



# Engineering and Regulatory Approaches to New and Innovative Design Submittals: Extended Duty Cycle Batteries and Gas Turbine Generators

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# Agenda

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- Regulatory approach to new and different electrical equipment applications
- Examples
  - Extended Duty Cycle Batteries for Passive Reactor Designs
  - Gas Turbine Generator as Class 1E AC Power Source for the US-APWR Design
- Conclusion



## Regulatory approach to new and different electrical equipment applications

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- Goal: To establish a licensing basis where there is no precedence in support of making a reasonable assurance finding
- Primary call: Safety
  - Review efforts will be focused on safety may result in longer review time



# Extended Duty Cycles Batteries

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- Safety Significance
  - New designs extend duty cycle range (24 to 72 hours). Operating reactors use batteries with duty cycles ranging from 4 to 8 hours.
  - Passive reactor designs have a unique need for battery power different from active reactor designs.



# Extended Duty Cycles Batteries

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- Issue
  - The passive reactor designs' unique reliance on batteries as part of the safe shutdown of the plants.
    - Qualification of electrical equipment important to safety is required per GDC 1 and GDC 4.
  - Existing regulatory guidance and industry standards only contemplate battery duty cycles with durations of 8 hours or less.



# Extended Duty Cycles Batteries

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- Regulatory approach followed:
  - Verify
  - Develop
  - Inquire
  - Review
  - Present findings



# Gas Turbine Generators

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- Safety Significance

- Gas Turbine Generators (GTG) are proposed as safety-related, Class 1E, onsite power sources
  - Operating reactors use Emergency Diesel generators (EDG).
- Per existing guidance, safety-related onsite power sources are required to have minimum reliability of 0.95 to meet Station Blackout Rule and acceptable Core Damage Frequency.



# Gas Turbine Generators

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- Issues

- No operational experience is available in the United States.
- To qualify this GTGs, testing is required to demonstrate that the equipment will perform its intended design function.
- Applicant's supporting operational data is based on commercial GTGs used in Japan.





# Gas Turbine Generators

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- Regulatory approach followed:
  - Verify
  - Develop
  - Inquire
  - Review
  - Present findings

# Conclusion



- NRO's goal with regards to new and different equipment applications is to establish a licensing basis where there is no precedence in support of making a reasonable assurance finding.
- NRO's primary call is safety.
- Our success path to review new and different equipment applications is based on a 5-step approach: verify, develop, inquire, review and present findings.