Day 2 Group Discussion: Needs and opportunities for OECD-HRP and international research into advanced technologies for decommissioning

1 Which new/emerging technologies may have significant impact on future decommissioning?

- Use of laser for cutting and decontamination work
- Vision guidance system for cutting, manipulators, decontamination
- Computer guided manipulation
- Automation of building surveys
- Reduced volume of abrasive cutting
- Laser guidance systems
- Robotics for decon, characterization, …
- Creating a database that controls all information flow for decommissioning
- Waste based decom strategies
- Use of a AR to control work
- Waste management tracking
- Use of geo statistics and other sampling approaches
- Non-destructive characterization
- Using burn off technologies for coating removal
- Once space travel becomes reliable, send waste into space
- GPS based systems for locating stuff
- Total optimization: Combination of technologies
- Real time 3D gamma ray imaging
- Waste management, treating of graphite

2 How can R&D into new techniques for decommissioning be improved through international collaboration?

- Share problems, and not just report success stories
- Training of staff and experience exchange
- Knowledge management in general
- Avoid doing work twice, use what others have developed
- Encourage private companies to share knowledge and methods developed in public projects

- Jointly develop decommissioning technologies and make results available to all
- Develop a (generalized) model for how to conduct decommissioning
- Brainstorming games similar to the Olympics for sharing and generating new ideas
- International database for sharing information
- Identify legacy facilities to do active demonstrations

3 What types of accident/incident scenarios are possible during decommissioning? Which scenarios are considered most likely and which have highest consequence?

- High consequence:
  - Important to consider criticality (accident or legacy site)
- Avoid spreading of contamination
- Risk of incorrect categorization of waste
- Avoid internal alpha-contamination
- Also pay attention to non-radiological accidents
- Likely scenarios involve human factors, tiredness and complacency during repetitive tasks
- Heavy lifting, fire, cutting high probability activities
- Unexpected consequences of simultaneous activities
- NRC has published a report that gives a list of decommissioning accident scenarios – will be linked in the proceedings
- Degradation of facilities
- High consequence: Fire in waste
- Industrial risks such as lifting, manual handling and a changing environment
- Handling of damaged fuel
- High risk for accidents when you are loosing the skill set – argument in favor of immediate dismantling
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4 Is there a potential to develop/adopt new techniques in this area? What are these techniques?

- Robotics
- 3D simulation for training
- Hololens type of application, call for help or information in real time
- Getting some experiences on decommissioning work from other non nuclear industries as well
- Increased level of automation to reduce repetitive tasks in decontamination and for characterization
- More direct and complete data collection through centralized database
- Availability of decision support systems
- Development of modular equipment to be able to repair on site
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5 Are technologies applied today for training of decommissioning workers for normal work and accident situations adequate? What improvements would you suggest?

- Available?
  - No, there is few applications available, mostly conventional training
  - Nothing specific for decommissioning in normal work, some for accident situations
- Improvements:
  - Information accessible on the working site
  - Improvement of training, and prioritization of waste management, characterization, sorting of waste, respecting waste level criteria
  - Training for lifting heavy object, let outside personnel visit the site virtually
  - Not forcing technologies into areas where they are not needed
  - Better coverage of plant data needed, including knowledge from retired workers, useful in data mining
  - Referring to 3) – changes in the plant etc need to be taken

into account from a training point of view

1. Is there a potential for improving safety demonstration (and regulatory interaction in general) through application of advanced information technology?

- Challenge to relay much information in short time to the regulators – visualization would be helpful
- If the regulator is also new to decommissioning, the operator has to show that they know what they are doing
- Visualisations will be helpful, but cannot replace safety reports
- A risk of using advanced IT to prove the logic is that you may have to prove the IT dependability as well
- Can be used to check that procedures derived from safety cases are correct and as intended
- Use adv IT for standardization, especially if you have a fleet for decommissioning
- Safety authority needs to accept the use of advanced IT beforehand
- Visualisation model is not as accurate as monte carlo, but as long as it is conservative it is useful for showing alternative scenarios, comparing and optimizing
- Beware of technical durability of IT resources – may be obsolete after 10 years.

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