited implementation of mitigation measures. Perhaps the best explanation for this is psychological—most people just assume that they won't be affected by natural hazards and aren't willing to invest even minimal time and resources into reducing the vulnerability of their own homes. Among the barriers to effective mitigation are:

- **Lack of useful loss data:** Windstorm loss data collection is not sufficiently detailed or comprehensive. The Federal Government has no uniform procedure for compiling loss data, including data on the economic effects of windstorms. The insurance industry does have mechanisms in place for more detailed data collection but the value of this data is unclear, largely because it is proprietary. In addition, the data only covers insured losses, a small portion of overall windstorm losses. Without access to accurate, meaningful data, it is difficult to measure the effectiveness of mitigation techniques or establish public policy priorities.
- **Lack of understanding:** Many homeowners are simply unaware of the dangers presented by windstorms, and even more are unaware that techniques exist for reducing structural vulnerability to these dangers. This is also a problem in the building and construction industry and among policy makers, although to a lesser degree.
- **High cost of implementation:** Existing mitigation techniques are effective, but often expensive. For example, a City of Lubbock housing program builds houses for low-income residents that are designed to withstand winds up to 150 miles per hour and have a safe room to provide additional protection. Of the $78,000 that it costs to build one of these houses, $8,500 goes towards windstorm mitigation. The City of Lubbock no longer offers residents the option of choosing conventionally built homes, but in the private sector where market forces dictate choices, most are still unwilling to pay.
- **Limited financial incentives:** Exacerbating the problem of high cost is the lack of financial incentives for homeowners who are willing to make the extra investment. In general, neither the insurance industry nor local, State, or Federal Governments have been willing to provide financial inducements in the form of rate or tax breaks for homeowners who take steps to reduce vulnerability.
- **Building codes:** For the most part, building codes and local enforcement practices do not address the problem of windstorm vulnerability. Local and state officials are generally either unaware of the dangers and potential mitigation solutions, or are unwilling to enact and enforce strict codes that might be expensive for their constituents.

6. H.R. 3980 Summary

H.R. 3980 establishes the National Windstorm Impact Reduction Program, and directs the Director of the Office of Science and Technology Policy to establish an Interagency Working Group of NSF, NOAA, NIST, and FEMA. The working group will be responsible for planning, management, and coordination of the program. This structure is similar to the National Earthquake Hazard Reduction Program (NEHRP). NEHRP, a long-term, comprehensive, multi-agency earthquake hazards reduction program, was established by Congress in 1977 to minimize the loss of life and property from earthquakes.

Drawing from recommendations provided by the American Association of Wind Engineers at the February 9th Science Committee hearing in Lubbock, Texas, H.R. 3980 focuses on improving understanding of windstorm impacts, and developing and encouraging implementation of mitigation measures to reduce those impacts. The legislation has been endorsed by the Wind Hazard Reduction Coalition, which includes the American Society for Civil Engineers (ASCE), National Fire Protection Association (NFPA), American Association for Wind Engineering (AAWE), International Code Council (ICC), and Manufactured Housing Institute (MHI). A section-by-section overview of H.R. 3980 is provided in Appendix I.

7. Questions for Witnesses

The witnesses were asked to address the following questions in their testimony:

Dr. Brighton

- Please describe NSF's current support for windstorm impact reduction-related research, including estimated funding in both engineering and the atmospheric sciences?
- What is the status of understanding and knowledge of windstorms and their impacts on buildings and infrastructure? What areas of research have the most potential for contributing to developments that will reduce windstorm impacts? How does NSF work to determine funding priorities in these areas.
- To what extent does NSF currently work with other federal agencies in addressing the impacts of windstorms?

Mr. Lowe

- Please describe FEMA's current activities in windstorm impact reduction, including collaborative efforts with public and private entities. How much support does FEMA provide for activities such as data collection and analysis, outreach, and information dissemination? What are some of the top opportunities for, and barriers to, addressing windstorm vulnerabilities, and how is this information used in determining priorities in various mitigation areas.
- What is the status of HAZUS–MH and how will it assist communities, states, and regions in reducing vulnerability to hurricanes once it is fully operational? What plans does FEMA have for developing a HAZUS version that will allow for modeling tornadoes and other types of windstorms?
- To what extent does FEMA currently work with other federal agencies, universities, and the insurance industry in addressing the impacts of windstorms?

Dr. McCabe

- How would you characterize the size and focus of ongoing wind hazard mitigation research and development being performed by the insurance industry? To what extent do insurance industry research efforts build on research done by universities or the government, and vice-versa? How does the insurance industry work with Federal, State, and local governments to share data that may help contribute to windstorm hazards reductions?
- Approximately how much damage do wind hazards cause in the United States on an annual basis, and are these damages broken down by variables such as building types, structural characteristics, and geography? What types of damage are taken into account in compiling these damage estimates, and what types are not included? What data gaps exist with regard to our knowledge and understanding windstorm hazards?
- What role does the insurance industry play in encouraging implementation of existing mitigation techniques in retrofitting and new home construction? To what extent do insurance policies consider and incorporate incentives for implementation of these mitigation techniques?

Mr. Sciaudone

- Please Describe IBHS' current activities in addressing windstorm impacts, including R&D. How much emphasis is placed on basic research versus applied R&D? To what extent do IBHS R&D efforts build upon research supported by universities and federal agencies? To what extent does IBHS collaborate with universities and federal agencies in its R&D efforts? How does IBHS work with federal, state, and local governments to share data that may help contribute to windstorm impact reductions?
- Please describe the insurance industry's windstorm impact data collection and analysis activities. How is this information used to help insurance companies estimate vulnerability? How could the Federal Government gain access to insurance industry data without damaging the proprietary value of that information?
- What are the greatest obstacles to increased implementation of windstorm mitigation techniques in new and existing structures? To what extent do insurance policies consider and incorporate incentives for implementation of these mitigation techniques?

Appendix I

SECTION-BY-SECTION ANALYSIS OF H.R. 3980,
NATIONAL WINDSTORM IMPACT REDUCTION PROGRAM (NWIRP) ACT OF 2004

Sec. 1. Short Title.

"National Windstorm Impact Reduction Act of 2004"

Sec. 2. Findings.

The Congress finds that:

(1) All states and regions are vulnerable to windstorms.
(2) The United States sustains several billion dollars in economic damages each year due to windstorms, and these vulnerabilities are increasing.
(3) Improved windstorm impact reduction measures have the potential to reduce these losses.
(4) There is an appropriate role for the Federal Government in mitigating windstorm impacts, and significant coordination and cooperation is required for any program to be effective.

Sec. 3. Definitions.

Defines terms used in the text.

Sec. 4. National Windstorm Impact Reduction Program.

(a) Establishment—Establishes the National Windstorm Impact Reduction Program.

(b) Objective—Achievement of major measurable reductions in losses of life and property from windstorms through a coordinated federal effort, in cooperation with other public and private entities, to improve understanding of windstorm impacts and develop and encourage implementation of mitigation measures to reduce those impacts.

(c) Interagency Working Group—Directs the Director of the Office of Science and Technology Policy to establish an Interagency Working Group on Windstorm Impact Reduction, consisting of representatives from NSF, NOAA, NIST, FEMA, and other federal agencies as appropriate. Also Directs the Director to designate an agency to chair the Working Group and to be responsible for managing the program. Specific agency roles and responsibilities shall be defined in the implementation plan in subsection (e). General responsibilities—

(1) NIST—support R&D to improve building codes, standards and practices for buildings, structures, and lifelines;
(2) NSF—support research in engineering and the atmospheric sciences to improve the understanding of the behavior of windstorms and their impact on buildings, structures, and lifelines;
(3) NOAA—support atmospheric sciences research to improve the understanding of the behavior of windstorms and their impact on buildings, structures, and lifelines;
(4) FEMA—support windstorm-related data collection and analysis, public outreach, and information dissemination.

(d) Program Components—

(1) Establishes three primary components for the Program: improved understanding of windstorms, windstorm impact assessment, and windstorm impact reduction. Requires the components to include activities such as data collection and analysis, outreach, tech transfer, and R&D. Requires that, to the extent practicable, research shall be peer-reviewed and the components shall be designed avoid duplication of other hazard reduction efforts.
(2) Understanding of windstorms—research to improve understanding of and data collection on the impact of severe winds on buildings, structures, and infrastructure.
(3) Windstorm impact assessment—(A) development of mechanisms for collecting and inventorying information on structural performance in windstorms and collection of information from sources including the design and construction industry, insurance companies, and building officials; (B) R&D to improve loss estimation and risk assessment systems; and (C) R&D to be improve simulation and computational modeling of windstorm impacts.

(4) Windstorm impact reduction—(A) development of cost-effective windstorm-resistant systems, structures, and materials for use in new construction and retrofitting; (B) development of improved outreach and implementation mechanisms to translate existing information and research findings into cost-effective practices for design and construction professionals, and state and local officials; (C) outreach to increase public awareness about windstorm hazard vulnerability.

(e) Implementation Plan—Requires the Interagency Working Group to develop a plan for achieving the objectives of the Program not later than 12 months after the date of enactment. The Implementation Plan shall include—

(1) an assessment of past and current public and private efforts to reduce windstorm impacts;

(2) a statement of strategic goals for each component area;

(3) a description of how the program will achieve its goals, including detailed responsibilities for each agency; and

(4) a description of plans for public and private cooperation and coordination.

(f) Biennial Report—The Interagency Working Group shall submit a biennial report to Congress providing an assessment of the status of the Program, including recommendations for changes.

Sec. 5. National Advisory Committee on Windstorm Impact Reduction.

(a) Establishment—Establishes a National Advisory Committee to review progress made under the Program, advise on improvements, and report to Congress on actions taken to limit vulnerability to windstorms. Requires that the Advisory Committee include between 11 and 15 members to be appointed by the Director, one of whom shall be designated as chair. Requires that members include representatives of a broad cross-section of interests. Federal agencies may not be members of the Advisory Committee.

(b) Assessment—Requires the Advisory Committee to assess the effectiveness of the Program.

(c) Biennial Report—Requires the Advisory Committee to provide, on a biennial basis, a summary report of the assessment to Congress and the Interagency Working Group.

(d) Sunset Exemption—Exempts the Advisory Committee from Section 14 of the Federal Advisory Committee Act (sunset requirement).

Sec. 6. Savings Clause.

States that nothing in the Act supersedes any provision of the National Manufactured Housing Construction and Safety Standards Act of 1974.

Sec. 7. Authorization of Appropriations.

H.R. 3980 Authorized Funding Levels by Agency ($ in millions)

H.R. 3980 Authorized Funding Levels by Agency ($ in millions)

	2005	2006	2007
FEMA	$8	$8.7	$9.4
NSF	$8	$8.7	$9.4
NIST	$2	$3	$4
NOAA	$2	$2.1	$2.2

Chairman SMITH. The Committee will come to order. Good afternoon and welcome. This is a joint hearing between the Research and the Environment, Technology, and Standards Subcommittees to receive testimony on H.R. 3980, the *National Windstorm Impact Reduction Act of 2004,* which was introduced last week by Mr. Neugebauer and Mr. Moore. And while some areas of the country are affected more than others by windstorms, every state in the Union is vulnerable. In my district last August, 70 mile-per-hour straight-line winds knocked down trees that looked like they were extremely healthy, but it is amazing what a 70-mile-an-hour wind can even do to strong trees. It destroyed many barns in our area and left 10,000 people without power.

In addition to the evident physical damage that was caused, many businesses and schools in the area were closed temporarily until power could be restored. The utility companies are looking at ways that they might best protect against windstorms, with more clearing of trees and limbs in the vicinity of those power lines. I was on an airplane a couple of months ago with one of the architectural engineers for home construction, and he had to pay for—collect money and pay for a wind tunnel to try to experiment with some of the ideas that his association had on how to reinforce home structures. And it turned out that they simply—looking at the damage from winds where they had double two by fours on top of those studs and one at the bottom, a windstorm tended to knock out the bottom but keep the top intact.

So in his architectural firm, and I would be curious about our witnesses' comments, they started putting a double studding on the bottom under those studs also. It seems to me we need to reduce vulnerability, and that might be really twofold. The immediate and most obvious problem is that annual damage from windstorms is estimated to be multiple billions of dollars. Most efforts to reduce windstorms' impacts today focus on weather prediction and evacuation. This strategy has been successful at reducing windstorm deaths, but does not address the problem of damage to the built environment. A greater focus on making buildings and structures more wind-resistant certainly would be very useful to reducing the costs of windstorms, as well as better predictions.

Perhaps even more concerning is that with rapid population growth in high-risk areas, our vulnerability is increasing every year. As population in an area grows, new structures and infrastructure are built to accommodate the new residence. If new construction in these high-risk areas does not incorporate adequate mitigation techniques for damage sustained from windstorms, then what we are looking at is higher insurance rates and the damage that, to both property and human life, that it is going to escalate.

H.R. 3980, introduced by the gentleman from Texas, Mr. Neugebauer, and Mr. Moore, who has been working hard on this issue since coming to Congress last year, would create a federal interagency program to reduce windstorm impacts. The legislation focuses on three component areas: developing a better understanding of how high winds impact building structures, enhanced windstorm data damage collection and analysis, and developing and implementing mitigation strategies. And I would like to call on

Mr. Neugebauer without objection for a comment as soon as Ms. Johnson makes her comment.

[The prepared statement of Mr. Smith follows:]

PREPARED STATEMENT OF CHAIRMAN NICK SMITH

Good afternoon, and welcome to this joint hearing between the Research and the Environment, Technology, and Standards Subcommittees to receive testimony about H.R. 3980, the *National Windstorm Impact Reduction Act of 2004,* which was introduced by Mr. Neugebauer and Mr. Moore.

We have an excellent panel of witnesses with us today, starting with Dr. John Brighton, Assistant Director for Engineering at the National Science Foundation. Before coming to NSF, Dr. Brighton served as Provost of National-Louis University, and prior to that was the Executive Vice President and Provost at Pennsylvania State University.

Our second witness is Anthony Lowe, Administrator of the Federal Insurance Mitigation Administration, a division of the Emergency Preparedness and Response (EPR) Directorate of the Department of Homeland Security. Mr. Lowe testified before the Research Subcommittee last year regarding the National Earthquake Hazard Reduction Program Act of 2003, and I look forward to hearing his comments today. Accompanying Mr. Lowe is Edward Laatsch, Chief of the EPR Building Science and Technology Branch.

I will yield at this time to the gentleman from Kansas, Mr. Moore, to introduce our next witness.

Our last witness to testify today will be Jeffrey Sciaudone, Director of Engineering and Technical Services for the Institute for Business and Home Safety. Mr. Sciaudone represents IBHS on various technical industry committees concerning natural disaster mitigation and oversees the development of products dealing with the public understanding of natural hazard mitigation. He also serves on the International Code Council's Industry Advisory Committee.

While some areas of the country are affected more than others by windstorms, every state in the union is vulnerable. In my district last August, 70-mile per hour straight-line winds knocked down trees, destroyed barns, and left 10,000 people without power. In addition to the evident physical damage that was caused, many businesses and schools in the area were closed temporarily until power could be restored.

The need to reduce vulnerability is really two-fold. The immediate and most obvious problem is that annual damage from windstorms is estimated to be multiple billions of dollars. Most efforts to reduce windstorm impacts today focus on weather prediction and evacuation. This strategy has been successful at reducing windstorm deaths, but does not address the problem of damage to the built environment. A greater focus on making buildings and structures more wind resistant would be useful in reducing the cost of windstorms.

Perhaps an even scarier issue is that with rapid population growth in high-risk areas, our vulnerability is increasing every year. As population in an area grows, new structures and infrastructure are built to accommodate the new residents. If new construction in these high-risk areas does not incorporate adequate mitigation techniques, damage sustained from windstorms will escalate.

H.R. 3980 would create a federal interagency program to reduce windstorm impacts. The legislation focuses on three component areas: developing a better understanding of how high winds impact buildings and structures, enhanced windstorm damage data collection and analysis, and developing and implementing mitigation strategies.

I look forward to hearing comments on H.R. 3980 from our witnesses and expect that they will lead to a productive discussion.

Ms. JOHNSON. Thank you very much, Mr. Chairman. I am pleased to join you in welcoming our witnesses today for this initial hearing on the *National Windstorm Impact Reduction Act of 2004.*

This hearing will build upon the field hearing regarding windstorms and their resulting casualties held on February the 9th in Lubbock, Texas. On April the 19th, 1995 at 8:02 p.m. Central Standard Time, a tornado hit my district in Dallas, Texas. The path of destruction there had a width of 100 yards and a length of 6 miles. After initially touching down just south of Irving, the

tornado then moved east of northeast before lifting just southwest of downtown Dallas. Major damage to apartment complexes was reported and a large number of trees uprooted. Two homes were destroyed and a business was heavily damaged. While most physical injuries are—were minor, this tornado caused over $6 million in property damages.

Each year, severe windstorms, including hurricanes and tornadoes, cause dozens of deaths and billions of dollars in property damage. Research has shown that wind events are responsible for about ¾ of the insured losses, and this figure seems to be applicable to the United States, as well as other parts of the world. Is there something that can be done to save these lives and avoid all of these monetary losses? We are finding, however, that with prewarning, we are saving lives, just not saving property.

We must work toward finding ways to mitigate these losses through a combination of efforts in the fields of forecasting, as well as materials technology and engineering. Currently, we are lacking a comprehensive federal program aimed at mitigating these losses before they occur. In response to these damages caused by windstorms in the past, there has been a great outpouring of federal as well as insurance industry funds for disaster response and relief. What if we had created a wind hazard research and mitigation program when we created the earthquake program? How many times over would we have paid for that research and mitigation in reduced losses of property and lives?

Not only should funds be made available for recovery, but there should also be funds for education of young wind engineers. These professionals could thereby carry on research that could better position us to significantly improve construction designs and materials, while also enabling property owners to add retrofit technology to better protect existing structures. If we concentrate on coordinating and harnessing our existing resources, we will be able to conduct this research more efficiently and with much more effective results.

Finally, the United States cannot afford to become dependent on professionals who receive their education in other countries. It is essential that the research being applied here be matched both with our own weather trends, as well as our own patterns for urban and residential development. Our degree of preparedness for these kinds of inevitable natural disasters impacts the security of our individual homes and families, as well as our homeland. For these reasons, we must invest more and do more to motivate young Americans to pursue this particular field of research. Congress has a responsibility to pass legislation that will employ the fruits of much needed research and development to reverse the trend of ever increasing losses from windstorms.

Mr. Chairman, I want to thank you for calling this hearing and thank our witnesses for appearing before the Subcommittee today, and I look forward to our discussion. Thank you.

[The prepared statement of Ms. Bernice Johnson follows:]

PREPARED STATEMENT OF REPRESENTATIVE EDDIE BERNICE JOHNSON

Mr. Chairman, I am pleased to join you in welcoming our witnesses today for this initial hearing on the *National Windstorm Impact Reduction Act of 2004.* This hear-

ing will build upon the field hearing regarding windstorms and their resulting casualties, held on February 9th, in Lubbock, Texas.

On April 19, 1995, at 8:02 p.m. Central Standard Time, a tornado hit my district in Dallas, TX. The path of destruction there had a width of 100 yards and a length of six miles. After initially touching down just south of Irving, the tornado then moved east-northeast before lifting just southwest of downtown Dallas.

Major damage to apartment complexes was reported, and a large number of trees were uprooted. Two homes were destroyed and a business was heavily damaged. While most physical injuries were minor, this tornado caused over $6 million dollars in property damages.

Each year, severe windstorms, including hurricanes and tornadoes, cause dozens of deaths and billions of dollars in property damage. Research has shown that wind events are responsible for about ¾ of insured losses and this figure seems to be applicable to the U.S. as well as other parts of the world. Is there something that can be done to save these lives and avoid all these monetary losses?

We must work towards finding ways to mitigate these losses through a combination of efforts in the fields of forecasting, as well as materials technology, and engineering. Currently, we are lacking for a comprehensive federal program aimed at mitigating these losses before they occur.

In response to these damages caused by windstorms in the past there has been a great outpouring of federal as well as insurance industry funds for disaster response and relief. What if we had created a wind hazard research and mitigation program when we created the earthquake program? How many times over would we have paid for that research and mitigation in reduced losses of property and lives?

Not only should funds be made available for recovery, but there should also be funds for education of young wind engineers. These professionals could thereby carry on research that would better position us to significantly improve construction designs and materials, while also enabling property owners to add retrofit technology to better protect existing structures. If we concentrate on coordinating and harnessing our existing resources we will be able to conduct this research more efficiently and with much more effective results.

Finally, the United States cannot afford to become dependent on professionals who receive their education in other countries. It is essential that the research being applied here be matched both with our own weather trends as well as our own patterns for urban and residential development. Our degree of preparedness for these kinds of inevitable natural disasters impacts the security of our individual homes and families as well as our homeland. For these reasons we must invest more and do more to motivate young Americans to pursue this particular field of research. Congress has a responsibility to pass legislation that will employ the fruits of much needed research and development to reverse the trend of ever increasing losses from windstorms.

Mr. Chairman, I want to thank you for calling this hearing and thank our witnesses for appearing before the Subcommittee today. I look forward to our discussion.

Chairman SMITH. Thank you. Mr. Neugebauer.

Mr. NEUGEBAUER. Thank you, Mr. Chairman. Damaging winds cause several billion dollars worth of damage in property and economic losses each year. In recent decades, with rapid population growth and development in high-risk coastal areas, we have accelerated our vulnerabilities. To date, the federal inference to address windstorm impacts have been relatively limited. For example, the National Academy of Sciences' review of federal programs to mitigate windstorms found that there is still a lack of leadership, focus and coordination of wind hazard mitigation activities across all agencies, and funding for the research and development specifically targeting wind hazard reduction issues is insufficient.

Unfortunately, the level of losses increases nationally each year, and will continue to escalate unless technology generation, education and public policies are improved. Like the gentlewoman from Texas, 30 years ago in Lubbock, Texas, a tornado came through the center of town in 1970, killed 26 people and injured 500 and destroyed my apartment complex. Fortunately, I was not in that

apartment complex at the time, but I saw firsthand what kind of damage can occur in some of these high-wind events. Last year, Hurricane Isabel wreaked havoc over the eastern half of the United States. These destructive storms are reminders of how vulnerable we are and how serious we should be about severe weather safety and preparedness.

This is why Congressman Moore and I have introduced H.R. 3980, the *National Windstorm Impact Reduction Act of 2004.* This legislation creates a multi-agency, National Windstorm Impact Reduction Program, which will coordinate input from individuals, academia, and the private sector, and other interested non-federal entities aimed at reducing the loss of life and property from windstorms. Today, we are here to discuss the role of federal research and development in windstorm hazard reduction.

I would like to thank my staff, the staff of the Science Committee, and the Wind Hazard Reduction Coalition for all their hard work in helping us put this bill together. Also, I would like to thank Dr. Brighton, Mr. Lowe, Dr. McCabe and Mr. Laatsch and Mr. Sciaudone for coming today, and look forward to hearing your testimony.

Mr. MOORE. Thank you, Mr. Chairman. I want to thank—and he is not here right now, but the Chairman of our committee, Chairman Boehlert, for following through on a promise he made to hold a hearing on this important issue in the 108th Congress, and I also want to thank Congressman Neugebauer for his work on this. He has really hit the ground running on this, and I really, really appreciate what he has done in his efforts here. Over the course of the past five years, we have done a lot of work on this. I want to thank Jim Turner of the House Science Committee staff and Brian Pallasch of the American Society of Civil Engineers for working on this issue with us.

Five months after I took office in 1999, my hometown of Wichita, Kansas was hit by a F4 tornado, which plowed through the suburb of Haysville, killing six, injuring 150 and causing over $140 million in property damage. The devastation of this attack motivated me to try to do something. I put together a bill modeled after NEHRP [National Earthquake Hazards Reduction Program], the successful earthquake research program, which was begun over 30 years ago, and the goal of this legislation was to mitigate loss of life and property due to wind and related hazards.

I reviewed comments from the American Society of Civil Engineers, the American Association of Home Builders, the insurance industry, meteorologists, emergency managers, academia, industry, and the Manufactured Housing Association to try to fine-tune this legislation, this bill. On May 4, just last year, almost four years to the day after the deadly 1999 Kansas and Oklahoma tornadoes, tornadoes again struck in metropolitan Kansas City and the surrounding suburbs, as well as in many of my Science colleagues' districts, destroying property, killing persons and injuring our constituents.

These tornadoes don't check to find out whether they are Republicans or Democrats they are hitting. This really is not, cannot be, a partisan issue. It is an issue about human tragedy. These wind-

storms destroy lives. I know many of us have seen it in our own districts and know many of my colleagues have seen it in theirs.

I want to again thank Representative Neugebauer for working diligently on this important issue, for introducing this important legislation and for Chairman Boehlert for having the hearing, and you, Mr. Chairman, for sitting in this hearing. I would like to thank all of the witnesses who are here today, and particularly Dr. McCabe, who is from the University of Kansas and a great basketball team, but we are here today to talk about weather. And thanks, all of you. I am interested to hear your comments. Thank you.

[The prepared statement of Mr. Moore follows:]

PREPARED STATEMENT OF REPRESENTATIVE DENNIS MOORE

I would like to thank Chairman Sherry Boehlert for following through on his promise to hold a hearing on this important issue in the 108th Congress, I would also like to thank Representative Randy Neugebauer for working with me on this important legislation. Over the course of the past five years I would also like to thank Jim Turner of the House Science Committee staff and Brian Pallasch of the American Society of Civil Engineers for working on this issue tirelessly.

Five months after I took office in 1999, my hometown of Wichita, Kansas, was attacked by a F4 tornado which plowed through the suburb of Haysville killing six, injuring 150, and causing over 140 million dollars in damage. The devastation of this attack motivated me to do something "about the weather" to paraphrase the old Mark Twain adage.

I put together a piece of legislation modeled after NEHRP the successful earthquake research program begun over 30 years ago. My legislation's goal is to mitigate loss of life and property due to wind and related hazards.

I utilized comments from the American Society of Civil Engineers, the American Association of Home Builders, the insurance industry, meteorologists, emergency managers, academia, industry, and the manufactured housing associations to fine-tune the legislation.

On May 4, 2003, almost four years to the day after the deadly 1999 Kansas and Oklahoma tornadoes, tornadoes touched down in metro Kansas City and the surrounding suburbs as well as in many of my Science Committee colleagues' districts, destroying property, killing and injuring our constituents.

These tornadoes did not check with Congress to see if they were hitting Republican or Democratic districts, just hit both. This is not a Republican or a Democratic issue it is a human issue, it is a human tragedy. These windstorms destroy lives; I have seen it in my own district and know many of my colleagues have seen it in theirs.

Thank you again Rep. Neugebauer for introducing this important legislation and Chairman Boehlert for having the hearing and I would also like to thank Dr. Steve McCabe of the University of Kansas for testifying. Dr. McCabe, I am very proud to have you here today. Thank you Mr. Chairman, I yield the balance of my time.

[The prepared statement of Ms. Jackson Lee follows:]

PREPARED STATEMENT OF REPRESENTATIVE SHEILA JACKSON LEE

Mr. Chairman,

Thank you for calling this important hearing that could mean so much to the American people, especially to my constituents in Texas where hurricanes and tropical storms are such a constant threat. Houston is still recovering from Tropical Storm Allison that hit on June 5, 2001. All told, Allison cost Harris County 22 lives, 95,000 cars and trucks, 73,000 homes, and $5 billion in property damage. That is an almost devastating blow to any community.

It is truly a testament to the awesome power of nature. Of course, we cannot fully harness that power. However, if we can use good science and planning to reduce the impact of such storms by even ten percent, it would be a tremendous service. Much of the damage of Allison and other hurricanes comes from windstorm damage, tearing off roofs, blowing out windows, and causing debris-related injuries and destruction. Across the Midwest, similar windstorm damage wreaks havoc during tornadoes.

It is in the excellent tradition of this committee that we are here today to discuss how we can use good scientific research, and to coordinate the various resources available in the Federal Government to have a meaningful impact on the lives and well-being of the American people.

I welcome this distinguished panel today, and look forward to hearing their comments. I hope to learn more about how advances in technology and design might be used to make our buildings and homes safer. Also, I think all of us have experienced the feeling in big cities like Houston, where the wind seems to be channeled and amplified between buildings. Therefore, I would like to know if long-term, there are ways to use smarter urban planning to make our cities less vulnerable to storm and wind-related damage.

And as we move to discussion of the bill we have before us, I would like to know if it rises to the magnitude of this problem, and how we might make the bill better.

Thank you.

Chairman SMITH. Mr. Lucas from Oklahoma.

Mr. LUCAS. Thank you, Mr. Chairman. Just ever so briefly, I want to thank my colleagues from Kansas and Texas for working on this piece of legislation. There are very few things that all of us who live in the southern plains have as much focus on as the weather, Mother Nature's great intensity. And while we have made huge progress in the last 50 years, there are communities all over our region littered with tragedies from days before that—the great losses of life in places like Leady, Oklahoma and Woodward, Oklahoma in the 1940's. While we have made great progress, clearly Mr. Neugebauer and Mr. Moore are on track for ways to make even greater progress in protecting our citizens, our lives, and making it just a little bit simpler to exist in the southern plains.

Thank you, Mr. Chairman, and I too look forward to this testimony.

Chairman SMITH. Anyone that hasn't sort of seen the damage of what wind can do I think is amazed what a tornado can do. In our area of southern Michigan, the 1965 tornado in our barns—I am a farmer—in our barns, it blew pieces of straw through the boards of the barn, and so it is an area where investigation and research I suspect can be very helpful.

We have an excellent panel of witnesses today, starting with Dr. John Brighton, Assistant Director of Engineering at the National Science Foundation. Before coming to NSF, Dr. Brighton served as Provost of the National-Louis University, and prior to that was Executive Vice President and Provost at Pennsylvania State University.

Our second witness is Anthony Lowe, Administrator of the Federal Insurance Mitigation Administration, a division of the Emergency Preparedness and Response Directorate of the Department of Homeland Security. Mr. Lowe testified before the Research Subcommittee last year regarding the National Earthquake Hazards Reduction Program Act, and I look forward to hearing his comments today.

Accompanying Mr. Lowe is Edward Laatsch, Chief of the EPR Building Science and Technology Branch.

Mr. Moore, I will yield to you for introducing the next witness from Kansas. Something about the yellow brick road or something out there in Kansas.

Mr. MOORE. We are going to stay away from Toto and Dorothy today, but I do again want to welcome Dr. McCabe for being here.

He—and I am embarrassed to say, I have lost my notes. They are right here. Thank you very much. Staff is absolutely wonderful.

Dr. Steven McCabe is a Professor in the Department of Civil, Environmental and Architectural Engineering at the University of Kansas. Dr. McCabe will be testifying on behalf of the American Society of Civil Engineers, of which he is a member. He currently holds a temporary position at NSF as Program Director for the structural systems and engineering programs within the division of Civil and Mechanical Systems, and I am very, very proud to introduce Dr. McCabe.

Chairman SMITH. Our last witness to testify today will be Jeffrey Sciaudone, Director of Engineering and Technical Services for the Institute for Business and Home Safety. Mr. Sciaudone represents the IBHS on various technical industry committees concerning natural disaster mitigation and oversees the development of products dealing with the public understanding of natural hazard mitigation. He also serves on the International Code Councils' Industry Advisory Committee.

Gentlemen, again, thank you for giving your time to the Committee, and Dr. Brighton, start with you, and without objection, the total text of your testimony will be included in the record. And so plus or minus a little, if you can hold it down to five minutes, we will proceed with questions.

STATEMENT DR. JOHN A. BRIGHTON, ASSISTANT DIRECTOR FOR ENGINEERING, NATIONAL SCIENCE FOUNDATION

Dr. BRIGHTON. Thank you, Chairman Smith, and distinguished Members of the Subcommittees. I appreciate the opportunity to testify on behalf of the National Science Foundation concerning H.R. 3980.

Windstorm and hazards related research and educational activities are supported by all directorates at NSF, but the main contributions are from three directorates: the Social, Behavioral, and Economic Sciences, the Geosciences and Engineering Directorates. Engineering programs support basic research into structures and their performance under multi-hazard loadings that include wind, hurricanes and tornadoes. Examples include investigations of the behavior of tall and low-rise buildings under hurricane wind, of tornado-induced wind loads on structures, and the performance of large coastal bridges under hurricanes. With new sensors and with wireless and distributed sensor networks, we anticipate a dramatic improvement in our ability to make spatial measurements of wind forces and directions, resulting in significant improvements in performance.

NSF's Atmospheric Sciences Programs support fundamental research on the structure and life cycle of tornadoes, hurricanes and windstorms. Significant progress has been made in our understanding of the structure of tornadoes and their parent thunderstorms. While the prediction of hurricane tracks has improved over the last decade, errors in prediction of landfall and hurricane intensity are still large. Field studies using deployed sensor networks will help us to know where the most critical winds will occur, so that early and accurate warnings are possible.

Windstorm-related social science research is supported through the Social and Behavioral Sciences Directorate and the Engineering Directorate. Projects include mitigation of losses through sustainable land management and improved warning systems and evacuation strategies. NSF also supports research on urban search and rescue and field activities studying community response and recovery from hurricane and tornado events. NSF supports windstorm-related research through other directorates, including post-storm ecological recovery, modeling of coastal processes, and K–12 and informal science projects.

NSF's Centers programs have been very important in windstorm research, as well. In 1989, the NSF began 11 years of support for the Center for Analysis and Prediction of Storms at the University of Oklahoma, in collaboration with NOAA. Last year, NSF started the new Center for Collaborative Adaptive Sensing of the Atmosphere at the University of Massachusetts at Amherst. The Center will develop low-cost dense networks of radars that will enable development of a new generation of meteorological software and emergency managers' needs for critical decisions.

NSF engages with other federal agencies in many activities. For example, NSF works with NIST to support the United States/Japan Joint Wind and Seismic Task Group. In reconnaissance efforts, NSF works with FEMA to ensure complementary and coordinated activities. NSF also coordinates its investments through the U.S. Weather Research Program, which is focused on the study of high-impact weather.

In closing, let me make a few observations concerning the proposed legislation. The bill would establish an interagency working group with a charge to plan and coordinate. A mechanism for such activities already exists through the National Science and Technology Council, NSTC, and this mechanism is working well. The legislation also directs the establishment of a National Advisory Committee on Windstorm Impact Reduction. In fact, federal agencies involved with windstorm impact mitigation regularly receive guidance from academic, government and industry sectors through professional societies, meetings and workshops. Such input is very valuable to establish important research directions, and an additional advisory organization would replicate these activities.

Finally, the proposed legislation defines a specific program on windstorms and mandates activities for research, impact assessment and impact mitigation. The National Science Foundation supports basic research, not research to address specific goals or priorities, as might be appropriate for a sector-specific or mission agency. The hallmark of NSF's success is its openness to receive unsolicited proposals to highly competitive programs with merit review by experts, which we feel gives us high-quality, high-impact results. Although we welcome Congressional attention and oversight in this area, we are always concerned about the unintended consequences of codifying research programs into law. And while we look forward to working with the Committee to implement the goals of this legislation, the administration believes that this legislation is unnecessary at this time.

Mr. Chairman, thank you for the opportunity to present this testimony. NSF is very excited about the research and investments in

this activity and what they have accomplished to date, and about what will be possible to achieve in the future. Thank you.

[The prepared statement of Dr. Brighton follows:]

PREPARED STATEMENT OF JOHN A. BRIGHTON

Introduction

Chairman Ehlers, Chairman Smith and distinguished Members of the Subcommittees:

I appreciate the opportunity to testify on behalf of the National Science Foundation (NSF) concerning H.R. 3980, the *National Windstorm Impact Reduction Act of 2004,* and NSF's robust research in this area. In order to provide context for the NSF involvement in windstorm research, let me first discuss the broader NSF mission in order to place in context my extended discussion of the role of NSF.

The NSF Mission

Recent years have seen an acceleration in rates of change in society and in the world at large. In this era of dynamic change, in which science and technology play an increasingly central role, NSF has remained steadfast in pursuit of its mission: to support science and engineering research and education for the advancement of the Nation's well being. Knowledge is our strongest insurance for preparedness. The Foundation is the main source of funding for the growth in fundamental scientific and engineering knowledge and, at the colleges and universities funded by NSF, scientists and engineers are working to provide ever more effective approaches for prediction and for prevention and mitigation of impacts of natural hazards including windstorms.

The investments made by NSF are critical to creating a complete picture of the Nation's vulnerability to windstorms—an understanding that leads to effective mitigation and hazard reduction. Collectively, the directorates of NSF cover the spectrum from natural and social sciences to engineering, from discovery to implementation, from prediction to response to mitigation. With the vulnerability of the Nation to natural hazards growing and becoming increasingly complex, it is important to have an integrated, multi-agency perspective to make significant progress. Fortunately, such agency partnerships are already in existence.

NSF and Current Support for Windstorm Impact Reduction Research

Windstorm and hazards-related research and educational activities are supported by many programs at NSF, including particular contributions from the Social, Behavioral, and Economic Sciences (SBE), the Geosciences (GEO) and the Engineering (ENG) Directorates. Estimated program investments in windstorm-related research at NSF are summarized in the table below for the past two fiscal years. Please note that these investment totals do not include a large body of research on, for example, heavy rains in hurricanes and thunderstorms, or portions of related infrastructure support (e.g., base support for national facilities such as radars, aircraft, computing centers).

NSF Directorate	Focus	FY2002 ($million)	FY2003 ($million)
Geosciences (GEO)	Windstorm	5.6	9.1
	Related (estimated)	3.2	4.8
Engineering (ENG)	Wind	3.3	4.7
	Multi-hazard Related (estimated)	2.0	2.8
	Social Science	1.3	2.3
Social, Behavioral and Economic Sciences (SBE)	Social Science	0.4	0.5
Biological Sciences (BIO) Computer and Information Sciences and Engineering (CISE) Education and Human Resources (EHR) Mathematical and Physical Sciences (MPS)	Wind and Multi-hazard Related	3.5	7.7

Fundamental windstorm research is funded in GEO, while ENG supports fundamental research into multi-hazard engineering that includes engineering design for wind impacts. Social science research related to hazard mitigation and preparedness

is supported through the SBE and ENG Directorates. Significant progress continues to be made in these programs in understanding windstorm processes, impacts, and the social and economic aspects of hazard reduction. NSF investments result not only in new knowledge and facilities, but also in the supply of trained researchers and professionals that the Nation needs.

NSF investments have supported growth of vibrant and integrated hazards-related research communities in engineering, geosciences, and in the social sciences. Leadership from the engineering, social science and geoscience research communities has been important to transfer of research outcomes into application, engineering practice and into improvements in codes and standards. Related NSF activities include programs involving wind research facilities, post-windstorm investigations, international cooperation, and information dissemination. Throughout the remainder of this testimony, recent highlights of such NSF activities will be presented.

Engineering programs support basic research into structures and their performance under loading from hazards that include earthquake, wind, hurricanes and tornadoes, fire, blast and other forms of non-static loading. Over the past three years, the number of proposals that were submitted in these research areas has doubled. The research is basic in nature, and projects are selected based on merit determined through rigorous peer review by experts.

Awards for wind-related research have included CAREER awards to young faculty, and other projects in which faculty study wind issues including wind forces, structural response and projectile damage. In addition, ENG supports reconnaissance studies of tornado and hurricane damage, equipment and facility development, and workshops or meetings to bring the research community together to discuss research issues. Examples of current work include the first full-scale study of the behavior of tall buildings under wind, underway at Notre Dame; a study of wind-structure interaction for low-rise buildings, underway at Florida Atlantic University; study of tornado-induced wind loads on structures, underway at Iowa State; and study of the performance of large coastal bridges under hurricanes, being conducted at LSU. In addition several studies aimed at developing new ways of monitoring structural performance are active, as are studies developing new damping or other technologies designed to reduce the effects of windstorms on structures.

Since FY 2000, basic research with a special focus on buildings has been supported through the joint NSF/HUD PATH (Partnership for Advanced Technologies in Housing) program. The main research areas explored in this program have been:

- New window materials that will reduce damage structural and collateral damage due to flying debris,
- Lightweight wall systems that have improved wind and projectile resistance,
- New technologies for retrofitting incorporating new materials such as Fiber Reinforced Polymers, and
- Robust structural and roofing systems.

The PATH program has also given particular attention to the protection of critical buildings such as school buildings.

Research in atmospheric sciences is strongly supported at NSF, including fundamental research on the structure and life cycle of tornadoes, hurricanes and windstorms. An example of NSF's investments is the FY 2003 sponsorship of the field phase of the Bow Echo and Mesoscale Convective Vortices Experiment (BAMEX). A focus of the BAMEX is the study of long-lived severe storms that produce damaging straight-line surface winds. The BAMEX project conducted detailed aerial and ground surveys of wind damage following bow echo events and will use this information to relate the severity and scale of damage to radar-observed convective system location and structural characteristics as well as perform analyses and mesoscale model simulations of bow echo events. BAMEX was conducted over a large experimental domain centered on St. Louis, Missouri, and involved unprecedented data collection via specialized airborne and ground-based observing platforms. The results of this research will significantly clarify the understanding of damaging wind production in bow echoes and will illuminate where the most damaging winds are most likely to occur, with what radar-observable attributes, and under what mesoscale environmental conditions. Ultimately, results may be applied by operational forecasters to issue more timely and accurate forecasts and warnings of damaging non-tornadic surface winds.

In addition to engineering and atmospheric sciences, NSF supports social, economic, and behavioral science research on windstorm and related hazards through both the Engineering and the SBE Directorates. The research currently focuses upon such critical issues as the mitigation of hurricane losses through effective

coastal and land use management; improvement in warning systems for short-fuse weather phenomena, such as tornadoes; more effective hurricane evacuation planning; improved urban search and rescue operations for collapsed structures resulting from hurricanes and tornadoes; and greater resilience and recovery of communities in the post hurricane and post-tornado environment. Research and practice indicate that adoption of effective, non-structural coastal hazard mitigation programs with their accompanying land-use controls over the coming decades will significantly lower property losses. The control of coastal development, developing effective warning and evacuation systems, and improving emergency planning and response in coastal and wind-prone areas cannot be ignored if loss reduction is to be achieved.

NSF also supports windstorm-related research through other directorates including BIO, CISE, EHR and MPS. Research foci include post-storm ecological damage and recovery, mathematical modeling of weather and coastal processes, and K–12 and informal science projects. Such investments in recent years have totaled on the order of $4 to $8 million per year.

Research at NSF Centers

NSF's centers programs provide very useful institutional arrangements for conducting complex holistic research. In 1989, the NSF Science and Technology Centers program began support for the Center for Analysis and Prediction of Storms (CAPS) at the University of Oklahoma (OU) in collaboration with the National Oceanic and Atmospheric Administration (NOAA). Since its establishment, CAPS has developed techniques for the numerical prediction of small-scale weather, especially aimed at substantially increasing the accuracy and reliability of warnings of hazardous weather associated with thunderstorms. NSF core support for CAPS ended in 2000, and the Center has continued to be a dynamic center conducting innovative research and expanding partnerships to include many federal and state agencies and public and private organizations. It also acts directly in service to the public—for example, in an effort to learn as much as possible about every aspect of the May 3, 1999 Great Plains Tornado Outbreak, CAPS organized a National Symposium that was convened with NSF funding. This conference brought together more than 400 meteorologists, social scientists, construction engineers, emergency managers, policy makers, and disaster relief workers from around the world in the first multi-disciplinary examination of a major tornado disaster. More than 1000 private citizens attended a half-day exhibition of safe room and advanced weather technology prior to the symposium.

Current weather forecasting and warning technology uses data from high power, long-range radars that have helped meteorologists improve forecasts significantly in the past 10 years. However, long-radars have limited ability to observe the lower part of the atmosphere because of the Earth's curvature. Today's radars cannot detect the full vertical rotation of most tornadoes, and they cannot observe tornado behavior at or near ground level. In addition, one in five tornadoes is undetected by current technology, and 80% of all tornado warnings turn out to be false alarms.

Last year, NSF began funding a new Engineering Research Center (ERC)—the Center for Collaborative Adaptive Sensing of the Atmosphere, or CASA. The CASA ERC is a partnership between the University of Massachusetts (lead institution), University of Oklahoma (including CAPS researchers), Colorado State University, University of Puerto Rico at Mayaguez, and a consortium of industrial partners and NOAA's National Severe Storms Laboratory. CASA is researching a new weather hazard forecasting and warning technology based on low-cost, dense networks of radars that operate at short range, communicate with one another and adjust their sensing strategies in direct response to the evolving weather and changing end-user needs. In contrast to today's physically large radars that have 30 foot diameter antennas, the antennas in the CASA networks are expected to be three-feet in diameter with electronics that are about the size of a personal computer. This small size allows these radars to be placed on existing cellular towers and rooftops, enabling them to comprehensively map damaging winds and heavy rainfall in the critical region beneath the coverage of current technology.

In addition to providing low-level coverage, this approach is expected to achieve breakthrough improvements in sensitivity and resolution leading to significant reductions in tornado false-alarms; fine-scale wind field imaging and thermodynamic state estimation for use in short-term numerical forecasting and other applications such as flood prediction and airborne hazard dispersion prediction. A new generation of meteorological software will be developed to use this radar data to support emergency managers and government and private industry organizations that need weather data for making critical decisions.

The team is configured to lay the fundamental and technological foundations for dense, adaptive radar networks and conduct proof-of-concept demonstrations using field-scale test beds deployed in hazard-prone areas. Research projects include the design and fabrication of low-power solid state radars, new hazard detection algorithms that make use of the data, and the design of the system architecture for organizing hardware and software components and interfacing to end-users. The first test-bed, comprising a network of nine small radars, will be installed beginning September 2005 on towers across central and western Oklahoma in a region frequented by tornadoes and severe thunderstorms. An end-user group comprised of emergency managers and public and private sector weather forecasters is included in the CASA team and will participate in the testing of the system.

Information Technology for Windstorm Research

Each year across the United States, floods, tornadoes, hail, strong winds, lightning, and winter storms cause hundreds of deaths and result in annual economic losses of more than $13B. Their mitigation is stifled by rigid information technology frameworks that cannot accommodate the unique real time, on-demand, and dynamically-adaptive needs of weather research.

Linked Environments for Atmospheric Discovery (LEAD), is an ITR (Information Technology Research) project started last year. The aim of LEAD is to create a series of interconnected virtual "Grid environments," that allows scientists and students to access, prepare, predict, manage, analyze, and visualize a broad array of meteorological information independent of format and physical location. A transforming element of LEAD is the ability for analytical tools, forecast models, and data repositories to function as dynamically adaptive, on-demand systems that can change configuration rapidly and automatically in response to the evolving weather; respond immediately to user decisions based upon the weather problem at hand; and steer remote observing systems to optimize data collection and forecast/warning quality.

LEAD will allow researchers, educators, and students to run atmospheric models and other tools in much more realistic, real time settings than is now possible, hasten the transition of research results to operations, and bring the pedagogical benefits of sophisticated atmospheric science tools into high school classrooms for the first time. Its capabilities will be integrated into dozens of universities and operational research centers that collectively reach 21,000 university students, 1800 faculty, and hundreds of operational practitioners.

Status of Understanding About Windstorms and Impacts, and Future Research Directions

Engineering knowledge about windstorms and their effects on manmade structures is still developing. Engineering practice relies on basic understanding of winds and simplified models to represent loadings on structures. However, the state of practice is such that most large buildings and many large bridges are wind tunnel tested at reduced scale to determine wind loads and performance. Wind tunnel test results permit improved design solutions for wind over those possible with analytical models. NSF has funded projects to improve testing facilities at a number of institutions, including a recent award to design and build a wind tunnel at Iowa State. For this and other facilities, NSF advocates shared use of data and facilities by the community to permit collaborative research and an integrated approach to wind research.

Experimental data from wind tunnel testing has been an important ingredient in the development of improved design procedures, and such approaches will no doubt be an element of future research. This empirical approach works, but the solutions are largely case-specific and difficult to transfer to other designs or to generalize. With the development of and easy access to sophisticated simulation models and high-end computational resources, NSF expects there to be rapid innovations in the analysis of complex structures or facilities located in complex environments.

Knowledge of basic questions such as wind speeds in hurricanes and tornadoes is still being developed. During Hurricane Isabel, one NSF-supported team from the American Association of Wind Engineering (AAWE) observed that in the Williamsburg area of Virginia, large trees were uprooted and blown down in some areas but not in other adjacent areas. Empirical data strongly suggests that the wind speeds at the hurricane front are not uniform, but have significant spatial variation. This observation is important because it suggests that the "conventional" engineering wisdom for wind distribution is too simplistic. Because current field wind-measurement instruments are limited in capability and not widely distributed, it has been difficult to gather meaningful data concerning spatial variability of wind forces and directions. With rapid development in sensors and wireless and deployable sensor

networks, we can anticipate a near-term improvement in our ability to make distributed measurements. Such work will lead to significant advancements in engineered design for windstorm impacts.

Open questions in Wind Engineering include:

- magnitude and distribution of wind forces on structures in actual severe windstorms
- effects of severe non-uniform transient winds on structures
- effects of scale in the predicted effects of steady and transient windstorms on structures
- development of computational models to predict structural loading from extreme wind events based on next generation experimental work
- development of improved reliability models based on transient wind studies
- effects of the loss of building envelop integrity on windstorm damage.

Regarding the atmospheric sciences, significant progress has been made over the last decade in fundamental understanding of the basic characteristics of the structure of tornadoes and their parent thunderstorms. Progress also has been made on the detection of thunderstorms that have the potential to be tornadic and, to a lesser extent, their prediction. Knowledge of the triggering mechanisms for the tornadic vortex itself is still lacking. Primary research thrusts today are in the triggering mechanism of the tornadic vortex and better short-range prediction (zero to six hours) of tornadic thunderstorms with an emphasis on thunderstorm initiation.

While the prediction of hurricane tracks has improved over the last decade due to better understanding of the controlling physical factors, errors in track location are still large. Research in this area continues. Little progress has been made on understanding and forecasting hurricane intensity changes. Current research thrusts focus on the impact of internal storm dynamics and air/sea/land interactions on wind intensity changes. As explained in the context of the BAMEX project, the study of the physical forcing mechanisms of straight-line winds from severe storms has been a major research thrust area. Knowledge of the physical factors that control severe straight-line wind episodes is rudimentary at this time.

Prior and ongoing research sponsored by NSF has been quite successful at determining the fundamental physics of microburst wind events, which have been shown to be responsible for many aircraft accidents. While research on microbursts continues, much knowledge has been transferred to the operational communities (FAA and NOAA) and much ongoing research is supported by the FAA. Overall, NSF supported research on this topic is decreasing.

Research into coastal zone management, which has the goal of removing property from the direct impacts of hurricanes, and research on warning and evacuation, which has the goal of removing people from vulnerable areas, are extremely cost-effective, non-structural activities that significantly reduce the losses from windstorm impacts. With the future development of sensor networks, distributed information technology and cyber resources, NSF anticipates that these areas of research will develop rapidly.

Most NSF awards are made for support of unsolicited research proposals submitted to disciplinary or cross-disciplinary research programs. These proposals are peer-reviewed by experts who are well-appraised of priorities identified by the research communities, and submissions are evaluated by established merit criteria. NSF also works directly with research communities through support of workshops and conferences to identify research priorities and opportunities. A few examples of such activities follow.

For example, NSF supported a Workshop in February 2004, conducted at the University of Central Florida for identifying the critical needs in the housing industry. In addition to the academe-based researchers involved in NSF/HUD (PATH) research initiative, expert attendees including architects and industrial representatives were invited to identify research areas that will improve safety, identify innovative construction techniques and develop products that will compete in international market. One of the focus areas was safety and security against natural and man-made disasters. Fire, wind and earthquake were identified as the critical safety areas for natural disasters. For wind, prioritized research foci included innovations to improve the performance of roof and frame connections and the shatter resistance of glass, and the use of sensors for warning and self-activation of safety measures.

Interagency Activities of NSF in Disaster Reduction

NSF functions by the peer review process and works under the direct input of researchers from the community. As such the mission of NSF is complementary to, but apart from, the more mission oriented efforts of other federal agencies. NSF is

very eager to support the research community in doing high quality basic research and works with other federal agencies within this context.

NSF is engaged with other federal agencies in several activities. With NIST, NSF co-supports the Joint Wind and Seismic Task Group to the U.S./Japan Natural Resources Development Program (UJNR). In reconnaissance efforts, NSF has direct contact with FEMA to ensure that NSF-supported efforts complement FEMA efforts and do not cause problems with emergency response and recovery. NSF also works to involve other federal agencies in research workshops as participants or as co-sponsors.

This bill designates that an Interagency Working group be formed to include NSF, NOAA, NIST, FEMA and other agencies. In fact, these agencies are represented on the Subcommittee on Disaster Reduction (SDR) of the NSTC (National Science and Technology Council). NSF is a strong supporter of strategic planning efforts by SDR agencies in order to further interagency coordination and integration, and NSF has taken a leadership role in preparing a forthcoming SDR report documenting "Grand Challenges" for hazards reduction research.

NSF works closely with other weather agencies in the conduct of many research efforts. A primary coordinating mechanism is the interagency U.S. Weather Research Program (USWRP), which is focused on the study of "high impact" weather (life threatening and/or economically significant weather events). Much of NSF-sponsored hurricane research and the BAMEX were conducted under the USWRP umbrella.

The results of NSF research are carried forward into implementation through the involvement of the researchers themselves in professional organizations, and through activities managed by our sister agencies. In this respect, NSF funding enables a knowledgeable research community to be prepared to answer questions posed by windstorm events themselves, and by observations of the performance of the built environment and socio-political systems during and after storms events. NSF-funded research enables changes warranted in engineering practice, and enhances understanding and assessment of risks and uncertainties in natural, physical, and social environments.

Since 1976 the NSF has supported the work of the Natural Hazards Research and Applications Information Center (NHRAIC) at the University of Colorado at Boulder. The NHRAIC serves as a national and international clearinghouse for research on all types of hazards, including hurricanes, tornadoes, and other wind-related phenomenon. The NHRAIC convenes an annual meeting that includes workshop activities, and serves as a bridge between researchers who produce hazard-related knowledge, and the users of that knowledge. It links those engaged in the study of wind-related hazards and disasters with government officials, policy-makers, emergency managers, and the public. The annual budget for the NHRAIC is about $850,000. Of that total, NSF contributes $300,000. The remainder of the funds are supplied by other federal agencies, such as FEMA, NOAA (including the weather service), U.S. Geological Survey (USGS), DOT, NASA, EPA, and the Centers for Disease Control (CDC).

Two other issues are of interest to NSF regarding windstorm impact reduction: Workforce and international activities. I will briefly describe some of NSF's activities in these areas.

Workforce Issues in Windstorm Impact Reduction

The initiation and eventual institutionalization of fields of inquiry is heavily dependent upon generational cohorts of scholars who not only produce new knowledge but also produce new generations of scholars who will continue to develop the field. NSF makes specific investments to support workforce development in all areas—including atmospheric sciences, engineering and hazards reduction. The following cases serve as examples of such investments.

The Directorate for Engineering has made an award entitled "Enabling the Next Generation of Hazard Researchers: An Education and Training Proposal" to the University of North Carolina, Chapel Hill. The project responds to a serious issue in the field of research on societal aspects of extreme events: the lack of an adequate cohort of junior faculty to sustain scholarship into future generations. This education and training initiative addresses this issue by developing a comprehensive, creative program of mentoring for recently appointed junior faculty at research universities.

NSF has also funded an Integrative Graduate Education and Research Traineeship (IGERT) award to Texas Tech that is aimed at producing a cadre of professionals prepared with multidisciplinary backgrounds and the technical and professional needed for the career demands in wind science and engineering, and associated economics/risk management. The program provides an integrated program

that crosses the disciplines of atmospheric science, engineering, and economics leading to an interdisciplinary doctoral degree. Some of the research areas are wind characteristics in tornadoes and landfalling hurricanes, post-disaster investigation of building damage and economic losses, deign criteria for shelters, full-scale building response in the field, wind tunnel studies, simulation of damage, forecast for wind power, and hurricane evacuation.

At NCAR (National Center for Atmospheric Research) at the University of Colorado, Boulder, the Directorate for Geosciences supports a program entitled "Significant Opportunities in Atmospheric Research and Science" or SOARS. This program offers summer research internships to undergraduates exploring a career in an atmospheric science or related field such as biology, chemistry, computer science, earth science, engineering, environmental science, mathematics, meteorology, oceanography, physics, or social science.

At the Oklahoma Weather Center (OWC), NSF supports a long-standing summer Research Experience for Undergraduates (REU) program. This program addresses the general lack of opportunities for undergraduates to gain research experience to complement their academic careers, and also the lack of participation by women and members of ethnic minorities in research in atmospheric science. The OWC in Norman boasts a unique environment that encompasses all aspects of meteorological research and can provide students with the opportunity to enhance their undergraduate careers.

International Collaborative Research

The National Science Foundation aims at nothing less than U.S. world leadership in science, engineering, and technology. Hurricanes, tornadoes and other windstorms are global hazards. Many countries find collaborative research and the sharing of information essential in meeting this challenge and the U.S. is no exception. NSF has a long history of cooperating with other countries. For example, NSF supports and participates in the NIST-managed U.S./Japan Joint Panel on Wind and Seismic Effects that convenes annual meetings for information exchange, and NSF has supported U.S. academic participation in a sequence of U.S.–Japan Workshops on Design for Wind and Wind Hazard Mitigation. An outcome of these workshops is an increased level of cooperative activity between the U.S. and Japanese wind communities. Many international research thrusts on weather topics are coordinated through the World Weather Research Program of the United Nations' World Meteorological Organization.

In closing, let me make a few observations concerning the proposed legislation. The bill would establish an Interagency Working Group to include NSF, NOAA, NIST, FEMA and other agencies as appropriate. The purpose of this Working Group would largely be planning and coordination, but a mechanism for such activities already exists through the Subcommittee on Disaster Reduction (SDR) of the National Science and Technology Council (NSTC), and this mechanism is working well.

The proposed legislation also directs the establishment of a National Advisory Committee on Windstorm Impact Reduction. In fact, federal agencies involved with windstorm impact mitigation regularly receive guidance from academic, government and industry sectors through professional societies, meetings, and workshops. These same agencies also support the Disasters Roundtable activity of the National Academies. Such input is very valuable to establish important research directions, and an additional advisory organization would replicate these activities.

Finally, the proposed legislation defines a specific program for windstorms and mandates activities for research, impact assessment, and impact mitigation. It requires the development of an implementation plan and biennial reporting. NSF supports basic research, not research to address specific goals or priorities as might be appropriate for a sector-specific or mission agency. The hallmark of NSF's success is its openness to unsolicited proposals to highly competitive programs. These proposals undergo a thorough merit review by experts according to defined criteria, and the most meritorious research is funded.

Although we welcome Congressional attention and oversight in this area, we are always concerned about the unintended consequences of codifying research programs into law. While we look forward to working the Committee to implementing the goals of this legislation, the Administration believes that it is unnecessary to enact this legislation at this time.

Mr. Chairmen, thank you again for the opportunity to present this testimony. NSF is very excited about what NSF research investments have accomplished to date, and about what will be possible to achieve in the future.

Web References:

American Association of Wind Engineering (AAWE): *http://www.aawe.org*

Bow Echo and Mesoscale Convective Vortices Experiment (BAMEX): *http://box.mmm.ucar.edu/bamex/science—frameset.html*

Center for the Analysis and Prediction of Storms (CAPS): *http://www.caps.ou.edu/* CAPS National Symposium on the May 3, 1999 Great Plains Tornado Outbreak, *(http://caps.ou.edu/may3.htm)*

Center for Collaborative Adaptive Sensing of the Atmosphere, University of Massachusetts Amherst: *www.casa.umass.edu*

Disasters Roundtable of the National Academies: *http://dels.nas.edu/dr/*

Significant Opportunities in Atmospheric Research and Science (SOARS): *http://www.ucar.edu/soars/*

Linked Environments for Atmospheric Discovery (LEAD): *http://lead.ou.edu/*

U.S. Weather Research Program (USWRP): *http://uswrp.org/*

BIOGRAPHY FOR JOHN A. BRIGHTON

John A. Brighton began his tenure as Assistant Director for Engineering at the National Science Foundation on April 30, 2003. Immediately prior to this appointment he served as Provost of National-Louis University. He previously served as Chair of the Teaching and Learning Consortium at The Pennsylvania State University from July 1999–June 2002. Brighton also served Penn State as Executive Vice President and Provost from July 1991–June 1999 and Dean of the College of Engineering from 1988–1991.

He was Director of the School of Mechanical Engineering at the Georgia Institute of Technology from 1982–1988, and was Chairman of the Department of Mechanical Engineering at Michigan State University from 1977–1982. Prior to taking a position at Penn State in 1965, Brighton served as assistant professor of Mechanical Engineering at Carnegie-Mellon University.

Brighton was also instrumental in helping Penn State University deal with change through the principles of continuous improvement. The University Council on Continuous Quality Improvement was appointed in 1991 and the University CQI Center was established in 1992.

In 1994, Brighton established the Women in Sciences and Engineering Institute to enhance recruitment and retention of women students and faculty in these disciplines. At Penn State, he received awards from the University Commission for Women and The University Committee on Diversity. He is a Fellow of the American Society of Mechanical Engineers, and of the American Society for Engineering Education. He served on the Advisory Committee for NSF's Engineering Directorate, and also as Chairman, Council of Deans of the ASEE.

Born in Gosport, Indiana, Brighton received his B.S., M.S., and Ph.D. in Mechanical Engineering from Purdue University. His research was focused on the structure of turbulent fluid motion, biofluid mechanics and research related to the development of the artificial heart and heart assist devices.

Chairman SMITH. Thank you, Dr. Brighton. Mr. Lowe, we are going to take a sort of an interim here. This is a Joint Committee Hearing with the Environment, Technology, and Standards Committee, which Mr. Vernon Ehlers chairs, as well as the Research Committee, which I chair. Congressman Ehlers is—arrived on the scene, and Mr. Ehlers, would you like to make a short statement before we proceed?

Chairman EHLERS. Well, thank you, Mr. Chairman, and I appreciate the opportunity. I am sorry to interrupt the proceedings and in the interest of time, I will not read my statement. I will just make a comment and ask that my entire statement be entered into the record. Thank you.

I am very pleased to see this subject under study. I do apologize to you and to the witnesses, as I am in the markup of a major Transportation Bill at the moment, so I am shuttling back and forth between the two, and I apologize if—for my frequent absences, but that is the way it is around here on days like this. But thank you very much for being here. I appreciate you coming and

appreciate your testimony on what I believe is a very important issue. We generate a good deal of wind on Capitol Hill, but we don't do any building damage with it. I—fortunately, we don't reach that velocity, but we appreciate the work you do in protecting buildings and their occupants from higher-level winds.

With that, I will yield back, Mr. Chairman.

[The prepared statement of Mr. Ehlers follows:]

PREPARED STATEMENT OF CHAIRMAN VERNON J. EHLERS

Along with Mr. Smith, I also am from the great state of Michigan. While most folks don't think of Michigan when they think of hurricanes or tornadoes, I can tell you from personal experience that we receive our fair share of windstorms, mostly in the form of tornadoes. Michigan experiences an average of 18 tornadoes annually, and Kent County in my district ranks third in the state for total number of tornadoes over the past 50 years.

I remember one night when my wife and I, along with our two young children, and our three month-old infant were huddled closely in our basement as a tornado passed nearby. We were all quite scared, except for the three month-old who slept through the whole thing. We had been house hunting that week and it just so happened that our first choice was destroyed by the tornado. Luckily our second choice had only minor roof damage so we bought that house.

I am pleased that we are here today to discuss the important legislation recently introduced by Mr. Neugebauer and Mr. Moore to reduce the damage to life and property by powerful windstorms. While we have learned much about how to build better buildings to withstand these storms in recent years, we have not been successful in translating that knowledge into practice.

It is not clear if the problem is a lack of understanding by the builders or consumers, the general higher cost to use new techniques or materials, or the difficulties in changing local building codes. I look forward to hearing from our witnesses today to help us better understand the problems and find the solutions that will lead to reducing the impact of these storms on property and, more importantly, saving lives.

Chairman SMITH. Now we understand the wind is at your back in proceeding with that Transportation Bill.

Chairman EHLERS. Actually, it is becoming a miniature tornado, Mr. Chairman.

Chairman SMITH. Mr. Lowe, please.

STATEMENT OF MR. ANTHONY S. LOWE, ADMINISTRATOR, FEDERAL INSURANCE MITIGATION ADMINISTRATION, EMERGENCY PREPAREDNESS AND RESPONSE DIRECTORATE (EPR), DEPARTMENT OF HOMELAND SECURITY; ACCOMPANIED BY MR. EDWARD LAATSCH, CHIEF, EPR BUILDING SCIENCE AND TECHNOLOGY BRANCH

Mr. LOWE. And good afternoon, Chairman Smith, Ranking Member Johnson of the Subcommittee on Research, as well as Chairman Ehlers of the Subcommittee on Environment, Technology and Standards, as well as the other Subcommittee Members.

My name is Anthony Lowe, Director of the Mitigation Division of FEMA, Department of Homeland Security. On behalf of the department, we welcome and appreciate the invitation to appear today before the Subcommittee on Research, on—and on Environment, Technology and Standards. Today I would like to discuss with you FEMA's efforts in the area of wind hazard mitigation. As you know, FEMA currently administers a number of programs intended to reduce the effects of hazards. These include the National Earthquake Hazards Reduction Program, the National Dam Safety Program, the National Flood Insurance Program and the National

Hurricane Program. To date, we have leveraged each of these programs to carry out all-hazards mitigation.

While some funds for wind hazard mitigation have come from the National Hurricane Program, most of the funds from this program are directed toward conducting and updating hurricane evacuation studies. These studies are essential to state and local emergency management to effectively respond to hurricanes at landfall. Over the last 30 years, FEMA has conducted a post-disaster field investigation through its disaster assistance program to determine how buildings and other structures performed and issued guidance on how to build more disaster-resistant construction. We also assist communities following a major disaster to support their efforts to build back properly so we can break the cycle of damage and repair. You all may also be aware that last month, we completed and released the first multi-hazard version of HAZUS, our tool for multi-hazard evaluation for hurricanes, earthquakes and floods. This module is the first of its type for hurricanes.

One of FEMA's greatest successes has been in the area of wind hazard shelters for tornadoes and hurricanes. FEMA has developed a number of technical guidance documents and helped establish national standards for both in-home and community shelters. These standards are in the—in use throughout the United States and currently being incorporated into the Nation's model building codes. In addition, FEMA's post-disaster Hazard Mitigation Grant Program, HMGP, has been used by a number of states to fund wind hazard shelters. Some states have elected to fund in-home shelters, while other states have chosen to fund community shelters at schools and other publicly-owned facilities. Oklahoma, Kansas, Iowa, Arkansas, Mississippi and Alabama have all funded shelters through various programs over the last four years. As a result of these initiatives, high quality and affordable wind hazard shelters have and continue to be constructed throughout the United States in areas that are threatened by tornadoes and hurricanes.

Following the 1999 tornadoes that tore through Oklahoma and Kansas, Oklahoma used its HMGP funds to establish a homeowner reimbursement program for in-home safe-rooms. Since homes damaged by tornadoes have given—were given priority by the state, many of the safe-rooms were built in Oklahoma City and in the surrounding areas. In May 2003, the Oklahoma City area was again struck by a major tornado and several safe-rooms that were built under the HMGP program provided safe shelter to many families. Following these storms, Albert Ashwood, the Director of Emergency Management for the State of Oklahoma publicly stated that the safe-rooms, built with FEMA's HMGP program funds, had saved many lives that day. Under Secretary Brown and I toured several of these damaged homes and ourselves saw both their tremendous damage and excellent performance of these safe-rooms.

This is the kind of work that FEMA is the most proud of; saving lives and property and getting people to take action before disasters strike. FEMA has and will continue to carry out wind hazard mitigation activities in close consultation with our mitigation partners, both inside and outside of government. Outside of government, we maintain strong relationships with the professional organizations, such as the American Society of Civil Engineers, the

American Association of Wind Engineers, code development organizations including ICC [International Code Council], the National Fire Protection Association. Our private sector partners include such groups as the National Association of Home Builders, Manufactured Housing Institute, the Portland Cement Association, and last but certainly not least, Texas Tech University.

In closing, it is fair to say that FEMA has considerable experience in administering hazard reduction programs. However, there is currently no federal wind hazard reduction program, and other than FEMA's National Hurricane Program, which focuses primarily on evacuations planning, there is little coordinated effort among federal agencies addressing mitigation, the effects of high—mitigating the effects of high winds on buildings, other structures and critical infrastructures. From this perspective, throughout this testimony, I would like to offer some thoughts on elements that a federal wind hazard reduction program might include.

We appreciate the opportunity to represent the Department of Homeland Security before the Subcommittees and we appreciate the time to answer any questions you may have. Thank you.

[The prepared statement of Mr. Lowe follows:]

PREPARED STATEMENT OF ANTHONY S. LOWE

Chairman Smith, Ranking Member Johnson, of the Subcommittee on Research and Chairman Ehlers, Ranking Member Udall, of the Subcommittee on Environment, Technology, and Standards, and Members of both Subcommittees, I am Anthony S. Lowe, Director of the Mitigation Division of FEMA of the Department of Homeland Security. On behalf of the Department of Homeland Security, we welcome and appreciate the invitation to appear today before the Subcommittees on Research and on Environment, Technology, and Standards.

Today, I would like to discuss with you FEMA's efforts in the area of wind hazard mitigation.

As you know, FEMA currently administers a number of programs intended to reduce the effects of hazards. These include the National Earthquake Hazards Reduction Program, the National Dam Safety Program, National Flood Insurance Program, and the National Hurricane Program. To date, we have leveraged each of these programs to carry out all-hazards mitigation.

While some funds for wind hazard mitigation have come from the National Hurricane Program, most of the funds from this program are directed towards conducting and updating hurricane evacuation studies. These studies are essential to state and local emergency management to effectively respond to a hurricane landfall. A small portion of the National Hurricane Program funds has been used to support wind hazard mitigation initiatives, such as FEMA's much-used Coastal Construction Manual. "FEMA 55," as it's referred to, is considered a reference for coastal construction and this critical guidance is offered for the benefit of architects, engineers, and building code officials.

Over the last 30 years, FEMA has conducted post-disaster field investigations through its disaster assistance programs to determine how buildings and other structures performed and issued guidance on how to build more disaster-resistant construction. We also assist communities following major disasters to support their efforts to build back properly so we can break the cycle of damage and repair.

With the advent of Geographic Information Systems (GIS) in the early 1990s, FEMA saw the value that this technology could bring to emergency planning and mitigation and undertook the development of a risk assessment tool, initially for earthquakes, called HAZUS, or Hazards-U.S. Last month, we completed and released the first multi-hazard version of our HAZUS tool called HAZUS–MH, or HAZUS Multi-hazard for hurricanes, earthquakes, and floods. The hurricane module of that tool is the first hurricane wind risk assessment tool available to state and local emergency managers and community planners. As we were completing the testing of this latest release of HAZUS, Hurricane Isabel was approaching the Atlantic coast and we used HAZUS to provide damages and economic loss projections to key decision-makers within DHS. Final HAZUS loss estimates as the hurricane

made landfall correlated well with the loss estimates provided by the property casualty insurance industry.

One of FEMA's greatest successes has been in the area of wind hazard shelters for tornadoes and hurricanes. FEMA has developed a number of technical guidance documents and helped establish national standards for both in-home and community shelters. These standards are in use throughout the U.S. and are currently being incorporated into the Nation's model building codes. In addition, FEMA's post-disaster Hazard Mitigation Grant Program (HMGP) has been used by a number of states to fund wind hazard shelters. Some states have elected to fund in-home shelters while other states have chosen to fund community shelters at schools and other publicly owned facilities. Oklahoma, Kansas, Iowa, Arkansas, Mississippi, and Alabama have all funded shelters, through various programs, over the last four years. As a result of these initiatives, high quality and affordable wind hazard shelters have and continue to be constructed throughout areas of the U.S. threatened by both tornadoes and hurricanes.

Following the 1999 tornadoes that tore through Oklahoma and Kansas, Oklahoma used its HMGP funds to establish a homeowner reimbursement program for in-home saferooms. Since homes damaged by the tornadoes were given priority by the State, many of the saferooms were built in the Oklahoma City area. In May 2003, the Oklahoma City area was again struck by a major tornado and several saferooms that were built under the HMGP program provided safe shelter to many families. Following these storms, Albert Ashwood, the Director for Emergency Management for the State of Oklahoma publicly stated that the saferooms, built with FEMA's HMGP program funds, had saved many lives that day. Under Secretary Brown and I toured several of these damaged homes ourselves and saw both the tremendous damage and excellent performance of these saferooms. This is the kind of work that FEMA is most proud of: saving lives and property, and getting people to take action before disaster strikes.

In all of these initiatives mentioned, FEMA has also focused on developing training to support technology transfer. FEMA, through its Emergency Management Institute, offers training in coastal construction for design professionals. Through our Multi-hazard Building Design Summer Institute, FEMA offers state-of-the-art training in wind resistant construction to university architectural and engineering faculty. This training is delivered by some of the Nation's leading wind engineers from Texas Tech University.

FEMA has and will continue to carry out wind hazard mitigation activities in close consultation with our mitigation partners both inside and outside of government. Outside of government we maintain a strong working relationship with professional organizations such as the American Society of Civil Engineers, American Association of Wind Engineers; code development organizations, including the International Code Council, and the National Fire Protection Association; our private sector partners that include the National Association of Home Builders, Manufactured Housing Institute, and the Portland Cement Association; and last but not least, our friends in the university wind engineering research community including, of course, Texas Tech University. It is worth noting that Texas Tech played a key role in the development of saferoom technology and continues to play a central role in our wind hazard mitigation initiatives.

Lessons Learned from Other Hazards Programs

It is fair to say that FEMA has had considerable experience in administering hazard reduction programs. However, there currently is no federal wind hazard reduction program. And other than FEMA's National Hurricane Program, which focuses primarily on evacuation planning, there is little coordinated effort among federal agencies to address mitigating the effects of high winds on buildings, other structures, and critical infrastructure. From this perspective I offer some thoughts on elements that a federal wind hazards reduction program should include.

It is vital that post-storm data be collected in an efficient and orderly manner and made readily available so researchers and others can learn from both poor and successful building performance. There is no better laboratory to learn from than the data-rich post disaster field environment.

It is essential to identify "cost effective and affordable" wind hazard mitigation approaches. There would be little value in coming up with great approaches only to find that no one will implement them because they are too difficult or too expensive. Solutions have to work in the "real world" to be effective.

A lead agency should be designated for any interagency working group formed to establish a wind hazard mitigation plan.

Closing

In closing, we appreciate the opportunity to represent the Department of Homeland Security before the Subcommittees on this important and timely issue. We would be pleased to answer any questions you may have.

BIOGRAPHY FOR ANTHONY S. LOWE

Anthony S. Lowe was appointed Director of the Mitigation Division of the Emergency Preparedness & Response Directorate/FEMA, in the newly created Department of Homeland Security, in March 2003. He continues to serve as the Federal Insurance Administrator, a role to which he was nominated by President Bush in March 2002. Mr. Lowe is responsible for providing leadership for some of the Nation's leading multi-hazard risk reduction programs, which seek to secure the homeland from hazards both natural or manmade. His areas of oversight include the National Flood Insurance Program, the National Earthquake Hazards Reduction Program, the National Dam Safety Program and the National Hurricane Program. In his position, Mr. Lowe works closely with public and private risk managers, as well as leaders in government, industry, research and academia.

Before assuming this post, Mr. Lowe was the senior legislative counsel for the U.S. Senate Judiciary Subcommittee on Antitrust, Competition and Business Rights and on the staff of the Subcommittee on Terrorism, Technology and Government Information. Previously, he was the deputy prosecutor with the King Country Prosecutor's Office. He also was a commissioner on the city of Redmond's planning commission.

Earlier in his career, Mr. Lowe was Associate Director at the International Center for Economic Growth and International Center for Self-Governance programs of the Institute of Contemporary Studies, in Washington, D.C. Mr. Lowe also served as legal counsel to the Washington State Senate majority office and as legislative assistant to U.S. Senator Slade Gorton of Washington.

A native of King County, Wash., Mr. Lowe holds a Bachelor of Science degree in international political science from University of Washington, a law degree from the University of Santa Clara and a Master of Divinity degree from Virginia Union University.

Chairman SMITH. Thank you, Mr. Lowe. We understand, Mr. Laatsch, you are not going to give a separate introductory statement, but as Chief of the EPR Building Science and Technology Branch, you are available to answer those questions.

Dr. McCabe.

STATEMENT OF DR. STEVEN L. MCCABE, PROFESSOR, DEPARTMENT OF CIVIL, ENVIRONMENTAL AND ARCHITECTURAL ENGINEERING, UNIVERSITY OF KANSAS

Dr. MCCABE. Thank you, Mr. Chairman. Good afternoon. My name is Steven McCabe. I am testifying today on behalf of the Wind Hazards Reduction Coalition and the American Society of Civil Engineers, of which I am a member. The Wind Hazard Reduction Coalition was formed due to the recognized need for better research and action and mitigation into predicting and mitigating damage from major wind events. The Coalition would like to thank Chairman Smith and Chairman Ehlers, as well as Full Committee Chairman Boehlert for their leadership in holding this hearing and their commitment to moving ahead on this issue. The Coalition also wishes to express its thanks to Mr. Neugebauer and Mr. Moore for their hard work and sponsorship of H.R. 3980.

The Wind Hazards Reduction Coalition would like to formally endorse H.R. 3980, the *National Windstorm Impact Reduction Act of 2004*. This bill represents five years of work in which stakeholders representing a broad cross-section of interests, such as the research, technology transfer, design and construction, and financial communities were involved. In addition, materials and system sup-

pliers, state, county and local governments, the insurance industry all have participated in crafting this legislation. This bill represents a consensus of all those with an interest in this issue and a desire to see the benefits this legislation will generate. The Coalition would be remiss if we did not acknowledge the contribution of the Committee staff on both sides of the aisle for their work on this important issue.

With the average annual damage from windstorms at more than $6 billion per year, the current $5 to $10 million federal investment in wind engineering research to mitigate these impacts is not adequate. In contrast, the Federal Government invests nearly $100 million per year in reducing earthquake losses through the National Earthquake Hazards Reduction Program, a program that has lead to significant reduction in the effects of earthquakes. A federal investment in wind hazard reduction would pay similar or greater dividends and save lives and decrease property damage.

In 1993, the National Research Council published a report entitled "Wind and the Built Environment." The report recommends the establishment of a national program to reduce wind vulnerability. A 1989 NRC study concurred with that recommendation and specifically urged Congress to designate "funds for a coordinated national wind-hazard reduction program that encourages partnerships between federal, state and local governments, private industry, the research community and other interested stakeholders."

In 2003, the RAND Corporation released a report, which was consistent with the NRC report, and it—and which, in many ways, formed the blueprint for H.R. 3980. In 2004, specific recommendations for a research and implementation program were laid out in a report released by the American Association for Wind Engineering and the American Society of Civil Engineers. All four reports highlighted the need to develop a greater understanding of severe winds and their impacts on building structures and infrastructure, assess—secondly, assess the performance of building structures and infrastructure under severe winds. Thirdly, develop cost effective construction practices consistent with research results for both new construction and retrofits. Lastly, effective transfer to design and construction industries of the research results and public outreach.

The Wind Hazard Coalition does have concerns with two aspects of this legislation. First, there is no new federal money authorized in the legislation to address the problem of wind hazards. The legislation merely asks for a shifting of resources within federal agencies. In support of new funding, it is clear that the average of $22 million annually in authorized funds in H.R. 3980 is a small sum compared to the $4 billion in average annual loss from windstorms.

Secondly, the Coalition strongly supports a creation of a National Advisory Committee on Windstorm Impact Reduction. A group of outside experts will be instrumental in guiding the new program and ensuring its success. The Coalition believes that this Advisory Committee can be accomplished in a cost-effective fashion if partnerships are formed with interested parties. In this way, resources can be leveraged for the benefit of the program.

In addition, we would like to note an opportunity that is presented through the work of the George E. Brown, Jr. Network for Earthquake Engineering Simulation, which is nearing full-scale operation. This national laboratory enables researchers from all parts of the country to collaborate in studying the effects of earthquake motions on structures and in studying ways to improve their performance. Taking advantage of the information technology infrastructure of NEES, the wind community can develop a wind analog to the NEES system, enabling wind researchers to collaborate in a similar manner to their earthquake engineering colleagues. Moreover, several of the NEES equipment sites could be utilized in the study of structural response to windstorms, thus leveraging the investment made by Congress in funding NEES.

A unified national plan of wind hazard reduction, such as contained in H.R. 3980, has the potential of reducing losses significantly in the next decade. Currently, a limited number of independent activities are underway to reduce the disastrous effects of windstorms. These activities will have a limited impact on reversing the trend of increasing costs unless action is taken to improve the resistance of the physical infrastructure that is now susceptible to damage by wind.

Once again, thank you for the opportunity to testify. I would be pleased to answer any questions you might have.

[The prepared statement of Dr. McCabe follows:]

PREPARED STATEMENT OF STEVEN L. MCCABE

Good afternoon, I am Dr. Steven L. McCabe, a Professor in the Department of Civil, Environmental and Architectural Engineering at the University of Kansas. I am currently on leave and working as Program Director, Structural Systems and Hazards Mitigation in the Directorate for Engineering, Civil and Mechanical Systems Division for the National Science Foundation.

I am testifying today on behalf of the Wind Hazards Reduction Coalition and the American Society of Civil Engineers of which I am a member. The Wind Hazard Reduction Coalition was formed due to the recognized need for better research and action (or mitigation) into predicting and mitigating the damage from major wind events.

The Coalition would like to thank Chairman Smith and Chairman Ehlers as well as full Committee Chair Boehlert for their leadership in holding this hearing and their commitment to moving ahead on this issue. The Coalition also wishes to express its thanks to Mr. Neugebauer and Mr. Moore for their hard work and sponsorship of H.R. 3980.

The Wind Hazards Reduction Coalition would like to formally endorse H.R. 3980, the *National Windstorm Impact Reduction Act of 2004.* This bill represents five years of work in which stake holders representing a broad cross-section of interests such as the research, technology transfer, design and construction, and financial communities; materials and systems suppliers; state, county, and local governments; the insurance industry, have participated in crafting this legislation. This bill represents a consensus of all those with an interest in the issue and a desire to see the benefits this legislation will generate. The Coalition would be remiss if we did not acknowledge the contribution of Committee staff on both sides of the aisle for their work on this important issue.

A. The Wind Hazard Problem

All 50 states are vulnerable to the hazards of windstorms. In 1998, hurricanes, tornadoes and other wind related storms caused at least 186 fatalities and more than $5.5 billion in damage. During the week of May 4–10, 2003, a record 384 tornadoes occurred in 19 states, including Kansas, Missouri, Oklahoma, and Tennessee resulting in 42 fatalities. On May 3, 1999, more than 70 violent tornadoes struck from north Texas to the Northern Plains. Forty-one people died and more than 2,750 homes were damaged. In 1992, Hurricane Andrew resulted in $26.5 billion in losses and 61 fatalities, in 1989, Hurricane Hugo resulted in $7 billion in losses and

86 fatalities and in 1999, Hurricane Floyd resulted in more than $6 billion in losses and 56 deaths.

The United States currently sustains billions of dollars per year in property and economic loss due to windstorms. The Federal Government's response to such events is to initiate search and rescue operations, help clear the debris and provide financial assistance for rebuilding. The Coalition is calling upon the Federal Government to provide increased research funding to mobilize the technical expertise already available to help reduce the significant annual toll in casualties and property damage from windstorms.

The Wind Hazard Reduction Coalition currently represents 23 associations and companies which are committed to the creation of a National Wind Hazard Reduction Program (NWHRP) that would focus on significantly reducing loss of life and property damage in the years to come. The Coalition includes professional societies, research organizations, industry groups and individual companies with knowledge and experience in dealing with the impact of high winds.

Near-surface winds are the most variable of all meteorological elements, making the prediction and control of their impacts all the more challenging. In the United States the mean annual wind speed is 8 to 12 mph, but wind speeds of 50 mph occur frequently throughout the country, and nearly every area occasionally experiences winds of 70 mph or greater. In coastal areas of the East and Gulf coasts, tropical storms may bring wind speeds of well over 100 mph. In the middle of the country, wind speeds in tornadoes can be even higher.

With the average annual damage from windstorms at more than $6 billion, the current $5–10 million federal investment in research to mitigate these impacts is inadequate. In contrast, the Federal Government invests nearly $100 million per year in reducing earthquake losses through the National Earthquake Hazards Reduction Program, a program that has lead to a significant reduction in the effects of earthquakes. A federal investment in wind hazard reduction would pay similar or greater dividends in saved lives and decreased property damage.

Unfortunately, reducing vulnerability to wind hazards is not just a question of developing the appropriate technical solution. Wind hazards are created by a variety of events with large uncertainties in the magnitudes and characteristics of the winds. The relevant government agencies and programs, as well as the construction industry, are fragmented. Finally, implementation requires action by owners and the public, who may not consider hazard reduction a high priority. Solving wind vulnerability problems will require coordinated work in scientific research, technology development, education, technology transfer and public outreach.

In 1993, the National Research Council (NRC) published a report entitled "Wind and the Built Environment."[1] The report included the recommendations of the Panel on the Assessment of Wind Engineering Issues in the United States. The panel recommended the establishment of a national program to reduce wind vulnerability. Such a program would include wind research that draws upon the expertise of both academia and industry and addresses both structural and nonstructural mitigation methods, an outreach program to educate State and local governments on the nature of the wind risks they face, a conscious effort to improve communication within the wind community and a commitment to international cooperation in wind-engineering.

A 1999 NRC study concurred with that recommendation and specifically urged Congress to designate "funds for a coordinated national wind-hazard reduction program that encourages partnerships between Federal, State and local governments, private industry, the research community, and other interested stakeholders."[2]

B. Federal Government & Congressional Action

As far as preventing or minimizing the impact of major wind events, the Federal Government has mainly limited itself to improvements in weather prediction and public warnings. In light of the damages and loss of life that windstorms cause every year, the Coalition strongly feels that the Federal Government can and should do more.

To that end, the Wind Hazard Reduction Coalition has worked with Congressmen Dennis Moore of Kansas, Walter Jones of North Carolina, and others, first to help form the Congressional Wind Hazard Reduction Caucus and then to develop legislation. The Caucus was created in October of 1999 and is chaired by Mr. Moore and Mr. Mario Diaz Balart. It has as its goal to increase Congress' awareness of the pub-

[1] National Research Council, Wind and the Built Environment (1993).

[2] National Research Council, Review of the Need for a Large-scale Test Facility for Research on the Effects of Extreme Wind on Structures (1999).

lic safety and economic loss associated with major wind events and to establish and fund programs to mitigate those impacts.

On October 19, 2000, Congressmen Moore and Jones and others introduced H.R. 5499, the *Windstorm Hazard Reduction Research and Technology Transfer Act.* The Coalition supported the development of this legislation by providing technical advice.

That legislation has evolved and been reintroduced in both the 106th and 107th Congresses. The current bill, H.R. 3980, represents the final evolution of the legislation.

C. The National Windstorm Impact Reduction Act of 2004 (H.R. 3980)

The Wind Hazards Reduction Coalition would like to formally endorse H.R. 3980, the *National Windstorm Impact Reduction Act of 2004.* This bill represents five years of work in which stake holders representing a broad cross-section of interests such as the research, technology transfer, design and construction, and financial communities; materials and systems suppliers; State, county, and local governments; the insurance industry, have participated in crafting this legislation. This bill represents a consensus of all those with an interest in the issue and a desire to see the benefits this legislation will generate. Additionally, much of what is contained in the bill was highlighted in two recent reports.

In 2003, the Rand Corporation released a report entitled, "Assessing Federal Research and Development for Hazard Loss Reduction." This report is one of the focuses for this hearing. The findings of the report are consistent with and support the goals of the coalition. Specific recommendations for a research and implementation program are contained in the report released by the American Association for Wind Engineering and the American Society of Civil Engineers entitled "Wind Engineering Research and Outreach Plan to Reduce Losses Due to Wind Hazards." Both reports support programs which would encompass four focuses:

- *Understanding of Wind Hazards*—developing a greater understanding of severe winds, quantify wind loading on buildings, structures and infrastructure and developing wind hazards maps;
- *Assessing the Impact of Wind Hazards*—assessing the performance of buildings, structures and infrastructure under severe winds, developing frameworks and tools for simulations and computer modeling and developing tools for system level modeling and loss assessment;
- *Reducing the Impact of Wind Hazards*—developing retrofit measures for existing buildings, structures and infrastructure, developing innovative wind-resistant technologies for buildings, structures and infrastructure and developing land measures and cost effective construction practices consistent with site-specific wind hazards; and
- *Enhancing Community Resilience, Education and Outreach*—enhancing community resilience to wind hazards, effective transfer to professionals of research findings and technology and development of educational programs and public outreach activities.

D. Coalition Comments Regarding H.R. 3980

The Wind Hazard Reduction Coalition has concerns with two aspects of the legislation.

First, there is no new federal money authorized in the legislation to address the problem of wind hazards, the legislation merely asks for the shifting of resources within federal agencies. The Coalition is concerned that federal agencies will resist implementing this new program without any new funding. In support of new funding it is clear that the average of $22 million in authorized funds in H.R. 3980 is small sum compared to the $4 billion in average annual loss from windstorms.[3] We strongly believe that the small federal investment in the wind hazard program will pay large dividends in the near term in decreased loss of both life and property, in essence paying for itself.

Second, the Coalition strongly supports the creation of the National Advisory Committee on Windstorm Impact Reduction. The group of outside experts will be instrumental in guiding the new program and ensuring its success. The Coalition believes that this Advisory Committee can be done in a cost-effective fashion if partnerships are formed with interested parties such as the International Code Council, American Society of Civil Engineers, American Association of Wind Engineers, Na-

[3] Congressional Testimony, Charles Meade, "Strengthening Research and Development for Wind Hazard Mitigation, February 9, 2004, House Science Committee.

tional Fire Protection Association and others who hold meetings of relevant experts. In this way resources can be leveraged for the benefit of the program.

In addition, we would like to note an opportunity being presented by the work at the George E. Brown, Jr. Network for Earthquake Engineering Simulation which is nearing operation. This national laboratory enables researchers from all parts of the country to collaborate in studying the effects of earthquake motions on structures and to improve their performance. Taking advantage of the Information Technology infrastructure of NEES, the wind community can develop a wind analog to the NEES system enabling wind researchers to collaborate in a similar manner to their earthquake engineering colleagues. Moreover, several of the NEES equipment sites could be utilized in the study of structural response to windstorms, thus leveraging the investment made by Congress in funding NEES.

The Coalition also observes that the lessons learned from the Earthquake Hazards Reduction Program (NEHRP) has shown that research into such social science issues as emergency preparedness and response, search and rescue, the delivery of emergency medical care, public and governmental adoption of mitigation measures, neighborhood and business citizen volunteer programs, and linking disaster recovery to mitigation were essential. Appropriate attention to social science research and implementation issues also should be a part of this effort to reduce the effects of severe windstorms.

E. Conclusion

Windstorm-related costs have averaged several billion dollars per year during the last decade with a high in 1992 exceeding $25 billion, primarily as a result of Hurricane Andrew. If a severe hurricane makes landfall in Miami, New Orleans, or New York City, the damage could exceed $50 billion with significant impact on the national economy in addition. Hurricanes, tornadoes, and other windstorms cause death and injury, business interruption, and unacceptably high levels of property damage in all 50 States and all U.S. territories. People continue to move to coastal areas adding to the trend toward larger disasters. Damage costs will continue to increase unless an effective wind hazard reduction plan is implemented.

A unified national plan of wind hazard reduction, such as contained in H.R. 3980, has the potential of reducing losses significantly in the next decade. Currently, a limited number of independent activities are underway to reduce the disastrous effects of windstorms. Unfortunately, these activities will have a limited impact on reversing the trend of increasing costs unless action is taken to improve the resistance of the physical infrastructure that is now susceptible to damage by windstorms.

Finally, the Coalition would be remiss if we did not acknowledge the contribution of Committee staff on both sides of the aisle for their work on this important issue.

Once again, thank you for the opportunity to testify. I would be pleased to answer any questions you might have.

BIOGRAPHY FOR STEVEN L. MCCABE

Dr. Steven L. McCabe is presently the Program Director for Structural Systems and Hazard Mitigation of Structures Program for the Civil and Mechanical Systems Division, Engineering Directorate of the National Science Foundation in Washington, D.C. His responsibility is managing the funding of research into structural performance under extreme loading, both natural and manmade. McCabe is on leave from his position as a Professor in the Department of Civil, Environmental & Architectural Engineering at the University of Kansas where he teaches a variety of courses in Structural Engineering including advanced analysis courses and reinforced concrete design. McCabe served as department chair from June 1998 until October 2002, when he left to assume his position at NSF. He received his Ph.D. from the University of Illinois at Urbana with an emphasis in earthquake engineering and structural dynamics and has been on the KU faculty since 1985. McCabe was a Fulbright Scholar during 1995–1996 and served as a visiting professor at the Norwegian Institute of Technology in Trondheim where he taught and conducted research.

His research interests include earthquake engineering and structural dynamics as well as the application of the Finite Element Method and other computer-based analysis techniques to static and dynamic analysis problems. A particular area of interest is damage mechanics, the identification of damage levels and reserve capacity as well as the bond and development of reinforcement. He has been active in recent years in mechanical splice performance issues and the development of specifications and design rules for headed reinforcing bars and other new reinforcing systems. He actively publishes technical papers on subjects related to these areas.

McCabe is an active member of many national and international professional societies including *fib,* CRSI, ASCE, ASTM, and ACI among others. A fellow of ACI, McCabe is the former chair of ACI Committee 439, Steel Reinforcement, and presently serves on the ACI 318 Building Code Committee and is chair of the ACI 318–B Subcommittee on Development and Reinforcement. He is a member of the *fib* Bond Models task force and is one of the U.S. delegates to the U.S.–Japan Seismic Reduction program as well as a member of the Wind Hazards Task Group and the U.S.–China Hazards Reduction Program. McCabe is a past Associate Editor for the ASCE *Journal of Structural Engineering* and is Chair of the ASCE SEI Committee on Concrete and Masonry Structures. McCabe is a registered professional engineer and serves as a consultant to engineering firms on advanced analysis projects and new reinforcing systems and specifications.

March 25, 2004

The Honorable Nick Smith
Chairman, Research Subcommittee
2320 Rayburn Office Building
Washington, DC 20515

Dear Congressman Smith:

Thank you for the invitation to testify before the U.S. House of Representatives Committee on Science on March 24th for the hearing entitled *H.R. 3980,* the *National Windstorm Impact Reduction Act of 2004.* In accordance with the Rules Governing Testimony, this letter serves as formal notice of the Federal funding I currently receive in support of my research.

I am presently on temporary assignment at the National Science Foundation and serve as program director, Structural Systems and Hazards Mitigation; Division of Civil and Mechanical Systems; Directorate for Engineering at the National Science Foundation. I still hold my position on the faculty in the Department of Civil, Environmental and Architectural Engineering at the University of Kansas and am on leave to serve at NSF.

My assignment at NSF has been funded via these two grants to the University of Kansas:

- $159,180, Grant Number 0403450, National Science Foundation, *Intergovernmental Mobility Assignment*, FY'04
- $158,158, Grant Number 0303908, National Science Foundation, *Intergovernmental Mobility Assignment*, FY'03

Please contact me if there are any questions regarding this information.

Sincerely,

Steven L. McCabe Ph.D., P.E.

Chairman SMITH. Mr. Sciaudone.

STATEMENT OF MR. JEFFREY C. SCIAUDONE, P.E., DIRECTOR, ENGINEERING AND TECHNICAL SERVICES, INSTITUTE FOR BUSINESS AND HOME SAFETY

Mr. SCIAUDONE. Thank you. Chairman Smith, Chairman Ehlers, Members of the Subcommittees, my name is Jeffrey Sciaudone and I am the Director of Engineering for the Institute for Business and Home Safety. IBHS is a nonprofit initiative of the insurance and reinsurance industries in this country with a mission to reduce deaths, injuries, property damage, economic losses and human suffering caused by natural disasters. At IBHS, we believe that windstorm impact reduction helps promote—excuse me, helps protect homes and families, keeps businesses open, and preserves jobs. We know a lot now, but we need to know more. Basic research like that as proposed in this legislation is critical to reduce future losses of lives and property.

The majority of IBHS' windstorm impact reduction activities involves applying the results of research and development as information for consumers and insurers. To that end, we produce a number of consumer and insurer focus publications and interactive internet tools to explain the hows and whys of windstorm mitigation. We also get involved with model building code development and state building code adoption to encourage the inclusion of state-of-the-art mitigation research in building regulations. We also have created and are implementing a Fortified for Safer Living Program to encourage disaster-resistance code plus residential construction throughout the country.

Most of our applied research efforts are based on research conducted elsewhere, including academia, private industry, federal agencies and other partner organizations. This includes numerous universities that are involved in windstorm mitigation research and through participation in committees, like the ASCE 7 taskforce on wind loads. Occasionally, we also get involved in basic research, usually as a match funding partner. For example, we provided match funding for a South Carolina Department of Insurance project involving the destructive testing of several repetitive flood loss homes in coastal South Carolina that were bought out by FEMA following Hurricane Floyd. This project helped validate and refine the mitigation methods that we encourage the public to undertake.

Of course, our success in our work is largely dependent on our ability to get the word out to consumers and insurers. In addition, due to the efforts of our in-house communication staff, we also distribute our consumer education materials through our member insurance companies, as well as through public and private local, state and national third-party organizations. Following windstorm events, the insurance industry collects a lot of data as a result of the claims adjusting process. The majority of this data relates to the adjuster's function, which is to make the policyholder whole by paying for the damage that was caused by the storm.

For many other insured perils, like fire and theft, such data is used for actuarial analyses to further assess the vulnerability of an insurer's book of business. Unfortunately, it is not quite that simple for windstorm losses. This is due to the fact that extreme windstorms do not occur every day, and when they do occur, they al-

ways seem to be different. Also, the data that is collected by insurance adjusters does not necessarily contain details that would be collected by wind researchers.

To get around this dilemma, insurers generally use catastrophe-modeling software that incorporates things like probability analysis, state-of-the-art wind engineering research and the latest in computer technology to estimate the vulnerability of properties they ensure. These models work in a similar manner to HAZUS, which has been developed through FEMA to assist the emergency management community. This lack of comprehensive data is also a reason why insurers choose to be a member of IBHS, because we are actively involved in developing means to measure the effectiveness of our mitigation recommendations.

As a part of this effort, I personally was involved with researchers from Clemson University and the University of Florida last September to develop data from Hurricane Isabel. The goal of our efforts was to determine relationships between measured wind speeds, building and environment characteristics and observed damage. This type of data is not available in other places, including within the insurance data. We are now involved with a similar effort to collect tornado damage information with Texas Tech University this spring. Based on IBHS' experience, we have found that the number one obstacle to convincing building owners to mitigate against windstorms is cost. Money that can be spent on mitigation competes with other items within homes that people will enjoy every day; things like granite countertops and hardwood floors.

Also, cost is by far the most used argument against implementing wind mitigation measures as a part of building codes. Further research will help build the data necessary to justify changes in building regulations and to help change people's minds about these risks.

In conclusion, IBHS believes that buildings that survive windstorms unscathed are a benefit to the communities in which they stand. People stay in their homes, businesses remain open, and people continue to go about their lives, with minimal disruption. Disaster-resistant communities are also not likely to be victims and will require little if any government assistance to recover from future windstorms.

Thank you for the opportunity to speak before this Committee.

[The prepared statement of Mr. Sciaudone follows:]

PREPARED STATEMENT OF JEFFREY C. SCIAUDONE

Chairman Smith, Chairman Ehlers, and Members of the Subcommittees, my name is Jeffrey Sciaudone, and I am the Director of Engineering for the Institute for Business & Home Safety (IBHS), which is a non-profit initiative of the U.S. property and casualty insurance and re-insurance industries with a mission to reduce deaths, injuries, property damage, economic losses and human suffering caused by natural disasters. In short, our mission mirrors the "Findings" section of the proposed House bill on Windstorm Impact Reduction. We are an organization dedicated to natural hazard loss reduction, and very much involved in windstorm impact reduction in our related efforts in research, communications, outreach, building code development and adoption and data collection and analysis.

Windstorm impact reduction helps protect homes and families, keep businesses open and preserve jobs. We know a lot now, but we need to know more. Basic research like that proposed by this legislation is critical to reduce loss of lives and property.

Background on IBHS

Six months ago, I met near the Carolina coast with hurricane researchers from Clemson University and the University of Florida (UF) as Hurricane Isabel bore down on North Carolina. Our purpose of gathering near the landfall of this powerful hurricane was to deploy mobile wind data acquisition towers in front of the land-falling hurricane in order to develop "ground truth" wind speeds in areas immediately adjacent to buildings in harms way. For centuries, hurricanes have assailed our coasts and destroyed homes, businesses and communities. But this past September, as with some previous land-falling hurricanes, these researchers were applying a pioneering technique to help determine a new and more direct correlation to a hurricane's wind speed and the resultant structural damage. Our goal is to document, with more precision than ever before, what works and what doesn't work at the point of impact. Research like this is very similar to the program components as outlined in the *National Windstorm Impact Reduction Program Act of 2004,* which calls for research to improve knowledge and data collection on the impact of severe winds on structures, as well as collecting and inventorying information on structural performance in windstorms. What this bill aspires to do in the future is essentially what our partners in hurricane research have been doing in the recent past. Activities like this form the basis for the development of mitigation action plans at IBHS.

In fact, the majority of IBHS activities relating to windstorm impact reduction involve applying research and development that has been conducted by universities, federal agencies and construction industry related trade associations. The goal of these activities is to understand, communicate and implement the latest knowledge on windstorm mitigation into the work of the organization. These activities include:

- Maintaining a series of consumer focused guides and brochures that relate to a wide range of natural disasters, including windstorms.
- Maintaining a website with information on natural disaster mitigation, including windstorm damage mitigation. You can learn more by visiting www.ibhs.org.
- Developing two interactive web-based programs to help home and business owners develop customized pre-disaster mitigation plans and post-disaster recovery plans, as well as identify home structural improvements.
- Implementing the "Fortified. . .for safer living" program to encourage natural disaster resistant new residential construction throughout the country.
- Serve as a technical resource for our member insurance companies to help them better understand technical aspects of windstorm mitigation.
- Support building codes that address natural disaster damage mitigation.
- Support the adoption of the latest model building codes as written on the state level.
- Participate in the development of the ASCE 7 wind provisions that are the basis for wind loads in the current model building codes.
- Establish statewide coalitions for natural hazard loss reduction that incorporate land use planning emphasis in mitigation activities among multiple State and local government agencies, as well as private concerns.

Over the past few years, IBHS has worked closely with several universities including Clemson University, the University of Florida, Florida International University and Oregon State University, to stay abreast of current research and information. Similarly, IBHS works with FEMA on flood and wind related retrofit issues as well as the Department of Energy through Oak Ridge National Labs as a part of the Roofing Industry Committee on Weather Issues (RICOWI). IBHS also has working relationships with several construction and testing related trade associations, including APA—the Engineered Wood Association, and the National Roofing Contractors Association. In addition, we also work regularly with code and standard development organizations like the International Code Council (ICC), the National Fire Protection Association (NFPA) and Underwriters Laboratories (UL).

In addition to the applied research related activities above, IBHS does occasionally get involved in performing and funding basic research. One such case involved IBHS providing match funding to Clemson University to conduct full scale, destructive testing of houses in Horry County, SC. This project involved testing actual homes before and after hurricane retrofits were applied to determine how much strength was being added to the structure using various retrofit techniques. The houses were made available because they were bought out by FEMA following their extreme flooding during Hurricane Floyd. Primary funding was provided by the South Carolina Department of Insurance.

The results of this research were used to help validate and refine the mitigation messages that we use at IBHS. For example, the conclusions from this research included:

- Straps used to retrofit roof-to-wall connections in older homes need to extend up, and preferably over, the rafter to prevent splitting under extreme wind pressures.
- Simple retrofits like gluing the roof sheathing to the rafters can increase the wind resistance of the roof deck by up to a factor of three.
- Lightweight, fabric based shutters installed from inside a home can be effective to stop wind borne debris and prevent internal pressurization of buildings and widespread water damage.

Perhaps more importantly, this research verified the fact that our recommendations will, in fact, make a difference in how individual homes will perform in the face of extreme windstorms. It is important that we continue to measure the effects of such mitigation actions and that research continues to find creative new ways to build new and retrofit existing structures to survive hurricanes and other windstorms.

IBHS also works with other partners from time to time to fund research studies that estimate the savings provided through the implementation of new and stronger building codes in coastal environments. Three such reports have been prepared over the past two years by Applied Research Associates in Raleigh, NC, for analysis of the impacts of new codes along the North Carolina, South Carolina and Texas coastlines. The reports prepared for the Carolinas show that there is a positive net present value for adding window protection to homes along the North and South Carolina coast when the cost of the protection today and the expected loss saving in hurricanes over the life of the mortgage on the home (30 years) are considered.

The Texas study took a slightly different approach and concluded that recommended changes to the Texas Windstorm Insurance Association Building Code for coastal Texas will reduce expected losses from a design level hurricane (130 mph) occurring in 2013 by $155 million. Likewise, these improvements would result in a savings of $377 million for the same storm occurring in 2023.

Studies like these would not have been possible 15 years ago. They are only possible today because of a combination of advanced wind engineering research and improved computer technology. This critical advanced wind engineering research was only possible through programs funded by federal and state governments. Continued and increased funding will provide even broader opportunities for the application of the research to reduce the windstorm impact.

Beyond research activities, IBHS works with organizations on the federal, state and local levels in a couple of different ways to support windstorm impact reduction. The first is through the distribution of our materials through third parties. Oftentimes, this is accomplished through providing materials to local grassroots organizations to help get the word out locally. Notable partners include South Carolina Sea Grant and North Carolina Sea Grant and several state departments of Emergency Management. The second way is participating in the building code adoption process on the state level. Over the past few years, IBHS has taken an active role in wind prone states, including North Carolina, South Carolina, Texas, Florida and New York.

Windstorm Data Collection and Analysis Activities

Typically, insurers use catastrophe modeling companies like Applied Insurance Research (AIR), Risk Management Solutions (RMS) and Applied Research Associates (ARA) to analyze their overall exposure to severe windstorms like hurricanes, tornadoes and even hail storms. These analyses are generally based on the underwriting data they collect and assumptions made by the modeling companies based on their research into construction practices on a regional level. The loss estimates produced by these catastrophe models are used by insurers to help them set reserves, determine the need for re-insurance and provide input for setting appropriate premiums. As discussed in the previous section, these models incorporate the latest wind engineering research and information and computer technology.

The main reason that insurers use these models to estimate their risk is because they can not adequately assess their risks using historical data alone since there have not been enough extreme wind events to produce enough data to perform traditional actuarial analyses.

When it comes to producing meaningful data to assess the effect of windstorm mitigation activities, several things need to be determined. First, the actual wind speed that the building was exposed to needs to be known. Then, details as to what parts of the building fail as a direct result of wind pressures need to be documented.

By comparing the wind speed with the pieces that are failing, researchers can begin to make credible quantifications of the effects of windstorm mitigation. This connection forms the basis for many of the available catastrophe models.

The data that insurers collect as a part of the claims process following major wind events, on the other hand, relate mainly to documenting the damage for which the policyholder needs compensation and making sure the insured is made whole in a timely manner. The role of the insurance adjuster in such a scenario is to document, estimate and pay (or arrange for payment to) the insured. This is why IBHS is interested in the topic of engineering data collection following extreme wind events. The data developed and collected from an engineering standpoint is absolutely critical to measure the effectiveness of mitigation efforts and to identify new areas for research.

This brings us back to IBHS' work with hurricane researchers from Clemson University and the University of Florida (UF). As mentioned earlier, teams from Clemson and UF have for several years now deployed mobile wind data acquisition towers in front of land-falling hurricanes to match the data of "ground truth" wind speeds with building damage. Hurricane Isabel in 2003 was the first time that these mobile towers were equipped with cellular modems that allowed for uploading of wind speed data in real time to the Internet. This information ensured that the systems were working throughout the storm as well as serving as input for NOAA's track prediction models.

The development of the wind speed data was accomplished mainly through the Florida Coastal Monitoring Program (FCMP). Additional information on the Hurricane Isabel deployment and other components of the program—including pressure instrumentation of individual homes—is available on the FCMP website located at *www.ce.ufl.edu/~fcmp.*

Also as a part of the Isabel data collection effort, IBHS staff developed a handheld, palm-pilot based damage data collection system in conjunction with Clemson and UF so that damage data could be collected quickly and efficiently following the event. The plan for damage data collection was to survey direct wind damage in the vicinity of the mobile towers where wind speeds were known. Fortunately for the residents of eastern North Carolina, very little direct wind damage was observed near the tower locations and in areas that were accessible to the teams.

While no significant direct wind damage data was collected from this event, IBHS and the university researchers are ready to develop this data from future storms. However, in order to continue and expand these programs, additional future funding will be required. The majority of the infrastructure developed by Clemson and UF on this project was funded through the Florida Department of Community Affairs. Sea Grant provided most of the funding for deployment of the university research teams in the Carolinas. In order to continue these efforts, new sources of funding for infrastructure investment, including new mobile wind towers and vehicles to deploy them, need to be established.

In March of 2004, IBHS participated in a forum organized by Texas Tech University (TTU) to standardize the data collected by wind researchers following all extreme wind events. The intent of this effort is to develop wind damage databases that are built on a common understanding of damage classification so that data collected from a variety of researchers can be combined and used together to create a more robust data set. IBHS is currently working with TTU to adapt the handheld, palm-pilot based forms for use in collecting tornado damage data later this year.

Availability of Insurance Data

Insurance data on losses from windstorms are currently available in a couple different places. First, the Property Claims Service (PCS), which is a part of the Insurance Services Organization (ISO), publishes insurance industry catastrophic property loss estimates following a wide range of natural and man-made disasters. Additionally, insurers are required to report loss data on a yearly basis to the respective state departments of insurance as a part of the regulation of the industry. The Federal Government may be able to get at some of the desired data through these channels.

However, based on the content of the draft legislation, it appears that the most desired data would be that which could quantify the reduction of windstorm impact over time and to determine target areas for future research. The insurance data discussed above will probably not serve this purpose well because it does not account for the specific actions that would ultimately be undertaken for individual buildings exposed to windstorms. The details important for quantifying the effects of mitigation actions are the details being gathered by wind researchers from institutions like Clemson, UF and TTU. In fact, IBHS is involved with these groups so that we

can provide this useful data back to our members in the insurance industry and appropriately focus our ongoing activities.

Obstacles to Implementation

The main obstacles to widespread implementation of windstorm mitigation techniques in new and existing structures relate directly to issues of complacency and cost. Our experience in implementing our "Fortified. . .for safer living" program tells us that homeowners are, in general, complacent about their exposure to extreme windstorms. For example, people who live in central Florida might say that the real risk is in South Florida, or the Panhandle. Likewise people who live in the Florida Panhandle may say the real risk in the Keys or in the Carolinas. The problem is that no one thinks they are the most exposed and they assume that the chances of a major windstorm are slight and not worth worrying about.

Because of the low perceived risk from windstorms, consumers are less likely to spend the money to make their homes more resistant to windstorms—especially when they can spend their money on upgrades they can enjoy everyday like granite counter tops and hardwood floors. The competition to spend extra money rarely ends with the mitigation actions winning out.

Concluding Remarks

Buildings that survive windstorms unscathed are a benefit to the communities in which they stand. People stay in their homes, businesses remain open and people continue to go about their lives with minimal disruption. Disaster resistant communities are also likely to not be victims, and will require little, if any, government assistance to recover from a disaster.

Windstorms and other natural disasters happen every year in the United States, and affect thousands of homeowners and businesses. Much is currently known about how to mitigate these losses and, fortunately, we are learning more every day. While there will always be an element of chance in where and how badly a windstorm strikes, we in this country increasingly have the choice to be better prepared against these events. I look forward to learning more from the continuation of the programs I discussed here today along with the creation of new research efforts that will help IBHS fulfill our mission to reduce the impact of natural disasters like windstorms.

Research into all aspects of windstorm effects, from public attitudes to meteorology and wind engineering, produced as a result of the National Windstorm Impact Reduction Act of 2004 will help form a foundation for protecting our citizens, property and economy from windstorms. The millions of dollars spent over the next few years could save billions of dollars in windstorm losses in the future.

Thank you for the opportunity to testify before the subcommittees today.

BIOGRAPHY FOR JEFFREY C. SCIAUDONE

Education and Registration

Bachelor of Science, Civil Engineering, Clemson University, 1994

Master of Science, Civil/Structural Engineering, Clemson University, 1996

Thesis topic: Analysis of Wind Borne Debris Impact Loads

Professional Engineer, Civil/Structural, Massachusetts #41577

Summary of Experience

Experience

Institute for Business & Home Safety, March 1999–present

Director, Engineering, 2002–present

Associate Director, Engineering, 2000–2002

Project Engineer, 1999–2000

Impact Forecasting, L.L.C., Engineer/Project Leader, August 1996–February 1999

Clemson University Wind Load Test Facility, Research Asst., January 1995–August 1996

Research and Development

- Responsible for development and implementation of an inspection based, code-plus, residential construction program.
  - Inspected damage following hurricanes, tornadoes and earthquakes.

- Developed computer models to predict wind damage to low-rise structures.
- Developed and implemented procedures for using proprietary risk analysis software.
- Established data conversion procedures for portfolio analyses.
- Designed and constructed apparatus to measure impact response and wrote software for data collection.

Leadership

- Provided technical continuity for all Engineering functions of IBHS throughout corporate relocation to Tampa, FL, from Boston, MA.
- Provided technical direction and support to strategic, operating and marketing plans.
- Developed proposals for new projects and programs to sharpen corporate focus.
- Participated in planning and execution of company-wide reorganization.

Communications

- Developed technical discussion documents for communicating natural disaster mitigation information.
- Provided technical expertise for print and video news releases, articles and specials on various natural disaster mitigation topics.
- Regularly presented projects and initiatives to various technical conferences, clients, member companies, partner organizations and corporate Board of Directors.
- Represented organization in print, audio and television media.
- Continually presented technical disaster mitigation information to a non-technical audience.
- Utilized GIS software to display risk analysis results.
- Authored occasional subject articles for construction and insurance related periodicals.

Building Codes and Standards Development

- Represented IBHS on several code development committees including ASCE 7 Main and Wind Load Committees, NFPA 5000 Structural Committee and SBCCI Hurricane Resistant Residential Construction Committee.
- Participated in numerous materials and construction standards committees for the ASTM and ANSI processes for roofing materials, edge flashing, doors, windows and shutters.
- Represented IBHS to Building Code Councils in North Carolina, South Carolina, Florida and Missouri.
- Provided staff support for committees of insurance professionals on issues regarding roofing performance, natural disaster related research and catastrophe data reporting.

Committee Service and Professional Affiliations

- Member of the Building Seismic Safety Council (BSSC) Board of Direction (2000–present).
- Secretary of the Roofing Industry Committee on Weather Issues (RICOWI) Board of Directors (1999–present).
- Liaison to the Applied Technology Council (ATC) Board of Directors (2001–present).
- American Society of Civil Engineers (ASCE), Member (1992–present).

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March 18, 2004

The Honorable Sherwood Boehlert
Chairman, Science Committee
2320 Rayburn Office Building
Washington, DC 20515

Dear Congressman Boehlert:

Thank you for the invitation to testify before the U.S. House of Representatives Committee on Science on March 24th for the hearing entitled *The National Windstorm Impact Reduction Act of 2004*. In accordance with the Rules Governing Testimony, this letter serves as formal notice of the Federal funding I currently receive in support of my research.

I received no federal funding directly supporting the subject matter on which I will testify, in the current fiscal year or either of the two proceeding fiscal years.

Sincerely,

Jeffrey C Sciaudone, PE
Director of Engineering

4775 East Fowler Avenue, Tampa, FL 33617 Tel: (813) 286-3400 Fax: (813) 286-9960 www.ibhs.org

DISCUSSION

Chairman SMITH. Thank you. We will now proceed with five minutes for the Members of this committee to ask questions, and we hope that you will be available for questions, so we might not ask—that staff still thought we should have asked, to send those questions to you.

Let me start out with insurance. Are there any insurance companies now that will reduce their charges, Mr. Sciaudone, Mr. Lowe, if you comply with extraordinary building to help protect against windstorms? Is there—do insurance companies charge less if you do that? Start with Mr. Lowe and then Mr. Sciaudone, maybe.

Mr. LOWE. Actually, I would be interested in what he says on this, because I am not aware of any that do——

Chairman SMITH. I don't think they do——

Mr. LOWE [continuing]. And——

Chairman SMITH [continuing]. And our testimony before—for earthquakes, I don't think there was that kind of what seems reasonable to encourage people to make some of those structural costs to the building. Mr. Sciaudone.

Mr. SCIAUDONE. I need to preface my statement with the fact that we are with some information that IBHS—we stay away from talking about the cost or the availability of insurance. That being said, there are some publicly—there is some public information out there about programs in the State of Florida, both voluntary and required through the Department of Insurance. Recently, in 2001, with the adoption of the new Florida building code, insurers are required to provide a recognition of the windstorm impact reduction features of the Florida Building Code.

Chairman SMITH. Well, what is the—what is—what does that mean——

Mr. SCIAUDONE. Well——

Chairman SMITH [continuing]. Recognition?

Mr. SCIAUDONE [continuing]. They have——

Chairman SMITH. You mean a lower premium?

Mr. SCIAUDONE. Yes. They had to recognize the building code as part of their rate filings, which is a lower premium. They won't—the Department won't accept something if it is a higher premium.

Chairman SMITH. Now I assume——

Mr. SCIAUDONE. The Building——

Chairman SMITH [continuing]. That there—I mean, we know there are areas that are more vulnerable to winds, tornadoes, hurricanes. Mr. Lowe and Mr. Laatsch, do we—there is no existing requirement like if you live in a potential flood plain, before you get government housing from HUD or some other government agencies, you are required to buy certain flood insurance. Do I understand that doesn't exist if you are in a vulnerable area getting a HUD or other federal loan for your home, in terms of the requirement to buy insurance for wind insurance?

Mr. LOWE. Right. Let me answer that question first, and then I want to go back to the last question because I think I understood that, as well. There is no similar requirement. Correct. Overall, I know I think there again, there are some in Florida, but other than that, there are no overall requirements for wind protection that are

universal, to the extent that it is the same way in the National Flood Insurance Program, particularly because there is that incentive, of course, for if you have a federal loan that you have to have insurance. We also have the Community Rating System that goes along with that, which provides up to a 45 percent decrease in insurance premiums to participating communities who take certain mitigating measures, which as I——

Chairman SMITH. 40—you are saying the private insurance sector——

Mr. LOWE. This is public. This is the——

Chairman SMITH [continuing]. In——

Mr. LOWE [continuing]. Flood program——

Chairman SMITH. Okay.

Mr. LOWE [continuing]. I am talking about.

Chairman SMITH. Yes. Right.

Mr. LOWE. And so I——

Chairman SMITH. Okay.

Mr. LOWE [continuing]. Am saying it exists there. There is nothing similar to that that I am aware of in the private sector, to the extent that that was just discussed. Now, you know, we are still talking, you know, one to ten percent reduction in premiums, so it is fairly nominal in terms of what they are doing in Florida. I don't think that is the sort of incentive you had in mind to——

Chairman SMITH. Let me move on——

Mr. LOWE [continuing]. Answer that question.

Chairman SMITH [continuing]. To the next question on wind tunnels. Do we—are wind tunnels that we have available for this kind of research now, and are they—is this part of the kind of research that helps us discover what kind of structures can reduce damage, Dr. McCabe and——

Mr. LAATSCH. Chairman—Mr. Chairman, the answer is yes. I mean, there are a number of wind tunnels located at academic institutions around the country. There also is the fact that most new large scale structures, buildings and bridges, undergo wind tunnel testing in order to come up with more accurate depictions of the loads from wind. So it is a—relatively speaking, a widely used research and experimental tool. The issue though with this is access. They are not available to everyone in the community. The other thing is an issue of scale, because the facilities require some fairly clever——

Chairman SMITH. Like earthquakes. We have a computer program that can simulate the shaking. Is there such a program that is in existence for wind?

Mr. LAATSCH. Certainly, but as with any model, there are always constraints and limitations as to the accuracy. As we develop more information and more knowledge, the models become progressively more comprehensive and progressively more accurate. We also have had limitations in the past with installed computational facilities. The computational fluid mechanics is an amazingly complicated area of engineering, and so as we get and develop more sophisticated computers, that along with the information technology facilities, we develop more capability to do more interesting and more accurate problems.

Chairman SMITH. My five minutes is up. Okay. I am going to check on my International Relations Committee, and Mr. Neugebauer, if you would—or Mr. Ehlers, would you like to take the chair? Okay. Mr. Neugebauer, if you would take the chair while I check in, in another committee.

Mr. NEUGEBAUER [presiding]. This is a question—and we can kind of go around the table here. But I think what—one of the questions that I have is kind of what mechanisms are in place today for transfer of knowledge in windstorm mitigation? How are you all talking to each other, and are you talking to each other?

Dr. BRIGHTON. I can——

Mr. NEUGEBAUER. Dr. Brighton.

Dr. BRIGHTON [continuing]. Answer that briefly. I—one of the ways we talk to each other is through professional societies, and that is probably the best way because this brings together the experts in the field to talk to each other and exchange information to some extent, and then publish papers as well as meeting at conferences and workshops to address particular issues around this area. And that is probably one of the best ways. There are data that are collected and exchanged among those people who do talk to each other and interact and collaborate.

The other way is through the educational process within the universities in which graduate students are working alongside the faculty to look at new ways of doing things and getting new data.

Mr. NEUGEBAUER. Mr. Lowe.

Mr. LOWE. Yeah. As you may be aware, FEMA chairs the Interagency Coordinating Committee on hurricanes, which is an ad hoc committee of federal agencies that have programmatic responsibilities that address tropic cyclones and other severe weather hazards. Also under the authority of the Stafford Act, we also lead the National Hurricane Mitigation Preparedness Program, which was formerly called the National Hurricane Program, and so we work federal, State and local on those sorts of efforts, as well as of course with federal partners, such as the Army Corps of Engineers, NOAA, DOT, NEMA, currently NSF, as well.

We also have the Hurricane Liaison Teams and the evacuation teams that we work with, and of course, we work very, very closely with the academic community, as well, on a number of existing projects, as well as a number of past projects that you may be aware of as well. So there is a lot of transferring, coordination that does occur.

Mr. NEUGEBAUER. Dr. McCabe.

Dr. MCCABE. I think the previous two speakers have outlined important areas. I think in particular, Dr. Brighton's comments regarding the technical community workshops, papers, they are very strong, robust lines of communication. I guess I would like to add that ultimately what really the average person sees from all of this are improved building code provisions and the enforcement of those on large structures and—as well as homes. And to that end, there are documents, such as ASCE–7, which is the—basically the loads document, as well as model building codes, such as the International Building Code. Those all ultimately reflect the information that is developed from the research community, as well as from

other sources. So the final analyses are the co-provisions and their enforcement.

Mr. NEUGEBAUER. Mr. Sciaudone.

Mr. SCIAUDONE. Just to build on what my colleagues were saying, it is very much through committee participation in all types of arenas, be it the codes or standards arena or academic arenas. Just recently, we were lucky enough to participate in a workshop conducted by Texas Tech to start working toward standard damage collection forms from wind events, and that is why—that is where we are applying some of the information we have on hurricane damage assessment to tornado damage assessment this year so that we can have a common pool and work toward things like the NEES program that Dr. McCabe mentioned in his testimony. Thank you.

Mr. NEUGEBAUER. Also I always appreciate the alma mater, Texas Tech, to this effort. I think the final question I have, and it is kind of a question—or statement. One of the things I think is the proof in the pudding of how successful this program will be is taking it from publishing to application and the commercialization of it, and we talk about codes, and I am always reluctant to talk about codes until we have some validation that what we are doing has commercial economic viability. I think it is easy to go say well, we are going to build all these buildings to this code, and then the probability of an event versus the cost of that event actually—or the cost of the ramifications of that event are sometimes different.

The other day, I visited a site where, you know, there is an above-ground tornado shelter where Texas Tech has been doing some important research, and I know other universities have been doing that, but this is also a concrete block, exterior-wall home. And to me, how we can measure the success of what we are going to do in this initiative is how we can take from the academic world and put it to—and I refer to with fond affection as Bubba and Bubbette in west Texas is how does—how is that good for me? Because I think we can study and I think we have done a great job of studying the impacts and we can—we have got wind modeling and all of those kinds of things.

But the people that are ultimately out there that are going to—they are making the decision of whether to take advantage of this technology has to, you know—what is in it for them? And so one of the things I want to encourage this group to do as we move forward is that we are forming this multi-disciplined group with the purpose ultimately of producing something tangible for the American people that they can say yes, I want to choose these options instead of the Formica, that kind of Formica. I want to choose this because, you know, my safety and the—you know, the safety of my property and the economic incentive through the insurance that is going to amortize that.

In the housing programs that we developed with energy-efficient homes in the 1970's and the 1980's, we were able to give people—let them take a higher-ratio mortgage because we knew that their costs for utilities were going to be lower than the competing houses. We have got to build into that same kind of formula, some incentive for the American people to choose to do that, and I think the insurance industry is going to have to be a major player in

that, and they are going to have to be shown that there is economic benefit to do that also. So that is not a question. It is more of a statement. But that is kind of my charge to you all, as we move forward with this process. Mr. Moore.

Mr. MOORE. Dr. Brighton, what is NEHRP? What does it do?

Dr. BRIGHTON. NEHRP is an earthquake engineering program that is put together by—for several agencies that have worked together to look at ways to deal with, understand, learn about and reduce the adverse effects of earthquakes.

Mr. MOORE. Okay. You heard Dr. McCabe's testimony that the dollars allocated to earthquake research was about $100 million per year, while the money for windstorm research is about $5 to $10 million. Would you agree with those numbers?

Dr. BRIGHTON. Not entirely. In the written materials that we sent to you, we noted that NSF as one agency in 2003 had a $31 million—roughly $31 million dollars of funding in this area.

Mr. MOORE. All right. With regard to the parts that impact on buildings, would those numbers be essentially correct, or do you know?

Dr. BRIGHTON. Apart from impact on buildings?

Mr. MOORE. Well, I am talking about the funding for research on impact on buildings. Would those numbers be essentially correct?

Dr. BRIGHTON. For—are you talking about an earthquake, or——

Mr. MOORE. Wind and earthquake.

Dr. BRIGHTON. Wind and earthquake.

Mr. MOORE. The $5 to $10 million for wind and $100 million per year for earthquake. Is that——

Dr. BRIGHTON. No, I don't think so. I still think that what we are talking about is—what I am talking about here is wind—the effects of what we are talking about today, that NSF does fund about $31 million for support for this kind of research.

Mr. MOORE. That has relevance to impacts on buildings specifically?

Dr. BRIGHTON. In addition to other impacts, yes.

Mr. MOORE. Okay. But I am talking specifically about impacts on buildings.

Dr. BRIGHTON. I don't have that exactly——

Mr. MOORE. Right.

Dr. BRIGHTON [continuing]. Broken out for just——

Mr. MOORE. Okay.

Dr. BRIGHTON [continuing]. Buildings, but we can get that for you.

Mr. MOORE. Very good, and we will try to get some information for you, as well.

Dr. BRIGHTON. Thank you.

Mr. MOORE. I want to ask Dr. McCabe a couple of questions here, I think. What would you recommend, Dr. McCabe, with regard to a suggested funding level for research on wind impact of this country? Do you have any thoughts in mind there? Understand that we have constraints on our budget right now.

Dr. MCCABE. Well, I think the numbers that are proposed in this bill—I mean obviously, in any kind of hazards research or mitigation, development of new standards, you really don't want to be put in the position where you are choosing between alternatives. And

that having been said, in the area of wind, this is a money maker because——

Mr. MOORE. Money maker in what sense?

Dr. MCCABE. Well, you—by mitigating the effects, you basically save not only property damage and not only injuries, medical costs, things of that nature, but the significant amount of economic impact that significant amounts of damage have to a location. The numbers that have been put forward here today, I would say in large part are strictly property damage numbers. And that—the earthquake community has recognized that that is becoming a smaller and smaller part of the overall damage picture.

And so I think if you look at the funding levels proposed within this bill, with a caveat that ASCE's position is that this needs to represent new resources, that this can be used to make an impact. And if you continue to support research, mitigation, code efforts at this level, over time, you are going to see a significant reduction in the effects of severe winds, and not just tornadoes, but severe windstorms, hurricanes; the whole suite of wind hazards.

Mr. MOORE. Thank you, Dr. McCabe. Mr. Lowe, in your testimony, you said, I believe, and this is from your written testimony, a quote, "There currently is no federal wind hazard reduction program." Is that correct, sir?

Mr. LOWE. That is correct.

Mr. MOORE. What would you like to see?

Mr. LOWE. Well, I am talking about certainly the coordinated sort of effort that I think that the Committee has focused on in terms of a problem.

Mr. MOORE. You think that effort exists right now?

Mr. LOWE. Well, I am agreeing with you that it doesn't exist, certainly not in the sense that you all referenced it, in term—in the context of a NEHRP sort of coordinated effort. Certainly the NEHRP effort is a much bigger effort than what seems to be raised here. Clearly, of course, the Administration has no formal position, but in the context of NEHRP, I would note for the advisory structure that is laid out, we have had some experience with that on, you know, kind of billion dollar programs, having such a construct on a million dollar—well, a $20 million program is a little different, and so we certainly have some information that I think would be helpful perhaps for the Committee, as we move forward to look at what sort of advisory structure—because what we found on our MAT/MOT coalition was that it was helpful to have an advisory group. We had many different interests that would actually respond directly to the agencies that were involved to help them develop what the structure, what the strategy, what the format should take.

And so you have got a number of different interests at play. Those need to be brought to bear in a formal way to assist the agency that they are trying to coordinate, not necessarily simply to report to——

Mr. MOORE. Sure.

Mr. LOWE [continuing]. Congress.

Mr. MOORE. I would just like to close, Mr. Chairman, by—Mr. Neugebauer for—by thanking FEMA for their efforts last year in this tornado that hit the Kansas City metropolitan area. They were

there helping people put their lives together, and I really appreciate that. Thank you, all.

Mr. NEUGEBAUER. Thank the gentleman from Kansas. The gentleman from Georgia, Mr. Gingrey.

Mr. GINGREY. Thank you, Mr. Chairman, and I am—I want to direct this question to Mr. Lowe, and in fact, Mr. Lowe, you may have been—got into that answer with Congressman Moore. You noted in your testimony though that it is vital that post-storm data be collected in an efficient and an orderly manner, and that there is no better laboratory to learn from than the data-rich post-disaster field environment. However, you did not elaborate at all on what FEMA is actually doing in this area, and if you will, could you tell us exactly how FEMA and/or any other agency and the private sector actually collect windstorm loss data immediately after an event?

Mr. LOWE. FEMA has had over 30 years of experience conducting post-disaster field investigations to determine how buildings and other structures performed, as well as issue guidance on how to build more disaster-resistant construction. We have also assisted many communities, following major disasters, to support their efforts to build back properly so we can break the cycle of damage and repair. However, the work we have done has been targeted and limited in nature, and it is focused on those disasters that had a strong potential to generate new knowledge or provide new insight to design construction and buildings and infrastructure.

The results of these reports have been used to guide future research. In fact, it is intended to identify solutions and identify deficiencies. This helps focus research, we believe, to avoid research, if you will, just for the sake of research, but for research that can be readily applied to save lives and property. FEMA routinely uses this information to validate the effectiveness of our own programs. We have also used this data to answer the question are mitigation programs working? We have coordinated with NIST and NCST.

This is the sort of data, however, that is—this Committee has just noted that would provide sufficient quantitative data for us to actually begin to push the idea of economic incentives. And so to the extent that this field data collection is expanding and begins to quantify in the real world what the potential damages are, then others will know that they can rely upon the sort of model provisions and other sort of building provisions that are out there to actually be able to rate and provide discounts based on those rates.

Mr. MOORE. And just—and actually the follow-up to that, and it seems—since it seems this is so critical measuring the effectiveness of various mitigation measures and identifying areas of research, how do you work to disseminate the information to individuals representing organizations such as the—those affiliated and others on this panel?

Mr. LOWE. I am going to turn over to Ed Laatsch because he has had some direct experience. I want him to share that with you.

Mr. LAATSCH. Thank you. Most other things, in terms of our implementation efforts, we develop and have used the information, both that we have gathered in the field and through some of our studies, to develop guidance for whether it be design professionals or the public, consumer groups, various—even building regulators

and things of that sort that takes the information that others have developed through research and that we have developed through field study and applied it.

We have also, in terms of guidance, tried to meet what we identified as public needs. There was a document called FEMA 320, Taking Shelter from the Storm, which has been fairly successful at helping communicate the benefits of storm shelters to the public and providing them actual small-sized versions of construction drawings that they can actually use to build a storm shelter. There are a number of other examples similar to that that we have tried to build on, where we take information others have, and our own, and we turn it into outreach activities and communications. CDs for the public, things of that sort.

Mr. GINGREY. Thank you. Mr. Chairman, thank you very much. I will yield back.

Mr. NEUGEBAUER. Thank the gentleman. In your opening comments, Dr. Brighton, you alluded to, I think a little bit if I understood you correctly, that you felt like that this legislation was not necessary. Could you elaborate on that a little bit?

Dr. BRIGHTON. What I would say is that it—this is probably not the best way for the National Science Foundation—and I will elaborate on that. The National Science Foundation really focuses a lot on more basic research, although it is research relevant and it can be extended to the application. And in that process, what we find is that we ask for and receive proposals across the board in any field of research in engineering and science, and what we have found in doing that is that we get excellent proposals that we review on a comparative basis or on a merit basis to make the award.

So our focus is on trying the best way we can to get the best possible work, and so we feel that by leaving it broadly, leaving it more open, that we have been successful and we would continue to be successful in funding this kind of research, which we believe in very much. It is not that we are opposed to the work. Obviously, we are very keen on making sure that we do the best we can to do the research that is necessary to deal with these kind of problems.

Mr. NEUGEBAUER. But one of the things that I don't—I understand if you are soliciting research, but in—the purpose of this bill is beyond just research. It is research and——

Dr. BRIGHTON. Right.

Mr. NEUGEBAUER [continuing]. Coordination.

Dr. BRIGHTON. Right.

Mr. NEUGEBAUER. We are trying to get this from the test tube to the neighborhood as quickly as we possibly can, and I think that is the reason that many of us felt like that this legislation brought some coordination to that process so that we can bring groups like the National Home Builders Association into this and have them help us start building some model homes with this technology as we are developing it, rather than coming out in the three or four years into——

Dr. BRIGHTON. Yeah.

Mr. NEUGEBAUER [continuing]. That community and saying, you know, here it is. Go implement it, and here is the new code. I don't think that is the way we want to approach that. I think we want

to literally have a living laboratory with this as we go, and I think we can get it in an application mode a lot quicker, if we do that.

Dr. BRIGHTON. Um-hum.

Mr. NEUGEBAUER. Mr. Sciaudone, what do you think the—as you have looked at this legislation, what do you think some of the challenges are going to be as we—once we get this legislation passed of getting it up and going? We already have some of the organizational aspects of it in groups that have been working together. Are some—are there some things that we have not included in the bill that we should have, or do you have some thoughts or direction on that?

Mr. SCIAUDONE. The one area that I did see where perhaps there could have been a little more influence, and you just alluded to it in your statement, was talking about bringing the homebuilders to the table. In a lot cases, believe it or not, the insurance industry and the Homebuilders Association don't always get along, and so we are coming at it from opposite sides and they are the ones that are saying it is too expensive to do these things, and we are the ones saying it is too expensive not to.

In that case, I think that they need to be around the table or they need to be included, and some of the things that, you know, as I was looking at the bill and looking over the legislation is somehow if we could evaluate—or maybe if there were activities in there to evaluate current construction practices. To say okay, how are things being constructed today? We have building codes, but that—the building code isn't the bottom line as to how things are being built, especially residential building codes are a combination of engineered construction, as well as conventional construction. As—we see that more and more and sometimes there are gaps as we heard a lot of testimony this morning about—or this afternoon, excuse me, regarding tornado damage in the Midwest of this—the Midwestern portion of this country. You drive through the Midwest and you watch the construction going up, no one is using full sheathing on the outside of houses.

Very few builders are actually doing that. That is a practice that would save enormous amounts of property. Not—maybe not for the homes that are in the direct path of an F4, F5 tornado——

Mr. NEUGEBAUER. No.

Mr. SCIAUDONE [continuing]. But certainly the ones that are on the outskirts, and certainly for the ones for the F0s and F1s. So I think the builder—the building industry needs to be around the table——

Mr. NEUGEBAUER. Yeah.

Mr. SCIAUDONE [continuing]. And included.

Mr. NEUGEBAUER. And I actually agree with you and I want to encourage, as this process moves forward and as we put together the advisory group, that we have all of the players at the table. It will not be a complete advisory group if we don't have everyone. You know, I will tell you—and the reason that is important, I will tell you that if you want to know a lot about how effective the building code is—for example, I was in the home building business for a number of years, is you ask a framer because they have come back after a windstorm the day after where they have seen what has happened to the framing work that they have done the day be-

fore. They can tell you where the failures occur, and so it is important from the early point, and I know that in a lot of—some of the windstorm research that has been done—the National Homebuilders have actually been at the table and actually raised money to help participate financially in some of that, and I will encourage them to be at this table.

If there are not any other questions of the panel, we want to thank the panel for being here today. We consider this a work in process, and we want to stay in touch with you as we move this legislation forward and get it passed. Then we want to work with you and make sure that it is successful. I think it will be. I think we have focused on something that is very important in our country, and I am delighted to—with Mr. Moore, to have been a part of sponsoring this legislation. I will say that I guess every Member can—you are back. I would give the gentleman the last word here before we close the hearing.

Mr. MOORE. Thank you, Mr. Chairman. I just want to thank the witnesses for coming today, and this is an important piece of legislation. There may be some minor differences on some of it, and I heard one of the witnesses state some differences, but I think it is important that we in this country start focusing on our ability to mitigate the losses to human life and to property damage as a result of wind events in this country. And I don't think we have done nearly the job that we could do and I think the goal of us all should be to work together, not to replicate anything that already exists, but to find better ways to mitigate losses due to windstorms in this country and wind events in this country, and I hope all of us can agree on that.

Thank you all very much.

Mr. NEUGEBAUER. Thanks to the gentleman. I just remind Members that they have five legislative days to revise and extend their remarks. If there is no other business, we are adjourned.

[Whereupon, at 3:25 p.m., the Subcommittees were adjourned.]

Appendix:

Additional Material for the Record

I

108TH CONGRESS
2D SESSION

H. R. 3980

To establish a National Windstorm Impact Reduction Program.

IN THE HOUSE OF REPRESENTATIVES

MARCH 17, 2004

Mr. NEUGEBAUER (for himself and Mr. MOORE) introduced the following bill; which was referred to the Committee on Science, and in addition to the Committee on Transportation and Infrastructure, for a period to be subsequently determined by the Speaker, in each case for consideration of such provisions as fall within the jurisdiction of the committee concerned

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A BILL

To establish a National Windstorm Impact Reduction Program.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "National Windstorm Impact Reduction Act of 2004".

SEC. 2. FINDINGS.

The Congress finds the following:

(1) Hurricanes, tropical storms, tornadoes, and thunderstorms can cause significant loss of life, in-

jury, destruction of property, and economic and social disruption. All States and regions are vulnerable to these hazards.

(2) The United States currently sustains several billion dollars in economic damages each year due to these windstorms. In recent decades, rapid development and population growth in high-risk areas has greatly increased overall vulnerability to windstorms.

(3) Improved windstorm impact reduction measures have the potential to reduce these losses through—

(A) cost-effective and affordable design and construction methods and practices;

(B) effective mitigation programs at the local, State, and national level;

(C) improved data collection and analysis and impact prediction methodologies;

(D) engineering research on improving new structures and retrofitting existing ones to better withstand windstorms, atmospheric-related research to better understand the behavior and impact of windstorms on the built environment, and subsequent application of those research results; and

(E) public education and outreach.

(4) There is an appropriate role for the Federal Government in supporting windstorm impact reduction. An effective Federal program in windstorm impact reduction will require interagency coordination, and input from individuals, academia, the private sector, and other interested non-Federal entities.

SEC. 3. DEFINITIONS.

In this Act:

(1) The term "Director" means the Director of the Office of Science and Technology Policy.

(2) The term "State" means each of the States of the United States, the District of Columbia, the Commonwealth of Puerto Rico, the United States Virgin Islands, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, and any other territory or possession of the United States.

(3) The term "windstorm" means any storm with a damaging or destructive wind component, such as a hurricane, tropical storm, tornado, or thunderstorm.

SEC. 4. NATIONAL WINDSTORM IMPACT REDUCTION PROGRAM.

(a) ESTABLISHMENT.—There is established the National Windstorm Impact Reduction Program (in this Act referred to as the "Program").

(b) OBJECTIVE.—The objective of the Program is the achievement of major measurable reductions in losses of life and property from windstorms. The objective is to be achieved through a coordinated Federal effort, in cooperation with other levels of government, academia, and the private sector, aimed at improving the understanding of windstorms and their impacts and developing and encouraging implementation of mitigation measures to reduce those impacts.

(c) INTERAGENCY WORKING GROUP.—Not later than 90 days after the date of enactment of this Act, the Director shall establish an Interagency Working Group consisting of representatives of the National Science Foundation, the National Oceanic and Atmospheric Administration, the National Institute of Standards and Technology, the Federal Emergency Management Agency, and other Federal agencies as appropriate. The Director shall designate an agency to serve as Chair of the Working Group and be responsible for the planning, management, and coordination of the Program, including budget coordination. Specific agency roles and responsibilities under the Pro-

gram shall be defined in the implementation plan required under subsection (e). General agency responsibilities shall include the following:

(1) The National Institute of Standards and Technology shall support research and development to improve building codes and standards and practices for buildings, structures, and lifelines.

(2) The National Science Foundation shall support research in engineering and the atmospheric sciences to improve the understanding of the behavior of windstorms and their impact on buildings, structures, and lifelines.

(3) The National Oceanographic and Atmospheric Administration shall support atmospheric sciences research to improve the understanding of the behavior of windstorms and their impact on buildings, structures, and lifelines.

(4) The Federal Emergency Management Agency shall support windstorm-related data collection and analysis, public outreach, and information dissemination.

(d) PROGRAM COMPONENTS.—

(1) IN GENERAL.—The Program shall consist of three primary mitigation components: improved understanding of windstorms, windstorm impact as-

sessment, and windstorm impact reduction. The components shall be implemented through activities such as data collection and analysis, outreach, technology transfer, and research and development. To the extent practicable, research activities authorized under this Act shall be peer-reviewed, and the components shall be designed to be complementary to, and avoid duplication of, other public and private hazard reduction efforts.

(2) UNDERSTANDING OF WINDSTORMS.—Activities to enhance the understanding of windstorms shall include research to improve knowledge of and data collection on the impact of severe wind on buildings, structures, and infrastructure.

(3) WINDSTORM IMPACT ASSESSMENT.—Activities to improve windstorm impact assessment shall include—

(A) development of mechanisms for collecting and inventorying information on the performance of buildings, structures, and infrastructure in windstorms and improved collection of pertinent information from sources, including the design and construction industry, insurance companies, and building officials;

(B) research and development to improve loss estimation and risk assessment systems; and

(C) research and development to improve simulation and computational modeling of windstorm impacts.

(4) WINDSTORM IMPACT REDUCTION.—Activities to reduce windstorm impacts shall include—

(A) development of improved outreach and implementation mechanisms to translate existing information and research findings into cost-effective and affordable practices for design and construction professionals, and State and local officials;

(B) development of cost-effective and affordable windstorm-resistant systems, structures, and materials for use in new construction and retrofit of existing construction; and

(C) outreach and information dissemination related to cost-effective and affordable construction techniques, loss estimation and risk assessment methodologies, and other pertinent information regarding windstorm phenomena to Federal, State, and local officials, the construction industry, and the general public.

(e) IMPLEMENTATION PLAN.—Not later than 1 year after date of enactment of this Act, the Interagency Working Group shall develop and transmit to the Congress an implementation plan for achieving the objectives of the Program. The plan shall include—

(1) an assessment of past and current public and private efforts to reduce windstorm impacts, including a comprehensive review and analysis of windstorm mitigation activities supported by the Federal Government;

(2) a statement of strategic goals and priorities for each Program component area;

(3) a description of how the Program will achieve such goals, including detailed responsibilities for each agency; and

(4) a description of plans for cooperation and coordination with interested public and private sector entities in each program component area.

(f) BIENNIAL REPORT.—The Interagency Working Group shall, on a biennial basis, transmit a report to the Congress describing the status of the windstorm impact reduction program, including progress achieved during the preceding two fiscal years. Each such report shall include any recommendations for legislative and other action the Interagency Working Group considers necessary and ap-

propriate. In developing the biennial report, the Interagency Working Group shall consider the recommendations of the Advisory Committee established under section 5.

SEC. 5. NATIONAL ADVISORY COMMITTEE ON WINDSTORM IMPACT REDUCTION.

(a) ESTABLISHMENT.—The Director shall establish a National Advisory Committee on Windstorm Impact Reduction, consisting of not less than 11 and not more than 15 non-Federal members representing a broad cross section of interests such as the research, technology transfer, design and construction, and financial communities; materials and systems suppliers; State, county, and local governments; the insurance industry; and other representatives as designated by the Director.

(b) ASSESSMENT.—The Advisory Committee shall assess—

(1) trends and developments in the science and engineering of windstorm impact reduction;

(2) the effectiveness of the Program in carrying out the activities under section 3(d);

(3) the need to revise the Program; and

(4) the management, coordination, implementation, and activities of the Program.

(c) BIENNIAL REPORT.—At least once every two years, the Advisory Committee shall report to Congress and the Interagency Working Group on the assessment carried out under subsection (b).

(d) SUNSET EXEMPTION.—Section 14 of the Federal Advisory Committee Act shall not apply to the Advisory Committee established under this section.

SEC. 6. SAVINGS CLAUSE.

Nothing in this Act supersedes any provision of the National Manufactured Housing Construction and Safety Standards Act of 1974. No design, construction method, practice, technology, material, mitigation methodology, or hazard reduction measure of any kind developed under this Act shall be required for a home certified under section 616 of the National Manufactured Housing Construction and Safety Standards Act of 1974 (42 U.S.C. 5415), pursuant to standards issued under such Act, without being subject to the consensus development process and rulemaking procedures of that Act.

SEC. 7. AUTHORIZATION OF APPROPRIATIONS.

(a) FEDERAL EMERGENCY MANAGEMENT AGENCY.—From sums otherwise authorized to be appropriated, there are authorized to be appropriated to the Federal Emergency Management Agency for carrying out this Act—

(1) $8,000,000 for fiscal year 2005;

(2) $8,700,000 for fiscal year 2006; and

(3) $9,400,000 for fiscal year 2007.

(b) NATIONAL SCIENCE FOUNDATION.—From sums otherwise authorized to be appropriated, there are authorized to be appropriated to the National Science Foundation for carrying out this Act—

(1) $8,000,000 for fiscal year 2005;

(2) $8,700,000 for fiscal year 2006; and

(3) $9,400,000 for fiscal year 2007.

(c) NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY.—From sums otherwise authorized to be appropriated, there are authorized to be appropriated to the National Institute of Standards and Technology for carrying out this Act—

(1) $2,000,000 for fiscal year 2005;

(2) $3,000,000 for fiscal year 2006; and

(3) $4,000,000 for fiscal year 2007.

(d) NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION.—From sums otherwise authorized to be appropriated, there are authorized to be appropriated to the National Oceanic and Atmospheric Administration for carrying out this Act—

(1) $2,000,000 for fiscal year 2005;

(2) $2,100,000 for fiscal year 2006; and

(3) $2,200,000 for fiscal year 2007.

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PREPARED STATEMENT OF RANDALL G. PENCE
PRESIDENT, CAPITOL HILL ADVOCATES, INC.
ON BEHALF OF
THE NATIONAL CONCRETE MASONRY ASSOCIATION

Chairman Smith and Chairman Ehlers, on behalf of the National Concrete Masonry Association (NCMA), I would like to thank you for holding this hearing regarding H.R. 3980 and a more coordinated and expanded program to reduce property damage, injuries and loss of life due to major windstorms.

NCMA is a national trade association representing hundreds of manufacturers of concrete masonry—Concrete Masonry Units (henceforth CMU) including concrete block of various shapes and sizes, concrete brick, concrete segmental retaining wall units, concrete pavers and more. Manufacturing processes include handling, storage and distribution of both raw materials and finished product. Many of the construction benefits that accrue from the use of CMU are based on the fact that CMU are generally high-density, high-mass items, characteristics that provide important advantages for any policy-maker to consider with respect to wind-resistant construction.

NCMA supports H.R. 3980, but recommends that certain changes and considerations be made part of the bill. Inasmuch as NCMA's experience and expertise focuses on construction materials, we will confine our remarks to aspects of the bill affecting materials, building types and designs.

Despite the laudable goals of H.R. 3980 and the new research it would support, we need to point out that the U.S. economy already has the materials and much of the technical know-how required to build homes and other structures that can withstand major windstorms.

The key ingredients lacking in making broad improvements today are perhaps focus and political will to institute large-scale technical transfer, public information, and policy inducements to encourage greater use of the materials and technology at hand.

These Subcommittees are familiar with the devastation caused by Hurricane Andrew. We would urge a review of the aerial photographs of entire neighborhoods destroyed at huge cost to all concerned. In those photos you will notice entire rows of houses utterly destroyed—with the occasional building that was left standing, relatively intact. Many of these surviving buildings were constructed using high-mass, cement-based materials that perform very well in high-wind conditions. The surviving buildings provide stark and striking examples of what can be done presently to resist catastrophic building failures, using off-the-shelf materials, existing technology, ubiquitous materials that are virtual commodities and available anywhere in the United States at competitive costs.

Of course, NCMA would highlight the performance of concrete masonry, NCMA's area of expertise, but other competing cement and/or masonry-based materials can perform extremely well also.

The point NCMA makes here impacts the time frame, mindset and flow of appropriations for the elements of H.R. 3980 to begin having an impact after passage of the legislation. Not all construction materials, designs and technologies are at the same stage of maturity and development in terms of resistance to windstorms; H.R. 3980, and its charges to the agencies and to the National Advisory Committee, should reflect this fact. Some are ready for immediate or nearly immediate broad implementation if the political will to aggressively advocate such a time line, under government imprimatur, can be generated.

NCMA urges that the Subcommittees consider specifying a stratified, longitudinal approach in the bill, one that recognizes that much of the research called for will require a number of years to conduct, but yet that much can be done near-term to enhance the wind-resistance of the thousands and tens of thousands of homes that will be built in the next few years.

In other words, rather than merely enumerate the tasks of the Interagency Working Group and the National Advisory Committee and allow them to address all missions equally and at once, the more effective approach would be to specifically charge both entities to prioritize their efforts to provide the most immediate impacts on wind-resistant construction as soon as possible—to "front-load" those missions, actions and funds that will have the most immediate impact on building safety and robustness.

The initial focus, the top priority, of H.R. 3980, in terms of time, money and effort, should be to spur existing successful wind-resistant materials, technologies and designs into the mainstream of construction planning and

use in those areas at substantial risk for major windstorms. The prime goal should be to impact construction and construction policy and practices as soon as possible.

This prioritization should be clearly set forth in the bill.

Clearly, materials manufacturers have a very important role to play in advancing the wind resistance of the Nation's building stock. However, NCMA notes that H.R. 3980 reduces the number of participants in the National Advisory Committee relative to H.R. 2020. We understand the desire to keep the Committee manageable in size and cost, but it will not make the Committee more effective if organizations with valuable insights are excluded from the process. NCMA has its own research laboratory and has conducted research in this area already—certainly NCMA and organizations with similar expertise and capability should be invited to participate and not have information diluted through the use of surrogates. NCMA strongly recommends that the Advisory Committee be large enough to accommodate the key players in construction materials, especially elements of the construction industry that we know will play a major role in wind-resistant construction policies such as the concrete and masonry industry.

Though America needn't wait for the results of much of the basic research called for in the bill to begin making earnest and measurable improvements to the U.S. building stock to survive catastrophic wind events, basic research is indeed important. NCMA supports the basic research aspects of the bill, and would like to identify specific issues and policy considerations that should be addressed:

- Safe Rooms—More research is needed regarding the addition of hardened structures designed to resist tornado-strength wind and associated flying debris, not only in new homes but also existing homes.
- Strengthened Community Structures—Every community should have structures where people can go for not only shelter, but also protection. These structures are particularly needed in manufactured housing communities.
- Hardened Exteriors—more research is needed to evaluate and communicate the specific benefits of hardened exterior wall surfaces in resisting the impact of flying debris.
- Insurance companies are a driving force in the choice of building materials and methods. H.R. 3980 should involve and consult with insurers at every level, and develop statistical information useful to insurers.

Thank you very much for this opportunity to offer NCMA's views on H.R. 3980.

PREPARED STATEMENT OF STEPHEN P. LEATHERMAN

Chair Professor and Director, International Hurricane Research Center & Laboratory for Coastal Research, Florida International University, Miami, Florida.

Florida International University (FIU) in Miami, Florida, supports, with reservations, H.R. 3980, the *National Windstorm Impact Reduction Act of 2004.* The Committee is commended for recognizing the need to establish a national windstorm impact reduction program and for conducting a hearing on this nationally important topic. We encourage the Committee to take prompt action so that enactment of this legislation can occur during the 108th Congress.

Florida International University—Miami's public research university—established in 1972, has 35,000 students, 1,100 full-time faculty, and close to 100,000 alumni, making it the largest university in South Florida and placing it among the Nation's 30 largest colleges and universities. FIU offers more than 190 baccalaureate, masters and doctoral degree programs in 19 colleges and schools. FIU is the top producer of Hispanic graduates in the U.S. and the third largest producer of minority graduates (52 percent Hispanic, 12 percent African-American, and four percent Asian).

FIU is an active member of The Wind Hazard Reduction Coalition, but as Director of FIU's International Hurricane Research Center, the state-wide center for hurricane research in Florida, my statement will reflect our unique university perspective. Before commenting on H.R. 3980, I wish to acquaint you with the work that we do at the International Hurricane Research Center and to explain why it is in the national interest, and the interest of the Federal Government, to support the development and implementation of a rational research strategy, focusing on the reduction of potential hurricane and other windstorm damage. The primary focus of my statement is on hurricanes, my area of my expertise.

International Hurricane Research Center

The International Hurricane Research Center (IHRC) at Florida International University (FIU) conducts basic and applied multidisciplinary scientific research to reduce the potential for damage from hurricane impacts to the human, natural and built environments in vulnerable communities throughout the United States and in other countries. It was established by the private sector in the aftermath of Hurricane Andrew.

As Florida's center for hurricane research, education and outreach in Florida, the IHRC offers a solid record of interdisciplinary and collaborative research, both basic and applied, focusing on the full spectra of hurricane impacts and the methods and techniques for hurricane loss reduction. The work of the IHRC has largely involved Florida and the larger Caribbean and Gulf basin, where most of the North Atlantic hurricanes make landfall.

The knowledge and findings resulting from the work of the IHRC, and the complementary education and outreach methodologies benefit not only Florida and specific countries in the Caribbean and Latin America, but every hurricane vulnerable community in the USA and abroad. These records and capabilities clearly allow the IHRC to support federal strategic objectives and priorities, providing increased assistance to international partners while concentrating on the domestic front.

In fulfillment of its mission the IHRC has engaged in a wide-ranging research agenda that includes the following areas:

Research and development of effective and credible hurricane loss reduction methods and techniques for housing in Florida. This involves the testing of various building components and assemblies, development of improved building design criteria, and the analysis of various architectural and structural elements and their role in modifying the performance of the building under hurricane conditions. (Funded by Florida Department of Community Affairs—Emergency Management)

Development of a public domain hurricane loss model to assess risk and estimate potential losses. This integrated model will be particularly useful to insurers, reinsurers, regulators as well as the financial and housing industries. The model will include newly-developed knowledge databases and an updated wind field model. (Funded by Florida Department of Insurance)

Implementation of a windstorm simulation and modeling project focusing on the use of high-resolution data acquisition with airborne LIDAR technology and IHRC-developed algorithms, enhanced storm surge modeling, computer simulation and visualization complemented by public education and outreach programs. (Funded by the Federal Emergency Management Agency)

Beach erosion and coastal vulnerability. Quantification and assessment of beach erosion resulting from hurricane impacts through the use of airborne LIDAR technology. This project uses high-resolution elevation data and local geomorphology features to assess coastal vulnerability at specific locations. (Funded by The Andrew W. Mellon Foundation)

Assessment of social consequences and the human impact of hurricanes. Evaluation of how various social factors such as demographics, socio-economic strata or education may affect perceptions and attitudes influencing critical issues such as hurricane evacuation and the use of mitigation measures. (Funded by the National Science Foundation and Florida Department of Community Affairs—Emergency Management)

To complement its research program, the IHRC also engages in efforts of education and outreach to transfer critical knowledge, and findings to potential users and policy-makers in various fields. This includes the *Developing a Culture of Mitigation through Education* project focusing on K–12 students, their parents and teachers, and the community at large.

Hurricane vs. Earthquake Research

Hurricanes are the most devastating and damaging natural hazards impacting the United States and its territories in the Caribbean and Pacific basins. The unavoidable seasonality of hurricanes and the damage they cause underscore our vulnerability to this awesome force of nature. Hurricanes now cause an average of 14 deaths and $5 billion in property damage per year in the United States. Industry data show that 65 percent of insured losses from natural hazards in the U.S. over the past half-century are due to the impact of hurricanes (Table 1). Inexplicably, the Federal Government has focused on earthquake research and mitigation with comparable little funding for hurricanes (Table 2).

Table 1 U.S. Insured Catastrophe Losses

Catastrophe Type	Number	Catastrophe Loss (billions $)	Percentage Loss
Hurricanes	**13**	**32.95**	**62%**
Tornadoes	**5**	**4.00**	**8%**
Other Weather	**5**	**5.18**	**10%**
Earthquakes	**2**	**6.41**	**12%**
Floods	**2**	**1.40**	**2%**
Human Destruction	**3**	**3.38**	**6%**
Total	***30***	***53.32***	***100%***

Source: Conning & Company (1994).

Table 2 Damage, Deaths, and Research Funding

	Earthquakes	Hurricanes
Deaths[a]	1,500	15,000
Damage[b]	$47.97 billion	$100.7 billion
Research Funding[c]	>$350 million	$50 million

[a] Death counts are for the 20th century. For hurricanes, it only includes the 30 deadliest tropical weather systems in the continental United States.
[b] Damage has been adjusted for 1994 dollars. Hurricane damage is for the 30 costliest tropical weather systems, while earthquake damage is for 13 major and 31 minor earthquakes.
[c] Funding is for earthquake research and mitigation, while the hurricane figures are for research, mitigation and operations.

Extreme hurricane events in recent years (i.e., Hugo, 1988; Andrew, 1992; Iniki, 1992; Opal, 1995; Georges, 1998; Mitch, 1998; and Floyd, 1999) have, with an increasing sense of urgency, reinforced the proposition that the Nation must continue to work on, but also move beyond weather prediction and evacuation to achieve significant damage reduction. Against this background, increasing population and urban development in coastal areas highlights the dynamic nature of our vulnerability to hurricanes and the urgency of the prob-

lem. According to the 2000 census, population has increased by 20 percent (11.7 million people) in the most vulnerable states over the last ten years. This trend is predicted to continue.

Mitigation offers the best alternative for reducing potential damages from hurricanes. Merely being prepared to respond to the inevitable damage that will occur from storms does nothing to reduce the ultimate cost of these dangerous events. Effective mitigation to build a solid foundation for policy-making and building practices can only be achieved through increased research, vulnerability assessments, education and outreach. Hurricane mitigation must continue to evolve by including not only a wide range of damage reduction tools such as improved building design and structural engineering methods, new construction technologies and materials, land use strategies, and building codes, but also new methods of data collection, continued social and behavioral research as well as improved communication technology, computer modeling, simulation and visualization.

It is in the national interest, indeed the interest of the Federal Government, to support the development and implementation of a rational research strategy, focusing on the reduction of potential hurricane damage. Building upon current programs and other initiatives with shared objectives, this strategy will be based on leading academic researchers nationally with the single focused goal of reducing the cost of hurricanes to the Federal, State, and local governments, as well as to businesses and households.

To contribute to the development and implementation of a strong, coherent and united research agenda focusing on hurricane loss reduction, the International Hurricane Research Center (IHRC) at Florida International University (FIU) has brought together the wealth of existing capabilities and evolving expertise of the public universities in Florida into an integrated multi-year, multidisciplinary cooperative research effort—the Florida Hurricane Alliance. This coordinated effort is being launched in 2004 with funding from NOAA.

Hurricane Research Priority Recommendations

The following list of research initiatives have been identified as priorities. In order to effectively mitigate hurricane losses, all require considerably more funding:

1. METEOROLOGY—Hurricane-force winds during Andrew resulted in $30 billion in damages in south Florida
   - Develop more-skillful forecasting techniques for hurricane intensification
   - Continue the momentum for improved hurricane motion forecasts
   - Develop neighborhood-level forecasts of wind, rain, and flooding
   - Improve the Weather Research and Forecasting (WRF) model and associated data assimilation routines as the next-generation forecasting system
2. INLAND FLOODING—Presently the leading cause of tropical-cyclone mortality
   - Better specification of topography through airborne LIDAR mapping
   - Improved precipitation measurement and forecasting techniques
   - Education and outreach, including development of a flood scale
3. STORM SURGES—Historically the greatest threat to life
   - Airborne LIDAR-based, high-resolution bathymetry and topography
   - Next-generation, real-time inundation models
   - More realistic atmospheric forcing
   - Simulation and 3–D animation to warn the affected populace
4. COASTAL EROSION
   - Beach and dune modeling utilizing up-dated airborne LIDAR data
   - Event-specific and long-term modeling
5. BUILT ENVIRONMENT
   - Laboratory and wind tunnel testing of structures and components
   - Cost-effective, geographically-appropriate building standards and practices
6. COST OF WARNINGS
   - Evaluation and preparation

- Lost productivity and business opportunities
- Impacts on minority and economically disadvantaged populations

7. ROLE OF PRE-LANDFALL PLANNING AND POLICY

8. THE ECONOMIC AND HUMAN FACTORS IN POST-DISASTER RECOVERY

Comments on H.R. 3980

Florida International University supports, with the following reservations, H.R. 3980, the *National Windstorm Impact Reduction Act of 2004.*

FIU believes that there is an important need for a coordinated program to reduce the impacts of hurricanes and other windstorms that account for the bulk of the economic damages from all natural hazards in the United States. FIU supports H.R. 3980's provisions in this regard.

Hurricanes alone result in $5 billion in damages annually, and currently there is insufficient funding to reduce these levels of impacts, which will likely increase. FIU is concerned that because no new federal money is authorized by this legislation, federal agencies will continue to be reluctant to fund hurricane and other windstorm-related research and will resist implementing this new program.

Much of the development along the U.S. East and Gulf Coasts was constructed during a lull in hurricane activity. As we are just entering a 20 to 30 year cycle of increased Atlantic hurricane activity, FIU is concerned that funding for hurricane research and mitigation will become even more insufficient at a time when the losses from hurricanes will be increasing in the future years. *FIU strongly encourages the Committee to authorize new funding for the wind hazard program.* We believe that a federal investment in this program will pay large dividends in the near term.

The cost of Hurricane Andrew, which hit South Florida a decade ago, was $30 billion dollars. That figure would be approximately $80 billion in today's dollars. Our research shows that funding for a strong, coherent and united research agenda focusing on hurricane loss reduction could lead to the reduction of this figure.

FIU strongly encourages the Committee to carefully review Tables 1 and 2 of this statement which provide statistics comparing earthquake and hurricane damage, deaths and research funding, as well as statistics on U.S. insured catastrophe losses. These numbers show the importance of establishing and funding a federal windstorm impact reduction program. We view H.R. 3980 as a good first step, and offer our expertise and services to the Committee in this regard.

FIU strongly believes that any windstorm reduction program should include appropriate attention to social science research and implementation, such as emergency preparedness and response, public and governmental adoption of mitigation measures, delivery of emergency medical care, and linking disaster recovery to mitigation. Lessons learned from the Earthquake Hazards Reduction Program have proved the importance of research into the social sciences issues as essential to a successful hazard reduction program.

We commend the legislation for establishing a national advisory committee and look forward to participating with the other key sectors to develop a comprehensive national windstorm mitigation program board based on the latest research and sound public policy strategies.

Finally, we believe that effective mitigation can only be achieved through increased research, vulnerability assessments, education and outreach. FIU encourages the Committee to explicitly recognize in H.R. 3980 the unique contribution that the higher education community can play in helping to build a solid foundation for policy-making and for reducing potential impacts and damages from hurricanes and other windstorms.

BIOGRAPHY FOR STEPHEN P. LEATHERMAN

Education

Ph.D., Environmental (Coastal) Sciences, University of Virginia, 1976

B.S., Geosciences, North Carolina State University, 1970

Publications

18 books authored or edited including *Dr. Beach's Survival Guide: What you Need to Know about Sharks, Rip Currents, & More Before Going in the Water; America's Best Beaches; Sea Level Rise: Causes and Consequences; Barrier Island Handbook; Cape Cod: From Glaciers to Beaches.*

Over 200 journal articles and technical reports authored, including articles in both *Science* and *Nature.*

Expert testimony for the U.S. Senate (1986, 1987, 1988, 1990, 1992, 1994) and U.S. House of Representatives (1989, 1990, 1991, 1993).

On-screen host and co-producer, "Vanishing Lands" film, 1992, winner of three international film awards, including the Golden Eagle.

Professional Presentations

Over 100 speeches at national and international scientific conferences including Antigua, Argentina, Bahamas, Brazil, Canada, China, Denmark, Egypt, England, France, Hong Kong, Iceland, Ireland, Italy, Japan, Mexico, Micronesia, Netherlands, Norway, Puerto Rico, Thailand, Venezuela and Wales.

Over 200 public presentations including talks at Meadow Club, Southampton, NY; Chappaquiddick Beach Club, Martha's Vineyard, MA; Ocean Beach Erosion Workshop, San Francisco, CA; Shores and Beaches Workshop, Palm Beach, FL; American Bar Association National Conference, Honolulu, Hawaii.