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# METERING FOR INNOVATIVE ELECTRIC RATES

## MANAGEMENT PLAN

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## Management Plan

The eight activities of this Project are designed to achieve the three goals listed in Article VI (Scope of Work) of the Cooperative Agreement between the Florida Public Service Commission and the Public Utility Research Center. The three goals involved:

(1) identifying and assessing metering products (including digital display devices) for load control, time-of-day pricing, and other innovative rates;

(2) investigating cutomer acceptance of alternative technologies and determining changes in electricity usage patterns stemming from innovative rates; and

(3) developing a cost-benefit tool which would allow State Regulatory Authorities to select cost-effective meters, and determine cost-justified prices for such devices.

### 1. Management Plan

The preparation of this Management Plan represents the first Activity of the Project. It was clear from the Addendum to the original Department of Energy Proposal that we needed a more detailed description of (a) methodologies to be followed, (b) variables to be modeled, and (c) the linkages among the various activites. The plan that follows represents our present view of how the Project will be organized. We recognize that the DOE and PSC will be providing regular feedback on our progress. As we gain further information, it may be necessary to modify the plan at some later date so as to achieve the three goals of the Project. Such modifications would only occur if there is agreement among the parties involved as to the desirability of such changes.

## 2. Selection of Innovative Rates

The innovative rate structures to be considered include time-of-day rates, flexible time-of-day rates, demand rates, and load management (interruptible) rates. Hybrid rates or different rates to customers with different consumption levels will be analyzed in Phase II of this project. Berg will review past and current DOE experiments and other utility studies. He will draw heavily upon the EPRI Electric Utility Rate Design Study (EURDS) for estimates of impacts upon customer group usage (pattern). Activity 3 (customer responses) will provide background information on this issue.

The key step to establishing specific rates involves translating the load shape changes into cost savings, which can then be used to calculate rates which reflect costs. For example, in the case of interruptible rates, the cost savings would determine the discount available to customers who adopted the rate (if the rate is voluntary). The price for customers remaining under the current rate structure would also be altered to reflect the costs of that choice. Similarly, in the case of time-of-day rates, there are a number of alternative rate determination methodologies. This component of the final model will be made flexible enough to incorporate future regulatory decisions on permitted costing techniques.

The main criteria for chosing from among the almost infinite-variety of innovative rates (and specific rate-determina-

TABLE 1

Bonbright's List of Traditional Ratemaking Objectives

1. Simplicity, understandability, public acceptibility, and feasibility of application;

2. Freedom from controversy about proper interpretation;

3. Effectiveness in yielding total revenue requirements under the fair return standard;

4. Revenue stability from yield to year;

5. Stability of the rates themselves, with a minimum of unexpected changes that are seriously adverse to existing customers;

6. Fairness of specific rates in the apportionment of total costs of service among customers.

7. Avoidance of undue discrimination in rate relationships;

8. Efficiency of the rate classes and rate blocks in discouraging the waste of resources while promoting all justified types and amounts of use

    a. By controlling the total amount of service supplied by the utility,

    b. By controlling the relative use of alternative types of service (peak versus off-peak electricity).

tion methodologies) will be Bonbright's listing of eight traditional ratemaking objectives (Table 1). First, the rates must be easily explained and understood. The second criterion, freedom from controversy is harder to meet, since every rate hearing nowadays has disagreements over proper cost allocations. Any movement toward innovative rates is bound to evoke stormy debate and court challenges. One side-benefit of this project would be to put bounds on the existing range of uncertainty with respect to customer impacts.

The next three criteria are important from the standpoint of the electric utility: revenue sufficiency, revenue stability, and rate stability. The structure of the innovative rates will affect the economic viability of the firm. This feedback will be incorporated into the cost-benefit model, since it establishes a constraint on rate structures. For example, the elimination of customer charges (in favor of a rate increment per kwh) may reduce revenue stability, since weather and income variability have significant impacts on kwh consumption.

The issues of fairness and avoidance of undue rate discrimination must also be confronted in the context of innovative rates. Cost-justification is central to the resolution of such issues, so our cost-benefit tool will contain a module which tests for undue rate discrimination. However, the main criterion will be economic efficiency - discouraging wasteful use of resources and promoting all cost-effective types of electricity use. Thus, the four types of innovative rates will be considered in terms of their impact on electric utilities and economic efficiency.

As can be seen from the time-chart, this Activity has three basic components, involving significant linkages at various stages of the Project.

Tis activity, the selection and estimation of innovative rates to be analyzed, is essential for estimating the cost-effectiveness of alternative metering systems. The six load management experiments now under way in Florida (see Table 2 ) vary in terms of incentive structures and availability of customer overrides. They illustrate the types of rate structures which regulatory commissions must be able to evaluate. Determining the differential rate that can be justified in terms of cost saving is a complicated process, requiring detailed information about load patterns, appliance saturation, customer characteristics, and other variables, including metering cost data. Initial efforts will focus on determining the availability of and appropriate format for the data. How price differentials will affect participation rates (considered in Activity 4) will be one factor in determining incentive structures associated with the innovative prices.

The methodological problems one must confront when estimating time-of-day rates have been debated at length in EPRI Rate Design Reports, including the recent Temple, Barker, and Sloan evaluation of four methodologies. This project will build upon work being completed by the Public Utility Research Center which applies the Cicchetti methodology for estimating time-of-day rates for Florida Power Corporation. Since the purpose of the project is to analyze the cost-effectiveness of alternative

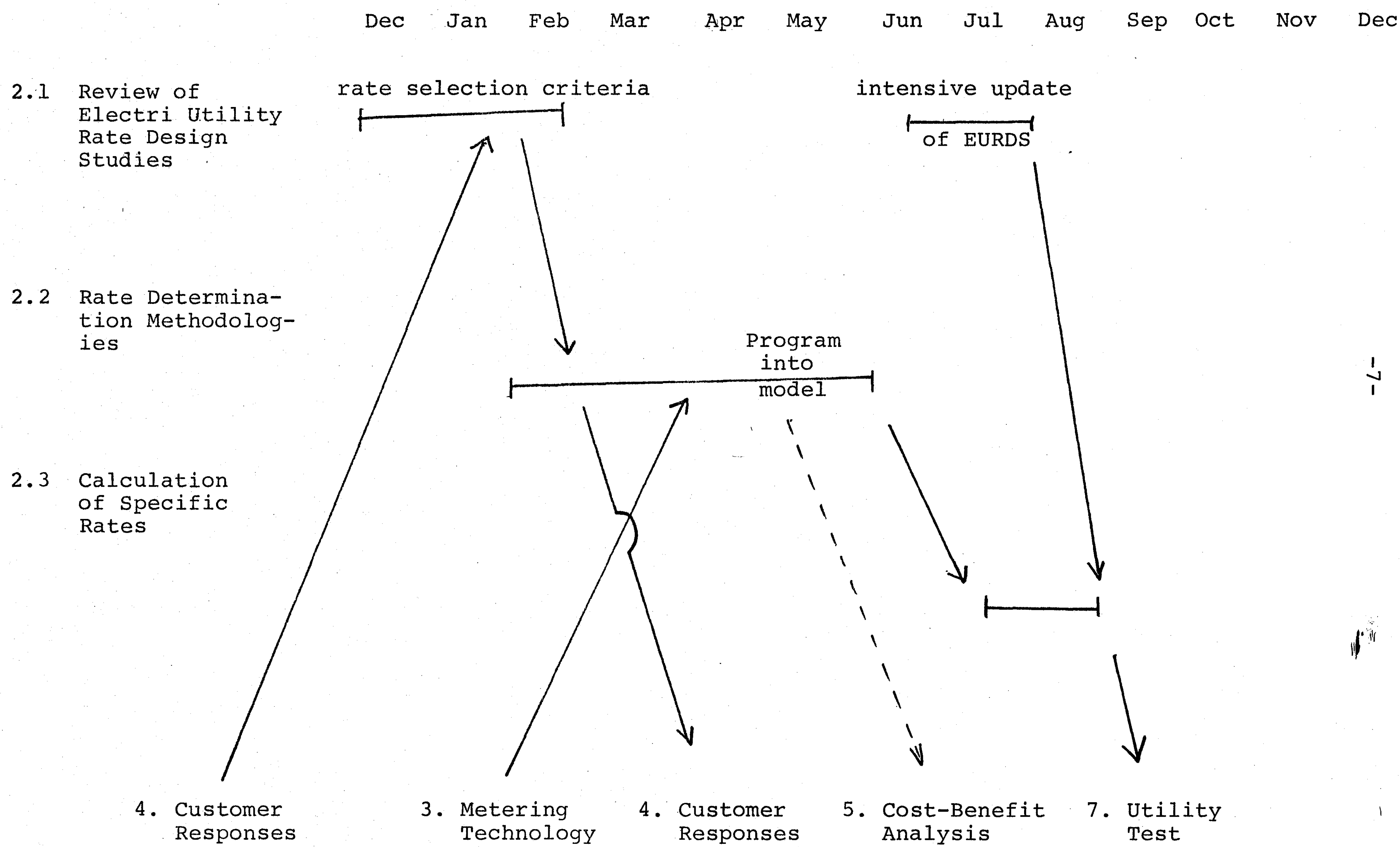
Table 2

## LOAD MANAGEMENT EXPERIMENTS IN FLORIDA

| COMPANY | TYPE | NUMBER OF CUSTOMERS | COMMENTS |
|---|---|---|---|
| lay County EA Coop. | Unidirectional Load Control of HVAC & W/H | 600 | One year of experience. |
| lorida Power orp. | Unidirectional Load Control of HVAC & W/H | 50 Residential W/H<br>50 RS W/H & HVAC<br>50 HVAC | Operational, 10/77 interim report filed. |
| lorida Power orp. | Unidirectional Load Control | 25 Commercial | Joint experiment with TECO, 7/1/79. |
| lorida Power orp. | Bidirectional Load Control | 125 HVAC & W/H in St. Pete<br>125 HVAC & W/H in Winter Park area | Not operational due to equipment problems. |
| lorida Power Light | Bidirectional Load Control | 125 HVAC & W/H in lower East Coast | Operational 5/1/79. |
| lorida Power Light | Bidirectional Load Control | 500 Optional T-O-D Rate<br>250 Load Control<br>250 Control Group | Expected operational Fall/1980. |
| Gulf Power Company | General Electric Comfort Control Center Load Management | 35 RS Good cents HVAC<br>35 RS HVAC | Operational 3/1/79. |
| Tampa Electric Company | Unidirectional Load Control | 25 Commercial | Joint experiment with Florida Power Corporation. |

(HVAC) Heating, ventilating, and Air Conditioning
(W/H) Water Heater
(RS) Residential Service

## Activity 2: Selection of Innovative Rates



metering (and price signaling) technologies for Florida, we are withholding judgement on which particular cost methodology is most logical or feasible for rate-making purposes. The first approximations we expect in the course of this project will then be refined as more informaion becomes available.

The estimates of appropriate innovative rates (which affect customer behovior and are affected by the cost-savings stemming from implementation) will be accomplished in three phases. After completing a review of current ERUDS studies and Florida experiments, the four rate determination methodologies will be identified and incorporated into the software. Later in this study, prior to cost-effectiveness comparisons, these rough estimates will be re-evaluated by PURC and refined to reflect state-of-the-art approaches to such rates. The calculation of specific rates for a particular Florida utility necessary for the utility test (Activity 7) will occur at the end of summer, 1980.

3. Metering Technology

The third activity, which runs parallel to the second requires close contact with manufacturers of metering technoloties and with utilities in the state. Contact with metering companies that produce the new technologies will be very useful in assessing the many different types of meters that are currently available and in many different types of meters that are currently available and in determining expected future metering developments. The experience of Florida utilities (and others involved in DOE or other experiments) will be used to provide realistic estimates of installation costs, reliability, and life-time for specific metering technologies -- each of which is associated with different price structures and time paths of customer participation.

The costs of communication/control technologies are in a state of flux, yet estimates are necessary if we are to implement either direct utility control of loads or indirect control via rate structure. Preset clock controleld switches and meter, and one-way radio control are simple low-cost technologies which can be viewed as serious contenders for implementing load management. Gulf Power's "comfort control" experiment uses temperature sensitive devices to pre-cool houses - and avoid peak use of air conditioning. One study by Florida Power Corporation, and one by Tampa Electric Company involving one-way radio control, are not yet operational, while another FPC one-way radio control study is under way. These technologies can be introduced to a system gradually and require minimal initial investments. However, they have several serious limitations. They offer limited flexibility and do not have easy upward compatability with more advanced technologies. Hence, if they are widely used in systems with very large load management potential, they might adversely affect the rate at which more advanced load management systems are adopted. A key activity of this Project, the Cost-Benefit Analysis (Activity 5), addresses this problem.

Other technologies which are viewed as serious contenders for implementing an integrated system approach to advanced load management are: two-way narrow-band power line communication, broad-band power line communication, telephone, and hybrid systems.

Of these, the final three appear to be the most promising in the long-run. Narrow-band systems such as ripple control systems can be expected to face stiff competition as widespread use of large scale circuit integration in broad-based power line and telephone systems push prices down. Two-way radio may also hold real promise, but the evidence in the open literature is not yet conclusive.

Thus, many types of meters are available that differ from the standard one-register watthour meter used by most utilities. This activity will identify all existing meter designs and load controls that are available in production or test environments. Meter manufacturers and utilities will be contacted to determine present state-of-the-art. Significant emphasis will be placed on digital display metering technologies that provide for direct load management and billing functions. General categories of metering and control include time-related pricing meters, demand-energy meters, demand-energy meters that allow time differentiation, temperature sensitive control and deferrable or interruptible load control. Both one-way and tow-way communication of metering information and load control will be considered. Two-way control will be considered. Two-way communication systems allows automatic meter reading plus feedback on the particular customers' response to metering signals.

To aid in identifying meter technologies, an interface with Activity 7 Workshops will be exploited. The first workshop will be used to seek inputs from meter manufacturers and utilities in order to determine that all candidate meters have been considered.

This workshop will be held as early as possible in 1980 to serve as an information gathering function.

Following the identification of metering technology for innovative rates, the specific meters will be evaluated for their range of functions, reliability, cost, price signaling ability, cost of installation and maintenance, and length of useful life. Data from experimental users of these meters will be examined and analyzed to supply pertinent decision criteria and parameters. For digital display meters, human performance criteria will be used to assess their basic performance characteristics.

Sources of meter performance data utilized will include industry reports, government sponsored projects and utility experiments. Activity 7 Workshop two will also be held early in the contract period and will be used to gain information and identify other information sources.

Another task under this activity will be a survey of utility load management experiments. Some preliminary survey results are already available, but these will be expanded to include numerous recent results. The purpose of this task will be to identify potential demand reductions from load management of water heaters, electric air conditioners and electric space heaters. This data is necessary in order to specify bounds for potential utility savings from customer load management.

Metering costs and potential benefits will be integrated into the overall computer model used for determination of the cost-benefit analysis. A metering cost module will be written as part of the extensive computer code used. This metering

## Activity 3: Metering Technology

Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Identification of Metering Technology

Preparation for Workshop #1

WS #1

Preparation for Workshop # 2

WS #2

Preparation of Metering Report

Survey of Load Management Experiments

Metering Technology Input to Cost/Benefit Model

Metering Input to Utility Testing

Assessment and Preparation of Final Report module will allow a parametric study of costs and benefits as a function of metering type and customer effect. Data on capital and operating costs will be included.

The result of this activity will be two-fold. First, a detailed report on metering technologies and their performance will be provided. As a separate report, this information should be of general use. Second, data from this review will be integrated into the cost-benefit computer model in order to assess the potential benefits of innovative rates.

4. Customer Responses - Assessment of Consumer Response to Candidate Metering Techonogies

Since the idrect collection of consumer response of data is beyond the scope of the current project, previous research conducted by utilities, suppliers of meters and load control devices, research organization (e.g. EPRI) and academicians must obviously be the prime sources of input to this Activity. Since preliminary research has shown these studies to be of widely varying quality, a methodological and theoretical review and critique must precede any use of the data to estimate functions or parameters in a cost-benefit study.

A. The first step will therefore be a systematic search of the literature to obtain or derive a sample of studies as possible. This will involve direct solicitation of reports on both metering technologies and innovative rate structures from state, local and Federal agency and public utilities, as well as private firms; it will also involve both direct and computer-assisted searches of the scientific literature (e.g. the PASAR automated search system of the American Psychological Association).

After collection of all available literature from these sources, each study will be reviewed with respect to the following criteria:

1. Internal validity. The degree to which the study is free from confoundings which render the conclusions uncertain as causal inference suspect. For example, the use of volunteer households in a load control study, in which only volunteers' appliances are controlled while the comparison is composed of non-volunteers confounds "volunteer" status with the control devices. This means that changes in amount or pattern of usage may be due to those factors which led people to volunteer in addition to or instead of the operation of load controls.
2. External validity. The degree to which the study's generalizability is limited to a particular sample of participants, a given locale, a certain type of meter or control device, type of climate, economic circumstance of participant, amount of shiftable load, etc. For example, a study in which all participants are volunteers, randomly assigned to time-of-day or "normal" rates, in internally valid but may not be generalizable to non-volunteer populations. Likewise, the results of a load management study in a rural area may not be applicable to an urban area.
3. Construct Validity. The degree to which measures of

ostensible satisfaction, behavioral changes, etc. in fact can be interpreted as measures of the underlying concepts (or constructs). In previous studies, it was not infrequently the case that measures have been misused or misinterpreted, especially where concepts such as satifaction or acceptance are involved.

4. Statistical Conclusion Validity. The extent to which the data has been properly analyzed. The question will be considered in detail in section C.

These critiques will allow the proper conclusions from various sources for final inclusion in the cost-benefit computations, and provide guidance as to the probable range of variation about estimated trend lines (see section C).

B. The second stage will be an assessment of the extent to which each study is based on current and valid theory in each area of concern. That is, what theoretical guidance has been used in designing the study, and what inferences are possible based on the theories in question. For eample, if a theory predictor that a certain type of feedback would be most effective in communicating price or usage information to the consumer, has this theory been taken into account in the relevant studies? If so, does this theory allow extrapolation of the data beyond the bahavior actually obseved. If such extrapolation is possible, it would obviously allow a more general cost-benefit computation to be made.

C. A serious shorcoming of many load research investigations has been that analysis of the effects of innovative rates has often been extremely limited. For example, numerous studies have involved statistical comparison only of differences in peak demand loads. It is extremely important, however, to model the load trend over the course of given days (at different points in the week and year) in order to effectively estimate costs and benefits of given load management programs and metering technologies. For this reason, curve fitting using polynominal regression will be employed to provide better estimate of effects on electricity consumption.

## Procedure

The questions to be addressed by this instrument pose unique problems, and therfore require a somewhat different approach than the typical attitude scale. The first problem is to assess perceived consequences of load control and/or time-of-day pricing (and evaluations of those consequences) as they change with experience. Ideally this would be done using a longitudinal experimental design assessing the effects of experience with the rate structure metering system, etc. Second is the need to assess changes in energy related behaviors which occur in response to the rate strucutre. This is necessary both for the prediction of demand and ultimate acceptance of the system (for example, the purchase of window air-conditioning units in response to load control). Third is the need for adequate experimental design.

No instrument, however, well designed, can predict the behavior of people under demand metering, load management or time-of-day pricing systems, or digital display meters, in everyday use without controlling for biasing factors present in any experimental evaluation. Further, the questionnaire should assess relevant demographic and socioeconomic factor (income, family size, power consumption, etc) that also influence consumer responses. Unique aspects of each utility's system must also be considered before cross-utility comparisons can be meaningful.

Therefore, the following procedure will be used to design principles to be followed:

1. Review of available literature on the effects of demand metering, load control and time-of-day pricing. This will permit evaluation of previous instruments and designs, as well as illuminate variables relevant to consumer acceptance patterns of and behavioral change.
2. Interviews with officials of utility companies. This will allow systematic inclusion of questions relevant to the characteristics of particular systems, and allow the design of an instrument permitting comparisons of different utilities.
3. Interviews with consumers currently participating in demand metering load control, and time-of-day pricing experiments. This will reveal some of the perceived consequences of the system's use and some of the behavioral adjustments made to it. Interviews will also be conducted with nonparticipants to determine potential reasons for non-acceptance.
4. Review of survey research literature, focusing on techniques to increase survey participation, insure

clarity of questions, appropriateness of wording for people of various income/education levels, etc. Questions of survey technique (e.g., interview vs. mail questionnaires) will also be addressed.

5. Development of preliminary instrument.
6. Pretesting to insure ease of administration, comprehensibility of questions, instructions, response scales, etc.

The final product will be a survey instrument for use in any load control or innovative rate structure study. The instrument will be modular in form.

We recognize the difficulties inherent in gauging long-run impacts of alternative metering technologies--which suggests a premium be placed on flexibility. Further complicating the analysis is the use of mandatory vs. optional rates (and cut-off points for mandatory participation on the basis of monthly KWH or shiftable load). One must choose from among an infinite number of plausible rate designs in conducting analysis (and sensitivity tests). We do not yet know whether the results will converge on one metering technology, but realize that these steps must be taken.

5. Cost Benefit Analysis

The methodology for cost-effectiveness will utilize the Wenders-Taylor approach to comparing benefits with costs.[1]

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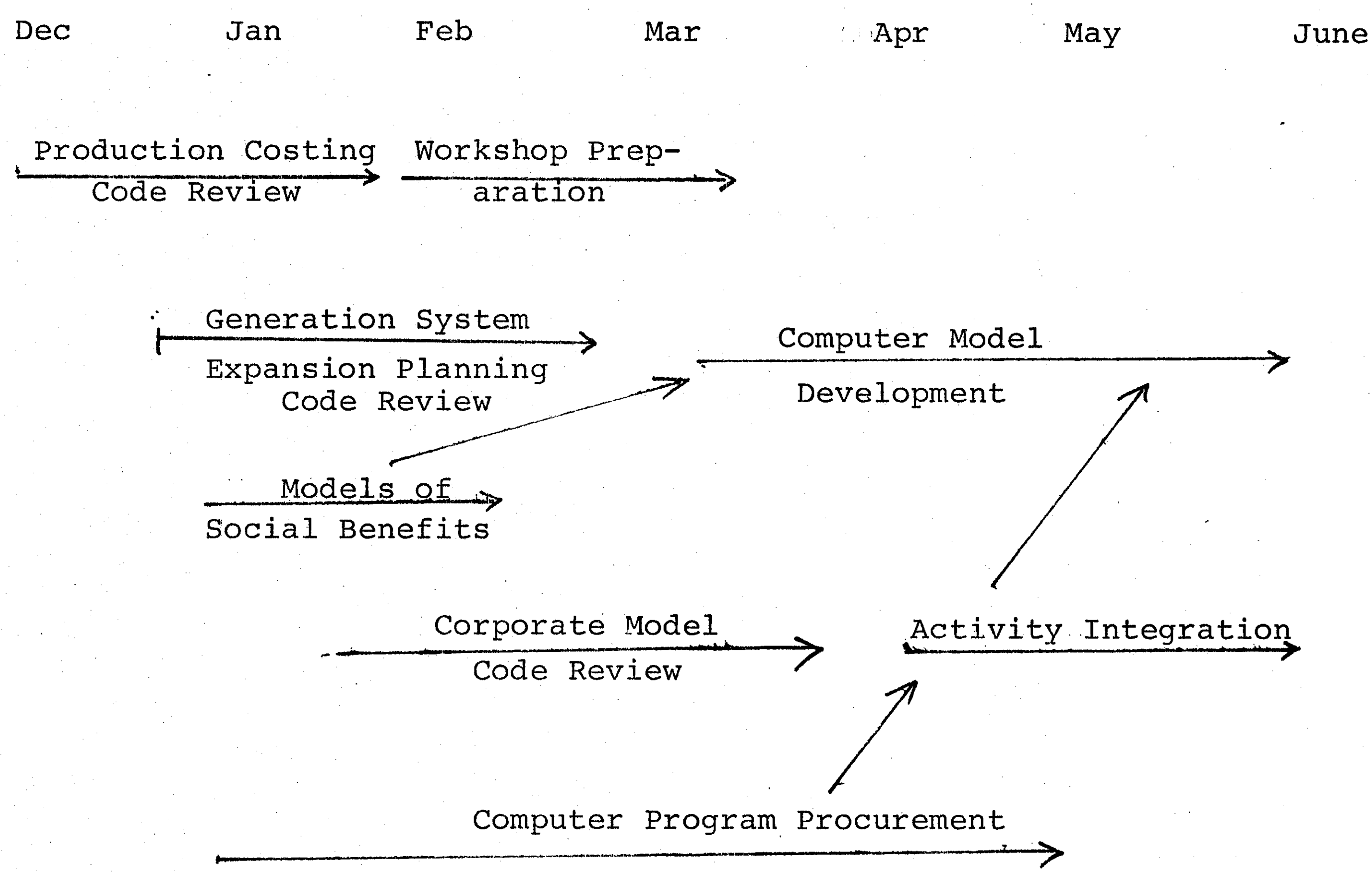
[1] See Stanford L. Levin, Lester D. Taylor and John T. Wenders, "The Impact of Marginal Cost Electricity Pricing in the State of Maryland," Feb. 1979, DRI, Inc. Also see John T. Wenders and Ashley Lyman, "An Analysis of the Benefits and Costs of Seasonal-Time-of-Day Electricity Rates," Problems in Public Utility Economics and Regulation, Michael Crew, ed.

Although identifying the key variables if fairly straightforward, it is also necessary to create software which will enable comparisons under alternative parameter estimates. Thus, Activity 5 will involve a modeling system, such as Westinghouse Research Laboratories' Load Optimatization Off-Peak (LOOPEAK) package, for assessing the impacts of load management. Modifications will probably be necessary to enable a more complete range of rate options (and a plausible range of customer responses). As Morgan and Talukdar note in their recent IEEE review of load management, past studies have only laid the groundwork for more realistic cost-effectiveness assessments. After key personnel assess the available alternative software packages, the persons involved in this activity will select one appropriate for application. It is not expected that extensive modifications will be necessary. Sub-routines (such as extensive sensitivity tests) can be written and integrated into existing frameworks.

Note that current use of such frameworks by utilities and consultants often lack proper economic analysis. For example, the operating cost implications of different types of load shifts were analyzed in a Systems Control FEA-sponsored study using input prices based on existing contracts. Yet, from the standpoint of social evaluations, the opportunity cost to society would be input prices specified in newly written contracts. Long-term contracts written years ago confer capital gains (or losses) upon custmers if the prices was below (or above) that which now reflects today's costs to society. The current price reflects the new conditions of the energy market.

## Activity 5: Cost-Benefit Analysis



Thus, when considering benefits and costs, one must be careful to take into account the opportunity cost today of delivering fuels to utilities. For purposes of analyzing financial impacts on a utility, the old contract rates may be appropriate, but if the full social impact is being considered, current opportunity costs ought to be used in the analysis. Similarly, the Florida Power Corporation analysis of its 1976 time-of-day rate experiment used a standard systems planning software packages for evaluating costs and benefits, yet the two major misallocations considered in the Wenders-Taylor peak laod pricing framework -- overconsumption during peak hours and underconsumption during off-peak -- are not considered at all.

In order to assess the overall cost of candidate metering and innovative rate options, each candidate will be subjected to a simplified corporate analysis. Such an analysis will include a simulation of the revenue generating process as well as a simulation of the feedback effects of both regulation and elasticities of demand. The adjusted gross income of an electric utility will be the key input into the regulatory loop where the adjustment will reflect production costs and other utility expenses. The production costs will be determined by simulating the real time operation of a utility including the effect that metering and innovative rates have on consumer use patterns. The generation system will be determined using a generation system expansion program and to insure consistency with actual generation system planning, only those generation system expansion plans that satisfy prespecified levels of reliability will be considered in the corporate analysis.

It is anticipated that the simulation should enable investigations to ascertain if adding meters coupled with innovative rates would be cost effective for a utility. This information would then be merged with customer level costs and benefits to determine the composite cost-benefits associated with various candidate metering and innovative rate options.

A review of existing computational codes, similar to those available from the National Regulatory Research Institute, for corporate analysis, production costing, and generation system expansion planning, reveals a number of quite detailed codes written around a utility structure as it exists today. Because these codes do not explicitly reflect the dynamics associated with innovative rates, it is anticipated that the codes will require extensive modifications, and, in some instances, complete redevelopment. In every case the primary concern will be to either develop or procure codes which retain the integrity of each interval of time over the study period. Those simulations using cumulative load distributions are clearly inappropriate here because the use of meters and innovative rates will directly affect the hourly consumption and consumption rates of electric energy.

The benefit measure to be used in this analysis will be net social benefits and can be defined as total revenues (producers surplus) plus consumers surplus less total production costs. The idea of net social benefits can be clearly illustrated through a graphical example. In figure 1 (next page) we assume there exists two distinct and independent demands: an off-peak (nighttime) demand and peak (daytime) demand. The actual marginal costs of a unit of electricity during the peak and off-peak periods are labeled $MC_p$ and $MC_o$, respectively. If a uniform price $P_u$ is currently charged for all consumption, then the implementation of time-of-day rates will cause a decline in the off-peak price to $P_o$ and an increase in the peak price to $P_p$. The net social benefits arising from pricing closer to actual costs are represented by the shaded areas abc + def. In this respect the area abc represents benefits for consumers who value the consumption of off-peak electricity more than the costs of producing it, but were not in a position to pay the old price of $P_u$. Likewise, the area def shows the benefits derived from an improved allocation of resources as consumers who are now not willing to pay the higher price of $P_p$ for peak electricity will reduce their consumption.

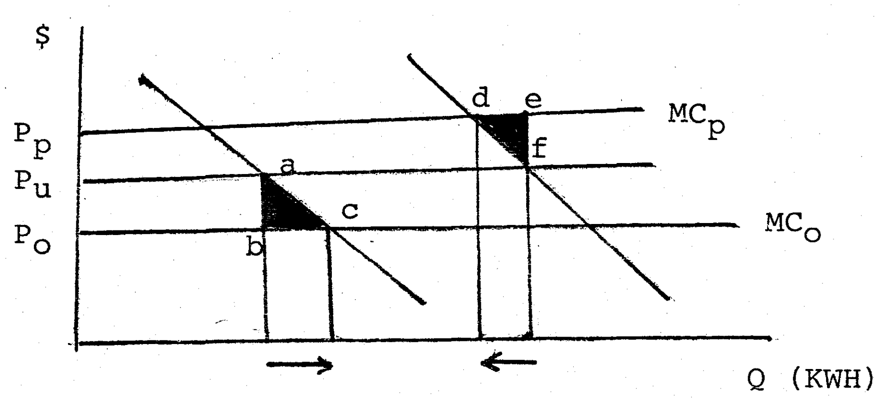



FIGURE 1

To get actual estimates of these benefits we need to know the present rate schedule, the new innovative rate schedule, and the long-run elasticities of peak and off-peak demands. Information concerning cross-elasticities and interdependencies in demand are also very important. The calculation of benefits stemming from interruptible rates and load management involves a similar (although more complicated) mode of analysis.

6. <u>Utility Test</u>

Activity 6, the utility test, requires three steps: selection of a utility, collection of data on load characteristics for entry into the model, and runs of the model under realistic assumptions about metering costs and innovative rate impacts. This activity provides a validity check for the Cost-Benefit tool. Assuming that the input has some basis in fact, there is still a limitation in applying the methodology to only one utility. Such an approach brings the generality of the results into question. Yet, here we are only determining the feasibility of using such a model. Once regulators are convinced of its applicability and once utilities become familiar with the methodology, it can be applied to other utilities across the nation. This Project create a tool that will permit implementation of innovative rates which can be demonstrated to be cost effective.

A correct comparison will consider the incremental benefits achieved for different levels of metering investment, using the apporpriate discount rate (a likely candidate for sensitivity tests). Some technologies (and associated rates) will be dominated by others. As mutually exclusive investments, the alternative technologies need to be compared with the next best investment. One base-line that might be adopted seasonal rates, in conjunction with relatively inexpensive timers (or temperatures sensitive devices).

7. Workshops

The Workshops (Activity 7) will enable feedback from meter manufacturers and the utility industry, and will serve an education function for the project. The topics are derived from the other Activities. Special speakers from major consulting firms and guests from other states who are engaged in parallel research will be invited. In some cases, special papers may be commissioned. Names of utility staff individuals working on active and passive load management have been collected by the FPSC Research Department, and will serve as the core list for attendees. Suggestions for invited guests will be obtained from regulators in other states, DOE, and the key national consulting firms.

At least two workshops will be conducted in association with the project. One of the workshops will be technical in nature with a relatively formal structure. The focus of this workshop will be on examining the type of hardware currently available. This will include the technical characteristics of various meters, and the necessary criteria a metering unit must satisfy in order for the system to be reliable and maintain its integrity. The participants in a workshop of this type will include representatives from the electric metering industry and electric utilities. The results of the workshop will yield very useful information (such as cost, durability, technical characteristics, etc.) concerning metering technologies and their possibilities for use in implementing a set of innovative rates.

Workshop Two will essentially be a generic discussion of Metering for Innovative Rates. Topics for discussion will include the impact of price signalling on the load curve; metering systems' requirements from the perspective of electric utilities; State Regulatory Authorities and the consumer; and digital display metering which provides for direct load control and billing functions. Participants would include electric utility company personnel, state regulators and staff, representatives from electric meter manufacturing companies, and researchers from outside consulting firms.

Workshop Two will provide estimates of plausible ranges associated with various control to the model. Since actual experimental data cannot be obtained directly through this project, the workshop will greatly help in identifying an accurate range of estimates, and the correct impacts of a given change. Other workshops and small seminars will be arranged when such meetings appear to be the best way to gather and correlate a wide range of research and experience.

8. Documentation

The final work products will result from Activity 8. Reports which are filed away rather than read are not useful. This project will aim for Executive Summaries which will reach utility Commissioners, government officials and top levels of utility management. The Technical Reports will be working documents -- used to obtain feedback staff members from commissions, utilities, and other agencies in the evaluation process. The Quarterly Reports serve as an "early warning" system to allow comment on and review of procedures. Regular feedback will strengthen the study considerably.