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## News 2010

### Cutting the Internet's carbon footprint

Over the last 20 years the Internet has grown from almost nothing to something of enormous economic and social value.

But in the meantime, its consumption of electricity, which currently stands at 3% to 5% of the global supply, is increasing exponentially.

Interdisciplinary research being undertaken by the universities of Leeds and Cambridge has received a major boost through a £5.9m, five-year EPSRC Programme Grant award to address this issue of enabling growth of ICT networks while at the same time reducing energy consumption.

The vision of the 'INTElligent Energy awaRE NETworks' (INTERNET) project is to reduce the carbon footprint of ICT networks by at least an order of magnitude - along with a corresponding reduction in non-renewable energy consumption. This will enable comparable growth beyond the current energy barrier.

Professor Jaafar Elmirghani, the project's lead investigator, said: "The funding will offer us the stability and flexibility needed to address the major challenges associated with energy utilisation in telecommunication networks. I am delighted that we have been recognised in this way."

Energy efficient processes are increasingly key priorities for ICT companies with attention being paid to both ecological and economic drivers. Although in some cases the use of ICT can be beneficial to the environment - for example by reducing journeys and introducing more efficient business processes - countries are becoming increasingly aware of the large growth in energy consumption of telecommunications companies.



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"The predicted future growth in the number of connected devices, and of the bandwidth of the Internet of an order of magnitude or two, is not practical if it leads to a corresponding growth in energy consumption. Regulations may therefore come soon, particularly if governments worldwide enforce moves towards carbon neutrality," Professor Elmirghani said.

"The INTERNET project is therefore of great importance in seeking to establish the current limits on ICT performance due to known environmental concerns and then developing new ICT techniques to provide enhanced performance. In particular, substantial advances can be achieved through the innovative use of renewable sources," he added.

The collaborative project will draw together leading research in three key areas: optical networks (led by Professor Elmirghani at the University of Leeds), optimization of internet and Web protocols and services (led by Professor Jon Crowcroft at the University of Cambridge) and optical routing and data communications (led by Professor Richard Penty and Professor Ian White at the University of Cambridge).

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### European recognition for Leeds terahertz expertise

Research into terahertz technology at the University of Leeds has received a major boost with a €2.5 million European grant.

The award – an Advanced Investigator Grant from the European Research Council – is in recognition of outstanding work in the field by Professor of Terahertz Electronics, Edmund Linfield. It is one of only 105 projects selected across Europe out of 736 applicants in physical sciences and engineering.

Professor Linfield will use the funding to study both the fundamental science and the potential applications of terahertz quantum cascade lasers. Quantum cascade lasers are small, and potentially portable, sources of radiation in the terahertz frequency range of the electromagnetic spectrum.





“The potential uses for terahertz technology are wide-ranging, but are currently limited to niche applications in fields such as pharmaceutical analysis and astronomy, as most systems on the market are both expensive and physically large,” explained Professor Linfield. “The availability of cheap, compact systems would open up a wide range of opportunities in fields including industrial process monitoring, security screening, atmospheric science, and medicine.”

The prestigious Advanced Investigator Grant award scheme is aimed at supporting the very best established research leaders to carry out pioneering work in their field. Leeds has had increasing success in the scheme, now in its second year. Professor Linfield’s grant follows an award in 2009 to Professor Giles Davies – also from the School of Electronic & Electrical Engineering – and is one of two made to the University in 2010.

The School has one of the world’s leading research groups in terahertz technology and one of the largest university facilities for terahertz research internationally. It is also one of only a very small number of laboratories in the world to grow terahertz quantum cascade lasers, using a technique known as molecular beam epitaxy (MBE). The School’s MBE system (costing around £1M), and Professor Linfield’s team’s expertise in using it, will underpin the research funded through this European grant.

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