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Déja Vu—Electric Power in the 1800s and Computer Power in the 1900s

In the industrial revolution, a power plant was built for each factory. This process was often carried over into other buildings including mines, government buildings, large houses, etc. These plants were used to initially provide power for work; heat, light, and ventilation came later. In many cases, gas was used for heat and light.

The plants operated on water power or on steam. Power distribution within a building was by means of cumbersome networks of pulleys, belts, axles, gears, etc.—in other words, mechanical means.

When electricity was discovered and applied, plants converted to it. However, there was initially no way to apply the right amount of power to each task (stepping down). So there was a combination of mechanical and electrical distribution in plants—but essentially still one central source. Characteristics of electric power use in the 1800s are shown in Exhibit 1.

Because power could not be transmitted, it was thought that the cities where the fuel for the power units was located would grow substantially as factories and the supporting infrastructure were built there. Thus at one time in the 19th century there was a major argument as to which would become the largest city in the world: Buffalo, New York, with its access to hydro power from Niagara Falls, or Liverpool, England, which was on top of the world's largest known coal deposit!

As the requirements to distribute electric power to users became more pronounced, the need for transmission grids and standards grew. The choices in standards were not only between AC and DC distribution but also involved the number of cycles and voltage to be used.

Once these grids and standards became established, the need to have a power unit for each geographic unit disappeared. Plants could be freely moved. Eventually both Buffalo and Liverpool declined into secondary cities. Power management in an organization became an administrative function: in some cases, such as in an aluminum plant, an extremely important one.

Consumers, whether business or individuals, bought electric appliances with motors suitable for each task. The use of electric power became integrated into everyday functions of business and working life.

Exhibit 1

Electric Power Evolution in the 1800s

• Mid-1800s	Plants/buildings/estates had own electric power generators
	Important separate unit
	Applications were lighting and work
	Usually driven by steam
	No transmission capability
	No fractional motors
	Mechanical local distribution
	Competing "protocols"
• Late-1800s	Transmission grids became available
	Standards emerged (AC over DC)
	Fractional motors applied appropriate power to tasks
	Dedicated power units disappeared a) generators b) organizations
	"Local-area networks" emerged

Source: INPUT

One can look at the emergence of the use of computer power since 1960 in an analogous manner as shown in Exhibit 2. Central power units grew ever larger through the 1970s and 1980s. However, in the 1980s we saw the emergence of the "fractional" motor of the information systems industry, the microprocessor or microcomputer. This enables the effective distribution of power in the amount needed to the point-of-work (POW).

Telecommunications networks that enable these POWs to be connected have also emerged.

Exhibit 2

Electric Power and Computer Power Analogs

Electric Power	Computer Power
Initially standalone generators	Initially standalone data centers
Standards (AC or DC) evolved	Standards evolved
Emergence of transmission grids	Emergence of networks
Step-down motor applied power to POW*	Microprocessor applied power to POW*
Provided physical illumination	Provides information (intellectual illumination)
Electric power application eventually absorbed by users	Computer power application eventually absorbed by users

*POW = Point of Work

Source: INPUT

These networks provide interfaces between non-standard devices of various power as did electric power networks. Just as transmission grids enabled widespread use of lighting, so computer networks enable widespread use of information.

The analogy can be drawn further.

Initially the money to be made in the electric industry was in building electric generators for factories and other buildings. The utilities (electric power generating and transmission) companies then started to become larger customers for the manufacturers but also drove them out of the generator business.

The real money then was made in the application devices used for the myriad tasks to which human ingenuity has applied electric power. This is not so much in the small electric motors themselves but in the whole devices, e.g., ovens, drills, vacuum cleaners, etc.—in other words, applications.

In the computer industry, initially the money was made in the mainframe business. Now increasingly, profit is in the services and products that provide application of computer power directly to POWs. As with the fractional electric motor, there is not so much profit in the microprocessor itself, the "engine" for these devices.

Of course, the analogy can be drawn too far. There are substantial differences as shown in Exhibit 3.

However, electric power has been perhaps the most significant "driving force" in the growth

Exhibit 3

Electronic Power and Computer Power Differences

- Electric power works with physical, tangible things
- Computer power works with intellectual, intangible things

- Application devices for electric power are physically driven
- Application devices for computer power are software, intellectually driven

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- Electric power network is a one-way consumption system
- Computer power network is a two-way flow of information

- Electric power utilities were heavily regulated
- Computer power "utilities" are non-regulated

- Electric power "standards" varied by geography
- Computer power standards will be global (?)

- Electric power requires huge generating facilities and expensive physical distribution capabilities
- Computer power requires ever smaller and cheaper generating facilities and transmission capabilities

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- Electric power is physically dangerous
- Computer power is intangibly dangerous

Source: INPUT

of our civilization in the 1900s. Computer power may well be the most significant "driving force" in the growth of our civilization in the 2000s. Therefore, an examination of the evolution of electric power and its use can be valuable in predicting what will happen to the computer industry. Perhaps the computer utilities are already here: EDS, ISSC, etc.

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