

# The Justification of Practices Involving Ionising Radiation Regulations 2004

Determination on an application for the use of a sealed radioactive source to measure gas flow in smart meters as an existing class or type of practice

# Summary

**An application was made under the Justification of Practices Involving Ionising Radiation Regulations 2004 for a determination as to whether the process of using a radioactive source in a smart gas meter was an existing class or type of practice. This document briefly describes the regulatory background and outlines the application and the process for considering it. The document then sets out the reasons for the Secretary of State for Energy and Climate Change's determination, as Justifying Authority, that this use of a radioactive source is not justified as an existing class or type of practice.**

## Justification of Practices Involving Ionising Radiation

1. Justification is one of the key principles of radiological protection, established by the International Commission on Radiological Protection, upon which the UK's radiological framework is based. The principle of justification is that no class or type of practice involving exposures to radiation should be adopted unless it produces sufficient economic, social or other benefit to the exposed individuals or to society in relation to the health detriment it may cause.
2. The Justification of Practices Involving Ionising Radiation Regulations 2004<sup>1</sup> (the Regulations) transpose into UK law the justification requirements of two European Directives which protect the health of individuals against ionising radiation:
  - Council Directive 96/29/Euratom of 13th May 1996, laying down basic standards to protect the health of workers and the general public against the dangers arising from ionising radiation;
  - Council Directive 97/43/Euratom of 30th June 1997, on health protection of individuals against the dangers of ionising radiation in relation to medical exposure, and repealing Directive 84/466/Euratom.
3. Under these Directives, a particular class or type of practice needs to be justified, not individual uses.
4. For new classes or types of practice (i.e. those which are undertaken for the first time after the 1996 Directive came into force on 13th May 2000), justification is required before they are first adopted. An existing class or type of practice is defined in the Regulations as one in which a practice of that class or type was carried out in the UK before 13th May 2000. A class or type of practice is also defined as existing if there

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<sup>1</sup> The Justification of Practices Involving Ionising Radiation Regulations 2004, [Statutory Instrument 2004 No. 1769](#)

has been an express justification decision made under previous arrangements or it has been found to be justified either under previous arrangements or it has been found to be justified under the Regulations.

## Nature of the Application

5. Sentec Ltd (the applicant) made an application under Regulation 12(1) of the Regulations requesting a determination as to whether the process of using a radioactive source in its smart gas meter was an existing class or type of practice<sup>2</sup>.
6. The applicant proposed that the use of a radiation source in its gas smart meter fell with the existing classes 10 and 15, which are defined in the guidance to the Regulations as follows<sup>3</sup>:
  - Class 10 is defined as: Substance measurement and process control – Use of sealed sources and x-ray generators for thickness gauging, density gauging, mass gauging, level gauging, flow measurement, borehole and well logging, control of pipeline crawlers.
  - Class 15 is defined as: Safety devices – Use of ionising radiation in smoke and fire detectors and other safety instruments.

## The Process for Considering the Application

7. The application was sent to the Justification Application Centre (JAC) in the Department of Energy and Climate Change (DECC). The JAC handles Justification Applications identifying which Government department is best placed to consider applications. The Secretary of State for Energy and Climate Change (“the Secretary of State”) was identified as the Justifying Authority (JA) for this application, and the Smart Metering Policy team in DECC acted on behalf of the JA in respect of gathering the information concerning the application. Before making a justification decision the JA is required by the Regulations to consult certain statutory consultees. A Justification Liaison Group (JLG) was formed for the purposes of giving effect to this consultation, its purpose was to collate the relevant information for the JA. The JLG consisted of the following statutory consultees:
  - Health and Safety Executive (HSE);
  - Health Protection Agency (HEPA);
  - Scottish Environment Protection Agency (SEPA);
  - Environment Agency (EA); and in addition

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<sup>2</sup> The application is listed on the [Justification Register](#) (reference number 15/10) and the documents are available for inspection on request to the Justification Application Centre.

<sup>3</sup> Defra, [The Justification of Practices Involving Ionising Radiation Regulations 2004 \(SI 2004 No 1769\) Guidance on their application and administration, Version May 2008, Annex 3](#)

- a metering technical expert from within the Smart Metering Programme in DECC.
8. The Food Standards Agency (FSA) is also a statutory consultee for these purposes. However, after an initial consultation on the application the FSA indicated that it was not in a position to offer advice in relation to this particular case, given that there were no evident food standards issues involved. The FSA therefore had no further involvement in this application.
  9. Under the Regulations the JA may also consult other persons whom he considers it appropriate to consult. On this application information was sought from the National Measurement Office, which has expertise in gas metering.
  10. The application sought a determination as to whether the practice, as set out in the application, belonged to an existing class or type of practice, and therefore the task for the JLG was to gather the information and views in order to enable the JA to make a determination, that is whether the use of a radioactive source for measuring gas flow in a smart meter fell within an existing class or type of practice, namely the existing Class 10 or Class 15.

## The Application

11. The applicant provided a summary of its design for a smart gas meter which incorporates an Americium 241 sealed source of activity  $< 37\text{Bq}$ . The summary notes that it is identical to the sources found in smoke detectors. Patented "LATTICE" technology employs the radioactive source to ionise the gas and detect the ions downstream by measuring the ion current. The rate of flow is determined by using a time-of-flight technique. The application noted a number of benefits to the technology.
12. The applicant said that the following product design features minimise the potential for exposure of personnel to the ionising radiation:
  - sealed source housed in a plastic flow tube which is electromagnetically shielded by a metal coating;
  - the flow tube is placed inside a gas leak-tight sealed metal box containing the gas envelope; and
  - the metal box is inside the outer plastic meter case.
13. The gas consumer or meter engineer would have no access to radioactive sources in the field. The engineer would be shielded from the radioactive source by a metal casing when replacing the battery, and the source would remain shielded by metal casing during meter refurbishment.
14. The applicant argued that the proposal was justified on the grounds that the measurement of gas flow meant that the practice fell within Class 10 and the alerts issued in the case of a possible gas leak along with a remote disconnect function shutting off the gas supply meant the practice fell within Class 15.

## Smart Meters Policy Background

15. The Government is committed to a rollout of smart meters to all homes in Great Britain and to businesses not already covered by existing advanced metering requirements.
16. Smart meters measure gas and electricity consumption and enable two way communications of data, enabling meter readings to be sent from the meter (for example to energy suppliers) and remote management of the meter. The information provided by smart meters will help consumers to better manage and reduce energy use and potentially save money. Energy suppliers will be able to offer a wide range of services and tariffs to manage their customer relationships better. A major programme, managed by DECC, is underway to design and implement new cross industry arrangements for smart metering, which will lead to the replacement of around 53 million meters, including around 23 million gas meters<sup>4</sup>.
17. Gas meters measure the flow of gas through them using a number of different methods and technologies including mechanical, electromechanical and electronic (for example ultrasonic). In terms of the measurement of gas flow, smart gas meters will operate in much the same way, but they will have additional capabilities linked to the communication of this information and remote management. The subject of this application is the first to use ionising radiation to measure gas flow through a meter that has been seen.

## Determination

18. The JA has determined that the process identified by the applicant and used in its smart meter does not fall within an existing class or type of practice. In reaching this determination the JA has taken into account the views of the JLG and the conclusions of its deliberations on this application.
19. As regards Class 10, this is understood to cover existing practices which are undertaken in non-domestic settings. For example, it is understood to cover existing practices such as:
  - thickness gauging: where a sheet of material is being processed through a mill, a radioactive source is placed on one side of the sheet and a detector on the other;
  - level gauging: the level of material in a container can be determined using a radiation source and detector. This process is used in a wide variety of operations from industrial hoppers to food canning operations. Radioactive gauging systems may be found in:
    - mineral processing;
    - industrial processing plants;
    - filling lines;

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<sup>4</sup> Details of the programme can be found on the [DECC website](#)

- hoppers and chemical processing plants;
  - cigarette manufacture;
  - paper manufacture.
20. Whilst some of the processes set out in the preceding paragraph use similar technologies to that proposed by the applicant (that is a sealed radioactive source and detector for measurement purposes) they are undertaken in non-domestic settings only. The environment in which the process is being undertaken is important because, given the scale of the smart meter rollout, there is the potential for the applicant's smart gas meter to be installed in a large number of domestic locations (potentially millions depending on its success in the marketplace). At present, it is understood there are no meters in use in domestic settings (or in non-domestic settings) using a radioactive source for measuring gas flow. In the view of the JA the fact that the process is proposed for use in the domestic setting places it firmly outside of Class 10, because this could significantly alter the relationship between the economic, social or other benefits and any health detriments that may be caused, and requires separate consideration. The JA therefore determines that the practice is not an existing class or type of practice justified within Class 10.
21. Class 15 describes safety devices. The JA found that the applicant's smart gas meter is not of itself a safety device. Whilst the smart meter includes a safety feature, that does not in itself qualify it as a safety device within this Class. It is also evident that it is not the radiation source in the meter that enables the supply shut-off in relation to the safety feature within the smart meter. The JA therefore determines that the process is not an existing class or type of practice justified within Class 15.

## The Scope of the Decision

22. For determinations under Regulation 12, functions performed by Justifying Authorities in Scotland, Northern Ireland or Wales are exercised only in respect of their own countries whilst those performed by the Secretary of State may be applied to the whole of the UK. However, Devolved Administrations must be consulted in advance of any such determination. The JA has consulted with Devolved Administrations regarding this application and that they have indicated their agreement with the conclusions. This Decision has effect in the UK.

## Public Availability of the Justification Outcome

23. The Secretary of State has informed the applicant and published this determination on the DECC website. This determination is also published in the London, Edinburgh and Belfast Gazettes as it affects all of the UK.
24. DECC wishes to thank the consultees for their detailed and wide-ranging contributions.

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Department of Energy & Climate Change  
3 Whitehall Place  
London SW1A 2AW  
[www.decc.gov.uk](http://www.decc.gov.uk)

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