

Executive Summary from "Final report on a study to conduct a cost-benefit assessment of radio propagation research", CTA027D008-1.1, 19 November 1999, Smith Group Ltd.

Executive Summary

The Radiocommunications Agency (RA) spends around £3 million per annum on external research, of which around £2 million is spent on a core programme of work on propagation activities, centred at the Rutherford Appleton Laboratory (RAL).

The RA recently conducted a strategic review of its research sponsorship, including consideration of future directions for the research and methods of managing it to ensure maximum value for money. One of the recommendations was for more emphasis on research assessment, including, if possible, economic cost-benefit assessment.

The purpose of this study was to review the available assessment techniques and to develop and demonstrate a framework for cost-benefit assessment that could be used to help answer a number of key questions underlying the research strategy:

- Has the RA (or UK plc) achieved value for money from previous research?
- Which areas for future research are likely to yield the greatest benefit?
- What is the correct level of funding for the research programme?

Our approach to cost-benefit assessments focuses on the economic benefits to the UK of increased producer surplus and consumer surplus from radio-using services. These are estimated either by reference to prices paid for spectrum at auction or in trading (which provide an indication of producer surplus), or by first principles analysis of potential cost savings to users of the radio spectrum. The latter methodology draws on previous work carried out by Smith/NERA in support of economic-value based spectrum pricing. The approach has been applied to two case studies.

Our first case study concerned research into the use of dual polarisation fixed links at 38 GHz. Prior to the research, there was judged to be a significant probability that rain-induced depolarisation would make use of dual polarisation impractical. RAL's research was able to demonstrate that this would not be a limiting factor, and it is expected that the specifications will be revised in 2000 to allow dual polarisation. This will increase the capacity of the band by at least 50%. Our model shows that even with single polarisation, the band will remain substantially uncongested over the period to 2013. However, limited congestion will arise in dense urban areas towards the end of this period, with a consequent economic cost to fixed link users who are forced (in some instances) to relocate links to a higher frequency band where a two-hop link is required. On the basis of avoided congestion costs through dual polarisation, we estimate a net present value (NPV) for the research investment of £3.1 million, representing a 33% internal rate of return on the research cost of ~£0.3 million. Our sensitivity analysis gives an uncertainty range for the NPV of £1.3 million to £4.2 million.

Our second case study concerned research into propagation for Multimedia Wireless Services (MWS) at 42 GHz. Prior to the research, there was considerable scepticism as to the technical and economic viability of operating services at these frequencies, in view of the shorter propagation distances and increased rain attenuation. RAL's research (as part of a wider

European Commission Framework project) demonstrated the feasibility and gathered valuable data for use in service planning. The results helped build confidence amongst the key players (regulators, manufactures, standards bodies and operators), and will be very important to the RA in allowing it to proceed with its proposed licensing of the spectrum in 2000. We estimate the producer surplus benefit of licensing MWS spectrum by reference to auction /trading valuations of LMDS spectrum in US and Australia, and assume that without the research, the benefit stream would have been delayed by 3 years. On this basis we estimate an NPV of £6.9 million (excluding consumer surplus benefits) on a research cost of ~£0.6 million. Our sensitivity analysis gives an uncertainty range for the NPV of £2.7 million to £13.9 million.

On the basis of these results, we recommend that:

- The cost-benefit approach should be applied to further case-studies, to test the applicability of the approach, and the extent to which the above results are representative of the programme as a whole.
- Economic cost-benefit assessment should form part of the overall process of research management within the NRPP. In particular, it should form an input to appraisal and selection of new projects, and to the ongoing monitoring.
- Existing peer review assessment be continued, and if possible strengthened through greater involvement of industrial end-users in the assessment process. Bibliometric assessment may also have a role at the programme level.
- Consideration should be given to expanding the overall budget of the programme. The size of the budget in real terms has remained constant in recent years, whereas the contribution of the radio spectrum to the UK economy has been growing at ~12%pa. If the results of this study are representative, there may well be a case to increase the funding.