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## **SCIENCE REPORT 2009**

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### **Issue**

1. The HSE Board has asked for an annual Science Report to examine the use, efficiency and effectiveness of our investments in science

### **Recommendation**

2. The Senior Management Team is asked to:
  - i. Note the Science Report and
  - ii. Comment on its contents and identify additional points, particularly on the impact of scientific evidence in delivering HSE's strategy.

### **Timing**

3. SMT members are asked to give comments today. The report is due to go to the HSE Board for their meeting on 25<sup>th</sup> February 2009.

### **Summary**

4. The Science Report is in the annex. It examines and outlines:
  - How HSE uses science and research in its work, what applied research has been done and how results are used;
  - How HSE is conducting its science work following MBUS (Making Best Use of Science);
  - How HSE gets better value and outputs from this science and research work; and
  - The approach to the next Science Strategy and Science Plan.

### **Background**

5. The Mainstream Research budget in 2008/09 is ~ £36.3m. In addition, about 1000 staff use their skills in science, technology, engineering or analysis as a key input to their work for HSE.<sup>1</sup>

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<sup>1</sup> There are separate funding arrangements for research for Nuclear Directorate and Pesticides Safety Directorate. These data are not included in the report.

6. Until recently, the quarterly performance report included assessments of progress in science and research. This Science Report now addresses these matters on an annual basis, and is the first of these reports.

### **Argument**

7. The Science Plan for 2008/09 is based pragmatically on ongoing needs stated in business cases approved by programme directors. Funding was allocated from the mainstream research budget to meet reactive support requirements in full, to complete the Local Authorities' S&T programme and to increase major hazards work. Delivery of the changes in this year's Science Plan has been affected by the ability of suppliers to align themselves at short notice to changed priorities.
8. During 2008, CSAG applied the MBUS recommendation that business need drives HSE's research. Work started on aligning priorities in science planning to meet HSE's DSO targets. Senior managers, scientists, specialists, policy staff and external specialists worked from early 2008 to establish a Science Plan - including research for the medium to longer term. However, the SMT Science Sub Group decided in October 2008 that work on the Science Plan should be reworked in line with the emerging HSE Strategy and should be issued after the HSE Strategy is completed in 2009.
9. A lesson learned when the previous HSE Strategy was implemented is that the time taken to realign HSE's activities caused a knock-on effect in delaying the development of science plans and commissioning and completing new research. To avoid any hiatus as HSE develops delivery arrangements for the new HSE Strategy, the Science Plan for 2009/10 will focus on stated business need – as in 2008/09 - and funding allocated accordingly.
10. During this work on the 09/10 Science Plan, Science Business Partners have a number of proposals for new strategic research and support which will put pressure on the mainstream extramural research budget. CSAG will seek additional funding when developing HSE's business plan for 2009/10.
11. The Science Report summarises how performance is being managed and demonstrated. This includes governance arrangements and controls on developing requirements within HSE.
12. The report also examines the effectiveness of investment in support and research including peer reviews of proposals and published outputs. While HSE can demonstrate the value of small-scale research projects, more work could be done to demonstrate the longer-term usefulness of support and research to delivering HSE's objectives.
13. The report examines how the quality of scientific work is demonstrated. For example, the CSA is proposing to conduct a rolling programme of science reviews at HSL with assistance from external specialists and academics.
14. SMT's views are sought
  - on what more can be done to demonstrate the impact and effectiveness of our investments
  - on any other points they wish to draw to the Board's attention

## **Consultation**

15. Consultation has taken place with science business partners in FOD, HID, CSAG, PG, LAU and ND.

## **Action**

16. Subject to SMT approval:

- i. The Science Report will be updated for the HSE Board meeting on 25 February 2009.

## Science Report 2009

### 1. Introduction

1.1 This is the annual update on HSE's use of commissioned science in support of its business activities<sup>2</sup>. It describes progress made following the Making Best Use of Science (MBUS) internal review.

1.2 It has four sections:

- Background information on HSE's scientific requirements;
- Overview of the value of science commissioned in 2008/09 (and earlier);
- Planning arrangements for 2009/10;
- Next steps to support the new HSE Board Strategy

### 2. Background

2.1 HSE commissions scientific support and applied research to:

- support HSE's operational work – especially forensic work for inspections, investigations and enforcement as well as technical support e.g. for land use planning advice;
- acquire evidence to develop new ideas and knowledge about occupational safety and health;
- apply new ideas and knowledge to new regulations, policies, guidance, standards, inspections, enforcement methods etc; and
- evaluate and disseminate the new knowledge and results of this work.

2.2 HSE's core requirement is scientific, technological and engineering support for regulatory and operational work - called reactive support and planned support. This support work accounts for about 2/3 of HSE's science expenditure.

2.3 HSE also commissions and publishes research in compliance with the Health and Safety at Work etc. Act 1974. Approximately half of the research is commissioned from HSL: the remainder including most of our opinion-based surveys is commissioned from other organisations.

2.4 HSE commissions applied research from HSL since this original work helps to maintain HSL's expertise in operational support work. It also enhances HSL's scientific reputation through the continued publication of original work in the peer reviewed scientific literature.

2.5 Apart from Futures Work (including Horizon Scanning), HSE commissions little basic research or blue-skies thinking. Futures Work identifies emerging trends and technologies that HSE may need to address over the next 10 years or so.

2.6 Commissioned work is managed in four main science programmes. For the last two years, these have corresponded to main business areas in the HSE Business Plan:

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<sup>2</sup> This report excludes consideration of science commissioned by the Nuclear Directorate, which has separate funding arrangements, and the Pesticides Safety Directorate, which has funding arrangements with DEFRA for its research.

- Justice - covering technical support for HSE's inspection, investigation and enforcement work. It includes a small number of projects. It currently includes resource to develop and maintain capability at HSL;
- Conventional Health and Safety – mainly research that supports the development and delivery of policy initiatives and operational interventions;
- Major Hazards – covering projects that support HSE's work in the major hazards sectors: offshore and onshore, mines, explosives and biological agents
- Corporate – covering projects with a longer term perspective, and important work not managed in the other programmes

2.7 In addition, HSE is spending smaller amounts in:

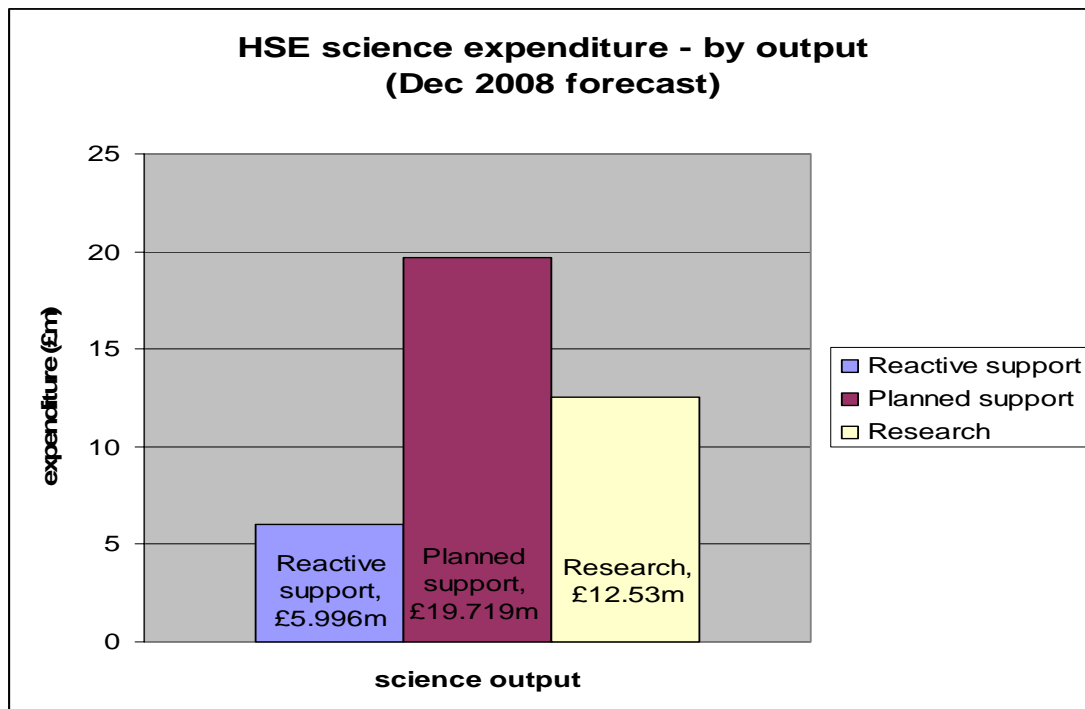
- Local Authorities' S&T initiative – which will cease in March 2009 when the LAs' requirements for support and research will be reallocated to other programmes; and
- Investment Research Programme – to enable HSL to research ideas of potential marketable value to future external customers and HSE.

2.8 Each programme produces an annual plan that identifies forward commitments and new projects to be commissioned in year. Currently, the plans are pragmatic, based on the Science Strategy 05/08 and on the science required to meet programme directors' ongoing needs. Proposals for new work are described in business cases that are subject to approval by programme directors.

2.9 In 2008/09, HSE plans to spend £29.79m from the science budget with HSL and £6.5m with other suppliers. HSE is currently planning to spend the same amounts in 09/10 and 10/11. There is upward pressure on extramural research, which will materialise in higher bids, particularly in 10/11.

### **3. Overview of science in 2008/09 and earlier**

3.1 So far, in 2008/09, the programmes have commissioned ~ 150 new main projects in addition to a range of small-scale support projects and reactive support. Scientific and technical support for operational activities accounts for ~ 2/3 of HSE's science spending, and meets relatively short term or immediate needs. Support work generally involves using existing information whereas applied research generates original information. The following chart provides the distribution of estimated spend between research and scientific and technical support at HSL.



## 3.2 Reactive Support

3.2.1 HSE requires immediate support for investigations and major incidents. This is classified as 'reactive support'<sup>3</sup>. In 2008/09 HSE expects to commission ~ £6m of reactive support, principally from HSL.

3.2.2 A wide variety of scientific disciplines is essential to provide a responsive and expert service, although the capabilities and capacity can fluctuate from year to year, depending on the types and number of incidents and investigations.

3.2.3 HSL has expertise and capacity in the following disciplines: engineering, explosion, fire and process safety, occupational hygiene, risk science, ergonomics, work psychology, health exposures, personal safety, mathematical sciences, analytical work, evidence management, mapping.

3.2.4 There are further core topic areas that HSE commissions from other providers where HSL has limited or no expertise for example radiation protection, aspects of offshore work and nuclear specialisms.

3.2.5 Since the requirement for reactive support can increase significantly following a major incident, science budgets are allocated to Main Budget Holders with the proviso that reactive support be fully funded. For example, the Buncefield investigation required ~£2m, which was made available by transferring funding and staff from other projects.

<sup>3</sup> Support is classified as 'reactive' if it used to:

- investigate a specific incident, or accident, and any subsequent enforcement activity;
- investigate local issues and matters of evident concern identified at inspections of particular factories/premises, and
- answer specific questions about HSE's policies e.g. PQs on sheep dips/FOI etc.

### 3.3 Planned support

3.3.1 Planned support includes a range of activities to deliver HSE's requirements, principally operational and policy projects and developing capability. Most is supplied by HSL. The Major Hazards Programme defines over 90% of its requirements as operational or regulatory support. Planned support includes:

- Work to assimilate information and knowledge (through research, statistical analysis, attendance at professional events etc.) and make it available to HSE to develop early thinking on policy formulation, work planning, focusing customer contacts etc.;
- Technical, social and economic advice for any topic area that falls under HSE's remit e.g. during negotiations and delivery of legislation;
- Test method development;
- Representational role at technical meetings;
- Production of draft Approved Codes of Practice, sector guidance, guidance on the interpretation or application of legislation; and
- Advice to the general public on scientific issues relating to health and safety

3.3.2 Specific examples of work contracted in 2008/09 are:

- Revision of HID's planning case assessment guide and support.
- Risk assessment methodologies and models
- Call off arrangements for the MusculoSkeletal Disease Programme
- Support for HSE's REACH and biocides competent authority functions.

### 3.4 Research

3.4.1 HSE commissions ~ £12.5m of research, contracting about half of this with other organisations, generally in areas where HSL has limited or no capability and where open competition stimulates thinking and value for money. This annual amount has declined by ~ £8m following completion of the HSL PFI deal in 2004/05.

3.4.2 Examples of research commissioned in 2008/09 are:

Conventional health and safety programme:

- Assessment of exposure to carcinogens and asthmagens in the contract import, processing and repackaging industries (£135k)
- Contamination of water based metal working fluids – as it relates to respiratory ill health (£278k)
- Biological monitoring in surface engineering (£710k – over 3 yrs)
- Validation of the work related Stress Management Standards Indicator tool (£130k)
- Wind loading on luffing cranes (£250k)
- Applying behaviour change / worker engagement to small and medium construction companies (£135k)
- Accidents, ill-health and lost time among construction workers – follow-up survey (£150k)
- Evaluation of Moving Goods safely programme (£200k)
- Flooring slip resistance – developing solutions (£200k)
- Footwear slip resistance – developing solutions (£250k)
- Developing the evidence base of high risk noise and hand-arm vibration industries and identification of activities for interventions (£150k)
- Pneumatic and internal combustion tools vibration emission test codes (£498k to 2011)
- Suitability of supplier information on noise risks and noise emission values for workplace risk assessment (£100k)

Major hazards programme:

- Carbon sequestration processing risks (£100k )
- Support for government policy on societal risk (£450k)
- Raising situational awareness of safety barriers for the prevention of accidents (£150k)
- Human factors in containments level 4 facilities (£100k)
- Ageing Plant (£300k)
- Formation of flammable mists offshore – Joint industry project – HSE contribution £50k)

Corporate programme:

- The relationship between shift work and disease (£520k – to 2011)
- Evaluation of the HSE – Local Authorities partnership (£95k)
- Hydrogen venting (£280k)
- The Health and Occupation reporting network (THOR) (£1.8m from 2008 – 2012)
- Questions on ill health and injuries in the 2009 Labour Force Survey (£220k )
- Electrostatic hazards associated with refuelling with fuel blends (a Joint industry project - HSE contribution (£100k)
- Investigation into the explosion mechanism following the Buncefield incident - a Joint industry project (HSE contribution £150k–£200k)
- iNTeg-Risk - Early recognition, monitoring and integrated management of emerging new technology related risks - a joint industry project (HSE contribution ~ £400k)
- Investigation of water spray barriers for smoke control in tunnelling (£163k)

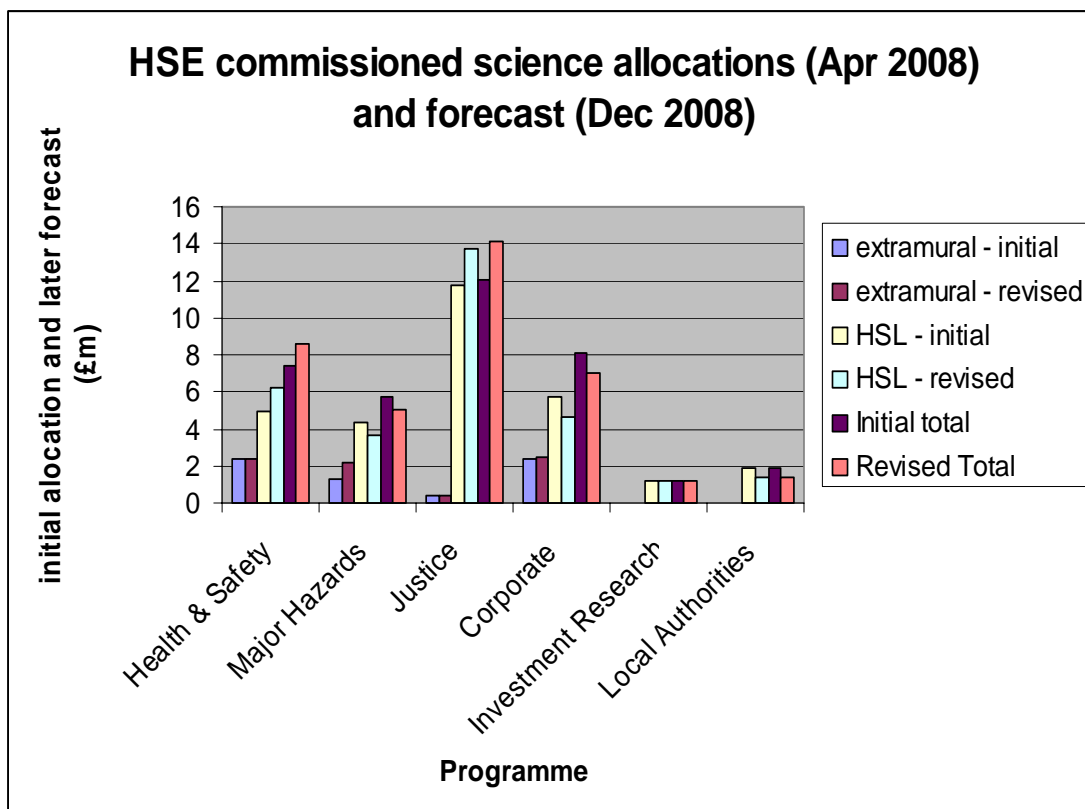
### **3.5 Financing science in 2008/09**

3.5.1 The Making Best Use of Science (MBUS) project recommended that from April 2008 the budgets allocated to programmes should be delegated to main budget holders. Budgets are managed by the programmes rather than centrally by the Chief Scientific Adviser as before.

3.5.2 Programme Directors' bids for 2008/09 exceeded the budget by ~ 10% for extramural funding and ~30% for work with HSL. Funding was prioritised and allocated from the science and technology budget to preserve the forward commitment to continue research already in progress, meet reactive support requirements in full, to complete the Local Authorities' S&T initiative and to increase major hazards work.

3.5.3 There have been pressures, new and changed requirements and delays that required reallocation of resource between programmes. For example, the Major Hazards Programme was allocated additional extramural funding to meet new Board objectives.

3.5.4 The initial allocations of the science budget between the programmes in April 2008 and the revised forecasts at December 2008 are presented in the following chart.



3.5.5 The science plans required HSL to respond at short notice to a markedly increased demand for Major Hazards work compared with 2007/08 (approximately double the 2007/08 figure) and to complete the requirements of the LA Science and Technology Initiative. The forecasts provided by HSL in December 2008 reflect HSL's capacity and capability. These show that, whilst real progress has been made to respond to HSE's requirements, there continue to be areas where demand exceeds delivery.

### 3.6 The use and value of science commissioned or completed in 2008/09

3.6.1 The timescale to commission, report on research and evaluate its impact means that benefits accruing from the research findings can take some time to realise. In this section, there are some examples of work completed in year plus observations on science that has contributed to delivery of the Fit3 programme. There is a short analysis of information provided by technical customers on completion of projects.

3.6.2 There have been some notable achievements where previous years' research is having an impact. For example:

#### Delivery of the Fit3 programme (Conventional Health and Safety)

- The major surveys (questions in the Labour Force Survey and THOR) provide HSE with the evidence base on the number and nature of work related injuries and diseases.
- There is a continuing programme to develop the evidence base on long latency diseases including occupational cancers, chronic obstructive pulmonary disease, caused or made worse by occupation and noise induced hearing loss. In 2008, the emphasis was on effective use of controls, developing leading indicators and collecting incidence and prevalence data in specific sectors such as the construction and the waste/recycling industries.
- HSE has a sound understanding of the causes and controls for some hazards and types of occupational ill health such as slips and occupational asthma, and have developed

tools to assist in the management of them. HSE is now looking to understand how to get industry to apply the solutions more effectively.

- HSE has evaluated a number of major interventions and continues to work to draw together lessons learned from these.
- HSE has continued research to develop tools to help prevent musculoskeletal disease and COPD.

### 3.6.3 Examples of work completed in year include:

#### Major Hazards Programme

- Research into optimising hazard management by workforce engagement and supervision is being used by industry.
- Several projects that draw together issues about underground storage of natural gas and the implications for the development of risk assessment
- Evaluation of the effectiveness of Non Destructive Testing screening methods for in-service inspection.
- Opportunity Cost Methodology applied to Land Use Planning Restrictions - Peer Review

#### Local Authorities S&T Initiative

- The Web-based toolkit - managing work-related violence in licensed and retail premises has been widely publicised through HSE and the LACORS.

#### Corporate Programme

- The evaluation of directors' awareness of the Institute of Directors/HSE guidance is due to report and represents the first part of a two-stage evaluation – the second part being the assessment of the impact of measures taken on the leadership behaviour of directors.
- Work on high pressure hydrogen releases is leading to a rethink of the safety of hydrogen dispensers.
- Research commissioned from University College London into the assessment of the mutagenic frequency of retroviral and lentiviral vector systems has been published in arguably the most prestigious peer reviewed virology journal. The results are being used to support amendments to HSE's guidance on the use of lentiviruses in research.
- A joint project between the Health Protection Agency and HSE to investigate factors affecting the likelihood of legionella pneumophilia causing disease
- The development of Trojan Horse health and safety messaging has been taken forward by industry, especially by the construction industry in Olympics work.

## 3.7 Project Utilisation

3.7.1 The main source of information on utilisation of results of projects comes from technical customers. They are required to comment on how well a project met its objectives, how the results are being used and to make a judgement on the quality of the work and its delivery to time and budget.

3.7.2 For all programmes, about 90% of reports submitted by technical customers describe the scientific quality and the contract management to be good or excellent.

3.7.3 Reports from technical customers for projects contracted in 2007 -2008 show that they judged 77% of projects were completed to time and cost. In comparison, reports about projects contracted in earlier years show that they considered 46% of projects were completed to time and cost.

3.7.4 This science report reviews the value of projects that were contracted in 2007-08, the first full year in which science planning and commissioning took account of MBUS recommendations. The timescale for commissioning through to reporting and evaluation of science projects means that there is a delay in determining the impact of this work. The data in the table below confirm that only a proportion of the work commissioned in year also report in year.

3.7.5 The drawback with existing information sources on research utilisation is that they provide for interpretation at project-level rather than programme level. They do not take account of the higher-level view from the Programme Director or Major Budget Holder, and there would be merit in adopting a broader approach.

<b>Programme</b>	<b>Number of new projects contracted</b>	<b>Value of new projects contracted</b>	<b>Number/cost of projects completed</b>	<b>Number of utilisation forms returned/value</b>
<b>Corporate</b>	34	£5059k	19 /£1661k	13/£1185k
<b>Fit3</b>	59	£7297k	20/£2770k	8/£850K
<b>Justice</b>	25	£15,900k	2/£132k	1/£42k
<b>Major Hazards</b>	30	£2190k	6/£219k	4/£175k
<b>TOTAL</b>	148	£30,446k	47/£4780k	26/£2252k

3.7.6 The Justice programme comprises operational support work that has been drawn into larger 2 – 3year blocks to facilitate access. The programme has few one off projects. Utilisation information on one project showed this provided information to enable HSE to take operational decisions about the applicability of new air monitoring software.

3.7.7 In 2008 - 2009, the Justice Programme has evaluated all recent reactive support work and concluded that approximately 90% of work commissioned from HSL had provided direct support to regulatory activity.

3.7.8 After 1 April 2009 following changes in procurement systems, reactive support work will be evaluated on a 3-year sample basis to check that the current criteria are still correct.

3.7.9 The Major Hazards Programme contracted projects in 2007/08 that supported offshore operational activity, HSE's societal risk commitments or contributed to joint industry projects.

3.7.10 In 2007/08, the Corporate programme managed research projects that contributed to HSE, wider government and EU policy making and evaluation. This included work on electromagnetic fields (EMF) measurement uncertainty, the impact of regulatory uncertainty on productivity, the relationship between health and economic growth, the effect of regulation on compliance, the quality of working life, HSE's contribution to the DCLG evaluation of the National Process Improvement Project. The programme also managed support contracts with HSL, including those for project specification and horizon scanning.

3.7.11 In 2007/2008, a large proportion of the science completed for the Fit3 programme addressed work to inform delivery of the programme such as support to programme delivery and tracking surveys. Other work covers the evidence base for musculoskeletal disorders, including work to inform decisions on appropriate interventions.

#### **4. Planning for 2009 – 2010**

4.1 Work to revise the 2005 – 2008 Science Strategy has been deferred until the HSE Strategy has been finalised. Nevertheless, the three themes of the existing Science Strategy continue to provide an indicative framework for the future.<sup>4</sup>

4.2 Until the new Science Strategy is ready, Programme Directors have been advised to plan their science requirements on a 'business as usual' approach, concentrating on key business areas.

4.3 It was originally intended that science planning for 2009 onwards would follow the MBUS recommendation for a 3-year rolling plan driven by corporate business need and subject to challenge and review in a more open debate. The move away from annual plans was intended to facilitate long term planning and avoid end of year 'cliff edges'. Three year plans were also seen as helping to redress the balance between the urgent support requirements that can dominate our use of the science budget at the expense of important longer term research questions.

4.4 A successful pilot for a new planning process was undertaken in 2007 and extended to science planning in 2008. The first phase, completed July 2008, brought together representatives from policy, programmes, HSL scientists, academia and stakeholders and used a backcasting technique to identify a wide range of ideas for research to deliver business objectives and fill gaps in scientific evidence.

4.5 The outputs of these workshops formed part of a draft discussion document on longer-term research requirements that was presented to the Science Subgroup in October 2008. The Subgroup advised that this document should be aligned with emerging Board strategy before further consultation. Consequently, the timetable for introducing a 3-year rolling science plan has been extended to ensure that the first year of the rolling programme fully supports the new HSE Strategy.

4.6 As a consequence, the 2009/2010 science plan is being developed along similar pragmatic lines to the previous year's plan. Detailed draft plans are expected in early 2009.

## **5. Next steps**

5.1 This section describes work in progress and ideas for further improvements to HSE's science.

### **5.2 Optimising the balance between support and research.**

5.2.1 Most of the commissioned science budget is devoted to operational support and relatively short-term science initiatives.

5.2.2 Work to develop HSE's longer-term research agenda has been initiated by the Chief Scientific Advisor, who is organising a number of workshops with invited academics and experts. Topics to be addressed are:

- demonstrating the impact of HSE
- developing and using appropriate data sources

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<sup>4</sup> 3 key themes of the Science Strategy 2005 - 2008

- Supporting delivery of the Strategy and Public Service Agreement targets
- Supporting front line regulatory functions (e.g. incident investigation)
- Looking ahead to identify and meet future challenges.

5.2.3 The results of the first workshop are due to be reported soon: the second workshop will take place in February. The Chief Scientific Adviser will present the emerging findings of these workshops to SMT for consideration of how new work will enable delivery of the HSE Strategy and with a proposal for appropriate funding to support key projects and begin work in 2009.

5.2.4 Other research initiatives to support the strategy include

- A review of requirements for surveys
- New research into the economics of regulation.

### **5.3 Governance and efficiency**

5.3.1 The Chief Scientific Adviser's Group (CSAG) and HSL are undertaking a number of projects to review the management of support and produce options for streamlining delivery in 2009/10. These include:

- a review of the Core Activity Programmes within the Justice Programme – recommendations to be available February 2009
- A review of HSE's core requirements from HSL - recommendations to be available February 2009 within the study of the governance of HSL.

5.3.2 The emerging findings indicate that a redistribution of responsibilities and budgets may be appropriate for 2009/10. This proposal would be subject to consultation with operational Directors. The value of work under consideration is ~ £2m.

### **5.4 Enhanced peer review**

5.4.1 Proposals to improve and extend how HSE assesses the quality of work provided for include:

- increased use of invited experts to workshops to debate research programmes and projects
- proposals for annual science conference
- Introduction of a 4-year rolling science review programme for HSL, incorporating external input from leading academics. The first review will be lead by Professor Sir Anthony Newman Taylor, and includes the Centre for Workplace Health, clinical measurement, epidemiology and related mathematical modelling.
- actions to increase the proportion of commissioned work that is published in peer reviewed journals.

### **5.5 Improved communication of research evidence**

5.5.1 HSE has an open publication policy with regard to research reports and we are increasingly looking at appropriate publication options for support projects. This is to discharge a statutory duty to share lessons with the wider health and safety community. It also has the benefit of demonstrating HSL's research capability to the worldwide scientific community, and helps manage reputation.

5.5.2 The Canadian Health Services Research Foundation has developed a simplified practical format for making research findings digestible to policy/decision makers that has been adopted in the UK by the Government Social Researchers and others. It assists the dissemination and uptake of research that provides evidence for strategic thinking, policy makers and scientists. HSE is beginning to pilot and promote this approach.

## **5.6 Summary**

While HSE will ensure that support for inspection, investigation and enforcement continues, pressure to get better value from research will grow. Attention will be given to

- Strengthening the link between science planning and delivering the HSE Strategy;
- Giving more attention to Futures Work and emerging trends that HSE would need to address;
- Demonstrating the value and impact of our work, especially in managing and exploiting the knowledge HSE acquires.