

**Submission to House of Commons Science and Technology Select Committee call for evidence: science and research budget allocations, 2011/12 – 2014/15**

27 April 2011

1. This submission has been produced jointly by three organisations which, between them, represent a significant part of the science and engineering base of the UK Oil and Gas industry. All three bodies promote, for the public benefit, education in Earth sciences related to petroleum exploration, development and production. They are:

- The Petroleum Exploration Society of Great Britain (PESGB)
- The British Geophysical Association (BGA)
- The Geological Society of London (GSL), working through its Petroleum Group

The Petroleum Exploration Society of Great Britain the national community for Earth scientists working in the oil and gas industry, with over 5,000 members worldwide. The objective of the Society is to promote, for the public benefit, education in the scientific and technical aspects of petroleum exploration. To achieve this objective the PESGB makes regular charitable disbursements, holds monthly lecture meetings in London and Aberdeen and both organises and sponsors other conferences, seminars, workshops, field trips and publications.

The British Geophysical Association represents geophysicists in academia and industry who are members of the Royal Astronomical Society or the Geological Society of London. Its role is to promote geophysics and knowledge about geophysics at national and international levels.

The Geological Society is the national learned and professional body for Earth sciences, with 10,000 Fellows (members) worldwide. Of these, around 1,800 are members of the Society's Petroleum Group, which encompasses those working in industry, academia and government, with a wide range of perspectives and views on policy-relevant science, and the Society is a leading communicator of this science to government, policy makers, media, those in education and the broader public.

The group which has prepared this submission includes senior figures from academia and from several sectors of the hydrocarbons industry. The document also draws on consultation carried out with the course leaders of UK petroleum geoscience MSc courses.

2. We have chosen to focus this joint submission solely on the effect which the science and research budget allocations have had on the provision of *taught Masters courses* in petroleum geoscience, and the likely consequences for the oil and gas industry. In particular, we note with concern the decision of the Natural Environment Research Council (NERC) to discontinue from 2011 the provision of studentships for those following MSc programmes across the Earth and environmental sciences, in light of the pressures on its overall budget. We now view the risk of serious market failure with regard to the provision of suitably qualified scientists and engineers as being

sufficiently important to the future of the UK oil and gas industry to warrant a combined response from our organisations, including the present submission to the Committee's call for evidence. While our focus here is on the hydrocarbons industry, we note that the risk to future supply of suitably qualified personnel is replicated in other sectors dependent on Earth science and engineering skills.

### ***Future skills needs***

3. NERC's response to budgetary pressures, including the decision to discontinue MSc funding, has been informed by a skills needs assessment report entitled 'Most Wanted: Skills needs in the Environment Sector'. This report takes a somewhat simplistic view of the energy and environmental landscape. In particular, the section on energy refers only to renewable sources – yet in 2011, 60% of the UK's total energy requirements will be met by oil and gas produced from UK reserves. Nonetheless, the skills framework document highlights the need for advanced geoscience skills for the energy sector.
4. In March 2011, an event at the Houses of Parliament was organised by PESGB Young Professionals, many of whom had graduated with Masters degrees in recent years. Government and opposition speakers noted the need to encourage students to take STEM (science, technology, engineering and maths) subjects, and the challenge the UK faces in this regard.
5. The UK hydrocarbons industry will depend on the supply of trained personnel qualified in a range of STEM subjects, including thousands of geoscientists, both to continue to develop the UK's resource base, and to maintain its strong foothold in the industry globally – many UK-trained geoscientists have gone on to achieve management positions at the highest levels in oil and gas companies the world over. The domestic industry delivers enormous economic value to UK plc (£38 billion of GDP in 2007), much of which is returned to government through taxation. It is also fundamentally underpins UK energy security. Oil and Gas UK have estimated that 50,000 job vacancies will arise in the UK oil and gas industry in the coming years.
6. The expertise of geoscientists, and of the UK oil and gas industry, will also be essential to delivering the government's stated aim of rapidly developing and deploying carbon capture and storage (CCS) at commercial scale – a necessity if we are to continue to burn fossil fuels while rapidly reducing our CO<sub>2</sub> emissions. This is an industry in which the UK has the potential to become a world leader, and which could rival the present North Sea oil and gas industry in size. This too would require thousands of trained geoscientists. The March 2011 Scottish Carbon Capture and Storage report estimates that in Scotland alone, the industry will require an additional 859 geoscientists with postgraduate training.
7. The continuing exploration, development and production of the UK's hydrocarbon resources, and the ability to ensure their sustainable use through CCS, demand a high degree of national capability in several geoscience disciplines, and a workforce equipped with skills and competencies which are not achieved at first degree level. The added value to industry of Masters degrees is indicated by the observation of

some employers that new recruits with such a qualification are typically regarded as 'profitable' within months, while for those with only a Bachelors degree this may take years. Applied Masters courses represent one of the principal sources of skilled personnel for industry, including those who go on to take senior management positions. The UK hydrocarbon industry's strong global position depends to a great extent on its excellent graduates at both Bachelors and Masters level, and would be placed in jeopardy should this supply of high-quality trained personnel founder.

8. Among the geoscience skills most vital to the energy sector, are environmental and engineering geophysics. These are crucial in servicing both the conventional and renewable energy sector, often indirectly through site investigations for new power stations and wind farms, waste disposal sites, and cable and pipeline routing.
9. Many of those entering applied MSc courses in geoscience disciplines have first degrees in other STEM subjects. For these graduates, Masters courses serve as 'conversion' courses – a great strength in meeting the growing need for personnel with interdisciplinary skills, who can work in teams with colleagues from a variety of scientific and engineering backgrounds.
10. MSc graduates also represent one of the most effective mechanisms for knowledge transfer, taking outputs from research-informed teaching into the commercial workplace.

### ***Sources of MSc funding***

11. The 285 studentships previously provided annually by NERC represented the only stream of direct public funding for Masters training in these vital areas. While recognising the pressures on Research Council's budgets, the BGA and GSL have previously written directly to NERC, pointing out some of the likely consequences of this decision. Notwithstanding the limitations of NERC's consultation and analysis regarding skills needs, it is by no means a foregone conclusion that public support for taught MSc programmes must in future be delivered through the Funding Councils, which are charged with setting their own budgets in line with their own strategic priorities. Our concern is not which agency of government provides this modest but hugely valuable stream of funding, but to point out the potential unintended consequences of its withdrawal – namely, greatly reduced economic productivity, national capability and energy security. There may be some reluctance on the part of government to distribute funding via NERC specifically for the support of applied Masters courses, if it is thought to be interfering in Research Councils' freedom to determine funding priorities. However, this is not a matter of setting research priorities – financial support for Masters training should be recognised as quite distinct from research funding.
12. Industry presently funds a significant proportion of MSc students in petroleum geoscience. The majority of this funding is from large oil and gas companies.

13. Other MSc students fund their studies themselves. With undergraduate fees rising, students may be less willing than before to take on more debt after graduation by undertaking self-funded Masters courses.

### ***Risk of market failure***

14. In the energy sector, it might be assumed that the hydrocarbon energy industry would make up the shortfall caused by NERC's cuts, but our community believe that this is unlikely. As noted above, larger companies already provide a significant level of MSc sponsorship. However, there is insufficient incentive for individual companies to provide further funding. Graduates may not be retained in employment by their sponsoring company for long enough to justify the investment, particularly given the high level of mobility of geoscience graduates. This risk is relatively greater for SMEs, for which the loss of investment in an individual is relatively greater, and which do not benefit from the smoothing effect of employing more graduates. (Companies in the service sector, such as those providing geophysical services for plant siting and construction referred to above, are also unlikely to sponsor geoscience students, particularly given their relatively low profit margins.) Recent changes to the UK tax regime for the hydrocarbons industry are likely to lead to an increased focus on controllable expenditures external to the companies, including reducing student sponsorships. Indeed, those companies with the largest part of their investment portfolio residing in the UK, who already might offer student sponsorships, will be facing the tightest challenges from their own management over costs in light of increased pressure on post-tax margins. This reinforces our experience as industry professionals and educators that industry will not respond immediately to make up much of the shortfall in MSc sponsorships and course funding.
15. The organisations making this submission are nonetheless committed to stimulating and supporting industry funding. The PESGB already provides student bursaries as part of its charitable purpose, and is also considering the viability of an additional scheme to pool resources from SMEs to fund studentships. The GSL is planning a similar initiative for other industrial sectors. However, we do not anticipate that these efforts alone will be sufficient to replace the funding previously provided by NERC.
16. A number of geoscience specialisms relevant to the oil and gas industry are identified by government as already suffering skills shortages, and are therefore listed on the UK Border Agency Shortage Occupation List (March 2011) – applicants in these occupations for Tier 2 migrant status are to be assigned high priority under the new immigration regulations. However, it would be wrong to assume that we will be able in future to import the qualified personnel we need. Despite the large number of Earth scientists being produced in emerging economies, there is not expected to be any surplus in global supply (see AGI/IUGS workforce study 2011). China is undersupplied by 30% in comparison to its projected needs, and India is neither importing nor exporting trained Earth scientists. New constraints on the student visa system may further limit the number of international candidates entering the UK postgraduate education system.

### ***Impact of reduced support for MSc students***

17. We have consulted the directors of 12 courses at 9 universities (Table 1) offering vocational training in geology and geophysics related to the energy industry. They report that of over 300 places on these courses, a significant majority is now taken by independently funded foreign students. Of the remainder, NERC has funded around 30 students per year, at a cost in the order of £500,000 (just over 10% of the total number of NERC MSc studentships). As well as helping to sustain UK student numbers, NERC's support has functioned as a quality kite-mark, recognising academic excellence. If this public funding is not restored or substituted, in the context of the increased pressures on industry funding and self-funding outlined above, the likely impacts are wide ranging. They include:
  - The availability of significantly fewer UK-based geoscientists to meet national energy, environmental and economic needs.
  - Increased risk to academic excellence. Securing a course place will be more likely to reflect a student's ability to secure funding than academic capability. Fewer MSc students will reduce an important 'feeder pool' for primary research at PhD level and beyond.
  - Reducing participation from less well-off students in Masters courses, adversely impacting industry's access to talent and increasing the probability of social divisions in access to higher education.
  
18. These factors may combine sufficiently to threaten the financial viability of some courses, many of which have long-established reputations for academic excellence globally. In some smaller specialisms, there may be few courses already, and further closures may threaten national capability. The absolute number of such specialists needed by industry is small, but many of those currently in the workforce are relatively near the end of their careers. If they cannot be replaced, this will soon critically undermine industry's ability to discover and characterise hydrocarbon resources, as well as increasing risk in the safe drilling of exploration and development wells. A crucial field of this kind is micropalaeontology, in which already there are no specialist MSc courses remaining (the last having been at UCL). What little capacity remains for teaching micropalaeontology within more general geoscience courses is further threatened by the loss of NERC funding. The UK was once internationally dominant in micropalaeontology and its industrial application in biostratigraphy, but is now a customer for such skills rather than a supplier. (See the Micropalaeontological Society's submission to the NERC 2010 UK Taxonomy and Systematics Review for further detail.)
  
19. If companies cannot recruit the skilled personnel they need in the UK, they may relocate elsewhere, and large multinationals may shift the focus of their activities outside the UK, to the detriment of national energy security and economic wellbeing.

## ***Recommendation***

20. The change announced in funding policy for applied Masters programmes in Earth sciences, when considered in the context of other policy changes (notably regarding undergraduate student fees, the taxation regime for the hydrocarbons industry and visa requirements) and the outlook for the global geoscience workforce, runs the risk of significant unintended consequences. We believe that there is a real danger that these short-term changes could have a disproportionate adverse impact on the long-term competitiveness of the UK energy sector both in research and business, given the modest amounts of public funding at stake.
21. Given this, we urge the Science and Technology Select Committee to recommend that government attend urgently to the likely market failure in funding of applied Masters programmes as a vital investment in UK plc:
  - Public funding of studentships should be restored, whether via NERC or through some other mechanism judged more appropriate in the context of the Higher Education policy regime more widely.
  - Government should also consider providing additional incentives to stimulate industry funding of applied Masters programmes, for example through tax breaks or fund matching.
22. Our three organisations would be pleased to discuss further any of the points raised in this submission, to provide more detailed information, or to suggest oral witnesses and other specialist contacts.

## References

**American Geological Institute / International Union of Geological Sciences.** 2011. Global Change Faces the Geoscience Profession. Paper from AGI/IUGS workforce study, published in First Break Recruitment Special (European Association of Geoscientists and Engineers), 6pp.

**British Geophysical Association.** January 2011. BGA response to NERC 2011-2015 Delivery Plan. Letter to NERC, 3 pp.

**Environment Research Funders' Forum.** 2010. MOST WANTED: Postgraduate Skills Needs in the Environment Sector Report 7, 22pp.

**Geological Society of London.** February 2011. Natural Environment Research Council support for MSc training. Letter to NERC, 2pp.

**Home Office UK Border Agency.** December 2010. The Student Immigration System: a consultation, 30 pp.

**Home Office UK Border Agency.** March 2011. Shortage Occupation List, 9pp.

**Micropalaeontological Society.** April 2010. Submission to the NERC UK Taxonomy and Systematics Review, 4pp.

**Oil and Gas UK.** 2011. Activity Survey, 26pp.

**Petroleum Exploration Society of Great Britain.** April 2011. PESGB Young Professionals at the Houses of Parliament. PESGB Newsletter, and online at <http://www.pesgb.org.uk/pesgb/pages/news-and-events/event-reviews/house-commons-review>

**Scottish Carbon Capture and Storage.** March 2011. Progressing Scotland's CO<sub>2</sub> Storage Opportunities. Online at <http://www.sccs.org.uk/progress-to-co2-storage-scotland>, 72pp.

**Table 1**  
**University Course Directors Consulted, March 2011**

|                          | MSc Course  | Director            |
|--------------------------|---|---------------------|
| University of Aberdeen   | Integrated Petroleum Geoscience   | Dave Jolley         |
| Bangor University        | Applied Marine Geoscience   | Dei Huws            |
| University of Derby      | Applied Petroleum Geology   | Dorothy Satterfield |
| University of Edinburgh  | Exploration Geophysics  | Mark Chapman        |
| Heriot Watt University   | Exploration, Appraisal and Development<br>Reservoir Evaluation and Management | Andy Gardiner       |
| Imperial College London  | Petroleum Geophysics  | Helmut Jakubowicz   |
|                          | Petroleum Geoscience  | Howard Johnson      |
| University of Leeds      | Structural Geology with Geophysics  | Douglas Paton       |
| University of Manchester | Exploration Geophysics  | Roger Clark         |
|                          | Petroleum Geoscience  | Jim Armstrong       |
| Newcastle University     | Petroleum Geochemistry  | Martin Cooke        |