MARGINAL COST ELECTRICITY PRICING

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Abstract

Historically, electric utilities have enjoyed relatively stable or declining marginal costs for new electric generating units, and (2) relatively stable or declining primary fuel prices. In the 1970s, these favorable conditions changed dramatically and with little forewarning. The price of natural gas and oil skyrocketed with the formation of the OPEC cartel and the ensuing embargoes. Interest rates on bonded capital, high environmental costs, increased capital costs of new generating plants, and the historical rate increases were all due to high levels of economic activity and the influx of people seeking jobs. Mega-trend cities such as Austin, Texas experienced annual growth rates of 15-20 percent in demand in the early 80s.

Marginal Cost Electricity Pricing

In the United States, we have essentially deregulated oil, gasoline, and natural gas and price these close to their marginal cost. Not so with electricity. The 1984 average price was 6.5¢/Kwh. But the replacement cost is about 12¢/Kwh. Why? Electric utilities are regulated monopolies; and regulators don't want to see them make obscene profits on cheap, depreciated dams and power plants. Therefore, we make them sell electricity at average cost. This of course signals users not to use electricity at more than 6¢/Kwh, and hence demotivates their investment in efficiency and renewables. So, electric demand grows; and we build more expensive new plants paid for by the increased ratepayer-cost the builder of new electricity guzzling buildings.

In principle, the solution is easy. Bill the customer at marginal prices. One marginal pricing solution with tremendous potential for immediately reducing electric demand and encouraging builders to construct efficient new buildings is capital recovery fees (CRF).

Capital Recovery Fees

CRFs are a form of hookups fee similar to those used to finance new water and waste treatment plants and are paid prior to new services being connected. CRFs can be structured to prepay the marginal-capacity related costs required to provide the service. Hookup fees for new buildings normally cover only the cost of the service drop and meter. The cost of distribution, transmission and generation plants are embedded in a historical rate structure. Assessing a CRF based on the connected building load is one means of making growth "pay its own way" while simultaneously providing an economic incentive to builders and owners to optimize the economic efficiency of new buildings. Less efficient buildings with higher peak demand would be assessed (penalized) more for a hookup fee than their more efficient counterparts to reflect the additional capacity required.

For the first time, higher than their average costs. At the same time, utilities in sunbelt states such as Texas were experiencing tremendous new load growth due to high levels of economic activity and the influx of people seeking jobs. Mega-trend cities such as Austin, Texas experienced annual growth rates of 15-20 percent in demand in the early 80s.

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CAPITAL RECOVERY FEE OBJECTIVES

The objectives of a properly designed CRF would be to:

- Optimize the efficiency of new building loads on the system,
- Send the correct pricing signal for new electric demand by reflecting the marginal cost of new capacity,
- Provide a significant new source of capital for electric utilities,
- Shift a portion of the debt burden for new plants from the utility industry to the building mortgage market,
- Avoid unreasonable discrimination among ratepayers and builders, and
- Be easily understood and administered.

The last two objectives — being easily understood and avoiding unreasonable discrimination — are key objectives for any kind of new utility rate structure. The achievement of these objectives often requires tradeoffs between the utility, ratepayer, and society.

BENEFITS OF A CAPITAL RECOVERY FEE

The benefits of a CRF to a utility and its customers are numerous. By recovering the marginal capacity related costs from new customers through a CRF at the time of new meter connections, a utility would be better able to:

- Defer or avoid the need for new generating capacity,
- Lower their requirements for new capital by the amount collected through CRFs,
- Reduce peak demand for existing plants,
- Avoid using expensive fuels in peaking plants, and
- Decrease their need for higher revenue (rate) requirements.

Potential Peak Savings. The potential for deferring the need for new generating plants in areas of high economic growth such as Texas is tremendous when one considers the savings that are technically and economically possible in building shell improvements and HVAC systems. The 1984 Public Utility Commission of Texas long-term electric load forecast for twenty generating utilities in Texas predicts a net system capacity increase from 55,000 MW in 1983 to 75,500 MW in 1993 — or a 20.5 Gigawatt (GW) increase. This is based upon the life cycle cost of buildings. The benefits to the building owner and/or occupant would be:

- Lower rate of energy consumption,
- Lower overall utility bills as a result of prepaying the capacity charges at the time of hookup, and
- Increased building value and return-on-investment.

DESIGN OF A CAPITAL RECOVERY FEE

The success of a CRF in financing new demand and improving new building power requirements depends upon proper rate design and an equitable allocation among new and existing customers.

Magnitude of a CRF. The level of a CRF should accurately reflect the relative difference between the incremental costs (the cost of adding new capacity) and the average, or historical costs. The marginal cost of serving the next customer can be determined on a dollar per KW basis and could range from $200 to $2,000 per KW depending upon the type of new generating plant being deferred.

The residential and commercial sector in Texas accounted for 65 percent of the total electric peak load in 1983. Buildings account for approximately 90 percent of the residential demand and 45 percent of the commercial demand. With a system peak of 44 GW in 1984, it is easy to extrapolate building demand to be 20 GW or 45 percent of the total system peak. With a forecast of 20.5 GW needed by 1993 in Texas and the assumption that buildings will continue to contribute to 45 percent of demand, new building demand will account for 9.23 GW of the new demand.

Estimates of the technical potential for commercially available improvements in new building construction by building scientists range from 25 to 70 percent. A recent study conducted at Lawrence Berkeley Laboratory stated that by investing at the margin through CRFs, the potential would obviously be even greater.

If one assumes a very modest 25 percent efficiency improvement in buildings at the margin through CRFs, Texas could easily defer 2.5 GW (25 percent of the 9.23 GW forecasted increase attributable to buildings) or the equivalent of four and one-half 500 MW power plants at an average cost savings to the ratepayers of $4.5 Billion over the next ten years. This is mega-savings even in Texas where big is normally something to brag about.

Benefits to Building Owners. Building designers, builders, and owners subject to the marginal cost pressures of a CRF would be prompted to abandon the least "first cost" approach of building design to seek opportunities for building improvements based upon the life cycle cost of buildings. The benefits to the building owner and/or occupant would be:

- Lower rate of energy consumption,
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Present APPROACH. The best way to focus the
attention of builders on the design of low peak
power buildings using CRFs, without causing an
inordinate disruption in the market value between
new buildings and old buildings, would be to phase in
new charges for at least 50 percent of the cost
commitment to new generation. This would help
prevent the 'windfall profit' resulting in CRF's being assessed
to new buildings. It would also help increase
initial acceptance by lowering the initial dollar
impact.

Application of the CRF. A CRF should be
allowed to the class of new customers causing the
new demand. Since most new buildings are either
residential or commercial, it is reasonable to limit the
charge to those customer classes for simplicity
and ease of administration. It should be paid only
once by a customer for a given level of connected
load.

Varying the CRF Charge. To send the proper
marginal pricing signal, the CRF should be increased
to those buildings with higher peak loads. If the
peak design load for a new residence is 50 percent
less than its less efficient competitor, then the
CRF should also be 50 percent less. Assuming a CRF
of one dollar per watt, a new low power building of
two KW of connected load would pay a $2,000 CRF
times a 50 percent phase-in factor or a total of
$1,000. A new building with 4 KW of connected load
would pay twice as much or a fee of $4,000.

Experience of Other Utilities with CRFs. the
issue of hookup fees to recover the marginal-
capacity related costs for new demand in not new
-- only the concept that it should be varied within the
customer class based upon the level of connected
load as an economic stimulus for efficient building
strategies. In October 1980, San Diego Gas and
Electric Company petitioned the California Public
Utility Commission for authority to begin a $2,000
"connection charge" for all new residential meters
based upon the cost of the new service and the
premise that existing customers should not subsidize
the higher costs for new customers. Although the
California PUC denied imposition of the connection
charge based upon insufficient evidence to support the
request, they did find that a properly designed
connection charge was lawful.(5)

In August 1984, the Electric Utility Commission of
the City of Austin, Texas, requested Electric
Utility Department staff to study the possibility of
increased hookup fees designed to help new customers
pay a fair share of the rapid system growth by tying
the fee to the level of building consumption and the
city's new base energy rating system.(7) In June
1985, the Austin City Council approved an increase in
residential and commercial hookup fees to pay for
the new transformer. The old fees only paid for
the meter and service drop. New commercial fees increased
from $250 to $400 for the lowest level of demand and
from $600 to $1,200 for the highest demand. The
maximum commercial fee jumped from $6,935 to
$14,000. The new fee structure is expected to raise
$15 million in PAB and require that new commercial
customers pay 100 percent of the hookup cost.

Austin's fee structure stops at the transformer and
does not extend to the distribution and generation
system as a CRF would.(8)

Potential IMPLEMENTATION PROBLEMS

Several potential problems arise when designing a CRF that is simple, justifiable, and
does not unduly discriminate among existing and new
customers. Some of the major problems are:

- Insuring that an involuntary contribution of capital to an investor-owned utility
  through a CRF does not violate constitutional
guarantees against undue
discrimination.
- Preventing the windfall profit to owners of
  existing, inefficient buildings after
  CRFs are imposed on all new units.
- Controlling administrative costs while
  identifying which new customers are
  causing an increase in demand.
- Determining accurately the amount of new,
  connected load upon which a variable rate
  CRF can be applied.
- Discriminating against large buildings
  versus small buildings.
- Conveying a "no growth" signal to new
  industry and commerce.

Solving the administrative and equity issues will
determine the ultimate potential to be gained
through applying CRF's to buildings at the time
of new service.

CONCLUSION

We presently live in an age of expensive new
electric generating plants and relatively cheap
efficiency. The potential for deferring new
electric plants through the charging of Capital
Recovery Fees to all new residential and commercial
buildings is significant. Adoption of a CRF could
potentially defer up to 4,500 new 500 MW generating
plants in Texas over the next ten years. The long-
term economic benefits to the end-consumer and
utility would far exceed the implementation
difficulties.

REFERENCES

(1) Cecil, E.A., Schmidt, M.B., Yeak, R.W., Retail
    Rate Design for Publicly Owned Electric
    Systems. American Public Power Institute,
    1984.
(2) Long-Term Electric Peak Demand and Capacity
(3) Edison Electric Institute, Statistical


McCann, B., "Electricity Fee for New Users is Reconsidered", Austin American Statesman, Austin, Texas, August 6, 1984


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