



The Royal Academy
of Engineering

Guidelines on Scientific Analysis in Policy Making

A response to the Government Chief Scientific Adviser

February 2010

Introduction

The Academy welcomes the update of the Government Chief Scientific Adviser's *Guidelines on scientific analysis in policy making* which build positively on the current document.

The Royal Academy of Engineering is one of four UK national academies. The Academy has a strong interest in the provision of independent advice to government and in the principles that underpin that provision. As well as providing advice directly, the Academy acts as a portal into the expertise to be found across the profession. Another key role for the Academy lies in helping government select the best candidates for a range of advisory roles.

This response highlights some important key issues, firstly that that engineering input into policy formulation is vital and it is not just about the end-point implementation. Engineering advice can contribute to the development of policy itself and it is therefore crucial that it is taken in the early stages of policy development. Engineers can bring perspectives to policy formation that can enhance decision making at all stages of the policy cycle.

Second, the Academy undertakes an active programme of public engagement on the often controversial issues surrounding engineering and its implications for national policy. We are keen to facilitate and support wider dialogue and engagement with the public in partnerships with government departments.

The Guidelines on Scientific Analysis in Policy Making originally published in 1997 and updated in 2000 and 2005 are comprehensive with the core principles remaining throughout re-drafting processes. Those core principles of supporting evidence based policy making with reliable scientific and engineering advice remain today. The gradual formalisation of the processes for government seeking external scientific advice and its embedding into the policy making processes of government is welcomed by the Academy.

Consultation questions

1. The provision of science and engineering advice to government has continued to develop since 2005, for example the appointment of Chief Scientific Advisers (CSAs) to all the major science using government departments.

- **Are the guidelines still necessary or relevant to the current context of science and engineering advice?**
- **In revising these guidelines, are there additional issues that could be usefully covered?**

1.1 The Royal Academy of Engineering supports the guidelines and views them as useful, necessary and relevant.

1.2 As well as being important in the delivery of policy, engineering advice can contribute to the development of policy itself and it is therefore critical that it is taken at the stage that the policy is developed. Engineering advice is likely to come from professionals working in industry as well as from academics. There are specific issues that need to be considered in the context of advice taken from professionals working in industry and the guidelines could usefully consider them.

1.3 However, we recognise that the guidelines are largely principle-based and that therefore such issues may be best explored in the form of supporting guidance in departmental policy procedures.

2. Adequate dialogue with experts, stakeholders and the public is crucial to allow early identification of issues that require specialist advice.

- **Are there other methods for identifying issues that require specialist advice that could usefully be highlighted in this section?**
- **How and when might advice at the strategic level (for example from Scientific Advisory Committees and Science Advisory Councils) be usefully distinguished from advice at the individual policy level?**

2.1 This principle is essential to all evidence-based policy making. The current guidelines address this principle in a clear and consistent manner. However engineering advice is not always sought at the policy formulation stage where it could be most beneficial.

Identifying issues that require specialist advice

2.2 Engineers have a broad contribution to make to policy development – yet their role may wrongly be restricted to implementation and checking after the fact. Engineers' skills in project management can be useful in scrutinising complex policy delivery. 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.

- 2.3 Although there have always been highly qualified engineers employed within government, those engineers have predominantly been employed in arms-length agencies rather than departments of state. This may be because engineering has tended to be seen as a discipline aligned to policy delivery rather than policy development.
- 2.4 From the point of view of engineering, 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 policy making has led to some individual engineers being called on to provide policy advice, which may then require further peer review. The current 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.
- 2.5 There have been cases in the recent past where policies have been designed around potential technical solutions (such as large interlinked databases); there the technical solution has clearly been thought of as a “black box” which makes everything work. Engineering advice at the policy making stage in these instances could have flagged up very early on that the required technological delivery solutions were either too complex or too expensive for reliable delivery. In these types of cases, the engineering advice required is concerned with engineering practice and comes with breadth of experience rather than academic depth.
- 2.6 It would be possible for government to access a broader range of engineering advice, and a mechanism for peer review of 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.

3. Critical to the formulation of robust, high-quality policy is that the full range of evidence and advice is taken into account.

3a) On the evidence base

- **Is there anything that can be said about ensuring an appropriate adequate evidence base and the role of expert advice in identifying gaps and weaknesses?**
- **What key indicators might policy makers use as guidance on when it is necessary to commission new research/expert advice?**

3b) On expert advisors

- **When developing policy, how can the government ensure that a full spectrum of evidence is heard, from across government and externally?**
- **What mechanisms should government use to identify expert advisors? What role should the National Academies and other learned societies play?**
- **The independence of science and engineering advisors, and of advice to government, is critical. How might independence be defined? Can we ensure “independence” is delivered in practice?**

3c) On government advisory structures

- **How might individual advisory structures determine whether a lay member/consumer representative/ethicist would add value to its working?**
- **How might government better draw upon established sources of expert advice (Science Advisory Councils and Scientific Advisory Committees for example)?**

3d) On external opinion and public dialogue

- **How should policy-makers manage a situation where public opinion ran contrary to expert evidence-based advice?**
- **What, if any additional items on public dialogue should be included in the guidelines?**

On the evidence base

- 3.1 The interpretation of what the evidence base consists of could be widened to specifically include assessment of engineering practice and capacity as both have significant implications for the delivery of policy objectives. This mirrors the delivery of healthcare, where medical practice is routinely taken into account as well as medical theory and science in the development of deliverable policies. This approach should be adopted across all policy areas to avoid the development of policies which cannot be delivered by the UK industrial base, the available assets or technology.

On expert advisors

- 3.2 Departments commissioning engineering advice, whether from the profession, academia, industry or a commercial consultancy, need to be “intelligent customers” for the commissioning and reviewing process. This is a reason to embed engineering skills within commissioning departments.
- 3.3 Advisory committees should be established in government departments which should be used to identify when engineering advice is needed and on what issues. The Royal Academy of Engineering, with our links into the profession, could advise on members for such committees.
- 3.4 Open and formal processes for inviting engineering advice at the onset of policy consideration should be established to inform both policy direction and delivery options. The Academy would be interested in helping design and deliver such a scheme.

On independence

- 3.5 Independence of the political decision making process is an absolute requirement. Independence of systemic bias towards or against any particular vested interest is also crucial. Vested interests can exist and are probably essential, but must be declared and balanced as a whole on a committee.

On government advisory structures

- 3.6 Expert advisors and committees should always be aware of the value of lay, consumer and ethical input to their advice and the departments commissioning advice should also be aware of when they have or have not

been taken into account. There are situations where the integration of lay, consumer or ethical viewpoints are not strictly necessary to deliver the expert advice required, but advisors may take the view that there is little point in providing advice or potential policy solutions which will, in time be found to be publically or politically unacceptable. Evidence should still be presented to the commissioning department in these cases, but the additional input to the advice may colour the expert opinion on what solutions should be adopted.

On external opinion and public dialogue

- 3.7 A stronger protocol should be in place for the handling of when expert evidence-based advice is contrary to perceived public opinion. In such a case, qualitative public attitudes research and more in-depth public dialogue methods should be used to understand why these differences occur. Public acceptance of a particular policy will not solely be dependent on the scientific evidence but also other issues such as safety and regulation, ethics, perceived social/cultural impacts and who the beneficiaries will be. Understanding of these issues is crucial and should inform the final decision making process.
 - 3.8 A clear protocol should be in existence for media handling in such a situation. There have, in the past, been instances when an advisory committee might have benefitted from media advice independent of the department it reports to. This would be a significant extra cost to the committee and only rarely required, so it may be more appropriate for departmental media advisors to have clear protocols as to how to support committees even when conflict exists with departmental objectives.
 - 3.9 The existing items on public dialogue in the guidelines are sufficient. However, the guidelines recommend that “public dialogue should begin as early as possible”, in practice this can be difficult to do with early buy-in from policy makers. A recent example is the Academy-led public dialogue on synthetic biology, which was first conducted in the UK. Given the broad range of impacts that synthetic biology may have, difficulties arose as no single department could be targeted. Public dialogue activities would benefit by having an avenue in which to engage a policy representative that could feedback to the number of departments in which an emerging technology may have an impact.
- 4. The Government is committed to evidence-based policy-making, and the provision of independent science and engineering advice is key to underpinning this aim.**
- **Academics and other external sources of research-based evidence can provide input at different times in the process of policy development, including policy formation and evaluation. How can the Government identify at what stages input would be most effective?**
 - **When in the policy making process should the Government publish the evidence base for a given policy decision?**
 - **On what occasions, if any, might it be appropriate for the Government or advisers to withhold advice provided/the evidence base for a policy?**

- **Should further distinction, if there is one to make, be made between advice in a crisis and advice delivery where the timescales are longer?**

Identifying at what stages input would be most effective

- 4.1 Engineering advice from both industry and academia should be sought early in the policy development process in order to support the formulation of policy that can be delivered. Open and formal processes for inviting advice at the onset of policy consideration should be established.
- 4.2 Policy makers should be encouraged to consider the engineering profession as a resource for informing policy at all stages as the US government does with the National Academies. It is recommended that an understanding should be developed of how governments in other countries take engineering advice as part of the policy process. The Royal Academy of Engineering would be interested in supporting such work.

Publishing/withholding the evidence base

- 4.3 The Academy supports the principle of openness and transparency wherever possible. We recognise that there will be occasions when making public the reasons for not fully reflecting scientific advice in policy decisions is not always possible or desirable. The guidelines should reflect those areas that may impinge upon national security, personal and commercial or other sensitivities.

Advice in a crisis

- 4.4 In a crisis, an 'expert committee' needs to be convened which, in time, as a crisis develops may become a 'committee of experts' with more general interests and expertise across the board. At the height of a crisis, the level of independence can be relaxed as expert knowledge becomes more important. To take the example of BSE, at the inception of the crisis, it would have seemed odd not to use the knowledge and expertise of stakeholders such as farmers and vets directly involved despite their vested interest to advise on immediate responses. Later, as the issues become clearer, a broader group of experts with fewer vested interests would be appropriate to advise on mitigation and recovery.

5. Peer review and quality assurance can play an important role in assessing the evidence-base for a policy.

- **How might departments identify when peer-review of the evidence base is warranted?**
- **What kind of quality assurance is needed in different circumstances and at different stages of the policy-making process?**
- **What other quality assurance processes might usefully be highlighted in the updated Guidelines?**

- 5.1 Peer review of the evidence base is of course necessary and desirable where possible. Further guidelines should be considered to support departments in ensuring the quality assurance of engineering advice, which involves the application by professionally qualified individuals or groups of scientific

principles in variable circumstances. The Academy would be interested in supporting such work.

6. Scientific evidence does not always provide a clear-cut answer and sometimes there are differing schools of thought on a subject. New research can valuably provide different perspectives on an issue, but managing the impact of this may be particularly challenging in the case of novel and emerging issues.

- **How should policy-makers deal with a situation where experts disagree on the interpretation of a body of evidence?**
- **How should policy makers respond to changes in the balance of evidence?**
- **How might public opinion be taken into account in a context of rapid evidential change?**
- **How do we ensure the ability or competence of policy advisers and decision makers to interpret advice and reach sound decisions, particularly when given conflicting advice?**

6.1 Policy decisions can be finely balanced. Where possible, we favour early, open engagement with the public on the often complex issues involved. The Academy undertakes an active programme of public engagement on the, often controversial, issues surrounding engineering and its implications for national policy. We are keen to facilitate and support wider dialogue and engagement with the public in partnerships with government departments.

6.2 The competence of those in posts of policy advice 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 the Engineering Council 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. We contend that government can only be confident with the advice it receives if it has been provided by a competent, assessed practitioner.

6.3 It is crucially important to ensure that government departments have the level of expertise required to reasonably assess the quality of scientific advice received.