ORIGINAL

Decision __93363__ JUL 22 1981

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

In the Matter of the Application)
of SOUTHERN CALIFORNIA EDISON)
COMPANY for Authority to Modify)
its ENERGY COST ADJUSTMENT BILLING)   Application 59499
FACTORS in Accordance with the)   (Filed March 5, 1980)
Energy Cost Adjustment Clause as)
Modified by Interim Decision)
No. 91277.)
)
_____)

(See Decision 91805 for appearances.)

Additional Appearances

Michel Peter Florio and John W. Blethen, Attorneys
at Law, for Toward Utility Rate Normalization
(TURN), interested party.

FINAL ORDER

I.   Introduction

By Application (A.) 59499 Southern California Edison
Company (Edison) requested an increase in its Energy Cost Adjustment
Clause (ECAC) billing factors and responded to a Commission directive
regarding an incentive procedure applicable to coal plant operating
performance. Hearings were bifurcated: the rate relief portion of
Edison's request was heard first and addressed in Decision (D.) 91805
issued May 20, 1980; the coal plant matter was the subject of
hearings on May 7 and 8, 1980, and June 3 and 4, 1980. This decision
concludes the coal plant incentive procedure portion of the
proceeding.

A.59499 ALJ/km/ks

The coal plants emerged as a major ECAC issue in a previous
Edison ECAC proceeding, A.58393. In that case the Commission staff
(staff) offered evidence and argument in support of its position
that Edison's coal plants could reasonably attain an annual capacity
factor of 60%. Consequently, staff recommended that the ECAC
balancing account balance be adjusted as if the 60% factor had been
achieved, and that a 60% factor be applied as a minimum in future
proceedings. For the record period the staff's recommendation would have dis-
allowed about $32 million in fuel expense as coal is a cheaper form of energy than
other fossil fuels. Edison offered evidence and argument in support of its position
that it had prudently operated its coal plants, the capacity factors were
reasonable under the circumstances, and no adjustment was necessary.

This Commission addressed these issues in D.90488. We
observed that ratemaking procedures had effectively shifted the risk
and opportunity associated with such plants from shareholders to
ratepayers. The staff proposal would have restored some incentive
to Edison, but would not have balanced risk and opportunity. We
were also concerned with the reasonableness of the underlying
assumption - that the 60% capacity factor could be attained and
sustained.

Accordingly we directed that the incentive procedure be
the subject of further examination. We ordered as follows:

"4. Edison shall prepare as part of its ECAC
application for rates to become
effective November, 1979, a proposed
system of incentives for improved
operation of its coal-fired power plants
and shall recommend standards on which
to base the incentives.

"5. In cooperation with the staff, Edison
shall select and retain an independent
consultant to assess, evaluate, and
report on Edison's coal plant operating
practices and the standard of performance
that can be expected of these plants."
(D.90488.)

The staff's proposed adjustment to the balancing account was not adopted.

The matter was subsequently deferred from Edison's next ECAC proceeding to this application by D.90967 (modified by D.91416). In that same decision we also deferred about $35 million of Edison's requested rate relief, pending completion of the coal plant studies.

In October 1979, System Development Corporation (SDC) was awarded a study contract "to assess, evaluate and analyze the design and operations of the Mohave Units 1 and 2 and Four Corners Units 4 and 5 generating stations and, based on this analysis, to recommend standards of performance that could be expected from the plants." The resulting report was received in this proceeding.

In addition to the consultant's report, evidence was offered by Edison and staff. The California Farm Bureau Federation (Farm Bureau) and Toward Utility Rate Normalization (TURN) also participated by way of cross-examination and briefs. On March 9, 1981, TURN filed a "Request for Reimbursement" for its "attorney's fees and other reasonable costs" in this proceeding. Edison and staff filed replies.

II. Issues Presented

The issues remaining in this proceeding are the following:

1. Should this Commission adopt an incentive procedure applicable to Edison's coal plant operations?

2. If we find that such a procedure is appropriate, what should be its terms?

3. Should Edison be allowed to recover the deferred $35 million in fuel costs?

Depending on the resolution of these issues we take up the matter of TURN's request for attorney fees.

A.59499 ALJ/km/jn */ks *

III. Summary

     This decision considers the need for an incentive procedure applicable to Edison's coal plant operations and finds it compelling. The specific procedure adopted is substantially as proposed by the ✓ consultant and supported by staff. It provides for a set of standards surrounded by a null zone. So long as performance falls within the null zone Edison receives dollar-for-dollar recovery of its fuel costs. If performance is above or below the zone, then rewards or penalties accrue. The rewards or penalties are based on the current price of fuel. The procedure provides for maximum limits and a sharing of rewards or penalties between the utility and its ratepayers. Appendix B is taken from the consultant's study and illustrates how the formula operates. A precise schedule for implementing the procedure is adopted.

     Edison is found to have been reasonable in its past coal plant operations. It is allowed to recover about $35 million in deferred fuel expenses.

IV. The Need for an Incentive Procedure

     The following description of Edison's coal plant operations is extracted from the staff report, Exhibit 31:

> "Edison operates the Mohave Power Plant which began operation in 1971. This plant is unique because of its large size, two 790 MW units, and because it uses slurry coal for fuel. The coal is transported 275 miles through the use of a slurry pipeline from a mine near Kayenta, Arizona to the plant located near Bullhead City, Arizona. Mohave not only pioneered the use of slurry coal but it is still the only large coal-fired plant using this fuel.

> "In the eight years since Mohave has been in operation, major problems that have caused outages and affected performance have occurred with hardware such as pulverizers, centrifuges, boilers, condenser tubes and the main steam leads. Labor problems and environmental regulations have also contributed to lowered performance.

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"At the time of the design and construction of
Mohave, experience with large coal-fired power
plants in the 800 MW range was extremely
limited. Equipment design was based in most
cases on upscaling equipment used in smaller
plants which had proven reliability. In many
instances, this reasoning did not prove to be
satisfactory. Also, because of the use of
slurry coal, it was necessary to design some
completely new types of equipment which had
unproven reliability. During the years that
Mohave has been in operation, Edison has been
active in redesigning, upgrading, modifying
and rebuilding equipment that proved deficient
and has been working to resolve other non-
hardware problems that restricted productivity.

"The Four Corners Power Plant, operated by the
Arizona Public Service Company (APS), is
located on the Navajo Indian Reservation, 20
miles west of Farmington, New Mexico. Edison
owns 48% of two 800 MW units, which have been
in operation since 1970. The plant, which
like Mohave is unique because of its large
size, has its coal supplied from a nearby
strip mine.

"In nine years of operation, Four Corners has
had many hardware and non-hardware problems
similar to those experienced at Mohave. As
in the case of Mohave, equipment problems were
related to the upscaling of designs used in
smaller plants and the operating utility, APS,
has been actively upgrading its equipment.
However, Four Corners has problems concerning
location and geology that are unique. Four
Corners is located entirely on the Navajo
Indian Reservation which places certain
constraints on operation of the plant and
restricts expansion. Perhaps the most serious
of all problems has been the fact that
significant subsidence has occurred in different
areas of the plant. This has caused severe
turbine vibration and also affected other
equipment, causing loss of productivity. The
problem has been temporarily arrested by
pressure grouting into the voids under the
plant."

These conditions led to the original staff recommendation that an incentive feature be incorporated into the ratemaking treatment of Edison's fuel costs.

Edison argues that no incentive is necessary. It contends that sufficient incentives already exist for it to maximize the output of these plants, referring to the prospect of ECAC review and general corporate policy. It cites its past reasonable operations and improvements as proof that ratepayer interests are sufficiently protected.

Edison warns that certain adverse consequences could occur on account of an incentive procedure. It warns that the operation of the incentive provisions could distort management judgment:

> "...any short-term objective that carries the possibility of financial penalties or rewards can cause the emphasis to be on potential short-term benefits. This could have an impact upon plant operations that is not in the best interest of the Edison ratepayers and shareholders in the long run."

Edison also warns that investors might perceive an incentive procedure as an increased element of risk, affecting Edison's ability to attract capital. It argues:

> "Thus the resultant shift in risk to the investor in event of the adoption of an incentive plan would represent a substantial increase in risk for the future, compared with risks of this type in the past due to the increased and increasing differential between the price of fuel oil and coal."

It observes that to the extent "risks go beyond matters involving management control" the procedures would "lose considerable effectiveness as incentive devices."

In support of an incentive procedure staff states as follows:

"Under conventional rate making, a utility's rates were set based on an estimated fuel cost. If poor efficiency or plant reliability caused that fuel cost to be higher than estimated, the utility's earnings were reduced. If, on the other hand, the utility were able to operate its plants in such a way as to require less fuel than estimated, the utility's earnings were increased. Under conventional rate making, the utility bore the risk that its plant would prove unreliable or inefficient. As compensation for this risk, the utility had the opportunity for increasing its earnings through more efficient operations. As the cost of energy grew, however, this risk became more than the utility could manage. Consequently, ECAC transfers the risk from the utility to the ratepayer except for imprudent actions.

"The proposed Incentive Program, by operating in a similar fashion to conventional rate making, is designed to transfer a portion of the risk assumed by the ratepayer back to the utility. In previous ECAC applications, the staff has attempted to prove that the utility was imprudent and negligent in the operation of its coal-fired power plants and should, therefore, be penalized for the plant's poor performance. The theory that the utility should share a portion of the risk for the operation of its power plants removes the necessity for the Commission to find the utility negligent or imprudent before assessing a penalty."

Staff points out that there has been no disallowance for managerial imprudence regarding the coal plants since the inception of ECAC.

The Farm Bureau also advocates an incentive procedure. It argues that existing incentives are inadequate and there are "persuasive reasons" for incentives for utilities to minimize fuel costs, referring to the dominant role of fuel costs in total operating expenses. It believes that "incentives to economize can produce results" and should be adopted.

TURN also supports an incentive procedure, but is very
critical of some of the features of the method proposed by SDC.
The criticisms are discussed herein.

We are persuaded that an incentive procedure applied to
Edison's coal plant operations should be adopted.

Our interest in incentives is reflected in D.92496, the
final decision in the generic ECAC proceeding, Order Instituting
Investigation (OII) 56:

> "In deciding the scope of ECAC we start from the
> basic proposition that balancing account
> treatment reduces the incentive to control
> costs by reducing the risk to the utility, by
> providing dollar-for-dollar recovery of
> reasonable costs. Thus, so long as costs are
> managed within the zone of reasonableness,
> the utility is made whole. Balancing account
> treatment also eliminates entirely the
> opportunity for the utility to profit from
> successfully managing expenses. For these
> reasons we can say unequivocally that we prefer
> general rate case type recovery."

We modified ECAC in several important respects to incorporate more
incentives.

A procedure such as suggested by staff in this proceeding
provides an opportunity to introduce meaningful incentives into
utility operations. As discussed herein Edison will not only have a
restored stake in its coal plant operations, but also an enhanced
interest in minimizing fuel oil costs. The benefits of such a
procedure far outweigh the alleged detriments.

Edison's argument that existing incentives are adequate
does not recognize the nature of utility operations. The prudency
test is very hard to apply to matters as complex and difficult as

plant reliability and efficiency. Neither our staff nor third
parties are equipped to evaluate utility plant operations at other
than a superficial level. The "imprudency" that affects a plant today
may have occurred ten years before, in the design or construction of
the plant. Decisions that are inherently management's should
reasonably be associated with risk and opportunity. We are encouraged
enough about the advantages of an incentive procedure that we will
direct our staff to proceed with similar measures for other plants
of each of the utilities.

With regards to Edison's anxiety regarding investment
community response, we note that the adopted method is based on
a comprehensive study of coal plant operations and reflects a
painstaking effort to develop a balanced procedure. The problems
with the alternate - traditional ECAC treatment - are exemplified
by the deferred $35 million and the associated prudency issues
discussed herein. We believe that the financial markets can
understand the merits of the forward-looking incentive procedure.

Terms of the Procedure

A. Summary of SDC's Proposal

The specific procedure proposed by SDC is distilled from
extensive examination and analysis of Edison's coal plant operations.
The resulting formula appears intimidating but is straightforward
in its application. The proposed terms are summarized as follows:

Specific standards of performance as recommended:

    Mohave Units 1 and 2 (790 MW Gross)
        Gross Capacity Factor (GCF) 61%   (4-year average)
        Gross Heat Rate (GHR) 10,250 Btu/kWh   (Annual average)

    Four Corners Units 4 and 5 (800 MW Gross)
        Gross Capacity Factor (GCF) 59%   (4-year average)
        Gross Heat Rate (GHR) 9,400 Btu/kWh   (Annual average)

These performance standards are applied by use
of a formula that converts actual unit gross
heat rate and gross capacity factor to dollars
of reward or penalty. A basis for imposing a
maximum annual reward or penalty as well as a
minimum performance deviation from the standard,
below which the reward or penalty is zero, is
proposed. The system also provides for
"qualitative modifiers" that allow for
conditions beyond the control of the utility
(such as earthquakes).

The formula is set out in Appendix A.

The features of the formula include the following:

a. The amount of reward or penalty is computed
    for each unit, based on these variables:

    - Unit gross heat rate for year.

    - Unit average gross capacity
      factor for past four years.

    - Cost of coal ($/10^6 Btu) for
      past year.

    - Cost of oil ($/10^6 Btu) for
      past year.

    - Average heat rate of oil-fired
      plants in Edison for past year.

    - Unit gross heat rate standard.

    - Unit gross capacity factor
      standard.

    - Gross maximum capacity of
      unit.

b. A four-year average of gross capacity factor is
    used to represent unit performance, computed
    from the most recent four years of data. For
    phasing in the procedure the standard is
    imputed as follows:

    1st year - (3 years at standard
                + 1st year's data)/4

    2nd year - (2 years at standard
                + 2 years' data)/4

3rd year - (1 year at standard
+ 3 years' data)/4

4th year - 4 years' data/4

c. A one-year average gross heat rate will be used to represent unit performance, computed for the past year.

d. The formula is applied annually.

e. The incentive system should be started for each unit following its major overhaul, adjusting the start time to include 28 weeks of planned outage over the following 4 years.

f. A "null zone" provides a band of performance about the standard to eliminate rewards or penalties for small deviations from the standard, while giving the utility some flexibility in scheduling appropriate corrective actions without severe penalty. Maximum limits establish the upper amount of reward or penalty to be assessed and ensures that the utility will receive substantial penalties for poor performance without financial jeopardy. Limit levels (based on 50% and 98% probability intervals about the standard) are as follows:

Minimum

Mohave - Gross Capacity
Factor ± 3%
- Gross Heat Rate ±
200 Btu/kWh

Four Corners - Gross Capacity
Factor ± 3%
- Gross Heat Rate
± 100 Btu/kWh

Maximum

Mohave - Gross Capacity
Factor ± 10%
- Gross Heat Rate ±
1,000 Btu/kWh

Four Corners - Gross Capacity
Factor ± 12%
- Gross Heat Rate
± 450 Btu/kWh

For performance within the minimum limits,
no rewards or penalties will be assessed.
When one performance measure is outside
the minimum limits, the measure inside the
limits will be assumed to be at the
standard and a reward or penalty computed
on the measure outside the standard only.

g.   Qualitative modifiers and categories of
events which could occur in the future and
under which the provisions of the incentive
system might be temporarily suspended or
modified are proposed, including:

- Regulatory constraints (e.g.,
environmental, safety, rate-
making).

- Labor relations (e.g., strikes,
sabotage, union slowdown).

- Coal quality.

- Natural disasters (e.g., flood,
earthquake, lightning).

- Catastrophic failures (e.g.,
boiler explosion, major fire).

- Reduced demand (e.g., unit no
longer base-loaded, transmission
system limitations).

Various parties object to particular features of these proposals.

B.   Standards of Performance

Staff and Farm Bureau support the consultant's proposed
performance standards.   TURN proposes major modifications.

TURN contends that:

"The proposed gross capacity factor standards
are several percentage points less than can
be reasonably expected on a sustained basis,
according to findings made by the consultant.
In the case of Four Corners, the proposed
standard is actually less than the past
operating performance." (Emphasis in original.)

It recommends that higher standards be imposed.

TURN relies on SDC calculations regarding performance improvements attainable through hardware and nonhardware changes in plant operations. It argues that the proposed standards assume correction of only 60% of identified "management deficiencies," removing the incentive for Edison to correct the remaining 40%, or resulting in artificially low standards. TURN contends that:

> "Adoption of the lower standards, when in fact the plants are evidently capable of achieving the higher standards, is unjust and removes incentive to improve."

It proposes that the applicable capacity factor standards should be: Mohave - 63.75%, Four Corners - 61.4%.

Staff supports SDC's proposed standards. It argues that TURN's comparison of the Four Corners past performance to the proposed standard is misleading - that for the more recent five years (1975-79) the gross capacity factor was only 55.45%. Thus, the proposed standard of 59% requires a substantial improvement.

Staff points out that the higher standards proposed by TURN were considered by SDC and rejected:

> "To appreciate why SDC did not utilize these ultimate standards, it is necessary to understand that some non-hardware remedies mentioned by SDC represent newest state-of-the-art innovations. Some of them would require great expenditures of time and money and the use of computers. While some costly and computerized remedies, such as a material inventory control system and a preventive maintenance system, are to be implemented, it did not seem reasonable to SDC to base its standards on the utilization of all available non-hardware betterments."

Staff characterizes the more stringent standards "as a useful resource and checklist during any future consideration of changes in incentive system standards."

Edison asserts that the standards "cannot be imposed without consideration of the costs involved in achieving the standards," quoting SDC as follows:

> "...if the standards are too high, their achievement may require added expenses, in operating and maintenance funds, exceeding the fuel cost savings realized thereby. This results not in the overall savings which the standards were designed to produce, but in an overall increase in costs."

Edison's improvements are "based upon a determination of cost-effectiveness." It contends that TURN ignores this type of consideration.

Farm Bureau also supports the proposed standards. It describes TURN's proposal as based on:

> "...the consultant's estimates of the maximum sustainable performance after full implementation of both hardware and non-hardware improvements. It is unreasonable to use them as a standard because not all of the non-hardware improvements can be achieved by the commencement of the incentive formula. Also, it assumes perfect implementation and continuation of management procedures which would be unreasonable to assume. Finally, it sets the standard at a level the consultant said not even the best management can exceed on a permanent basis; it would make an illusion of the concept that rewards as well as penalties should be possible."

Farm Bureau characterizes this approach as "clearly contrary to the position already expressed by the Commission that an incentive program must offer rewards as well as penalties."

We find that Farm Bureau has accurately expressed our reservations regarding TURN's position on performance standards. As discussed earlier, our intention is to adopt a procedure that balances risk and opportunity for the utility. This necessarily requires a standard that can be attained, sustained, and exceeded. TURN seems to have in mind something more like the original staff proposal that allowed for only penalties.

C. Null Zone

Staff, Edison, and Farm Bureau support the "null zone" as an integral part of the incentive procedure. TURN opposes its inclusion.

TURN states that:

"The problem with the deadband is that it is _assumed_ to be equitable, based on the assumption that actual performance will be equally distributed on either side of the standard, within the deadband, so that cash-flows back and forth will be equal and can therefore be equitably eliminated.

"There is, however, no reason to believe that this assumption will turn out to be true. On the contrary, judging from past history, it is far more likely that performance will be below standard than above. For continual performance below standard a net ratepayer subsidy of the utility will occur. In that case the actual effect of the deadband would be to effectively lower the standards by 3 percentage points."

TURN suggests that the null zone be postponed until operation of the procedure proves the zone equitable.

Staff defends the null zone as allowing "the utility reasonable target areas on which to base its efforts to avoid penalties and attain rewards." It characterizes TURN's objections as due to

TURN's misconception of the purpose of the incentive procedure. Staff criticizes TURN's "facile" assumption that the plants will always operate at the low end of the null zone as "highly unlikely."

Edison supports the null zone as "clearly essential to allow the utility some flexibility in scheduling corrective actions." The null zone eliminates cash flows back and forth between the company and the ratepayer for small departures from the standard and frees the utility "to use its best judgment for making near-term improvements that would benefit the ratepayer over the long term."

We are not persuaded by TURN's argument. In fact we are confused that it can argue first, that the proposed standards are too low, then that "it is far more likely that performance will be below standard than above." Why? The "past history" is an odd reference since TURN had earlier argued that past performance exceeded the standards.

If TURN means to imply that Edison management will simply be satisfied by continued performance at the low end of the zone, this implication is rebutted by simple logic. Continued operation at the low end of the zone leaves no margin for unplanned outages.

The major benefit of the null zone is that it overcomes the short-term, long-term problem raised by Edison as an argument against an incentive procedure. It also provides a measure of safety for this first attempt at such a procedure. We caution all parties that the standards should be reexamined periodically and changed as conditions and experience indicate. However, three consecutive years of performance at the low end of the null zone would not necessarily prove that the null zone operates counterproductively. It might just as well prove that the standards are set too high.

No party has directly questioned the exact boundaries of the null zone. SDC states that "The minimum limits have been chosen at the 50% probability interval for the mean about the standard." This is a reasonable basis for setting the zone.

Regarding the actual operation of the procedure, SDC and Edison recommend that when one of a unit's standards (gross capacity factor or gross heat rate) falls within the null zone and the other standard falls outside the null zone, the standard of performance will be imputed for the operating result falling within the null zone.

Staff stated that it is not categorically opposed to this approach, but cautioned that such imputation would tend to reduce the penalty. We note that this approach would also tend to reduce any reward. In this decision, we adopt a weighting factor which has the effect of sharing both the penalties and rewards with the ratepayer. We see no need to adopt an additional mechanism that will lessen either the positive or negative impact of the incentives on the company. The proposal to impute a specific operating result which differs from the actual result will only serve to weaken the incentive we seek to establish. Therefore, we do not adopt the recommendation of SDC and Edison on this matter.

D. **Maximum Limits**

Staff supports SDC's proposed maximum limits on rewards and penalties. Edison proposes a maximum limit of $10 million. Farm Bureau supports Edison's limit. TURN opposes Edison.

SDC's proposed limit is based on "the utility's performance at the bounds of the 98% confidence intervals about the respective standards of approximately the gross capacity factor and gross heat rate." As fuel prices increase, the incentive limit increases. In its final report SDC calculated a hypothetical limit of $15 million for one unit of Mohave, based on reasonable assumptions regarding oil and coal prices. "As oil prices become larger relative to coal, capacity factor increases its importance relative to heat rate in determining the limit. On the other hand, if in the future the cost of energy rises more rapidly than that of oil, the heat rate contribution will increase."

Edison argues that a maximum limit should expressed in
terms of dollars, not performance. It argues that:

> "...even at the lower outside performance limit
> of the standard, the ratepayer is benefiting
> from the coal-fired generation as compared to
> their total cost if an oil unit had been
> installed instead of these coal units. On

this basis it does not seem prudent to allow a
large positive or negative monetary adjustment
to potentially occur. If instead a reasonable
limit of $10 million was established, for either
positive or negative monetary adjustments, then
both ratepayer and shareholder would receive
potential benefit without either being
substantially adversed as they could be if the
limit were set too high."

Edison warns that:

"...the mere fact that an incentive is adopted
without such maximum dollar limitations adopted
beforehand will have a detrimental effect on
the attractiveness of the Company's stock to
the investment community and may very well
adversely affect the Company's bond and
preferred stock ratings."

Edison refers to limitations built into an incentive-type clause in
Michigan as supporting its position.

Farm Bureau supports Edison. It offers several criticisms
of the SDC position:

"First, the consultant's maximum limits will
escalate quickly in dollar amounts if oil
prices increase. Second, the penalty/reward
has no relationship to Edison's financial
ability to absorb its impact. Third, Staff
has not evaluated the impact on Edison's cost
of capital of instituting a program with a
potential penalty of $60 million. Finally,
Edison's financial witness showed that if
penalties were imposed as large as permitted
by staff, Edison would be unable to raise
capital and to construct new plant necessary
to meet growing demand and to replace
expensive oil fired generation."

Farm Bureau suggests there is no point imposing a penalty that hurts
ratepayers as well as Edison.

Staff argues that Edison's limit is based on speculative
and tentative assumptions. It characterizes Edison's proposal as
only a $5 million limit, because of tax consequences. Staff states:

> "...the real possibility of improving performance and removing from the ratepayer the entire financial risk associated with poor coal plant operation, makes the option of accepting SDC's penalty limits, as proposed, the more prudent choice at this time."

Staff observes that a fixed dollar limit is "not realistic" because of changes in the costs of fuel and suggests that "the proper time to consider fixed dollar limits is in that ECAC proceeding wherein possibly excessive penalties (or rewards) first become manifest."

TURN objects to Edison's proposed limit. It argues that if the penalty is not "significant" or "substantial", there is no incentive to improve. TURN contends that Edison's limit is actually less than the minimum penalty if each unit operated only slightly outside the null zone. It states that Edison "deserves" to pay penalties if it does not correct the identified "management deficiencies." TURN takes the example of 1979, a "bad year" for the coal plants, and calculates a penalty of only $11 million to demonstrate that "one bad year does not cause a large penalty." It suggests that the elimination of the limit might deter Edison from postponing planned outages in order to accomplish short-term gains.

We are satisfied that SDC's proposed maximum limits are reasonable and should be adopted. We are concerned that Edison's proposal would seriously undermine the operation of the incentive procedure by greatly reducing the applicability of the formula. If one unit suffered a prolonged outage, the effect could be to exceed the limit just with that one unit, thereby rendering the procedure inoperative in regard to the other units. The procedure should provide an incentive for all realistically attainable improvements in performance.

E. Fuel Costs

Staff, Farm Bureau, and TURN support SDC's proposed method of calculating fuel costs for purposes of the penalty or reward. Edison offers its own proposal.

Edison argues that:

"...rather than using a one-year average price for coal and oil, the price should represent a four-year average for purposes of calculating deviations from the capacity factor standard. Again this would tend more to quantify any penalty or reward in terms of the actual impact on the ratepayer resulting from the deviation from the standard reflecting the fact that a four-year average GCF is used in the incentive formula."

It agrees that a one-year standard is appropriate for the heat rate.

Staff characterizes Edison's position as intended "to assure a lower scale of penalties." Staff argues that more current prices provide a more effective incentive and states:

"In order to secure not only an effective economic incentive, but also a readily available monetary figure, the Staff recommends that the specific fuel cost figure utilized in an incentive calculation be the same current fuel cost being utilized for the ECAC period then under consideration."

This "simplified" calculation is consistent with the proposed heat rate price differential calculation.

Farm Bureau suggests that "current prices are a more appropriate signal to management regarding current and future decisions." It observes that neither proposal "guarantees that the exact economic effect of other-than-standard performance will be calculated." Farm Bureau "prefers" the SDC proposal "because it gives Edison the best signal of the value of maintenance expenditures."

TURN observes that Edison's proposal "results in decreased penalty (or reward) to the utility if the oil/coal price differential increases from year to year." TURN argues:

"...under the proposed incentive formula one cannot separate the capacity factor effect from the heat rate effect. The effects are interdependent, as evidenced by the presence in the formula of the third term, which depends on both heat rate and capacity factor deviations." (Emphasis in original.)

Thus, it concludes that Edison's proposal does not fit into the formula and must be rejected.

We agree that more current prices are most appropriately applied to the formula. Although the four-year average is used in making the initial calculation, at any time the opportunity for improvement is immediate and prospective. The prices used should reflect this opportunity. SDC's proposed method reasonably achieves this purpose and is adopted.

F. Weighting Factor

The formula includes a "weighting factor" (WF), intended to account for the following:

"1. Rewards and penalties are equal for comparable deviations on either side of the standard. Rewards and penalties should be shared between the rate payer and the utility.

"2. The higher the setting of the standard capacity factor, the higher the reward for each unit of capacity factor improvement. Because it is harder to go from 65 to 67 GCF than from 55 to 57%, the reward for the improvement from a higher level should be greater. Therefore, the reward per unit of improvement should increase as the standard is set higher.

"3. In steam plants capacity factors range from 0 to 80% and never achieve 100%. We call this level CF MAX."

The WF is the ratio of the standard to the maximum. The specific factors are: Mohave - .7625; Four Corners - .7375. Staff, Edison, and Farm Bureau support the inclusion of the WF. TURN opposes its use.

TURN again states its major premise:

"Judging from past history, we do not have to worry
about the utility exceeding the standard. While
TURN appreciates the CPUC Staff's concern that
ratepayers share in any potential rewards, TURN
is frankly far more concerned about ratepayers
'sharing' millions of dollars of penalties for
which they are not responsible."

This statement is apparently based on the assumption that its own
proposed standards are adopted, for if they are not, TURN warns that:

"...then the effect of the 'Weighting Factor'
would be to decrease the amount of the
inequitable reward whenever the utility
performed above the artifically low standard."

TURN points out that the WF apparently originated with the staff and
is appropriately characterized as a policy judgment. It suggests that
if the factor is adopted, it be uniform for all the plants and
clearly identified as a policy judgment.

Staff states that the WF reflects its view of the object of
the incentive procedure:

"...to use the threat of monetary penalties
and the promise of rewards as a means of
concentrating and intensifying SCE's efforts
to upgrade performance at its coal stations."

within the context that:

"The Staff wants the penalty sanction to be
credible and not of such a magnitude that the
Commission would be reluctant to exact it for
fear of crippling SCE financially."

It supports the WF as a policy judgment that equitably apportions
burdens and benefits.

Edison agrees with staff on this issue. It states that one
of the criteria for evaluating the incentive procedure is that "rewards
and penalties on Edison must both benefit the customer base." Absent
a WF, Edison argues that "the ratepayers will not benefit at all
from any improvement in operating performance above the standards -

all benefits in terms of lower fuel costs would go to the utility."
Edison contends that if ratepayers should share in the benefits,
they should also share in the penalties.

Farm Bureau also supports staff. While expressing some
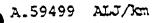reservations regarding the stated rationale for the WF, Farm Bureau
argues:

> "...the desirability of some weighting factor is
> clear. First it cannot be said that all
> deviation from the standard can be blamed on
> or credited to management. A weighting factor
> effectively assigns some portion of the
> deviation to factors beyond management's
> control. The factor is also necessary to
> insure that customers will benefit from
> above-standard performance; without it, all
> the rewards of above-standard performance would
> go to the shareholders only."

Farm Bureau suggests that the amount of the factor is a matter of
judgment.

We find that a WF is appropriate and that the specific factor
proposed by SDC is reasonable. We can say without hesitation that
this is a policy judgment intended to provide some direct sharing of
rewards and penalties.

We disagree with Edison's statement that ratepayers would
not benefit from rewards. Such sufficiently high performance would
at least contribute positively to Edison's cost of capital, providing
a real benefit, even if difficult to quantify. However, the WF allows
a more direct sharing.

Sharing is appropriate because, as stated by Farm Bureau,
rewards or penalties cannot necessarily be credited to or blamed on
management. The adopted incentive procedure is intended to allow
the possibility for penalties without imprudence proved or presumed.
In this respect TURN's statement that "the utility is not liable
for penalties caused by circumstances outside of the utility's
control" is simply wrong.

We make one other observation about TURN's position on
this issue. It assumes that performance will be low (below 60%) if
the higher standards are adopted and high (above 60%) if the lower
standards are adopted. This is a compelling argument in support of
the lower standards.

G. Qualitative Modifiers

SDC proposes "qualitative modifiers" to allow for
modification of the incentive procedure on account of conditions
beyond the control of the utility. It cites as examples:

a. Regulatory restraints.

b. Stoppages due to labor disputes.

c. Degradation of coal quality.

d. Natural disasters, sabotage, war.

e. Availability of cheaper baseload power.

f. Special conditions relating to
catastrophic outages.

Two methods of adjusting the incentive system are proposed. Every
party apparently agrees that these factors are reasonably recognized.
However, Edison proposes to go further than SDC. The other parties
oppose Edison.

Edison offers a list of 12 proposed qualitative modifiers to
be included in its tariff. In addition to the six proposed by SDC,
Edison suggests:

1. Catastrophic failures.

2. Coal quantity restrictions.

3. Environmental constraints.

4. Reduced demand.

5. Restrictions imposed by other coal plant
participants.

6. Transmission restrictions.

It would offer appropriate adjustments based on all these modifiers,
to be reviewed in the ECAC proceeding.

Staff vigorously opposes Edison. It argues that:

"A public utility's tariff is the locus for
rules and terms of service as between the
utility and its customers.' . . .

"Not only would the enumeration of qualitative
modifiers tend to clutter up the tariff, it
also would lend a false assurance to SCE about
such provisions. Qualitative modifiers deal
with a wide range of events that usually are
beyond control. However, aside from natural
disasters or events wholly attributable to
nature, each instance where the qualitative
modifier proviso would be invoked, would require
a specific review by the Commission, within the
context of an ECAC proceeding, as to how much
effect should be attributed to the modifier,
etc. Moreover, SDC's listing of qualitative
modifiers or conditions is never presented as
an exhaustive, exclusive list. Their
enumeration in SDC's reports serves the useful
purpose of conveying the types of events that
could be 'outside utility control.' However,
'to cast them in stone,' as it were, by
enumerating them in a tariff would only raise
more controversy than it would solve, since
the concept is essentially generic and should
not be viewed as a means of certifying just
how and when the concept will be applied."

TURN and Farm Bureau agree that the tariff should not provide for such
modifiers. Farm Bureau emphasizes that the burden of proof is on
Edison to support any adjustments.

We find that the staff has reasonably stated the problems
with Edison's proposal. The same problems exist with respect to the
SDC proposal. Such modifiers as "regulatory restraints", "degradation
of coal quality", and "availability of cheaper baseload power" raise
serious questions. The phrase "regulatory restraints" is over-
broad and could lead to endless debate in hearings. This proposed
modifier also does not recognize that even some safety regulatory
constraints could flow from the failure of management to take necessary
remedial action. "Degradation of coal quality" is a problem within

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the control of management. Quality of coal is specified in either case. If
delivered coal does not meet contract or market specifications, management should
seek relief in the form of damages from the supplier. Even more
important, management can exercise greater control in its acceptance
of coal shipments. In order for the modifier "Availability of
cheaper baseload power" to come into play, one must assume that all
oil and natural gas has been backed out of Edison's supply system.
Edison is primarily reliant on oil and gas today and will continue
to rely significantly on these resources for at least another 15 years.
There seems little value to indicating this modifier might be used
in the incentives program when there is no realistic prospect of its
occurrence.

A principal motivation for adopting an incentives plan is
the difficulty of evaluating the prudence of the company's management
of these plants. Little will have been gained if we merely shift the
issue to a determination of those matters over which management could
have exerted some control. This does not mean that under no
circumstances should the Commission consider the impact of events on
the operation of the plants. Rather, we will not establish a
procedure by which review of such events is encouraged. Instead
such events must be raised on a case-by-case basis. A heavy burden
of proof will rest on the proponent of a "modifying event" to show
that the event was beyond the ability of management to control or
foresee and that no remedial action could have been taken to mitigate
the effect of the event. We shall also require any person who
intends to raise the occurrence of an event as a factor in applying
of the incentive plan to advise this Commission of such intent within
90 days of the occurrence of the event.

H. Initialization

SDC's proposed phasing in of the procedure was developed in response to the following constraints:

> "Include no performance data from years prior to the installation of the system.
>
> "Do not bias the system to favor ratepayers or stockholders.
>
> "Allow assessment of incentive in first year of operation.
>
> "Adjust system to permit computation of incentive on a calendar year basis."

Staff supports SDC's solution. Edison proposes slight modification. TURN is strongly critical.

Edison seeks a delay in the application of the gross heat rate standard until after both units at Mohave and both units at Four Corners return to service after their scheduled overhaul or betterment outage. Edison argues that such a delay is reasonable because the standard is calculated on the basis of both units at a generating station.

Staff supports SDC's recommendation that each unit "initialize" after its major overhaul or betterment outage in the 1980-82 period. It argues that:

> "Any prolonging of the time during which performance at the standards is credited to the utility should be discouraged. Merely because the Gross Heat Rate Standard for a coal plant station is derived from a consideration of its two individual units, a delaying of the act of comparing the initial unit's actual heat rate with that standard is ill-advised, given the delayed starting dates already provided."

Farm Bureau agrees that "it would be preferable to accelerate" the impact of the incentive procedure beyond Edison's suggestion.

We are not convinced that any further delay in the application of the procedure is required, in which case we decline to adopt Edison's proposal. We are eager to put the procedure to work, as a possible model for other power plants. Unnecessary delay simply bends the learning curve.

TURN complains about the "Start-Up Subsidy" that it says occurs because of the imputation of the standard during the initialization period. It offers a computation based on the assumption that Edison will operate the plants below the standard for the first three years as the extent of the subsidy and to demonstrate that "the utility will suffer no penalty for several years even if performance is below standard." TURN offers three alternatives:

"1. Apply the standards retroactively.

"2. Apply the national average retroactively.

"3. Use a one-year average in year one, a two-year average in year two, and a three-year average in year three."

Any of these is supported as fair.

Staff and Edison oppose TURN. Staff states:

"A retroactive imputation of standards or of a national average would be patently unfair. Also ill-advised is the use of averages based only on results actually experienced. Such a methodology would tip the scales toward a reward situation for the utility since performance would likely be on an upswing for the first two years after a major overhaul outage."

Staff points out this circumstance would occur only once in the life of the procedure, to the advantage of the utility. Edison's arguments are similar.

Farm Bureau objects to the use of "only one-year" results, but states that "use of a three-year average in the third year would be an acceptable and fair method of accelerating the impact of the incentives," in order to avoid further delay.

We are satisfied that SDC's proposal is reasonable and should be adopted. We are not convinced that TURN's criticism has merit.

We see no point in applying the standards retroactively, except as the basis for assessing a penalty against Edison. The same result appears intended by the use of the national average. Such retroactive consideration is discussed further in that portion of this decision relating to a penalty for past performance. The use of a one-, two-, or three-year average is unnecessary and inconsistent with the underlying assumption that a four-year average is required to provide for recognition of the cyclical nature of overhaul schedules and the gradual deterioration of operating performance between overhauls.

TURN also objects to the scheduled initialization of Mohave Unit 1 - four weeks prior to the completion of the betterment outage, rather than eight weeks as provided for each of the other units. TURN argues that "if the other three units can be initialized eight weeks prior to completion of the betterment outage, then so can Mohave Unit 1." It suggests that 16 weeks might be appropriate to reflect actual downtime.

Edison argues that:

> "TURN apparently fails to understand the reason
> for this treatment of Mohave Unit 1. The idea
> is to start each unit under the incentive
> formula upon completion of its betterment
> overhaul, back dated by the normal amount of
> time scheduled for outages. In the case of
> Mohave Unit 1, the normal amount of time
> scheduled for its overhaul in 1980 was four
> weeks."

The schedule reflects this "normalized" sort of treatment.

We are satisfied that SDC's proposal is reasonable. There is no suggestion that Edison prolonged the downtime. We see no basis for tilting the procedure toward a penalty at the outset. It would

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be unfair to burden Edison now for a betterment outage that was presumably scheduled without regard to the initialization of this incentive procedure. Perhaps TURN might have been able to press this point with more vigor (or might have abandoned it entirely) if it had chosen to cross-examine the SDC witness.

I. Conclusion

The foregoing discussion reflects obvious satisfaction with the work product of the staff and SDC in this matter. This decision only hints at the wealth of technical detail provided in the record and the considerations underlying their recommendations. We are very pleased to be able to proceed to such an important task upon such a sound foundation.

VI. Deferred Fuel Costs

By D.91416 dated March 4, 1980 (modifying D.90967), this Commission provided that a portion of Edison's ECAC relief in the amount of about $35 million should be deferred as a result of low capacity factors at its coal plants, pending a determination of the reasonableness of those capacity factors. The decision further provides that the Commission may allow recovery of all or part of the $35 million in a future ECAC proceeding if justified by further investigation. Edison requests authority to recover the deferred $35 million. Staff and Farm Bureau support Edison. TURN is opposed.

Edison recites the historical operation of the coal plants. It points out that its choice was between coal or oil and gas, and that the change in differential fuel costs was not foreseen at the time the plants were built. "Naturally, the economics prevailing at the time affected design concepts and the selection of equipment." If assumptions had been more accurate, greater availability and reliability could have been built in.

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It characterizes performance expectations as "overly optimistic", but considered reasonable by the industry at the time. It cites the lack of real experience with plants of comparable type and size and some of the innovative features of the facilities as circumstances contributing to the unrealistic predictions of plant performance.[1]/

It describes the coal plants as "highly advantageous" to the ratepayers in terms of reduced fuel costs, despite their failure to live up to original projections.

Edison offered the testimony of its Manager Steam Generation, R. S. Currie, regarding operation of Mohave and Four Corners. He discussed past maintenance programs and current maintenance and construction programs intended to increase capacity factors, as well as administrative measures taken to improve performance.

At the request of the presiding administrative law judge, Edison presented evidence regarding its expenditures at Mohave and Four Corners in excess of expenses reflected in rates. Edison showed that for the period 1976 to 1979, its share of operation and maintenance expense for these plants was $27.1 million higher than reflected in base rates. For 1980 Edison estimated that such expenses would amount to an additional $17.7 million, a total of $44.8 million. For the period 1976 through 1979 Edison showed that it spent $37 million for capacity improvement programs at Mohave and $16 million at Four Corners.

TURN argues that past performance of the coal plant:

"...has been unreasonable both because performance has been far below the national average and, more importantly, because the consultant has found that management deficiency has caused capacity factors to average more than 6 percentage points below a reasonable level over the last 5 years."

Its allegation of management deficiency is based entirely on SDC's findings regarding management of the plants.

1/ The design goal was 90% availability factor. This was reduced to 84% in 1975 and then to 77% in 1977.

Regarding the national average, TURN cites several
different sources of net capacity factor information and concludes:
"No matter how you slice it, Edison's performance has been far
below national average and has resulted in many millions of dollars
of replacement fuel costs." We are not persuaded of the relevance
of any such comparison.

A comparison to the national average can be useful to
determine whether a prospective performance standard is being set in
the proper range. We have established standards of 61% and 59%
capacity factor. For plants with boilers manufactured by the same
companies that manufactured the boilers in Edison's coal plants,
Babcock and Wilcox and Combustion Engineering, the national average
capacity factor is slightly above 56%. For all coal plants of the
type at issue, the national average is 63-66%. Thus, it appears
that our performance standard is in the proper range. To use the
national average to impose a penalty on the company for past performance
would, we believe, be grossly unfair to the company.

Regarding the alleged management deficiencies TURN admits
that "the consultant has taken no position regarding reasonableness
of past performance." However, it points out that the consultant
has identified "deficiencies associated with planning, home office
support, personnel, delays, documentation and information management,
operation and management procedures, and other related items," and
argues that ratepayers should not pay resulting replacement fuel
costs. TURN contends that:

> "...management deficiency has been directly
> responsible for decreased capacity factors
> at Mohave and Four Corners of about 6
> percentage points for the last five years."
> (Emphasis in original.)

It argues that an additional $7 million should be disallowed.

Edison contends that TURN distorts the record. It suggests
that TURN fails to understand the method used by the consultant to
derive its standards. It claims that the nonhardware programs serve
to sustain performance between overhaul cycles and cannot improve
performance beyond the hardware capability of the plants.

Staff agrees with Edison that the effect of nonhardware
recommendations cannot be considered apart from hardware improvements.
It states that there is no evidence that if Edison were to forgo
all hardware improvements, that the percentage increases in capacity
factor computed by TURN could be attained by merely nonhardware
improvements.

Staff also disputes TURN's equating of nonhardware
improvements recommended by the consultant with imprudence. It
points out that the improvements "deal with subtle areas" and argues
that imprudence should not be found simply because management
procedures were later judged not to have been effective.

We are not persuaded that the consultant's proposed nonhardware
improvement programs support a finding of past imprudence. We are
satisfied that Edison has recognized the low performance of these
plants and has acted reasonably in trying to improve them. The record
shows that it has expended substantial dollars unrecognized in rates
to improve the plants - more than the proposed penalty. TURN supports
improvements, but it offers no financing. The ratepayer is more
reasonably served if the money is available to improve the plants:

TURN's position illustrates the sort of problem that
supports the adoption of the incentive procedure. It keeps score of
the misses but gives no credit for the effort. There is no
recognition of the trial and error process over time that yielded the
current set of assumed solutions. The incentive procedure frees us
from this kind of hindsight.

VII. TURN's Attorney Fees

As indicated above, TURN filed a "Request for Reimbursement"
of its attorney fees and reasonable costs in this proceeding. Based
on the disposition of the issues we find that TURN made no
"substantial contribution" for Public Utility Regulatory Policies
Act of 1979 (PURPA) purposes as defined by our rules. Each position of
TURN was either rejected or had been proposed by staff. Therefore its
request is denied.

Findings of Fact

1. Edison participates in the Mohave and Four Corners coal plants.

2. During their years of operation the Mohave and Four Corners plants have each experienced major problems that have resulted in unsatisfactory performance.

3. In Edison's ECAC application, A.58393, staff proposed that a 60% capacity factor be imputed to past performance and applied in future proceedings. Staff proposed that $32 million be disallowed.

4. In D.90488 we declined to adopt the staff recommendation, but directed that a consultant be retained to report on Edison's coal plants as a basis for an incentive procedure.

5. By D.90967 we deferred $35 million from Edison's requested ECAC relief pending completion of the coal plant studies.

6. SDC was retained to perform the study.

7. SDC proposed a comprehensive incentive procedure in addition to standards of performance for the coal plants.

8. Existing ratemaking procedures do not provide sufficient incentives for efficient plant operations.

9. The prudency test is very difficult to apply to matters as complex and difficult as plant reliability and efficiency.

10. An incentive procedure should provide for a balance between risk and opportunity.

11. SDC's proposed standards of performance achieve a balance between risk and opportunity.

12. A null zone built into the incentive procedure avoids the problem of short-term inducements to act contrary to long-term interests.

13. The null zone eliminates trivial cash flows back and forth for small departures from the standard.

14. The null zone should be set at the 50% probability interval for the mean about the standard.

15. There should be no imputation of standards in the event that one of a unit's measures falls within the null zone and one falls outside.

16. The maximum limit of rewards or penalties should be set at the bounds of the 98% confidence intervals about the respective standards.

17. As fuel prices increase, the incentive limit increases.

18. A $10 million limit would unduly restrict the application of the incentive procedure.

19. Current fuel prices relate to the immediate opportunity for plant performance improvement and should be the basis of rewards or penalties.

20. A Weighting Factor provides a basis for sharing rewards and penalties.

21. SDC's proposed Weighting Factor provides a fair basis for sharing.

22. Use of qualitative modifiers should be limited, should be subject to a heavy burden of proof, and should not be included in the tariff.

23. Unnecessary delay in initialization of the procedure is unwarranted.

24. SDC's proposed phasing-in procedure is consistent with the purpose of the incentive procedure.

25. The "national average" for performance of coal plants is useful in evaluating the proper range of a prospective standard but should not be used as a basis to penalize past performance.

26. Mohave Unit 1 is reasonably initialized based on a normal betterment outage, consistently with other units.

27. Edison's past coal plant operations have shown Edison's awareness of low performance and its willingness to try to improve capacity factors.

28. Edison has spent substantial dollars in excess of expenses reflected in base rates in its efforts to raise performance.

29. SDC's proposed nonhardware improvement programs do not support a finding of past imprudence.

30. TURN has not made a substantial contribution to the resolution of any PURPA issue in this matter.

Conclusions of Law

1. A coal plant performance incentive procedure is reasonably adopted for Edison's coal plants.

2. The procedure proposed by SDC is reasonable.

3. Edison's past coal plant operations have been prudent.

4. The effective date of this order should be the date of signature in order to proceed with implementation of the procedure.

IT IS ORDERED that:

1. Southern California Edison Company (Edison) shall incorporate into its tariffs as part of its Energy Cost Adjustment Clause (ECAC) the incentive procedure proposed by System Development Corporation in this proceeding and that in future annual ECAC review filings it shall report on the application of the procedure to its coal plants.

2. Edison may include in its ECAC balancing account the $35 million previously disallowed as energy expenses, plus applicable interest.

This order is effective today.

Dated _____JUL 22 1981_____, at San Francisco, California.

President

Commissioners

APPENDIX A

Formula:

$$I = K_1 \, \Delta GCF + K_2 \, \Delta GHR + K_3 \, \Delta GCF \; \Delta GHR$$

where:

I = Dollar amount of reward (- values) or penalty (+ values)

$$K_1 = \left[(CC)(GHR_S) - (CO)(GHR_O) \right] \left[\frac{Period\ Hours}{1000} \times GMC \times SHR \times WF \right]$$

$$K_2 = \left[(CC)(GCF_S) \right] \left[\frac{Period\ Hours}{1000} \times GMC \times SHR \times WF \right]$$

$$K_3 = \left[(CC) \right] \left[\frac{Period\ Hours}{1000} \times GMC \times SHR \times WF \right]$$

$$\frac{Period\ Hours}{1000} \times GMC \times SHR \times WF = 2955 \text{ (normal year Mohave Units 1 \& 2)}$$
$$= 2953 \text{ (leap year Mohave Units 1 \& 2)}$$
$$= 2480.3 \text{ (normal year Four Corners Units 4 \& 5)}$$
$$= 2487.5 \text{ (leap year Four Corners Units 4 \& 5)}$$

GMC = Gross maximum capacity = 790 MW Mohave Units 1 & 2; 800 MW Four
Corners 4 and 5

SHR = SCE share of units = .56 Mohave; = .48 Four Corners

WF = Weighting factor to provide for reward sharing between rate payer and
utility and to account for fact unit cannot operate at 100% gross
capacity factor

$= CFS/CF_{MAX}$ = Standard GCF/upper limit of sustained CF for that type
unit $= \frac{.61}{.80} = .7525$ (Mohave); $= \frac{.59}{.80} = .7375$ (Four Corners)

CC = Cost Coal ($/$10^5$ Btu) for Unit (Annual Average)

CO = Cost Oil ($/$10^6$ Btu) for SCE System (Annual Average)

GHR_O = Gross Heat rate for SCE oil fired plants (Annual Average)

GHR_S = Gross Heat rate standard = 10,250 Btu/KWH (Mohave); = 9400 Btu/KWH
(Four Corners)

GCF_S = Gross Capacity factor standard = .51 (Mohave); = .59 (Four Corners)

ΔGCF, ΔGHR = Variance from standard GCF and GHR, respectively

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APPENDIX C - DERIVATION AND APPLICATION OF REWARD/PENALTY AND PERFORMANCE LIMIT EQUATIONS

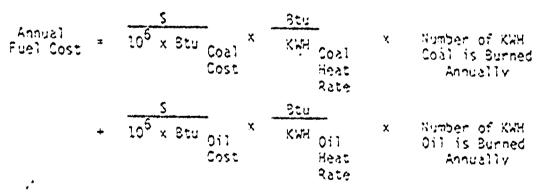### C.1 EXCESS FUEL COST OR SAVINGS FORMULATION

The basic relationship of excess fuel cost or savings can be formulated as follows:

$$\text{Annual Fuel Cost} = \frac{\text{Coal Cost}}{\text{KWH}} \times \begin{array}{c}\text{Number of KWH}\\\text{Coal is Burned}\\\text{Annually}\end{array} + \frac{\text{Oil Cost}}{\text{KWH}} \times \begin{array}{c}\text{Number of KWH}\\\text{Oil is Burned}\\\text{Annually}\end{array}$$

There are several assumptions involved in the above relation. Namely:

a. Fuel cost refers strictly to purchase cost of coal and oil. Coal and oil cost in dollars per KWH is directly proportional to the purchase cost in dollars per million Btu's, the proportionality constants being the average heat rates of coal and oil respectively.

b. The unit will only utilize coal as long as it is operating. When the unit is temporarily not operating (for whatever reason), another unit will burn oil in its place.

The above relation can now be restated as:

$$\text{Annual Fuel Cost} = \frac{\$}{10^6 \times \text{Btu}_{\text{Coal Cost}}} \times \frac{\text{Btu}}{\text{KWH}_{\begin{array}{c}\text{Coal}\\\text{Heat}\\\text{Rate}\end{array}}} \times \begin{array}{c}\text{Number of KWH}\\\text{Coal is Burned}\\\text{Annually}\end{array}$$

$$+ \frac{\$}{10^6 \times \text{Btu}_{\text{Oil Cost}}} \times \frac{\text{Btu}}{\text{KWH}_{\begin{array}{c}\text{Oil}\\\text{Heat}\\\text{Rate}\end{array}}} \times \begin{array}{c}\text{Number of KWH}\\\text{Oil is Burned}\\\text{Annually}\end{array}$$

This can easily be put in terms of megawatt hours (MWH), since:

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Number of KWH Coal is Burned Annually	=	Unit Gross Capacity Factor	x	$\dfrac{10^3 \text{ KWH}}{\text{MWH}}$	x	Unit Capacity (MWH)

Number of KWH Oil is Burned Annually	=	1 - Unit Gross Capacity Factor	x	$\dfrac{10^3 \text{ KWH}}{\text{MWH}}$	x	Unit Capacity (MWH)

In mathematical notation, these concepts can be incorporated directly as follows:

$$Y = \left[(CC)(GHR_C)(GCF) + (CO)(GHR_O)(1 - GCF) \right] \times F_1 \qquad (C-1)$$

Where:

Y	=	Average Annual Fuel Cost (Dollars)
CC	=	Average Plant Cost of Coal (Dollars/10^5 Btu)
CO	=	Average System Cost of Oil (Dollars/10^5 Btu)
GCF	=	Average Annual Gross Capacity Factor of Generating Unit $\ldots\ldots (0 < GCF < 1.0)$
GHR_C	=	Average Gross Heat Rate of Coal (Btu/KWH)
GHR_O	=	Average Gross Heat Rate of Oil (Btu/KWH)
F_1	=	Factor Required to Convert from KWH to MWH and Annualize the Result = $GMC \times \dfrac{\text{Period Hours}}{1000}$
GMC	=	Gross Maximum Generating Capacity (Megawatts)

The expression for the effect a change in gross heat rate and capacity factor (from the standards) would have on fuel costs can be obtained as follows:

Let GCF_S be the generating unit's gross capacity factor standard, and GHR_S be the gross heat rate standard for coal. Also, let Y_S be the annual fuel cost if standards GHR_S and GCF_S are achieved. Further, let Y be change in fuel cost for deviations $\Delta GCF = (\overline{GCF} - GCF_S)$ and $\Delta GHR = (GHR_C - GHR_S)$ from the respective gross capacity factor and heat rate standards.

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Then $Y_S + \Delta Y$ is the resulting fuel cost when $GCF = GCF_S + \Delta GCF$, and $GHR_C = GHR_S + \Delta GHR$.

Thus, substituting into equation (C-1):

$$Y_S + \Delta Y = \left[(CC)\,(GHR_S + \Delta GHR)\,(GCF_S + \Delta GCF) + (CO)\,(GHR_O)\,(1 - (GCF_S + \Delta GCF))\right] \times F_1$$

$$Y_S = \left[(CC)\,(GHR_S)\,(GCF_S) + (CO)\,(GHR_O)\,(1 - GCF_S)\right] \times F_1$$

But also:

$$\Delta Y = (Y_S + \Delta Y) - Y_S$$

So that subtracting the second equation from the first gives:

$$\Delta Y = \left\{\left[(CC)\,(GHR_S) - (CO)\,(GHR_O)\right]\Delta GCF + (CC)\,(GCF_S)\,\Delta GHR + (CC)\cdot(\Delta GCF)\cdot(\Delta GHR)\right\} \times F_1$$

This can be written simply as:

$$\Delta Y = k_1\,\Delta GCF + k_2\,\Delta GHR + k_3\,\Delta GCF\,\Delta GHR \qquad\qquad (C-2)$$

Where:

ΔY = Change in Average Annual Fuel Cost (Dollars)

ΔGCF = $(GCF - GCF_S)$ = Average Annual Deviation in Gross Capacity Factor from the Standard ($0 < GCF_S < 1.0$)

ΔGHR = $(GHR_C - GHR_S)$ = Average Annual Deviation in Coal Gross Heat Rate from the Standard (Btu/KWH)

And:

k_1 = $\left[(CC)\,(GHR_S) - (CO)\,(GHR_O)\right] \times F_1 \qquad\qquad (C-3)$

k_2 = $(CC) \times (GCF_S) \times F_1$

k_3 = $(CC) \times F_1$

$$F_1 \quad = \quad \frac{\text{Period Hours}}{1000} \times \text{GMC (Gross Maximum Generating Capacity in Megawatts)}$$

All other variables are as previously defined (also see Glossary of Symbols at
end of Appendix C).

In the event both $\Delta GCF < 0$ and $\Delta GHR > 0$, neither of the standards are met, and
the fuel cost will be greater than if the standards had been met. Also, when
both $\Delta GCF > 0$ and $\Delta GHR < 0$, the standards are exceeded and the fuel cost will
be less than if the standards had merely been met. It is assumed that the
ratio of oil cost to coal cost always exceeds the ratio of coal heat rate to
oil heat rate. The case of neither standard being met will result in excessive
fuel cost. The case of both standards being exceeded will result in fuel cost
savings. Applying this to equations (C-2) and (C-3) gives:

$\Delta Y > 0$ represents excessive fuel costs.

$\Delta Y < 0$ represents savings in fuel costs.

B.2 FORMULATION OF INCENTIVE EQUATION

It is reasonable to base the incentive system of rewards and penalties on
savings in fuel costs or excess fuel costs respectively, when deviations from
capacity factor and heat rate standards occur. The reward/penalty equation is
thus based on Equation (C-2), a linear representation of fuel cost changes,
with a modification to include two weighting factors. The first weighting
factor, called SHR, prorates the equation to reflect Edison's share of the
generating unit in terms of its investment as a fraction of the total worth of
the unit.

Thus:

SHR   =   0.45 (Four Corners)

SHR   =   0.56 (Mohave)   (C-4)

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The second weighting factor reflects the fact that there is some capacity factor less than 100% (CFMAX) at which the generating unit could realistically be expected to operate, under the most optimum conditions, averaged over either a smoothing period or annually. The plant can never be expected to do better than CFMAX on a long-term average basis.

Incorporating the above factors, the incentive equation is written as:

$$I = \Delta Y \times (SHR) \times (WF) \tag{C-5}$$

Where:

I	=	Dollar Amount of Reward if I > 0
I	=	Dollar Amount of Penalty if I < 0
ΔY	=	Average Savings or Excess Fuel Cost in Dollars as Given by Equation (C-2)
SHR	=	Edison's Prorated Share of Plant from EQ (C-4).
WF	=	$\dfrac{CF_S}{CFMAX}$
CFMAX	=	Maximum Capacity Factor Above Which no Coal-Fired Plant can be Expected to Operate, Averaged Over a Long-Term Basis

It follows from Equations (C-2) and (C-5) that the incentive equation can be written as:

$$I = K_1 \Delta GCF + K_2 \Delta GHR + K_3 \Delta GCF \, \Delta GHR \tag{C-5}$$

Where:

$$K_1 = \left[CC \times GHR_S - CO \times GHR_O \right] \times F_1 \times SHR \times WF \tag{C-7}$$
$$K_2 = CC \times GCF_S \times F_1 \times SHR \times WF$$
$$K_3 = CC \times F_1 \times SHR \times WF$$

and all other variables are as previously defined.

<u>Example:</u> What would the reward or penalty be if, in a given four-year period, gross capacity factor drops an average of 5% (on a basis of 100) below its standard, and annual gross heat rate increases (degrades) by 1000 Btu/KWH above its standard for an 800 MW unit? Assume that:

CC = Average Annual Plant Cost of Coal = (1.0/Btu $\times 10^6$)

CO = Average Annual System Cost of Oil = (5.0/Btu $\times 10^6$)

GHR_S = Gross Heat Rate Standard for Coal = 9,500 Btu/KWH

GHR_O = Average Annual Gross Heat Rate for Oil = 10,000 Btu/KWH

GCF = Capacity Factor Standard = 0.60

$CFMAX$ = Maximum Capacity Factor Realizable = 0.80

$Share$ = Edison Share of Plant = 0.48

WF = $\frac{.60}{.80}$ = .75

$Period\ Hrs$ = 8,760

<u>Solution:</u> Substitution of the above variables into EQ (C-7) gives:

$$K_1 = \left[(1.0)(9,500) - (5.0)(10,000)\right] \times F_1 \times .48 \times .75 = -14,580\ F_1$$

$$K_2 = 1.0 \times .60 \times F_1 \times .48 \times .75 = .216\ F_1$$

$$K_3 = 1.0 \times F_1 \times .48 \times .75 = .36\ F_1$$

$$F_1 = \frac{Period\ Hours}{1000} \times GMC = 8.760 \times 800 = 7008$$

The above is substituted into (C-6):

$$I = (-14580)(7008)\ \Delta GCF + (.216)(7008)\ \Delta GHR + (.36)(7008)\ \Delta GCF\ \Delta GHR$$

From the conditions of the problem:

$$\Delta GCF = GCF - GCF_S = -.05$$

$$\Delta GHR = GHR_C - GHR_S = +1000$$

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So:

$$I = (-102.177 \times 10^5)(-.05) + (1513.??8)(1000) -$$
$$(2522.88)(-.05)(1000)$$

$$I = (5.109 \times 10^6) + (1.51? \times 10^5) - (?.1?5 \times 10^6) =$$
$$\$6.497 \times 10^6$$

Since the result is positive (representing a measure of excess fuel cost), a penalty of \$6.5 million is assessed. If gross capacity factor had increased by 5% and heat rate had improved (dropped) by 1000 Btu/KWH, a reward would have been allowed in the amount of \$6.75 million instead of a penalty, reflecting a measure of fuel savings which would have been indicated by a minus sign (-) in the answer.

C.3   CALCULATION OF MAXIMUM INCENTIVE LIMITS

The incentive system provides for financial rewards or penalties based on utility performance. However, it is not desirable to permit this monetary incentive to grow without limit. The recommended approach to setting a monetary limit is based on the utility's performance at the bounds of the 98% confidence intervals about the respective standards of approximating the gross capacity factor and gross heat rate. Changes in performance at these points are put into the incentive equation. The resulting dollar values of incentive are the limits on both rewards and penalties, respectively.

Example: What would be the upper limit on incentive if the gross heat rate standard was 10,250 Btu/KWH and the 98% confidence interval was ± 1000 Btu/KWH? The gross capacity factor standard is 51%, and the 98% confidence interval ± 10%.

Assume also:

CC	=	Average Annual Plant Cost of Coal = ($1.0/Btu \times 10^5$)
CO	=	Average Annual System Cost of Oil = ($5.50/Btu \times 10^5$)

GHR_0 =   Average Annual Gross Heat Rate of Oil = 10,000 Btu/KWH

CFMAX   =   Maximum Capacity Factor Realizable = 0.80

SHR   =   Edison Share of Plant = 0.56

WF   = $\frac{.61}{.80}$ = .7625

GMC   =   Gross Maximum Generating Capacity = 790 MW

Period Hours   =   8,750

Solution: Substitution of the above variables into the incentive equation (C-7) gives:

$$K_1 = \left[(CC)(GHR_S) - (CO)(GHR_0)\right] \times SHR \times WF \times F_1$$
$$= \left[(1.00)(10,250) - (5.50)(10,000)\right] \times .56 \times .7625 \times F_1$$
$$= -.01911(F_1) \times 10^6$$

$$K_2 = (CC) \times (GCF_S) \times SHR \times WF \times F_1$$
$$= 1.00 \times .61 \times .56 \times .7625 \times F_1 = .26047(F_1)$$

$$K_3 = F_1 \times SHR \times WF = .4270(F_1)$$

Also:

$$F_1 = GMC \times \frac{\text{Period Hours}}{1000} = 790 \times \frac{8760}{1000} = 6920.4$$

Therefore:

$$K_1 = -.01911 \times 6920.4 \times 10^6 = -132.249 \times 10^5$$
$$K_2 = .26047 \times 6920.4 = 1802.556$$
$$K_3 = .42700 \times 6920.4 = 2955.011$$

The next step is to substitute these values into the incentive equation (C-6):

$$I = K_1 \, \Delta GCF + K_2 \Delta GHR + K_3 \, \Delta GCF \, \Delta GHR \tag{C-8}$$

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From the conditions of the problem

$$\Delta GCF = .71 - .61 = .10$$
$$\Delta GHR = 9250 - 10,250 = -1000$$

Hence:

$$I = (-132.249 \times 10^6)(.10) + (1802.666)(-1000) + (2955.011)(.10)(-1000)$$
$$= -13.225 \times 10^6 - 1.803 \times 10^6 - .296 \times 10^6$$
$$I = 15.324 \times 10^6 \text{ in Absolute Value}$$

Hence, for this example no reward can be earned above a limit of $15.3 million. The dollar limit will vary from year to year, even though the performance standards remain the same, due to fluctuations in the oil cost : coal cost ratio.

The first term in the incentive equation is the contribution of the capacity-factor performance to the total incentive. The second term is the heat-rate performance contribution, while the third term is their joint product. Thus, in the above example, pure capacity-factor performance accounts for $13.2 million out of the total $15.3 million, which is over 85% of the incentive. In succeeding years, if coal cost rises faster than oil cost, heat rate performance will become significant in determining the dollar value of the limit.

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GLOSSARY OF SYMBOLS

CC — Average annual purchase cost of coal (dollars/10^5 Btu's).

CO — Average annual purchase cost of oil (dollars/10^5 Btu's).

GCF (or $\overline{GCF}$) — Four-year Average gross capacity factor ($0 < GCF < 1.0$).

GCF_S — Gross capacity factor standard ($0 < GCF_S < 1.0$).

$CFMAX$ — Maximum capacity factor attainable over a long-term basis.

F_1 — Factor required to convert from kilowatt hours to annual megawatt hours.

GMC — Gross maximum generating power (megawatts).

GHR_C — Plant average annual coal gross heat rate (Btu/KWH).

GHR_O — System average annual gross oil heat rate (Btu/KWH).

GHR_S — Gross heat rate standard (Btu/KWH).

I — Annual incentive (dollar reward or penalty).

k_1, k_2, k_3 — Proportionality constants in the calculation of average annual change in fuel costs.

K_1, K_2, K_3 — Proportionality constants in the calculation of annual incentive.

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GLOSSARY OF SYMBOLS (Continued)

SHR   Edison's prorated share of plant.

WF   Weighting factor used in incentive equations.

Y   Average annual fuel cost (dollars).

Δ GCF   Deviation in gross capacity factor from its
                       standard (GCF − GCF_S).

Δ GHR   Deviation in gross heat rate from its standard
                       (GHR − GHR_S).

Δ Y   Change in average annual fuel cost (dollars).

(END OF APPENDIX B)