European ALARA Network

The application of the ALARA principle for radon at the workplace
Feedbacks from the European ALARA Network

The ALARA for Radon at Work (A-RAW) working group

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Context and objectives

- **The questions**
  - Challenges associated with the implementation of the new regulation for radon at the workplaces
  - Interpretation of Directive 2013/59 in national regulations?
  - Graded approach for optimisation (ALARA) purposes?

- **The method**
  - Creation of ALARA for Radon At Work working group (EAN A-RAW) (Jan. 2021)
  - Design a survey instrument: radon regulation + case studies
  - Circulated by email (June-September 2021)
  - Qualitative analysis of the data collected

Answers received

Country	Details on the case study
Belgium (B)	2 cases: ● Show cave 🦇 ● Water pumping facility 💦
France (F)	2 cases: ● Cooking equipment factory 🏭 ● Veterinary clinic (underground) 🏥
Ireland (IRL)	1 generic case: 4,000 schools 🏠
Norway (N)	Overview of the regulation
Slovenia (SLO)	1 case: Show cave 🦇
Switzerland (CH)	3 cases: ● "A company" 🏢 ● An industrial building with open work space 🏭 ● 200 water supply facilities 💦
United-Kingdom (UK)	2 cases: ● Heritage castle 🏰 ● Mine

Identification of workplaces

Workplace	Scope	Location	Action
Specific workplaces 🐓 💦	List (cave, dam, sewage, …)	All location	Measurement
Ordinary workplaces 🏠 🏥 🏭	All workplaces with ground level	• All location (B, CH, F, N, UK) • Radon prone area (IRL, SLO)	Radon risk assessment

- **Radon risk assessment,** can be inclusive of
  - Location in radon prone area (if not previously considered)
  - Underground basement
  - Radon presence suspected
  - Workers presence ("*regularly occupied*" (UK), "*15 h/week*" (B), "*several h/d*" (CH), …)
  - Building characteristics

① **Elevated number of workplaces concerned by the regulation**
② **Challenges in communication (incl. Labour Inspectorate)**
③ **Guidance needed for the risk assessment?**

Initial measurement

- **Most protocols based on 'classical' passive measurement**
  - Winter season min. 2 months (FR, N) or min. 3 months (BE, CH, IRL, UK);
  - Min. 1 month in the winter and 1 month in the summer (for specific workplaces, CH);
- **Mixed provisions with regard to active measurement:** not stipulated (F, IRL), possible (B, UK), part of measurement (N) , mandatory (specific workplaces, BE, SLO)

Value in radon concentration	Country	Usage
100 $Bq.m^{-3}$	N	Action level: active measurement needed and, if the value is confirmed, remediation
200 $Bq.m^{-3}$	N	Maximum level: not to be exceeded
300 $Bq.m^{-3}$	B, CH, FR, IRL, SLO, UK	• Reference Level: remediation • In UK: remediation and ionizing radiation regulation apply
1,000 $Bq.m^{-3}$	CH	Action level: workplace ≡ radon area, dose assessment required and ionizing radiation regulation apply

① **Legacy of former national radon management**

② **Incursion in Ionizing Radiation Regulation possible after initial measurement if > RL**

Exposure assessment

The result shall be compared with "*an exposure value of 6 mSv/y or a corresponding time-integrated radon exposure value*" (2013/59/Euratom art. 35(2))

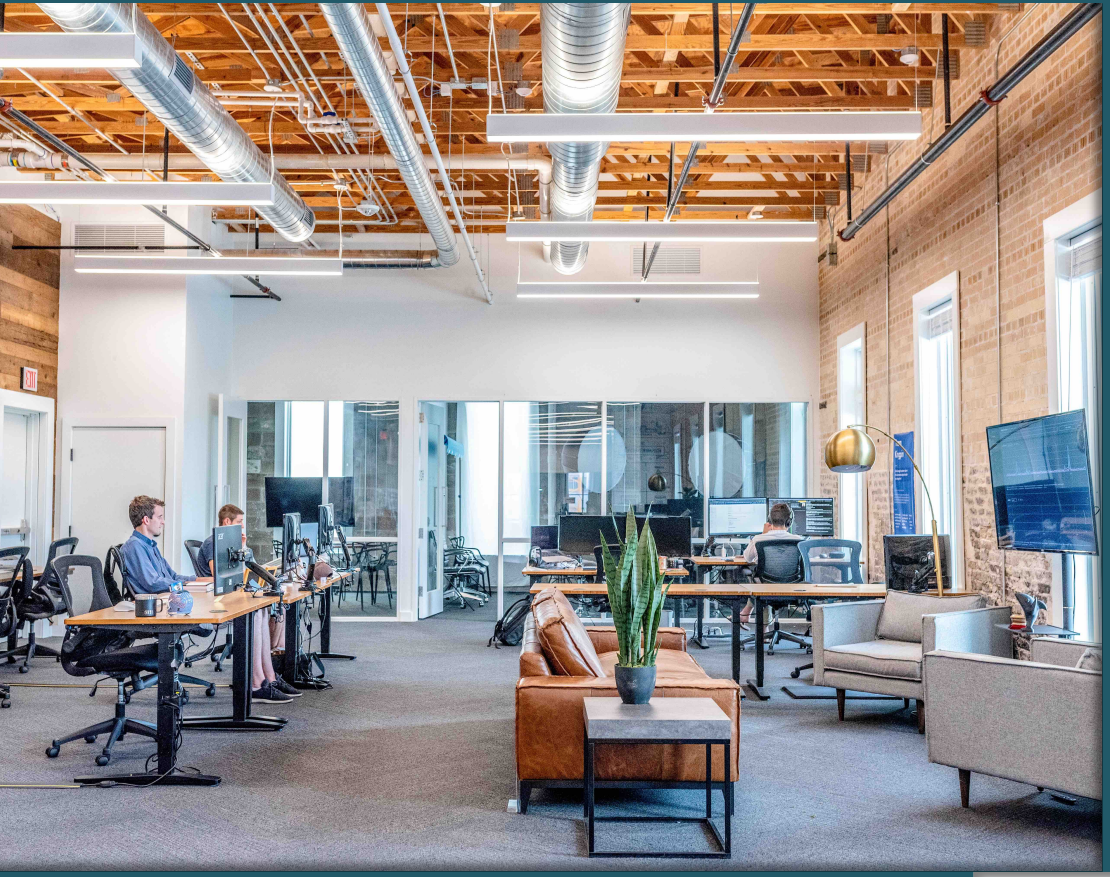
Exposure threshold	Country	Usage
6 mSv/y	F, IRL, UK, SLO	If above, ionizing radiation regulation (or comparable requirements) applies
6 mSv/y or 0.6 MBq.h/m^3	B	
• Ordinary workplace: 0.36 MBq.h/m^{-3} • Specific workplace: 0.72 MBq.h/m^{-3}	N	
10 mSv	CH	

- But …
  - F, SLO and UK: former coefficients published in [ICRP, 1993]
  - SLO: specific workplaces where F≠0.4, coefficients in [ICRP, 1981]
  - B, CH, IRL and N: recent coefficients published in [ICRP, 2010] or [ICRP, 2017]

① Time-integrated value is close to Working Level Month concept

② Exposure assessment is expected to × 2 or × 4 with most recent ICRP coefficients

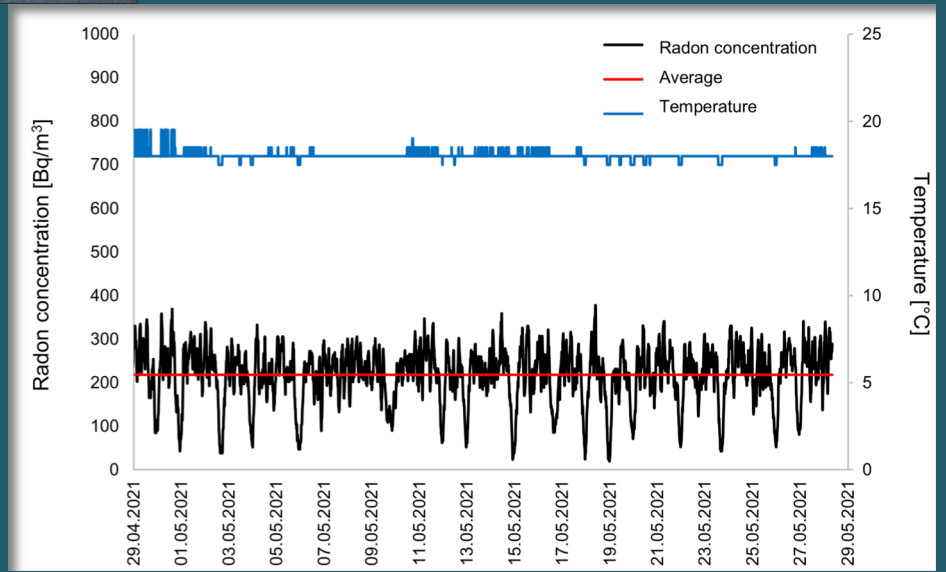
③ Number of workplaces concerned by the planned exposure situation ?~~??~~

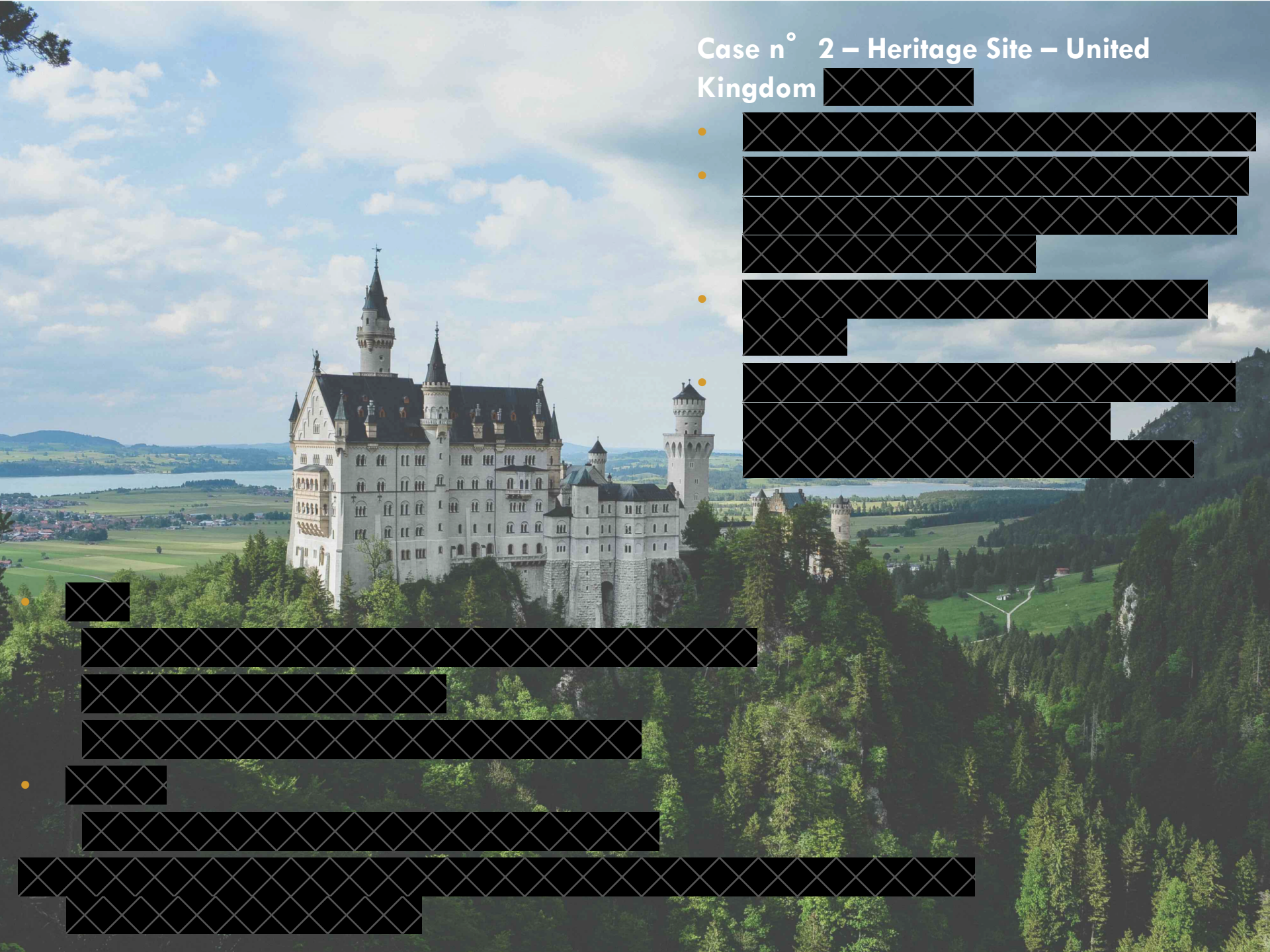


Case n° 1 – "A company" – Switzerland (2020)

- Approved radon measurement service: [^{222}Rn] > 350 Bq.m^{-3} at work place
- Radon consultant: propose to control automatically the opening of the window with a dedicated radon detector
- Owner of the building: responsible for radon management

- Test performed to find the threshold and sampling period (300 Bq.m^{-3} and t=15 min)
- Remediation success validated by passive measurement





Case n° 2 – Heritage Site – United Kingdom [redacted]

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

- **No 2 similar national regulations**
- **Different approaches applicable at each step**
- **A diversity that contributes to the richness of the results**
- **Collected data, practical feedbacks and good practices are source of inspiration**
- **The A-RAW WG has the objective to inform interested parties:**
  - Presentations in other conferences possible
  - An article is under way
- **Discussion on transversal issues:**
  - Integration of the radon regulation in existing regulations
  - Challenges in awareness and dissemination of information
  - About the graded approach and the application of the ALARA principle under the circumstances

EUROPEAN ALARA NETWORK

Gaining interest in the EAN and its activities?

And remember that EAN is an open network!