



## NATIONAL NUCLEAR REGULATOR

*For the protection of persons, property and the environment against nuclear damage.*

# Challenges and Implementation from a Regulatory Perspective South Africa – Special Case Mines (SCM)

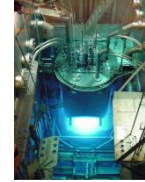
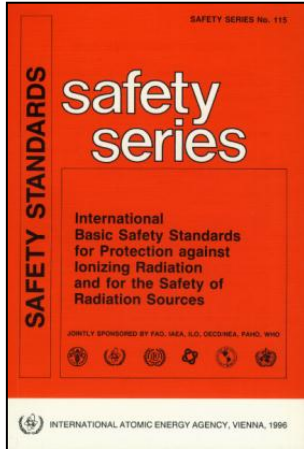
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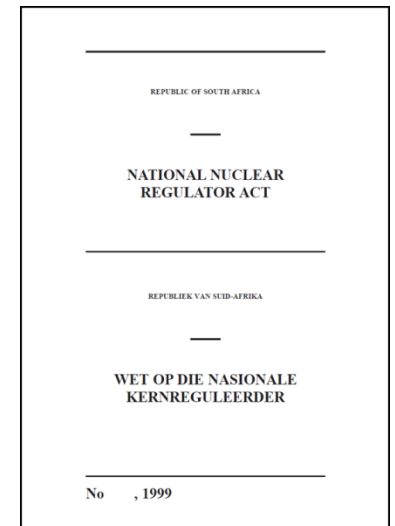
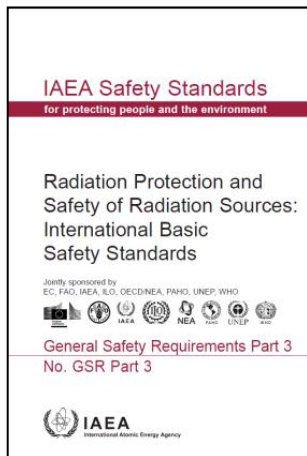




# LEGISLATIVE REQUIREMENTS (i)



## Revised





## LEGISLATIVE REQUIREMENTS (ii) DOSE LIMITS - SSRP ANNEXURE 2

The *occupational exposure* of any worker shall be so controlled that the following limits are not exceeded:

### General Dose Limits

1.1.1

- The *occupational exposure* of any worker shall be so controlled that the following limits are not exceeded an (average) *effective dose* of 20 mSv per year averaged over five consecutive years,

### General Dose Limits

1.1.2

- a (maximum) *effective dose* of 50 mSv in any single year,

### General Dose Limits

1.1.5

- in special circumstances, provided that *radiation protection* in the *action* has been optimised as required by 4.5.1 of the regulations but *occupational exposures* still remain above the *dose limit* in 1.1.2 above, **the Regulator may approve a temporary change in the dose limit** subject to the agreement of the affected employees, through their representatives where appropriate, and provided that all reasonable efforts are being made to improve the working conditions to the point where compliance with the *dose limits* can be achieved. This temporary change shall not exceed 5 years and shall not be renewed.



# MINING AND MINERALS PROCESSING – SPECIAL CASE MINES

## RADIATION EXPOSURES IN UNDERGROUND MINES

- **Highest annual effective doses** occupationally
- From  $^{222}\text{Rn}$  and **particulate progeny** inhalation

## REASONS

- **Uranium and thorium in most gold reefs** in South Africa
- Dynamic nature of underground mining
- **Challenges with ventilation controls**
- Unexpected consequences from opening **“Old Worked Out”** Areas



## HISTORY

- Radiological Exposure and Radioactive Material were **not regulated in the NORM industry before 1993**.
- Radon dose conversion conventions at the time.
- Biggest concern was Radon Exposure and the Control thereof.

## DEFINITION of SCMs

- Potential radiological exposure of **1.7 mSv/month or above**,
- **Projected** annual radiological dose **exceeding 20 mSv/a**





## OPERATIONAL MONITORING FOR SCMs



NNR's response had been consistent with:

- **Identify all working areas** where workers could be exposed to doses **above the dose limit**,
- Remove all workers whose annual projected could **exceed the 50 mSv/a**,
- Supply the NNR with **mechanisms** by which compliance with occupational radiation dose limits will be achieved.

Remedial Plans would include:

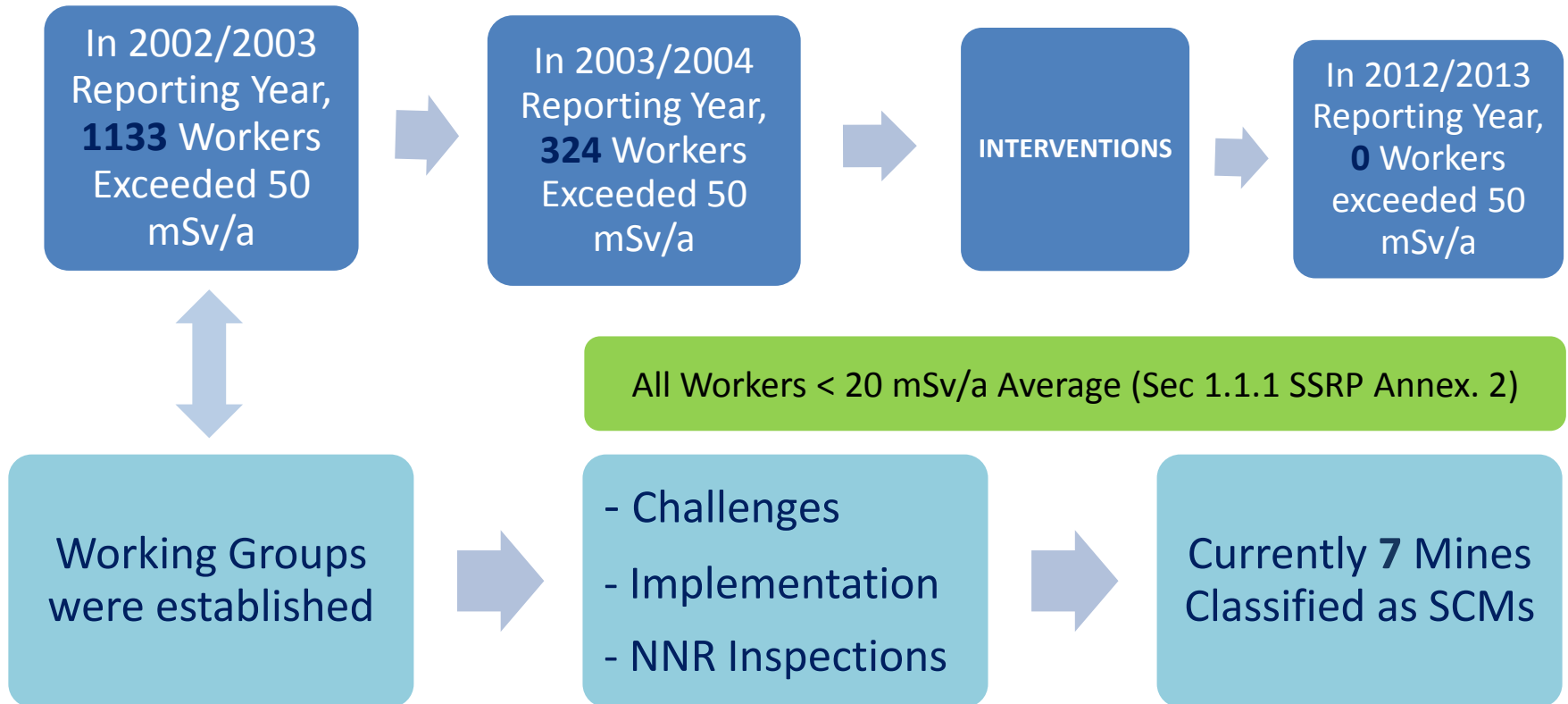
- **Prevent contaminated (used) air to be recirculated** in current working places
- **Ventilation of the underground workings must provide for:**
  - a) installation of **ventilation control systems in stopes**, booster fans
  - b) **dedicated return airways (RAW)**
  - c) **Sealing programmes - Sealing off all old working areas to prevent air contaminated with <sup>222</sup>Rn entering current working areas.**
  - d) **introduction of fresh air into problem areas**



# IMPROVEMENTS



- What did the picture look like?
- How does the picture look like now?





# CHALLENGES



The Following On-Going Problems are Noted:

- There are still workers in the 20 to <50 mSv/a exposure grouping (s).
- Some ventilation systems are not fully optimised.
- Strategies for sealing programmes have not been fully realised.
- Integrated Time and Attendance Systems not adopted by all stakeholders – some loopholes in systems where T&A systems are deployed.
- A great number of the workforce makes up “Roaming” workers deployed on levels in shafts with varying degrees of  $^{222}\text{Rn}$  levels.
- Timeously identification of work areas/levels with high  $^{222}\text{Rn}$  activity concentrations.
- Implementation of Worker RP Programmes.

In the Near Future:

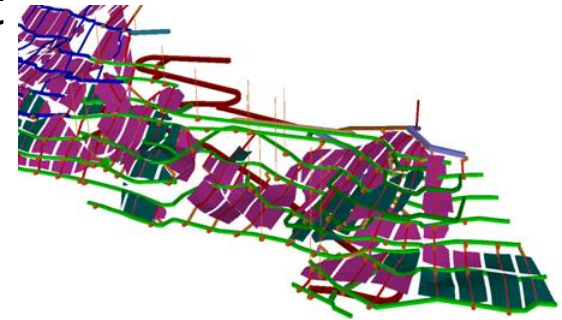
- Publication of updated Rn Dose Conversion Factors
- Decision on Adoption of Rn DCFs (Country)
- Possibility of an Increase in Special Case Mines





## CONCLUSIONS

- The need for adequate protection from complex exposure scenarios in the workplace bring significant challenges to the fore
- The need to mine and produce more product (e.g. Au, U, etc.) enhances the risks
- The response(s) to the challenges are highlighted:  
Regulatory Inspections and Audits Commensurate with Exposures at the Facility → Enforcement
- The off-set for Cost and Effort that go into Implementation is measured - ALARA
- Role of the Regulator vs Role of the Operator in Finding Solutions to the Problems
- Appropriate Response in Legislative Revisions (where gaps exist)
- Key Focus should be Continual Improvement







FIN

THANK YOU

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