

1.5

**Regulatory aspects of naturally occurring radioactive materials (NORM) in the oil and gas industry**

**E.I.M. Meijne, A.W. van Weers**

---

---

**Netherlands Energy Research Foundation**

**The Netherlands**

# REGULATORY ASPECTS OF NATURALLY OCCURRING RADIOACTIVE MATERIALS (NORM) IN THE OIL AND GAS INDUSTRY

By: E.I.M. Meijne  
A.W. van Weers

Netherlands Energy Research Foundation, P.O. Box 1, 1755 ZG Petten, The Netherlands

## Abstract

Naturally Occurring Radioactive Materials (NORM) associated with oil and gas production is caused by the mobilization of natural radionuclides from oil or gas bearing formations, and their subsequent deposition in parts of the production system. Although the phenomenon of NORM in oil and gas production was already discovered many decades ago, the number of installations encountering NORM, the observed activity levels and the radiological consequences have only been acknowledged in the last decade. In the oil and gas industry NORM can be encountered in four different forms: 1) sludge; 2) scale; 3) radon gas and 4) produced water. Regulations concerning NORM vary widely between different countries. The Netherlands, Germany, United Kingdom and Norway for example all are using different formulas to calculate the total activity of radioactive scales and sludges, due to differences in including daughter radionuclides for the calculations. Not only do the applied formulas differ, also the concentration levels used to qualify scale or sludge as radioactive waste and the disposal options available for the different waste categories vary per country. As the new Council Directive published by the European Commission identifies nuclide specific exemption levels, application of this Directive to NORM in the non nuclear industry would harmonize some of these differences. The consequences of the proposed exemption concentrations would however vary per country and depend not only on the difference with the previously used exemption concentrations but also with the disposal options allowed. With regard to NORM the Directive is however only obligatory for natural radionuclides which have been processed in view of their radioactive or fissile properties (article 2). As NORM is unintentionally produced during oil and gas production the new Council Directive leaves the decision to each member state whether oil and gas production should be regarded as a work activity which leads to a significant increase in the exposure of workers and members of the public. The present paper discusses the differences in current regulations regarding NORM between The Netherlands, Germany, United Kingdom and Norway and the consequences of an implementation of the new Council Directive (especially the exemption levels listed in Annex 1) for the oil and gas industry in these countries.

(Full paper available from first author)