

**International Workshop on
Environmental Aspects of Coal Ash Utilization**

Tel Aviv, Israel
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Radiological Aspects of Coal Ash Practices in Israel

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Abstract

Background

Most natural ores, contain radioactive isotopes e.g. ^{40}K , ^{232}Th and ^{238}U and their decay products (^{222}Rn , ^{228}Ra ^{220}Rn with their radioactive progenies). The same elements are present in enhanced concentrations in fly ash and bottom ash produced in the process of coal combustion in power stations. These two ash types are widely utilized as refill material in infrastructure (road and railway) construction and as constituents of many types of building products, mainly concrete and masonry blocks.

In recent years fly ash serves in Israel also as a replacement of sea sand in concrete mixtures in addition to its role as constituent of cement. To some extent coal ashes are used also in agriculture, dairy farms and other applications.

The extensive utilization of "radioactive" coal ashes in the infrastructure and building industries (close to 2 million metric tons a year) drew and is still drawing attention and concern of the health authorities and environmental organizations. This concern is caused by the potential exposure of the public to Ionizing radiation in various pathways during the handling of the ashes, their transportation and their permanent presence in the walls floors and ceilings of human habitat. The results of these concerns is a public demand to control the concentrations of radioactive elements and radioisotopes of natural origin in building products.

This presentation deals with the radiation doses encountered in "coal ash practices" by workers and those caused to members of the public by the products resulting from these practices and the consequences of these exposures. The presentation is partly based on earlier publications of the author and his colleagues (NCAB 2008, Schles 2004, Schles 2005).

The basic features of the major "coal ash practices" operating in Israel (i.e **handling** of the ash during its stacking, transportation, storage and disposal and **utilization** of the ash in the infrastructure and building industries and in agriculture) are described. The pathways of the exposures and the doses encountered in these practices or caused by the products resulting from them are evaluated.

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The implications of these doses and the search for an optimal legal, and administrative control framework which can ensure the health and safety of the public on one hand while being simple, practical, efficient and not expensive on the other hand are discussed.

Such an optimized framework can be built by applying the concepts of exclusion, exemption as recommended in recent international documents, e.g. IAEA Safety Guide RS-G-1.7 (**IAEA 2004**) and ICRP Publications 82 (ICRP 2000), 103 (**ICRP 2007**) and 104 (**ICRP 2007a**).

The important feature of this framework is that the radiation doses resulting from the utilization of the ashes rather than the ashes themselves are controlled. This can be done by the sophisticated use of a "graded approach" as outlined in ref. (**IAEA 2004**).

References

IAEA 2004 - Application of the Concepts of Exclusion, Exemption and Clearance, Safety Standard Series No. RS-G-1.7, IAEA, Vienna (2004).

ICRP 2007- The 2007 Recommendations of the International Commission on Radiological Protection, ICRP Publication 103, Annals of the ICRP, Elsevier 2007.

ICRP 2007a - Scope of Radiological Protection Control Measures, ICRP Pub. 104, Elsevier 2007.

ICRP 2000 - Protection of the Public in Situations of Prolonged Radiation Exposure, ICRP Publication 82, Annals of the ICRP 29 (1-2), Pergammon Press 2000.

NCAB 2008 - Radiological Aspects of Coal Ash Practices (stacking, transportation, storage and utilization in Infrastructure, in the building industry and in agriculture) A statement of opinion by T. Schlesinger, NCAB 2008 (in Hebrew).

Schles 2005 - T. Schlesinger and Y. Grof, Israeli Standard IS 5098 , setting limits on the concentration of natural radionuclides in building products, Proceedings of an Int. workshop on the environmental aspects of coal ash utilization, Tel Aviv, November 2005.

Schles 2004- T. Schlesinger and J. Koch, Protection against Natural Radiation at Home and at Work Exclusion, Practice, Intervention - Theory and Practice, proceedings of the 11Th International Congress of IRPA , Madrid Spain , May 2004.

Schles 2002 - T.Schlesinger The legal control of NORM in building products, in coal ash and in coal imported to Israel for its combustion in power stations for production of electricity (radioation safety aspects and legal and economical considerations of the utilization of the ash in the building industry) (in hebrew).

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Additional references some of which may be referred in the oral presentation

IAEA 1996- Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, IAEA Safety Series 115.

ICRP 1991- 1990 Recommendations of the International Commission on Radiological Protection, ICRP Pub. 60, Annals of the ICRP 21 (1-3).

ICRP 1984 - Principles for Limiting the Exposure of the Public to Natural Sources of Radiation, ICRP Pub.39, Annals of the ICRP Vol.14, No.1, Pergamon Press 1984.

EC 1997a - Recommendations for the Implementation of Title VII of the European Basic Safety Standards Directive (BSS) concerning Significant Increase in Exposure due to Natural Radiation Sources, Radiation Protection 88, EC 1997.

(EC 1997b- Enhanced Radioactivity of Building Materials, Radiation Protection 96, EC 1997.

(EC 1996) Council Directive 96/29/Euratom, Official Journal of the European Communities No L 159, 29.6.1996.

NCAB 2009 – WWW.coal-ash.co.il/index.html

(UNSCEAR 1993) United Nations Scientific Committee on the Effects of Atomic Radiation, Sources and Effects of Ionizing Radiation, *1993 Report to the General Assembly, with Annexes*, UN, 1993.

(UNSCEAR 1988) United Nations Scientific Committee on the Effects of Atomic Radiation, Sources Effects and Risks of Ionizing Radiation, *1988 Report to the General Assembly, with Annexes*, UN, 1988.

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