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What's Inside

ELECTRONIC DOCUMENT MANAGEMENT

Components of a Solid Document Retention Policy

By David G. Bates

David G. Bates is a shareholder of Gunster Yoakley in West Palm Beach, Fla., and chair of the firm's Emerging Company Practice and Technology Practice Groups. He regularly counsels clients in business law, technology law, venture capital, mergers & acquisitions, licensing & distribution, and corporate finance & securities, and was a featured speaker at AICPA's TECH 2005 Conference.

You only have to read a few of the headlines relating to the improper destruction of corporate records, or the tremendous costs for companies to retrieve critical documents and information, to realize the importance of creating and implementing a document retention policy (DRP).

A well-thought-out DRP is more than a proactive response to a crisis. A carefully prepared DRP may help a company comply with litigation retention production obligations, as well as facilitate easier and more timely access to valuable information, reduce operating and storage costs, improve efficiency and productivity, and leverage information capital. A DRP also helps preserve corporate history and memory, meet statutory/regulatory information and record retention obligations, and incorporate new information and records management technologies.

The goal of any DRP is to preserve only useful documents and records for the limited period of time when their retention is valuable to the company or mandated by specific laws. Unfortunately, this goal is difficult to achieve due to the complicated combination of the company's business needs and culture; federal, state and local rules and regulations; industry-specific laws; contractual restrictions; possible court orders and evidentiary rules; and other factors imposing particular requirements for document retention and destruction.

There is no such thing as a one-size-fits-all DRP, and each one must be customized for the particular company's needs. There are a variety of methods for designing and implementing a DRP, and it is impossible to prescribe universal parameters for all policies; however, the following lists are attributes shared by all successful DRPs.

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The DRP Complies with Legal Requirements. A document retention policy cannot be created solely based on the business needs of the company. Numerous federal/state rules and regulations, and industry-specific laws mandate particular requirements for document retention and destruction. These include the Sarbanes-Oxley Act, the SEC, the Patent and Trademark Office, Fair Labor Standards Act, and the Environmental Protection Agency. In addition, the Health Insurance Portability and Accountability Act (HIPAA), the Occupational Health and Safety Administration, the IRS, the Consumer Product Safety Act, the Employee Retirement Income Security Act, and many other federal and state laws, explicitly regulate the retention and destruction of documents.

The company also may have certain contractual restrictions on its right to destroy documents, and organizations with multiple business units across various industries and companies that operate in more than one jurisdiction may need to tailor the DRP to comply with additional rules and regulations.

Use a Team Effort to Develop the DRP. All too often I am engaged to advise the sole individual appointed by the CEO to create the DRP. This will not work. Creating a successful DRP is a team effort that requires input from many individuals and all departments, including legal, outside CPAs, senior management, business unit managers, department heads, compliance officers, and very often, expert consultants. Each member of the team must understand his or her respective department's work processes, and the specific documents and records routinely handled by the department.

Systematically Retain and Destroy Documents. Although rules, regulations and laws mandate retaining specific documents, the systematic destruction of documents is primarily driven by the needs of the company and the particular nature of each document. As a result, a company must begin by categorizing its documents to determine what types of documents exist.

Next, the company identifies applicable rules, regulations and industry-specific laws, and contractual requirements mandating particular requirements for document retention for each category of documents. For example, the DRP may provide that accounting records are maintained for 10 years, employee records are maintained during the employee's employment and contracts are maintained for three years after the employee's termination.

Consistently Implement the Plan. Once a company adopts a DRP, it must consistently implement the policies. Unless the organization's executives enjoy the excitement of receiving criminal indictments or paying hefty fines, the entity cannot routinely ignore its policies for document destruction and conveniently destroy potentially damaging documents in the face of an investigation or litigation. Ideally, the DRP should establish automatic procedures for categorizing, saving and destroying documents.

Thoroughly and Clearly Document the DRP. The DRP must be carefully documented in a manner that is comprehensive and, perhaps just as importantly, easily comprehensible by the company's employees. The DRP must explain for how long each category of document must be retained, the method for retaining the document and where it must be retained. The DRP must also explain how and when documents are to be destroyed.

Create a Litigation Response Team. The DRP must include policies and procedures ensuring that the company does not destroy documents relating to pending or anticipated proceedings, investigations or lawsuits. Generally speaking, an organization that destroys such relevant documents is subject to sanctions and penalties, and the individuals that destroyed the relevant documents may face civil or criminal liability as well. Therefore, the DRP must specify the circumstances when its document destruction policies must be suspended.

Empower Management. Employees responsible for the DRP must have sufficient authority to implement, monitor, audit, enforce, suspend and modify the DRP.

Incorporate Employee Training. Merely creating a DRP is insufficient. Employees must be trained to implement the policies in connection with routine employee orientation, and the continued training and reinforcement of the DRP. It is good practice to include the DRP in the Employee Handbook, to incorporate training on the DRP into employee orientation and to include a frequently-asked-question session on the company's intranet. Documentation of a company's DRP training demonstrates to a court that the company takes its records' management seriously.

Include Routine Auditing. To ensure the policies and procedures of the DRP are being observed, it is necessary to routinely and randomly audit the company's compliance with the DRP.

Remember That the DRP is Discoverable. In litigation, a DRP is discoverable and may be read to the jury. Therefore, it should be written

with this stipulation in mind, and clearly state that is the company's policy to retain relevant documents in connection with litigation and investigations. Moreover, to withstand a court's scrutiny, the DRP must be reasonable and must not be initiated in bad faith.

Include Enforcement Procedures. Once implemented, the company must fully enforce the DRP. A partially enforced policy is often worse than not having one because many courts will view a partially enforced DRP as unreasonable; this may result in exposure to the company for fines, an adverse inference in litigation and possible criminal penalties.

Studies indicate that 10 percent of employees ordered to destroy documents in accordance with a DRP simply will not follow orders. Therefore, the DRP should specify penalties for employees who do not comply with the DRP, and incorporate an internal procedure providing employees a method for reporting violations of the DRP.

Regularly Update. The DRP should be reviewed and updated on a regular basis to ensure it is operating effectively, and that it complies with rules, regulations and industry-specific laws. The DRP also reflects the company's current business practices and incorporates the latest technology.

A successful DRP is critical for every business, and the best time to implement a document retention plan is immediately. If your company or organization does not have a policy, there are numerous resources on the Internet, including a sample policy from the American Bar Association at *www.abanet.org/lpm/lpt/articles/*

Document Retention Policy Checklist

- ✔ Comply With Legal Requirements
- ✔ Develop the DRP Through a Team Effort
- ✔ Use a System Approach to Retain and Destroy Documents
- ✔ Consistently Implement the Plan
- ✔ Document the Policies
- ✔ Create a Litigation Response Team
- ✔ Give Employees the Authority to Manage the Plan
- ✔ Routinely Audit the Plan
- ✔ Keep in Mind the DRP is Discoverable
- ✔ Include Enforcement Procedures
- ✔ Update on a Regular Basis

sampledocretentionpolicy.pdf. A simple Google search will provide numerous other examples of similar policies.

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An Update on XBRL: 2005

By Eric E. Cohen, CPA

Eric E. Cohen, CPA, is one of the founders of XBRL and serves as the XBRL Global technical leader for PricewaterhouseCoopers. He is chief architect of XBRL GL, a past chair of XBRL US and a past chair of the AICPA Technology Conference. He is especially interested in the audit, assurance, tax, security opportunities and challenges of XBRL.

It's almost 2006, and XBRL (Extensible Business Reporting Language) continues to be one of the biggest movements in accounting, yet many corporate executives and CPAs still seem largely unfamiliar with it and its usefulness. Ironically, many countries are standing by to start or expand their XBRL jurisdictional efforts, and government representatives globally are extolling its praise. In our own country, the SEC opened the door to voluntary XBRL filing and the IRS is increasingly engaged.

If you think XBRL is far off — or that XBRL is only relevant to large, publicly traded companies because it is only about SEC filing — read on! XBRL is useful to CPAs across a wide range of internal and external accounting processes.

In its most basic format, XBRL focuses on the agreement to improve gathering, analyzing and sharing business reporting data. This includes:

◆ agreement on the use of XML to represent business reporting-related tagging languages (the Specification),

◆ agreement on the use of XBRL to represent specific areas of business reporting (XBRL taxonomies), and

◆ agreement on using the taxonomies to tag business reports (XBRL instance documents).

This story is structured along those three lines of agreement to provide updates on issues related to the Specification, on taxonomies and their use, and on adoption and instances.

Specification

XBRL is not only about technology; it is about standards and bringing the business reporting supply chain together to agree. There is, however, a large technological component, and one of the greatest challenges to keeping up with technology is changes to the underlying specifications. So the best news for any professional seeking an update is that the current version of the Specification, published in December 2003, is unchanged except for the most minor corrections. XBRL International, Inc. (XII), the international non-profit consortium that oversees XBRL, has promised that there will be no substantial changes to the core Specification through 2006.

However, the technical people of XBRL have not rested on their laurels for the last two years. Instead, they developed extensions to the Specification to improve interoperability, and facilities to validate information, as it moves through a business reporting process. These developments include the XBRL Formula Linkbase Specification to perform sophisticated checks of data, and XBRL Dimensions to provide new rigor to segmental reporting.

Just as in construction when the blueprints are ready and you can begin building in earnest, with the

Specification stable, the architects of business reporting are beginning to put down the foundations for growth, referred to as the "Three T's" — taxonomies, tools and training. When taxonomies are in place, tools are available and work in an interoperable fashion … when training is provided, organizations are enabled and can begin publishing their data.

Taxonomies

Taxonomies are the special business tagging languages of XBRL. They are the definitions, interrelationships and codes used to identify specific pieces and groupings of business information. In 2005, key taxonomies reached their final stages of preparation, so that companies may use them to code their financial statements for publication. Along with the IFRS (International Financial Reporting Standards) General Purpose taxonomy being finalized, a number of taxonomies for U.S. financial reporting were released in final and public working draft forms. These include U.S. GAAP for Commercial and Industrial, Banking and Savings Institutions, Insurance Entities, and Investment Management companies. More about the U.S. taxonomies and the framework that supports them can be found at *www.xbrl.org/ FRTApproved*. For those with an international interest, the International Financial Reporting Standards, General Purpose Financial Reporting for Profit-Oriented Entities, Incorporating Additional Requirements for Banks and Similar Financial Institutions, was finalized May 15, 2005 and available at *http://xbrl.iasb.org/int/fr/ifrs/gp/ 2005-05-15*.

XBRL for Financial Reporting is growing worldwide. Canada, New Zealand, the Netherlands and even China are preparing for filing with their own taxonomies. However, XBRL is not only concerned with financial statements, and especially not just about benefits to big, publicly held companies. In addition to the financial reporting taxonomies, two other taxonomies may be of interest: one for bank call reports and another that will have meaning for companies of all sizes and in all industries: XBRL GL.

First, the FDIC (Federal Deposit Insurance Corporation) – or more accurately, the FFIEC (Federal Financial Institutions Examination Council) Call Report Agencies, which includes the FDIC – announced the plan to modernize the collection of bank call report data starting October 2005. This effort will replace five existing bank reports with a single XBRL-formatted report file which will be filed in the new CDR (Central Data Repository), where all U.S. banks will file their XBRL reports based on the XBRL-based Call Report Taxonomy. This process improvement will strengthen the quality of the reporting data by moving up validation much earlier in the process, eliminating multiple versions of the truth, reducing processing time by more than 95 percent and reducing processing costs by 40 percent or more.

A global taxonomy receiving special interest from the accounting community, especially those responsible for internal processes, is XBRL GL. Anyone who has to move information between modules of an accounting system will benefit from the adoption of XBRL GL. If you need to enter information from your external payroll provider into your general ledger, migrate from one accounting product to another, or consolidate detailed ledgers across different accounting products, XBRL GL has the potential to streamline the flow of data and enhance process controls and audit trails.

Large companies can benefit from XBRL GL as part of their continued Sarbanes-Oxley controls assessment and design efforts. This is especially true as they deal with getting control of the untold spreadsheets that are used today to collect and prepare data for business reporting – a situation known as "spreadsheet sprawl", "spreadsheet spaghetti" or "spreadsheet he**.""

Tools

Tools relates to the solutions that help automate the process of "doing" XBRL. A number of familiar software products enabled to produce, consume and analyze XBRL have hit the market, including the add-in to Microsoft (MS) Office products. In addition, to create XBRL, Rivet Software's (*www.rivetsoftware.com*) Dragon Tag brings XBRL tagging capabilities to MS Word and MS Office. To consume and analyze XBRL, Edgar-Online's I-Metrix (*http://i-metrix.edgar-online.com*) and Hitachi's Xinba (*www.hitachi.us/xbrl*) offer different approaches to reading, displaying and comparing XBRL reports. Grabbing data from accounting systems and turning it into XBRL GL is simplified through mapping tools from XBRL vendors, including Xabra (*www.xabra.org*) from Dynamic Access Systems. Other XBRL tools are listed at the XBRL Web site, *www.xbrl.org/tools*. For example, immediate access to a wide variety of XBRL tools is available from Fujitsu's XBRL Tools page, *http://software.fujitsu.com/en/interstage-xwand/activity/xbrltools/index.html*.

Even with a standard, it is sometimes challenging for one vendor's tools to read what another vendor's tools produce. The solutions providers benefit from new conformance guidance from XBRL that helps ensure tools will work in a more interchangeable manner.

Training

Training is where potential publishers, filers and consumers of XBRL come to learn about the taxonomies and the tools. XBRL-US, the jurisdictional presence of XBRL in the United States, has actively planned and offered awareness and publishing sessions, both at its semi-annual meetings and conferences, and as part of XBRL and FEI (Financial Executives International) events across the country. Awareness breakfasts, Web casts and preparer training sessions are conducted nationwide (and virtually) to help lower the bar to creating XBRL. Visit *www.xbrl.org/us/events* for more information.

Implementation and Adoption

Of course, the best standards are those that someone actually uses. Having a sophisticated Specification, taxonomies that can represent what needs to be published and consumed, and easy to use powerful tools mean little if there is no interest in adoption.

For those who have been waiting to believe in XBRL until the SEC allows filing in the format, *it is time to believe*; the SEC encourages XBRL filing and a number of companies have begun providing XBRL versions of their filings. The PCAOB (Public Companies Accounting Oversight Board) has opened the door for assurance on XBRL documents as well. As

Technology FAQs With Michael Kridel

Michael S. Kridel, CPA*/CITP, CFC is a partner with Daszkal Bolton LLP in Boca Raton, Fla. He is responsible for the firm's litigation services and consulting practice, as well as its internal human resource and information technology systems. A new member of the AICPA's IT Editorial Advisory Board, Michael was one of the first CPAs to attain the CITP designation. We recently sat down with him to learn how technology has impacted his firm, and how the future holds promise for enhanced services via technology-based processes.

*Regulated by the State of Florida.

ITU: *Over the last three years, how has your firm integrated new or improved technology-related processes into its practice?*

Kridel: For us, a regular year is like a dog year. In other words, we have grown so quickly and consistently that infrastructure is a moving target and the changes we make tend to be rapid, both in terms of design and execution.

We've moved all senior management to BlackBerrys and installed a BlackBerry Enterprise Server, giving us faster turnaround on communications at nearly every level, and the ability to deal with documents while
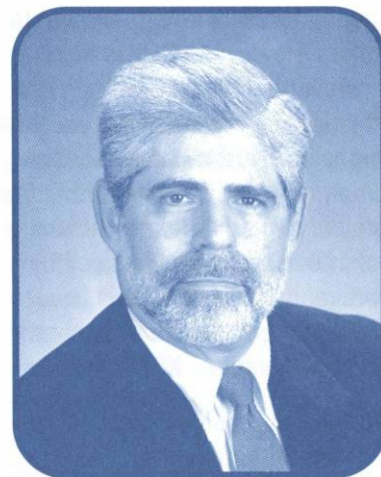
**Michael S. Kridel
CPA*/CITP, CFC**

noted previously, the IRS is among the tax regulators actively engaged in moving XBRL — and especially XBRL GL – forward through the efforts of OASIS Tax XML. OASIS is the Organization for the Advancement of Structured Information Standards, another leading, non-profit consortium; Tax XML is a technical committee under OASIS promoting interoperability of XML tax-related information.

Along with banking in the United States, the insurance industry has shown a particular interest in XBRL. Earlier this year, the primary standards' setter in the insurance industry, ACORD, co-published a white paper, "XML Standards in the Insurance Value Chain," highlighting the use of ACORD, XBRL GL and other XBRL reporting (*www.acord.org/webfiles/AuthoringDocuments/453/ACORD_XBRL_WhitePaper_Feb05.pdf*).

The NAIC and state insurance commissioners also are considering XBRL for statutory reporting.

Professional bodies and leading associations in the United States, including FEI, the Institute of Management Accountants and the National Investor Relations Institute are working with XBRL-US to further XBRL's development and encourage its members to take part.

Along with the FFIEC leading the way for U.S. banks, European banking regulators are joining together to see XBRL used for Basel II requirements. For example, Europe is a hotbed for XBRL activity; the European Commission provided 1 million euro funding to establish XBRL in Europe to increase awareness and support the development of new European jurisdictions. The Spanish Stock

Exchange, the Central Statistics Office in Ireland and nearly the entire Dutch Government are exploring what XBRL can do to increase transparency and decrease filing costs.

This article just hit some of the highlights of XBRL's progress over the last year. If you would like to keep up with XBRL news on a more frequent basis, additional announcements and progress reports, the XBRL Web site is a good resource. Of course, to stay on top of all the news — and to take part in moving the effort forward — consider becoming a member in XBRL. To find out more, send an e-mail to *xbrlus@xbrl.org* with your interest; there are membership categories just right for you.

Contact Eric E. Cohen at *eric.e.cohen@us.pwc.com.* ●

out of the office. This has proven to be extremely valuable, because nearly a year ago, we established a second office approximately 40 miles away and are in the process of opening a third location that will be located about 15 miles in the opposite direction from the second office.

Our notebooks all have some form of wireless access. We have also upgraded our networking and client operating systems to the most current "flavor" of Windows, as well as upgraded our four Citrix server farm.

Another project we accomplished was installing a Cisco VoIP system to accommodate various communication efficiencies and establish a platform for our future growth. We are in the process now of actively working on projects involving video conferencing, desktop faxing, paper-less and encryption solutions.

ITU: *Have these processes enabled growth?*

Kridel: Our growth has historically come from internal development rather than practice acquisition. We've determined that our future will not be dependent on more hours, or to a degree, more people; rather, our capacity for growth and the related profitability, will be interdependent with an, as yet, undefined effectiveness quotient.

Each technological change we implemented was founded in the paradigm of increased effectiveness and, sometimes, efficiencies. For example, BlackBerrys cut response time and provide an opportunity to be billable when someone would ordinarily not be, and operating system upgrades enhance system response time and reliability. Telephone systems and video conferencing provide avenues to communicate more effectively

internally and externally, and setup time for additional offices is reduced by the systems we developed for new office infrastructure.

We know, from experience, that we cannot accommodate reasonable, much less outstanding, growth without effective systems and processes that are "owned" by each person in the firm. It is creating that ownership that is our greatest challenge because it involves substantial capital, time and managing change.

ITU: *Tell me three technologies every practitioner should become familiar with if he/she is not already aware of or using them.*

Kridel: (1) Converged devices to maximize use of downtime. BlackBerry is no longer the *only* answer, but it is the gold standard for the enterprise. Practitioners should look to the alternatives, such as Good, Exchange ActiveSync and others. (2) Paper-less engagement execution, for audit and tax (and maybe litigation). Complete paperless-ness is not really a reality for generations, but the economies offered through this technology, once the capital investment is absorbed, will lead the firm to enhanced profitability. (3) Disaster recovery technologies. This is still a young market, but one that will grow exponentially in the coming few years based on recent events. The use of hot sites, mirrored sites and offline storage, may be the best means of practice continuity available to the firm.

ITU: *How has technology training changed over the last few years for your firm's members?*

Kridel: Technology training is an area that we have not been able to develop due to competing objectives that were deemed higher priorities. We, like so many other firms, relied on the old

"Here, watch me do this. Any questions? Good. Now go do it and see another associate with any questions."

We are attacking this on several fronts: video conferencing capabilities, seeking out high-quality online CPE and hiring an additional IT associate, part of whose responsibilities will include skills assessment and technology training. We have used online training as a viable alternative to off-site seminars in some of our specialized practice areas (e.g., litigation services) and the results were good. The challenge is isolating the participant from other distractions, which requires both self-discipline and acceptance of others. Our expectation is that technology-driven training, in all arenas, will increase over the next 24 months and provide a much higher leveraged ROI than the methods we use now.

ITU: *As the AICPA makes plans to unveil its list of 2006 Top Technologies, what do you think will be the one "hot" technology for 2006?*

Kridel: Globally, I think it will be RFID, which will also impact CPA firms in their audit practices. Second will be enhanced wireless communication methodology and capacity as more devices are able to alternate between WiFi and cellular connections, reducing costs of communications, expanding use and further reducing communication and work product turnaround times. ●

Fuel Cells Coming Into View

By Michael Kujawa

Michael Kujawa is a associate analyst with BCC Research (*www.bccresearch.com*). He has authored book-length market research analyses on markets for various clean energy technologies, including stationary fuel cells, large wind turbines, photovoltaics, small hydro, biogas, cogeneration, geothermal and ocean energy conversion devices. Mr. Kujawa has a background in distributed energy resources, aerospace and marine operations research, and systems software.

Few technologies have created a short-term buzz in the financial markets, power industry or technology pioneers as fuel cells have in the recent year or so. Based on their infancy in the way they affect the accounting profession, "fuel cells" were chosen as one of the 2005 Emerging Technologies. Here's why.

A Short History of Fuel Cells

For the past century, the main sources of electricity were central power plants that used hydropower, coal, oil, nuclear and natural gas. The past decade has seen increasing recognition and market expansion of something called "distributed generation," or that the electricity being generated is being used where it is being produced. The technologies employed to do this were traditionally steam boilers, small hydro facilities and, more recently, small gas turbines. The units provide enough power to run, for example, factories, government facilities, hospitals and college campuses.

Technological progress never ends, but it does tend to make things smaller, more efficient, higher performing and more economically compelling – now occurring with devices called "fuel cells," which were invented in 1839 by Sir William Robert Grove, a Welsh judge, inventor and physicist. His invention didn't produce enough electricity to be useful, and so it languished for over a century until the United States began to seriously pursue the development of manned spaceflight. The best available technology, which needed considerable development to satisfy the power demands of spacecraft, was the fuel cell.

What is a Fuel Cell?

A fuel cell is a device that directly converts the electrochemical energy stored in fuel into electricity without combustion. It does this by exposing a fuel such as hydrogen or a pure metal to a catalyst that strips away the electrons from the atoms in the fuel. The electrons are given a conductive path to travel in and are collected to form a current that can do useful work. The electron-starved atoms are exposed to an air feed, which lets them "oxidize," thus forming a new, stable waste product.

Since single electrons don't do much, enough fuel must be oxidized to provide whatever power levels are needed. The amount of electrons released is proportional to the surface area of the catalyst. As a result, the catalysts are arranged in layers in proportion to the desired output. By putting layer upon layer, tightly bound and sealed, a fuel cell "stack" is formed.

A wide variety of fuel cell technologies has been developed and more are being invented. The most widely used technologies are proton exchange membrane (PEM), solid oxide fuel cell (SOFC) and molten carbonate fuel cell (MCFC). There are other technologies, but none have the traction that these technologies have in the early marketplace.

PEM technologies are favored for smaller outputs for cars, houses (mainly in Japan), portable power supplies, and backup power systems of a few to a few tens of kilowatts. MCFC fuel cells are suitable for businesses, hotels, wastewater treatment plants, institutions and other buildings, as well as shipboard power supplies. SOFC units, which like MCFC can use propane and natural gas directly, are getting attention for residential combined heat and power systems, and auxiliary power units on big trucks, businesses and factories.

Competitive Factors Favoring Fuel Cells

There is a "magic" number for on-site power production machinery. For economic viability, the buyer wishes to pay about $1,000 per kilowatt for the installed system and all of its associated "balance of plant" equipment, including fuel cleaners, compressors, heat recovery system, exhaust and control electronics. The number is approximate, because even the lowest-cost on-site system, reciprocating engines (modified versions of systems used in road vehicles) will cost over $1,200 per kilowatt capacity installed. A 100 kW unit, suitable for powering an apartment building, small office park building or a car wash, will cost approximately $120,000 (plus maintenance contract).

After installation, fuel prices and consumption rates come into play. There also may be a problem with emissions, particularly nitrogen oxide and carbon monoxide. Various air quality regulations may prohibit regular operation of reciprocating engines in some areas, or limit the number of hours they can operate annually. These factors are precisely why fuel cells have caused so much excitement.

Fuel cells have carbon emissions that are up to 80 percent lower than combustion technologies, plus there are virtually no nitrogen oxides, a principal cause of smog in the exhaust. Fuel cells can be used in areas where other on-site power supplies are simply not permitted.

Efficiency is where fuel cells are far superior. Both MCFC and SOFC systems are 50+ percent efficient in extracting electricity from fuel. Reciprocating engines and gas turbines have native efficiencies that are just under 30 percent at best. A current new-technology darling, the microturbine, operates with low emissions, but is so inefficient at producing electricity by burning fuel that it sometimes called a heat generator that produces electricity as a byproduct.

A final attractive feature is reliability. Proven fuel cells routinely operate nearly unattended for 95 percent to 99 percent of the time, so maintenance costs are very low. Reciprocating engines and gas turbines, on the other hand, have a good year with uptimes that reach 85 percent. Oil changes, worn parts and component failures are much more common. When they are down for maintenance or repair, the owner must pay peak power rates to utility for backup power, which can significantly erode any economic gain from having an on-site power supply.

The Economics of Fuel Cells

First price is where fuel cells suffer compared to other power generation technologies. The best price for proven products (there aren't that many on the market) is $3,000 per kW. That is not attractive, even with soaring fuel prices.

Consider, though, that fuel cells costs averaged around $20,000 per kilowatt in 1999, so prices are definitely headed in the right direction. In the right situation, they are even competitive. For example, sewage running through municipal wastewater treatment plants emit large amounts of methane, which is a valuable fuel (it is the major constituent of natural gas). In cities designated as "severe nonattainment zones" by the Environmental Protection Agency because of air quality issues, fuel cells and microturbines are the only option for capturing the energy in that waste gas.

The federal government, and many state governments and municipalities, have established grant funds for clean energy projects. Fuel cells are ranked with wind turbines, photovoltaics and small hydro as favored "Tier 1" renewables. Technically, fuel cells don't belong there unless they are using pure hydrogen electrolyzed from water using electricity from a renewable power generator, such as a wind turbine, a run of the river small hydro plant or solar cells. They also can use methane at wastewater treatment plants, landfills or anaerobically digested animal waste at concentrated animal feed lots.

There is plenty of money available to buy down the initial cost of fuel cells. The Energy Policy Act of 2005 authorizes several billion dollars of tax credits for fuel cell purchases. Some state governments with "clean energy funds," whose monies come from a small surcharge on electricity consumed in the state, make grants available that essentially halve the price of a fuel cell. Such grants are usually offered in states that are trying to encourage the growth of a fuel cell industry within the state.

The Department of Defense (DOD) also runs an ongoing program that buys fuel cells and sets performance parameters that move the technology forward. The equipment, purchased, and development projects funded, cover a wide range of military applications, including stationary and portable power supplies; micro fuel cells to replace batteries that soldiers would otherwise have to carry; ship engines; aircraft auxiliary units; and land, sea and aircraft propulsion systems. The military was the main funding source of fuel cell development through the 1990s, after which investors and venture capital became the prime mover of technological progress.

Fuel Cell Markets

Fuel cell markets are generally divided into stationary, vehicular, portable and micro fuel cells.

Stationary fuel cells are essentially on-site power plants that provide electricity and often hot air or water, while vehicular fuel cells provide motive power. Every car company on the planet now has a fuel cell program, or is partnering with other car companies to share the costs of development. A new trend is that many vehicle manufacturers are jointly attempting to define standards to reduce costs by encouraging commonality and mass production of components.

Virtually all development efforts for vehicles are focusing on PEM fuel cells, which use hydrogen as a fuel. Corresponding programs are being carried out internationally, encouraged

and coordinated by the International Energy Agency, to develop worldwide agreement on technological goals for supplying, storing and delivering hydrogen, particularly for vehicles.

It is probably worthwhile to note that hydrogen fuel cell-powered cars became competitive with gasoline-fueled cars when the price of gasoline reached $2.00 per gallon in the United States. Even with this economic milestone having been passed, PEM fuel cells are regarded as being only half as reliable as they need to be to fully replace gasoline-fueled internal combustion engines.

In the stationary market, only a small handful of companies are marketing fuel cells commercially. The largest fuel cells available are the MCFC from FuelCell Energy, which produces modular fuel cells that are used to build power plants with capacities ranging from 300 kW to more than a megawatt (a megawatt is enough electricity to power several hundred homes). The only competitor is United Technologies, which has several hundred 200 kW phosphoric acid fuel cells operating around the world.

The company recently won a contract to build a 10 megawatt fuel cell power plant for the Long Island Power Authority. It will be the largest fuel cell installation on earth. FuelCell Energy, which was the only other bidder for the power plant, has established a business supplying fuel cells to wastewater treatment plants and hotels (the Starwood chain, for example). Both companies depend on grants or direct military or utility purchases for their sales, which have climbed to be about a quarter of what they need to be for the price of the products to be directly competitive with other distributed power generation technologies.

Micro fuel cells that power electronics such as laptops, cell phones and MP3 players are regarded as the most promising for commercialization by 2007 or 2008. These small devices supply essentially endless power by allowing refueling from small hydrogen or methanol cartridges. The methanol option is receiving the most attention. International standards were recently defined for transporting methanol cartridges on board aircraft.

Portable fuel cells that deliver tens to hundreds of watts are being sold commercially into markets where price is not a concern, for example, in military applications and as power supplies on yachts.

Other markets that are emerging are telecommunications backup power at remote cell towers where batteries developed a reputation for costly unreliability. A busy cell tower can lose tens of thousands of dollars for its owner when its power supply fails. Fuel cells in this application have proven to have operating life costs that are lower than those of batteries.

Another early market is a packaging concept that allows fuel cells to be inserted into industrial lift trucks (fork lifts) as a direct replacement for batteries. Hydrogen-fueled PEM replacements can be refueled in as little as eight minutes, compared to six hours of recharging for battery-powered forklifts. Wal-Mart is moving to a beta test of a few such fuel cell fork lifts, which is encouraging for the industry since Wal-Mart alone operates a fleet of 14,000 fork lifts.

Conclusions

The fuel cell industry is slowly reaching commercial status as companies place products in places unseen by the general public, such as forklifts and remote sites. These are directly competitive with existing technologies on a lifetime cost basis and, considering the environmental impacts, an overall superior choice for the purchasers. Having established a preferred status in such large market niches, the industry will soon begin to look to develop other markets where similar commercial advantages can be discovered.

Such successful installations depend on being able to control all salient aspects of the application. Stationary power supplies for buildings will, for several years more, continue to rely on grants and other buydowns. The federal tax credits will help accelerate the sales rates so that companies will be able to ramp production to reduce the cost per component.

The buydowns, grants and subsidies do make proven products competitive now; companies that consume more than a few hundred kilowatts of electrical demand and also have use of waste heat have fuel cell options that are economically justified. The challenge faced by the few companies that produce viable products, such as those that can be warrantied for more than a decade, is to find markets where a few subsidized projects will lead to repeated sales of increasing quantities.

At stake is an industry whose technologies can double and triple the efficiencies at which fuels are consumed and whose emissions are generally cleaner than the ambient air. What is emerging is a next generation industry that generates tens of thousands of jobs over the next decade — a cornerstone of a technological age that may lead to the end of fire as a central tool of civilization.

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Migration Tips

I have a new computer and it's sitting right over there.
However, I'm still using "this" computer to write my col-
umn. Why? Because this time, rather than doing what I've
done in the past, I wanted to have a freshly built, clean
workstation. I also didn't reuse a hard drive as I've done in
the past and I didn't ghost the drive over to the new one.

The migration process is slow at best. How many weeks
later is it now and I'm *still* on this old computer? Just like
everyone else, *not* switching to a newer computer with a
better operating system might be the status quo, but how
efficient is this? Right now, whenever I have multiple win-
dows open, I realize that the slow CPU is operating at
warp speed, but there are times I have to wait for the sys-
tem to "catch up" when my brain functions faster than the
hardware! If this is the case, why am I putting up with the
status quo and not updating?

Once upon a time when computers had green screens,
programs could be quite easily moved from place to place.
All you had to do was to copy the folder and move it lock,
stock and barrel to another computer. Everything worked,
right? Well, not exactly; what made those programs work
with a mere copy-and-paste was that everything needed to
run that program was self contained. The program had its
own printer drivers, routines and all-inclusive directory.

Then, the registry was born. No longer did we have to
ensure that the program had a driver for a printer, it could
use a generic driver built for the operating system.
Equivalent to ensuring that printer companies only had to
build the driver "once," this opened up a huge savings in
software coding and debugging time. It also meant that no
longer could we merely move folders and expect software
to run.

Of course, I'll *eventually* migrate to my new computer, so
what tools am I planning to use to move my data to the
new machine? First, because I am at home and am using
Microsoft Outlook 2003 with MS Exchange server on a
home MS Small Business Server 2003, the data for my
mail isn't on this machine – it's on the server. What I need
to do is merely join the new computer to my home
domain, put in my username and password, and Outlook

will automatically pull in all of my mail from the Exchange
server.

My documents can be moved over with the Windows XP
file and transfer wizard. However, one warning: In using
the file and transfer wizard, if you use it to pull "every-
thing" across, you will need to make sure that any add-on
or customization you may have in MS Word is also includ-
ed in the new system. If you do not, you may need to
install on that new machine any third party add-ins (e.g.,
Adobe Acrobat) to avoid any issue after migration. It does,
indeed, help you to migrate those vital documents and set-
tings you need on a machine. More information can be
found *www.microsoft.com/technet/prodtechnol/winxppro/
deploy/mgrtfset.mspx*.

What other tricks can you do? You can use a ghosting or
imaging program to migrate exactly everything from the
old system to the new system. I have migrated from small-
er hard drives to larger hard drives within the same com-
puter system (and motherboard), even on OEM (original
equipment computers). Therein lies our next slight issue
when dealing with migrations. You may think you own the
operating system or Office suite loaded on that OEM Dell
or Gateway, and may think it's fully moveable to another
computer, but in reality, it's not. Software is tied to the
hardware, and even more so to the motherboard. An
upgrade of the motherboard is considered to result in a
"new personal computer" to which Microsoft OEM operat-
ing system software cannot be transferred from another
computer.

If the motherboard is upgraded or replaced for reasons
other than a defect, then a new computer was created
and the license of the new operating system software is
required. If the motherboard is replaced because it is
defective, you do not need to acquire a new operating
system license for the PC. Visit *www.microsoft.com/oem/
authdist/default.mspx* for more information. Many times,
we purchase OEM software thinking that we have the best
deals, but don't realize how tied we are to that hardware.

How about Server software purchased as an OEM soft-
ware purchase with a Server? Indeed, it, too, is perma-
nently tied to that server hardware, so if you have a major

failure, you lose that operating system in many ways. As a result, buying OEM software may not give an organization the flexibility it needs to migrate, grow or expand as needed. You may wish to look into Open licensing or adding software assurance to that OEM to be more flexible.

In the meantime for this old computer of mine, I'll be taking the drives out of this computer and putting them as Plan B for the new one. Just in case I forget a bit of this or a dash of that, all of my old data from the old computer will be there, just in case. But honestly, next time, I'll be smarter and stop putting things on the local drive. Similar to the office where anything that important goes on the server to be automatically backed up, I will be doing backups now on my home network.

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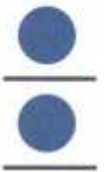
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