U.S. HOUSE OF REPRESENTATIVES

COMMITTEE ON SCIENCE

SUITE 2320 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515–6301
(202) 225–6371
TTY: (202) 226–4410
http://www.house.gov/science/welcome.htm

October 27, 2006

The Honorable Samuel W. Bodman
Secretary
U.S. Department of Energy
1000 Independence Ave., S.W.
Washington, D.C. 20585

Dear Secretary Bodman:

More than 20 years ago, the Nuclear Regulatory Commission sought advice for designing nuclear power plants to make them more secure from attack or accident. The NRC contracted with experts from the Department of Energy, specifically at Sandia National Laboratories, to study this issue. In 1981, Sandia prepared a multi-volume report entitled, "Nuclear Power Plant Design Concepts for Sabotage Protection." The report identified dozens of concepts for potential plant design changes and layout modifications for new plants that would make them more resilient against both natural disasters and intentional terrorist attacks.

The measures identified by DOE's experts included physically separating vital systems and relocating vital equipment to more protected areas. Running to hundreds of pages of analysis and detailing dozens of specific steps that could be incorporated into new nuclear plant design, the Sandia reports are a road map that anticipates the very security concerns that have come to the fore since 9/11.

In 1982, a second report was also prepared for the NRC by the Department of Energy's Argonne National Laboratory titled, "Evaluation of Aircraft Crash Hazards Analyses for Nuclear Power Plants." This study concluded that aircraft crashes might subject nuclear plants to "numerous multiple failures" that could lead to "total meltdown" even without damaging the containment structure. The report did not address plant design changes, but clearly showed that design changes could help mitigate the potential impact of aircraft hazards at nuclear power plants.

Since those reports were completed, the United States government has spent billions of dollars on new plant design work. Much of the research and development of new nuclear power plants has been conducted by the Department of Energy. Although no new plants have been licensed for construction since 1978, many utilities have expressed a desire to construct such plants and the NRC has approved the design of several new reactors since the Sandia studies were completed.

I want to know what steps have been taken by the Department of Energy to incorporate the lessons of these prior studies into these new systems. In the wake of 9/11 it would be unconscionable to find that none or few of the design improvements, a generation old, have been incorporated into planning, design or licensing standards.

The two papers cited above may not be the entire universe of studies done by the DOE regarding improving security and survivability of nuclear plants. However, the Sandia study alone identifies dozens of changes that would be feasible. Attached are pages from the Sandia anti-sabotage report that provide a sample of the kind of design changes experts considered. By this letter, I ask you to explain:

1. How did the DOE factor security – and specifically the concepts detailed in the Sandia report – into the plant designs or plant layout of nuclear plants designed since the early 1980s? Please provide details on what specific security measures were incorporated into the design of these new plants. I am particularly interested in how these concepts were folded into the current generation of plants.

2. What is the DOE currently doing or planning to do regarding the implementation of security measures into the next generation of nuclear power plants now being designed?

We are aware that steps to improve the physical security of nuclear plants in the United States have been implemented since 9/11. However, I want to be reassured that similar attention is being paid to the security integrity of the plant designs themselves both for the current generation of approved reactors and for the generation under development. Please provide whatever documentation you feel is necessary to demonstrate your efforts to address these questions.

Your assistance in this matter is greatly appreciated. Please contact Douglas Pasternak or Dan Pearson (202-225-6375) of the Committee staff to arrange for delivery of your response. I would appreciate your answers by Friday, November 17, 2006.

Sincerely,

Bart Gordon

BART GORDON
Ranking Member

U.S. HOUSE OF REPRESENTATIVES

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October 27, 2006

The Honorable Dale Klein
Chairman
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852-2738

Dear Chairman Klein:

More than 20 years ago, the Nuclear Regulatory Commission sought advice for designing nuclear power plants to make them more secure from attack or accident. In 1981, Sandia National Laboratories prepared a multi-volume report entitled, "Nuclear Power Plant Design Concepts for Sabotage Protection." The report identified dozens of concepts for potential plant design changes and layout modifications for new plants that would make them more resilient against both natural disasters and intentional terrorist attacks.

The measures identified by NRC-contracted experts largely located at Department of Energy labs included such steps as physically separating vital systems and relocating vital equipment to more protected areas. Running to hundreds of pages of analysis and detailing dozens of specific steps that could be incorporated into new nuclear plant design, the reports are a road map that anticipates the very security concerns that have come to the fore since 9/11.

In 1982, a second report was also prepared for the NRC by Argonne National Laboratory titled, "Evaluation of Aircraft Crash Hazards Analyses for Nuclear Power Plants." Contrary to statements by the NRC in the aftermath of 9/11, this study concluded that aircraft crashes might subject nuclear plants to "numerous multiple failures" that could lead to "total meltdown" even without damaging the containment structure. The report did not address plant design changes, but clearly showed that design changes could help mitigate the potential impact of aircraft hazards at nuclear power plants.

Since those reports were completed, the United States government has spent billions of dollars on new plant design work. We have not licensed a new plant for construction since 1978, but over the past few years many utilities have expressed a desire to construct such plants. As I understand it, as many as 18 nuclear power plants are in various stages of seeking approval for construction, and earlier this year, the NRC approved the design for Westinghouse's AP1000 reactor.

I want to know what steps have been taken by the NRC to incorporate the lessons of your prior studies into these new systems. In the wake of 9/11 it would be unconscionable to find that none or few of the design improvements, a generation old, have been incorporated into planning, design or licensing standards.

The two papers cited above may not be the entire universe of studies done by the NRC regarding improving security and survivability of nuclear plants. However, the Sandia study alone identifies dozens of changes that would be feasible. Attached are pages from the Sandia anti-sabotage report that provide a sample of the kind of design changes experts considered. By this letter, I ask you to explain:

1. How did the NRC factor security into the plant designs or plant layout for recently certified nuclear plants, including Westinghouse's Advanced Pressurized Water Reactor (AP1000) and General Electric's Advanced Boiling Water Reactor (ABWR)? Please provide details on what specific security measures were incorporated into the design of these new plants.

2. What is the NRC currently doing or planning to do regarding the implementation of security measures into the next generation of nuclear power plants now being designed?

We are aware that the NRC has taken steps to improve the physical security of nuclear plants in the United States and you are to be lauded for attention to this issue. However, I want to be reassured that similar attention is being paid to the security integrity of the plant designs themselves both for the current generation of approved reactors and for the generation under development. Please provide whatever documentation you feel is necessary to demonstrate your efforts to address these questions.

Your assistance in this matter is greatly appreciated. Please contact Douglas Pasternak or Dan Pearson (202-225-6375) of the Committee staff to arrange for delivery of your response. I would appreciate your answers by Friday, November 17, 2006.

Sincerely,

Bart Gordon

BART GORDON
Member of Congress

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NUCLEAR POWER PLANT DESIGN CONCEPTS FOR SABOTAGE PROTECTION

VOLUME I

David M. Ericson, Jr.
G. Bruce Varnado
Nuclear Fuel Cycle Safety Research Department 4410

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Albuquerque, New Mexico 87185
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are only indicative of the types of alternatives that were examined. Further detail on the design options is provided in Section 4 and Appendices D and E.

Table 2-1

Plant Design Alternatives[2,4]

Category	Description	Typical Candidate Measures
Hardening critical systems or locations	Little or no change in either plant layout or operational systems	Harden the spent fuel pool
		Eliminate obvious means of sabotaging vital equipment
		Harden compartments containing vital equipment
Plant layout modifications	Major changes in plant layout but only minor changes in operational systems	Physically separate redundant vital systems
		Relocate vital equipment into more protectable configurations or locations
System design changes	Major changes in operational systems	Assure the independence of each train of emergency power
		Provide design features to accommodate damage control measures
		Consider containment designs which could mitigate the consequences of core meltdown
Addition of systems	Major additions of operational systems	Add a hardened decay heat removal system

Table 4-1

Categorization of Design Alternatives

Category	Title	No.
I Hardening critical systems or locations	Underground siting (3.2)[a]	1
	Hardened containment building (3.3)	2
	Hardened fuel handling building (3.4)	3
	Hardened enclosure of control room (3.5)	4
	Hardened enclosure for RPS[b] and ESFAS[c] cabinets (3.6)	5
	Hardened ultimate heat sink (3.7)	6
	Taking advantage of natural protective features in site selection (3.8)	7
	Hardened enclosures for makeup water tanks (3.9)	8
II Plant layout modifications	Separation of containment penetrations for redundant trains of safety equipment (3.10)	1
	Separation of safety-related piping, control cables, and power cables in underground galleries (3.11)	2
	Spent fuel storage within containment (3.12)	3
	Spent fuel stored below grade (3.13)	4
	Physically separated and protected redundant trains of safety equipment (3.14)	5
	Separate areas or rooms for cable spreading (3.15)	6
	Alternate control room arrangements (3.16)	7
	ECCS[d] components within containment (3.17)	8
	Administrative, information, and construction buildings located outside of protected area (3.18)	9

[a] Each number in parentheses refers to the section number of the description in Appendix D.

[b] RPS = Reactor protection system

[c] ESFAS = Engineered safety features actuation system

[d] ECCS = Emergency core cooling system

Table 4-1 (Continued)

Categorization of Design Alternatives

Category	Title	No.
III System design changes	Isolation of low-pressure systems connected to reactor coolant pressure boundary (3.19)	1
	Design changes to facilitate damage control (3.20)	2
	Alternate containment designs (3.21)	3
	Extra-redundant, fully separated, self-contained and protected trains of emergency equipment (3.22)	4
	Additional protected control rod trip (3.23)	5
	Additional protected control rod trip acting on diverse, protected trip breakers (3.24)	6
	Turbine runback (3.25)	7
	Reduced vulnerability of intake structures for safety-related pumps (3.26)	8
	Trip coils for breakers/switchgear energized by internal power source (3.27)	9
	High-pressure RHRS[e] (3.28)	10
IV Add'l. Systems	Hardened decay heat removal system (3.29)	1
	Additional independent, diverse scram system (3.30)	2

[e]RHRS = Residual heat removal system

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RS

NUCLEAR POWER PLANT DESIGN CONCEPTS FOR SABOTAGE PROTECTION

VOLUME II
APPENDICES D, E, F, G

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Sandia National Laboratories
Albuquerque, New Mexico 87185
Operated by
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Prepared for
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U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
Memorandum of Understanding DOE 40-550-75
NRC FIN No. A1210

Table 2-1

CATEGORIZATION OF DESIGN ALTERNATIVES

I	Hardening Critical Systems or Locations	Underground siting	1
		Hardened containment building	2
		Hardened fuel handling building	3
		Hardened enclosure of control room	4
		Hardened enclosure for RPS and ESFAS cabinets	5
		Hardened ultimate heat sink	6
		Taking advantage of natural protective features in site selection	7
		Hardened enclosures for make-up water tanks	8
II	Plant Layout Modifications	Separation of containment penetrations for redundant protection systems	1
		Separation of safety-related piping, control cables, and power cables in underground galleries	2
		Spent fuel storage within containment	3
		Spent fuel stored below grade	4
		Physically separated and protected redundant trains of safety equipment	5
		Separate areas or rooms for cable spreading	6
		Alternate control room arrangements	7
		ECCS components within containment	8
		Administrative, information, and construction buildings located outside of protected area	9
III	System Design Changes	Isolation of low pressure systems connected to reactor coolant pressure boundary	1
		Design changes to facilitate damage control	2
		Alternate containment designs	3
		Extra-redundant, fully separated, self-contained and protected trains of emergency equipment	4
		Additional protected control rod trip	5
		Additional protected control rod trip acting on diverse, protected trip breakers	6
		Turbine runback	7
		Reduced vulnerability of intake structures for safety-related pumps	8
		Trip coils for breakers/switchgear energized by internal power source	9
		High pressure RHR system	10
IV	Add'l Systems	Hardened decay heat removal system	1
		Additional independent, diverse scram system	2

Table A-1

Categorization of Design Alternatives Derived from Safeguards Studies

Category	Title	No.[a]
II Plant layout modifications	Increase protected diesel fuel oil supply (2.6)[b]	10
	Revise diesel building layout (2.7)	11
	Relocate RHRS inside containment (3.17)	12
III System design changes	Provide ac power swing-load capability (2.1)	11
	Provide switchgear and MCC[c] enclosures with internal circuit breaker trip (2.2)	12
	Revise vital electrical area cooling arrangements (2.3)	13
	Provide vital ac power cross-connections for multiple unit sites (2.4)	14
	Revise diesel engine cooling arrangement (2.5)	15
	Increase station battery capacity (2.8)	16
	Provide dc load-shedding capability (2.9)	17
	Provide Class 1E dc division cross-connections (2.10)	18
	Provide extended dc power generation capability during station blackout (2.11)	19
	Provide consolidation (common location) of safety-related instrumentation transmitters (2.12)	20
	Provide additional local-remote indicators for plant equipment (2.13)	21
	Rearrange instrumentation cabinets to minimize panel-front controls (2.14)	22
	Modify small-diameter pipeway to higher schedules and all-welded construction (2.15)	23
	Maximize use of passive lubrication (2.16)	24
	Maximize use of enclosed modular components (2.17)	25
	Provide localized cooling for vital pumps and motors (2.18)	26

[a]The numbering in this table continues from that in Table 4-1 in Volume 1 (Table 2-1 in Appendix D) for convenience in later discussions.

[b]Each number in parentheses is the section of the description in Appendix E.

[c]MCC = motor control center.

Table A-1 (Continued)

Categorization of Design Alternatives Derived from Safeguards Studies

Category	Title	No.
III System design changes (Continued)	Reduce vital area cooling dependence on active systems (2.19)	27
	Provide a Class 1E auxiliary steam turbine-generator (3.1)	28
	Provide Class 1E power to pressurizer heaters (3.2)	29
	Add additional insulation to pressurizers (3.3)	30
	Provide reactor vessel water level instrumentation (3.4)	31
	Provide capability to remotely vent reactor vessel head (3.5)	32
	Provide dc motor actuators to reactor coolant pump seal leak-off isolation valves (3.6)	33
	Provide parallel and independent valves in pressurizer auxiliary spray line (3.7)	34
	Provide automatic actuation of AFWS[d] (3.8)	35
	Provide expanded supply of onsite emergency feedwater (3.9)	36
	Provide swing-load capability for motor-driven AFW pump (3.10)	37
	Provide expanded set of local instruments for manual control of steam turbine AFW pump (3.11)	38
	Provide dc motor drivers for motor-driven lube oil pumps on steam turbine (3.12)	39
	Pipe gland seal leakage out of turbine AFW pump room (3.13)	40
	Relocate temperature-sensitive turbine controls from AFW turbine pump (3.14)	41
	Provide dc motor-driven or steam-turbine-driven pump room ventilation (3.15)	42
	Increase safety injection tank pressure rating to make it available as passive source (3.16)	43
IV Add'l. Systems	Provide an RHR system for BWRs which operates in a natural circulation mode (4.1)	3

[d]AFWS = auxiliary feedwater system.