Science Funding in the UK and the priorities for the Science and Technology Facilities Council

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Introduction

- Science funding landscape in the UK
  - and where STFC fits in
- Role and activities of STFC
- Priorities for UK Science Priorities (including particle physics)

BIS | Department for Business Innovation & Skills

RESEARCH COUNCILS UK

Arts & Humanities Research Council

BBSRC bioscience for the future

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

EPSRC Pioneering research and skills

MRC | Medical Research Council

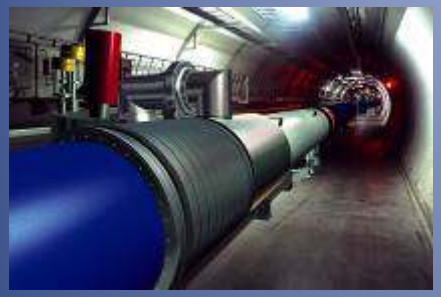
NATURAL ENVIRONMENT RESEARCH COUNCIL

Science & Technology Facilities Council

STFC Remit

- Funding agency for research in Astronomy and Nuclear and Particle Physics
- Responsible for major international subscriptions (CERN, ESO, ILL, ESRF)
- Operator of National Laboratories at RAL and Daresbury

Understanding our Universe
STFC's Science Programme



Particle Physics

Revealing the structure and forces of nature
Large Hadron Collider (LHC), CERN

Ground based Astronomy

- European Southern Observatory (ESO), Chile
- Very Large Telescope (VLT)
- Atacama Large Millimeter Array (ALMA)
- European Extremely Large Telescope (E-ELT)

Space based Astronomy

- Funding for exploitation of space missions
- STFC Space Science Technology Department (RAL Space)

Nuclear Physics

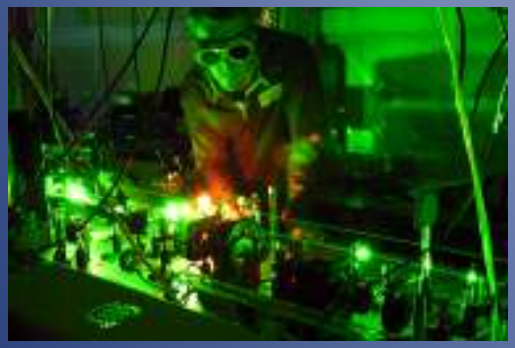
- Facility for anti-proton and Ion research (FAIR), Germany
- Nuclear Skills for - medicine (Isotopes and Radiation applications)
  - energy (Nuclear Power Plants)
  - environment (Nuclear Waste Disposal

CERN

ALMA Chile

STFC Facilities – driving scientific research

Neutron Sources
Providing powerful insights into key areas of energy, biomedical research, climate, environment and security.
Institute Laue-Langevin (ILL), Grenoble
ISIS Pulsed Neutron and Muon Source



High Power Lasers
Providing applications on bioscience and nanotechnology
• Central Laser Facility
Demonstrating laser driven fusion as a future source of sustainable, clean energy
• HiPER

Light Sources
Providing new breakthroughs in medicine, environmental and materials science, engineering, electronics and cultural heritage
• Diamond Light Source Limited (86%)
• European Synchrotron Radiation Facility (ESRF), Grenoble

Diamond Light Source

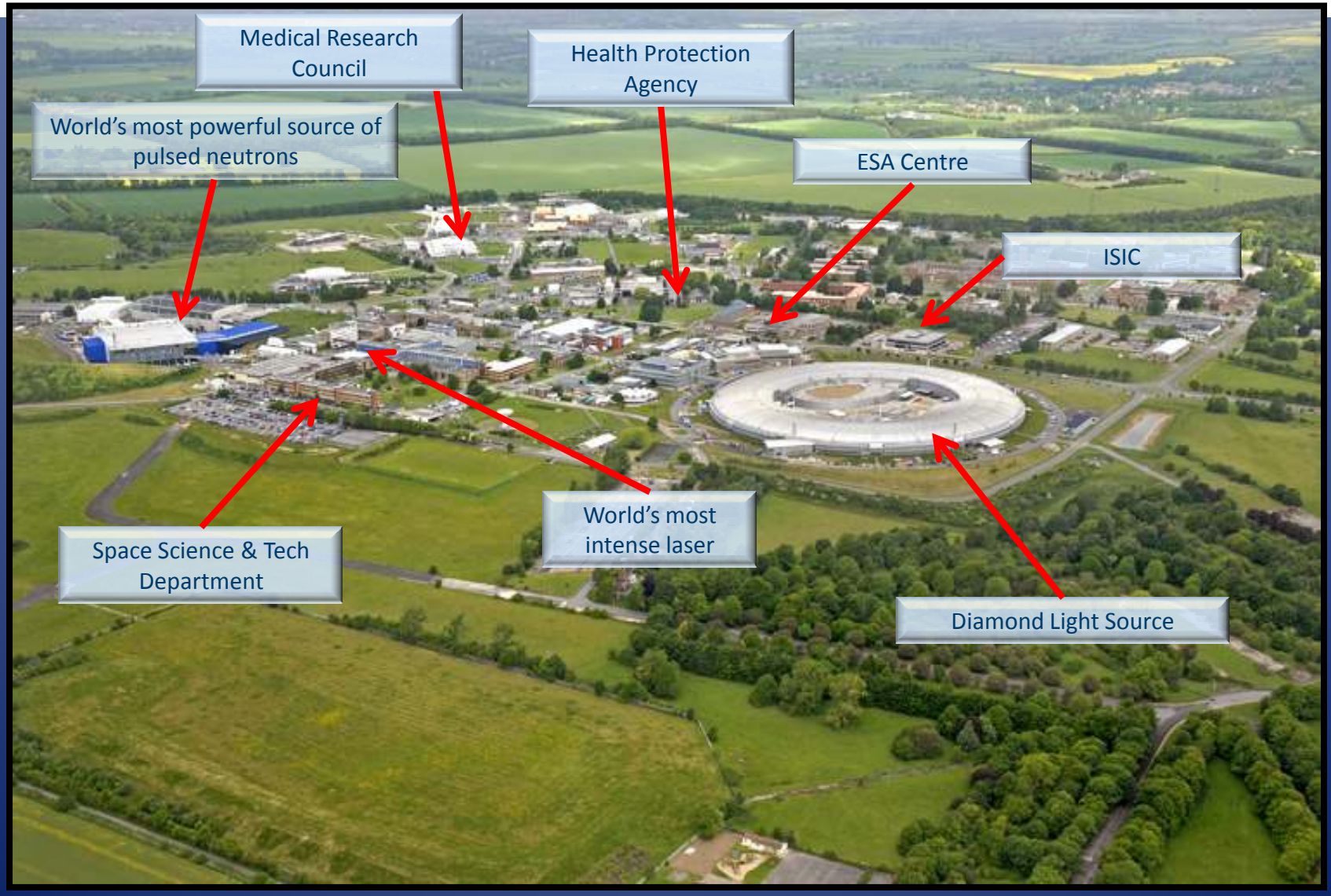
ISIS Pulsed Neutron Source

ILL High Flux Reactor

ILL and ESRF

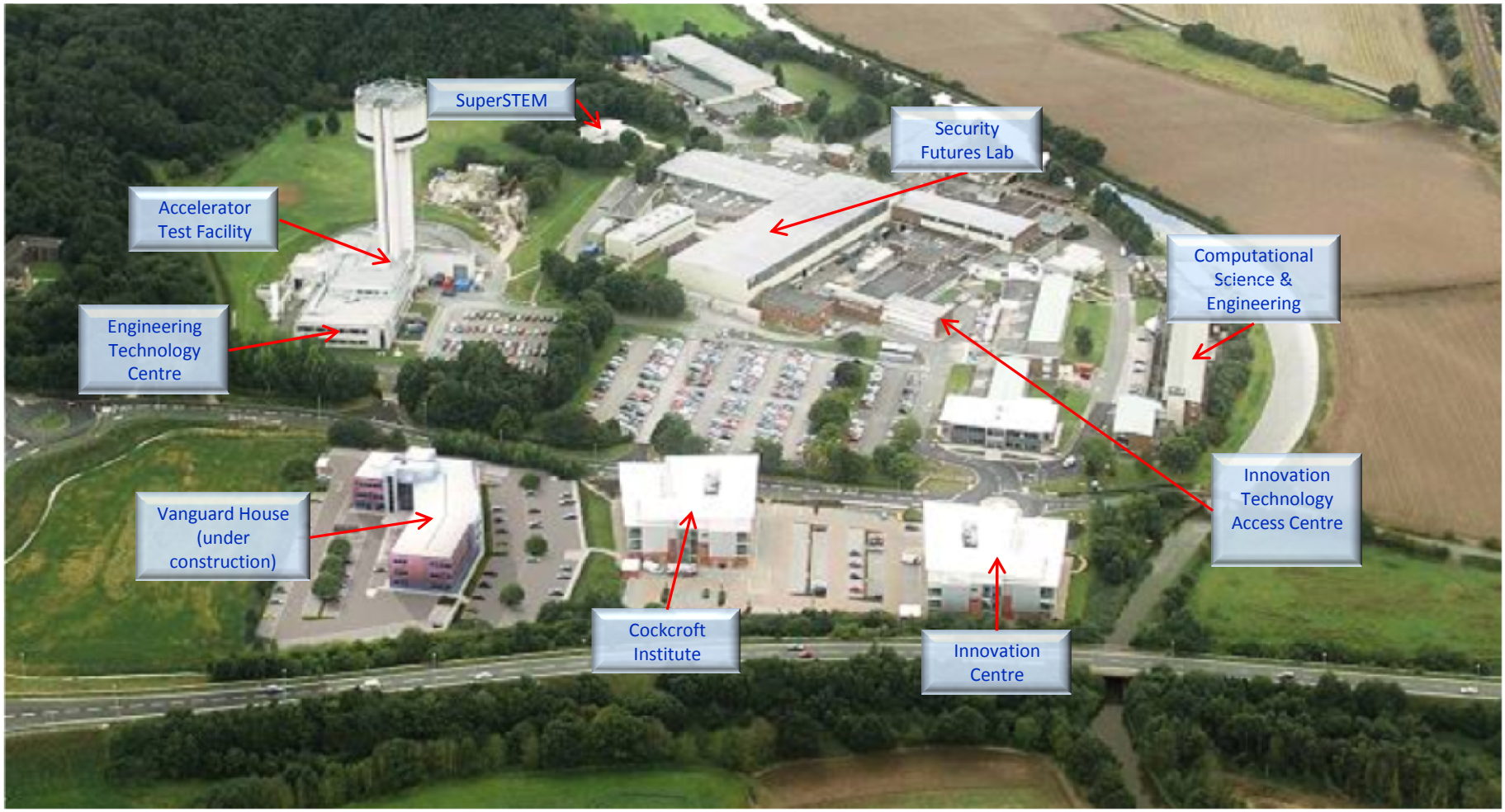
Science & Technology Facilities Council

Harwell Campus



Science & Technology Facilities Council

Daresbury Campus



Science Funding Landscape

Background

- The UK is a relatively small country with 60m population and 6th biggest economy globally.
- But produces around 9% of scientific papers and 14% of the most highly cited scientific publications.
- Ranked second to US in most scientific disciplines based on publications and citations.
- Has some of the best Universities in the world (3 in the top ten list of Universities in the world).

So what's the problem

- Widely held perception that we are smart but fail to capitalize
- Collapse of traditional manufacturing
  - manufacturing contributes just 18% of GDP
- Reliance on service industries (particularly banking and insurance)
- A feeling that if we could harness and exploit our ideas better then the economy would grow

What's the evidence for this

- First thing to say is that the UK investment in research as a percentage of GDP is lower than our competitors (US, Japan, Germany and France for the purpose of this discussion)
- Despite this we are second to the US in terms of numbers of papers and citations
- And interestingly we top the list in terms of papers and citations per capita!
- But we are bottom of the list in terms of patents per capita.

http://www.ifm.eng.cam.ac.uk/cig/documents/Innovation_gap_FINAL.pdf

No shortage of government initiatives

- Realizing our Potential
- Technology Transfer (one way)
- Knowledge Exchange (two way)
- Economic Impact
- Impact (societal and economic)

Note that these are not initiatives to put more money into science, they are ways of getting more out of the investment.

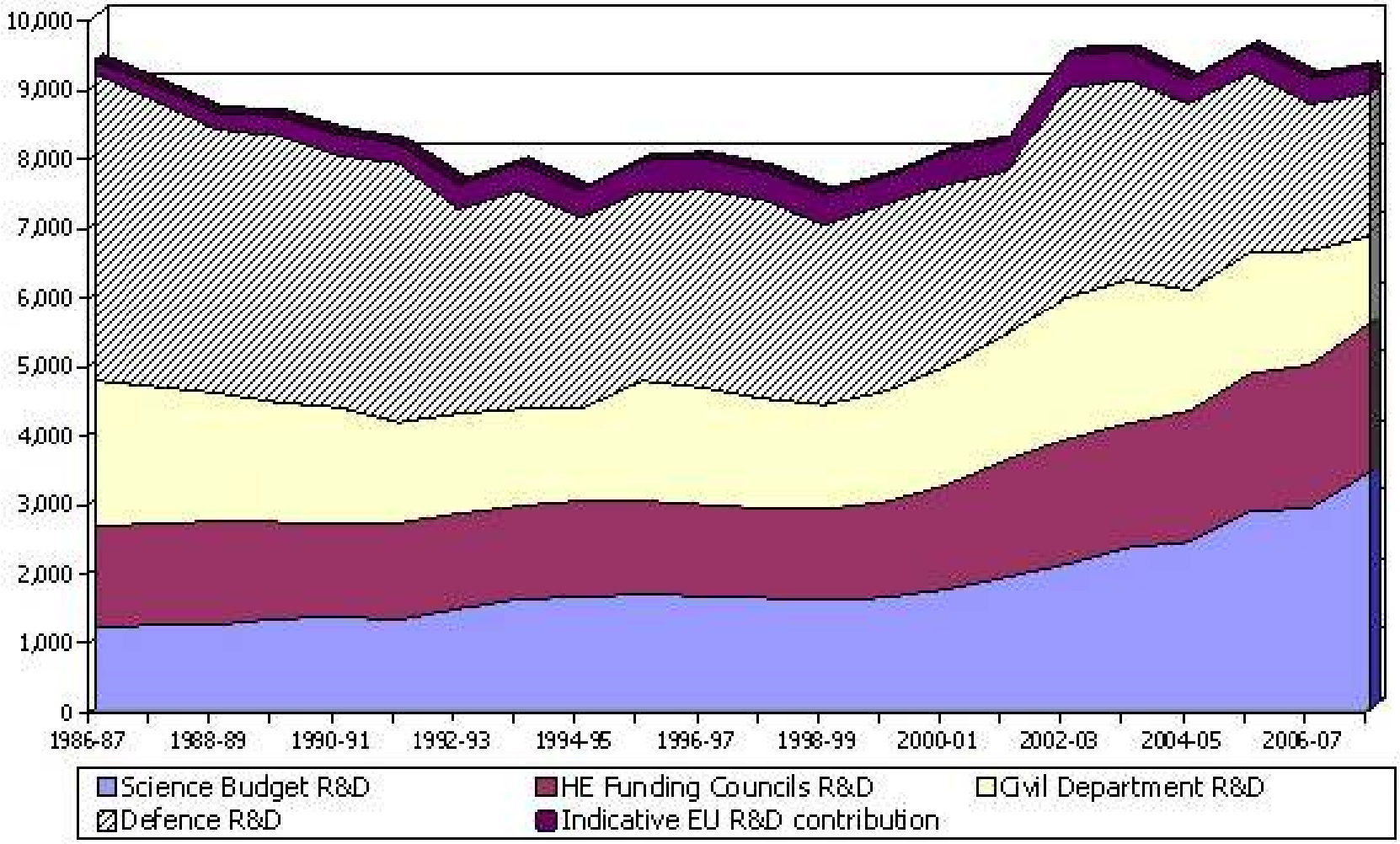
Just a little history

- 1979 Margaret Thatcher
  - 1st woman Prime Minister
  - 1st Prime Minister with a degree in science!
  - Only Prime Minister with a science degree
- 1997 Tony Blair
  - Appoints David Sainsbury as Science Minister
  - Gordon Brown Chancellor of the Exchequer
  - None of them scientist but they get it.
  - Pledge to double science spending!

Just a little history

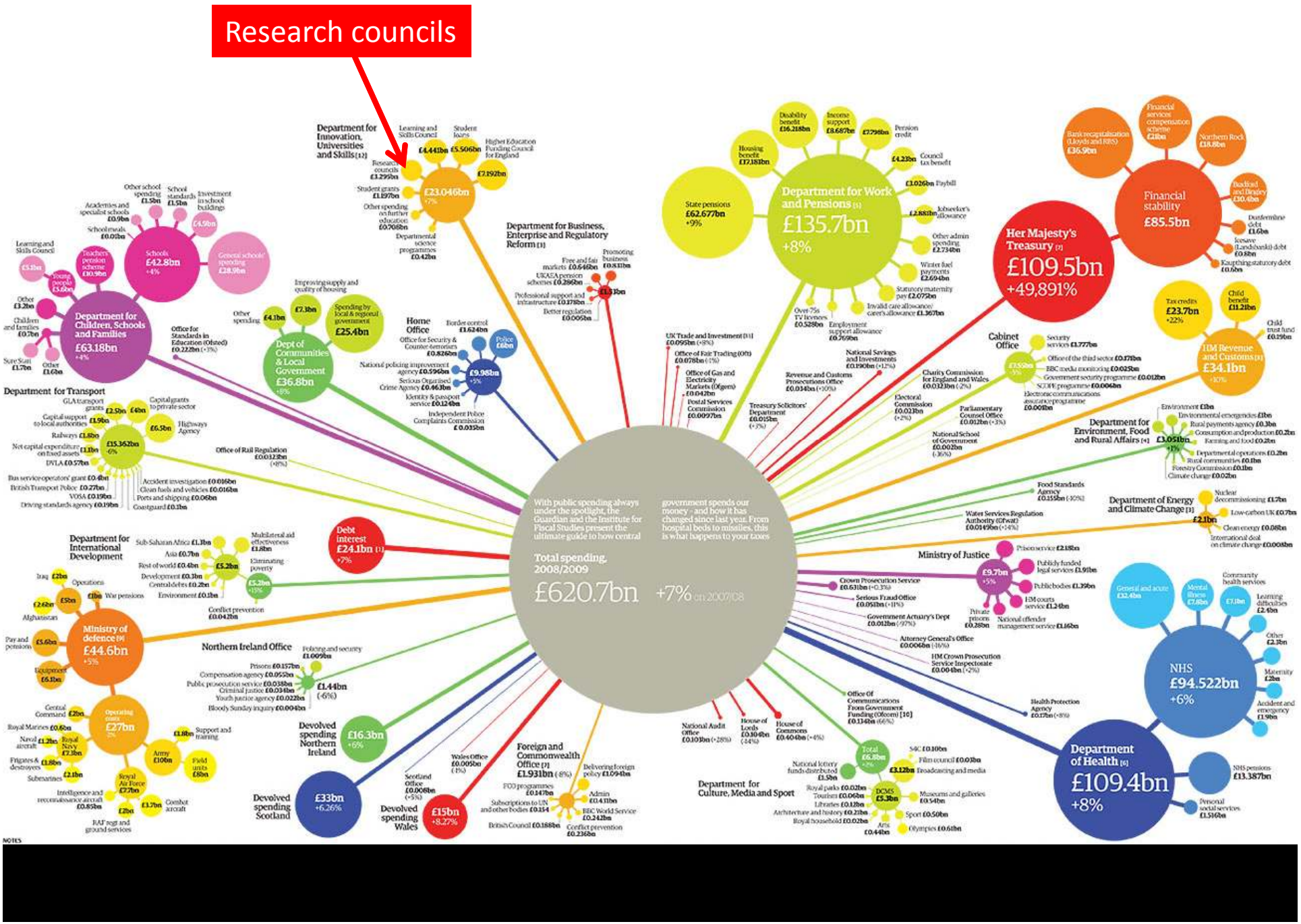
- In addition Gordon Brown was happy to borrow in order to fund capital projects
- The scientific community were encouraged to think big. Projects would be funded by capital investment and the running costs would be affordable in the context of growing budgets.

R&D Spending in Real Terms



And then came the economic crisis

- Halts economic growth
- Bank bail-out adds to national debt
- Loss of confidence in and popularity of government
- May 2010 election results in coalition government
- Election fought on a platform of cuts and debt reduction
- But where would the cuts fall


Research councils
With public spending always under the spotlight, the Guardian and the Institute for Fiscal Studies present the ultimate guide to how central government spends our money – and how it has changed since last year. From hospital beds to missiles, this is what happens to your taxes
Total spending, 2008/2009
£620.7bn +7% on 2007/08
Department for Innovation, Universities and Skills [12]
£23.046bn +7%
Research councils £3.299bn
Learning and Skills Council £4.441bn
Student loans £5.506bn
Higher Education Funding Council for England £7.192bn
Student grants £1.197bn
Other spending on further education £0.708bn
Departmental science programmes £0.428bn
Department for Children, Schools and Families
£63.18bn +4%
Schools £42.8bn +4%
Academies and specialist schools £0.9bn
School meals £0.018bn
Other school spending £1.5bn
School standards £1.5bn
Investment in school buildings £4.9bn
General schools' spending £28.9bn
Teachers' pension scheme £10.9bn
Young people £5.6bn
Learning and Skills Council £5.3bn
Other £3.2bn
Children and families £0.7bn
Sure Start £1.7bn
Other £1.6bn
Office for Standards in Education (Ofsted) £0.222bn (+3%)
Department for Transport
£15.362bn -6%
GLA transport grants £2.5bn
£4bn Capital grants to private sector
Capital support to local authorities £1.9bn
£6.5bn Highways Agency
Railways £1.8bn
Net capital expenditure on fixed assets £1.1bn
DVLA £0.578bn
Bus service operators' grant £0.4bn
British Transport Police £0.278bn
VOSA £0.195bn
Driving standards agency £0.198bn
Office of Rail Regulation £0.032bn (+8%)
Accident investigation £0.016bn
Clean fuels and vehicles £0.016bn
Ports and shipping £0.06bn
Coastguard £0.1bn
Dept of Communities & Local Government
£36.8bn +8%
Other spending £4.1bn
£7.3bn Improving supply and quality of housing
Spending by local & regional government £25.4bn
Home Office
£9.98bn +5%
Border control £1.624bn
Police £6bn
Office for Security & Counter-terrorism £0.826bn
National policing improvement agency £0.596bn
Serious Organised Crime Agency £0.463bn
Identity & passport service £0.124bn
Independent Police Complaints Commission £0.035bn
Department for Business, Enterprise and Regulatory Reform [1]
Free and fair markets £0.646bn
USAEA pension schemes £0.286bn
Professional support and infrastructure £0.378bn
Better regulation £0.005bn
Promoting business £0.833bn
£1.33bn
Department for Work and Pensions [5]
£135.7bn +8%
State pensions £62.677bn +9%
Housing benefit £17.188bn
Disability benefit £16.218bn
Income support £8.687bn
£7.798bn Pension credit
£4.23bn Council tax benefit
£3.026bn Payroll
£2.881bn Jobseeker's allowance
Other admin spending £2.734bn
Winter fuel payments £2.694bn
Statutory maternity pay £2.075bn
Over-75s TV licences £0.528bn
Employment support allowance £0.769bn
Invalid care allowance/ carer's allowance £1.367bn
Her Majesty's Treasury [7]
£109.5bn +49,891%
Financial stability £85.5bn
Bank recapitalisation (Lloyds and RBS) £36.9bn
Financial services compensation scheme £20bn
Northern Rock £18.8bn
Bradford and Bingley £50.4bn
Dunfermline debt £1.6bn
Icesave (Landsbanki) debt £0.8bn
Kaupthing statutory debt £0.6bn
HM Revenue and Customs [11]
£34.1bn +10%
Tax credits £23.7bn +22%
Child benefit £11.2bn
Child trust fund £0.19bn
Cabinet Office
£3.55bn -5%
Security services £1.727bn
Office of the third sector £0.378bn
BBC media monitoring £0.025bn
Government security programme £0.012bn
SCOPE programme £0.006bn
Electronic communications assurance programme £0.001bn
Department for Environment, Food and Rural Affairs [14]
£3.051bn +1%
Environment £1bn
Environmental emergencies £1bn
Rural payments agency £0.3bn
Consumption and production £0.2bn
Farming and food £0.2bn
Departmental operations £0.2bn
Rural communities £0.1bn
Forestry Commission £0.1bn
Climate change £0.02bn
Department of Energy and Climate Change [3]
£2.1bn
Nuclear decommissioning £1.7bn
Low-carbon UK £0.7bn
Clean energy £0.08bn
International deal on climate change £0.008bn
Food Standards Agency £0.155bn (-10%)
Water Services Regulation Authority (Ofwat) £0.014bn (+14%)
Ministry of Justice
£9.7bn +5%
Prison service £2.158bn
Publicly funded legal services £1.911bn
Public bodies £1.396bn
HM courts service £1.24bn
National offender management service £1.168bn
Private prisons £0.288bn
Crown Prosecution Service £0.631bn (+0.3%)
Serious Fraud Office £0.051bn (+11%)
Government Actuary's Dept £0.012bn (+17%)
Attorney General's Office £0.006bn (-16%)
HM Crown Prosecution Service Inspectorate £0.004bn (+2%)
Health Protection Agency £0.178bn (+8%)
NHS
£94.522bn +6%
General and acute £32.4bn
Mental Illness £7.8bn
£7.1bn Community health services
Learning difficulties £2.4bn
Other £2.3bn
Maternity £2bn
Accident and emergency £1.9bn
Department of Health [6]
£109.4bn +8%
NHS pensions £13.387bn
Personal social services £1.516bn
Debt interest £24.1bn [13] +7%
Department for International Development
£5.2bn +15%
Sub-Saharan Africa £1.3bn
Asia £0.7bn
Rest of world £0.4bn
Development £0.3bn
Central debts £0.2bn
Environment £0.1bn
Multilateral aid effectiveness £1.8bn
Eliminating poverty
Conflict prevention £0.042bn
Ministry of defence [9]
£44.6bn +5%
Iraq £2bn
Operations £1bn
£5bn War pensions
£2.6bn Afghanistan
Pay and pensions £5.6bn
Equipment £6.3bn
Operating costs £27bn 2%
Central Command £2bn
Royal Marines £0.6bn
Naval aircraft £1.2bn
Royal Navy £7.3bn
Frigates & destroyers £1.8bn
Submarines £2.1bn
Army £10bn
£1.8bn Support and training
Field units £8bn
Royal Air Force £7.7bn
Intelligence and reconnaissance aircraft £0.85bn
£3.7bn Combat aircraft
£2bn RAF regt and ground services
Northern Ireland Office
£1.44bn (-6%)
Policing and security £1.009bn
Prisons £0.157bn
Compensation agency £0.055bn
Public prosecution service £0.038bn
Criminal justice £0.034bn
Youth justice agency £0.022bn
Bloody Sunday inquiry £0.004bn
Devolved spending Northern Ireland
£16.3bn +6%
Devolved spending Scotland
£33bn +6.26%
Devolved spending Wales
£15bn +8.27%
Wales Office £0.005bn (-1%)
Scotland Office £0.008bn (+5%)
Foreign and Commonwealth Office [7]
£1.931bn (-8%)
FCO programmes £0.147bn
Subscriptions to UN and other bodies £0.154
British Council £0.188bn
Delivering foreign policy £1.094bn
Admin £0.411bn
BBC World Service £0.242bn
Conflict prevention £0.236bn
National Audit Office £0.103bn (+28%)
House of Lords £0.104bn (-14%)
House of Commons £0.404bn (+4%)
Office Of Communications From Government Funding (Ofcom) [10] £0.134bn (66%)
Department for Culture, Media and Sport
Total £5.28bn +7%
DCMS £5.3bn
National lottery funds distributed £1.5bn
Royal parks £0.021bn
Tourism £0.066bn
Libraries £0.128bn
Architecture and history £0.21bn
Royal household £0.02bn
Arts £0.44bn
Film council £0.03bn
£3.12bn Broadcasting and media
Museums and galleries £0.54bn
Sport £0.508bn
Olympics £0.618bn
S4C £0.106bn

To the edge of the cliff and back

- In preparation for a change of government the Treasury asks for “bleeding stumps” scenarios
- Modeling for 25% cut in resource and 50% in capital
- Forced to stare into the abyss
  - At this level just not possible to continue business as usual (everything on the table for cuts)
  - Cut in capital poses particular threat to CERN membership

So what happened?

- We made a strong case for the importance of science (both applied and more fundamental) to the economy.
- We also argued for the inspirational value of subjects like HEP and Astronomy (attracting students etc).

In the end science did relatively well

- Despite 25% average cuts across government, science budget is protected and held flat
- Government buys the argument that membership of international organizations such as CERN cannot be subject to short term financial threats and fully funds
- National facilities top-sliced
- New emphasis on impact and economic growth

Priorities for the Future

Promoting Greater Interaction with Industry

- Collaborative access to facilities
- Establishment of Science and Innovation Campuses at Harwell and Daresbury

Focus on Global Challenges

- Energy
- Climate change
- Security
- Health

Diamond Light Source

- The largest scientific instrument built in the UK in > 40 years.
- Funding announced for 10 new beamlines (~£100m)

ISIS

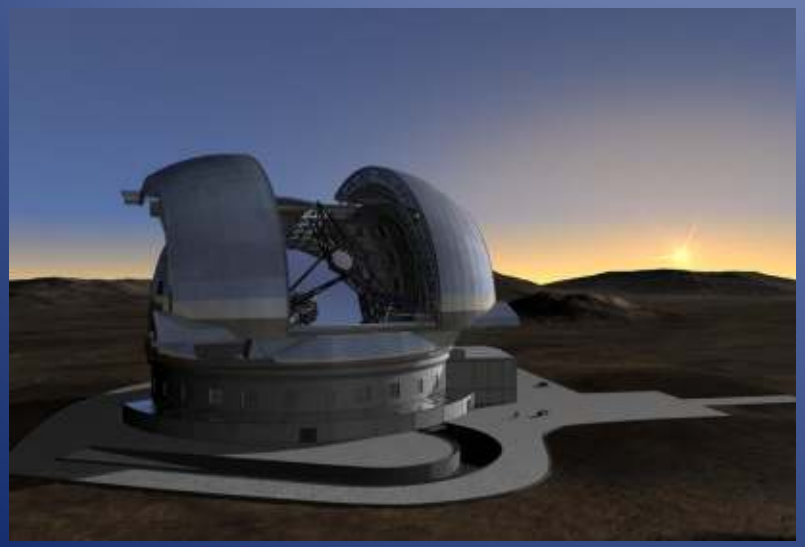
- ISIS is the world's most productive pulsed neutron spallation source.
- Target Station 2 expands the science programme into soft matter, advanced materials and bio-science
- £21m announced for new beamlines

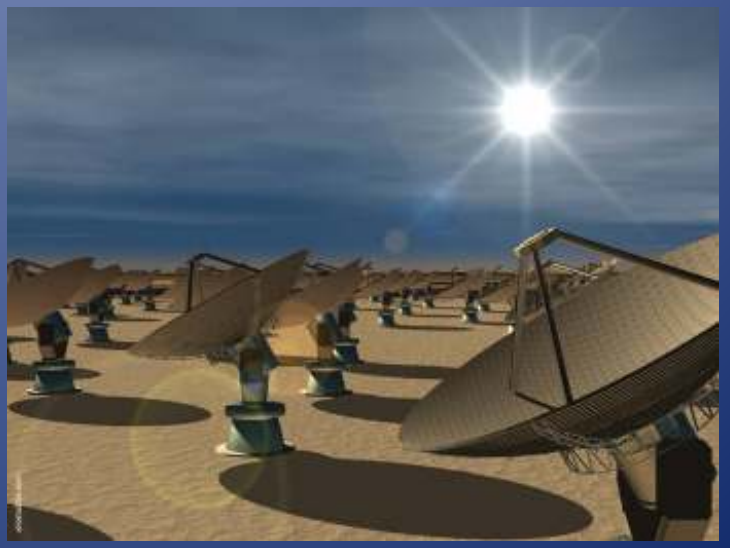
International Subscriptions

- International subscriptions are fully funded at the levels which have been agreed with our international partners.
- A planned reduction of ESRF exploitation from 14% to 10% is included.

Astronomy and Cosmology

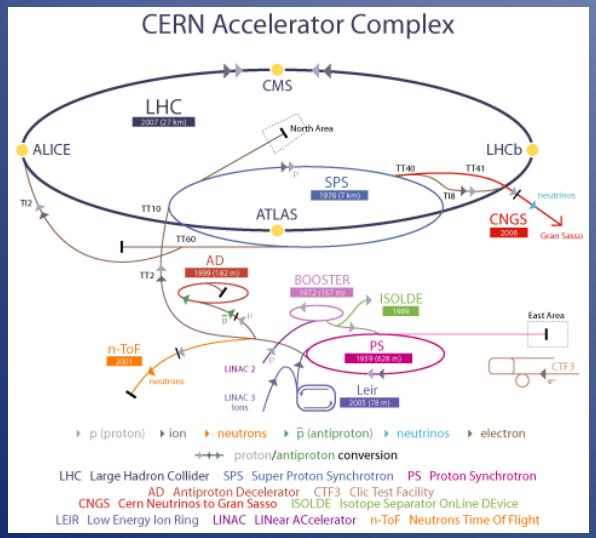
- Our highest priorities in ground-based astronomy are:
  - to exploit our membership of ESO, which gives access to the world-leading VLT telescopes and to the new ALMA millimetre astronomy array, and to carry out R&D towards the next generation European Extremely Large Telescope (E-ELT) and
  - the UK-led Square Kilometre Array (SKA) radio telescope project.





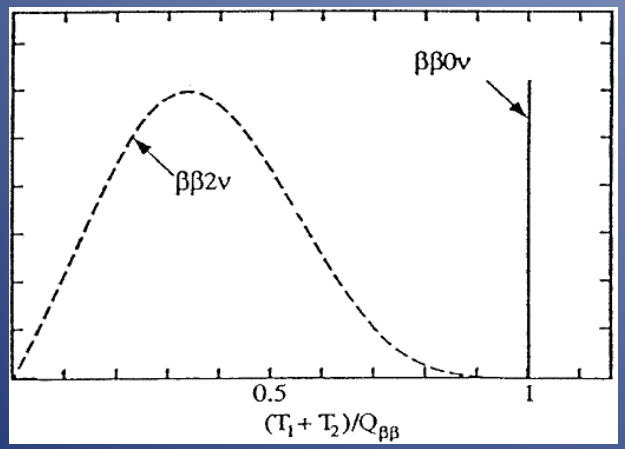
Particle Physics Priorities

- Energy Frontier
  - Exploitation of LHC
  - Upgrades to ALTAS and CMS detectors
  - LHC luminosity upgrades



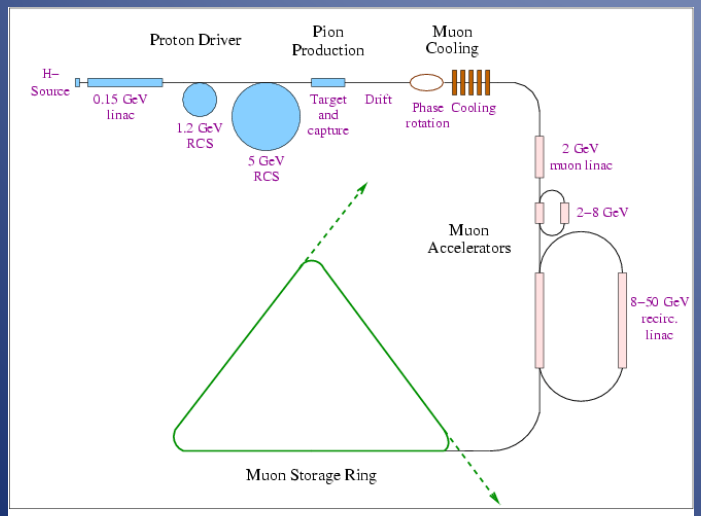
Neutrino mass and mixing

- Minos
- T2K
- Super-Nemo



Muon Collider and Neutrino factory

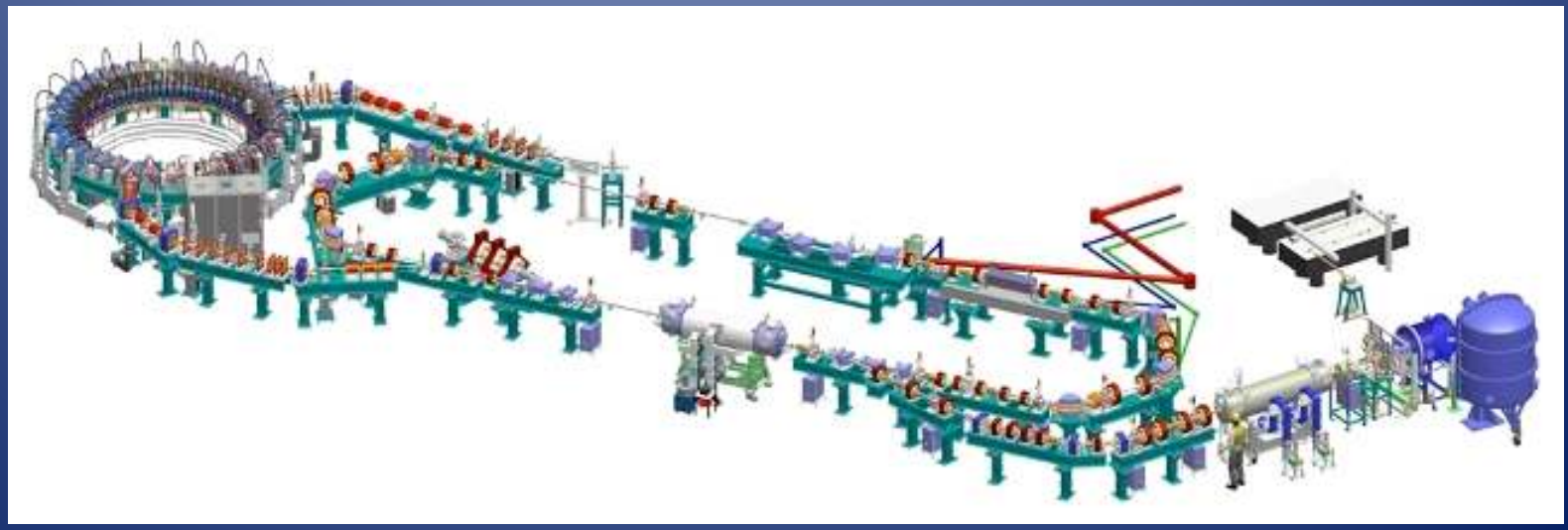
- MICE
  - Capital funding very tight
- NF R&D
  - Unlikely to be able to grow activity



Neutrino factory at RAL

Accelerator R&D

- Funding via Cockcroft and John Adams Institutes and the ASTec Centre
- ALICE and EMMA (energy recovery linac, electron FFAG)
- Front End Test Stand for high power proton beams
- Targets
- Applications



Conclusions

- Inflation will eat into flat budgets so funding will be tight over the next four years.
- The science programme for Particle Physics and Astronomy is very narrow.
- Government will want to see evidence of impact.
- But the government has recognized the importance of science including fundamental science.