CR-3 Decommissioning Submittals

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DUKE ENERGY®

Duke Participants

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Overview

- Decommissioning status
- Permanently defueled (PD) accident analysis
- Near-term submittals
  - PD Emergency Plan (PDEP) LAR
  - PD Technical Specifications (PDTS) LAR
  - Post-Shutdown Decommissioning Activities Report (PSDAR)
  - PD Security Plan
- NRC expectations on review durations

Decommissioning Status

- Announcement to decommission under the SAFSTOR alternative made on 2/5/13
- 10 CFR 50.82(a)(1) certifications submitted on 2/20/13
- NRC acknowledgement pursuant to 10 CFR 50.82(a)(2) received on 3/13/13
- Certified Fuel Handler Training Program submitted on 4/15/13
- LAR 313 on Section 5 of the Technical Specifications submitted on 4/25/13
- Decommissioning Transition Organization in-place 6/3/13
  - Initial staffing level about 50% of operating level
  - Staff size expected to be reduced to dormancy levels in 2015
- Inspection oversight transitioned to Region I on 8/1/13
- All fuel assemblies remain in the spent fuel pool (SFP)
  - 177 fuel assemblies were last critical on 9/26/09
  - SFP and cooling lines are seismically qualified

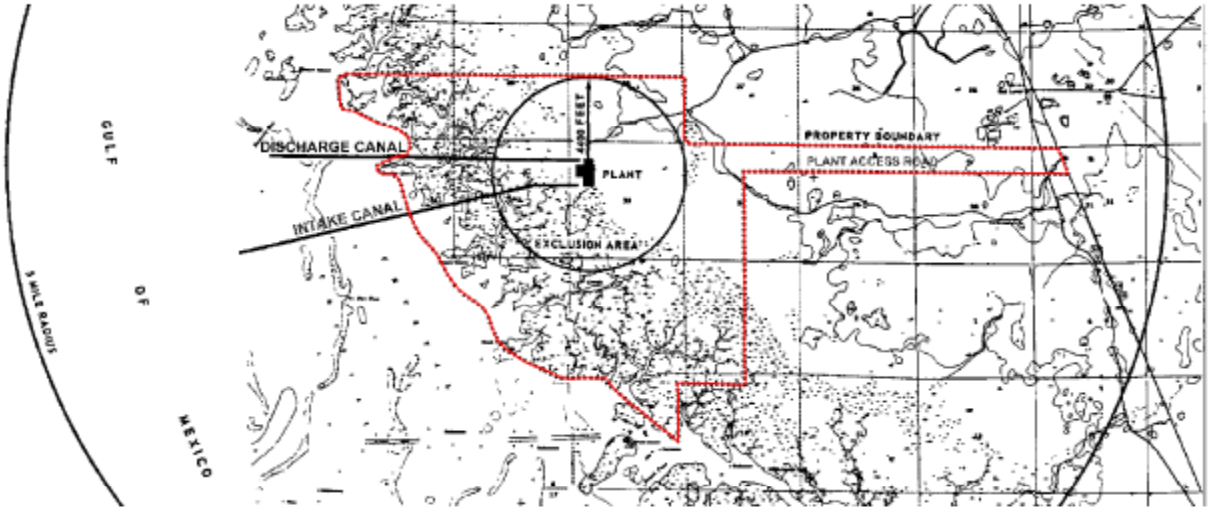
PD Accident Analysis

- Anticipated Operational Occurrence
  - Loss of SFP Cooling
- Design Basis Accidents
  - Fuel Handling Accident
  - Waste Handling Accident
- Beyond Design Basis Event
  - Loss of SFP Inventory

Loss of SFP Cooling

- Both loops of recirculating cooling are unavailable
- SFP contains greater than 380,000 gallons of water which provides abundant passive cooling
  - SFP heat up rate is approximately 1°F/hr
  - Time to boil is over 100 hours
- Slow heat up rate provides ample time for mitigating actions
  - No radiological consequences expected

Dose Receptors



- Exclusion Area Boundary (EAB) – 4,400 feet
- Low Population Zone (LPZ) – 5 miles

PD Accident Analysis Dose Limits

- Alternative Source Term (AST) amendment was approved 9/17/01
  - 10 CFR 50.67 dose limits apply
  - RG 1.183 guidance implemented
- §50.67(b)(2) dose limits
  - Control Room (CR) – 5 rem TEDE
  - EAB – 25 rem TEDE over 2 hours
  - LPZ – 25 rem TEDE
- EPA PAG Manual
  - 1 rem TEDE offsite
- Accident analysis dose limits
  - CR – 5 rem TEDE
  - EAB – 1 rem TEDE

Fuel Handling Accident

- Current licensing basis (CLB):
  - All 208 rods in a fuel assembly are assumed to fail (100% gap release)
  - No credit taken for Auxiliary Building and Control Room ventilation filters
- Atmospheric dispersion factors (X/Qs) were updated
  - Meteorological data from 2003 – 2007 was analyzed
  - ARCON96 was used to calculate onsite X/Qs
  - PAVAN was used to calculate offsite X/Qs
- RADTRAD dose results
  - CR → 1.3E-04 rem TEDE
  - EAB → 5.9E-05 rem TEDE

Waste Handling Accident

- Waste gas decay tank rupture accident no longer possible
- Bounding accident is a dropped high integrity container (HIC)
- Conservative primary resin source term assumed
  - Composite of highest radionuclide concentrations in shipments over last 5 years
- 10% release fraction assumed (factor of 10 larger than 10 CFR 30.72, Schedule C)
- Offsite receptors analyzed consistent with CLB and BTP 11-5
- Dose results
  - EAB $\longrightarrow$ 0.04 rem TEDE

Loss of SFP Inventory

- Thermal hydraulic and dose consequence analyses conducted
- Thermal hydraulic scenarios
  - Air cooled analysis
    - Peak clad temperature is 547°C (no credit for ventilation)
    - Cladding remains intact
  - Adiabatic analysis
    - Time to 900°C approximately 20 hours
    - Sufficient time is available to take mitigating actions and, if necessary, offsite protective measures without preplanning

Loss of SFP Inventory (cont'd)

- Dose rates calculated using MCNP5, Version 1.60
  - CR → 8 E-06 rem/hr TEDE
  - EAB → 2 E-07 rem/hr TEDE
- Time to reach dose limits much greater than a year

PDEP LAR

- Anticipated submittal: October 2013
- Scope of LAR
  - PD EALs
  - Exemptions to §50.47 and Appendix E
  - PDEP

PD EALs

- Current EAL scheme based on NUMARC/NESP-007, Revision 2
- PD EAL scheme will be based on NEI 99-01, Revision 6
  - Recognition Category “PD” initiating conditions used
  - No deviations taken
- Classification levels
  - Unusual Event and Alert
    - Radiological conditions
    - Hazards
    - System malfunctions

Proposed Exemptions to 10 CFR 50.47

- §50.47(b)
  - (1) assigned responsibilities
  - (3) requesting assistance
  - (4) classification
  - (5) notification
  - (6) communications
  - (7) public information
  - (9) offsite monitoring
  - (10) protective actions for EPZs
  - (14) exercises
- §50.47(c)
  - (2) define EPZs

Proposed Exemptions to 10 CFR 50 Appendix E

- IV. Content of Emergency Plans
  - A. Organization
  - B. Assessment Actions
  - C. Activation of Emergency Organization
  - D. Notification Procedures
  - E. Emergency Facilities and Equipment
  - F. Training
  - I. Onsite Protective Actions During Hostile Action

PDEP

- Significant changes
  - Offsite organizations removed
  - Shift and emergency staffing capabilities deleted
  - Fire Brigade defined in the Fire Protection Plan
  - Departures from the guidance in NUREG-0654

PDTS LAR

- Anticipated submittal: November 2013
- Technical Specification changes based on 10 CFR 50.36 applicability to a PD plant
- License Condition deletions and revisions proposed

10 CFR 50.36 Requirements

- *"Safety limits for nuclear reactors are limits upon important process variables that are found to be necessary to reasonably protect the integrity of certain of the physical barriers that guard against the uncontrolled release of radioactivity."*
  - The Safety Limits in the ITS relate to the operating reactor core and RCS pressure which are not needed in PDTS.
- *Criterion 1. Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary."*
  - The reactor coolant pressure boundary performs no safety function with all fuel stored in the fuel pools. No Limiting Conditions for Operation (LCOs) included in the ITS to satisfy Criterion 1 are needed in the PDTS.

10 CFR 50.36 Requirements (cont'd)

- *Criterion 2. A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier."*
  - The only fission product barrier that is still performing a safety function is the fuel cladding. No LCOs associated with the reactor coolant or containment fission product barriers that satisfy Criterion 2 are needed in the PDTS.
- *"Criterion 3. A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier."*
  - The fuel handling accident and the radioactive waste handling accident are the only design basis accidents which can occur in a permanently defueled plant. There are no structures, systems, or components which actuate to mitigate either of those accidents

10 CFR 50.36 Requirements (cont'd)

- *Criterion 4. A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."*
  - Each limiting condition for operation (LCO) in the ITS was evaluated for applicability to a permanently defueled plant, and its significance to public health and safety. If an LCO is not applicable for the protection of nuclear fuel stored in the spent fuel pools it was not included in the PDTS.

Remaining Technical Specifications

- 3.7.13 Fuel Pool Water Level
- 3.7.14 Spent Fuel Pool Boron Concentration
- 3.7.15 Spent Fuel Assembly Storage

License Condition Deletions

- Mitigating Strategies for addressing large fires and explosions
  - 10 CFR 50.54(hh)(3) states that §50.54(hh) does not apply to a nuclear power plant for which certifications under §50.82(a) have been submitted.
  - NRC letter dated 11/28/11 rescinded Item B.5.b of the Interim Compensatory Measures Order EA-02-026
- Cyber Security
  - 10 CFR 73.54 states, "By November 23, 2009 each licensee currently licensed to operate a nuclear power plant under part 50 of this chapter shall submit, as specified in §50.4 and §50.90 of this chapter, a cyber security plan that satisfies the requirements of this section for Commission review and approval."
  - NRC letter dated 3/13/13 acknowledged that pursuant to 10 CFR 50.82(a)(2), the 10 CFR Part 50 license for CR3 no longer authorizes operation of the reactor or emplacement or retention of fuel in the reactor vessel.

Remaining Programs, Manuals, and Reports

- 5.6.2.3 – Offsite Dose Calculation Manual
- 5.6.2.17 – Technical Specifications Bases Control Program
- 5.7.1.1.b – Annual Radiological Environmental Operating Report
- 5.7.1.1.c – Radioactive Effluent Release Report

PSDAR

- Anticipated submittal: December 2013
- SAFSTOR approach will be pursued
- Spent fuel storage strategy under evaluation
  - Dry storage in ISFSI
  - Wet storage in nuclear island
- LLW storage footprint will be minimized
- Environmental contamination is minimal
- GEIS bounds expected environmental impacts

Defueled Security Plan

- Anticipated docketing: June 2014
- Changes will not decrease effectiveness of the following plans:
  - Physical Security Plan
  - Guard Training and Qualification Plan
  - Safeguards Contingency Plan
- Changes will be docketed under 10 CFR 50.54(p)(2) within 60 days
- A closed meeting will be requested in early 2014 to discuss proposed changes

NRC Review

- Duke Energy is committed to carefully planning the decommissioning transition phase
- Changes in staffing levels are linked to the approval of the
  - PDEP and
  - PDTS
- CR3 decommissioning schedule assumes one year reviews
- Predictable review durations facilitate effective staffing transition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