Will the New Economy Use *More* or *Less* Energy?

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The conventional wisdom used to be that the information-based economy would be far more energy efficient than the old economy. The arguments in support of this were that more people would telecommute, cutting down on driving: fewer people would travel, relying on teleconferencing and so on. As the economy shifts towards services and knowledge workers, there would be less manufacturing—which tends to be energy-intensive. And that wonderful thing called the Internet would connect people around the globe around the clock, making organizations more productive, and processes more efficient at little cost. People would order more goods from the likes of **Amazon.com** and there would be fewer trips to the stores, and fewer warehouses.

While the jury is still out on this rosy picture, our own view is that this vision will be as true as the paperless office. While it is possible in theory, we know of no paperless offices. If anything, people print—and waste—more paper than before. The Internet, Intranet, e-mail, and instant wireless, and ubiquitous telecommunications have not reduced our reliance on paper—they have increased it.

So it seems with energy consumption in the new economy. What seems to be happening is that we have created more demand for new electricity-guzzling devices of the new economy without significantly reducing energy usage in the old economy. True, more goods are now ordered via the Internet, avoiding a trip to the mall. But that means that somebody else has to drive to our house to drop off the goods.

And the Amazons are now building new warehouses, without replacing the old economy warehouses. And people still like to drive to

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Connected to the Internet

Percent of population connected to the Internet, selected countries

Source: Donaldson, Lufkin & Jenrette

the mall to browse and mingle. Consequently, the demand for energy in general, and electricity in particular, appears to be surging in the service and high-tech sectors but has not fallen off appreciably in other sectors. The former trend is noticeable in regions with heavy concentrations of such businesses.

How do we know this? There is no conclusive evidence that we can point to. The topic is highly controversial. Empirical results gathered so far are contradictory, as are the interpretation of inconclusive data. But the evidence favors the interpretation presented. Consider the following:

THE CHIPS

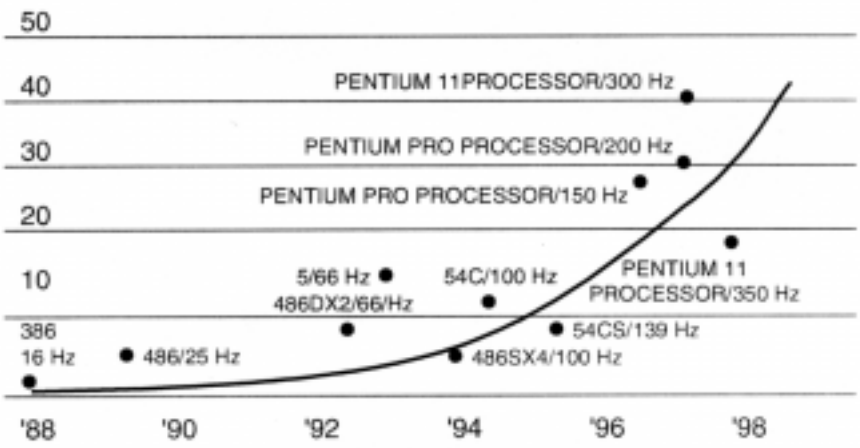
The microchips that everyone in the new economy uses in great abundance are a major consumer of power when measured in aggregate

terms. Not only have computers gotten faster and more powerful, but they also create more heat, which has to be dissipated by keeping them cool. As the chart below demonstrates, the processing power of Intel's processors have been doubling roughly every 18 months, and their prices falling. But few people realize that their appetite for power has also been doubling roughly every 36 months. This chart does not even show the more recent chips in the 500-1000 Hz, now considered child's play in new PCs. Multiply the number of PCs in use in an area such as Silicon Valley, or the financial district of any major city and the numbers quickly add up.

THE PERIPHERALS

It is not just the PCs and the hand-held devices that are proliferating, but the so-called office peripherals that are the real culprits. For every PC sitting on someone's desk, there is a laser printer, a scanner, a modem, a server, a router, a telephone switch, a fax, and a host of other

What Goes in as Power, Comes out as Heat
The power consumption of microchips doubling every 36 months
Peak thermal power, Watts
Source: Kaveh Azar, Bell Labs, adopted from Electronics Cooling



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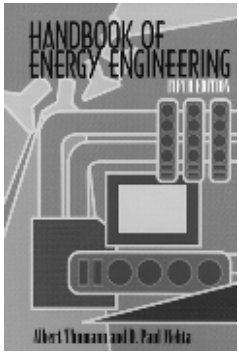

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gadgets, many of which are invisible to the average user. True, a Palm Pilot or portable computer does not use a lot of power, or may be battery powered, but connect it to the Web, the server, and the printer, and it turns into an energy guzzler.

THE INFORMATION ECONOMY

People may not realize it, but high tech companies such as Cisco Systems, Oracle, Sun Microsystems, HP, and Intel are major consumers of electricity. Oracle's three-tower complex in Silicon Valley uses an estimated 13 MW; Sun's campus to the south 26 MW, and the list goes on and on. Moreover, for reasons that are not well-understood, electricity usage per square foot of office space at such high tech outfits is growing year after year. Peter Huber and Mark Mills, two researchers at the Manhattan Institute and the Competitive Enterprise Institute, respectively, claim demand growth of 7% per year per building! The same people must be upgrading their computers and using more peripherals, one must surmise.

WEALTH EFFECT

Another interesting effect of the information economy is the rapid wealth creation—which results in bigger homes, bigger cars, more and bigger appliances, more travel by car and plane, both for professional and personal reasons. True, homes, cars and appliances are getting more efficient over time—but not fast enough. The net result? More energy usage, not less.

Can we prove any of this? No, but we can point to a few examples. For the past few years, electricity demand in Silicon Valley has been growing at three times the rest of California. How much of this is new people moving to the area, and how much of it is the existing people using more electricity is hard to decipher. For the utilities serving the area, the question is academic. The growth is real and has to be met.

Nor is such phenomenal growth limited to regions in North America with a high concentration of new-economy companies—loosely defined as high tech and/or information-based. EnergieNed, Nether-

lands' power industry association, for example, claims that distributors are having a hard time keeping up with the explosive growth in demand, particularly in and around Amsterdam and Rotterdam—both major growth hubs. Currently there is a waiting list for new connections and service upgrades, and the list is getting longer.

According to EnergieNed, the annual growth in demand has been running at 600 MW per annum, but is expected to grow at 1,000 MW per year for the next 10 years. Overall, Dutch electricity consumption is expected to grow by 10% over the next few years. Demand in Britain is growing at an even faster pace.

What could be responsible for this? Explosive growth in the IT and communication sector. Normal businesses would cherish such growth, but with new tariff discounts imposed by the Dutch energy regulator, DTE, distributors are reluctant to make the necessary investments to serve the load. But that is a separate matter.

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