50-275
G
11/20/78

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Appeal Board

In the Matter of	
PACIFIC GAS AND ELECTRIC COMPANY	Docket Numbers 50-275 O.L. 50-323 O.L.
(Diablo Canyon Nuclear Power Plant Units 1 and 2)	

PETITION FOR DIRECTED CERTIFICATION FOR REVIEW OF "RECONSIDERATION OF BOARD'S ORDER OF SEPTEMBER 5, 1978" RELATING TO QUALIFICATION OF SECURITY EXPERT

This petition concerns continuing efforts of Intervenor San Luis Obispo Mothers for Peace to obtain discovery in accord with guidelines previously established by this Appeal Board in In the Matter of Pacific Gas and Electric Company (Diablo Canyon Nuclear Power Plant, Units 1 and 2). ALAB-410, 5 NRC 1398, Commission review declined, CLI-77-23, 6 NRC 455 (1977).

On October 6, 1978, Intervenor petitioned for directed certification and review of the Licensing Board's decision of September 5, 1978, denying the qualification of David Dinsmore Comey as an expert witness for discovery purposes in this case. Intervenor's Petition for Directed Certification was granted. The September 5, 1978 order of the Licensing Board was vacated, and the cause remanded. The

Licensing Board was directed to comply with the long-standing principle that the Board has the obligation "to articulate in reasonable detail the basis for (their) determinations" (ALAB-5[illegible]. 8) so that all parties, and the Appeal Board on review, can readily apprehend the foundation for a ruling. More specifically, ALAB-504 stated that this Intervenor was:

> ". . . entitled to an explanation of why the Licensing Board found the analysis of the staff and the applicant to be persuasive -- i.e., why Mr. Comey's prior activities in the realm of security and security plans are individually or collectively insufficient to qualify him as an expert for present purposes." ALAB-504, p. 10.

On November 3, 1978, the Licensing Board issued a "Reconsideration of the Board's Order of September 5, 1978" attached Appendix 'A' (hereafter "Reconsideration").

The "Reconsideration" does not follow either ALAB-410 or ALAB-504. In the "Reconsideration" the Licensing Board establishes its own rules for qualification of experts that are inconsistent with conventional methods under the Federal Rules of Evidence.

Intervenor petitions now for directed certification and review of the "Reconsideration;" for the issuance of an immediate order that Mr. Comey is qualified to act as an expert witness for discovery purposes in this case; and for other necessary orders.

ISSUES PRESENTED

Whether David Dinsmore Comey, whose abundant qualifications have been lodged with the Licensing Board, may be

denied qualification as an expert witness either because he does not have specific academic training in nuclear power plant electronics, or because he does not have practical knowledge flowing from working with the assembly of "nuts and bolts" of the various mechanical components of a security system.

ARGUMENT

I

THIS APPEAL BOARD SHOULD EXERCISE DISCRETIONARY POWER OF DIRECTED CERTIFICATION TO REVIEW ASLB "RECONSIDERATION" DENYING QUALIFICATION OF DAVID DINSMORE COMEY AS AN EXPERT WITNESS FOR DISCOVERY PURPOSES

A. Certification is Appropriate and Necessary in This Instance to Further Clarify the Requirements Imposed on Intervenors to Qualify an Expert to Review and Testify Concerning Various Aspects of an Applicant's Security Plan and to Properly Define "Expertise".

This Appeal Board recognizes that important questions of general applicability present appropriate circumstances for exercise of its directed certification powers, See, e.g., In the Matter of Toledo Edison Co., et al. (David-Besse Nuclear Power Station), ALAB-300, 2 NRR 30,028, 27,181, 27,190 (1975), and has recognized that the issue of this Intervenor's right to discovery of the security plan has broad implications beyond the facts of this particular case. It has previously found it necessary on two occasions to provide guidance to the Licensing Board with regard to current standards governing disclosure for discovery purposes of security plans.

B. Certification is Appropriate Here Because Normal Appellate Procedures are not Adequate and a Request to the Licensing Board to Certify Would be Futile and Act Only to Delay this Proceeding.

If the Licensing Board's "Reconsideration" order is allowed to stand, the hearings now scheduled to begin December 4, 1978, will proceed without opportunity for any Intervenor to present expert testimony regarding the adequacy of applicant's security plan. Denying such opportunity to Intervenors is detrimental to the public interest, and is inconsistent with the result contemplated in ALAB-410.

This Appeal Board has recognized the great value to public health and safety of intervenor participation in review of the adequacy of an applicant's security plan. In the Matter of Pacific Gas and Electric Co. (Diablo Canyon, Units 1 and 2), ALAB-410, 2 NRR 30,197, 28,022, 28,024-5, 28,028-29 (1977); Consolidated Edison Co. of New York (Indian Point, Unit 2), ALAB-197 and 197R, 7 AEC 473, 826, on review, CLI-74-23, 7 AEC 947, 949-50, on remand, ALAB-243, 8 AEC 850, 853-54 (1974). This Appeal Board, in a previous ruling supporting the request by this Intervenor for discovery of applicant's security plan, explicitly noted that participation by an intervenor's expert in Indian Point 2 "helped...in assuring that the [security] plan eventually adopted for the plant was adequate." In the Matter of Pacific Gas and Electric Co. (Diablo Canyon, Units 1 and 2), ALAB-410, 2 NRR 30,197, 28,022, 28,024-5 (1977). As Mr. Salzman stated in

his additional comments to the Appeal Board's Memorandum in ALAB-410: "[C]onsiderable benefit can be derived from the independent scrutiny of such [security] plans which litigation engenders." Id. at 28,029. [Emphasis added.]

C. Recent Hearings Indicating Strong Congressional Intent that the Nuclear Regulatory Commission do Everything Possible to Ensure Adequate Security Systems at Existing and Future Plants Further Compel Direct Certification and Review Herein.

The adequacy of domestic nuclear power plant security has been the subject of much Congressional concern and criti ism. See, e.g., Accuracy of U.S. Nuclear Regulatory Commission Testimony: Oversight Hearing Before the Subcommittee on Energy and the Environment of the House Comm. on Interior and Insular Affairs, 95th Cong., 2d Sess. (Feb. 27, 1978); Allegations Concerning Lax Security in the Domestic Nuclear Industry: Oversight Hearing Before the Subcomm. on Energy and the Environment of the House Comm. on Interior and Insular Affairs, 95th Cong., 2d Sess. (July 29, 1977) [hereinafter cited as July 29th Hearing]; Nuclear Reactor Security Against Sabotage: Oversight Hearing Before the Subcomm. on Energy and the Environment of the House Comm. on Interior and Insular Affairs, 95th Cong., 1st Sess. (May 5, 1977) [hereinafter cited as May 5th Hearing]; Subcommittee on Energy and the Environment of House Comm. on Interior and Insular Affairs, Report on Safeguards in the Domestic Nuclear Industry, Comm. Print No. 17, 94th Cong.,

2d Sess. (August 1976). In recent years, much of the controversy over whether nuclear plants are adequately protected against sabotage stemmed from a GAO report, released on April 7, 1977, which concluded:

> "[T]he Commission has not operated decisively or effectively in the security area, and as a result, security systems at perhaps all power plants would not be able to withstand sabotage attempts by threats that are now considered minimum by the Commission." See May 5th Hearing, supra, at 1.

Chairman Udall stated in his opening remarks during the hearing held on May 5, 1977:

> "[T]he consequences of sabotage of a nuclear reactor could be disastrous....
>
> "It is because of the enormous consequences... that we want to assure ourselves that all reasonable steps are taken to prevent the worst from occurring." Id. at 1. (Emphasis added.)

Congressional concern over particular elements of nuclear plant security systems compels the fullest possible review of an applicant's proposed security plan. Elements of security systems receiving particular scrutiny by Congress ought to receive the same high level scrutiny by the NRC, not only in the formulation of regulations, but also in the implementation of those regulations. Reviewing a security plan is not simply a matter of measuring the plan against the regulations. There is always inherent flexibility in implementing regulations. Each security plan has to be adapted, within the standards set by the regulations, to the physical location and layout of each proposed nuclear power plant.

In light of Congressional concern for the integrity of existing security systems and the provision for adequate security at nuclear plants, the Licensing Board should welcome the independent and critical eye of someone with Mr. Comey's background and experience. Mr. Comey's participation in the upcoming licensing hearing could only help to minimize the possibility of overlooking weaknesses in applicant's security plan and to maximize the opportunity for improvement of the plan. If the Licensing Board were less resistant to the idea of recognizing the expertise of someone with other views, even possibly differing from those of the applicant and staff, such exchanges as follow would perhaps not occur with such frequency:

> "Mr. Gossick. ... There is a belief by some that terrorists might be attracted by a light-water reactor in terms of trying to breach it and cause a meltdown, with results as effective or of a similar nature. The attractiveness to a terrorist is that this would not involve the problems of trying to assemble material into a weapon, which we assume can be done but is yet certainly not a simple task to do.
>
> "I am not trying to be flip, but if I were a terrorist...I would certainly go for other facilities in lieu of that.
>
> "Mr. Tsongas. I guess it would be a disappointment to you if you were wrong.
>
> "Mr. Gossick. That is exactly why we are in the process of upgrading safeguard capabilities. ...
>
> "Mr. Tsongas. Let me pursue that. I have been on this committee for 2-1/2 years, and have been -- in fact, at all of the hearings invariably

> NRC comes up and has the attitude, "I am all right, Jack." The safeguards are adequate. Then we are told well, some of the things that Mr. Conran [a nuclear engineer with the NRC, who disagreed with Commission's official position regarding adequacy of safeguards programs] looked into are correct and we are changing our procedures and we have new regulations that will update everything a year from now. ...
>
> "I, for one, really have no stomach for going through these sessions on a semiannual basis.... It seems to me that it is in everyone's interest that NRC -- I was going to say bite the bullet, but that seems to be inappropriate, but for once and for all to agree to have adequate safeguards, to establish a criterion at a level that reasonable men will say, that is enough, and to undertake procedures to implement that once and for all." July 29th Hearing, supra, at 31-32.

The present regulations reflect a commendable effort by the NRC to upgrade levels of safeguards at nuclear power plants, a response in large part to the criticism expressed in Congressional hearings. However, there is no reason for the Licensing Board to take the attitude "I am all right, Jack," simply because the regulations have been recently revised, and exclude qualified experts with potentially different perspectives from analyzing Applicant's security plan for conformity with those regulations.

II

THE "RECONSIDERATION" DOES NOT FOLLOW EITHER ALAB-504 OR ALAB-410 AND IS CONTRARY TO THE FEDERAL RULES OF EVIDENCE

A. In Limiting the Qualification of an Expert to Those Who Have "Nuts and Bolts" Experience With the Actual Hardware Components of the Plan, the Board Violates Both ALAB-410 And ALAB-504 by Virtually Eliminating As Potential Experts All Those Who Have Not Worked In The Nuclear Industry.

The essence of the Licensing Board's reasoning is that to qualify as a security expert, Mr. Comey must have worked with the "nuts and bolts" of components of security systems "at least to the extent of being able to design an overall system." ("Reconsideration," p. 3) The Licensing Board has the mistaken idea that the main issue regarding security is whether certain equipment has been assembled properly and will function dependably.

The real issue is much broader; namely, whether the overall security plan is adequate to "...provide protection with high assurance against successful industrial sabotage...." (10 C.F.R. §73.55(a)), even if it is assumed that the hardware performs as it was designed to do. As will be discussed infra, hardware components, such as alarm devices, are only one of many elements of a security plan that must be evaluated. In fact, the hardware components are the least of the problem. No one seriously questions the functioning of the mechanical components; the issue is the breach of the entire system by sabotage or terrorist attack.

Mr. Comey is uniquely qualified to evaluate the adequacy of the overall plan. The Licensing Board, in its preoccupation with the dependability of hardware, dismisses the unique combination of his qualifications on the basis that each one of them alone does not establish "prima facie"

qualification ("Reconsideration," p. 7). The "Reconsideration" ignores the composite picture of Mr. Comey's knowledge and relevant experience in nuclear power plants and security, his past participation in similar proceedings, and even his "perhaps prestigious" participation in a study of Nuclear Proliferation and Safeguards performed by the Office of Technology Assessment of the United States Congress. The Cover, Advisory Panel and Table of Contents of this study are attached as Appendix 'D' to show the relevance of this work to the qualification of Mr. Comey.

In failing to determine what the members of the Advisory Panel "actually do" ("Reconsideration," p. 10), the Board overlooks Mr. Comey's testimony before the California Energy Commission on Sabotage Considerations of the Proposed Sundesert Nuclear Powerplant. This testimony, attached as Appendix 'B,' is a part of the record in this proceeding. Had the Licensing Board reviewed the entire Sundesert testimony (rather than the one entry in footnote, p. 10 of the "Reconsideration,") it would have seen the detailed discussion of the work of and concerns of this group (the "January" group), particularly with regard to threat levels, "insider" sabotage, security responses and guard qualifications (see pp. 15-17, Appendix 'B'). Instead the Board takes the overly-simplistic and erroneous view that everyone without a degree in electronics and "nuts and bolts" assembly experience

is just "a well-informed layman." (The Licensing Board did grudgingly concede, at page 12, that Mr. Comey "has acceptable status in his general knowledge of reactor plant layout and operation of its various components.")

Intervenor contends that a security expert is one whose broad general knowledge of the field, whose education, knowledge, and experience enable him to evaluate the overall adequacy of a security plan that by its nature includes, but is not limited to "nuts and bolts". Mr. Comey is precisely such an expert. He has previously testified on security matters; he has studied security matters for years; he stays current on breaches of security; he has even discribed in his Sundesert testimony how a pressurized water reactor of the same design as Diablo Canyon may be sabotaged to result in a meltdown (App. 'B,' p. 11). To rule that Mr. Comey is not qualified is contrary to ALAB-504 and ALAB-410 and is a de facto ruling that the only security experts are those who have previously designed or installed alarm devices, etc., at the other nuclear power facilities and, hence, that the only "experts" are those who are, or have worked, in the nuclear industry.

B. The "Sensitive Nature" of Security Plans has no Bearing on the Issue of Expertise, and the Licensing Board's Reliance on this Irrelevant Consideration is Improper and Contrary to Law.

While conceding in a footnote ("Reconsideration", p. 5) that the Licensing Board has no reason to believe that Mr. Comey would not violate a protective order, the Board nevertheless raises the misleading spectre of a security

breach by dredging out of the public file resolutions of concern ("Reconsideration," p. 3-4) about unauthorized disclosure of the security plan. These documents are not a part of the record in this proceeding and are irrelevant to the legal issue of what constitutes expertise. The emotional impact of these resolutions on the Licensing Board, and of this entire secrecy issue, has led the Board to establish, without any legal authority, "somewhat more restrictive requirements for the demonstration of expertise than has [sic] previously existed." ("Reconsideration," p. 5) The Board has, in effect and directly contrary to ALAB-504, adapted a different standard than exists at law under Rule 702, Federal Rules of Evidence,[1] for the qualification of experts in security cases.

Intervenor urges this Appeal Board to reaffirm that it is one thing to determine the qualifications of an expert witness; and entirely another to establish, through use of protective orders, safeguards against disclosure of a security plan by any expert so qualified.

---

1. Rule 702, Federal Rules of Evidence, raises two issues: (1) the qualification of the expert and (2) whether the testimony will assist the trier of fact to understand the evidence, Moore's Federal Practice, Vol. II, p. VII-23 (2d Ed. 1976). There can be no serious doubt but that Mr. Comey's testimony would aid the Licensing Board in this proceeding. Further, "Expertise for legal purposes means that a witness has sufficient specialized knowledge, skill, experience, training or education to testify in the form of an opinion." Forbro Design Co. v. Raytheon Co. (C.A. 5th 1976) 532 F.2d 758, 762.

III

MR. COMEY IS UNIQUELY QUALIFIED TO REVIEW APPLICANT'S SECURITY PLAN TO DETERMINE WHETHER THE PLAN CONFORMS TO CURRENT REGULATIONS

A. Current Regulations.

Section 73.55, Title 10 of the Code of Federal Regulations, specifies the elements of applicant's security plan:

"(a) General Performance Requirements. The licensee shall establish and maintain an onsight physical protection system and security organization which will provide protection with high assurance against successful industrial sabotage by both the following:

"(1) A determined violent external assault, attack by stealth, or deceptive actions, of several persons with the following attributes...

"(i) Well-trained (including military skills)...;

"(ii) Inside assistance;

"(iii) Suitable weapons;

"(iv) Hand-carried equipment...

"(2) An internal threat of an insider...

"(b) Physical Security Organization.

"(1) The licensee shall establish a security organization including guards, to protect its facility against industrial sabotage...

"(c) Physical Barriers.

"(1) The licensee shall locate vital equipment only within a vital area..., located within a protected area...

"(d) Access Requirements.

"(1) The licensee shall control all points of personnel and vehicle access into the protected area...

"(e) Detection Aids. All alarms required pursuant to this part shall enunciate in a continuously manned central alarm station located within the protected area.. that a single act cannot remove the capability of calling for assistance...

"(f) Communication Requirements.

"(1) Each guard, watchman or armed responsible individual on duty shall be capable of maintaining continuous communication with an individual in each continuously manned alarm station...

"(g) Testing and Maintenance. Each licensee shall test and maintain intrusion alarms, emergency alarms, communications equipment, physical barriers and other security related devices...

"(h) Response Requirement.

"(1) The licensee shall establish and document liaison with local law enforcement authorities..."

B. Intervenors Contentions.

This Intervenor contends that applicant's security plan does not comply with 10 C.F.R. §73.55 in these ways: (See Amended Security Contentions of Intervenor, filed January 18, 1978.)

1. The plan fails to meet general performance requirements;

2. The plan has deficiencies relative to the organization, leadership, duties and qualifications of its security force;

3. The plan has deficiencies relative to the location of vital areas, vehicle parking restrictions, size of isolation zones, penetration detection devices and arrangements, and illumination relative to physical barriers;

4. The plan has deficiencies relating to identification and search of individuals entering a protected area, search of packages and other handcarried items for things which could be used for industrial sabotage, identification and authorization of packages, designation, control and search of vehicles, badging and escort requirements for individuals, access to vital areas, alarms, locks, and positive access control over reactor containment and other equipment in protected and vital areas;

5. The plan has deficiencies relative to alarm annunciation, central alarm stations, required features, types and locations of alarms;

6. The plan has deficiencies relative to guard communications capabilities, alarm station communications capabilities, communications links to local law enforcement authorities, and independent power sources for non-portable communications equipment;

7. The plan has deficiencies relative to testing and maintenance of security equipment;

8. The plan has deficiencies relative to guard response to abnormal activity and security emergencies.

C. Mr. Comey's Qualifications.

A statement of Mr. Comey's qualifications to be an expert witness for discovery purposes on security matters, as developed in the record and submitted in previous pleadings, is attached hereto as Appendix 'C.' Mr. Comey possesses the composite professional qualifications to analyze applicant's plan for conformity with current guidelines and regulations. This statement of broad qualification includes the requisite knowledge, skill, training and experience in specific areas of greatest concern in judging the adequacy of applicant's security plan; for example:

(1) Guard Force Requirements. (See App. 'B;' para. 8, 15, App. 'C').

(2) Sabotage and Definition of Threat Level. (See App. 'B;' para. 4, 5, App. 'C;' and Deposition of David Dinsmore Comey, Chicago, Illinois, July 5, 1978, p. 17).

(3) Organizational Structure, Deployment of Security Forces, Coordination with Local Law Enforcement Authorities. (See App.'B;' and Deposition of David Dinsmore Comey, Chicago, Illinois, July 5, 1978, p. 32).

(4) Physical Barriers, Perimeter Detection Systems. (See paras. 9, 12, App. 'A').

D. The Distinction Between Exclusion of Mr. Comey and the Weight to be Given to his Testimony.

Intervenor recognizes the possibility, but does not concede, there may be subjects of inquiry into Applicant's security plan as to which Mr. Comey is not an expert. Intervenor will not know that until the Licensing Board follows the direction of ALAB-410 (p. 15) to permit inspection of a "sanitized" version of the plan. Such an inspection would permit Intervenor to determine what portions of the plan are relevant to Intervenor's contentions, and what portions may be beyond Mr. Comey's expertise.

Reasoned analysis of the regulatory requirements, Intervenor's contentions and Mr. Comey's qualifications, noted in this paragraph III, (A) through (C), supra, require the conclusion that Mr. Comey is qualified to testify on most, if not all, elements of the security plan. Even if Mr. Comey is not qualified on the "nuts and bolts" of the security system components (which Intervenor does not concede), he should not be excluded as an expert for discovery

of other elements of the plan as to which he is qualified. Further, to the extent that Mr. Comey may have a higher degree of expertise with respect to one element of the plan (e.g., threat levels) relative to other subjects (e.g., assuming arguendo, "nuts and bolts" of components) the significance of the distinction should go to the weight to be given to his testimony;[2] not in his exclusion as an expert witness in the proceeding.

CONCLUSON

For the reasons stated herein, Intervenor requests:

1. That this Petition for Directed Certification be granted;

2. That this Appeal Board determine that Mr. Comey is qualified to act as an expert witness on security matters for purposes of discovery;

3. That this Appeal Board suspend action on security issues in the Licensing Board proceeding under 10 C.F.R. §2.785(b)(1) and §2.711 until discovery of Applicant's security plan can be conducted by Intervenor on an expedited basis;

4. That this Appeal Board issue such further orders as are necessary in the circumstances to afford Intervenor the

---

2. See, Moore's Federal Practice, supra, n. 1 at VII-35.

right of discovery without undue delay of the operating license proceeding.

DATED: November 20, 1978

Respectfully submitted,

Paul C Valentine

PAUL C. VALENTINE
YALE I. JONES

Attorneys for Intervenor San Luis Obispo Mothers for Peace

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Appeal Board

In the Matter of	)	
	)	Docket Nos. 50-275 O.L.
PACIFIC GAS AND ELECTRIC CO.	)	50-323 O.L.
	)	
(Diablo Canyon Nuclear Power Plant, Units 1 and 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that I have this 20th day of November, 1978, served copies of the PETITION FOR DIRECTED CERTIFICATION FOR REVIEW OF "RECONSIDERATION OF BOARD'S ORDER OF SEPTEMBER 5, 1978" RELATING TO QUALIFICATION OF SECURITY EXPERT upon all of the parties listed below by depositing copies thereof in the United States Mail, first-class, postage prepaid.

* Mrs. Raye Fleming
1920 Mattie Rd.
Shell Beach, CA 93449

Bruce Norton, Esq.
3216 N. Third St.
Suite 202
Phoenix, Arizona 85012

* Arthur C. Gehr, Esq.
Snell & Wilmer
3100 Valley Center
Phoenix, Arizona 85073

* Philip A. Crane, Esq.
John C. Morrissey, Esq.
Pacific Gas & Electric Co.
77 Beale St., Rm 3127
San Francisco, CA 94106

* Janice E. Kerr
Lawrence Q. Garcia, Esq.
J. Calvin Simpson, Esq.
California Public Utilities Commission
5246 State Bldg.
350 McAllister
San Francisco, CA 94102

* John Phillips, Esq.
Center for Law in the
Public Interest
10203 Santa Monica Dr.
Los Angeles, CA 90067

* Mrs. Sandra Silver
1792 Conejo Avenue
San Luis Obispo, CA 93401

* Mr. Frederick Eissler
Scenic Shoreline Preservation
Conference, Inc.
4623 More Mesa Dr.
Santa Barbara, CA 93105

* Mrs. Elizabeth Apfelberg
1415 Cozadero
San Luis Obispo, CA 93401

James R. Tourtellotte, Esq.
Office of the Executive Legal
Director
BETH 042
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

* Dr. William E. Martin
Battelle Memorial Institute
Columbus, Ohio 43201

* Mr. Glenn Bright
Atomic Safety & Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

* Docket and Service Section
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mrs. Elizabeth Bowers
Chairman
Atomic Safety and Licensing
Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Alan S. Rosenthal, Esq.
Chairman
Atomic Safety and Licensing
Appeal Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Helen J. Donovan

* Without appendix

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	
PACIFIC GAS AND ELECTRIC COMPANY	)	Docket Nos. 50-275 OL
	)	50-323 OL
(Diablo Canyon Nuclear Power Plant, Units 1 and 2)	)	

RECONSIDERATION OF THE BOARD'S ORDER OF SEPTEMBER 5, 1978

INTRODUCTION

On September 5, 1978, this Licensing Board issued an Order which denied Intervenors' (San Luis Obispo Mothers for Peace) petition to qualify Mr. David Comey as a security plan expert witness. The Order recited the positions of Intervenors, Applicant, and the NRC Staff. On September 22, and October 6, 1978, the Intervenors petitioned the Atomic Safety and Licensing Appeal Board to grant direct certification in this matter and to issue an immediate Order that Mr. Comey is qualified as an expert witness for discovery purposes. On October 27, 1978, the Appeal Board, in ALAB-504, determined that the petition for directed certification is granted; this Board's Order of September 5, 1978, is vacated. The Order remanded the matter to this Board for

APPENDIX "A"

prompt reconsideration and a full explication of the reasons underlying the result upon such reconsideration.[1/]

GENERAL CONSIDERATIONS

The Board has before it the following documents: Intervenors' petition of May 23, 1978; the Applicant and the Staff's responses of June 5, 1978; Mr. Comey's deposition of July 5, 1978; the Staff response of August 14, 1978; Intervenors' petition for Immediate Order and Response to NRC on August 25, 1978; and Applicant's response to the original petition following deposition of August 28, 1978. The Board has also reviewed the Appeal Board Memorandum and Order in ALAB-410 which was issued on June 9, 1977.[2/] We perceive the pertinent part of this decision concerning the criteria to be applied to determine who is an expert witness to be in paragraph (3) on pp. 1404, 1405, as follows:

> "(3) A security plan need not be revealed to a witness who lacks relevant expertise for evaluating it. Access to the plan or portions thereof should be given only to witnesses who have been shown to possess the technical competence necessary to evaluate the portions of the plan which they may be shown. Any other course would contravene the requirement that

---

1/ Pacific Gas and Electric Company (Diablo Canyon Nuclear Power Plant, Units 1 and 2), ALAB-504, 7 NRC _____.

2/ Pacific Gas and Electric Company (Diablo Canyon Nuclear Power Plant, Units 1 and 2), ALAB-410, 5 NRC 1398 (1977).

> access be afforded only to 'persons properly and directly concerned' (10 C.F.R. §2.790(b)(6)). See also Federal Rules of Evidence, Rule 702.
>
> "In the latter connection, it is noteworthy that when an expert is challenged (as on voir dire examination), the party sponsoring the witness has the burden of demonstrating his expertise. As Wigmore has pointed out, it is 'universally conceded' that the 'possession of the required qualifications by a particular person offered as a witness, must be expressly shown by the party offering him.' 2 Wigmore, Evidence, §560, at pp. 640-41 (3d Ed. 1940)(emphasis in original)."

The key words here are "technical competence" and "the party sponsoring the witness has the burden of demonstrating his expertise." Webster defines "technical" as "having special, usually practical knowledge, especially of a mechanical or scientific subject." We believe that "technical competence" to evaluate the components of a security plan ideally requires practical knowledge flowing from working with the assembly of the "nuts and bolts," etc., of the various components of the security system, at least to the extent of being able to design an overall system. It does not necessarily mean the raw manual labor involved, but an intimate, on-the-spot knowledge of the fabrication and assembly of each component. We recognize that the Board must make a subjective determination here, but, noting the fact that the burden is on the party sponsoring the

candidate, we believe that the burden will not have been met unless there exists evidence of actual practical knowledge or its equivalent.

We are also aware that if we recognize a candidate as technically qualified, before discovery can proceed, we must also be assured that the person has signed a proper protective order and will honor it. This could demand extreme care, as was illustrated prior to our in camera prehearing conference. Members of the Mothers for Peace excused themselves from the hearing room before we commenced, saying that they were concerned that if they had actual knowledge of the security plan or if potential saboteurs believed they did, they feared for the safety of their homes and their persons. Concern about security of the plant and the community also prompted the Criminal Justice Administrator's Association of San Luis Obispo County to pass a resolution on May 12, 1976, which received full service, asking the Board not to permit disclosure of the security plan due to their concern about "the risk of unauthorized release of the details of such plans." The Board of Supervisors, County of San Luis Obispo passed a similar resolution on August 24, 1976, which also

received full service. We recognize the concern of the individuals and the organizations but it does not persuade us that a technically competent individual under a carefully drawn protective order will not fully honor the protective order. We believe it can be done or we would not have admitted the security plan contention.[3/]

The Board does believe, however, that these expressed concerns, along with those stated by, inter alia, the Advisory Committee on Reactor Safeguards and the Atomic Safety and Licensing Appeal Board in this case, mandate the Board to quantify, insofar as possible, the requirements for establishing expertise in this field. It is for this reason the Board has attempted to define "technical competence," above, and has adopted the suggested guidelines set forth in the comments by Drs. Johnson and Quarles which were attached to ALAB-410. This has led to what are perhaps somewhat more restrictive requirements for the demonstration of expertise than has existed previously.

3/ We have no reason to believe that Mr. Comey would in any way violate the restrictions of a protective order, and this factor did not enter into the Board's original disqualification of Mr. Comey.

SPECIFIC CONSIDERATION OF MR. DAVID COMEY

In general, the qualifications of an expert witness are established either through consideration of his academic training or of his relevant experience, or through some combination of these factors. The Board has considered these factors, and addresses them, seriatim.

ACADEMIC BACKGROUND AND TRAINING

In its original petition to establish the qualifications of Mr. Comey, Intervenors attached a "Statement of Personal Qualifications of David Dinsmore Comey." In this statement, it was revealed that he " . . . is a graduate of Princeton University and worked for many years as an analyst of Soviet scientific research. He had two one-year Ford Foundation Fellowships, and spent two years as an Assistant Professor at the Osteuropa Institut of the Universitat Freiburg/Schweiz. In 1963 he became a Research Associate at the Center for International Studies at Cornell University, and for six years he was the Director of the Research Institute on Soviet Science."

The Board feels that this bare statement sheds little light on Mr. Comey's academic qualifications. No mention is made of his undergraduate major, nor is any information presented to the Board on any relevance his studies might have to the question of nuclear plant security. In his deposition, he did state that he had audited 12 graduate courses in physics at Cornell University while he was on the staff of the University, but, again, no particular relationship between this academic training and the various areas of expertise laid out by the Appeal Board guidelines was made. (Tr. 5-6, 51-52). He also stated (Tr. 52-53) that he had taken courses in symbolic logic and social psychology, which he believed had some relevance to the security problem. He further stated that he had taken no formal course work which principally involved physical security (Tr. 6), and that he has no educational background in electronics. (Tr. 60).

Based on the representations by the Intervenors and the proposed witness, the Board finds no prima facie qualification of Mr. Comey by virtue of academic training grounds alone has been established.

RELEVANT EXPERIENCE

In Mr. Comey's statement of qualifications and subsequent deposition a number of items concerning relevant experience were presented for the Board's consideration. After thorough review of these submissions, the Board finds them less than compelling.

The Intervenors have relied heavily on Mr. Comey's "experience qualifications" from the fact that he participated in the Zion 1 and 2 hearings in 1973, and the Donald C. Cook 1 and 2 proceedings in 1974. Mr. Comey stated he was qualified in the Zion proceeding as a "2.733 expert," and was qualified by the Chairman of that Board to conduct cross-examination on security matters. (Tr. 10). In the Cook case, he reviewed security plans and participated in negotiations of an in camera settlement agreement on security matters.

Careful review of the pertinent section of Mr. Comey's deposition (Tr. 6-14) yielded little in the way of hard facts. It is certainly true that Mr. Comey participated in these actions. In the case of Cook 1 and 2 it appears that no formal acceptance of Mr. Comey's status as an expert was made, but

that he was allowed to participate inasmuch as the Applicant in the case did not object. The situation during the Zion 1 and 2 hearings was somewhat more complex. The Intervenors have not established whether Mr. Comey actually underwent a voir dire examination on security matters.[4/] The Board has no way of determining what standards were adopted by the Zion Board for Mr. Comey's qualifications as an expert. Testimony on these points was somewhat inhibited by the fact that it was an in camera session and by Mr. Comey's understandably less-than-eidetic memory of the proceeding plus the fact that he recognizes that he is still under a protective order in that proceeding.

In any event, the Board does not believe that Mr. Comey is automatically qualified as a security expert in this case simply because he might have been accepted as such by another Board in an earlier case. The instant Board would, of course, give appropriate weight to his previous qualifications. However, the Board believes that the situation today is not parallel to that which existed some four or five years ago.

4/ The Staff was able to locate two in camera transcripts and neither shows voir dire on security. (Tr. 11-13).

Until ALAB-410 was handed down the various Boards had few guidelines to follow, and little in the way of quantitative standards to apply. This Board believes that more definitive, perhaps stricter standards apply today. We, therefore, must evaluate Mr. Comey's qualifications in this case without presumption of his standing as an expert.

OTHER EXPERIENCE

Mr. Comey's membership in the Nuclear Safeguards and Proliferation Panel of the Office of Technology Assessment of the U.S. Congress is indeed, perhaps, prestigious, as attested by the names of the other members, most of whom are readily recognized by the Board as being elder statesmen. What is not apparent is what they actually do. This Board is not concerned with general findings and recommendations which usually emanate from such a group.[5/] We are concerned with

---

5/ The qualifications statement also included, as a matter to be considered by this Board, the fact that Mr. Comey ". . . has served, together with Willy Higinbotham and a staff of outside consultants from Brookhaven National Laboratory, the Defense Nuclear Agency, and the Rand Corporation, on a special review group on physical security and safeguards against terrorist attack on nuclear facilities." In Mr. Comey's deposition, Ex. 1, Testimony of Deponent on Sundesert Plant -- Sabotage Consideration, p. 2, it continues (although not included in the qualifications statement), "The discussions and majority concensus of the January group were never incorporated in the Panel's final report." The Intervenors have not established the significan if any, of these statements. Discussions in the deposition (Tr. 20, 42-47) shed little further light.

the implementation of the philosophy, if you will, that is laid out in 10 CFR Part 73. The Board is unable to find, from the evidence presented by Intervenors, any specific relationship between our objective and the workings of the Panel.

It is further represented that Mr. Comey ". . . has testified on nuclear plant security matters in in camera sessions before the Advisory Committee on Reactor Safeguards, and has had numerous consultations on the subject of reactor sabotage with members of the staff of the U.S. Atomic Energy Commission and the U.S. Nuclear Regulatory Commission, both at the regional office level and also at headquarters in Bethesda, Md."

This type of statement is of little value to the Board in its evaluation of Mr. Comey's expertise. Unless the Intervenors have apprised the Board of the reasons for appearance and/or participation, plus the subjects involved, it is impossible for the Board to relate possible expertise to the various specific components of the guidelines which the Board has set forth previously. An inspection of the deposition yields little further insight. (Tr. 14-18).

The Board does agree that Mr. Comey has acceptable status in his general knowledge of reactor plant layout and operation of its various components. While he has not specifically inspected the Diablo Canyon installation, (Tr. 41-42), his stated familiarity with some six pressurized water and four boiling water reactors satisfies the Board in this regard. This familiarity with reactor plant systems and laycuts is, we must add, a necessary but not sufficient condition to qualify as an expert on security.

Although no specific claim was made in the statement of qualifications as to Mr. Comey's knowledge of plant detection and alarm mechanisms, this was gone into at some length in his deposition. (Tr. 30-32, 61-65). The Board reviewed this testimony closely, and could only come to the conclusion that, based on the information before us, no depth of knowledge sufficient for expert qualification was revealed. Rather, the general tenor of Mr. Comey's statement appeared to the Board to be at the level we would expect of a well-informed layman.

SUMMARY

The Board has carefully reviewed the submissions which have been made relevant to the qualifications of Mr. Comey to act as an expert witness in the security field. We find that he is not qualified on the basis of his academic background alone. After considering Mr. Comey's relevant experience, on the basis of the submissions we have before us, the Board finds that Mr. Comey is a well-informed layman, with a broad general knowledge of the field, but does not have the requisite depth of knowledge in any specific aspect identified in ALAB-410 (and adopted by this Board) to qualify as an expert. On reconsideration, the petition of the San Luis Obispo Mothers for Peace to establish qualifications of David Comey is therefore DENIED.

IT IS SO ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING BOARD

Elizabeth S. Bowers
Elizabeth S. Bowers, Chairman

Dated at Bethesda, Maryland
This 3rd day of November 1978.

STATE OF CALIFORNIA

State Energy Resources
Conservation and Development Commission

In the Matter of:	:	
	:	
Notice of Intention of SAN DIEGO GAS & ELECTRIC COMPANY to File an Application for Certification of the Sundesert Nuclear Plant together with Transmission Lines and Necessary Appurtenances	:	Docket No. 76-NOI-2

TESTIMONY OF

DAVID DINSMORE COMEY

ON

SUNDESERT PLANT

SABOTAGE CONSIDERATIONS

19 July 1977

APPENDIX "B"

Testimony of
DAVID DINSMORE COMEY
for
State Energy Resources
Conservation and Development
Commission of the State of California
in the Matter of
Sundesert Nuclear Plant
Docket No. 76- NOI-2
Sacramento, California
19 July 1977

My name is David Dinsmore Comey. I am President of Citizens for a Better Environment, a not-for-profit corporation specializing in environmental research. We have four offices in the Midwest, with a full-time research staff of 14 scientists, economists, engineers and research associates, plus two lawyers. Our main office is at 59 East Van Buren Street, Suite 2610, Chicago, Illinois 60605.

I have been invited to testify as an expert witness on reactor sabotage and physical security requirements by the State Energy Resources Conservation and Development Commission of the State of California, in connection with considerations of security at the proposed Sundesert Plant of San Diego Gas & Electric Company.

I am a graduate of Princeton University and worked for many years as an analyst of Soviet scientific research. I had two one-year Ford Foundation Fellowships, and spent two years as an Assistant Professor at the Osteuropa Institut of the Universität Freiburg/Schweiz. In 1963 I became a Research Associate at the Center for International Studies at Cornell University, and for six years was the Director of the Research Institute on Soviet Science.

In 1969 I resigned to become Director of the Research Division of Schickel Environmental Development Company, an environmental consulting firm with headquarters in Ithaca, New York.

In 1970, I resigned to become Director of Environmental Research at Businessmen for the Public Interest (BPI), a public interest law firm located in Chicago, Illinois. At BPI one of my responsibilities was research on nuclear power plant design problems, much of which culminated in litigation before the Atomic Safety and Licensing Boards of the U. S. Atomic Energy Commission (AEC).

In this connexion, I reviewed the Safety Analysis Reports and Safety Evaluations of approximately two dozen power reactors located in the U. S., and in addition have read several thousand safety-related reports generated by the U. S. AEC and its successor agencies. I have also studied in detail more than four thousand Abnormal Occurrence Reports describing failures of safety equipment at nuclear power plants in the United States.

I have conducted detailed, and sometimes repetitive on-site inspections of the nuclear steam supply systems, control systems and auxiliary power systems at four boiling water reactor units and six pressurized water reactor units, including five Westinghouse reactors.

In each of two of these Westinghouse reactors, I reviewed the plant security plans as well.

I am familiar on a first-hand basis with the physical layout and operation of the above-mentioned systems at these plants, including control rooms and plant security control centers.

I have testified on nuclear plant security matters in in-camera sessions before the Advisory Committee on Reactor Safeguards and have had numerous consultations on the subject of reactor sabotage with members of the staff of the U.S. Atomic Energy Commission and the U.S. Nuclear Regulatory Commission (NRC), both at the regional office level and also at headquarters in Bethesda, Maryland.

For the past year I have served as a member of the Nuclear Safeguards and Proliferation Panel of the Office of Technology Assessment of the U.S. Congress. This panel, which consisted of myself, Chester Cooper, William Higinbotham, George Kistiakowsky, Herbert Scoville, Henry DeWolf Smyth, George Stathakis, Theodore Taylor, Cyrus Vance, Alvin Weinberg, Mason Willrich and others, has reviewed U.S. nuclear policy with respect to preventing nuclear proliferation, particularly to "non-state adversaries."

In addition, I attended a special meeting convened by OTA January 5-6, 1977, to discuss safeguards against terrorist attack on nuclear facilities, which was attended by Higinbotham, a special team of experts from Brookhaven National Laboratory, the former director of the Defense Nuclear Agency, and experts on terrorism from the Rand Corporation. The discussions and majority consensus of the January group were never incorporated in the Panel's final report.

On the basis of my experience, I have come to the conclusion that the NRC has seriously underestimated reactor sabotage as a potential threat and that steps currently being taken to prevent it will not be sufficient.

First of all, the consequences of a sabotage-initiated reactor accident have been underestimated, so that the threat has not been taken seriously.

Secondly, the difficulties as to how reactor sabotage can be planned and implemented have been overestimated, so that almost no one believes that it can be done.

Thirdly, the NRC response to the problem has been too cautious and too minimal to offer sufficient protection against such events taking place.

Fourth, it has been assumed that the motivations of terrorists are such that a nuclear reactor would be a highly unlikely target.

I shall proceed first by trying to challenge the conventional wisdom that there is a negligible chance that reactor sabotage would result in significant releases of radioactive materials.

PART ONE: THE CONSEQUENCES OF REACTOR SABOTAGE

The consequences of sabotage of a 1000 megawatt light water reactor have been recently set forth by the Chief of the Emergency Technology Section of the Health Physics Division of the Oak Ridge National Laboratory:

> "SABOTAGE OF A LARGE (500- TO 1000-MW(e)) LIGHT-WATER REACTOR RESULTING IN AN UNCONTAINED MELTDOWN
>
> "If a large (500- to 1000-MW(e)) light-water reactor is isolated from all heat sinks after several months of operation at full power, the heat from the fission-product inventory in the core will boil away all the water in the primary loop in a few hours and melt the core out of the pressure vessel. If the containment is breached either deliberately or by pressure from non-condensable gases, the volatile and semivolatile fission products will distill out of the molten core in the form of vapor or aerosol and diffuse out of the damaged containment to be carried for many miles by local wind patterns. The principal lethal hazard from this material is from the radiation dose received following its inhalation and retention in the body. In the following calculations, we have used a source term and biological model developed by Chester (R. O. Chester, Biological Dose and Radiological Activity from Nuclear Reactor or Nuclear Weapon Fission Products, USAEC Report ORNL-4996, Oak Ridge National Laboratory, December 1974) which gives results similar to those of the Rasmussen study (U. S. Nuclear Regulatory Commission, REACTOR SAFETY STUDY (WASH-1400), Appendix VI-Calculation of Reactor Accident Consequences, October, 1975).
>
> "The consequences of such a release will depend on the weather conditions at the time, the population distribution downwind, the effectiveness of attempts to restore containment, and the actions of civil authorities in evacuating or providing expedient protection information to the population at risk. The areas in which the population faces death or serious injury can be quite large. For a 1000-MW(e) boiling-water reactor undergoing an uncontained meltdown in an 8-km/hr wind and neutral atmospheric stability, persons breathing at 10 liters/min without respiratory protection will receive an inhaled whole-body-dose commitment of 500 R or more in a plume of 1-km maximum width and extending 30 km downwind . . .
>
> "Our results are consistent with the final version of the Rasmussen study, which estimated early fatalities from uncontained meltdown of pressurized-water reactors for various meteorological conditions."
> (C. V. Chester, "Estimates of Threats to the Public from Terrorist Acts Against Nuclear Facilities", NUCLEAR SAFETY, Vol. 17, No. 6, November-December 1976, pp. 659-665.)

The Rasmussen study gives the following estimates for the early and long-term fatalities and health effects of the Category 1 release from a pressurized water reactor (a "PWR-1 release") resulting from a breach of containment accompanied by core meltdown, assuming worst-case weather conditions ventilating a high-density population, but mitigated by evacuation of 70% of the population within a few hours of the accident:

TABLE A

Early Fatalities	3,300
Long-Term Cancer Fatalities	45,000
Thyroid Tumor Cases (10% Fatal)	240,000
Long-Term Genetic Defects	28,500
Total Property Damage	$14, 000,000,000
Decontamination Area (sq. mi.)	3,200
Relocation Area (sq. mi.)	290

(U. S. Nuclear Regulatory Commission, REACTOR SAFETY STUDY (WASH-1400), October, 1975, pp. 72-76.)

If a successful evacuation were not carried out, the human fatalities and injuries could be up to three times larger than the figures given by the Rasmussen study, and if the reactor in question were sited closer to a major population center than the six artificially composited sites postulated in the Rasmussen study, the fatalities and injuries could be considerably higher.

In calculating the probabilities of reactor accidents, the Rasmussen study did not consider sabotage as an initiating cause:

> "The study concluded that, while there is no current methodology for comprehensively estimating the probability of successful acts of sabotage, any consequences produced by sabotage could not exceed the largest predicted by the study and would likely be much smaller." (WASH-1400, p. 172).

This conclusion misses the point. Assuming that the consequences produced by sabotage would not be greater than the consequences described in the Rasmussen study, the probabilities of the event initiating are no longer dependent upon the relatively low probability of a piping rupture occurring simultaneous with the failure of the emergency core cooling system as well as the failure of the containment spray system as well as the failure of the containment to isolate. The probabilities of the initiating event change, for one is no longer calculating the chances of machines malfunctioning; one is estimating the probability of human beings malfunctioning. One probably does not have to be a psychiatrist to realize that this probability is relatively higher than the 5×10^{-5} value assumed as the probability of the release causing the fatalities and property damage given in Table A above; one need only read the newspapers.

For purposes of my analysis of a sabotage initiated reactor accident at a pressurized water reactor, I assume as a Reference Incident the accident set forth in Table B.

TABLE B

SABOTAGE-INITIATED REFERENCE INCIDENT

Rasmussen Study PWR Accident Symbol	Rasmussen Study Descriptive Phrase	Cause Assumed in Sabotage-Initiated Reference Incident
A	Intermediate to large LOCA	Charge at Location #1
C	Failure of containment spray injection system	Charges at Location #2
D	Failure of emergency core cooling injection system	Charges at Locations #3 & 4
E	Failure of emergency core cooling system to function	Charges at Locations #3 & 4
F	Failure of containment spray recirculation system	Charges at Locations #2 & 4
H	Failure of emergency core cooling recirculation system	Charges at Location #4
B	Containment failure resulting from inadequate isolation of containment openings and penetrations	Opening containment purge valves

Note: For description of the 9 charges at the 4 locations, see Table C.

TABLE C

Location No.	No. of Charges	Types of charge, Location of Equipment Sabotaged, Nature of Damage	Time Required (Minutes)	Radiation Exposure
1	1	15 lb. RDX/PETN shaped charge on cold leg or reactor coolant pump suction leg causing 6" break in primary piping (inside containment)	6	< 3 rem (less than maximum permissible quarterly exposure)
2	3	Detasheets or C-4 putty on both motor-driven containment spray pumps and on single diesel-driven containment spray pump (all in one room in auxiliary building next to containment)	4	Negligible
3	2	Detasheets or C-4 putty on both motor-driven safety injection pumps (two adjoining rooms in auxiliary building next to containment)	3	Negligible
4	3	Detasheets or C-4 putty on both motor-driven residual heat removal pumps and on single diesel-driven residual heat removal pump (3 adjoining rooms in auxiliary building next to containment)	5	Negligible

Note: At Zion Station, Location 1 is 60 feet from bottom of stairway two floors down from containment airlock. (Containment airlock is two floors up from Location 2. Location 3 is 60 feet away from Location 2 on same floor. Location 4 is one floor directly down adjacent stairway from Location 2. (Commonwealth Edison Company, ZION STATION FIRE PROTECTION REPORT, (In response to Appendix A of Branch Technical Position (Auxiliary & Power Conversion Systems Branch) 9.5-1), April 29, 1977; Drawing 2.3-3, Sheet 3; Drawing 2.3-5, Sheet 3; Drawing 2.3-9; Drawing 2.3-12, Sheet 12; Drawing 2.3-13.)

According to the Rasmussen study, the following PWR accident sequences are all Release Category 2 (hereinafter "PWR-2"):

TABLE D

ACDF- B	ADF- B
ACEF- B	AEF- B
ACHF- B	AHF- B

(WASH-1400, p. 155)

PWR-2 releases are generally worse in terms of health effects than even PWR-1 (the release associated with a steam explosion in the reactor pressure vessel, followed by a large fraction of the core exiting at high velocity through the roof of the containment building).

The worst radionuclides, ranked in order of their human health effects, are listed in Table E. Except for Tellurium-132, a PWR-2 release results in larger fractions of the reactor core being released for the most dangerous radionuclides than a PWR-1 release does.

There is some reason to believe that the casualties may be greater from a sabotage-initiated reactor accident than the PWR-1 accident analyzed in the Rasmussen study, for if the charges placed in the assumed Reference Incident were detonated via radio detonators shortly after a successful takeover of an operating nuclear power plant, the release of radioactive fission products would be almost instantaneous, instead of several hours into the accident as assumed by the Rasmussen study. Less plateout of radionuclides would occur, and evacuation times would be considerably shorter, with a distinct possibility that no successful evacuation could be carried out. This might cause the early fatalities to be higher than the figures calculated in the Rasmussen study.

The casualty figures set forth in Table A should serve as a reminder that the magnitude of the consequences of sabotage-initiated reactor accidents represent a potential for holding a very large population hostage by saboteurs who have rigged the plant with radio-detonatable explosive charges, such as in the Reference Incident, and then make their demands known. (A fuller discussion of this follows below).

The NRC's Office of Nuclear Regulatory Research recently commissioned Sandia Laboratories to carry out a study of reactor sabotage. The study team included "adversary teams" that developed detailed sabotage sequences in order to empirically "game" the situations. Their conclusions were as follows:

> "The sequences developed by the adversary teams and the systematic presentation of plant failure modes described by the fault trees jointly demonstrate that there is negligible chance that acts of willful destruction would result in significant release of radioactive materials . . . .

TABLE E

Released Radionuclide	Early and Continuing Health Effects	Long-Term Health Effects	Percentage By Which PWR-2 Exceeds PWR-1
Tellurium-132	Cloud dose, short-term ground dose; inhalation doses: bone marrow, lung, GI, thyroid, testes	Inhalation doses: bone marrow, lung, bone mineral, testes, other organs	-25%
Cesium-134	Inhalation doses: bone marrow, lung, testes	Ground dose; inhalation doses: bone marrow, lung, bone mineral, testes, other organs	+25%
Iodine-131	Cloud dose, short-term ground dose; inhalation doses: bone marrow, lung, thyroid, testes	Inhalation doses: bone marrow, lung, bone mineral, testes, other organs	+16%*
Iodine-133	Cloud dose, short-term ground dose; inhalation doses: bone marrow, lung, GI, thyroid, testes	Inhalation doses: bone marrow, lung, testes, other organs	+16%*
Iodine-135	Cloud dose, short-term ground dose; inhalation doses: bone marrow, lung, GI, thyroid, testes	Inhalation doses: bone marrow, lung, testes, other organs	+16%*
Iodine-132	Cloud dose, short-term ground dose; inhalation doses: bone marrow, lung, GI, thyroid, testes	Inhalation doses: bone marrow, lung, testes, other organs	+16%*
Cesium-137	Inhalation doses: bone marrow, testes	Ground dose; inhalation doses: bone marrow, bone mineral, testes, other organs	-25%
Strontium-89	Inhalation doses: bone marrow, GI, testes	Inhalation doses: bone marrow, bone mineral, testes, other organs	-20%

* Organic fraction only; elemental iodine releases same. (WASH-1400, Appendix VI, p. 13-21 and 2-5.)

> "The Reactor Safety Study (Rasmussen study) developed methods to predict the magnitude of the radioactivity released and the public consequences occurring from random equipment failure and human error for various accident sequences. All sabotage options that have been identified lead to plant failure sequences that were included in the Safety Study. Therefore, sabotage cannot create consequences greater than those considered by the Safety Study .... Evaluation of the probable consequences arising from the sequences developed by the adversary teams yielded values that are a small fraction of the maximum consequences considered by the Reactor Safety Study."
> (Sandia Laboratories, SAFETY AND SECURITY OF NUCLEAR POWER REACTORS TO ACTS OF SABOTAGE, March 1976)

I believe that these conclusions are wrong. The NRC, however, has chosen to accept them and base its regulatory position both on these conclusions and on their assessment that a nuclear reactor is very difficult to sabotage. I believe that this latter conventional wisdom is also based on misperceptions of nuclear power plant design and security measures taken to protect nuclear reactors, and the following section will try to show why it is mistaken.

PART TWO: THE DIFFICULTIES OF REACTOR SABOTAGE

According to the Sandia Laboratories report prepared for NRC, nuclear reactors are inherently resistant to sabotage:

> "The following characteristics of commercial nuclear power plants greatly increase the difficulty of releasing radioactivity by sabotage:
>
> (1) The "defense-in-depth" concept of reactor plant design;
>
> (2) The massive structure of the plant, which protects critical components from external attack;
>
> (3) The safety design basis of the plant, which emphasizes system reliability, flexibility, redundancy, and protection against common mode failures; and
>
> (4) Engineered safety features, which are added to the basic system to cope with abnormal operations or accidents.
>
> As an example, in a commercial light water reactor plant, fuel containing the radioactive fission products is enclosed in metallic cladding and is located within a thick steel reactor vessel. The reactor vessel and coolant piping are located within a massive steel and concrete containment structure. Although, in part, the purpose of these multiple containments is to provide successive confinement of radiotoxic fission products, the containments may also serve as effective physical barriers against external threats . . . . .
>
> "Nuclear power reactors appear far less susceptible to sabotage than most other civil or industrial targets. The technical requirements, planning, and necessary manpower and equipment are much greater for a credible sabotage attempt on a nuclear power reactor than are required for an attack on other potential industrial or civil targets. The probable consequences of successful sabotage of a power reactor are comparable to the consequences that could be produced by sabotage of many other targets. The lower susceptibility to sabotage attack of nuclear reactors reduces the likelihood of credible attacks being mounted by unsophisticated elements."
> (Sandia Laboratories, SAFETY AND SECURITY OF NUCLEAR POWER REACTORS TO ACTS OF SABOTAGE, March 1976).

These Sandia conclusions, adopted by the NRC as their regulatory defense against sabotage, create an erroneous impression that it is very difficult to sabotage a reactor. According to the Sandia report, a successful sabotage of a power reactor is comparable in its consequences to "the consequences that could be produced by sabotage of many other targets."

It is hard to imagine other targets in our industrialized society that, via the detonation of a total of less than 40 pounds of conventional explosives at less than 10 locations closely adjacent to one another, could produce the release of radioactive fission products equivalent in quantity to those produced by the detonation of several hundred Hiroshima-sized weapons.

The Sandia conclusions also leave the impression that the design of a nuclear plant makes it very difficult to sabotage it. In a trivial sense it does, but in the most important sense it does not. The vital equipment of a nuclear power plant is designed for access during operation so as to perform the tests required by the Technical Specifications of the plant's operating license (issued by the NRC). In some cases, the safety equipment is tested daily, in others weekly or monthly or at the time of refuelling. Only in a boiling water reactor, where the containment is usually inerted with nitrogen, and where the radiation levels at the recirculation loops are on the order of 25 R per hour, is access limited during reactor operation. Virtually all other systems are not only accessible but specifically designed so that people working on them will not be exposed to radiation at levels that will cause them to exceed the maximum permissible quarterly radiation dose of 3 rems.

Because of these design considerations, a saboteur engaged in placing explosive charges on the key systems in a nuclear plant is exposing himself to very little risk of contamination with radioactivity. Even if he put on a respirator and goes into a BWR containment to place a shaped charge on one of the recirculation loop pipes, if he can place the charge in less than 7 minutes, he will not receive an exposure in excess of the maximum permissible quarterly dose. In a PWR containment, where radiation fields at the pump suction leg run approximately 5 R per hour, he will receive an exposure considerably less than the maximum permissible quarterly dose.

There have been frequent statements to the effect that terrorists would be much more likely to utilize biological or chemical toxins to effect widespread damage to the public (see for example Bernard Cohen, "The Potentialities of Terrorism", BULLETIN OF THE ATOMIC SCIENTISTS, June 1976, pp. 34-35). It is argued that this offers considerably less risk than sabotaging a reactor would.

I think this is a mistaken hypothesis. Anyone messing around with toxins or even plutonium oxide is much more likely to contaminate himself than if he plants explosives inside a nuclear plant, both because of the very design considerations outlined above, and also because radiation levels can easily be detected instantaneously with hand-held Geiger-Müller counters, whereas toxins are not instantly measurable in any convenient way.

The Sandia report also makes much of the planning requirements for an effective reactor sabotage. I would submit that thanks to all of the information that is publicly available, planning the sabotage of a reactor is far easier than that of any comparable facility, including planning a bank robbery. First of all, in order to figure out precisely which systems, if failed, produce the maximum damage, the potential saboteur need only consult WASH-1400 (the Rasmussen study) and its appendices. Other relevant safety-oriented documents produced by AEC and NRC can be ordered from the National Technical Information Service (NTIS), but are hardly crucial.

Secondly, the specific piping and instrumentation drawings for any plant are in the NRC's Public Document Room at 1717 H Street in Washington or at a public library near the plant. Another relevant document similarly available is the report each plant filed in reply to Appendix A of BTP APCSB 9.5-1 in April 1977. (See the Note at the foot of Table C). This five-inch thick document is a veritable road-map to all of the systems, electrical, hydraulic, electronic and mechanical, that if damaged, will lead to a core meltdown.

The only document not available in the Public Document Rooms is the plant security plan. Even if it were obtained by a saboteur, however, it would tell him little that a few days' worth of observation of the plant exterior would not inform him of regarding security guard routines, intrusion alarm locations, closed-circuit television cameras, etc. As I will discuss at greater length in Part Three below, the fixed safeguards and plant security forces are such that entry into the plant by a well-armed group of intruders is highly likely. If they use diversionary tactics and stealth, they may even get into the plant without being detected, or at least simultaneous with their presence being detected.

Once inside the plant, it would require only a few minutes to take over the control room and send a small party to the auxiliary building to set explosive charges and radio detonators on the key safety systems. If one chose to place charges so as to knock out the emergency core cooling system and containment spray system pumps, as in the Reference Incident, plus place a radio-detonatable charge on the reactor coolant piping so as to initiate the loss of coolant accident, the whole procedure would take three men less than 10 minutes to accomplish. This is less time than it takes the local constabulary to arrive on the scene.

Once the saboteurs have placed the charges and taken over the control room and the primary central alarm system, they themselves are in a position to use the plant's security system against the response forces that arrive. Using the closed circuit television system to monitor the exterior of the plant, and the plant loudspeaker system as a method of communicating, they could very well say "Keep out, or we'll blow this place up."

This would not be as suicidal a threat as the layman would believe. In fact, at this point, the saboteurs are in the safest place in the entire county. If they were to open the PWR's containment purge valves and then explode the charges, causing a meltdown, the containment would be breached, but the cloud of radionuclides would be released at the top of the reactor stack. Unless there were a severe downdraft, the radioactive cloud would ventilate upward away from the normal intakes for the control room air. Even if some of the cloud did begin to seep in through the ventilating system, the charcoal filters would keep out most of the nuclides except for krypton and the other noble gases. If those began to reach unacceptable levels, the control room could be sealed off and go on its own interior source of bottled air and oxygen, which for most reactors is sufficient for at least 24 hours of totally sealed operation. The control rooms also maintain adequate food and water for several weeks. If it became necessary to abandon the control room after some period of time, the saboteurs could don radiation protection suits and respirators that are kept in the control room and make their exit from the plant. It is highly unlikely that anyone would be on the exterior of the plant to prevent them from leaving.

I will discuss what demands the saboteurs are likely to make as part of my assessment of motivation in Part Four. Meanwhile I should like to assess what the NRC has been doing -- mostly not doing -- to prevent such events from taking place.

PART THREE: SECURITY MEASURES OF THE N. R. C.

Until recently, the only relevant AEC/NRC regulatory document on prevention of reactor sabotage was Regulatory Guide 1.17 (issued June 1973), which referenced an American Nuclear Society standard ANSI N18.17 (ANS-3.3), "Industrial Security for Nuclear Power Plants" (March 23, 1973). This ANS standard mentioned only indeterminate numbers of possible saboteurs:

> "In preparing this standard, specific consideration was given to potential threats posed by: (1) a single disgruntled employee who is authorized to have access to the plant and who is familiar with the details of construction and operation of the plant; (2) a single fanatic or mentally deranged person, either an authorized employee or an outsider, whose knowledge of the plant may range from none to intimate familiarity; (3) a small group of discordant individuals, not normally authorized access to the plant, who are intent on perpetrating acts of sabotage or seizing control of the plant; and (4) spontaneous and undisciplined actions of a relatively large group of people involved in mob activities associated with acts of civil disturbance. Although it is clear that other potential threats may exist or develop, conscientious application of measures designed to protect against the threats discussed above will provide substantial protection against other postulated threats."

Subsequently the AEC began to think in terms of an undefined "design basis threat".

The first published estimates of the design basis threat for nuclear facilities were contained in the so-called "Rosenbaum Report" in 1974. According to the report's authors,

> "The maximum credible threat to any facility or element of transportation handling special nuclear materials is 15 highly trained men, no more than three of whom work within the facility or transportation company from which the material is to be taken".
> (D. M. Rosenbaum, et al., SPECIAL SAFEGUARDS STUDY, U. S Atomic Energy Commission, April 1974).

No basis was given for the selection of this particular upper bound, although the report stated that "It was arrived at after informal discussions with the FBI and CIA . . . and on prior relevant experiences of the members of this study", many of whom were former FBI specialists on terrorist and guerrilla activities.

In his testimony before Congress on this subject nearly two years later, General Kenneth Chapman, Director of the NRC's Office of Nuclear Material Safety and Safeguards, stated

> "Historical data on the size of terrorist groups indicates that terrorist assault groups larger than six persons are not likely to be formed. We have examined over 4,000 incidents of terrorism and other anti-social behavior and were able to find 1,271 cases where the number of perpetrators could be identified. The number of incidents involving groups of more than six persons account for only about 2.5 percent of the cases. Groups with as many as 12 persons have been very rare. By far, the largest percent----86 percent----involved groups of three persons or fewer."
> (HEARINGS BEFORE THE SUBCOMMITTEE ON ENERGY AND THE ENVIRONMENT OF THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS, February 26-27, 1976, pp. 145-146.

The sample used by the NRC is of dubious value. The 4,000 incidents are known as the "HERO File" and were compiled by the Historical Evaluation and Research Organization, and are a listing of acts of violence and sabotage commencing in 1870. Because many of the acts are assassinations of public officials, involving only one perpetrator, as well as many other acts of dubious relevance to attacks on nuclear facilities, inclusion of all these data tend to reduce the size of the design basis threat unnecessarily.

A similarly faulty methodology was utilized by the BDM Corporation in its report to the NRC, which surveyed 1,204 incidents of terrorism and other armed attacks, hijacking, etc. between 1965 and 1975. In 702 of the incidents, no data were available on the number of attackers, so only 502 were ultimately analyzed. Of these, 247 were hijacking of aircraft, and 77 were bombings. Since nearly all of these acts are usually perpetrated by individuals working alone, the BDM data base similarly underestimates the relevant group size, and its conclusion that less than 5 percent of the incidents involved more than 6 attackers and less than 1 percent involved more than 12 attackers is of questionable relevance in assessing the design basis threat to a nuclear power plant. (The BDM Corporation, ANALYSIS OF GROUP SIZE, Vienna, Virginia, 1975).

A more balanced approach has been followed in a Rand Corporation report done for the Nuclear Proliferation and Safeguards Panel of the Office of Technology Assessment.

> "Current research at The Rand Corporation which involves a selected number of events that are more closely analogous to potential nuclear theft or sabotage shows that groups of 3 to 6 are common, that larger groups do appear, that a group size of 12 does appear to be somewhat of an upper boundary although there are a few cases in modern industrialized societies (United Kingdom, France, and United States) in which larger groups have been involved. More importantly, the Rand researchers argue that one must be extremely cautious in interpreting historical data regarding the number of attackers since the figures represent for the most part what the perpetrators, criminals or terrorists, perceived to be necessary to accomplish their mission, and in most cases what turned out to be sufficient. In other words, they came with as many as they needed to do the job, and no more. The fact that most came with a handful of persons, 3 to 6, thus does not represent an upper limit on their capacity to mobilize people.

> "Although the historical data are useful as a guide, an estimate on the number of attackers is inescapably a matter of judgment. Without speaking in terms of a "maximum" threat, a dozen or so attackers would seem to be a prudent estimate. The term "a dozen or so" has been chosen deliberately. We are not talking about a precise figure, but rather a range of anywhere from 7 to 8 to about 15. To be more precise would imply some type of actuarial chart based upon concrete data that simply does not exist and a false sense of precision. That is not to say that no group of adversaries could not muster more persons if needed, or even that this many would be needed to accomplish the task. 'Prudent' is the key word here."
> (Brian Jenkins and Joseph Krofcheck, THE POTENTIAL NUCLEAR NON-STATE ADVERSARY, Rand Corporation, Santa Monica, California, May 1977.)

As of this writing, the NRC design basis threat officially postulated is still the "small group" of outsiders assisted by one "insider" at the plant. From numerous conversations and internal memoranda of the NRC, it is clear that the NRC is basically proceeding with a 3-and-1 design basis threat. Knowledgeable observers were predicting that the NRC would upgrade this to a 6-and-2 scenario when it revised its reactor security regulations in the spring of 1977, but this did not occur.

The group of experts convened by OTA (see page 2; hereinafter "January group") were in agreement that a more realistic design basis threat against which nuclear facilities should be protected is a 12-and-3 scenario: 12 outside attackers, and up to three insiders. It should also be assumed that the outside attackers will be armed with more than long guns; since a commercially available AR-15 can be converted into a fully-automatic M-16 by filing the cam, the attackers can be expected to have automatic weapons, and given the types of arms caches recently discovered in California, heavier weapons including recoilless rifles, mortars, anti-tank missiles, and the like cannot be excluded.

The January group was also in agreement that Lanchester equations (mathematical models developed during World War I to predict battle results given the number of attackers and defenders) were not necessarily the most appropriate models for engagements between a small group of heavily armed terrorists and a group of civilian security guards. Use of such mathematical models places too much emphasis on armed frontal assaults, which would not be the likely mode of attack on a nuclear plant. Terrorists are much more likely to use diversionary techniques, multi-point penetration, deception and psychological warfare techniques to breach the defenses of the facility instead of storming the fence, weapons blazing. For this reason, the January group agreed that 24 guards should be the security force for the defense against such a 12-and-3 design basis threat. (It is interesting to note that Lanchester equations yield 22 guards in this instance.)

There was also consensus that the guards should have strongly reinforced points of defense such as concrete bunkers, field-of-fire points, instead of "bullet-proof" free-standing guard shacks. They should have firepower far in excess of shotguns and side-arms, and probably equivalent to what the attackers may be expected to have.

The site should be equipped with numerous arrays of physical barriers to slow down attackers, and all fixed systems should incorporate "mystery and randomness" such as strobe lights in entries, intense noise, doors leading nowhere, etc.

Security procedures should be constantly re-evaluated in light of new development not only in terms of increased security systems - technology improvement and more sophisticated strategies - but also in terms of changes in terrorist modes of operating both abroad and domestically.

It was unanimously agreed that any response force that cannot arrive in force within ten minutes is irrelevant to any analysis of the plant's defense capabilities. In view of the fact that the NRC places heavy reliance on response forces that now are on the scale of 3 sheriffs or policement arriving within 15 minutes with shotguns, and about 20 policemen within 30 minutes armed with rifles, almost no nuclear plants presently have meaningful outside defense forces.

There was doubt on the part of the January group that any reliance should be placed on response forces for plant security, since if there was any lesson gained from our experience in the Vietnam War, it was that the relief column always gets ambushed. In fact, the more isolated the plant site, the fewer the access roads, and the easier it is to set up such ambushes. It can also be predicted that if the terrorists are at all sophisticated, the response forces will probably have been diverted to some other location just before the penetration of the nuclear power plant.

A majority of the January group also agreed that the NRC should have an Inspector General Directorate with a capability of constantly black-hatting licensees in order to test the defense. Non-compliance should be penalized with major penalties, not only fines of only $5,000 to $10,000, including facility license revocation and imprisonment or criminal fines against individuals failing to carry out their responsibilities.

The guard forces should be upgraded in terms of pay (current average pay is about $3.25 an hour) to $12,000 - $15,000 a year, with considerably greater emphasis on weapons training.

In virtually all states at the present time, a nuclear plant security guard cannot kill an intruder unless he is defending his own life. If he shoots someone mounting the fence, he is liable to the same punishment under the law as any citizen. Thus under 10 CFR 73.55(h)(3), the security organization is instructed to:

> "(iv) Require guards or other armed response personnel to interpose themselves between vital areas and any adversary attempting entry for purposes of industrial sabotage; and
>
> "(v) Instruct guards or other armed response personnel to prevent or delay an act of industrial sabotage by applying a sufficient degree of force to counter that degree of force directed at them, including the use of deadly force when there is a reasonable belief it is necessary in self-defense or in the defense of others."
> (42 FR 10840, 24 February 1977).

Thus a guard must "interpose" himself between the adversary and the vital equipment and get the adversary to try to kill him before he is legally able to use fatal force in response. Whether powers such as "shoot-to-kill" should be invested in civilian security forces under the control of private utilities is a social decision that must be made by legislative bodies after due deliberation, but the present situation contains vulnerabilities from a security point of view.

Background investigations on security guards should also be strengthened to the equivalent of a full-field ("U" clearance) investigation.

Since these recommendations go far beyond what the NRC has committed to in its recently promulgated (February 24, 1977, March 17, 1977, and July 5, 1977) regulations, presently existing and proposed NRC regulations regarding the physical protection of nuclear plants do not in my opinion offer assurance that saboteurs cannot gain access to the interior of a plant.

The physical security of a nuclear plant is seriously compromised if any "insiders", particularly within the plant security force, are involved in any sabotage operation. Just one security guard can render the plant wide open to any number of intruders without detection. Because of the legal difficulties inherent in psychological testing and evaluation or use of polygraph tests to detect possible internal defectors, it is not clear that this problem can ever be solved. Any employee who is at all vulnerable to blackmail because of gambling debts, monetary problems, sexual predilections or atypical life style could be utilized by a group intent on sabotaging a reactor. Unless a licensee is prepared to intrude on plant employees' privacy to an extent as yet untested in the courts, no assurance can be given that "insiders" may not be a significant sabotage threat, either working on their own or in collaboration with outsiders. There are already numerous instances of disaffected employees indulging in small acts of sabotage at operating nuclear reactors; at the nuclear plant nearest my home, there have already been 13 such incidents, plus 3 bomb threats that are believed to have been made by members of the plant security force.

The insider threat is partially a question of motivation, however, which I will cover below in Part Four.

PART FOUR: MOTIVATIONS OF POTENTIAL SABOTEURS

The nuclear industry has not generally taken the potentiality of reactor sabotage seriously. Most of the officials regard their problems as largely the difficulty of complying with vague and ambiguous NRC regulations, not of protecting the plant against a threat they perceive to exist. The Rand Corporation researchers asked one director of security at a nuclear plant what he regarded as the biggest threat to his facility; his reply was, "A dedicated and determined band of NRC inspectors."

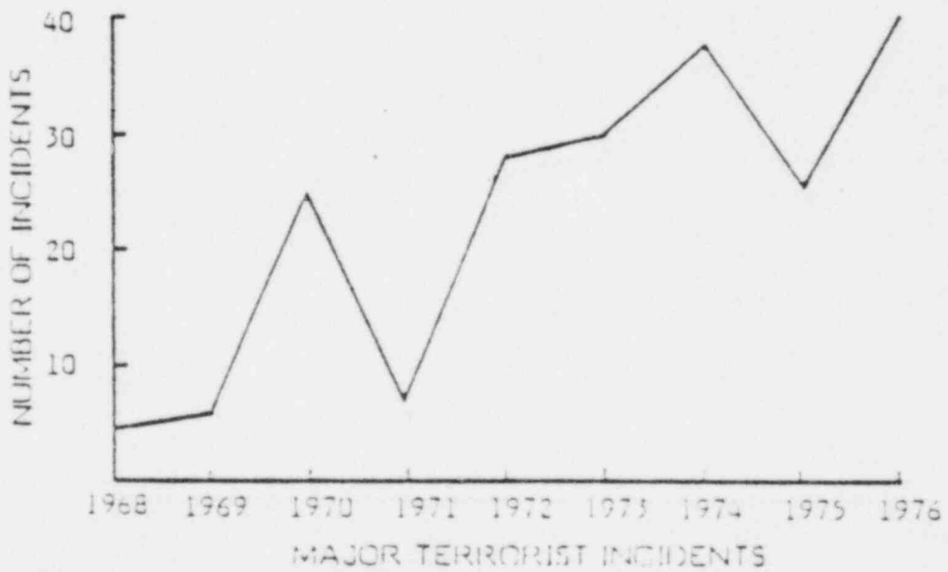
Some persons have speculated that organized crime would be interested in sabotage of nuclear facilities. I find this highly unlikely. Similarly I doubt that in peacetime foreign intelligence agents and saboteurs would be likely to try to commit such acts.

The two principal groups most likely in my opinion to carry out sabotage attempts against nuclear reactors are (1) disgruntled employees and (2) terrorist groups.

Terrorists generally use violence or the threat of violence in order to gain publicity and cause fear. By doing so, they seek to influence people who would otherwise ignore them. Terrorists usually have little political or military strength, so their terrorist acts are deliberately designed to be as alarming as possible. Thanks to world-wide television and real-time news coverage, they have access to an enormous population of witnesses.

If one defines "major terrorist activities" as involving fatalities or the holding of a government official hostage (and excluding non-fatal airline hijackings and planting of small bombs), then the trend of terrorist incidents around the world is upward, as Figure A below indicates.

FIGURE A



The question has arisen as to whether terrorists are likely to begin attacking nuclear facilities. In a study commissioned by the NRC, the MITRE Corporation reported in 1975 that:

> "There are active terrorist organizations in many countries that have nuclear facilities of their own, often of American design. Thus large numbers of individuals in these countries know the details of the design and operation of certain types of American nuclear power plants.
>
> "Terrorist groups with substantial capabilities are to be found in Latin America, the Middle East, Europe, and Japan. These groups can, and frequently do, interact. They use each other's weapons, training facilities, intelligence, money, and personnel. In addition, they have contacts with national intelligence agencies, particularly those from the Soviet-Cuban bloc. It is not difficult to imagine that such organizations could recruit members with any needed engineering, scientific, or military skills. They have no difficulty in acquiring whatever portable weapons they find useful.
>
> "All of this must be coupled with the openness of our borders and the contacts and resources some foreign terrorist groups have in this country through students and other foreign nationals living here . . . Terrorist groups may find themselves in political positions where they feel they have nothing to lose by an act, no matter how outrageous . . . Terrorists might sabotage a nuclear facility as an act of vengeance. Alternatively, they might attack and gain control of a nuclear facility, and hold it hostage to destruction unless certain demands were met. These groups are certainly aware of the power which any sort of nuclear action would give them. By the strange logic of the world in which we live, it might also make them heroes to a substantial segment of the world, particularly if the target were the United States. This is certainly a type of threat which should be taken very seriously."
> (Mitre Corporation, THE THREAT TO LICENSED NUCLEAR FACILITIES (MTR-7022), September, 1975, pp. 137-138.)

The MITRE report regards unknown terrorist groups as equally dangerous as known covert organizations.

> "Both types of groups often like to start operations in a way which draws world publicity. Such an operation might involve a licensed nuclear facility in the United States. This would involve long and detailed planning but . . . history is replete with examples of dramatic initial operations by insurgent organizations whose existence was previously unknown to their adversaries . . .
>
> "The only prudent prediction is that there will continue to be international operations by most of the presently active terrorist organizations throughout the world; that new ones will spring into existence, sometimes without warning before their first dramatic strike, and that some of these groups, driven by ideology, need for political leverage on the United States, or desperation, many choose the United States, and perhaps licensed nuclear facilities, as a target."
> (IBID., pp. 139-140).

The NRC concluded, in promulgating its security regulations in February of 1977 that

> "On the basis of intelligence and other relevant information available to the NRC there are no known groups in this country having the combination of motivation, skill, and resources to attack . . . a nuclear power reactor."
> (42 F.R. 10836, 24 February 1977).

Inasmuch as the first knowledge of the existence of many successful terrorist groups was simultaneous with their first terrorist operation, the NRC's evaluation is slightly optimistic. Simply because you have no evidence of the existence of a terrorist group is no assurance that you are not about to become the victim of an attack. Terrorists generally do not ring up in advance.

It is correct that although there have been nearly 300 recorded threats or incidents of violence at nuclear facilities in the United States, there have been few serious incidents at nuclear power plants so far. The most serious was a $10 million fire at the Indian Point nuclear plant on November 4, 1971, caused by an arsonist who was a former employee of the company. In August 1971 an intruder entered the premises of the Vermont Yankee nuclear plant and wounded a night watchman. Generally most of the incidents have been bomb threats or acts of low-level sabotage.

In South America, 15 members of the People's Revolutionary Army seized a nuclear plant under construction at Atucha, 62 miles north of Buenos Aires on March 25, 1973. They overran the guards, stole weapons, painted slogans on the walls, but did relatively little damage.

In Europe, however, nuclear terrorist incidents have increased markedly in the last few years. On May 3, 1975, the Fessenheim nuclear power plant in France was damaged by two bombs planted by the Meinhof-Puig Antich Group. The reactor at the time did not contain any fuel. A month later, a bomb was set off at Framatome's main computer center in Courbevoir, destroying half the input terminals. A second bomb damaged the valve testing shops at Framatome's factory in Argenteuil. The Garmendia-Angelo Luther Commando group took credit for these bombings. In August of that year, two bombs were set off at the Mt. D'Arree nuclear plant in France, damaging equipment and causing the plant to be shut down. In November 1976, a very damaging bomb blast occurred in Paris at the offices of Cerca, a nuclear fuel manufacturer; a group called COPEAU claimed credit, and followed up a week later with two bombs at the Margnac uranium mine that caused $2 million damage and put the mine out of action for about two months.

In West Germany, there have been demonstrations at nuclear plant sites, including one where the police had to use tear gas and water cannons on 3000 demonstrators armed with Molotov cocktails and other weapons. In Sweden, a 44-pound dynamite bomb was found next to the Ringhals nuclear reactor; the note, signed "M" said "This is the last warning. Next time we will level the station to the ground."

Since opposition to nuclear power is more organized in Europe than in the United States, these events may prove to be precursors of similar activities here in the United States, particularly if direct action against nuclear power comes to be seen as the only effective method of attacking the nuclear industry by people disillusioned with what they view as meaningless and biased proceedings before Atomic Safety and Licensing Boards and Public Utility Commissions.

Whether or not terrorist groups, either domestic or imported, will come to view nuclear power plants as desirable targets for sabotage, depends largely one one's assessment of the motivation of terrorists. Some people have argued that terrorists are not really interested in killing large numbers of people. I tend to agree. There have been few terrorist acts that have actually killed more than a few dozen people. In 1925, a bomb set off at the Cathedral in Sofia, Bulgaria killed 128 persons. In 1946, 91 people were killed by a bomb set off in the King David Hotel in Jerusalem by the Irgun. (It is ironic to note that recently the man responsible for that particular incident was wined and dined at the White House by the President of the United States). The most recent incident of mass murder occurred in late 1976 when anti-Castro Cubans killed 73 persons aboard a Cubana Airlines jet by placing a bomb aboard.

Generally terrorists have not set out to kill large numbers of people. They are far more interested in hostage situations involving heavy doses of publicity. A nuclear power plant that has been seized and rigged with explosives that will cause a meltdown is precisely the sort of target that fulfills these requirements. The taking of Indian Point 1,2,3 would be a media event without parallel. The juxtaposition of the words "terrorist" and "nuclear" has an especially synergistic effect, probably exceeding any possible threat from toxins in the water supply or other mass threats save detonation of a nuclear device.

But aside from the difficulty of diverting special nuclear material and then fabricating a nuclear device, there is the whole question of credibility of such a threat. Numerous nuclear bomb threats have been made and evaluated as being false. Considerable effort is necessary on the part of a "nuclear bomber" to convince authorities that he does in fact have the special nuclear material and that the design of his device is such that it will go off.

The saboteurs who seize a nuclear power plant have no such problem. All they need to do is call the media and say, "If you don't believe us, ring us back in the control room at the number listed in the power company's phone directory." When they answer the return call, they have instant credibility.

There is some evidence that terrorists evaluate risk versus the degree of panic that their activities will induce, tending to stick with opportunities involving low risk but producing maximum levels of fear in large numbers of people. Judged in these terms, reactor sabotage stands out as a low-risk, high-yield action.

Given the fact that it would be extremely difficult for authorities to evacuate the large population that would be exposed if the saboteurs carried out their threat to cause a reactor meltdown, an extremely large group of involuntary hostages would be created. We have no previous experience with such situations, and few guideposts to help us. I have discussed elsewhere the problems associated with evacuations around nuclear plants and the numerous instances where mock drills revealed serious gaps in carrying out simulated evacuation exercises. ("Do Not Go Gentle Into That Radiation Zone", BULLETIN OF THE ATOMIC SCIENTISTS, November 1975, pp. 45-47.) I doubt a successful evacuation could be carried out.

Most evacuation planning focuses only on areas of responsibility and means of communication. Little attention has been paid to developing policies with respect to implementing evacuation plans, particularly in hostage situations involving large numbers of people. The State of California's Office of Emergency Services has produced a plan entitled "Nuclear Blackmail, or Nuclear Threat Emergency Response Plan for the State of California", dated December 1976. It does not, however, address such questions as: What are the bases on which officials must decide whether to evacuate a large population in the face of a nuclear threat? Are public officials liable if they fail to order an evacuation? Are they liable if they do order it and people are injured as a result? Who pays for food, shelter, lost time, etc., when large numbers of people are evacuated?

Given the indeterminacy of these problems, terrorists who rigged a reactor for sabotage would be able to make extraordinary demands, either political or monetary. Safe inside the control room, they are in command of events and can dictate the terms they wish. Even if the nuclear plant is in an unpopulated remote area, the owner may not be willing to see a one or two billion dollar investment written off.

Given the above arguments, it seems irresponsible to me for the NRC to write off reactor sabotage as a higly unlikely event. It seems equally irresponsible for licensees seeking to operate nuclear plants not to implement the sort of strict security measures I outlined in Part Three. Yet most utilities would balk at the idea of having five shifts of 24 security guards at $15,000 a year each. The total of $1,800,000 in salaries alone would be considered unacceptable, even though it would be only a marginal incremental increase in the cost of electricity produced.

(For two 900 megawatt units, assuming the reactors ran at the 57.34% capacity factor averaged by presently operating Westinghouse reactors in the U. S. (cumulative-to-date average, weighted by plant size), the additional cost would be 0.19 mills per kilowatt-hour, about a half of one percent increase). (For Westinghouse data, see Table 4 at the end of this testimony).

Protection of the plant against "insiders" intent on committing sabotage is more difficult. One nuclear plant has installed a computerized access control system to the vital safety systems in its plant, so that each operator authorized to open doors in the vital area inserts a coded magnetic card in a card-reader that is controlled by a computer in the security control center. The door opens only if the operator is properly authorized to open that door. The computer can be re-programed instantly to bar access to that individual if the computer shows a series of suspicious door openings not connected with routine inspection and maintenance.

Some nuclear plant owners have rejected such systems on the grounds that they compromise the safety of the plant, particularly if the computer fails or the electric supply to the system is interrupted. (The system also can be readily compromised by the security guard who programs the computer).

This is symptomatic of what many nuclear plant designers feel is the crucial aspect of protecting vital safety systems against sabotage. To the extent that one makes it difficult to gain access to the equipment to sabotage it, one makes it difficult to gain access to repair it or check it in emergency situations. Security protection systems could prevent a minor accident from being controlled before it escalated into a major accident.

There is also the additional hazard that frequent screening of plant employees for security loyalty and suspicious activities may produce a backlash and cause the very activities the security program is designed against. No one likes being spied upon. Some nuclear industry spokesmen have warned that qualified people will not work under such conditions, and that this in itself will lead to a diminution of safety.

CONCLUSIONS ON SABOTAGE

> "To evaluate the risk resulting from sabotage of a given target objectively, we must know the following factors: (1) the likelihood that sabotage will be attempted, (2) the susceptibility of the target to sabotage, and (3) the consequences of successful sabotage. Reliable methods have not been developed for prediction the likelihood of attack. Thus judgments of the seriousness of the threat must be based on perception and intuition. The latter two factors, susceptibility and consequences, are amenable to analysis."
> (Nuclear Fuel Cycle Program Staff, "Safety and Security of Nuclear Power Reactors to Acts of Sabotage", NUCLEAR SAFETY, Vol. 17, No. 6, November-December 1976, p. 669).

In Part One of this testimony, I have attempted to show that the consequences of sabotage-initiated reactor accidents are extremely large. They are sufficiently large to make reactor sabotage a societal risk as great as that of the explosion of a nuclear weapon.

In Parts Two and Three, I evaluated the susceptibility of nuclear power plants to sabotage, and found that the difficulties have been overestimated and the security measures taken to prevent such sabotage incidents are too minimal to prevent them from taking place.

In Part Four, I have tried to show that although the likelihood that sabotage of nuclear power plants will be attempted is an exercise in judgement as to the motivations of terrorists and disgruntled employees, enough is known about the modes of operation of terrorists to be able to predict that targets of opportunity that have a low degree of risk and a high degree of publicity value are the most likely to be selected. In view of the facts set forth in Parts One through Three, reactor sabotage would seem to rank quite high on the list of potential targets.

Questions may be raised as to why I have approached this problem in as much detail as I have. Some may argue that by revealing the gravity of the problem, I may be making a self-fulfilling prophecy. I am well aware of this risk. The information contained in this testimony, however, is already well known to large numbers of people in the nuclear industry and the Nuclear Regulatory Commission. It has been withheld from other public officials who must make policy decisions about the siting and operation of nuclear power plants. Unless they also have access to the information I have given here, they will be unable to assess the risk, and determine whether the public should incur it.

Finally, I believe that just as Ted Taylor's publications on the ease of constructing nuclear device have led to improved safeguards for special nuclear material and a greater understanding of the dangers of nuclear proliferation, a fuller discussion of reactor sabotage and its potential consequences will force improvement of security measures to make it more difficult.

DAVID DINSMORE COMEY'S QUALIFICATIONS
AS AN EXPERT WITNESS FOR DISCOVERY OF APPLICANT'S
SECURITY PLAN

In his deposition, Mr. Comey established that he was qualified as an expert witness on security matters under the guidelines of ALAB-410:

1. Mr. Comey reviewed security plans under the terms of a protective order in 1974, inspected plant facilities, participated in negotiations of an in camera settlement agreement with respect to Donald C. Cook, Units 1 and 2, nuclear plant. (Depositions of David Dinsmore Comey, July 5, 1978, [hereafter "depo."] p. 6, l. 23 -- p. 8, l. 17).

2. Mr. Comey reviewed the security plans under the terms of a protective order in 1973, inspected facilities on the security plan for Zion, Units 1 and 2, Docket Nos. 50-295 and 50-304. (Depo. p. 8, l. 18-23). In reference to the relevant regulations applicable to that proceeding, Mr. Comey was qualified as a "2.733 expert". (Depo. p. 10, l. 1). He was examined by voir dire at the beginning of the in camera proceeding, (Depo. p. 10, l. 8-10), and ultimately was qualified by the Chairman to conduct cross-examination:

> "Alright, the Board will rule. Mr. Comey will be permitted to cross-examine in areas indicated by his counsel. That, of course, will be subject to control of his counsel." (Depo. p. 11, l. 12-15).

APPENDIX "C"

3 Mr. Comey has testified on security plant matters in in camera sessions before the Advisory Committee on Reactor Safeguards on a number of occasions. (Depo., p. 14, l. 19 -- p. 15, l. 1).

4. Mr. Comey participated in numerous meetings with members of the United States Atomic Energy Commission and the U. S. Nuclear Regulatory Commission, who were conducting a special study to determine what safeguards levels the NRC ought to impose; safeguards including physical security plans for nuclear power plants. (Depo. p. 15, l. 19 -- p. 16, l. 24). Mr. Comey participated in a special review group on physical security and safeguards against terrorist attacks on nuclear facilities established by the Office of Technology Assessment for the purpose of going over a report on that subject that had been prepared by the Rand Corporation. (Depo., p. 20, l. 10 -- p. 21, l. 24). Mr. Comey was a member of the Nuclear Proliferation and Safeguards Advisory Panel of that group. (Depo., p. 22, l. 5-6).

5. Mr. Comey is currently writing a report on physical security and potentiality of nuclear sabotage of nuclear power plants, and has been participating in that work for the past nine months. (Depo. p. 23, l. 15-17).

6. Mr. Comey is familiar with the relevant literature on security matters, particularly with the implementation of 10 C.F.R. §73.55, (Depo., p. 24, l. 12-18) and has copies of NUREGS 0207, 0419, 0220 (Depo., p. 25, l. 3-6).

7. Mr. Comey made an extensive review of the literature on security systems in preparation for his deposition. A list of those materials was attached as Intervenor Exhibit 2 to the deposition, and as Exhibit 1 to Intervenor's Petition for Immediate Order. (See Exhibit "A" of Intervenor's Appeal of September 22, 1978.)

8. Mr. Comey is familiar with the qualifications and requirements, which were promulgated in 1974, for guards for nuclear plants. (Depo., p. 26, l. 18-22).

9. Mr. Comey is familiar with current research being conducted in the field of security systems, both by the contractors for ERDA and NRC, and groups such as Sandia Laboratories, Brookhaven National Laboratory, Oakridge National Laboratory, the Rand Corporation, BDM Corporation, and Mitre Corporation. (Depo., p. 27, l. 22 -- p. 28, l. 14.)

10. Mr. Comey is familiar with the use of fault-tree analysis in the development and identification of vital systems. He was able to describe the methodology of fault-tree analysis and what factors should be taken into account in such an analysis. ("You would first start off with what device or devices or types of devices you would use in order to initiate a rupture in the primary coolant pipe, what sort of mechanical or explosive devices were necessary, then consider such questions as portability, access, how many

persons would be needed, what routes they would use to gain access to the pipe, what entries they would come through, et cetera, et cetera.") (Depo., p. 29, l. 14-21.)

11. Mr. Comey was retained by the California Energy Commission as an expert witness and conducted a fault-tree analysis on breach of physical security for a nuclear plant. (Depo., p. 29, l. 22 -- p. 30, l. #6). Mr. Comey incorporated this analysis into testimony on sabotage considerations of the Sundesert plant in testimony delivered July 19, 1977, before the California Energy Commission. A copy of Mr. Comey's testimony in that proceeding is attached as Intervenor Exhibit 1 to the deposition, and is attached as Exhibit 2 to Intervenor's Petition for Immediate Order. (See Exhibit A of Intervenor's Appeal of September 22, 1978.)

12. Mr. Comey was able to describe some currently available perimeter detection systems, including microwave systems, seismic systems, magnetic systems, electromagnetic systems, all in some detail. (Depo., p. 30, l. 11 -- p. 32, l. 9.)

13. Mr. Comey has spent a great deal of time instructing others in the use of hand-held armaments. (Depo., p. 33, l. 17-19).

14. Mr. Comey effectively described the purpose of security at a nuclear plant: "To prevent either an intruder

or insider from compromising any of the safety systems such that a release of radioactivity to the environment could occur." (Depo., p. 34, l. 24 -- p. 35, l. 1). He is familiar with the defense in depth concept as applied to physical security. ("Basically you have an isolation zone and you have a perimeter defense, and you have a vital area defense, and then within the vital area you have various other administrative and physical configurations designed to prevent acts of sabotage or of damage from taking place.") (Depo., p. 35, l. 12-16).

15. Mr. Comey is familiar with practical considerations to be considered in the size of a guard force: ("One way of doing it is to use Lanchester equations. Simply to postulate a certain attack force . . .") (Depo., p. 36, l. 24 -- p. 37, l. 11). Mr. Comey knew what a central and secondary alarm station was. He knew the minimum number of guards required for the protection of a nuclear power reactor. (Depo., p. 37, l. 12 -- p. 38, l. 6). Mr. Comey described what protection should be provided for site specific information related to security systems. ("First of all, it ought to be kept under physical security. It should probably be kept in the confines of the security force. . .") (Depo., p. 38, l. 23 -- p. 39, l. 5). He is able to identify criteria that he would use to identify vital equipment areas in a nuclear power plant. (Depo., p. 39, l. 20 -- p. 40, l. 7).

16. Finally, Mr. Comey clearly understands that the function of a security expert in this case is to determine whether or not the security plan for this facility complies with the regulations of the Commission. (Depo., p. 41, l. 1-3).