Uranium Mining Industry Views on ICRP Statement on Radon

John Takala - Director, SHEQ Systems
Cameco Corporation
on behalf of WNA UMSWG
Introduction

• WNA working group
• Industry views on radon
  – Recent epidemiological results
  – Dosimetric approach
• Path forward
WNA Radiation Protection Working Group

• World Nuclear Association
  – Comprises full nuclear fuel cycle
  – Nearly 200 companies
  – 90% world uranium mining production

• WNA Uranium Mining Standardization and Radiation Protection Working Groups

• Specific task group focussed on radon issues
  – Major and junior uranium companies
  – Companies operate in Africa, Australia, Canada, Kazakhstan, Mongolia, United States
Evolution in Radon Risk

• ICRP 2009 statement
  • Dose conversion factor (DCF) based on epidemiological approach likely to increase
  • Shift from epidemiological approach to a dosimetric approach for DCF
Epidemiological Results

• ICRP has indicated it believes the latest epidemiological results support an approximate doubling of radon risk

• Industry supports using latest epidemiological results, but notes several issues that need to be addressed transparently
Epidemiological Results

• Risk projection models are relative risk models and underlying population characteristics important

• Smoking is the dominant risk for lung cancer
  – Recent ICRP report notes risk is on the order of 20 times greater for smokers vs non-smokers

• General trend of declining smoking rates, which implies subsequent decrease in lung cancer rate
Epidemiological Results

• Sensitivity of dose conversion factor (mSv per WLM) to smoking rates done by SENES using different published risk models
• Median result 6 to 7 mSv/WLM for nominal 30% smoking rate (current value 5 mSv/WLM)
• Given decreasing smoking rates expect to see decreasing population average lung cancer risk from radon
Epidemiological Results

• Current DCF of 5 mSv/WLM very protective of non-smokers
• Doubling current DCF of 5 mSv/WLM seems very conservative
• Exposures are optimized at uranium mines and will remain so if DCF changes
• Significant reduction in radon progeny exposure has been achieved through optimization
Dosimetric Approach

• Industry views adopting the dosimetric approach as premature at this time
  – Validation needed for the dosimetric model
  – Unclear that model adequately accounts for smoking
  – Lack of field data and no widely accepted measurement protocols

• Industry views this as a long-term goal
Dosimetric Approach

• Validation needed for the dosimetric model
  – Is the apparent agreement between the average DCF from the epidemiological studies and “typical” dosimetric parameters coincidence?
  – Can the dosimetric model explain some of the variations in the DCF between different miner cohorts?
  – Examine aerosol parameters for some epidemiological studies and determine if calculated risks are compatible
Dosimetric Approach

• Dosimetric model and smoking
  – Since smoking is the dominant risk dosimetric needs to account for smoking
  – Note recent paper by Baias et al (2010) only shows a factor of two between non-smoker and smoker using dosimetric model
  – ICRP notes a difference on the order of 20 in the risk factor between non-smokers and smokers
LEGEND:

HLT  Heavy Long-Term Smoker
NS   Never Smoker
HST  Heavy Short-Term Smoker

DCC (mSv/WLM)

ICRP 65 (1993)
Epidemiology ICRP 11/07/2010
Tomasek (2008)
Effect of Smoking -Occupational (Epidemiology, See Text)
Dosimetry 7.6 Table 4.1 ICRP 11/07/2011 ICRP 115 (2010)
Olive et al. 2010

13.34 HLT

7.2 NS
Dosimetric Approach

• Lack of relevant field data and measurement protocol
  – Little work characterising Rn progeny aerosols in over last two decades
  – Many changes to uranium industry and mining over last 20 years (reduced exposures to other substances)
  – Little ability to collect needed data in short term
  – No standard measurement protocol
Dosimetric Approach

• More work is needed to:
  – validate the model
  – improve knowledge of Rn progeny aerosol conditions in current workplaces

• Industry strongly recommends deferring the adoption of the dosimetric approach until needed work completed
Path Forward

• Industry organized through WNA to measure radon progeny aerosol conditions
• Working on developing standard measurement protocol (consulting with SENES)
• Goal is to have publishable quality results within several years