RAMP Atmospheric Codes Overview

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ARCON96

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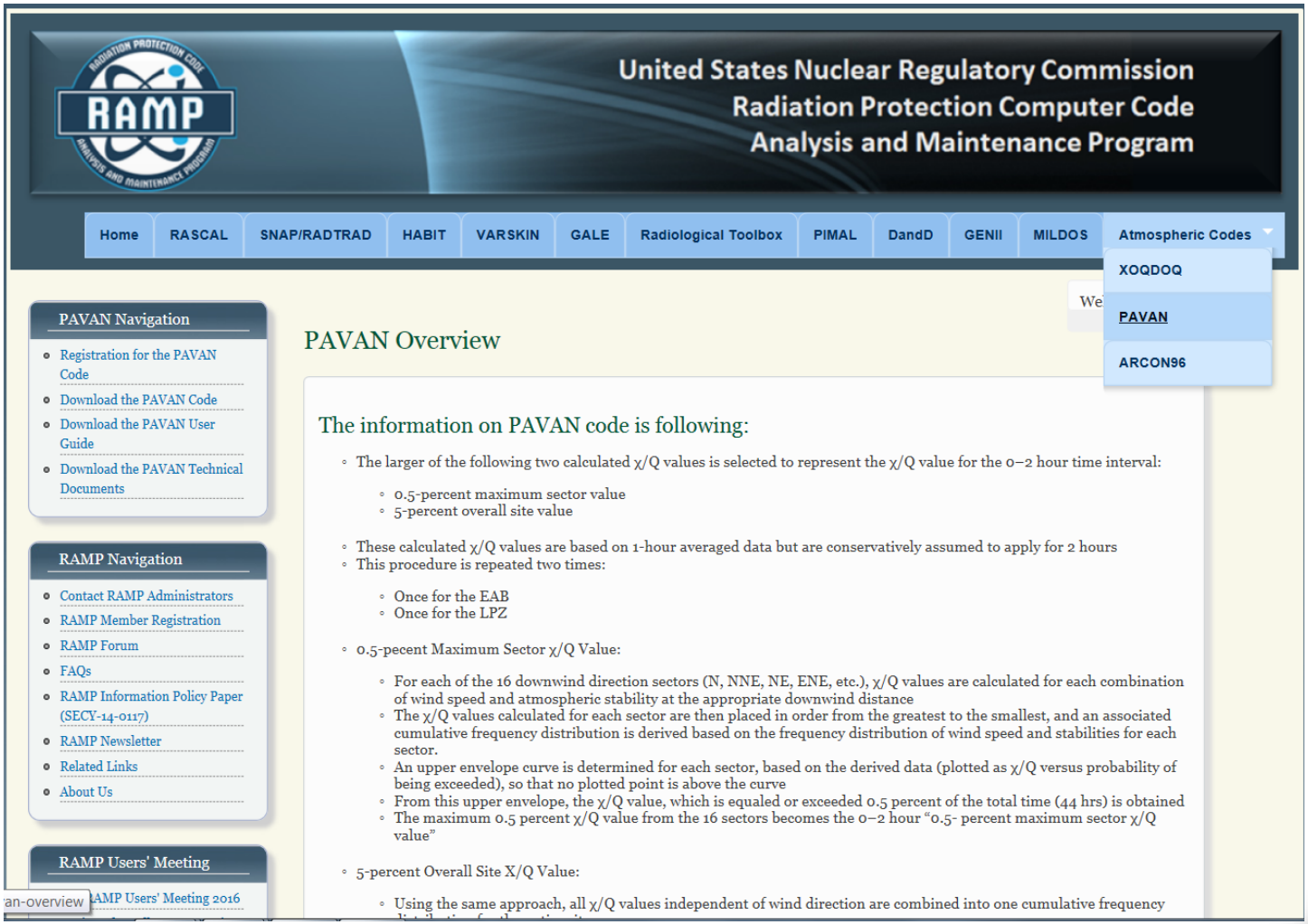
ARCON96: Overview

- ARCON96 is a Gaussian dispersion model for calculating short-term relative concentrations (χ/Q's) at nuclear power plant control room air intakes that would be exceeded no more than 5% of the time.
- Dispersion is near-field, in the vicinity of buildings.
- ARCON96 includes enhanced diffusion coefficients for low wind speed conditions and building wake.

ARCON96: Use

- Used by the NRC for New Reactor Safety Reviews for design-basis accidents
- 10 CFR Part 50, Appendix A, General Design Criterion 19 (GDC 19), Control Room
  - Adequate radiation protection shall be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 5 rem (0.05 Sv) whole body, or its equivalent to any part of the body, for the duration of the accident

PAVAN



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PAVAN: Overview

- PAVAN is a Gaussian dispersion model for calculating short-term relative concentrations (χ/Q's) at offsite locations, including the:
  - Exclusion Area Boundary (EAB)
  - Low Population Zone (LPZ)
- PAVAN uses Pasquill-Gifford (PG) diffusion coefficients with simple modifications to account for low wind speed conditions and building wake for ground-level releases.

PAVAN: Use

- Used by the NRC for New Reactor Environmental Impact Statements and Safety Reviews for design-basis accidents
- 10 CFR 52.79(a)(1)(vi), Contents of applications; technical information in final safety analysis report
  - Perform an assessment assuming a fission product release from the core into the containment
    - An individual located at any point on the boundary of the EAB for any 2-hour period would not receive a dose in excess of 25 rem (0.25 Sv) TEDE
    - An individual located at any point on the outer boundary of the LPZ would not receive a dose in excess of 25 rem (0.25 Sv) TEDE during the entire period of the passage of the radioactive cloud

XOQDOQ

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XOQDOQ: Overview

- XOQDOQ is a Gaussian dispersion model for calculating long-term relative concentrations (χ/Q's) and deposition (D/Q's) at user-specified locations and standard radial distances/segments out to 50 miles
- XOQDOQ plume horizontal distribution is assumed to be evenly distributed within the 22.5 degree downwind sector (sector-averaging)
  - For ground-level releases, plume vertical diffusion coefficient modified to account for building wake

XOQDOQ: Use

- Used by the NRC for New Reactor Environmental Impact Statements and Safety Reviews to access impacts from routine releases
- 10 CFR Part 20, Subpart D, Radiation Dose Limits for Individual Members of the Public
  - The annual average concentrations of radioactive material released in gaseous effluents at the boundary of the unrestricted area do not exceed the values specified in Table 2 of Appendix B to Part 20
    - Intended to result in doses below 0.05 rem (0.5 mSv)
- Appendix I of 10 CFR Part 50, Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet ALARA Criterion for Radioactive Material in Reactor Effluents
  - Section II.B: Unrestricted annual air dose < 10 mrad (0.1 mGy) gamma or 20 mrad (0.2 mGy) beta
  - Section II.C: Unrestricted annual individual organ dose from all pathways of exposure < 15 mrem (0.15 mSv)
  - Section II.D: radwaste system cost-benefit analysis based on population dose out to 50 miles

- *Jeremy Rishel*
  - *Mr. Rishel support the RAMP Atmospheric Codes, including ARCON96, PAVAN, and XOQDOQ. In addition, Mr. Rishel supports the development of the NRC's RASCAL emergency response code.*
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