Development and implementation of Severe Accident Management Guidance (SAMG) for shut-down conditions.

Extending the SAMGs from full power to shut down to provide appropriate guidance for fuel damage events that might occur during plant shutdown conditions requires an understanding of severe accident behaviour that takes into account the plant conditions and physical changes in equipment configuration during shut-down conditions. SAMG for low power and shut down were finalized at the end of 2006, again prepared with support from the same external organisation. Typically, in such an accident the time until the fuel in the core or the spent fuel pool assemblies heat up is much longer than for severe accidents in full-power operation. Several specific SAMG are prepared to deal with such situations, while others from the full power SAMG are used as well.

The Accident Management Program at KKM including Severe Accident Management Guidance for shut-down conditions is remarkably comprehensive.

There are capabilities for severe accident analysis, PSA and SAM guideline development within the company.

NPCIL has developed its own code package for severe accident analyses and the capacity to conduct in-house PSA. The in-house codes allow the analysis of complete accident scenarios from the initiating event up to performing radiological release and dose assessments. The company has expert and trained personnel to use, maintain and further develop these codes in the corporate office at Mumbai. NPCIL experts also participate in international activities organized by the IAEA for comparing severe accident analyses of PHWRs. Based on these capabilities NPCIL has worked out the SAM guideline development model and the generic SAM guidelines with support of in-house severe accident analyses. Based on these generic documents the full set of station-specific SAM guidelines will be developed. The station has a specialist to carry out station-specific PSA activities jointly with the PSA team in the corporate office.

There are many benefits of capabilities within the company:
- as work is carried out within the same organisation, there is a regular interaction between the NPCIL headquarters and the station;
- personnel obtain a deep understanding of the physics behind the analyses;
- station personnel are well informed about SAM guidelines;
- transfer of knowledge and developing SAM trainer positions at the station;
- the station's review comments are analyzed by corporate office concerning their applicability to other stations.
Clinton Power Station has been actively involved in the development of the Boiling Water Reactor Owners Group (BWROG) generic Severe Accident Guidelines (SAGs) shared with other BWR operators, thus contributing to the worldwide implementation of SAMGs. Since the beginning of construction in the 1980s the Clinton Power Station has been actively involved in the voluntary US industry activity aimed at developing severe accident guidelines (SAGs). The process started with the BWROG generic SAGs developed by General Electric and a group of engineering organizations. The generic SAGs were developed using technical information from the EPRI Technical Basis Report, from published analyses and reports and from plant specific Individual Plant Examinations (IPEs). Afterwards the generic SAGs were further developed into CPS plant specific SAGs.

There is continuous support from the BWROG, resulting in adequate updates of the documents, whenever justified. Considering operating experience (e.g. Fukushima accident), the safety philosophy change or the significant number of partial changes are drivers for development of a new version of the guidelines. The process is coordinated by the BWROG Emergency Procedures Committee. All US BWRs including Clinton NPP are represented on the Committee. The Committee meets 4-times a year; continuous support to all BWRs is provided. Contacts with the corresponding group for PWRs were also established. Generic guidelines developed by the BWROG (all US BWRs utilize the generic guidelines) are afterwards transformed into plant specific guidelines. Clinton Power Station is actively involved in this systematic process by contributing to this coordinated activity and reflecting agreed approaches into plant specific procedures and guidelines.

Development of generic strategies and guidelines became an important sample (pilot) which was later, with some derivations, followed by many NPPs worldwide. To some extent, the lessons learned and experience gained from the development and use of SAGs in the USA was also reflected in the development of the relevant IAEA Safety Guide (NS-G-2.15).