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Thanksgiving Day, 1979

President Jimmy Carter
The White House
Washington D.C.

Subject: TMI-2 AND NUCLEAR POWER SAFETY

Dear President Carter:

The "Report of the President's Commission on the Accident at Three Mile Island," which was presented to you on October 31, 1979, six months after the accident, sets forth a brief account of events from March 28 to April 1, a narrative overview of Commission conclusions, a concise and lucid statement of the Commission's findings, and approximately 120 specific and thoughtful recommendations.

This letter is in response to the opportunity for public comment made possible by the Kemeny Commission report.

Enclosed for your consideration are:

A. "Axelrod Recommendations on Nuclear Power Plant Safety" Nov. 1979

Presents 50 recommendations to complement and supplement the 120 recommendations by the President's Commission.

B. "Axelrod Summary Statements on Five Braod Nuclear Power Issues Raised by the Kemeny Commission Report & Supplementary Statements" Nov. 1979

Discusses energy alternates, nuclear moratorium, remote siting, NRC capability, utility capability.

C. "Axelrod Perspectives on the Three Mile Island-2 Accident" Nov. 1979

Presents ten views on the significance of TMI-2 and subsequent activity.

Nuclear energy is one of the great issues of our time.
This letter addresses many specific aspects of nuclear power safety.
But it should also emphasize the fundamental position of nuclear power as a necessary component of our current and near-term energy mix, and as an essential energy source for the future.

Yours truly,
Daniel M Axelrod

cc. Dr. Joseph Hendrie, Chairman, NRC
Dr. John Kemeny, President's Commission on TMI-2

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Enclosure A

AXELROD RECOMMENDATIONS ON NUCLEAR POWER PLANT SAFETY

by Daniel M. Axelrod, P.E.
Consulting Engineer

November 1979
DMA - 9R - 79

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OUTLINE OF CONTENTS

OUTLINE OF CONTENTS (cont'd)

A. NSA -- NUCLEAR SAFETY ADMINISTRATION
(nee:NRC-Nuclear Regulatory Commission)

1. Responsibility for Nuclear Power Plant Safety

a. Change emphasis from "a preoccupation with regulation" to "an absorbing concern for safety."

b. Attachment 1 summarizes and comments on AEC/NRC licensing legislative authority
c. Attachment 2 illustrates a utility corporate policy on nuclear safety

d. There should be a thorough review and public hearing on roles in nuclear safety of:
- Industry (utility, reactor manufactuer, engineer-constructor, and equipment vendors and consultants)
- Government (Federal, state, local)

e. The review and public hearing on roles in nuclear safety should place particular emphasis on:
- Statements of Policy and Responsibility
- Roles during an emergency situation

2. Agency Name -- Nuclear Safety Administration (NSA)

To emphasize the safety rather than the regulatory function, and to emphasize the role of the administrator recommended in A3 and 4,

the Nuclear Regulatory Commission (NRC) shall be redesignated the Nuclear Safety Administration (NSA).

3. NSA Top Management

a. To provide strong technical and administrative leadership,
to provide decisive executive action during emergencies,
to retain the collegial mode of consultation among diverse viewpoints,
to better define top management responsibilities,
to retain knowledgeable NRC management and staff, and
to comply with the intent of the President's Commission recommendations,
NRC top management will be reorganized to NSA top management as shown in 3b.

b. Top management reorganization for nuclear safety/licensing:

NRC Top Management	NSA Top Management
NRC--Nuclear Regulatory Comm. (Chairman + 4 Commsnrs)	NOC--Nuclear Oversight Commission (Chairman + 5 or more commsnrs)
None	ADMINISTRATOR
Executive Directors (2)	Deputy Administrator -- Licensing
	Deputy Administrator -- Operations
None	Assistant Administrator-Administration

A. NSA--Nuclear Safety Administration (cont'd)

4. NSA Administrator

a. In line with the Kemeny Commission report, it is recommended that an Administrator be appointed by the President, with the advice and consent of the Senate, to head the NSA. The Administrator should be Federal Executive Level II.

b. Functions of the Administrator should include:
- Executive responsibility for NSA
- Federal executive responsibility for nuclear emergency action
- NSA policy initiation and formulation
- NSA budget formulation
- NSA personnel decisions

c. Qualifications of the Administrator should include (ideally):
- leader and indepth technical knowledge of the nuclear industry,
- responsible management position in a nuclear power utility/mfr./engr-constr.
- close familiarity with the Federal government and its operation

d. Possible candidates for administrator may include:

From industry: Vince Boyer, Vice-Pres. Engineering, Philadelphia Elec. Co.; Past-Pres. American Nuclear Society

From government: David Freeman, Chairman, Tennessee Valley Authority; engineer, lawyer, OST report on plant siting; manager of Ford Foundation energy study

5. NOC -- Nuclear Oversight Commission

a. The Commission concept should be retained to provide a high federal body exclusively concerned with policy and deliberation of nuclear affairs.

b. Functions of the NOC should include:
- Policy initiation and review
- Budget guidance and review
- Deliberation (collegial mode)
- Deliberation and focal point for staff action (individual area of interest)
- External communication -- with Congress, public speaking, interagency affairs

c. Suggested commissioner areas of interest and competence:

Commission member	Area of interest	Areas of competence
Chairman,	Commission leader and spokesman	Technical and communicatn
1st Commissioner,	Nuclear power plants	Technical, power plant
2nd Commissioner,	Nuclear fuel cycle & waste disposal Nuclear facility siting	Technical, environmental
3rd Commissioner,	Nuclear weapons/military/sabotage, International affairs	Technical, military, diplomatic
4th Commissioner,	Other uses(medical,etc.),health stds, U.S. intergovernmental affairs	Technical, medical, governmental
5th Commissioner,	Independent, non-nuclear view	Legal and communication State elected office Federal elected office

A. NSA--Nuclear Safety Administration (cont'd)

6. ACRS--Advisory Committee on Reactor Safeguards

a. Reaffirm its importance, heavy workload and effective past service.
b. Free ACRS to devote more detailed attention to generic issues, first-of-a-kind plants, special topics, or ACRS identified topics (see 7).
c. Strengthen ACRS with appointment of managers from utilities, reactor manufacturers and engineer-constructors to get first-hand experience from these functions as the nuclear industry matures from initial to follow-on plants, and from plant design to plant operation.
d. Full ACRS comittee will not automatically review each nuclear power plant. An ACRS subcommittee will review each plant site and design. The ACRSsubcommittee will decide whether the full committee review is needed.

7. NSA Staff Responsibility

a. NSA Staff responsibility will be upgraded to make the staff primarily responsible for nuclear power plant evaluation without mandatory ACRS review.
b. NSA Staff capabilities will be upgraded as noted in A11.

8. NSA Staff Organization

a. To assure adequate and continuing staff coverage of individual plants:
   . establish minimum staff levels for CP through OL application review
   . establish minimum staff levels for I&E for construction and operation
b. Define individual branch levels for I&E divisions
c. Appoint a permanent chief for the key Reactor Systems Branch
d. Reorganize divisions and branches, as appropriate to top management changes, TMI-2 recommendations, and NRC/NSA initiated reorganization study.

9. NSA Inspector General (I-G)

a. Establish an NSA Inspector General as recipient of named or anonymous comments from NSA professional staff or persons external to NSA (industry, public,other).
b. I-G to compile comment log (number, short title, recommended action) for distribution to NOC, NSA top and middle-level management. NSA Administrator to approve action, assign responsibility for implementation.

10. NSA Internal Communications

To improve NSA internal communications, especially accross branches(always difficult

a. Conduct informal, internal seminars at least once per week
   . For NSA professional staff by NSA professional staff
   . For NSA professional staff by outsiders (e.g. industry, DOE, national labs)
b. Each NSA staff member to have 3-6 month temporary assignment every three years at another NSA Headquarters branch, at a NSA Regional office, or at NRTS or lab.
c. Each NSA staff member to receive: weekly "NEWS RELEASES," monthly NSA employee periodical and quarterly listing of NUREG and other relevant documents

NOTE: Formal written communication, especially involving regulatory functions, shall be through formal organization lines of communication.

A. NSA--Nuclear Safety Administration (cont'd)

Items A 1-10 dealt with NSA organizational considerations.
Items A 11-12 and B-G deal with functional considerations.

11. NSA Capabilities--New Areas of Emphasis

a. NSA capability will be upgraded in the following areas of special emphasis:
   . Control rooms
   . Operator and operator supervisor training
   . Operating procedures and emergency in-plant procedures
   . Inspection and enforcement (I&E)
   . Emergency off-site procedures and plans

b. NSA capabilities and past experience will be more fully used and communicated by systematic evaluation and clear presentation for public distribution of:
   . Multi-plant comparative analyses
   . Accident and incident analyses
   . Existing standards and regulations
   . Planned standards and regulations

12. NSA Capabilities--Emergency Operations Center (EOC)

a. NSA Headquarters building shall be expanded, as required to include:
   . Space for the Administrator and NOC (Nuclear Oversight Commission)
   . An Emergency Operations Center (EOC)
   . Necessary emergency transportation facilities

b. The Emergency Operations Center will have all necessary facilities including:
   . Control room
   . Communications facilities
   . Reference materials
   . Working and briefing spaces
   . News media spaces
   . Computation capability
   . Post-accident evaluation team working spaces

B. THE UTILITY AND ITS SUPPLIERS

1. The prime responsibility for nuclear power plant safety, and the corresponding legal responsibility must lie with the utility owner/operator of the plant.
   .This must remain so, even though the Federal government licenses the plant and has superior technical specialty resources, including national laboratories.
   .It is fitting and proper that nuclear power plants be owned and operated by the local utility whose employees live and work in the area served by the plant.
   .For further comment see Recommendation A1 and Attachment 1 and 2.

2. Statements of safety policy, e.g. Attachment 2, shall be required by regulation.

   a. The statement shall be signed by the Chairman of the Board and Chief Executive Officer of the corporation (or their equivalents).

   bb. The PSAR and FSAR shall contain the statement of safety policy of the utility owner/operator, of the reactor manufacturer, and of the engineer-constr.
   .Nor new Construction Permit or Operating License shall be issued without submission of such statements of safety policy.

   c .The statements of safety policy will be given to each corporate employee working on nuclear power plants, and will be prominently posted on corporate bulletin boards.

   d .For plants which already have an Operating License, each utility owner shall submit to the Federal government a statement of safety policy, and distribute copies per 2c.

   e .Each time the person of the corporate chairman of the board and/or chief executive officer changes, the statement of safety policy shall be reissued with the current chairman/ceo signature on the statement.

3. Qualifications of Corporations and Reactor Operators

   a. Nuclear Safety Administration (NSA) shall define and issue for public comment minimum qualifications for utilities to own and operate nuclear power plants.
   b. NSA shall define and issue for public comment minimum qualifications for:
      - reactor manufacturers
      - engineer-constructors
   c. NSA shall review and redefine, as necessary, minimum qualifications for:
      - reactor operators (RO)
      - senior reactor operators (SRO)
      - operator supervisors (OS)

4. To emphasize individual responsibility and to contribute to NSA assessment of applicant qualifications:

   a. The PSAR shall list the names and titles of key design personnel.
   b. The FSAR shall list the names and titles of key operating personnel.
   c. A "topical report on design organization" shall include:
      . Organization charts of: .utility headquarters staff
      .reactor manufacturer project and support staff
      .engineer-constructor project and support staff
      .project quality assurance staff and communication
      .power plant operating staff
      .Experience resumes of: .key personnel identified in the organization charts
   d. A "topical report on operating organization" shall include:
      .Organization charts of: .power plant operating staff
      .safety review boards
      .utility headquarters staff
      .Experience resumes of: .key personnel identified in the organization charts

B. The Utility and Its Suppliers (cont'd)

5. Communication from NSA to Industry (and the public)

To expedite, direct and assure communication from NSA to industry, NSA will establish the following communications distribution system:

Distribution Category	Estimated Quantity	NSA Approving Authority	Distribution Scope
A	200 (+500 B)	NOC or Admin/Deputy	Senior management of nuclear plant utilities, NSSS mfrs., engr-constructors.
B	500	NOC;Admin/Dep. Division Dir.	Safety managers of nuclear plant utilities, NSSS mfrgs, engr-constructors and of each nuclear power plant
C	2000 (+500B)	NOC + Admin. +Bur.ofBudget	Nuclear power plant reactor operators and maintenance managers (see B7)
D	3000 (+500 B) (+NSA staff)	NOC + Admin. +Bur.ofBudget	Weekly news release plus public requests

A, B and C distribution will be listed in weekly "News Releases." The public will be allowed to request copies (upon payment, if appropriate).

6. Compilation of Regulations and Standards

a. Nuclear power plant laws, regulations, NRC advisory positions and an eventual estimated 5000 standards have become very voluminous. Two types of compilations are needed(from NSA (see A11b):

(1) Summary booklet to include:
..summary of each category of information
..tabulation of all existing,relevant laws,regs, advisories, stds.
..tabulation of all planned, relevant laws,regs, advisories, stds.
(2) Looseleaf and microfiche compilations of " laws,regs, advisories, stds.

b. The summary booklet and looseleaf and microfiche compilations shall be clearly indexed, well organized, and in readily readible type-set format.
c. Items (1) and (2) above shall receive Distribution B plus public notice.

7. A "Nuclear Power Plant Operating Experience" quarterly journal will be instituted, and will receive distribution C. Copies will be mailed to the home address of each licensed RO/SRO/OS(reactor operator, sr. reactor operator, and operator supervisor).

8. Eliminate time deadline tax incentives

Current Federal tax laws provide tax incentives of a whole year's credit is commercial operation is achieved as late as the last week of the year. Such Federal (or state) tax laws should be revised to provide credit prorated to week of achieving commercial operation.

C. TRAINING OF OPERATING PERSONNEL

1. The U.S. "Nuclear Safety Administration" will reevaluate and redefine the minimum prerequisites and minimum standards of training of reactor operating personnel.

2. To insure first-hand inputs to operator training the NSA will establish two National Nuclear Power Schools as follows:

   NNPS-1: Run by Oak Ridge National Laboratory in cooperation with Tenn.Valley Auth. — for PWR, gas-cooled reactor and "other" reactors

   NNPS-2: Run by Argonne National Laboratory in cooperation with Commonwealth Edison — for BWR and LMFBR

3. Prerequisites for reactor operators and senior reactor operators/operator supervisors are:suggested as follows:

	Reactor Operator	Senior Reactor Operator and Operator Supervisor
Education	2 years tech. school (assoc. degree)	4+ years technical school (Bachelor's Degree or higher) or Reactor Operator License + 3 years RO experience

4. Nuclear power training for RO and SRO/OS is suggested as follows:

Training	Note	Reactor Operator	SRO/OS--Sr.R.Oper/Oper Supvsr
a. Nuclear energy	A	6 months	3 months
b. Startup of a research reactor	A	2 months	1 month
c. Nuclear Power	B	4 months	4 months
d. Simulator	B	2 months	2 months
e. Plant Specific	C	12-24 months	12+ months plus preparation of operating and emergency procedures
f. Plant specific oper. license	D	RO License	SRO/OS License
g. Operator Retraing	E	2 weeks every 2 yrs	4 weeks every 3 years
h. Operator relicense	F	RO License renewal	SRO/OS License renewal

NOTES: A: By NNPS or NSA approved private school (including NSA approval of curriculum and minimum course content)
B: By NNPS (National Nuclear Power School) only
C: By reactor manufacturer, engineer-constructor and utility
D: By U.S. NSA
E: By NNPS only
F: By U.S. NSA

5. Curriculum and minimum course content standards shall be defined by NSA.

D. TECHNICAL ASSESSMENT

DD. TMI-2 Followup

1. TMI-2 Recovery Operations: shall be conducted with great attention to obtaining additional data regarding the accident sequence, extent and consequences.
.Complete photographic records and other data will be made as the containment building is enterred and in particular as the reactor core/internals/vessel are examined.
.Hot laboratory examination of core remains will be given high priority at national laboratories.

2. TMI-2 Accident Worst Potential Conditions will be evaluated and reported in-depth.
.What are the worst possible in-plant and off-site conditions which might have evolved with further equipment and/or operator malfunctions?
.What recommendations for preventive, in-plant mitigating, or off-site response designs and actions are appropriate based on these evaluations?

3. TMI-2 closed emergency feedwater block valves (Kemeny commission finding E5b v&vi)
.Provide a detailed statement on the valve status prior to and during accident.
.Provide an evaluation, confidential if necessary, of cause of shut valves, including the possibility of sabotage.
.Evaluate use of computer shift-status report (see D8, below).

DDD. Further Evaluations

4. Hydrogen bubbles are a generic problem requiring further evaluation.
.Prepare an in-depth study of hydrogen bubble formation and dissipation in reactors under accident and post-accident conditions.
.Prepare an in-depth study of hydrogen bubble problems at TMI-2 and how resolved.
.Prepare an in-depth study of possible consequences of hydrogen bubbles.
.Prepare an in-depth study of hydrogen bubble elimination methods
.Prepare recommendations, as appropriate, for retrofitting existing plants and recommendations for new CP or OL licenses to minimize in-reactor H_2 bubbles

5. Comparison of TMI-2 Accident Evaluations

a. Prepare an in-depth comparison of the TMI-2 accident evaluations,
..During the emergency---by Met Ed Operators and Met Ed/GPU hq. staff
--by NRC, Federal and state agencies
--by nuclear industry representatives (identify each; called to site or off-site support)
--by news media and public comment
..Post-emergency ---by President's commission and presidential staff
--by NRC staff
--by NSAC (Nuclear Safety Analysis Center) of EPRI
--by Met Ed and GPU and other utilities
--by news media and public comment

b. The purposesof comparing the TMI-2 accident evaluations are:
--to evaluate the evaluations
--to assess capabilities for future emergencies
--to provide guides for NSA Hq. Emergency Operatns Center
--to provide guides for site EOC and relation to NSA Hq.

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6. Operating Experience Review by NSA staff with a multi-plant overview is essential to obtaining possible common mode failures for multiple plants. This is especially true when current maximum nuclear plant lifetimes are up to 20 years, compared with design lifetimes of up to 40 years. Reviews should take place after 1st core complete replacement, and at 10,20,30,40 years after commercial operation is achieved.

D. TECHNICAL ASSESSMENT (cont'd)

DDDD. Further Actions

7. TV Monitors and Videotapes -- Control Room and Containment Building

a. Install control room TV monitors and videotapes, activated on reactor or turbine-generator trip to provide control room to NSA Hq. Emergency Operations Center one-way real-time visual communications link. Videotapes to serve as emergency and post-emergency evaluation data base.

b. Install containment building shielded (from radiation and missiles) TV cameras and videotapes to monitor activity (e.g. during refueling) and for emergency and post-emergency evaluation data base.

8. Shift Status Report

a. All operating plants shall generate shift summaries, including key valve status reports, at the end of each shift for information of oncoming shift and for operations evaluations.

b. All plants receiving new construction permits, and where possible plants to receive or already possessing operating licenses, should have computer generated shift status reports.

9. PSAR/FSAR/Topical Report Additional Coverage shall include:

a. PSAR:
- .List the names and titles of key design personnel. (See B4)
- .Control room information (See attachment 3
- .Small break LOCA (loss-of-coolant accident) analyses
- .Complete outline of plant documentation.

b. FSAR:
- .List the names and titles of key operating personnel (B4)
- .Complete index of plant documentation
- .Failure sequence charts for about 50 accident initiating even
- .Guidelines for operating/emergency procedure preparation
- .At least two examples of key procedures (startup; post-LOCA)

c. Topical Reports:
- .Design organization (see B4)
- .Operating organization (see B4)
- .Control room design (see Attachment 3)
- .Plant and utility Hq. nuclear safety committee
- .Off-site emergency (including radiation) medical support

D. Technical Assessment (cont'd)

10. Control Room Evaluation

a. Required documentation

Document	Scope	Due Date
• For new plants		
(1) PSAR	Per current PSAR requirement	With PSAR
(2) Topical report	Per Attachment 3	4 months prior to any new CP or OL
(3) FSAR	Per current FSAR requirement	With FSAR
(4) As-Built Drawings	Microcards of as-built dwgs	Prior to initial fuel loading
(5) Drawing Update	Microcards of dwgs updates	Yearly or on major changes
• For operating plants		
(6) Topical report	Per attachment 3	4 months after regulation issued
(7) Drawings Update	Microcards of dwgs updates	8 months after regulation issued, then yearly changes

b. Nuclear Safety Administration action

Committee	Membership	Results Due
(1) ACRS/NRC committee on control room review methods	.ACRS subcommittee .NRC key division/branch mgrs.	2 months
(2) NRC control room evaluation; Full ACRS review	.NRC staff & management .Full ACRS committee	4 months after first two control rooms begin eval.
(3) NRC control room evaluations; ACRS subcommittee review	.NRC staff & div. mgmnt .ACRS cntrl rm. subcomm.	4 months after begin evaluation
(4) Control Room Review Task Force	.NRC/ACRS staff .National labs. .ANS/IEEE/ISA reps.	12 months--synopsi 24 months--final report
(5) Control Room Standards Task Force	.NRC .Utilities .NSSS manaufactueers .Engineer-constructors .ANS/ANSI/IEEE/ISA .I&C manufacturers .Simulator mfrs. .National labs. .DOD/NASA/aircraft mfr. .Human factors engineering consultants	12 months--outline 24 months--draft 36 months--issued

E. PUBLIC HEALTH AND SAFETY

1. State governor to make evacuation decision and announcement

Pennsylvania Governor Dick Thornburgh had to make a prudent and timely decision regarding evacuation. On the advice of NRC Chairman Joseph Hendrie, he advised at 12:30 March 30 that pregnant women and preschool children leave the region within a 5-mile radius of Three Mile Island.

It must be presumed that Gov. Thornburgh and almost all other Governors will not have had nuclear training or first-hand experience and will need to rely on expert guidance for advice. Because of the individual nature of each accident and circumstances and with widespread effect upon the public involved, the Governor as the chief political authority of the state affected should be the one to make the evacuation decision, and he needs to havethe latitude to make the informed decision based on all factorsthat need to be considered.

2. Evacuation guidelines for state Governors

However, the Nuclear Safety Administration should be in a position to have preestablished guidelines for evacuation recommendations, including:

- Guidelines for emergency preparedness and facilities/supplies required
- Dose levels to evacuate pregnant women and preschool children
- Dose levels to evacuate general population
- Guidelines for distance from site for evacuation
- Guidelines for direction from site for evacuation
- Guidelines for advance notification timing and for estimated evac. times

These guidelines shall be developed after detailed technical reports, including that suggested in E3, and presuming on-site meteorological and site-vicinity radiation monitoring suggested in E4, and communications for emergency management suggested in F3&4. The guidelines shall be made available for public comment and public hearing prior to adoption. They shall be advisory to the governors.

3. Evaluation of evacuations

a. A detailed comparison shall be made of TMI-2 evacuation and other actual evacuations, considering:

- extent of evacuation--area, population, type of persons
- triggering event
- basis for, and timing of, evacuation decision
- action of government officials; official ordering evacuation
- method and time to notify public
- public response; time to implement evacuation
- newsmedia role
- emergency preparations and emergency facilities used
- total public cost; estimated private costs

b. A detailed comparison shall be made of TMI-2 evacuation and other planned evacuations for at least five nuclear power plants.

c. Preparation of evacuation requirements estimates, based on actual and planned evacuations, including:

- government decision making time requirements and inputs
- public notification method and time requirements
- time required to implement evacuations
- transportation requirements; hospital assistance required
- housing and supplies requirements for 4-14 days

(e.g. if 100,000 people are in evacuation zone, need may be:
..100 facilities for 1000 each --or--
.. 50 facilities for 1000 each and 10,000 dwelling units

E. Public Health and Safety (cont'd)

4. Meteorological and off-site radiation monitoring capability

a. Meteorological: the operating utility shall be responsible for maintaining an on-site meteorological tower. Outputs of the tower shall communicate by hard-wire to the control room, the site emergency operations center, and the local police station.

b. Fixed radiation monitoring capability: the operating utility shall be responsible for maintaining the following gamma radiation monitoring equipment. Outputs shall communicate by hard-wire to the control room, the site emergency operations center, and the local police station.

. On-site gamma radiation monitors	-- 2 minimum
. Off-site gamma radiation monitors	-- prevailing wind direction(s) at 2, 5 and 10 miles
. Off-site gamma radiation monitors	--quadrants other than prevailing wind at 2 miles

c. Mobile radiation monitoring teams: the operating utility shall be responsible for providing at least two mobile radiation monitoring teams for quick response following an incident or accident. These teams may be supplemented by local police, state, and NSA regional teams. Mobile teams shall be able to communicate by radio to the site emergency operations center and the local police station. All teams shall have previously prepared maps and checkpoint designations available.

5. Medical support capability

a. The operating utility shall be responsible for:

. Obtaining medical consultants for use in emergencies
. Obtaining predesignated hospital capability for radiation casualties, from on-site overdoses to site personnel
. Training medical consultants and hospital capability in radiation

b. Nuclear Safety Administration shall:

. Establish guidelines for operating utility medical support capability
. Stock 5 million doeses of potassium iodide in each NSA region for use by the industry and general public in event of accidents

F. EMERGENCY PLANNING AND RESPONSE

1. Emergency Definition and Notification

(Re: Kemeny Comm. finding D1)

a. NSA shall define "Guidelines for Classifying Incidents and Accidents."
b. NSA shall define "Guidelines for Notifying Government Officials."
c. NSA shall issue the above for public comment prior to being adopted.

2. Emergency Responsibilities

a. NSA shall define, issue for public comment, and hold public hearings on "The General Roles of NSA, the Operating Utility, the Nuclear Industry, and Local, State & Federal Government in Nuclear Power Plant Emergencies."

b. Suggested responsibility guidelines, based upon TMI-2 precedent, are:

- Utility---- legal and financial responsibility (up to Price-Anderson limits)
  - -- notification and subsequent reporting to governments
  - -- control room and in-plant operations
  - -- off-site radiation monitoring and other off-site activities under guidance of state government
- NSA ---- Run NSA Headquarters Emergency Operations Center (EOC)
  - -- Run On-site Emergency Operations Center (external to control rm)
  - -- Oversight of utility on-site operations
  - -- Override of utility on-site operations to protect public health and safety
- State Gov't. ---- Final authority on evacuation decisions
  - -- Off-site activities involving the public
- Local Gov't. ---- Consultation with and from other governments
  - -- Implementing actions off-site under state government guidance
- Federal Gov't. ---- Assistance in communications, civil defense, emergency relief, etc
  - -- White House news conference, if appropriate

3. Emergency Communications

a. Adequate, preplanned telephone, telecopier and radio and tv communication links shall be provided between the nuclear power plant, NSA Headquarters EOC, NSA Region EOC, Utility Hq. EOC, State EOC, and local police station. Attachment 4 illustrates requirements for "Nuclear Power Plant Emergency Communication Links."

b. American Telephone & Telegraph (AT&T) Company and the U.S. Army Signal Corps:
- .shall assist NSA in preparing general specifications for emergency communication links, and
- .shall participate in the detailed planning and implementation for each nuclear power plant

F. Emergency Planning and Response (cont'd)

4. Emergency Outside Technical Support

a. Hot-lines:
.On-duty nuclear power plant operating supervisory shall have immediate access to outside technical advice on a 24 hour/7 day per week basis.
.NSA Hq. Emergency Operations Center will be manned 24 hour/7day per week basis.
.NSA Region EOC, Utility Hq., Reactor Manufacturer and Engineer-Constructor will all establish 24 hour/7day per week telephone answering and notification capabilities.
.State EOC and local police stations will be manned 24 hour/7 day per week basis

b. EAT -- Emergency Action Teams
.EAT, emergency action teams shall be formed by NSA Hq., NSA regions, the nuclear power plant, the utility Hq., the reactor manufactueer, the engineer-constructor, and the NSA/DOE National Laboratories.

. EATs shall report to NSA Hq. EOC within 24 hours after requested by NSA Hq.EOC
. EAT representative to NSAHq. EOC will receive NSA Hq.EOC situation briefings, will provide their own individual expertise, and will coordinate with their organizational EAT and organization's capabilities.

c. EOC -- Emergency Operations Centers

.NSA Headquarters will have the primary Emergency Operations Center which will be fully equipped (see A12) and staffed (see F4a).
.A temporary on-site emergency operation center will be established at a predesignated location and with predesignated capabilities.
.NSA will define the relationships and capabilities for NSA Hq. EOC and On-site EOCs. Such capabilities will then be established, after public comment and adoption, by NSA Hq. and the operating utility, respectively.

5. Emergency plans and tests

a. Complete emergency plans and tests requirements shall be defined by NSA.

b. The operating utility is responsible for preparing complete emergency plans, in cooperation with local, state and federal officials. The public and local, state and federal officials shall have opportunity to comment on emergency plans. NSA shall approve on-site emergency activity plans. The state government shall approve off-site emergency activity plans.

c. Once per year NSA Emergency Operations Center will initiate and emergency communications exercise for each nuclear power station site.

d. Once per year each state will initiate an emergency test (including communications, off-site mobile radiation monitoring, and medical facilities) with each utility have nuclear power plant(s) in the state.

G. THE PUBLIC'S RIGHT TO INFORMATION

1. Background information for news media

a. The National Power Reactor Schools (see C2) shall prepare pre-packaged briefing booklets (8½x11) for the news media. These shall include 16 page and 96 page handouts with graphics suitable for TV or newspaper publication. Representatives of TV and print news media will review and comment on the graphics.

b. Reporting of a nuclear power plant accident will include reporting of dose rates received from various sources, and are likely to site manyfold increases in dose rates above normal background, possibly at large distances from the site. Uncorrelated and without perspective these reports can be unduly alarming and give a false impression. Attachment 5 is an "Illustrative Example of Nuclear Power Plant Accident Off-site Radiation Levels and their Possible Significance." An accurate chart, based on TMI-2 and other technical inputs, shall be prepared by NSA.

c. The National Power Reactor School shall assign instructors to be stationed at accident sites news media facilities to answer news media technical questions without taking the time of emergency managers.

d. Accident site news media facilities shall be provided with appropriate reference material including: PSAR/FSAR, site/environmental reports, emergency plans, utility annual reports, organization charts (utility, state, NSA, etc.), detailed area maps, etc.

2. News briefing facilities

a. Each nuclear power plant site shall have a predesignated news media briefing facility. Possibly the local school or the site public information building. The facility shall have adequate reference material (1d) and communications links and briefing/work space. The latter items should be capable of routine productive use as well as accident use.

b. The NSA Emergency Operations Center shall include separate news media facilities. (See A12b).

3. Responsibility for News Releases to the News Media

a. Responsibility: NSA shall establish guidelines for news release official responsibility, such as:

- Utility representative--plant design & operation; other until superseded
- NSA site representative--plant status during emergency
- National power reactor school-- background information
- State government --off-site radiation dose measurements
  --protective action and evacuation; statements
- NSA Emerg. Optns center--NSA EOC activities; NSA Hq. statements
- White House --Federal emergency relief; White House statements

b. News briefings will be regularly schedules for 10 a.m. and 3p.m., if possible. News briefings will bring together simultaneously, if possible, representatives of utility, NSA site team, NPRS instructor, and state and local government. Additional news briefings will be held as warranted.

c. News media will be free to question official news sources at news briefing. News media may obtain additional information per good news reporting practices

WHO IS RESPONSIBLE FOR NUCLEAR POWER PLANT SAFETY?

RECAPITULATION OF U.S. LEGISLATIVE AUTHORITY

Note: 1954 = Atomic Energy Act of 1954, Chapter 1073, Public Law 703--83rd Cong/2ndSess
1974 = Energy Reorganization Act of 1974, PL 93-438; 88Stat 1233

1954: 1a. Policy: atomic energy shall...make the maximum contribution to the general welfare, subject to...the paramount objective of...common defense and security

1954: 2e. Findings: nuclear utilization facilities are affected with the public interest and regulation by the United States...is necessary in the national interest.

1954: 3. Purpose: to provide for programs for research, for dissemination of information, to control of atomic energy, for peaceful uses

1954: 10. Licenses: It shall be unlawfulto own or operate "any utilization or production facility except under and in accordance with a license issued by the /Atomic Energy/ Commission."

1974: 2c. "Congress finds that it is in the public interest that the licensing and related regulatory functions of the Atomic Energy Commission be separated from the performance of the other functions of the Commission..."

1974: 202:"The Nuclear Regulatory Commission shall...have licensing and related regulatory authority pursuant to chapters 6,7,8, and 10 of the Atomic Energy Act of 1954..."

1974: 203:The Office of Nuclear Reactor Regulation shall perform..."principal licensing and regulation involving all facilities, and materials licensed under the Atomic Energy Act of 1954, as amended, associated with the construction and operation of nuclear reactors."

COMMENTARY ON INADEQUATE LEGAL DEFINITION OF RESPONSIBILITY

The key operative statement in the above recapitulation is 1954: 10 which talks of licenses and states "It shall be unlawful" (ed. underline) to own or operate a nuclear power plant "except under and in accordance witha license"issued by the Federal government.

Any legislative authority or regulatory requirements growing out of the TMI-2 accident and subsequent evaluations and recommendations should seek to state unequivocally and with great clarity the following concepts:

Utility owner/operators: .Are responsible for the safety of the nuclear power plants which they own and operate.
.Shall prepare and publish widely for their employees statements of corporate safety policy. (e.g.seeAttachment 2)

Reactor manufacturers: .Are responsible for the design and manufacture of the equipment which they furnish.

Architect/engineers: .Are responsible for the designs which they furnish.

Constructors: .Are responsible for the construction they perform.

Nuclear Regulatory Comm. or its successor): .Is responsible for Federal licensing and regulation.
.Is responsible for setting minimum standards for licenses.
.Is responsible for independent review to grant licenses and to inspect and enforce licenses granted.
.Will perform detailed reactor review and extensive R&D.
.Is responsible for public safety override and 1954:186 license revocation upon failures in report and operate.

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STATEMENT OF PUBLIC ELECTRIC SERVICE COMPANY POLICY REGARDING SAFETY OF NUCLEAR GENERATING STATIONS

A. *Nuclear Generating Stations will be designed, fabricated, constructed, tested and operated in a safe manner, consistent with sound engineering practice.*

B. *Nuclear Generating Stations will be designed, fabricated, constructed, tested and operated in a manner to minimize release of radioactive effluent during normal operation, consistent with sound engineering practice.*

C. *Nuclear Generating Stations will be designed, fabricated, constructed, tested and operated with the following priorities:*

1. SAFETY 2. Performance 3. Schedule 4. Cost

Public Electric Service Company will spend what is required to first assure the Station is safe, then to assure it performs as required and is brought into commercial operation on schedule. A safe, high performance, on-time Station is Public Service's best method of assuring there is no undue risk to the public health and safety; of meeting our public responsibility and commitment of keeping our customers supplied with reliable electrical energy and keeping the land we live in clean and beautiful; and of assuring continued sound corporate growth and profitability.

* * * * *

The following statements define the responsibilities of PUBLIC Electric Service Company, of its two principal contractors--the reactor manufacturer and the construction manager, and of Public Service 's policy on compliance with government requirements.

1. Public Electric Service Company is responsible for the safety of the Nuclear Generating Stations which it designs and operates. The best assurance of safety is the professional integrity of the individuals who design, fabricate, construct, test and operate the Station, or parts thereof. Public Service will assure itself that objectives A, B and C defined above are met. The results of Public Service safety evaluations are presented in Safety Analysis Reports and the public record filed with the U.S. Atomic Energy Commission.

Individual responsibilities will be clearly defined for all participants in Nuclear Generating Station projects. Responsibility for final nuclear safety review rests with a Nuclear Safety Review Board reporting to the Vice-President of Electric Operations. Members of the Board are included on a Nuclear Design Safety Review Team reporting to the General Manager-Engineering, and on a Nuclear Operational Safety Review Team reporting to the General Manager-Operations.

EXAMPLE OF A UTILITY CORPORATE POLICY ON NUCLEAR SAFETY (cont'd)

2. The reactor manufacturer is responsible for the design, fabrication, installation and initial test of the equipment it provides, including definition of all interface requirements to assure the safe operation of such equipment.

In the specialized area of reactor core calculation, Public Service (using consultants where necessary) will assure itself that it understands the objectives and design bases of the reactor core, the interface responsibilities placed on , and that the Final Safety Analysis Report clearly reflects the inputs, methods and conclusions of the reactor manufacturer's evaluations. Public Service will look to the U.S. Atomic Energy Commission for the in-depth review of this specialized area.

3. The construction manager is responsible for assuring the quality of the construction equals or exceeds specified requirements, and for recommending changes where appropriate to improve Station safety.

4. Public Service recognizes that the U.S. Atomic Energy Commission has a statutory responsibility to satisfy itself that the nuclear generating units it licenses provide no undue risk to the public health and safety.

Public Service will comply with the intent of all requirements of the U.S. Atomic Energy Commission. Where there are any exceptions to specific requirements, they will be clearly defined and justified on a sound technical basis, and normally Public Service will propose an alternate which complies with the intent of the AEC requirement with equal or greater safety.

5. Public Service recognizes that the State of _____ has responsibilities in the areas defined by the "_____ Radiation Protection Code," in defining and implementing protective action guides, in reviewing environmental radiation monitoring, and as an intervenor in AEC hearings.

Within these areas Public Service will comply with the intent of all requirements of the State of _____. Where there are any exceptions to specific requirements, the same policy as defined in 4, above, will apply.

6. Public Service recognizes that the State of _____, the _____ River Basin Commission, and officials of the Federal government, neighboring states and local government have responsibilities in various areas related to Nuclear Generating Stations, some of which have a bearing on safety.

Public Service will cooperate with all responsible government agencies, seeking to identify, define the interrelationships between, and comply with, the requirements of such agencies. Where there are any exceptions to specific requirements, the same policy as defined in 4, above, will apply.

President

Chairman of the Board of Directors

NUCLEAR POWER PLANT CONTROL ROOM DESIGN TOPICAL REPORTS

- GENERAL

1. The control room is a key part of the nuclear power plant and critical to safety.
2. It is an area where men, computers, and plant equipment interface.
3. The Control Room Design Topical Report will be submitted to the Nuclear Safety Administration for licensing review.
4. The Report can subsequently be used for specifications, procurement, detailed design and construction.
5. Scope of the report:
   (1) Purpose and Summary
   (2) Design bases
   (3) Control building arrangement
   (4) Control room design
   (5) Safety shutdown room design
   (6) Computer design
   (7) Relay room design
   (8) Mechanical equipment room design

- CONTENTS OF THE CONTROL ROOM DESIGN TOPICAL REPORT

1.0 Purpose and Summary

1.1 Describe the purpose of the Topical report.
1.2 Summarize the principal results and sections of the report.
1.3 Discuss unique features of the control room design.

2.0 Design Bases

2.1 Define all control room design bases, including operator staffing.
2.2 Define all support design bases, including for the control building, computer, safe shutdown room, relay room, and mechanical support.

3.0 Control building arrangement
Provide 11" x 20" figures for the following:
3.1 Control building longitudinal elevation
3.2 Control building floor plans
3.3 Control room floor plan, including location of, and function of, consoles & panels
3.4 Safet Shutdown room floor plan, w/ location of, and function of, consoles & panels
3.5 Relay room floor plan and elevation sections, showing cabinets and cable trays
3.6 Mechanical equipment room floor plan

4.0 Control Room Design (continues on next page)

NUCLEAR POWER PLANT CONTROL ROOM DESIGN TOPICAL REPORTS (cont'd)

4.0 Control Room Design

4.1 Overall design

4.1.1 Describe and summarize control room design.
4.1.2 Include a matrix chart "Summary of Control Room Design Criteria" which summarizes:
- Functional requirements
- Physical design
- Human factors engineering
- Computer and computer I/O

4.1.3 Discuss control room functions.
4.1.4 Discuss bases for control room vs. local control panel function location.
4.1.5 Discuss main control room vs. safe shutdown room design criteria and functions.
4.1.6 Discuss control room layout, access control, lighting, ventilation, radiation shielding, fire protection, emergency power, and communication.
4.1.7 Discuss human factors engineering design.
4.1.8 Discuss control room/computer interface design.

4.2 Control Room Annunciators

4.2.1 Discuss annunciator selection and location design philosophy.
4.2.2 Provide figures showing all annunciator arrangement and wording and coloring.
4.2.3 Tabulate, for each annunciator:
- .number, wording, location, color coding, audible signals
- .initiating event(s), operator action(s)
- .criteria for operator or automatic annunciator turnoff

4.3 Control Room Main Control Console (MCC)

4.3.1 Discuss main control console arrangement, function selection, and design philos.
4.3.2 Provide figures for MCC arrangement drawings.
4.3.3 Tabulate, for each MCC item:
- .number, name, function
- .capability (e.g. sensor and instrument range and sensitivity)
- .switch positions

4.4 Control Room Input/Output Devices (I/O)

4.4.1 Discuss main control room input/output device selection, function, philosophy.
4.4.2 Provide figures for each I/O device, including communication devices for contact outside the plant
4.4.3 Tabulate specifications and characteristics for each I/O device

4.5 Control Room Wall Panels (WP)

4.5.1 Discuss function of each wall panel area and discuss any unusual features.
4.5.2 Provide figures for each WP arrangement drawings.
4.5.3 Provide figures for key safety related displays (e.g. core/fuel/control rod state
4.5.4 Tabulate for each WP item:
- .number, name, function
- .capability (e.g. sensor and instrument range and sensitivity)
- .switch positions

4.6 Control Room Evaluations
4.6.1 Evaluation for normal operations
4.6.2 Evaluation for startup
4.6.3 Evaluation for emergency conditions

NUCLEAR POWER PLANT CONTROL ROOM DESIGN TOPICAL REPORTS (cont'd)

5.0 Safe Shutdown Room Design
Provide design information comparable to section 4.0 for the main control room.

6.0 Computer

6.1 For computers used as a Data Acquisition and Processing System (DAPS):

6.1.1 Summarize DAPS characteristics in the control room topical report, as noted below.
6.1.2 Provide complete specification for all DAPS functions, detailing specific systems and variables monitored, displayed, or on historical file.
6.1.3 Discuss in detail and provide examples of CRT alarm message displays.
6.1.4 Describe and provide examples of CRT display hierarchy and format.
6.1.5 Discuss in detail all computer safety orsafety related functions. Specifically, is DAPS required for manual initiation of any safety equipment?
6.1.6 Consider possibility of operator overdependence on DAPS.
6.1.7 Justify why the DAPS system is not a seismic Category I system.
6.1.8 Provide a separate topical report on DAPS.

6.2 For computers used for plant operation or control: A complete ACRS review is needed

7.0 Relay Room Design

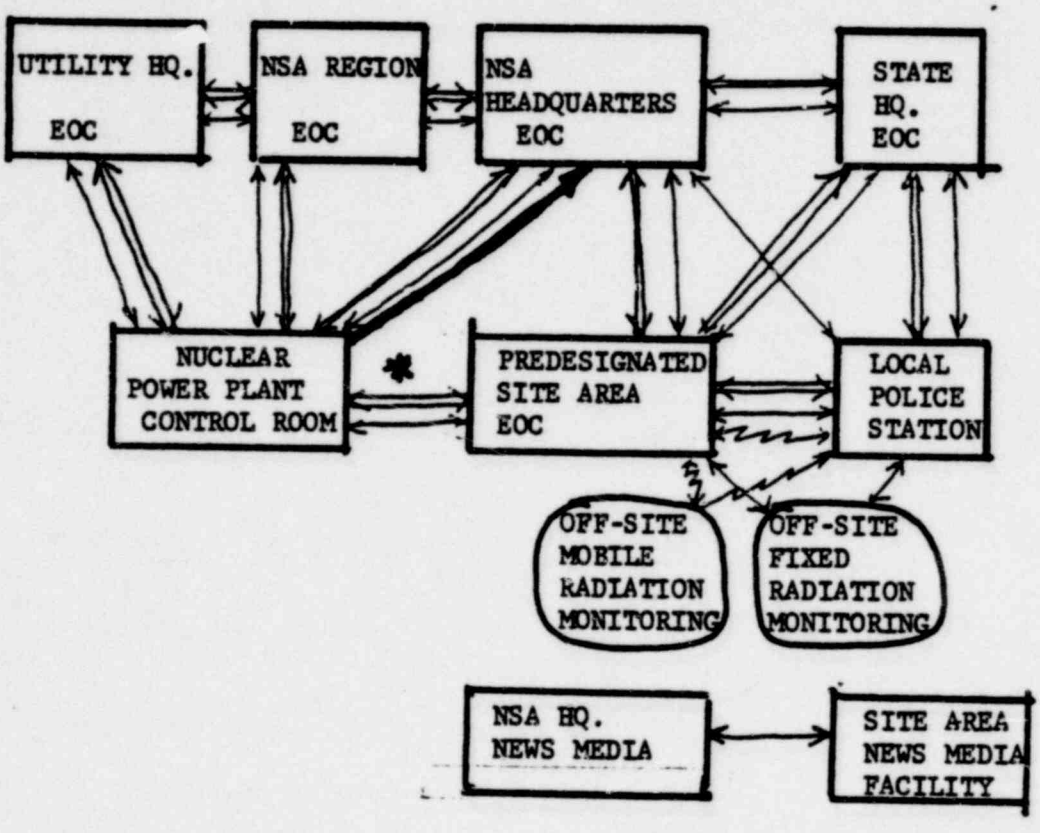
7.1 Describe the relay room design.
7.2 Discuss criteria for locating relay panels and selecting relay technology.
7.3 Discuss the criteria for cable tray location and spacing.
7.4 Discuss cable routing criteria and cable identification specifications.
7.5 Discuss cable routing methodology or computer code.
7.6 Discuss control room/relay room interfaces.
7.7 Discuss relay room construction, access control, panel access control.
7.8 Discuss relay room lighting, ventilation and fire protection.

8.0 Mechanical equipment room design and other control room support functions

8.1 Mechanical equipment room design and equipment specifications
8.2 Control room support functions--other
(e.g. describe kitchen and toilet facilities to meet criteria for operators remaining in control room during accident condtions)

NUCLEAR POWER PLANT EMERGENCY COMMUNICATION LINKS

The following illustrates possible regulatory requirements (diagrammatic summary) to be established for Nuclear Power Plant Emergency Communication Links.



Legend:

EOC	= Emergency Operations Center	
⟺	= Hot-lines telephone/telecopier communication link	(2-way)
⟷	= Ordinary telephone communication link #	(2-way)
⇝	= Radio communication link	(2-way)
➡	= TV closed-circuit communication link	(as shown, 1-way)

Notes:

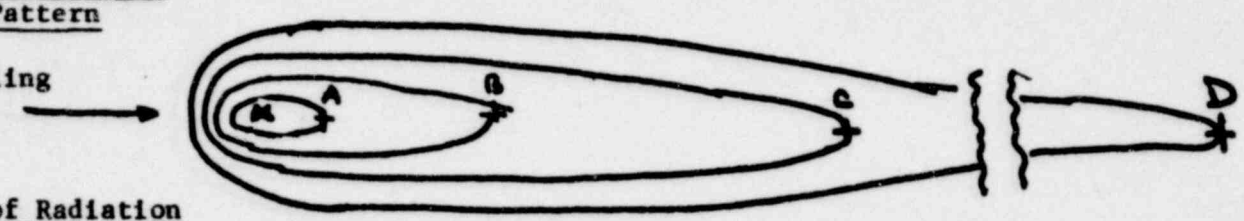
✱ Preferred Site Area EOC -- Adjacent to Control Room *
Alternate Site Area EOC -- Adjacent to Nuclear Plant site

* if conditions permit.

\# Ordinary telephone communication links will also be available between all boxed locations. Such links are omitted in the above diagram for clarity.

ILLUSTRATIVE EXAMPLE OF NUCLEAR POWER PLANT ACCIDENT OFF-SITE RADIATION LEVELS and THEIR POSSIBLE SIGNIFICANCE

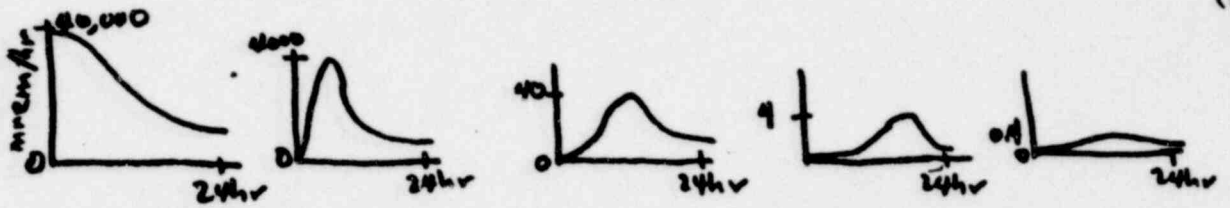
Example of Radiation Downwind Pattern



Examples of Radiation Characteristics

Point	X	A	B	C	D	Outside Radiation "Footprint" area
Distance	In Containment Building	½ mile	2 miles	10 miles	100 miles	
Maximum radiation level, mrem/hr	40,000	400	40	4	0.4	0.02 (normal background)
Total dose for 24 hrs, mrem		4000	400	40	4	½ mrem/day (150 mrem/year)

Example of 24hr radiatn pattern



NOTES: 1. "rem" is a measure of radiation dose; "mrem"= millirem = 1/1000 of a rem
2. Assume a 7:1 rule for reactor fission products, i.e. every 7 hours radiation decreases to 1/2.
c.f. the 7:10rule for a-bomb fission products, i.e. every 7 hours radiation decreases to 1/10.

COMMENTS:
1. Radiation decreases with distance from plant.
2. Radiation will take time to travel distance.
3. Radiation levels at distance may be very low, but still easily detected by radiation devices.
4. Total doses may be compared with the following examples:
   - 1 mrem/year--Nuclear plant neighbor
   - 150 mrem/year--Natural radiation dose
   - mrem/24hr--Evacuate women/children
   - 5,000 mrem/year--Nuclear worker allowable
   - 50,000 mrem/24hr--Initial sickness effects
   - 500,000 mrem/24hr--50% of people will die

SPECIAL NOTE: THIS PAGE TO BE DEVELOPED AS A FORMAL PRESS INFORMATION SHEET USING AUTHORITATIVE DATA OBTAINED FROM APPROPRIATE TECHNICAL SOURCES

Enclosure B

AXELROD SUMMARY STATEMENTS ON FIVE BROAD NUCLEAR POWER ISSUES RAISED BY THE KEMENY COMMISSION REPORT & SUPPLEMENTARY STATEMENTS

by Daniel M. Axelrod, Nov. 1979

1. Alternatives to Nuclear Fission Energy

Dr. R.W. Peterson, former Governor of Delaware and former Chairman of the President's Council on Environmental Quality, issued a supplementary statement urging the need "to provide humanity with alternate choices of energy" and recommending that the federal government develop "a strategy which does not require nuclear fission energy."

a. The goal is a desirable objective, but appears unlikely to be achievable. For example, consider the following solar based effort to achieve useful diversity but minimum additional bulk energy supply:

- 10 million solar homes .....1 quad of energy
- 200 biomass to alcohol fuel plants.0.2 quad of energy
- 4000 5MWe small hydroelectric " ..1 quad of energy

Nor is coal an adequate long-term resource. The 50 billion tons of strip-minable coal in Powder River formation of Montana would provide about 2 million barrels/day of synthetic oil (about 10% of current use) for only 80 years before being exhausted. It is, by far, the largest coal deposit, which is also readily accessible.

b. Attachment 1, my "U.S. Energy Supply in Year 2000 -- A 1979 Summary Estimate and Appraisal", presents an overview of likely energy sources and their magnitude of supply for the U.S. in year 2000. It provides a balanced gas, oil (including 10% imports), coal/shale, nuclear and solar mix. Nuclear is an essential part.

As noted in my earlier and more complete papers on "Bicentennial Perspectives on Energy" as both domestic and world oil and gas decline sharply in the post-year 2000 era, nuclear will be required to assume an even larger role.

c. I believe that energy price decontrol (supplemented by governmental assistance faced with heat or eat hardship decisions) will lead to free market choices of thousands of companies and millions of individual consumers and will be the most effective, the most rapid and the most innovative response to the energy crisis. The 1970's have demonstrated price elasticity of energy, spurred by government conservation goals, can significantly reduce energy demand (and hence energy supply, including nuclear power, requirements).

d. I believe that the OKTP--One Kilometer Theta Pinch Fusion Energy Center concept offers the most significant engineering feasible, large scale (30GWth, 10GWe, 200,000bbl/day equivalent), clean, inexhaustible energy option. Physics demonstration of end-stoppering should be expanded to a $10+ million effort and made a major objective of a broad based, varied participant national research effort.

2. Moratorium on Nuclear Power

a. I oppose a blanket moratorium on nuclear power.
I view the Ralph Nader, Jane Fonda, and Joel Jacobson ("put the nuclear genie back in the bottle") positions simplistic and nihilistic.

b. I favor continued priority on energy conservation and efficient use to reduce demands to manageable and achievable proportions.
(e.g. 70% diesel cars at 40-50 miles per gallon could save 1.5 quads)

c. The Three Mile Island-2 accident has been a useful stimulus to a thorough review of the nuclear power industry. (e.g. see "Axelrod Recommendations on Nuclear Power Plant Safety" which are intended to complement and supplement the President's Commission recommendations)
I favor taking adequate time for such a thorough review, and delay (not moratorium) in issuing Construction Permits and Operating Licenses while the active Nuclear Regulatory Commission and nuclear industry interaction is being conducted.

3. Remote from Population Siting of Nuclear Power

Several President's Commission members favored siting new nuclear power plants"in locations remote from concentrations of population," "to the maximum exeent feasible."

a. 10CFR100 siting criteria (e.g. low population zone) should be reevaluated in the light of TMI-2 accident and Kemeny Commission report recommendations.

b. Electric power requirements are basically where the population is.
In the northeast U.S., for example, is siting away from concentrations of population possible?

c. Consider N.J., for example, which I believe may require 18 nuclear power plants by year 2000 (see Attachment 2, my paper on "New Jersey's future supply of energy). No N.J. site is remote from concentrations of population.
What alternates are possible?

. Great plains states siting and electric transmission cross-country.
(What about Great plains states populations and their reactions?)
. Drastic changes in institutions/infrastructures/lifestylesto use less energy. N.J. Dept. of Energy conservation efforts are necessary
. but not sufficient.
. Crash program and unexpected breakthroughs in fusion (e.g.OKTP end-stopperin

d. In light of the above there is a need for further indepth evaluation of nuclear fission power plant siting near populations--with realistic consideration and assessment of risk and mitigating measures.

4. Is the Nuclear Regulatory Commission capable of fulfilling its responsibilities?

President's Commission finding G12 states: "With its present organization, staff, and attitudes, the NRC is unable to fullfill its responsibility for providing an acceptable level of safety for nuclear power plants." This is a very telling and emotional statement.

a. NRC (or successor agency) government responsibilities need to be more clearly defined relative to utility owner/operator and reactor manufacturer and engineer-constructor responsibilities.

b. The October 1979 NRC organization chart has over 150 boxes. Each box represents a specific technical capability evolved over several years, and represents typically tens of manyears of experience. I oppose layoffs and arbitrary reorganization for political or cosmetic purposes.

c. For my specific NRC organization recommendations see "Axelrod Recommendations on Nuclear Power Plant Safety."

d. For detailed changes in NRC divisions and branches the present NRC, the successor management, if any, and current senior management should conduct an in-house review and should seek external consultation. Upon completion of recommendations, the intended functions and capabilities of each Division and Branch should be summarized in a brief booklet for widespread dissemination within NRC and to the nuclear industry and the public.

e. If not NRC personnel, then who? NRC personnel will be complemented and supplemented by additional staff, consultants, industry advisory groups and lab support which will evolve from TMI-2 recommendations and nuclear growth/interaction dynamics. Current NRC personnel will still be the core of the government licensing function.

f. In regards to attitude , on the whole the NRC and the nuclear industry have been very safety conscious, and very open to public scrutiny. If anything there is a need for less arbitrary requirements, less emphasis on conservative models, and less stifling adversary approach (q.v. T.H. Pigford supplementary statement item # 16).

5. Who shall own and operate nuclear power plants? (Are all utilities qualified?)

Governor B. Babbitt asks: "Who should be allowed to run nuclear power plants?" And he adds: "It is time to assess ... which companies are qualified to handle /nuclear power plants/ and which are not."

a. I favor ownership/operation by local utility people living and working in the territory being served by the nuclear power plant.

b. NRC should set qualifications guidelines for utility owner/operator, reactor manufacturer and engineer-constructors. They should be issued for public comment prior to adoption.

c. The PSAR should list the names and titles of design personnel, who are key. The FSAR should list the names and titles of operating personnel who are key. Topical reports should provide the experience resumes of all specified key personnel, to supplement the PSAR and FSAR lists.

* * *

6. Consideration of remote siting and owner/operator qualifications, suggests the desirability of nuclear energy centers which can be remotely located and because of their scale can support a larger and more varied staff. With this in mind the following items should be accelerated:

a. Nuclear energy center (NEC) studies should be continued and expanded.
b. Superconducting transmission research, development and demonstration should be accelerated.
c. Dry cooling tower research,development and demonstration should be accelerated.
d. Site selection efforts should be initiated leading to priority designations for each NERC region.
e. Institutional qualifications and arrangements for NECs should be defined and evaluated.
f. Financial arrangements should be defined and evaluated.
g. A national supertransmission network, interconnecting about 30 NECs shoudd be defined and evaluated.

* * *

7. Nuclear power remains a necessary and desirable energy option. There is a need for a better public image, with more news media coverage of the positive aspects of nuclear power, if the nuclear industry is to attract good people to make nuclear power achieve the safe, reliable, and essential energy option it is destined to be.

U.S. ENERGY SUPPLY IN YEAR 2000 - A 1979 SUMMARY ESTIMATE AND APPRAISAL

by Daniel M. Axelrod, P.E., Consulting Engineer, 11/9/79

No.	Supply Source	1980 Energy --quads/yr=10^15 Btu/yr-----	Yr.2000 Energy --quads/yr=10^15 Btu/yr-----	Yr.2000 Quantity		Appraisal
A.	Natural Gas	20	20	20	trln cu.ft.	
1.	U.S. reserves,current, 200tcf	19	--	--	" " "	Current reserves exhausted
2.	U.S. reserves, new, 200tcf	--	15	15	" " "	Use 3/4 of new reserves estimate
3.	U.S. unconventional geology	--	3	3	" " "	Aggressive development
4.	Imported gas (Mex.,Can.,LNG)	1	2	2	" " "	Could be higher
B.	Oil	38	25	12½	miln bbl/day	
5.	U.S. reserves, current, 30B bbl	19½	--	--	" " "	Current reserves exhausted
6.	U.S. reserves, new, 40B bbl	--	10	5	" " "	Use 1/2 of new reserves estimate
7.	U.S. tertiary recovery of oil	½	5	2½	" " "	Aggressive development
8.	Imported oil (crude + products)	18	10	5	" " "	1/3 less than 1980 per US policy
C.	Coal and Oil Shale	15	41	3450	miln ton/yr	
9.	Oil shale(in-situ)(@ ½bbl/ton)	*	5	1700	" " "	Favorable economics; aggresv devel.
10.	Coal-East(elec &c)(24MMbtu/ton)	10	12	500	" " "	Moderate growth
11.	Coal-East(synfuel)(24MMbtu/ton)	--	6	250	" " "	Aggressive develop & deploy
12.	Coal-West(elec &c)(18MMbtu/ton)	5	8	450	" " "	Marked growth
13.	Coal-West(synfuel)(18MMbtu/ton)	--	10	550	" " "	Very aggressive develop & deploy
D.	Nuclear	4	25	400	miln KWelec	
14.	Fission converters (LWR, HTGR)	4	22½	363	" " "	Could be higher if politically ok
15.	Fission breeders (LMFBR,GCFBR)	--	2½	36	" " "	Aggressive development & deploy
16.	Fusion	--	*	1	" " "	Successful rushed development
E.	Non-fossil and non-nuclear	3	9			
17.	Hydroelectric	3	5	100	miln KWelec	50% increase over 1980 KWe
18.	Geothermal and solar electric	*	2.8	50	miln KWelec	Very aggressive develop & deploy
19.	Solar homes and wood heat	*	1	10	miln homes	Very aggressive deployment
20.	Biomass to alcohol fuel	*	0.2	3	biln gal.alc.	Aggressive deployment
F.	TOTAL U.S. ENERGY SUPPLY INPUT	80	120			50% increase over 1980 is a high estimate

OTHER 1979 ESTIMATES OF U.S. ENERGY SUPPLY IN YEAR 2000:

EPRI	- Electric Power Research Institute	135
DOE	- U.S. Dept. of Energy, Energy Info. Admin.	110-140
	- Harvard Business School (Stobaugh & Yergin)	100

Based on 108-132 in 1995

THE COURIER-NEWS/Thursday, June 7, 1979 A-15

Bridgewater, N.J. 08807

New Jersey's future supply of energy

The writer, a resident of West Millington, is a registered professional engineer (nuclear) and a member of the American Institute of Chemical Engineers. He has worked on fission, fusion, coal-based synthetic fuels and future energy supply studies during his 18 years with the U.S. Atomic Energy Commission, Public Service Electric & Gas Co., Exxon Engineering, United Engineers & Constructors, Foster-Wheeler Energy Corp. and as a consultant. He participated in the electric utility industry's Research and Development Task Force recommending year 2000 goals that led to the formation of the Electric Power Research Institute.

By DANIEL M. AXELROD

Energy is vital to survival as we know it.

New Jersey consumes 1 percent of total world annual energy use.

The purpose of this brief article is to summarize the world energy supply possibilities for New Jersey in the year 2000, just one generation from now. This is needed to provide an intelligent perspective for our actions now.

To discuss energy supply I will use a "unit" of one trillion Btu/year. A British thermal unit, or Btu, is the heat needed to raise one pound of water one degree Fahrenheit. In 1970, New Jersey used 2,000 "units" of energy, roughly equivalent to one million barrels (or 42 million gallons) of oil per day.

The 2,000 units were derived as follows: out-of-state oil imports — 1,300; out-of-state gas imports — 600; out-of-state coal imports — 50; nuclear fission fuels — 50. Current annual consumption is about 15 percent greater, with nuclear fission showing the largest increase as the Salem, N.J., and Peach Bottom, Pa., nuclear plants add their contribution to the Oyster Creek, N.J., plant which was operating in 1970.

The out-of-state oil comes from U.S. sources such as Texas, Louisiana and the Gulf of Mexico; from Venezuela, which is providing heavy oil for electric utility boilers; and from Middle East and Nigerian sources. U.S. oil production peaked in 1970. World oil production capability is expected to peak in the late 1980s, unless it is held to close to current levels in the early 1980s as a conservation measure. The 1973 Arab oil embargo and the 1979 oil shortfalls are early warning signs of the far more serious shortfalls of oil supply relative to increased worldwide demand to be expected in the year 2000.

The out-of-state gas comes from U.S. sources, principally by pipeline from Louisiana and the Gulf of Mexico. U.S. natural gas production peaked in 1973. Some companies propose liquefying natural gas in Algeria and importing the LNG by tanker as a supplementary gas source.

THE OIL AND GAS COMPANIES have paid more than $1 billion to the U.S. government for leases, and have spent several hundred million dollars to explore for oil and gas in the Atlantic Ocean, about 100 miles east of Atlantic City. So far they have drilled a dozen "dry" holes, and three wells with natural gas in insufficient quantity to justify a recovery program and pipeline to the New Jersey mainland.

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Coal is currently used to generate electricity for New Jersey at plants within the state and in Pennsylvania near the coal mines. Further coal-burning plants in New Jersey are currently limited by environmental regulations.

Research and development have been under way for some time to convert coal to synthetic gas and to synthetic oil — but U.S. demonstration plants will not be in operation until the mid-1980s, and commercial plants are not expected to be on line until the 1990s. Because of the ample supply of U.S. coal, and because synthetic fuel plants recover 60-70 percent of usable energy from coal (compared with only 40 percent in electric generation), coal- (and oil shale-) based synfuels will be significant replacements for oil and gas by the year 2000, and major sources of energy in the 21st century. New Jersey will import these synfuels from out-of-state plants located near the coal and oil shale deposits.

Eighteen nuclear fission plants could provide more than 1,000 units of energy. Four plants now provide electricity for New Jersey, and four more are under construction in New Jersey. Nationwide, more than 60 plants are now in operation, and about 150 are under construction or on order. New methods of using surplus heat from nuclear plants — for aquaculture, agriculture, space heat or low-temperature process heat — are essential if the full benefits of this energy source are to be realized.

One and one-half million solar homes in New Jersey could provide about 100 units of energy. There would be 500,000 new solar heated homes; 250,000 old homes retrofitted for solar heating; 330,000 new solar hot water heaters, and more than 400,000 old homes retrofitted for solar hot water. Since there are less than 1,000 solar homes now in New Jersey (mostly hot-water units), the 1½ million homes implies a massive reorientation of the New Jersey home-building and home improvement industry, and a very widespread homeowner acceptance of $5,000-$10,000 solar heat and $1,000-$2,000 solar hot-water capital costs.

SOME ADDITIONAL ENERGY could come from burning of solid waste and from converting trees to alcohol for gasahol. The former option requires extensive effort to deliver solid waste to using plants. The latter could require *one-third* (!) of the state of New Jersey land area to get the energy equivalent to the heat to one nuclear plant.

In summary, here is a possible simplified New Jersey energy box score, with numbers in trillion Btu/year "units."

Energy Source	1970	2000
A. Gas: N.J. Atlantic	—	50
A. Gas: Out-of-state imports	600	400
A. Oil: Out-of-state imports	1,300	1,000
A. Coal: Out-of-state imports	50	450
B. Nuclear fission (18 plants)	50	1,080
B. Solar homes (1½ million)	—	100
B. Solid waste and trees	—	100
A. Subtotal fossil fuels	1,950	1,950
B. Subtotal non-fossil fuels	50	1,280
• Total energy input	2,000	3,130
• Total energy output	1,800	2,000

In essence: Oil and gas out-of-state imports decrease, while New Jersey Atlantic gas and U.S. coal increase to equal the loss. Non-fossil fuel energy sources expand substantially. Although the total energy increases about 50 percent, the energy "output" usable in the year 2,000 is only 10 percent more than for 1970, because new energy sources are less efficient.

Enclosure C

AXELROD PERSPECTIVES ON THE THREE MILE ISLAND-2 ACCIDENT

by Daniel M. Axelrod, Nov. 1979

1. Three Mile Island-2 was the worst accident in nuclear power plant history.

2. The extensive damage to the core, the radiation release to the containment building, the cost of facility recovery (if possible), and the cost of replacement power -- amounting to $1-2 billion -- is a severe financial penalty to Metropolitan Edison for its deficiencies.

3. This powerful economic stimulus will provide incentive to all utilities owning nuclear power plants to upgrade their "attitudes" and commitment of resources and to expand their staffs.

4. The delay in licensing of other nuclear power plants while the analyses, findings and recommendations of TMI-2 post-accident investigations are evaluated and applied can be both a penalty of time and money but also a benefit of improved performance and safety for the nuclear industry.

5. The TMI-2 accident demonstrated the basic soundness of the design and equipment for the protection of the public health and safety and is a vindication of the AEC/NRC and nuclear industry safety consciousness and care to prevent "undue risk to the public health and safety."

6. The TMI-2 accident emphasized a transition from initial plant design to followon plant operations, and the need for greater emphasis on people related (as opposed to hardware related) aspects of nuclear safety.

7. The nuclear industry, the government and the public will all learn from the TMI-2 accident and this will mature each sector and make them better prepared to prevent and mitigate future accidents.

8. No technology is risk free. However, the forty-years of nuclear research and industrial effort, the several thousand years of nuclear navy reactor operation, and the almost five hundred years of civilian nuclear power plant operation have established the nuclear industry as one of the safest and most safety conscious of industries.

9. The benefits of nuclear power--current and potential future economic savings, security of energy supply, the value of the electricity--outweigh, by far, even the severe financial penalty of Three Mile Island. In my opinion, the actual benefits of nuclear power outweight the potential safety hazards of nuclear power and the actual safety hazards of coal electric power.

10. Nuclear power remains a necessary energy component of our current and near-term energy mix, and nuclear is an essential energy source for the future.