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THE INTERNET BEGINS WITH COAL, GREENING EARTH SOCIETY RELEASES NEW REPORT BY SCIENCE ADVISOR MILLS

(**Arlington, VA — June 1, 1999**) Greening Earth Society science advisor Mark P. Mills examines the impact of Internet activity on electricity consumption in a new report entitled The Internet Begins with Coal. His findings – already highlighted in the May 31st edition of Forbes magazine in an article co-authored by Mills and Peter W. Huber * – translate into a figure of one pound of coal being burned for every two megabytes of information moved over the Internet. A fairly typical on-line transaction such as ordering a book from Amazon.com or downloading an MP3 music file translates into a half-pound of coal being burned to generate the electricity energizing the transaction, according to Mills, who is President of Mills·McCarthy & Associates, Inc., of Chevy Chase, Maryland.

"The electricity appetite of the equipment on the Internet has grown from essentially nothing ten years ago to 8% of total U.S. electricity consumption today," Mills writes. "In all likelihood, the Internet is responsible for one-half to two-thirds of all the growth in electricity demand." Using intentionally conservative calculations, Mills finds that when other uses of computers are included (many of which are linked to the Internet economy), the share of all U.S. electricity consumed by computer-based microprocessors jumps to 13%. With 56% of the electricity on the U.S. grid produced by coal-fired generators, the Internet's share of fuel use is on the order of 70 million tons per year of coal, out of the nearly billion tons of coal consumed to make electricity in the U.S. each year.

Mills' report grows out of an inquiry by Greening Earth Society president Fred Palmer about the implications of Intel's vision of one billion personal computers (PCs) on the Internet within the next five years, as highlighted in Intel's annual report. "Intel's vision represents a global kilowatt-hour demand equal to the output of the U.S. electric grid," Mills' responds in summarizing his research results. "It now seems reasonable to forecast that in the foreseeable future, certainly within two decades, the direct and indirect needs of the Internet will consumer 30-50% of the nation's energy supply."

Mills reports that as a result of extensive interviews and discussions with dozens of experts in Internet-related companies, it is abundantly clear that they typically do not considered the aggregate kilowatt-hour impact of their activity in meeting the market's voracious appetite for the Internet. "The impact of the Internet on the national electric grid is one of the furthest things from their minds," he observes noting that although many analysts point to the power of "bits" to transform industries, what is lost in the shuffle is the simple fact that every information technology device has two connections – one to move bits and another for electrical power.

Networked computers generate demand for other electric-powered devices to push, amplify, transmit, receive, route and manage bits, thereby creating an "echo effect" unprecedented in the evolution of electricity use. On top of those millions of computers and millions of other devices, the industry that manufactures the devices is one of the most electric-intensive in the world. The semiconductor industry in 1995 surpassed autoparts to become the largest manufacturing sector of the economy. Mills identifies four distinct categories of "boxes" using electricity that comprise the architecture of the Internet:

Devices like personal computers (PCs) that consumers and businesses use to access the Internet.

Devices that make the Internet possible, such as routers, amplifiers, transmitters, and switches.

Devices like Web servers and computers used to feed information into the Internet and are the heart of the "dot-com" companies, retail Web pages, educational sites, and corporate sites.

The factories that manufacture all of the equipment use of the Internet requires.

As tallied by Mills, these four categories total 108 million "boxes" consuming 295 billion kilowatt-hours per year. This is the equivalent of 8% of the nation's total electric supply and does not count all other uses for computers. It is a power requirement greater than the total electric output of Italy and represents more electricity than is consumed by the U.S. metals-processing industry, or more than is used by all the U.S. industries involved in chemicals, petroleum and paper production. "By itself, the Internet is already one of the largest parts of the electric-consuming infrastructure of the U.S. economy," he reports.

"While environmentalists and utility employees have been standing on desks to screw in light bulbs that save 10 watts here and 50 watts there, the people seated at those desks have been plugging in PCs and peripherals that gobble 1000 watts and more, and create an echo on the Internet requiring even more power," Mills observes. This has another important effect. "On

top of the sheer demand for power, the very nature of the Internet and information age creates an unprecedented demand for reliability," he writes. "Keeping a gigawatt-based network up 24 hours per day, seven days per week sets a new standard for high power reliability. Issues pertaining to the price of electricity and supply now assume central importance for the companies comprising the networked part of the economy. The debate over what sources of power we should encourage the market to use, which dominates the electric restructuring debate, will be buried by the demand for lots of cheap, increasingly reliable power."

"The Intel vision represents not just $1 trillion in computer sales, it also represents something on the order of a $1 trillion investment in an expanded information backbone and another $1 trillion investment in a hard-power backbone to supply electricity," Mills concludes. "One billion PCs on the World Wide Web represents a global electricity demand equal to the total electricity generation of the U.S., today." Even though the integrated circuits used in all of the Internet-related equipment will become increasingly efficient in terms of units of electricity to processing power, there will be an increase in the amount of electricity required by each chip as its processing power increases, Mills projects. And although the cost of processing power is forecast to keep going down, the use of networks will increase, meaning Internet electricity use will keep rising at a rate far faster than old-fashioned efficiency programs can possibly offset.

"We are at the beginning of a new convergent age of information and electrons," Mills observes. "There has been no challenge like this since the dawn of the electric age a century ago, when the new inventions of the electric motor and electric light bulb changed American industry and created the electric age. Many electricity policy proposals are on a collision course with demand forces. While many environmentalists want to substantially reduce coal use in making electricity, there is no chance of meeting future economically-driven and Internet-accelerated electric demand without retaining and expanding the coal component."

Note: Request a copy of The Internet Begins With Coal: A Preliminary Exploration of the Impact of the Internet on Electricity Consumption by e-mail info@co2andclimate.org, by telephone (703) 907-6159, or by fax (703) 907-6161. Soon to be available for downloading on-line at http://www.greeningearthsociety.org.

* "Dig more coal – the PCs are coming: Being digital was supposed to mean less demand for hard energy. It isn't turning out that way," Forbes, May 31, 1999, pp 70-72.