NRC Update

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Nuclear Regulatory Commission

NEI Radiological Effluents and Environmental Workshop
June 28, 2016

Newport, RI

Topics

- Revised NRC inspection procedures
- NUREG/CR-2907 effluent summary reports
- Principal radionuclides & LLDs
- RG 4.15 & QA control charts
- Intersystem cross contamination
- Groundwater issues
- Direct radiation monitoring (ANSI N13.37)
- Plant and animal protection
- New reactors update

Revised NRC Inspection Procedures

- IP 71124.06 Effluent inspections
  - Inspect effluent monitor calibrations
- IP 71124.07 Environmental inspections
  - Inspect ground-water issues
  - Document observations of incomplete implementation of NEI 07-07

NUREG/CR-2907

- Compares each plant's effluents and dose to other plant's data
- Includes C-14 starting in 2010 report
  - The reports highlight differences between plants
  - Example
    - Tritium – Liquid discharges
      - **some BWRs report 150 curies, others zero**
      - **some PWRs report 1,700 curies, others zero**
    - Noble gas – Gaseous discharges
      - **Some BWRs report 450 curies, others zero**
      - **Others PWRs report 207 curies, others zero**

Principal Radionuclides & LLDs can be based on:

- NUREG-1301/1302 historical list of principal radionuclides and associated LLDs, or
- Review of current source term, and use of new methods in RG 1.21, Rev. 2 to identify:
  - principal radionuclides based on “activity,” AND
  - principal radionuclides based on “dose,” THEN
  - develop LLDs for principal radionuclides

RG 1.21 Rev. 2

Principal Radionuclides

- "Dose-based" principal radionuclides
  - Dose > 1% of the App I dose for each effluent type, OR
- "Activity-based" principal radionuclides –
  - Activity > 1% of the total activity in that effluent type
- Derive new LLDs (e.g., using NUREG-1576, MARLAP methods to achieve DQO – i.e.; small fraction of Appendix I dose)
- Once detected, all radionuclides must be included in dose calculations and effluent reports

RG 1.109 Effluent Types

- Liquid effluents
- Noble gases in airborne releases
- Other radionuclides released to atmosphere; e.g., through BWR turbine building vents leading to localized contamination such as icicles and groundwater contamination

Revised LLDs
(for principal radionuclides)

- Historical LLDs – may have unnecessarily long count times
- Revised LLDs - can be developed and used
  - Document basis for new LLDs
  - Review previous commitments
  - Revise commitments as needed per NEI- 99-04 (ML003680088)
  - Revise ODCM with new LLDs

RG 4.15 - QA

- Control Charts
  - Variability will exist in all measurements
  - Unexpected variability can be identified using control charts
  - Historical data is plotted vs current data
  - Used to identify unexpected variability; e.g., gradual monitor failure, water from condensation, or sample line separation

Intersystem cross contamination

- Several Information Notices and IE Bulletins (i.e., IE 80-10)
- Lack of procedures to preclude overflow of tanks or containers
- Establish survey and monitoring programs to detect intersystem cross contamination
- Need procedures to assess impacts once cross-contamination is detected

Reporting Requirements for Leaks & Spills

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- 50.72(b)(2)(xi) reporting of events (related to public health and safety or notification to other government agencies)
- NEI 07-07 flow chart interpretation:
  - Leak or spill > 100 gal and > 2,000 pCi/L
  - Ground water sample > 20,000 pCi/L
  - Different interpretations on reporting criteria
- Intent of NEI 07-07 is to enhance communication and build trust with local authorities and the NRC

Environmental Groups

- Environmental groups are monitoring daily the "NRC Preliminary Notifications" and 10 CFR 50.72 reports

- NRC Preliminary Notifications (PNs)
  - PNs used to be called "Daily Event Reports"
  - NRC Sr. Residents inform NRC Regions (daily)
  - NRC Regions issue "preliminary notifications" to HQ
  - NRC posts the PNs on public web site
  - http://www.nrc.gov/reading-rm/doc-collections/event-status/prelim-notice/

List of Leaks and Spills

- 6 month update published on NRC web site
- http://www.nrc.gov/reactors/operating/ops-experience/tritium/sites-grndwtr-contam.html
- 45 sites historically have had ≥ 20,000 pCi/L
- 9 sites currently have ≥ 20,000 pCi/L

Decomm Planning Rule
(effective date 2012)

- 10 CFR 20.1406 - minimize residual radioactivity into the site (includes the plant, onsite subsurface soil, and groundwater)

- 10 CFR 20.1501 – perform subsurface surveys (e.g., groundwater)
  - Credit for NEI 07-07 implementation

Potential Rulemaking
for prompt remediation

- Draft Regulatory Basis was completed in 2013
- Two public webinars were held
- NEI commented extensively against rulemaking
- Most members of public commenting supported rulemaking

Prompt Remediation

- NEI 07-07 – Voluntary Initiative
  - Objective 1.4.a – develop site procedure for "decision-making process" for remediation
- NRC inspection (TI-2515/172 & 185)
  - Deficiencies observed in meeting NEI 07-07 Objective 1.4.a
- EPRI Groundwater and Soil Remediation Guidelines (July 2011)

Commission directed NRC staff SRM-SECY-13-0108

- Evaluate need for rulemaking for prompt remediation
  - Review effectiveness of Decomm Planning Rule by collecting and evaluating 2 years of operational experience
  - Engage stakeholders in a webinar/public meeting (Monday, July 11th, 2016, 1:00 pm – 3:30 pm)
- Provide Commissioners with recommendations (schedule: September 30, 2016)

EPRI Groundwater Workshop
July 13-14th, Pittsburgh

- NRC is reviewing operating experience on remediation & decision-making process
  - Remediation Methods?
  - Successes & Failures?
  - Cost vs. Effectiveness?
  - Lessons Learned?

On-going Remediation

to minimize contamination

- Monitored, Natural Attenuation
- Active Remediation (Extract & discharge)
  - Vermont Yankee
  - Oyster Creek
  - Salem
  - Brunswick
  - Turkey Point
  - Braidwood
  - Dresden
  - Duane Arnold
  - Hatch
  - Indian Point (fall – 2016)

Remediation

- Palisades
- Point Beach
- VC Summer
- Beaver Valley
- Columbia

Groundwater Discharges
to Off-site Environment

- NRC draft RG (DG-4025) on calculating ground-water discharges to unrestricted areas
- DG-4025 was issued for public comment (December, 2015):
  - 10 individuals & environmental organizations provided comments :
  - 47 comments from 3 industry groups (NEI, Exelon, Dominion)

Industry Comments (DG-4025)

- Does it apply to leakage from onsite ponds, settling basins into groundwater?
- Is there any “grandfathering” for existing plants?
- Use BRC, or NCRP negligible dose concepts, since there are no adverse effects of low dose at very low dose
- Make terminology consistent with RG 1.21

Public Comments

- Planet's lifeblood is water, so leakage is unacceptable
- Some plants have leaked for years and are not able to find/fix leaks
- If leaks cannot be found, reactors should be shutdown
- No basis for license extension with leaking plants
- Prompt remediation should be mandatory
- Need constant real-time monitoring and reporting
- GDC 60 states the design shall include means to control the release of RAM, including anticipated operational occurrences
- There is no known remediation possible once groundwater is contaminated

Excel Spread Sheet for DG-4025

- Excel spreadsheet is available on NRC web site (see draft RGs - Division 4) or

  http://www.nrc.gov/reading-rm/doc-collections/reg-guides/environmental-siting/draft-index.html

- Other dose calculation methods are OK, but will be evaluated by NRC inspectors

Direct Radiation –
Compliance with 10 CFR 20.1301 & 1302

- 10 CFR 20.1301(e)
  - Comply with EPA's 40 CFR 190 dose limit of 25 mrem whole body
- 10 CFR 20.1302
  - Requirement to perform "surveys" in controlled areas and unrestricted areas
  - "Surveys" include the "calculations of levels of radiation" from plant

Direct Radiation Sources

Methods of demonstrating compliance

- ~1980 - NRC guidance was that compliance with Appendix I would demonstrate compliance with 40 CFR 190
- Caveat was that this was based on direct radiation sources existing in ~1980

Direct Radiation Sources

- ~1980 radiation sources:
  - Direct radiation from N-16
  - Short-term in-plant radwaste storage
- 2016 additional sources:
  - ISFSI spent fuel storage
  - Rx Head and SG storage
- Planned revision of RG 4.13 (DG-4019)
  - Adopts ANSI/HPS N13.37 Environmental Dosimetry
  - Provides method of determining facility-related dose
  - Can be used to demonstrate compliance with 10 CFR 20.1302 surveys and 40 CFR 190

ANSI N13.37 (2014)

Environmental Dosimetry

- RG 4.13, Rev. 1 has 3% criteria for reproducibility
- ANSI N13.37 Performance standards
    - for processor - 7.5% reproducibility and uniformity standard per group, 5% for a 10 group average
    - For end-user – betterdata analysis methods
- Preliminary draft RG 4.13
  - Rev. 2 endorses ANSI/HPS N13.37
  - daft RG will be published for public comment (2nd half, 2016)
- REEW training session was given yesterday on data analysis methods

Minimum "Detectable" Dose (MDD) for environmental dosimetry

- "Detectable" dose is when measurements at any location are more than 3 sigma above background dose at that location

- If 3 sigma is 5 mrem, then MDD is ~ 5 mrem

- Good dosimetry systems can achieve MDDs at:

  ~ 5 mrem/qtr, and ~ 10 mrem/yr

  Sq root ($\sqrt{}$) of sum of squares = $\sqrt{(5^2 + 5^2 + 5^2 + 5^2)} = 10$

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NRO Update

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Division of Site Safety and Environmental Analysis
Office of New Reactors

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Topics

- 10 CFR 50, Appendix I
- New reactor applications
- GALE code lessons learned
- Works in Progress

10 CFR 50, Appendix I

- Develop regulatory basis for proposed revisions to Parts 20 and 50, Appendix I (SRM-SECY-12-0064)
  - Part 20 (1991) based on ICRP-26 (1977); Part 50 Appendix I based on ICRP-2 (1959)
  - Alignment with ICRP-103 (NRC, Federal family, international)
  - EPA/NRC IAA with ORNL to develop ICRP-103 data
  - Part 50, Appendix I ANPR (May 1 - October 1, 2015)
    - 20 commenters (public, professional organization, industry)
    - mixed support for rulemaking changes
- Re-baselining and Project AIM (SRM-SECY-16-0009)
  - Parts 20 and 50, Appendix I rulemaking activities were shed

New Reactor Applications

- APR1400 Design Certification
  - Korea Electric Power Corporation (KEPCO) and Korea Hydro & Nuclear Power Co., Ltd. (KHNP)
  - CE System 80+ design
  - Review in Phase 2 (SER with OIs)
- Review approach
  - NUREG-0800 (SRP), BTPs, and ISG
  - Lessons learned (AP1000, ESBWR, US-APWR, U.S. EPR, ABWR)
  - Confirmatory calculations (modified GALE, NRCDose, MCNP, MicroShield, Excel)

New Reactor Applications

- TVA Clinch River Nuclear Site Early Site Permit
  - Plant parameter envelope
  - Normal and accident source terms (4 SMR designs)
  - Acceptance review in progress
- Review approach
  - SRP, BTPs, and ISG
  - Lessons learned (Clinton, Grand Gulf, North Anna, Vogtle, PSEG)
  - Confirmatory calculations

New Reactor Applications

- NuScale Design Certification
  - Scalable multl-modular design
  - Sharing of SSCs
  - Alternate source term
  - Regulatory gap analysis
  - Readiness assessment (fall 2016)
  - DC submittal (winter 2016)
- Review approach
  - SRP, Design-Specific Review Standard (DSRS), BTPs, and ISG
  - Risk insights (safety-focused approach) (SRM-SECY-11-0024)
  - Lessons learned
  - Confirmatory calculations

GALE Code Lessons Learned

- GALE86 (CCC-506)
  - Available through RSICC (https://rsicc.ornl.gov/)
  - Industry standard and NRC staff code (ANSI/ANS-18.1-1984)
  - NUREG-0016/0017
  - SRP and DC/COL-ISG-05 (ANSI/ANS-18.1-1999)
  - Initial reactor licensing, design changes, and power uprates
- Modified GALE code applications
  - DC applications
  - Describe modifications (source term, design features, output)
  - Provide technical basis (electronic files, documentation)

Works in Progress

- Update to NRCDose
  - Available through RSICC (https://rsicc.ornl.gov/)
  - Industry standard and NRC staff code system
  - GUI runs 3 NRC codes: XOQDOQ (CCC-316), LADTAP II (CCC-363), and GASPAR II (CCC-463)
  - NUREG/CR-2919, NUREG/CR-1276, NUREG-0597, RG 1.109
  - Initial reactor licensing and evaluating exposure pathway doses
  - Enhancements:
    - Minor code corrections
    - GUI, format, file structure, and print options
    - Radionuclides in reactor effluents
    - ICRP dose factors and site-related design parameters
    - Documentation (Quick Start Guide, User Manual, V&V)
    - “Application-ready” output
    - Industry feedback?

Questions?