



HSC Science Strategy 2005 – 2008

- **Gathering Evidence**
- **Developing Understanding**
- **Identifying Solutions**

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Gathering Evidence; Developing Understanding; Identifying Solutions

Preface by Chair of the Health and Safety Commission

In February 2004, the Commission published the new HSC Strategy, *A Strategy for Workplace Health and Safety in Great Britain to 2010 and beyond*.

The strategy has committed the Commission and HSE, working with Local Authorities, to build on past success in industrial safety by opening a new front to bring about equally substantial improvements to occupational health, to develop partnerships with other authorities and hard to reach organisations, and to bring the benefits of good occupational health and safety practice to people working in economic sectors overseen by Local Authorities. This HSC Science Strategy sets out how HSE will apply science to the delivery of this commitment and to the realisation of our targets.

Properly targeted expenditure on research for policymaking and operational support offers exceptionally good value for money. It provides solid evidence for policy development and delivery and for operational activities; it can prevent flawed policies and initiatives from proceeding and money being wasted.

I would like to extend my thanks to all those who have submitted helpful comments during consultation on this science strategy. The draft strategy has been amended in the light of this consultation and now reflects the views of our partners in the health and safety community.

Bill Callaghan

HSC Science Strategy 2005 - 2008

Gathering Evidence; Developing Understanding; Identifying Solutions

Foreword by the Chief Scientist

The application of science and engineering knowledge has always been a key component in delivering HSE's mission. HSE uses its scientists, engineers and the research it funds to understand problems and develop effective practical solutions for a wide range of workplaces, from the complex technologies used in major industrial sectors, (e.g. nuclear and chemical industries) through to the problems faced by individual workers, (e.g. falling from heights and stress). Science and engineering provides HSE with evidence on the causes of ill-health and incidents in the workplace; it influences where our priorities lie; and it contributes to developing solutions to control a range of workplace risks.

In February 2004, the Health and Safety Commission published '*A strategy for workplace health and safety in Great Britain to 2010 and beyond*'. This strategy aims to tackle the challenge of making health and safety risk management relevant to the modern and changing world. It does this by concentrating on four strategic themes, including a greater focus on occupational health issues and increasing involvement with stakeholders. The strategy is for the whole of the GB health and safety system. HSE will deliver its contribution through Strategic Programmes, which will help focus our efforts where they will have most impact.

HSE's science and engineering resources will make a critical contribution to this work. This strategy describes the principles HSE applies in the use of science and sets out how HSE plans to use its science and engineering resources to address the challenge of delivering the new HSC Strategy.

This science strategy will develop as circumstances and our understanding change. As such, it will be a 'living' document to be refined and updated. I would be pleased to receive comments on our approach or progress at any time.

Paul Davies
Chief Scientist

Executive Summary

Introduction

The application of science and engineering/technology plays a vital part in achieving the Health and Safety Commission's (HSC's) vision – 'to gain recognition of health and safety as a cornerstone of a civilised society and, with that, to achieve a record of workplace health and safety that leads the world'. This Science Strategy 2005-08 sets out how HSE will apply science and engineering to provide a sound evidence base to help deliver the HSC's vision and mission to protect people's health and safety by ensuring that risks in the changing workplace are properly controlled.

HSE has a strong science base and we are committed to maintaining and strengthening this capacity to meet the needs of a changing society. We already have a large cadre of well-qualified scientists and engineers, many of whom have achieved national and international recognition in their chosen professions. Over the next 3 years we will continue to strengthen our capability in the behavioural and social sciences, economics and statistics.

The current commissioned science research and support budget is approximately £37 million and will be maintained for the next three years. A significant proportion of this budget is spent with the Health and Safety Laboratory (HSL), an in-house agency of HSE. The HSL has recently concentrated its activities in new state-of-the-art laboratory facilities at its Buxton site. Together HSE and HSL have a wealth of scientific expertise and resource to develop practical solutions to improve health and safety. This Science Strategy sets out how we will use this resource more flexibly and efficiently to meet the new health and safety challenges posed by the UK's changing workforce and workplace.

1 Key Science Themes for 2005-2008

This Science Strategy is structured around three themes:

1 Supporting delivery of the HSC's strategy¹ and Public Service Agreement target² (progressive improvement in the control of risks in the workplace, reducing accidents, ill-health and days lost)

¹ The HSC Strategy 'A strategy for workplace health and safety in Great Britain to 2010 and beyond.

² The new Public Service Agreement commits the Department of Work and Pensions to: 'Improve health and safety outcomes in Great Britain by 2008, through progressive improvement in the control of risks from the workplace'.

The PSA targets are by 2008:

- To reduce the incidence rate of fatal and major injuries by 3%
- To reduce the incidence rate of work-related ill health by 6%
- To reduce the number of working days lost per 100,000 workers from injury or ill health by 9%
- That the numbers of recorded major hazard precursor incidents will reduce by levels as previously agreed and published in joint HSE and industry targets for onshore hazards, offshore hazards and the nuclear industry.

The HSC strategy sets out how we will deliver our Revitalising Health and Safety (RHS) targets by 2010, PSA targets by 2008 and contribute to the broader Government objectives of employment, health and rehabilitation. The strategy has four themes:

- Developing closer partnerships.
- Helping people to benefit from effective health and safety management and a sensible health and safety culture.
- Focussing on our core business and the right interventions where we are best places to reduce workplace injury and ill health.
- Communicating the vision.

HSE is developing these themes through major programmes of work. Two Strategic Delivery Programmes³ will deliver the occupational health and major hazards contributions to the PSA targets. These will be supported by four enabling programmes covering business involvement, worker involvement, the Local Authority/HSE partnership and enforcement. In addition, programmes on efficiency, economy and productivity, better regulation and policy address HSE's long-term capability.

The Science Strategy sets out how HSE will use its science resource to support these programmes. Currently over 70% of HSE's scientific and engineering staff and 50% of HSL's staff are involved in delivery of these strategic programmes.

Key areas of research and support that contribute to the delivery of HSC's strategy and programmes include:

- organisational/human behaviour, including management systems and the management of change.
- epidemiology and statistics to improve understanding of occupational injury, ill health and disability, the workplace factors that contribute to these and the barriers and incentives to rehabilitation.
- intelligence gathering and the main factors causing injuries and ill health.
- improving our understanding of the effectiveness and efficiency of interventions by the regulator and the motivators for compliance.
- occupational health issues, including trial and evaluation of Occupational Health Support pilots and research into management of sickness absence.
- worker involvement in improving health and safety performance including understanding what changes and attitudes gain acceptance of the role of workers.
- structural integrity of ageing plant and equipment.

³ The 'Fit for Work, Fit for Life, fit for Tomorrow' Strategic Programme aims to deliver a 3% reduction in the incidence or work related fatal and major injuries, a 6% reduction in the incidence rate of cases of work related ill health and a 9% reduction in the incidence rate of days lost due to work-related injuries and ill health in the period 2005/06 to 2007/08. The Major Hazards Strategic Programme aims to achieve a 5% reduction in the number of reports made to HSE by licence holders, which indicate a challenge to nuclear safety, a 45% reduction in the number of major and significant hydrocarbon releases in the offshore oil and gas sector and a 15% reduction in the number of relevant RIDDOR reportable dangerous occurrences in the onshore sector.

- cultural and demographic aspects of the workforce including healthy and safe working of older workers
- effective use of communications, including research to explore effectiveness of campaigns as an intervention and how to deliver messages to all stakeholders including small businesses and other hard to reach groups.

2 Supporting front line regulatory functions (eg incident investigation)

Undertaking forensic work as part of incident investigation and inspection activities demands high quality, specialised scientific expertise. Much of this expertise is delivered by HSL, which has unique skills and facilities to provide analytical and investigative services, together with many years of experience of applying these in a wide range of investigations. We will maintain this capability and readiness to respond to future incidents in all critical areas. Lessons learned from incident investigation and inspection have always played a critical part in development of operational, scientific and policy decisions and will continue to make equally important contributions to both the enforcement enabling programme and the Strategic Delivery Programmes.

3 Looking ahead to identify and meet future challenges

Horizon scanning is the process through which HSE will identify issues with the potential to change or present significant new workplace risks that are emerging in the medium to long term, and place them in the wider social context.

HSE's scientific specialists and front line staff are well placed to identify emerging issues in the course of their work and through professional networks. A new grouping of scientists in HSE and HSL will work with these staff and other internal and external experts to identify issues for further consideration.

A recent example is our work on the science of nanotechnology. We are collaborating with others to research potential health and safety risks of new materials, and leading research into the health and other hazards of nanoparticles and nanotubes.

Delivering the Science Strategy (changing the way we work)

HSE's regularly reviews its science skills base to ensure that it continues to meet the evolving needs of the organisation.

The main changes over the next three years will be:

- to increase opportunities for partnership working and to involve a broader range of external organisations in the development of our research strategy.
- to work in partnership with the Local Authorities and enable them to make increased use of HSE's and HSL's scientific resources.
- improving the way we communicate science issues, to contribute to public understanding of health and safety risks. An important aspect of the strategy is to develop and improve communication tools. For example

HSE's science web pages have been redesigned to improve communication with the wider scientific community and to improve access to our scientific reports. HSE's Science and Research Outlook, a quarterly electronic newsletter and interactive website, has recently been launched.

- We will significantly increase our expertise in social science, human and organisational behaviour, ergonomics, economics and statistics.

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1. Introduction

In February 2004, the HSC launched a new strategy for health and safety to 2010 and beyond⁴, with the vision – ‘to gain recognition of health and safety as a cornerstone of a civilised society and, with that, to achieve a record of workplace health and safety that leads the world’. This Science Strategy 2005-08 sets out how HSE will apply science and engineering to provide a sound evidence base to help deliver the Commission’s mission to protect people’s health and safety by ensuring that risks in the changing workplace are properly controlled. This includes achieving improvements in health and safety performance, especially the delivery of the *Revitalising Health and Safety (RHS)* targets by 2010. By 2008, HSE has agreed to deliver the following Public Service Agreement (PSA) targets: 3% reduction in fatal and major injuries; 9% reduction in days lost through work-related injury and ill health; and 6% reduction in new cases of work-related ill health.

HSE will apply its science and engineering resources to support delivery of the HSC Strategy and the PSA targets, meeting the needs of those developing policy and the operational requirements of its Inspectorates. Further, it is essential to maintain and develop the appropriate internal and external scientific expertise to support HSE’s longer- term needs and this strategy sets out how we will do this.

HSE will deliver its contribution to the HSC Strategy primarily by concentrating on the areas that need tackling most through a number of Strategic Programmes (SPs) (see Table 2). HSE’s science provides an essential, broadly based foundation to deliver its Strategic Programmes.

HSE, in partnership with the Local Authorities (LAs), regulates workplace health and safety. Its business is heavily science based, dealing as it does with a wide range of workplaces and industry sectors, often with complex technical issues to be regulated. HSE has a first rate scientific staff, with around 780 in-house specialists, covering a very broad range of specialisms. These range from the traditional engineering professions (e.g. mechanical, civil and electrical engineers) through occupational health specialists (including doctors, nurses and occupational hygienists), statisticians, economists and social scientists to highly specialised staff/ inspectors (including offshore well engineers and nuclear criticality experts). HSE staff are supported by the Health and Safety Laboratory (HSL) and commissioned science projects. This mix of in-house and contracted science supports policy development and the delivery of our statutory functions. In addition to delivering the SPs, it contributes to:

⁴ A strategy for workplace health and safety in Great Britain to 2010 and beyond. Available through the HSE website at: <http://www.hse.gov.uk/aboutus/hsc/strategy.htm>

- Investigating incidents and complaints;
- Delivering statutory schemes, e.g. asbestos licensing;
- Positioning HSE's capabilities to respond to future H&S issues arising from industrial innovation by, for example, horizon scanning, developing the evidence base and understanding the impact of its interventions.

HSE draws on a wide community of scientific expertise (including academics, consultants, workers, the public) to gather evidence, develop understanding – including peer review, and identify solutions.

2 Principles for the Strategic Use of Science in HSE

The delivery of HSC's vision and mission for health and safety demands HSE's strategic use of science according to the following principles.

HSE will:

- Use science to deliver its strategic business priorities, with a strong focus on health and human and organisational behaviour, having regard for equality issues, and ensuring that money and resources are targeted at the delivery of the strategic priorities.
- Use its scientific resources flexibly to meet its changing business needs, including making more use of external contractors where that provides better value for money.
- Contribute to the development of Government science policy and apply it to all its work.
- Improve the linkages between science, policy and delivery and promote a better collaboration between scientists, policy makers and deliverers.
- Use science to meet its role as a modern regulator to understand the most effective and efficient ways of securing improved health and safety outcomes.
- Use its in-house resource, supported by external expertise where appropriate, to deliver its regulatory functions and contribute to the evidence base for the development of policy. This will be achieved through -two levels of application of science:
 - Front line work (e.g. incident investigation; inspection; safety case and report assessment; standards & ~~guidance~~ guidance)
 - Cross-cutting activity (e.g. horizon scanning; generic guidance)

- Continue to commission science in accordance with the arrangements in Appendix 1 and apply research:
 - Where independent advice is required by HSE on the extent and nature of the hazards and risks involved
 - Where there is a need for informed HSE participation in national and international standards making
 - Where information is needed in the light of incident experience or to support specific enforcement activities or policy initiatives
 - Where projects, though with clear health and safety benefits are too risky for firms to go ahead with themselves; for example, when timescales are long and/or the technical risks are high
 - When the particular part of industry lacks the relevant scientific and technological expertise
 - When entry costs are high for manufacturers of safety-related equipment and the industry is small and fragmented
 - Where industry is complacent or uninnovative and requires the stimulus and competition of new ideas to encourage improvement
 - When the potential beneficiaries are too diffuse for any one company to undertake the research on its own or the availability of results will be restricted

- Provide support for HSE’s regulatory activities through the commissioning of scientific support, with HSL as primary supplier to:
 - Understand the causes of incidents and ill-health;
 - Propose remedial measures;
 - Contribute to the evidence base to develop and deliver its priorities and programmes;
 - Make the knowledge gained widely available

- Have regard to, and use, relevant science activities in GB and internationally. Where appropriate, HSE will seek opportunities to collaborate with others.

- Make publicly available information on our science programmes subject to over-riding considerations for national security and/or HSE’s intellectual property policy.⁵

3 Contribution to Strategic Themes

HSE will use science to provide a proper evidence base for the delivery of the strategic themes and priorities arising from the HSC Strategy. The contribution that science will make to the delivery of the strategic themes is shown in Table 1.

Table 1: Science contribution to the strategic themes and key points from the HSC Strategy, *A Strategy for Workplace Health and Safety in Great Britain to 2010 and beyond*

Strategic themes and key points	Science contribution
Developing closer partnerships	

⁵ www.hse.gov.uk/research/iprights.pdf

<p>Working through others – we want to give full recognition to the contribution of a properly designed and executed health and safety system to the broader agenda and to utilise the contribution of others to our aims.</p> <p>HSE and LAs working together – we have looked closely at the current division of enforcement responsibility between LAs and HSE and their ways of working and wish to see HSE and LAs work in a closer partnership based on a mutual understanding of the value of local versus central intervention.</p>	<p>Be aware of the relevant science activities of others and increase collaborative working, particularly through joint projects with stakeholders.</p> <p>Provide improved support to LAs using our internal resource and through use of research. Increase support for research into new ways of working, and better evaluation of existing forms of intervention.</p>
<p>Strategic themes and key points</p>	<p>Science contribution</p>
<p>Developing closer partnerships (cont.)</p> <p>Rising to the challenge of occupational health – significant advances have been made in pressing down on the causes of safety failures using existing tools and methods, but leverage on health issues will require new methods.</p>	<p>Increase the proportion of research and focus more internal resource on health issues. Establish and renew partnerships with new and existing stakeholders including DWP, DoH and NHS. Use our science resource to engage GB’s occupational health community in <u>improving understanding of workplace health issues, in particular through</u> a new occupational health support system. Develop a new national Workplace Health and Safety Survey.</p>
<p>Helping people to benefit from effective health and safety management and a sensible health and safety culture</p> <p>Understanding the benefits of health and safety – Some businesses, particularly small ones, perceive HSE as an organisation of experts, talking to experts and devising approaches and guidance for the same experts. We need to do more to make health and safety and its benefits more widely understood and accepted</p> <p>Involving the workforce – an organisation’s greatest asset is its workforce. We need to expand the base of employee involvement in health and safety management to cover the whole workforce</p> <p>Providing accessible advice and support – our consultations show that some businesses, particularly small businesses, say they want to comply with health and safety standards, but are fearful of approaching HSE or LAs for advice. We want to develop channels of support and advice that can be accessed without fear of enforcement action while allowing the regulators to continue to be tough on those who wilfully disregard the law.</p>	<p>Use our science resources to communicate the moral, social and economic benefits of health and safety working with our new Social Science Unit and Communications Directorate.</p> <p>Exploit previous and ongoing research into promoting worker involvement in health and safety through the use of safety management and culture, including worker safety advisors.</p> <p>Fully assess HSE/others’ previous and existing best practice for dissemination activities. Work with others to encourage them to produce good practice information sources. Use science resources to focus on improving relevance, availability and usability of the advice we produce.</p>
<p>Focussing on our core business and the right interventions where we are best placed to reduce workplace injury and ill health</p>	

<p>Being clear about our priorities – The Health and Safety at Work etc Act can be construed very broadly and, as our consultations have shown, stakeholders frequently want us to do more than we are able. Even with increased efficiency, HSE and LAs will not be able to meet these demands and they must manage their priorities rigorously.</p>	<p>Improve the evidence base on the best way to target HSE and LA resources to achieve the greatest impact.</p> <p>HSE will continue to apply its unique expertise to provide public assurance that risks in the major hazards industries are properly managed.</p>
<p>Strategic themes and key points</p>	<p>Science contribution</p>
<p>Focussing on our core business and the right interventions where we are best placed to reduce workplace injury and ill health (cont.)</p> <p>An interventions strategy – acceptable health and safety standards can be achieved in many ways. HSE and LA’s will do more to identify the value of their impact and to trust the impact of others.</p> <p>Continuing to enforce where appropriate – enforcement or the fear of enforcement is an important motivator for some employers. Our evidence confirms that enforcement is an effective means of securing compliance and promoting self-compliance, but too many deaths and major injuries result from simple failures. This is, and will remain, unacceptable.</p>	<p>Evaluate the impact of existing HSE and LA interventions and capture the views, knowledge and experience of HSE and LA practitioners. With others, develop an improved intervention strategy, implement it and evaluate its impact.</p> <p>HSE will continue to work to prevent incidents from those industries which have the potential to cause significant harm, including to members of the public, such as the chemical, offshore, nuclear and railways industries and to maintain our international obligations. HSE will review its safety case regimes to ensure that they remain relevant and proportionate to the changing nature of these industries in Great Britain. This work has already started by seeking the views of stakeholders.</p> <p>Provide the evidence needed to support enforcement and the advice to assist self-compliance.</p>
<p>Communicating the vision</p> <p>We will champion the case for sensible health and safety controls that are sensibly applied. Our goal is not to have a risk-free society but one where risk is properly appreciated, understood and managed. We want to enable activities to take place that might otherwise give rise to concern, To communicate this message effectively, we need to develop more mature, open,</p>	<p>Improve the inclusion of risk concepts and health and safety skills in the National Curricula and ensure that safety critical professionals receive adequate education in risk management. Improve understanding of how to communicate better the</p>

transparent and inclusive two-way communications with a wide range of stakeholders. We want productive dialogues, particularly at the regional level.

management of risk to all our stakeholders.

The contribution that science will make to HSE's work varies depending on the nature of the problem, the maturity of the technology and our understanding of the related technical, social and human factors issues. The following paragraphs illustrate how the nature of science activities changes as a technology matures and our knowledge of any associated risks develops. We will continue to keep the range and balance of our science activities under continual review and ensure that these important resources are used effectively.

Identification of new risks: With new technologies, workplace developments and social change, a key activity is horizon scanning to anticipate, assess, evaluate and prepare for any new or changed risks in the workplace and to the public from work activities. HSE will scan the horizon to identify developments in technology, the workplace, socioeconomic trends which affect the labour market, the UK political agenda, the EU and international developments which could significantly affect health and safety in the workplace. HSE will use research to further our understanding of the emerging risks.

Example: Nanotechnology. HSE identified nanomaterials as having the potential to cause new ill health and fire and explosion risks. We have contributed to Royal Society review on nanotechnology, focusing on new risks from the currently available technology. HSE has produced an information note on precautions for workers to adopt. It adopted the precautionary principle because of the uncertainties with the available science. HSE will encourage, in collaboration with others, the development of the science on potential new ill health and fire and explosion risks and measures to control these risks. HSE will also monitor the development of the technology, identifying other new risks.

Provision of risk information: Once a technology is in use, it is the responsibility of those who use it in the workplace to ensure that any risks they create are properly controlled. However, HSE working in partnership with employers and employees, uses its in-house specialists, HSL and an extensive research programme to help develop the necessary regulations, standards and guidance. The knowledge gained in this way is also used to inform the regulation of workplaces ensuring that activities are controlled in ways that are proportionate to risk, facilitating technological progress by understanding both costs and benefits.

Example: COSHH Essentials. COSHH Essentials was developed and launched in 1999 to protect workers from health risks from chemicals. It uses a unique system of hazard risk banding to provide small and medium enterprises with a simple solution for carrying out a risk assessment under the Control of Substances Hazardous to Health Regulations (COSHH). The system identifies the proper controls for the substances used and the way in which they are used. In 2001, research was undertaken to convert the paper version of COSHH Essentials into an electronic expert system, which carries out all calculations behind the scenes making it even simpler and quicker to use. The user is able to print off or download all the information needed to provide proper controls from exposure to chemicals in their workplace. The tool is available free on the Internet at: www.coshh-essentials.org.uk. Web statistics to date show that there have been just over 150,000 unique visitors to the site and over 148,000 risk assessments completed.

Incident Support work: Incidents continue to occur and some of these are serious, involving fatalities, major injuries and ill health. HSE investigates these to understand the causes and propose remedial measures and make knowledge widely available for future preventative action. In support of this, HSL provides a fast, expert, multidisciplinary forensic support service for a wide range of incidents. HSE funds research at HSL to develop analytical techniques and improve its reactive response.

Example: Potter's Bar investigation. Following the train derailment in May 2002, which killed seven people, the Field Engineering Section of HSL took the lead in the technical investigation. Where required, and working under the direction of HSL, additional specialist expertise was obtained from outside organisations. Point 2182A was identified as the cause of the derailment and removed to HSL's Buxton site for detailed examination. The vehicles were also examined. Great care was taken to maintain the integrity of the evidence and HSL worked in conjunction with all representatives of interested parties to ensure they were satisfied with the investigation and so could not raise this as an issue in any potential legal proceedings. The results of the examination of point 2182A raised several safety concerns, which were brought to the immediate attention of Railtrack. In addition, further research related to the impact of vibration on points was commissioned with the aim of preventing such an event happening again.

Management of risk information: By the time a technology is mature, HSE will have an extensive understanding of the risks and the means to ensure that these are properly controlled. We manage knowledge to ensure that appropriate scientific and technical information and the practical expertise of our specialists is made available to implement HSE's and LA's operational and policy activities.

Example: ALARP. Reducing risks "as low as reasonably practicable" (ALARP) is a key requirement of British occupational health and safety law. In principle, reducing a risk ALARP involves weighing the risk against the sacrifice needed to remove or reduce it, and deciding whether the sacrifice is warranted. The decision is weighted in favour of health and safety because the rule is that a risk control measure should be implemented unless the sacrifice is *grossly disproportionate* to the risk reduction achieved. In practice, in the majority of cases, individual duty-holders will not have to undertake an explicit weighing of risk against sacrifice because the risk control measures that they have to adopt are already established as authoritative good practice which represent a consensus between stakeholders as to what is reasonably practicable. Scientific evidence about risks and the effectiveness of control measures provided by HSE is often the basis of this consensus.

4 Strategic Programmes

HSE will deliver its major contribution to the HSC Strategy through its SPs. Table 2 provides an indication of the key areas in which research will contribute to the work of the SPs. These arise from well developed, strategic research plans supporting the main programmes. A more detailed description of planned research work will be issued regularly in the Strategic Research Outlook document.

As shown in Table 3, over 70% of HSE's scientific and engineering staff and 50% of HSL's staff are involved in delivery of these SPs. HSE has recently reviewed how science and engineering staff contribute to the delivery of its work. This review concluded that the overall proportion and pattern of scientists and engineers in HSE's workforce was generally right for its business. However, significant changes are needed to improve flexibility in the use of specialists and their input into delivery of the SPs. HSE is piloting some new ways of deploying its resource to increase flexibility. For example, specialists in work psychology and organisational behaviour (Human Factors) are being managed as a single pool of resource drawn on by the SPs. The review also recognised that HSE needs to increase its capabilities on health and in particular in human and organisational behaviour, social sciences, epidemiology and statistics. HSE will continue to increase its capabilities in the areas identified through its in-house resource and its support arrangements. HSE's SPs are evolving and the research and support contribution is evolving with them. Some themes common to all of the Programmes are emerging:

- Developing the evidence base;
- Developing understanding of the impact of HSE's interventions;
- Establishing the intervention-effect business model for each SP, formulating agreed trajectories to show progress against the strategic targets and developing more robust indicators to measure progress against these trajectories;
- Getting greater involvement of stakeholders;
- Understanding how to communicate better with our stakeholders.

In addition to supporting the individual SPs, HSE science also supports a number of mandatory activities, of which the larger elements are incident investigation and statutory schemes, e.g. Notification of New Substances (NONS). This mandatory work currently uses 12% in-house resources and 40% of HSL resources, mostly on forensic incident investigation. HSE will retain the ability to investigate a diverse range of incidents in all of the industries for which we are responsible, to determine what went wrong, propose remedial measures and take enforcement action where necessary. An improved challenge function is being introduced to ensure that such scientific support is targeted and proportionate, and that the intelligence and knowledge generated does feed into the SPs. Action is also being taken to ensure that scientific investigations do not continue without good reason when an incident investigation is stopped.

Finally, enabling and underpinning work, which cuts across SPs, will be undertaken to ensure HSE's effectiveness. Elements of this work, largely provided by the Corporate Topic Groups (see Section 7.1, Appendix 1), deliver improvements to health and safety in the medium to longer term, for example through the development of standards and guidance in collaboration with industry. HSE has taken a strategic decision to cut back on such activities to ensure that our science resources are used to the best effect to support delivery of the SPs and the improvements in health and safety needed to achieve the strategic targets (see Table 3). The consequence of this is that other parts of the health and safety system may need to undertake more of this work if we are to retain the longer term improvements in health and safety that this work delivers.

New directions for this strategy include the planned introduction of an episodic survey of health and safety in Britain's workplaces, a more formal horizon-scanning process, the provision of funding to help the LAs to increase their usage of science in delivering their contribution to the HSC Strategy and a reduction in the amount of money spent on research in mature areas, especially Major Hazards:

- The new **Workplace Health and Safety Survey** will be a large-scale, representative survey of the state of occupational health and safety in Britain's workplaces, across all economic sectors, with inputs being sought from up to 3,000 employers and up to 30,000 employees. The overall aim of the survey is to enhance the data on occupational injury and ill health by estimating self-reported health and safety outcomes in the context of workplace conditions and employers' health and safety systems and enable us to monitor better HSE's performance against its strategic targets. This will significantly strengthen the information base for our policy and operational initiatives. It is planned to conduct the survey on a periodic basis, probably bi-annually, in parallel with the Labour Force Survey, managed by the Office for National Statistics. This new national survey is intended to evolve into a key data source, among a range of data sources, used by HSE to assess the state of health and safety at work in Great Britain, now and for the future.
- **Horizon scanning** is the process through which HSE will identify issues with the potential to change or present significant new workplace risks that are emerging in the medium to long term, and place them in the wider social context by using the expertise of behavioural and other social scientists. HSE's horizon scanning activities will identify developments in technology, the workplace, socio-economic trends, which affect the labour market, trends in public attitude to health and safety and national and international political changes which could significantly affect workplace health and safety in GB. It will involve HSE's scientific and operational staff and policy makers. Intelligence on new developments will be gathered through Communities of Practice and Interest involving a wide range of external stakeholders. The results will be assessed and prioritised enabling the HSE Board and HSC to identify where further work is justified. Current examples of detailed studies commissioned as a result of horizon scanning are those on nanotechnology, the hydrogen economy, distributed electricity generation and gene therapy. The results will be used to inform the development of the HSC Strategy, the

identification of new programmes of work and the identification of HSE's future needs for internal and external scientific expertise.

- **Local Authorities** will receive funding of £5 m over the next **four** years to investigate how they might make **increased** use of **science, especially** HSL's scientific resources, to support their delivery.
- Major Hazards** research has consumed over 20% of HSE's research budget for many years, often to support the development of technical standards. HSE recognises the need to continue to collaborate and engage with these industries particularly focusing on new areas of health and safety risk control but with a likely lesser proportion of HSE science funding. This will allow HSE to devote more of its limited science resources to resolving specific regulatory policy and operational issues to underpin delivery of its Strategic Programmes over the coming years.

5 Science and Risk Communications

HSE is committed to improving communications with all stakeholders and has an over-arching communications strategy. We recognise the importance of informing and involving all those with an interest in health and safety how HSE applies science to help the delivery of HSC's strategy. We look to the wider scientific community for assistance in refining our needs and requirements. It is important that the work we undertake is targeted either where maximum benefit will accrue to the workforce or where we need to be better informed on the risks from new or changing hazards in the workplace of tomorrow.

HSE's science web pages were redesigned in Autumn 2003 and are continually updated. They can be found at: <http://www.hse.gov.uk/science/index/htm>. The website provides access to technical reports produced from our research as well as a projects directory for work commissioned since 2001. We are keen to receive feedback on the projects we commission and the directory provides the opportunity for users to comment on the work being undertaken.

A new e-newsletter, HSE Science and Research Outlook (<http://www.hsesro.com/>), provides information on all aspects of our science and technology programme. Alongside the newsletter, we will publish foresight reviews on science issues of the future. Through our Horizon Scanning web pages, we will be inviting comments and ideas on these from stakeholders.

To complement these electronic systems we aim to improve the ways we communicate and explain scientific information and risk to stakeholders, and engage them in promoting better understanding and confidence in science and effective risk management. In particular we will ensure we implement the government's ['Principles on Managing Risks to the Public'](http://www.hm-treasury.gov.uk/media/8B2AE/risk_principles_220903.pdf) (http://www.hm-treasury.gov.uk/media/8B2AE/risk_principles_220903.pdf); paying particular attention to how we communicate scientific uncertainty and take account of people's concerns about different types of risk.

6 Working with others

The targets in the HSC Strategy are for the health and safety system as a whole and HSE will work actively with stakeholders to secure their delivery. We are just one organisation among many across the UK, Europe and internationally, that has an interest in the science relating to occupational safety and health and HSE and HSL have well established links with these organisations and undertake a range of collaborative projects.

We will continue to draw out opportunities for information exchange and collaboration with others, whether within the global research community itself, or with Government organisations (in the UK or other countries), international working groups or with other bodies with whom we have common interests. A growing proportion of our resource – people and funding – involves some degree of collaboration with others and we will continue to explore all available avenues to benefit from such joined up working.

HSE already has a number of formal and informal national and international links, and we will build on these to identify gaps in scientific understanding, to share knowledge, to coordinate work with that underway in the wider science base and to undertake collaborative projects and work.

Examples of national and international collaboration
<ul style="list-style-type: none">• Quantification and control of the hazards associated with the transport and bulk storage of fireworks with European partners (through the European Union Framework Programme);• Nanotechnology, with the Royal Society and the Royal Academy of Engineering;• Various issues related to carbon monoxide in domestic premises in conjunction with Advantica Technology (British Gas plc), Gas de France and other industrial partners;• A number of construction-related projects, such as: façade retention; designing in safe practice for building maintenance and repair; and guidance on the Construction (Design and Management) Regulations 1994, coordinated by CIRIA and involving a number of industrial and other partners;• Undertaking workshops on cross cutting research issues, such as: shiftwork and breast cancer; susceptibility and variability in human response; male fertility research, neurotoxicity, possible adverse health effects of magnetic fields; ageing, work and health; low toxicity dusts; obstructive lung disease; and the Borna Disease virus.

We will extend our work with other Government organisations to take account of their activities, identify issues of common interest and improve joint working on cross-departmental and multi-disciplinary challenges, thereby meeting one of the key recommendations of the Phillips Review of BSE.

HSE works with other partners and stakeholders as part of its process to quality assure research outputs. We choose processes which are proportionate to the particular projects ranging from internal review through to external peer review, presentations, workshops and publications in peer reviewed literature.

Much of this external input is received at the end of research projects. Although valuable, we want to establish better mechanisms for involving academic and professional institutions at the beginning of the process, e.g.:

- Constructive partnerships to assist in the development of more coherent programmes of research to aid delivery – particularly for the more complex health issues and broader rehabilitation and return to work agendas.
- HSE’s Competition of Ideas exercises which provide a mechanism to present broad issues to the research community who are then invited to put forward proposals to address issues through research.

We will explore these and listen to other suggestions as part of our commitment to develop more innovative partnerships.

Examples of Cross-Government working

- With the Department for Work and Pensions (DWP), we have joint interests, share information and work collaboratively on topics such as stress, rehabilitation, vulnerable groups and older workers, active case management, work psychology, social research skills and major episodic surveys.
- With the Environment Agency (EA), we have recently re-energised joint collaborative activities on science by agreeing a new Memorandum of Understanding. Our collaboration with EA and the Scottish Environmental Protection Agency has already covered topics such as hand-arm vibration, antifoulants, environmental monitoring and assessment, chemical storage, Control of Major Accident Hazards (COMAH) and waste handling.
- With the Health Protection Agency, we have existing working links on biological agents, the development of surveillance schemes, ionising radiation and the effects of chemicals on health. We also intend to improve links on behavioural and social science and demographically linked work, particularly in relation to vulnerable groups.
- Through the Risk Improvement Managers’ Network to implement the recommendations of the Strategy Unit Report “Risk: Improving government’s capability to handle risk and uncertainty. This Programme continues the work of the Interdepartmental Liaison Group on Risk Assessment (ILGRA), which was established by HSE to help secure coherence and consistency within and between policy and practice in risk assessment as undertaken by Government and help disseminate and advance good practice.
- Through the Interdepartmental Group on Health Risks from Chemicals (IGHRC) to stimulate the development of new improved approaches to the assessment of risks to human health from chemicals.
- With DWP, Customs and Excise, Inland Revenue, the Immigration Service, the Home Office and the Department for the Environment, Food and Rural Affairs to target seasonal and migrant workers and involvement in ‘Operation Gangmaster’ initiative.

Table 2: Research Priorities of the ~~Strategic~~Strategic Programmes.

Strategic Programme	<u>Component</u>	Science Priorities ¹
<p><u>Fit 3 (Fit for work, fit for life, fit for tomorrow)</u></p> <p><u>Injuries Reduction</u></p>	Slips and Trips	<p>Gathering information on causes – technical and human factors. Determination of baseline statistics. Evaluation of the impact and adequacy of available countermeasures and production of case studies. Development of standards and testing methodology.</p>
	Falls from height	<p>Evaluation of fall protection systems. Development of expert systems to guide dutyholders. Encouraging the designing out of the need for work at height. Perception of risk in occupations vulnerable to low falls from height. Gathering of data to identify causative factors and to identify areas where efforts can best be directed.</p>
	Workplace Transport	<p>Intelligence gathering and analysis of causation factors, particularly behavioural issues and safety management systems. Identification of practical ways to improve the safety of the work site, vehicle and driver. Impact evaluation of various interventions.</p>
	Construction	<p><u>Communications and Strategic Outreach: to identify the drivers required to raise the profile of health and safety amongst stakeholder intermediaries and the most effective means of intervention to secure action and improvement.</u></p> <p><u>CDM issues: to improve the compliance of CDM dutyholders in addressing health and safety issues, by the provision of education, guidance or other means, and to identify the drivers that will increase their health and safety performance.</u></p> <p><u>Health: to determine the extent of particular types of ill health in the industry, its causes and most effective mechanisms for its reduction, and to provide the most appropriate information to help target the most vulnerable.</u></p> <p><u>Safety: to identify key risk areas, provide guidance on best practice to reduce injury, and to predict where HSE may be vulnerable in respect of situations giving rise to multiple fatalities and to take appropriate action to minimise the likelihood of such events.</u></p> <p><u>Core Programme: involving cross-cutting intelligence issues, to underpin Construction Division’s knowledge base and the above portfolios.</u></p>

	<u>Sector Stakeholder Engagement</u>	<p>Behavioural research on how to convert H&S awareness into actions, e.g. how to influence farmers' attitudes. Analysis of accident statistics - causation factors. Extent of ill health - rehabilitation. <u>Effectiveness of targeted initiatives in the manufacturing sector.</u> <u>Analysis of reported manual handling injuries in the woodworking industry to establish the main causes of MSD injuries.</u> <u>Extent of contractorisation across manufacturing industries.</u> <u>Household waste recycling: selection of appropriate collection/sorting systems to reduce occupational risk.</u> Targeted activities: identification of suitable targets and support to accident/ill-health reduction techniques. Stakeholder engagement: research aimed at areas where stakeholder groups are the primary drivers of change. Operational engagement: providing a coordinated and consistent approach by both HSE and LA inspectors. Standards and compliance: improving market surveillance techniques. Productivity, knowledge and communication: research aimed primarily at the evaluation of Programme work and improving intelligence gathering and data analysis.</p>
<u>Fit 3 (Fit for work, fit for life, fit for tomorrow)</u>	Stress	<p>Identification of good practice in stress prevention and rehabilitation. Establishment of reliable baseline data and firming up of indicative targets. Elucidation of the benefits for taking organisational action on stress. Development of our understanding of the relationship of work stressors and health outcomes. Specific stressor areas, e.g. demand, support, role, relationship, change.</p>
<u>Ill-health Reduction</u>	MSD	<p>Involvement of stakeholders. Gathering of information on incidence and prevalence in order to target high-risk groups. Rehabilitation: to find out which solutions work and under what circumstances. Determining the range of competencies and skills that apply to MSD and evaluating the effectiveness of training and development. Identification of the information, advice and support needs of stakeholders. Analysis of reported manual handling injuries in the woodworking industry to establish the main causes of MSD injuries.</p>
	<u>Disease reduction – respiratory disease, skin disease, cancer</u>	<p><u>Refine baseline information on skin disease and asthma.</u> <u>Develop baseline information for long latency respiratory disease and cancer.</u> <u>Develop and pilot interventions.</u> <u>Develop better understanding of behavioural barriers to improving control.</u> <u>Development and piloting of key messages by a range of communications media.</u> <u>Development, validation and piloting of IT based tools for delivery of practical advice to duty holders.</u> <u>Studies to assess which interventions work best and why.</u> <u>Evaluation studies to determine whether the programme is on track to deliver its contribution to the PSA targets.</u></p>

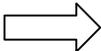
	Noise and vibration	<p>Identification of exposure risks. Relationships between exposures and risks. Health surveillance and diagnostic techniques. Exposure assessment and estimation. Exposure control measures. Evidence base. Evaluation of HSE interventions.</p>
	<u>Workplace Health Direct</u>	<u>Comparison of OH provision in other EU member states to establish best practice.</u>
<u>Fit 3 (Fit for work, fit for life, fit for tomorrow)</u> <u>Days lost</u>	<u>Public Services</u>	<p>Behavioural issues: contribution of training, work environment design and work patterns to workplace violence. Management issues: how to influence management to take up the business case for H&S management and rehabilitation; measures of effectiveness of interventions. Health risks: examples of good practice, work acquired infections, stress, MSDs.</p> <p>Development of a tool that can be used to evaluate HSE and LA enforcement activity to put enforcers/regulators on the same assessment footing. Extent of existing OH support and sickness absence management, good practice models. Sickness absence statistics. Sickness and OH support in areas such as the emergency services. Targeted research in specific LA areas where specific trends have been identified with <u>no apparent solutions.</u></p>
	<u>Absence Management</u>	<p><u>Management of sickness absence and return to work:</u> <u>Communication</u> <u>Trial and evaluation of an approach to SMEs.</u></p>
	<u>Rehabilitation</u>	
Major Hazards	<p>Nuclear Offshore Onshore Railways</p>	<p>Cross Cutting Issues: characterise emerging operational needs on key issues in the major hazard sectors, including containment, ageing plant structural integrity and industry sustainability human factors and management of change and emergency arrangements.</p> <p>Human factors: deliver HF ‘science’ programme (2004 – 2007) to resolve key issues in organisational change, competences, safety critical communications and safety cultures. This work will form the basis of definitive guidance on good practice, mainly aimed at onshore chemical industries.</p> <p>Management and organisational factors: deliver programme of work (2004 – 2006) developing HSE’s understanding of the key features for effective Safety Management Systems.</p> <p>Effectiveness of the H&S framework: support key evaluation programmes that provide evidence of the effectiveness of</p>

		<p>HSC/E's permissioning regimes.</p> <p>Biological Hazards: complete knowledge base to deliver regulatory technical assessments and decisions.</p> <p>Onshore COMAH: delivery of major hazards targets: assessment of safety reports, inspections and investigations of incidents for all sectors. Scoping studies to identify level 2 issues for the theme on Emergency Arrangements at major hazard sites that will be used for the development of HSE's contribution to Civil Contingencies.</p> <p>Offshore: support two Key Programmes a) (2004-2007) to improve and maintain the integrity of offshore installations to prevent major accidents and to sustain the offshore infrastructure in the national interest b) 2003-2006) to reduce accidents in drilling and deck operations. Together with support to generic themes e.g. assessment of novel systems in Emergency response and rescue.</p> <p>Process Safety:</p> <p>a) Specific projects identified through peer review in HSE's Fire Protection Interest Group: to conclude good practice guidance on water deluge systems and passive fire protective coatings for pressurised storage vessels.</p> <p>b) Fireworks: deliver EU sponsored research programme (2002 – 2006) reviewing the classification of certain types of fireworks</p> <p>c) Research associated with the emerging 'hydrogen economy' in collaboration with UK and EU industrial partners.</p> <p>Risk assessment: evaluate societal risk techniques to support high level policy and operational strategies for regulation of onshore major hazards.</p> <p>Programme of Nuclear Safety Research: a balanced programme agreed with HSC that promotes the application of risk assessment and technological understanding to standard setting and enforcement activities based on Nuclear Safety Directorate's (NSD's) and industry's needs for improved knowledge to target safety improvements and prevent serious system or plant degradation. In addition, support contracts are used to provide additional support to NSD assessors, by access to specialist advice or expertise not available within NSD or HSE.</p>
Local Authority Partnership	Development of the new partnership between HSE and LAs.	<p>Identification of prevalent occupational health issues in LA enforced sectors and determination of the true picture of LA enforcement activity on occupational health (as opposed to safety) issues.</p> <p>Identification of the routes to influence LAs' compliance with section 18 HSAW and guidance.</p> <p>How to distinguish effective joint interventions from the less effective. Identification of key training needs for LAs and how they can be delivered cost effectively.</p> <p>Identification of any extra burdens on HSE's resources from closer joint working.</p>
<u>Cross-cutting and enabling activities</u>	<u>Overarching and Underpinning Research and Support (OURS)</u>	<p>Statistics and data gathering: to deliver the intelligence necessary for the Strategic Programmes to best define their requirements, HSE funds a range of data gathering and statistical projects ranging from the broad Labour Force Survey to specific health and safety programmes such as WHASS, surveys on work related sickness and ill-health reported to GPs and econometric studies.</p> <p>Communications: HSE has recognised the need to increase its profile among the workforce and increase its influence with its</p>

		<p>stakeholders. To achieve this, HSE's Communications Directorate has initiated a major research programme focused on stakeholder mapping, media penetration, marketing and communicating occupational health and safety messages and influencing key decision makers.</p> <p>Risk awareness and education: it is important that the concept of risk is taught at an early age and reinforced throughout the educational cycle. HSE is involved in a number of projects on risk from primary/secondary education through to ongoing awareness in the work place.</p> <p>Horizon scanning: HSE recognises the importance of early intelligence on new or developing hazards and associated risks in the changing workplace. The OURS programme supports small studies that are forward looking and could have an impact across HSE.</p> <p>Social inclusion: a wide variety of work is undertaken by HSE's Social Inclusion Policy Branch which includes issues of ethnicity, disability & gender to comply with National and EU Regulations. Research work is also undertaken in relation to SMEs.</p>
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¹These arise from well developed strategic research plans supporting the main programmes.

Table 3: Current and Future Use of Science Resource

	STRATEGIC PROGRAMMES			
	MAJOR HAZARDS	<u>FIT 3</u>	<u>ENABLING</u>	<u>MANDATORY (INCLUDING OURS)</u>
Approximate HSL Resource (% of total)	20%	<u>30%</u>	=	<u>50%</u>
In-House Science Resource ¹ (staff years and % of total)	450 (57%)	110 (14%)	<u><10 (<2%)</u>	<u>220 (27%)</u> <u>188 (23%)²</u>
Staff years and % of total		570 (72%)		<u>220 (28%)</u>
Budget allocations for commissioned science 2004/05 (£M/% total) ³	8.5 (24%)	<u>7.6 (20%)</u>	0.5 (1%)	<u>19.4 (54%)</u>
Provisional allocations for commissioned science 2005/06 (£M/% total) ³	6.0 (15%)	<u>11.1 (29%)</u>	1.2 (3%)	<u>20.9 (53%)</u>
Future Resource and Commissions				

¹ Excludes HSL

² Excludes biocides and pesticides

³ Excludes spend on Nuclear Safety Research Programme and railways research funded through the Rail Delivery Programme and the Rail Standards and Safety Board.

7 HSE's Science Arrangements

7.1 People and competence

HSE has a first rate scientific staff, with around 780 in-house specialists costing around £35.5M in total salary costs. They comprise a very broad range of specialisms, ranging from the traditional engineering professions (e.g. mechanical civil and electrical engineers) through occupational health specialists (including doctors, nurses and occupational hygienists), statisticians, economists and social scientists to highly specialised deep topic specialists (offshore well engineers and nuclear criticality specialists). All of our specialists have recognised qualifications and experience in their topic and most are affiliated with professional bodies.

HSE's specialists are deployed around the organisation to meet its local or corporate business needs. Most specialists are inspectors, located within the Operating Directorates. This enables them to work closely with their regulatory colleagues providing specialist support and advice and also enables them to work directly as regulators with our stakeholders. Many of the engineering specialists are located in those parts of HSE that deal with the Major Hazards industries, reflecting the highly technical nature of these industries. Some of our specialists are centrally based in Corporate Topic Groups (CTGs). These provide a corporate source of expertise for the organisation and contribute to corporate functions such as horizon scanning and knowledge management in their topics. Some of the CTGs also deliver statutory schemes on HSE's behalf.

The profile of the risks from work activities has changed substantially in recent years and will continue to do so. HSE's scientific manpower and career development planning approaches are being adapted to cope with these changes, to increase flexibility and to ensure best value for money.

7.2 The Health and Safety Laboratory

HSL is an in-house agency of HSE. It concentrated its activity on its Buxton site following the opening of a new laboratory in autumn 2004. HSL's vision is to be a world-class health and safety laboratory and its primary aim is to be the first choice supplier of effective research, scientific support and intelligence to HSE, in support of HSE's business objectives. It also provides scientific services and advice connected with health and safety to other public and private sector organisations in the UK and overseas. HSL will continue to focus on improving its performance and to publish an Annual Performance Agreement setting out key targets for the year.

HSL's strength is the sum of the range of skills and experience of its people at the leading edge of health and safety science, enhanced by their ability to network with other experts in their field. To enhance and promote HSL's reputation and capabilities, its staff are continually strengthening the links with scientific and technical organisations at a national and international level. HSL's health sciences activity has led to its recognition as a Collaborating Centre in Occupational Health for

the World Health Organisation (WHO) for a number of years. This status has recently been extended by WHO to the whole of HSL in recognition of the contribution made by all areas of the laboratory in the investigation of workplace health and safety problems.

Examples of HSL Collaboration

- HSL is a founder member of the newly formed Partnership for European Research in Occupational Safety and Health (PEROSH), a network of twelve occupational safety and health research institutes from across Europe.
- At a global level, HSL's Chief Executive chairs an international group of directors of health and safety laboratories. The group was formed a number of years ago and comprises 20 members from Western and Eastern Europe, North America and Australia. A similar group is being set up across the UK.
- Locally, HSL chairs the Sheffield Occupational Health Development Group. The group brings together representatives from HSE, Sheffield hospitals, Sheffield City Council, the Engineering Employers' Federation, the University of Sheffield and the local Primary Care Trust to develop a clear framework for occupational health services on a citywide basis.
- At a working level, HSL's scientists represent HSE on many national and international technical standards committees and in some cases lead the UK delegation negotiating European standards.
- The Laboratory also participates in collaborative projects, which are part-funded under the European Union's Framework Programme. Such projects unite expertise from across Europe to achieve common results and goals.

HSL has evolved over the years to fit HSE's reactive needs for suitable and wide-ranging health and safety science skills, which are readily available to solve problems and are independent of other interests. These skills and competencies fit alongside HSL's facilities and equipment to provide the total support service valued by HSE.

HSL's skills, expertise and external networks cannot be sustained by reactive work alone. HSL needs to be involved in research and technical development activities in order to have internal and external credibility, and be able to trade with other national and international experts. HSL's research activity, generating new information and techniques, keeps it at the leading edge of the science that underpins HSE activity. Failure to sustain parts of its skills and expertise by undertaking relevant research activity would progressively lead to a narrowing of its field of activity and its multi-disciplinary strength. In 2003/04, HSE spent around £22m with HSL, including £18.5m (>80% of the total) on scientific support. HSE will aim to ensure that at least 20% of the work it procures from HSL is research in order to maintain HSL's position as a world class laboratory.

HSE is both owner and major customer of HSL, and will continue to maintain a strict separation between these roles. As owner, the Executive holds six-monthly planning meetings with HSL's Chief Executive in the presence of independent advisers. The Science Strategy Committee (SSC) oversees the customer relationship and the Chief Scientist Unit maintains day-to-day liaison with HSL. HSE customers procure research and scientific support from HSL under a 3-year Scientific and Technological Services Agreement, which is rolled forward annually. The Agreement provides HSL with a guaranteed minimum level of core income from HSE (£10m in 2004/05).

7.3 Science Governance

Our governance arrangements continue to evolve to meet the changing needs of the organisation.

The Chief Scientist reports to the Director General and is a member of the HSE Board, and is advised on strategic direction, quality issues and resources by the SSC, comprising HSE's top managers and outside advisors. The Chief Scientist is supported for the use of commissioned science by the Chief Scientist Unit, who manage HSE's science budget in accordance with business needs and priorities, exercising an appropriate challenge function with regard to agreed HSE priorities, use of public funds, competition, etc. A new Project Record Form (PRF) was introduced in April 2004 to strengthen the arrangements to ensure that science funds are used effectively to support business objectives by requiring those who commission a piece of research to:

- Identify at the planning and appraisal stage, the business objectives/targets to which the project will contribute and show how that contribution will be measured and evaluated.
- Ensure, subsequently, that the deliverables are properly and effectively utilised. The PRF requires evidence on how the project outcomes have been exploited and of the impact on realisation of operational or policy programme objectives

Usage of the PRF will be kept under continual review and refinements introduced as appropriate to ensure that HSE continues to make the best use of its science funds.

Formal peer review of outputs from individual projects or groups of projects is undertaken where it is considered relevant, although owing to the nature and breadth of HSE's work it is not appropriate to establish standing external review arrangements for proposal appraisal or review of research outputs. The requirement for peer review is notified at the proposal development stage and detailed on the PRF. Details of newly commissioned research work are posted on HSE's research project directory which has a facility for comments to be attached. Links are provided to outputs from completed projects <http://www.hseresearchprojects.com/ProjectSearch.aspx>.

HSL undertakes periodic audits involving international teams of renowned scientists to assure the quality of its science. The reports of these science audits are published on the HSL website (<http://www.hsl.gov.uk/about-us/corporate-info.htm#audit04>).

The Corporate Science and Knowledge Unit provides support on the development and use of in-house resources and works with the Chief Scientist Unit on the strategic direction and balance of HSE's scientific activities; and developing suitable procedures and guidance for operation of internal resource and the Research Programme.

HSE's Resources and Delivery Group (RDG), comprising its most senior managers, monitors the portfolio of programmes to ensure that HSE progresses towards the PSA targets and implementation of the Strategy. The RDG ensures a sound financial position, oversees the Efficiency Programme and holds managers to account for operational, financial and efficiency targets.

The Chief Scientist advises RDG on the science requirements.

The Chief Scientist is responsible for HSE's science policy and direction. HSE is committed to ensuring that its policies are based on the best available scientific advice, in line with the Chief Scientific Adviser's Guidelines 2000 and that we learn the lessons from the Phillips BSE Inquiry report.

HSC also receives integrated scientific and technical policy advice from some Subject Advisory Committees, which comply with the Chief Scientific Adviser's Code of Practice for Scientific Advisory Committees. Details of the HSC Advisory Committees can be found at: <http://www.hse.gov.uk/aboutus/hsc/iacs/index.htm>

7.4 HSC Coordinated Programme of Nuclear Safety Research

HSE oversees a national programme that is run under guidelines from the DTI and agreed by the HSC. The guidelines require an adequate and balanced programme of UK nuclear safety research. In principle, the requirements cover all nuclear licensees, but HSE exercises its oversight on a proportionate basis, and concentrates its attention on operating reactors and nuclear chemical plant, and to a lesser extent decommissioning reactors and chemical plant. The programme is undertaken in cooperation with the licensees, who commission the majority of it, and who also pay for the research commissioned by HSE. In addition, support contracts are used to provide additional support to NSD assessors, by access to specialist advice or expertise not available within NSD or HSE.

7.5 Science Delivery

Science requirements are sourced from and delivered by internal and a range of external providers to guarantee access to the required quality of service in a timely manner.

Most work is commissioned against a defined HSE specification, by competition wherever appropriate. HSE will commission work from organisations that can demonstrate that they have the necessary competence and capability and follow sound health and safety and environmental practices. HSE will also take into account the existence and proper operation of appropriate quality management systems, and in certain circumstances, e.g. where the aim of the work is to underpin regulatory activity, accredited status will be required.

In commissioning research, HSE has to take into account various external and internal requirements, including those arising from the government's control of surveys, the

European Union Public Procurement Directive, Treasury spending limits for individual projects and HSE's Research Ethics and Scrutiny Committees.

Framework Agreements, enabling the rapid provision of technical support from a number of specified suppliers, have been operated successfully for a number of years. The Agreements rendered enabling HSE to continue to obtain a range of support services, to complement our work on risk assessment and the control of technological hazards, on a call-off basis. HSE will also explore the possibility of setting up similar, synergistic arrangements for longer-term programmes of work or to allow easy access to the services provided by strategic suppliers.

Our procurement team play an increasingly vital role in providing HSE with a route to appropriate competence (quality and quantity) on an assured basis with value for money.

7.6 Monitoring and evaluation

In May 2004, we introduced a more strategic monitoring and performance measurement system – using the established balanced scorecard technique – which provides the Chief Scientist and the HSE Board with an improved overview of activity within the Strategic Programmes and its impact.

Science helps to make policy choices and deliver policy, and as such it is evaluated primarily as an integral component of work to evaluate the effectiveness and value for money of policy initiatives. Several major policy evaluations have been concluded in the past two years, including, for example, the evaluation of the Rail Safety Case Regulations, which noted the positive contributions of science to the wider performance of HSE in this area. In addition, there have been several smaller exercises carried out to research into the effectiveness of science as a mode of intervention, to improve our calibration of this important 'tool' and our confidence in terms of making the best choices regarding methods and approach that are appropriate to a given business challenge.

We will significantly increase our effort on evaluation. HSE has not undertaken sufficient evaluation in the past and we face key knowledge gaps that need to be addressed. Evaluation will also be undertaken on the SPs to assist the RDG in monitoring progress against the strategic targets.