

PANEL I

Regulation Systems Concerning Reactor SCRAM Events in the World

Panelists: Yoshiharu Nagao (Japan), Chris Humphrey (Australia), Bon Goo Kim (Korea), Pavel Frajtag (Czech Republic), Duane Hardesty, US Nuclear Regulatory Commission (United States), and Pablo Abbate (Argentina)

The topic of this panel was a follow-up to the first International MTR Symposium discussion on SCRAM recovery issues. Panelists compared and contrasted regulations in each of their countries. Overall, it appears that safety regulations in Japan are very different and more stringent than other countries.

Panel discussion highlights for international requirements for restart of reactors are shown below.

Yoshiharu Nagao (JMTR)

- Japanese regulations are very strict for both material test reactors and power reactors (reference slides)
- Different approvals are required for power reactors and test reactors. There are similar reporting requirements for both, but more stringent requirements for fire equipment.
- Same actions are required for safety or non-safety systems (including experiment systems).
- Would like to have reporting requirements that are more like other countries.
- Other nuclear facilities in Japan (e.g., spallation neutron source) are managed and regulated separately. Other “source” licenses only report on radiation protection.

Chris Humphrey (OPAL)

- Used NRC power plant Tech Specs as basis, to include strict limits.
- Focus is on operational time.
- Not as much PRA as power reactor Tech Specs, but still have some level of PRA
- Basis for safety system settings, and operations with equipment out of service.
- Within Australian law, no power reactors are allowed now.
- There is a federal regulator (ANSTO), but no jurisdiction over states, for handling radioactive material.
- Quarterly reports are prepared and submitted on operations, emissions, LCO operations, plans, safety significance operations, outages (frequent commercial power outages).
- Historically, there are two to three outages per year.
- Shift managers can make the decision about whether or not to restart the reactor if conditions are acceptable and the cause is understood - this information is reported quarterly to the regulator.
- Safety performance indicators for the plant were identified (unplanned trips, SS actuations, LCO's, personnel exposures, etc.), and reported quarterly as “red, yellow,

green” performance. These are evaluated by regulators to determine if increased need for oversight exists.

Bon Goo Kim (HANARO)

- Based on Atomic Energy Act, different requirements exist between power and research reactors. Focus on both tech standards for nuclear facilities and radiation safety control.
- Reporting is similar for power (more requirements related to bigger systems) and non-power reactors.
- The Korean system is similar to the Japanese system for reporting requirements, but the Japanese requirements for restart are more stringent.

Duane Hardesty (NRC)

- A graded approach to operation of the reactor after an event is defined in Tech Specs in advance (part of licensing requirements). Tech Specs are written by the licensee.
- Reporting requirements are also established in the license.
- Typically do not require PRA at non-power reactors, but base on releases and exposures.

Pavel Frajtag (LVR-15)

- Similar to NRC power/non-power differences.
- Some actions are the decision of the operator. Operators are trained to act after an event and they can decide whether they need to report the event or not.
- May not have to report scram if situation is known (e.g., commercial power that is restored without incident).
- Have limits and conditions for operation of the reactor that are approved by the regulatory body as part of license.
- Regulatory body does not work 24/7, but reporting center is open 24/7. Plant managers available by cell phone 24/7. Operator and senior operator call plant manager, who decides to call regulator or not. Easily repaired failures (<24 hrs) can be completed without regulator involvement. It is not necessary to report every scram.
- There are different requirements between power and research reactors.

Pablo Abbate (INVAP)

- Suggested that a level of safety graded approach to allow limited operation (LCO).

Closing Comments

- Everyone is interested in maintaining safety while maximizing availability of the reactors.
- It would be useful to assemble a group of international experts to review Japanese regulations and make recommendations for potential changes.

PANEL II

Synopsis by Topic and Path Forward

Panelists:

Session 1 – Rob Dimeo

Session 2 – Gordon Kohse

Session 3 – Takehiko Nakamura

Session 4 – Chris Humphrey

Session 6 – Dave Robertson

Session 1 (Rob Dimeo): Status, Future Plans and Partnership Networks Involving Test Reactors

- Unique capabilities are offered by individual MTRs which provide opportunities for international collaborations, for example:
 - Instrumentation and dosimetry in extreme (high temperature, high pressure) environments (Pavel, Allen)
 - Large in-core irradiation area in JMTR (Masanori Kaminaga)
- MTR facilities provide opportunities as scientific user facilities
 - Outreach to international community and potentially interested sectors to use unique irradiation capabilities
- Potential topics for future symposiums
 - Barriers to international collaborations
 - Barriers to industrial partnerships
 - Capability gaps and demands
 - Capacity demands
 - Assessing the effectiveness of an MTR-based scientific user facility (user demand, availability, reliability, new opportunities not previously available to academia)
 - Assessing the effectiveness of a multi-facility scientific user facility
 - Enhancing facility use by offering different access mechanisms
 - Industrial partnerships with an MTR-based scientific user facility
 - Simple steward model
 - Steward-partner model
 - Experiences of other MTR user facilities – what can we learn from them?

Session 2 (Gordon Kohse): Irradiation and Post-Irradiation Examination Instrumentation and Technology

- We are trying to do different things across different facilities and different institutions have unique emphases and strengths, therefore collaboration is and will be very important
- There is a long planning horizon for new facilities and yet we need to be responsive to customer/user needs - this challenge can best be met by collaboration and communication between the facilities (and we are often faced with customers who may or may not know what they need)

Session 3 (Takehiko Nakamura): Research Support for Light Water Reactor Aging Management

- Industry – clarified need for further study
- Pilot program at INL discussed
- JMTR – research program for fuels and materials
- Infrastructure is being upgraded at each reactor
 - Should collaborate with industry and universities
- U.S. could use an aging management program for research reactors

Session 4 (Chris Humphrey): Reactor Operations

- It appears that refurbishment of existing reactors will be the focus of the future - will therefore need an increase in reliability and running of these programs to support needs
- Refurbishing JMTR (2011 startup), ATR, OPAL, etc. therefore should consider the following
 - Shortening of the approval process
 - Distinguishing between events
 - Management of spare parts
 - Reassurance of regulators
- Key topics for future meetings
 - Maintenance plans for “Age Management”
 - Maintenance plans for “High Availability”
 - Spare parts management
 - Instrumentation and control upgrades to achieve 60 – 80 year design life
 - Regulatory requirements for reactor operations
 - Regulatory framework of different organizations and how they can work together

Session 6 (Dave Robertson): Isotope Production and Transmutation Doping

- MTR and research reactors meet a wide variety of needs
- The isotope of greatest world-wide interest now is Mo-99
- While isotope production using reactors is unique, we need to keep in mind there may be other ways of producing
- We become reluctant to talk to one another about lessons learned due to pressures, however...
 - We need backup facilities
 - We should be encouraged to work with one another to assure redundancy in production for each isotope
 - COLLABORATION is very important!

Closing Remarks

- All reactors operating are busier than they have been in the past and we must take advantage of international research and collaboration

What makes this symposium distinct/valuable?

- Keep it targeted to a specific audience – to people focused on using research or MTR for specific research
- The smaller size is valuable
- PIE focus is useful

Future symposiums

- May need to look at timing for next year's symposium to keep it from overlapping with other reactor meetings
- Invite users to participate
 - What do they like and need from NSUF?
- Key topics
 - Life extension and management of aging
 - Irradiation and PIE
 - Instrumentation
- Next year's symposium will be held in the Czech Republic