Office for Nuclear Regulation

Events reported to the Nuclear Safety Regulator in the period of 1 April 2001 to 31 March 2015

Executive summary

The Office for Nuclear Regulation (ONR) is the regulatory[1] body with statutory responsibility for the regulation of health and safety at nuclear sites in Great Britain (GB), of security at GB civil nuclear sites, and for the regulation of the safety and security of the civil transport of fissile and radioactive materials.

In December 2014, ONR published its strategy for 2015-20. A key element of this is ONR's commitment to developing a climate of trust, respect and confidence amongst its stakeholders. As a consequence, ONR is seeking to place increasing amounts of information relating to its regulatory and corporate activities into the public domain. This report is one contribution to the wider delivery of ONR's commitment to openness and transparency regarding its regulation and related decision-making.

ONR has, in the past, placed information relating to some of the small number of more significant safety events into the public domain. However, this is the first ONR report to provide a consolidated and comprehensive overview of all of the safety events reported, both minor (representing the large majority, 3857 events) and the few that are of more nuclear safety significance (nine events), between 1 April 2001 and 31 March 2015. It provides supplementary information to that in the Chief Nuclear Inspector's Annual Statement – 2014/15[2] contained in ONR's Annual Report and Accounts 2014/15, and to that already placed into the public domain.

For reasons of national security, and reflecting that the International Atomic Energy Agency (IAEA) and Euratom are the joint regulators of safeguards, neither nuclear security nor safeguards related events are included within the scope of this report.

Whilst ONR's regulatory focus is principally aimed at ensuring that dutyholders achieve and maintain appropriately high standards

1 The UK nuclear regulatory body was, during the dates of this report, a part of the Health and Safety Executive (HSE) (variously as its Nuclear Safety Directorate / Nuclear Directorate and, from April 2011, as the Office for Nuclear Regulation (ONR) – a non-statutory Agency of HSE). On 1 April 2014, ONR was established as an independent public corporation responsible for regulating the UK nuclear industry.

2 ONR Annual Report 2014/15 Chief Nuclear Inspector's Annual Statement http://www.onr.org.uk/documents/2015/annual-report-2014-15.pdf

of safety and security, the occurrence of safety related events (predominantly minor in nature) provides important opportunities to identify additional actions that dutyholders can take to improve safety. Whilst dutyholders are responsible for controlling any risks arising from such events, and for delivering related improvements, ONR actively holds dutyholders to account on behalf of workers and the public to ensure that this is done. By so doing, ONR seeks to secure legal compliance and continuous improvement in the interests of public and worker safety.

For the majority of the period covered by this report, ONR and its predecessor organisations' primary focus on events was on reviewing and regulating them on a case by case basis. The arrangements for recording reports of events prior to 2012, were tailored to this purpose and are not intrinsically suitable for detailed thematic or trend analysis. Consequently, and in the interests of avoiding the drawing of invalid conclusions, such analysis is not attempted in this report.

In 2012, ONR introduced improvements to its event reporting and recording arrangements, particularly in relation to the consistency of information recorded, and the extent and consistency of event categorisation (for example, new event categories were introduced and improved guidance on categorisation was made available). This was intended to facilitate more meaningful reporting and analysis of the data in the future, to better inform continuous improvement by dutyholders and ONR's future regulatory focus.

To date, whilst three years of data has been collected under the improved arrangements, this is judged insufficient to support meaningful detailed trend analysis. However, the ability to conduct more detailed analysis of the data will develop as the post 2012 data set increases over time.

Notwithstanding this, the data does suggest a small number of high level conclusions as follows:

- There has been an increase, over recent years, in the rate of reporting of events of no or very low nuclear safety significance, which is consistent with a positive, proactive and developing safety culture. This is welcomed, as a mature and open reporting culture is important in order to achieve the highest standards of safety. This increase in reporting of very minor events, in part, reflects an increased focus on reporting by dutyholders, even if the event did not result in any adverse safety outcome. It is also a reflection of the broadening of the scope of ONR's regulatory activities to areas other than nuclear safety and security (e.g. conventional health and safety, radioactive materials transport safety);

- Of the 3866 events reported to ONR during the period covered by this report, the nuclear safety significance of 3857 (more than 99.7%) was very low (rated at or below level 1 – anomaly - provided by the seven level International Nuclear and Radiological Event Scale (INES));
- Eight events, only one of which has occurred since 2009, were rated at the next significance level of the scale (INES level 2 – incident);
- One event - that took place approximately ten years ago - was of sufficient significance to merit an INES level 3 rating (serious incident);
- None of the more significant events reported had any detrimental effect on public safety or the environment.

ONR considers all events reported to it, whether minor or otherwise, as being of potential importance in providing opportunities for dutyholders to make improvements to safety arrangements. As a consequence, ONR expects dutyholders to review all events in order to identify and deliver safety improvements. For its part, ONR regulates and oversees the delivery of necessary improvements in a manner that is proportionate to the nature of the event.

In addition to the list of events reported to ONR during the period covered by this report, a number of case studies are also included. These provide examples of real events reported to ONR (of varying significance), or themes recognised by ONR as meriting regulatory attention, and set out the actions taken by the dutyholder and ONR as a result.

These also provide practical examples of ONR's approach to regulatory enforcement and the influencing of dutyholders in a range of circumstances in accordance with its Enforcement Policy Statement, and of ONR's commitment to ensuring that necessary improvements are delivered.

ONR uses the intelligence gained through event reporting, in conjunction with information gained through its other diverse regulatory activities, to inform its future regulatory focus and priorities. In this way, ONR is able to secure effective oversight of the delivery of safety improvements and to maintain a focus on addressing themes and trends identified. ONR's wider regulatory focus and activities are set out in the 'Chief Nuclear Inspector's Annual Statement – 2014/15' contained in ONR's Annual Report and Accounts 2014/15.

It is ONR's intention to publish future reports of events reported to it, and to continue to review the nature of information reported in order to increase its transparency and usefulness further.

Table of contents

Events reported to the Nuclear Safety Regulator in the period of 1 April 2001 to 31 March 2015

1 Introduction

The Office for Nuclear Regulation (ONR) is the regulatory body with statutory responsibility for the regulation of health and safety at nuclear sites in Great Britain (GB), security at GB nuclear civil sites, and for the regulation of the safety and security of the civil transport of fissile and radioactive materials.

ONR's regulatory obligations are provided by a combination of provisions of the Energy Act 2013 (which provided the statutory basis for the creation of ONR), the Nuclear Installations Act 1965 (which provides the nuclear site licensing regime and associated licence conditions), the Safeguards Act 2000, the Health and Safety at Work etc. Act 1974, the Nuclear Industry Security Regulations 2003, the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009, and a range of other relevant and more general health and safety legislation.

In recognition of the breadth of its regulatory responsibilities, and to ensure that it delivers efficient and effective regulation across its broad scope of regulatory responsibilities, ONR is organised into operational programmes, which act collectively to ensure a coherent approach to its regulatory priorities, activities and decision-making.

In December 2014, ONR published its strategy[3] for 2015-20, which sets out, as a key strategic theme, its commitment to working to develop a climate of trust, and to gain the respect and confidence of all of its stakeholders by (amongst other actions) placing into the public domain increasing levels of information about its regulatory and corporate activities.

The publication of this report (which places the list of events[4] reported to ONR between 1 April 2001 and 31 March 2015 into the public domain,

3 http://www.onr.org.uk/documents/2014/onr-strategy-2015-2020.pdf

4 For the purposes of this report, an 'event' relates to any unintended event reported to ONR (e.g. operating errors, equipment failures, initiating events, accident precursors, potential mishaps, unauthorised acts etc.) whether significant in terms of actual or potential outcome or not, whereas the term 'Incident' is a sub-set of events, and is used to describe events that have been classified as INES 1, 2 or 3, for which the actual or potential consequences are judged to be non-negligible from the point of view of safety, but which have not resulted in an accident (INES 4 and above).

and other information on how ONR regulates events reported to it) is one of many measures being taken by ONR to increase the openness and transparency of its activities, regulation, and decision-making. It is ONR's intention to publish updates of the events reported to it.

It should be noted that ONR has already placed information relating to some of the more significant safety events into the public domain. ONR has published information relating to events that have occurred at civil nuclear installations in Britain which have met ONR's publication criteria, with reports since December 2000 being available on ONR's website[5]. The statements are published quarterly by ONR and are reported to the Secretary of State for Energy and Climate Change and the Secretary of State for Scotland.

However, this report goes further, and makes available to the public a list of all safety events reported to the nuclear regulator since 2001, whether they meet ONR's publication criteria or not.

The publication of this data represents an important step towards both transparency, and the future enhanced analysis of industry trends, themes, and other learning.

2 Scope of the report

This report places into the public domain a comprehensive list of nuclear, fire and radioactive materials transport safety related events reported to it by dutyholders from 1 April 2001 to 31 March 2015, and for conventional health and safety from 18 July 2013 to 31 March 2015.

Whilst the scope of this report is broad, it does not include security events reported to ONR as, to do so would require the report to be subject to national security restrictions that would preclude its accessibility to many stakeholders. Equally, it does not include safeguards events reported to ONR as it is not a safeguards regulator, with such events being notified to ONR for information only.

In summary, this report:

- sets out the context for the reporting of events to ONR, and the relative responsibilities and actions of dutyholders and regulator respectively;
- identifies and discusses a small number of high level features of the data (where the quality of the data supports it);
- provides examples of ONR's response to events, and the application of its Enforcement Policy Statement[6] in holding dutyholders to account for delivering necessary safety improvements on behalf of workers and the public.

5 http://www.onr.org.uk/quarterly-stat/index.htm

6 http://www.onr.org.uk/documents/2014/enforcement-policy-statement.pdf

3 Legal framework for event reporting

Legislation places specific legal obligations on dutyholders to respond to and report events associated with activities for which they are legally responsible.

In GB, the Nuclear Installations Act 1965 requires that specified nuclear activities may only be conducted where a nuclear site licence to do so has been granted (e.g. operation of a civil nuclear reactor; any other installation etc. designed or adapted for the production or use of atomic energy, or the carrying out of any process which is preparatory or ancillary to the production or use of atomic energy and which involves or is capable of causing the emission of ionising radiations; or the storage or processing of nuclear fuel or of bulk quantities of other radioactive matter which has been produced or irradiated in the course of the production or use of nuclear fuel etc.). It specifically requires the notification of certain events to the regulatory body. The events and legal reporting requirements are set out in the Nuclear Installations (Dangerous Occurrences) Regulations 1965.

Nuclear licensed sites are subject to standard licence conditions which require dutyholders to put in place a broad range of safety arrangements, including for the reporting of certain events and incidents.

In the cases of conventional health and safety, nuclear security, and transport related events, there are additional specific legal requirements to report specified events to ONR (e.g. the 'Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013' for conventional safety, the 'Nuclear Industries Security Regulations 2003' for nuclear security; and the 'Carriage of Dangerous Goods and use of Transportable Pressure Equipment Regulations 2009' for the transport of radioactive materials).

ONR has responsibility for the regulation of nuclear, radiological, and conventional health and safety (including fire safety) on GB nuclear sites, of nuclear security on civil GB nuclear sites, and for the safety and security of civil transport of radioactive materials. ONR receives reports of, and provides regulatory oversight in relation to, a broad range of events and incidents.

To facilitate this in practice, protocols have been agreed with major dutyholders to clarify what should be reported to ONR, and the format and manner of such reporting.

- In determining the need for or nature of regulatory enforcement action as a result of events, ONR's decisions are made in accordance with its Enforcement Policy Statement[6] and related formal enforcement decision-making processes.

4 International Reporting

The International Nuclear and Radiological Event Scale (INES)

The International Nuclear and Radiological Event Scale (INES) was introduced in 1990 by the International Atomic Energy Agency (IAEA) and the Nuclear Energy Agency of the OECD, to enable prompt and consistent communication of safety significant information on nuclear events.

The INES scale operates by assigning a scale level to events, with each level on the scale representing an approximate tenfold increase in severity in relation to the previous level.

For most events reported (those of lesser significance and where the applicable INES level is clear), the INES level is determined by the originator of the report. In other cases, advice is sought from the UK INES National Officer, who also has the authority to determine the INES level for any event[7].

Determination of the appropriate INES level requires careful judgement regarding the severity of events/ incidents in relation to:

- People and the environment (e.g. the extent of harm to people or the environment);
- Radiological barriers and controls at facilities (e.g. impact on containment, contamination control); and
- Defence in depth (e.g. the extent to which measures put in place to prevent or cope with accidents may have been compromised).

As a consequence, the INES scale applies not only to circumstances where the outcome is likely to be harm to people or the environment, but also to a broad range of other circumstances where the effectiveness of a safety protection measure may have been compromised without harm to people or the environment.

In practice, there are some types of event (primarily related to those resulting from human factors shortcomings), where the verification of certain aspects can take some time. As a result it is not uncommon for the INES rating to be revised over time and following investigation.

The scale levels and example criteria are summarised in Figure 1 on page 10.

7 The Department of Energy and Climate Change (DECC) is the lead government department for INES administration and reporting. DECC appoints the UK INES National Officer, currently from within ONR, although the duties are independent of ONR's regulatory responsibilities.

Figure 1 – Summary of INES scale levels and indicative criteria

INES level	Description	Example criteria (from: http://www-pub.iaea.org/MTCD/Publications/PDF/INES2013web.pdf)
0	No safety significance	Event is of no nuclear/radiological safety significance
1	Anomaly	Lost or stolen minor radioactive source Minor problems with safety components, with significant defence in depth remaining Over exposure of a member of the public in excess of statutory limits
2	Incident	Significant failures in safety provisions, but with no actual consequences Inadequate packaging of a high activity source Exposure of a worker in excess of the statutory annual limits
3	Serious incident	Near accident with no safety provisions remaining Lost or stolen highly radioactive sealed source Severe contamination but low probability of public exposure Non-lethal deterministic health effects (e.g. burns) from radiation
4	Accident with local consequences	Damage to fuel resulting in more than 0.1% release of core inventory Significant release of radioactive material within a facility Minor release of radioactivity from facility (planned countermeasures unlikely to be needed)
5	Accident with wider consequences (e.g. Three Mile Island, 1979; Windscale, 1957)	Severe damage to reactor core Large release within a facility with high probability of significant public exposure Limited release of radioactivity, likely to require implementation of some planned countermeasures Includes events resulting in several radiation fatalities
6	Serious accident (e.g. Waste Tank Explosion, Mayak, 1957)	Significant release of radioactivity likely to require implementation of planned countermeasures
7	Major accident (e.g. Chernobyl, 1986; Fukushima, 2011)	Major release of radioactivity with widespread health/environmental consequences requiring implementation of planned and extended countermeasures

International Reporting Systems

The International Atomic Energy Agency (IAEA) provides guidelines on event reporting for the purpose of international learning, which the UK supports. ONR has reporting arrangements that accord with these guidelines.

In addition, the IAEA operates (and ONR contributes to) two international events databases (one relating to events at reactor sites and the other to events related to nuclear fuel cycle sites). These encourage sharing of experience between countries.

ONR identifies events that are of relevance in terms of international learning, and works with dutyholders to make these available through these databases. In so doing, ONR encourages international learning from UK events, and benefits from the learning from events reported by other states. This ensures that learning from events is achieved at local, national and international levels.

5 Responses to events/incidents

The respective roles of dutyholders and the regulator in responding to events are necessarily and appropriately separate and discrete. This ensures that ONR remains independent and objective of dutyholders at all times. As a result, ONR is able to hold dutyholders to account on behalf of workers and the public.

The relative responses of dutyholders and the regulator to the occurrence and reporting of events are summarised as follows:

Dutyholder response to incidents/events

Legal responsibilities are placed on those who conduct activities that give rise to nuclear or radiation risks, and for ensuring that all such risks are reduced so far as is reasonably practicable. Those with such legal responsibilities are referred to as ‘dutyholders’.

An important duty of dutyholders is the requirement to establish procedures and arrangements to maintain the safety of their relevant activities.

Should an event occur, the relevant dutyholder must take appropriate actions to ensure that any resulting risks are minimised, so far as is reasonably practicable; that the event is properly investigated; and that appropriate lessons are learnt and acted upon.

The dutyholder is also responsible, in accordance with regulatory requirements and provisions (see Section 3), for ensuring that ONR is notified. This is an important aspect of their response to events in that it allows ONR to regulate dutyholders as is appropriate in the circumstances.

For nuclear/radiological events, the dutyholder is expected to assign a preliminary INES scale rating (see Section 4) for the purposes of international reporting should that be appropriate. This is reported by the dutyholder to ONR, and is communicated onwards to the UK INES officer. Where required by specific IAEA reporting criteria, a subsequent report will be made by the UK INES officer to IAEA to meet international notification requirements.

ONR response to events

As discussed in section 3, the regulatory framework provides for the reporting to ONR of relevant events by dutyholders.

Whilst ONR is required to be notified of the occurrence of specified events, the legal responsibility remains that of the dutyholder at all times in order that ONR remains independent and able to hold dutyholders to account on behalf of workers and the public.

ONR reviews the nature and potential or actual significance of all events reported to it.

In determining the nature of its response to such events, ONR applies the key principles underpinning its Enforcement Policy Statement and related processes, which include the requirements that ONR acts proportionately and in a targeted and consistent manner.

This means that the nature of ONR's response and subsequent enforcement are informed by, and proportionate to the magnitude of any failure to comply with the law (including any failure to minimise risk to workers or the public, so far as is reasonably practicable).

Consequently, when events of a minor nature occur (those that present minimal, if any, risk to workers or the public, and which represent the large majority of events reported to ONR), ONR's main focus is on reviewing the nature of the event and the dutyholder's response, in order to satisfy itself that the dutyholder has:

- taken effective action to minimise, so far as is reasonably practicable, any risk to workers or members of the public;
- competently and diligently investigated the event, and that appropriate learning opportunities and improvements have been identified; and
- been proactive in delivering appropriate improvements to an appropriate timescale (in order to minimise the potential for a recurrence).

In cases where the actual or potential consequences are judged to be more significant, ONR may elect to investigate the incident in its own right in order to establish the magnitude of any failure to comply with relevant law. If warranted, ONR will also take appropriate enforcement action in accordance with its Enforcement Policy Statement.

It is important to note that incidents are only one consideration in relation to enforcement decisions and, indeed, ONR may carry out enforcement action where it believes that there has been a breach of law but where no incident has occurred.

Additionally, and where appropriate, ONR will use the information it obtains to:

- notify relevant government departments if pre-agreed reporting criteria are met[8];
- inform its future regulatory strategy and inspection programmes; and
- disseminate any generic learning points to the wider industry and, where appropriate, internationally.

Where the notification relates to an INES level 2 or more significant incident, it is immediately notified to the UK INES National Officer[9] in order to facilitate timely international dissemination of the event.

Finally, in the highly unlikely event of a nuclear or radiological emergency, ONR has the capacity to coordinate its national safety/security regulatory activities to provide support and advice to local government, other government agencies, and in support of national government emergency plans.

6 Quality of event data

There were 3866 events notified to ONR (or its predecessor organisations) during the period of 1 April 2001 to 31 March 2015.

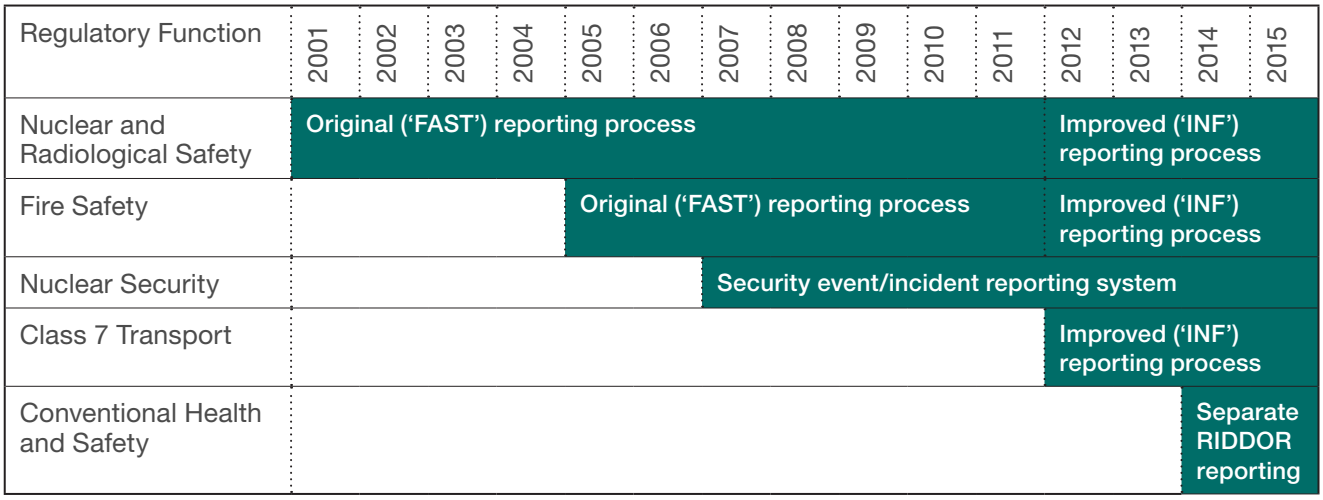
However, during this time, ONR's (or its predecessor organisations) legal responsibilities have been extended to incorporate the regulation of fire safety on GB nuclear sites, nuclear security (2007), and transport of Class 7 materials (October 2011). This limits the validity of simple numerical comparisons of reporting rates across years.

An overview of the development of ONR's regulatory responsibilities and reporting arrangements is included in Figure 2 on page 14.

8 Events meeting certain criteria are included in a 'Quarterly Statement of Incidents at Nuclear Installations', which is published on the ONR website.

9 The UK INES national officer is currently an ONR nuclear inspector.

Figure 2 – Overview of Incorporation of Regulatory Functions into ONR and Event/ Incident Reporting Systems used, by financial year



The progressive increase in the scope of ONR's regulatory responsibilities, over the period covered by this report, has resulted in an extension of the scope of events reported to ONR (and its predecessor organisations). These additional regulatory functions have, therefore, only contributed to ONR's databases of events since ONR assumed regulatory responsibility for them (any events relating to these regulatory functions that occurred before incorporation into ONR, will not normally appear in ONR's records).

In addition, and as indicated in Figure 2, security and conventional safety events are recorded on separate databases. In the case of security events (outwith the scope of this report), this separation reflects the need to apply appropriate protection to the information from a national security perspective. In the case of conventional safety on nuclear sites, the existence of a discrete recording database is likely to be retained to maintain consistency with equivalent reporting arrangements for non-nuclear sites (i.e. for which the Health and Safety Executive (HSE) is the responsible regulator).

Data reported in the period of 1 April 2001 - 31 March 2012

Annex 1 contains a listing of the events reported to ONR during the period of 1 April 2001 to 31 March 2012.

During this period and as described above, whilst dutyholders were required to report incidents and events to ONR, ONR's principal focus was on reviewing and regulating events on a case by case basis at the dutyholder level.

Arrangements at the time (the 'FAST stream' process) were, therefore, simple in nature and tailored for this purpose. The principal objectives of the reporting system, during this period, were to:

- record events on (or, in some cases, related to) GB nuclear industry sites on a case by case basis;
- alert senior and other ONR inspectors, thus enabling ONR to review, regulate and enforce at dutyholder level as appropriate; and
- allow ONR to notify relevant government departments, in a timely manner, of any events that met specific reporting criteria.

Hence, whilst the records of the period were sufficient for these intended purposes, they were not intended to provide the level of consistency necessary to support generic industry comparisons or a meaningful statistical analysis.

The descriptions of the events recorded at the time were often lengthy and uninformative to those without detailed and expert knowledge of the site, plant, or operation in question. For the purpose of their longer term retention as records, experienced ONR staff did, however, categorise them into a manageable number of generic categories of event (which is what is reported in Annex 1).

During the drafting of this report, ONR did consider whether it might be practical to undertake a major retrospective update of these records, including work to generate simplified yet accurate specific event descriptors from the records for use in this report. However, this was judged to be impractical on the basis that it would require disproportionate effort (potentially many person years of effort), would result in the redirection of substantial regulatory resources away from ONR's regulatory priorities and core regulatory function, and would generate little if any practical benefit given the historical and retrospective nature of much of the data. However, it was judged to be practicable for specific event descriptors to be generated for the latter period of 1 April 2012 to 31 March 2015, and these are included in Annex 2.

In addition, the data was reviewed, both by ONR and the relevant dutyholders, to provide confidence that at least the majority of events had been appropriately categorised.

Whilst providing a good degree of confidence in this respect, the review did suggest evidence of some residual inconsistencies.

For example, it appears that occasional duplicate entries may have been created in some cases where the event could reasonably be assigned to more than one event category or where follow-up information was subsequently received, and some instances where INES ratings have been updated after the initial report to ONR as further information became available. There is also evidence that, in a small number of cases relating to minor events only, changes to INES ratings (i.e. from INES level 0 to 1 or vice versa) made some time after the event were not updated in the database itself.

ONR also notes that its' database includes a small number of minor events that relate to Ministry of Defence (MoD) authorised sites (e.g. NRTE Vulcan, HMNB Clyde and possibly a small number of those attributed to Devonport) for which MoD, rather than ONR, is the nuclear safety regulator.

As a consequence of these factors, whilst the data provides a reasonable overview of the rate and category of events reported to ONR (and its predecessor organisations), a cautious approach must be taken to ensure that only robust conclusions are drawn from its analysis.

Improvements to data reported during the period of 1 April 2012 – 31 March 2015

In consideration of the inherent limitations of event data prior to 2012, and recognising the potential for the data to be utilised to greater effect in supporting industry wide learning if recorded more consistently, ONR implemented significant improvements to its processes.

These improvements were applied from 1 April 2012 onwards, and Annex 2 contains a listing of the events reported to ONR during the period of 1 April 2012 to 31 March 2015. Specifically, ONR introduced:

- substantial improvements to the use of event reporting codes in order to secure more consistent classification of events for the purposes of analysis and comparison;
- a requirement for improvements to the quality and timeliness of the provision of preliminary information by dutyholders to ONR (on events and incidents, and on immediate post-event actions undertaken);
- the conservative requirement to notify ONR in cases where the dutyholder is unclear as to whether event notification criteria have or have not been met;
- a requirement for the dutyholder to complete the event report (previously undertaken by an ONR inspector) and to assign a preliminary INES rating to the event (see Section 4, 'The International Nuclear and Radiological Event Scale (INES)');
- the requirement for ONR to record, on the report form, its intended actions and also whether government reporting criteria have or have not been met; and
- improvements to quality checks to provide confidence that events are being properly recorded.

Since their introduction, these improvements have enhanced the accuracy and consistency of reporting of events to ONR, and offer

a more consistent basis for the identification of generic trends and themes. As the enhanced quality data builds over future years, it offers the potential for ONR to identify, more reliably, trends and themes which will inform both the future regulatory focus of ONR and initiatives by industry groups.

In Annex 2, in addition to the events category, a more specific event descriptor/ title has also been added (a practice that will be carried forwards into future reports), in order to enhance transparency.

However, as data of a consistent quality standard has only been generated since 1 April 2012, this is judged insufficient to support meaningful detailed trend analysis for the purposes of this report.

Proposals to further improve data quality

Whilst significant improvements have been made since 1 April 2012, ONR is continuing to seek further improvements in the reporting of events by dutyholders and in ONR's associated arrangements for recording and analysing such reports.

7 Review of events

Annexes 1, 2 and 3 contain the lists of events reported to ONR, respectively, for:

- Financial years 2001/02 to 2011/12 (1 April 2001 to 31 March 2012);
- Financial years 2012/13 to 2014/15 (1 April 2012 to 31 March 2015); and
- Conventional health and safety from 18 July 2013 to 31 March 2015 (prior to the transfer of vires from HSE to ONR on 1 April 2014, ONR set up a shadow team and began to collect event information. The data in Annex 3 reflect both this, and changes in the way that data were recorded at that time).

Approach to interpretation of the data

Due to the quality limitations described in section 6, events reported to ONR are presented as simple lists (Annexes 1 to 3).

However, to supplement the lists of reported events in Annexes 1 to 3, and to provide insight into ONR's regulation of these and the outcomes generated, a number of short case studies (reflecting a range of events and regulatory observations) are included in Annex 4. These provide practical examples of ONR's approach to regulatory enforcement and influencing of dutyholders, in accordance with its Enforcement Policy Statement, and of ONRs' actions to ensure that necessary improvements are delivered in the interests of public and worker safety.

The case studies also exemplify the application of key enforcement principles including those of 'proportionality' (relating the nature and severity of ONR's enforcement action to the level of risk presented) and 'targeting' (focusing of ONR's regulatory effort on those events that give rise to the most serious risks), and ONR's wider role in encouraging industry-wide learning where generic trends and themes are identified.

Review of the data

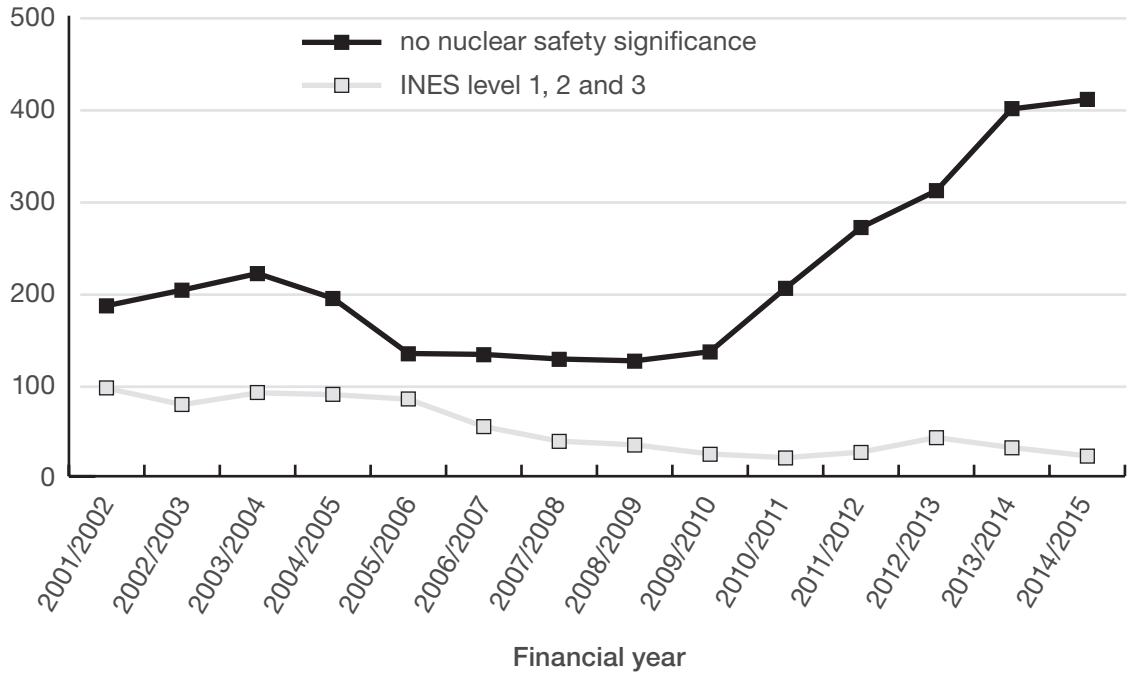
Figure 3 shows the number of events rated at INES level 1 and above, and those of no nuclear safety significance for the period of 1 April 2001 to 31 March 2015.

Whilst this figure suggests a gradual reduction in the occurrence of the more significant INES 'level 1 and above' events, the number of events in this category is relatively small, which limits our ability to reach any firm conclusion in this regard.

However, Figure 3 does indicate that there has been a significant increase in the number of events of 'No nuclear safety significance' reported to ONR each year since 2009/2010.

On the basis that events of no nuclear safety significance, whilst typically minor in nature, nonetheless contain important lessons and present opportunities to improve safety, this trend is viewed as positive.

Figure 3 – Number of incidents/ events reported by financial year



The increase over recent years in the reporting of events of 'No nuclear safety significance' is consistent with greater attention on the reporting of near misses and very minor events by dutyholders, the ongoing and developing maturity of their event reporting arrangements, and the extension of ONR's scope of regulatory duties beyond nuclear safety regulation, as described in section 6.

There are 3866 events included in Annexes 1, 2 and 3 for the period of 1 April 2001 and 31 March 2015 (including conventional health and safety events).

Of these, 3141 were rated on the INES scale as being of no nuclear safety significance (INES level 0 or not rated), and 716 were rated at INES 'level 1 (anomaly), being the lowest level of nuclear safety significance on the INES scale. There were eight events rated at INES Level 2 (incident), and a single event rated at INES level 3 (serious incident). No events occurred that merited a higher INES rating during this period, and none were designated as accidents.

It is notable that the one INES level 3 event occurred over ten years ago (15/4/2005), and that all excepting for one of the INES level 2 events occurred in or prior to 2009. It is also notable that none of the INES level 2 or 3 events had any detrimental effect on public safety or the environment.

Whilst ONR reviews the nature of all events reported to it, in the cases of the more significant events, ONR takes more formal but proportionate investigation and enforcement action to ensure that necessary safety improvements are identified and delivered by dutyholders. Examples of such investigation and enforcement actions, and the resultant safety outcomes, are presented in the case studies in Annex 4.

Due to the nature of the data generated prior to 2012, and changes made since 2012, the ability to conduct specific year on year comparisons is limited by:

- the intrinsic data inconsistencies outlined in section 6 above;
- changes to the nature of work undertaken by some dutyholders over this period, including those relating to plant lifecycle factors (e.g. the balance of construction of new facilities, operating existing ones, and decommissioning of older ones); and
- the historic nature of most of the data (which effectively renders consistent retrospective re-examination and re-interpretation impracticable).

Although these limitations exist, some general features of the data appear to be significant, as follows:

Increases or decreases in reporting in some categories of events since 2011

Changes in annual rates of reporting of some categories of events, coincide with the introduction of the new reporting arrangements (see section 6). These improvements clarified, standardised, and extended the categorisation of events, which will have affected some judgements as to the most appropriate category to which to allocate certain events (NB. As most events have multiple potential attributes that link them with more than one generic event category). The improvements also increased awareness amongst dutyholders of the need for more consistent event reporting.

However, as regards the total number of events reported to ONR, whilst this has increased since 2012, Figure 3 demonstrates that this trend reflects an increase in the reporting of events that are of no nuclear safety significance, and began at around 2009. This suggests that increases in the overall reporting rate are not related solely to changes to the reporting process introduced in 2012.

It is important not to confuse an increase in reporting of very minor events with poor safety performance. A higher rate of reporting of very minor events, in the absence of an increase in the occurrence of more significant safety events, is more likely to be the result of (and is consistent with) a maturing, positive, proactive and transparent safety reporting culture amongst dutyholders. This is welcomed by ONR and is recognised as being important in achieving and maintaining the highest standards of safety.

This is consistent with positive steps taken by some dutyholders to increase the focus of their workforces on the reporting of very minor events, some of which may not previously have been reported on the basis that they did not result in any adverse safety outcome.

The trend will also, however, reflect the broadening of the scope of ONR's regulatory activities to areas other than nuclear safety (e.g. conventional health and safety, radioactive materials transport safety, etc.).

It is also likely that the Fukushima accident in Japan of March 2011 would have further enhanced regulatory and dutyholder focus on the reporting of events, which may also have affected event reporting rates at around that time.

Changes to the reporting rates of certain event categories as a result of ONR assuming additional regulatory responsibilities

Although the progressive incorporation of conventional health and safety regulatory capability into ONR commenced in 2011 through the secondment of inspectors from HSE, ONR became an independent

regulator under the Energy Act on 1 April 2014 and assumed responsibility for the regulation of conventional health and safety and fire on nuclear sites on behalf of ONR. During this transitionary period (2011 – 2014), the protocol for reporting of conventional safety events on GB nuclear sites was aligned to the reporting methodology used under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR).

Similarly, the incorporation of radioactive material transport regulation into ONR (in October 2011) correlates with the increase in the number of transport events reported to ONR since that time.

Emergency arrangements and capability
Whilst emergency preparedness has always been an important regulatory focus of ONR and its predecessor organisations, and related events have always been regulated by ONR, there was not a dedicated reporting category for such events prior to 2011. Prior to 2011, these events were assigned to other event categories that reflected the main underlying issue (e.g. administrative shortcomings, plant defects). However, in the course of ONR's considerations following the Fukushima event of March 2011, the decision was taken to introduce a dedicated event category for event reports relating to emergency preparedness shortcomings.

Examination of the categories that relate to non-nuclear specific events (e.g. conventional health and safety and fire events, external events (those occuring outside of the nuclear licensed site), and those relating to the transport of radioactive materials) confirms that these represent a significant proportion of the total events and incidents reported to ONR (i.e. approximately 24% of events reported to ONR over the period 2001/15 were non-nuclear specific).

Whilst detailed analysis of the data has not been undertaken for the reasons described in section 6 and above, the lessons learnt from such events remain an important source of regulatory intelligence for ONR, and contribute to the information ONR uses to ensure that its regulatory focus, priorities, interventions and enforcements are targeted at where they are needed.

The improvements made to event reporting, and those further improvements currently under consideration, will enhance the future contribution of event reports to informing ONR's regulatory focus.

Example case studies

In accordance with its Enforcement Policy Statement, ONR applies a targeted and proportionate regulatory response to both nuclear and non-nuclear events. This is illustrated in the range of case studies presented in Annex 4.

An example of ONR's response to the most significant of the nuclear safety incidents that occurred during this period (e.g. the one INES level 3 event) is presented in Case Study 1. This event was rigorously investigated by ONR and, on the basis of the facts thereby established and, in addition to corrective measures implemented by the dutyholder, ONR took robust and formal enforcement action.

In this case, ONR judged it to be in the public interest to serve two Improvement Notices and to apply its primary powers under the nuclear site licence, and decided to prosecute the dutyholder. This prosecution was successfully undertaken and resulted in the court applying a substantial fine. The dutyholder committed substantial resources over an extended period of time to make the necessary safety improvements to minimise the likelihood of the recurrence of such an event. On completion of these, ONR reviewed the evidence of improvements made and, only when satisfied that the required safety improvements had been delivered, did it consent to the recommencement of operations.

Other examples of ONR's regulatory approach, in relation to a range of lower significance events, are provided in Case Studies 2, 3 and 4. These outline ONR's response to an example INES level 2 (incident), INES level 1 (anomaly) and an INES level 0 (below scale) event respectively. In each case, ONR's enforcement action reflects the application of its Enforcement Policy Statement. It is worth noting that, whilst ONR took enforcement actions in relation to Case Studies 3 and 4 (i.e. an Improvement Notice and formal letter respectively), ONR decided not to take formal enforcement action in relation to the INES level 2 event in Case Study 2. This reflects ONR's judgement at the time, of the extent of the compliance gap and of its high level of confidence that the required safety improvements would be secured in a timely manner without the need for formal enforcement action (ONR's enforcement decisions are informed by a broad range of considerations that extend beyond the nature of the event itself). However, in each of the examples in Case Studies 2, 3 and 4, ONR carefully monitored the work of the dutyholder, to ensure that required improvements to safety were delivered. In each case they were.

Case Study 5 outlines ONR's response to the identification of deficiencies in the control of risks from legionella (a health and safety hazard) at two separate nuclear sites. In this case, and noting the potential and serious risk to health presented by hazards of this nature, ONR took the decision to serve Improvement Notices on the two dutyholders concerned, requiring that specific improvements be made. As a result, the dutyholders successfully completed the necessary improvement work and, subsequently complied with the requirements of the Improvement Notices.

Case Study 6 refers to a radioactive transport event, which revealed a significant failure of a dutyholder to comply with the relevant transport

legal requirements. ONR took the view that this was aggravated by deficiencies in safety improvements made by the dutyholder in response to a previous similar event. As a result, ONR decided to prosecute the dutyholder on the basis that such losses of control had the potential to have a direct impact upon public safety. The dutyholder pleaded guilty and received a significant fine. Appropriate safety improvements have since been delivered by the dutyholder.

In addition to acting upon potential breaches of the law by individual dutyholders, ONR also looks for any trends or themes that might indicate the need for an industry-wide response (often, in addition to regulatory enforcement action taken at individual dutyholder level).

Case Study 7, relating to an ONR concern that a series of health and safety accidents (each being investigated at site level) may have indicated a reduction of focus on conventional safety, is an example of an instance where ONR adopted an industry wide response. ONR decided to meet with senior industry executives to raise the profile of conventional health and safety and to develop its confidence that senior industry leaders were committed to allocating sufficient focus and resources to the management of conventional safety risks on nuclear sites. ONR also took the additonal step of increasing the focus of its own specialist conventional health and safety inspectors on inspecting the adequacy of the management of conventional health and safety risks on GB nuclear sites.

Similarly, Case Study 8 summarises ONR's response to its observation that reports relating to the management of the examination, inspection, maintenance, and testing of nuclear safety equipment across a number of older sites were a significant contributor to events being reported to it. Whilst ONR had taken appropriate intervention action at site level, it also initiated a study to codify relevant good practice, which is being used to benchmark dutyholders and identify improvements by the industry.

Finally, Case Study 9 describes the respective responses of the licensee and ONR to an INES level 1 event relating to a reactor emergency charging system (one of a number of diverse reactor safety systems). The ONR site inspector was satisfied that the licensee had adequately identified the root and contributing causes and had taken appropriate and timely action to secure safety and prevent a recurrence. In line with ONR's operational procedures and enforcement guidance, ONR judged that no further investigation or enforcement action was justified in this case. Once more, the dutyholder delivered the necessary improvements revealed by the event.

Whilst only some of the events reported to ONR merit formal regulatory enforcement action (the large majority of events being very minor in nature), ONR reviews all events reported to it, and will take formal regulatory enforcement action in cases where it judges it to be

appropriate, in the interests of securing compliance with the law, and in the interests of the health and safety of workers and the public in general.

Equally, where it is appropriate to do so, ONR also seeks to influence the wider industry to facilitate industry-wide improvements.

8 Conclusions

This publication of the list of events reported to ONR between April 2001 and March 2015 represents a significant step in ONR's ongoing commitment to openness, transparency, and accountability to those that it serves (workers and the public), and is an important element of ONR's commitment to fostering a climate of trust, respect and confidence amongst its stakeholders.

The data presented in this report is that held by ONR, although it is recognised that, for historic reasons, the capacity and suitability of the data to accommodate detailed trend, thematic or detailed statistical analysis is restricted (as explained in sections 6 and 7). Consequently, whilst the data provides a useful overview of what has been reported to and recorded by ONR during the period covered by this report, its detailed analysis has not been attempted in this report.

Whilst ONR considered the viability of conducting a major retrospective review and update of its records, it concluded that this would necessitate the re-direction of disproportionate regulatory resources away from core regulatory activities for little practical or material benefit.

However, the improvements made to ONR's arrangements from 2012 onwards will render future data of higher quality and greater consistency. As the amount of data subject to these improved arrangements accumulates over time, this should enhance its capacity to support more trending and thematic analysis in the future.

Notwithstanding its limitations, the data confirms that the total number of events reported to ONR has increased over recent years but, correspondingly, that the number of nuclear safety significant INES level 1, 2 and 3 events (i.e. those that are of nuclear safety significance) has not. The most significant nuclear safety event in the period covered by this report occurred approximately ten years ago, with one event rated above the lowest level of significance of the INES scale having occurred since 2009. Hence, the increase in the rate of reporting of events to ONR is attributable to an increase in the reporting of events of no nuclear safety significance.

This increase in the reporting of events of no nuclear safety significance should not be interpreted as suggesting any degradation in safety performance. Indeed, in general, more diligent reporting of

very minor events, in the absence of an increase in more significant safety events, is consistent with a maturing and positive safety reporting culture, which is important in achieving and maintaining the highest standards of safety.

Improvements to the reporting of very minor events is welcomed by ONR as, through learning from such events, improvements to safety can be identified, which help prevent occurrence of more serious events.

The increase in reporting of minor events is consistent with work undertaken by many dutyholders, over recent years, to increase the awareness of their workforces of the importance of reporting such events, even where they have no safety outcome. However, it is also noted that the increase in reporting of events of no nuclear significance will also reflect the extension of ONR's scope of regulatory duties beyond nuclear safety regulation (see section 6).

Changes to the reporting rates of specific event categories like 'transport events', 'conventional health and safety and fire' events, and 'emergency capability' related events, reflect the relatively recent incorporation of 'class 7' transport regulation into ONR's remit, changes to the focus of ONR's conventional health and safety inspection, and the introduction of a specific event category for emergency response capability matters.

It is ONR's intention to publish further reports of events, as the improvements made to the quality and consistency of data collection, since 2012, render the data set suitable for more detailed analysis. In addition to this, ONR also intends to review the event information that it reports in future to increase its transparency and usefulness to the reader.

Glossary

DECC	Department of Energy and Climate Change
IAEA	International Atomic Energy Agency
INES	International Nuclear and Radiological Event Scale
GB	Great Britain
HSE	Health and Safety Executive
MoD	Ministry of Defence
mSv	milli-Sievert
OECD	Organisation for Economic Cooperation and Development
ONR	Office for Nuclear Regulation
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013
Sv	Sievert
UK	United Kingdom
UKINO	United Kingdom INES National Officer

Office for
Nuclear Regulation

© Office for Nuclear Regulation 2016

The text of this document may be reproduced free of charge in any format or medium, providing that it is reproduced accurately and not in a misleading context under the terms of the Open Government Licence v2.0.

ONR logos cannot be reproduced without the prior written permission of the Office for Nuclear Regulation. Some images and illustrations may not be owned by ONR and cannot be reproduced without permission of the copyright owner.

Any enquiries regarding this publication should be addressed to:

ONR communications team
Office for Nuclear Regulation
Redgrave Court
Merton Road
Bootle
Merseyside L20 7HS

Email: onr@onr.gsi.gov.uk

Published February 2016

Further information about ONR is available at www.onr.org.uk