OHIO CITIZENS FOR RESPONSIBLE ENERGY

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JULY 5, 1985

COMMENTS ON DRAFT NUREG-1032, "EVALUATION OF STATION BLACKOUT ACCIDENTS AT NUCLEAR POWER PLANTS"

The following constitute specific comments on draft NUREG-1032 submitted by Ohio Citizens for Responsible Energy, Inc., a public interest ogranization specilizing in nuclear reactor safety issues.

1. The report appears to rely heavily on the work and concepts of EPRI, specifically the work of H. Wyckoff. See, e.g., pp. 2-3, 2-4. While some of these remarks on the information contained in the LERs may have validity, it must be ensured that EPRI's approach has not introduced a bias in the other direction, i.e., of under-reporting the frequency and duration of LOOP events. Attachment 1 is a memorandum from Mr. Wyckoff discussing "misleading" reporting of LOOP events in LERs. The heavy hints on improving the records of industry and specific stations and avoiding "inappropriate" regulations strongly suggest this possibility of bias, if not outright deception.

The assumption that other power sources could have been made available does violence to the whole concept of using operating experience as a data base. Station blackout can result from or be prolonged by human error. For example, the description of the Indian Point event of 06/03/80 (p. A-10) does not indicate why the available gas turbine was not used. Was human error involved? Similarly, the incidents discussed in Attachment 1 involve the assumption of manual connections of reserve transformers. Before taking credit for these sources, it must be asked whether these connections could be made easily. Are they routine operations? Have operators been trained to accomplish this,
and are there written procedures available? How long would such a connection take? Until all uncertainties are accounted for, the favorable interpretation of LER data advocated by EPRI may not be warranted.

Of similar concern is the use of responses to generic letters. See p. A-17. The utilities' responses to that letter undoubtedly contain a factor of optimism which might not be confirmed by actual experience.

2. The use of EPRI LOOP data, encompassing more recent events, and older diesel generator reliability data (NUREG/CR-2989)

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creates a bias toward lower frequencies for LOOP and higher DG reliability. See Attachment 2, in which data for the years 1980-82 will lower the LOOP probability from previous estimates based on older data. This gain might be offset by adverse DG experience in these and later years, particularly the poor performance of Transamerica Delaval engines, and recent events at North Anna and Fermi-2.

It is dangerous to promulgate policy or regulations to be in effect for decades based on a few years of plant operating experience. The past experience may or may not be representative of that to be expected in the future. Because of these uncertainties, it is best to err, if at all, on the conservative side.

The diesel generator reliability problem is a case in point. After decades of experience with internal combustion engines, and with large, medium speed diesel generators in particular, one would logically expect that such machines would become more reliable with time. Yet, in the 1980s, we have the pervasive problems with Transamerica Delaval engines, resulting from poor design and quality practices.

The optimism expressed in Attachment 2 on "continually improving off-site power reliability" due to more and larger generating sites, may also be misplaced. The concentration of system capacity in a few large generating sites (to be expected as smaller, older units are retired) may also decrease grid reliability. Take, for example, a hypothetical system having 6000 MW capacity, concentrated in 3 2000-MW generating sites, versus a system with the same total capacity but supplied by 6 1000-MW sites. If we assume that both systems suffer a loss of one generating site at a time when another generating site is unavailable, and system demand is 4000 MW, the first system has only 2000 MW available, while the second system has 4000 MW, enough to meet its demand. The first system will have to obtain power from other systems to meet demand, or brownouts/blackouts will occur. The current trend of constructing 2 or more large power plants at one site thus increases the vulnerability of the whole system to disruptions of power caused by loss of one site.

3. The use of the median in evaluating the time to repair a diesel generator (see p. 1-2) is misleading. Figure 4.6 indicates that almost 22% of the DG failures reported took 24-1600 hours to repair. The mean time to repair a DG is thus greater than the median (8 hours) and is highly dependent on the breakdown of the DG repair times in this lumped category. If we assume that the average value for the 15-24 hour lumped category is 20 hours, and the average for the 24-1600 hour lumped category is 100 hours, the total mean is 27 hours. This is over

3 times the median value. It is not clear if the median or the mean was used in the calculations of Appendix B. This should be clarified
and the choice justified. The actual mean time to repair the DGs should also be reported.

4. The statement (p. 6-6) that equipment in containment can be expected to withstand station blackout environmental conditions is not justified for all plant designs, since it was found in NUREG/CR-2182 that the BWR Mark I drywell electrical penetration would become thermoplastic and cause containment failure by excessive leakage.

5. The last paragraph on p. 7-17 contains inaccurate and unduly optimistic information. The new hydrogen and QP/ML rules do not require the installation of igniters; the choice of system is left to the licensees, who all have chosen igniters powered by AC power. The problem referred to could easily be avoided by powering the igniters off the DC system, easily accomplished as the igniters are merely resistive heating devices operable by either AC or DC. It is stated that the problem of restoring power when the hydrogen concentration is detonable can be mitigated through proper procedures. I am not aware that any such procedures are yet developed (at least not for BWR Mark IIIs).

I fail to see how the use of the igniter system can mitigate such a situation. The igniters are an ignition source, and if introduced into hydrogen concentrations of approximately 18% (as would result in the Mark III from a 75% metal-water reaction), severe overpressures would result from the ensuing deflagration. A detonation, though less likely, would be even worse. It is possible that procedures for this situation, if and when developed, will instruct operators to vent the containment. Either way, containment integrity is lost.

Sincerely,

Susan L. Hiatt

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ATTACHMENT 1

Subject: Misleading Reporting of Loss of Off-Site Power

A just completed investigation by NSAC has shown that the true number of incidents where all off-site power is lost at nuclear stations is substantially less than LERs and other types of "Event Reports" have implied. This is a vital matter because as reported they suggest that generically there is a greater probability of loss of off-site power than in fact exists. If this misperception continues it may ultimately result in inappropriate regulations.

When a station reports a loss of any off-site power source, the LER typically states, "LOSS OF OFF-SITE POWER". This is followed by a description of the source that was lost. However, inquiries reveal that in many instances there remained energized sources of off-site power, and these are almost never mentioned. In one instance a reserve transformer from the 345 kV yard was lost and the diesels started automatically. But unreported, there also was a full capability backup reserve transformer that is fed from a 23 kV off-site line. It was energized and would have been connected manually if the diesels had not started.

In another incident the reserve transformer from a 138 kV source became deenergized and the diesels started. The report stated that off-site power was lost. In reality however, a reserve transformer fed from a 13 kV bus remained energized and could have been connected manually.

The chance that the availability of a backup off-site source will not be mentioned appears to be accentuated if a choice has been made to start the diesels automatically and to use the backup off-site source as a manual backup to the diesels. In any event it is understandable that the loss of the main off-site power source might become thought of by the reader as a loss of all off-site power while the availability of a backup off-site source is not reported, perhaps judged by the utility to be beyond the scope of the LER requirements.

You can help your station's record and the industry's record by providing a few more details when reporting loss of off-site power events: 1) Specifically state at the beginning how many sources of off-site power were lost and how many remained available. 2) You might use the term "partial loss of off-site power" in all cases except when a total loss of all sources occurs.

3) Include at least a sentence about which source or sources remained available so that there can be no confusion regarding whether all off-site power was in fact lost, or if in reality certain sources continued to be available, as is usually the case. 4) It is also important to state clearly how long the total loss of all off-site power lasted. Often the LERs state when the faulted line was again available, but fail to mention that another off-site source became available much sooner. Also, once a station is on the diesels, it often chooses to stay on the diesels, even though an off-site source may become available. However, in determining risk, what counts is when off-site power was again available, whether used or not.

Please encourage your NRC regional office and site representative to be complete and accurate when reporting events that involve any loss of an off-site source. NRC PNOs and "daily plant status reports" (transmitted on NOTEPAD) have also tended to be incomplete in reporting these events.

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NUCLEAR SAFETY ANALYSIS CENTER
operated for the electric utility industry by the Electric Power Research Institute

ATTACHMENT 2

Memorandum

September 23, 1983

TO: Distribution

FROM: H. L. Wyckoff HLW

SUBJECT: LOSS OF OFF-SITE POWER AT NUCLEAR POWER PLANTS DATA FOR YEARS 1980, 1981 & 1982

NSAC has completed a survey of the incidence of the loss of all off-site power at U.S. nuclear power plants for the years 1980, 1981, and 1982. A number of previous studies at EPRI[1] and elsewhere had collected this data for earlier years, but not for these three most recent years. This memo provides the results of the survey.

LERs FOR YEARS 1980, 1981, AND 1982

For the three years, 1980 through 1982 there were a total of 5 events where all off-site power was lost,[2] or would have been lost if the main turbine-generator had tripped off. For the 53 operating sites during the period, this represents an average loss-of-all-off-site power failure probability of 3.1×10^{-2}, or once every 32 years per site. This compares to the 15.7×10^{-2} loss-of-off-site power failure probability that the NRC staff used in a presentation to an ACRS subcommittee in May, 1983.

The probability used by the NRC appears to be based on the experience of the late 1960s and the 1970s. It should be expected that as more and larger generating sites continue to come on line, plant interties overall will continue to become shorter and stronger. This can be expected to result in continually improving off-site power reliability, as appears to be the case.

[1]EPRI NP-2301 (Loss of Off-Site Power at Nuclear Power Plants: Data and Analysis)

[2]The LaCrosse nuclear unit has not been included in this survey because of unique off-site power supply problems.

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YEAR 1981

For the year 1981, we confirmed one instance where all off-site power was lost.

It was:

MONTICELLO
DATE: 4-27-81
LER: 81-009
CAUSE: During a refueling outage a 4.16 breaker was racked out under load and shorted, causing an outage of the 4.16 essential bus network.
OUTAGE: 15 Minutes

YEAR 1982

For the year 1982, we confirmed two instances where all off-site power was lost. The loss at Nine Mile Point 1 was for only 10 seconds and its inclusion is a matter of judgement. The two instances are:

NINE MILE POINT 1
DATE: 2-07-82
LER: 82-004
CAUSE: Inappropriate relay action on 138 kV line during test.
OUTAGE: 10 Seconds

NOTE
The unit did not trip off and the 345 kV switchyard remained energized. However, the auxiliary transformer is connected directly to the generator output. With the 115 kV source of off-site power deenergized, there would have been a loss of all off-site power (for 10 seconds), if the main turbine-generator had tripped.

QUAD-CITIES 2
DATE: 6-22-82
LER: 82-009
CAUSES: Unit trip and associated loss of unit auxiliary transformer while reserve auxiliary transformer was out for maintenance.
OUTAGE: 29 Minutes