



Adaptive Reuse of Obsolete Power Plants

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ABSTRACT

A new world has dawned in the Electric Utility Industry because of the combined effects of deregulation, fuel costs and unit efficiencies, and changes in regulatory requirements applicable to “Grand-fathered” fossil power plants. Many electric utility companies are finding that older facilities are no longer viable as electrical generating stations in the new competitive environment. Fortunately, the strong economy and interests in urban renewal, combined with the locations and architectural scale of old power plants, have resulted in creating opportunities for adaptive reuse of these obsolete facilities. This paper will examine the background for the current wave of plant decommissioning and then highlight some of the creative reuses that have been implemented or are currently underway in the United States and abroad. Examples include the Tate Modern museum in London, England; the Power Plant museum in Toronto, Canada; the Power Plant complex at Inner Harbor in Baltimore, Maryland; the Comal Power Plant in New Braunfels, Texas and the Seaholm Power Plant in Austin, Texas.

INTRODUCTION

The electric utility industry is currently undergoing significant changes. This is ironic for an industry that has historically been quite stable. Deregulation is a driving force behind the new world in which electric utility companies currently operate. State by state changes in the regulatory framework governing electric utility operations have unleashed unprecedented levels of activity in mergers and acquisitions. Other factors are also contributing to the changes occurring in electric utility company operations, including:

- Competition
- Fuel costs
- Improved heat rates for new units
- Aging facilities
- Increasingly stringent environmental regulations
- Sociological issues

Varying combinations of these factors have led to some older power generating units becoming obsolete. Extensive maintenance and component upgrades, or repowering have kept many facilities viable. There are those units, however, that are simply not viable any longer and the future of these units and/or facilities must be evaluated. In many cases this evaluation leads to the decision that a power plant is obsolete. Once a power plant has

been deemed to be obsolete from a power generation perspective, it opens the door for new opportunities to adapt the facilities for new, non-power related uses.

The term 'adaptive reuse' has been commonly applied to situations where a facility is obsolete from the perspective of its original purpose but it can be modified for a new function. In the case of obsolete power plants, this typically entails removing the power generating equipment and support systems, addressing any existing environmental contaminants, and leaving a 'clean' shell of a building for a new function or adaptive reuse that is not related to power production. Typical environmental considerations for these older facilities include asbestos, metals-based paints and coatings, mercury, and sometimes polychlorinated biphenyls (PCBs).

The following discussion looks at the adaptive reuse of obsolete power plants and provides some examples both in the United States and abroad.

OBSOLETE POWER PLANTS

As stated above, there are many factors that can contribute to a power generating facility becoming obsolete. Considering that demand for electricity continues to grow, the decision that an entire power plant or individual generating unit is obsolete typically can be distilled to economic viability. The electrical demand still exists but some facilities or generating units simply can not compete to produce electricity at market rates.

One of the results of the mergers and acquisitions that have been occurring as a result of deregulation is that larger power production companies are being established. This can lead to economies of scale that make marginal units expendable. Additionally, the increased competition of deregulation puts pressure on the economic viability of all generating units.

Increased fuel efficiency (improved heat rates) of new generating units combined with increasing fuel costs can contribute to older units becoming unable to compete on an economic basis. Unit modifications and upgrades can affect this economic equation but at a price. The potential future life span of the modified or upgraded unit is a factor in this economic evaluation. The logistics of making modifications to an existing unit with space limitations must also be considered.

The ability of older generating units to compete in an open market is also impacted by environmental regulations. New units are designed to comply with the current stringent environmental requirements. Older units were built based on a different set of standards. Some older units have operated under a "grand-fathered" status that has not required that modifications be made to comply with new environmental regulations as the requirements have become more demanding. The economic viability of older units is being impacted now as the environmental regulations are ratcheted up and "grand-father" exemptions are being removed. The balance between the costs of compliance and the anticipated income from sales of electricity produced must be weighed. In older plants,

the costs of upgrades and modifications are typically impacted significantly by the current condition of the unit, equipment accessibility, and space limitations.

Combinations of these factors lead to facilities becoming obsolete. It is the older facilities that often become obsolete because of their inability to compete in an open generation market. This is important from a sociological perspective because many older facilities are located in geographic areas that are heavily populated. The facilities might have been originally constructed on the edge of a growing city but now are in the middle of an urban area. Many of these older power plants have operated for decades and there has been plenty of time for city sprawl to engulf them.

This proximity to the general public increases sensitivity to environmental discharges and noise. The airborne discharges through power plant stacks can make a strong visual impact. Noise levels at power plants have been a contentious issue in some cases, especially because of the continuous operations of the facility on a 24-hour per day basis. Additionally, many older power plants are located adjacent to surface water bodies because of cooling water considerations. As urban renewal efforts strive to focus public recreational opportunities around these water bodies, power plant operations may become an unwelcome neighbor.

FACTORS AFFECTING ADAPTIVE REUSE

The proximity of some older power plants to an increasingly dense population center can result in citizen opposition to operation of the facility. The argument that the power plant was at the location before the growth that followed typically does not sway the general public. Negative public sentiment toward an urban facility can have an impact on an electric utility company when they are making decisions about where to commit their limited funding for unit upgrades and modifications. This can accelerate the march toward the point in time when an urban power plant becomes obsolete.

At the same time, the proximity of the obsolete power plant to the urban center can make it a candidate for adaptive reuse. If the facility has the right combination of location, architectural scale, and aesthetic or historical appeal, it can be an extremely attractive prospect for adaptive reuses that are oriented toward the general public. In some cases, adaptive reuse of old industrial facilities including power plants is being incorporated into urban renewal efforts. The opportunity to reuse obsolete facilities in the urban core supports sustainability and smart growth initiatives designed to focus redevelopment in inner cities in an effort to decrease urban sprawl.

There are a number of attributes that old power plants have that make them attractive candidates for adaptive reuse. One of the major attributes of older power plants is that they were constructed with large turbine-generator “halls”. Unlike many new generating units that are based on combustion turbines and include minimal buildings or structures, old power plants were typically steam-cycle based and included large-scale buildings to cover the turbine-generator set(s) and control rooms. The boilers were also enclosed by structures in some cases. These very large open spaces represent significant opportunities

for developing new functions on a grand scale. In many cases, the power plant buildings themselves were designed with a significant amount of style that makes them attractive today from an aesthetic or historical perspective.

In addition to their physical location, many of the older power plants represent adaptive reuse potential because of their relationship to the surrounding urban area, any recreational areas that have been developed around the cooling water bodies, and the infrastructure that often is connected to a power plant such as rail access. The architectural scale of many of these old power plants combined with their locations in urban areas and proximity to water make them attractive candidates for adaptive reuse.

Two very important factors in assessing the adaptive reuse potential of an obsolete power plant are who currently owns the facility, and who or what is/are the driving force(s) behind creating a new use for the facility. In many cases the power plant is still owned by an electric utility company. The owners may want to convert the facility into an internal use such as offices or warehouse space. In other cases, the owner may be interested in selling the property for a profit. External forces outside the electric utility company that could be interested in an obsolete power plant include economic development groups, museum committees, businesses, or government entities such as municipalities.

Museums and similar public use activities are commonly the type of function to which old power plants are adapted. In other cases, restaurants, hotels or other hospitality based businesses have been the selected use. The decision seems to be based on a combination of numerous factors, some of which are project specific, but often include ownership issues, public interest and involvement, local demographics and land use, and funding.

EXAMPLES OF CONVERTED POWER PLANTS

Obsolete power plants have been adapted to a variety of new uses, such as:

- Museums
- Restaurants
- Hotels

The architectural scale and open spaces of former power plants are very well suited to being used as museums. There are numerous examples of former power plants being converted into museums. These facilities include:

- The Tate Modern, London, England
- The Power Plant Contemporary Art Gallery, Toronto, Canada
- Sydney Powerhouse Museum, Sydney, Australia

The Tate Modern is a high profile museum located on the south side of the River Thames opposite the St. Paul's Cathedral. The museum is the result of converting the former Bankside Power Station. The historical information on the museum's website (www.tate.org.uk/modern/)¹ indicates that the station was closed in 1981 because of

increasing oil prices making operation of the facility uneconomical. Attributes discussed on the website include the size of the building, its architectural distinction, location opposite St. Paul's Cathedral, and the historical significance of the surrounding area. The museum's reports having over 370,000 square feet of internal floor area which includes display and exhibit space, shops, cafes, an auditorium, education area, and support areas.

The Power Plant Contemporary Art Gallery is located in downtown Toronto in the beautiful waterfront area known as Harbourfront Centre. This area has a mixed use of commercial businesses and public green space along the harbor. The web site for this gallery proclaims that 'Since 1987, The Power Plant has been Canada's leading public gallery devoted exclusively to the art of our time.'" (www.culturenet.ca/powerplant/homepage)². The brick building and tall brick chimney of this facility stand out along the Toronto waterfront.

The Sydney Powerhouse Museum opened in 1988. According to their website at (<http://sydney-australia.net/tourism/sydney/attracts/power/powp23mb.html>)³, the facility is Australia's most distinguished museum. The historical information on the website indicates that the Powerhouse Museum was built in and around the shell of the former Ultimo power station originally constructed in 1899 to 1902. It was originally built to provide power to the electric tram system and did so for over 50 years. Buses eventually replaced the electric tram system and the power station was closed in 1963. The modifications for converting the facility into a museum included renovating the existing structure and adding a new building. According to the website, the museum has over 25 exhibits that explore human achievement, science and technology, the decorative arts, and the everyday lives of Australians.

Not all adaptive reuse projects are oriented towards museums. In Baltimore, Maryland, a former power plant facility located on the east side of the City's Inner Harbor has had multiple uses since the original conversion. Historically, the Power Plant has been oriented to commercial uses but the businesses located there have not always prospered. This is in spite of the overall popularity of the Inner Harbor and the proximity of the Power Plant to the outstanding National Aquarium. The Power Plant complex underwent additional renovations in 1995 to make the area more commercially viable. One of the high profile businesses that was brought into the Power Plant complex was a Hard Rock Café restaurant.

In New Braunfels, Texas, a power plant owned by the Lower Colorado River Authority is currently in the middle of the process of adaptive reuse. The power plant was originally built in 1921 and operated as an electrical generating facility until 1977. The facility is located adjacent to the Comal River and popular Landa Park, both of which are popular public recreational areas. The power plant equipment has now been dismantled and the environmental issues addressed. These environmental considerations included primarily asbestos and metals-based paint. The future use of the facility was determined by a request for proposal process in which any interested party was encouraged to submit a proposal for reuse of the facility. The selected reuse is planned to be a commercial complex with a hotel and restaurants open to the general public. Renovation and

construction activities for these new facilities should start this year. This adapted reuse of the shell of this former power plant should work well with the surrounding public recreational activities.

The Seaholm Power Plant in Austin, Texas is interesting because the facility is currently in the middle of the equipment dismantling and environmental remediation phase, and the future use of the facility is still undetermined. The Seaholm Power Plant main building was built in the 1950's using concrete and glass bricks in an Art Deco style. This main building has over 110,000 square feet of floor space with the turbine hall representing an estimated 27,000 square feet and a ceiling height of 65 feet according to information on the Seaholm website (www.Seaholm.org)⁴. The environmental considerations in decommissioning this facility are interesting and complex because there are PCB impacts on operating equipment and concrete floors, in addition to the typical asbestos, metals-based paint, and mercury issues.

The Seaholm facility is also interesting because the driving force for its adaptive reuse has been a dedicated group of local citizens that see promise in converting the obsolete power plant into a new public use. This group sees the architectural style, scale, location, and ownership by the City of Austin Electric Utility as attributes toward adapting this facility for a new public life. The ultimate future public reuse for the Seaholm power plant has not been determined although all the most popular ideas center on an adapted public use. Leading examples include a museum, science and technology center, and a performing arts center. Other suggestions include a hub or station in the planned public transportation system, or an aquarium. There is a possibility of combining a number of these suggested uses. The process for making the ultimate selection is ongoing.

The adaptive reuse project at the Seaholm Power Plant presents an informative case study because the driving force for adaptive reuse has been the general public, the City Council has directed that the plant be decommissioned, and the future use has not been selected. The citizens group, 'Friends of Seaholm', prevailed in a campaign to get the Austin City Council to direct the City owned Electric Utility to decommission the plant. This decommissioning effort includes dismantling power-generating equipment and support systems, and addressing environmental concerns. Not knowing the future reuse of the facility, however, has created conflicts in the decommissioning process. For example, supporters of the idea for using the building as a Science and Technology center have expressed a desire to keep significant portions of the plant equipment on-site for display purposes. These requests have included retaining items ranging from gauges and chart recorders to a turbine generator set and the steam boilers. Other interested parties want the equipment totally dismantled and removed with only the "clean" shell of the building left remaining. Similarly, there was a great deal of debate about whether to demolish the boilers or develop an approach that would address the asbestos and metals-based paint while maintaining the aesthetic profile of the existing facility. All of these discussions occurred concurrently with the Electric Utility committing to be responsible to decommission the power plant while expressing their desire to eliminate their future potential liabilities at the facility, such as leaving asbestos in place. This has created uncertainty during the execution of the decommissioning efforts.

Not all adaptive reuse projects relating to obsolete power plants are oriented toward public, civic, or commercial uses. For example, an unfinished Hanford Nuclear power plant unit in Hanford, Washington has been discussed as a potential conversion into an industrial park⁵, and multiple electric utilities have considered converting old power plants and other operations related facilities into office space for internal company use.

CONCLUSIONS

There is a great deal of change occurring in the electric utility industry. Part of the fallout from these changes is that some older power plants are becoming expendable or obsolete. Although these old power plants may be obsolete from a power generation perspective, they may have the potential for a new life that is unrelated to the electric utility industry. Many old, obsolete power plants are attractive candidates for adaptive reuse because of their scale, architectural style, location, and proximity to urban centers. There are numerous examples of successful projects where obsolete power plants have been converted into museums or commercial businesses such as restaurants. These projects to successfully adapt power plants to new uses have been performed both in the United States and abroad. Although this paper has focused on adaptive reuse of power plants, there are similar reuse opportunities and success stories with other large-scale industrial facilities worldwide.

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Key Words:

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