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Some good thoughts in this Bill

Mailstop AR-400
NRC/TMI Special Inquiry Group

To David Evans,

Reply to NTFTM 790806-39

My name is Irving A. Peltier and I am a Senior Project Manager for NRR/DPM/LWR-1. My office address is the Phillips Building, Bethesda, Maryland; phone number 492-8379.

I have been in my present position for about seven years and prior to that I worked for about 10 years in the AEC/RDT Nuclear Safety Program. Six of the 10 years were spent at the National Reactor Testing Station in Idaho Falls, Idaho as Chief of the Reactor Safety Test Branch of the Idaho Operations Office. The Reactor Safety Test Branch had responsibility for programs such as SPERT, SNAPTRAN, Semiscale Tests, LOFT and PBF.

My involvement with licensing of B+W plants included Oconee, Units 1, 2 and 3 at the operating license stage; Davis Besse, Unit 1 at the operating license stage; and Boardman, Units 1 and 2 at the site review stage (Boardman site was abandoned and project became Pebble Springs).
My involvement with the above plants was as project manager (licensing) during the staff's

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review of the respective applications for licenses.

I was only involved with the three Oconee plants at the operating license review stage and there was no public hearing. The application was reviewed by the ACRS subcommittee and the full committee.

As I recall some of the significant issues raised during the review and early operation of the plants were

a) Flow induced failure of vessel internal instrument guide tubes.

The failure took place during preoperational testing of Unit 1 when there was no core in the vessel. It was a big problem for the utility and B+W because it resulted in damage to the steam generator tube ends in addition to a redesign of the guide tubes. B+W carried out an extensive program of vibration testing on all vessel internals and beefed up the guide tubes. The damaged steam generator tube sheets and tube ends were machined and repaired. Units 2 and 3 were modified similarly to the modifications made in Unit 1.

So far, it would appear that the

redesign and repair efforts were successful.

During this failure incident the installed loose parts monitoring system was in service and the event contributed considerably to its fame since it was instrumental in the decision to shut down the flow test and investigate.

b) ECCS.

This issue was generic to all plants and was in rulemaking hearing. The major staff concerns regarding ECCS performance in accordance with the interim rule dealt primarily with reflooding after a LOCA. The B+W design evolved around reflooding tanks and check valves in the downcomer plenum in order to assure recovery of the core after initial blowdown.

B+W ECCS models meeting the requirements of Appendix K to 10CFR-50 were eventually approved by the staff but as I recall small break modeling was troublesome as I would expect because of the three dimension thermal hydraulic nature of the core, the complexity of flow paths and void formation.

c) High Energy Line Breaks.

As I recall, this issue was stimulated by an anonymous letter to the ACRS but was generic to all plants. With respect to this issue, Oconee was peculiar because of the way in which one main steam line on each plant was routed through the penetration room which housed much of the piping and electrical wiring for the engineered safety features. Also, Oconee does not have main steam isolation valves.

The applicant added many pipe whip restraints and modified the penetration room to relieve over pressure in order to satisfy the staff that failure of high, moderate and low energy systems would not jeopardize the engineered safety features of the plant, either by direct pipe whip or environmental (pressure, temperature, moisture) effects. All three plants were modified.

d) Fuel Densification

This issue was generic to all plants and was resolved on a generic basis for B+W plants. The effects of fuel densification on the integrity and heat transfer characteristics of the fuel were studied analytically and by irradiation tests and actual in-reactor fuel experience. Empirical data and analytical models were combined to provide a basis acceptable to the staff for accounting for the effects of fuel densification in the core operating limits throughout core lif . I do not know who initially raised the issue.

e) Primary Pump Seal Failure

I cannot recall if it was Unit 1 or Unit 2, but one of the Oconee plants suffered a main coolant pump seal failure during operation. The event resulted in 50 or 60 thousand gallons of slightly radioactive water being dumped on the containment floor. The event in itself was not of serious safety significance but it did highlight the fact that liquid waste storage and processing at the plant were inadequate. This fact was recognized by the staff and the applicant had agreed to build additional liquid waste storage prior to the event but I believe the addition had not been completed. In preference to dumping the low level liquid waste in the river, it was trucked away (to Savannah River I think).

f) Onsite Power

The Oconee Station is unique with respect to onsite power. Instead of diesel generators, the plant relies on the Keowee Hydro Station on site for a back up to grid power. The Hydro station is tied into the nuclear plants for automatic start on ESF signal. The hydro station is highly reliable and has an abundance of power output available. However, it is not single failure proof to the extent that the two hydro turbines were feed by a single penstock gate in the Keowee Lake above the dam. The applicant resolved the problem to the staff's satisfaction by chaining and locking the inlet gate in the open position. Maintenance of the Keowee Hydro station which requires closing the inlet leaves the plant without onsite backup power. However, I believe that this was resolved without the requirement for shutting down the nuclear plants by the applicant bringing in a separate and dedicated power line from one of its gas turbine stations during periods of hydro station maintenance.

g) Control Rod Drive Motors

For some period of time, the earlier B+W reactors had a problem with over heating and burning out of control rod drive stepping motors. The scram function was not impaired and the problem was eventually resolved by replacing the older drives with a newer model.

h) ~~At least [illegible] of the~~ Pump Lub Oil Fires

At least ~~[illegible]~~ one of the Oconee plants experienced fires inside containment resulting from lub oil for the main coolant pump ~~[illegible]~~ motors overflowing the sumps and falling on hot reactor coolant piping. On one occasion the event occurred even after the sump capacity had been effectively increased by piping the overflow to a 50 gallon drum. I believe maintenance personnel had left a transfer valve closed.

As well as the physical fixes to prevent sump overflow, investigation into lub oils with higher flamability temperatures was conducted. I do not recall whether a new oil was ultimately used.

i) Liquid Waste Storage Capacity

As mentioned above, the staff felt that the liquid waste storage capacity was initially inadequate. The applicant agreed to increase the capacity by building waste storage buildings.

j) Core Mapping ~~One of the se~~

One of the earlier problems that staff had with the B+W system was core mapping by way of fixed neutron flux probes in the core. I do not remember the details anymore but a number of meetings were held with B+W on this subject and a program for core mapping acceptable to the staff was developed.

I do not recall major safety issues being raised on Davis Besse 1 since the Oconee plants as well as the other Oconee type plants served as effective prototypes for Davis Besse 1 and therefore, most of the generic problems had been worked out. The major issues on Davis Besse 1 were environmental because it was located in a wild ~~[illegible]~~ bird sanctuary on Lake Erie.

There ~~are~~ is one significant difference between Davis Besse 1 and other B+W NSSS prior to it and that ~~is~~ is it is housed in a dual containment. The dual containment concept employed raised a number of staff concerns about fission product leakage control because of the number and type of bypass paths. This matter was not directly a function of the NSSS, however.

The Boardman plant never got beyond the site review stage. The applicant was not successful at getting the Navy to move the practice bombing range near the Boardman site because of some rather complex politics and therefore elected to move to the Pebble Springs site when the staff insisted on the site being hardened for aircraft crashes in the vicinity of the plant structures.

To the best of my recollection B+W took part in all of the issues raised by the staff and the ACRS on the above plants and ACRS transcripts are probably the only transcripts that would exist at this time. Of course B+W took part in the ECCS rule making hearing.

For the most part on issues raised by the staff, disagreements were over technical approach to resolution and not over principle. Cooperation between applicant, B+W and staff was good.

✓ The role of the staff outside of the adjudicatory process, I would rate as "Fair" on a scale of "Excellent", "Good" "Fair" and "Poor". I believe the main reason for this is that the Standard Review Plan was ✓ hurriedly conceived and composed and does not provide the effective mechanism for assuring that each application meets the legal requirements for licensing. It is * oriented too much toward guiding technical ✓ reviewers in making judgements in their field of expertise.

The staff's role in the adjudication process, I would rate as "Poor" since management support * appears to be almost non-existant. Management tends to over-react to ASLB and ALAB decisions which ultimately result in much extra expenditure of manpower and resources on seemingly trivial matters (Note ALAB 444). However, management is seldom present at hearings prior to such decisions to help establish ~~a~~ an adequate record and steer the boards away * from trivial issues.

The staff's documentation of its positions is generally "Good" both in volume of coverage and adequacy of description. Implementation is sometimes confusing and inconsistent but applicants appear to have a good first hand knowledge of our positions (from the Reg Guides, SRP and BTP) whether or not they necessarily agree with them. More and better bases for the implementation are needed.

The staff's post-licensing actions, I would * rate as "Poor" because it appears that all post-licensing actions are band-aid remedial actions, taken on a shot-gun approach. Our tendency seems to be to over-react to a new problem, shut plants down all over the country and then settle for a procedural or * analytical fix. Plants should not be shut down unless the problem is real and if it * is real the plants should be fixed. Objective safety and subjective safety should be clearly separate in the decisions to shut plants down and fix them.

The licensing and review process in general I would rate as "Fair" with respect to consistency. Staff positions are evolving and changing but implementation policy worsens the applicant's understanding of what we are doing and when. Likewise, our effectiveness in implementing the statutory standards is only "Fair" probably because there are too many interpretations of these standards. This of course, could result

* from the standards being too general in their description or too poorly conceived. Sometimes, if you don't really know what you want, it is difficult to ask for it and if a problem can't be defined, its solution is difficult to formulate. Someone suggest to me that before we impose a new requirement, we should eliminate two old ones. This approach may be more effective than allowing old requirements to accumulate and fall into obsolescence.

The staff is effective and should be rated as "Good" in controlling vendors, A-E's and constructors but the technique is "arm twisting" and not the "power of our logic". Appeals meetings are very few and even when one takes place the atmosphere that prevails is "do it our way or you don't get your license (at least not until after a schedule crippling review period)". I feel that we often deal too directly with vendors, A E's and constructors at considerable expense and loss-of-control by the utilities. Licensing issues become contractual issues between utilities and their suppliers.

Effectiveness in ensuring safe design and operation of plants is a difficult thing to assess meaningfully because fate plays tricks on everyone. The safest plant may be the one that has the accident and therefore goes to the bottom of the public and political will. Notwithstanding quirks of fate, I would have to rate our effectiveness as "Poor" in the hypothetical sense because we tend to side step real defficiencies and rely too heavily on procedural cures to improve the level of safety.

The evolution of nuclear safety must take place as a process of experience, taking steps to minimize the chance that something that has happened will happen again and the fixes should be real hardware fixes. However, this process is slow and does not necessarily correct more basic defficiencies because the accident resulting from or worsened by a basic defficiency may never have occurred. Improvement in basic concepts such as "the one rod criticality criteria" are few and far between. Regulation has concentrated on quality of design, fabrication and construction as a subterfuge to inherently safe concepts. The result has been safer components backed up by complex and complicated add on safety system. An approach which we call "defense-in-depth."

I can recall standing on top of the SL-1 reactor and having an Army Captain describe the SL-1 to me as the safest reactor in the world because it had experienced the worse combination of failures and still remained under control. Two months later the rod was pulled. It is not that such experiences are not invigorating in human activity but we should not discourage the kind of thinking that would have made the SL-1 accident very difficult right from the very first design concept. Much of our think has not evolved since the Chicago pile with its rope and ax.

The licensing process or regulation does need to be reformed. Licensing and regulation is a legal process. It should be separated from the function of setting national safety standards. The system as it now exists is like having the executive, legislative and judiciary branches all in one branch — the law makers and the police in the same department.

Regulation should have the function of assuring that licensees have met and continue to meet their legal requirements for a license.

National Safety Standards should be formulated by a technical organization, divorced from Regulation, and which works with industry with common goals.

Hearing Boards should be independent of both the above and their function should be to settle disputes over violations of legal requirements.

The above reforms, I believe, would tend to restore public confidence and discourage the tendency for covering up misjudgements resulting from conflicts in functions. More importantly, however, it would tend to put strong technical management where it belongs and strong legal management where it belongs. These functions are diffused in Regulation at the present time.

I don't see how there can be any doubt that the nuclear industry is non-competitive in the sense of incentive to "build a better mouse trap". The game often appears to be to skate by the licensing process and look over the other guy's shoulder to see how it is done. Our rules and positions very clearly telegraph the message, "do it our way or suffer severe licensing delays and penalties."

The steps outlined above for reform would go a long ways toward correcting this problem because a vendor with a good idea could go to the national safety standards organization and get the idea reviewed for safety prior to getting into the licensing crunch or putting it on the market even.

The technical qualifications of licensees vary but generally are very good when compared to the norm of the technological industry and government regulatory bodies.

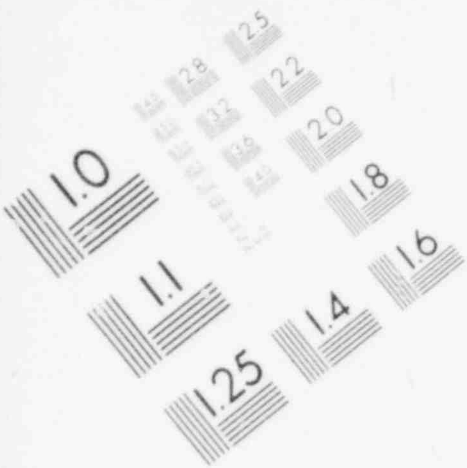
Quality assurance is generally very good but oversold as important and effective in assuring safety. Quality assurance and control works best as a tool for cost reduction and standardization on mass produced items. It is an economic tool. It could and may work to the detriment of safety on any given nuclear plant because it instills the thinking that "someone will catch the mistake" rather than "do a good job because a lot is riding on it."

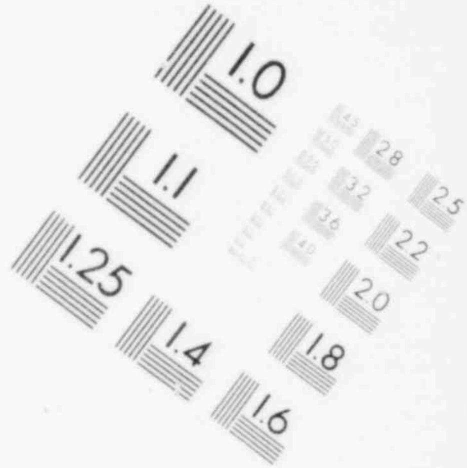
Emergency planning is somewhat of a smoke screen issue for nuclear power plants. Most public service organizations such as the police, rescue squads, national guard etc. can and do routinely take protective measures on behalf of the public during crisis and disasters of one type or another. That is their business and they are trained and skilled and very effective. Protective measures in the event of a nuclear incident in many respects are much easier to handle because radiation effects are not disabling to the general public, at least in the short-term and ample time is available for assessing and predicting the course of an event. One of the nice things about radiation is that it can be detected and measured at levels well below thresholds of disabling damage to the population around the release area. The release area is also fixed and not random in its place of occurrence.

Of course utilities must give the public service organizations adequate notification of and realistic assessments of any incident but that should be enough. The higher up an incident gets in the political system the more it is likely to result in ineffective action, particularly when interactions with the press and news media lead to confusion about the facts.

As safety standards change, the nuclear industry must change with them. Industry should have the right to be a party to and to test any propo-d changes which are techn-ical in nature (affect technical concepts and configurations of nuclear plants). Those safety standards which are social-economic, environmental or political should be tested by the public for acceptance. In any event "backfitting" and "ratcheting" are a way of life and should be accepted by the industry and regulatory as acceptable changes in standards take place.

The concept of the "design basis accident" is a good one for establishing design bases for nuclear power plants with limited accident experience.





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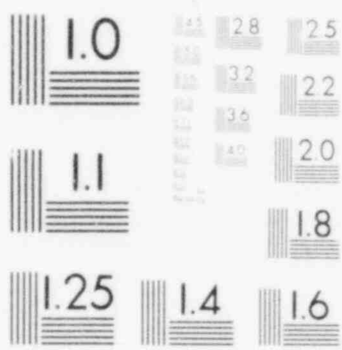

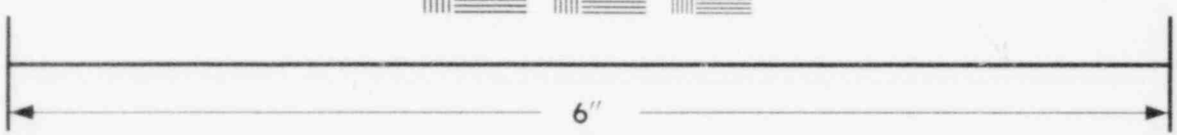

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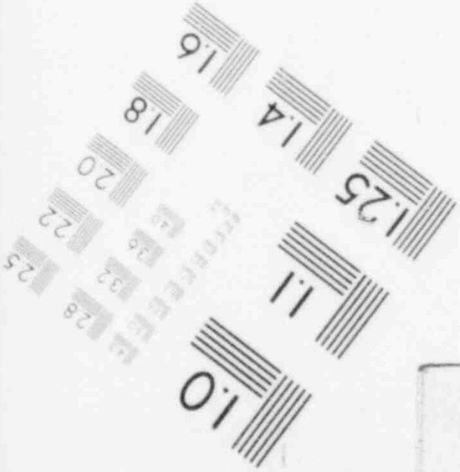

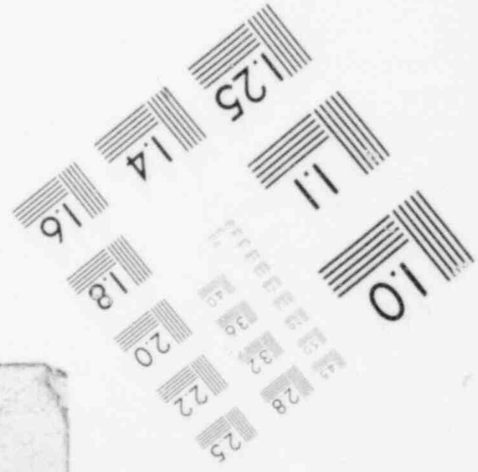

However it has two drawbacks.

1) The analytical consequences of a "design basis accident" have been misconstrued by the public as "reality". Thus there is a demand for more conservatism and safety assurance than that which is already in the analysis assumptions. The old AEC and now NRC has never been successful in communicating "reality" to the public. They have said, "The cage is strong enough to hold a tiger" so the public assumes that there is a tiger or worse inside the cage. It may only be a lamb. We still hear talk about 10's of thousands of people getting killed.

2) The "design basis accident" tends to force emphasis on those safety systems required in the analysis to mitigate the consequences of the hypothetical event. As a consequence, the role of so-called non-safety grade systems is diminished and sometimes their functions are defeated when, in fact, it may turn out that they could be very useful during the course of the incident. They may even turn out to be essential in mitigating the effects of or controlling the progress

of an incident which does not precisely fit the description of the "design basis accident."

A safe machine has the following character:

1) Inherent safety (controls or limits itself by fundamental design)

2) Ability to control an induced transient resulting from operator action, component failure or some other unexpected event by the normal control and process systems.

3) A manual or automatic backup system in the event 1) and 2) are not successful.

4) A last-ditch system to prevent the first three items above from resulting in a worse consequence if they are not successful.

The "design basis accident" assumes that 1) and 2) above are non-existent or fail, concentrates on 3) and ignores 4).

If "safety-grade" means "redundancy", "single failure proof" and "pedigree" and "non-safety-grade" means the absence of the three, it must be recognized that there is not a one-to-one correspondence between the three characters and "effectiveness". A system can have all three and not be effective for the function for which it is intended.

There has been a long standing debate between the industry and Regulatory about the use of non-safety grade equipment and the reliance placed upon it to prevent or mitigate the consequences of anticipated transients. Essentially no debate has taken place with respect to accidents. Yet it is not difficult to reason that any conceivable accident starts as a transient and whether or not it is ultimately dubbed an "accident" often depends on the circuitous reasoning that it was an accident because it was not expected to occur during the life of the plant and/or engineered safety features were called into action. In some thinking, TMI would be appropriately characterized as a transient for which fuel temperatures got outside of anticipated acceptable limits and yet engineered safety features were called upon to act. It is difficult to understand what was accidental about TMI. Surely it cannot be reasoned that malfunctioning of a PORV is not anticipated at sometime or even that someone might misoperate the plant.

The only important real question is, "What systems were necessary to bring the plant under control and which ones complicated the process or may have made it worse."

If a seat belt is designed to reduce death by impact and yet increases the probability of death by fire, one should not be faced with the choice between death by impact and death by fire. In a nuclear plant, an operator should not be left with the choice between overpressurization and core melt. There should be a clear preference for one or the other or measures should be taken to assure that reducing the probability of one does not increase the probability of the other. It is conceivable that both the chances of overpressurization and core melt can be reduced by using non-safety grade plant systems but it will require a hard look at the three-dimensional thermal hydraulic character of large cores to assure that flow systems provide adequate quantity and distribution of flow to prevent flow starvation in hot regions of the core and bypass through cooler regions. A mismatch between heat generation and heat rejection in the primary system can be tolerated but not for long. Loss of flow cannot be tolerated. It is questionable that current safety-grade systems on PWR's guarantee the necessary conditions stated above. Also, there are no "last resort" systems such as pressure vessel dome venting on PWR's to assure flow through cooling of the core.

I do not understand the term "Residual Risk", therefore, I cannot comment on it.

The Special Inquiry Group should assure that the TMI-2 incident is reported to the public in unambiguous ways and in terms of everyday values that the public can understand. For example, a realistic assessment of the financial losses and how these will be distributed among the rate payers and public at large. These losses and cost to the public should be compared with other casualties suffered on a routine basis. Secondly, the health hazards compared to routine health hazards from radiation should be published and compared with health hazards from other environmental factors (man made or natural). The Government should publish realistic assessments of nuclear plants and their hazards as a basis for comparing nuclear impacts with 10 CFR, Part 100 criteria.

I can only recall, vaguely, issues on the Oconee Plants which may be related to the TMI-2 incident (precursor events). These had to do with the design of rad waste capacity, auxiliary feedwater reliability and PORV malfunction. It would be risky, however, to assume that past experience with faulty brakes and windshield wipers explain why a car drove off a cliff. Attempts were made to correct defficiencies in Oconee. I do not know whether these defficiencies were corrected in other B+W plants, if they existed, or not. I doubt, however, that in themselves these defficiencies signaled a TMI event.

I can think of no people with information or knowledge who could or should be contacted by the Special Inquiry Group and who could bring more to bear on the subject than those people already in the act.

I have no additional comments.

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