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October, 1995

Dear Colleague:

Enclosed is the 1995 forecast update for the utilities market, one of fifteen such markets or industries tracked by INPUT as part of its U.S. Market Analysis Program (MAP).

The report examines the information services needs of this marketplace, with special attention to the unique requirements of the industry and technological and economic realities that are influencing the utilities industry sector. The trends, events and issues driving this market are identified and expenditures are forecast for each of seven information services product/service categories.

Key topics discussed include: the supply/demand conundrum, impacts of regulation and deregulation, the accelerating pace of competition, concerns with cost/containment and price competitiveness, industry globalization; and the impact of these forces on the demand for information services and products. The analysis of the technology trends and industry issues, together with other research, is used to project the growth in the utilities market for information services over the next five years—a market that is growing at a 14% compound annual rate through the year 2000.

Your purchase of this report includes access to our consultants who will be happy to answer any questions that you may have regarding this, or other INPUT reports which you receive.

You should file this report in your MAP Program binder, behind the tab marked Utilities industry.

Sincerely,

Robert Goodwin

Robert Goodwin
Vice President

Enc.

Information Services Markets
1995-2000

Utilities

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Information Services Markets in the Utilities Industry, 1995-2000

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Table of Contents

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List of Exhibits

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I

Introduction

A
Purpose, Organization and Methodology

This section identifies the purpose and scope of this report, notes how the document is organized, and explains INPUT's research methodology and the techniques used in the preparation of forecast data.

1. Purpose

The purpose of this forecast report is to identify key changes in the market for information services in the utilities industry, and to provide the 1995 INPUT forecast for this market sector.

Sector Definition - The utilities sector, as defined by INPUT, includes:

- Electric utilities, which can be investor-owned, cooperatives, municipally owned, federally owned, or state power districts
- Gas utilities, which consist of pipelines (transmission) and distribution (local) companies, some of which are municipal
- Water/sewage/waste disposal utilities, which can be publicly or municipally owned, or privately owned

2. Organization

In addition to this introductory chapter, the report contains analyses of the information services market and competitive environment as described below:

- Chapter II, *Trends, Events and Issues*, discusses changes, market issues and activities, and competitive factors in the utilities sector that can affect the current and future use of information services.

- Chapter III, *Information Systems*, notes how the utilities sector organizes and uses information technology, and identifies key technologies and major trends in the use of information systems. Key applications and the use of outside products and services are also considered.

- Chapter IV, *Information Services Market Forecast*, presents an analysis of the expenditures for information services, by product/service group and subgroup, for the U.S. utilities market.

- Chapter V, *Vendor Competition*, discusses key industry issues and considers the competitive positioning of major vendors. It also identifies significant vendors by size and application area and offers profiles of a selection of leading vendors.

- Chapter VI, *Conclusions and Recommendations*, offers suggestions and recommendations for participants in the utilities market.

- Appendix A, *Forecast Database*, presents a detailed 1995-2000 forecast, by information services product/service group and subgroup, for the utilities vertical market, and also provides a reconciliation to the previous forecast. The Forecast Database for 1994-1999 is also included.

3. Methodology

Much of the data on which this report is based was gathered during 1994 and the first half of 1995 as part of INPUT's ongoing market analysis program. Trends, market sizes, and growth rates are based upon INPUT research and in-depth interviews with users in the utilities industry and the IS vendors serving the industry. INPUT maintains ongoing relationships with, and a database of, all users and vendors interviewed. Interviewees for the research portion of this report were selected from this database of contacts.

INPUT Library - In addition, extensive use was made of INPUT's corporate library located in Mountain View, California. The resources in this library include on-line periodical databases, subscriptions to a broad range of computer and general business periodicals, continually updated files on over 3,000 information services vendors, and the most up-to-date U.S. Department of Commerce publications on industry statistics.

Financial Data - It must be noted that vendors may be unwilling to provide detailed revenue information by product/service group or industry. Also, vendors often use different categories of industries and industry segments, or view their services as falling into different product/service groups than those used by INPUT. Thus, INPUT must estimate revenues for these categories on a best-effort basis. For this reason, the product/service group and individual segment forecasts should be viewed as indicators of general

patterns and trends rather than specific, detailed estimates for individual years.

Rounding - The values used in many of the exhibits contained in this report have been rounded for ease of reference. User expenditures for all information services categories are detailed to the nearest $1 million, however, in Appendix A, the Forecast Database.

B
General Business Overview

As documented by the U.S. Department of Commerce, economists and business journals, the U.S. economy ended 1994 on a high note—perhaps too high from the Fed's viewpoint— with growth at approximately 4.6%. Since employment has also returned to an acceptable level, there is some concern that the strong growth increases the threat of inflation in 1995. However, January's gain in employment—134,000 people—was well below 1994's monthly average gain of 290,000. This decrease has generally been regarded by economists and the financial markets as the first solid evidence of slower growth. Most economic observers now feel that growth should slow to around 2% by the third quarter of 1995, giving the American economy what some economists are calling a "soft landing." There is also general agreement that the economy seems to be in a mid-cycle slowdown, and that, long term, the risk of that slowdown becoming another period of recession in late 1995 is low.

From a financial markets viewpoint, in 1994 bond yields rose nearly 200 basis points, and the Federal Funds rate was up 250 basis points. In 1995, most market analysts expect the Fed rate to top out at 6.5%, bond yields to move sideways in the range of 7.5% to 8.0%, and S&P 500 earnings to increase approximately 7%—an amount smaller than in 1994. In general, most sectors of the U.S. economy should grow more slowly in 1995 than they did in 1994—the result of slight decreases in productivity and price/cost pressures. U.S. manufacturers are still restructuring, emphasizing cost-cutting and downsizing, and, coupled with the early-1995 weakness of the dollar (especially against the yen), world markets should find U.S. goods attractively priced. Imponderables remain the short-term impact of supports for Mexico's peso and trade disputes with China. Both situations have the potential for significant short-term volatility, but in the long run should have little effect on the U.S. economy's return to modest, steady growth. Inflation in 1995, as measured by the *Blue Chip* consensus of approximately 50 private-sector economists, is expected to be at a conservative 2.9%, growing slightly through the year 2000 to a maximum of 3.3% (1996 and 1997) and then declining to 3.0 % by the millennium.

The most encouraging sign of a healthy economy was seen recently in a statement by Federal Reserve vice chairman Alan Blinder who noted, on March 9, that the U.S. economy is downshifting to a more sustainable growth rate. He agreed with Fed chairman Alan Greenspan that the Consumer Price Index probably overstates the rate of inflation by 0.5 to 1.5 percentage points. As subsequent actions by the Fed have demonstrated (the July 7 reduction in the Federal Fund Rate of 1/4%), it appears that no further increases will be seen in 1995, unless there is a major change in the economy.

Overall, however, the outlook for the U.S. economy in 1995 is for controlled, steady growth in the 5.7% range, with inflation at about 3%, and corporate after-tax profits at approximately 7%, down slightly from 1994's 10%.

II

Trends, Events and Issues

This chapter notes the trends, events, and issues that are affecting the utilities industry and driving the use of information services.

A
Trends and Events

Exhibit II-1 summarizes the major trends affecting the utility industry. Each is discussed in greater detail below.

Exhibit II-1

Major Trends Affecting the Utility Industry

- Supply/demand in sync, but uncertain
- Deregulation/reregulation
- Accelerating competiton
- Cost containment/price competitiveness
- Globalization

Source: INPUT

1. Supply and Demand

Current estimates indicate annual growth of about 1.7% in electric demand for the remainder of the 1990s. While generating capacity is forecasted to expand at 1.2% annually, the industry is still growing into the excessive capacity brought online in the 1980s. Transmission capacity, critical in an era of anticipated wholesale wheeling, will experience a 10% increase over the current 192,000 mi. in the U.S. and Canada. Both figures seem appropriate to the forecasted demand, but many uncertainties continue on both sides of the supply/demand equation.

In both 1993 and 1994, gas well completions exceeded oil well completions and, similarly, gas revenues exceeded oil revenues. Gas continues to be the preferred fuel used to generate electricity. In fact, of the new generation of resources planned by 2001, 66% will be gas turbines, resulting in a growth in gas demand by electric utilities from 3.1 quadrillion BTU in 1994 (est.) to 3.8 quadrillion in 2000 (forecasted). Though bearing more expensive fuel costs than competing coal technologies, natural gas plants—in particular gas-fired combined cycle—are smaller, have lower heat rates and thus cost less per kilowatt. Gas supply fluctuates with demand. Thus, increasing demand provides increased incentive to produce more gas. Forecasted 2000 demand is 23.9 quadrillion BTU, up from 21.7 quadrillion in 1994. Natural gas prices fell in 1994, the result of a cooler-than-normal summer and growing gas supplies. In 1994, the average number of gas rigs was estimated to exceed 400, the highest since 1990. In addition, advances in drilling and seismic technologies are resulting in more holes and more gas per production dollar.

2. Regulatory Environment

In general, the federal government is attempting to create a competitive environment for electric utilities, much as it has for gas. In addition, 50 different state Public Utilities Commissions (PUCs) micro-manage the rate structures and business decisions of utilities, which find themselves caught in the middle.

a. Climate of Deregulation

Utilities have followed the deregulation path of the airline and telephone industries. Basically, the gas pipeline industry has been deregulated. Order 636, issued by the FERC in 1992, separated gas sales services from transportation services, making pipelines common carriers. Further steps to deregulate electric utilities were part of the Energy Policy Act of 1992 (EPact), which was also aimed at reducing consumption and promoting alternate fuels.

At the distribution level, as in the telephone industry, deregulation—and hence competition—is more difficult to achieve. This is an area in which a natural monopoly occurs, caused by the poor economics of having side-by-side telephone and electric lines—or gas, water, or sewer pipes. At the distribution level, it is more logical to look for `reregulation' rather than deregulation, implying a tightening rather than a loosening of state government oversight.

b. Retail Wheeling

Caught somewhere between the states and the federal government is the subject of `retail wheeling' or `open access' in the "electric industry." Note that increasingly this phrase, instead of "electric utilities," is used to

underline the fact that the power generated by non-utility generators (NUGs) has now passed 10% of the national output. Through 2015, utilities and NUGs will each account for about half of the projected 380 GW in generation capacity additions.

Basically, retail wheeling envisions the transmission networks owned and operated today by utilities as common carriers, (which is what happened with gas pipelines), available to carry any utility or NUG's electrons to any potential customer. The charge is being led by industry. General Motors, for example, feels it cannot be a low-cost producer if it deals with high-cost suppliers. Annually, GM buys $700 worth of electricity from 45 utilities in 25 states. That is leverage! $700 of the typical $15,000 GM auto was spent on electrons by GM or by its suppliers. That is motivation. Decreasing the price of electricity by a third could result in a $4 billion to 5 billion profit in a good year. A cut of one cent per kilowatt hour from the national average of seven cents would save U.S. industry and consumers about $28 billion per year.

The ramifications for electric utility and NUG alike are immense, and it is generally assumed that the industry will consolidate and high-cost producers will be absorbed. But the timing is critical, as utility executives attempt to don the mantle of competitive businessmen, an unfamiliar role to many. Regulatory lethargy may well be the salvation of some.

The Clean Air Act Amendments (CAAA) of 1990 "kick in" in 1995 and affect 111 coal-fired plants (with an additional 700 by the year 2000). Utilities began to trade emission allowances in 1992, thereby putting a specific economic value on environmental costs. In 1993, the Chicago Board of Trade ran the first auction in allowances. Environmental concerns, which vary by region, have weakened the traditional camaraderie among utilities by dividing them along lines of self-interest.

c. Consumerism and the Public Utilities Commissions (PUCs)

Although technically representing consumer and utility interests, most PUCs (many of which are elective) tend to side with consumers' short-term interests. Utilities try to maintain positive public relations to help assure a cooperative PUC, and thus spend a great deal of executive time with the PUC.

The regulatory fishbowl in which utilities operate engenders an unusually conservative philosophy. The prudence of utility decisions is always subject to question by politically influenced second-guessers. Rate cases are supported by immense paperwork, and the number of rate cases is increasing after a steady decline throughout the 1980s. The Nuclear Regulatory Commission's paper requirements have been overwhelming since the Three Mile Island accident in 1979, albeit licensing requirements have been relaxed

recently. Still, it is unlikely that any utility will undertake new nuclear construction on its own in the next few years.

d. Performance-based Incentives

Traditionally, utility earnings have been limited by a rate of return on invested capital set by the PUC based on a rate case filed by the utility. Recently—in the light of the increasingly competitive environment as well as recognition of the incredible bureaucracy entailed in rate cases—performance-based incentives have begun to displace rate of return. Under performance-based incentives, improvements in operational efficiencies as well as customer satisfaction are measured, with resulting rewards and penalties for the shareholders. PacifiCorp, San Diego Gas & Electric and Brooklyn Union Gas are among the pioneers in this area.

3. Increasing Competition

The monopolistic nature of utilities suggests the absence of competition, and utilities, with their conservative approach to business, can hardly be considered cutthroat. However, in recent years it has become increasingly apparent that the humdrum style of many utilities has given way to an era of intense competition. In fact, preparation for a competitive environment is the dominant element of most utilities' strategies, including considerations of downsizing and culture change.

a. Gas versus Electric

Competition among different fuel sources is hardly new. The basic rivalry has always been between gas and electricity. This competition is normally limited to the industrial and heating/air conditioning markets. Unconstrained by the contradictory forces of marketing versus conservation that afflict many electric utilities, gas companies continue to be the more aggressive marketers.

b. Independent Power Producers (IPPs)/Cogenerators

Encouraged by federal regulators during the Carter administration's Public Utility Regulatory Policy Act of 1978 (PURPA), independent power producers and cogenerators offer an important dimension of utility competition. Both of these entrants have a tendency to use gas as fuel for their generators. The result is a ratchet effect between electric and gas rates.

c. Resurrection of Marketing

After the oil crisis of 1973, marketing went out of fashion for electric utilities. Marketing departments shrank and, renamed, refocused on conservation. The theme was: "Let me help you not use my product."

Contradictory as this seems, conservation continues to be preached by many electric utilities, beholden as they are to the PUCs. Some 30 states have encouraged conservation by allowing utilities to treat related costs as though they were an investment in plant. However, as larger utility customers have begun to discover that there are alternatives to local utilities, these utilities have reacted by reintroducing true marketing into their methods and organizations. With the passage of the North American Free Trade Agreement (NAFTA), utilities bordering Mexico have taken an aggressive interest in markets south of the border.

4. Cost Containment/Price Competitiveness

To deal with a competitive world, utilities have fallen in line with much of corporate America in focusing on the cost side of the equation. For many years, utilities were regarded as "cost-plus" businesses. Indeed, that is basically the nature of the regulatory compact that traded monopoly status for the obligation to serve. But today, both the "cost-plus" and "obligation to serve" philosophies are under intense pressure. Notice, for instance, that as utilities rename themselves, the term "service" often drops out.

Many power utilities view their key objective as becoming the low-cost producer in their region. Production costs are spread over customer bases varying in mix (industrial, commercial, residential). They are also a function of customer density, embedded costs of plants and other facilities, and long-term contracts, typically for fuel or energy from IPPs or other utilities. The result is a hodgepodge of costs resulting in dramatically inconsistent pricing of identical electrons. Exhibit II-2 offers a ranking of average residential electrical costs by region:

Exhibit II-2

Average Residential Electrical Costs, by Region

Rank	Region	Cents per KWH
1	Northeast - NY, NJ	13.03
2	New England - ME, NH, VT, CT, MA, RI	11.94
3	Pacific - CA, NV, AZ, HA	11.16
4	Central Plain - NE, KA, IA, MO	9.01
5	Mid-Atlantic - PA, WV, VA, DE, MD	8.99
6	Midwest - MN, WI, IL, IN, OH, MI	8.82
7	Southwest - NM, TX, OK, AK, LA	8.77
8	Southern - KY, TE, MS, AL, GA, SC, NC, FL	7.96
9	Rocky Mountain - MO, ND, SD, WY, UT, CO	7.18
10	Norhtwest - WA, OR, ID, AK	5.57

Source: INPUT

a. Culture Change

In the view of many utility executives, the threat and reality of increased competition has changed the industry from "cost-plus" to "sink-or-swim." Growing up in the industry, few utility employees ever learned the dog paddle, much less the Australian crawl. To address this, some executives have opted to immerse their employees in focus groups and use other awareness-enhancing techniques. The objective is to change the fundamental culture of these businesses so that they can compete aggressively in a brave new utility world. The utility executives hope that this will be achieved by dramatically changing the orientation and motivation of their employees.

b. Downsizing/Rightsizing

As utilities assume a lean and mean stance, they have taken a knife to the fat that gathered during less-contentious times. Most utilities have already been through at least one painful downsizing exercise. Few would argue that the industry was not ripe for downsizing. The term rightsizing has also been used to describe the process, suggesting the appropriateness of the staff reductions. Capsizing has been used by some to describe inappropriate reductions.

5. Globalization

Within just the last year or two, U.S. utilities have learned there is more to this planet than the USA. Focused on their individual service territories, utilities seldom thought to market their capabilities outside U.S. (and at times Canadian) borders. All this is changing—rapidly. U.S. utilities are building power plants, transmission facilities, pipelines and a wide variety of infrastructure in Latin America, China and India. The markets in these developing areas are huge and utilities, with their new-found competitive viewpoint, are interested. Globalization is not restricted to construction, as several large U.S. utilities have already acted to acquire electric distribution utilities in the U.K.

B
Issues

Exhibit II-3 summarizes the major issues driving the utility industry.

Exhibit II-3

Major Utility Industry Issues

- Composition
- Competition
- Diversification/Bankruptcies/Consolidations
- Environment
- Fuels
- Constituencies

Source: INPUT

1. Composition

Over the years, the traditional structure of the utility industry has evolved slowly but its basic demographics are clearly changing. For example, there are now 44 non-utility generating companies in the U.S., supplementing the production of the 198 investor-owned utility companies. Increasingly, power brokering companies are being formed to address the coordination of supply and demand in an open access/retail wheeling environment. Power pools are taking on increasing significance as possible Regional Transmission Groups (RTGs), linking producers with their markets both physically and economically. Power brokers and marketers providing intermediary services for gas and now electricity have emerged from nowhere. Gradually, the utility industry is fragmenting into functional organizations, e.g. pipelines versus local distributors in gas, generators versus transmitters versus distribution companies in electric. This is happening while the industry consolidates, with stronger competitors acquiring weaker. Despite the turmoil, however, the traditional plodding pact of utilities and their regulators may result in little true revolution in day-to-day operations.

2. Competition

As noted earlier, the major influence on most utilities' strategies is the increasingly competitive environment and the pressing need to reshape their organizations from the bottom up. It is difficult to overstate the importance of these concerns on utility thinking and, consequently, decision making. Most utilities view competition with trepidation, if not outright fear. Utility people, including much of the executive tier, have little or no experience in competing. IS solutions that can be clearly related to improving utility competitiveness will be well received.

3. Diversification/Bankruptcies/Consolidations

a. Diversification

During the 1980s, many utilities found themselves with excess cash generated by rates that had finally caught up with the regulatory lag of the 1970s. Constrained as they were to a rate of return determined by the PUC, utility managers attempted to expand their horizons by diversifying their businesses.

For some, this expansion consisted merely of dabbling in fields related to the core utility business. Others pursued related endeavors more vigorously. Some entered entirely different businesses, such as savings and loans and insurance. Few efforts at diversification prospered. With very few exceptions, utility managers have now decided to stay with what they know best. Most recently, as noted earlier, that includes marketing their utility expertise in developing countries. For most utilities, this is new territory both literally and figuratively.

b. Bankruptcies

The never-can-happen happened. A utility went bankrupt. Saddled with immense debt caused by cost overruns at the Seabrook Nuclear plant, Public Service of New Hampshire went belly up. Since then, the Columbia Gas System, Tucson Electric and El Paso Electric have been added to the list. Bankruptcy is now an issue that can touch the utilities sector.

c. Consolidations

Merger and acquisition activity is a natural consequence of increasingly competitive utilities seeking synergies. However, many regulatory approvals are required and the process can be extremely time-consuming. Iowa Electric (Cedar Rapids) has recently merged with Iowa Southern, while Iowa-Illinois Gas & Electric (Davenport) and Midwest Resources (Des Moines) are in the process. Entergy and Gulf States Utilities also merged. Cincinnati Gas & Electric accepted a buyout from PSI Resources after the latter had fended off a hostile takeover from IPALCO, the parent of Indianapolis Power & Light. Tiny Southwest Public Service and behemoth Central and Southwest squared off in attempts to take over bankrupt El Paso Electric. The big guy won in what many view as the beginning of an inexorable surge in consolidations. Then Sierra Pacific (Reno) and Washington Water Power (Spokane) proposed to merge into Resource West Energy, and Northern States Power and Wisconsin Energy (Milwaukee) announced plans to merge to form Primergy, which will be the tenth largest investor-owned utility. Later, it was Union Electric and CIPSCO (Central Illinois); Baltimore Gas and Electric pairing with PEPCO (Potomac Electric) and the hostile bid of PECO (Philadelphia Electric) to acquire Pennsylvania

Power & Light. The pond is the same, but the number of fish is declining rapidly.

4. Environment

Environmental issues are having a significant impact on utilities for a variety of reasons, including the current political climate, and concerns over broad, long-term issues such as the greenhouse effect.

Buoyed by passage of the Clean Air Act, environmental activists are now focusing on higher-hanging fruit, such as lawnmowers.

5. Fuels

a. Nuclear

The Three-Mile Island (TMI) accident triggered an intense focus on the safety of U.S. nuclear plants. The result was a massive increase in Nuclear Regulatory Commission regulations that impacted existing nuclear plants and caused the cancellation of all orders for new plants. No new nuclear plants have been ordered since 1979.

The result of these regulations has been to dramatically increase the cost of operating nuclear plants. Since TMI, staffing levels have risen from 150 employees per plant to over 1,000. As a result, in addition to the astronomical capital costs of bringing a nuclear plant on-line, the operations and maintenance expenses are higher than a comparable-capacity coal plant—a bitter disappointment for those who had bet on the promise of nuclear power. In responding to these realities, several nuclear utilities announced the premature retirement of their nuclear facilities.

b. Gas

The advantages of gas suggest that it is to be the preferred fuel for the 1990s. However, because gas heats 56% of U.S. homes, distribution profits can suffer dramatically in unusually warm winters, such as have occurred in much of the country in recent years. Some PUC's have approved special rates that protect utilities from revenue short-falls resulting from unseasonable warmth. The natural gas industry has contended that greater use of its fuel could reduce oil dependence and, in addition, help achieve a cleaner environment. The Clinton administration seems to agree, but is not likely to have much influence with a Republican Congress on the subject.

c. Coal

The effects of the Clean Air Act are viewed by some as making it difficult—and in some regions impossible—to increase the electrical output of coal-fired

power plants to meet increasing demand. However, mine prices continue to slide as the coal industry seems caught in a cycle of over-investment and overcapacity. One hundred fifty-four utilities use coal in large quantities. Of the billion tons of coal produced each year, an estimated 80% is sold to utilities.

d. Alternate Energy Sources

Interest in alternate energy sources, such as geothermal, solar and wind, which peaked in the 1980s, may see a resurgence as a result of EPAct, as well as the pressures from environmental interests. Recent technological advances in wind turbines and solar energy have received renewed interest from utilities. But, in general, the future of renewable energies is uncertain because gas-fired plants produce electricity more cheaply. Exhibit II-4 notes the costs per KWH for various energy sources.

Exhibit II-4

Cost per KWH

Energy Source	Cents Per KWH
Natural Gas	3
Wind	5
Geothermal	5.5
Solar	14

Source: INPUT

6. Constituencies

Utility people like to refer to the varied constituencies they try to please as "stakeholders"—employees, customers and shareholders, with regulators implicitly included. The utility challenge has been to keep all the stakeholders happy. In recent years, customers, particularly larger ones, have pressed for options regarding price. Employees have been downsized and had their attitudes reshaped. And for stockholders, dividends have been cut.

In the past decade, 12 of the largest 40 utilities have reduced dividends on stocks that had been viewed as solid for a "widows and orphans" clientele. Another three are paying out more than 90% of earnings in the form of dividends. The result is growing resentment from shareholders who often have planned their retirement, perhaps naively, around anticipated utility dividends. In a classic utility response, one Florida utility has taken to moving its annual meeting to Fort Worth, perhaps to beat the heat. Another

utility in the southeast is lobbying its state legislature to allow company boards to block shareholder initiatives on contentious issues like executive compensation. As an industry, utility executive compensation is quite low, averaging about 60% of that in non-utilities of equal size. No one is particularly happy!

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III

Information Systems

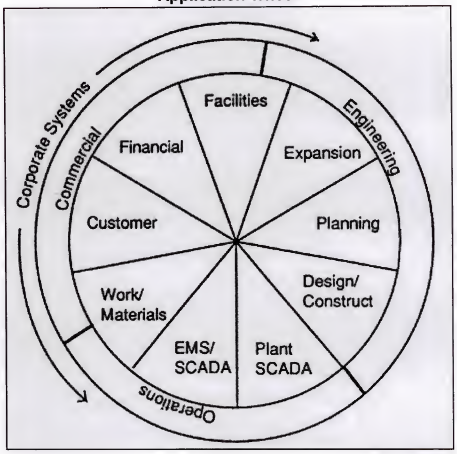
A
Overview

1. Evolution

As illustrated in Exhibit III-1, the utility application portfolio can be regarded as an "applications wheel" and divided into three major segments: commercial, engineering, and operations. Frequently, the formal information systems organization has responsibility for only the commercial applications. Operations (and sometimes engineering) applications are often the responsibility of the respective end-user departments and are processed outside of the information systems organization's corporate data center. This chapter will describe each of the major applications in these three categories.

Exhibit III-1

Application Wheel



Source: INPUT

The three segments of utility information systems evolved from different beginnings:

- The commercial applications, largely accounting related, were derived from early punch-card accounting machines used to do billing. Punch-card bills were the norm in the 1940s and 1950s, but have been displaced completly by statement bills today.

- Engineering applications were derived from analog computers used to model the network. With the advent of digital systems and particularly the popularity of the minicomputer in the 1970s, these engineering applications were replaced, but responsibility continued to be held by an engineering organization (there may be several in a large utility).

- The operations function lives in a real-time world that is perceived to be totally distinct from commercial and engineering functions (although that concept is arguable). Computerized SCADA (supervisory control and data acquisition) systems, which are the basic component of today's EMSs (energy management systems), were developed in the 1960s when the supervisory control systems—operated by individual switches and push-buttons from consoles and wall boards—were first replaced by systems with digital, computer-based master stations.

Office systems, first in the form of word processing and later as E-mail, began to appear in the early 1980s. After a few organizational stirrings, it was generally assigned as the responsibility of the IS organization. Similarly, although not to the same degree, telecommunications responsibility was moved to IS with exceptions likely to be: 1) SCADA/EMS responsibility remaining with operations, and/or 2) voice being separated from data with responsibility in facilities administration.

2. Centralization

Given its accounting heritage and the state of technology at the time, it was natural for the commercial applications to be processed on a centralized basis using mainframe systems. The industry evolved with amazing consistency in this regard.

One major driver of this consistency was the development of CICS (Customer Information Control System) as the premier mainframe database/data communication (DB/DC) enabler of the 1960s and 1970s. In developing CICS, IBM involved several utilities, and the resulting program product was rapidly adopted by 90% of the larger utilities in the U.S. It was a serendipitous surprise for IBM when CICS proved to be so successful outside of utilities.

Another factor influencing the centralization of information systems in utilities is that utilities were by definition geographically constrained to their service territories As a result, communications costs and other benefits associated with a more decentralized approach (that have a bearing on other, more national, industries) were not a major consideration for utilities.

In the last few years there has been a clear shift away from utilities' centralized view of information systems, both physically and organizationally. Client/server is today's hottest technology in utilities—although the definitions vary greatly, when indeed they are offered. And increasingly, development responsibility for major systems is being assigned to end-user departments, increasing their accountability.

3. Corporate Systems versus Engineering/Operations

In most utilities, the 1980s saw the development of a closer relationship between engineering computing and the information systems organization. This relationship was a logical outgrowth of information systems' reaching out to end users under the organizational and philosophical banner of the Information Center. But the lines of separation between operations and information systems, with some significant exceptions, generally continue.

Most power plants are not built by the utilities themselves, but rather by contractors. Typically, there is tremendous pressure to get the plant into operation so that its costs can be put into the rate base and the utility can earn on them. In this environment, little emphasis is placed on the niceties of the information systems used within the plant.

Unlike other utility organizations, in a power plant the superintendent or manager is a czar. His job is to keep that plant in operation; each day out of production can cost millions of dollars. The manager is not inclined to be beholden to the information systems group for support. Most plant systems are not systems at all, but rather a series of unrelated subsystems or "islands of information," as some refer to them.

During the 1990s, there has been a wholesale integration of utility information systems—not only of the commercial systems managed by information systems, but also of the engineering and operations applications that are now outside of the corporate systems' jurisdiction. The reason for this is that competitive utilities can ill afford not to capitalize on their information resources. The situation has been likened to a nervous system with two brains—it might work, but not very well. The analogy is particularly apt in light of increasing skittishness among utility executives as competitive pressures continue to increase.

4. Reengineering

Utilities have frequently shared their decision making with outside consultants; consequently, the work of Messrs. Hammer and Champey was warmly received by utilities, as was the stream of consulting disciples of re-engineering. There are mixed reviews in utilities on the value of reengineering; however, the concept of focusing on business processes and relating them to the goals of the corporation is here to stay. Initially, IS was caught unawares by the rapid spread of reengineering through the executive suite to which IS was not often privy. However, for the most part, utility re-engineering projects now consistently involve IS representation. Some utilities have gone so far as to not fund any new application unless the related process has been reengineered.

B
Applications

1. Customer Information System (CIS)

The backbone system of the utility is the Customer Information System, "where it all began." As noted earlier, the first computer systems in utilities focused on accounting applications. The customer accounting job in a utility is a big one. These systems were extended from batch accounting to on-line customer inquiry and related sub-applications. The modern CIS is the key information system of the utility and includes service order processing, dispatch, meter reading, billing, credit and collection, adjustments, cash, and customer information. Larger electric and gas utilities are highly complex but fairly similar in function. They tend to want solutions tailored to their unique situations. Smaller utilities such as water, cooperatives, and municipals are much simpler, making this segment more amenable to packaged solutions.

In the larger utilities, the most important characteristic of a CIS is its age. Many of these systems were developed in the early 1970s and are extremely difficult to maintain. The result has been a spurt of activity in rewriting these systems. In the late 1980s, the cost of rewrites soared, with some estimated to be in excess of $100 million. However, in the 1990s, the bubble has burst and very few utilities now think in terms of a completely customized new CIS. A CIS is no longer viewed as "the cost of doing business" and new systems are subject to the same economic scrutiny as any other system. With few exceptions, these newly initiated redevelopments are for an S/370 architecture using DB2 as the DBMS. Cooperative processing is currently on the leading edge of these systems, with some viewing the mainframe as a giant server, in one popular industry definition of a client/server architecture. Some medium-sized utilities have begun efforts to apply RISC UNIX workstations to the customer system application, while others have downsized from mainframes to minis.

The CIS area includes meter reading. For well over twenty-five years, utilities have piloted automatic meter reading (AMR) over telephone lines, using RF readouts, even digitized pulsing of a power line. Only one of even modest size, Yankee Energy, has ever fully deployed AMR throughout its service territory (183,000 customers). Few pilots have gone far in competing with the overall economics of the meter reader. However, in recent years the pilots have been broadening and it appears that a major move to AMR finally may be on the horizon.

It costs $6-$7 per year to read a meter. In the 1980s, the meter reader was armed with a hand-held computer that simplified the task and introduced new efficiencies. The market for hand-held devices was quickly saturated for larger utilities. Today the new market for hand-held devices is in the cooperative and municipal utilities. Use of hand-held devices is sometimes confused with AMR. It is hardly automatic.

Usually, true AMR must be augmented by additional functionality in order to prove economical. The major candidate for addition is load management, but two-way communication links could offer many interesting variations, not the least of which would be spot-pricing of energy at the residential level. It is here that traditional distinctions between CIS and other applications, e.g., work management, distribution SCADA, distribution automation, etc., begin to blur, resulting in numerous potential integration opportunities.

2. Marketing Support Systems

Some utilities view marketing support systems (MSS) as part of the customer support system. One fundamental difference is that a customer system usually follows customers only, whereas an MSS also follows prospects. This is not a subtle distinction to a marketer. Of course, an MSS uses extracts from the customer database for market analysis. This need not be totally current data (as maintained by the CIS). Rather, it is a snapshot at a point in time, perhaps monthly, and it is frequently complemented by related demographic data from external sources. The database is often relational to allow ease of access for unanticipated analyses.

Beyond the analysis aspects of an MSS, a variety of other tools are used. These include tracking and account planning systems and mailing lists. Most important are forecasting tools that enable the marketing organization to evaluate various rates, since price is often the only way to differentiate products.

3. Financial Systems

Utility accounting practices have many quirks that distinguish them from other industries. These reflect the ramifications of regulation and its associated reporting requirements, as well as creative devices used to reflect the capital-intensive nature of the industry.

- An example of the former is the use of FERC codes for reporting purposes despite their inapplicability to actually running the business.

- An example of the latter is the Allowance for Funds Used During Construction (AFUDC), which somehow allows a utility to claim revenue for funds used to finance construction work in progress.

In addition, the bookkeeping requirements of utilities covered under the Public Utility Holding Company Act of 1935 are quite different from the requirements of companies not so unfortunate. A major objective of many utilities is to introduce true-cost accounting techniques into financial systems, enabling product pricing on a situation-by-situation basis. Additionally activity-based cost accounting (ABC), derived from the manufacturing industry, is gaining increasing attention among utilities. Such systems increase the capabilities of utility supervisors and managers to manage controllable costs. The systems themselves are not enough; a culture change toward disciplined business decision making must also be present for ABC to succeed. The combination of culture change and supporting cost systems offers an attractive consulting opportunity. It is fair to say that utility financial systems are highly complex and a critical part of utility operations.

4. Transmission and Distribution (T&D)—Work/Materials Management

Work management and complementary materials management systems are the cornerstones of utility operations in the field. Work management involves the inspection, surveying, maintenance, and construction of transmission and distribution facilities. The activities include those normally required for day-to-day control of construction, maintenance, and operations tasks—from receipt of a work request through design, scheduling, performance, reporting of completed work, and closing activities. Complementing work management is the materials management system, which tracks the inventory of stores (materials) to assure that sufficient materials are available to the work crews, at the same time assuring that capital is not tied up unnecessarily in excess inventory.

It is not unusual for utilities to have multiple work management and/or materials management systems. This is due to the varying levels of detail required—e.g., the number of facilities in a distribution network (100,000s) versus those in a coal-fired plant (100s)—as well as to the different organizations and functions involved (T&D focusing on construction versus plants focusing on maintenance).

5. Facilities Management

Often referred to as AM/FM (Automated Mapping/Facilities Management) or GIS (Geographic Information Systems), in utilities, facilities management refers to the management of distribution facilities—e.g., transformers, feeders, poles, pipes—although it may be applied to the transmission level as well. Facilities management (FM), the application, has a spatial context in that the facilities are stationary at a certain point of geography. FM has a connectivity aspect in that the facilities are interconnected to form a

network. This can be contrasted with the proper use of the term GIS, which has no implication regarding connectivity. FM has a variety of other attributes of an engineering and accounting nature.

The geographic aspect of these systems is evident in the myriad maps maintained (some of the time) by utilities, many of which can be redundant and contradictory. Various departments have maps of the same territory and maintain them with information provided by different sources. As a result, maps seldom agree and there is no agreement as to which is correct. But the map is only a reflection of the underlying function, which is to manage these facilities. In this sense, facilities management systems are database systems that provide for geographically based output (maps).

As a database system, facilities management is often confused with applications that make use of facilities data. These may be commercial (e.g., taxes based on political boundaries), engineering (e.g., flow analysis), or someday even operational (an actual SCADA database). But in a pure sense, the facilities management system only maintains the data and does not apply it.

Facilities management systems have different requirements with respect to accuracy. For example, a gas utility in a major city needs to know rather precisely where its pipe is before it starts tearing into the downtown asphalt. On the other hand, an electric utility can be off by a wide margin if it is looking for the transmission line on the south forty of the Jones' farm. The importance of accuracy is not simply esoteric because conversion costs for facilities management systems have been known to increase exponentially with the level of accuracy required. Costs to convert from paper to computer records can represent half or more of the costs of a typical facilities management system. In recent years, the need for pinpoint accuracy has seemingly diminished despite the availability of an increasing number of tools, e.g., geo-positional sensing, now available.

6. Supervisory Control and Data Acquisition (SCADA)/Energy Management Systems (EMSs)

Some would argue that the most important utility systems in the 1990s are the SCADA/EMSs. This importance is predicated on the belief that at a time of cost-consciousness, the ability to safely reduce margins in the transmission of electricity, gas and water is the only way to meet demand. This reduction must be done in an era of deregulation that enables access to networks outside the control of the utility. In addition, it is argued, the wholesale brokering of energy, both electric and gas, vastly complicates the financial implications of utility day-to-day operations.

SCADA and the more advanced energy management systems are the backbone of utility operations. These systems monitor and control the utility

network in real time. Thus, these systems are responsible for the network's economical and reliable operation. These are sensor-based systems that feed into a control center, either directly or through a hierarchical control arrangement.

The introduction of open systems has had a profound effect on the SCADA/EMS market in recent years. Virtually all major suppliers in this turnkey market have espoused the benefits of distributed, workstation-based architectures. The cost implication of this approach is to more than halve the price of prior systems.

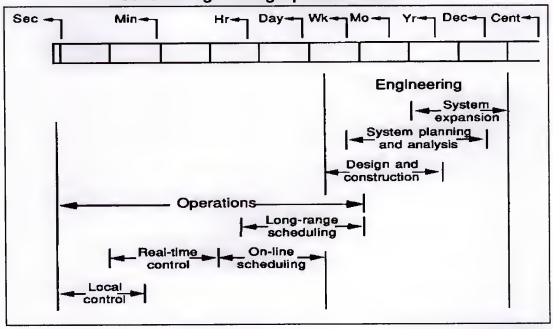
SCADA is not limited to gas and electric utilities. It is an important application in the water industry as well, although the consequences of an error in the network are not usually as extreme. These systems are typically microprocessor-based.

7. Engineering

Utilities are described as both engineering marvels and engineering monuments. Whichever definition is preferred, it is a fact that engineering is at the core of what a utility does. Many utility executives have engineering backgrounds. In utilities, engineering and planning are closely related disciplines. The essence of a utilities engineering mission is to plan a system to meet a future demand. "Future" here can indicate different timeframes, as illustrated in Exhibit III-2.

Exhibit III-2

Utilities Engineering/Operation Futures



Source: INPUT

Systems expansion applications are focused on the system as it must be five and ten years from the present and on the planning, design, and construction of required facilities. These elements include load forecasting, generation mix analysis, production costing, and environmental and facility land use analysis.

Systems planning applications look to a one- to three-year horizon and the reliable and economic operation of the network in conjunction with interconnected systems. These include load flow, transient analysis, and assorted engineering "exotics."

Systems planning leads to design and construction activities with the related applications, including CAD/CAE, structural design, piping HVAC, economic analysis and, of course, project management.

8. Power Plant Management

The power plant is usually far removed from the utility headquarters, and uses many applications. Because of its geographic and organizational separation from the rest of the business, the plant is best viewed as an application unto itself, typically a very large application with many subsystems. As noted earlier, most plant systems were installed by a contractor (or more typically, a subcontractor) and they lack integration.

For example, consider assigning a work crew to fix a leaky valve in a nuclear facility. One needs to know the history of repairs on the valve, who is available with the skills to do the job (plant maintenance system) and what materials they can use (materials system), how much radiation each has been exposed to (health physics system), how much radiation is in the area of the faulty valve (radiation monitoring system), and whom the access control system should admit. It's easy to discern the need for integration of these subsystems. A fully integrated system is referred to as a plant management system.

As might be expected, the driving application of the power plant is the work management system, sometimes called the plant maintenance system, a traditional transaction-based application, not all that different from its transmission and distribution (T&D) counterpart. The plant also runs a variety of engineering applications along similar lines to T&D. These applications are related to the economic use of fuel. Nuclear plants are exceptionally computer-intensive in this regard. The plant operations counterpart to an EMS is the plant monitoring and control system, a SCADA-type system used to manage all the basic operations of the plant in real time.

New plants can be expected to be small and gas-fired, with less complex systems requirements than older plants. Successful vendors will team with construction firms to ensure that the systems are installed as part of the base plant rather than requiring a retrofit. Independent power producers (IPPs) offer a new market—often overlooked because they are remote and have not been covered by the traditional vendors. Integrating various subsystems within aging yet efficient plants is often part of "life extension" activities and offers a sound opportunity for services.

9. Distribution Automation

The most rapidly growing application in electric utilities is distribution automation (DA), which can be defined as the real-time automation of feeders in the distribution network, SCADA operations, and communications within the network. By this definition, DA overlaps functionality typically included in AM/FM, CIS and work management, which can be wiewed as a threelegged stool on which DA resides. Potentionally, DA provides the infrastructure enabling two-way communication beyond the meter to individual appliances, spot-pricing of power and a host of services ranging from alarms to the rather ethereal information superhighway. The market is a classic systems integration opportunity involving computers, software (mostly custom at this early stage), communications and remote terminal units (RTUs) located in overhead or underground distribution lines, with interfaces to the three legs noted above.

C
Information Systems Issues

The key issues facing the information systems function in the utilities industry are listed in Exhibit III-3. Each is discussed in this section.

Exhibit III-3

Key Information System Issues

- Regulatory impact
- Downsizing/culture change
- User department development
- IS—Strategic or Core?
- Expanding application portfolio

Source: INPUT

1. Regulatory Impact on Operations

Although clearly a major influence on the utility industry as a whole, changes in the regulatory climate are having a specific impact on many aspects of utility operations.

- The Clean Air Act Amendments (CAAA) of 1990 established two phases for the reduction of sulphur dioxide—the first affecting 111 coal-fired plants by 1995, the second an additional 700 by the year 2000.
- Order 636 issued by the FERC in 1992 separated gas sales services from transportation services, making pipelines into common carriers.
- The Energy Policy Act of 1992 (EPact), one of the last acts of the Bush administration, was aimed at reducing consumption, promoting alternate fuels, and increasing competition.

The primary focus of federal regulation has been, and will continue to be, the safeguarding of the environment and encouragement of competition. These areas have a direct impact on the operations side of the utility application portfolio, which must respond to environmental concerns as well as the need to monitor the use of plant and transmission facilities more closely. Energy management systems will require the ability to dispatch power on the basis of environmental considerations as well as the traditional economic and reliability (security) objectives. Plants will require tighter monitoring of operations, particularly emissions. At the same time, open access will require careful supervision to maintain security, while techniques for charging all users of the grid, utility or not, will be required. Ultimately, retail wheeling will result in metering and billing outside the franchised service territory. Gas utilities will need to expand their SCADA capabilities to better manage the gas in their lines and to feed vital information to the gas supply organization in an evolving application that is sometimes called gas management.

2. Downsizing/Culture Change

As utilities plan for the sink-or-swim world of competition, they are:

- Improving productivity through reengineering and staff downsizing
- Building customer relationships through marketing departments/systems
- Attempting to change their cultures through employee motivation/education.
- Forming partnerships/alliances with other, sometimes technology, firms.

These actions present a variety of issues to the utility IS organization, running the gamut from:

- Rapidly increasing interest in outsourcing
- Downsizing from mainframes to minis, and minis to micros and, at times, from mainframe directly to micro
- Development of marketing systems employing sophisticated decision support tools
- Expansion of office systems to support a leaner, flatter organization
- Redevelopment of financial systems to get a better handle on costs
- Integrating systems to enhance effectiveness

All of this is directed at using technology to enhance effectiveness. Utility managers have never been so amenable to new ideas that will help them become more efficient producers.

3. User Department Development

During the early 1980s, with the advent of the PC and the information center, progressive utility information systems organizations took a pro-active stance in helping end users make use of computer technology. They even went so far as to refer to end users as "clients." (Seldom did the clients reciprocate by referring to information systems people as "consultants.")

At first, the tasks performed by these end users were somewhat trivial and limited to individual, or at most departmental, productivity. However, as the technology advanced and the PC went on-line, more and more end users downloaded corporate data into their PCs to manipulate it there. This downloading was fine as long as it was not represented as "corporate data."

In recent years, a shift has occurred in which user departments assumed overall responsibility for the development of systems directly impacting their mission. For example, today it is common for the Customer Service department to have responsibility and full accountability for the development of a new CIS. The IS department's involvement in this type of development may range from merely providing development support at the data center to consulting on database matters. But the ball is in the user department's court.

There are significant advantages to this approach in terms of accountability. There are negatives as well, in terms of the role of the CIO, IS career paths and the enforcement of standards. An example of the latter would be when

the CASE tool employed by the CIS department is deliberately spurned by the IS organization because "they're using it; so it can't be any good."

4. Information Systems—Strategic or Core?

With increased cost pressures on utilities, the information systems organization, like all utility departments, has come under more careful scrutiny. A debate, both philosophical and pragmatic, over the role of information systems in the utility organization has developed. On the one hand, information systems can be viewed as an expense, a necessary evil, something out of the mainstream of what a utility is all about, and something to be trimmed and pruned to least cost. On the other hand, information systems can be viewed as an investment, a solution to the need to cut costs, and a lever to increase productivity—perhaps a competitive edge. Though there is no unanimity on these alternatives within the industry, an INPUT survey of 18 non-IS utility senior executives indicated a tight definition of "core business" that would not include IS. However, many senior executives feel that IS is a critical, strategic component of their companies. The distinction between "core" and "strategic" here is that a core component would not be outsourced, but a strategic one might be if it could be done better outside the enterprise.

In the utility industry, information systems do not generally enjoy a high reporting status within the organizational structure, and thus there is a propensity to view them as an expense. Interestingly, gas utility information systems executives seem to report higher in the chain of command—often to the COO—than do their electric utility counterparts. It has been suggested that electric utility top executives, particularly for nuclear companies, have more on their plate from a production side than do their gas counterparts.

5. An Expanding Application Portfolio

After years of chipping away at an extensive application backlog, few utilities have made appreciable progress in exploiting the power of modern information technology. In part, this is due to the rapid change in the technology, but it is exacerbated by the complexity of utility information requirements and the tedious committee-oriented decision making employed by most utilities.

The typical utility is installing one new and one old application at any point in time. If it normally takes three years to develop an application (and it does), the inference is that utilities will continue to lose ground to the application backlog—unless better development techniques are used or they make more use of external resources. CASE tools, discussed below, have not made a significant impact. As a result, there are outstanding opportunities for professional services and systems integration in the utilities sector.

D
Impact of New Technologies

This section considers the impact of new information systems technologies on the utilities industry. The major technologies are summarized in Exhibit III-4.

Exhibit III-4

Major New Technologies

- Telecommunications
- Imaging/graphics
- UNIX/open systems/OS2/Windows NT+
- RDBMSs
- CASE Tools
- Artificial intelligence
- Data warehousing

Source: INPUT

1. Telecommunications

Recent advances in telecommunications, ironically derived from the deregulation of that industry, impact utilities in two ways: 1) as technologies enabling enhanced communications with customers and 2) as technologies offering potential new revenue streams based on utility right of way.

In their simplest forms, voice systems can provide account information to customers. In more sophisticated forms, and capitalizing on automatic number identification (ANI) technology, customer service reps can have a client screen displayed without asking for the customer's name or number. In even more sophisticated systems, involving the integration of several systems, an out-of-service customer can be automatically identified (CIS), the outage related to a specific transformer (facilities management), a crew dispatched through a mobile terminal, and the customer advised on how long repairs are anticipated to take (the customer can even be called back at intervals to provide an update on progress)—all done automatically.

Mobile computing is moving into utilities quite rapidly and showing significant cost benefits. Interestingly, much of the savings is found in backoffice accounting operations made unnecessary by the source data entry aspects of mobile computing. Optimized routing is an an adjunct to dispatching through mobile computers. One forward-looking utility is working toward a gereral-purpose mobile terminal applicable to meter reading, collections and service orders, enabling significant flexibility in field operations.

Utility rights of way offer opportunities to string fiber with capacity to serve far more than internal communications needs. As a result, utilities are pursuing a wide variety of business arrangements ranging from leasing capacity to telephone companies to becoming full participants in the information highway—especially if the telecommunications competition and deregulation bill before Congress this year passes as expected. Given past experiences in utility diversification efforts outside the core competencies, the latter would give an investor pause.

2. Imaging/Graphics

The massive amounts of utility paper records (particularly in a nuclear facility) require control and accessibility. Storage and retrieval programs have provided contextual search capabilities to abstracts that index the actual documents. The advent of affordable image technology offers an opportunity to control the documents directly. A critical requirement for utilities is the ability to handle engineering drawings, not just the standard 8.5" by 11" documents used in other business sectors such as insurance and banking.

Imaging technology has also been related to graphics in the facilities management application and has enabled a more gradual conversion approach. In this case, old maps are image-scanned. Gradually, as required by actual use, the raster images are vectorized and made manipulatable for engineering and other applications. This helps to spread conversion costs over a longer period and thus enables an earlier cost/benefit crossover. A somewhat crude, but effective subset of this involves the service cards used by gas utilities to indicate the line from mainpipe to service entry. These are typically hand drawn and a straightforward image storage and retrieval application can be quite effective in cleaning up cumbersome manual files.

Imaging is beginning to be exploited in the CIS area for managing customer correspondence files. Imaging also complements electronic data interchange (EDI) technology in enabling image documents (e.g., shipping lists) from vendors not using EDI to be managed by the same system that manages the EDI records.

3. UNIX/Open Systems/OS2/Windows NT+

The increasing popularity of UNIX and resultant open systems is seen by many in the engineering/operations community as an opportunity to avoid the pitfalls of proprietary solutions that have proven to be dead ends in the past. Newer systems feature a workstation-based distributed architecture with stunning price/performance and the potential for cross-vendor portability.

In the engineering/operations areas of utilities, it is no longer a question of whether UNIX will be implemented, but of when. Typically, this is answered by "with the next change-out" (utility vernacular for "when we re-do the application"). However, with the increasing focus on integrating applications, that answer may no longer suffice. Specifically, the rapid growth of facilities management systems, coupled with their swing position between commercial and engineering applications and the fact that virtually all major AM/FM vendors are on UNIX systems, suggests that AM/FM decisions may drive the platform for other applications that exploit the AM/FM database.

On the commercial side, though there is appreciable interest in UNIX, the real battle is between IBM's OS2 and Microsoft's Windows NT follow-on. A clear winner may never emerge in utilities. As a result, successful integrators will need solutions under both operating environments to avoid fracturing in an already modestly sized market.

4. Relational Database Management Systems (RDBMSs)

During the mid-1980s, utilities began to dabble in relational databases, particularly DB2. At first, there was a reticence to use this approach on mainstream applications such as CIS. However, today there is no hesitation, even though performance on batch operations has sometimes forced utilities to employ flat files. The corporate information systems organization has embraced DB2, and few packaged commercial mainframe application solutions are likely to meet with success unless they are compatible with DB2.

Today, all commercial database managers are proprietary. However, some, such as Oracle, have a multivendor strategy and, as a result, are becoming increasingly popular for both engineering and commercial applications. They have entered the operations world, but only as shadow databases because they cannot as yet meet stringent real-time performance requirements.

5. CASE Tools

Utility interest in the use of CASE (computer-aided software engineering) technologies grew rapidly because of the large transaction-based systems that form such a critical part of the application portfolio. Selection of CASE tools offers the same pitfalls as any major architectural choice—language, operating systems, etc.—in that resulting systems will be locked into that CASE tool for future maintenance. In some situations, the lock extends to the support services provided by the owner of the tool. As a result, some utilities selected CASE tool vendors that are unlikely to exploit such a relationship.

Many IS organizations have chosen to ignore this issue, being preoccupied with the question of whether or not the tools will really result in the promised productivity gains. There appears to be considerable uneasiness within the industry on this point, with some participants pointing to object-oriented programming as the next applications panacea.

6. Artificial Intelligence (AI)

Expert and knowledge-based systems have been developed for utility applications ranging from plant operations (alarm response advisor, fire protection review, machine vibration diagnostics) to rate analysis. In general, they are aimed at addressing skills shortages that have increased as a result of industry-wide downsizing. Utility reactions to artificial intelligence have been mixed—some hold the view that AI is more a technique than a technology, and that economic justification is questionable.

7. Data Warehousing

Industry interest in data warehousing to enhance decision making has grown rapidly in the last several years. Financial (particularly costing), work management and human resource databases are increasingly being made available read-only through both mainframe-based (typically DB2) and server-based (often Oracle) warehouses. Activity based costing (ABC) is a classical application of this technology, in which utility supervisors are able to "drill down" through layers of cost data to assist in devising cost-effective steps for their operations. Previously, coding structures required for regulatory reporting completely obscured the value of this information for managing the business.

E
Information Systems Organization and Budget

More often than not, the information systems organization reports within the financial function of the utility. Typically, the VP of information systems reports to the CFO or the VP of management services. It is not uncommon for this executive to have other responsibilities, ranging from purchasing to facilities.

Comparison of utility information systems budgets is a difficult task because of different inclusions and exclusions. For example, some budgets treat data entry as an information systems expense, whereas others charge this function directly to the user department. Similarly, some budgets include some or all of the costs of engineering or operations computing, where others do not. Data and/or voice communications may or may not be included. As a result, without considerable analysis it is difficult to compare budgets.

Information systems budgets have capital and expense elements. In general, capital outlays for utilities can be added to the rate base and the utility can earn a return on them. At the same time, large capital expenditures may require review by the PUC, where the utility must defend the prudence of its management decisions.

Utilities make great use of ratios in comparing various facets of their operations. Of particular relevance to the information systems community (subject to the caveats mentioned earlier) is the information systems budget as a percentage of revenue. A representative figure in the utility industry is 2.1%, with a wide range of 1.0% to 3.5%. Such numbers can be dangerous, however. Whole power plants, SCADA/EMS, remittance processing, bursting, and meter readers may or may not be included. As a result, comparisons may not be meaningful.

Utility information systems budgets can be expected to grow between 4% and 8% annually through 1998. Concurrently, staffing will continue to decline as some IS personnel are moved to user departments and others are let go as a result of corporate downsizing. It can be reasonably concluded that a larger proportion of the growing information systems budget will be spent on outside services.

F
Information Systems Objectives

Exhibit III-5 lists the key objectives of the information systems function within the utilities industry.

Exhibit III-5

Information Systems Function—Key Objectives

- Job security
- Adapt to a competitive world
- Build a flexible IS infrastructure

Source: INPUT

Today, the objective of most utility information systems executives is to keep their jobs. This means that they strive to convince senior management of the importance of information systems' role to the strategic interests of the utility, and their personal ability to get that job done. A recent study of top IS executive turnover in larger utilities disclosed that between 1990 and 1994, about half of the incumbents were no longer in their jobs, and frequently without any job.

To gain respect, information systems executives seek ways in which their systems can be more responsive to the changing culture of utilities. Examples of such systems are a tax model to assess the implications of various alternatives in a merger negotiation, and an energy management system to support the brokering of power with neighboring utilities.

The dramatic regulatory changes taking place in the utility industry combined with the rapid technological changes occurring in information technologies result in traumatic times for utility IS organizations. Clearly, those with a thoughtfully developed IS infrastructure enabling ease of development and maintenance will be able to respond best to change. Flexibility is the byword for systems work in the utilities industry. As a result, employing outside resources to handle the inevitable but unplanned-for peaks has become business as usual. One person's problem is another's opportunity.

IV

Information Services Market Forecast

This chapter discusses the markets for information services in the utilities industry. The information and market estimates presented draw upon data, trends, and issues noted in earlier chapters.

Section A, Overview, notes the overall size and growth rate of the utility industry's expenditures for information services.

Section B, Product/Service Analysis, segments these expenditures into INPUT's seven standard product/service groups. A detailed five-year market forecast, by subgroup, is contained in Appendix A.

A
Overview

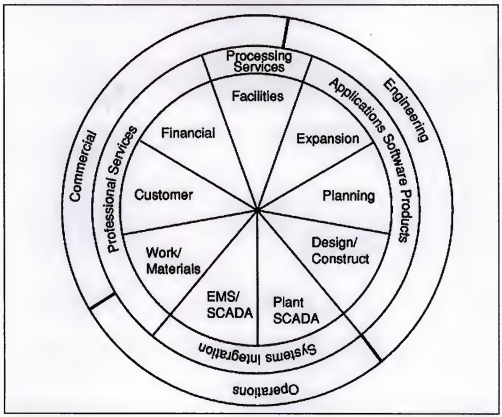
Technical, philosophical, and historical differences among the commercial, engineering, and operations organizations and applications within a utility result in varying approaches to information software and services. Most information systems organizations actively consider the applicability of outside solutions before deciding on in-house development, and downsizing has resulted in their being willing to settle for a less-than-perfect functional match with requirements. This is not only clearly true in areas such as resource management, but has become so for the previously sacrosanct customer systems.

On the engineering side, applications packages are commonly used, while the operations organizations favor a more customized, systems integration approach. Although the latter claim an interest in off-the-shelf solutions, the reality is that only the hardware (primarily workstation) is purchased off the shelf. Much software development remains a custom activity.

Exhibit IV-1 illustrates the primary products/services by application. It is not intended to suggest an inflexible view of these relationships, but rather offers a general perspective of the market and its segmentation into commercial, engineering, and operations activities.

Exhibit IV-1

Products/Services by Application

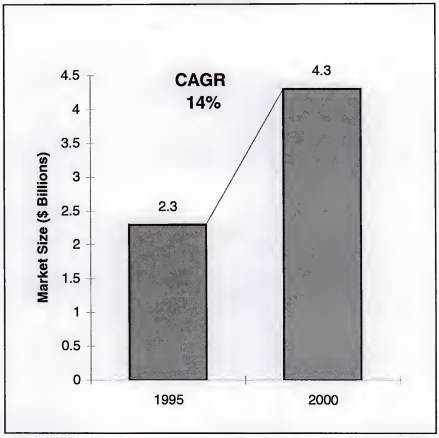


Source: INPUT

INPUT projects that information services expenditures in the utilities market will grow from almost $2.3 billion in 1995 to about $4.3 billion in 2000, at a compound annual growth rate of 14%, as noted in Exhibit IV-2.

Exhibit IV-2

Utilities Sector, Information Services Market, 1995-2000



Source: INPUT

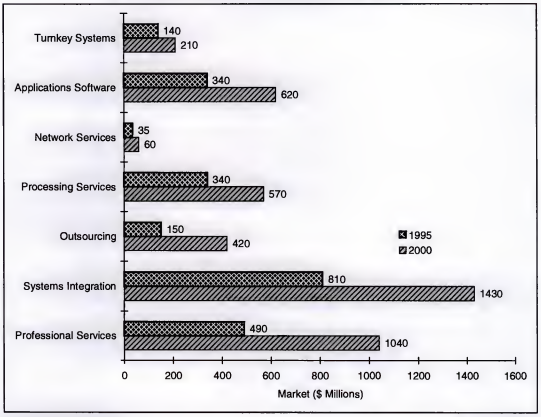
The 14% compound annual growth rate is somewhat higher than the 12% rate projected by INPUT for the 1994-1999 period, and reflects the strong growth in outsourcing and professional services during the forecast period.

B
Product/Service Analysis

User expenditure forecasts by product/service category for the utilities sector are shown in Exhibit IV-3. Analyses of the factors influencing user expenditures for each product/service are noted in the following paragraphs.

Exhibit IV-3

Utilities Sector, Information Services Market by Product/Service Category, 1995-2000



Numbers are rounded *Source: INPUT*

1. Professional Services

Two elements favor the use of professional services: on the systems side, the increasing complexity of modern technology makes it difficult for utilities to permanently retain staff with the necessary technical skills; on the applications side, the age (10-20 years) of their legacy systems—plus the many retirement incentive programs—have left utility staffs devoid of the application know-how needed to develop replacement systems.

Utilities have long understood the concept of peak shaving. Hence, the use of outside resources is normal business procedure. Outsourcing of systems operations, described below, will most often include significant software development/maintenance activities. As a result, growth of professional services will be accelerated by the complementary growth of systems operations, just as the use of applications software generates needs for professional services resources.

Professional services growth, although constrained by a decreasing demand for unique high-function customer systems in favor of more packaged applications software solutions, will accelerate as outsourcing continues to take hold in utilities. Many vendors will attempt to parlay their outsourcing relationships into utility application credentials by remarketing developed code, as EDS has already done. However, utility applications software, not originally developed for a broad market, is usually only a "foot in the door" to selling professional services.

As a result of these forces, INPUT forecasts the 1995 expenditures for professional services in the utilities market sector to be $493 million, growing at a 16% CAGR through 2000.

2. Systems Integration

The major operations-type applications in utilities are all systems integration opportunities. In addition, there is an increasing requirement to integrate operational systems with other corporate systems. This integration is intended to enhance the overall efficiency of day-to-day operations, and to align them with strategic goals such as power brokering. Power plants, particularly nuclear plants, are especially attractive systems integration opportunities. Other areas of significant, albeit slower, growth are in SCADA/EMS and power plant control systems aimed at optimizing the use of existing facilities.

Given these driving forces, INPUT projects 1995 systems integration expenditures to be over $800 million, growing at a 12% CAGR through 2000.

3. Outsourcing

Interest in data center operations outsourcing grew appreciably during 1992 and 1993 with the first major contracts established: Yankee Gas, Washington Water Power, and Northwest Natural Gas. With the precedent thus set, outsourcing of the central data center received increased consideration as cost pressures continued through 1994. Many utilities benchmarked their data centers against other operational resources and found themselves to be far above average in both efficiency and cost-effectiveness. In fact, through some statistical anomaly, it appears that perhaps 90% of the utility installations are in the top 10%, across all industry segments. If nothing else, this suggests an opportunity for honest outsourcing consultants.

As shown in Exhibit IV-4, outsourcing activity accelerated rapidly in 1994. Information systems investments—including the corporate data center—have traditionally added to the asset base and thus the measurement relative to rate-setting by the PUC. Changes in this orientation, apparent in

recent outsourcing decisions, suggest that outsourcing has become a highly viable alternative in the utilities industry.

Exhibit IV-4

Major Utility Outsourcings

Year	Utility	Vendor	Contract Years	Contract Est'd ($M)
1990	Nashville Electric	SC&B	7	37
1992	Yankee Energy (Gas)	ISSC	10	25
1992	Wahington Water Power	EDS	10	30
1993	United Illuminating	CSC	10	30
1993	Texas Utilities - A	EDS	n/a	6/year
1993	IES Utilities (Iowa)	EDS	12	100
1993	Northwest natural Gas	ISSC	4	10
1994	PECO Energy	ISSC	10	450
1994	San Diego Gas & Electric	CSC	10	60
1994	Texas Utilities - B	ISSC	n/a	7/year
1995	PS of Colorado	ISSC	10	500
1995	Pennsylvania Power & Light	EDS	5	(not avail.)

Suorce: INPUT

INPUT forecasts 1995 utilities industry expenditures for outsourcing at $150 million, growing at a compound annual growth rate of 23% (the largest for any utilities sector product/service) and exceeding $400 million in 2000.

4. Processing Services

Small utilities, primarily REAs and municipals, frequently use processing services for day-to-day transaction processing. An important opportunity for vendors is the conversion of facilities records to computer form—a labor-intensive, one-time, but long-term, multiyear effort. Automated conversion tools are becoming both practical and economical, helping to justify the overall application, in which conversion can represent more than half of the total costs.

Processing services growth has experienced upward pressure from facilities management conversion services, which is slightly offset by a declining volume of transaction processing services in the low end of the market. The latter will also be impacted by the increasing penetration of turnkey system customer solutions.

INPUT projects utilities expenditures for processing services to be almost $340 million in 1995, growing at a compound annual rate of 11% to almost $575 million in 2000.

5. Network Services

The major uses of network services in utilities are the traditional LEXIS/NEXIS-type services, which may feed executive information systems. Demographic databases, available either on-line or as a package, offer utilities a complementary view of their customers and prospects and are a useful addition to a marketing support system. The Internet has been used to assure that weather condition updates are instantly available throughout the utility when storms threaten services.

Network services growth is influenced by a steady increase in the utility use of EDI, which allows on-line interchange between utilities and their many suppliers, and is also used in materials management systems as well as more advanced CISs. The logical extension of EDI is to tie utilities into their major industrial and commercial customers, as well.

Because most utilities are regional, their needs for network services do not match those of other industries. As a result, the market for network services is relatively modest in the utilities industry.

INPUT projects 1995 utilities industry expenditures for network services to be $36 million, growing to $57 million in 2000, at a compound annual rate of 10%.

6. Applications Software Products

The use of applications software products has grown rapidly in the utilities industry. Cross-industry applications—e.g., stockholder and human resources (not considered in this report)—are the most widely accepted. Another significant area is the entire spectrum of financial applications, with an emphasis on the cost accounting needed in the new competitive world of utilities. The use of utility-unique application code, often modified by the utility or the vendor to meet the specific requirements of the individual utility, is also growing rapidly. Customizing, particularly for larger utilities, is the rule, not the exception. Consequently, applications software also has a drag-along effect on professional services.

The steady growth in applications software, driven by large utilities opting to use packages, and trading their tradition of internal development for cost and response considerations, will continue throughout the forecast period, with 1995 expenditures of almost $340 million swelling to $616 million by 2000. The five-year compound annual growth rate will continue at 13%.

7. Turnkey Systems

Utility operations organizations frequently refer to their sensor-based control systems as turnkey systems. However, these often employ specialized hardware and are considered systems integration projects in this report. Small utilities (less than 50,000 customers) are the core turnkey market in the utilities market sector. Their application set is usually limited to customer information systems, with an emphasis on billing.

INPUT projects user expenditures for turnkey systems to be $135 million in 1995, growing to $212 million by 2000 at a compound annual growth rate (CAGR) of 9%.

V

Vendor Competition

A
Introduction

This chapter presents a description of information services vendors serving the utilities sector. The chapter is divided into the following sections:

- Competitive Climate
- Competitive Positioning
- Selected Vendor Profiles

B
Competitive Climate

The utility information services market is composed of a variety of niche submarkets in which no vendor is truly dominant overall. To a great extent, the lack of a dominant vendor is the result of the different application sets (commercial, engineering, operations) and therefore different buyers, as already discussed. In addition, the lack of dominance is also the result of different disciplines that these groups represent, such as engineering and accounting. However, the major reason for the lack of coherence is that until recently, no vendor has chosen to make the across-the-board investment necessary to stake out a major claim.

Vendors of software and services to utilities find themselves in a market of unaccustomed turbulence as cost pressures, diminished IS staffs and application obsolescence engulf the market. As a result, an increasing focus has been placed on alliances both among vendors and with customers. Increasingly, hardware manufacturers espouse open systems and seek application-oriented relationships to gain product differentiation. Services vendors are capitalizing on the need for staff augmentation brought about by across-the-board downsizing.

The typical large utility staff declined 3% during 1994 alone. Applications software vendors continue to enjoy an expanding market.

There has been a shift in information systems in the utilities market toward client/server architectures and UNIX platforms. Vendors currently are presented with a significant opportunity to redevelop many of the legacy systems still in place from the 1970s. Most vendors, known primarily for their mainframe applications, have moved to software that functions in a multiplatform environment. There has also been a significant shift in the control and responsibility for information systems in the utilities sector. In many cases, user departments have assumed overall responsibility for the development of systems directly related to their functions.

C
Competitive Positioning

In the early 1990s, Andersen Consulting emerged as the clear market leader in the fragmented utilities sector, achieving a market share that peaked at 20% in 1991. However, at that point, the market for large customer information systems, Andersen's strongest suit, began to shift from a heavy professional services delivery mode toward more use of application packages. In part as a result of this, Andersen's share began to decline to approximately 12% in 1994. In 1993, IBM, through its ISSC subsidiary, began to focus on the utility industry as a major opportunity (and to invest in it). The primary strategy was to provide comprehensive outsourcing services to the top tier of utilities. In late 1994, ISSC won a contract with PECO Energy for $450 million; this was followed by a contact with Public Service of Colorado for $500 million in early 1995. (Both are 10-year contracts.) The result is two ISSC annuities that will finance further investment and assure a market share of 7% in 1995 and growth beyond. Both Andersen and ISSC have attempted to broaden their range of utility solutions by developing expertise in Energy Management Systems; Andersen by providing consulting services and ISSC by its acquisition of Stagg Systems. At the present pace, ISSC will pass Andersen in market share in 1996. However, Andersen's relationship with GE Capital may provide the deep pockets necessary to challenge ISSC as an outsourcer. Of the remainder of the "Big 6,"only Price Waterhouse with an estimated share of 2%, is active outside of traditional financial applications. EDS, which acquired EMA as its utilities division in 1992, announced client/server (DB2/OS/2) entries into both the CIS and work management markets.

Exhibit V-1 lists most of the software/services vendors engaged in the various niches of the utility market.

Exhibit V-1

Utility Software/Services Vendors—U.S.

Vendor	CIS	Financials	WMS/ MMS	AM/FM	Mobile	Engineer'g	Plant	EMS/ SCADA	DA/ DMS	X-Industry/ Other
A&C Enercom									X	
Advanced Control Systems (ACS)								X		
ADL-Pipe						X				
Alliance Systems, Inc.					X					
Alterra Systems	X				X					
American Software, Inc. (ASI)			X							
Anderson Consulting	X	X	X				X	X		X
ASCADA Limited								X		
Asea Brown Boveri (ABB)						X	X	X	X	
Automated Micro Systems, Inc.										X
Axiom Information Consulting, Inc.	X									
CAP Gemini										X
Computer Sciences Corp. (CSC)										X
Control Software, Inc. (CSI)			X				X			
Coopers & Lybrand		X								
Daffron	X									
Deloitte & Touche		X								
Digital Equipment Corp.										X
D & B Software (Dun & Bradstreet)		X								
ECC, Inc. (Energy & Control Consultants)								X		
Electrocon International, Inc.						X				
Energy Management Associates (EDS)	X		X				X			X
Enghouse Systems Limited				X						
Environmental Systems Research Institute (ESRI)				X						
Ernst & Young		X								
ESCA								X		
Genex, Inc.										X
Hansen Information Technologies, Inc.	X									
Harris Corp.								X	X	
Hewelett-Packard Co.										X
INDUS			X				X			
ILEX Systems, Inc.								X		
Integrated Systems Solutions Corp. (IBM)	X		X		X		X	X		X
Intergraph				X						
Itron, Inc.					X					
J.D. Edwards	X									
KnowledgeWare, Inc.										X
Landis & Gyr, Inc.								X		

Exhibit V-1 (Continued)

Utility Software/Services Vendors—U.S.

Vendor	CIS	Financials	WMS/ MMS	AM/FM	Mobile	Engineer'g	Plant	EMS/ SCADA	DA/ DMS	X-Industry/ Other
M3i				X	X	X			X	
Macro Corp.								X		
Mentor	X									
Micon, Inc.	X									
Mobile Data Solutions, Inc. (MDSI)					X					
Motorola Communications & Electronics, Inc.					X					
Oracle Corp.	X	X								X
OrCom Systems, Inc.	X									
PeopleSoft										X
Planmetrics, Inc.							X			
Power Technologies, Inc. (PTI)						X				
Price Waterhouse	X	X	X							
SAIC (Science Applications International Corp.)							X			
SAP America, Inc.			X				X			X
Saratoga Systems, Inc.										X
SCT Utility Systems, Inc.	X									
Seimens						X	X	X	X	
Seltmann, Cobb & Bryant, Inc.										X
Severn Trent Systems	X		X							
Southern Electric International (SEI)							X			
Stockholder Systems, Inc.										X
Stone & Webster Engineering Corp.						X	X			
Stoner Associates, Inc.						X				
Synercom, a division of Logica North America, Inc.			X							
Systems & Computer Technology Corp.										X
Systems Programming Limited (SPL)	X									
Tellus				X		X				
Tenera							X			
Tesseract										X
The Systems Works, Inc.							X			
Texas Instruments			X							X
Utility Resources, Inc. (URI)			X				X			
UGC Corp. (Utility Graphics Consulting)				X		X				
Utility Partners					X					
Walker Interactive Systems		X	X							
Westech Information Systems, Inc.		X		X						
Xenergy, Inc.									X	

Source: INPUT

D
Selected Vendor Profiles

This section highlights one established (SAP America) and two "up-and-coming" vendors of information services to the utilities industry. A broad selection of more detailed profiles (8-10 pages) is available from INPUT's Vendor Analysis Program (VAP).

1. Utility Partners
600 N. West Shore Bolevard, Ste. 1200
Tampa, FL 33609-1145
Phone: (813) 282-8828
Fax: (813) 282-8526
Employees: 70
1994 Revenue: $5.9 million

Under varying names, Utility Partners has focused on the mobile computing opportunity in utilities since 1986, initially as TECO Technologies, an outgrowth of Tampa Electric. Driven by enhanced technologies in mobile computing as well as the development of a suitable communications infrastructure, Utility Partners focuses exclusively on the electric, gas and water utility industry, providing consulting, technology, software, and process solutions in all areas of field operations. Its expertise includes: field automation software, field process reengineering, systems integration, RF and other forms of communications, open systems and client/server technology, work management, meter management and mobile hardware technology. Targeted 1995 revenues are $9.2 million.

2. M3i Systems, Inc.
1111 St. Charles St., W., Suite 115
Longueuil, Quebec, Canada J4K 5G4
Phone: (514) 928-4600
Fax: (514) 442-5076
Employees: 400
1994 Revenue: N/A

M3i (Management through instant interactive information) was incorporated in 1990 to deliver and support the M3i distribution management system (DMS), developed internally at Hydro-Quebec. It has since become a leader in integrating systems for outage restoration, command and control centers, dispatch management and large-area screen displays. It also offers PCMOBILE, a mobile computer for field personnel. In September 1994, M3i acquired Scott & Scott Systems, Inc., of Seattle, which concentrates on engineering and analysis, adding 20 employees. But its rapid growth (from a mere seven in 1990 to its current 400) is witness to a strong operation, a rarity among utility spin-offs in IS. M3i remains focused on electric, gas and

water utilities, which generate 80% of its income, the balance coming from similar applications in transportation and telecommunications.

3. SAP America, Inc.
International Court Three
300 Stevens Drive
Philadelphia, PA 19113
Phone: (610) 521-4500
Fax: (610) 595-4910
Employees: 1,000
1994 Revenue: $367M ($20M est. in utilities)

SAP America is the largest of SAP AG's 28 international subsidiaries. It offers two product lines: the client/server-based R/3 system and the mainframe-based R/2 system.

There are three major packages: accounting, human resources, and materials management and logistics. All are table-driven to provide highly flexible functionality. The accounting package is being enhanced to include utility-unique functions such as AFUDC (Allowance for Funds Used During Construction) and hot areas such as activity-based costing. The maintenance package has been used primarily in fossil plants, but there are plans to apply it to T&D as well as nuclear plants. Although 80% of its revenues are derived from the discrete and process manufacturing industries, SAP has chosen utilities as one of six industries supported by an Industry Center of Expertise (ICOE), in this case, headquartered in Toronto (Canada). About 75% of SAP America's 1994 revenue was derived from applications software and 25% from consulting, training and professional services. In part, this is due to the heavy use of implementation partners (small) and Logo partners (large) to handle installation support. SAP AG has 165 utility customers worldwide, but only began marketing in North America in late 1993, securing ten utility customers through mid-1995.

VI

Conclusions and Recommendations

This chapter offers INPUT's conclusions and recommendations regarding information services opportunities in the utilities industry.

A
Overview: Opportunities Abound

Competitiveness and cost-consciousness have become an integral part of the utility industry's thinking. The time is opportune for the use of outside services to enhance utility efficiency. But utilities remain conservative and look for a proven track record and financial stability in their suppliers. New entrants require patience and deep pockets.

Given the age of the legacy portfolio and its lack of flexibility in a rapidly changing industry, a substantial application backlog exists in most utilities. The cost squeezing of utilities in recent downsizings (IS organizations included) creates even more pressure from that backlog.

IS organizations are under pressure to respond to the corporate need for efficiency. This pressure is IS's opportunity to improve its position in the corporate hierarchy and some organizations are capitalizing on it, seeking outside help where needed; others are not. For the latter, the odds of outsourcing increase significantly.

For all these reasons, the outlook for utility information services-based solutions looks bright for the remainder of the 1990s.

B
User Issues and Recommendations

1. Strategic Impact of IS

The IS community in many utilities needs to establish itself as a proactive force with a legitimate mission to manage the data assets of the utility. This change requires a listening ear at the top of the business, and the establishment of a Chief Information Officer (CIO) level of authority, if not title. Education of senior management in this regard is critical. Vendors and consultants with established credentials—not just in esoterics, but in organization, management, marketing, and the utilities industry itself—can help.

2. Disintegrated Integration

As the industry prepares for a competitive world, many utilities are positioning themselves to separate different aspects of their integrated, vertical structure, e.g., generation from transmission, transmission from distribution. Within each business, as well as between them, there is a need to integrate the hodgepodge of systems. However, because of the prospect of organizational dis-integration, the prudent vendor will emphasize integration within the business areas rather than between them.

3. Merger Management

Anticipated merger activity will create another set of opportunities. Here, consolidating redundant systems to gain the economic leverage envisioned by mergers presents the need to select the base platform (often a politically charged task), and then move or redevelop functionality to that base, integrating business philosophy and strategy at the same time.

C
Information Services Vendor Issues and Recommendations

The utilities sector continues to increase its willingness to look to external sources for improved return on its information systems efforts and investments. Vendor recommendations are summarized in Exhibit VI-1.

Exhibit VI-1

Vendor Recommendations

- Develop a thoughtful strategy
- Have funding patience
- Form alliances
- Consider long-term partnerships
- Limit multiplatform support
- Balance marketing

Source: INPUT

1. Strategy

Some vendors have struck out into the utilities sector with little understanding of its unique character. A thoughtful strategy for utilities requires insight as to where the skeletons lie. In many cases, the market is best viewed as global to leverage expertise across a wider prospect set. Any vendor new to utilities would benefit from a careful review of its strategies by an independent authority.

2. Funding

Most utility applications are large, complex, and require a lengthy sales and implementation cycle with or without outside services. As a result, vendors must have financial resources to handle front-end cash-flow problems even beyond the normal start-up/development costs.

3. Alliances

Although the industry seeks integrated systems solutions, few vendors are able to develop all the required pieces. The successful vendor will form strategic alliances with other firms that have complementary, compatible offerings. It is critical to this strategy that the architecture of these systems be consistent.

4. Partnering/Alliances

Utilities are beginning to realize that the traditional adversarial acquisition process may not always be in their best interests. There is movement toward a partnering approach built more on a spirit of trust than the letter of a specification. In this scenario, sole-sourcing—versus the lengthy, legalistic RFP process—becomes the general rule. Vendors need to focus on establishing solid, long-term client relationships and to "be easy to do business with." Another consideration is to appreciate how the vendor might avail itself of the client's product or service as a client itself, in this case as a

user of gas or electricity. Here, a long-term agreement to be one another's customers might be in both organizations' best interests.

5. Multiple-Platform Support

There is a temptation to attempt to be all things to all people, suggesting that a vendor wishes to support a solution on many platforms. The successful vendor seeks to address markets where there is some coherence without incurring inordinate development/support costs for multiple platforms. UNIX is one approach, but probably not a panacea. The key is to assess marketing advantage versus development/support costs accurately.

6. Balancing Marketing and Development

Critical to success in the utility market is the balancing of marketing with development. This balancing is particularly critical in systems integration, which is highly customized and skills intensive. Marketing when one cannot fill the order is a waste of time. Development in the absence of demonstrable need is also questionable.

A

Forecast Database

A
Forecast Database

This appendix contains the forecast database for the period 1995-2000.

Exhibit A-1 presents the detailed 1994 actual and 1995-2000 forecast for the utilities sector.

B
Forecast Reconciliation

Exhibit A-2 offers a reconciliation of the 1994 and 1995 forecasts for the utilities sector.

There were only minor differences between the 1994 projection for 1995 expenditures and the actual amounts noted in the 1994 forecast.

Overall, the 1994 and 1999 market forecasts have remained relatively consistent, with the exception of outsourcing, where the growth accelerated markedly because of two major transactions in 1994 and 1995. The 1999 market sizes for both professional services and systems integration are a result of the growing use of these resources by the utilities industry.

The effect of the Internet on utilities appears to be trivial at this time. Though several utilities are exploring "information highway" two-way communications with their customers, the Internet does not appear to be an appropriate medium. In the future, power trading could be an avenue that would capitalize on the Internet's broad accessibility.

C
1994-1999 Forecast

Although a full report on the utilities industry was not published in 1994, the industry forecast of information services expenditures for the period 1994-1999 was completed. For continuity, and because it is the base against

which this year's (1995-2000) forecast is reconciled, a copy of the 1994-1999 forecast is included in this Appendix as Exhibit A-3.

Exhibit A-1

Market Size by Product/Service Category, 1994-2000
($ Millions)

PRODUCT/SERVICE CATEGORIES	1994 ($M)	Growth 94-95 (%)	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	2000 ($M)	CAGR 95-00 (%)
INDUSTRY TOTAL	1987	16%	2295	2626	2992	3395	3841	4342	14%
Professional Services	420	17%	493	577	669	774	897	1036	16%
- IS Consulting	140	20%	168	202	240	283	331	388	18%
- Education & Training	90	17%	105	122	140	162	184	212	15%
- Software Development	190	16%	220	253	289	329	382	436	15%
Systems Integration	709	14%	805	910	1027	1150	1285	1430	12%
- Equipment	232	10%	255	278	303	327	354	378	8%
- Software Products	70	17%	82	93	105	118	134	151	13%
- Professional Services	380	15%	437	503	578	659	744	841	14%
- Other	27	15%	31	36	41	46	53	60	14%
Outsourcing	99	52%	150	194	240	294	348	418	23%
- Platform Operations	36	67%	60	75	86	101	116	131	17%
- Applications Operations	28	46%	41	53	66	81	100	120	24%
- Desktop Services	12	50%	18	25	34	44	51	63	28%
- Network Management	13	31%	17	22	27	34	40	52	25%
- Application Management	4	50%	6	7	8	9	11	13	17%
- Business Operations	6	33%	8	12	19	25	30	39	37%
Processing Services	305	11%	339	377	420	467	520	573	11%
- Transaction Processing	305	11%	339	377	420	467	520	573	11%
Network Services	34	6%	36	40	44	49	53	57	10%
- Electronic Information Svcs	30	7%	32	35	39	43	47	51	10%
- Network Applications	4	0%	4	5	5	6	6	6	8%
Applications Software	298	13%	337	380	429	483	544	616	13%
- Mainframe	59	7%	63	67	72	77	83	88	7%
- Minicomputer	86	12%	96	107	119	130	141	153	10%
- Workstation/PC	153	16%	178	206	238	276	320	375	16%
Turnkey Systems	122	11%	135	148	163	178	194	212	9%
- Equipment	53	8%	57	61	66	71	75	80	7%
- Software Products	48	13%	54	60	67	74	83	93	11%
- Professional Services	21	14%	24	27	30	33	36	39	10%

Source: INPUT

Exhibit A-2

1995 MAP Database Reconciliation
($ Millions)

DELIVERY MODES	1994 Market				1999 Market				94-99 CAGR	94-99 CAGR
	1994 Market (Fcst) ($M)	1995 Report (Fcst) ($M)	Variance From 1994 Forecast ($M)	Variance From 1994 Forecast (%)	1994 Market (Fcst) ($M)	1995 Report (Fcst) ($M)	Variance From 1994 Forecast ($M)	Variance From 1994 Forecast (%)	per data '94 Rpt (%)	per data '95 Rpt (%)
Total	1963	1991	28	1%	3528	3841	313	9%	12%	14%
Professional Services	411	420	9	2%	775	897	122	16%	14%	16%
Systems Integration	700	709	9	1%	1148	1285	137	12%	10%	13%
Outsourcing	85	103	18	21%	262	348	86	33%	25%	28%
Processing Services	310	305	-5	-2%	525	520	-5	-1%	11%	11%
Network Services	35	34	-1	-3%	57	53	-4	-7%	10%	9%
Applications Software	296	298	2	1%	556	544	-12	-2%	13%	13%
Turnkey Systems	126	122	-4	-3%	205	194	-11	-5%	10%	10%

Source: INPUT

Exhibit A-3

Market Size by Product/Service Category 1993-1999
($ Millions)

PRODUCT/SERVICE CATEGORIES	1993 ($M)	Growth 93-94 (%)	1994 ($M)	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	CAGR 94-99 (%)
INDUSTRY TOTAL	1751	12%	1963	2201	2473	2782	3132	3528	12%
Professional Services	362	14%	411	467	530	601	684	775	14%
- IS Consulting	119	13%	135	154	177	202	232	265	14%
- Education & Training	81	14%	92	105	119	135	153	174	14%
- Software Development	162	14%	184	208	234	264	299	336	13%
Systems Integration	634	10%	700	771	852	942	1040	1148	10%
- Equipment	206	13%	232	253	277	303	331	362	9%
- Software Products	58	16%	67	76	87	99	113	129	14%
- Professional Services	345	8%	374	412	455	503	555	612	10%
- Other	25	8%	27	30	33	37	41	45	11%
Outsourcing	70	21%	85	107	133	167	209	262	25%
- Platform Operations	34	21%	41	50	61	75	91	111	22%
- Applications Operations	19	16%	22	28	35	44	55	69	26%
- Desktop Services	9	22%	11	14	17	22	28	35	26%
- Network Management	8	38%	11	15	20	26	35	47	34%
Processing Services	279	11%	310	344	382	425	472	525	11%
- Transaction Processing	279	11%	310	344	382	425	472	525	11%
Network Services	32	9%	35	38	43	47	52	57	10%
- Electronic Information Svcs	29	7%	31	34	38	42	46	51	10%
- Network Applications	3	33%	4	4	5	5	6	6	8%
Applications Software	260	14%	296	335	380	431	490	556	13%
- Mainframe	56	7%	60	65	71	78	85	93	9%
- Minicomputer	76	14%	87	97	108	120	134	149	11%
- Workstation/PC	128	16%	149	173	201	233	271	314	16%
Turnkey Systems	114	11%	126	139	153	169	185	205	10%
- Equipment	50	8%	54	58	63	68	73	79	8%
- Software Products	44	11%	49	55	61	68	75	84	11%
- Professional Services	20	15%	23	26	29	33	37	42	13%

Source: INPUT