Our mission:
The prevention of death, injury and ill health to those at work and those affected by work activities
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Foreword

HSE generates and uses knowledge to ensure that its activities are founded on the best available evidence. To this end, the Science Plan has been developed by our scientists, engineers, physicians and analysts following discussions with policy and operational staff in HSE. The plan sets out how we will apply science and engineering resources to the delivery and realisation of the four main aims in HSE's Business Plan: leading others to improve health and safety in the workplace; providing an effective regulatory framework; securing compliance with the law; and reducing the likelihood of low-frequency, high-impact catastrophic incidents.

HSE’s scientific and engineering skills and research programmes provide the robust evidence that underpins policy and delivery of operational activities, thus making a critical contribution to the delivery of HSE’s objectives and ensuring the effective use of public resources and value for money.

This is a three year rolling plan that describes how HSE’s use of science will bring about improvements within the health and safety system. It will facilitate continuity and support for longer term strategic research programmes beyond the next three years, including foresight activities. This will be important to ensure that we are prepared for future changes in the workplace that might give rise to new risks. The plan will be updated as circumstances dictate.

I very much welcome comments and views on this science plan which should be sent to science@hse.gsi.gov.uk.

Professor Andrew Curran, HSE Chief Scientific Adviser and Director of Research
A. Lead others to improve health and safety in the workplace

Where improvements in health and safety standards are necessary and where HSE can make a distinctive contribution, we will work closely with individual companies, industry bodies, stakeholder groups and others to assist them to drive forward sector-led improvements. These improvements can be informed through research and information and advice, and working with local authority partners by inspection, investigation and enforcement.

Use evidence and knowledge to prioritise our own actions and guide the actions of others

HSE’s statisticians develop statistical sources and analyse and interpret statistical data to provide up to date information on the incidence of work-related injuries and ill-health. Statisticians will also seek to use data from external sources where it can complement our internally collected statistics. These analyses help HSE to target and design interventions by identifying sectors and occupations where there is a relatively higher risk of injury and occupational ill-health.

Regular sources include:

- **Labour Force Survey** and associated Self-reported Work-related Illness (SWI) surveys - these surveys are managed by the Office for National Statistics and we will commission questions on ill-health and injury for inclusion in the surveys.
- Data reported under the **Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR)** regulations, for injury statistics.
- **Medical specialist and General Practitioner** injury and ill-health surveillance schemes.

A suite of health and safety statistics will be published annually in the autumn.

In addition to these data sources we may commission ad hoc surveys to support HSE’s initiatives with particular priority sectors. We will undertake some exploratory analysis of a database of measurements from individuals in noisy industries and further explore the usefulness of this database in obtaining health information on **hand-arm vibration syndrome (HAV)** – **report due December 2016**. Further analyses of data will investigate noise-induced **hearing loss** and **HAV** to allow comparison between different occupations and job descriptions – **report due December 2016**.

We will collaborate with the European Agency for Safety and Health at Work (EU-OSHA) on their 2014 **European Survey of Enterprises on New and Emerging Risks (ESENER)**, to provide us with data on working conditions and the management of health and safety in UK workplaces – **report available in 2015**. There is also provision to undertake specific research on demand, in response to emerging issues.

HSE commissions economics research to inform the efficient use of resources, of both HSE and duty holders, in designing programmes, policies and projects. Topics planned over the next three years include:

- A valuation study of the impact of work-related injury and ill health on subjective wellbeing – Phase 1 completed in November 2014, currently subject to peer review. Phase 2 of the work will apply the methodology to other data sources to enable valuation of a broader range of injury and ill health conditions – **starting April 2015**
- A study to estimate the costs of occupational cancer in the UK. This expands the ‘Costs to Britain’ framework to estimate the costs to individuals, businesses and tax payers from current registrations of occupational cancer arising from past work conditions – **final report due mid 2015**
- Supporting a 3 year PhD project to estimate the monetary value of a life year in the UK for use in economic appraisals and impact assessments. This research will

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1 The figures and dates given for report delivery are based on the latest information and therefore subject to change.
inform considerations over whether a single value or suite of values is required, and how these should be applied – **starting autumn 2015**

We will also commission and use research and evidence, including social science research, to enhance our knowledge to support identification and delivery of HSE’s current and future priorities in the following areas:

- **Asbestos** – further analysis of asbestos lung burdens in young adults – **starting 2015**
- **Chronic Obstructive Pulmonary Disease (COPD)** – a large scale epidemiological study to establish the principal causes of COPD – estimate of current burden and initial assessment of causes of work related COPD - final assessment **February 2016**
- Methodological approaches to estimate the future burden of occupational cancer in UK – **proposals starting 2015**
- **Waste and Recycling** – occupational exposures, ill health and effective control procedures to manage risks - **report due mid 2016**
- **Ill health in construction** – first reports (e.g. paint, diesel engine exhaust emissions ‘DEEE’) from **end 2015**
- **Ill health in the chemical industry** – further research to understand the underlying causes of chemical exposure **starting 2015**
- Develop ‘CAREX’, an information system to gather occupational carcinogen exposure in GB – **first report by mid 2016**
- **Shift work** – conduct a major epidemiological study examining the relationship between major chronic disease (including cancer) and shift work - **report early 2016**
- Updating the evidence base for wood dust exposure risks in the construction and woodworking industries – **report end 2017**
- **Agriculture** - updating the evidence base for organic dust and bioaerosol exposure in the agricultural industry – **report end 2016**
- Take forward any HSE-led research requirements arising from the ‘Tackling Occupational Disease - Developing New Approaches’ stakeholder conference held in **March 2013**
- Commission a suite of projects on exposure to **isocyanates** – **first reports due mid 2015**
- Understanding use of and future applications for **collaborative robots** – **first report early 2015**
- **Asthma** – examine the socio-economic impact of work-aggravated asthma. Commission research to review occupational asthma in cleaners – **final report mid 2016**; investigate exposure control to respiratory allergens in the fish and shellfish industry – **starting 2015**
- **Pesticides** – a general health survey of pesticide applicators – **report spring 2015**. Pilot pesticide usage survey – **report spring 2015**

**Target and conduct inspections of those sectors and activities which give rise to the most serious risks or where risks are least well controlled**

We commission science to provide immediate and high quality support for our operational activities - investigations, inspections and enforcement activity. We will:

- Inspect where robust evidence and intelligence indicate health and safety performance is of serious concern and where inspection is the most effective intervention to secure compliance.
- Commission research requirements as identified in HSE’s sector strategies e.g;
  - development of a competency framework for supervisors and team leaders in roadside **waste and recycling** collection activities – **final report by end 2015**
  - **agriculture** –investigate the reliability of current guidance to reduce the number of hydrogen sulphide and slurry-related deaths and accidents in the UK – **starting 2015**
- Examine current exposures and work practices in the licensed asbestos removal industry – report by end 2016
- Review supervisor competence in managing musculo-skeletal disorders (MSD) in the poultry processing industry – starting 2015

Provide guidance and support to enable informed workplace health and safety decisions

We will commission and utilise scientific research, support and expertise to underpin our guidance and we will provide expertise to enable others to develop, produce and disseminate their own guidance and best practice. We will also fund research to encourage an increase in competence which will enable greater ownership and profiling of risk, thereby promoting sensible and proportionate risk management.

Specific projects include:
- **Construction** – evaluate the effectiveness of secondary guarding on mobile elevated work platforms (MEWPS) – starting 2015
- Develop a benchmarking tool for managing exposure to silica dust in quarries - by end 2015
- Develop practical cost-effective solutions for dust control in SME bakeries – report end 2016
- **Landlords’ gas safety duties** – research to look at levels of awareness and barriers to compliance amongst landlords in the private rental sector and ways in which we can influence this – Autumn 2015
- Provide scientific support for Agriculture Safety and Health Awareness Days – deliver support for ~ 20 events during 2015/16
- Work with other government departments to explore the development of a ‘Mindspace for Business’ toolkit using behavioural insights. This will outline the most effective ‘behavioural insight’ tools and approaches that Government can use to influence the actions of businesses towards regulatory compliance – on going
- **Ports industry** – research project examining safety leadership and workforce engagement – report March 2016
- Research into gas release during storage of wood pellets – report due early 2016
- **Wind turbines** – a review of construction, structural supports and foundations – report due July 2015
- **Metal working fluid (MWF)** – research to inform duty holder guidance on the safe use of biocides in MWF – report due December 2015
B. Provide an effective regulatory framework

Over the past three years HSE has undertaken an extensive review of health and safety regulations and has simplified the regulatory framework, making legislation easier to understand with the consequence that compliance levels should increase. Science and research will continue to be used to underpin how we do this. We will also continue to negotiate and secure the best possible outcome for British industry within Europe to minimise the burden on business and maintain protection for workers. HSE is alert to the implications for health and safety of new technologies and changes in the workplace and we seek to advise and inform so that the UK is well placed to capitalise on innovation without detriment to our mission to prevent death, injury and ill-health to those at work and those affected by work activities.

Simplify and consolidate domestic health and safety regulations to make the law easier to understand

- Unregulated biocidal products - identify currently unregulated products available in the UK to inform the future process for authorisation of biocides under the Biocides Products Regulations – starting 2015

- Improve the evidence base for impact assessment analysis: combining analytical approaches to ensure the assumptions used in impact assessments are as accurate and robust as possible – report due end 2015

Negotiate and secure the best possible outcome in Europe for the UK

We will provide underpinning scientific and technical evidence to contribute to the social dialogue process, proposals and negotiations on Directives and EU Regulations as required.

Taking the wider perspective

We will work collaboratively with a range of contractors and leading industries to investigate new hazards associated with emerging and expanding technologies. We also recognise that we need to do more to identify what new research will be needed to help identify future occupational disease priorities and how we design effective mechanisms for stakeholders to tackle these and current disease priorities. HSE has commissioned a dedicated ‘Foresight’ team in the Science Directorate to provide it with early intelligence about emerging new technologies and trends.

On-going science topics include:

Emerging energy technology: HSE will remain instrumental in ensuring the safe and efficient introduction of hydrogen fuel cell technology in the UK. In supporting the European ‘H2FC’ project, we will enable and facilitate the safe and efficient introduction of hydrogen and fuel cell technologies to the benefit of workers, the public, the environment, UK science and technology and business. HSE is involved in the H2FC work packages focusing on improvements to different fuel cell technologies, development of appropriate infrastructure and improved hydrogen storage solutions, and the development of software for risk assessment analysis of installations.

Renewable energy: Over the next decade and beyond the UK is set to take significant steps towards a new energy economy. From a health and safety perspective, the scale and speed of changes caused by the drive towards a new energy economy will pose a significant challenge. HSE’s current research in this area focuses on further enhancing our knowledge of the renewable energy sector and its possible future directions in the next 3-5 years, to ensure that our approaches for regulating this sector remain robust and
coordinate effectively with those of other European Member States and the wider international arena.

Complexity science: Research to look at the feasibility of estimating impacts of HSE’s interventions through complexity science. This work will look at the feasibility of using complexity framework and computational modelling approaches to understand and, where possible, estimate the impact of HSE on health and safety behaviour, given that intervention seldom impacts in a precise and linear way in complex systems such as the health and safety system. The research will be most useful in informing decision-making and building understanding of how HSE impacts on behaviour. This is an area of science being explored by other Government departments and HSE analysts are collaborating with counterparts.

Nanotechnology: Work over will focus on exposure and the control of exposure in the workplace to manufactured nanomaterials. Future research commitment will concentrate on conducting research to identify the numbers of workers exposed to nanomaterials in UK industry.

Strategic Research Programmes (SRP): Three long term (up to 5 years) SRP are on-going within the Science Directorate focusing on:

- **Health surveillance and health impact assessment** – this SRP will develop quantitative methodologies and an accompanying evidence base to allow effective intervention strategies to be planned, implemented and evaluated for long latency diseases such as COPD, asthma and silicosis. The work will develop, pilot and evaluate the effectiveness of health surveillance tools in UK workplaces.
- **Exposure and response profiling** – this SRP will improve HSE’s intelligence of, and response to, emerging workplace health issues in an environment of constrained resources.
- **Mathematical modelling** – this SRP includes projects to develop dense gas dispersion modelling and the integration of Quantified Risk Assessment (QRA) in Geographical Information Systems (GIS) which will be used to support delivery of work in hazardous industries.
- ‘Advanced manufacturing and new emerging materials’ – this SRP is investigating the integrity of new materials and where their use in manufacturing is a risk to occupational health and safety.

Reports on all SRPs produced quarterly and publications in peer-reviewed journals.
C. Secure compliance with the law

Firm, properly targeted and proportionate enforcement underpins the action we need to take to deliver a sustainable, long-term reduction in occupational injury and ill-health. Of the thousands of inspections and investigations each year, a significant proportion require particular science or engineering knowledge to identify the causes of problems and to identify solutions which meet the key criteria of being reasonable and practicable.

Investigate work related accidents, incidents and ill health and take formal enforcement action to prevent harm and secure justice where appropriate.

We have specialists from over 20 disciplines that provide expert technical knowledge in support of investigations. This corporate expertise and knowledge, and the facilities available within our Science Directorate, are unparalleled and it means that our inspectors can call on immediate support at any time.

Our continuing science and engineering requirements are:

- Maintaining and developing capability (equipment and facilities) and staff expertise for a range of core scientific disciplines necessary to support incident investigation and other mandatory activity associated with all industries and sectors regulated by HSE (and Local Authorities).
- Maintaining provision of timely/immediate technical support to investigate incident investigations, anywhere in the UK.
- Learning and disseminating lessons learned from incident investigation.

All provided within agreed timescales

Types of technical work that support investigations and which are retained on a regular basis include:

- Evidence management and archiving of incident material – including transport and secure storage of large pieces of equipment.
- Evidence presentation. HSE’s experts provide high quality evidence for presentation in court cases. This is supported by the provision of excellent animations and physical models that make the evidence more understandable by the courts and lay people.
- Statutory schemes. Support for the Explosives Notified Board under the EU pyrotechnic articles directive. Support to HSE as the Competent Authority for work on biocides, pesticides and the REACH programme.
- Maintenance and calibration of instruments and equipment to support field activities.
- Provision of photographic services – including video, aerial photography, CCTV decoding etc.
- Access to data including GIS and mapping facilities, Ordnance Survey maps.
- The ability to buy in expertise not present in-house at short notice (in unusual disciplines).
- Technical support for targeting and intelligence.

All provided within agreed timescales.
D. Reduce the likelihood of low-frequency, high-impact catastrophic incidents

HSE’s function as an effective regulator of major hazard and specialist industries (including offshore and onshore petrochemicals and chemicals, gas and pipelines, facilities handling human and animal pathogens, explosives and mines), requires a high degree of expertise and experience. For each industry sector there is a requirement for specific scientific and engineering competencies to enable us to meet our regulatory objectives. These are met by HSE’s own staff but also through the commissioning of appropriate practical support from external contractors.

Provide scientific and technical advice in relation to the Control of Major Accident Hazards (COMAH) Regulations

The main aim of the COMAH Regulations is to prevent and mitigate the effects of major accidents involving dangerous substances, such as chlorine, liquefied petroleum gas, explosives and arsenic pentoxide, which can cause serious damage/harm to people and/or the environment.

Scientific support includes:

- **Technical contributions** to the assessment of complex Safety Reports submitted by operators under the COMAH regime - support provided within agreed timescales
- An operational intelligence project which will collect, collate and analyse information from a variety of sources to make recommendations to the Competent Authority Intelligence Review Group (CAIRG) on priorities for effective regulation of COMAH sites. This will feed into prioritisation of objectives (operational and science) by the COMAH Competent Authority – annual reports to CAIRG on regulatory performance and trends published in the autumn
- A project to estimate the environmental costs of major accidents in collaboration with the Environment Agency – report due end 2016
- A scoping literature review of methods for quantifying the likelihood of major accidents occurring and the influence thereon of various factors - starting March 2015

Provide scientific and technical advice in relation to land use planning

HSE is a statutory consultee for land use planning (LUP) applications around major hazard sites and pipelines. HSE’s LUP advice is aimed at mitigating the effects of a major accident on the population around a major hazard site.

Scientific support includes:

- Support for delivery of 3-zone maps and LUP advice; utilising skills of the Science Directorate GIS team to enhance the support to Local Planning Authorities and site developers using PADHI+ (Planning Advice for Developments near Hazardous Installations) and the information available to them on the LUP extranet - support provided within agreed timescales and in line with Government’s expectations for responding to applications
- Support to LUP policy and strategy development, for example development work to support assessment of societal risk presented by major hazard sites, and assessment of models for management of Hazardous Substance consents, with other Government Departments – ongoing support provided within agreed timescales
• Scoping study to assess available data and potential methods for an estimation of the economic impact of proximity to major accident hazard sites on property prices. If successful, this initial project should enable a fuller assessment of economic impacts to be taken into account in the land use planning process – report due autumn 2015

• Specific advice and intelligence from our Science Directorate to frontline inspectors on failure rates at Major Hazard sites and technical support to develop LUP methodologies. These include the development of dispersion models and methodologies to predict behaviour for specific substances and/or conditions – ongoing technical support provided by agreed timescales to update methodologies

Provide scientific and technical advice in relation to offshore and specialised industries

Key priority areas for the offshore industry are: taking forward leadership, emphasising major hazard potential risks associated with poor asset integrity; and promoting a safety culture that encourages the active involvement of the offshore workforce, as a driving force for improvement. Specialised industry sectors (e.g. mines, biological agents, explosives and gas and pipelines) can vary greatly in terms of maturity and complexity, and also the size, distribution and resources of duty holders. This results in some very diverse needs from the science plan. Much of the work is commissioned under ‘call-off’ arrangement when required operationally. All provided within agreed timescales

Projects include:

• Science Directorate support for delivery of major hazard objectives with regard to Safety Case assessment under the Offshore Regulations - support for up to 100 cases provided within agreed timescales and in line with Government’s expectations for responding to assessments

• Specific technical support in response to a wide variety of specific technical and engineering problems identified in the areas of fire and explosion, structural integrity, corrosion/fatigue failure and emergency response procedures – e.g. composites degradation - report due end 2015; bolting corrosion – report due end 2016; stress corrosion cracking – first report due 2017; valve degradation – report due March 2016

• An investigation of degradation of underground polyethylene pipework for LPG conveyance – proposals starting 2015

• Participation in joint industry and European projects on Carbon capture and storage - reports due to mid 2015

• Identification of a tool to measure situational awareness in process safety industries – report end 2016; Development of a methodology for the evaluation of workload in process safety industries – initial report due May 2015

• Support for future policy and strategy development in biological agents sector e.g. evaluation of new and emerging bio-technologies; development of safety performance indicators for biological agents industries - technical support provided within agreed timescales, development of a rapid detection method for Legionella - report by end 2015
How we will use our resources and funding

HSE’s mainstream budget for commissioned research and technical support for 2015/16 is approximately £25 million; this excludes funding for the research portfolio for pesticides that is funded by DEFRA.

We will continue to publish an annual science report on our website which covers the use, efficiency and effectiveness of HSE’s investment in research and technical support commissioned from our Science Directorate and external contractors. We will continue to publish research findings in HSE’s freely available research report series and more of our peer-reviewed articles will be published in open access journals; for 2015/16 the estimated numbers are ~50 for occupational health and ~15 each for occupational safety and major hazards topics.

We will develop and seek to implement an approach to identify commercial opportunities with industry and governments and public bodies within and outside the UK where they are willing to pay for our intellectual property and expertise. We will implement the strategy to enable our Science Directorate to deliver growth in external revenues and sustained profitability, whilst maintaining the quality and responsiveness of its service delivery to HSE.

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