CNSC Severe Accident Management Regulatory Activities

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Regulatory Actions in Response to Fukushima

Enhancing Emergency Response:
1 – Updated Regulatory Documentation and licensing requirements
2 – Evaluation of Licensees’ SAMG Implementation
3 – Assessment of SAMG Strategies
1. Introduction of REGDOC-2.3.2

Regulatory Document replaces previous Guidance Document (G-306).
Consistent with IAEA requirements.
Integrated = EOP + EMEG + SAMG
Now included as part of the license.
2. SAMG Evaluation - Overall Approach

1. Review the SAMG Documentation
   Criteria: IAEA NS-G-2.15 and IAEA SVS-9

2. Interview Staff

3. Observe a Severe Accident Drill

Note: CNSC staff have developed review criteria which follows SVS-9.
1. COG SAMG follows on WOG SAMG
2. Regular Exercises involving Severe Accidents
3. Staff very cooperative and helpful during review
4. Staff keen to work towards improving program
5. Physical upgrades: CFVS, H$_2$ Sampling Line, Moderator make-up.
SAMG Evaluation - Recommendations for Improvement

1. Severe Accident Progression and Phenomena Training needed for BDBA

2. Severe Accident Simulation – over-reliance on simulator which is not capable of simulating BDBA

3. Availability/accuracy of Instrumentation – not accounted for during emergencies
3. Analytical Assessment of SAG strategies

Objectives of the Assessment of SAG Strategies:

- Gain insight into SAG actions
- Verify the merit and advantage
- Ascertain the potential negative impacts
- Characterize the plant conditions with time prior to and following a mitigating action

Process:
Using MAAP-CANDU severe accident code, assess the impacts of implementing SAG Strategies
Assessment of SAG strategies

Includes 7 Severe Accident Guides (SAG)
1. Inject into Heat Transport System
2. Control Moderator Conditions
3. Control Shield Tank / Calandria Vault Conditions
4. Reduce Fission Product Releases
5. Reduce Containment Hydrogen
6. Control Containment Conditions
7. Inject Into Containment
CANDU Technology

Calandria
Mitigating Action

SAG 2 - Injecting into the Calandria

- 1 hour delay in starting the strategy once SAG entry conditions have been met (CV level < 6800 mm)
- 500 Mg of water added over 24 hours (20 fire trucks)
- Make-up water limited to prevent over-flooding of containment sump – containment airlock seal challenge
Results – Calandria Vault Water Level

- CV B/RV open
- SAG-2 entry condition
- CV make-up begins 1 hour following SAG-2 entry
- Loop 1 dump
- Loop 2 dump
- Make-up causes CV RD to burst causing a sudden inventory ejection into containment
- Make-up delays further core damage progression by ~22 hours
Results – Containment Pressure

- CV RD Burst
- Loop 1 Dump
- CV Make up Begins
- Loop 2 Dump
Results – SAG 2 Implementation

Effect of SAG 2 is to delay core collapse by approximately 20 hours.
Significant time in terms of executing off-site measures.

Negative impact not recognized in original SAG documentation:
Challenge to containment due to calandria rupture disk bursting.
Conclusion

Regulatory documentation has expanded to include an integrated accident management program

SAMG is now part of the operating license.

CNSC will continue to assess SAM Programs in Canada as part of the Fukushima Action Plan