Special Joint Canadian Nuclear Safety Commission and U.S. Nuclear Regulatory Commission Symposium on the:

Dose to the Lens of the Eye

October 31, 2018

Albert at Bay Suite Hotel, Ottawa, Canada

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United States Nuclear Regulatory Commission
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RAMP and The Dose to the Lens of the Eye

Fall 2018 RAMP Meeting

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Office of Nuclear Regulatory Research
United States Nuclear Regulatory Commission

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Agenda/Goals

- RAMP Program – *Why are we having an Dose to the Lens of the Eye Symposium during a RAMP Meeting?*
  - Joint Health Canada/US NRC Request
  - NRCs Office of Research
    - Monitoring the Science
    - REIRS Database – Reporting Requirements for LDE
    - Cooperative Research Program - RAMP
      - International Collaboration
      - Developing confirmatory tools such as computer codes

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FEATURED PRESENTATIONS:

Dose to the Lens of the Eye: ICRP's Latest Recommendations
Christopher Clement, ICRP

U.S. Nuclear Regulatory Commission's Perspective on the ICRP's Recommendations
Rebecca Tadesse U.S. NRC

The Canadian Nuclear Safety Commission's Dose Limits for Lens to the Eye
Adelene Gaw, Canadian Nuclear Safety Commission

Operational Considerations for Dosimetry Service Providers and Dose Registries
Keith Henderson and Philippe Prince, Health Canada

Eye Dosimetry Using VARSKIN
Logan Anspach & Nicholas McDaniel, Oregon State University

Development of a Deterministic Eye Dosimetry Model
David Boozer, Oregon State University, and David Hamby, Renaissance Code Development

Hp(3) Comes into Focus: Views from a Health Physicist
Christopher Passmore, Landauer, Inc.

Epidemiology and Mechanistic Effects of Radiation on the Lens of the Eye: Review and Scientific Appraisal of the Literature
Phung Kim Tran, Electric Power Research Institute

Benchmarking Dose Modeling for Eye Cataracts
Vinita Chauhan, Health Canada

Australia's Response to the ICRP's Recommendation
Blake Orr, Australian Radiation Protection and Nuclear Safety Agency

To register, please provide your name, email, and organization to RAMP @nrc.gov

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Nuclear Regulatory Research

- Mandated by Congress
- Three technical divisions:
  - Division of Engineering
  - Division of Risk Analysis
  - Division of Systems Analysis (RAMP)
- About 200 engineers, scientists, analysts, and support staff.
  - ~ 30% M.S. and 30% Ph.D.
- About $40 M funding

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Key Research Areas

- Thermal-Hydraulics
- Fuel and Core
- Severe Accident and Accident Consequences
- **Radiation and Environmental Protection**
- Risk Analysis
- Human Reliability and Human Factors
- Fire Safety
- External Hazards
- Materials Performance
- Structural Performance
- Digital Instrumentation & Control and Electrical
- Domestic and International Collaboration

http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1925/

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What Is RAMP?/Need for RAMP

RAMP is a Computer Code Management Program for development, maintenance and distribution of radiation/dose assessment codes:

- Streamline updates/ recognized code issues
- Incorporating the latest accepted state of the art models
- Incorporate new models as the need arises in current codes: VARSKIN and eye dosimetry
- Fiscally responsible by leveraging group dynamics
- Leverage the US NRC expertise in member country activities; share international codes
- Consolidation efforts to gain in efficiencies (IMBA, RESRAD, TURBOFRMAC)

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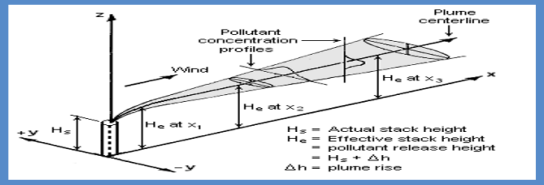
Dose Assessment Codes in RAMP

Environmental

MILDOS 4

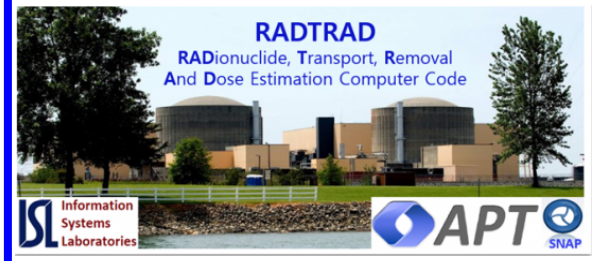
Radiological Dose from Uranium Milling

Atmospheric Codes



PAVAN ARCON96 XOQ/DOQ

NPP Licensing



Gaseous And Liquid Effluent

Habit 2.0

Emergency Response Code

Other Dose Assessment Codes

VARSKIN

RADIOLOGICAL TOOLBOX

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Current RAMP International Agreements

We currently have 9 RAMP Agreements with these partners:

- **South Africa**
- **Canada**
- **South Korea**
- **Taiwan**
- **UAE**
- **China**
- **Armenia**
- **Vietnam**
- **Spain**
- **Under negations: Ukraine, Ghana, Australia**

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Benefits to RAMP Partnerships

- For South Africa
  - RASCAL: Input Atmospheric Tower Information
  - ARCON96: Helping with confirmatory analysis
- For Canada
  - RASCAL: Candu Source Term interface
- For Taiwan
  - RASCAL: Inputting Reactor Source Term Information
  - GENII: Decommissioning Examples
- VARSKIN is now available in Spanish, (easy to add French)
- Larger user group: troubleshooting, forums, training
- United States
  - With times of less resources, greater governmental HP community and ability to collaborate on governmental family of codes

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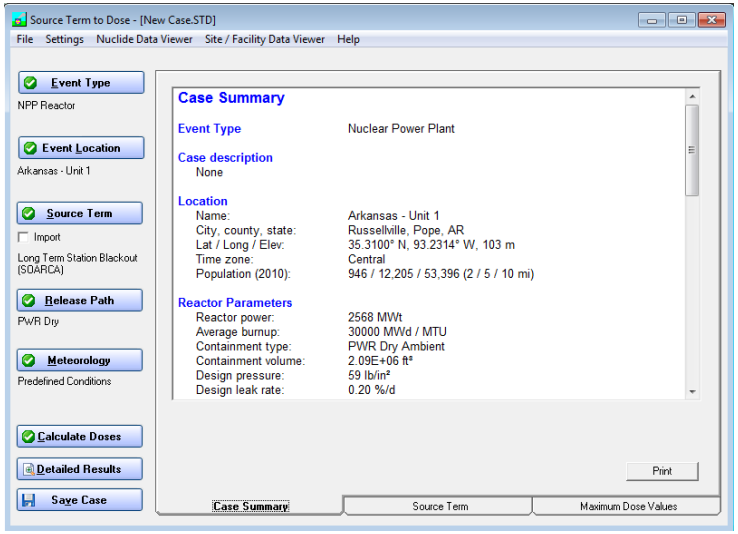
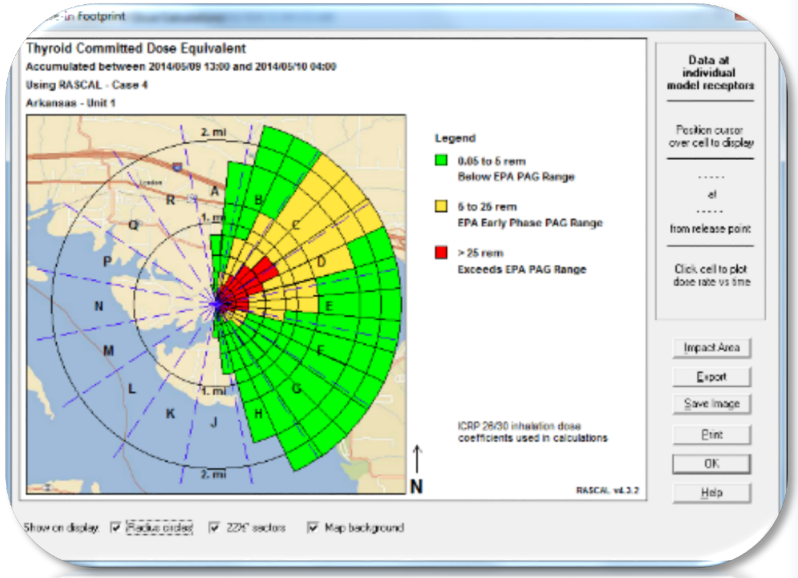
RASCAL (**R**adiological **A**ssessment **S**ystem for **C**onsequence **A**na**L**ysis)

Purpose: Radiological incidents to assess off-site dose consequences

Uses: Response organizations for pre-release or plume phase of radiological release to atmosphere; to help inform or evaluate protective actions





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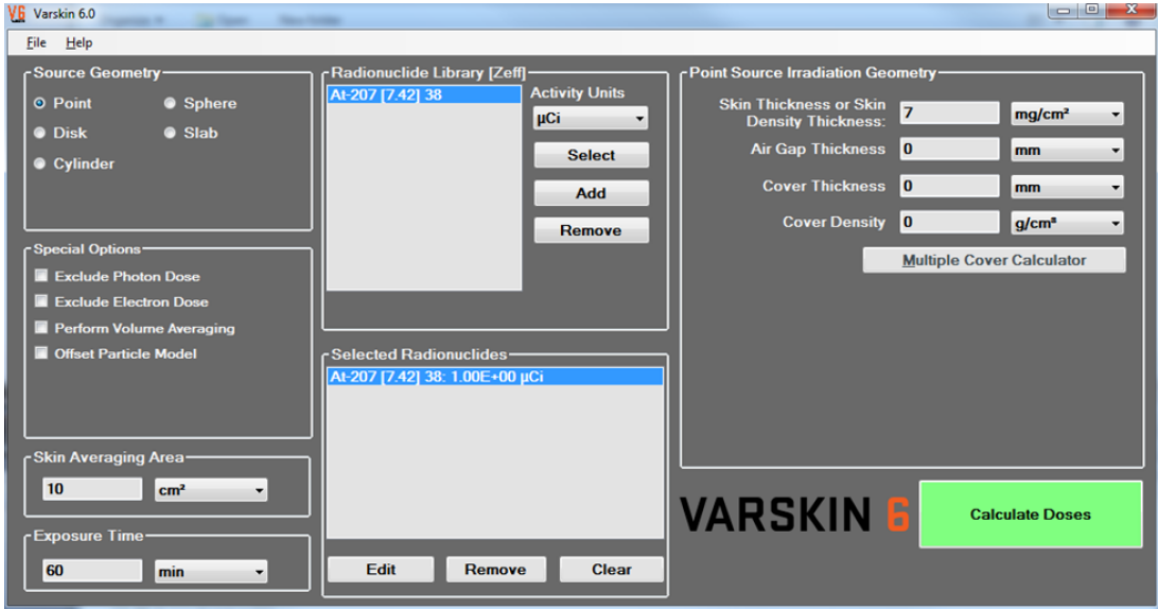
VARSKIN

Purpose: calculate occupational dose to the skin resulting from exposure to radiation emitted from hot particles or other contamination on or near the skin over a contiguous 10 cm^2 of skin at a tissue depth of 0.007centimeters (7 mg/cm2).

Uses: NRC staff uses the code to perform confirmatory calculations of licensees' skin dose estimates from both electron and photon emissions as required by 10 CFR 20.1201(c).



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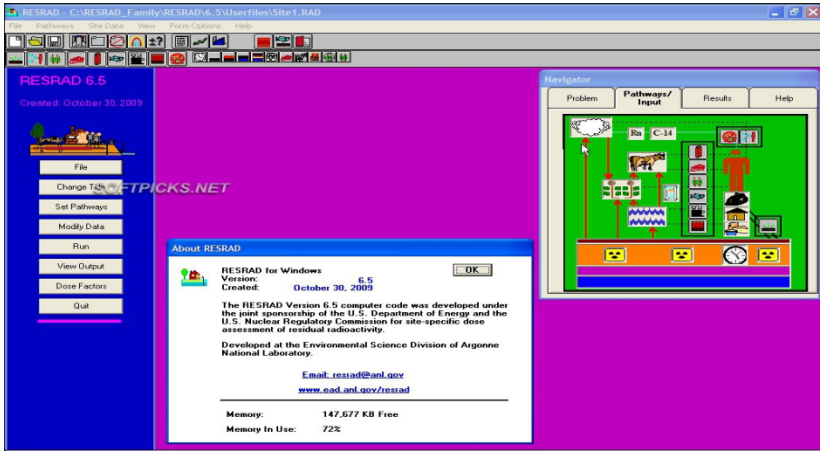
RESRAD (RESidual RADioactive Materials)

RESRAD in RAMP in 2018

Purpose: Family of codes used to analyze human and biota radiation exposures from environmental contamination of residual radioactive materials

Use: The codes are used worldwide by regulatory agencies, the risk assessment community, and universities in more than 100 countries



U.S. RAMP Meeting in Canada 2018
Monday: Opening Session

Lets Continue with Day 3: Dose to the Lens of the Eye