

Individual Sensitivity and the Nuclear Industry

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3rd October
2024



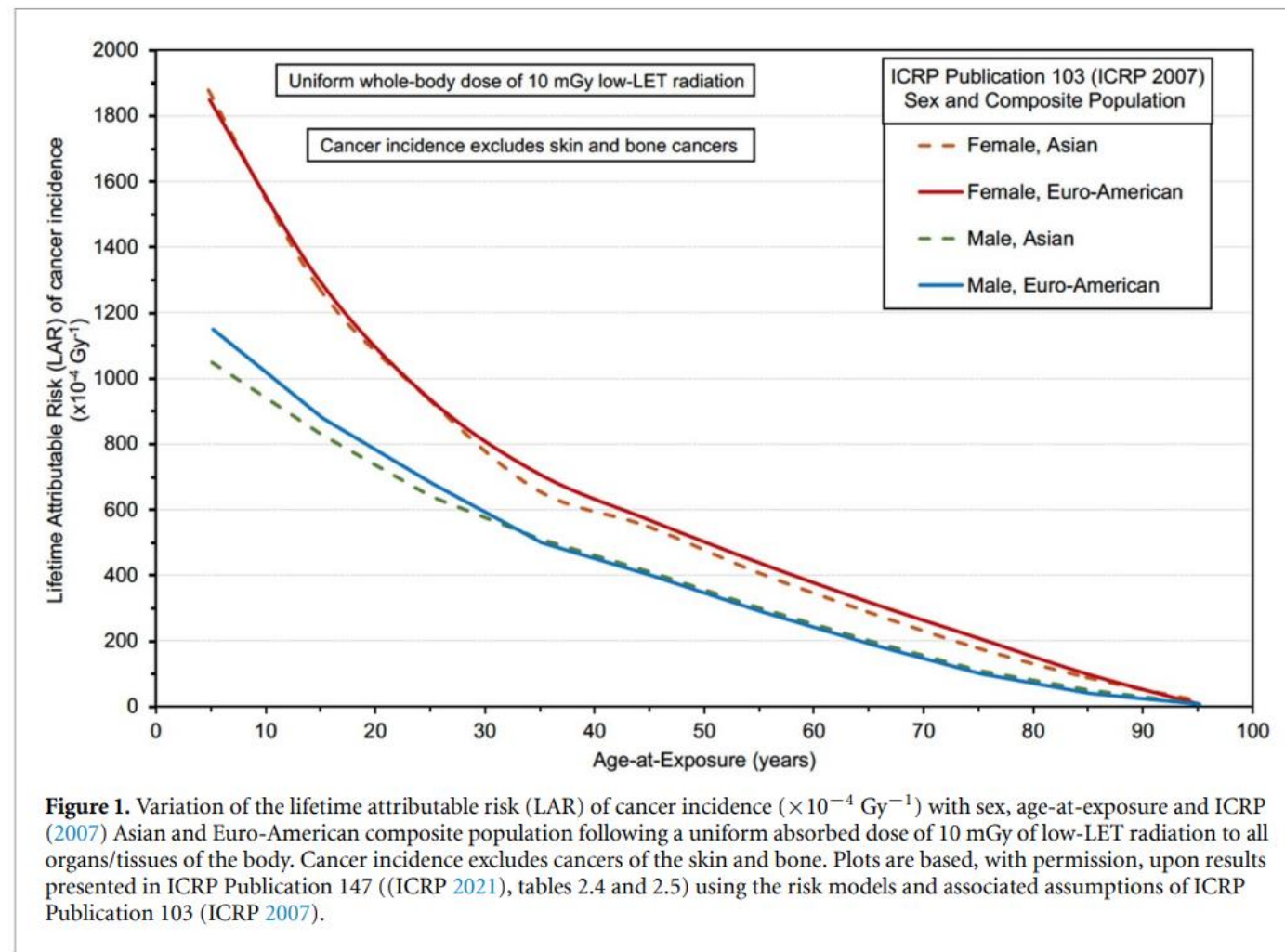
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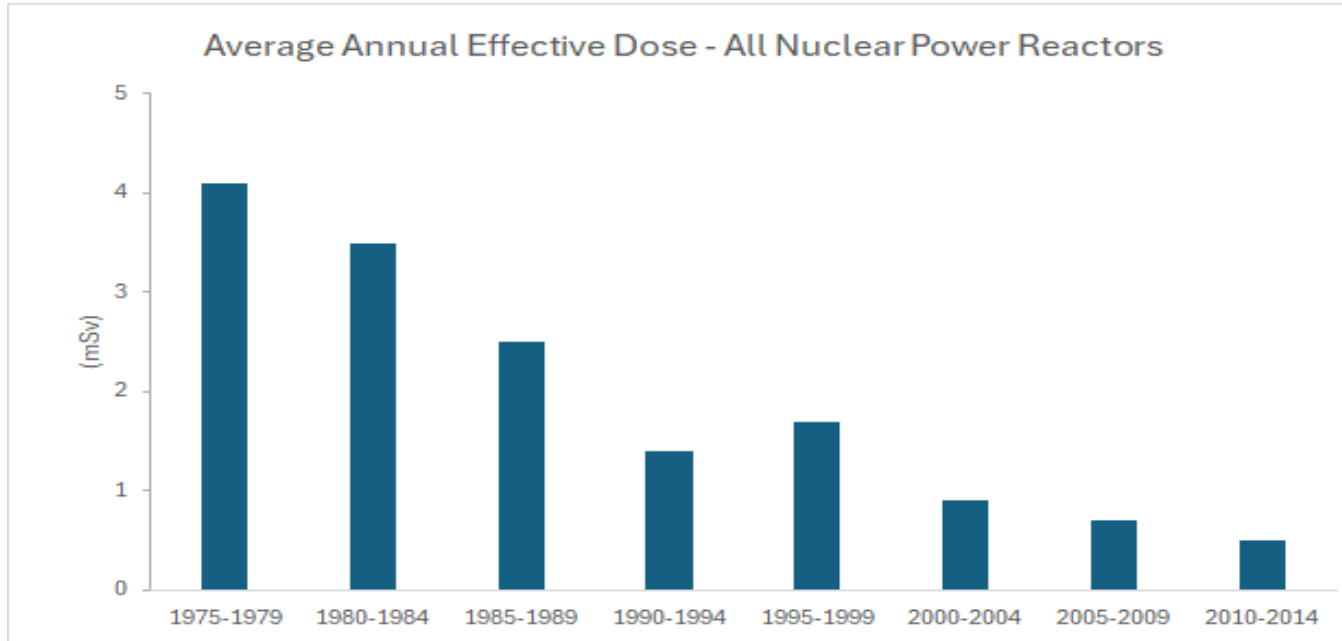
Individualization and Stratification in RP system

- We recognize that scientific studies of individual sensitivity to radiation represent a valid and appropriate contribution to the field of radiation protection.
- Outcomes of these studies are likely to be very relevant and important in the medical sector.
- The situation in the nuclear industry and most other occupational situations is completely different





Why Nuclear Industry is different?



Annual average effective dose for workers at nuclear power reactors.

Source: UNSCEAR 2020/2021 Volume IV Scientific Annex D

Period	# of monitored workers	Average Annual Effective Dose
2000-2004	652,000	0.9
2005-2009	660,000	0.8
2010-2014	762,000	0.6

Annual average effective dose for the entire Nuclear Fuel Cycle

Source: UNSCEAR 2020/2021 Volume IV Scientific Annex D

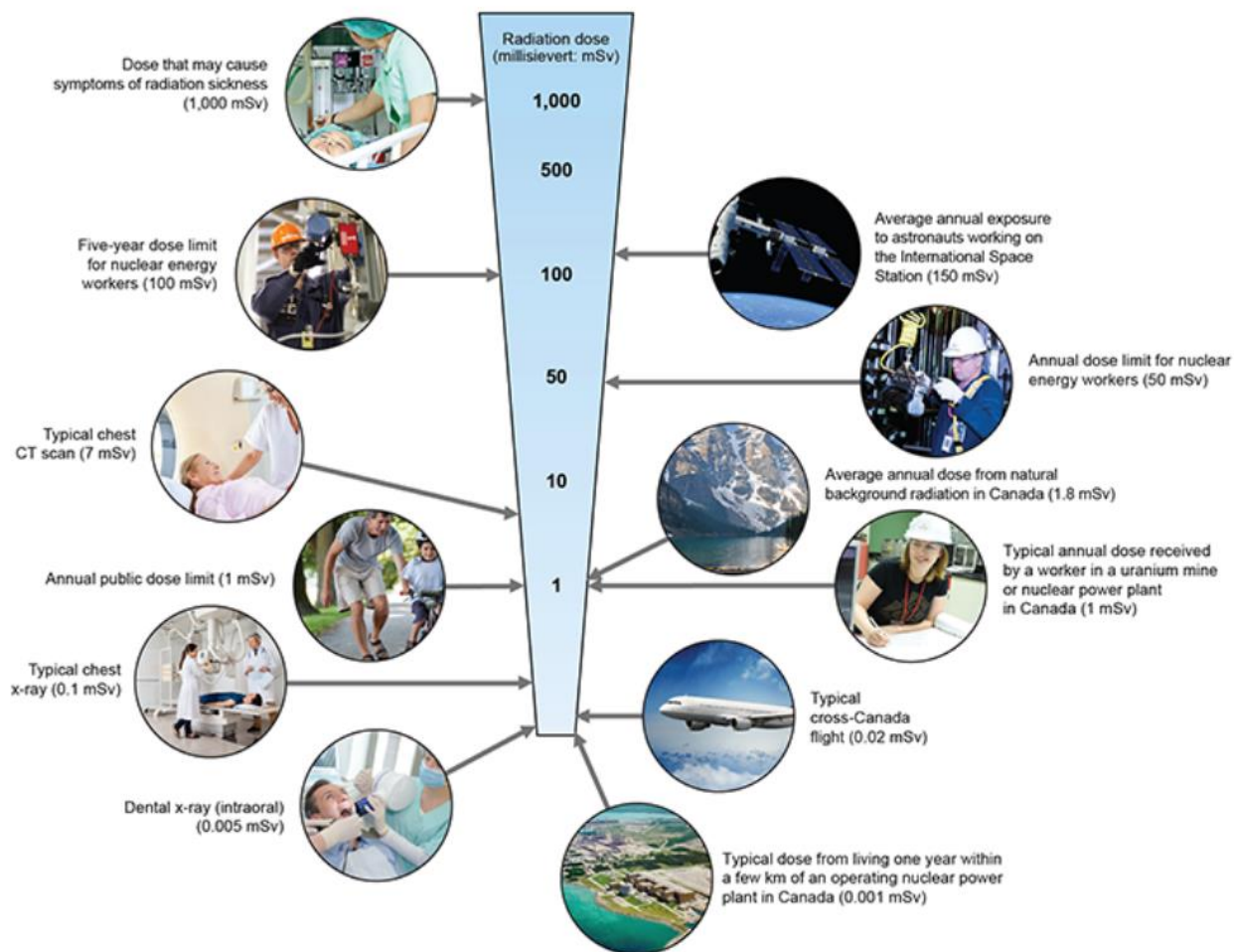
Why Nuclear Industry is different?

- **Medical treatment is personalized.**
- **There are no dose limits and dose constraints** are applied for **patients** (The emphasis is on the Justification of the medical procedures and on the optimisation of protection and, for diagnostic procedures, and the use of diagnostic reference levels).
- **Justification of a radiological practice in nuclear industry is general.**
- In the **Medical field**, it is much more specific - to the **particular medical procedure and to the individual patient**
- Recently published data on the number of **patients**, with **cumulative effective doses greater than 100 mSv**, are ranged from 3% and 4% in CT and interventional radiology which is not the case for public or occupational exposure in nuclear industry



Individualization and the graded approach

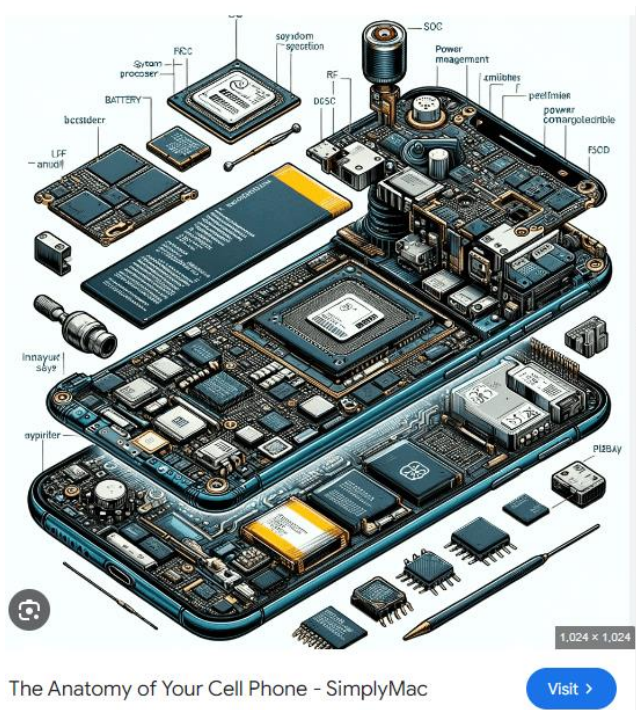
Radiation dose examples



- Broad adoption of individualization for most planned exposure situations does not seem justified at the current time
- Adoption of more individualised/stratified approach for nuclear industry is not consistent with the graded approach considering the LNT model.
- Risks from typical exposures very low
- Application of individualization in nuclear industry limited to special cases
 - As part of environmental assessments of discharges, particularly for children and infants
 - pregnant women and breastfeeding mothers

Graphic from CNSC Introduction to Radiation: [Radiation doses \(cnsccsn.gc.ca\)](https://www.cnsccsn.gc.ca/radiation-doses)

Individualization and practicability of the RP system



- ICRP system of RP has a number of strengths which has contributed to its success
 - Solid scientific basis
 - Conservative (i.e., protective in most situations)
 - practical to implement
- Largely adopted across the world
- However, the system is already complex and to need be cautious about the application of “refinements” that don’t substantially improve protection
- There are still considerable uncertainties about possible impact of genetic factors and lifestyle risk modifying factors
- Individualization raises broader social and equity issues



Conclusions

- Application of individualized approach could be appropriate in some situations where individual doses are exceptionally high. (e.g., Space travel, Medical imaging).
- The nuclear industry has for years controlled and reduced occupational and public exposure to ionizing radiation.
- The overwhelming majority of occupational exposures in the nuclear fuel cycle are at most a few mSv per year (less than or comparable to natural background levels).
- Public exposures from the nuclear industry are at levels of a very small fraction of a mSv per year.
- There is no justification for applying a complex formal individual dose limitation system as part of the control system for occupational and public exposure. This would be a totally disproportionate use of resources.
- Nuclear Industry will continue to support individualization of pregnant women and breastfeeding mothers and considering different age groups in the environmental impact assessment from discharges.
- Adoption of more individualized/stratified approach for nuclear industry is not consistent with the graded approach considering the LNT model.
- Application of more individualized/stratified approach for nuclear industry would introduce more complexity in the RP system and create more confusion to RP practitioners and general public.

Helping the global nuclear industry
deliver 24/7 clean energy for all

Thank you

