



Analysis of Cancer Risks near Nuclear Facilities - Phase 1 Study Request

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Analysis of Cancer Risks Study Request

- NRC identified and initiated project to develop up-to-date cancer risk information for responding to recurrent stakeholder concerns
- Agency wide interest in performing the new study





Study Request

- The 1990 National Cancer Institute (NCI) report "Cancer in Populations Living Near Nuclear Facilities" should be updated
 - Demographic changes in the last 20 years
 - Limited cancer incidence information
 - Does not include facilities operated after 1982
 - Staff desire to reduce the county size study unit to something smaller





Expectations

- Ensure an open, credible, and objective study with opportunities for stakeholder input
 - Webcast public meetings
 - Hold meetings in different geographical regions of the U.S.
 - Provide opportunity for public comment on study recommendations for NRC consideration

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Expectations

- Up front consideration of off-site radiation doses from facility operations to inform health study design



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Expectations

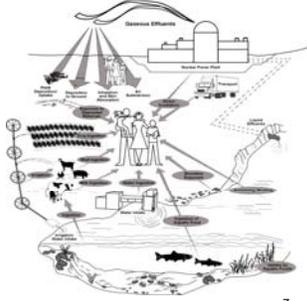
- Determine whether a technically defensible approach to meet the goals of the study request is feasible
 - and if so, develop recommendations for phase 2 using scientifically sound processes for evaluating whether nuclear facilities pose a cancer risk

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Dose Considerations

- Pathways, receptors, and source terms
- NRC's program to keep off-site doses As-Low-As-Reasonably-Achievable (ALARA)





Dose Considerations

- Address completeness, and quality of information on gaseous and liquid radioactive releases and direct radiation exposure from nuclear facilities

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Dose Considerations

- Address potential methodological limitations arising from the variability in radioactive releases over time and other confounding factors

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Sources of Radiation

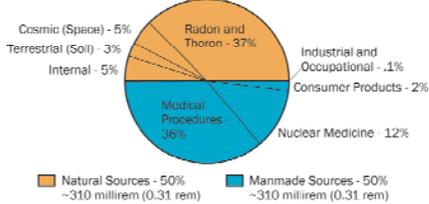
Radiation occurs naturally in the soil, air and water. The average dose to people in the U.S. is about 620 millirem (6.2 mSv) of radiation a year. Half of that exposure comes from natural sources (also called background radiation). The other half largely comes from nuclear medical exams and treatments. Small amounts of radioactive material are also used in common items such as smoke detectors, exit signs and some watches.





Average Dose

Sources of Radiation Exposure in the United States



Source: NCRP Report No. 160 (2009)
If full report is available on the NCRP Web site at www.NCRPpublications.org.



Regulatory Framework

- All NRC radiation protection regulations stem from 10 CFR Part 20, "Standards for Protection Against Radiation"
- 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities", includes the implementation requirements for nuclear power reactors to comply with Part 20



10 CFR Part 20

- Public dose limits (Subpart D)
 - 100 mrem/yr (1 mSv/yr) total effective dose equivalent per reactor
 - A total of 25 mrem/yr whole body, 75 mrem/yr thyroid, and 25 mrem/yr to critical organ from all fuel cycle facilities within 50 mile radius (0.25 mSv/yr | 0.75 mSv/yr | 0.25 mSv/yr) (EPA, 40 CFR 190)

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10 CFR Part 20 cont.

- Public exposures must be kept ALARA
- Releases must be monitored to demonstrate compliance
- Releases must be monitored to evaluate: magnitude and extent, concentration and quantity, and potential radiological hazards

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10 CFR Part 50

- Part 50.34a – Effluent releases must be controlled
- Part 50.36a – Licensees must have an effluent release program to keep annual releases ALARA and report results
- Appendix A – General Design Criteria (GDC)
 - GDC 60, Each plant must have a means to control liquid and gaseous effluent releases
 - GDC 64, Each plant must monitor effluent discharge paths and plant environs for radioactivity

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10 CFR Part 50 cont.

- Appendix I – ALARA Numerical Dose Objectives
 - Liquid pathways
 - 3 mrem/yr (0.03 mSv/yr), total body
 - 10 mrem/yr (0.1 mSv/yr), critical organ
 - Gaseous pathways
 - 5 mrem/yr (0.05 mSv/yr), total body (noble gases);
 - 15 mrem/yr (0.15 mSv/yr), critical organ

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Effluent Releases

- Reactor licensees are required to monitor and report annual radiological effluent releases
 - Gaseous, liquid, and abnormal releases
 - Curies/year by radionuclide and summary role-up
 - Annual report for every plant
- Fuel cycle licensees report every 6 months

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Study Design

- Demographic characteristics of the study and control populations (e.g., all age groups, including children and nuclear facility workers)
- Geographic areas to use in the study (e.g., county, zip codes, census tracts, or annular rings around the facility at some nominal distances)

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Study Design cont.

- Cancer types and endpoints (i.e., incidence, mortality)
- Availability, completeness, and quality of cancer incidence and mortality data

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Study Design cont.

- Different epidemiological study designs and statistical assessment methods (e.g., ecologic, cohort, case-control)

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Study Design cont.

- Address potential methodological limitations arising from
 - low statistical power,
 - random clustering,
 - changes in population characteristics over time,
 - and other confounding factors

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END
