

I am submitting this response in a private capacity, but as an individual with experience over many years of the provision of electronic networks in support of the research and higher education communities. This experience, just over the last ten years, includes networks at campus level, as Director of Computing and IT Services at Cardiff University; at regional level, as chairman and leader of the South Wales MAN (Metropolitan Area Network) project; at UK national level, as a member of the Joint Information Systems Committee, the body which sets policy and provides funding for the JANET/SuperJANET networks for UK research and education; and at European level as secretary of the European Networking Policy Group.

The points which I wish to make are as follows.

**Electronic Networks are now essential to support internationally competitive research.**

Future leading-edge scientific and non-scientific research will be carried out by bringing together resources (computing, data, instruments, sensors, and people) in world-wide collaborations. This is recognised on both sides of the Atlantic as the path ahead, and major programmes have been launched in response. In the UK, the e-science programme has been set up with substantial funding, and there are similar programmes in other European countries. In the US, a major inter-agency report (the Atkins Report) has identified the needs for a programme of 'Cyberinfrastructure' which the National Science Foundation is now charged with delivering. At the EU level, the need for an e-infrastructure to support pan-European research has been identified and supported with considerable resources under the 5<sup>th</sup> and 6<sup>th</sup> Framework Programmes for research.

References:

Information on the UK e-Science programme is available at [www.rcuk.ac.uk/escience](http://www.rcuk.ac.uk/escience).

The text of the "Blue-Ribbon Advisory Panel on CyberInfrastructure" can be obtained via the home page of the division of Computing Information Systems and Engineering of the National Science Foundation at [www.cise.nsf.gov](http://www.cise.nsf.gov).

Information on the EU's e-infrastructure programmes is available at [www.cordis.lu/ist/rn](http://www.cordis.lu/ist/rn).

**Research Networks are undergoing a quantum leap in technology, from broadband to optical paths.**

For a period of about ten years, starting in the early 1990's, research networks were based on broadband technologies, advancing steadily in bandwidth from typical speeds of 2 Mb/s to 10 Gb/s. Recently, however, it has become clear that a discontinuous development is in prospect, which will raise research networks up to the next level. This has been described in a number of various terms; dark fibre, optical paths, hybrid networks and others. However, the key features are a move to ownership of the fibre infrastructure (often by IRU.s); the lighting of paths being under the dynamic control of the research networking bodies; and, in the most advanced cases, the ability of research users to set up and take down optical paths 'on demand' between research sites. These research sites are typically on different continents.

## References:

For the importance of access to dark fibre, see the EU-funded study on *Networks for Knowledge and Innovation: a strategic study of European research and education networking*, December 2003. ([www.serenate.org](http://www.serenate.org)) The text of the report and the appendices are available, They contain detailed analyses of the market and regulatory situation throughout Europe.

For information on the current state of play in the US, see the National Lambda Rail project ([www.nlr.net](http://www.nlr.net)) This project has acquired many thousands of kilometres of fibre assets and is deploying them in the service of national and state-wide research and education networks in the states. These are available for both long haul and local networks.

For a series of case studies, in North America, Europe and world-wide, on the building of fibre/optical networks for research and education, see the list of news releases maintained by the Canadian networking organisation Canarie at [www.canarie.ca/canet4/library/list.html](http://www.canarie.ca/canet4/library/list.html) and in particular the archives such as [mail.canarie.ca/MLISTS/news2004/index.html](mailto:mail.canarie.ca/MLISTS/news2004/index.html). Recent examples of relevance include the reports on networks in New York State (3 November), Florida (18 October), Poland (30 October), Czech republic, Ireland and Greece (all 11 November) and the item on User Controlled Light Paths (20 December).

### **To remain internationally competitive, UK research networks will need to have access to dark fibre.**

This is a vital consideration for UK research, and the Ofcom consultation may have some bearing upon it. It is, however, not directly addressed in the consultation although Annex I, on duct-sharing, is relevant under some circumstances.

The European study mentioned above did make a number of specific recommendations, as follows (SERENATE Summary Report, p. 6, document obtainable from [www.serenate.org](http://www.serenate.org)):

*All stakeholders in European research and education networking need to reflect on the rapid move towards optical transmission technologies for communications and networking, and urgently consider its implications. In particular, in countries where the national fibre-optic infrastructure is not available at competitive prices and on a transparent basis, steps should be taken to remedy that situation.*

*The European Commission and the national regulatory authorities should establish an annual census of installed optical fibre and ducting, and the resulting information should be made publicly available.*

*The European Commission should, by the end of 2004, consider under what conditions, and for which parties, it would be reasonable to introduce a right of non-discriminatory access to optical-fibre infrastructure at equitably negotiated pricing.*

*In general terms, all European governments, politicians and national regulatory authorities should strive hard to introduce a truly competitive environment for the provision of Gigabit network services. More specifically, it is very important that governments across the whole of Europe, including those beyond the borders of the European Union, ensure that their NREN [National Research and Education*

*Network], should it so wish, be empowered to install, or lease, its own optical-fibre transmission infrastructure.*

**Access to dark fibre should be available in all regions and localities, as far as is practically possible, not just in metropolitan and other major economic areas.**

There are signs that access to dark fibre is becoming available in major centres in the UK. However, the needs of research mean that all members of a research collaboration, wherever they are located, need high-performance network connections. A lack of such provision to smaller towns and less-favoured regions of the UK will prevent the many academics and researchers in those areas from participating fully in leading-edge research in the future.

### **Summary**

The research and education community may not be the largest customer for network services. However, it is a significant user base, with demanding requirements, which has often stimulated the development of advanced network services. It is important that the regulatory regime in the UK encourages and in no way inhibits the development of internationally-competitive research networks.