EXECUTIVE SUMMARY

Science into innovation: realising the potential

0.1 Innovation is at the heart of productivity growth and social gain. Science makes an important contribution to providing the raw material for innovation – new knowledge and ways of understanding our world, new problem solving techniques, new technology and businesses, but above all highly educated people. Together, the generation and exploitation of science enable us to do more and to do it better: to deliver economic growth and enrich the quality of life, to widen choices for industry and individuals and improve the way we meet our current and future needs. Startling advances in communications, information, health and basic technologies are now converging to magnify the pace of scientific and technological change and the productivity of scientific research. Now more than ever before, investment in science accompanied by matching investments in technology and innovation offers the prospect of sustained social and economic dividends.

0.2 The potential of scientific and technological discoveries will only be realised, though, if they can be effectively translated into innovation – new products, processes, services and systems. A vibrant innovation system is the key to reaping the gains from research, connecting science and technology with developments in market demand and social needs. The individual entrepreneurs, businesses, and investors are the essential catalysts who convert science and technology into new ways of meeting economic and social needs. They translate ideas into commercial reality. Success in innovation can in turn provide the motivation for focused research, attract talented people and inspire public confidence in science and technology as well as providing the extra value added which can resource future increases in scientific research and business R&D. It is only through innovation that science and technology can benefit our economy and society.

0.3 The UK has a long tradition of scientific excellence and technological invention but has been much less successful in capitalising on earlier waves of scientific and technological breakthroughs. We must not allow this opportunity to elude us now. In previous decades, weak links throughout the innovation process have held back delivery of economic benefits. Excellence in scientific research had been insufficiently funded, weaknesses in education and training meant that many firms lacked people who could interface with the science base and exploit new technology. Too often, senior management failed to appreciate the importance of science and technology to their businesses. Firms were insufficiently committed to innovation and the exploitation of new markets, partly because the competitive spur to innovate was not as sharp as it should have been. Industry's own investment in technology and innovation was undermined by the instability of the economy as a whole, which damaged investment incentives. Early innovation gains were not diffused through the economy as rapidly as in other countries, contributing to the UK's relative productivity decline.

0.4 Investment in innovation is now embedded in a wider strategy for raising the sustainable growth rate of the economy through productivity gains. We have laid strong foundations of macroeconomic and structural reform. Improvements in the investment climate, the opportunities for enterprise, and the acquisition of skills provide a more supportive environment for the exploitation of science, the development of new technology and subsequent investment in innovation, which in turn will boost productivity growth. This document sets out how the science, engineering and technology research strategy is intimately connected to the Government's economic goals.

Investing in science capital and capacity

0.5 This strategy addresses the two key challenges facing UK science and technology: renewing, in a sustained manner, the physical and human capital stock which underpins our growing research endeavour; and investing in capacity to exploit the burgeoning opportunities for new science. It also addresses the way Government departments obtain and use research and scientific advice.

0.6 Because the benefits from innovation spread right across the economy and society, investment in this arena needs a collective input from all the major research funders: Government, business and research charities. The Government has the primary responsibility as lead investor in basic scientific research, and in sustaining the science education and training infrastructure. For this partnership to work well, there must also be greater clarity about the respective roles and contributions of companies and charities to research funding.

0.7 **The Government will therefore take the lead in providing a new dedicated capital stream and enhanced research funding to enable the science and engineering base to restore, maintain and grow the infrastructure for research.** Universities will be able to invest with greater certainty for the long term, but will at the same time have sharper responsibility to ensure that their research is sustainably funded. **The Government will establish clear principles on the contribution of public, private and charitable funding to maintaining the science infrastructure.** In return, universities will improve the transparency and accountability of their increasingly diverse funding streams, demonstrating clearly that, over time, the full economic costs of their research activities are covered.

0.8 The opportunities from investing in innovation are matched by imperatives to do so. Business and R&D are conducted in a global market, in which other countries are boosting their investment in science and technology. Without the body of highly educated and skilled manpower and the knowledge gained from past investments in R&D and innovation, business will not be able to exploit R&D and innovations generated elsewhere. The UK starts from a strong position of excellence in many areas, backed by good science education and training. But in key disciplines we are living off the human capital acquired in previous decades. The Government's strategy, therefore, responds positively to the findings and recommendations of Sir Gareth

Roberts' review of science skills[1]. We need to ensure that our scientific talent is continually refreshed and rejuvenated, and that the UK is an increasingly attractive location for individuals and business to engage in research.

0.9 **The Government will invest a further £100 million per year by 2005-06, through the Office of Science and Technology (OST) to improve the development of the UK's science and technology skills base. It will increase the basic support for Research Council funded PhD students to an average of over £13,000 per year, with the increases focused on subjects with recruitment difficulties. Training and career paths for researchers will be opened up. Universities will be able to invest in pay flexibility to meet skill shortages in key disciplines. Schools will gain resources to attract science graduates into the classroom, and the Government will fund science training to revitalise skills throughout teaching careers. This will include a partnership with the Wellcome Trust to deliver a National Centre for Excellence in Science Teaching. Schools and universities will also be given resources to modernise and upgrade their science engineering and technology laboratories.**

0.10 These reforms and funding should set the science and engineering base on course towards renewal over the coming decade. At the same time, the Government will boost the resources available for expansion of research, both to maintain the vibrancy of the UK's best research programmes and to enable growth in new priority areas. **By investing an extra £400 million per year by 2005-06 in science and engineering research programmes, and an additional £100 million per year by 2005-06 in equipment and capital infrastructure, the Government will fund real annual growth in research programmes of 5 per cent. This will finance the expansion of world class basic research – the life blood of scientific innovation – and allow a start to be made on new priority areas of research to tackle social challenges such as: brain science, regenerative medicine, proteomics (building on the foundation of genome sequencing in which the UK has played a key role), sustainable energy, and rural land use.**

0.11 **To complement these measures for the science base, the Government will also take steps to strengthen the use of science and management of research by Government departments.** This will help ensure that science priorities are carefully considered and given proper weight alongside other priorities in spending decisions. Arrangements for knowledge transfer will be enhanced. The Government's Chief Scientific Adviser, accountable for the quality of science in Government, will lead a new rolling programme of external scrutiny and benchmarking to reinforce best practice and high standards across departments. Improving the competence of departments to act as an intelligent customer for, and manager of, research and scientific advice, will be driven by a Chief Scientific Adviser in each of the major Government departments which perform or commission research.

[1] ***SET for success:*** The supply of people with science, technology, engineering and mathematics skills.

Closing the innovation gap

0.12 Science and technology manifests itself in our lives through products and services, medical treatments and communications networks. The drive for this innovation must come from business. A key goal of the Government is increasing the productivity of industry and manufacturing in particular. If UK manufacturers matched the productivity levels of France, Germany and the US, and all else remained the same, the economy would be £70 billion per year better off, creating prosperity for all. Investment in innovation not only helps manufacturers retain a competitive edge in the face of growing global competition, but it is also a key driver of productivity improvements. The Government's strategy for manufacturing[2] provides a comprehensive framework for taking forward the manufacturing agenda in partnership with key stakeholders. This will be achieved, not least, by joining up Government activities and polices which underpin manufacturing success. The Government has now put in place the necessary framework of macroeconomic stability and structural reforms to create a better climate for investment. Of itself, this should encourage R&D investment by business, which by the late 1990s had shown the first signs of reversing several decades of relative decline.

0.13 The UK's strongest innovative industries are global leaders, but too many of our sectors are significantly lagging behind international investment levels in R&D. In 2000, the Government started to tackle this, through introducing tax incentives for R&D among smaller technology-based firms. This year, the Government has widened these fiscal reforms to encompass all UK-based business R&D. The Government is now investing through the tax system around £500 million per year across the full range of British manufacturing and services to underpin more than £11 billion of business R&D.

0.14 Industry's own efforts to exploit the ideas and skills emerging from the UK science base will be buttressed by continued and growing investment by the Government in knowledge transfer from the science base. Government resources will be sharply focussed on identified gaps in the transfer of scientific knowledge to industry, enabling collaboration between business and universities and forward-looking investment in future 'disruptive' technologies.

0.15 To complement this, the universities and publicly-funded research establishments need to build on their recent progress in linking with business to create value for the regional and national economy. **The Government will consolidate the Higher Education Innovation Fund (HEIF) as a permanent third stream of funding for universities, with investment rising to £90 million per year by 2005-06.** This will provide pump-priming resources for technology transfer, entrepreneurship training, corporate spin-outs and seed venture funding. The **Regional Development Agencies** will play an enhanced role in helping to direct resources from HEIF and other knowledge transfer programmes, so that they contribute most effectively to regional growth strategies.

[2] DTI (May 2002), The Government's Manufacturing Strategy.

Science and innovation in the Devolved Countries and English regions

This science strategy covers policy areas that are reserved to the UK Government such as science funding by the OST and tax credits, and those areas where policies are devolved such as higher education funding. In areas which are reserved to the UK Government, the coverage of this science strategy, and increases in funding associated with it, are UK wide. In areas that are devolved it will be for the devolved administrations to decide what policies they wish to implement; they will receive their share of increases in comparable programmes in the spending review in the normal way.

The Government intends to work closely with the devolved administrations in implementing this science strategy to ensure that the partnership between the Government and the devolved administrations delivers improved prosperity and productivity across the UK.

The Government will similarly work closely with the RDAs to strengthen the science base in the English regions, with the aim of strengthening innovation as a key driver of improved regional productivity.