



**Australian Government**  
**Department of Innovation**  
**Industry, Science and Research**



## **COOPERATIVE RESEARCH CENTRES COMMITTEE**

### **House of Representatives Standing Committee on Infrastructure and Communications – Inquiry into the role and potential of the National Broadband Network (NBN) - submission by the CRC Committee**

The Cooperative Research Centres (CRC) Committee welcomes the opportunity to make a submission to this Inquiry.

The CRC Committee notes the potential for an NBN to add substantially to Australia's research capacity and to have widespread positive ramifications for Australia's future social, health and economic wellbeing. The NBN will provide a mechanism which allows all types of services from health to education and trade to be delivered more effectively and efficiently to our whole population, particularly those citizens in regional and remote communities.

The Committee considers that the NBN will benefit CRCs by providing a core platform for research programs, a vital tool for conducting research, and a management tool to improve their efficiency and effectiveness. The NBN will provide significant support for new types of research and also allow large data sets to be combined and analysed, which of itself will open up a range of new research possibilities.

This submission highlights the benefits that the NBN will bring to CRCs and their ability to improve national well being, as a particular example of the potential impact of the NBN.

The CRC Committee also considers that an NBN will have widespread benefits across many aspects of Australia. For example it will create increased employment opportunities in our less populated regional areas. People not living in the major population centres will be better able to engage and interact by remote means and it will be possible to have broader and more rapid (essentially instant) interaction between individuals or numbers of people located anywhere in Australia. This engagement will go beyond commercial opportunities and extend to all aspects of their daily lives, including access to health and education services.

Attachment 1 provides some background on the CRC Program and the CRC Committee's role together with the Committee's response to each of the Inquiry's Terms of Reference.

Neville Stevens AO  
Chair  
CRC Committee  
9 March 2011



**Australian Government**  

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Infrastructure and Communications – Inquiry into the role  
and potential of the National Broadband Network (NBN)

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## **Background**

### **The CRC Program**

The CRC Program was established in 1990 as a collaborative, medium to long-term research program focused on linking high quality public research to end-users. Its objective is to deliver significant economic, environmental and social benefits to Australia by addressing clearly articulated, major real world challenges that require medium to long-term collaborative efforts.

During the time the CRC Program has been operating, the Australian Government has committed more than \$3.4 billion in CRC Program funding and participants in CRCs have committed a further \$11 billion in cash and in-kind contributions.

An economic impact study undertaken by Insight Economics in 2006 found that for each dollar invested by Government in the CRC Program rather than left with taxpayers, Gross Domestic Product is cumulatively \$1.16 higher than it would otherwise have been.

To date, 190 CRCs have been funded or approved for funding. There are currently 42 CRCs operating in four broad ANZIC industry categories: agriculture, forestry and fishing (11 CRCs, 26%); manufacturing (5 CRCs, 12%); mining (4 CRCs, 10%); and services (22 CRCs, 52%).

### **The Cooperative Research Centres (CRC) Committee**

The CRC Committee provides advice to the Minister for Innovation, Industry, Science and Research about: applications for CRC funding; performance, monitoring and reviews of individual CRCs during their period of operation; and the planning monitoring and evaluation of the CRC Program. The Committee has 14 members: an independent Chair; ten independent Members; and three *ex-officio* members.

## **Summary**

The proposed National Broadband Network (NBN) will significantly benefit Australia and help address the tyranny of distance, both within Australia and between Australia and the rest of the world.

The NBN will also benefit CRCs and their participant organisations in several ways. The main benefits will flow from the faster broadband speed it will offer, the more universal coverage, and the very much larger quantities of data that it can carry at any one time.

Many CRCs work in the medical and agricultural areas using data intense fields and the NBN will allow them to collect, process and analyse data far more efficiently than is possible with the current arrangements. Currently, such data often needs to be collected, then stored and then downloaded. The

NBN will allow a move to continuous monitoring and feedback, thus improving productivity and opening up new opportunities.

CRCs are large, multi-participant collaborative organisations which operate from multiple sites or nodes across Australia. CRC participants (research organisations and end-users) are geographically dispersed. The NBN will generate efficiencies by making it possible to use high definition, two-way real time video, opening up a new dimension in terms of video meetings and the ability to concurrently work on data. In addition, many CRC participants are international organisations and, to participate economically and effectively in a CRC, need to be able to access and interact with their CRC partners electronically. The NBN will facilitate greater involvement of overseas participants.

The potential benefits of the NBN can be seen with reference to the current high speed academic network, AARNET (the Australian Academic and Research Network) which is used by the universities and CSIRO. This network services over one million end-users who access it through local area networks at member institutions.

However many of the organisations that participate in CRCs (from within Australia and also from overseas) do not have access to AARNET. An ubiquitous NBN will expand this capability to all researchers and other groups in Australia, enabling greater collaboration between all CRC participants.

During the recent disasters in Queensland (floods and Cyclone Yasi), the CRC for Spatial Information (CRCSI) provided high quality images of the floods across four states, Queensland, Victoria, New South Wales and Western Australia, using radar imagery from the constellation of four Italian satellites. Satellite reception and pre-processing was done in Europe with local enhancements performed in Australia.

Because these images were so useful, the state agencies have agreed to fund a temporary mobile satellite reception and processing facility at Bathurst. This will allow the satellite imagery to be received and processed locally, greatly reducing the turnaround time. CRCSI is planning to use AARNET to transfer satellite data from this temporary facility to Kensington (UNSW) for processing. Response time will be significantly reduced when the mobile facility is online at Bathurst. Dissemination of such high quality images and this type of work more generally, will be facilitated by the NBN.

The majority of staff involved in a CRC concurrently hold other positions in a research organisation (such as a university or CSIRO) or in an end-user organisation and need to be able to participate readily in both the CRC's activities and also their 'day job' activities, somewhat interchangeably – the NBN will help provide that flexibility.

Access to fast and effective broadband can increase the ability to remotely access expensive research infrastructure which will directly benefit many CRCs. Because CRCs are at the forefront of innovation and technology

advances, the NBN can be expected to greatly assist their collaborative research endeavours, the dissemination of their research outputs and their ultimate utilisation by end-users and the community more broadly.

The Australian continent is vast and for the most part, sparsely populated. As a consequence, it lacks the normal economies of scale for infrastructure and other essential services that many of our competitors, particularly emerging economies like India and China enjoy. The NBN will help compensate for the lack of economies of scale, allowing Australia to compete more effectively in the global economy.

## **Comments against the Terms of Reference**

### **a) the delivery of government services and programs**

The NBN will allow effective on-line delivery of Government services and programs to all Australians. Many of these services, for example on-line learning require significant bandwidth to be fully effective.

Turning specifically to the CRC Program, much of its delivery is undertaken electronically. For example, the Department of Innovation, Industry, Science and Research (DIISR) collects and stores information from CRCs and their participants, pays them and conducts much of its management of the Program electronically. A web-based contract management and reporting system (CRC Online) is used to record information about contracts, personnel involved in CRCs, participant contributions (both pledged and provided) and the milestones to be achieved by the CRC. Both DIISR staff and CRC staff input data directly into CRC Online.

The CRC Committee has adopted the use of Sharespace to access documentation relating to its oversight of the CRC Program.

All CRCs must include at least one Australian higher education institution (or research institute affiliated with a university) and one Australian end-user (from the private, public or community sector). In practice, most CRCs involve multiple universities and many also involve major publicly funded research institutions such as CSIRO.

These organisations (universities and CSIRO) are served by AARNET which is about to trial an upgrade to its network that will offer internet speeds ten times faster than that planned for the NBN. Such a system is necessary to cater for universities' reliance on high speed data transfer for much of their research and communications (see Campus Review vol 21, 24 January 2011).

However, many of the other organisations that participate in CRCs (from within Australia and also from overseas) do not have access to AARNET. For a CRC to work effectively as a collaboration, all its participants need access to high speed communications and this could be provided by the NBN.

The CRC for Spatial Information is implementing a program of user driven research that aims to facilitate broad adoption of spatial information technologies by government, industry and the community more broadly. Reliable, ubiquitous, real-time access to spatial information products and services is a vital element in achieving this objective. In many cases, the volumes of data being delivered to users are significant (e.g. digital maps, satellite imagery), for some applications, the speed of transmission is critical (e.g. real-time position, navigation and time information), and in other cases users are operating in remote parts of the country (e.g. precision agriculture, mining, fire-fighting and other emergency situations). In all cases, the NBN will be a key enabler, allowing end-users to access and utilise information-rich spatial products and services in a timely, pervasive, cost efficient and reliable manner in all parts of the country.

**b) achieving health outcomes**

One of the applicants successful in the most recent CRC selection round (the CRC for Young People, Technology and Wellbeing) will develop safe and supportive on-line environments and provide strategies and tools that promote cybersafety, mental health and wellbeing for the more than one million young people that currently use the internet daily.

As Dr Terry Cutler noted in his article in Science Alert (Broadband: it's needed now – 14 January 2011), the demand on our national health budget is escalating and this is likely to continue as the population ages and people live longer. The 2010 Intergenerational Report estimated that the percentage of Australians aged over 65 will grow from 13.5 percent now to 19.3 percent by 2030.

Living longer does not necessarily involve being healthy during that additional time – it is generally accompanied by an increase in the incidence of chronic disease and preventable ill-health.

While e-health solutions will not solve all of the issues in our increasingly stretched health system, they should be one of a suite of strategies used to better manage our health resources over time.

CRCs working in the medical area such as the CRC for Biomedical Imaging Development have indicated that the capacity to transfer large image files afforded by the NBN will be particularly useful for their activities.

**c) improving educational resources and training available for students and teachers**

One of the defining features of a CRC is that it must have an education and training program, including a PhD program. PhD students that undertake at least part of their training and research in a CRC gain access to industry ready skills and are often more readily able to find employment in industry because of their dual understanding of the requirements of high quality

research endeavour and of the drivers faced by business.

While CRC students can access AARNET when they are located at or visiting their 'home' university, they spend at least some time at various nodes of the CRC, so an NBN would enable them to spend more time at these locations.

**d) the management of Australia's built and natural resources and environmental sustainability**

Several CRCs undertake research and utilisation activities in the environmental sustainability field, including the Antarctic Climate and Ecosystems CRC, the CRC for Greenhouse Gas Technologies and the CRC for Contamination Assessment and Remediation of the Environment. All are using electronic communication both for conducting their research activities, managing large data sets and communicating the outputs to end-users for take-up.

Effective environmental sustainability and built and natural resource management requires the ability to monitor a range of conditions and factors at a multitude of sites or points across vast distances. The speed and spread of access provided by the NBN should facilitate these types of activities. With the NBN in place, such sites should be able to be managed more economically and generate productivity gains, which could be used to do further sustainability and management work.

**e) impacting regional economic growth and employment opportunities**

Access to the NBN will facilitate improved communication between the nodes of individual CRCs – many have regional nodes and need to communicate frequently and on an ongoing basis with each other and the CRC headquarters. It will encourage the further development of these nodes in regional Australia.

Access to the NBN will allow people in regional areas to have fast and effective access to mainstream Australia – they will be less isolated and more engaged. Effective communication links between regional areas and the larger cities can also be expected to increase regional economic growth and regional employment opportunities.

The Poultry CRC relies heavily on the internet to deliver its outputs to end-users spread across rural Australia. Currently the CRC delivers its vocational education and training mainly through face-to-face workshops or field days. This has to be done because the capacity of the network is insufficient to allow fully interactive online courses to be delivered. However, farm workers have to seek leave from work and travel significant distances to attend training. Employers are hesitant to give leave of absence to workers and workers themselves are reluctant to take up further educational opportunities because of the cost and time involved in travel. The NBN will greatly enhance the CRC's ability to deliver quality training to farm employees in a timely and

cost effective manner and up-skilling of these workers will generate significant benefits.

The CAST CRC together with the Australian Foundry Institute has supported development of a new Certificate IV in Engineering (Foundry Technology) designed for on-line delivery. The course development has been driven by industry as there are no other metallurgy courses available and most Australian metal foundries are based in regional areas. On-line delivery is crucial for students from remote locations, but current internet speeds are very slow, making access difficult for them. The NBN will improve access to this and other on-line courses for students and workers in remote areas.

**f) impacting business efficiencies and revenues, particularly for small and medium business, and Australia's export market**

A majority of Australian businesses are SMEs and all CRCs are required to have an SME engagement strategy. In 2009-10, each CRC had on average, 16 SMEs as participants.

The NBN can be expected to assist SMEs on two main fronts. Firstly allowing them to have greater involvement in CRCs, which can lead to innovation and market advantage, and secondly, making it possible for them to engage more effectively with potential customers located anywhere in Australia or overseas. This can help avoid the need for expensive shopfronts and multiple premises. The NBN will allow an SME to effectively reach customers anywhere in the world, all from a single location.

As CRCs are involved in cutting-edge research and development and are end-user focussed, the outputs of their research are more likely to be exportable. The NBN should assist on this front also.

Two of the CRC for Infrastructure and Engineering Asset Management's research programs will greatly benefit from the enhanced capacity to be delivered by the NBN. The Integration and Interoperability program will deliver consistent and timely, high quality information about assets and their management to people and information systems throughout an asset-intensive organisation and its supply and value chains. This program will allow information from different sources to be integrated and delivered in a common format wherever it is needed, and delivery and management of high quality information including metadata. The Capability Optimisation program will provide asset operators with customised tools to manage their high value assets and make scientifically based and informed decisions in real time or near real time.

**g) interaction with research and development and related innovation developments**

As with existing high speed academic networks, the NBN will become a crucial tool for research and development, opening up new opportunities for research, in areas such as medical imaging and remote monitoring. There is



potential for new applications and systems to be developed that rely on real time, high definition video and the rapid transfer and manipulation of massive amounts of data.

As indicated in the summary, the NBN will open up opportunities for new and more effective research collaboration and for new areas of research requiring continuous monitoring and feedback using rich data, and improved remote access to expensive research infrastructure.

The Committee notes that the NBN will allow very large research data sets to be combined and analysed – this can be expected to open up possibilities for new avenues of research and technological developments.

As CRCs are end-user driven collaborations, the NBN will allow faster and easier communication of their research outputs and more effective utilisation of those outputs across the economy.

#### **h) facilitating community and social benefits**

As the Australian population ages, it is likely to be more cost-effective and humane to allow more people to stay in their homes, rather than in aged-care facilities. For this to happen, it is essential to have cost effective and reliable ways for those people and their carers to be in contact at any time of the day or night. The NBN will facilitate this, by providing better and faster electronic communication across the entire population. We need to be able to take a wide range of services to elderly people and monitor their condition and needs remotely.

An effective NBN would allow many services not presently within reach of isolated communities to be provided to those communities.

#### **i) the optimal capacity and technological requirements of a network to deliver these outcomes.**

The overwhelming benefit of the NBN will come from the greatly increased capacity it will provide for all types of activity, including research.

According to Professor Rod Tucker, a Federation Fellow and eminent researcher in this area, the current copper network has reached its capacity limit and is degrading and the wireless network is running out of capacity because of the limited size of the radio frequency spectrum. On the other hand, he notes that the optical spectrum used in optical fibre has virtually limitless capacity, with the main limiting factor being the electronic switching technologies in the network and at the user interface.

Professor Tucker suggests that the NBN will be easily able to be upgraded as new generations of electronic switching technologies evolve.

The Committee notes that a number of other countries are also developing national broadband systems and that the Economist Intelligence Unit (EIU)

has developed a league table of 16 nations which ranks Australia's NBN at 9<sup>th</sup>, behind South Korea, Japan, Singapore, Sweden, Finland, Estonia, France, Spain and Denmark (in ranked order). The ranking takes into account, broadband speed, access and rollout time as well as cost and regulatory plans.

The EIU report acknowledges that Australia has special circumstances (large territorial mass and a sparsely dispersed population) which add considerably to the cost of a nationwide optical fibre network. However, it has compared our situation with that involved in rolling out a broadband network in South Korea which has a population more than twice that of Australia, settled in an area 0.13 percent the size – the economics of broadband provision are very different in the two countries.

In relation to the relative capacities of wireless and optical fibre, the Committee recognises that there is a role for both technologies. Wireless is clearly more mobile and will have application also in reaching some more remote consumers.

However it is limited by spectrum availability and physics. While capacity and speed can be increased by using higher frequencies and shorter distances, fundamental limitations remain. Wireless is also less amenable to providing the higher speeds and catering for large volumes of data at any one time that will be possible with the NBN.

The Committee considers that wireless is not a reasonable substitute for the proposed NBN. Wireless has less potential for expansion than the proposed optical fibre network, which can be readily scaled to meet increased demand by adding additional wavelengths or ultimately adding another fibre. Wireless is likely to be more appropriate for use over the last section of the communications path – ie from the optical fibre at the footpath, to the house. Larger buildings such as businesses, schools, hospitals, etc will still require the certainty and capacity of optical fibre covering that last section.

The Committee also notes that while it is relatively easy to calculate the cost of building the NBN, especially when it will be largely Government-funded, it is much harder to quantify its benefits in advance. It is likely that the NBN will be put to many more uses once it is in place, than we can envisage now. This is the way with much technology – not all applications of a technology are evident in advance.