



The Royal Academy  
of Engineering

## Research Excellence Framework, second consultation

Response to the Higher Education Funding Council for England

On behalf of:

The Royal Academy of Engineering  
The IET  
The Institution of Civil Engineers  
The Institution of Mechanical Engineers

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## Introduction

This response has been prepared by the Royal Academy of Engineering in partnership with IET, Institution of Civil Engineers and the Institution of Mechanical Engineers, acting under the banner of Engineering the Future. In this response we are concerned predominantly with what is good for the engineering profession as a whole; this may not always coincide with what is best for a research unit or research intensive university, but can be expected to coincide in most cases.

There is currently a political will to see a refocusing of the UK economy away from financial speculation and towards the creation of wealth through manufacturing products and services. It is in the creation and sustaining of those wealth creating products and services that engineering has a pivotal role to play. The preservation of a vibrant and productive engineering research community is therefore vitally linked to the future prosperity of the UK. Allied to this general policy direction, is a desire to see the impact of research assessed more rigorously as part of the portfolio of indicators used to assess research excellence.

The general principles behind the development of the Research Excellence Framework (REF) and the move away from the Research Assessment Exercise (RAE), namely reducing complexity, cost and the potential for what HEFCE has termed game playing between institutions, are fully accepted and endorsed. However, there is concern within the engineering community that some of the proposed changes might in fact increase the likelihood of game playing. Of particular concern, is where a proposed change from RAE procedures is large. In this case, all submitting institutions find themselves in a "prisoners' dilemma"; if all institutions play the same tactics in the REF, all may win moderately, but if a small group play a high risk tactic, some may potentially lose significantly. While the effects of these tactics will reduce over time as the REF beds in, in the short term, there would be a real danger of currently excellent research groups losing significant funding streams and potentially not surviving until the next REF round.

Two issues within the proposed REF have caused concern to the engineering community: the proposal for engineering to become a single Unit of Assessment (UoA) combining the present six UoAs into one representing nearly 4,500 Full Time Equivalent (FTE) research staff and the proposed mechanisms for the assessment of impact. The Royal Academy of Engineering hosted a meeting with HEFCE on 23 November 2009 to discuss and workshop these issues. The meeting did not reach firm conclusions on either topic, but the discussion and workshop sessions have helped inform this response. The Academy is grateful for the participation of HEFCE in this and previous meetings, in particular, the meeting of 5 June 2009, held over the last three years as the REF proposals have developed. The recordings and full transcripts of these meetings are held by the Academy.

Whatever the structure of the panels and UoAs turns out to be, there are real concerns that increased selectivity of funding, which has already been signalled, will lead to significant losses in funding for a number of engineering departments. There will be more losers than winners and the fewer the number of UoAs within engineering, the more losers there will be, potential leading to the closing of departments as Vice Chancellors take investment decisions across institutions.

In all of our deliberations, a single principle has come to the fore; that all disciplines must be treated similarly by the REF and its processes. Many correspondents felt that this should go so far as to suggest that if engineering was to become a single UoA with sub-disciplines as diverse as civil engineering and electronic engineering, there seems little reason not to combine the physical sciences into one UoA covering both chemistry and physics for example.

## **1. Proposed key features of the REF**

- 1.1. The change in definition of research as “a process of investigation leading to new insights effectively shared” with no requirement for research to be original appears, on first reading, to be a downgrading from the definition used in RAE 2008 which defined it as “original investigation undertaken in order to gain knowledge and understanding”. Whether the simple change in definition will have an effect on the type of research carried out and its originality is yet to be seen. The change in emphasis from originality to the sharing of knowledge does place emphasis on what is done with the outputs or research.
- 1.2. The primary purpose of the REF is the assessment of research quality. However, it will undoubtedly have a role to play in influencing the behaviour of institutions and researchers. If it is to be effective in this role, it will be necessary to publicise firm assessment criteria as early as possible. This may not be possible in the first iteration of the REF as new panels will have significant leeway in interpreting how to carry out the assessment, but over time, the influencing of behaviour should become more routine. It should be noted that the opportunities for influencing behaviour, and hence reduction in the opportunity for institutions to indulge in game play for the first REF is rapidly slipping away.

## **2. Assessment of outputs**

- 2.1. The selection of staff to be assessed by institutions is welcomed as a pragmatic solution and we see institutions as best placed to make the informed judgements required. Similarly, the introduction of more rigour concerning the inclusion of part-time staff is welcomed.
- 2.2. We agree that the use of citation analysis is not yet robust enough to be used in the assessment of research outcomes and suspect that it will never be able to deal with the breadth and types of output that would need to be assessed for engineering, or the radically different publication habits from one area of engineering to another. If, as is recommended, engineering is assessed as a single UoA, we believe there will be some difficulty in defining normalisation factors across associated fields, as all are included in the same UoA.
- 2.3. There are well rehearsed arguments about the lack of sufficient coverage of engineering outputs within the readily available citation databases that came to the fore in the previous consultation rounds. The advice that panels should only make use of citation information to inform their review of quality outputs is welcomed but we are still concerned that if it is used, it must be used consistently across the entire engineering UoA. As has been previously demonstrated, this has very different results for the different sectors within engineering. Consequently, it could have more influence in supporting quality assessment for some submissions than others.

### **3. Impact**

#### **3.1. General issues**

- 3.1.1. We agree that impact of research should be assessed. From the perspective of engineering, there is significant impact to be demonstrated, but the breadth of potential economic and social impacts vary so considerably that their categorisation can prove problematic. We agree that taking account of the impact of research in the REF reflects policy aims in all parts of the UK to maintain and improve the achievements of the Higher Education sector. We also recognise that impact will be difficult to assess in the first round of REF and it will take some time for experience to refine the system.
- 3.1.2. The weighting of impact in the final analysis of research excellence is currently 25%. The view of the Academy's 23 November meeting, was that this was too high, especially for a new system of assessment that will need time and iterations to settle down and become coherent across all panels.
- 3.1.3. In RAE 2008 industrialists were full members of Panel G and of each the engineering sub-panels, taking part in the assessments of research outputs as well as environment and esteem. It would be regrettable and a backward step, if they became marginalised by being involved only in the assessment of Impact. In a subject like engineering where Impact is an important criterion, all members of the panel, academic and research users, should be involved in assessing impacts and, we would argue, industrial members have a contribution to make in assessing other aspects of excellence. The broader definitions of impact in the REF include social, public policy and cultural impacts, so some thought needs to be given to how broad in expertise the groups assessing impact need to be.
- 3.1.4. In paragraph 53a, the consultation document states that the REF will identify impacts built on excellent research and that other activities are supported by other means such as the Higher Education Innovation Fund (HEIF). However, the most significant impacts from research do not always stem directly from excellent research and is often a product of bringing together multiple strands of research which will have taken place over a significant length of time.
- 3.1.5. There appear to be a range of views as to how strictly the impact that is assessed should be linked to the group that carried out the original research and paragraph 68 states: "We do not envisage that a unit could claim credit for impact which was based on research undertaken in the unit but which was exploited or applied through the efforts of others, without a demonstrable contribution by the unit to that exploitation". If the purpose of assessing impact is to encourage exploitation of research more generally, the rigid linking does not make sense. However, if the purpose is to encourage research teams to exploit their own research, then the link is sensible. Given that so much impact comes from the bringing together of multiple strands of research, the likelihood is that impact will be made by others outside of the original research team and significant impact and value could be missed by the REF.

- 3.1.6. Loosening the link between original research teams and those who create the impact from that research would encourage the creation of another stream of activities within research intensive institutions specifically around translational research, and potentially encourage the formation of groups specialising in translational research. This approach will also overcome potential problems with assessing impact arising from collaborative work.

### **3.2. Types of evidence submitted**

- 3.2.1. The common menu of impact indicators is helpful but limited and we welcome the fact that it is only a draft and therefore open to adjustment or additions as the REF develops.
- 3.2.2. In particular, from an engineering perspective, welcome additions to the list would include contributions to engineering practice and contributions to standards, both of which are of significant importance to industry.
- 3.2.3. Specific inclusion of engagement in policy processes as an impact is strongly welcomed and it is to be hoped that this encourages wide participation.
- 3.2.4. Inclusion of public engagement is welcomed, but the measurement of impact through the use of surveys will not reflect the true level of engagement achieved. Within the case studies presented for assessment, submitting units should be able to demonstrate impact through outcomes and accompanying narrative. There should also be demonstrable impact on the researchers and their understanding of the social implications of their research as well as their ability to communicate confidently with the public.

### **3.3. Impact statements**

- 3.3.1. There is some concern that the preparation of impact statements for each submission will simply duplicate information presented in case studies. Either an impact statement prepared according to a well-designed template or the case studies themselves should be sufficient. Having to write case studies increases the burden for institutions, each case study requiring as many as 1000 words of description according to the draft case study template at Annex D. However, limiting the number of case studies in a submission may cause unfairness: a small unit may have more successes than it is allowed to report in detail on, while the case studies provided by a large unit may be the only noteworthy stories that it has. If case studies are used, they should be optional and there should not be a UoA size dependent limit on the allowed numbers of case studies.

#### **4. Environment**

- 4.1. There is a minor inconsistency introduced by including industrial or departmental research income under “impact”, while Research Council funding is considered under “environment”. As research funding is effectively an input metric rather than an output metric, there may be merit in considering all research funding under “environment” rather than retaining some in “impact”.
- 4.2. Expanding on that perceived inconsistency, the Academy’s 23 November meeting came to the view that the assessment of impact should include some aspects – although not all aspects – of environment that are output related as opposed to input related. In particular, this means looking at things like postgraduate training and aspects that heretofore have been measured under “esteem”.

#### **5. The balance of impact and environment**

- 5.1. The Academy’s 23 November meeting came to the view that, while impact was important, it was environment that allowed and encouraged impact. Consequently, although HEFCE has chosen to rate impact more highly than environment in the final assessment of excellence, the future relevance of impact might be protected better by increasing the weighting for environment.
- 5.2. Previously in the development of the REF, environment and impact have each been weighted as 20% of the final outcome; the latest consultation puts the balance at 15% for environment and 25% for impact. While this may, ultimately, be the right direction to go in and reflect wider policy aims, it may be prudent to revert to the even weighting of environment and impact until the system for assessing impact is fully proven.

#### **6. Panel configuration**

##### **6.1. General issues**

- 6.1.1. The 23 November meeting addressed the desirability or otherwise of a single unit of assessment. Rather than getting involved deeply in the process of how a single unit of assessment for the whole of engineering might function, the meeting first posed the question, is it desirable to have a single unit of assessment, or otherwise?
- 6.1.2. Concentrating firstly on concerns, the meeting considered that, if the REF coalesced all of the six panels engineering panels into one single unit of assessment, engineering would be the largest panel by far, with the largest number of outputs and so on, to deal with. It was argued that, as engineers, the community could deal with that if it had to; that we would find a way, and we would find a purpose, of being able to deal with that. Nevertheless, the single panel would be dealing with a very large volume of material under one single heading.
- 6.1.3. One of the consequences of that which was of particular concern was an effective downgrading of engineering in comparison to other disciplines. It

was felt that, once you brought all six panels together into a single UoA, there was the danger that the pinnacles of excellence that exist across individual engineering disciplines could well be averaged out

- 6.1.4. An indirect consequence of that averaging could be that there would be a reduction in income for engineering research departments. We believe that this would be a bad outcome for engineering as a profession and would also be a bad outcome for individual institutions.
- 6.1.5. There was an assumption that one of the key reasons for moving from multiple UoAs to a single UoA was to reduce the burden of the REF on institutions. However, this is not self evident, as the final shape of the single unit has not yet been established. There appears to be good reason to believe there will need to be a number sub-groups and sub-panels to deal with the breadth and depth of engineering. It may be that this would lead to an increase in the burden, as opposed to a reduction but, once again, that would depend to some degree on the process.
- 6.1.6. There was discussion about whether a single UoA would help in terms of achieving greater coherence across engineering and encourage more interdisciplinary types of research. The feeling was that a single Unit of Assessment would not necessarily make a positive contribution in this direction. This was partly because interdisciplinary research already happens and does not need to be forced into a single unit of assessment in order to make it work.
- 6.1.7. There were questions raised as to how Vice Chancellors would deal with the increased granularity of information available to them on engineering research. While it is accepted that the fine grained information on research generated by the RAE process is not required for the distribution of QR funding, the unintended consequences for departments arising from the lack of such detail in future has yet to be fully assessed.
- 6.1.8. We have expended a significant amount of time and effort in attempting to construct a single UoA option and multi panel options with discrete groups of disciplines into rationalised panels. All rationalisations show various weaknesses when viewed from particular points of view, whether from an institutional view, a departmental view or profession wide view – non are perfect and non command unanimous support. As an example of the sort of rationalization we believe could be achieved, we have set out one of the options we have discussed below. It is important to emphasise that this particular rationalization is offered only as an example and should HEFCE choose to go down this route, it must consult at length with the engineering community to understand the benefits and disadvantages of any particular breakdown.
- 6.1.9. Having discussed the implications of a single UoA for engineering, the Academy has consulted with a number of Fellows, all of whom are senior academics and many of whom have had detailed involvement in previous rounds of the RAE. This consultation has led to the proposals for a constructive way forward set out below.

## 6.2. A single UoA with multiple submissions

- 6.2.1. A main attraction of a single UoA for engineering, beyond the context of the REF is that it would be a demonstration of the profession acting in a unified coherent manner. In addition, since REF Main Panel B will contain a wide variety of science areas, it will not be possible to have the same level of coherence across it as there was across engineering in RAE 2008. Hence to have multiple engineering UoAs within REF Panel B could actually lead to more variation across engineering than was apparent in the last round of the RAE.
- 6.2.2. In considering how such a large UoA could work for engineering, we considered that there were a number of alterations to the current proposals which would, in our opinion, preserve the peaks of excellence that currently exist in individual disciplines and reduce the options for institutional game play in the transition from RAE to REF. First of all it would be **absolutely essential and non-negotiable** that if engineering were to be a large UoA, multiple submissions could be made to it by a single institution. It will be very important for institutions to have proper recognition if some, but not all, their engineering departments are excellent. The additional burden to the panel of dealing with multiple submissions could be minimised and kept to a modest and acceptable level by having a series of rules, which would be:
- They must to be requested by the institution.
  - Permission would only granted at the discretion of the chair of the engineering UoA who must to be convinced that:
    - i) The multiple submissions were separate units within the university, i.e. separate departments, or equivalent,
    - ii) If multiple submissions are made, the minimum size of any submission would cover at least 15 FTEs.
- 6.2.3. In order to assess the large number of submissions, the engineering sub-panel would need to have a large number of members. Paragraph 96 of the consultation accepts that a sub-panel receiving submissions for around 2,000 staff would need around 20 panel members assisted by about 15 to 20 “associate members”. The engineering sub-panel workload is likely to be beyond even these levels.
- 6.2.4. Research outputs for engineering would need to be assessed in expert groups each led by a member of the engineering sub-panel but bringing in 2 or 3 additional external experts. The research outputs would be allocated to the expert groups by the Chairman. The journal sub-categories that the REF team will be using to provide citation data might provide an appropriate automatic way of doing the first sort of research outputs. However, the chair would need to check those allocations and ultimately the choice would be his or hers.
- 6.2.5. At the 23 November meeting between the HEFCE and Academy, HEFCE suggested that panels should be allowed to code their outputs by various sub-groups, the results of which, although it would be amalgamated in the overall REF reporting, could be reported back to universities give Vice Chancellors the granularity of information they require to make internal funding decisions. Such a mechanism implies that multiple submissions would have to be allowed, as without multiple submissions, there would be nothing to breakdown to sub-group level.

- 6.2.6. The environment assessments would again be done with the UoA working in sub-groups. We think the work load would be reasonable with 4-5 Sub-groups for this.
- 6.2.7. The impact assessments would again be in sub-groups, and here we would again expect some additional sub-group members or “associate members” to be brought in, potentially to represent the users of research. However even for impact, as elsewhere in the assessment, it is essential that in assessing engineering, academics and research users work together as integrated teams.

### **6.3. Multiple UoAs**

- 6.3.1. The framework accompanying a single UoA must include the multiple submission structure outlined above (paragraph 6.2.2) if it is to provide an effective assessment of engineering research excellence. Otherwise, an alternative solution must be found that would divide engineering into a number of discrete UoAs. Therefore either the *status quo* of six engineering panels must be preserved, or a rationalised structure of three or four panels designed with the consensus of the engineering research community.
- 6.3.2. At the meeting between the Academy and HEFCE held on the 23 November, it was agreed with HEFCE that a single UoA for engineering as a solution was not set in stone; that maybe, a smaller, rationalised grouping of UoAs would be a suitable outcome.
- 6.3.3. There are a number of rationalisations to the panel structure proposed that would make the establishment of discrete engineering panels both more workable and more logical. Currently, there are a number of areas of research very closely related to engineering and in many cases almost indistinguishable from engineering allocated to other panels. It is proposed that some areas of built environment be brought into engineering to be alongside civil engineering.
- 6.3.4. As mentioned previously, all rationalisations of the six engineering panels that we have examined show various weaknesses when viewed from particular points of view, whether from an institutional view, a departmental view or profession wide view – none are perfect and none command unanimous support. As an example of the sort of rationalization we believe could be achieved, we have set out one of the options we have discussed below. It is important to emphasise that this particular rationalization is offered only as an example and should HEFCE choose to go down this route, it must consult at length with the engineering community to understand the benefits and disadvantages of any particular breakdown.
- i) Mechanical, aero, chemical and manufacturing engineering
  - ii) Electrical and electronic engineering and materials
  - iii) Civil engineering and construction

6.3.5. Numbers of FTEs considered within these panels are estimated as follows.

i) Mechanical, aero, chemical and manufacturing engineering

<b>Category</b>	<b>FTEs</b>
Mech, Aero, Manu	1039
Chemical	230
General Engineering	600
<b>Total</b>	<b>1869</b>

ii) Electrical and electronic engineering and materials

<b>Category</b>	<b>FTEs</b>
Electrical & Electronic	842
Materials	390
General Engineering	400
<b>Total</b>	<b>1632</b>

iii) Civil engineering and construction

<b>Category</b>	<b>FTEs</b>
Civil	513
Built environment	390
General engineering	450
<b>Total</b>	<b>1353</b>

6.3.6. In this proposal, it would be important for the community to decide if an additional general engineering panel is still required. It is anticipated that the larger groupings would allow a number of research groups who submitted to general engineering for RAE 2008 to submit to the discrete UoAs, thus reducing the burden on a general engineering panel. The numbers of FTEs that would transfer out of general engineering is not certain, but there would be a core of genuinely general engineering submissions that would definitely stay if the option was open.

6.3.7. The 23 November meeting agreed with HEFCE that in previous rounds of the RAE, the existence of the general engineering panel had allowed a degree of game playing which was undesirable. Some institutions with genuinely integrated engineering departments used the general engineering UoA as expected, but a small number used it as an alternative to a discrete panel. The 23 November meeting recognised the need to accommodate those institutions submitting to general engineering correctly and thus an option for an “integrated engineering” panel rather than general engineering was discussed. In this interpretation of the multiple engineering panel vision of the REF, it was thought important that institutions submitting to an integrated engineering panel should clearly demonstrate that its submission covers integrated engineering and could not sit in one of the other discrete panels. Thus the option for a smaller general, or integrated engineering panel must be kept open.

6.3.8. Under this proposed structure, three UoAs of substantial size (plus computer science and informatics as a fourth engineering panel if the community believes this to be a good idea) could be considered as stand alone UoAs under an engineering umbrella. Similarly, if general or integrated

engineering is seen as necessary by a large enough sector of the community, it too could become a discrete UoA under engineering.

- 6.3.9. Overall, the reduced number of UoAs compared to RAE 2008 would reduce opportunities for game playing. For example, in 2008 many civil engineering departments chose to submit either to general engineering or built environment. In addition, some mechanical and electrical engineering departments opted for general engineering. If however built environment continues to be assessed separately from engineering there is potential for even greater numbers to migrate from engineering which would give a strong impression of a decline in UK civil engineering research.
- 6.3.10. One further consequence of the move of 390 FTEs from built environment to engineering would be that the architecture, built environment and planning UoA becomes less viable as it would only cover about 550 FTEs. However there may be some logic in absorbing this into geography and environmental studies where there are some strong synergies. Thus the number of UoA would be reduced by one

## **7. Consistency between panels**

- 7.1. We agree that larger panels will lead to greater consistency, but this must be balanced against panels becoming too large and amalgamated for worthwhile assessment of research in specialised areas.

## **8. Nominating bodies**

- 8.1. The Royal Academy of Engineering and the major engineering institutions are all included in the list of nominating bodies and all are willing to continue in this capacity.

## **9. Conclusions**

- 9.1. Within the engineering community, there has been considerable concern about the amalgamation of all engineering research into a single UoA and the vast majority of the community find the proposals as laid out in the consultation document unworkable and unacceptable. We have proposed two alternative structures which we believe to be workable and which address the majority of concerns expressed.
- 9.2. We remain fully committed to helping HEFCE realise the headline objectives of the REF: to reduce opportunities for game play and to significantly reduce the burden of assessment on both panels and institutions. We would, therefore, welcome the opportunity to work with HEFCE on the refinement and introduction of the panel structures and mechanisms we have suggested.
- 9.3. The assessment of impact in the REF is broadly welcomed and we can see the logic of the weightings proposed and are aware of the pressures from outside the academic community to maintain or increase this weighting. However, because the structure for assessing impact is necessarily new and untried, the engineering community is concerned that attempting to weight impact as 25% in the first instance will open the process to considerable amounts of game playing and be subject to considerable inconsistencies

across panels until experience is gained. The engineering community strongly recommends reverting to the 20% weighting originally proposed.

- 9.4. As we have identified significant overlap of the impact indicators and environment indicators, we do not expect reverting to a 20% weighting will alter outcomes significantly, but we strongly recommend rationalisation of the indicators for both impact and environment so that impact assesses outputs more rigorously.