

Invited paper

Energy Consumption in IP Networks

Rodney S. Tucker, Jayant Baliga, Robert Ayre, Kerry Hinton and Wayne V. Sorin
ARC Special Research Centre for Ultra-Broadband Information Networks (CUBIN) and National ICT Australia
Department of Electrical and Electronic Engineering, University of Melbourne, Victoria 3010, Australia.
r.tucker@unimelb.edu.au.

Abstract

We present a model of energy consumption in IP networks. Using this model, we identify energy “hotspots” and estimate how energy consumption will grow with increasing network capacity. Today’s Internet uses less than 1% of the available electricity supply. However, network energy consumption could grow substantially as access rates increase.

Extended Abstract

We present a network-based model of energy consumption in IP networks and use this model to estimate the energy consumption of the public Internet. The model includes the core, metro, and access networks, and takes into account energy consumption in switching and transmission equipment. We include a number of alternative optical fibre based access technologies, including fiber to the home (FTTH) using passive optical networks, fiber to the node (FTTN) combined with VDSL and point-to-point optical links. Based on this model, we make predictions of the energy consumption in a future higher-capacity Internet using estimates of increased network capacity and estimates of improvements in efficiency in coming generations of network equipment. We estimate that the current Internet uses less than 1% of the available electricity supply in broadband enabled countries. However, the energy consumption of the Internet could grow to well over 1% of the electricity supply as access rates increase. Finally, we include a summary of methods that may be used to militate against future increases in energy consumption of the network.

Rodney S. Tucker



CV

Rod Tucker is a Laureate Professor at the University of Melbourne, Australia, and Research Director of the Australian Research Council Special Research Centre for Ultra-Broadband Information Networks. He has held positions at the University of California, Berkeley, Cornell University, Plessey Research (Caswell), AT&T Bell Laboratories, Hewlett Packard Laboratories and Agilent Technologies. He is a Fellow of the Australian Academy of Science, the Australian Academy of Technological Sciences and Engineering, and the IEEE. He was awarded the Australia Prize in 1977 for his contributions to telecommunications and the IEEE LEOS Aron Kressel Award in 2007 for his contributions to semiconductor optoelectronics.