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**DIGEST OF MEETING SPONSORED BY ATOMIC INDUSTRIAL FORUM ON JUNE 30, 1959
FOR DISCUSSION OF THE NOTICE OF PROPOSED RULE MAKING REGARDING FACTORS
CONSIDERED IN SITE EVALUATION FOR POWER AND TEST REACTORS**

The meeting was held at the Atomic Industrial Forum offices in New York City and was attended by representatives of the nuclear power industry including utilities, manufacturers, designers and constructors. Mr. Phillip Sporn was chairman of the meeting. Government representatives participating were:

- Harold L. Price - Division of Licensing and Regulation
- John F. Newell - " " " " "
- C. R. McCullough - Advisory Committee on Reactor Safeguards
- James B. Graham - " " " " "
- Eugene Simpson - U.S. Geological Survey (Presently assigned to Division of Reactor Development)
- Charles Hessler - U.S. Weather Bureau

Mr. Sporn opened the meeting by stating that its purpose was for an exchange of ideas between the industry and the AEC on the subject of the Notice of Proposed Rule Making in order to provide a better understanding by the industry of the thinking behind the Notice and, in addition, to give the AEC the benefit of the thinking of industry on the subject. He stated that he did not expect that policy would be formed during the meeting but he did want to "talk out" the subject. In the forenoon he called on the government representatives for discussion of the problem and in the afternoon the floor was open for general discussion from all present.

Mr. Harold Price described the purpose for publishing the Notice was to list some factors which are considered in the present evaluation of proposed sites, to invite comments on these factors as well as suggestions on other factors which should be considered and to stimulate thinking and discussion on the subject. It was made clear that the publication or its wording is not considered the final answer to the siting problem, but instead, is the beginning step in development of a rational approach to the problem. The wording of the Notice was discussed and the importance of finding a way to express the intent of the Notice in a general way for public use as well as awareness of the danger of adopting definitive requirements prematurely was

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pointed out. In this regard it is possible that a policy statement might be formulated expressing the intent of the rule which would be helpful to the Commission and to the industry. Also an outline of the kinds of information needed from an applicant and the order in which it is needed in obtaining a construction permit and operating license is presently being prepared. The need was discussed for developing a policy statement of safety philosophy which would tie together all the safety factors associated with the reactor facilities and siting considerations. It was indicated that criteria on topics relating to other aspects of safety are presently being developed for public comment and with their formulation it is believed that a fairly complete policy statement covering all aspects of reactor safety can be developed.

There was discussion regarding the rationale behind the statements in the Notice. Nuclear power is considered by some utilities as the type of power they would like to locate in centers of population for reasons of economy of operation, particularly with regard to fuel handling, and smoke control. The opinion was expressed that the present statement of considerations in the Notice would preclude construction of a power reactor in a city.

Dr. McCullough described the role of the ACRS in evaluation of the safety of power and test reactors. Since Part 20 of the Commission's regulations gives a guide for normal operations, the ACRS is concerned primarily with "other than normal" operations of a reactor and the impact on the health and safety of the public if an accident should occur. Operating reactors store up fission products and the amount stored is a measure of the hazard potential. The amount of fission product escape is a function of the design of the reactor and the barriers for preventing escape. The factors of design and environment as relating to public health and safety, if an accident should occur to a reactor, was discussed.

Exclusion distance between a reactor and the neighboring property is important in protection of the public from radiation if there is an accident. It will reduce gamma shine, which would result from fission products retained in the containment sphere, provide time for reduction in concentration of fission products which might escape to the atmosphere, and provide some time for initiation of an emergency plan. The exclusion distance can be reduced by engineering design; however, as distance becomes smaller correspondingly higher integrity of engineering design and construction is demanded. The problem is to find a practical way to express means for reducing damage to people in terms of probability of an accident happening.

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There will be accidents but there is not enough information available to make a statistical evaluation at this time.

In answer to a question regarding the cost of safety, Dr. McCullough stated that the ACRS Charter does not include economics, however, it realistically can't be completely blind to this problem. In broad terms there is a background of hazard we always live with which is not easy to define. If someone wants to locate a reactor in a place where the ACRS believes is too high a risk it does not want to be in a position of recommending "fantastic" safety provisions. It is indicated that nuclear plants need to have a factor of safety of 10 to 100 above other hazards because of the limited experience in the nuclear industry to date.

There was general discussion in which the point was made that a bad accident to a reactor, particularly at this time, could seriously hinder progress in the nuclear power industry. Also, there was discussion on the question of how much safety is required in a reactor facility. There was feeling that "absolute safety" is being required in the reactor industry which is not reasonable to attain. The maximum credible accident varies with who writes it and the accident which is predicated more than likely will not happen. However, one cannot predict the accident that will happen nor its consequences. The industry needs to have a firm understanding of what constitutes good and prudent design. A facility can be designed to prevent damage from exceeding a certain level which poses a philosophical question of acceptance of minor damage from radiation. Ignorance of medical and engineering facts and statistics contributes to the difficulty of this approach. An approach to the problem of rating sites on the basis of total damage which might result from an accident and which might suggest the degree of protection to be engineered into a reactor facility for a site is under consideration by the ACRS.

Mr. Charles Hessler discussed the role of meteorology in the siting of reactor facilities. The pattern of air movements in and around the site will have some bearing on the suitability of one site versus the other. From a study of the meteorological records available at stations near to the potential sites, prevailing wind directions and likelihood of frequent inversions or slow dispersion conditions can be determined. Full understanding of the meteorology will permit some use of the atmosphere for dilution of gaseous effluents and at the same time assure that a normal operating plant effluent can be released to the atmosphere safely. The meteorological situation at the time of an accident in which fission products are released can have considerable impact on consequences to the public and surrounding area. The need for maintaining records on meteorological conditions associated with gaseous effluent emissions and incorporation of meteorological considerations into

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the emergency plan was described. The point was made that meteorology cannot always be relied on to give the expected dilution as indicated by Sutton's equations. A study made at Shippingport was described in which the relationship of the site meteorology to the regional conditions was determined with the use of smoke tests. It was found that the Weather Bureau meteorologist in Pittsburg could forecast with at least 70 per cent accuracy the direction a smoke cloud would travel at the Shippingport site by using the regional meteorological situation at the time of release.

In discussion it was brought out that meteorology is not an exact science but is subject to statistical treatment in relation to the other environmental parameters such as topography and population distribution. The value of meteorological information in the hazards report was questioned. However, several remarks were made in support of the usefulness of this information, particularly in determining the operational and engineering requirements for management of gaseous effluents.

Dr. Eugene Simpson prefaced a discussion on hydrology with definitions of a number of terms and a description of procedures involved in selection of a site. Each site contains an infinite number of characteristics that could be described and those most pertinent should be determined for the locations under consideration. The degree of detail devoted to describing the environmental characteristics depends on the size of the proposed facility in terms of quantities of radioactive materials and their containment or disposal.

Since water moves in close contact with earth materials many of the radioactive materials in liquid waste effluents tend to become absorbed as the effluents flow through these materials. The absorption of radioactivity does not mean that it is fixed to the earth materials, but merely moves at a slower rate than the water or liquid. The interaction between earth materials and radioisotopes is a chemico-physical process. Many earth materials slow down and even concentrate the radioisotopes during the course of movement of liquid waste through the terrane. It appears possible to classify various terrane types in terms of relative radioactivity mobility. The limestone terranes in northern Florida, for example, would have a relatively high mobility; whereas a sand plain, such as the Sand Hill region of Nebraska would have a relatively low mobility. The mobility will vary from place to place within a given terrane. The range of variation in some terranes will be small, such as the Limestone or Sand Hill terranes, and will vary widely in others, such as the glaciated regions of New York and New England. Where the range of variation is small the choice in site conditions from the hydrologic viewpoint makes little difference.

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Where the range is large significant variations in geohydrological conditions will occur over relatively short distances. Thus by shifting a site a relatively short distance in a general locale, it may be possible to move from a location which has poor liquid waste disposal characteristics to one of good characteristics.

The conditions favoring low mobility of radioactivity sometimes favors unavailability of water. Since power plants require large quantities of water they tend to be located on banks of large streams which is a point of high radioactive mobility. Consideration should be given to location of a plant reasonably removed from the very bank of a stream in order to take advantage of the lower mobility of the adjoining earth materials.

The question of seismology was raised and was generally considered of not too great importance in site selection except for the west coast although the largest earthquake in the history of this country occurred in Missouri. It was considered good judgment to avoid sites on faults, particularly active faults.

Mr. John Newell described the general site consideration problem as a combination of two problems: 1) The environmental factors of the particular nuclear plant under consideration and 2) the environmental factors of the site. The problem is to match the factors of the plant and site in a reasonable manner.

The plant factors to be considered are: (a) Effluents from the plant (gaseous or airborne, liquid and solid) from normal operations as well as accident situations; (b) inherent safety of the plant and integrity of the plant systems for retaining the fission products; (c) safety engineered into the plant including containment, ventilation and air cleaning, and liquid and solid waste management.

The site factors to be considered are: (a) People in the site area, their property and works, and the natural resources; (b) the relative abilities or weaknesses of the various segments of the natural environment at the site under consideration in providing protection. These considerations lead to the factors listed in the Notice of Proposed Rule Making.

The Chairman requested comments from utilities on problems their plants would have in meeting requirements of the Notice. Yankee site has no problem but believed they would not want to locate in such a remote location in the future. Consolidated Edison of New York is surrounded by dense population but is situated in as remote a location as available in its system. Local population is enthusiastic about

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the "no smoke" aspects of the plant. Believes that containment can be designed to modify the distances specified in the Notice and asked that numbers be omitted from any rule developed. Dresden site meets requirements of the Notice, however, believes the site is larger than necessary. The numbers expressed in the Notice gives problems. Although the Dresden reactor is considered large by today's standards, it may be small when compared to reactors in the future. Believes it would be very desirable if the Commission would prepare a list of information that is required on the siting problem and the timing for its submittal.

The general concensus of the ensuing discussion was to the effect that issuance of a rule at this time is premature and misinterpretation by other governmental groups of the language (numbers) used in the Notice might cause industry unwarranted problems. With few exceptions, there was opposition by the industries represented to incorporation of siting criteria as a part of the Commission's regulations, although it was believed that the Commission should issue a policy statement on siting at this time. In addition, it was urged that detailed instructions on the items which should be considered in site analysis and evaluation be issued at an early date. It was believed desirable that the AIF support sponsorship of a series of technical papers and discussions on the siting problem in order to develop information which might be applied to development of a regulation in the future.

The group of industries represented at the Forum adopted resolutions on the following points:

1. That it is not now timely for the AEC to issue any firm and definitive rule governing site selection.
2. To support and encourage the Division of Licensing and Regulation in preparing a list of information needed in applications for construction permits and operating licenses together with the time at which each type of information should be submitted.
3. To support symposia dealing with various aspects of site selection and hazard analysis. The papers should be presented under such auspices as to permit free expression of views to reflect advances in the related technologies.
4. Encourage the AEC to prepare and issue a paper setting forth its philosophy regarding the interrelated factors of reactor siting, engineering design characteristics of nuclear power plants and hazard analysis.

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5. Encourage the ACRS in its approach to evaluation of reactor accidents and to make available its studies on the subject because it might provide a basis for rating the relative hazard status of a particular reactor project or suggest other means for classifying or rating the relative safety of projects.

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