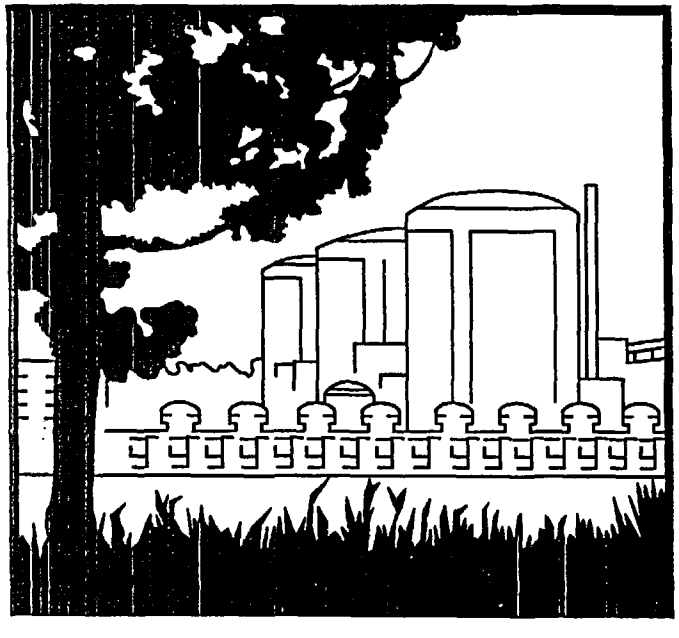
Duke Energy℠



Duke Power Appendix R Reconstitution

Oconee (ONS)
Catawba (CNS)
McGuire (MNS)

December 06, 2004

Attachment 2

Appendix R Reconstitution

- Duke Participants
  - Appendix R Working Group
    - Harry Barrett – Appendix R Working Group Lead (ONS)
    - David Goforth – Appendix R Engineer (CNS)
    - Bob Johansen – Appendix R Engineer (MNS)
    - Dennis Henneke – PRA Engineer (NGO – Severe Accident Analysis)
    - James Oldham – Fire BEST Lead (MNS)
  - Reene' Gambrell, Regulatory Compliance (ONS)
  - Graham Davenport –Regulatory Compliance Manager (ONS)
  - George Mc Aninch – Design Basis Group Manager (ONS)
  - Duncan Brewer – SAA Manager (NGO)

Appendix R Reconstitution Agenda

- Purpose
- Goals
- Background
- Safe Shutdown Methodology
  - Manual Action Process
  - Issue Resolution Process
  - Configuration Management
- Armored Cable Fire Testing
- Schedule
- Summary

Purpose of Meeting

- Duke Power Appendix R Reconstitution Project
- Establish a Dialog to discuss potential issues
  - Design/Licensing Basis Improvements
  - Multiple Spurious Actuations
  - Manual Actions
  - Armored Cable Fire Testing

Goals of Appendix R Reconstitution Project

- Strengthen Appendix R Programs to bring clarity
- Clear Up design and licensing issues
- Improve Design and Licensing Documentation Quality and Completeness
- Improve safety (do the right thing)

Background

- Recent experience with Appendix R Safe Shutdown analysis at all three sites indicated opportunities to improve
- Started to respond to issues separately at each site
- ONS performed an Appendix R Program Self Assessment in 2002
- ONS Initially Created Reconstitution Project to trace cables and correct documentation deficiencies
- Audit/Inspection findings and newly identified compliance issues at all units eventually drove the formation of 3-Site Appendix R Working Group
- Reconstitution planned for all Duke units

Background - Continued

- Duke Unique Features and Approaches
  - Armored Cable
    - Longer time to damage, lower spurious operation probability, no cable-to-cable interactions
  - Exclusionary Analysis
    - Did not originally trace all cables, only opposite/available train cables for each fire area
  - Oconee Facility Design
    - Class 1E Electrical Distribution located in most significant fire area (Turbine Building)
    - No train separation
    - All trains of EFW in Turbine Building

Background - Continued

- Duke Unique Features and Approaches
  - Standby Shutdown Facility
    - Bunkered facility with separate power and control to provide RCP seal cooling and decay heat removal
  - Single Spurious design basis
    - Single, worst case spurious, addressed in design documents but not in SER
  - Three different licensing criteria (Appendix R, post Appendix R and NUREG 0800)
    - Standardization is difficult

Appendix R Reconstitution Safe Shutdown Methodology

- Based on methodology outlined in NEI 00-01
- Incorporates Industry Operating Experience
  - NRC RIS 2004-03
  - NEI 00-01 Rev. 1
  - NEI 04-06

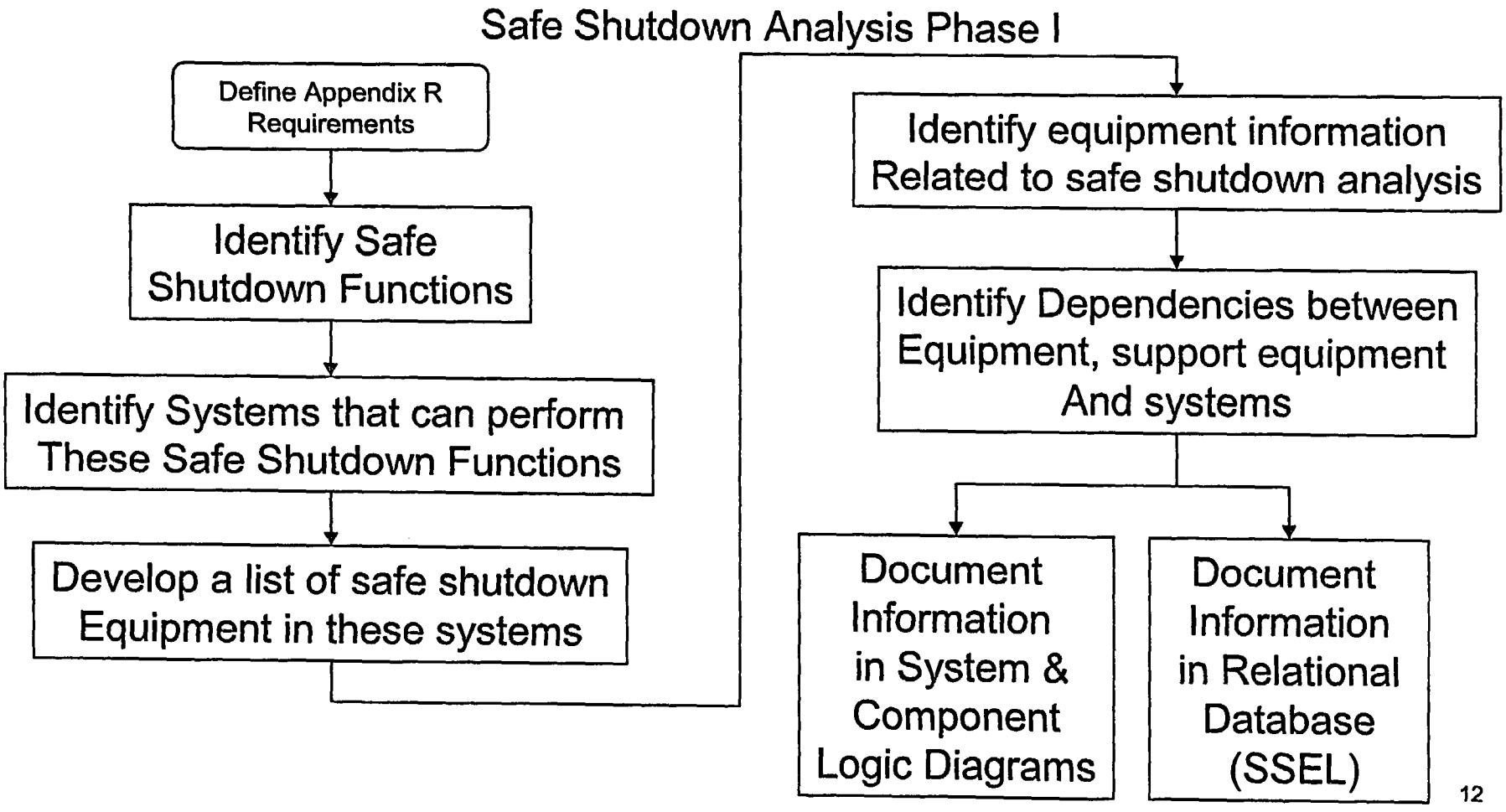
Appendix R Reconstitution Safe Shutdown Methodology - continued

- Split into Three Phases:
  - Phase I – Safe Shutdown Equipment List (SSEL) and Logic Diagrams
  - Phase II - Cable and Fire Area Analysis - identifies all cable/component "hits"
  - Phase III - Performance Based/Risk Informed analysis of multiple spurious actuations

Appendix R Reconstitution Safe Shutdown Methodology - continued

- Phase I
  - Define Safe Shutdown Functions, Systems and Components
  - Safe Shutdown components listed in a Safe Shutdown Equipment List (SSEL)
  - System and Component Dependencies are documented on System and Component Logic Diagrams

Appendix R Reconstitution Safe Shutdown Methodology - continued

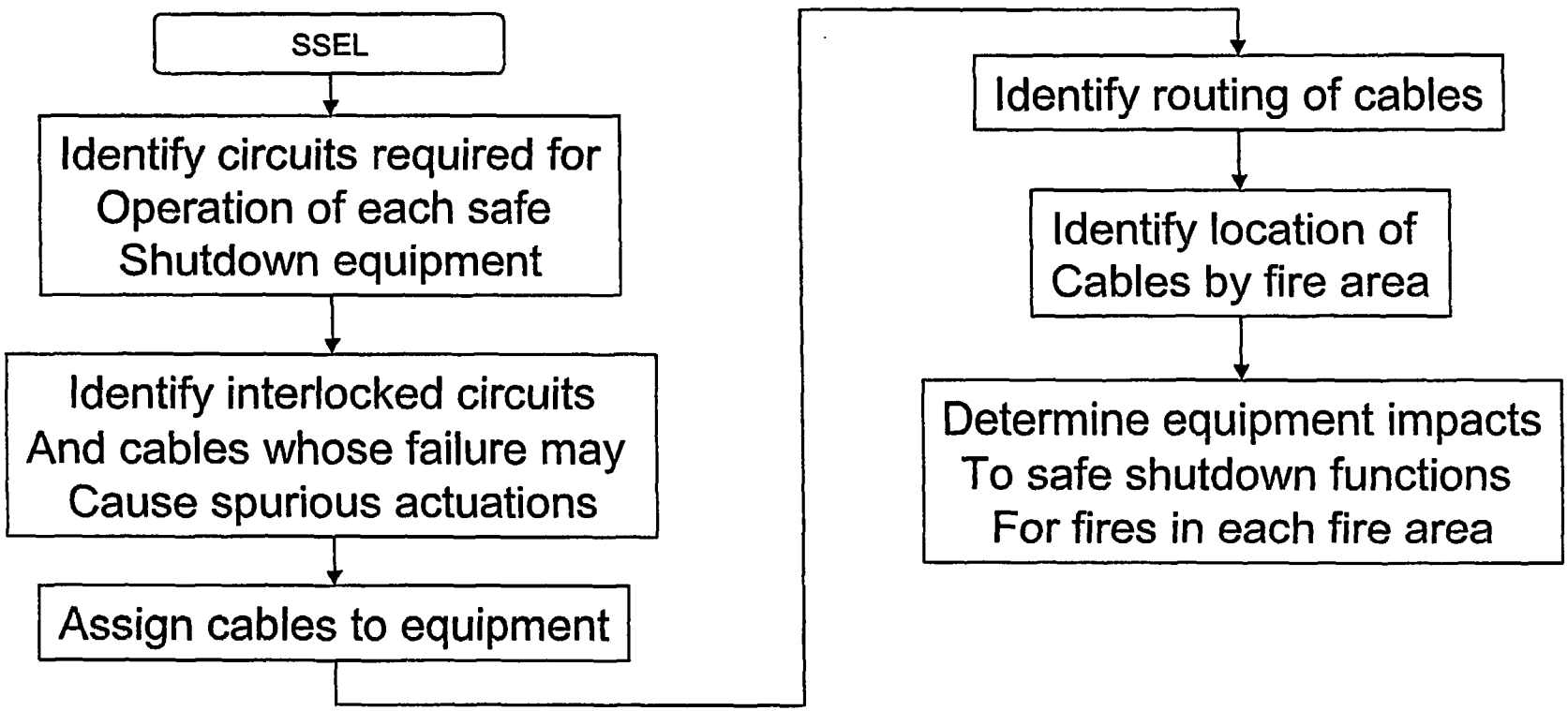


Appendix R Reconstitution Safe Shutdown Methodology - continued

- Phase II
  - Identify cables for each component
  - Identify routing for each cable
  - Routing through each Fire Area documented
  - Fire Area damage assessments performed
  - Results of damage assessments used with Logic Diagrams to determine impact on Safe Shutdown Functions
  - Loss of Safe Shutdown Functions addressed through Appendix R Issue Resolution Process for spurious actuations within Design Basis

Appendix R Reconstitution Safe Shutdown Methodology - continued

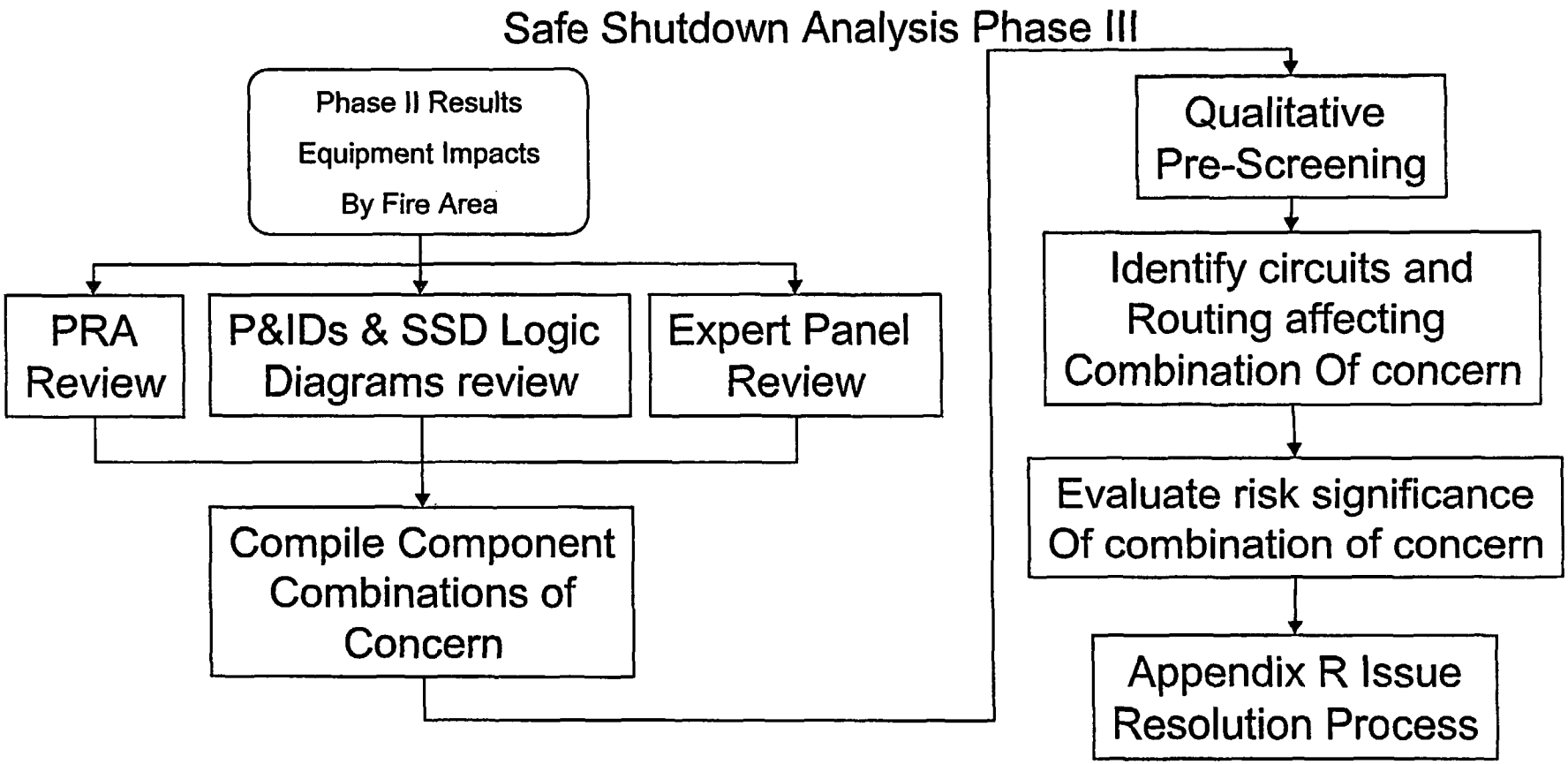
Safe Shutdown Analysis Phase II



Appendix R Reconstitution Safe Shutdown Methodology - continued

- Phase III
  - Results of Phase II are combined with an extensive Multiple Spurious Review to address completeness of multiple spurious population
    - Deterministic Analysis Output (Phase II)
    - PRA Cut Set Review
    - Expert Panel Review
  - Loss of shutdown functions outside Design Basis also addressed through Appendix R Issue Resolution Process

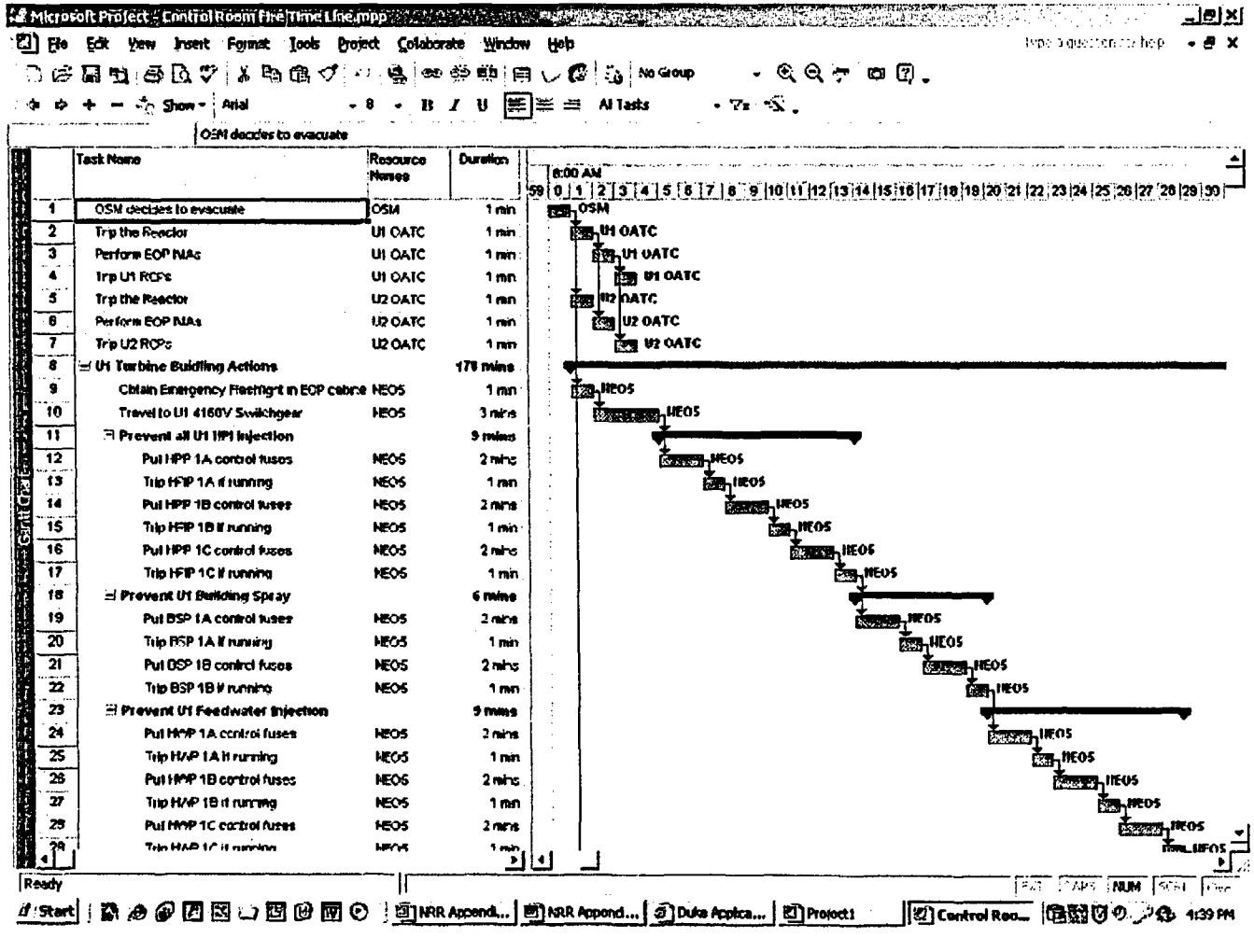
Appendix R Reconstitution Safe Shutdown Methodology - continued



Manual Action Process

- 3-Site Engineering Guidance Document
  - Feasibility Criteria (based on NRC interim criteria)
  - Thermal-Hydraulic Analysis
  - Graphical approach to document timelines (MS Project)

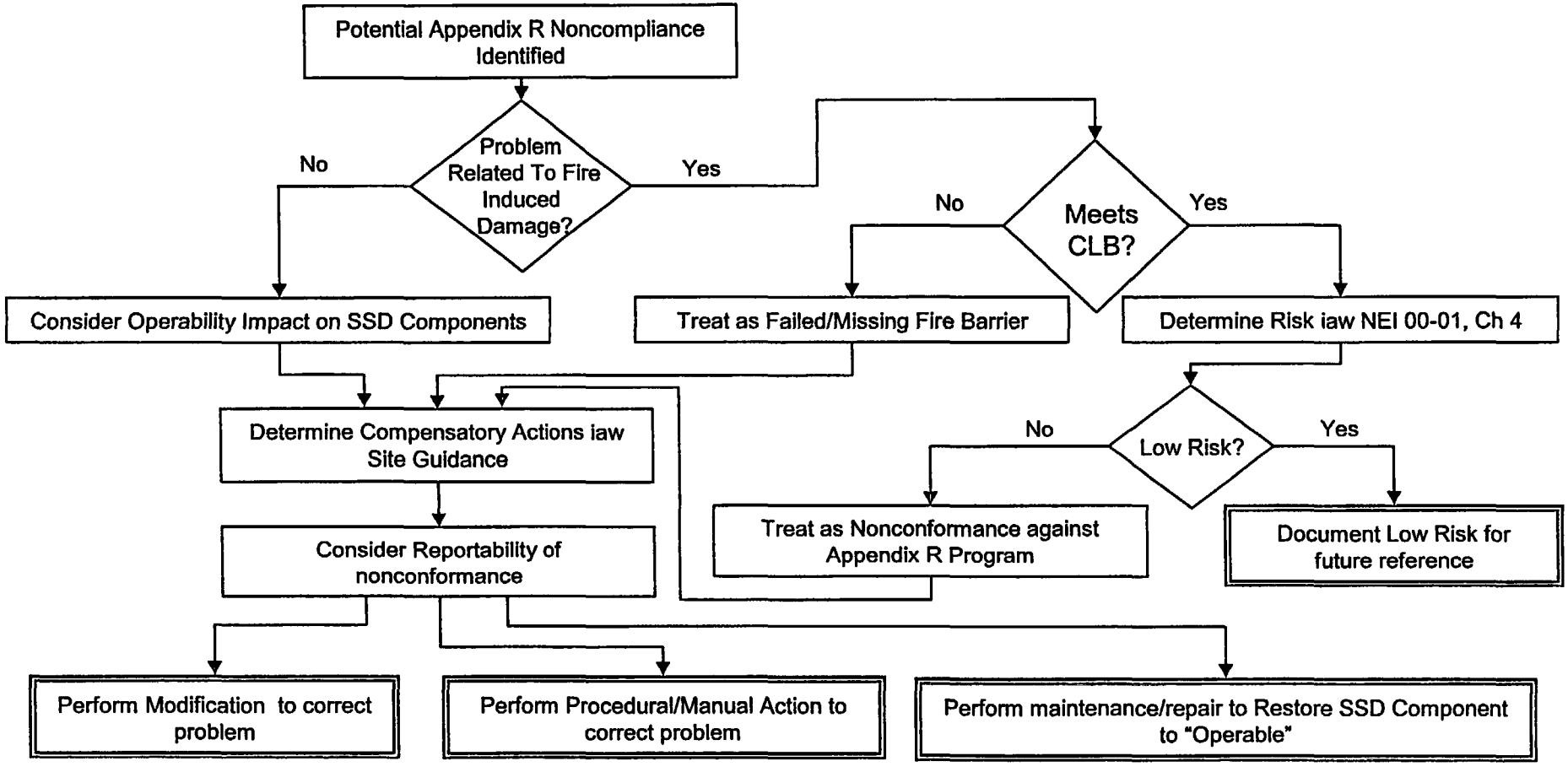
Manual Action Process - Continued



Issue Resolution Process

- Appendix R Issue Resolution Process
  - Uses Logic Diagram to Direct User to appropriate action
  - Separates Spurious Actuations to Inside License Basis and Outside License Basis
  - Treats Cable Routing/Spurious Actuation Issues as "Missing Fire Barrier"
  - Addresses Operability issues for real hardware/performance problems

Issue Resolution Process - Continued



Configuration Management

- Appendix R Reconstitution Project is also intended to address Configuration Management Issues
  - Design Documentation
  - Design Change Process
  - Software Quality Assurance for Appendix R Safe Shutdown Analysis Database(s)
  - Engineering and Management Training on new Appendix R Safe Shutdown Analysis

Armored Cable Fire Testing

- Duke plans on performing additional fire testing of armored cable
  - More thoroughly determine robustness of armored cable
  - Determine spurious hot short probability given cable damage
    - Use many configurations found in Duke Plants
    - Determine sensitivity to various factors
      - Grounded vs. Ungrounded
      - Large Multi-conductor vs. small

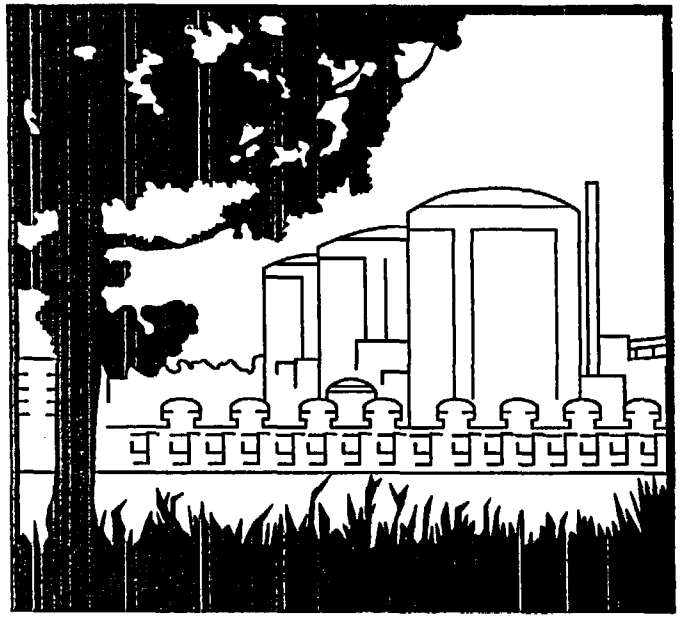
Status/Schedule

- All three sites have completed Phase I
- ONS is in process of completing Phase II
- Expect to implement remaining Appendix R Reconstitution tasks in staggered fashion (Dates are approximate):
  - ONS Phases II and III complete in 2005
  - MNS to complete by end of 2006
  - CNS to complete by end of 2007
- Dates may need to change pending decision to transition to NFPA-805

Summary

- Duke Power plans to institute an Appendix R Reconstitution Project at all three nuclear plant sites
- Project intended to address programmatic weaknesses, incorporate latest industry guidance and clear up vague design basis
- Through detailed cable/fire area analyses and risk analysis methods, address multiple spurious actuations
- Staggered implementation schedule – ONS first, MNS next, CNS last

Duke Energy SM



Transition to NFPA-805

Oconee (ONS)
Catawba (CNS)
McGuire (MNS)

December 6, 2004

Attachment 3

Outline

- Why are we here?
- Background
- Duke Status on NFPA-805
- Technical Issues
- Administrative Issues

Why are We here?

- Duke Power continues to be interested in Transitioning to NFPA-805, Performance Based, Risk-informed Fire protection. Our purpose here is to:
  - Provide discussion on why we are interested
  - Begin discussions with NRR on some of the technical and administrative issues.
- We do not yet have full management buy-in, but are pursuing buy-in and funding.

Background

- Duke Power has been an industry leader in both Fire Protection and Probabilistic Risk Assessment (PRA) for many years.
- Our power plants have unique attributes that could be considered in a risk-informed approach:
  - Armored Cable throughout the plant
  - Standby Shutdown Facility - SSF

Background - Continued

- Our Fire Protection License Basis for all three plants have areas that can be interpreted.
- We see the use of NFPA-805 as a method for both clearing up our license basis, and assuring the fire risk at the plants is acceptable.

Present Status on NFPA-805

- Duke is contemplating transitioning to NFPA-805, with the following potential schedule:
  - Oconee starting in mid to late 2005
  - McGuire starting in mid 2006 to early 2007
  - Catawba starting in late 2007
- The Appendix R Reconstitution schedule affects NFPA-805 implementation schedule.
- Transition appears to be cost-beneficial
- Several Technical Issues outstanding which may affect our decision: Results in uncertainty in cost

Technical Issues

- Multiple Spurious
  - No Clear License Basis for Multiple Spurious
  - Will propose a new and clear License Basis in our transition report, which will be consistent for all 3 sites. Proposed words would be something like the following:
    - **The Safe Shutdown Analysis shall address all single spurious and all potentially risk-significant multiple spurious (See next slide).**
  - Expert Panel will be used at each site to supplement traditional SSA (See NEI-00-01, Appendix F).

Technical Issues - Continued

- Potentially risk-significant:
  - Risk is above Reg. Guide 1.174 criteria (CDF 1E-06, LERF > 1E-07), prior to operator response.
  - DID or Safety Margins are inadequate per NEI Implementation Guide, prior to operator response.
- New Multiple Spurious scenarios identified are considered outside the license basis, until they are determined to be potentially risk significant.

Technical Issues - Continued

- Multiple Spurious Combinations that do not meet the "Potentially Risk Significant" Criteria, but have an estimated CDF risk > 1E-08/year (LERF > 1E-09/year), are treated as follows:
  - Design change or procedure change put in place, if possible
  - Procedural actions still meet feasibility criteria, but actions are not considered "required"

Technical Issues - Continued

- Recovery Actions:
  - Present Manual Actions at the plant will transition over as recovery actions: Will need to meet feasibility criteria.
- Options during transition:
  - Change Analysis is assumed not required for all III.G.2 manual actions:
    - However, develop deterministic criteria indicating which actions need change analysis. For example:
      - All III.G.2 manual actions that directly fail safe shutdown, or following a single spurious.
  - Change analysis required: Reevaluate manual actions determined to be low risk when the model is updated.

Technical Issues - Continued

- New Requirement in DG-1139(Section 3.1.2, d) for a Risk Evaluation of each plant change, even if the deterministic criteria are met needs to be clarified:
  - Large burden to perform a risk review for a change of any document or system affecting fire safe shutdown.
  - Present NEI Change process is reasonable.
  - Risk evaluations are then required when deterministic criteria not met, as a part of the change process.

Administrative Issues

- Duke Power will be performing Full Plant Fire PRAs during the transition to NFPA-805:
  - Not required as a part of 805
  - Good idea for addressing circuit failures and multiple spurious in a risk-informed way
  - PRA will meet Category II of the draft Fire PRA standard, for fire areas where quantitative risk assessment is used for change evaluations:
    - Category I or qualitative evaluation OK if the risk increase from the change is very low.

Administrative Issues – Cont.

- All three sites have URIs and recent issues including:
  - Issues raised during inspections
  - Self identified during self assessments, etc.
- If Duke transitions to NFPA-805, we will resolve these issues under NFPA-805.

Administrative Issues – Cont.

- Open issues:
  - Do previously identified issues receive enforcement discretion, given NFPA-805 implementation being scheduled for 2006-2007 for McGuire and Catawba?
  - What about the ONS 95-002 inspection scheduled for March 2005?

Schedule

- Jan. 16th deadline?
  - Will need feedback on the above issues by the end of December if date is not extended.
  - Reg. Guide and NEI Implementation Guide will not be complete by January 16th. Some details still a concern.
- 2 Year Transition:
  - Need to discuss options on delayed transition.