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What Can We Learn From Digital Control Rooms?

RIC Panel TH40: Operating Crew Performance with Advanced Technologies:
Insights from Experiments and Simulator Training

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Halden Reactor Project (HRP) training simulator studies in the U.S.

- Over the last 4 years, HRP has performed multiple studies at U.S. PWR plant training simulators with licensed operators, as well as at the NRC Technical Training Center
- HRP project *Operator Performance in Digital Control Rooms (CRs)*
- Study topics were defined in close collaboration with NRC and other HRP member organizations

AP1000 control room



Testing of the Westinghouse AP1000 control room simulator software in preparation for training of Vogtle 3 and 4 plant operators.

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Study 1: AP1000-style crew organization

- Research question
 - What are the benefits and potential problems for an AP1000-style crew organization where the Reactor Operator executes the emergency procedures?
- Method
- Results
- Benefit for participating plant



Study 2: Baseline study at a new-build plant

- Motivation: Obtain detailed understanding of
 - How crew uses technology (in particular procedure system)
 - How communication / teamwork is different from legacy control rooms
- Method
- Results



In what ways may digital CRs be superior to legacy CRs?

- Communication?
- Teamwork / team organization?
- Information availability and distribution?
- Team situation awareness?



What are the success factors for digital CRs?

- Design?
- Training?
- Ownership?
- Legacy vs. innovation?




Next steps

- **General study needs**
 - To address the information needs regarding operator performance in digital control rooms, 3-4 large scale studies per year would be needed (8-12 crews per study)
- **2020 studies for HRP project Operator Performance in Digital Control Rooms**
 - Follow-up of crew role study at legacy plant, but using difficult scenarios
 - Follow-up of study at new-build training simulator, but using difficult scenarios
 - Micro-task data collections comparing legacy and digital control room interfaces



Take-home messages

- There are similarities and differences between digital control rooms and legacy control rooms
- We need to look for new error modes due to digital interfaces, automation, new conducts of operation
- We also need to be cautious about assuming that the legacy control rooms are the benchmark
- We need to highlight where digital control rooms are superior to legacy control rooms
 - What can legacy plants learn from new-builds?



Thank you!

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