EMRAS – NORM WG

Vienna, November 2005

Model usage

1. regulatory assessment
2. impact assessment
3. research

- recommended models need to be
  - easily available
  - easy to use
  - well documented
  - well tested

NORM Industries

Mining (uranium, mineral sands, coal, copper, aluminium,….)
Mineral processing (uranium, rare earths, copper, aluminium,…)
Phosphate industry
Oil and gas production
Generation of electricity from coal

Other industries & issues

- Water treatment industry
  - Waste water, drinking water
- Paper and pulp industry
- Paint industry
- Geothermal power generation
- Misuse of NORM (mill tailings, waste rock,…) – building, metal recycling
- Inadvertent use of NORM

Hypothetical Scenarios

- Three hypothetical scenarios
  - Point source
  - Area source
  - Area source + river
- Improvements?
- Assessments?
- Other possible scenarios?

Modifications to hypothetical scenarios

- Radon exhalation rate – specify or calculate?
  - specification is easier, but the value has to be consistent with the radionuclide concentrations specified in the waste
  - specify composition of cover material is the same as the underlying layer
  - K_d value for underlying material (TRS-364 group?)
- Extend prediction times to 10,000 years
- Clear description of the link between the hypothetical scenarios and real situations
- Put real data into hypothetical scenarios and compare with real scenarios
- Doses to “associated workers” involved in disposal of the waste (land-spreading, reuse, transport)
- Hand calculations

Relevance of hypothetical scenarios

Hypothetical scenario	Real situation	Operating	Legacy
Point source	Power station	Yes	Unlikely
	Ventilation shaft	Yes	Yes
	Mine water discharge	Yes	Yes
Area source	Tailings pile	Yes	Yes
	Waste rock pile	Yes	Yes
	Waste storage	Yes	Yes
	Waste disposal	Yes	Yes
Area source + river	Tailings pile	Yes	Yes
	Waste rock pile	Yes	Yes
	Waste storage	Yes	Yes
	Waste disposal	Yes	Yes

Testing hypothetical scenarios

- Different models may require different input data, because of
  - Different assumptions
  - Different equations
  - Lumping and splitting of parameters in different models

Hypothetical scenarios - model testing

point source	Jan Horyna	CAP-88
	Danyl Perez Sanchez	CROM
	Richard O'Brien	CREAM
	Eduardo Quintana	CREAM
	Paul McDonald	CREAM
area source	Theo Zeevaert	DOSDIM + HYDRUS
	Richard O'Brien	RESRAD
	Loren Setlow	Soil screening model
	Loren Setlow	JENNY
	Jan Horyna	PRESTO, RESRAD
(+ river)	Danyl Perez Sanchez	AMBER

Debugging/Model testing

RESRAD

tested for bugs in area source scenario specifications

deterministic - determined by equations already in program

Testing regimes

- Same data with different models
- Same model with different data and assumptions
- Use “standard” values for parameters as much as possible, to keep the modeling simple and avoid confusion
- Specify the input data for model runs

Model characteristics

- RESRAD, CREAM, PRESTO, CROM - deterministic - determined by equations already in program
- AMBER - compartmental model - much more flexible package - can be applied to almost any scenario, but more complicated - allows both deterministic and probabilistic calculations
- IMPACT - WG needs to find out more detail about this package

Other modelers

- Other working groups

  interacting with other EMRAS groups

  need to investigate interaction with groups from other IAEA (NORM related) projects

- IMPACT – Canada

- Knowledge of models under development

Real Scenarios

CAMDEN - former gas mantle manufacturing plant – urban site - near river

- general discussion
- suggestions?
- improvements?

HUELVA - phospho-gypsum disposal near river

Other possible scenarios

- Lignite burning power station

Real Scenarios - Camden

- continue preparation of data base
- specify scenario conditions for modelers
- run models (e.g. RESRAD) using average soil concentrations - keep the definition of the source term as simple as possible

Real scenarios - Huelva

- Collect available data and set up data base for modeling
- develop model using AMBER
- maintain links with University of Seville
  - Aquatic WG is also developing a scenario for this site

Draft Report

- Contributions for next meeting
  - model specifications and descriptions
  - Results of hypothetical scenario testing
  - Specification, description and testing of real scenarios (Camden, Huelva)
  - Results of real scenario testing

- Suggestions for further work
  - Other industries
  - Other scenarios
  - Assessments
  - Other models - new models
  - Bibliography

Work Plan

- Model testing on hypothetical scenarios
  - end by mid-March 2006
  - testing scenarios with different data sets (real)
- Circulate results to WG members for discussion and inclusion in draft report
- Development of real scenarios for discussion at next WG meeting
- Continue development of draft report

Next WG Meeting
(April or June, 2006)

Possibilities?

Italy:	Mestre
	Napoli
Greece:	Athens
Cyprus:	
South Africa:	
USA:	Florida

Criteria:	to get as many people as possible to the meeting
	NORM site visit easy to arrange