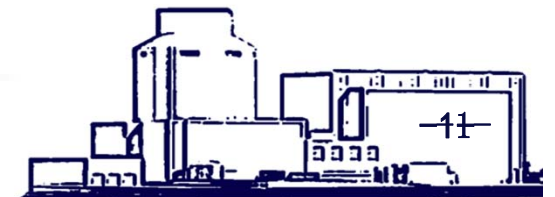
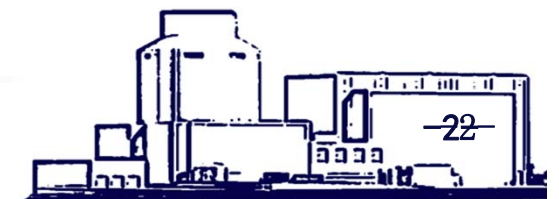


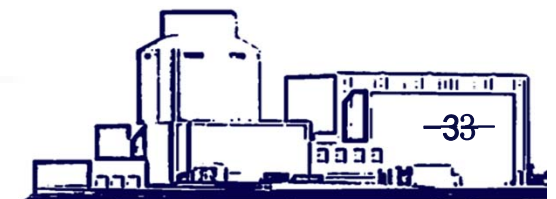
Equipment Survivability Issue



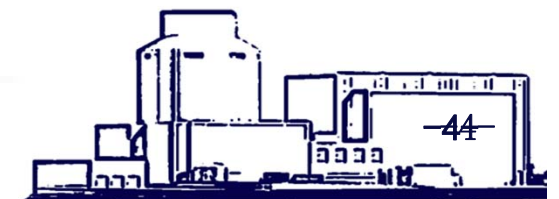
- Background
- Current practice
- Discussion
- Suggestion



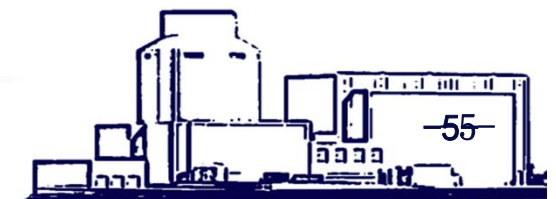
- Sever accident mitigation
 - Mitigation actions: to achieve a controlled, stable state after core damage
 - More limiting harsh environment attendant with influences of hydrogen burns
 - Evaluation of equipment and instrumentation availability for intervening in a sever accident



- Equipment survivability Vs. equipment qualification
 - A level of assurance provided for the safety related equipment operability during DBE ---- “equipment qualification”
 - A reasonable level of assurance or confidence of equipment mitigative function in sever accident within the time span required ---- ”equipment survivability”



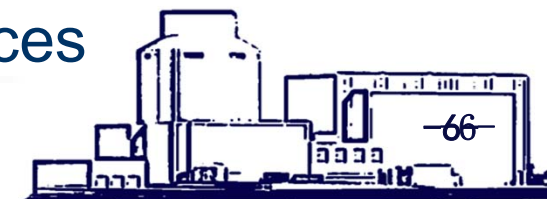
- Regulation and criteria
 - Equipment criteria for in-vessel severe accidents recovery: 10CFR50.34(f)
 - Guidance for ex-vessel severe accidents consequences mitigation: SECY-90-016, and SECY-93-087



□ Regulation and criteria

● NRC criteria:

- Features provided only for severe accidents protection need not be subjected to the requirements of operability in DBE
- A high confidence of survivability need to be provided in case of safety related equipment relied upon to cope with severe accidents situation
- Guidance such as that found in Appendices A & B to R.G. 1.155 is appropriate for equipment used to mitigate severe accidents consequences



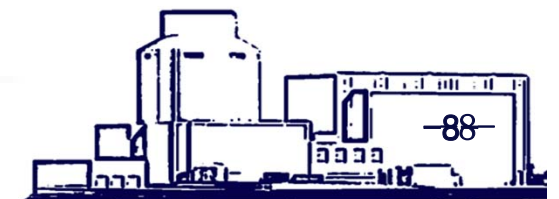
□ Survivability assessment

- Analyses demonstrate that there is reasonable assurance that equipment used to mitigate and monitor severe accident progression is available at the time it is called upon to perform.
- Provide reasonable assurance that the designated equipment will operate following a severe accident by comparing the severe accident environments to design basis event / severe accident testing or by design practices.

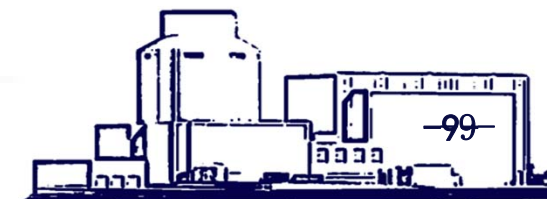


- Survivability assessment approach
 - Identification of equipment type, location, required survival time
 - Determine the bounding environment for the needed time span
 - Use of DBE qualification data
 - Use of severe environment experimental data

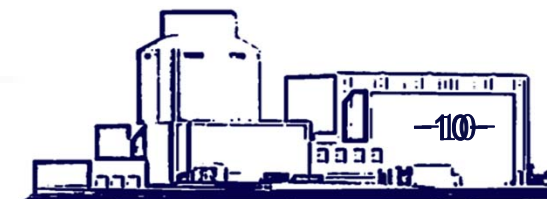
Survivability of the equipment was evaluated based on DBE qualification testing, severe accident testing, and the survival time required.



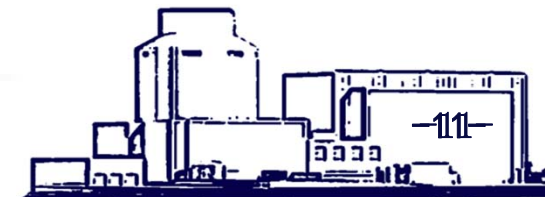
- Severe accidents experiments
 - EPRI NP-4354, “Large Scale Hydrogen Burn Equipment Experiments.”
 - NUREG/CR-5334, “Severe Accident Testing of Electrical Penetration Assemblies.”
 - Provided test data for use in assessing survivability of safety related equipment in hydrogen burn environments postulated for degraded core accidents



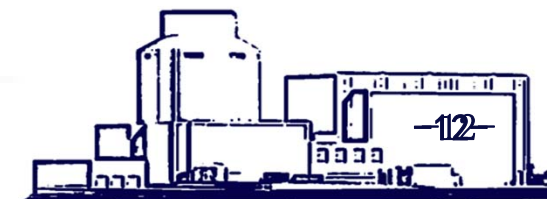
- Severe accidents experiments
 - Showed many equipment that is qualified for design basis events has a high probability of surviving postulated severe accident events and performing satisfactorily for the time required (e.g. capable of operation during and after hydrogen burns).



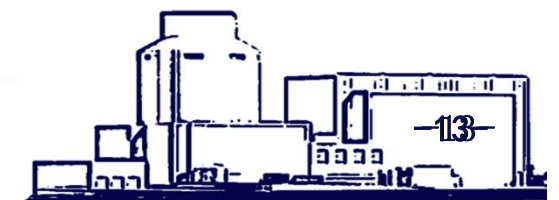
- Current practices are based on:
 - significant difference in likelihood between occurrences of the DBE and BDBE (very low probability events)
 - equipment qualified for design basis events has a high probability of surviving postulated severe accident events and performing satisfactorily for the time required



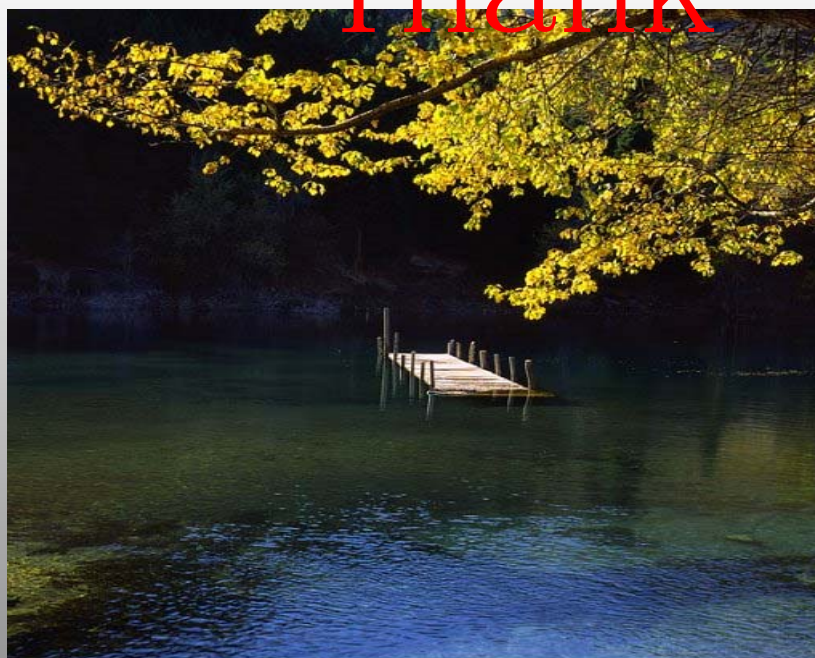
Necessity of expanding the EQ umbrella to cover survivability demonstration for those safety-related equipment relied upon to cope with BDBE situations, through which, the level of assurance of mitigative functioning should be defined.



- The sub-committee is suggested to develop discussion or topical working for the stated issues
- Severe accident survivability of equipment with mitigation features is suggested to be discussed in updating of related EQ standards



Thank You !



上善若水 (新疆·天池)