UTILITY CONNECTION CHARGES AND CREDITS
Stepping Up the Rate of Energy Efficiency Implementation

Jim Lazar
Consulting Economist
Olympia, Washington U.S.A.

Presented to:
Second International Conference on Energy Consulting
Graz, Austria
September 25-27, 1991

INTRODUCTION

One of the most severe barriers to implementation of cost-effective energy conservation is the fact that the person or company making the decision of what type of equipment to install in a building, or even of what building to construct, is often not the same person who will pay the energy bills over the life of the building. Because the builder will not have to pay the energy costs resulting from these decisions, they have little incentive to invest in energy-conserving measures.

This problem is most obvious in the residential sector, where contractors who build new single-family or multi-family housing select the type of construction, the type of lighting systems, the type of heating and water heating equipment, and even the major appliances. The home buyer or apartment renter -- who will ultimately pay the energy bill -- has little or no opportunity to influence these decisions. While a more efficient refrigerator may cost as little as $50 more than a standard model, the builder perceives no benefit to such an expenditure -- even though the energy savings each year may be great enough to repay the investment in just a year or two.

In the commercial sector it is often no different. General contractors construct buildings on behalf of limited partnerships, which then rent the facilities with leases where the tenants are responsible for the energy bills. More efficient equipment provides no benefit to either the builder or the building owner. The economics are even more stark in this sector. More efficient and more precise lighting can save operating costs, the installation of fewer fixtures can save capital funds and cooler operation of efficient lighting systems can reduce the size of chillers needed to provide a comfortable structure. Such precision lighting systems, however, require high quality engineering, which is itself a significant capital expenditure.

The most common approach in the United States for encouraging energy efficiency in new buildings is for governmental agencies to adopt building codes requiring specified levels of energy efficiency. While beneficial, codes are often poorly written, ineffectively enforced, and chronically out of date. One way that utilities and other policy makers can influence the efficiency of new buildings is through connection charges and credits for electric utility service based upon the efficiency of the structure.

This paper examines several different approaches which have been considered or implemented in the Pacific Northwest region of the United States for achieving electrical energy efficiency in new building, and compares the effectiveness of each approach.

THE FAILURE OF THE MARKETPLACE

A good western economist should theoretically argue against any interference with competitive market forces, which we supposedly believe will result in the maximum cost-effective energy efficiency as buyers and renters of buildings demand that their landlords install measures which will save them money. Unfortunately the market theory fails when energy efficiency is at issue primarily because the conditions necessary for an efficient market are utterly lacking. Market theory holds that competition will produce an efficient allocation of goods and services under the following conditions:

1) All goods are perfectly substitutable;
2) All buyers and sellers have perfect information about the marketplace;
3) No buyer or seller is large enough to influence the market; and
4) Capital is highly mobile and will find it's way to the highest return.

Obviously these conditions are not met in the marketplace for new structures. Energy efficiency, which is a capitalized item, is not "perfectly" substitutable for electricity purchases, which are an operating expense. Most buyers of buildings have far from perfect information about building energy economics. In the residential sector, renters may have almost no information at all. Major contractors and equipment vendors may be large enough to influence the choice of equipment installed through cooperative ventures with builders; this may result in inefficiency when neither the builder nor the vendor will be paying the energy bills. Finally, access to capital is not equal for all potential borrowers, and it may be easier for a builder to obtain capital than for a vendor of energy-conserving equipment to do so.

Energy conservation is not perfectly substitutable for energy generation for several reasons. One important difference lies in the fact that electric utilities constructing generating plants to serve new buildings typically construct long-lived facilities and finance them with long-term securities. Buyers and renters typically have much shorter time perspectives, desiring a recovery of their investment (payback period) of as little as two to four years. This is not "perfect" substitution.

The end result is that "pure competition" does not exist in the market for energy efficiency, and we should not expect an efficient allocation of resources without intervention in the marketplace.

THE PACIFIC NORTHWEST

The Pacific Northwest region of the United States includes the states of Washington, Oregon, Idaho, and Western Montana. The largest cities are Seattle, Portland, Spokane, and Boise. It is divided by the Cascade mountain range, with forests west of the mountains, and desert to the east. The primary economic activities are aircraft construction (Boeing), forestry, grain and vegetable farming, and computer software development. The region is characterized by rapid economic growth in urban areas of western Washington and Oregon, and stagnant economic conditions in the rural areas.

The region enjoys the largest hydroelectric power system in the United States, and typical retail electric charges prior to 1980 were approximately $.01/kwh, less than half the average for the nation. Today, electricity prices have increased dramatically, but, at $.03- $.05/kwh, remain at about half the level of most of the country. These low prices have led to much greater dependency on electricity, relative to other fuels, in the Pacific Northwest, and to rapid historical growth in electrical demands.

In 1980, the fast-growing region was facing the prospect of a severe electric power shortage, and the United States Congress enacted the Pacific Northwest Electric Power Planning and Conservation Act (the Act). The anticipated power shortage, the passage of the Act, and the creation of the Northwest Power Planning Council, which is responsible for implementing the Act, have created an atmosphere where energy efficiency planning is a focus of the region.

The Act directed the creation of a regional power plan, and required that "Model Conservation Standards" be implemented designed to achieve all conservation which was cost-effective to the region and economically feasible for consumers. To make the "economic feasibility" issue easier to satisfy, the Act directed that consumers be given financial assistance where necessary to assure that cost-effective conservation measures were achieved.

When the power shortages loomed a decade ago, due primarily to delays in construction of new electrical generating plants, utilities reacted by implementing some of the first energy conservation programs in the nation. Some state regulatory bodies stepped in with creative approaches. The Bonneville Power Administration, a wholesale electric supplier to numerous small electric distribution utilities in the Northwest, began financing locally implemented conservation measures.

The power shortages projected for the 1980's never materialized, primarily due to very large increases in electric prices required to pay for the (delayed) new generating plants, several of which were never completed. The price increases caused a great deal of price response in the form of conservation, fuel substitution, and curtailment of operations. However the decade served as a laboratory for testing many alternative methods of meeting electrical requirements for the region.

The goal of the Act was to evaluate energy conservation and energy supply measures in a common manner, and to choose the most economical based upon the life-cycle economics of each. The term "life-cycle costing" generally refers to the life-cycle acquisition and energy costs. An evolution of this, "value engineering" incorporates the same concepts, but includes recognition of such costs as labor savings associated with less frequent replacement of compact fluorescent replacements for incandescent lamps.

After a decade, progress has been slow but steady. A large number of different programs have been attempted. Some have been extremely successful. Others have not. Among the <u>least</u> successful have been attempts to amend building codes to require efficiency measures to be built in. Among the <u>most</u> successful were direct policies implemented by electric utilities to require improved efficiency as a condition of service, or to impose high fees on builders of less efficient structures based on the expected energy use of those structures.

RESIDENTIAL BUILDING CODES

The entire history of building codes for energy efficiency in the Pacific Northwest has been characterized by "following the market." Codes tend to be consensual, and barely better than the lowest efficiency level being achieved in the marketplace. Once the majority of contractors and builders, driven by market forces, have implemented a standard of energy efficiency, it then becomes politically feasible for governmental agencies to adopt a mandatory standard.

In the residential sector, once floor, ceiling, and wall insulation and insulated glazing became standard practice, they were imposed by code. In the commercial sector, only after the incandescent lamp became archaic did codes place limitations of any kind on the wattage per square foot of lighting to be installed.

The first building codes for energy efficiency were implemented in about 1977. These required only minimal upgrades to then-conventional building techniques. Modifications to the codes which increase the required level of energy efficiency have been implemented throughout the region in stages, most notably in 1980, 1985, and 1991. However, the improved codes typically have not kept pace with improvements in energy conservation technology.

The most recent residential code in the Seattle area, for example, requires only R-38 insulation in attics and R-19 insulation in walls, although R-49 and R-27 are now clearly cost-effective. Technological evolution, such as heat-mirror glazing, compact fluorescent lighting systems, high-efficiency appliances, and heat-recovery ventilating systems are still not required.

Each code amending process has been characterized by bitter fights between conservation advocates, including most electric utilities, and builder groups. Legislative delays have pushed back to 1991 implementation of a code which was to take effect in 1986, at the direction of the Northwest Power Planning Council, and the code's efficiency standards were weakened in the process. Frustrated with the political process of adopting building codes, some local utilities have taken innovative approaches involving connection fees and standards for new buildings.

CONNECTION FEES AND STANDARDS -- EARLY EXPERIMENTS

Several attempts to impose energy efficiency measures through direct utility charges and standards have been made in the region. Some of the earlier efforts may have failed, but in the process, may have created the potential for future success.

State of Idaho

The first regional experiment with a connection standard or fee was implemented in 1979 by the state of Idaho Public Utilities Commission (IPUC). The IPUC directed the Washington Water Power Company to begin charging $50 per kilowatt of connected load for new residential structures. Given a typical installed size of 20 - 30 kilowatts for electric heating systems, this imposed a $1000 - $1500 additional charge on builders. The intended effect was to shift new electric heating installations to natural gas, a lower cost fuel, or to at least cause builders installing electric heat to more fully insulate the structures to reduce the size of the connected heating load.

The implementation of this fee per connected kilowatt immediately resulted in significant improvements in the energy efficiency of the new buildings constructed, and did succeed in shifting new construction to use natural gas for space and water heating purposes. The IPUC was encouraged by these results, and convened a proceeding to establish a "point system" by which new residential structures would pay a progressively increasing connection charge if all available and cost-effective energy conservation measures were not installed.

Builders reacted vigorously to this policy initiative on two fronts. First, they succeeded in having the regulations invalidated by the state Supreme Court on the grounds that these type of standards exceeded the legal authority of the IPUC. Second, builders persuaded the legislature to more specifically limit the authority of the IPUC. The experiment came to a rapid end; the $50/kw fee was eliminated. However, the precedent was not lost, and this approach was successfully utilized in the state of Washington a decade later.

State of Washington

In 1979, Puget Power, the largest electric utility in the state, requested a moratorium on new connections of electric resistance space and water heat in areas where natural gas service was available. An "unholy alliance" of natural gas utilities, conservation advocates, industrial power users, and low income citizen advocates succeeded in persuading the Washington Utilities and Transportation Commission to order a complete ban on new electric resistance space and water heating installations. The only exceptions granted were for superinsulated buildings, and as backup systems to solar heating systems.

Builders again succeeded in the courtroom where they had failed in the regulatory arena. A local judge invalidated the moratorium, and before it could be reviewed by an appellate court, the passage of the conservation Act referenced earlier created a completely different wholesale power market in which Puget Power could obtain supplies not previously available to it. The moratorium was never implemented.

Oregon

Building construction standards in the state of Oregon adopted in 1985 allowed a form of perimeter crawl space insulation which is substantially inferior to conventional underfloor insulation. Salem Electric a small electric utility serving 12,000 households, implemented a $200 connection surcharge during 1989 for any new home which was not fitted with full underfloor insulation. The amount was selected to equal the additional cost of installing underfloor insulation [so that builders would be indifferent from an initial cost perspective.] The program was initially successful -- nearly 100% of new homes were fitted with underfloor insulation. It was never challenged in court action by builders. Within a year the state building standards were modified to require underfloor insulation, and the program became unnecessary. At that time, the program was modified into an incentive mechanism to encourage a higher level of energy efficiency than required by code, but the penalty provision was abandoned.

THE MODEL CONSERVATION STANDARDS

The Northwest Power Planning Council adopted residential model conservation standards (MCS) in 1983, which were intended to be in operation throughout the region by 1986. The standards called for new residential structures to have heating requirements less than one half the level required by conventional construction as of 1983. In theory, areas within the Pacific Northwest which did not adhere to the standards by 1986 were to be subjected to surcharges of up to 10% on the price of wholesale power purchases from the Bonneville Power Administration.

City of Tacoma

The first governmental body in the region to adopt the MCS was the city of Tacoma, a community of about 200,000 people about 50 km south of Seattle. In 1984, the city council implemented the standards throughout the city limits. These were expanded in 1985 to include areas outside the incorporated city which were served by the Tacoma municipal lighting system. This was the first utility-imposed efficiency standard in the region. It was challenged by builder groups, but the utility prevailed in court. While enforcement may have been somewhat lax, this requirement did succeed in greatly improving the level of energy efficiency in new homes in the Tacoma area.

Super Good Cents

In an effort to encourage higher efficiency and to train builders in efficiency construction techniques, the Bonneville Power Administration initiated a program called "Super Good Cents" (SGC) in 1984. It provides for payments of up to $2000 to builders who constructed electrically heated homes meeting the SGC standards. The program has remained in operation since that time. After seven years of operation, the program is still only reaching about 28% of all new electrically-heated single family homes, 26% of new multi-family apartment units, and 8% of new factory-built homes.

CODES AND INCENTIVES FOR COMMERCIAL STRUCTURES

Commercial structures are much more complex than residential buildings, and it is more difficult to design and implement building codes to achieve desired energy efficiency in this sector. Although there is a commercial MCS, it is not nearly as strict as the residential MCS. Various other approaches have been attempted to improve energy efficiency in new commercial buildings in the region.

Design Assistance

The Design Assistance programs are of the greatest interest to energy consultants. The programs operated by different electric utilities have different names, such as Design Plus, Energy Edge, and Energy Smart Design. In each of these programs the utilities pay for all or part of the cost of professional design assistance to builders of new commercial buildings in order to ensure that cost-effective conservation measures are evaluated. The builder is responsible for the actual cost of installing the measures, but they are often very inexpensive.

An evaluation of the design assistance program by the Washington State Energy Office concluded that only about half of the recommended cost-effective measures are installed. Building aesthetics, personal preferences of builders and designers, and continuation of past practices all were influential in the rejection of cost-effective measures. While design assistance has the potential to become a valuable tool, in the absence of conservation financing mechanisms or mandates of any type, it does not accomplish the goal of ensuring that all cost-effective measures are installed.

For example, improved lighting efficiency may mean installing fewer fixtures, and reduced lighting energy levels can reduce the need for air conditioning capacity. In many cases, the increased energy efficiency reduces the initial cost of construction, and also reduces annual operating expenses.

UTILITY CONNECTION CHARGES AND STANDARDS

Mason County Public Utility District #3 Hookup Charge

Frustrated with slow progress on adoption of statewide energy codes, the Mason County Public Utility District (PUD), which serves about 20,000 customers in Washington state, adopted a $2000 hookup charge for new homes which do not meet the MCS. It was intended to recover the portion of the costs of serving inefficient structures which are not recovered in current electric prices. A novel aspect of the Mason PUD approach is that it applies equally to conventional site-built homes and to factory built housing which is brought to the site by truck. Efficiency requirements for factory-built homes are governed by federal standards, not by the states. The Mason PUD approach circumvents this preemption because is not technically a "standard." Mason PUD operates the Super Good Cents program, so home builders and buyers are faced with a choice between receiving a payment of $1000 - $2000 if they build homes which meet the MCS, or paying a penalty of $2000 if they do not.

In 1990, the first full year of operation, the Mason PUD hookup charge reached approximately 98% of conventionally built housing, and 85% of new manufactured housing units. This is a much higher rate of achievement than any of the incentive programs such as Super Good Cents alone have achieved. It is important to note that with such high participation rates, the program is producing virtually no revenue. This is consistent with the goal of the utility to achieve the desired efficiency, rather than to collect high surcharges.

The Mason PUD approach is currently being considered by a number of other electric utilities in the region. Clallam County PUD, another small electric utility in Washington, simply imposed an absolute ban on new connections of homes which did not meet the MCS. This was in effect for about a year before an improvement in the state building code which achieved nearly the same level of efficiency took effect in July, 1991.

Snohomish County Public Utility District $200/kw Progressive Charge

The Snohomish Public Utility District, which serves some 200,000 customers in the fast-growing area north of Seattle, is considering numerous strategies to reduce the rate of growth in electricity demand. These include participating in the Super Good Cents residential program, the Energy Smart Design commercial program, and even a cooperative (and very controversial) venture with the local natural gas distribution utility to shift electric water heating to natural gas.

The utility is currently considering a service connection charge for new commercial buildings which would be based on the requested level of peak service. The basic connection charge would be $200 per kilowatt. While significantly less than the cost of facilities needed to serve growing loads, this is an amount sufficient to gain the attention of builders, and is often an amount sufficient to cover the cost of energy efficiency measures. If builders reduce the demand of a new building on the utility they reduce their initial costs by $200 multiplied by the reduced demand. Depending on the conservation alternatives available for a particular building, the cost of doing so may be significantly less than $200 for each kilowatt of demand reduction.

Under the proposal now being considered, this $200 amount would be reduced to $150 per kilowatt if the builder agreed to participate in the Energy Smart Design program to identify cost-effective conservation options. It would be further reduced to $50 per kilowatt if all cost-effective measures identified in the design assistance process were installed. The fee would be completely waived if all cost-effective measures were installed and the building owner agreed to make at least a portion of the connected load subject to interruption during the highest peak hours of the year.

Mason PUD #3 Commercial Line Extension Policy

Mason County PUD #3, the same utility which implemented the connection charge for new residential structures not meeting the MCS, is now considering a similar approach for new commercial customers. Currently the utility typically extends service to commercial customers, including distribution line extensions, transformers, services, and meters, at no direct charge. Under the proposed policy, where customers do not install all conservation measures determined to be cost-effective as a result of a design assistance program, they would be required to pay the entire cost of the service connection. The current policy would apply to those buildings where all cost-effective conservation measures are installed.

New School Design Standards

The state of Washington is currently experiencing rapid population growth, and there is a continuing need for new public schools. Nearly 300 locally controlled school districts are responsible for the construction process, but a large portion of the construction and operating funds are supplied by the State. The state Superintendent of Public Instruction, in cooperation with the Washington State Energy Office, adopted rules in 1990 which require that designs for new public schools be subjected to engineering analyses of cost-effective lighting, heating, and cooling alternatives. A life-cycle costing approach is used to determine cost-effectiveness over the entire useful life of the building.

The standards require approximately 30% greater efficiency than the level permitted by the current commercial building codes. Any increase in state control typically meets some resistance among school districts which historically have enjoyed a greater measure of local control, but the design review process is in place and appears to be working reasonably well. While there is not enough data available to conclude that the savings are as expected, it is clear that lighting levels have been reduced, that use of electronic ballasts has increased, and that the use of electric resistance heating has declined in favor of greater use of natural gas compared with patterns in existence before 1990.

APPLICABILITY IN EMERGING EASTERN EUROPEAN MARKET ECONOMIES

Eastern European economies are characterized by inadequate and inefficient electrical generating capacity, a need for massive construction and reconstruction of residential units and commercial buildings, and limited capital availability. Clearly it is economically unsatisfactory to limit energy efficiency investments in new buildings if the result is to require much larger capital outlays and operating expenses for new electrical generating capacity. In a planned economy (in theory), these tradeoffs between capital investment in a building and capital investment in the utility sector are given full consideration. In a market economy, they probably will not. The ability of these economies to grow may depend on the efficient allocation of capital -- an outcome which is unlikely to occur without some method to ensure that builders take the impacts of their decisions on the utility sector into account when designing and constructing new facilities.

Design assistance programs, incentive payments, and codes have all proven relatively ineffective at achieving cost-effective energy goals. Connection standards and connection charges based upon the amount of connected electrical load have been far more effective.

CONCLUSION

Building codes are only one of a number of strategies available to encourage residential and commercial energy efficiency, and their effectiveness is constrained by political considerations. Incentive programs, such as Super Good Cents, which provide funding for greater energy efficiency, but do not mandate increased efficiency, are beneficial, but do not typically achieve high participation rates. Other options, such as hookup connection charges and standards, which force builders to make decisions on energy efficiency early in the construction process, are proving more effective at achieving desired energy goals. By *internalizing the cost of inefficiency* into the builder's costs, hookup charges appear to be a way to achieve a cost-effective market response to energy costs.

If a policy goal is to achieve all cost-effective conservation measures, a system of connection standards and inefficiency surcharges may prove extremely effective at motivating the marketplace.