



Canadian Nuclear  
Safety Commission

Commission canadienne  
de sûreté nucléaire

# 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



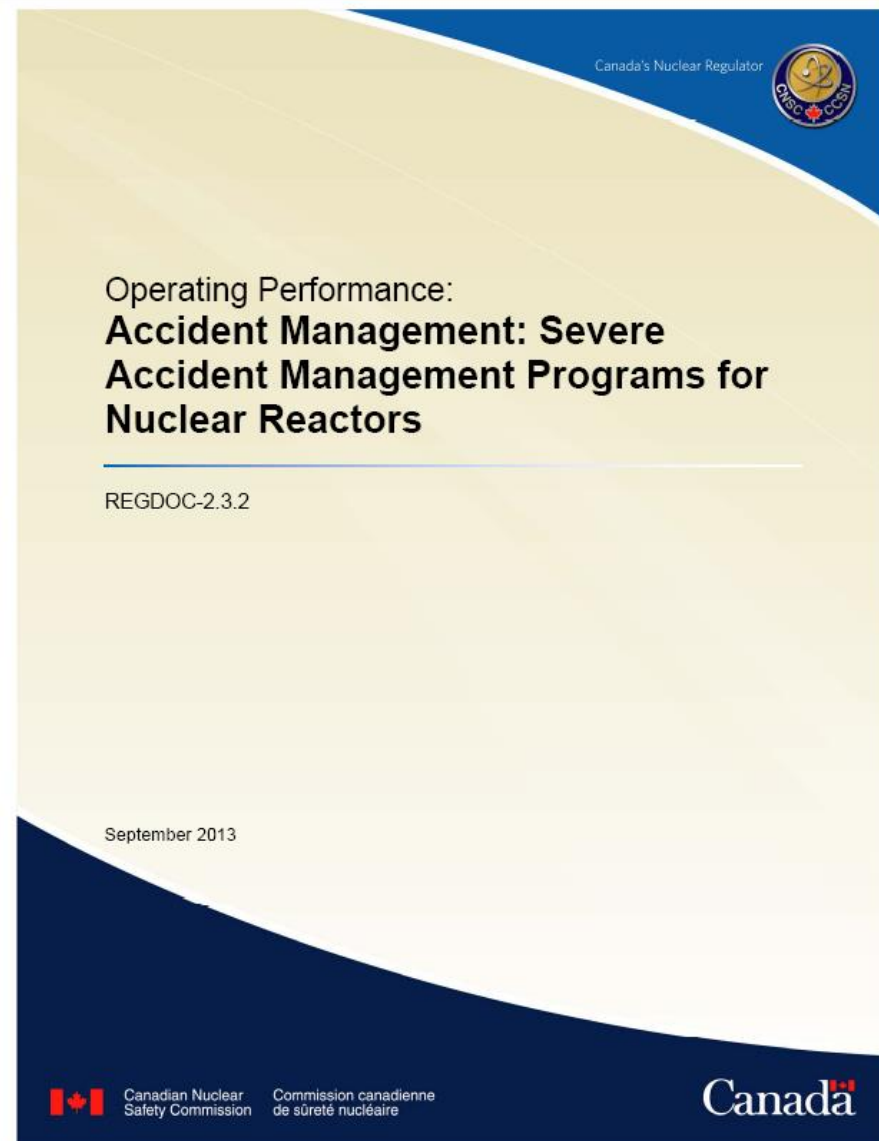
Regulatory Document replaces previous Guidance Document (G-306).



Consistent with IAEA requirements.

Integrated = EOP + EMEG + SAMG

Now included as part of the license.



## 2. SAMG Evaluation - Overall Approach

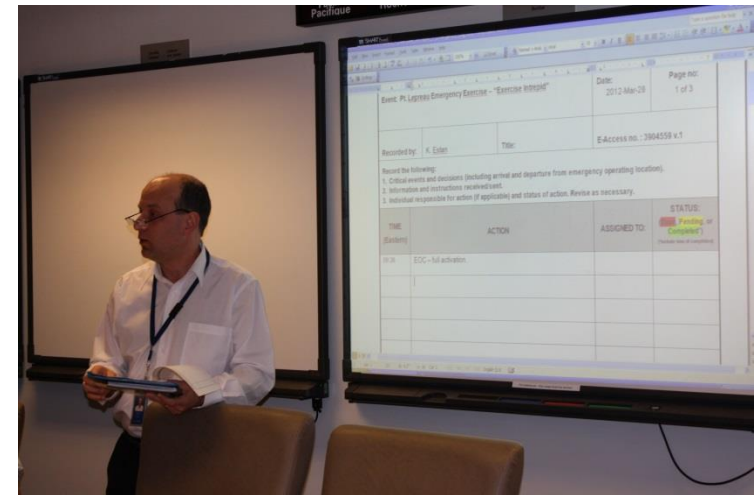
### 1. Review the SAMG Documentation

Criteria: IAEA NS-G-2.15 and IAEA SVS-9

### 2. Interview Staff

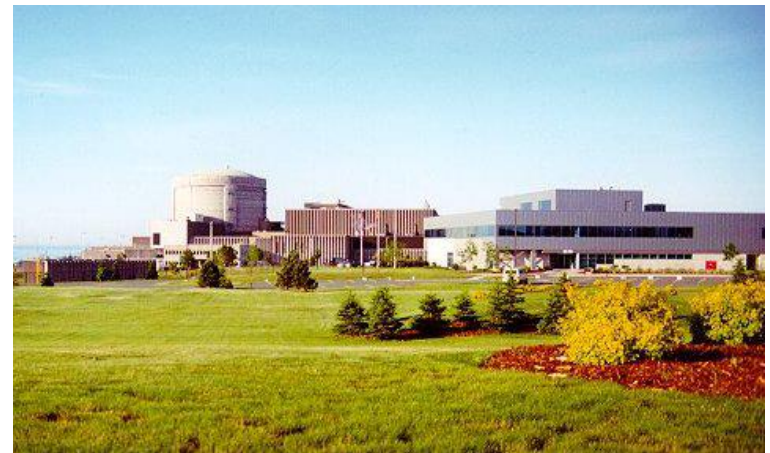
### 3. Observe a Severe Accident Drill

Note: CNSC staff have developed review criteria which follows SVS-9.



# SAMG Evaluation – Key Positive Findings

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<sub>2</sub> 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

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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

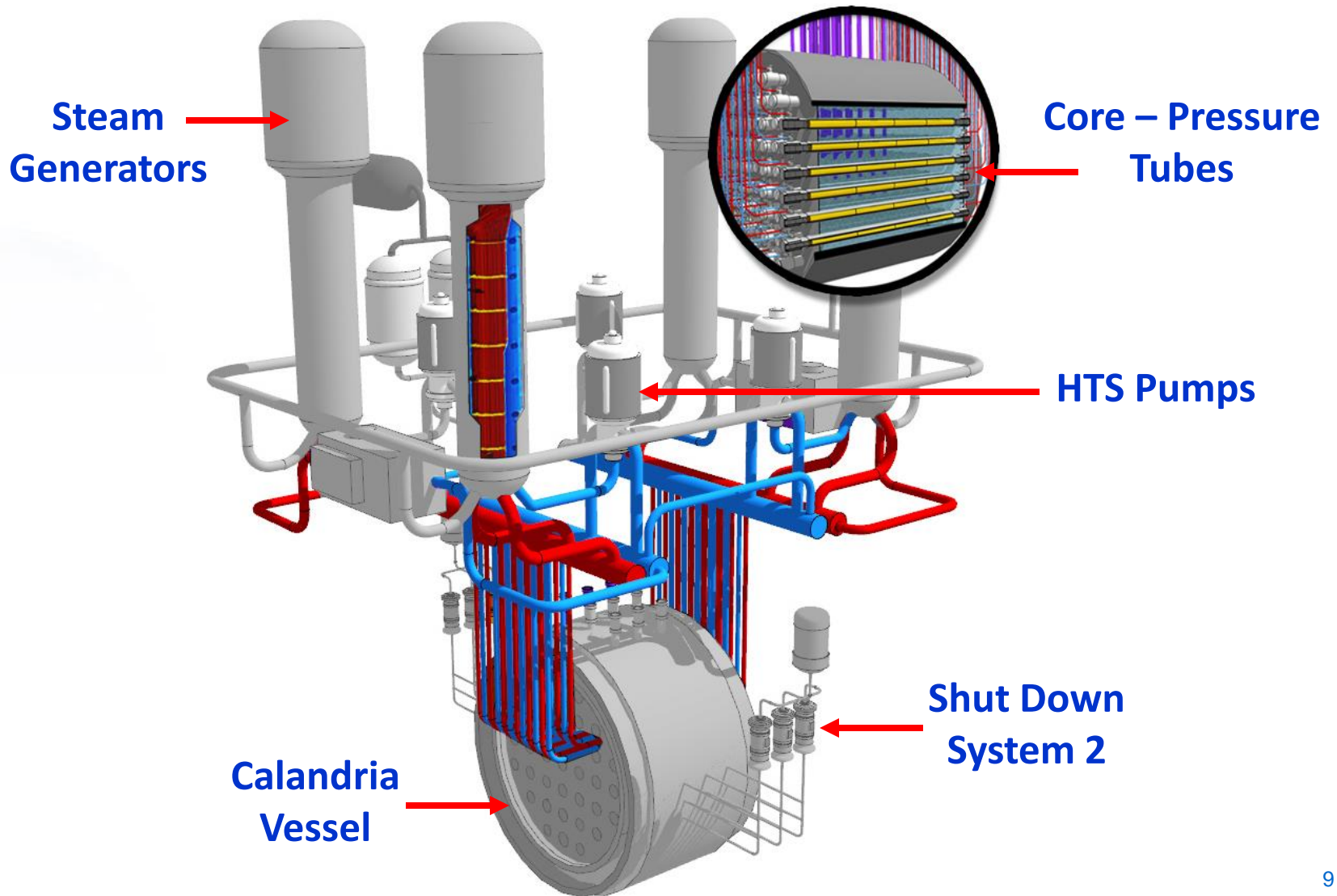
Includes 7 Severe Accident Guides (SAG)

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



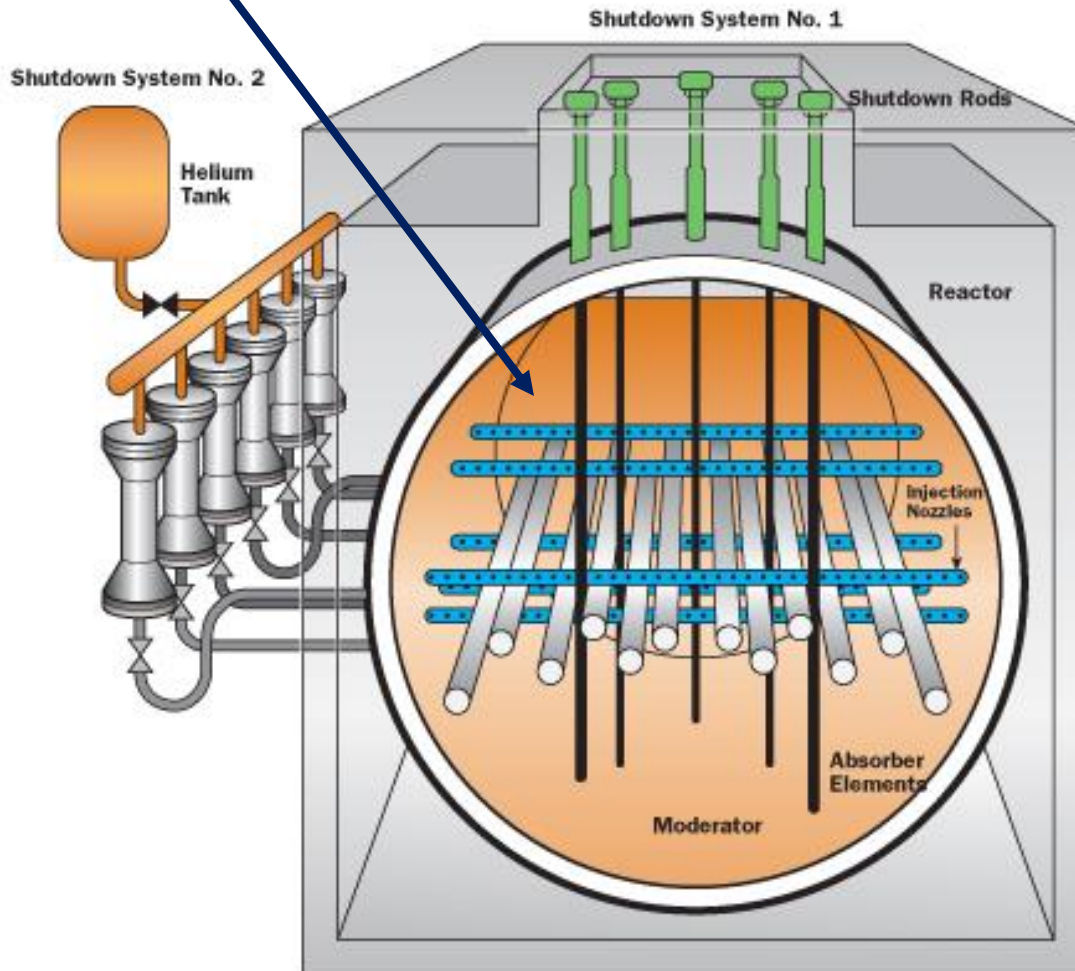


# CANDU HTS Layout




# CANDU Technology

Calandria

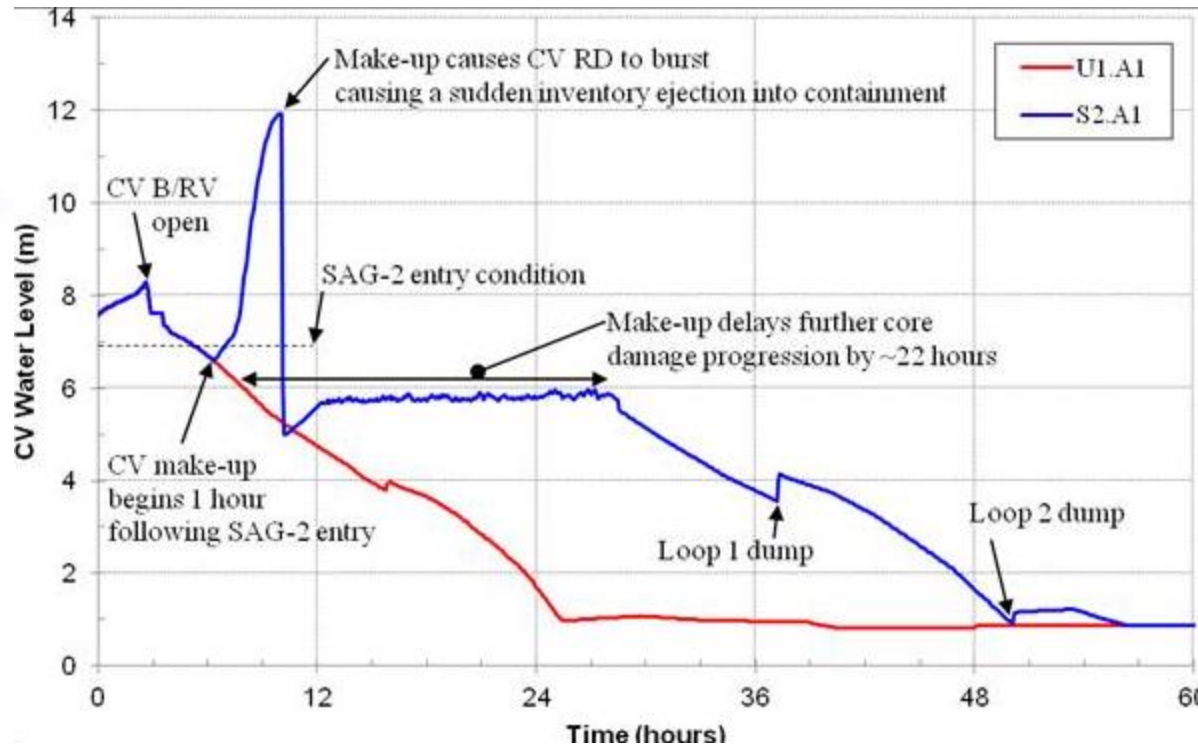


# Mitigating Action

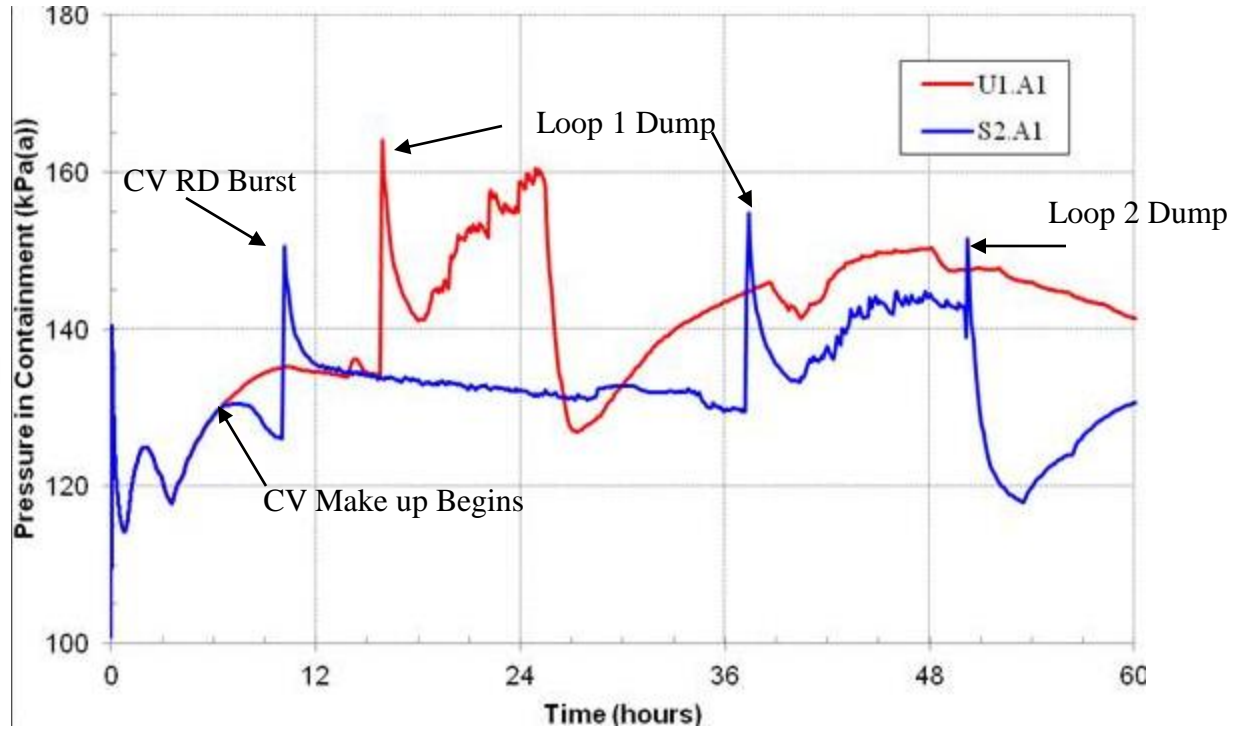
## SAG 2 - Injecting into the Calandria

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- 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



# Results – Containment Pressure



## Results – SAG 2 Implementation

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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

