



Station Blackout Preparedness and Coping

George Wilson

**Branch Chief, Division of Engineering
Office of Nuclear Reactor Regulation**

April 28, 2011

SBO Rule

- **Rule in Federal Register 10CFR50.63
“Loss of all alternating current power”**
- **SBO Rule requires each plant to be able to cope and recover from an SBO event of specified duration**
- **NRC issued Regulatory Guide (RG) 1.155, “Station Blackout,” on August 1988 and endorsed NUMARC 87-00 industry guidance to implement the SBO Rule**

SBO Coping

- **Rule provided guidance on how to calculate the plant specific SBO duration.**
- **The coping duration based on following factors:**
 - **The redundancy of the onsite emergency ac power sources**
 - **The reliability of the onsite emergency ac power sources**
 - **The expected frequency of loss of offsite power**
 - **The probable time needed to restore offsite power**
- **SBO event ends when either offsite or onsite power is restored**

Coping Methods

- **AC independent**
 - **44 plants rely on batteries only**
 - **Maximum duration 4 hours**
- **Alternate AC**
 - **60 plants in this category**
 - **Emergency Diesel Generators from adjacent unit with excess capacity**
 - **Gas turbine generators, diesel generators and hydro units**
 - **Appendix R Diesel generators**

Staff Review of SBO Rule Implementation

- **NRC staff reviewed and approved by safety evaluations all 104 plants SBO submittals.**
- **NRC staff conducted pilot inspections at 8 sites (2 per region) using NRC Temporary Instruction 2515/120**
- **Inspection results revealed that the licensees were implementing the SBO Rule consistent with NRC requirements and staff's safety evaluations**

Design Overview

- **Battery coping plants - maximum coping duration is 4 hours**
- **Battery life may be extended to required duration by load shedding**
- **Effects of loss of ventilation.**
- **Condensate, compressed air and RCS inventories verified for adequacy**
- **Procedures developed for SBO**
- **Operator training**

SBO Procedures

- 1. Specific actions for restoration of AC power**
- 2. Ensure support equipment functional without AC**
- 3. High priority on steam driven pumps**
- 4. Identify RCS leakage paths**

Grid Interface

- **Grid Interface Enhancements**
 - **Grid operator evaluates network on daily basis**
 - **Plant procedures for degraded grid conditions**
 - **Plant controlled work in switchyard**
 - **High priority for TSO to restore power**
 - **New guidelines from NERC**

Summary

- **Only one U.S plant has had an SBO, it was in 1990 (App. 1 hour)**
- **SBO compliance evaluated for**
 - **License renewal**
 - **Power uprates**
 - **License amendment requests**
 - **New Reactors**
- **Staff interfacing with FERC to maintain reliability with future changes in generation mix and transmission system upgrades.**