Panel Presentation

Concepts of Operations/Control Room

- **Technology Overview/Scope**
  - Advanced control room technologies, e.g.,
    - Human system interface
    - Procedures
    - Alarm systems
    - Decision support systems
  - New concepts of operation, e.g.,
    - Remote operation
    - Control room staffing
    - Load following
    - Non electric applications of nuclear energy

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- **Summary of Pre-Meeting Survey Input**
  - Reduced staffing
  - Single operator, multiple units
  - Online refueling
  - Automated operations
  - Different control parameters

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- **Summary of Break-Out Sessions Input by Reactor Type**
  - HTGR
    - Electricity is byproduct, main product is heat
    - Need high reliability (>99.9%), I&C and concept of operations need to support achieving that high reliability
    - Hybrid system
    - really don't need operators for protection and control functions, but required for licensing.
  - MSR
    - taking advantage of passive safety to simplify control room functions, control room is more of the conventional approach.
  - Fast reactor
    - Passive safety should influence requirements for post-accident monitoring.
  - LWR
    - have some field operators for field equipment operations (<10% of total equipment operations). This is for infrequently operated equipment. Other reactor types reporting no field operators required.
    - some important human actions but none credited in safety analysis.

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- **Common Development Needs Among Reactor Types**
  - Autonomous/semi autonomous operation
    - Minimize operator actions
    - Operator may serve the role of investment protection in passively safe systems
    - First deployment will take a more conventional approach (with reduced staffing) until the concept is proven
    - Challenge is regulatory acceptance (and public acceptance, rather than technical one)
  - Regulatory approval of getting full credit in ConOps/Control Rooms for passive plants
  - Maintaining operator engagement and skill will be a challenge
    - Make use of VR for infrequent operations and field activities
    - Information visualization to support operators
    - Define a different role for operator

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- **Common Development Needs Among Reactor Types**
  - Control Room requirements
    - Post accident monitoring
    - Habitability
    - Remote operation
    - Portable control room, e.g., single laptop

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Concepts of Operations/Control Room

- **Ideas for DOE Sponsored Research Topics**
  - Regulatory acceptance of reduced staffing and/or autonomous operation, including gaining full credit for passively safe systems.
  - Identification of operator roles in passively safe systems, what functions does he or she perform?
  - Understanding of to how to maintain operator skill and engagement in autonomous/highly automated operations.
  - Development of decision support tools and information visualizations to provide actionable information to operator.
  - Developing the technical basis for minimal control rooms, e.g., remote operations or single workstation or laptop.