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COMMENTS OF OHIO CITIZENS FOR RESPONSIBLE ENERGY ('OCRE') ON PROPOSED RULE, 'EMERGENCY RESPONSE DATA SYSTEM,' 55 FED. REG. 41095 (OCTOBER 9, 1990)

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OCRE supports the issuance of this rule. The need for ERDS is well-supported and documented, and the need for rulemaking to make industry participation in ERDS mandatory rather than voluntary is well-established.

It is quite clear from the regulatory analysis that ERDS will work to the benefit of all parties involved: NRC, utilities, and the public. The NRC will benefit by having better and more timely data on plant conditions so that NRC resources can be focused on its response role. The Regulatory Analysis states that in tests of the ERDS concept, 'NRC response teams functioned more efficiently and their assessments were more timely. They noted major improvements in the ability to focus on significant factors and to predict the course of events.' Regulatory Analysis at p. 4. The licensees will benefit by being able to focus on managing the incident rather than on relaying data by voice to the NRC. The public will benefit by better use of NRC and licensee resources: 'the public in the vicinity of those units that are not part of the ERDS would be at some higher incremental risk since NRC's assistance in the case of an emergency at these plants is not likely to be as effective as it would be for plants with ERDS.' Regulatory Analysis at p. 13.

The costs of achieving these benefits are quite minimal. The NRC has been very accomodating to the industry in order to lessen the burden of ERDS. E.g., the NRC is not requiring licensees to upgrade current plant computer systems to support ERDS. One plant, Big Rock Point, was even exempted from the rule entirely. Given the great value of ERDS, with minimal impact on the industry, the proposed rule should be approved without delay.

While implementing ERDS, the NRC should reconsider a system such as the proposed Nuclear Data Link which would provide continuous information to the NRC on the status of each reactor. As beneficial as ERDS is, it does have the drawback of requiring the licensee to activate it in an emergency of ALERT level or higher. This assumes that the licensees are capable of accurately diagnosing and classifying accident conditions. Unfortunately, this has not always been the case. See Information Notice 89-72, 'Failure of Licensed Senior Operators to Classify Emergency Events Properly;' News Release 89-129, which describes deficiencies for which a $75,000 civil penalty was assessed, in the ability of operators at the Limerick plant to properly classify 'certain fast breaking severe accidents;' and a 1989 INPO report on Niagara Mohawk's

DS10

Nine Mile Point plant which identified, among other deficiencies, the failure of operating crews to properly classify a simulated general emergency (the operators improperly classified it as an alert or unusual event). In situations such as these, the ERDS, with all of its great benefits, would have been unavailable to the NRC because the licensee would not have activated it.

OCRE has enclosed as part of its comments on this rule the report of the Citizens Advisory Council on Nuclear Safety. This Council, of which the undersigned OCRE Representative is a member, was established by the State of Ohio to advise state government on measures affecting nuclear safety and emergency planning. The Council is composed of a diverse and balanced membership which includes representatives of the nuclear industry and university nuclear engineering departments as well as public interest groups. The section of the report relevant to ERDS, pp. 21-24, describes the Data Link established by the State of Ohio. While it monitors a very limited set of parameters, Ohio's Data Link does have the advantage of continuously monitoring these values and alarming on off-normal conditions. The Council recommended expanding the Data Link so that it would have access to ERDS data, and further recommended support of federal legislation to establish ERDS. The instant rulemaking, of course, obviates the need for legislation, so the ERDS rulemaking is in fact fulfulling one of the Council's recommendations. The additional parameters provided by ERDS would partially fulfil another Council recommendation: that the number of parameters monitored by the Data Link be expanded to include those plant conditions and data points that would cause entry into the EOPs or cause declaration of a General Emergency. The parameters to be monitored in ERDS are sufficient to partially satisfy this recommendation. ("Partially" because the ERDS parameters are not continuously monitored, as are the Ohio Data Link parameters.)

OCRE would urge the NRC to expeditiously issue a final rule requiring participation in ERDS for all plants.

Respectfully submitted,

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CITIZENS ADVISORY COUNCIL
ON
NUCLEAR SAFETY

RECOMMENDATIONS ON IMPROVING NUCLEAR POWER SAFETY IN OHIO

PRESENTED TO:

GOVERNOR RICHARD F. CELESTE
STATE OF OHIO

APRIL 1989

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EXECUTIVE SUMMARY

The Citizens Advisory Council on Nuclear Safety (Citizens Advisory Council, Council, CAC) was established by Governor Richard F. Celeste in August of 1987 to provide a forum to consider public concerns about nuclear safety and to advise state government on ways to improve nuclear safety in Ohio. Governor Celeste asked the Chairman of the PUCO, Thomas V. Chema, to establish the Citizens Advisory Council.

The Chief and staff of the Nuclear and Gas Pipeline Safety Division of the Consumer Services Department of the Public Utilities Commission were assigned to facilitate and to support the work of the Council. State officials from the PUCO, Emergency Management Agency (OEMA) of the Adjutant General's Office and the Department of Health (ODH), as well as academicians from Ohio Universities served the council as Technical Resource Members.

The Citizens Advisory Council developed a working mission statement to guide its work:

> *To advise the Governor, the Public Utilities Commission of Ohio, the Ohio Emergency Management Agency, and other appropriate state agencies on measures and factors affecting the safety and economics of nuclear facilities, including, but not limited to plant design, operations, management, emergency planning, public health and environmental impacts, and regulatory standards and policies.*

A series of informational programs was scheduled to support the Council in its work to review nuclear safety concerns and issues. The Facilitator worked closely with the Ohio Department of Health and the Ohio Emergency Management Agency representatives to organize and schedule informational programs designed to make the Council familiar with the institutional, governmental, and technical aspects of nuclear safety and emergency preparedness.

After a series of meetings with experts on a variety of nuclear safety matters, such as with former NRC Commissioner James K. Asselstine, OEMA, ODH, Ottawa and Lake County officials, CAC began preparations to develop a report on nuclear power safety for the Governor. A Report Development Steering Committee was formed to identify potential issues. The Steering Committee proposed a priority list of issues

for full CAC membership consideration. The following issues were accepted by consensus of the CAC:

Future Role of the CAC
Role of State and Local Government
Emergency Planning: Recovery & Reentry; Other Counties
Emergency Planning Issues
Independent Radiation Monitoring
Oversight of Nuclear Power Plants
Real and Perceived Concerns

The Steering Committee members formed Issue Subcommittees to address each of the identified issue areas and conducted workshops to explore the issue, draw conclusions and develop recommendations. Before and after each of the workshops and at the completion of the development of Issue Recommendations, each Issue Subcommittee's report status was reviewed and discussed by all the active CAC members. Prior to making the final decisions to achieve consensus on the final CAC Report and Issue Recommendations, the CAC sent copies of the available draft issue reports to the Planning Advisory Council (PAC) formerly known as the EERT Working Group, for review and comment. The CAC invited the PAC members to a meeting to discuss the draft reports to ensure that errors of fact or important omissions would be identified prior to publication of the final CAC Report.

The product of the subcommittee workshop sessions consisted of draft issue reports, authored principally by the subcommittee chairpersons. The full CAC membership considered the draft issue reports at the March 16 meeting and made a number of changes to the issue reports to reflect the general agreement of CAC membership. However, it should not be inferred that all CAC members completely agree with every issue report. The reports included herein are the result of negotiation and compromise among the CAC members. The reports reflect the agreements of the majority of CAC members.

The CAC recommends that State Government take a variety of actions to improve nuclear safety in Ohio. The CAC recommendations include:

Support for pending legislation (H.B. 111) to create the Utility Radiological Safety Board (URSB); Defining the role of state and local governments in the event of nuclear emergencies; Specific improvements to existing emergency plans; the future of the CAC; State oversight of nuclear power plants; Supporting emergency planning activities for Recovery & Reentry phases and the involvement of affected counties; Research and survey projects about public education, public risk assessment and decisionmaking; An evaluation of the state's nuclear power plant data link and a later reconsideration of an independent nuclear power plant radiation monitoring system; and, encourages nuclear utility management interaction with innovative managers and programs in other industries.

CLOSING STATEMENT

The Citizens Advisory Council finds that the Emergency Evacuation Review Team report, recommendations and implementation thereof has resulted in a significant benefit to the quality of emergency planning. The Council believes that the efforts of the EERT and the Council demonstrate that critical assessment of and public participation in emergency planning and nuclear power reactor safety issues and activities can serve to make a positive contribution to the health and safety of the public. Such efforts also serve to enhance the public understanding of these matters which is vital to informed public participation in our democratic society. However, the success of the EERT and Council efforts should not lead to complacency. Further opportunities may exist to enhance public safety and emergency preparedness. The Planning Advisory Council, the Citizens Advisory Council, and the proposed Utility Radiological Safety Board provide appropriate vehicles for realizing the benefits of these opportunities. The Council encourages the continuation of these activities.

The Citizens Advisory Council on Nuclear Safety makes the following recommendations:

ROLE OF STATE AND LOCAL GOVERNMENTS

RECOMMENDATION: Government Notification

Notifications through the Ohio State Highway Patrol and data transmission through the data link should be carefully monitored to make sure the Governor and Ohio EMA are getting proper and timely notifications.

RECOMMENDATION: Governor's Staff Involvement

Designated members of the Governor's staff should continue to work closely with the Ohio EMA to be trained and familiar with emergency operation procedures and the Ohio Plan for Radiological Emergencies.

RECOMMENDATION: Governmental Jurisdictions

Reaffirm the present concept followed in emergency planning in Ohio which is that all disaster related actions are the responsibility of the local governments and that the responsibility of the State and Federal governments is to supplement local actions, render assistance when requested, and assist in planning for all emergencies.

RECOMMENDATION: Local Government Coordination

Review the ability of local governments in the EPZs and IPZs during drills to coordinate decisions, to implement those decisions, and to identify and request assistance from State and Federal agencies when appropriate.

RECOMMENDATION: Legislation To Create URSB

Pass and implement the legislation creating the Utility Radiological Safety Board which will help State departments and agencies better coordinate their activities and programs for nuclear safety.

RECOMMENDATION: County Emergency Operation Plans

Continue to implement the writing and testing of radiological annexes to county Emergency Operation Plans (EOP) in those counties which are in the 50 mile IPZs but outside the 10 mile EPZs. Continue to develop guidance and planning for reentry and recovery phase of radiological emergency.

RECOMMENDATION: Emergency Evacuation Exercise Participation

Continue to participate in at least one full radiological exercise a year with full activation of the State EOC. Consider familiarization tours of local EPZs and facilities by members of the State EOC and tours of State EOC facilities by local emergency personnel and officials.

FUTURE ROLE OF CAC

RECOMMENDATION: The CAC To Continue

A Citizens Advisory Council on Nuclear Safety should continue to function and should advise the proposed inter-agency Ohio Utility Radiological Safety Board. If the proposed Board is not implemented, the CAC should report to the Chairman of the Public Utilities Commission of Ohio. This Council should be an independent forum for citizens to have input into nuclear power issues. The Council should have the following responsibilities:

(a) to assess the adequacy and distribution of emergency information materials and determine whether the public will be likely to follow their directions in an emergency;
(b) to solicit and receive public comment on the adequacy of nuclear power plant emergency response plans;
(c) to assess the validity of assumptions in nuclear emergency response plans as they relate to citizen response;
(d) to assess the need for additional information on retraining of special response personnel; and

(e) to make recommendations regarding citizen participation in nuclear response plan exercises.

The membership of the CAC should be appointed by the Chairman of the proposed Utility Radiological Safety Board with concurrence by other members of the Board or by the Chairman of the Public Utilities Commission of Ohio. Appointments should be made annually. The CAC would serve at the pleasure of the appointing authority. Membership should include:

(a) three citizen members, one from each of the three Ohio Emergency Planning Zones, not representing any other of the following categories;
(b) one local elected official from each of the EPZs, who participate in the development and implementation of nuclear emergency response plans;
(c) a local government employee response for nuclear plant planning;
(d) a representative of an environmental organization familiar with radiation issues;
(e) an employee of a utility operating a nuclear power facility;
(f) a psychologist or psychiatrist who specializes in the study of mass behavior;
(g) a medical expert familiar with radiation emergency procedures;
(h) a representative of an independent research facility;
(i) a representative from a department of Nuclear Engineering of an Ohio Institution;
(j) a health commissioner from one of the three EPZs; and
(k) membership could include other appointees.

The CAC should meet at least quarterly and submit a written annual report to the proposed URSB or PUCO. Support staff and reimbursement for CAC expenses only should be provided by the proposed URSB or PUCO. The proposed URSB or the PUCO should at the end of each year consider whether CAC should continue to function.

RECOMMENDATION: The CAC Mission

The future mission of the CAC should focus on public health and safety issues associated with the operation of nuclear electric utilities that are either located within the State or having Emergency Planning Zones (EPZs) within the State.

OVERSIGHT OF NUCLEAR POWER PLANTS

RECOMMENDATION: Joint Inspection Program

State employees or representing consultants should participate with the NRC in their audits and inspections as outlined in joint inspection guidelines (Policy Statement "Cooperation with States at Commercial Nuclear Power Plants and Other Nuclear Production or Utilization Facilities", 54 FR 7530) and as proposed in the pending Utility Radiological Safety Board legislation (House Bill 111).

RECOMMENDATION: Performance Indicators

The State oversight activities of nuclear power plants should use performance indicators, such as developed by Nuclear Regulation Commission and Institute of Nuclear Power Operations, comparing them to national industry averages. In addition, the State should review NRC audit and inspection reports such as the Systematic Appraisal of Licensee Performance (SALP). These reports and activities should be used as a basis for State and utility executive management reviews of plant performance and future performance goals.

RECOMMENDATION: Oversight Efficiency

State oversight should be designed to be efficient and add minimal new burdens for plant managers and staff. Accordingly, State employees or consultants should have strong training and practical experience in large scale manufacturing plants and meet the qualification requirements outlined in the NRC Policy Statement February 22, 1989, "Cooperation with States at Commercial Nuclear Power Plants

and Other Nuclear Production or Utilization Facilities", Federal Register 54 FR 7530. The State must constantly challenge itself as to whether this additional oversight program contributes to better safety.

RECOMMENDATION: Inter-Industry Cross-Pollinization

As part of the nuclear power plant review process, opportunities should be created for inter-industry cross-pollinization between the nuclear utility industry and other process industries with innovative management and maintenance programs.

INDEPENDENT RADIATION MONITORING

RECOMMENDATION: Evaluate Nuclear Power Plant Data-Link

The Ohio EMA should keep records of the frequency, causes and duration of failures in the new data link system. The State should reconsider the need for improved monitoring after six months to a year.

RECOMMENDATION: Protective Action Guides

The State should urge USEPA to publish Appendix C to EPA 520/1-75-001 as soon as possible.

EMERGENCY PLANNING

I. DATA LINK

RECOMMENDATION: Include Beaver Valley Nuclear Power Station

The State should continue trying to expand their Data Link system to include Beaver Valley information.

RECOMMENDATION: Expansion of Monitored Parameters

The State should investigate the need to increase the number of monitoring points to include parameters which could cause entry into plant Emergency Operation Procedures (EOPs) or would cause declaration of a General Emergency.

RECOMMENDATION: The NRC Emergency Response Data System

The State of Ohio should, in cooperation with the Ohio Congressional Delegation, actively promote legislation establishing a national Emergency Response Data System. Such legislation should be enacted expeditiously. However, this legislation must preserve Ohio's data link because of its real-time, continuous on-line monitoring of plant conditions which will give the earliest warning of an accident.

II. INSIGHTS FROM THE CALIFORNIA SENATE TASK FORCE

RECOMMENDATION: Availability of Evacuation Routes

The Ohio Department of Transportation, in coordination with local governments, should give careful consideration to the availability and condition of evacuation routes in the three EPZs in Ohio when planning road repair and construction activities. Maintaining adequate evacuation routes should be a top priority, and possibilities for flooding and other impediments to evacuation should be considered and corrected to the extent possible.

III. EFFECTIVENESS OF SIREN ALERTING SYSTEM

RECOMMENDATION: Siren Effectiveness

The state should conduct a comprehensive program of testing, analysis and public surveys to determine the degree of effectiveness of prompt alerting systems within the EPZs in Ohio. The program should address the following considerations:

(a) The adequacy of the siren system for alerting outdoor rural populations within 1000 feet of major roadways must be determined, since the background noise levels in such locations may be such that the 10 decibel differential is not achieved using the 60 decibel siren sound level specified in FEMA REP 10 for rural areas.

(b) Populations in industrial work environments must be altered using special means. The adequacy of these means should be verified.

(c) To determine the capability of the siren system to alert people indoors, a comprehensive and integrated program of analysis, testing and public surveys should be conducted. The objective of the program is to make a realistic finding of siren system effectiveness under a number of adverse scenarios. Such scenarios should include or assume winter conditions, when windows will be closed and storm windows in use; the effects of snowfall, heavy rains, high winds or other meteorological conditions which would diminish the propagation or detection of the siren signal; and indoor environments and human activities which represent the least chance of alert, e.g., Scenario 3 of NUREG/CR-2655 and the problem of awakening people from a deep sleep, (Harris, 23 NRC at 382). These worst-case scenarios are bounding for all other conditions. Validated analytical models must be used for determining the chance of arousal from sleep. The analytical models should give best estimate results, because they alone must be used to determine the effectiveness of the siren system at night, due to the impracticability of conducting an actual test and survey.

(d) If the analytical or public survey results indicate that the siren system will not alert more than 95% of the EPZ population in all the scenarios considered, then corrective action must be taken. This could include the addition of sirens or the distribution of tone alert radios, or some combination of the two, whichever is the most cost effective.

(e) The Harris Licensing Board took credit for the phenomena of informal alerting, which assumes that persons alerted by the sirens will voluntarily make an effort to notify their neighbors of an emergency (by means other than the telephone). The degree to which this would actually occur is highly uncertain. However, it is appropriate and beneficial to encourage informal alerting through public educational efforts or as part of the

emergency EBS messages, by suggesting that people alert their neighbors in the event of an emergency, (23 NRC at 388).

(f) Public education efforts should be made to help identify those areas of the EPZ where siren levels are deficient. People should be encouraged to call the local EMAs if they cannot hear the sirens during the regularly scheduled tests. Additional analysis or field surveys could then be performed in areas so identified, and corrective action taken if necessary. The public should be informed of the benefit and availability of tone alert radios, which individuals may wish to purchase themselves for added assurance of protection.

IV. EMERGENCY HANDBOOK REVIEW

RECOMMENDATION: CAC Review Future Handbooks

The CAC should review and evaluate the emergency information materials distributed to the public within the EPZs to ensure that they are accurate and effective in promoting public understanding of nuclear plant hazards and emergency plans and procedures.

RECOMMENDATION: Effectiveness of Handbooks

The State should conduct a public survey to ascertain the effect of public information materials and programs and assess the publics awareness and knowledge of emergency plans.

V. POTASSIUM IODIDE

RECOMMENDATION: Public Education

A public education effort should be conducted to inform the public of the benefits and risks of potassium iodide (KI) and where it may be obtained.

EMERGENCY PLANNING: Recovery & Reentry; Other Counties

RECOMMENDATION: Planning Standards Working Group

The Planning Standards Working Group should become a permanent task force at the functional level, and meet regularly to consider the status of ingestion zone and recovery and reentry planning. In this manner it would be a de facto oversight committee that would ensure effectiveness and continuous updating of Ohio's emergency response capability in the event of a serious incident or accident at those nuclear power plants in Ohio and western Pennsylvania that would affect the health and safety of Ohio residents. It would also be a useful resource for the Citizens Advisory Council if the Council continues to function in the future.

RECOMMENDATION: Enact URSB Legislation

Legislation creating the Utility Radiological Safety Board, House Bill 111, should be enacted as soon as possible.

RECOMMENDATION: Interaction with URSB

Existing members of the Planning Standards Working Group could be named as designees of cabinet members serving on the URSB. House Bill 111 provides for delegation of membership by the cabinet level members of the proposed URSB. Existing members of the Planning Standards Working Group have the experience and responsibility for dealing with radiological safety issues and emergencies and would enhance the effectiveness of the Board. They should, in cases where the cabinet level members themselves participate in board meetings, accompany the cabinet level members as resource persons or observers/advisors.

RECOMMENDATION: Risk vs. Benefit Survey

The State of Ohio should commission an authoritative study of nuclear energy. Specifically, this would be a statistical evaluation of its risks versus its benefits and a compilation of mainstream, expert thinking. Such an approach would best allow people to decide whether or not nuclear energy is a viable option for electricity production. They would not have to consider nuclear issues in a vacuum, but rather would have some perspective allowing more rational judgments.

HISTORY
OF THE
CITIZENS ADVISORY COUNCIL
ON NUCLEAR SAFETY

The Citizens Advisory Council on Nuclear Safety (Citizens Advisory Council, Council, CAC) was established by Governor Richard F. Celeste in August of 1987. Governor Celeste called for the creation of an advisory council of citizens to advise the state on nuclear power issues. This official forum allowed for nuclear safety concerns of citizens to be heard and addressed. Thomas V. Chema, Chairman of the Public Utilities Commission of Ohio (PUCO) was charged with the responsibility of creating the Citizens Advisory Council on Nuclear Safety.

Mr. Andrew Grandjean, Chief of the Nuclear and Gas Pipeline Safety Division in the Consumer Services Department of the Public Utilities Commission, was assigned as Facilitator to the Citizens Advisory Council on Nuclear Safety.

Ten citizens actively involved in taking citizen concerns to the Governor were accepted by Chairman Chema as core members. In keeping with the objectives of Governor Celeste and Chairman Chema, additional citizens were selected and appointed as members to the Council to achieve diversity of philosophical backgrounds and balanced geographic representation to create a broad-based, interest-balanced forum which could provide recommendations to state government on nuclear safety issues. This forum was designed to better meet the goals of the State by achieving a substantive exchange of views on the issue of nuclear safety. The Citizens Advisory Council on Nuclear Safety was expected to deal with issues related to emergency and evacuation planning and other safety issues to provide substantive recommendations to improve nuclear power safety in Ohio. Members of the Council are:

COUNCIL MEMBERS

* *Mr. Dale A. Baich*
Ms. Jeanne Bento
Mr. Russell Bimber
Dr. John Christenson
Mr. Mickey Donahue
Ms. Shirley Dornbusch
* *Mr. Robert Hagan*
Mr. Brian Hajek
Ms. Susan Hiatt
Mr. James Laurenson
Mr. Joel Lucia
Mr. John Mountain
Mr. Darrell Opfer
Mr. Sheldon Thorpe
Mr. Ronald Vanni
* *Dr. Thomas Webb*
* *Mr. David Williams*
Mr. Charles Wise

RESOURCE MEMBERS

Mr. Ken Cole
Mr. Steven Lesser
Dr. Floro Miraldi
Dr. David Newman
Mr. Robert Quillin
Mr. Ben Wilmoth

Support Staff

Ms. Marsha P. Ryan, Director
Mr. Andrew Grandjean PUCO
Ms. Edith Binford, PUCO
Mr. John Corven PUCO
Mr. Robert Mazampour, PUCO
Mr. Paul Shircliff, PUCO

* *Attended some meetings, but did not participate in drafting of issue reports.*

One of the first acts of the Citizens Advisory Council was to develop a working mission statement:

> *To advise the Governor, the Public Utilities Commission of Ohio, the Ohio Emergency Management Agency, and other appropriate state agencies on measures and factors affecting the Safety and Economics of Nuclear Facilities, including, but not limited to plant design, operations, management, emergency planning, public health and environmental impacts, and regulatory standards and policies.*

In an effort to support the Council in its work to examine nuclear safety concerns and issues, Mr. Grandjean and his Nuclear Safety Section Staff organized and scheduled comprehensive informational programs designed to enable the Council to make significant contributions on nuclear safety issues. The majority of program presentations were scheduled and held in conjunction with regular Council meetings. A summary of programs and activities coordinated for the CAC are described in the following sub-section entitled "Meetings and Presentations".

Growing pains are often synonymous with new endeavors. Such was the case, early on, with the Citizens Advisory Council. Clear understanding of the PUCO's desire to achieve and maintain a balance of viewpoints within the CAC was not heard by some of the interim membership of the CAC. Early attempts at self-organization were not successful. The PUCO intervened to develop that much needed and desired balance. By broadening the range of expertise, the PUCO ensured the preparation of a valid report of recommendations to Governor Celeste and state and local government.

Subsequent to the reorganization of membership, the CAC has diligently worked toward one common goal - to provide state and local government with substantive recommendations to improve or enhance nuclear power safety for all citizens in Ohio.

MEETINGS AND PRESENTATIONS

September 25, 1987 — First meeting of the Citizens Advisory Council on Nuclear Safety. Thomas V. Chema, Chairman, PUCO and Marsha Ryan, Director, PUCO, Consumer Services Department - welcomed Council members and introduced Andrew Grandjean as Facilitator to the Council. A mission statement was proposed.

Presentation: Mr. Ken Cole, Chief of Technological Hazards, Ohio Emergency Management Agency - reviewed status of the development of agreements to implement the EERT resolutions among the utilities, counties, and the state.

October 30, 1987 — Second meeting of CAC. Organizational guidelines proposed. Discussion on Council membership expansion.

Presentation: Mr. Ken Cole, OEMA - reviewed status of EERT recommendations and EERT Working Group Resolutions.

December 4, 1987 — Third meeting of CAC. Vote on proposed expansion to Council membership. Discussion on organizational guidelines.

Presentation: Mr. Andrew Grandjean, PUCO - overview on nuclear power regulatory issues. Also reviewed reports on CAC activities in other states.

Presentation: Commissioner Darrell Opfer, Ottawa County - updated CAC on Ottawa County emergency planning.

Presentation: Mr. Robert Quillin, Ohio Department of Health - Reported on the Potassium Iodide (KI) issue and the state's policy.

Presentation:	Ms. Susan Hiatt and Mr. Russell Bimber presented survey materials regarding KI availability, dosage levels, manufacturers, and pharmacists.
Presentation:	Mr. Ken Cole, OEMA - update on EERT working group progress.
January 15, 1988	Fourth meeting of the CAC. Organizational matters discussed.
April 11, 1988	Fifth meeting of the CAC. Facilitator Grandjean conducted the meeting. Greetings to the newly-appointed members to the Council. Discussion about restructuring the Council to achieve diversity of views. Discussion about organizing Council work to develop a formal report began.
Presentation:	Mr. James K. Asselstine, former Commissioner with the U.S. Nuclear Regulatory Commission - gave a presentation on: (1) The status of the industry with regard to safety since Three Mile Island; (2) The Nuclear Regulatory Commission--how it functions; its strengths and weaknesses; and (3) What the state's role with regard to nuclear safety should be.
April 20, 1988	CAC members and PUCO staff attended the emergency evacuation "dry run" exercise for the PNPP as observers.
May 4, 1988	CAC members and PUCO Staff attended the emergency evacuation "full-participation exercise" for the PNPP as observers.
July 27, 1988	Sixth meeting of the CAC. Meeting held at the headquarters of the Ohio Emergency Management Agency. Council members toured OEMA facilities hosted by Mr. Dale Shipley, Director of EMA and his staff. Steering Committee consisting of volunteering Council members organized to begin work on development of the Council Report.

Presentation:	Mr. Ken Cole and Mr. Larry Grove, Radiological Program Supervisor for OEMA reported on the EERT issues status, proposed computer link to provide direct information on Ohio's nuclear reactors, Emergency Team responsibilities, activities, and objectives.
Presentation:	Mr. Dan Bement, Acting Branch Chief of Technological Hazards at FEMA Region 5 located in Chicago, Illinois - discussed FEMA's evaluation of the Perry Nuclear Power Plant emergency exercise held May 4, 1988.
September 9, 1988	First meeting of the CAC Report Steering Committee convened in Medina, Ohio to discuss potential report issues.
October 6, 1988	Second meeting of the CAC Report Steering Committee to decide on potential issues for full membership consideration.
October 28, 1988	Seventh meeting of the CAC. Meeting held at Case Western Reserve Medical School, Cleveland, Ohio. First workshop session held to decide on proposed issues and issue chairpersons.
Presentation:	Dr. Floro Miraldi, Director, Division of Nuclear Radiology for University Hospital of Cleveland - discussed "Health Effects of Exposure to Low Level Radiation".
Presentation:	Mr. Robert Quillin, Ohio Department of Health - discussed "Radiation Health Programs".
Presentation:	Mr. Russell Bimber, Member of the American Chemical Society - demonstrated various types of radiation monitoring instruments.

December 14, 1988 — Eighth meeting of the CAC. Issues workshop sessions in preparation for the final report. Update by Facilitator Grandjean on the Reed Report. Review progress, and the proposed establishment of an Inter-agency Utility Radiological Safety Board. Input from CAC on these were solicited for consideration.

Presentation: American Nuclear Society - sponsored presentation by various radiation monitoring equipment manufacturers on the variety of monitoring equipment currently available.

January 13, 1989 — Ninth meeting of the CAC. Issues workshop session in preparation for the final report.

January 24, 1989 — Special meeting presentation for CAC members and the PUCO on the OSU Review of the 1975 G.E. Reed Report.

February 10, 1989 — Tenth meeting of the CAC. Issues workshop session in preparation for the final report.

Presentation: Mr. Larry Grove, OEMA - demonstrated the computer data link, on line at the OEMA and now at the PUCO, to monitor Davis-Besse and Perry Nuclear Power Plant activities.

February 23, 1989 — Eleventh meeting of the CAC. Full Council review of the draft issues for the final report.

March 16, 1989 — Full Council review of all issue reports prepared for inclusion in the CAC Recommendation Report. Comments about the CAC draft issue reports were invited and considered by the Council from the Ohio Emergency Management Agency, the Ohio Department of Health, and the Planning Advisory Council.

ISSUE REPORTS

INTRODUCTION TO ISSUE REPORTS

At the April 11, 1988 Citizens Advisory Council meeting, the CAC began to discuss the plan for developing a Recommendation Report to the Governor. This report was conceived to outline the work of the Council and make recommendations for improvements in three possible areas; (1) Public Education, (2) Reactor Safety, (3) Role of State in Nuclear Safety. The Council agreed to form a Steering Committee to discuss, refine and identify issues. Ms. Susan Hiatt, Mr. Russell Bimber, Mr. Sheldon Thorpe and Mr. Darrell Opfer volunteered to serve as the Steering Committee. Members of Council offered issues and suggestions for the report. A list of potential items was compiled for the Steering Committee to work with to choose a "priority" list of issues to include in the report. The initial issue list included the following:

a. *Radon - Public Education*
b. *Radioactive Materials - Health Hazards*
c. *Health Effects of Ionizing Radiation*
d. *Siren Testing*
e. *Emergency Information Handbook/CAC Review*
f. *Review of EERT Issues*
   - *bus drivers*
   - *location of receiving schools*
g. *Potassium Iodide*
h. *EERT #2 and #5 - CAC Review*
i. *Nuclear Power Plant Maintenance*
j. *Whistleblower/Investigation Service*
k. *Severe Accident Reduction Methods (design modifications)*
l. *Protective Action Guide Reconsider/Complete*
m. *Independent Radiation Monitoring*
n. *Potassium Iodide Host Strategy*
o. *Role of State/Local Government*
p. *Future Role of Citizens Advisory Council*
q. *Utility Management/Performance Monitoring*
r. *Nuclear Power Plant Reliability*
s. *Medical Response*

After two meetings the Report Steering Committee selected and proposed five issues for the CAC Report for Council members consideration. The Steering Committee members also offered to chair each issue subcommittee. The issue areas proposed for inclusion in the CAC Report and the chairperson of each issue subcommittee were:

ROLE OF STATE/LOCAL GOVERNMENT; FUTURE ROLE OF CAC
D. Opfer, Chair

EMERGENCY PLANNING: RECOVERY & REENTRY; OTHER COUNTIES
D. Opfer, Chair

EMERGENCY PLANNING ISSUES
S. Hiatt, Chair
- *Protective Action Guide*
- *Data Link*
- *School Location*
- *Medical Response*
- *Siren Testing*
- *Potassium Iodide (K.I.)*
- *Emergency Information Handbook*

INDEPENDENT RADIATION MONITORING
R. Bimber, Chair

OVERSIGHT OF NUCLEAR POWER PLANTS
S. Thorpe, Chair

These five issue areas were reviewed at the seventh CAC meeting at Case Western Reserve and accepted by the Council. One additional issue, "Real Concerns and Perceived Concerns", was offered by R. Vanek who also offered to chair this issue subcommittee. The final organization of the issue areas and the membership division into subcommittees is listed below.

ROLE OF STATE/LOCAL GOVERNMENT; FUTURE ROLE OF CAC
Darrell Opfer, Chair
John Mountain
Jeanne Bento
Brian Hajek
Shirley Dornbusch
John Christenson

EMERGENCY PLANNING: RECOVERY & REENTRY; OTHER COUNTIES
John Mountain, Chair
Darrell Opfer
Jeanne Bento
Brian Hajek
Shirley Dornbusch
John Christenson

EMERGENCY PLANNING
Susan Hiatt, Chair
Russell Bimber
Joel Lucia
John Mountain

INDEPENDENT RADIATION MONITORING
Russell Bimber, Chair
Susan Hiatt
Joel Lucia
John Mountain
Mickey Donahue

OVERSIGHT OF NUCLEAR POWER PLANTS
Sheldon Thorpe, Chair
Ronald Vanek
Russell Bimber
Mickey Donahue
James Laurenson

REAL CONCERNS AND PERCEIVED CONCERNS
Ronald Vanek, Chair
Sheldon Thorpe
Russell Bimber
James Laurenson

The next three CAC meetings were conducted as workshop sessions where the Council divided into issue subcommittees to discuss the development of their issue recommendations for the draft reports. Upon completion of a draft report, the subcommittee reported and forwarded the draft to the full Council. Members of Council had an opportunity to review available drafts to make suggestions for additions, deletions or changes. At the final two meetings, February 23 and March 16, the full CAC reviewed and discussed the issue report drafts to prepare the final report. Representatives of the Ohio Emergency Management Agency and Ohio Department of Health were available at all scheduled meetings for resource information and to respond to questions relating to their agency's jurisdiction.

The issue reports contain a background or discussion of the issues and conclusions or findings that were drawn about an issue. From these, the Citizens Advisory Council recommends actions that the State should take to help improve the safety of nuclear power in Ohio. A complete list of the recommendations is included in the Executive Summary. Additional information about some of the issues can be found in the Appendix. The first issues to be presented are the Role of State/Local Government and Future Role of the Citizens Advisory Council. These lead into the issues of Oversight of Nuclear Power Plants and Independent Radiation

Radiation Monitoring. The next topics to be presented are the Emergency Planning Issues, Recovery and Reentry, and Real and Perceived Concerns.

ROLE OF STATE AND LOCAL GOVERNMENT

ROLE OF THE STATE AND LOCAL GOVERNMENT

The EERT suggested a need for improved notification of state agencies when events which could lead to more serious problems occur at Ohio nuclear power plants. As part of the resolution of EERT issues #2 and #5, a computerized data link system has been installed by which the Ohio Emergency Management Agency monitors key operating systems and functions at Davis-Besse and Perry power stations on a twenty-four hour basis. Procedures are now in place to notify the Governor's staff of any major problems noted by the person monitoring the data link or through the required direct notification of the Ohio EMA by the Ohio State Highway Patrol. Updating of the Governor's staff and the Governor will be accomplished by the Ohio EMA upon the declaration of an Unusual Event.

RECOMMENDATION ONE

Notifications through the Ohio State Highway Patrol and data transmission through the data link should be carefully monitored to make sure the Governor and Ohio EMA are getting the proper and timely notifications.

RECOMMENDATION TWO

Designated members of the Governor's staff should continue to work closely with the Ohio EMA to be trained and familiar with emergency operating procedures and the Ohio Plan for Radiological Emergencies.

The State Radiological Plan has established a coordination arrangement outlining the responsibilities of the utility, state government and its agencies, and local government and their agencies. No evidence has been presented to suggest that this arrangement has not or cannot work in drills or actual emergencies. A review of FEMA and NRC evaluations of drills at Ohio nuclear plants will show that county officials have had no problems coordinating and making decisions between counties. Communication networks are in place to allow consultation and

exchange of information between counties in the Evacuation Plan Zones (EPZs) at all stages of an emergency. A communication system to incorporate those counties in the 50 mile Ingestion Pathway Zones (IPZs) is being developed and will be tested during the August Davis-Besse drill.

The Chairman of the CAC Role of Government/Role of CAC Subcommittee invited County Commissioners and county emergency planning officials to meet to achieve a unanimous agreement to EERT Issue #12, "the Role of the State". This issue was not completely resolved through the EERT Working Group efforts. Ottawa County Commissioner Darrell Opfer chaired the meeting and led the discussion among county commissioners, planners, OEMA and PUCO representatives to forge unanimous agreement on new language to resolve this outstanding EERT Issue.

The proposed statement of the resolution developed at this meeting has been circulated to the counties and is restated here.

> *EERT RECOMMENDATION: The plan should be altered to make the State the principal point of contact and responsible for making emergency response decisions.*
>
> *RESOLUTION: The Governor is included in the decision making process at the Unusual Event stage. A coordination arrangement has been developed through the Radiological Emergency Plan whereby the State, with its sovereign powers for health and safety, will be closely involved in recommending actions to be implemented by county government.*
>
> *The State will monitor and coordinate State response activities when the State Emergency Operations Center is operational and will continue to work with its counties to implement maximum protection for the residents.*
>
> *This entire concept is in keeping with the State role for any major disaster: flood, tornado, chemical hazard or nuclear incident.*

The 1984 Public Officials Handbook published by the Ohio Disaster Services Agency, states this relationship very clearly on page I-1, Par II:

> *Although State assistance can be made available to elements of local government for assistance during a disaster or imminent disaster, it should be stressed that the responsibility for all disaster related actions*

lies with the executive head of local government. Before State assistance can be rendered, the head of local government must assure the Governor that all of his resources have been expended and that State assistance is mandatory to protect the life and health of the people. . . All actions required and taken during a disaster are the responsibility of local government officials. Any assistance rendered by the State or Federal government is a supplement to local government actions and its not . . nded to replace or assume any of the local government responsibilities.

RECOMMENDATION THREE

Reaffirm the present concept followed in emergency planning in Ohio which is that all disaster related actions are the responsibility of the local governments and that the responsibility of the State and Federal governments is to supplement local actions, render assistance when requested, and assist in planning for all emergencies.

RECOMMENDATION FOUR

Review the ability of local governments in the EPZs and IPZs during drills to coordinate the making of necessary decisions, to implement those decisions, and to identify and request assistance from State and Federal agencies when appropriate.

RECOMMENDATION FIVE

Pass and implement the legislation creating a Utility Radiological Safety Board which will help State Departments and Agencies better coordinate their activities and programs for nuclear safety.

RECOMMENDATION SIX

Continue to implement the writing and testing of radiological annexes to county Emergency Operation Plans (EOPs) in those counties which are in the 50 mile IPZs

but outside the 10 mile EPZs. Continue to develop guidance and planning for reentry and recovery phase of a radiological emergency.

RECOMMENDATION SEVEN

Continue to participate in at least one full radiological exercise a year with full activation of the State EOC. Consider familiarization tours of local EPZs and facilities by members of the State EOC and tours of State EOC facilities by local emergency personnel and officials.

FUTURE ROLE OF THE CITIZENS ADVISORY COUNCIL ON NUCLEAR SAFETY

FUTURE ROLE OF THE CAC

The Chernobyl accident and Northeast Ohio earthquake of 1986 are usually cited as major factors which have raised public awareness and concern about the safety of operations at Ohio's nuclear power plants. The Governor and Attorney General, responding to the public concern about the adequacy of the Ohio Plan for Response to Radiation Emergencies at Licensed Nuclear Facilities, instituted a series of extraordinary measures including:

(1) On August 15, 1986 the Governor withdrew support for the evacuation plans for the Perry and Davis-Besse power plants after several letters had been sent to the Nuclear Regulatory Commission requesting an investigation of the adequacy of Perry's seismic design and Davis-Besse safety standards.

(2) In August, 1986 the Governor directed Thomas Chema, Public Utilities Commission of Ohio Chairman; Raymond Galloway, then Adjutant General; and William Denihan, Director of Highway Safety to conduct a study of the adequacy of the Ohio Plan. The Emergency Evacuation Review Team (EERT) report was completed January 7, 1987 and concluded that "current response plans for Ohio's nuclear plants are inadequate to protect the public."

(3) In September, 1986, the Governor requested the Attorney General to intervene in the Perry licensing proceedings before the Nuclear Regulatory Commission insisting that the plant not be permitted to operate above the 5% power level until the Ohio Plan could be more thoroughly reviewed. The NRC denied the petition on the ground of untimeliness.

(4) On October 27, 1986 the Attorney General asked the NRC to suspend the operating license at the Davis-Besse Power Station and jointly with the Toledo Coalition for Safety Energy filed petitions under 10 C.F.R. 2.206 charging emergency plans were inadequate. After denial of the petition, the State filed in the Sixth Circuit U.S. Court of Appeals against the NRC's

denial of the States petition to suspend the license. The appeal was ultimately denied.

(5) A similar petition was filed on November 7, 1986 appealing to the Sixth Circuit Court an NRC decision to authorize a full power license for Perry. The petition was denied and the license issued.

(6) From January to October, 1987, representatives of Toledo Edison and Cleveland Electric Illuminating, County Emergency Management Directors, Ohio Emergency Management Agency, Ohio Department of Health and PUCO worked diligently to implement the Ohio Plan based on recommendations made by the EERT. This included the installation of a data link computer monitoring system to provide Ohio EMA with the capability to monitor meteorological, radiological and plant performance data from the Perry and Davis-Besse nuclear power plants.

(7) On August 7, 1987 the Governor announced the PUCO Chairman would establish a Citizens Advisory Council on Nuclear Safety to monitor a range of nuclear issues and to provide public involvement and advice regarding the issues of nuclear plant safety. The Governor also requested the hiring of an independent consultant to review the 1975 General Electric document known as the Reed Report to determine if safety issues raised in that report had been satisfactorily resolved. After a rather stormy beginning, the CAC reviewed the progress being made on the EERT issues as well as many other nuclear issues.

Why were such extraordinary measures deemed necessary? How can Ohio avoid having to use similar legal and administrative processes again?

CONCLUSION

A major factor which could have strengthened the Ohio Plan is early constructive citizen input. The Ohio Plan and individual county plans were developed according to Federal Emergency Management Agency guidelines. They are tested regularly and revised with new guidance provided by the NRC and FEMA and

input from local officials, drill participants, industry off site emergency departments and State agencies. There was, however, little citizen involvement in issues such as the development of emergency information materials. There was a lack of awareness or reluctance by handicapped persons of the need to identify themselves and their special needs prior to a real emergency. Although not in the majority, there were some persons assigned responsibilities during an emergency scenario who had been given little training or input as to performance of their duties.

The CAC believes another factor which would contribute to a stronger Ohio Plan would be an increase in positive communications and a reduction in confrontation and mistrust between citizens, the nuclear industry and local, state and federal agencies. Lack of communication and direction has kept state agencies from resolving for several years the question about issuance and taking of radioprotective drugs by emergency workers and the public. Lack of federal guidance for recovery and reentry activities after a radioactive release was blamed by state and local agencies for a lack of planning for post accident activities and planning for the 50 mile ingestion zone. Letters to the editor and statements by some citizens tried to blame the nuclear industry for unrelated medical problems.

Although many of the above problems have been addressed by the EERT working group and much progress has been made in resolving the EERT issues, the CAC believes there is continuing need for a mechanism in which citizen, academic, industry and government representatives can be brought together to broaden their individual and group perspectives and build a network of communication and understanding. There must be established a method for exchanging and testing information and ideas.

Active citizen involvement should result in decisions made by government and industry based on more complete information including a variety of social political and economic factors. Active citizen involvement could apply constructive political pressures and hold government and industry accountable for proper planning and testing of nuclear plant evacuation plans. The involvement of citizens should also increase public confidence in the evacuation plans.

RECOMMENDATION ONE

A Citizens Advisory Council on Nuclear Safety should continue to function and should advise the proposed inter-agency Ohio Utility Radiological Safety Board. If the proposed Board is not implemented, the CAC should report to the Chairman of the PUCO. This Council should be an independent forum for citizens to have input into nuclear power issues. The Council should have the following responsibilities:

(a) to assess the adequacy and distribution of emergency information materials and determine whether the public will be likely to follow their directions in an emergency.
(b) to solicit and receive public comment on the adequacy of nuclear power plant emergency response plans.
(c) to assess the validity of assumptions in nuclear emergency response plans as they relate to citizen response.
(d) to assess the need for additional information on retraining of special response personnel.
(e) to make recommendations regarding citizen participation in nuclear response plan exercises.

The membership of the CAC should be appointed by the Chairman of the proposed Utility Radiological Safety Board with concurrence by other members of the Board or Chairman of the PUCO. Appointments should be made annually. The CAC would serve at the pleasure of the appointing authority. Membership should include:

(a) three citizen members, one from each of the three Ohio Emergency Planning Zones, not representing any other of the following categories:
(b) three local elected officials, one from each EPZ, who participate in the development and implementation of nuclear emergency response plans.
(c) a local government employee responsible for nuclear plant planning.
(d) a representative of an environmental organization familiar with radiation issues.
(e) an employee of a utility operating a nuclear power facility.
(f) a psychologist or psychiatrist who specializes in the study of mass behavior.

(g) a medical expert familiar with radiation emergency procedures.
(h) a representative of an independent research facility.
(i) a representative from a Department of Nuclear Engineering of an Ohio Institution.
(j) a health commissioner from one of the three EPZs.
(k) membership could include other appointees.

The CAC should meet at least quarterly and make a written annual report to the proposed Utility Radiological Safety Board or the Public Utilities Commission. Support staff and reimbursement for CAC expenses only should be provided by the proposed Board or PUCO. The proposed URSB or the PUCO should at the end of each year consider the question of whether CAC should continue to function in the following year.

CONCLUSION

The Council has carefully considered whether the future activities of the CAC should be broadened to include public health nuclear safety issues generated by the DOE facilities located in the State of Ohio. The Council realizes that such facilities have associated with them important public safety issues, but it feels that these issues would be better addressed by a separate citizens council rather than by the CAC.

The Council also looked at the following considerations:

(1) The current CAC is operating under the authority of the PUCO, a state agency which has clear mandate to address the public policy aspects of nuclear electric utility operations.
(2) PUCO authority to address the public policy aspects of DOE facilities within the state does not exist. It appears that the state agency that will have the primary responsibility in this area will be the Ohio EPA. Under these circumstances it appears that the appropriate appointing authority for a citizen council addressing public safety issues associated with DOE facilities is the Ohio EPA.

(3) Many of the important public safety issues associated with DOE facilities involve chemical rather than radioactive hazards.

(4) Historically, during the past 12 months the CAC has concerned itself almost exclusively with nuclear electric utility public safety issues. It does not seem to be desirable to dilute the Council's interest and expertise.

RECOMMENDATION TWO

The future mission of the CAC should focus on public health and safety issues associated with the operation of nuclear electric utilities that are either located within the state or have Emergency Planning Zones within the state.

OVERSIGHT OF NUCLEAR POWER PLANTS

OVERSIGHT OF NUCLEAR POWER PLANTS

Reviews of existing, well-defined Performance Indicators for each of the Ohio plants seem to be one acceptable method as part of State oversight of nuclear power plants. Ten indicators have been developed by the Institute of Nuclear Power Operations (Appendix A), and others are under development. The Nuclear Regulatory Commission uses seven Performance Indicators and is developing others. Comparison of nuclear plants serving Ohio with national average statistics for similar plants, and with the industry in general, should provide useful insights. Performance Indicators should be used in conjunction with informal discussions with executive plant management to review past performance and goals for the future. Regular reviews of NRC reports such as the Systematic Appraisal of Licensee Performance (SALP), and the reports that form the database for the SALP, are another important means of State oversight.

Numerous other indicators and factors were considered for possible inclusion in the "oversight" category. The subcommittee discussed these additional indicators and rejected them because they are too subject to forces outside the control of utility management. Further, and most importantly, these are mostly covered in established collective bargaining agreements at each utility; State involvement in reviews of these would be a highly undesirable intrusion into the labor/management relation.

Participation by key State employees or consultants in NRC audits and/or plant inspections could be very informative and helpful in understanding the NRC Performance Indicators and inspection reports. Those representing the State in joint inspections or analyzing the data from reports must have strong training and practical experience in large scale manufacturing plants. Graduate scientists or engineers would be a plus. The NRC issued a Final Policy Statement on February 22, 1989, Federal Register 54 FR 7530, "Cooperation with States at Commercial Nuclear Power Plants and Other Nuclear Production or Utilization Facilities" which provides guidelines for qualifications of State personnel. State representatives participating in NRC programs should be at least as qualified as the minimum requirements stated by the NRC. Such training and experience are vital for balanced interpretations of the findings from audits and inspections. It can also

significantly improve the effectiveness of communications with utility staff. The Council believes that strong technical professionalism should be a top priority for those representing the State.

Another way to contribute constructively during such appraisals would be to include highly experienced managers of innovative programs at other process industries. Proctor and Gamble, Goodyear and BP America are companies that are leaders in innovative plant management and maintenance. They may be able to contribute constructive ideas or insights to key utility personnel.

The subcommittee considered PUCO staff suggestions to review and consider using the NRC Proposed Rulemaking on Maintenance Standards published November 28, 1988, Federal Register 53 FR 47822. These proposed NRC changes to 10 CFR 50 and the findings in NUREG-1212 are considered by a number of prominent nuclear engineering leaders to be highly controversial and grossly excessive. Litigation may occur between the Nuclear Management and Resource Council and the NRC over these. Finally, the subcommittee simply did not have time to digest and evaluate the very lengthy supporting documents furnished by the NRC via PUCO. In light of these, the subcommittee recommends no action on the proposed maintenance standards and evaluation for the Ohio plants. When and if the NRC proposed rules are accepted, or supported by court action, it will be appropriate for the State to reconsider its involvement pertaining to them. Even then, State involvement in maintenance standards and appraisals runs a strong risk of duplicating a future NRC program, which would be highly undesirable.

The subcommittee included people with extensive experience in process and power plant construction, operation and maintenance. A profound concern was voiced in that this new State oversight may prove to be a significant additional burden for already busy plant managers and staff members. The NRC already maintains a comprehensive program, how much more is truly justified by the State. Those involved in this State program must constantly challenge themselves as to whether or not their appraisals truly contribute to better safety.

RECOMMENDATION ONE

State employees or their consultants should participate with the NRC in their audits and inspections as outlined in joint inspection guidelines (Policy Statement "Cooperation with States at Commercial Nuclear Power Plants and other Nuclear Production or Utilization Facilities," 54 FR 7530) and as proposed in the pending Utility Radiological Safety Board legislation (House Bill 111).

RECOMMENDATION TWO

The State oversight activities of nuclear power plants should use performance indicators, such as developed by NRC and INPO, comparing them to national industry averages. In addition, the State should review NRC audit and inspection reports such as the Systematic Appraisal of Licensee Performance (SALP). These reports and activities should be used as a basis for State and utility executive management review of plant performance and future performance goals.

RECOMMENDATION THREE

State oversight should be designed to be efficient and add minimal new burdens for plant managers and staff. Accordingly, State employees or consultants should have strong training and practical experience in large scale manufacturing plants and meet the qualification requirements outlined in the NRC Policy Statement February 22, 1989, "Cooperation with States at Commercial Nuclear Power Plants and Other Nuclear Production or Utilization Facilities", Federal Register 54 FR 7530. The State must constantly challenge itself as to whether this additional oversight program contributes to better safety.

RECOMMENDATION FOUR

As part of the nuclear power plant review process, opportunities should be created for inter-industry cross-pollinization between the nuclear utility industry and other process industries with innovative management and maintenance programs.

INDEPENDENT RADIATION MONITORING

INDEPENDENT RADIATION MONITORING

Instantaneous, real-time radiation monitoring can assure prompt warning of any incident which requires an off-site response to reduce the probability of injury. Secondarily, it may help estimate the extent of any exposures which might occur. On-site monitoring systems should provide the earliest detection and most accurate information on any major release. We applaud Ohio's Emergency Evacuation Review Team for facilitating sharing of this data from Davis-Besse and Perry.

We must be sure that exposures in excess of the limits set by prior federal law (10 CFR 20.105) are properly justified, so the monitoring will pay attention to the correct levels. Hence, we must insist that USEPA publish Appendix C to EPA 520/1-75-001, which was published in 1975, ("Protective Action Guides," Appendix B).

It is unwise to depend entirely on any one monitoring system, especially one which monitors only the most likely release points, to provide a warning. With the new data link system, we no longer depend on a single observer.

A federal interagency task force provided substantial early guidance to state and local governments in this area in a publication entitled "Interim Guidance on Off-Site Radiation Measurement Systems", NRC, August 1977. The recent TMI Public Health Fund Report, "A Radiation Monitoring System for Nuclear Power Plants", December, 1987, deals with the need for improved monitoring. We share its concerns about radioactivity escaping via currently unmonitored pathways, and improving credibility by sharing data and perhaps including public participation in the monitoring process.

Maine has provided for public participation. On June 29, 1987, the Governor of Maine approved a law establishing a continuous radiation monitoring system around commercial nuclear power facilities; it includes making portable monitoring devices available to volunteer monitors. Maine Yankee was assessed to finance 45 monitors like the Citizens Monitoring Network has been using and 16 more sophisticated monitors which cost $165,000.

We have considered possible ways of independent monitoring, and are grateful to those vendors who displayed their wares for us. Concern about electric rates requires a cost-benefit approach to improved monitoring. Some possibilities are:

(a) A full time system of gamma radiation monitors on the perimeter of the plant such as commercial pressurized ion chambers, with up to sixteen monitors, costing up to $200,000. Annual maintenance would add about $17,000 per year.

(b) Adding a smaller number of gamma monitors to the systems where computer links to government EOCs already exist. Pressurized ion chambers cost about $7500 each, plus installation. These might preclude unmonitored releases and give additional data at little cost.

(c) Mobile monitoring teams. Those such as Lake County has do not provide full-time monitoring capability. The cost of teams operating around the clock would be much greater than fixed location electronic monitors. Their main value is in confirming the plume location after an emergency has already been detected.

(d) A citizens monitoring network, analogous to Maine's. The detectors used in this network would be in protected locations in homes or business places near the plants; they need not be the expensive rugged construction like most professional equipment. Detectors coupled to a phone dialer could provide a local visual indication of radiation levels and provide full-time coverage. The equipment might be signed out to nearby residents, e.g. those within five miles, by the Ohio Resident Radiological Analysts, or the local EMAs or Health Departments.

Any high radiation levels detected would initiate closer scrutiny of other data. It might also cause monitoring teams to be sent out.

RECOMMENDATION ONE

The Ohio EMA should keep records of the frequency, causes, and duration of failures in the new data link system. The State should reconsider the need for improved monitoring after six months to a year.

RECOMMENDATION TWO

Ohio should urge USEPA to publish Appendix C to EPA 520/1-75-001 as soon as possible.

EMERGENCY PLANNING

I. Data Link System
II. Insights from California Senate Task Force Report
III. Effectiveness of Siren Alerting Systems
IV. Emergency Information Handbook Review
V. Potassium Iodide as a Thyroid Blocking Agent

I. DATA LINK SYSTEM

The Emergency Evacuation Review Team found the emergency plans to be seriously flawed in the area of timely notification of government authorities. Timely and accurate notification of government authorities of plant conditions in the event of an accident is the essential first step in establishing the appropriate emergency response. The EERT found that:

> *The plan contains no provisions for providing State officials with a source of independent information about radiation releases from nuclear reactors.... While the current plan includes some criteria for determining appropriate off-site emergency actions, it does not give state authorities the ability to assess changes in reactor conditions and decide earlier, by referring to established thresholds, if a particular emergency response may be appropriate. Both these problems--lack of timely notification and inaccurate classification of a problem--occurred during the accident at Davis-Besse on June 9, 1985. While lives were not directly threatened on this occasion, delays in providing information, and misinformation, could prevent the quick responses necessary to protect the public, (EERT Report, 11-12).*

Based upon these findings, the EERT made two recommendations:

EERT Issue #2: Monitoring System: A radiation monitoring system should be established to provide the state with independent information on radiation releases in the vicinity of the plants.

EERT Issue #5: Communication Link: A direct computer link should be created between the State and the nuclear facilities' control rooms to provide the State with direct information about reactor conditions. The plan should be amended to include the identification of thresholds in various accident sequences which, when exceeded, would trigger specific emergency response actions. This would help reduce uncertainty and potential delay in responding and provide a greater margin of safety for the public in case an evacuation were required.

The Ohio Emergency Management Agency has addressed these recommendations. EMA has established a computer data link system which will continuously monitor certain plant parameters, meteorological data, and plant radioactive effluents at Perry and Davis-Besse. A list of the specific data points being monitored is in Appendix C. The system will alarm if the parameters exceed established set points, thereby providing early notification of plant off-normal conditions. This system is a vast improvement over the previous situation of relying entirely on utility reporting of accident conditions and represents a significant enhancement of emergency response capability for protecting the public.

However, it is apparent that some further additions and improvements could greatly promote the system's usefulness in accident assessment and emergency response management. The most serious omission is that the Beaver Valley plants, located very close to the Ohio-Pennsylvania border, are not part of the system. The people living within the portion of the Beaver Valley plume EPZ located in Ohio are entitled to the same level of protection as those living near Perry and Davis-Besse.

The number of data points for reactor and containment conditions is quite limited. For Perry, only four such points are monitored: reactor power, reactor water level, reactor pressure, and containment pressure. Six such points are monitored at Davis-Besse, one of which is containment radiation level, which should be monitored at Perry as well.

Additional parameters should be monitored to give state/local officials more complete information during an accident situation. These should include those plant conditions and data points which either will cause entry into plant Emergency Operation Procedures (EOPs) or would cause declaration of a General Emergency.

The system is also vulnerable to disruptions caused by failure of plant computers through which the data is transmitted. The CAC observed one such failure for Perry at the data link demonstration at the February 10, 1989 meeting. The plant computers are not safety-related and thus are not designed and built to withstand severe phenomena, such as earthquakes, and are not designed and built in accordance with a formal quality assurance program in accordance with 10 CFR 50 Appendix B. The data link will also not function during a station blackout, as power

to the computers in the plants will be lost. Unfortunately, this scenario dominates risk in the BWR/6. NUREG-1150, the NRC's Reactor Risk Reference Document, found that station blackout contributes 99% of the risk for Grand Gulf, which is a BWR/6 with a Mark III containment like Perry.

Fortunately Ohio's data link system does have the capability for expansion to interface with the national Emergency Response Data System (ERDS) which has been proposed. In the 100th Congress, a bill, H.R. 1570, was introduced which would have established a national Emergency Response Data System, which would enable the NRC to monitor plant parameters at any U.S. nuclear power reactor during an accident. Although this measure passed the House of Representatives, it was rejected by the Senate. Because this bill had some unfavorable provisions, the worst of which would have pre-empted Ohio's data link, it is fortunate that it failed to pass. However, a national Emergency Response Data System, to which the states would have access, should be established. It is likely that legislation to this effect will be considered in the 101st Congress.

Ohio's data link is superior to that proposed in H.R. 1570 in that in Ohio, the plant parameters, radiation releases, and meteorological data are monitored continuously for off-normal conditions which could signal the onset of an accident. The H.R. 1570 ERDS would only be activated after a licensee declared an emergency. For this reason, it is imperative that any new legislation establishing ERDS specifically permit Ohio's datalink system to continue to operate, while enabling it to have access to additional data provided by ERDS. It is especially important that Ohio have access to data from Beaver Valley, even though the plants are located in Pennsylvania, because part of the plume EPZ is located in Ohio.

RECOMMENDATION ONE

The State should continue trying to expand their Data Link system to include Beaver Valley information.

RECOMMENDATION TWO

The State should investigate the need to increase the number of monitoring points to include those that will cause entry into plant Emergency Operation Procedures (EOPs) or would cause declaration of a General Emergency.

RECOMMENDATION THREE

The State, in cooperation with the Ohio Congressional Delegation, should actively promote legislation establishing a national ERDS. Such legislation should be enacted expeditiously. However, this legislation must preserve Ohio's Data Link because of its continuous, real-time on line monitoring of plant conditions which give the earliest warning of an accident.

II. INSIGHTS FROM CALIFORNIA SENATE TASK FORCE REPORT

The Citizens Advisory Council has reviewed a report titled "Senate Task Force on California Nuclear Emergency Response", dated April 1988. This report was prepared by a special task force established by the California State Senate as a result of the Chernobyl accident. The task force was charged with examining California's emergency response capability in the event of a major nuclear accident. The task force made 31 recommendations on all facets of emergency planning, including medical response, emergency response management, and public education and information.

The CAC finds that most of the recommendations, where applicable to Ohio, have been addressed or will be incorporated in emergency planning efforts by the Ohio Emergency Management Agency, the Emergency Evacuation Review Team, and the activities of the Citizens Advisory Council. However, one series of recommendations which dealt with evacuation routes deserve further consideration. The specific recommendations are:

> *The Task Force recommends that the state and local law enforcement traffic flow plans for the EPZs and surrounding areas take into account the possibilities for flooding and other impediments to evacuation. These agencies should also designate alternative routes in the event primary routes are not passable.*
>
> *The Task Force recommends that the Department of Transportation (DOT) provide funds to ensure that evacuation routes do not become flooded when there are no reasonable evacuation alternatives available.*
>
> *The Task Force recommends that the DOT include within its criteria for funding repair and construction projects the need for adequate emergency evacuation routes.*
>
> *Recommendations 17, 18 and 19, p. 24 of the California Senate Task Force report.*

Unfortunately, an example of lack of consideration of evacuation routes in planning road repairs occurred in 1986 in the Perry EPZ. Two bridges over the Grand River,

the U.S. 20 Bridge and the Main Street Bridge in Painesville, were closed at the same time. In addition, westbound Route 2 was down to one lane due to resurfacing. This severely limited the available evacuation routes to the west from the areas closest to the Perry plant.

RECOMMENDATION ONE

The Ohio Department of Transportation, in coordination with local governments, should give careful consideration to the availability and condition of evacuation routes in the three plume EPZs in Ohio when planning road repair and construction activities. Maintaining adequate evacuation routes should be a top priority, and possibilities for flooding and other impediments to evacuation should be considered and corrected to the extent possible.

III. EFFECTIVENESS OF SIREN ALERTING SYSTEMS

Alert and notification systems are a crucial part of emergency preparedness and response. These systems provide the communication link between response organizations and authorities and the public so that the public is informed of the emergency and the protective actions which need to be taken.

Nuclear Regulatory Commission regulations require as a design objective that public alert and notification systems "have the capability to essentially complete the initial notification of the public within the plume exposure pathway EPZ within about 15 minutes", 10 CFR 50 Appendix E, Section D.3.

NUREG-0654, FEMA-REP-1, Revision 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants", provides additional guidance and amplification of the NRC's requirements. Appendix 3 of NUREG-0654 describes the concept of operations as the use of commercial broadcast stations to inform the general public of emergency conditions and recommended protective actions. An acoustic signal is used to alert the public to turn on a radio or television receiver to hear the details. The acoustic alerting signal is usually provided by sirens.

Appendix 3 sets forth the following as the minimum acceptable design objectives for the alert and notification system:

(a) *Capability for providing both an alert signal and an informational or instructional message to the population on an area wide basis throughout the 10 mile EPZ, within 15 minutes.*

(b) *The initial notification system will assure direct coverage of essentially 100% of the population within 5 miles of the site.*

(c) *Special arrangements will be made to assure 100% coverage within 45 minutes of the population who may not have received the initial notification within the entire plume EPZ.*

FEMA-REP-10, "Guide for the Evaluation of Alert and Notification Systems for Nuclear Power Plants", elaborates upon the requirements of NUREG-0654. This

document indicates that, for fixed sirens, compliance with NUREG-0654 requirements is achieved by demonstrating that:

> *The expected siren sound pressure level generally exceeds 70 dBC (anywhere in the area) where the population exceeds 2,000 persons per square mile and 60 dBC (anywhere in the area) in other inhabited areas; or*
>
> *The expected siren sound pressure level generally exceeds the average measured summer daytime ambient sound pressure levels by 10 dB (geographical areas with less than 2,000 persons per square mile). FEMA-REP-10, p. E-8.*

FEMA-REP-10 also explains the public survey, taken by telephone, which is conducted to ascertain the effectiveness of the sirens in alerting the public. The form of the survey and the statistical method for determining the sample size are included in Appendix 3.

The siren system for the Perry Nuclear Power Plant has been evaluated by FEMA using the standards of FEMA-REP-10 and has been found acceptable. The telephone survey was conducted on March 13, 1986, following a double activation of all the sirens. Despite these favorable findings, the Emergency Evacuation Review Team found shortcomings. The EERT report states that it "is dissatisfied with the execution and testing of the plan's provisions for notifying the public of failures at nuclear reactors. At our public hearings in Lake and Ottawa counties, many citizens complained that they have not been able to hear the sirens during the tests", (EERT Report, January 7, 1987, p. 6). The EERT recommended that the State conduct "an independent test of the warning sirens and other components of the public notification system", (Id., p.15). The State is presently in the process of selecting a contractor to perform the tests, which are to be based on the survey methodology of FEMA-REP-10.

In examining this issue the CAC has reviewed other studies critical of siren system alerting capabilities. NUREG/CR-2655, "Evaluation of the Prompt Alerting Systems at Four Nuclear Power Stations", prepared by Bolt Beranek and Newman, Inc. and the Pacific Northwest Laboratory for the NRC, used analytical procedures to predict siren system effectiveness under defined conditions in the vicinity of four nuclear power plants: Trojan in Oregon, Three Mile Island in Pennsylvania, Indian Point in

New York, and Zion in Illinois. The predicted chance of alert varied with the postulated weather conditions and time of day. The results ranged from a 100% chance of alert for a warm summer weekend day at Trojan to 42% for a winter night during snowfall at Three Mile Island. In all cases the chance of alert at night was less than that predicted during the day or evening. The chance of alert for a winter night was always less than that for a summer night. The chance of alert for rural populations was always less than that for urban populations. The worst-case scenario was always during the night in winter, for rural populations. The chance of alert under these conditions for each of the four plants studied was: Trojan - 60%; Three Mile Island - 42%; Indian Point - 53%; Zion - 51%. These results indicate that siren systems which presumably meet FEMA and NRC criteria may be grossly ineffective under certain conditions.

Litigation before the NRC's Atomic Safety and Licensing Board in the operating license proceeding for the Shearon Harris nuclear plant in North Carolina has revealed similar inadequacies. See Carolina Power & Light Co. (Shearon Harris Nuclear Power Plant), LBP-86-11, 23 NRC 294 (1986). The issue considered was whether the siren system was capable of waking people sleeping at night with windows closed and air conditioners running. Evidence presented in the case indicated that, even though the Harris siren system met FEMA criteria for 60 dB coverage in the EPZ, the 60 dB sound level would wake only one-third to one-half of residents sleeping in houses with windows closed, (23 NRC at 368). Using the median outdoor sound level in the Harris EPZ, 82 dB, the Licensing Board calculated that the probability of arousal from sleep of one person was 62%. Accounting for household sizes in the EPZ, the Board calculated that 83% of all households in the EPZ would be alerted, (23 NRC at 385-86). The Board determined that this did not meet the "essentially 100%" standard NUREG-0654, which the Board interpreted to mean greater than 95% in the first five miles of the EPZ. The utility has provided tone alert radios to each household within the first five miles of the Harris EPZ. The Board found that the siren system, the tone alert radios, and the phenomenon know as informal alerting, when considered together, satisfied the "essentially 100%" standard, (23 NRC at 391-97).

The data presented in NUREG/CR-2655 and the Harris decision indicate that siren systems meeting the FEMA-REP-10 criteria fail to meet the design objectives of NUREG-0654 for alerting people indoors with moderate to high levels of

background noise or for arousing people from sleep in the winter or whenever windows are closed and storm windows in use.

A more detailed analysis of this issue is available in Appendix D.

RECOMMENDATION ONE

The State should conduct a comprehensive program of testing, analysis, and public surveys to determine the degree of effectiveness of prompt alerting systems within the plume EPZs for Perry and Davis-Besse and that portion of the Beaver Valley plume EPZ which is in Ohio. This program should address the following considerations :

(a) The adequacy of the siren system for alerting outdoor rural populations within 1000 feet of major roadways must be determined, since the background noise levels in such locations my be such that the 10 dB differential is not achieved using the 60 dB siren sound level specified in FEMA REP 10 for rural areas.

(b) Populations in industrial work environments must be alerted using special means. The adequacy of these means should be verified.

(c) To determine the capability of the siren system to alert people indoors, a comprehensive and integrated program of analysis, testing, and public surveys should be conducted. The objective of the program is to make a realistic finding of siren system effectiveness under a number of adverse scenarios. Such scenarios should include or assume winter conditions, when windows will be closed and storm windows in use; the effects of snowfall, heavy rains, high winds, or other meteorological conditions which would diminish the propagation or detection of the siren signal; and indoor environments and human activities which represent the least chance of alert, e.g., Scenario 3 of NUREG/CR-2655 and the problem of awakening people from deep sleep, (see Harris, 23 NRC at 382). These worst-case scenarios are bounding for all other conditions, so that if the siren system meets the "greater than 95%" standard for these conditions it

will meet the standard for virtually all other conditions. Validated analytical models must be used for determining the chance of arousal from sleep. The analytical models should give best-estimate results, because they alone must be used to determine the effectiveness of the siren system at night, due to the impracticality of conducting an actual test and survey.

(d) If the analytical or public survey results indicate that the siren system will not alert more than 95% of the EPZ population in all the scenarios considered, then corrective action must be taken. This could include the addition of sirens or the distribution of tone alert radios, or some combination of both, whichever is the most cost-effective.

(e) The Harris Licensing Board took credit for the phenomenon of informal alerting, which assumes that persons alerted by the sirens will voluntarily make an effort to notify their neighbors of an emergency by means other than the telephone. The degree to which this would actually occur is highly uncertain. However, it is appropriate and beneficial to encourage informal alerting through public educational efforts or as part of the emergency EBS messages, by suggesting that people alert their neighbors in the event of an emergency, (see 23 NRC at 388).

(f) Public education efforts should be made to help identify those areas of the EPZ where siren levels are deficient. People should be encouraged to call the local EMAs if they cannot hear the sirens during the regularly scheduled tests. Additional analysis or field surveys could then be performed in areas so identified, and corrective action taken if necessary. The public should be informed of the benefit and availability of tone alert radios, which individuals may wish to purchase themselves for added assurance of protection.

IV. EMERGENCY INFORMATION HANDBOOK REVIEW

The Nuclear Regulatory Commission's emergency planning regulations require that provisions be made for "yearly dissemination to the public within the plume exposure pathway EPZ of basic emergency planning information, such as the methods and times required for public notification and the protective actions planned if an accident occurs, general information as to the nature and effects of radiation, and a listing of local broadcast stations that will be used for dissemination of information during an emergency", (10 CFR 50 Appendix E, Part IV.D.2). Implementing guidance contained in NUREG-0654, FEMA-REP-1, Rev. 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants", states that licensees and State and local government emergency response organizations should

> *provide a coordinated periodic (at least annually) dissemination of information to the public regarding how they will be notified and what their actions should be in an emergency. This information shall include, but not necessarily be limited to:*
>
> *(a) Educational information on radiation.*
> *(b) Contact for additional information.*
> *(c) Protective measures, e.g. evacuation routes and relocation centers, sheltering, respiratory protection, radio-protective drugs.*
> *(d) Special needs of the handicapped.*
>
> *(Planning Standard G, Public Education and Information, Evaluation Criterion 1.)*

The utilities and State and local governments have annually distributed an emergency information handbook to the population within the plume EPZs. However, the effectiveness of these handbooks has been questioned. The Emergency Evacuation Review Team made the following finding regarding public information about emergency response plans:

We have found that many people are uninformed and misinformed about the plan. Many people at the EERT's public hearings in Lake and Ottawa counties said that in case of an emergency they would not know how to respond. The methods of disseminating information about the plan, and the quality of that information, have been inadequate, (EERT Report, January 7, 1987, p. 12).

The EERT recommended that the "State should conduct a campaign to improve the public's understanding of emergency response plan procedures", (Id. at 15).

The effectiveness of the emergency information handbooks may be undermined if they contain inaccurate information or material which downplays the risk of nuclear accidents. This has been recognized by NRC case law. In Consumers Power Co. (Big Rock Point Plant), LBP-82-60, 16 NRC 540 (1982), the Atomic Safety and Licensing Board stated that "one attribute of an effective pamphlet is accuracy. Important inaccuracies may become known and may detract from the credibility and the necessary acceptance of the pamphlet", (16 NRC at 544). The Board also criticized a section of the pamphlet which "merely reassured Big Rock's neighbors that plausible accidents could lead only to minimal doses. Such an unmitigated reassurance might, however, have led people to disregard evacuation warnings. After all, why respond when no harm could come to one anyway?" (16 NRC at 546). The Licensing Board ordered changes in the emergency information handbook for the Big Rock Point facility to correct such deficiencies.

Believing that the 1986 version of the emergency information handbook for the Perry Nuclear Power Plant contained such deficiencies, the Concerned Citizens of Lake, Geauga, and Ashtabula counties filed a formal petition documenting these deficiencies with the NRC under 10 CFR 2.206. The petition thoroughly reviewed the handbook and detailed it shortcomings. The petition primarily alleged that the handbook contained false and misleading information concerning the health effects of ionizing radiation and the risks of nuclear accidents, which was primarily aimed at creating public acceptance of nuclear power. Such material is likely to persuade those reading it to minimize or disregard the need for emergency planning.

As a result of the petition, the Cleveland Electric Illuminating Co. has voluntarily changed the handbook, now issued in the form of a calendar, by removing or rewriting many objectionable passages. Moreover, the EPA and NRC have

confirmed the validity of some of the concerns raised in the petition. In an EPA memorandum to FEMA regarding the handbook's characterization of the health ef cts of ionizing radiation, it is stated that, with regard to the petition's assertions that the handbook contained misleading statements on the health effects of ionizing radiation, "we largely concur with these assertions". However, this portion of the booklet was uncorrected in the 1988 calendar. The Director of the Office of Nuclear Reactor Regulation corroborated the petition's concerns, "I agree with the Petitioners that the 1988 calendar fails to properly characterize the ionizing radiation that can be emitted by a nuclear power plant by inappropriately comparing it with certain types of non-ionizing radiation." (Cleveland Electric Illuminating Co. (Perry Nuclear Power Plant, Units 1 and 2), DD-88-15,28 NRC 401, 407 (1988)). The Director also found the assertion in the 1988 Calendar that doses of radiation less then 25 rems are harmless to be inaccurate, (Id.). The Decision stated that corrective action would be required in the next edition of the handbook. On December 6, 1988 the NRC issued a letter to CEI formally advising the licensee to take the corrective actions identified in the Director's Decisions on the petition. The 1989 calendar has incorporated these corrective actions.

This experience with the Perry Emergency Information Handbook illustrates the public benefit which can result from critical scrutiny of the handbook's contents. There is still some need for improvement in the Perry handbook, and the handbooks for Davis-Besse and Beaver Valley have not been evaluated at all.

It is necessary to obtain feedback on the effect of public information materials and programs, as well as to assess the degree of public awareness and knowledge of emergency plans. This can be accomplished through the use of public surveys professionally designed to determine whether people have received, read, retained and understood the Emergency Information Handbook and other public informatuon materials. The survey could also ascertain the actual public response in a nuclear emergency. This information will enable the Emergency Management Agency's public information program to focus on identified misconceptions and deficiencies in the publics knowledge of emergency plans.

RECOMMENDATION ONE

In the future, the CAC should review and evaluate the emergency information materials distributed to the public within the plume EPZs to ensure that they are accurate and effective in promoting public understanding of nuclear plant hazards and emergency plans and procedures.

RECOMMENDATION TWO

The State should conduct a public survey to ascertain the effect of public information materials pertaining to emergency plans and the degree of public awareness of emergency plans.

V. POTASSIUM IODIDE AS A THYROID BLOCKING AGENT

A nuclear power plant radiological emergency carries the potential for release of radioactive isotopes of iodine. An atmospheric release of significant quantities of radioiodine poses an immediate health hazard to persons exposed to the plume in that radioiodine, if inhaled, is absorbed into the bloodstream from the lungs and is transported to and concentrated in the thyroid gland. This concentration of radioactive iodine will expose the thyroid gland to elevated levels of ionizing radiation, which can result in thyroid nodules or malignancies. Extremely high levels of radiation may cause the thyroid gland to degenerate, while moderate levels can cause some loss of thyroid function.

According to the U.S. Environmental Protection Agency in its draft Appendix C to EPA 520/1-75-001, on Protective Action Guides for use in radiological emergencies, ablation of the thyroid gland requires doses of 100,000 rads, while the gland can be rendered hypothyroid by doses of 3000 to 10,000 rads. Impaired thyroid capability may occur above a threshold of 200 rads, (Appendix C, pp. C-23 and C-24.) Lower levels of exposure may result in thyroid nodules or cancers. Doses as low as 14 rads to the thyroid have been associated with thyroid malignancy in the Marshall Islanders. The risk of cancer commences about 10 years after initial exposure and continues throughout the life of the exposed individual. Thyroid [illegible]s must be examined, by either surgical removal or needle biopsy, to determine whether they are benign or malignant. Thyroid cancers can be fatal if they are not surgically removed. EPA estimates that 1 rem of thyroid exposure carries a risk of 3.6E-4 (one in 2800), of producing a thyroid cancer of which a small fraction (about 10%) will be fatal, (Id., p. C-37). Based on these considerations, the EPA has established Protective Action Guides ranging from 5 to 25 rems for the thyroid as levels of projected dose for which protective action is advised.

The administration of stable iodine can reduce the uptake of radioactive iodine by the thyroid gland by saturating the thyroid with stable iodine. The Food and Drug Administration has approved the use of potassium iodide (KI) as a thyroid blocking agent for use in radiological emergencies. Recommended doses are 130 milligrams for adults and 65 mg for infants under one year of age, to be taken if the projected

thyroid dose if 25 rem or greater. Daily doses should be taken for 10-14 days. In these doses and for this purpose, KI was declared "safe and effective" by the FDA and approved for sale as an over-the-counter, nonprescription drug.

To be effective, KI should be taken before or immediately after exposure to radioiodine, and KI should continue to be taken for 10 to 14 days. When used in this manner, KI will limit the uptake of radioiodine by the thyroid to less than 10% of what it would be without the use of a blocking agent. This effectiveness decreases to less than 50% blocking if the administration of KI is delayed until four hours after exposure to radioiodine.

KI should not be taken by persons who are allergic or sensitive to iodine. KI is effective only in reducing radiation doses from radio-iodines which involve mainly the thyroid gland. It is not effective in reducing exposure to other radioisotopes. For this reason, KI should be used in conjunction with evacuation, sheltering, or other protective methods.

The Soviets used KI successfully during the Chernobyl accident. According the NUREG-1250, "Report on the Nuclear Accident at the Chernobyl Nuclear Power Station," KI was taken by 45,000 residents of Pripyat and 90,000 people in 91 villages within 30 km of the nuclear plant. "Thousands of measurements of I-131 activity in thyroids of the exposed population suggest that the observed levels were lower than those that would have been expected had this prophylactic measure not been taken. The use of KI by the Pripyat population in particular was credited with permissible iodine content (less than 30 rad (sic)) found in 97% of the 206 evacuees tested at one relocation center. It is also important to note that no serious side effects of KI use have been reported to date", (NUREG-1250, pp. 7-8 and 7-9, citations omitted). Another source indicates that 5.4 million people received stable iodine after the Chernobyl accident. No mention was made of side effects, (Nuclear Safety, Vol. 29, No. 3, p.261).

The Federal Emergency Management Agency has issued a policy statement on the distribution of KI around nuclear power sites, (50 Fed. Reg. 30258 (July 24, 1985)). This policy statement recommended the stockpiling and distribution of KI to emergency workers and institutionalized individuals. Predistribution or stockpiling KI for use by the general public was not recommended, although the policy

statement specifically permits State and local governments to make their own policies and decisions on this matter. FEMA also recognized that since the FDA has authorized over-the-counter sales of KI, it is legally available to individuals who, based on their own personal analysis, choose to have the drug immediately available.

The State of Ohio has followed FEMA and FDA recommendations on the use of KI and has no plans to supply the drug to the general public. The Emergency Evacuation Review Team, however, recommended that the State should encourage pharmacies to carry KI. Despite the educational efforts of the Department of Health, pharmacies within the plume EPZ of the Perry Nuclear Power Plant do not carry KI for use as a thyroid blocking agent. In fact, the Nuclear Regulatory Commission recently issued an Information Notice on KI which stated that the drug is not stocked in pharmacies and must be ordered from the companies that produce it, (NRC Information Notice 88-15, April 18, 1988, "Availability of U.S. Food and Drug Administration (FDA) - Approved Potassium Iodide for Use in Emergencies Involving Radioactive Iodine").

NUREG-0654, FEMA-REP-1, Rev. 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," states that public education and information efforts should include information on radioprotective drugs, (Planning Standard G, Evaluation Criterion 1). The emergency information handbooks distributed in the plume EPZs for Perry and Davis-Besse do not contain any information on radioprotective drugs.

RECOMMENDATION ONE

A public education effort should be conducted to inform the public of the benefits and risks of KI and where it may be obtained.

The following is an example text for public education materials on KI:

A nuclear power plant accident may release radioactive iodine. If you inhale radioactive iodine, it will be absorbed by your body and accumulate in your thyroid gland, giving a radiation dose to your thyroid. This may cause damage to the gland in high doses, and lower doses may cause thyroid cancer to occur later. There is a drug you can use to prevent radioactive iodine from harming your thyroid gland. This drug is potassium iodide. You may wish to use potassium iodide in a nuclear power plant emergency for added personal protection. The Food and Drug Administration has approved potassium iodide for use as a thyroid blocking agent in daily doses of 130 mg for adults and 65 mg for infants under one year of age. Potassium iodide should only be taken if there is a nuclear power plant emergency. If you plan to use potassium iodide, you should take it if you are advised to evacuate or take shelter during such an accident. You should then continue to take daily doses of potassium iodide for 10 days. People who are allergic or sensitive to iodine should not use potassium iodide. Persons experiencing any side effects or adverse reactions from potassium iodide should discontinue its use and seek medical attention. You should consult with your physician for more information on potassium iodide to determine whether you should or should not use it. If you want to use potassium iodide during a nuclear emergency, you should have it on hand in your home. You should be able to buy potassium iodide for use as a thyroid blocking agent from your pharmacy without a prescription. If you cannot obtain it from a pharmacy, you can order it from ANBEX, Inc., 15 West 75th Street, New York, NY 10023 or P.O. Box 863, Radio City Station NY, NY 10019, phone (212) 580-2810: ANBEX's trade name for potassium iodide is IOSAT. Be sure to read and follow the directions for use on the package or package insert.(*). Potassium iodide is only effective against radioactive iodine and not against other radioactive materials which may be released in a nuclear accident. Therefore, you must follow directions for sheltering or evacuation during an accident, even if you decide to use potassium iodide.

(*) The directions for use will say to take potassium iodide only when public health officials tell you to do so. You should be aware that public health authorities do not plan to issue directions on the use of potassium iodide in a nuclear power plant emergency. Therefore, you should take potassium iodide, if you choose to use it, when advised to evacuate or take shelter in a nuclear accident, or upon the advice of your physician.

REFERENCES FOR FURTHER READING ON POTASSIUM IODIDE:

FDA, "Potassium Iodide as a Thyroid-Blocking Agent in a Radiation Emergency, " 43 Fed. Reg. 58798 (December 15, 1987).

FDA, "Potassium Iodide as a Thyroid-Blocking Agent in a Radiation Emergency: Final Recommendations on Use," 47 Fed. Reg. 28158 (June 29, 1982).

FEMA, "Federal Policy on Distribution of Potassium Iodide Around Nuclear Power Sites for Use as a Thyroidal Blocking Agent,"50 Fed. Reg. 30258 (July 24, 1985).

NRC, NUREG/CR-1433, "Examination of the Use of Potassium Iodide (KI) as an Emergency Protective Measure for Nuclear Power Reactor Accidents," (March 1980).

FDA, "Background Material for the Development of the Food and Drug Administration's Recommendations on Thyroid Blocking with Potassium Iodide," HHS Publication FDA 81-8158, (March 1981).

NCRP Report No. 55, "Protection of the Thyroid Gland in the Event of Releases of Radioiodine," Recommendations of the National Council on Radiation Protection and Measurements, August 1977, Reprinted (October 1979).

Diane G. Crocker, "Nuclear Reactor Accidents - The Use of KI as a Blocking Agent Against Radioiodine Uptake in the Thyroid - A Review", Health Physics, Vol. 46, No. 6, pp. 1265-1279, (June 1984).

EPA, Draft Appendix C to EPA 520/1-75-001, Manual or Protective Action Guides, (June 22, 1988).

Report of the Environmental Hazards Committee of the American Thyroid Association, The Use of Iodine as a Thyroid Blocking Agent in the Event of a Reactor Accident, Revised Report, (December 1982).

Recommendations on the Use of Potassium Iodide as a Thyroid Blocking Agent in Radiation Accidents: An FDA Update, Symposium on the Health Aspects of Nuclear Power Plant Incidents - 1983. Subcommittee on Environmental Health.

Committee on Public Health. New York Academy of Medicine and New York State Department of Health, (April 1983).

Perspective on Potassium Iodide (KI) as a preplanned protective measure. Policy Issue. SECY-83-362. USNRC (August 30, 1983).

EMERGENCY PLANNING RECOVERY AND REENTRY; OTHER COUNTIES

EMERGENCY PLANNING: RECOVERY & REENTRY; OTHER COUNTIES

The coordinating body for emergency planning in Ohio is the Emergency Management Agency, located at 2825 West Dublin-Granville Road in Columbus, Ohio. This group serves also with the Ohio Department of Health as a key element in planning for nuclear emergencies.

As an outgrowth of development of issue resolution activities of the Emergency Evacuation Review Team in mid-1987, the recommendation was made that workable planning standards be developed addressing ingestion zone planning, recovery and reentry, and decontamination and waste disposal. To develop these planning standards, a working group was formed.

The group, known as the Planning Standards Committee, is chaired by the Ohio Department of Health and made up of representatives from the Ohio Emergency Management Agency, the Ohio Environmental Protection Agency, the Ohio Department of Agriculture, the Ohio Department of Natural Resources, the Public Utilities Commission of Ohio, and two branches of the U.S. Department of Agriculture, the Cooperative Extension Service and the Agricultural Stabilization and Conservation Service. Also sitting in on meetings of the group are representatives of nuclear utilities and the Emergency Management Association, which is the organization of county emergency management directors. These representatives are encouraged to provide input to the development of the planning standards.

Since mid-1987, the working group has had several meetings to discuss responsibilities and prepare draft versions of the planning standards. The planning standards are based on, but not limited to, federal guidance. The standards will serve as a pattern for response to emergencies by county emergency agencies as well as the state agencies responsible for various activities.

The working group has hired a planner to assist in setting up and planning the meetings of the working group and to incorporate guidance addressing ingestion zone planning, recovery and reentry, and decontamination and waste disposal

coming out of the group's deliberations and guidance from the Federal government. Funding for the group has been established, a special revenue account has been approved, and representatives from the group have observed an emergency exercise in Michigan in August, 1988, and participated in an agriculture conference concerning nuclear emergency response in Wisconsin in October, 1988.

A key activity for the state agencies making up the group and for the county and local agencies is the Davis-Besse Nuclear Power Station Exercise in August, 1989. This exercise will use an accident scenario which will escalate through four levels of severity: (1) unusual event, (2) alert, (3) site emergency, and (4) general emergency. It is designed to test the response capability of all groups involved in emergency response.

Meetings of the working group remaining before August will be directed toward preparing for the Davis-Besse exercise, and will be oriented toward achieving a fine tuning of the planning standards, procedures, and coordination necessary to prepare adequately for a real emergency.

Basically, the plan is designed to indicate those actions required within a 50 mile ingestion pathway to protect the public during the critical stages of a hypothetical accident scenario: (1) the emergency stage involving decisions concerning the severity of radiation exposure, pathway area definition, evacuation, sheltering and relocation; and (2) recovery and reentry, involving decisions concerning identifying a "footprint" of deposition, where and how much, where protective action can be relaxed or increased, what needs to be done concerning water, crops, livestock, food supplies, etc., determination of where people who return require special protective measures. The emergency phase is usually the period immediately following the accident and could persist for one or more additional days. After the accident situation is stabilized, the return decision is made and the recovery and reentry stage takes over.

The working group has drafted information on responsibilities and functions for the various agencies for the ingestion pathway, and recovery and reentry activities. These agencies and their responsibilities are listed in Appendix E of this report.

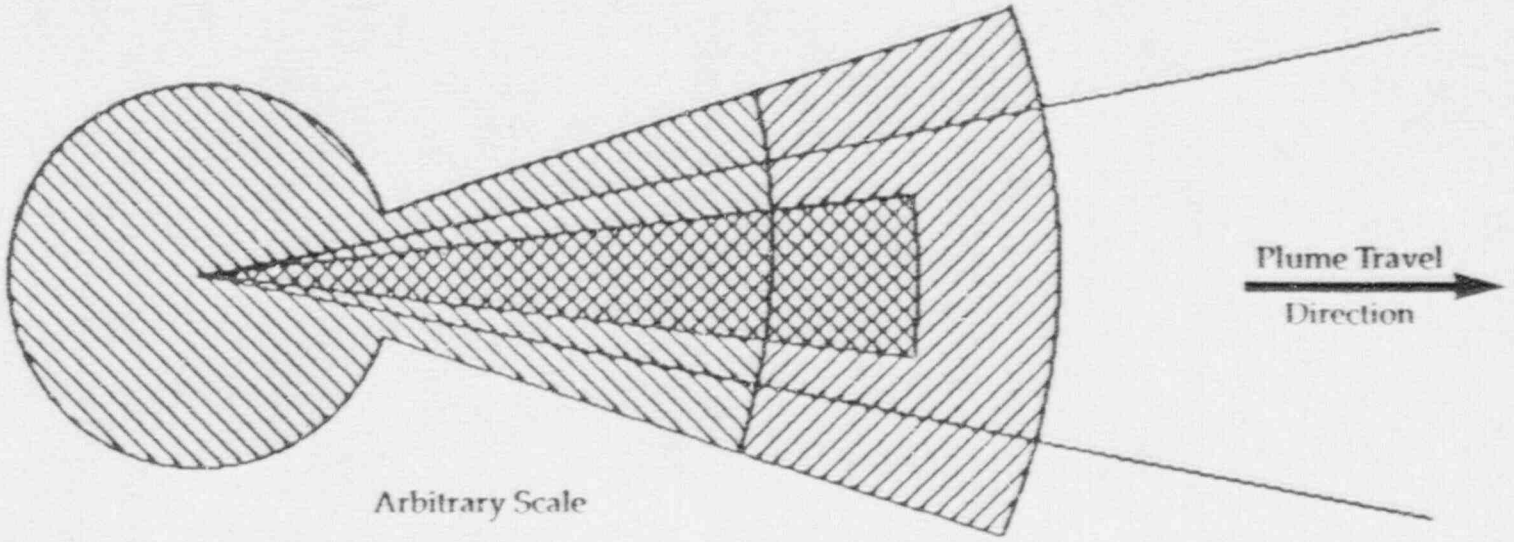
The implementation of the plan is covered in Section 3 of the Planning Standards Document, "Methods of Accomplishment." The section calls for establishment of an Ingestion Zone, Recovery and Reentry Committee (IZRR), which is composed of representatives of all the agencies, state, federal, local, and private, mentioned as having responsibilities in an emergency.

The committee will assemble at the State Emergency Operations Center (EOC) in the early stages of an emergency involving a nuclear power station. The primary function of the committee will be to advise local officials and the general public in those counties lying either wholly or partially within a 50 mile ingestion pathway on actions necessary for the protection of life and property (see Figure 7-1, Response Areas). The major advisory categories include public education and advisory service for residents; milk, dairy, and animal products; availability of uncontaminated water reserves and cattle feed; public water supplies; foodstuffs and truck farm products, including honey.

The State of Ohio adopts as a basis for interagency planning and emergency protective actions, guidance contained in U.S. Environmental Protection Agency (USEPA) Document No. 520/1-75-001, Federal Register Vol. 47, No. 205, and Federal Emergency Management Agency (FEMA) Guidance Memorandum IN-1, which are maintained on file as a matter of record by the Ohio EMA.

The second stage of a nuclear emergency at a power plant, the Recovery and Reentry Stage, is directed toward assuring an efficient and orderly return to a pre-emergency environment for affected areas as soon as possible. The Recovery Phase will take the form of two major efforts. The first will be recovery of the sheltered or evacuated area to allow the reentry of the public to homes and businesses. The second, which is primarily a state and federal agency function, will concentrate on recovery efforts in the 50 mile ingestion pathway.

Recovery and reentry assumes that significant quantities of radioactive particulates and gases have been released from the site; that release quantities warranted sheltering or evacuation as a protective action; and that air, water, vegetation, milk and soil samples were collected during the emergency phase. The IZRR committee's direction now becomes one of consolidating data obtained during the emergency phase, such as definition of the contaminated area based on plume path,



Legend

1. Plume deposition area.
2. Area from which population is evacuated.
3. Area in which population is sheltered
4. Area from which population is relocated (restricted zone).

Figure 7-1 RESPONSE AREAS

levels of radiation including possible isolated hotspots, numbers and location of evacuees, and isolation of the affected area through maintenance of perimeter control points.

During the intermediate phase, the IZRR committee collects and consolidates new and relevant data to better define the boundary of the restricted zone. The IZRR continues monitoring and sample analysis to refine and specifically define contaminated areas and hotspots. It may adjust the boundary depending on man-made barriers near the contaminated area that lend themselves to effective control of access.

The IZRR committee may determine and identify areas where, with moderate decontamination efforts, return or continued habitation can be permitted. It will establish after enough data are collected procedures for reentry into the restricted zone for field monitoring teams and other emergency workers. It will establish a staging area for people desiring to reenter a restricted zone. The staging area personnel will help those desiring to reenter understand what the conditions are in the restricted zone and whether there are special considerations they have to be aware of.

The IZRR committee determines if the facility is in a safe shutdown condition. If it is feasible for the population to return to uncontaminated or lightly contaminated areas of the evacuation zone, the committee determines access control points, return to specific sub-areas for better traffic control and security, and notifies local officials to reestablish essential public services, i.e., water, power, police and fire protection.

With regard to development of the planning standards and preparations for the August, 1989, Davis-Besse exercise, work will continue on refinement of the plan itself until June, when the plan will be written and the written exercise scenario will be completed. Intensive training will be conducted in the latter half of June and a "dress rehearsal" or "dry run" will be held at the end of June. Mid-July will be a backup date for the dry run to work out any additional perceived needs or revisions before the exercise in August.

The Chairman of the Citizens Advisory Council subgroup studying this particular issue has participated as an observer in one of the meetings of the working group that will eventually make up the IZRR committee. He also has held discussions with several key members of the group representing the Ohio Department of Health and the Ohio Emergency Management Agency.

The persons in charge of public information in all of the affected state agencies will meet in late February or early May to discuss the important function of informing the public concerning what it needs to know in case of a nuclear emergency, and specifically to make the public aware of the August exercise and its importance as a means of assuring effective response in the event of a real emergency.

A significant corollary development that is apart from, but most certainly relevant to, the mission of the working group that is preparing for the Davis-Besse exercise is consideration within the legislative branch of state government of legislation (House Bill 111) to create a cabinet level group that will have statutory responsibility for developing a comprehensive policy for the state regarding nuclear power safety. This group would be known as the Utility Radiological Safety Board, and it would be made up of cabinet-level state officials representing the Ohio Departments of Environmental Protection, Health, Agriculture, and Industrial Relations, or their designees. It would also include the Chairman of the Public Utilities Commission of Ohio and the Adjutant General, or their designees.

The board's objectives are to ensure utility management and performance required to produce safe, reliable, and economical power; establish and implement a Memorandum of Understanding with the U.S. Nuclear Regulatory Commission and the State, including agreements with individual state agencies to interact with the Commission and the Federal Emergency Management Agency; and create policies and practices that ensure that safety, performance, emergency preparedness, and public health standards are defined and enforced to meet the state's needs.

CONCLUSIONS

The Planning Standards Working Group represents a desired mix of experience and authority, and includes relevant organizations at the federal, state and local level, as well as affected utilities, which should be a part of the emergency planning process.

The August, 1989, Davis-Besse emergency response exercise will prove a worthwhile evaluation tool. It will provide a mechanism for testing the emergency response capability under the critical observation of national regulatory and emergency response agencies. Their critique will provide an objective measure of the state's emergency response process and will point out areas where improvement can be made.

The Emergency Response Plan being developed appears to be comprehensive and effective.

Public information aspects of the plan and exercise deserve more attention. Particularly, recognizing that the exercise will be held during the height of the tourist season, communication channels that will reach the boating public and the resort patrons should be utilized in an effort to let them know what to expect and what might be expected of them. The public information effort surrounding the exercise should be done in a comprehensive manner involving more than just the conventional mass media, but also the neighborhood and community commercial giveaway papers and community groups.

House Bill 111 legislation proposing the URSB, is useful in the sense that it focuses cabinet-level attention on this important issue.

RECOMMENDATION ONE

The Planning Standards Working Group should become a permanent task force at the functional level, and meet regularly to consider the status of ingestion zone and recovery and reentry planning. In this manner it would be a de facto oversight committee that would ensure effectiveness and continuous updating of Ohio's emergency response capability in the event of a serious incident or accident at those

nuclear power plants in Ohio and western Pennsylvania that would affect the health and safety of Ohio residents. It would also be a useful resource for the Citizens Advisory Council if the Council continues to function in the future.

RECOMMENDATION TWO

Legislation creating the Utility Radiological Safety Board, House Bill 111 should be enacted as soon as possible.

RECOMMENDATION THREE

Existing members of the Planning Standards Working Group could be named as designees of cabinet members serving on the Utility Radiological Safety Board. House Bill 111 provides for delegation of membership by the cabinet-level members of the proposed Utility Radiological Safety Board. Existing members of the Planning Standards Working Group have the experience and responsibility for dealing with radiological safety issues and emergencies and would enhance the effectiveness of the Board. They should, in cases where the cabinet-level members themselves participate in board meetings, accompany the cabinet-level members as resource persons or observer-advisors.

REAL AND PERCEIVED CONCERNS

REAL AND PERCEIVED CONCERNS

Nuclear issues are still hotly contested in Ohio, largely because the public reads and hears so many conflicting views. People are not able to sort fact from fiction; nor do they know whom to believe. The news media seem to have the same difficulties and further compounds the confusion by reporting on nuclear issues in dramatic headline seeking ways. Reporters often times emphasize the negative. They give extensive publicity to incidents that would never get a mention if they occurred in any other industry. Reporters quote the opinions of experts on nuclear energy and non-experts as if they have equal validity. With no clear perspective on nuclear energy itself, the public is unable to put nuclear news into perspective. This results in confusion, controversy, and fear.

The State of Ohio should assign an independent consulting agency to survey the most widely recognized experts in the fields of energy, engineering, medicine, public safety, the environment and the other appropriate disciplines from which input is required. Once the study is completed, the study and all of it's documentation should be submitted to the Citizens Advisory Council for evaluation and approval. Following this, steps should be taken to assure that this study receives maximum publicity and, further, it be widely distributed, both in full and condensed form. In addition, this study and all corollary materials ultimately offered to the public should bear a clear label indicating that they result from studies commissioned by, or made by the State of Ohio.

While this report is not expected to eliminate all controversy or resolve all concerns, it will let Ohio's citizens know the mainstream expert thinking on nuclear energy. With this knowledge, Ohio's citizens will be better equipped to make up their own minds on nuclear issues.

Some of the questions that this study should resolve, include:

(1) How harmful is radiation from a nuclear power plant compared to radiation from other sources?

(2) How hazardous are nuclear wastes compared to other toxic wastes?

(3) Is there a recognizable incremental increase in radiation exposure to people living near a nuclear power facility as contrasted to those living at a distance? If so, what quantitative value can be assigned to this increased risk?

(4) How does radiation from a nuclear plant compare to coal plant emissions as a threat to the public and to the environment?

(5) Do the risks associated with the production of electrical power using nuclear technology represent a serious departure from the level of risk associated with common every day activities now accepted by the public?

RECOMMENDATION

The State of Ohio should commission an authoritative study of nuclear energy. Specifically, this would be a statistical evaluation of its risks versus its benefits and a compilation of mainstream, expert thinking. Such an approach would best allow people to decide whether or not nuclear energy is a viable option for electricity production. They would not have to consider nuclear issues in a vacuum, but rather would have some perspective allowing more rational judgments.

The study would encompass these areas, among others:

(1) A comparison of nuclear and other forms of electricity production in terms public safety;

(2) A comparison of nuclear and other forms of electrical energy production in terms of environmental impact; and

(3) Based upon the valid premise that living is not risk free, and risk taking is a normal and necessary part of a balanced and productive life, it would be appropriate to offer the public the option of rational risk management. This can be accomplished by providing a statistical evaluation contrasting the health and/or safety risks expected from the production of electrical energy using nuclear technology, with risk expectations now found and accepted by the public in pursuit of routine and daily activities.

Such routine activities would include, but not be limited by, the following:

(A) Travel (auto, train, airplane);

(B) Medical Techniques (x-ray, surgery, dental treatment, vaccines, drug therapy, etc.);

(C) Accidents around the home (falls, burns, insect bites, chemical exposures, etc.);

(D) Individual and team sports;

(E) Food preparation, handling, and preservation;

(F) Use of alcoholic beverages, recreational drugs, smoking, etc.;

(G) Dietary insufficiencies;

(H) Ingestion of certain food components (sugar, salt, cholesterol, additives, adulterants);

(I) Infections from common viral and bacteriological agents (flu, measles, etc.);

(J) Natural phenomena (earthquake, lightning, tornado, etc.).

The conclusions reached from such investigations should be set forth in a manner so as to allow easy interpretation of risk comparisons by the general public.

(4) The social and economic risks/benefits if Ohio were to abandon the use of nuclear energy.

CLOSING STATEMENT

The Citizens Advisory Council finds that the Emergency Evacuation Review Team report, recommendations and implementation thereof has resulted in a significant benefit to the quality of emergency planning. The Council believes that the efforts of the EERT and the Council demonstrate that critical assessment of and public participation in emergency planning and nuclear power reactor safety issues and activities can serve to make a positive contribution to the health and safety of the public. Such efforts also serve to enhance the public understanding of these matters which is vital to informed public participation in our democratic society. However, the success of the EERT and Council efforts should not lead to complacency. Further opportunities may exist to enhance public safety and emergency preparedness. The Planning Advisory Council, the Citizens Advisory Council, and the proposed Utility Radiological Safety Board provide appropriate vehicles for realizing the benefits of these opportunities. The Council encourages the continuation of these activities.

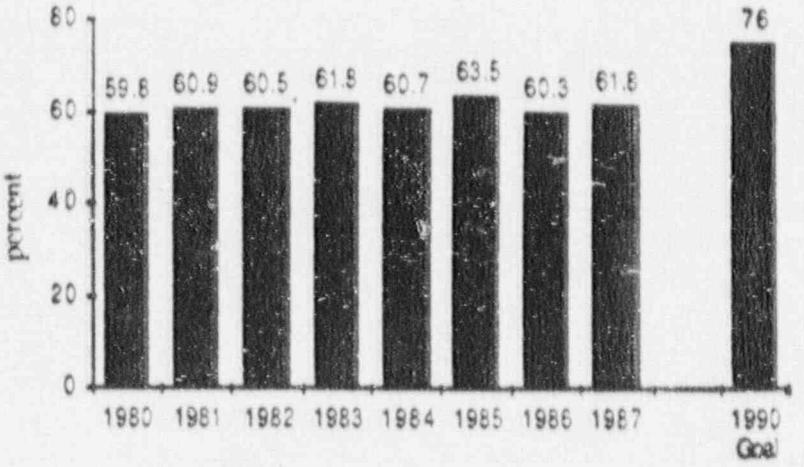
APPENDIX A

INSTITUTE OF NUCLEAR POWER OPERATIONS

PERFORMANCE INDICATORS

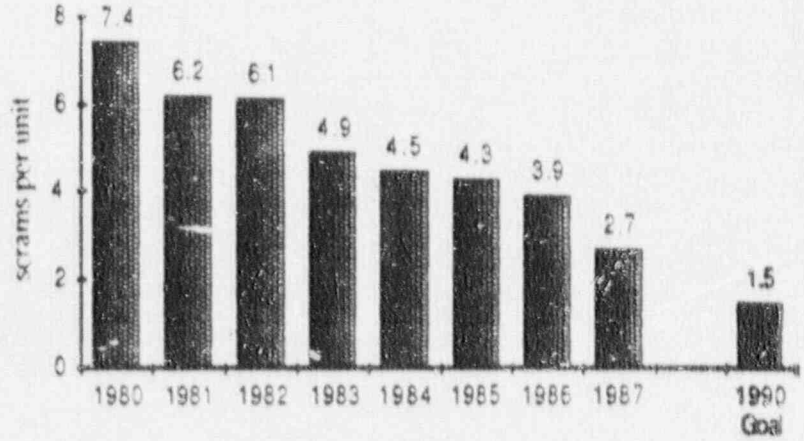
Equivalent availability factor

Equivalent availability factor is the ratio of the total power a unit could have produced, considering equipment and regulatory limits, to its rated capacity, expressed as a percentage. A high equivalent availability factor indicates effective plant programs and practices to maximize electrical generation and indicates well-operated and well-maintained plants. In 1986 and 1987, performance in this area was significantly affected by the long-term shutdown of several plants that had equivalent availability factors of 0.0 percent.



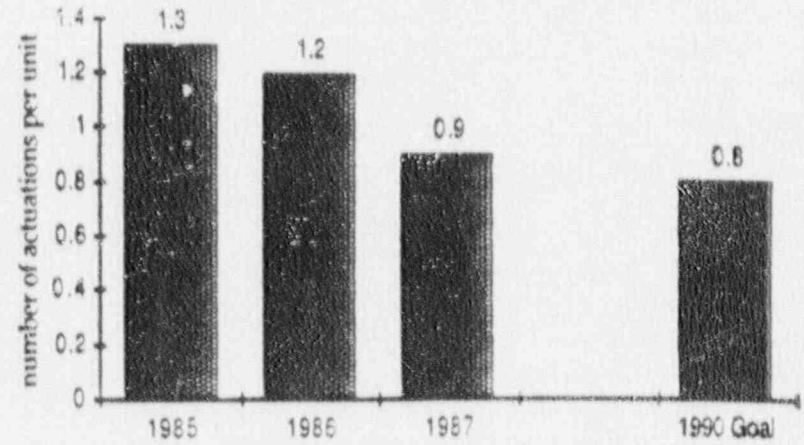
Unplanned automatic scrams

The graph shows the average number of unplanned automatic scrams while the reactor is critical that occurred at nuclear power plants operating with a cumulative capacity factor of 25 percent or greater. A low number is desirable, as these scrams result from equipment failures or personnel errors. The first four years of scram data were estimated from the number of unplanned automatic scrams while the units were synchronized to the power grid. In 1984, INPO expanded its data collection to include unplanned automatic scrams while the reactor was critical.



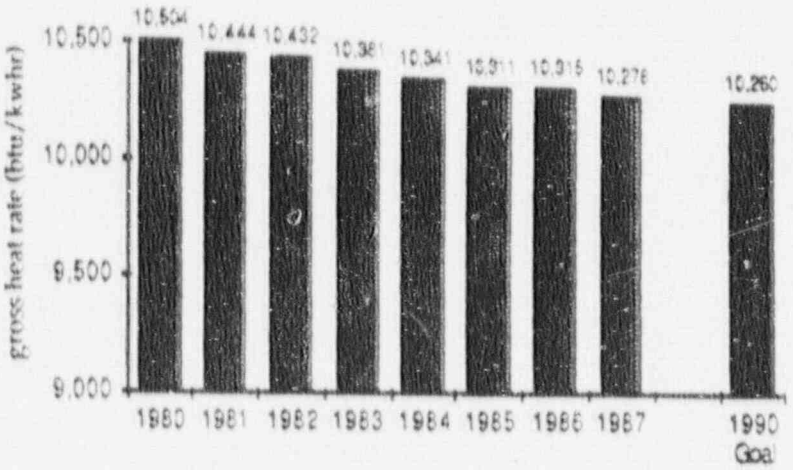
Unplanned safety system actuations

Unplanned safety system actuations are the number of unplanned emergency core cooling system actuations and emergency AC power system actuations (due to loss of power to a safeguards bus). Fewer actuations indicate a greater margin of plant safety is being maintained. Data collection for this indicator began in 1985.



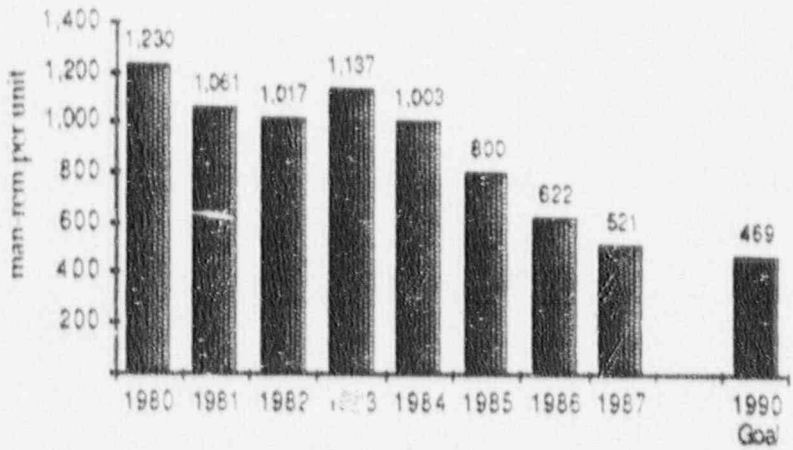
Gross heat rate

Low gross heat rate, or Btu per kilowatt-hour, reflects emphasis on thermal efficiency and attention to detail in the maintenance of balance-of-plant systems. An efficient or "well-tuned" plant enables operators to detect abnormal trends and correct them early. The minimum heat rates attainable are a function of plant design.

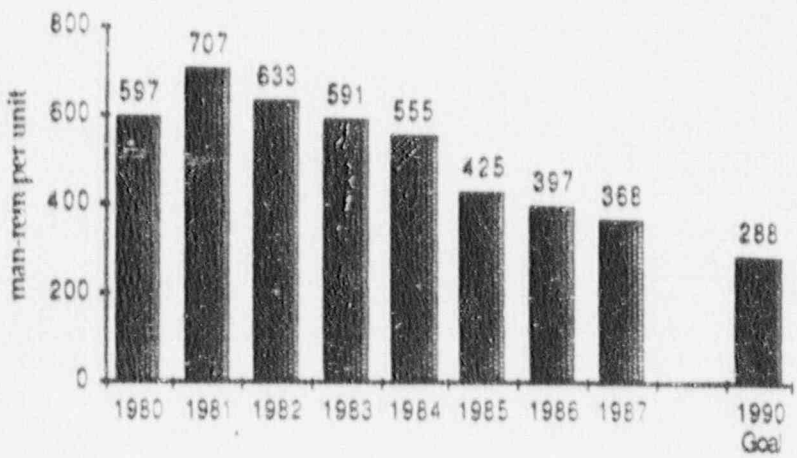


Collective radiation exposure per unit

These plants show the average collective radiation exposure in man-rem per unit both for boiling water reactors and pressurized water reactors since 1980. Low exposure indicates radiological protection programs are effective in minimizing radiation-related health risks to plant workers.



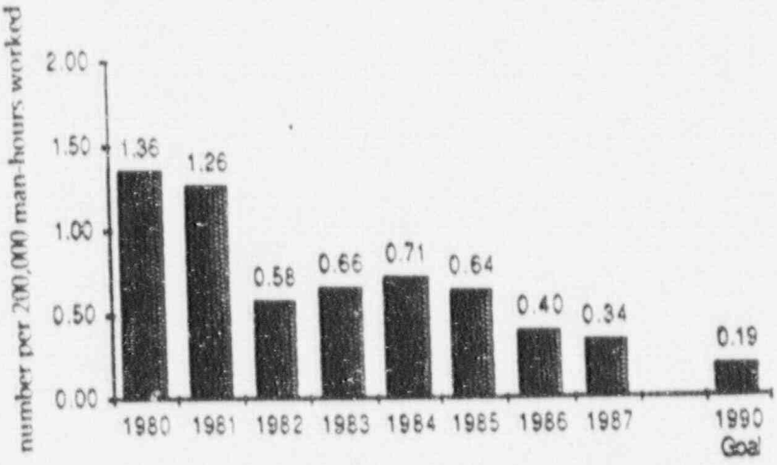
BWR PLANTS



PWR PLANTS

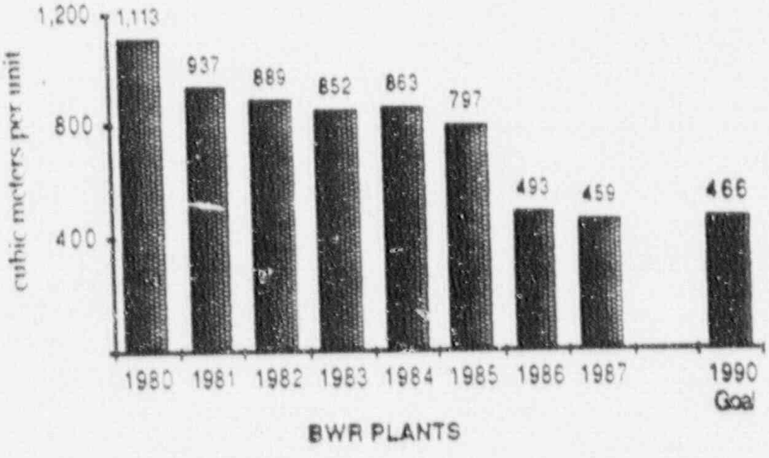
Lost-time accident rate

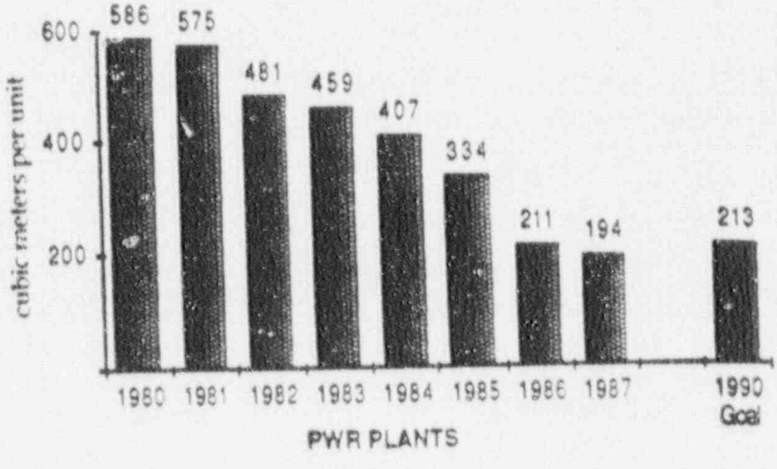
Lost-time accident rate is the number of worker injuries involving days away from work for every 200,000 man-hours worked. This indicator monitors progress in improving industrial safety for workers. The graph shows industry lost-time accident rates for nuclear plant personnel for the years 1980 to 1987.



Low-level, solid radioactive waste per unit

These graphs show the average volume of solid radioactive waste per unit both for BWRs and PWRs since 1980. Minimizing the production of radioactive waste reduces storage, transportation and burial needs and thereby reduces the environmental impact of nuclear power.





INPO and the industry have begun tracking three new overall indicators: safety system performance, thermal performance and fuel reliability.

SAFETY SYSTEM PERFORMANCE

Safety system performance is defined separately for each of three BWR and each of three PWR safety systems. The indicator is based on the hours that components for the safety systems are unavailable to perform their intended functions. A low value indicates a greater margin of safety in preventing reactor core damage; it also reflects less chance of extended plant shutdown due to safety system failure during an operational event.

Data collection for the safety system performance indicator begins in 1988.

THERMAL PERFORMANCE

Thermal performance is defined as the ration of the corrected design gross heat rate to the adjusted actual gross heat rate (where gross heat rate is expressed in Btu per kilowatt-hour.) The design gross heat rate, measured at 100 percent power, is corrected to reflect plant modifications and operating deviations from the initial thermal design. The actual gross heat rate is adjusted for circulating water temperature and the effect of feedwater pump efficiency.

Thermal performance reflects emphasis on thermal efficiency and on maintenance of balance-of-plant systems. This indicator provides a more meaningful basis for unit-to-unit performance comparison than gross heat rate.

Data collection for the thermal performance indicator began in 1987. The industry average for the year was 98.7 percent. Units in the best quartile achieved values higher than 98.8 percent.

FUEL RELIABILITY

Fuel reliability is measured by the amount of fission products released into reactor coolant; in effect, the more reliable fuel is, the less the release. High fuel reliability benefits plant operations and maintenance and reduces radiological hazards to plant workers. Fuel reliability is measured differently for BWRs and PWRs due to design differences.

Data collection for the fuel reliability indicator began in 1987. The 1987 industry value for BWRs was 128.4 microcuries per second, with units in the best quartile achieving a value less than 28.9 microcuries per second. The 1987 industry value for PWRs was .0049 microcuries per gram, with units in the best quartile achieving a value less than .0014 microcuries per gram.

APPENDIX B

PROTECTIVE ACTION GUIDES

APPENDIX B
PROTECTIVE ACTION GUIDES

The Protective Action Guide (PAG) has been defined as the actual and/or projected dose of ionizing radiation to off-site individuals around a nuclear facility, commencing at the beginning of an accident, which warrants protective action.

The numerical values of the PAGs were set (at 1-5 rem whole body or 5-25 rem thyroid) by the USEPA in EPA 520/1-75-001 (Sept. 1975). The technical justification of the numerical values was to have been given in Appendix C of that Document. The Document was revised and republished in 1981, still without Appendix C.

Without a published Appendix C, there is no justification for PAGs exceeding the levels of 10 CFR 20.105. It says people in unrestricted areas should not be exposed to more than 500 millirems/year, 100 mr/week or 2 mr/hr.

USEPA prepared a 9/23/83 revision of a 7/15/83 draft Appendix C, but did not publish it.

A committee of the NRC urged Chairman Zech to ask the EPA to expedite its "updating" of these PAGs; NRC Press Releases 86-163 (11/17/86) and 87-155 (11/18/87).

A December 1987 letter from Steve Rothblatt, Chief of the Air and Radiation Branch, Region V, USEPA, to Dan Bement, FEMA (Chicago) conceded that Appendix C still had not been published.

A June 22, 1988 draft of Appendix C has been quietly circulated, without any mention of EPA 520/1-75-001, and without the usual Federal Register notice. This draft ends with 119 references, but does not include a major work: Report of the Interagency Task Force on the Health Effects of Ionizing Radiation, U.S. Department of HEW, June 1979 (a 113 page summary volume, plus seven volumes of details totalling 3 1/2 inches thick, with EPA and NRC among the seven participating

agencies). Does EPA really intend to publish this? After nearly fourteen years, one can't help wondering.

The 1975 PAGs seem inconsistent with worldwide concern about the biological effects of progressively lower levels of radiation exposure, including the USEPA's concern about radon.

PAGs are not uniformly understood. For example, the underlined portions of the definition herein is based on the Rothblatt letter, and were not included in the definition on page 1.1 of EPA 520, taught in training sessions at the Perry Nuclear Power Plant.

If exposures already received were meant to be included, or are now desired to be included, there is a need to revise and reissue EPA 520. Actual exposures which exceed the PAG might justify protective actions, even without any expected future exposure. For example, large thyroid exposures might justify evacuation if it was the fastest way to administer KI.

APPENDIX C

DATA LINK MONITORING POINTS

APPENDIX C
DATA LINK MONITORING POINTS

PERRY

Unit 1 Vent Flow
Unit 1 Vent Activity Low
Unit 1 Vent Activity Medium
Unit 1 Vent Activity High
Unit 2 Vent Flow
Unit 2 Vent Activity Low
Unit 2 Vent Activity Medium
Unit 2 Vent Activity High
Off Gas Vent Flow
Off Gas Vent Activity Low
Off Gas Vent Activity Medium
Off Gas Activity High
Turbine Building/Heater Bay Vent Flow
Turbine Building/Heater Bay Vent Activity Low
Turbine Building/Heater Bay Vent Activity Medium
Turbine Building/Heater Bay Vent Activity High
10 Meter Wind Speed-Main
10 Meter Wind Direction
60 Meter Wind Speed
60 Meter Wind Direction
10 Meter Wind Speed-Backup
10 Meter Wind Direction-Backup
Data Temperature
Standard Deviation
Stability Class
Reactor Power
Reactor Water Level
Reactor Pressure
Containment Pressure

DAVIS-BESSE

Wind Direction
Wind Speed
Wind Direction Standard Deviation
Temperature Difference 75-10 Meters
RCS Hot Leg Pressure
RCS Hot Leg Temperature
Pressurizer Compensated Level
Reactor Power
Containment Pressure
Containment Radiation
Unit Vent Iodine-131
Unit Vent Xenon-133
Unit Vent Stack Flow

APPENDIX D

ANALYSIS OF SIREN TESTING

APPENDIX D
ANALYSIS OF SIREN TESTING

Alert and notification systems are a crucial part of emergency preparedness and response. These systems provide the communication link between response organizations and authorities and the public, so that the public is informed of the emergency and the protective actions which need to be taken.

Nuclear Regulatory Commission regulations require as a design objective that public alert and notification systems "have the capability to essentially complete the initial notification of the public within the plume exposure pathway EPZ within about 15 minutes", (10 CFR 50 Appendix E, Section D.3). See also 10 CFR 50.47(b)(5), which requires that emergency plans establish "the means to provide early notification and clear instruction to the populace within the plume exposure pathway Emergency Planning Zone."

NUREG-0654, FEMA-REP-1, Revision 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants", provides additional guidance and amplification of the NRC's requirements. Section E, "Notification Methods and Procedures", of NUREG-0654 establishes standards and evaluation criteria. Detailed requirements and guidance are given in Appendix 3.

Appendix 3 of NUREG-0654 describes the concept of operations as the use of commercial broadcast stations to inform the general public of emergency conditions and recommended protective actions. An acoustic signal is used to alert the public to turn on a radio or television receiver to hear the details. The acoustic alerting signal is usually provided by sirens, although other means, such as tone alert radios or automatic telephone dialers, can also be used if they meet the design objectives.

Appendix 3 sets forth the following as the minimum acceptable design objectives for the alert and notification system:

(a) *Capability for providing both an alert signal and an informational or instructional message to the population on an area wide basis throughout the 10 mile EPZ, within 15 minutes.*

(b) *The initial notification system will assure direct coverage of essentially 100% of the population within 5 miles of the site.*

(c) *Special arrangements will be made to assure 100% coverage within 45 minutes of the population who may not have received the initial notification within the entire plume EPZ.*

Appendix 3 further states that "the lack of a specific design objective for a specified percent of the population between 5 and 10 miles which must receive the prompt signal within 15 minutes is to allow flexibility in system design. Designers should do scoping studies at different percentage coverages to allow determination of whether an effective increase in capability per unit of cost can be achieved while still meeting" objective (a).

Appendix 3 contains guidance specific to sirens. For example, the siren signal is to be a 3 to 5 minute steady signal capability of repetition. The maximum sound level received by any member of the public should be lower than 123 dB. The basic criterion for the design of the siren system is the 10 dB dissonant differential, i.e., that the sound level be at least 10 dB above average daytime ambient background noise levels. The 10 dB differential is "meant to provide a distinguishable signal inside of average residential construction under average conditions. Where special individual cases require a higher alerting signal, it should be provided by other means than a generally distributed acoustic signal."

Appendix 3 provides guidance for testing of sirens to assure their operability. In addition, it is stated that the Federal Emergency Management Agency will conduct periodically a survey of "the residents of all areas within about ten miles to assess the public's ability to hear the alerting signal and their awareness of the meaning of the prompt notification message as well as the availability of information on what to do in an emergency."

FEMA-REP-10, "Guide for the Evaluation of Alert and Notification Systems for Nuclear Power Plants", elaborates upon the requirements of NUREG-0654. This

document indicates that, for fixed sirens, compliance with NUREG-0654 requirements is achieved by demonstrating that:

> *The expected siren sound pressure level generally exceeds 70 dBC where the population exceeds 2,000 persons per square mile and 60 dBC in other inhabited areas; or*
>
> *The expected siren sound pressure level generally exceeds the average measured summer daytime ambient sound pressure levels by 10 dB (geographical areas with less than 2,000 persons per square mile). FEMA-REP-10, P. E-8.*

That these criteria are met must be shown in a design report submitted by the NRC licensee. Included in the design report is a map depicting the EPZ, areas within the EPZ where the population density exceeds 2,000 persons per square mile, siren locations, and sound pressure level contours of 60 dBC and 70 dBC (the latter is needed only for those areas having population densities exceeding 2,000 persons per square mile). If the 10 dB differential criterion is used instead of the 60 dB standard, the map shows contours for sound pressure levels which are 10 dB above the average outdoor daytime ambient. The sound pressure level contours on the map are based on either a 10 dB loss per distance doubled attenuation factor, used in the absence of intervening topographical features, or a site-specific analysis based on meteorological and topographic factors, (FEMA-REP-10, p. E-7 and Appendix 2).

FEMA-REP-10 also explains the public survey, taken by telephone, which is conducted to ascertain the effectiveness of the sirens in alerting the public. The form of the survey and the statistical method for determining the sample size are included in Appendix 3.

The siren system for the Perry Nuclear Power Plant has been evaluated by FEMA using the standards of FEMA-RFP-10 and has been found acceptable. The telephone survey was conducted on March 13, 1986, following a double activation of all the sirens. Based upon the survey, at the 95% confidence level, between 82.6% and 90.6% of the households within the EPZ would have stated that they were alerted by the siren system. With regard to the survey questions asking whether the respondents had received emergency information, based on the survey, it was projected, at the 95% confidence interval, that between 69.3% and 79.1% of the

households would have reported receiving the information, between 17.3% and 26.5% would have reported not receiving the information, and between 2.3% and 6.9% would not have known whether they had received the information. See letter of September 8, 1986, from Samuel W. Speck, Associate Director, State and Local Programs and Support, FEMA, to Victor Stello, Jr., Executive Director for Operations, NRC, and enclosure.

Despite these favorable findings, the Emergency Evacuation Review Team found shortcomings. The EERT report states that it "is dissatisfied with the execution and testing of the plan's provisions for notifying the public of failures at nuclear reactors. At our public hearings in Lake and Ottawa counties, many citizens complained that they have not been able to hear the sirens during the tests." (EERT Report, January 7, 1987, p. 6). The EERT recommended that the State conduct "an independent test of the warning sirens and other components of the public notification system." (Id., p. 15). The State is presently in the process of selecting a contractor to perform the tests, which are to based on the survey methodology of FEMA-RFP-10.

In examining this issue the CAC has reviewed other studies critical of siren system alerting capabilities. NUREG/CR-2655, "Evaluation of the Prompt Alerting Systems at Four Nuclear Power Stations", prepared by Bolt Beranek and Newman, Inc. and the Pacific Northwest Laboratory for the NRC, used analytical procedures to predict siren system effectiveness under defined conditions in the vicinity of four nuclear power plants: Trojan in Oregon, Three Mile Island in Pennsylvania, Indian Point in New York, and Zion in Illinois. The predicted chance of alert varied with the postulated weather conditions and time of day. The results ranged from a 100% chance of alert for a warm summer weekend day at Trojan to 42% for a winter night during snowfall at Three Mile Island. In all cases the chance of alert at night was less than that predicted during the day or evening. The chance of alert for a winter night was always less than that for a summer night. The chance of alert for rural populations was always less than that for urban populations. The worst-case scenario was always during the night in winter, for rural populations. The chance of alert under these conditions for each of the four plants studies was: Trojan, 60%; Three Mile Island: 42%, Indian Point: 53%, Zion, 51%. These results indicate that siren systems which presumably meet FEMA and NRC criteria may be grossly ineffective under certain conditions.

Litigation before the NRC's Atomic Safety and Licensing Board in the operating license proceeding for the Shearon Harris nuclear plant in North Carolina has revealed similar inadequacies. See Carolina Power & Light Co. (Shearon Harris Nuclear Power Plant), LBP-86-11, 23 NRC 294 (1986). The issue considered was whether the siren system was capable of waking people sleeping at night with windows closed and air conditioners running. Evidence presented in the case indicated that, even though the Harris siren system met FEMA criteria for 60 dB coverage in the EPZ, the 60 dB sound level would wake only one-third to one-half of residents sleeping in houses with windows closed, (23 NRC at 368). Using the median outdoor sound level in the Harris EPZ, 82 dB, the Licensing Board calculated that the probability of arousal from sleep of one person was 62%. Accounting for household sizes in the EPA, the Board calculated that 83% of all households in the EPZ would be alerted, (23 NRC at 385-86). The Board determined that this did not meet the "essentially 100%" standard of NUREG-0654, which the Board interpreted to mean greater than 95% in the first five miles of the EPZ. The utility has provided tone alert radios to each household within the first five miles of the Harris EPZ. The Board found that the siren system, the tone alert radios, and the phenomenon known as informal alerting, when considered together, satisfied the "essentially 100%" standard, (23 NRC at 391-97).

Both NUREG/CR-2655 and the Harris decision present information and principles which can be used at any site to estimate the chance of alert under specified conditions. The siren system around the Perry Nuclear Power Plant will be used as an example for comparison with the insights deduced from NUREG/CR-2655 and the Harris decision. There are 76 sirens in the Perry EPZ, with the following characteristics: 39 rotating sirens, Whelan WS-3000, rated 123 dB at 100 feet; 19 Whehan WS-2000 stationary, omni-directional sirens rated at 115 dB at 100 feet; and 18 Whelan WS-2000 stationary, omni-directional sirens rated at 109 dBC at 100 feet. The variation in siren sound level with distance from the siren can be estimated from the 10 dB loss per distance doubled attenuation rate assumption permitted by FEMA-REP-10. Figure 1 plots the siren sound level with distance from the siren using the 10 dB per distance doubled assumption for each of the three types of sirens. In the field, the actual sound level at any particular distance may be greater or less than that found from Figure 1 due to meteorological and terrain effects. There is also likely to be some overlap of coverage from adjacent sirens.

NUREG/CR-2655 has graphically correlated the chance of alert under various conditions with siren sound levels. Figures 5-3 and 5-4 present the chance of alert outdoors vs. outdoor siren level, for both rural and urban locations, and for both stationary and rotating sirens. Siren duration for all graphs is assumed to be four minutes. Different graphs are used for stationary and rotating sirens, since a rotating siren produces its estimated sound level for only about one-fourth of its operating time at any particular listener location. It can be seen from Figures 5-3 and 5-4 that a 60 dB siren sound level in rural locations will assure notification of virtually all of the population, as will a 70 dB siren sound level in urban locations. Since the FEMA-REP-10 criteria are clearly adequate for alerting outdoor populations, no further consideration will be given to the issue of outdoor alerting, with the exception of rural locations within 1000 feet of major roadways, which are defined as roadways having more than one lane in each direction. Table 5.4 of NUREG/CR-2655 indicates that such locations have background noise levels similar to those in urban locations, with a maximum of 57 dB. If rural locations within 1000 feet of major roadways only receive the 60 dB siren sound level required by FEMA-REP-10 for rural areas, the 10 dB differential is not achieved for maximum background noise levels. Further analysis should be done for rural areas within 1000 feet of major roadways to assure the effectiveness of the siren system for outdoor alerting in these locations.

Figures 5-5 and 5-6 present the chance of alerting people indoors at home vs. indoor sound level. The curves assume two scenarios, labelled Scenario 1 and Scenario 3. Tables 5.5 and 5.6 explain the scenarios and the assumed distribution of indoor activities and associated background noise levels. These indoor activities were combined into a single indoor range presented in Figures 5-5 and 5-6. Thus, although the two scenarios assume different weather conditions as well as time of day, the curves for the scenarios are actually derived from the postulated distribution of indoor activities and associated noise levels, and are therefore applicable to any similar indoor environment.

Figure 5-7 of NUREG/CR-2655 presents the chance of alert for people working in commercial or institutional settings. For industrial environments, it was assumed that the chance of alert from sirens would be 0% due to building attenuation and

high background noise levels, (NUREG/CR-2655, p. 2-19). Persons in such locations must therefore be alerted by other means.

Tables 1A and 1B were prepared from Figures 5-5, 5-6, and 5-7, and show the indoor siren sound levels above which there exists a chance of alert in excess of 95% (the criterion which the Harris Licensing Board established to equate regulatory compliance with the "essentially 100%" standard of NUREG-0654). Tables 1A and 1B show data for five different siren durations; these were calculated from the four-minute siren curves on the figures using the procedure of Appendix E of NUREG/CR-2655.

To find the outdoor siren levels needed to alert 95% of the indoor population, one must know the attenuation due to building structures. Both NUREG/CR-2655 and the Harris decision agree that the degree of building sound attenuation is attributable almost entirely to whether the windows are open or closed and whether storm windows are in use. Houses with windows open are assumed to have 12 dB attenuation from outdoors to indoors, while houses with windows closed and storm windows in use are assumed to have 30 dB attenuation, (Harris, 23 NRC at 375, 411-12). NUREG/CR-2655 assumes an attenuation of 16 dB for houses with windows partly open and 31 dB for houses with windows closed and storm windows in use, (P. 5-8). Since winter represents the worst case, 31 dB attenuation will be assumed. Tables 2A and 2B show the outdoor siren levels above which there exists a chance of alert in excess of 95%, obtained by adding 31 dB to the values in Tables 1A and 1B. Note that a three-minute rotating siren must exceed 99 dB for Scenario 3 to meet the NUREG-0654 requirement. From Figure 1, 99 dB can be expected within only a 530 foot radius of the WS-3000 rotating siren used at Perry. A three-minute stationary siren must exceed 94 dB for Scenario 3 in order to meet the regulatory requirement. From Figure 1, 94 dB can be expected within only 280 feet of the WS-2000 109 dB siren and within 440 feet of the WS-2000 115 dB siren.

Tables 3A, 3B, 3C, and 3D present the chance of alerting people indoors from outdoor siren levels meeting the criteria of FEMA-REP-10, i.e., 60 dB in rural areas and 70 dB in urban areas. Tables 3A, 3B, 3C, and 3D were prepared from Figures 5-5, 5-6, and 5-7, which assume a four-minute siren duration; the procedure of Appendix E was used to compute the values for other siren durations. Note that a 60 dB siren level gives 0% chance of alert in commercial locations, and generally less than 10%

for Scenario 3. A 70 dB siren level yields better results, but even the best case, Scenario 1, stationary siren, 70 dB level, duration of nine minutes, gives only a 74% chance of alert, far below the required greater than 95% chance of alert. These results indicate that a siren system meeting the standards of FEMA-REP-10 will fail to perform its intended function under the conditions specified.

NUREG/CR-2655 and the Harris decision used different criteria to determine the chance of arousal from sleep. NUREG/CR-2655 used Figure 5-2. The Harris Licensing Board used Figure 2 (23 NRC at 380), where the solid line (used for the analysis) was derived from a study conducted by Krallmann on the effectiveness of sirens in waking people, (See 23 NRC at 377-83). Both approaches are based on the Single Event Level (SEL, in dB), which is defined as the indoor siren sound level plus 10 times the logarithm of the siren duration in seconds. See 23 NRC at 379; note that Figure 5-2, in defining the SEL for a four-minute siren duration, uses the same form of equation and assumes that a rotating siren is effective for only one-fourth of its duration; i.e., 24 = 10 log (4x60), and 18 = 10 log 60. (The Harris decision also assumed a 3 dB difference between dBC and dBA, which was the basis of the SEL. It is not apparent that this was considered in NUREG/CR-2655, and it was not included in the computations herein.)

Table 4 uses Figure 5-2 to obtain the chance of arousal from sleep from four-minute outdoor siren should levels of 60 dB, 70 dB, and 80dB. The SEL was calculated by subtracting 31 dB for the building attenuation and adding either 24 for stationary sirens or 18 for rotating sirens. Note that for a 60 dB outdoor siren sound level, the chance of arousal from sleep is only 5% for a rotating siren and 18% for a stationary siren. Even a 80 dB outdoor siren sound level achieves only 4% to 53% chance of alert. From Figure 5-2, using the middle curve, for a four-minute siren, an indoor SEL of 115 dB is needed to achieve a 95% chance of alert. This translates to an outdoor siren level of 122 dB for a stationary siren and 128 dB for a rotating siren. Note that these levels exceed the ratings of the sirens used in the Perry EPZ. The 128 dB exceeds the maximum sound level of 123 dB set forth in Appendix 3 of NUREG-0654.

Tables 5A, 5B, and 5C use Figure 2 from the Harris decision to determine the chance of alert for outdoor siren levels of 60 dB, 70 dB, and 80 dB for varying siren durations. The SEL was calculated by subtracting 31 dB for the building attenuation

and adding 10 log (duration in seconds). Note that a 60 dB outdoor siren level will only arouse 26% to 38% of the population, depending on siren duration and whether the siren is stationary or rotating. Even a 80 dB outdoor siren level, duration of nine minutes, and a stationary siren yields only a 61% chance of arousal from sleep. Extrapolating the solid line of Figure 2 to 95% chance of arousal yields an indoor SEL of about 120 dB. This translates to four-minute outdoor siren levels of 127 dB for a stationary siren and 133 dB for a rotating siren. These levels exceed the ratings of the sirens used in the Perry EPZ and the maximum sound level of 123 dB set forth in NUREG-0654. It must be concluded that siren systems meeting the FEMA-RFP-10 criteria fail to meet the design objectives of NUREG-0654 for arousing people from sleep in the winter or whenever windows are closed and storm windows in use.

The State should conduct a comprehensive program of testing, analysis, and public surveys to determine the degree of effectiveness of prompt alerting systems within the plume EPZs for Perry and Davis-Besse and that portion of the Beaver Valley plume EPZ which is in Ohio. This program should address the following considerations:

(1) For the purposes of determining whether there is compliance with NRC regulatory requirements, the plume EPZ must be divided into two portions, the area within five miles of the nuclear plant, and the area from five to ten miles, as different acceptance criteria apply to each area. For the first five miles of the EPZ, the prompt alerting system must meet the "essentially 100%" criterion of Appendix 3 of NUREG-0654, which the Harris Licensing Board has interpreted to mean "greater than 95%," (23 NRC at 369-72). There is no minimum percent of the population in the five to ten mile area which must be alerted, according to NUREG-0654. An earlier version of NUREG-0654 had specified 90% as the proportion of the population which must be alerted in that area, but Revision 1 has deleted any specified percentage to allow greater flexibility, (23 NRC at 369-70). The State, however, in the interest of achieving maximum protection for all its citizens, may wish to establish a minimum percentage of the population in the five to ten mile portion of the EPZs which must be alerted. Establishing a uniform standard of "greater than 95%" throughout the plume EPZ will ensure maximum protection for the

entire EPZ population and will simplify the testing and analysis by avoiding the need to make separate findings for the 0 to 5 mile area and the 5 to 10 mile area.

(2) The adequacy of the siren system for alerting outdoor rural populations within 1000 feet of major roadways must be determined. As noted above, the background noise levels in such locations may be such that the 10 dB differential is not achieved using the 60 dB siren sound level specified in FEMA-RFP-10 for rural areas. Field surveys of background noise levels and siren sound levels should be conducted to ensure that the 10 dB differential exists. Corrective action, such as the addition of sirens, should be taken in those areas where the 10 dB differential is not achieved.

(3) Populations in industrial work environments must be alerted using special means. The adequacy of these means should be verified. For example, in the Perry EPZ, local fire department personnel will directly contact such industries. However, it is questionable whether this method will ensure prompt notification of such facilities, considering the number of industrial sites in the Painesville vicinity and the other duties to be performed by fire department personnel, such as the direct notification of hearing-impaired individuals. The use and effectiveness of other means, such as tone alert radios, should be investigated.

(4) To determine the capability of the siren system to alert people indoors, a comprehensive and integrated program of analysis, testing, and public surveys should be conducted. The objective of the program is to make a realistic finding of siren system effectiveness under a number of adverse scenarios. Such scenarios should include or assume winter conditions, when windows will be closed and storm windows in use; the effects of snowfall, heavy rains, high winds, or other meteorological conditions which would diminish the propagation or detection of the siren signal; and indoor environments and human activities which represent the least chance of alert, e.g., Scenario 3 of NUREG/CR-2655 and the problem of awakening people from deep sleep (see Harris, 23 NRC at 382). These worst-case scenarios are bounding for all other conditions, so that if the siren system meets the "greater than 95%" standard for these conditions it

will meet the standard for virtually all other conditions. The following are the suggested components of the program:

(a) Site-specific analysis of siren coverage and sound levels within the EPZ using validated analytical methods. The analysis must consider the effects of topography, meteorology, siren frequency, buildings, vegetation and other applicable factors (see 23 NRC at 374) and must be able to predict siren sound levels at any given location in the EPZ for any specified meteorological condition. The analytical procedure should be used to generate maps of the EPZ showing siren sound level contours around each siren, at dB levels from rated output to 60 dB using either a 5 or 10 dB contour interval (see e.g., Harris, Figure 1, 23 NRC at 376) for each meteorological scenario considered. Field surveys of siren sound levels during periodic tests should be performed to verify the analytical methodology. (To accomplish this, a post-test analysis rather than a predictive analysis must be performed to model the actual meteorological conditions present during the test.)

(b) A limited survey of building structure attenuation, assuming winter conditions, to verify that the 31 dB loss assumed in NUREG/CR-2655 is valid; or, in the alternative, a survey of any published literature or studies of building structure attenuation. (Considering the agreement between NUREG/CR-2655 and the evidence developed in the Harris case, using 31 dB is probably sufficient, but additional verification is desirable.)

(c) Validated models for predicting chance of alert of people indoors at home and in commercial environments. In the absence of better data, the assumptions and curves of NUREG/CR-2655 should be used. The models should be capable of predicting chance of alert under conditions similar to those existing at the time of the periodic siren testing, after which the public telephone survey will be performed. The distribution of human activities assumed in Scenario 1 of NUREG/CR-2655 would probably correspond to that expected at the time of siren testing in the Perry EPZ (11 AM on the

second Wednesday of each month). A more adverse indoor environment, such as that of Scenario 3, should also be modeled.

(d) Validated models for predicting chance of awakening people from deep sleep. The Krallmann data used in the Harris case appears to be the most relevant, as it was derived from a study of 617 subjects, aged 16 to 71 years, which specifically examined the effectiveness of sirens in waking sleeping people, (23 NRC at 381-82). The effect of age on arousal probability should also be considered. The tendency of people to be awakened by sound increases with age, such that people aged 12-34 years are 0.71 times as likely to be awakened as those aged 35-54 years, and people aged 55-75 years are 1.73 times as likely to be awakened as those aged 35-54, (23 NRC at 383-85). The Harris Licensing Board used census data to conclude that use of data for the 35-54 age group was appropriate, since there are twice as many people in the Harris EPZ aged 12-34 years as those aged 55-75 years; the age effects therefore approximately cancel out, considering the population as a whole, (Id). Census data for the Ohio EPZs should be used to determine the degree to which age effects must be considered. (Note that it is not entirely clear from the Harris decision that the Krallmann data shown in Figure 2 is valid for just the 35-54 age group or if it consist of all ages, although it might be inferred from the discussion at 23 NRC 384-85 that the former is the case. The Harris evidentiary record should be examined to verify this.)

(e) The probability of household alerting must be computed by first preparing a distribution of houses by outdoor siren sound levels (found by counting the houses at various sound levels depicted on the sound level contour map which is prepared for each meteorological condition considered), (23 NRC at 375). The indoor sound levels are then determined by applying the building attenuation factor, and the appropriate models are used to find the chance of alert for each outdoor sound level distribution for each scenario considered. The alert probabilities, multiplied by the number of houses located in each outdoor sound level, are then summed to give the number of households alerted for each scenario.

The number thus obtained is actually that for alerting one person in each house; it is reasonable to assume, as did the Harris Licensing Board, that in multi-person households, if one person (aged 12 years or older) is alerted that person will alert all members of the household. Census data on household size in the EPZs should be used to account for this effect. For example, the probability of alerting a household consisting on members is given by

$$P_n = \sum_{1}^{n} P_1 (1-P_1)^{n-1}$$

where P_1 is the probability of alerting one person, (23 NRC at 385-86). The following indicates the number of calculations which must be performed:

Meteorological Scenario	Activity Scenarios
Siren Test/Survey Conditions	Scenario 1
Snowfall	Scenario 3
	Arousal from sleep
Heavy rain	Scenario 3
	Arousal from sleep
High winds	Scenario 3
	Arousal from sleep

For each adverse meteorological condition examined, two human activity scenarios must be considered. The siren test and survey scenario is used to verify the analytical methodology. The chance of alert models should account for expected siren duration during an actual emergency, as well as whether the dominant sirens are stationary or rotating. The models used for the siren test and survey scenario should assume the actual length of the siren test.

(f) The public telephone survey should be conducted after a routine siren test conducted during the winter. The siren test duration should approximately equal the three to five minute duration specified in NUREG-0654. The survey and methodology of Appendix

3 of FEMA-REP-10 are sufficient for conducting a random survey of the entire EPZ area. It should not be announced beforehand that a survey will be taken following the siren test, as this may cause people to listen for it. (It has been well documented in psychological, industrial, and medical experiments that people who know that are part of an experiment, even in the control group, will often display different behavior than they would normally; this is the reason for double-blind testing.) The weather conditions present during the siren test used for the survey should be used for a comparative analytical prediction of the survey results, assuming human activity corresponding to Scenario 1. The analytical methods should yield either realistic or somewhat conservative results when compared with the results of the survey. Nonconservative or extremely conservative analytical results indicate the need for revision or adjustment of the analytical methods. The analytical models should give best-estimate results, because they alone must be used to determine the effectiveness of the siren system at night, due to the impracticality of conducting an actual test and survey.

(5) If the analytical or public survey results indicate that the siren system will not alert more than 95% of the EPZ population in all the scenarios considered, then corrective action must be taken. This could include the addition of sirens or the distribution of tone alert radios, or some combination of both, whichever is the most cost-effective. In the Harris case tone alert radios were used within the first five miles of the EPZ. Commercially available tone alert radios, Radio Shack model 12-140, were used. These radios sound an alarm tone upon receipt of an alert signal broadcast by the National Weather Service. Cost data was included in the Harris decision; total cost for initial purchase, distribution, and development of a public education program for the first five miles of the Harris EPZ (consisting of 589 houses) was about $80,000, (23 NRC at 391-95). Use of such tone alert radios in the portion of the Beaver Valley EPZ in Ohio would require a commitment from the National Weather Service to broadcast an alert signal in the event of a nuclear power plant emergency. Obtaining such a commitment would be advantageous in that it would facilitate the use of commercially

available, privately purchased tone alert radios on a voluntary basis by persons in the EPZ who find they cannot always hear the sirens or who may want additional assurance of protection. If tone alert radios are officially distributed, the distribution program should meet the standards of pp. E-13 to E-15 of FEMA-RFP-10. The program used by the Harris utility appears to also have a number of desirable features, (23 NRC at 392-95).

(6) The Harris Licensing Board took credit for the phenomenon of informal alerting, which assumes that persons alerted by the sirens will voluntarily make an effort to notify their neighbors of an emergency, (23 NRC at 388-89). The degree to which this would actually occur is highly uncertain. Furthermore, informal alerting cannot be taken credit for in computing the degree of compliance of the prompt alerting system with NUREG-0654 requirements because the governing criterion states that "the initial notification system" must "assure direct coverage of essentially 100% of the population within 5 miles of the site." NUREG-0654, Appendix 3, p. 3-3. Informal alerting cannot be considered part of the initial notification system. (The Harris Board did not really need to take credit for informal alerting, as the combination of sirens and tone alert radios would assure coverage of more than 95% of the population. Both the sirens and the tone alert radios were assumed to be capable of alerting 83% of the population; assuming that 83% of the population not alerted by sirens would be alerted by the radios, the total fraction alerted equals 0.83 + (0.83) (0.17) or 0.97, which exceed 0.95, (23 NRC at 386, 395)). However, it is appropriate and beneficial to encourage informal alerting through public educational efforts or as part of the emergency EBS messages, by suggesting that people alert their neighbors in the event of an emergency by means other than telephone, (23 NRC at 388).

(7) Public education efforts should be made to help identify those areas of the EPZ where siren levels are deficient. People should be encouraged to call the local EMAs if they cannot hear the sirens during the regularly scheduled tests. Additional analysis or field surveys could then be performed in areas so identified, and corrective action taken if necessary.

The public should be informed of the benefit and availability of tone alert radios, which individuals may wish to purchase themselves for added assurance of protection.

Table 1A

INDOOR SIREN LEVELS (dB) ABOVE WHICH
CHANCE OF ALERT EXCEEDS 95%

STATIONARY SIRENS

	SIREN DURATION, MINUTES				
	2	3	4	6	9
SCENARIO 1	58	57	55	53	51
SCENARIO 3	64	63	62	58	56
COMMERCIAL	49	48	48	47	45

Table 1B

INDOOR SIREN LEVELS (dB) ABOVE WHICH
CHANCE OF ALERT EXCEEDS 95%

ROTATING SIRENS

	SIREN DURATION, MINUTES				
	2	3	4	6	9
SCENARIO 1	62	61	60	58	57
SCENARIO 3	68	68	67	64	62
COMMERCIAL	53	52	52	51	50

Table 2A

OUTDOOR SIREN LEVELS (dB) ABOVE WHICH
CHANCE OF ALERT EXCEEDS 95%
ASSUMING 31 dB OUTDOOR-TO-INDOOR ATTENUATION

STATIONARY SIRENS

	SIREN DURATION, MINUTES				
	2	3	4	6	9
SCENARIO 1	89	88	86	84	82
SCENARIO 3	95	94	93	89	87
COMMERCIAL	80	79	79	78	76

Table 2B

OUTDOOR SIREN LEVELS (dB) ABOVE WHICH
CHANCE OF ALERT EXCEEDS 95%
ASSUMING 31 dB OUTDOOR-TO-INDOOR ATTENUATION

ROTATING SIRENS

	SIREN DURATION, MINUTES				
	2	3	4	6	9
SCENARIO 1	93	92	91	89	88
SCENARIO 3	99	99	98	95	93
COMMERCIAL	84	83	83	82	81

Table 3A

CHANCE OF ALERT (%) INDOORS FROM A 60 dB OUTDOOR SIREN LEVEL

STATIONARY SIRENS

	SIREN DURATION, MINUTES				
	2	3	4	6	9
SCENARIO 1	34	35	37	40	44
SCENARIO 3	7	8	8	9	11
COMMERCIAL	0	0	0	0	0

Table 3B

CHANCE OF ALERT (%) INDOORS FROM A 70 dB OUTDOOR SIREN LEVEL

STATIONARY SIRENS

	SIREN DURATION, MINUTES				
	2	3	4	6	9
SCENARIO 1	61	63	65	69	79
SCENARIO 3	26	28	30	33	38
COMMERCIAL	44	45	45	46	48

Note: Tables 3, 4, and 5 all assume 31 dB outdoor-to-indoor attenuation.

Table 3C

CHANCE OF ALERT (%) INDOORS FROM A 60 dB OUTDOOR SIREN LEVEL

ROTATING SIRENS

	SIREN DURATION, MINUTES				
	2	3	4	6	9
SCENARIO 1	28	29	30	32	34
SCENARIO 3	3	4	4	5	5
COMMERCIAL	0	0	0	0	0

Table 3D

CHANCE OF ALERT (%) INDOORS FROM A 70 dB OUTDOOF SIREN LEVEL

ROTATING SIRENS

	SIREN DURATION, MINUTES				
	2	3	4	6	9
SCENARIO 1	53	54	55	58	61
SCENARIO 3	17	18	19	21	24
COMMERCIAL	19	20	20	21	22

Table 4

CHANCE (%) OF AROUSAL FROM SLEEP FROM A 4-MINUTE SIREN USING FIGURE 5-2 (MIDDLE CURVE)

	OUTDOOR SIREN LEVEL					
	60 dB		70 dB		80 dB	
	SEL IN	%	SEL IN	%	SEL IN	%
STATIONARY	53	18	63	35	73	53
ROTATING	47	5	57	25	67	44

Table 5A

CHANCE OF AROUSAL FROM SLEEP FROM A 60 dB OUTDOOR SIREN LEVEL USING FIGURE 2 FROM HARRIS (SOLID LINE)

	SIREN DURATION, MINUTES				
	2	3	4	6	9
STATIONARY					
INDOOR SEL, dB	50	52	53	55	56
CHANCE, %	31	32	34	37	38
ROTATING					
INDOOR SEL, dB	44	46	47	49	50
CHANCE, %	26	27	28	30	33

Table 5b

CHANCE OF AROUSAL FROM SLEEP FROM A 70 dB OUTDOOR SIREN LEVEL USING FIGURE 2 FROM HARRIS (SOLID LINE)

	SIREN DURATION, MINUTES				
	2	3	4	6	9
STATIONARY					
INDOOR SEL, dB	60	62	63	65	66
CHANCE, %	42	44	46	48	49
ROTATING					
INDOOR SEL, dB	54	56	57	59	60
CHANCE, %	37	38	39	40	43

Table 5C

CHANCE OF AROUSAL FROM SLEEP FROM A 80 dL OUTDOOR SIREN LEVEL USING FIGURE 2 FROM HARRIS (SOLID LINE)

	SIREN DURATION, MINUTES				
	2	3	4	6	9
STATIONARY					
INDOOR SEL, dB	70	72	73	75	76
CHANCE, %	54	56	58	60	61
ROTATING					
INDOOR SEL, dB	64	66	67	69	70
CHANCE, %	48	49	50	52	55

TABLE 5.5. ASSUMED ACTIVITIES AND BACKGROUND NOISE ENVIRONMENTS FOR PEOPLE INDOORS

Scenario	Percentages of People Engaged in Various Activities Indoors (%)						
				Indoor Noise Environment			
	At Place of Business	Listening to TV/Radio	Sleeping	Obviously Noisy[1]	Busy and Active[2]	Isolated[3]	Obviously Quiet[4]
1. Warm Summer Weekday Afternoon (clear to partly cloudy)	41	27	5	-	8	9	14
2. Summer Weekday Night (clear to partly cloudy)	4	-	96	-	-	-	-
3. Winter Weekday During Evening Commuting Hours (cold and overcast)	-	20	-	5	50	20	5
4. Winter Night During Snowfall	5	-	95	-	-	-	-

NOTES:

1. Vacuum cleaning, dishwasher, shower, vent fan on, etc.
2. Dinner conversation, kitchen work, playing music, children at play, etc.
3. Noise-producing activity in adjacent room, soft background music, etc.
4. Reading, study, eating alone.

TABLE 5.6. MINIMUM BACKGROUND NOISE LEVELS FOR GENERALIZED CATEGORIES OF INDOOR ACTIVITIES/ENVIRONMENTS.

Generalized Activity/Environment	Range of Minimum Background Noise Levels in db[1]	
	1-Min. Period[2]	4-Min. Period[3]
At home, obviously noisy[4] (i.e., vacuum cleaning, dishwasher, shower, vent fan on)	41-76	41-73
At home, busy and active[4] (i.e., dinner conversation, kitchen work, playing music, children at play)	21-64	21-54
At home, isolated[4] (i.e., noise-producing activity in adjacent room, soft background music	23-49	23-38
At home, obviously quiet[4] (i.e., reading, study, eating alone)	11-39	11-28
At work, office and commercial	28-49	28-45

NOTES:

1. Refers to the range of the minimum (L90) sound pressure levels in the 630 Hz one third octave–band.

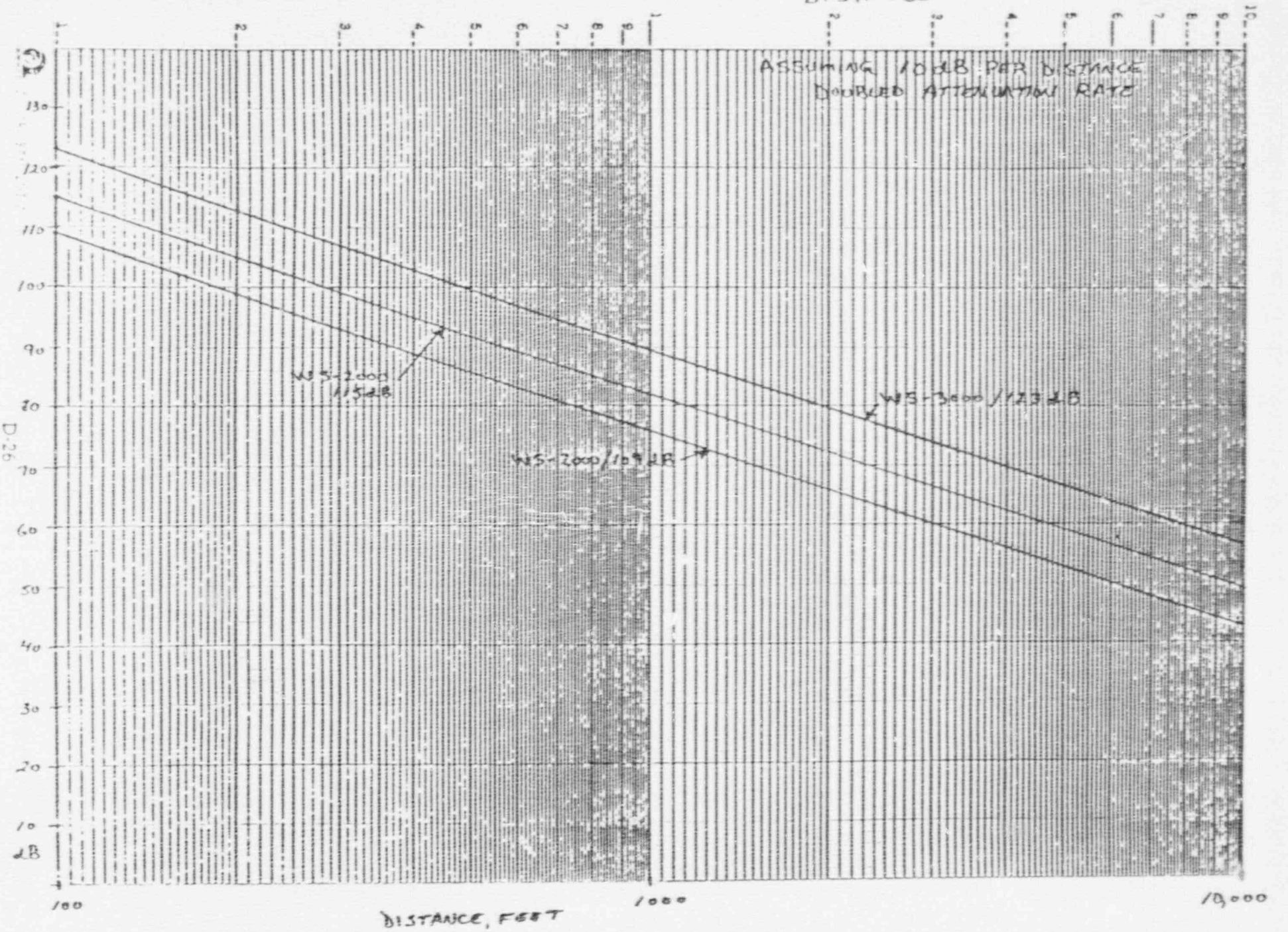
2. Applicable for analysis of rotating sirens operated for 4-minutes.

3. Applicable for analysis of stationary sirens operated for 4-minutes.

4. To simplify the procedure, these are combined into a single indoor range on the basis of the activity fractions in Table 5.5.

FIGURE 1

SIREN SOUND LEVEL VS. DISTANCE



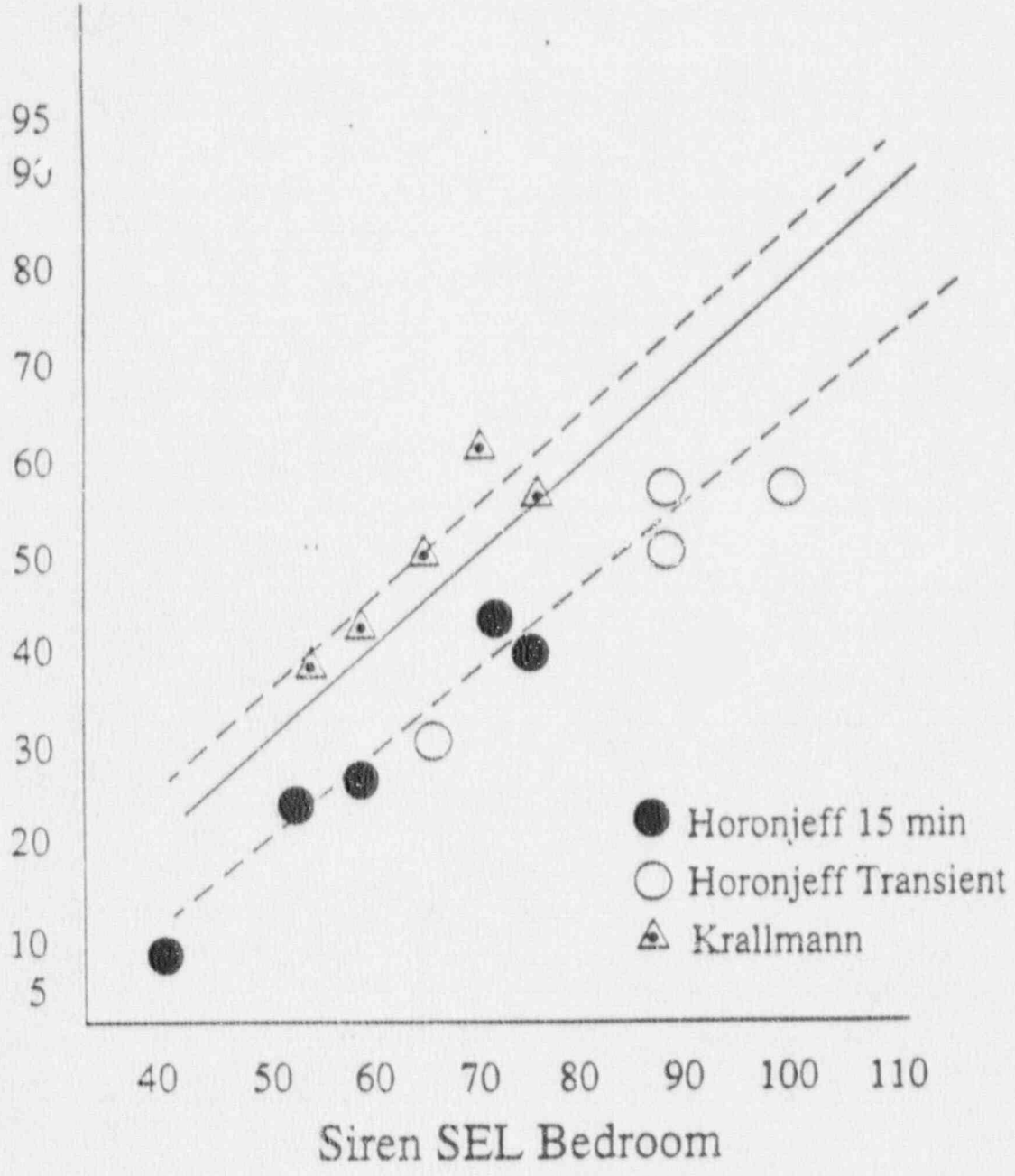


Figure 2. Arousal probability versus siren SEL. Solid line is Board estimate of arousal probability in Harris EPZ. See Findings 40,43,46.

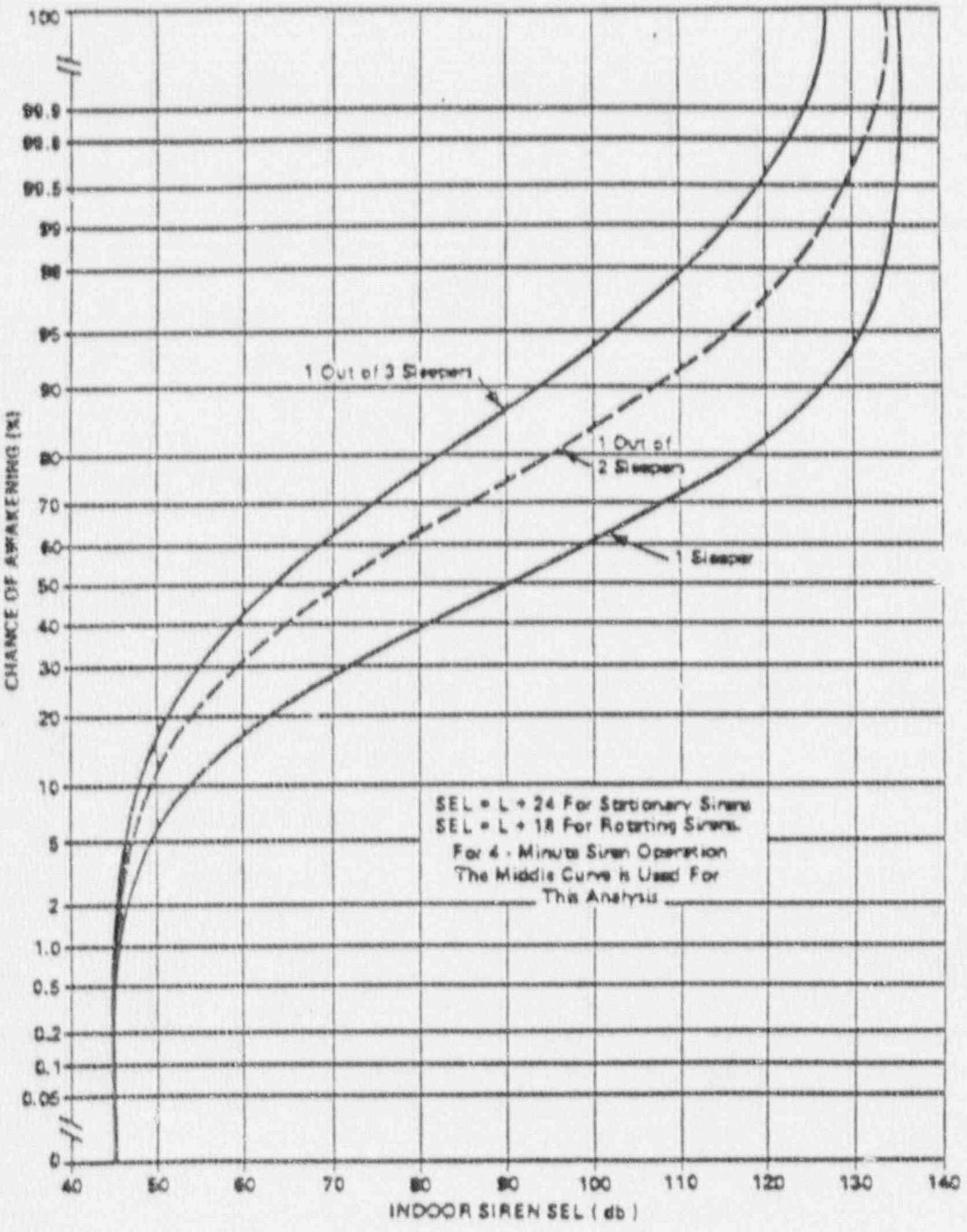


FIG. 5-2. CHANCE OF ALERT FOR AWAKENING PEOPLE ASLEEP.

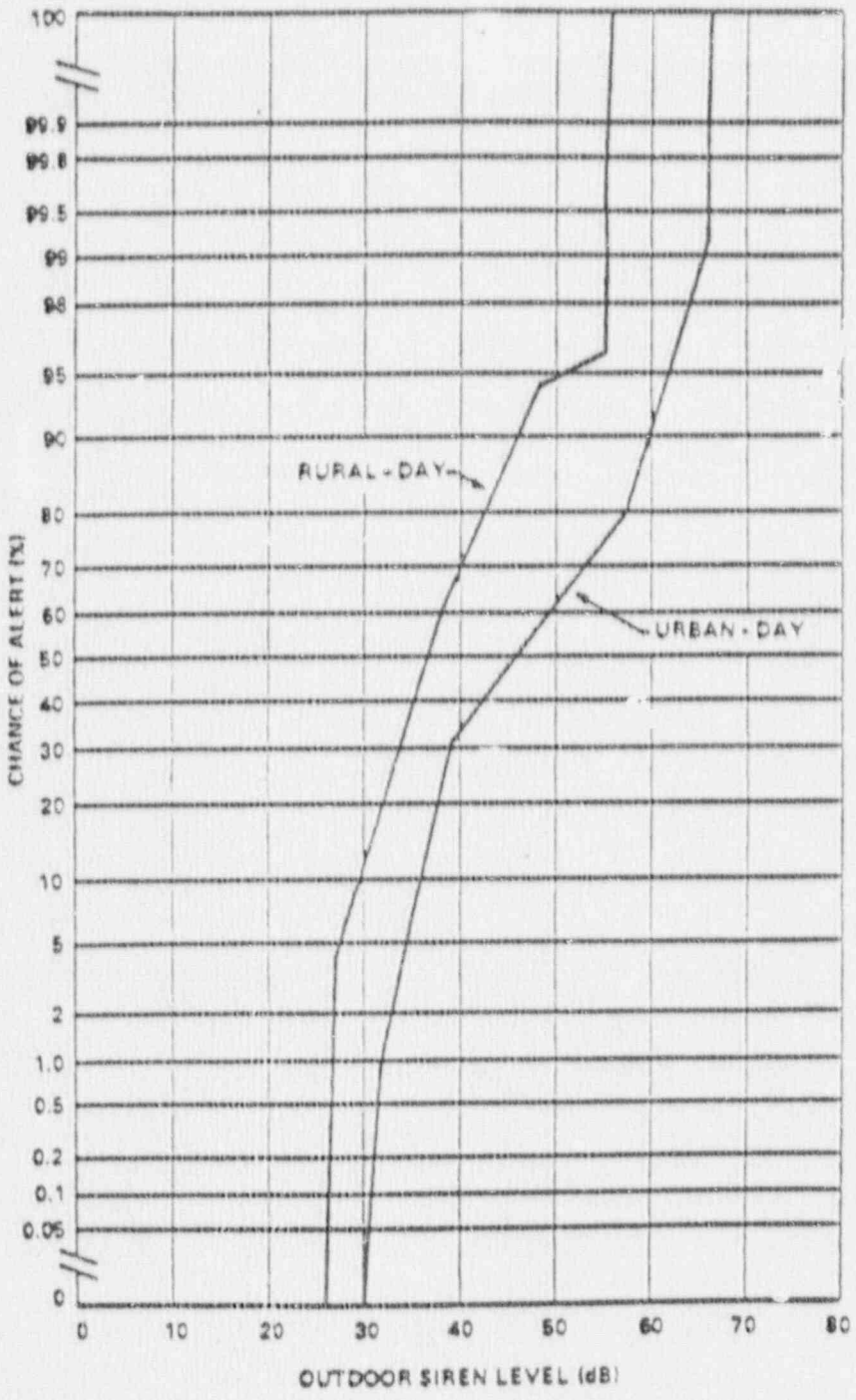


FIG. 5-3. CHANCE OF ALERT FOR PEOPLE OUTDOORS (4-MINUTE STATIONARY SIREN).

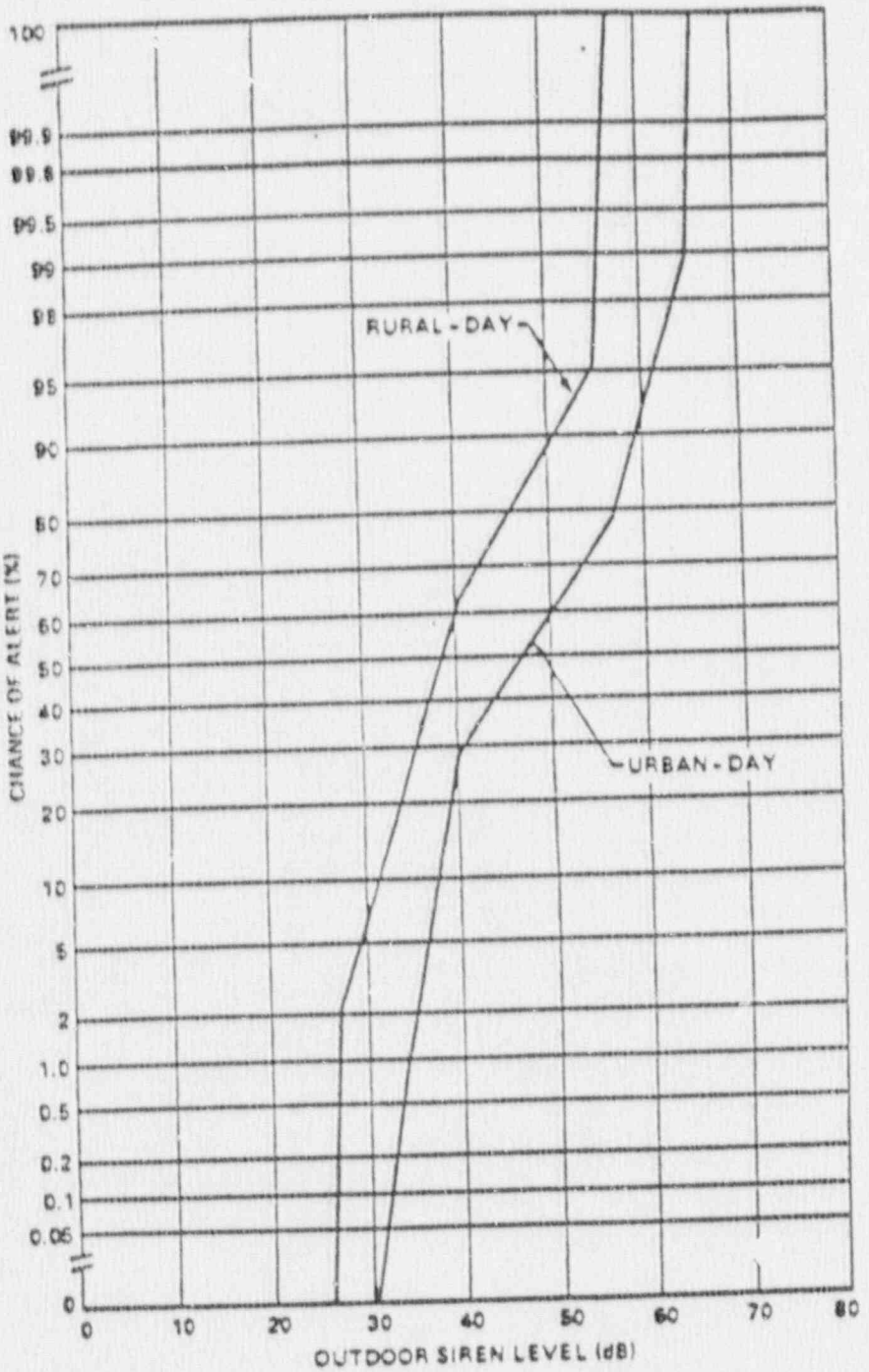


FIG. 5-4. CHANCE OF ALERT FOR PEOPLE OUTDOORS (4-MINUTE ROTATING SIREN).

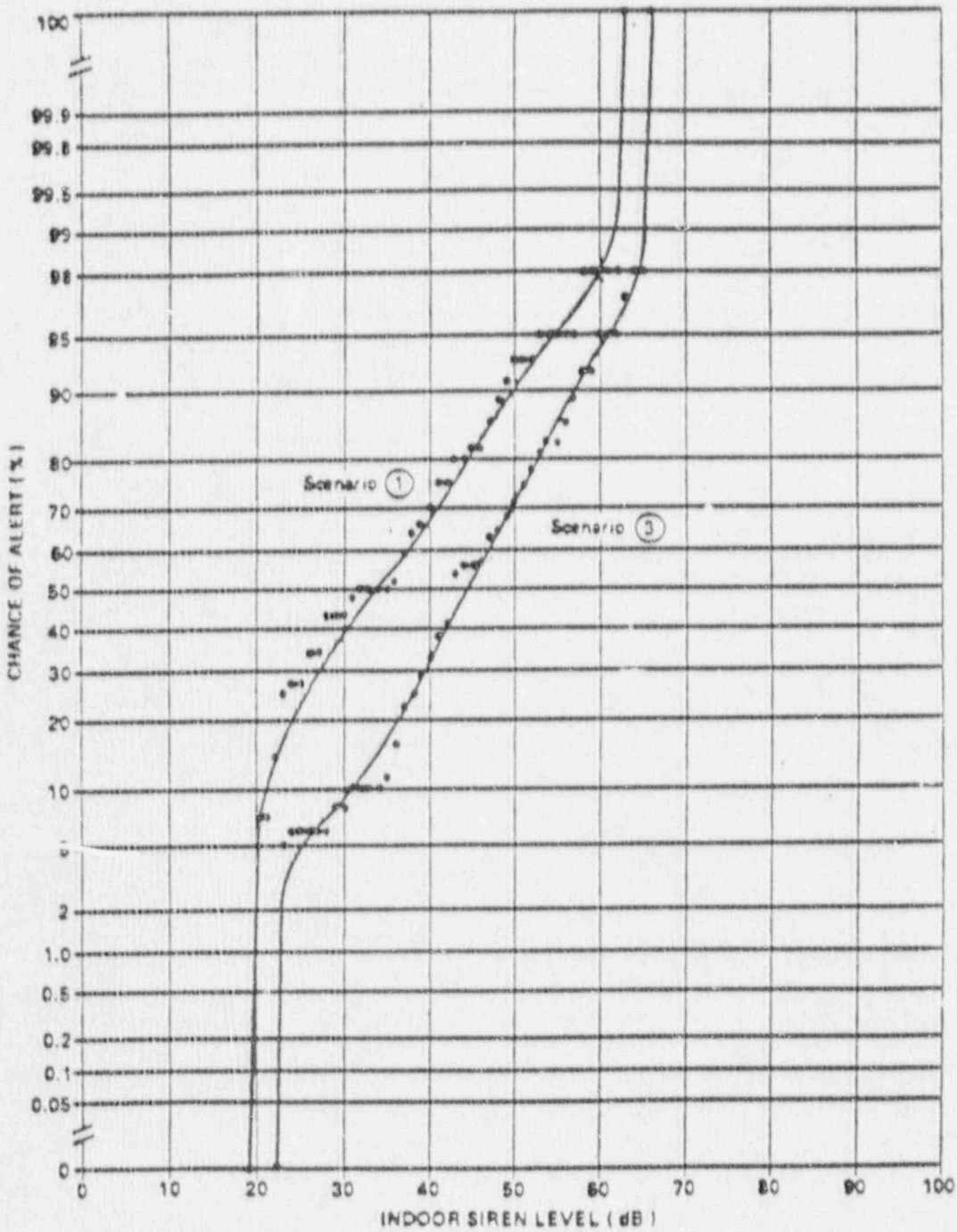


FIG. 5-5. CHANCE OF ALERT FOR PEOPLE INDOORS AT HOME (4-MINUTE STATIONARY SIREN).

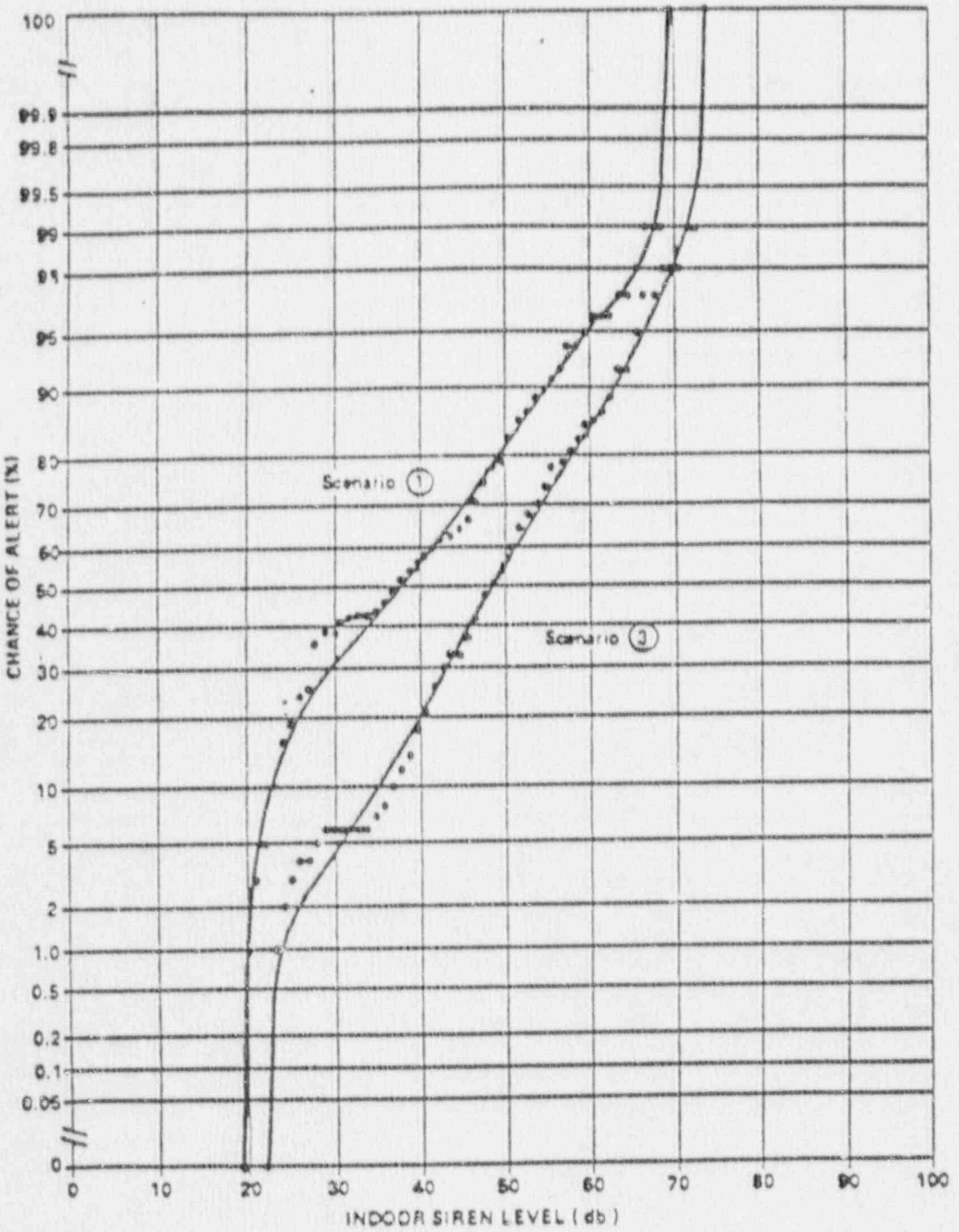


FIG. 5-6. CHANCE OF ALERT FOR PEOPLE INDOORS AT HOME (4-MINUTE ROTATING SIREN).

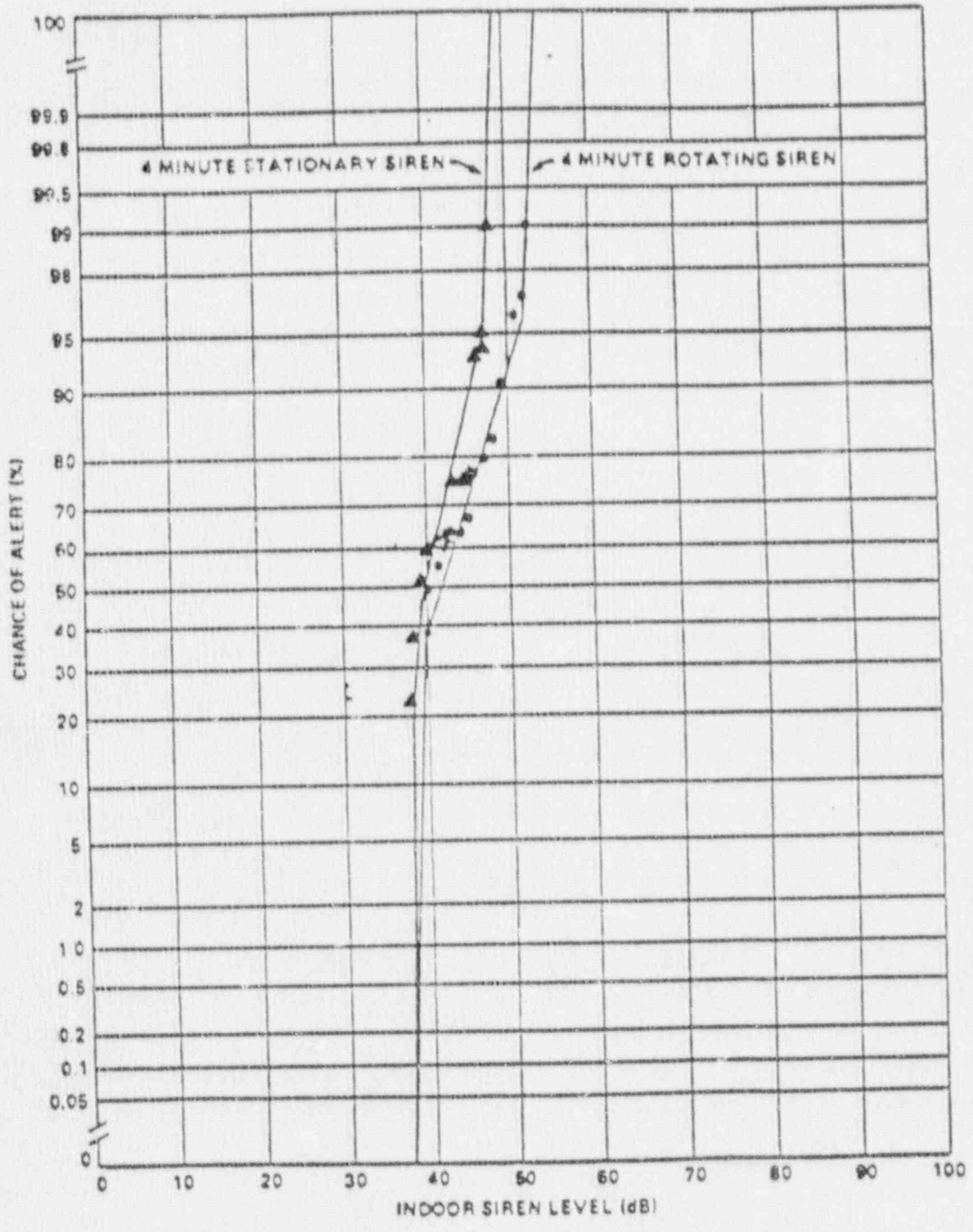


FIG. 5.7 CHANCE OF ALERT FOR PEOPLE INDOORS AT WORK IN COMMERCIAL/INSTITUTIONAL ESTABLISHMENTS.

APPENDIX E

EMERGENCY RECOVERY RESPONSIBILITITES

APPENDIX E
EMERGENCY RECOVERY RESPONSIBILITY

The primary and secondary responsibilities for planning, coordination, and implementation of protective actions for government and the general public within the ingestion pathway and the coordination of these responsibilities in an overall response effort rests with selected state, county, federal and private agencies as listed below:

The Ohio Emergency Management Agency is responsible for fixing procedures for detection. Monitoring teams will identify contaminated areas and provide escort and any necessary protective equipment to other agency sampling teams should the need arise to enter a contaminated area. It will estimate dose commitment consequences and computerize sample information for translation into dose commitment for key isotopes and compare these estimates with protective action guides.

Operationally, the EMA will provide for common facilities. It will maintain the State Emergency Operations Center at which each agency will provide a representative with specific authority relating to ingestion zone decision making. It will also identify an off-site Forward Command Center at which each agency will provide a representative with authority for command of its sample teams.

The Ohio Department of Agriculture through its Division of Animal Industry, will sample feeds and determine alternate feed sources for poultry and livestock. After consultation with the Ohio Department of Health it will impose quarantines if necessary pertaining to the sale, transfer and transport of dairy cattle and goats. It will also provide information to practicing veterinarians and livestock owners on the effects of radiation on animals.

ODA's Division of Foods, Dairies and Drugs will ensure appropriate sanitation and wholesomeness of processed food products. It will consult with ODH regarding restrictions and/or cessation of the handling, processing and sales of Grade "A" milk and milk products and develop recommendations for handling, processing and sales of Grade "B" milk products. It will maintain a

list of licensed distilled water producers for use in acquiring emergency water supplies.

ODA's Division of Plant Industry will maintain a list of bee keepers and impose restriction and/or cessation of the handling, processing and sales of honey products. It will check feed mills for compliance with federal regulations for good manufacturing practices and maintain a list of feed mills and feed haulers. The Plant Pest Control Section will ensure that pest control measures will be taken if needed. The Seed Section will determine through coordination with the County Cooperative Extension Service Agents, types, sizes and locations of commercial crops being grown. It also will inspect and test seed for purity and ability to germinate.

ODA's Meat Inspection Division will inspect meat and poultry plants to assure that meat and poultry products are wholesome and unadulterated. The Consumer Analytical Laboratories (Reynoldsburg) will provide analysis on ingestion zone food samples and agricultural commodities. The Markets Division will utilize the market news service to keep farmers informed of precautions and developments.

The Ohio Department of Health will recommend the imposition of quarantines (in coordination with ODA) pertaining to the sale, transfer and transport of dairy cattle and goats, and cause the restriction or cessation of handling, processing and sales of Grade "A" milk and milk products. It will impose controls (in conjunction with the Ohio Department to of Natural Resources) pertaining to the drawing and distribution of private water supplies within the 50-mile ingestion pathway. It will provide certified laboratory facilities for sample analysis.

The Ohio Environmental Protection Agency through its Division of Public Drinking Water, will provide technical coordination and assistant for the determination of quality limitations for established public drinking water supplies. It will sample, monitor, test, and furnish advisories based on its findings concerning public drinking water supplies. Ambient sampling of vegetation, soil and water will be done by the Division of Water Quality Monitoring and Assessment. It will be supported in this activity by the

Division of Environmental Planning and Management, which will in addition provide sampling of industrial waste water discharge and non-point source discharge.

The Ohio Department of Natural Resources (ODNR) will maintain a listing of locations of water intake points in a plume exposure pathway, as well as alternate sources of water within an ingestion pathway. The Division of Wildlife will sample indigenous plant and animal wildlife to ensure wholesomeness of game, fish or plants entering the human food chain. It may halt fishing and hunting activities in a particular area if necessary.

The federal government will also have a role in the state's efforts through the U.S. Department of Agriculture's Cooperative Extension Service and the Agricultural Stabilization and Conservation Service (ASCS). The Extension Service will provide use of its computer system through each county agent's office for accessing a bulletin board to inform local officials of developments and actions taken by state and federal agencies. Its laboratory facilities at the Ohio Agricultural Research and Development Center in Wooster will be made available to state responders, and will be used to provide emergency information to farmers. The ASCS will provide a list of food and feed facilities, fertilizer facilities, grain facilities and the availability of grain, and a list of farmers in the area including local information on crop production, acreage, and farm capability. Through its county newsletter system, ASCS will provide a means of informing farmers about preventative actions. It will activate the distribution for mass consumption of food or grain commodities owned, controlled, or purchased by the Commodity Credit Corporation (CCC). It will assist state and local governments in the collection of agricultural samples within the ingestion zone, and it will provide office space and clerical help for a local crisis center.

The county and local EMA (disaster services) Directors will serve as a point of contact for affected ingestion counties and inform county commissioners of protective actions that will take place within the county. They will assist state agencies with logistical problems.

The affected utilities will provide state government the results of analyses and all environmental samples, and provide a liaison at the Forward Command Center.

APPENDIX F

BIOGRAPHIES OF THE CITIZENS ADVISORY COUNCIL ON NUCLEAR SAFETY

APPENDIX F

BIOGRAPHIES OF THE CITIZENS ADVISORY COUNCIL AND TECHNICAL RESOURCE MEMBERS

DALE A. BAICH, Attorney at Law - Public Defender's Office, State of Ohio

EDUCATION:

Bachelor of Arts Degree - Bowling Green State University
Juris Doctor Degree - Cleveland State University

PROFESSIONAL AFFILIATIONS:

Member of the Bar:
Ohio State Bar Association, Greater Cleveland Bar Association, U.S. Supreme Court, U.S. District Court for Northern District of Ohio; U.S. Court of Appeals (District of Columbia Circuit), U.S. Court of Appeals (Sixth Circuit), American Bar Association

JEANNE M. BENTO, Ashtabula County Commissioner

EDUCATION:

Kent State University

PROFESSIONAL AFFILIATIONS:

Ashtabula Area Chamber of Commerce
Community Action Agency
Area Agency on Aging
Birthcare, Inc.
Anita Garibaldi Lodge
Ashtabula County Data Processing Board
United Way Campaign Board

RUSSELL BIMBER, Chemist and Research Associate - Ricerca, Inc.

EDUCATION:

Bachelor of Science Degree - Antioch College
Master of Science Degree - Western Research University

PROFESSIONAL AFFILIATIONS:

Chairman National Committee of American Chemical Society
National Committee of American Chemical Society
PNPP Impact Study Committee
PNPP Emergency Response Team, former Member

JOHN CHRISTENSON, Ph.D., Professor - Nuclear Engineering University of Cincinnati - College of Engineering

EDUCATION:

Doctor of Philosophy, University of Washington
Industrial Resident of Prairie Island Nuclear Power Plant

PROFESSIONAL AFFILIATIONS:

American Nuclear Society
American Society for Engineering Education

KENNETH B. COLE, Chief - Technological Hazards Branch, Ohio Emergency Management Agency, Division - Adjutant General's Department

EDUCATION:

Bachelor of Science Degree, Engineering Technology - Franklin University

MICKEY DONAHUE, International Representative - Building and Construction Trades Council. Special Representative for the United Association of Plumbers, Pipefitters, and Sprinklerfitters in the United States and Canada

EDUCATION:

East Technical High School - Machining and Foundary
U.S. Naval Vocational School, Engineering - Refrigeration and Air Conditioning
U.S. Naval Vocational School, Mechanical Engineering

PROFESSIONAL AFFILIATIONS:

Cleveland Building Trades Council, past President
State AFL-CIO Board, former Member
Cuyahoga County Cleveland Metropolitan Housing Authority, former Commissioner
Pipefitters Local Union 120, past Vice President
Pipefitters Local Union 120, former Business Representative

SHIRLEY R. DORNBUSCH, Concerned citizen, representing Davis-Besse EPZ

EDUCATION:

Graduate - Oak Harbor High School
Studies in Computer Function Training

PROFESSIONAL AFFILIATIONS:

Carroll Township Parent Teacher Association, past President
Carroll Township Parent Teacher Association, former Treasurer
Ottawa County Genealogy Society
Carroll Township Fire Auxiliary
Edgewood Manor Nursing Center
Toledo Coalition for Safe Energy

ROBERT E. HAGAN, Consultant - Department of Highway Safety; former State Representative.

EDUCATION:

Youngstown State University
Naval Aviation Cadet - Iowa State University

PROFESSIONAL AFFILIATIONS:

Former State Representative
Youngstown, Ohio, Kiwanis past President
Youngstown Chamber of Commerce, former Member

BRIAN K. HAJEK, President - Nuclear Education and Training Services, Inc.

EDUCATION:

Bachelor of Arts Degree - Otterbein College
Bachelor of Science Degree - Otterbein College
Master of Science Degree - Ohio State University

PROFESSIONAL AFFILIATIONS:

American Nuclear Society
Executive Committee Health Physics Society

SUSAN L. HIATT, Director - Ohio Citizens' for Responsible Energy, Inc. (OCRE)

EDUCATION:

Associate Degree, Electronic Engineering - Lakeland Community College
Bachelor of Arts Degree, Political Science - Regents College, University of the State of New York

JAMES LAURENSON, Attorney at Law - Arter & Hadden

EDUCATION:

Bachelor of Arts Degree - Ohio University
Juris Doctor Degree - Case Western Reserve Graduate Law School

PROFESSIONAL AFFILIATIONS:

Member of the Bar:
State of Ohio Bar Association
American Bar Association
Cleveland Bar Association

STEVEN LESSER, Deputy Director - Transportation Department, Public Utilities Commission of Ohio

EDUCATION:

Capital University Law School Graduate

JOEL LUCIA - Health Commissioner, Lake County General Health District

EDUCATION:

Bachelor of Science Degree - Kent State University
Master of Public Health - University of Hawaii

PROFESSIONAL AFFILIATIONS:

Association of Ohio Health Commissioners
Ohio Public Health Association
American Public Health Association
Ohio Environmental Health Association
National Environmental Health Association
Veteran of Foreign Wars

FLORO D. MIRALDI, Ph.D., Director - Division of Nuclear Radiology, University Hospitals of Cleveland. Also, Director - Positron Emission Tomography Facility, University Hospitals

EDUCATION:

Graduate - College of Wooster, Physics
Graduate Massachusetts Institute of Technology, Physics
Master of Science Degree - MIT Nuclear Engineering
Doctor of Science Degree - MIT Nuclear Engineering

PROFESSIONAL AFFILIATIONS:

American Nuclear Society
American Nuclear Society (Cleveland Branch), past Chairman
American Nuclear Society - Executive Committee
Sigma X
Cleveland Radiological Society
Society of Nuclear Medicine
Association of University Radiologists
American Roentgen Ray Society
Radiological Society of North America

JOHN M. MOUNTAIN, Senior Institutional Advisor - Project Management Division, Battelle

EDUCATION:

Bachelor of Arts Degree - Ohio State University

PROFESSIONAL AFFILIATIONS:

Public Relations Society of America, past President
Society of Professional Journalists, past President

DAVID NEWMAN, Ph.D., Professor Chemistry - Chemistry Department, Bowling Green State University

EDUCATION:

Bachelor of Arts - Earlham College
Master of Science Degree - New York University
Doctor of Philosophy - University of Pennsylvania

PROFESSIONAL AFFILIATIONS:

American Chemical Society
Electrochemical Society
North American Thermal Analysis Society
Phi Kappa Phi

DARRELL OPFER, Ottawa County Commissioner

EDUCATION:

Bachelor of Science, Education - Bowling Green State University
Master of Arts, History - Bowling Green State University
Peace Corps Training - Columbiana Teachers College

PROFESSIONAL AFFILIATIONS:

Vice Chairman - Emergency Preparedness Committee County Commissioners' Association of Ohio

ROBERT QUILLIN, former Director - Radiological Health Programs, Ohio Department of Health

EDUCATION:

Bachelor of Education Degree, Civil Engineering - Yale University
Master of Science, Sanitary Engineer - Ohio State University
Master of Science Public Health, Radiology Health - University of North Carolina

PROFESSIONAL AFFILIATIONS:

American Board of Health Physics
American Association of Physicists in Medicine
American Association for Advancement of Science
American Public Health Association
Health Physics Society

SHELDON THORPE, Principal Engineer - Welsh and Whelan, Inc.

EDUCATION:

Graduate, MIT Chemical Engineering
Mathematics and Statistics, Special Program Studies - University of Cincinnati

PROFESSIONAL AFFILIATIONS:

Chairman - Technical Advisory Safety Group for Northern Ohio Section of the American Nuclear Society

RONALD J. VANEK, Director - Research and Education Department, Utility Workers' Union of America, AFL-CIO

PROFESSIONAL AFFILIATIONS:

Utility Workers Union of America (UWUA) - Local Union 270 and former Member
Past President of Local Union 270

THOMAS R. WEBB, Executive Vice President - URS Corporation

EDUCATION:

Bachelor of Arts Degree in Economics - Michigan State University
Bachelor of Arts, Business Administration - Michigan State University
Masters Degree, Business Administration - Michigan State University

PROFESSIONAL AFFILIATIONS:

Board of Directors - Kinetics, Inc.

DAVID T. WILLIAMS, Director - Governor's Office of Advocacy for People with Disabilities, State of Ohio

EDUCATION:

Physics Major Graduate - Youngstown State University
Master of Science Degree - University of Toledo Medical College of Ohio
OJT Program in Nuclear Medicine - Cleveland Clinic Foundation

PROFESSIONAL AFFILIATIONS:

Chairman - Ohio Developmental Disabilities Planning Council
State Job Training Coordinating Council
Chairman - Governor's Task Force on Continuing Disability Investigations

BEN WILMOTH, Health Physics Supervisor - Ohio Department of Health

EDUCATION:

Bachelor of Science Degree, Zoology - Ohio University
Masters Degree, Environmental Science - Ohio University

PROFESSIONAL AFFILIATIONS:

Health Physics Society
Associate Member - Conference of Radiation Control Program Directors

CHARLES E. WISE, Partnership - CJR Wise; Sandusky County Lifetime Grain and Dairy Farmer

EDUCATION:

Business Administration - Bowling Green State University

PROFESSIONAL AFFILIATIONS:

Sandusky County Farmers' Union, past President
OCC Governing Board, former Chairman
Ohio Farmers' Union Executive Committee
Martin Luther King, Jr. Commission

APPENDIX G

TABLE OF ACRONYMS

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TABLE OF ACRONYMS

CAC	Citizens' Advisory Council
CFR	Code of Federal Regulations
DOE	Department of Energy
EERT	Emergency Evacuation Review Team
EOC	Emergency Operations Center
EPZ	Emergency Planning Zone
ERDS	Emergency Response Data System
FEMA	Federal Emergency Management Agency
FR	Federal Register
INPO	Institute of Nuclear Power Operations
IPZ	Ingestion Pathway Zone
IZRR	Ingestion Zone Recovery Reentry
KI	Potassium Iodide
NRC	Nuclear Regulatory Commission
ODA	Ohio Department of Agriculture
ODH	Ohio Department of Health
OEMA	Ohio Emergency Management Agency
OEPA	Ohio Environmental Protection Agency
PAC	Planning Advisory Council
PUCO	Public Utilities Commission of Ohio
SEL	Single Event Level
URSB	Utility Radiological Safety Board
USEPA	United States Environmental Protection Agency