RSC RESPONSE Research Councils UK's consultation on the Capital Investment Roadmap.

The Royal Society of Chemistry (RSC) welcomes the opportunity to respond to Research Councils UK's (RCUK) Capital Investment Roadmap.

The RSC is the largest organisation in Europe for advancing the chemical sciences. Supported by a network of 47,000 members worldwide and an internationally acclaimed publishing business, its activities span education and training, conferences and science policy, and the promotion of the chemical sciences to the public. This document represents the views of the RSC. The RSC has a duty under its Royal Charter "to serve the public interest" by acting in an independent advisory capacity, and it is in this spirit that this submission is made.

The importance of the chemical sciences to the UK economy cannot be underestimated. In 2010 the RSC and Engineering and Physical Sciences Research Council (EPSRC) published a joint report, *The economic benefits of chemistry research to the UK* [i]. This report found that chemistry research broadly underpins 6 million jobs in the UK and enables the UK to generate £258 billion each year, or 21% of GDP.

What do you think are the significant capital investments needed in the next 10 years to maintain future sustainable national capability in your area of research?

A coherent national strategy focused around regional centres is required to ensure that national capability in Chemistry is maintained over the coming 10 years. Over this time it is apparent that it will become increasingly difficult for individual institutions to maintain the level of capital expenditure that they have now. Because of this, it will be necessary to institute a system by which some equipment is shared either regionally or nationally. What 'level' of equipment is shared and the manner in which it is are matters of great importance, and both should be decided in consultation with the community – including the RSC, Heads of Chemistry UK (HCUK), and other stakeholders.

Capital investment can be considered from either the specific equipment or facilities required, or instead from the challenges for which this investment is required to address. HCUK's response to this consultation deals with the former, proposing specific research equipment required by the community. Their proposals for mass spectrometry, nuclear magnetic resonance, X-ray diffraction and atomic level microscopy, are all supported by the RSC. Further to this, our consultation with the chemical science community has also highlighted a need for strategic investment in central computing facilities. These facilities could be made available for any number of theoretical calculations, for instance the modelling of proteins, or to support the EPSRC Dial-a-molecule Grand Challenge, allowing storage of a vast quantity of information on both successful and un-successful reactions.

Considering capital investment instead from a 'challenges' perspective is a useful complementary approach to that of specific capability. In 2009 the RSC launched *Chemistry for Tomorrow's World* [ii], a roadmap for the chemical sciences identifying global challenges, and the ways in which the chemical sciences can provide technological and sustainable solutions. Solutions to the challenges highlighted in this report will require an interdisciplinary approach. As such the RCUK Capital Investment Roadmap should also consider interdisciplinary fields. One role for the Capital Investment Roadmap should be to cover investment in areas on the 'fault lines' between individual Research Councils.

It is important that regardless of the stratagem used for capital investment, that the current capacity of the UK is maintained and existing facilities' operation costs supported.

The RSC would support the introduction of an 'open distributed network' of equipment in universities around the country, as proposed in the HCUK submission to this consultation. Whether this equipment should be distributed with a national framework, or instead organised with self-sufficient regions (in a similar way to EaStChem and WestCHEM in Scotland) requires a great deal of thought, and should be decided in consultation with the community.

Regardless of the structure, it is the case that equipment beyond the investment capabilities of individual institutions will be required to maintain the UK's excellent research base. This equipment should be accessible to universities other than those in which it is sited, but potentially also external businesses. The action of bringing industry into greater contact with universities would have the potential to encourage the fostering of new partnerships and developing new "innovation ecosystems".

Further to this regional strategy it will be important also to maintain a number of national facilities like the Diamond Light Source, or Neutron and Muon Source at Harwell, ensuring that their development keeps track with scientific progression and national need.

What are the key challenges, if any, in ensuring this capital investment?

As we have noted already, it is essential that long term funding is provided for any capital investment projects. Large initial sums of money are of course crucial, but investment must be maintained to ensure ongoing capacity.

The largest challenges with regard to an open distributed network are the decisions regarding what specific equipment and capacity sits within it, and the manner in which the network is structured. Both of these considerations have been given mention in the previous answer, but will require a great deal more thought and should be decided only after extensive consultation with the community, including the RSC, HCUK, and other stakeholders.

One of the key advantages that can be seen from the instigation of an open network would be its ability to provide access to equipment for institutions in which essential research is being performed without extensive research council funding. In order to ensure that the network is truly 'open' however, arrangements for access and maintenance will need to be put in place to ensure that a wide range of stakeholders are able to utilise the facilities.

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[i] The economic benefits of chemistry research to the UK, RSC/EPSRC, 2010
[ii] Chemistry for Tomorrow's World, a roadmap for the chemical sciences, RSC, 2009