The Royal Academy of Engineering

Engineering in Government

House of Commons IUSS Select Committee

September 2008

1. Introduction

1.1. The overriding messages of this response are that the Government must recognise the difference between scientific advice and engineering advice and ensure that policy is appropriately informed by engineering advice at all stages of development and delivery. Presently, the Government does not articulate a clear view of the role of engineering in society or in policy making. Too often, phrases such as “science and technology” or scientific “innovation” are fielded as a substitute for “engineering”.

1.2. Engineering is concerned with the art and practice of changing the world in which we live. In doing this, engineers seek to achieve useful and beneficial outcomes in the physical world and in a business context. Much Government policy is delivered by means that require engineering solutions, which need to be developed, informed and tested by engineers as part of the policy development process.

1.3. As well as informing the delivery of policy, engineers can bring perspectives to policy formation that can enhance decision-making at all stages of the policy cycle. Engineers understand how to work with risk and uncertainty in project delivery, a key element of identifying and weighing options in policy formation. In articulating the engineering issues inherent in and raised by a policy, engineers can help identify potential barriers to implementation and ways of avoiding them.

1.4. A number of key policies fundamental to the long-term national well-being have suffered and been found wanting as a result of a lack of good engineering advice being taken at the formulation stage. The Climate Change Bill, Sustainability and Planning Bill and recent Energy Bills over the last five years failed to address engineering risks and reality in delivering the engineering assets required to enable policy to be realised and targets to be met.

1.5. Government should make better use of the expertise that resides in the engineering institutions and their overarching bodies to obtain engineering advice at all stages of the policy cycle. The Royal Academy of Engineering could act as a broker in the preparation, collation and submission of profession-wide[1] advice where and when it is required.

1.6. Government needs to be an intelligent customer for the engineering advice it receives. This means having civil service staff who are able to understand and evaluate engineering advice. With the focus strongly on evidence-based policy, the civil service should have amongst its staff engineers who are able to source and assess technical evidence. Evidence-based policy in key areas such as climate change, energy supply and low-carbon transport is only achievable with the input of policy advisers with an understanding of the required evidence – and that will include engineering evidence.

1.7. There always have been highly qualified engineers employed within Government, but because engineering has generally always been seen as a policy delivery issue rather than a policy development issue, those

[1] Engineering encompasses pure civil, electrical, process and mechanical engineering, of course, but also engineering directly related to building, transportation, ICT, materials, utilities, agriculture, healthcare, and mining

engineers have predominantly been employed in Agencies rather than Departments. As political ideas and imperatives are developed into policy within Departments, there is a need to embed engineering advice within them.

2. Recommendations

2.1. The response makes the following recommendations which appear here in the same order as they do in the text:-

a). Certain key Departments should have Chief Engineering Advisers, rather than or as well as Chief Scientific Advisers to reflect the increased importance of engineering to those Departments. Chief Engineering Advisers in these Departments are likely to be engineers by profession (as some DCSAs already are). This would allow them to articulate and address the engineering issues faced by those Departments and would ensure that the Government Chief Scientific Adviser has access to engineering advice within his or her team. Chief Scientific Advisors and Chief Engineering Advisors also require high quality staff support within their Departments if they are to provide a service with the required breadth.

b). Effort should be made to recruit engineers with practical experience of large-scale projects to these posts. The required remuneration package and terms of employment to attract a senior engineer from industry to a DCSA post will be necessarily different from that offered to an academic engineer expected to maintain his or her post at a university and return to it after the term of office as a DCSA.

c). The GCSA and the DCSAs should meet regularly with the engineering profession (through the Royal Academy of Engineering, the engineering Institutions and their overarching bodies) to communicate issues of current interest and discuss the sourcing of engineering advice.

d). Engineering advice should be sought early in the policy development process even if the engineering aspect of a problem is not obvious to policy makers.

e). Any large-scale project should be carried out with the advice of engineers – engineers have project management skills relevant to complex projects, especially those with a technical component.

f). Advisory committees should be established in Government Departments which should be used to identify when engineering advice is needed and on what issues. The engineering community, through the engineering institutions and the Royal Academy of Engineering could advise on members for such committees.

g). Open and formal processes for inviting engineering advice at the onset of policy consideration should be established.

h). Recruitment of engineers through the Fast Stream should be increased, with more engineering graduates able to forge careers within the civil service, leading to senior positions, but with the opportunity to retain engineering as a specialism.

i). Government should actively advertise the role for engineering graduates in the civil service for policy development functions as well as through delivery Agencies, so that it is perceived to be a viable career path.

j). The Government should require the professional registration of both its technical staff and also the staff of its consultants and suppliers to ensure that it receives the best advice from fully qualified, up to date engineers.

k). Government should be encouraged to consider the engineering community as a resource for informing policy at all stages as the US government does with the National Academies.

l). An understanding should be developed of how Governments in other countries take engineering advice as part of the policy process.

2.2. In addition to making these recommendations, the professional engineering community offers:

a). To continue to undertake policy studies that identify matters of importance to Government policymaking, provided there is a willing recipient for those reports.

b). To respond, as a coordinated body, to requests to give advice on draft policy and to peer review research carried out for Government, when invited.

c). To agree a process with Government whereby the professional engineering community can provide advice on key policy topics to support Government decision-making.

3. The role and effectiveness of the Government Office for Science and the Chief Scientific Advisers in providing engineering advice across Government and communicating issues relating to engineering in Government to the public.

3.1. The system of Departmental Chief Scientific Advisers (DCSAs) is new – the result of an initiative of the previous Governmental Chief Scientific Adviser (GCSA), Sir David King. At this stage, it is difficult to judge the effectiveness of the system. Some general comments can, however, be made.

3.2. Firstly, the role of the GCSA is broad, intended to encompass both science and engineering. This is not, however, reflected in the department's title (Government Office for Science), unless it is simply assumed that engineering is a sub-discipline of science. But engineering is a quite different discipline, pursued in a different manner towards different ends. Engineering is concerned with solving practical problems and in changing the physical world, using scientific, technical and business skills. Science, on the other hand, is principally about understanding the nature of the world. The practical nature of engineering means that engineering advice and expertise is of great value in developing policy and delivering projects. For example, the need for engineering advice is particularly pertinent in the area of climate change. The big challenge is no longer the search for evidence for climate change but rather the search for means of avoiding its advance and mitigating its effects, many of which will be matters of engineering and technology.

3.3. The impact of the GCSA depends to a large extent on the influence of the individual DCSAs within their Departments and the strong leadership provided by the GCSA ensuring the role of the DCSAs is appreciated and understood at Cabinet level. The recent GCSAs have done a very effective job of raising the profile of the scientific aspects of policy issues, especially in the arena of climate change. The status and impact of the DCSAs depend in part on how many opportunities they have to speak to ministers. The support they get in terms of staff is also an issue as most of the DCSAs are part-time positions. Building the influence of DCSAs within their Departments might be helped by making the posts full-time and ensuring that DCSAs have appropriate and effective staff resources within Departments.

3.4. There are some Departments in which it is important that an engineer fills the DCSA role – the DfT, the MoD and potentially BERR and DIUS. In these cases, it would make sense to call these advisers Chief Engineering Advisers, to reflect the kinds of expertise needed and the advice required. In the MoD for example, there is a Chief Scientist, and the Defence Science Advisory Board. The MoD is a Department where the budgetary spend on engineering is ten times that spent on science. Science advice in MOD is a combination of blue sky research, management of applied research, operational analysis and scrutiny of technical requirements and project approvals. Engineers are involved in this but are mainly engaged in delivering equipment projects. The CSA's role is an essential element of the checks and balances over £Bns of public expenditure on mainly high-tech projects. Although DSTL is an agency of the MOD (employing more engineers and scientists than any other Government agency), its expertise does appear to be used by the MOD in policy formation far more than any other agency in Government. In other Departments both scientific and

engineering advice is needed – DEFRA is a clear example where the life sciences and engineering are both relevant, yet the current description of the role of its CSA does not include the provision of engineering advice[2]. In these Departments, it should be made clear in the job description and potentially in the job title that providing and assessing engineering advice is a core role. It is also important that the expertise of advisers is not limited to their own Department. Many issues and the successful delivery of many policies cut across Departmental boundaries and a free exchange of engineering advice across Departments is necessary. For example, a transport issue being considered by the DCSA for the DfT might impinge on local community issues addressed by the DCLG and environmental issues addressed by DEFRA.

3.5. Many of the current DCSAs are scientists and engineers working in academia who may not have current experience of delivering major industrial projects. This could result in the CSA service struggling to provide robust advice on practical application of scientific and technical knowledge and therefore in the successful delivery of policies even where they are based on robust scientific and technical evidence. The search for DCSAs should extend beyond the world of academic research into business and industry where there is a wealth of skill in finding appropriate, cost-effective solutions to practical problems. This experience would be invaluable in helping Departments to understand practicalities of rolling out technology at scale and understanding the breadth of engineering research in the private sector, research that the Government can stimulate and can gain from.

3.6. We recommend that:

3.6.1. Certain key Departments should have Chief Engineering Advisers, rather than or as well as Chief Scientific Advisers to reflect the increased importance of engineering to those Departments. Chief Engineering Advisers in these Departments are likely to be engineers by profession (as some DCSAs already are). This would allow them to articulate and address the engineering issues faced by those Departments and would ensure that the Government Chief Scientific Adviser has access to engineering advice within his or her team. Chief Scientific Advisors and Chief Engineering Advisors also require high quality staff support within their Departments if they are to provide a service with the required breadth.

3.6.2. Effort should be made to recruit engineers with practical experience of large-scale projects to these posts. The required remuneration package and terms of employment to attract a senior engineer from industry to a DCSA post will be necessarily different from that offered to an academic engineer expected to maintain his or her post at a university and return to it after the term of office as a DCSA.

3.6.3. The GCSA and the DCSAs should meet regularly with the engineering profession (through the Royal Academy of Engineering, the engineering Institutions and their overarching bodies) to communicate issues of current interest and discuss the sourcing of engineering advice.

[2] See http://www.defra.gov.uk/science/how/adviser.htm

4. The use of engineering advice in Government policy making and project delivery, including examples of policy decisions or project delivery that have been or will be taken with or without engineering advice.

4.1. Engineers are not sufficiently often invited to contribute to policy development – their role seems to be restricted to implementation and checking of policy after the fact. But the routine engineering practices of comparing solutions for cost-effectiveness, efficacy and public acceptability would be highly valuable in informing policy decision-making at the earliest stage. Engineers' skills in project management would also be useful in scrutinising complex policy delivery.

4.2. Recent energy policy is an area of policy development that appears to have suffered as a result of lack of engineering input at an early stage. We have been told privately by reliable sources that unrealistic estimates have been made about the contribution of non-fossil fuel sources to energy supply and CO_2 emissions reduction as well as the potential carbon emissions savings of various energy efficiency measures. A sound engineering insight would have given a clearer picture of the contributions of the different energy technologies, the timescales in which they could feasibly come on-stream and the measures necessary to mitigate risk – whether technical, political, commercial or otherwise. Engineers' views are also essential to identify barriers to certain policy solutions as well as ways to circumvent or overcome them. For example, while the use of microgeneration of electricity through wind power might be recommended, this recommendation is undermined by the fact that the electricity grid is not currently[3] designed to deal with the feeding back of large amounts of power into the grid – the distribution system is designed to be one-way.

4.3. Recent plans for developing Eco-towns were drawn up with the help of a steering committee (the Eco Towns Challenge Panel) which had no engineering input. The contribution of an engineer in this case would have been to look at the intended outcome – reducing domestic carbon emissions within the UK – and assessing whether this was the best means to meet that outcome. Engineers would have been highly likely to conclude that the outcome would be better served by retro-fitting existing housing to reduce its carbon emissions, a view that seems to be emerging through the consultation process.

4.4. Large IT systems are an area of Government procurement that has and continues to experience both bad press and implementation problems. Some would assert that specifications have been driven by political imperatives rather than being derived from operational requirements; a situation which would apply to both the ID Card project and the National IT Programme (Connecting for Health). It is possible that this approach has led to decisions about the architecture of systems being taken or assumed before detailed expert advice was taken. Here, a distinction needs to be made between the advice received by Government in the procurement of systems, which is often good and realistic, and the advice received in the development of policies which are delivered through the procurement of IT, which is often lacking.

[3] Although, with some planning and investment, engineered solutions can be provided.

4.5. The MoD has the Defence Science Advisory Council, but there are limited opportunities for inputting engineering advice through this structure. Advisors have said that they are unable to get close to the real engineering problems themselves, and have a somewhat distant role, being asked to comment on the scientific quality of advice received in terms of the bibliometric citation rate of the authors rather than addressing the real world problems the advice has been sought to address. Although the MoD continues to struggle to deliver projects to time, cost and performance, it appears more likely to take engineering advice than other Departments. The recent review of the Royal Navy procurement of two large aircraft carriers by Sir John Parker FREng was instigated at a late stage to give the Government comfort that the contract could be managed and delivered by industry. It is welcome that the Government should seek such advice, but it could be an integral part of the procurement process for difficult projects rather than a late stage add-on.

4.6. Although aspects of risk are routinely addressed in the assessment and development of policy, the specifics of engineering risk are more often than not entirely missed. As an engineering concept of risk is wide, including project risk as well as risk of failure or catastrophe, an appreciation of it in the policy development phase when implementation relies on engineering would be advisable. In many cases, particularly in energy policy, the financial risk that investors are expected to take on has been badly assessed, leading to financial incentive structures being put into place that can actually increase risk to investors.

4.7. We recommend that:

4.7.1. Engineering advice should be sought early in the policy development process even if the engineering aspect of a problem is not obvious to policy makers.

4.7.2. Any large-scale project should be carried out with the advice of engineers – engineers have project management skills relevant to complex projects, especially those with a technical component.

5. How Government identifies the need for engineering advice and how Government sources engineering advice.

5.1. From the point of view of the profession, there are neither established means by which Government decides when engineering advice is required nor what advice specifically is needed. There is also no clear, open and formal process by which individuals or groups are invited to provide advice or proposals. This style of much policy making has led to some individual engineers and industrialists being called on to provide policy advice, however this advice is seldom peer reviewed. It would, however, be possible for Government to access a broader range of engineering advice by means of a more formal policy-making process that would call for advice and ideas at a much earlier stage than at present. The current formal consultation stage in policy-making, where open invitations for evidence are made, is generally at a late stage of policy development by which time the direction of travel is often already framed and the opportunities to explore alternative solutions are closed.

5.2. The Government often procures engineering advice from external consultants which is of variable quality. For instance, we understand that some reports produced for the DfT Low Carbon Cars strategy produced by third party consultants under extreme time pressures contained inaccuracies that would be obvious to an engineer with relevant expertise, but not necessarily to an official without that expertise or access to it. Engineering expertise is needed within Government Departments to ensure the quality of the procurement and quality control of that advice.

5.3. Advisory committees such as DSAC in the MoD and the interdisciplinary committee in the Home Office have great potential value in advising Departments on whether engineering advice would be valuable to inform policy development and planning policy implementation. There are engineers with the relevant experience on these committees to fulfill this role and it is the duty of the relevant Departments to engage them appropriately.

5.4. Greater use could also be made of university research, but there are obstacles to academic-Government interaction. As will be discussed in a forthcoming Council for Science and Technology (CST) report, there are disincentives for academics to carry out research for Government use. The results are often secret, or at least not published, so they cannot be used by the academic as examples of their work. Government Departments may offer little remuneration or may expect work to be carried out pro bono. Often the process of setting out what advice is needed is too extended, meaning that academics may have moved on to other projects between being invited to provide advice to Government and receiving the details of the arrangement. The Academy's experience of helping to place engineers on advisory panels for various Departments and Agencies is that remuneration or honoraria range from average to inadequate considering the amount of expertise and engagement requested.

5.5. The CST itself is a valuable source of advice on engineering. Although the title does not include "Engineering", the Council includes many engineers amongst its membership (with more Fellows of The Royal Academy of Engineering than of The Royal Society). But Government rarely proactively seeks advice from the CST and the reports produced by the CST are not always heeded. The CST's report *Better use of personal information:*

opportunities and risks (November 2005), is a salient case in point that contained timely advice the Government would have done well to heed.

5.6. The issue of engineering advice also extends to advice about how to ensure an adequate supply of competent professional engineers and technicians. Here, the Royal Academy of Engineering and the engineering institutions have worked closely to respond to Government wish to clarify and strengthen careers advice. However, in the field of education, despite the importance of engineering to the economy, advice tends to be sought first from the Sector Skills Councils, and rarely specifically solicited from the profession. This can lead to short-sightedness on the part of Government on such issues as the Bologna Declaration, and the development of the new points-based immigration rules (which fail to recognise professional qualifications).

5.7. We recommend that:

5.7.1. Advisory committees should be established in Government Departments which should be used to identify when engineering advice is needed and on what issues. The engineering community, through the engineering institutions and the Royal Academy of Engineering could advise on members for such committees.

5.7.2. Open and formal processes for inviting engineering advice at the onset of policy consideration should be established.

6. The status of engineering and engineers within the civil service, including assessments of the effectiveness of the science and engineering fast streams, and the role and career prospects of specialist engineers in the civil service.

6.1. The Fast Stream of the Civil Service encourages a culture of educated generalism. Fast streamers spend time in all parts of a Department to gain an understanding of all aspects – giving the ability to take a broader view. However, the focus on handling a new brief every 2-3 years and delivering ministerial advice pulls against the retention of specialist skills and knowledge. Within the Science and Engineering Fast Stream it may be possible for engineering graduates to specialise in engineering-related projects, but the numbers of graduates entering via this route is small – 15 in 2007-2008 compared with 190 recruited to central departments and 100 into the Economics Fast Stream. And of course, this number encompasses both science and engineering graduates and it is likely that the greater proportion is from science.

6.2. In Government, the focus is strongly on evidence-based policy, so it would seem important that it has amongst its staff engineers and scientists able to source and assess technical evidence. Evidence-based policy in key areas such as climate change, energy supply, low carbon transport and so on is only achievable with the input of policy advisers with an understanding of the required evidence – and that will include engineering and other technical evidence, whereas this is currently done by analysis professionals, usually with an economics background.

6.3. More engineers are needed within the civil service if Government is to be a genuinely intelligent customer of external advice, with sufficient expertise to be certain of knowing what questions to ask and to assess the accuracy of answers returned. The potential for establishing Government policy on incorrect evidence is of concern. For example, the errors in the reports on low carbon cars for the DfT could have been used to make policy decisions. There is therefore a pressing need for more engineers within the civil service, as lack of engineering expertise can lead to financially and politically costly errors. There must not only be a recognised career path for engineers within the civil service, but engineers must be recognised for their contribution to the policy making process and must not be perceived as career limited as compared to other professions within the civil service.

6.4. However it is not just a numbers game. The competence of those in post should not be taken for granted in such a fast moving profession. The engineering institutions exist, in part, to develop and maintain high professional standards in engineering. The institutions assess and register engineers to the standards agreed by ECuk and all require their members to comply with a professional code of conduct. Most provide information, continuing professional development and networking opportunities that enable engineers to stay up to date and competent. Whilst this may appear to be self promotion on the part of the engineering institutions, we contend that Government can only be confident with the advice it receives if it has been provided by a competent, assessed practitioner.

6.5. We recommend that:

6.5.1. Recruitment of engineers through the Fast Stream should be increased, with more engineering graduates able to forge careers within the civil service, leading to senior positions, but with the opportunity to retain engineering as a specialism.

6.5.2. Government should actively advertise the role for engineering graduates in the civil service for policy development functions as well as through delivery Agencies, so that it is perceived to be a viable career path.

6.5.3. The Government should require the professional registration of both its technical staff and also the staff of its consultants and suppliers to ensure that it receives the best advice from fully qualified, up to date engineers.

7. The role and effectiveness of professional engineers and the engineering community in promoting engineering and providing engineering advice to Government and the civil service.

7.1. The professional engineering organisations have the potential to make a significant contribution to Government policy. The focus of the professions is the public good and the engineering profession seeks to improve quality of life through its work. Therefore, professional bodies have a duty to input to public policy processes. The engineering bodies have a greater interest in providing such advice than does industry which naturally focuses on growing a market, shareholder value, international competitiveness and so on. We support the advice of the erstwhile Science and Technology Committee in its 2006 report *Scientific advice, risk and evidence-based policy making* that Government should turn more readily to the profession and learned societies.

7.2. Individually and collectively, the engineering institutions offer what advice they can but recognise that this advice must be well co-ordinated and focused. The institutions, with The Royal Academy of Engineering acting as focal point, are, however, able to commit to provide Government with detailed, co-ordinated, professional advice. However, for this to work optimally, an agreed, clear mechanism for dialogue will be needed. A number of engineering institutions as well as the Academy already publish high quality policy advice to Government,[4] but better communication would ensure that this advice were more timely, constructive and informative.

7.3. The institutions and The Royal Academy of Engineering could help provide engineering advisory committees for key Government Departments to assist Departments in scoping questions for consultants and peer-reviewing the resulting work. Such committees could also comment on the feasibility of policies such as the national ID card plan to highlight strategic engineering and technical issues around their delivery. A positive example of such an undertaking is the engineering advisory group convened by BERR for the Severn Barrage feasibility study, comprising members of The Royal Academy of Engineering, the IET, IMechE, IChemE and the ICE.

7.4. However, there is always a limit on how quickly a group of professional engineers providing advice on a voluntary basis can produce the information needed by Government Departments. The engineering community should not be the sole source of engineering advice – there must also be competent engineers within Departments who can provide engineering expertise and assess the work of consultants. It is most important that engineering is embedded in the civil service so that policymakers are alive to the engineering aspects of policy and know when to ask for advice and how to use it.

7.5. A more structured process for the provision of advice, agreed by Government and the professional engineering community, would greatly improve the effectiveness of the provision of independent advice.

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[4] Some recent examples are recent typical examples being the Flooding Report issued by the Institution of Civil Engineers in June 2008 http://www.ice.org.uk/downloads/2008_flooding.pdf, the IMechE Low Carbon Transport Report in March 2008 http://tinyurl.com/6bq2bm, and the Need for Domestic Air Services in the UK, published by the Royal Aeronautical Society in August 2008 http://tinyurl.com/5td67z.

7.6. We offer:

7.6.1. To continue to undertake policy studies that identify matters of importance to Government policymaking, provided there is a willing recipient for those reports.

7.6.2. To respond, as a coordinated body, to requests to give advice on draft policy and to peer review research carried out for Government, when invited.

7.6.3. To agree a process with Government whereby the professional engineering community can provide advice on key policy topics to support Government decision-making.

8. International examples of how engineers and engineering advice are embedded in Government.

8.1. In the USA, there is a constitutional relationship between the Executive, the Legislature and the National Academies, with the Executive and Congress procuring research through the National Research Council (NRC). As a result, the US National Academy of Engineering (which stands in a similar relationship to the US engineering societies as The Royal Academy of Engineering does to the engineering institutions in the UK), is a large, well-staffed organisation that is able to be responsive to the needs of Government. Although the National Academies in the USA were established with this relationship intended from the outset, the engineering community in the UK, with The Royal Academy of Engineering as the co-ordinating body, could develop a similar role. This could become a two-way communications channel between the community and Government, with Government requesting advice and the community responding promptly. The collaboration between The Royal Academy of Engineering and the Royal Society on the Nanoscience and Nanotechnologies report, which was commissioned by Government, is very much in the US mould. Opportunities for similar projects that bring together experts from the engineering community should be sought by both Government and the engineering community. In summer 2007, an offer was made to the Treasury and BERR by the engineering community to produce a report on the engineering aspects of climate change. This was not taken up but would have been a substantial piece of work of great value in informing energy policy.

8.2. Another initiative to adopt from the USA might be the secondment of senior engineers to Government departments. In the USA engineers are seconded to departments such as Department of Defense and Department of Energy. This would be an effective way for Government to make use of the experience of engineers in industry.

8.3. In China the engineering professions and government have strong links. Obviously the political systems in this country differs significantly from that in China, but the close relationship between engineering and government and the status of engineers within government is something that the UK should learn from. If it is possible to understand why engineers have this greater involvement and if it were possible to make some steps toward creating such a situation in the UK, it could have great benefit for the Government in being able to deal with engineering challenges.

8.4. The Australian Government is focusing effort on exploiting engineering expertise through the Prime Minister's Innovation, Science & Engineering Council. The title of the relevant senior position, held recently by former Institution of Chemical Engineers President Dr Robin Batterham FREng, was Chief Scientist; however the Council's scope clearly included engineering. The Australian government is also developing a body of experts on software systems engineering and looking for international expertise to populate it. It is essential that our Government recognises the need to use global engineering expertise as engineering challenges require the best thinkers from around the world.

8.5. We recommend that:

8.5.1. Government should be encouraged to consider the engineering community as a resource for informing policy at all stages as the US government does with the National Academies.

8.5.2. An understanding should be developed of how Governments in other countries take engineering advice as part of the policy process.

This response has been prepared by The Royal Academy of Engineering with the input and support of a large body of organisations from across the engineering community, whose names are listed below:

Signatories

The British Computer Society
The British Nuclear Engineering Society
The Chartered Institution of Building Services Engineers
The Engineering and Technology Board
The Energy Institute
Engineering Council UK
The Institute of Acoustics
The Institute of Healthcare Engineering and Estate Management
The Institute of Highway Incorporated Engineers
The Institute of Marine Engineering Science and Technology
The Institute of Materials, Minerals and Mining
The Institute of Measurement and Control
The Institution of Agricultural Engineers
The Institution of Civil Engineers
The Institution of Chemical Engineers
The Institution of Engineering and Technology
The Institution of Engineering Designers
The Institution of Lighting Engineers
The Institution of Mechanical Engineers
The Institution of Nuclear Engineers
The Institution of Railway Signal Engineers
The Institution of Royal Engineers
The Institution of Structural Engineers
The Institution of Water Officers
The Royal Academy of Engineering
The Royal Aeronautical Society
The Royal Institution of Naval Architects
The Society of Environmental Engineers
The Welding Institute