DETERMINATIONS ON RATEMAKING STANDARDS

STANDARD 1 - COST OF SERVICE

I. Standard Under Consideration

Cost of Service - Rates charged for providing electric service to each class of electric consumers shall be designed, to the maximum extent practicable, to reflect the cost of providing electric service to such class.

II. Observations and Findings

Consideration of this standard has been made in light of the principles set out in section 115(a) of PURPA that the costs of providing electric service to each class of electric consumers shall, to the maximum extent practicable, be determined on the basis of methods which shall permit identification of differences in cost-incurrence attributable to (1) daily and seasonal time of use and, (2) differences in customer, demand, and energy components of cost. Section 115(a) further provides that entities prescribing such methods shall take into account the extent to which total costs are likely to change if (a) additional capacity is added to meet peak demand relative to base demand and (b) additional kilowatthours of electric energy are delivered to electric consumers. These costs are generally referred to as marginal costs, as contrasted with average or embedded costs.

Standard 1, Cost-of-Service, was practically uniformly supported in the Record. There was, however, considerable difference of opinion as to whether fully allocated average embedded (accounting), or marginal costs should be used for rate design. TVA has had experience with both methodologies.

Marginal cost pricing is now being advocated by some to achieve economic efficiency or efficient allocation of society's resources. According to economic theory, efficient utilization of resources is achieved when price, which represents society's value of the last unit consumed, exactly equals marginal cost, the opportunity cost or the value of the resources used in producing that unit.

Major problems are encountered, however, in applying marginal cost pricing to the current situation. One major practical problem is that pricing all sales of electricity at marginal cost will result in revenues which do not match the revenue requirement needed to meet the embedded costs incurred by the electric system. In fact the long-run marginal costs do not match the embedded costs, thus too much money would be collected using a pure marginal cost rate, contrary to the TVA Act requirement that rates be kept as low as feasible. One approach would be to charge the higher marginal costs to consumers who are more likely to respond by changing consumption and reduce rates below marginal costs to consumers who are unable or unwilling to change their consumption, whatever the price. This method would be difficult to apply, however, because it requires more detailed information on demand elasticities than can now be obtained.

Another method suggested would be to use marginal costs and then reduce the rate components in each class enough to meet the revenue requirement. Although more practically appealing, it is not clear that such rates would promote more efficient use of electricity. There would be a loss in the accuracy of the price signal from rates developed by this method, especially where they do not reflect different costs for different times of use and when consumers are billed only on a kWh basis.

Because of these problems associated with marginal cost pricing, marginal costs should not be the basis for determining TVA's revenue requirements. Average embedded costs were generally endorsed for determining TVA's total revenue requirements and they are more in keeping with the requirements of the TVA Act. Moreover, it is believed to be appropriate to continue to use average embedded costs for determining revenue requirements for each class of service. Although some participants argued that the revenue problems with marginal costs could be overcome by various kinds of special adjustments, such an approach could lead to disruptive swings in revenue requirements for the various classes.

Marginal costs are, however, an appropriate tool in designing rates in keeping with TVA's traditional use of marginal costs to shape the design of rates to properly reflect cost conditions even though revenue requirements for each class of service should be determined by average embedded costs. Some questioned whether it is appropriate to use marginal costs in retail rate design if they are not employed in setting class revenue requirements, but there is no reason not to do so. Marginal costs, in this context, are merely a tool in better designing a rate in accordance with the actual costs particular consumers impose upon the system given a particular revenue requirement. Such rates will not only be equitable but will serve to encourage consumers to take actions contributing to efficient use of electric power facilities and resources in the TVA region.

Both long-run and short-run marginal costs should be considered in order to gain a full understanding of the current and future capacity situation and how costs are likely to change in the future. The decision on whether to reflect short- or long-run marginal costs through rates may vary depending on the particular cost and capacity circumstances. Studies and refinements of marginal costing techniques should be continued in developing methods most appropriate for the TVA system.

When the change in total cost associated with producing one more unit of electricity is considered in rate design on a time-differentiated basis, system benefits may be realized even if rates do not precisely track these costs due to a predetermined revenue requirement. Reflecting the differences in costs between peak and offpeak hours is important. Short-run marginal costs seem particularly appropriate from a practical point of view for designing time-of-day rates because they reflect the cost of producing additional energy at various times of the day.

It is recognized that it is possible to design time-of-day rates utilizing only average embedded costs. However, time-of-day rates reflecting average embedded costs do not as accurately signal to the consumer the cost consequences for the electric system of his consumption decisions as do such rates based on marginal costs. Moreover, the Record indicates that rates based on short-run marginal costs should ensure that incremental changes in system revenues more closely track incremental changes in costs. In addition, time-of-day rates reflecting marginal costs are appropriate for use in conjunction with cogeneration, load management, and other types of dispersed power production.

In summary, embedded costs should be continued as the basis for determining class revenue requirements. However, marginal costs are an appropriate tool to be used in the design of retail rates. The proper combination of both types of costs should lead to more efficient utilization of electric power facilities and resources, conservation of energy, and equitable rates by reflecting, through the rate structure, the costs being imposed on the TVA system.

Several advocates of marginal costs believe a major problem with basing class revenue responsibilities on average embedded cost determinations is TVA's use of the single annual coincident peak method as the basis for allocating virtually all embedded fixed costs, especially in view of the capital intensive nature of TVA's nuclear plants and the cost of money to finance them. This method assumes that capacity is built to meet the 1-hour single annual peak load and, therefore, the cost of this capacity is allocated based on each consumer group's contribution to this peak. It was argued that this method ignores the fact that a high cost baseload plant such as those now being constructed on the TVA system is built not only to provide peak capacity but also to provide energy for periods of long duration.

Baseload plants with high capital costs and low energy costs will only be built if load conditions are such that the plant can be run continuously. Thus, baseload plants are built when additional load growth is projected to have a high load factor. If additional capacity is needed for only a short duration around the system peak, then a peaking type unit with lower fixed costs would be added. On the TVA system, which is adding capital intensive baseload nuclear plants, it was argued that too much of the capital costs is being allocated through the coincident peak demand allocator to those groups that are not necessarily causing TVA to incur such costs. Some, although not all, marginal cost methodologies take into consideration that the capital costs of baseload plants are not entirely capacity related, but are also energy related.

Historically, TVA has allocated most of the embedded fixed costs of generation and transmission on the basis of class contribution to the one hour annual winter peak since TVA has been a winter peaking system. Because the residential load is greatest at the time of the system winter peak, the coincident peak method allocates a greater portion of fixed costs to the residential class than other methods.

In recent years, however, TVA's summer peak load has been growing at a rate faster than, and is now approaching, the winter peak load. Projections indicate that the summer load may equal or surpass the winter load within the next few years. When winter and summer peaks are of similar magnitude, allocating class demand responsibility according to a single annual peak becomes less appropriate.

One relatively well known alternate methodology that was suggested to allocate embedded fixed costs is the average and excess method. This method allocates a portion of embedded fixed costs based on the energy requirements of each class and a portion of the costs based on the class demands. Thus, the average and excess method recognizes that baseload plants were built to provide both capacity and energy requirements.

Another recognized option would be to move to the average summer and winter coincident peak allocation method, which takes account of the fact that capacity is not installed solely to meet the annual peak but that other months may contribute to capacity requirements. Under this approach there is an averaging of the demand responsibility of the classes between the two seasonal peaks. For a system such as TVA's, which because of changing conditions now anticipates two comparable sharply defined seasonal peaks, the average summer and winter coincident peak method appears most appropriate and should be implemented by 1982. In a related matter, some argued that the single annual coincident peak method also incorrectly allocates the interest on Construction Work in Progress (CWIP) among customer classes. The method used in allocating all other fixed costs is the most appropriate method for allocating interest on CWIP among the consumer groups.

Allocation of these embedded costs by time-of-day was also recommended by some as a way to more equitably allocate fixed costs. Insufficient analysis is available at this time to fully evaluate such an approach, which would be a considerable departure from TVA's historical treatment of demand allocation. TVA will continue to investigate this and other approaches to cost allocation in order to determine which is most appropriate.

Several questioned whether the Chattanooga Load Research data should be used for determining consumer load characteristics for the entire TVA system. TVA presently has underway an expanded load research program that will provide substantial additional data on system loads. When this program is fully implemented, TVA's load research data base will consist of over 4,000 points on several widely dispersed distribution systems. Until the program is operational, the Chattanooga data, interpreted by appropriate weighting techniques, provide the best information available on consumer load patterns.

The Record indicates that under the present rate structures there have been significant disparities in the level of margin being received from the several service classifications. This has been the cumulative effect of the frequent adjustments to the rates for fuel and other cost increases that have occurred since the last rate structure change in 1977. The Record supports a return to a more uniform level of return from the several service classifications.

Such a move, however, should take into consideration any cost differences caused by variations in the supplier's risk in providing service. It has been suggested, however, that other methods exist for handling risk for industrial consumers including demand ratchets, minimum bills, and contract provisions. These additional factors will be considered in any evaluation of risk in moving toward more equitable margin levels.

The application of this standard will enable TVA to adhere to the practice of having rates reflect costs of service. TVA, however, under PURPA is required to determine, after an evidentiary hearing, whether a lifeline rate (a rate which provides certain service at less than cost) should be implemented for residential consumers. As discussed herein, TVA believes that rates reflecting cost of service and designed to encourage conservation are the most effective at helping to achieve the desired purposes. Unless the hearing on lifeline rates reveals something different, TVA on the basis of existing information does not believe that as a matter of policy it would be desirable on the TVA system to disregard costs and use lifeline rates. The determination on this matter must, of course, be made following the required hearing.

III. Determination

It is appropriate to implement the standard.

In implementing the standard, TVA will from time to time prepare fully allocated average embedded and marginal cost-of-service studies. The results of the fully allocated average embedded cost studies will be used in helping to determine the amount of revenues to be collected from each consumer class as well as being a factor in establishing rates pursuant to TVA's ratemaking responsibilities under the TVA Act. The demand allocator most appropriate at the time the study is conducted will be used for fully allocated average embedded cost studies. Variations in system costs by time of day determined from the marginal cost studies will also be used in establishing rates.

STANDARD 2 - DECLINING BLOCK RATES

I. Standard Under Consideration

Declining Block Rates - The energy component of a rate, or the amount attributable to the energy component in a rate, charged for providing electric service during any period to any class of electric consumers may not decrease as kilowatthour consumption by such class increases during such period except to the extent that the costs to the TVA system of providing electric service to such class, which costs are attributable to such energy component, decrease as such consumption increases during such period.

II. Observations and Findings

Residential - Residential consumers on the TVA system are presently billed under inverted rates in almost all cases, and thus this standard does not apply to this group. Some participants recommended adoption of a flat rate for these consumers. As indicated in the TVA Staff Report, implementation of flat rates for residential consumers would not encourage conservation. Therefore, the present rate structure as revised will be maintained for all residential consumers.

Commercial and Industrial - The elimination of declining block rates for general power consumers on the TVA system was generally supported by those commenting. The majority of those opposed to the continued use of declining block rates believe that this structure fails to reflect the true nature of the cost of providing electricity. The Record shows that energy costs do not decrease as consumption increases and no evidence was presented in the Record indicating a cost basis for declining energy charges when these charges include only energy costs. Many participants argued that declining block rates are promotional, thereby encouraging excessive consumption.

One participant maintained, however, that declining block rates approximately track costs for smaller users when both fixed and variable average costs are collected in a single charge per kWh. This participant went on to state that declining block rates can be inequitable in that the effect of varying levels of load factors on costs is not reflected in the rate and that this deficiency can be remedied by eliminating declining block rates and moving to a 3-part rate structure which collects fixed and variable costs through separate demand, energy, and customer charges. However, this method does entail higher metering costs.

Some argued that since high load factor industrial consumers take a larger share of their energy offpeak than onpeak, and since other data suggest offpeak costs to be lower than onpeak costs, declining block rates are cost justified. Even if high load factor consumers do use more energy offpeak than onpeak, however, it is believed that a time-of-use rate would more appropriately reflect costs than declining block rates. The decrease in the average cost of providing energy to these consumers is not because of the increased electricity consumed, but rather the time when it is consumed. Time-of-use costing and pricing reflecting the different load characteristics of consumer groups and consumers within each group would more accurately reflect to the consumer the cost consequences of his consumption than declining block rates.

The Record indicates that one situation that might call for declining block rates is when rates are based on marginal costs that are lower than the embedded cost revenue requirements. If elasticity of demand increases as consumption increases, then using the inverse elasticity rule, the charge for the initial block of consumption would be increased to bring in the embedded cost revenue requirement while causing the least change in consumption. However, the long run marginal costs are higher than embedded costs at this time.

While there was little substantive opposition to the elimination of declining block rates, there was a great deal of discussion about their proper replacement. The Record shows that rate forms other than declining block should be implemented if they are found to track costs adequately, and encourage conservation and efficiency while promoting equity. There are cost-based rate alternatives, specifically 3-part rates with flat energy charges for consumers who are demand metered, flat energy charges for consumers billed only on the basis of kWh and time-of-day rates, that can be implemented which meet these criteria.

One consumer believed that declining block rates should be replaced by inverted rates for all consumers. For commercial and industrial consumers, however, an abrupt movement from declining block rates to inverted rates could cause rapid increases in electric bills for a number of consumers and some attendant economic disruption. Furthermore, it is by no means clear that inverted rates reflect the marginal costs of TVA's nuclear plants now under active construction.

III. Determination

It is appropriate to implement the standard.

The existing rates for residential consumers will continue to have their present inverted block structure as revised. For commercial and industrial power consumers, with demands greater than 50 kW and less than 5000 kW, the current declining block energy charges will be eliminated and replaced with flat charges over three years. For consumers with demands less than 50 kW, flat rates will be phased in over time to avoid severe bill impacts. Additionally, commercial and industrial power consumers with demands less than 50 kW, who are currently not demand metered, will be continually monitored for possible application of a 3-part rate.

As discussed more fully in Standard 3, Time-of-Day Rates, voluntary time-of-day rates will be introduced for all general power consumers with demands less than 5000 kW as well as residential consumers. Time-of-day rates will be implemented for consumers with demands greater than 5000 kW after rate discussions with distributors.

TVA will continue to review system data for potential application of declining block rates if the cost situation warrants them.

STANDARD 3 - TIME-OF-DAY RATES

I. Standard Under Consideration

Time-of-Day Rates - The rates charged for providing electric service to each class of electric consumers shall be on a time-of-day basis which reflects the cost of providing electric service to such class of electric consumers at different times of the day unless such rates are not cost-effective with respect to such class.

II. Observations and Findings

Consideration of the standard has been made in light of the principle set out in section 115(b) of PURPA that a time-of-day rate should be considered cost-effective with respect to each class if the long-run benefits of such rates to the system and the electric consumers in the class concerned are likely to exceed the metering costs and other costs associated with the use of such rates.

The concept of time-of-day rates was broadly endorsed in the Record. In addition to encouraging conservation of energy and efficiency of use of facilities and resources, it was pointed out that equity in rates is enhanced in that consumers are being charged the costs of providing electric power that the system incurs at the time of their use. Moreover, such rates make consumers aware of the cost consequences of their consumption decisions, and thus provide them the opportunity to change consumption patterns and reduce utility bills.

One participant, while supporting the concept of time-of-day rates, specifically questioned whether such rates were appropriate for TVA. Using TVA's methodology for determining time-of-day rating periods, the participant came to the conclusion that only 1.6 percent of all hours could be defined as peak hours. Thus, the participant maintained that energy costs do not vary significantly on the TVA system, and the rating periods used for illustrative purposes in the TVA Staff Report did not track costs effectively. This conclusion apparently was reached, however, due to an incorrect understanding of the explanation of the derivation of rating periods contained in the Staff Report.

As discussed in the Record, the rating periods presented in the Staff Report were derived by analyzing the peak days of each season. Assuming a high correlation between loads and costs, it was determined that on the peak day for both summer and winter, all hours in which the load exceeded 90 percent of the peak adequately represented the hours of highest cost in each season on the TVA system for all days. This procedure did not provide that any hour during the year that was included in the onpeak period should exceed 90 percent of the seasonal peak. Rather, those hours that were determined to represent the onpeak period on the peak day would be the same set of hours of similar costs and apply to all days within each respective season.

In commenting, this participant indicated that TVA made the assumption that loads and costs are related and asserted that this may not be the case. In response to these comments, additional study of the appropriate rating periods was undertaken by TVA. The study included an analysis of both hourly system loads as well as TVA's hourly reducible power costs. TVA's reducible power costs, which are similar to short-run marginal costs, are the out-of-pocket costs that could have been saved had the last 100-megawatt increment of load not been served. The analysis showed that not only are costs highly correlated with loads, but also substantiated the rating periods presented in the Staff Report. Although the latter analysis yielded slightly longer peak periods, the hours closely followed those previously reported and represented a fine tuning of the previously selected hours.

This same participant also questioned some of the specifics of the design of one of the illustrative rates in the TVA Staff Report. The rate alternative specifically questioned by this participant is an example of the way in which marginal costs can be used in rate design. The generating units used to determine the marginal costs which form the basis of the rate in question were determined from TVA's cost compendium for generating units, which determines how generating units are economically dispatched to meet the load. Many factors affect the marginality of units on an electrical energy supplier's system. Among these factors are planned as well as forced outages, the type of generating plant, level of loading, and the quality of fuel. It is recognized that the same units are not always the system's marginal units, but the method employed to calculate these costs is reasonable and appropriate for the present. TVA will continue to evaluate and refine methods for determining offpeak as well as onpeak costs.

As discussed above under Standard 1, marginal cost analysis is a useful tool for rate design even though the resulting rates do not exactly match these costs because of revenue constraints. When other components of a rate are set at marginal cost, as is the case with the time-of-day rate in question, using a revenue requirement limitation to determine a final component is one method of revenue reconciliation. As pointed out in the TVA Staff Report, traditional embedded costing techniques also require a certain amount of analytical judgment to apportion certain costs; however, this does not invalidate their usefulness. Traditional rate designs are no more likely to be theoretically perfect than are innovative designs.

It is useful to recall that rate designs now considered traditional were quite innovative when TVA first put them into effect. Rate designs must reflect the present and future shape of TVA's costs, not the past, if TVA is to be true to the statutory mandate to provide electricity to its consumers at the lowest feasible price in the future.

Rate design should be guided by the most rigorous cost analysis possible. However, it was suggested in the Electric Utility Rate Design Study Reference Manual and Procedures for Implementing PURPA that the intent of PURPA was not solely that variations in time-of-day rates exactly reflect the time-of-day variations in costs of providing service. The intent was to structure rates so as to lower the peaks and fill the valleys of load curves and in so doing save on expensive peaking generation and support the three purposes of PURPA.

Potentially, time-of-day rates will offer considerable benefits for both TVA and consumers of TVA power, a fact recognized by some participants. These rates track costs more closely than non time-variant rates and consumption is priced more accurately. One obvious benefit to consumers is the opportunity to make rational choices of consumption levels during any period. If consumption or demand is shifted from onpeak to offpeak periods, then consumers can realize savings on electric bills. Such pricing also promotes load management and solar installations which reduce more costly onpeak consumption as well as other conservation efforts.

Additionally, if consumers respond to time-of-day rates as anticipated, the amount of additional capacity needed would be reduced, thus helping to hold down the rising costs of power. The magnitude of this benefit will be contingent upon the degree of consumer response to these price signals.

A major problem with implementing time-of-day rates is the additional cost associated with metering and billing consumers on the rate form. For most small consumers this can be a significant additional cost that must be offset by savings in electricity costs for such rates to be economical. This fact was stressed by several participants in this proceeding.

Several of those commenting asserted that TVA may have overstated elasticity estimates; i.e., the degree of consumer response to a particular rate, and underestimated the costs associated with implementing time-of-day rates. For example, one participant indicated that even though electricity prices increased by 243 percent between 1969 and 1979, average electricity consumption actually increased, thereby indicating that TVA's elasticity estimates were incorrect. Using TVA's elasticity estimates, this participant calculated that residential electricity consumption should have fallen by as much as 80 percent during the past 10 years. This participant, however, erroneously used nominal price changes in its calculations of the effects on electricity consumption. Elasticity estimates measure consumer response to changes in real prices; i.e., changes in electric rates after the effects of inflation are removed. Thus, the real price increase between 1970 and 1980 was only 55 percent. Additionally, other exogenous factors such as changes in incomes, the number of consumers, and the price and availability of alternative fuels also must be considered along with changes in price in estimating overall changes in consumption. These factors are considered in TVA's estimates of elasticity.

TVA recognizes that the studies and empirical evidence from which elasticity estimates, particularly those by time-of-day, are drawn are by no means conclusive. The elasticity estimates used by TVA, however, are generally consistent with those found in the literature on the subject. For example, TVA's own empirical estimates of price elasticities are within the range of elasticity estimates reported in a well-known survey by Lester D. Taylor which was published in the Bell Journal of Economics. Most data suggests, however, that time-of-day pricing will have some impact on reducing onpeak consumption and thus reducing the cost of providing electric service. It is generally agreed that long-run response to correct price signals will be greater than the short-run response. While caution should be used in evaluating such data, TVA should proceed with judicious implementation of time-of-day pricing while conducting additional research for accurate quantification of consumer response. As additional data become available, it will be utilized to evaluate and modify, if necessary, such rates as have been implemented.

It is useful to recall that no such data was available to TVA in the early years when it implemented its promotional rate design. TVA's innovation was successful not because it tracked costs precisely and accurately predicted consumer response, but because it generally reflected the downward slope of the cost curve.

The TVA system is currently a high load factor system, and the existing mix of power generating plants has been installed to serve such a system. The TVA construction program is devoted almost entirely to large nuclear baseload generation units with high capital costs, but low operating costs. The power system of the late 1980's and 1990's will function at the lowest cost for all consumers only if system load factor remains high. It seems both prudent and appropriate, therefore, to begin taking measures such as the phased implementation of time-of-day rates whose long-term effect will be to shape demand into a profile that can be most efficiently served.

In addition to questioning the elasticity estimates used by TVA, specific questions regarding other inputs into TVA's cost-effectiveness evaluations were also raised. For example, it was argued that TVA had not considered all the costs that would be experienced by TVA distributors such as greater meter reading expenses, data processing expenses, and increased payments in lieu of taxes when implementing time-of-day rates. There was disagreement as to the appropriate discount rate and cost escalation rate in determining the net present value of implementing time-of-day rates. Also questioned were TVA's capacity cost savings projected under an assumed load shift due to time-of-day rates. Additionally, it was pointed out that system costs and benefits resulting from the implementation of time-of-day rates for certain groups such as all new residential dwellings had not been fully evaluated.

TVA recognizes that there may be greater administrative and other types of costs associated with implementing time-of-day rates than originally estimated and has concluded that estimates of the cost-effectiveness of time-of-day rates for certain consumer groups are not adequately reliable. Therefore, TVA at this time will not mandate time-of-day rates for any residential consumer or any commercial and industrial consumer with demands less that 5000 kW, preferring to gain additional information as to consumer response to time-differentiated pricing by offering voluntary time-of-day rates for these consumers. Cost-effectiveness determinations will be made later in accordance with the parameters available at the time.

TVA has suggested that time-of-day rates should be available on a voluntary basis for consumers who also agree to participate in a load management, solar, or other such program that ensures benefits to the power system. It was suggested that, otherwise, only consumers who could realize savings with current consumption characteristics would opt for a voluntary time-of-day rate. Thus, TVA would lose revenue without any offsetting reduction in operating costs. While this may be true to a limited extent, many participants pointed out that consumers whose consumption is concentrated in offpeak periods are less expensive to serve than others. Thus, a time-of-day rate will provide a more equitable rate for these consumers. Voluntary time-of-day rates would also facilitate determination of consumer response to time varying price signals which will be useful in determining potential benefits from wider application of time-of-day rates.

For these reasons, time-of-day rates should be made available to all consumers with demands less than 5000 kW on an optional basis. Consumers opting for time-of-day rates, however, will incur the additional metering and billing costs that will be reflected in the rate.

The Record shows that it is appropriate to implement time-of-day rates for consumers with demands greater than 5000 kW. One participant objected to implementation of such rates for these consumers on the grounds that a specific cost-effectiveness evaluation had not been conducted. However, metering costs are the principal item that would keep time-of-day rates from being cost-effective, and metering capable of yielding a time-of-day bill is or will be shortly put in place for all consumers in this category. The additional cost of billing these consumers at time-of-day rates will therefore be negligible.

With respect to benefits, even though empirical evidence relating to consumer response to time-of-day rates is limited, the experience of other electric systems indicates that potential response to such rates is significant. Such response will result in system benefits through a reduction in the need for peaking capacity and more efficient utilization of baseload capacity. If TVA is to develop rates as fully reflective of costs as practicable, time-of-day rates should now be implemented for these consumers.

Participation of consumers with demands between 1000 and 5000 kW on time-of-day rates would seem to offer potential benefits to both TVA and consumers. As with the greater-than-5000 kW consumers, there are relatively few consumers in the 1000 to 5000 kW range, and additional metering costs are likely to be only a small portion of their total electric bill. Moreover, several of these customers already have time-varying metering in place. Therefore, TVA will continue to evaluate time-of-day rates for this group of consumers for possible later application. Additionally, TVA will encourage installation of time-varying metering for all consumers in this range. Such metering will not only facilitate current billing but also will provide useful data about the consumption characteristics of these consumers.

One consumer believed that since time-of-day rates encourage installation of residential storage devices which may consume more energy than conventional space conditioning systems, time-of-day rates are promotional. Rather than being promotional, this tends, as suggested in the Record, to shift consumption from peak to offpeak periods. This shift not only provides cost savings by reducing the amount of additional capacity that will be needed, but also in many cases serves to help conserve scarce resources. On the TVA system this could mean less dependence on oil, purchased power, and inefficient coal-fired units for peaking purposes and greater dependence on more efficient coal and nuclear baseload units.

Some suggested that there are socioeconomic costs to consumers which result from the implementation of time-of-day rates. It was argued that for residential consumers these costs may include the inconvenience associated with deferring to offpeak periods chores, meals, and leisure time activities requiring the use of electricity. Additionally, industrial firms, trying to minimize costs, may reschedule production activities.

Residential time-of-day rates will not necessarily require any changes in lifestyle. Consumers who are unable or unwilling to use more power offpeak would simply continue to use power onpeak. However, these consumers would pay the approximate cost imposed on the system to serve them, and efficiency and fairness for all consumers would be advanced. If time-of-day rates are implemented concurrently with the application of load management techniques, then benefits to the power system are enhanced and consumers are assisted in shifting demands to offpeak periods with a minimum of inconvenience.

Many large industrial consumers expressed concern that higher electric bills would result from implementing time-of-day rates.

For most large industrial consumers, however, the higher costs from onpeak consumption should be greatly offset by the lower costs of offpeak energy. This is not to say that all industrial consumers will save money on time-of-day rates. However, time-of-day rates will more properly reflect to consumers the costs they are imposing on the system. It is unlikely that high load factor industrial consumers will receive significant impacts from the implementation of time-of-day rates. Depending on when use occurs, lower load factor industrial consumers could incur higher bills from time-of-day rates. However, these consumers are the group with the greatest potential to respond to such rates.

One participant recommended a methodology for determining the net benefits or costs of time-of-day rates which indicated even greater benefits than those shown in the TVA Staff Report. These results, however, may be optimistic when time-of-day rates are not used in conjunction with load management techniques due to assumptions concerning elasticity and the relationship of production costs to actual rates. Moreover, it was suggested that cost-effectiveness evaluations of time-of-day rates should attempt to identify incrementally all consumer groups for whom time-of-day rates are cost-effective. By the same token, however, evaluation should also reflect the declining marginal system benefits resulting from incremental implementation of time-of-day rates, particularly in combination with load management activities.

Some suggested that if TVA were to implement time-of-day rates, distributors of TVA power may experience some short-run adverse effects. These might include revenue fluctuations caused by a shift of a significant amount of usage to offpeak periods or demand shifts causing distributors to incur new peak loads. The proper design of a wholesale rate schedule should minimize the possibility of such occurrences and will be considered in rate change proceedings with distributors under the provisions of the power contract.

Some of those supporting time-of-day rates do so on the basis that they would be based on average rather than marginal costs. However, as explained in the discussion under Standard 1, Cost-of-Service, marginal costs should be considered in developing such rates.

III. Determination

It is appropriate to implement the standard to the extent feasible.

For all consumers with demands less than 5000 kW, time-of-day rates will be offered on a voluntary basis. Time-of-day rates will be implemented for all consumers with demands in excess of 5000 kW upon completion of rate change discussions with distributors. Prior to that time, TVA for at least a 6-month period will provide direct-served consumers a sample time-of-day rate bill calculation for comparison with billings under the existing rate. Distributors will also be encouraged to provide such calculations for their customers which will be affected by the implementation of the time-of-day rate. In addition to providing a basis for consumers to compare what charges would be under a time-of-day rate structure, a period during which dual calculations are made will provide an opportunity for TVA and distributors to develop efficient time-of-day billing procedures. Time-of-day rates for other consumer groups may be implemented at some time in the future.

STANDARD 4 - SEASONAL RATES

I. Standard Under Consideration

Seasonal Rates - The rates charged for providing electric service to each class of electric consumers shall be on a seasonal basis which reflects the costs of providing service to such class of consumers at different seasons of the year to the extent that such costs vary seasonally for the TVA system.

II. Observations and Findings

Rates designed to reflect seasonal variations in cost can help achieve efficiencies in the use of facilities and resources by allowing consumers to make more informed decisions concerning energy consumption. They can also help discourage growth of demand during peak use periods, thus decreasing the need for new generation capacity and helping to conserve capital.

The Record shows that most parties commenting on seasonal rates were in favor of the concept of cost-based seasonal rates because of the potential benefits which may be realized both by TVA and consumers where seasonal variations in cost occur.

There was also general recognition that there is no significant seasonal cost variation on the TVA system at the present time. The

TVA Staff Report contained information on seasonal marginal energy costs per kWh, seasonal average fuel and purchased power costs per kWh for fiscal year 1979, and forecasted capacity requirements. The staff did not find a significant seasonal variation in the overall level of costs.

There are two important aspects of cost variation which need to be taken into consideration, however: variation in the overall level of cost, and variation in the pattern in which cost is incurred. Rate designs traditionally have mostly reflected the overall level of costs. Certain rate designs such as time-of-day rates, give an increased role to the pattern in which cost is incurred. By tracking the pattern of costs more closely, it is believed that a more efficient use of the generation system will result. This should also encourage investment in load management techniques and dispersed power generation, both of which should lead to more efficient use of facilities and resources. Those commenting on this standard supported it, although some cautioned that the rates should not be made so complex that customers could not understand the rate schedules.

III. Determination

It is appropriate to implement the standard.

While there is no significant seasonal cost variation at this time, the TVA system is typically faced with very different daily load shapes in the winter and summer months. This suggests the need for different sets of onpeak and offpeak rating periods for the two seasons for time-of-day rates. In such case, time-of-day rates will be implemented on a seasonal basis in the TVA region. Similarly rates designed to be used in connection with load management techniques, such as heat storage, will reflect such seasonal variations.

STANDARD 5 - INTERRUPTIBLE RATES

I. Standard Under Consideration

Interruptible Rates - Each industrial and commercial electric consumer receiving TVA power will be offered an interruptible rate which reflects the cost of providing interruptible service to the class of which such consumer is a member.

II. Observations and Findings

Making available interruptible power promotes efficient use of facilities and resources. The capability to interrupt power use lessens the need for additional peaking capacity and improves system load factor, thereby promoting conservation of capital and lowering system costs. This provides an opportunity for both the consumer utilizing interruptible power and the TVA system, and thus all the ratepayers, to benefit through such cooperation in lowering system costs.

Among those commenting on this standard, the record shows almost universal agreement with the concept of offering interruptible power. There was some difference of opinion concerning which consumer groups should be offered interruptible power. Participants generally believed that interruptible power was effective and useful when offered to large consumers but did not consider it appropriate for the residential and small commercial groups. However, some thought that consideration should be given to making it available to residential consumers.

As the record indicates it is not now feasible to offer interruptible power to all consumers. Since the consumer must be notified before his power supply is decreased, usually by telephoning, only a limited number of interruptions may be effected in a limited time. Interruptions of a few small loads would not provide significant enough demand reductions to make the interruptions beneficial for the system.

However, some load control techniques are now being developed which, it is anticipated, will make it feasible for loads of numerous residential and small commercial consumers to be interrupted at the same time. There are load management techniques such as heat storage and appliance cycling which are discussed below under Standard 6. These require less direct intervention on the part of the power supplier, and so may be applied to large numbers of smaller consumers to obtain effective and significant load control similar to that achieved through interruptible power.

A number of participants discussed the amount of credit for interruption rights. One participant submitted a study based on the experience of an interruptible power consumer during 1978 which purports to show that the benefits to TVA derived from load interruption were not adequately shared with the customer. That study was not based on the type of interruptible power arrangements that have been offered by TVA since early in 1979. Moreover, to be accurate, a study of this nature would need to cover the entire interruptible power contract term and not just one year. The credit has been designed so that fair sharing of benefits occurs over the entire contract term, and not necessarily during any one year of the term, when power demand levels may require that power be interrupted at a rate greater than the contract average.

Others pointed out that as rates are adjusted upward, the value of the demand credit to interruptible customers is eroded. Another participant emphasized that flexibility must be retained in establishing the value of the demand credit. Still another view was that TVA must not set the credit so high as to subsidize interruptible customers at the expense of ratepayers generally.

TVA has recognized that consumers need assurance that the credit will rise as retail rates increase to ensure that the interruptible arrangements will be economical in the long run. Therefore, the current arrangements call for increases in the value of the interruptible credit after any change, modification, replacement or adjustment in the rates according to an established formula. Present contract provisions also allow for the escalation of the base interruptible credit when TVA determines that the value of the avoided costs have increased. In this way the amount of the credit can reflect actual savings to the TVA system.

TVA's use of consumers' load factors in calculating the effective interruptible demand permits the credit to reflect the reduced probability that a low load factor consumer's use will be coincident with the time the interruption rights are needed. While this practice resulted in one low load factor consumer questioning the fairness of present interruptible power arrangements, it actually reflects sound cost-benefit principles.

It should be noted that the value of the interruptible credit may change when offered in conjunction with time-of-day rates, load management, and other programs which potentially will alter the load shape and therefore affect the cost savings to the TVA system. Since the interruptible credit reflects expected cost savings, the credit should be periodically reviewed so that it may reflect cost changes resulting from time-of-day, load management, and other load shaping activities.

As expressed by some commenting on the standard, interruptible rates should only be offered on a voluntary basis since many consumers cannot efficiently use interruptible power.

III. Determination

It is appropriate to implement the standard to the extent feasible.

Each consumer, whether served directly by TVA, or by a distributor, will be offered interruptible power on a voluntary contractual basis in amounts equal to or greater than 5,000 kW, with requests for amounts as small as 1,000 kW being considered. The interruptible power arrangements now offered effectively align the credit with the benefits derived from individual consumers and are thus equitable to consumers. Interruptible power arrangements offered by TVA will continue to be reviewed to determine whether revisions would be appropriate because of changing circumstances.

STANDARD 6 - LOAD MANAGEMENT TECHNIQUES

I. Standard Under Consideration

Load Management Techniques - Each electric consumer receiving TVA power will be offered such load management techniques as TVA has determined will --

(A) be practicable and cost-effective

(B) be reliable, and

(C) provide useful energy or capacity management advantages to the TVA system.

II. Observations and Findings

As discussed in the TVA Staff Report, TVA has been examining a wide range of load management techniques. Included in these are cycling of air-conditioners, cycling of water heaters, cycling of central heating systems, heat storage systems, and storage water heaters. Each of these techniques, as shown in the Record, is potentially cost-effective for implementation in the TVA region. Many of the technologies under consideration are already in use by various power systems throughout the United States with information available on practicability and reliability. TVA has already initiated the first phase of a program to cycle central air-conditioners and electric water heaters. Other technologies showing potential for being beneficial to the consumer are undergoing additional planning, development, and demonstration before a decision is made concerning their general availability.

Consumer groups, industrial representatives, and power distributor representatives commenting on the standard generally supported the implementation of those load management techniques which prove to be practicable, cost-effective, reliable, and useful.

Comments by various legal services groups supported the implementation of load management techniques but suggested that special attention be given to the development of programs in which low-income consumers could participate directly. These consumers usually cannot afford to own central space conditioning systems, and therefore cannot participate directly in those programs involving the cycling of such systems. However, such consumers may be able to participate in other programs such as a program to control electric water heaters.

The Record also contains comments suggesting that load management techniques should be offered to consumers only on a voluntary or optional basis. This concept of voluntary participation is an integral part of TVA's load management philosophy and has been incorporated into all existing activities as well as into the planning of those potentially feasible programs discussed in the TVA Staff Report. It is contemplated that load management techniques offered in the future, consistent with the determination set out below, will be on the basis of voluntary consumer participation.

Some comments expressed concern about the use of offpeak rates as incentives to encourage the use of energy storage systems. Such incentives, whether provided in the form of offpeak rates or other programs, should not be provided to one class of customers at the expense of the other classes of customers. It is also recognized that the incentive offered should send the correct long-run price signal so that consumers will not be led to make a capital investment decision based on rate structures or incentives which may later be changed and make the equipment investment uneconomical. Detailed studies undertaken prior to recommendation of specific programs include the evaluation of a wide range of consumer incentives. Determination of cost-effectiveness includes consideration of the short- and long-term costs of any required incentive. Such programs will not be pursued unless the potential benefits of the program to all consumers of all customer classes exceed these costs, thus, assuring the stability of the incentives over the life of the program.

Another concern expressed about energy storage devices centered around the fact that such devices may actually use more energy than conventional systems. This may be true with many systems. TVA has demonstration tests underway to determine the reliability, efficiency, and cost-effectiveness of several types of heat storage systems. Results obtained from these tests will provide more information about energy efficiency and will be used to perform more detailed evaluations of heat storage techniques. In those cases where storage equipment may use more energy than conventional systems, it is still possible that these systems are advantageous to the power system and the consumer. Such systems may still offer valuable conservation opportunities since the energy used in these devices can be produced in offpeak hours by generating units which utilize coal and uranium fuels rather than expensive imported oil. Thus, the energy used in these storage devices costs less to produce and can be purchased by the consumer at a lower offpeak rate. Although more energy may be consumed, the use of storage devices may be economical for the consumer and the power system and allow conservation of valuable resources.

Some distributors and the TVPPA commented about the involvement of distributors in the implementation of load management programs developed by TVA. It should be noted that the evaluation to determine whether such programs should be offered includes analysis of the impact of the techniques on the distribution system as well as the generation system, thus including consideration of the impact on the TVA system as a whole. Direct load control activities are new cooperative arrangements and may require modifications through time in order to develop the most satisfactory program. For this reason, one of the objectives of TVA's first full-scale control program, the Air-Conditioning Cycling Program, is to work closely with the participating distributors in order to determine the adequacy of the operating procedures, control strategies, wholesale and retail rate design, and cooperative arrangements. Close coordination and cooperation in this project should generally answer the questions raised about potential negative impacts of load control projects.

TVA is working with distributors, through the TVPPA, on the development of a load management policy, including possible wholesale rate modifications which would take account of noncoincident demands. The formulation of this policy and possible rate modifications should help ensure that both TVA and distributor initiated load management activities are beneficial to the TVA system, the distributor, and the consumer.

III. Determination

It is appropriate to implement the standard.

TVA will continue its efforts to develop and implement those load management techniques which are consistent with the purposes of PURPA and meet the criteria established in section 115(c). Programs to implement such techniques shall be offered to consumers on the basis of voluntary participation.

The development and implementation of load management programs which are consistent with the purposes of PURPA can be readily accomplished through cooperative efforts of TVA and the distributors of TVA power. Evaluation to determine whether load management techniques should be offered will include consideration of the impact of the techniques on the distribution system as well as the generation system, thus including consideration of the impact on the TVA system as a whole. Load management activities will be constantly evaluated as they are implemented to determine any institutional or rate design changes necessary to make them function with better effectiveness and equity.

STANDARD 7 - SPECIAL ADDITIONAL CHARGE FOR NEW, ELECTRICALLY HEATED OR COOLED, ENERGY-INEFFICIENT HOMES

I. Standard Under Consideration

Effective six months after the commencement of TVA's forthcoming New Home Conservation Program, a special additional charge will be applied each month to the electric bill rendered for service to each new detached, single-family, electrically heated or cooled dwelling first connected to the system of a distributor of TVA power after the effective date, unless the residence has been surveyed for compliance with the objective standards established under the New Home Conservation Program and been determined to qualify for either a TVA Energy Conservation Award or a TVA Solar Award. The level of the additional charge will be designed to recover from consumers who occupy such energy-inefficient residences the additional cost imposed upon the TVA system by reason of failure to adequately weatherize those residences, but the additional charge will be removed upon the implementation of all the cost-effective weatherization measures recommended pursuant to a survey conducted under TVA's existing Home Insulation Program.

II. Observations and Findings

As the record shows, many new homes are not being constructed to incorporate the level of weatherization measures that would be cost-beneficial to their owners. There is ample data to suggest that using increased levels of weatherization measures, such as those included in the TVA Super Saver specifications, would result in new homes having a lower total cost of ownership and lower power demands on the TVA system. More energy-efficient new homes will reduce TVA's need to use expensive generating sources during peak times and will postpone the future need to build additional generating plants.

Those opposing the proposed determination expressed the view that traditional codemaking and governmental enforcement bodies should be relied upon to develop and enforce energy-efficiency standards for new buildings. It was further argued that sufficient Federal, State, and local codes are in force and that most new houses already undergo several inspections.

The Record shows that there is now a substantial and growing interest by State and local governments and by the home builder associations in improving weatherization standards in new buildings. Rather than unnecessarily duplicating the efforts of such governmental bodies and trade associations, TVA prefers to work with them in a voluntary program of public education and standards improvement.

TVA has traditionally conducted educational activities for its consumers on the efficient use of electricity. The home building industry has expressed a willingness to work with TVA toward this objective. In these circumstances TVA can promote the implementation of energy-efficient building standards for new homes and apartments through a program of public education.

III. Determination

Implementation of the standard is not considered appropriate at this time.

However, TVA will develop a program to promote energy-efficiency standards for new homes and apartments in conjunction with participating power distributors, home builder associations, home builders, local governments, lending institutions, real estate agencies, appraisers, and other Federal agencies. Use of the proposed standards will be voluntary, and TVA will promote their use through various efforts such as the following:

1. TVA will develop and maintain energy-efficiency standards known as Energy Saver standards for new homes and small apartments in conjunction with the participating home builder associations.

2. TVA and the participating power distributors and home builder associations will work together to encourage existing local government building inspection departments to inspect participating homes and small apartments in their jurisdiction for compliance with the Energy Saver standards.

3. Homes meeting the standards will be designated as Energy Saver Homes, and TVA will provide the builder with an Energy Saver sign for promotion of the house and an Energy Saver medallion to be attached to the house.

4. TVA and participating power distributors will work together to encourage architectural design firms and local government building permit departments to refer plans for large new apartment projects to TVA for technical assistance in meeting the ASHRAE 90-75 standards, and for further recommendations involving conservation of energy and solar energy designs.

5. TVA and participating power distributors will work with lending institutions, appraisers, real estate agencies, and participating home builder associations to obtain favorable loan qualification and appraisal considerations for homes designated as Energy Saver Homes and to provide technical assistance on meeting the standards.

6. TVA and participating power distributors will conduct public education campaigns on the benefits of building or buying an Energy Saver Home and will encourage the media to assist in this educational effort.

7. Home builder associations will be encouraged to participate in the voluntary promotion of Energy Saver Homes with TVA and to adopt specific goals for Energy Saver Homes as a percentage of all homes built by their members.