OFD SPECIAL STUDIES

85035--003

Power - Follow up

1973 (April - May)

INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

# OFFICE MEMORANDUM

file Power Follow-up

TO: * See Distribution

DATE: May 25, 1973

FROM: Y. Rovani R by TWB

SUBJECT: Public Utility Note No. 5
Pricing in Power and Water Supply

Please find attached draft of Public Utility Note No. 5 on "Pricing in Power and Water Supply".

As you already know, there is no policy content in this Note and the primary purpose for circulating it is to get quality inputs and comments from a select panel of readers consisting of staff particularly experienced in this area as well as other Bank staff of various backgrounds. I am asking you, therefore, to be kind enough to act in this capacity.

I would appreciate comments to be sent directly to Mr. Berrie by June 11, 1973.

Attachment

* Mr. Willoughby, Mr. van der Tak, Mr. Bohr, Mr. Baneth, Mr. Churchill, Mr. Pouliquen, Mr. Rajagopalan (through Mr. Arnold), Mr. Ribi (through Mr. Krombach)

Mr. Howell, Mr. Jennings, Mr. Anderson, Mr. Friedmann, Mr. Berrie

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May 25, 1973

PUBLIC UTILITY NOTE No. 5

Pricing in Power and Water Supply

(State of the Art Paper)

Introduction

1. Public utility pricing has always received careful consideration in Project Appraisal. Until recently, however, the only systematic concern has been with ensuring that the level of tariffs would be sufficient to provide the revenues needed for financing operating costs and an adequate portion of the needs of the Utility towards future expansion. Some attention has always been given to attempting to spot and remedy glaring inconsistencies in the structure of tariffs, e.g. customers with obviously small costs of supply subsidizing customers with obviously large costs of supply. Occasionally certain fiscal and/or income distribution objectives have been taken into consideration.

2. In the last five years attempts have been made in the Bank to examine the subject more deeply. Desk as well as case studies have been done. The most suitable approach is likely to be in future to learn more from practice, by case studies and operational work through Economic Missions and the various stage of the Project Cycle.

3. This Note brings the reader up-to-date, indicating what lessons have been learned, what information is now available for operational use and what further work is being done. It further suggests that economic, social and fiscal aspects of utility pricing be more systematically considered in all phases of operational work. At present no specific quidelines can be laid down for these aspects. Further investigatory work is required both by Central Projects and Regional Public Utilities staff (see paras. 42-44).

Main Aspects of Public Utility Pricing

4. There are four main aspects of Public Utility Pricing: financial, fiscal, economic and social.

Financial

5. The Bank has always attached considerable importance to the financial reliability of its public utility borrowers, to ensure not only their solvency but also their ability to generate cash internally and raise in the form of debt and equity capital, the resources necessary for their continuing development, thus serving broad economic and fiscal purposes. The policies of the Bank in this regard, the criteria used to determine the appropriate level of tariffs charged to customers, and the covenants, and other arrangements designed to ensure that this level is maintained despite inflation are described in OPM 2.63 "Public Utilities", and need not be further developed here.

Fiscal

6. The fiscal impact of Bank public utility projects requires more systematic attention, as has been demonstrated in a number of instances. In this connection the Operations Evaluation Unit recommended that a paragraph be included in appraisal reports on the subject. It is suggested that this recommendation, which is being followed in other sectors, be accepted.

Economic

7. In order to obtain the optimum use of resources, prices must be broadly in line with incremental (marginal) costs of supply. Recently much work has been carried out with respect to marginal cost pricing, and it is this work which is the main subject of this Note. Marginal cost pricing has an impact on both the level and the structure of public utility tariffs.

It is a very important dimension in tariff making, and basically consists of reflecting in the tariffs the incremental economic cost of supplying one extra unit of service (kWh or gallon of water) at any period in time. A compromise is always needed between the theoretical and the practical.

Social

8. Increasing attention is being paid to social aspects which can be part of tariff making e.g. the degree that redistribution of income or social priorities can be built into tariff structures. The Operations Evaluation Unit recommended that a paragraph be included in appraisal reports on this subject, especially with respect to providing supplies to the poorer parts of urban and rural communities, when the annual financial return, at least in the early years of supply, may well be low.

Components of Public Utility Tariffs

9. A fundamental feature of all Public Utilities is that they provide each of their customers wtih two kinds of service:

(a) Ability to supply any quantity of the service demanded at any particular point in time (e.g. the capactity to provide the maximum amount of power or water demanded over the peak hour; kW of electricity capacity, and millions of gallons per hour of water capacity).

(b) The actual amount of the service which they consume (e.g. kWh of electricity or gallons of water).

10. The most representative form of tariff structure is, therefore, to have a component which represents the cost of being able to supply the amount of services demanded over the peak hours (a maximum demand or capacity component) and another component which represents the cost of the actual services supplied (a consumption component). For some customers, ability to supply at the peak

hours may cost more than the actual services supplied and vice versa. Such two part tariff structures are not peculiar to the public utility sectors; they occur in many other sectors, e.g. the cost of the ability to supply transportation services at the peak hour and the cost of the services themselves.

11. The maximum demand or capacity component of a two part tariff (e.g. in $ per kW) can be transformed for convenience into a pseudo consumption component by dividing the component by the number of hours in the year which can be classed as "peak hours". This pseudo consumption component can then be added to the true consumption component appropriate to those peak hours to give a composite figure. It may be necessary to use such a mechanism if the metering of the capacity component does not warrant the expense or is technically difficult, e.g. in most residential and small commercial installations. In a great many cases, the latter type of customer is charged on a tariff structure which "averages out" both the capacity component and the consumption component over every hour of the year to give a "flat rate" tariff (e.g. in $ per kWh or gallons of water).

12. Two further important points in connection with the form of Public Utility Tariffs are:

(i) A third component is often added to represent costs allocable to the one particular customer only (e.g. the cost of connection of the service to the common main or the cost of the meter); the customer component.

(ii) Both the capacity component and (more commonly) the consumption component are sometimes divided into two or more "slabs" either to more truly represent the cost of supply with quantity of service used or for "promotional" reasons.

13. With respect to calculating the values to be used in the tariff structure, all basic information is obtained from the accountancy systems. Examples of typical conventional tariff structures used in practice are shown in "Electricity Costs and Tariffs: A General Study", a United Nations Report[1/] which lists 25 countries. A later paragraph indicates how accountancy costs may need to be modified for use in dealing with the main subject of this paper, namely, marginal cost pricing.

What Has Been Done Already in the Bank in Marginal Cost Pricing.

14. The bare additional cost incurred in supplying an extra unit of service (a kWh of electricity or a gallon of water) at any particular instant in time, present or future, disregarding all actual previous investment costs, is known as the marginal cost of supplying that service and the corresponding tariff, the marginal cost tariff. By the logic of paragraph 9, any marginal cost tariff structure should have two components, a capacity component and a consumption component. (Usage of typical marginal cost tariff structures will be referred to later.) In order to adequately reflect the interplay of economic forces from within and without the economy, marginal costs of supply must adjust accountancy costs in order to more adequately reflect the "true" value of foreign exchange, labor, cost of capital etc. This type of "shadow pricing" is required in any case for determining least-cost solutions for public utility investment programs.

15. Since 1967 a good deal of work has been done by or for the Bank on marginal cost pricing and the economic aspects of public utility pricing, especially in the power sector. Several desk studies made in the period 1967-1968 brought out some important points:

1/ Available in Public Utilities Department

(a) The strict application of marginal cost pricing gives (i) the optimum use of existing and future resources; and (ii) leads to optimum investment decision making.

(b) However, such strict application is impossible, and likely to remain so, because of problems of measurement (e.g. of each unit of service supplied for each hour, of each day of each year), and lack of data with respect to the marginal cost of supplying an extra unit of service e.g. from the normal accounting system.

(c) Thus, compromises must be made both in the application of marginal cost pricing and in the process of changing from present tariff structures to any structure based upon marginal cost pricing. This, in effect, is what places emphasis on developing by case studies practical means of implementing marginal cost based tariffs, to achieve better rather than optimum use and allocation of resources.

16. Allowing for some adjustment with respect to differing costs and practicalities of providing storage (which tends to add important constraints in the power sector), similar findings apply to both the water supply and the electric power sectors. However, experience suggests that, in defining operational tariffs for the two sectors, primary emphasis in the case of water supply should be on average tariff <u>levels</u>; this is because rising unit construction cost is generally a feature of the sector. Whereas in power tariff <u>structure</u> is a much more important consideration. In the latter case, increasing unit costs of supply are not as clearly a characteristic of the sector; there is, however, greater scope for ensuring that different types of consumption are charged at different rates, normally requiring that the peak/off-peak differential be increased.

Boggis-Westfield Report

17. In 1968 a first case study was mounted to investigate directly the economic, financial, technical and institutional problems involved in determining (i) a practical marginal cost pricing structure and (ii) carrying out the process of changing from the existing tariff system to one based upon marginal cost pricing. Another important objective was to determine the most efficient means, whether through pricing or physical control methods, of cutting down demands at peak hours. The country chosen was Pakistan, and the sector power, because of the large amount of data expected to be available from a previous power system planning study made there for the Bank, and the willingness of the Government to have such a study carried out.

18. The Bank hired two consultants to carry out the study, Professor F. Westfield, an economist with a great deal of background in marginal cost pricing and Mr. J. Boggis, an engineer well experienced in the technical and institutional aspects of tariff making. The team was in the field for about two months and required about another three months for briefing, debriefing and writing their report.

19. The Boggis-Westfield Report[1/], addressing itself to the fact that when electricity is in short supply it should be made to be more expensive than when it is plentiful, concluded that how much more expensive it should be is a most difficult question, since it involves all sorts of important judgments about the correctness of prices in other sectors, income distribution, capital outlays and public acceptability. What is important, however, is that prices should signal relative scarcities. This was regarded in the Report as the "bare bones" of a marginal cost pricing system. The Report was not at all enthusiastic about physical rationing of electricity. Although various methods

1/ Power Load Control Study, Report No. C-57a, March 31, 1972 available from the Public Utilities Department.

of non-price rationing are described, marginal cost pricing is at the heart of the recommendations. The concept that the demand for electricity is a "given" which must be met irrespective of cost, no matter when it occurs, is rejected.

20. Two specific actionable items are recommended. The fact that they appear to be modest illustrates the difficulties encountered in going from an existing tariff system to another. The first recommendation was that seasonable tariffs (price linked to month of supply) based upon the demand made on the power system during peak hours should be introduced for all industrial consumers. The second recommendation was that an experiment be undertaken to explore the practical possibilities of introducing a time-of-day tariff for electrical energy consumed by a particularly important class of consumer (private operators of agricultural tubewells). The report, however, did not produce any "dollar" costs or prices, nor much idea of orders of magnitude of these.

The Turvey Report

21. During 1970, the Public Utilities Projects Department engaged Dr. R. Turvey to carry out a desk study on public utility pricing problems. Dr. Turvey spent a total of about five weeks in Washington and two more in his own office in London. His report[1/] covers electric power in some depth, water and wastes in somewhat less depth and telecommunications superficially.

22. The Turvey Report assumes that the financial viability requirements of a Utility are predetermined; it studies the public utility pricing problems from the points of view of economic efficiency and social fairness. The

1/ "Public Utility Pricing Problems" by R. Turvey (SCICON), December 1971, available from the Public Utilities Department.

Report frequently refers to marginal cost pricing. It argues that the structure of marginal costs should first be investigated and the pros and cons of setting prices higher or lower then studied. In some cases, the barrier to expansion of output is not a high marginal cost but a physical or administrative limitation. In such circumstances, a high price is one way of determining who shall have a share in limited supply while waiting lists, priority rules and "black markets"constitute other ways. The problem is to determine the best mix in a particular situation. If, for any reason, there is a need to provide revenue over and above that collected by marginal cost pricing, the Report recommends concentrating the excess of actual price charged over marginal costs on those components of demand least sensitive to price. Furthermore, it may well be policy to subsidize some (or all) consumers by setting prices below marginal costs to encourage consumers to consume more of the Utility's service (a Utility function) or to leave them with more money to spend on other things (a function of government, not of the Utility as there are many other ways of redistributing income).

23. The Turvey Report makes the following general and positive recommendations with respect to studying public utility pricing:

(i) Do consider the effects of pricing upon resource allocation, i.e. the incentives which pricing provides to customers to consume more or less at different times and under different circumstances, and incentives in relation to the structure of costs of providing the higher or lower level of service.

(ii) Look for alternative courses of action and weigh up their advantages and disadvantages as systematically as possible.

(iii) Avoid both "conventional wisdom" and the assumption that the best practices in developed countries are also necessarily best in less developed countries.

(iv) Be explicit about any political and social judgments involved, whoever makes them.

Power Sector Working Paper

24. Immediately following the receipt of the Turvey Report by the Bank, the latter published its Electric Power Sector Working Paper.[1/] With respect to pricing, the Working Paper points out that, when forecasting electricity demand, the assumption is normally made that demand is price inelastic. While this is probably true, peak demand could be reduced and off-peak demand increased by some form of marginal cost pricing, although the precise amount of the reduction might be difficult to predict. The United Kingdom reports a peak reduction, attributable to marginal cost pricing, of only 1½% of system maximum demand and France a reduction of 3% of system maximum demand. This statement is a reinforcement of the Boggis-Westfield Report's caution in approaching the application of marginal cost pricing (see paragraph 20).

25. The Working Paper states that the scope for changing the shape of the demand curve for electricity in developing countries through the pricing mechanism needs further investigation. Although care must be taken to "avoid cutting the original peak demand in such a way as to form a new peak at a different time of day and season, which would cause greater diseconomies than before, many developing countries could benefit from tariff structures which reflect more closely than at present the structure of system marginal costs." The last phrase of the quotation above is reflected also in a recommendation made by the Bank's Operational Evaluation Unit[2/] after examining the electric power sector in a cross-section of countries.

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1/ Electric Power Sector Working Paper, World Bank, December 1971, available from the Bank's Publication Office.

2/ Operations Evaluation Report: Electric Power, Operations Evaluation Division, 1972, available from the Director, Programming and Budgeting Department.

The Tunisian Case Study Report

26. In order to fit into the pattern of the desired objectives emerging from the Boggis-Westfield Report, the Turvey Report, the Working Paper and the Operations Evaluation Unit Report (including internal discussions concerning these reports within the Bank), Public Utilities Projects Department (later Public Utilities Department) oriented further work on public utility pricing towards three objectives:

(i) The resolution of any major theoretical problems connected with marginal cost pricing.

(ii) The commissioning of further case studies in power, water supply and sewerage to identify the practical difficulties of applying marginal cost pricing.

(iii) The production of guidelines for use by Operating staff to examine existing tariff structures, examine terms of reference for carrying out reviews of existing tariff structures and guiding the Bank's Borrowers and their Consultants on the whole aspect of tariff making.

27. One of the these further case studies has been carried out by Mr. D. Anderson of the Public Utilities Department and Dr. Turvey. The country chosen was Tunisia because a review of the tariff structure of the main power Utility (STEG) has recently been examined by Consultants. A first draft of the Report on the Case Study[1/] has been produced.

28. The estimation of marginal costs had already been undertaken within STEG during periodic working sessions and discussions with Electricité de France (EdF); the approach being similar to that used by EdF in computing

1/ Electricity Tariffs in Tunisia, October 19, 1972, available from the Public Utilities Department.

the French marginal cost system, the "tarif vert". STEG's attempt to estimate the structure of marginal costs has been handicapped by certain deficiencies in information available:

(i) The future investment costs per kW for the distribution part of the network are unknown; the extent to which they vary with KW, kWh, number of consumers etc., can only be guessed.

(ii) The cost of reinforcing distribution to meet a growing demand from existing consumers cannot be distinguished from the costs of extending it to supply new consumers. (This differentiation between existing and new customers is showing itself to be of increasing importance in economic analysis.)

(iii) The information on losses is very approximate.

(iv) Little is known about the Low Voltage network, its capacity or the diversity of demands of its consumers; indeed consultants are being paid to map it.

(v) The daily and hourly consumptions of STEG's consumers are unknown; this is particularly important if new tariffs are to be introduced.

Whether these deficiencies are typical of other utilities will not be known until some more Case Studies have been carried out. It is considered likely, however, that STEG has probably less deficiencies than most.

29. On the STEG system, only additional kWh which are demanded at time of system peak demand require installation of extra capability (kW) to be able to supply them. It is, therefore, only the marginal costs at time of system peak demand which include a "capacity" component. Marginal costs at "day" and "night periods require only a "consumption" component (see paragraph 10), Even the capacity cost can be converted into a pseudo-consumption component

(see paragraph 11). The Maringal Cost Structure can thus be presented either as a two part (capacity and consumption components) or single part (consumption component) basis.

30. Despite the deficiencies in data STEG was able to make very reasonable, if approximate, estimates of marginal costs which could be used as a basis for a marginal cost pricing structure:

MARGINAL COST STRUCTURE

| | Medium Tension Consumers | Low Tension Consumers |
|---|---|---|
| Maximum Capacity (kW) - Electrical Consumption (kWh Basis) | | |
| Marginal Capacity Costs, Dinars kW/Year | 38½ | 70 |
| Marginal Energy Costs, Millimes/kWh: | | |
| - Peak | 9 | 9½ |
| - Day | 4 | 4 |
| - Night | 3½ | 3½ |
| All Electrical Consumption (kWh) Basis | | |
| Marginal Costs, Millimes/kWh: | | |
| - Peak | 40 | 68 |
| - Day | 4 | 4 |
| - Night | 3½ | 3½ |

31. The above presents a serious dilemma for STEG, typical of marginal cost pricing. It is not feasible for STEG to implement such a cost structure because of hostility from consumers and the Government. Indeed, it is hardly "fair" to inundate consumers with new, radically different tariffs when they may have bought appliances on the basis of the existing tariffs, however uneconomic, offering special advantages through cross-subsidies. A slow transition to the new structure will be necessary.

What Has Been Done in Bank Lending Operations to Examine Tariffs

32. Several studies have been carried out with respect to tariffs and tariff structures in direct connection with the Bank's lending operations, examples of which are given below:

Power Sector

33. In the appraisal of the fourth power loan to Argentina,[1/] the existing tariff structure (which was thought at the time to have several anomalies) was examined from three separate angles:

(i) How well the average revenues per kWh collected from each consumer class met the cost of supply.

(ii) How close was the existing tariff structure to marginal cost pricing.

(iii) From the point of view of equity between consumer classes, allocating all costs borne by the Utility to the different consumer classes in accordance with their average utilization of the assets.

34. A similar type of study was carried out for the third power loan to Mexico.[2/] Both sets of studies indicated the same approximate value for the ratio of marginal cost of supplying electricity on-peak compared with off-peak as given for the Tunisian Study above. A "practical" value to be placed on the ratio was suggested in each report (obviously considerably lower than the "calculated") which altered the levels to be aimed both for the average and the off-peak tariffs. These practical values together with the financial tests (average revenue per kWh versus average cost of production) and the commercial tests (allocation of costs to consumer classes according to

1/ Appraisal Report No..... on SEGBA IV Power Loan 1969, Argentina, available from the Reports Desk.

2/ Appraisal Report No..... on Mexico III Power Loan, 1970, available at the Reports Desk.

utilization of the assets), enabled an overall judgment to be made on the amount of distortion in the present tariff structures (considerably less was indicated to be present in the Argentine tariff structure than had previously been believed to be the case).

Water Supply Sector

35. The water supply appraisal mission[1/] to Tunisia in 1972 attempted, after some analysis, to persuade the borrower to implement a pricing policy that reflected sharply rising long-run marginal costs (a situation which tends to be common in the water supply sector); also that summer peak demand should bear the preponderant share of incremental costs in that new capacity, i.e. ability to supply a given quantity of water over (say) an hour, is basically installed to meet new peak demand. The result of the Bank intervention has caused the borrower to seriously reconsider his attitude for the future, even though comparatively little can be done for the present.

36. Bank advice was sought by the Pakistan government to examine the case for introducing domestic water metering into the city of Lahore (the question of to meter or not to meter is usually an important one in the Water Supply sector). A study[2/] carried out by the Bank indicated that, in view of the low cost of supply of water in Lahore, the cost of metering would probably exceed the benefits. These findings have since been accepted by the borrower.

37. Approval by the Bank of the Libreville (GABON) Water Supply Project[3/] laid stress on the implementation of a tariff structure that reflected increasing unit costs. It also recommended that the tariff structure take into account in a positive way the inability of low income groups to pay the financial price charged. Both of these suggestions were accepted by the borrowers.

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1/ Appraisal Report No. .... on Tunisian Water Supply Loan 1972, available at the Reports Desk.

2/ Full Report from J.J. Warford to Mr. H.R. Shipman dated April 19, 1971, available from general files.

3/ Appraisal Report ..... on GABON, Libreville Water Supply Project, available at the Reports Desk.

38. The case of Mexico City water supply demonstrates dramatically increasing unit costs of supply. This is due mainly to the terrain, the changing level of ground-water and several other physical factors. The case for a marginal cost pricing system is thus very strong and this point was made by the Bank mission during appraisal.[1/] This would mean an increase in tariffs that proved unacceptable to the borrower, even after many ways had been examined (e.g. by a sliding scale of charges) of making such a policy more palatable.

39. A comparison of known costs and revenues of the Bombay Water Supply project[2/] initially yielded a return on investment of minus 20%. The reflection in the calculation of tariff increases firmly projected to be necessary for financial purposes (the mission found that there was a definite need to increase the average level of tariffs) only turned the return slightly positive. This demonstrated that (a) the true incremental system costs were unknown and (b) the willingness to pay was certainly not used as an indicator, or even benchmark, of the justification of investment. A tariff study, incorporating an analysis of incremental system costs and its consequence for pricing policy (including metering practices) will stem from this exercise of calculating the return on investment.

40. It is important to realize that, particularly in connection with the two latter cases, the economic analysis in the reports led to Bank recommendations for gradual increases in price levels over and above what would have been regarded as adequate to ensure the financial viability of the entities concerned. This logically reflects the increasing scarcity, and therefore the

1/ MEXICO - Mexico City Water Supply Project, Appraisal Report No..... , available at the Reports Desk.

2/ INDIA - Bombay Water Supply and Sewerage Project, Appraisal Report No.... , available at the Reports Desk.

increasing cost, of water over the long term.

Both Sectors

41. Within the last two years the number of appraisal reports in the public utility sectors which have recommended that studies of tariff structures be carried out (sometimes recommending that the foreign exchange costs for the study be included in the loan) has steadily increased. During FY ____ such studies were recommended for the power sector _____ for the water supply sector. To date for FY73, equivalent numbers are _____ and ____ respectively.

What Public Utilities Department and Regional Divisions Should Now Do

42. The Public Utilties Department plans to complete in FY74 the methodological desk studies in connection with marginal cost pricing (see paragraph 26). These involve:

(i) Methods of calculating marginal costs of production for power systems with an appreciable proportion of hydroelectric generating plant.

(ii) Methods of calculating marginal costs of production for power systems taking into account uncertainty, reserve capacities of generation and transmission plant, etc.

43. Two more Case Studies will be completed in the Power Sector during FY73 and FY74, following which a summary of the main points learned from the Case Studies will be issued, possibly together with a revised version of the Turvey Report dealing with marginal cost pricing in the power sector. A Case Study in the Water Supply Sector is planned for FY74.

44. Guidelines and seminars for Regional Operating Staff are in the course of preparation. In the meantime, in order to start a more systematic approach to the whole subject of the examination of tariff structures, it is recommended that, as part of the preappraisal and appraisal data collection exercise, missions should:

(i) Get as much information as possible on the tariff structures of borrowers. (See, as examples of analysis, the following appraisal reports _____ .)

(ii) Ask the regional economist to analyze these tariffs (whether he be part of the Mission Team or not) in the light of the marginal costs of supply for the Utility in question. Assistance will be available from the Public Utilities Department and its consultants as to how to calculate the marginal costs in the field and how to analyze the tariffs.

(iii) Check with the country economist on the relevance of shadow pricing, fiscal policies, regional/rural development policies and income distribution factors, and obtain his views about the extent to which the Utility's pricing policies should reflect a need for increasing government revenues, taking into account the likely economic effects of increasing tariffs for this purpose.

(iv) Consider the financial aspects of the present tariff level and structure with respect to (a) average revenues per kWh collected in total and from each type of customer reflecting the average cost of providing the service and (b) average tariffs for each type of customer reflecting their appropriate utilization of assets and share of operating costs.

(v) Prepare suggestions regarding a plan of action during the Mission, e.g. new tariff structure, study of present tariff structure by specialist consultants, request for specialist economic assistance on future Missions, etc. in the cases where this seems worth tackling.

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Mr Willoughby
Tue Power Follow-up

# OFFICE MEMORANDUM

TO: Mr. H. van der Tak DATE: May 21, 1973

FROM: Y. Rovani

SUBJECT: IRAN: CPN - Power

We have reviewed the final version (May 4, 1973) of Iran's CPN as it will be presented to the President and have noted with dismay that some significant - and in our view - difficult to support changes have been made in the treatment given to the Power Sector.

The CPN as it is now drafted has reduced programmed lending for Power from 5 to 4 loans and from $340 to $255 millions. Furthermore, it suggests that there is no rationale for lending beyond 1977. This is surprising. In the past Bank lending has been concentrated in supporting TAVANIR, the national bulk generating and transmitting utility and TREK, the Teheran distribution company. A loan planned for FY74 of about $100 million would also go to TAVANIR for new thermal plant and high voltage transmission. Our expectation had been that during the next five years the Bank would address its Power lending activities in Iran to strengthen institutionally the other 9 Provincial Utilities - particularly because they will be called upon to extend electricity supply to those sectors of the country and population, the poor urban and rural people, to which the Bank's proclaimed policies of assistance are preferentially addressed. These expectations were further supported by the fact that the Iran Government has undertaken under its latest development plan to increase substantially provincial and particularly rural electrification. Sector investments approaching $2 billion are foreseen, of which a $100 million Rural Electrification program was going to be supported by the Bank in the near future.

In the light of general Bank policies, it looks inconsistent that we phase out lending to the Power Sector, just when this lending becomes more socially significant. You will recall that a very parallel situation was pointed out by us in connection with the recent Colombian CPP. In these two cases, the Bank has been involved fundamentally with supporting Generation, High Voltage transmission and Distribution for the capital cities. When the evolution and progress of the Sector naturally calls for a policy of penetration into provincial areas and rural groups we find ourselves withdrawing our institutional and financial support. (In fact Operations Evaluation reports have criticized the Bank for not shifting earlier to these areas of the Sector - what will be their position if the above noted trends persist?)

We have discussed with some Public Utilities' regional staff on both the above cases and they have agreed with our views, however, they seem to carry little weight in final decisions regarding sectoral

policies. Could you support our views at the next stage of discussion? Mr. Friedmann will be glad to brief you further if necessary.

cc: Messrs. Wapenhans, Willoughby, Wyatt, de Lusignan, E.A. Moore
Howell, Berrie, Friedmann

Files

EFriedmann:jr
IBRD

Jim Brown
Follow-up

May 16, 1973

Your Ref: PMP

Mr. P.M. Prior
Deputy Chief Engineer
The South Wales Electricity
Board
St. Mellons,
Cardiff CF3 9XW
Wales, U.K.

Dear Mr. Prior,

Standards of Urban Electricity Distribution

Thank you for your phone call the other day and your letter of May 7, 1973, which had as attachments the CV's of George Brown and yourself. Please give George my regards.

I will give you my reactions to your comments on the draft Terms of Reference for the study very shortly. Meanwhile, let me confirm that it is Stage I(a), involving the writing of the "State of the Art" paper only, which is the commitment with which we are presently dealing. It could well be that considerable further detailed work will be necessary and arranged, possibly through the Electricity Council, elsewhere or both.

Sincerely yours,

T. W. Berrie
Power Economics Advisor
Public Utilities Department

cc: Messrs: Ray, Dunkerley, Willoughby, Rovani, Howell, Friedmann, Berrie
Files

TWBerrie:jr
IBRD

CODE No. MISC. 3.20

INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

# OFFICE MEMORANDUM

**TO:** Mr. Yves Rovani **DATE:** May 4, 1973

**FROM:** Dennis Anderson

**SUBJECT:** EL SALVADOR - Village Electrification Study
Supervision Mission, March 25 - April 6
Back-to-Office and Full Report

## I. INTRODUCTION

1.01 In accordance with terms of reference of February 21, 1973, I visited San Salvador to assess the progress of the study being undertaken jointly by the Bank and Universidad Centroamericana Jose Simeon Canas, to help organise the main field work, which is now begining and to report on the results obtained so far. Seminars were held at various times 1/. I was joined by Messrs. Churchill (Transportation Projects) and Selowsky (consultant) during March 20-23, and again by Mr. Selowsky during March 30-April 6.

1.02 As you know, the study has been divided into three phases:

| Phase | Status |
|---|---|
| I. General Background Studies of Rural Areas; of the Electrification Program; and of Available Data. | Completed Oct.31,'72 |
| II. (a) Development of Methodology; Assessing Data Requirements; Development of Questionnaires; Pilot Field Studies (of 200 families). | Completed March '73 |
| (b) Full Field Work | Completion expected July '73. |
| III. Analysis and Reporting | Draft Report Sept. '73<br>Full Report, Oct. '73 |

1.03 There are also three aspects to the study: (1) A sample survey of 400 households with and without electricity, of varying levels of income, social background, location, occupations, living conditions, etc; this is the largest part of the study, from which we hope to obtain an understanding of the families' responses to the change in energy supply conditions which village electrification brings about. (2) A series of about 40 case studies of farms, agro-industries, commerce and public services with and without electricity; similarly these should provide us with an understanding of the responses of these activities to electrification. (3) Finally there is a descriptive study, which involves an analysis of the aggregate economic performance of the electrification program, and also a comparative analysis of the performance of

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1/ Papers available on request. See Annex for full listing of topics.

the program in 16 villages of varying socio-economic characteristics. These three aspects of the study are, of course, complementary.

1.04 The results obtained (though obviously tentative) and the experience gained so far should, I believe, be of general interest. I therefore outline below some principal findings to date.

## II. SUMMARY

2.01 Urban-Village-Rural Population Levels. As in other developing countries, the larger part of El Salvador's population is in the villages and outlying rural areas. Approximately:

- 1.0 million live in the larger towns and cities;
- 0.35 million live in villages;
- 2.15 million live in the outlying rural areas; about half of these live in small hamlets (most of which have no distinct cultural identity) while the remainder are scattered, living on farms or on unused land.

The rural population is partly a shifting population, on account of the large number of migrant workers, and partly a fixed population, rigidly bound by the system of land tenure.

2.02 Village Population Growth. Migration from rural areas has, it seems, been towards villages as well as towns and cities. What seems to happen is that villages are able to hold onto and increase their populations on a par with cities in the presence of migration from rural areas (which is marked in El Salvador but not however as marked as in other developing countries). The migration is of three kinds:

- towards villages;
- towards cities;
- towards the rural surroundings of cities; and, possibly,
- towards hamlets in the rural areas (though we have to check this).

Villages are thus forming potential growth centres.

2.03 "Rural" Electrification Program. The main plans for this began in 1962 and were carried out by Comision Ejecutiva Hydroelectrica del Rio Lempa (CEL); a number of private distribution companies, who buy most of their electricity from CEL, have also participated in the plans since then. To date, all but four of the 213 principal villages (cabeceras) receive electricity, and about 250 out of 2,000 to 4,000 hamlets in the outlying rural areas are also served. Approximately:

- There were 20,000 consumers connected since 1962.
- This is about 5% of the village-rural population.
- But in electrified villages about 50% of households become electrified quite quickly.
- Aggregate investment since 1962 in distribution networks ≃ $10 million.
- This is approximately $450, per consumer.

2.04 Consumer Response: In Aggregate (for CEL's program). There has been a very lively response to the program. Typical sustained growth rates of demand per consumer (including agro-industries) are 16% per year, which is twice that of urban areas. Consumption per consumer in 1971 was 110 KWh/month, which is about 1/3 the level for San Salvador, or the level for San Salvador in the mid' 1950's. Moreover, the response has been an all round one, with commerce, industry and farms taking 64% of the load (as compared with 74% for the whole of El Salvador), and with a wide range of low income groups generating the growth of household demand.

2.05 Consumer Response: In 16 Cabeceras (for CEL's program and some private companies). Confirms the aggregate data. Rate of growth of demand/consumer varies from village to village, but is generally high, and averages at about 16% p.a. The rate of growth of new consumers also varies from case to case, but averages at about 6% p.a. The overall (sustained) growth of demand on existing networks averages therefore at about 22% per year, which is very high, and twice that of urban areas. Again, response is all round, stemming from a wide range of low-income groups and from farms, commerce and agro-industries.

2.06 Household Surveys. One reason for the lively response of domestic consumer demand is that per capita incomes in villages and rural areas are large in relation to the per capita incomes at which families decide to become connected (threshold income):

$300 = Mean Income (per capita) for El Salvador.
$120 = Mean Income (per capita) for Villages and Rural Areas.
$ 50 ≃ Mean Threshold Income (per capita).

Thus villages and rural areas are poor, but households are not uniformly poor, and many have incomes well above the threshold income.

2.07 Micro-Studies of Farms, Agro-Industries, Commerce and Public Services. Case studies of businesses using electricity or its substitutes are complete or underway for: irrigation pumping on farms (large and small); coffee processing; sugar processing; refrigeration in shops; milk cooling; pumping water; small corn grinding machines.1/ The data vary from case to case, and the sample is still too small for clear patterns to emerge. However, when it is decided to use electricity it is evidently because it offers useful net benefits to the activity, at prevailing prices, in the form of cost savings (as with pumping, over diesel power) and/or in the form of extra output (as with refrigeration, where alternative cooling devices are too costly). These net benefits may give rates of return of 12 to 20% or more. Since the rate of growth of activities using electricity is very large, it is evident that these private benefits are widely felt and increasing. But there are known distortions to prices, and credit facilities are uneven; so this view of benefits is likely to change during the course of our study, when price distortions are allowed for in the analysis. (E.g. sensitivity studies show that the choice between diesel and electric irrigation pumping is quite a close one.)

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1/ Studies of several other activities are also planned.

2.08 Nature of Benefits. A basic change in energy supply conditions occurs after electrification. When net benefits are positive, they have one, two or all of three effects:

- resource savings due to lower energy costs;
- the value of higher quality energy (e.g. as with light);
- extra output due to cheaper and/or better quality energy (e.g. more light).

All are important for both household and non-household demands. Relative magnitudes vary accordingly to the case and scale. For light, the important effects are quality and extra output. For electric heating (as with ironing): mainly quality effects alone. For cooling: extra output. For small-scale motive power: resource savings (if any) over diesel. For motive power on a large scale: resource savings and extra output.

2.09 The desirability of living in villages instead of cities may also be enhanced by electrification. This is widely held to be a benefit on account of the social costs of urban squalor and congestion. People's private views of this benefit are reflected in their migration to and staying in villages, and then becoming electricity consumers: that is, it is reflected in the growth of number of village consumers and their demand levels.

2.10 Tariffs, Costs and Benefits. Tariffs are generally higher in villages than urban areas, though investment costs are higher and capacity utilization (load factors) much lower. Costs initially average at 6 to 8 US cents per KWh or more, about twice those of urban areas. But with load densities increasing quite rapidly, and with steady improvements in capacity utilization, they should fall to much lower levels of around 4 US cents/KWh, perhaps less. (At this moment we have meters connected at various points to measure capacity utilization.) Hence economic returns should continually improve, if only because of cost reductions.

2.11 The uneven incidence of subsidies, taxes and credit is also adversely affecting the efficiency of energy use - but in which directions, it is not yet clear. Credit is non-existent for housewiring and electrical appliances are highly taxed; but kerosene, gasoline are taxed too, and the credit for diesel motors is probably poor (we expect our surveys to show how poor).

2.12 From the economic viewpoint it is better that electricity is not subsidised, if only because alternatives are not subsidised. There is no evidence to show that this would cut back the demand seriously except for certain important classes of pumping loads.

2.13 Tariffs and Finance. It is probable that villages which have been connected for longer periods of time are providing profits, since average costs are declining, for reasons just noted. Some private companies are also making profits. The extensive use of block-declining tariffs is undermining the financial performance of the projects, while having no sound economic rationale. Where financial performance is poor, it can often be found to be a poor reflection on tariff policy, rather than on the project.

2.14 Tariffs and Income Distribution. Block declining tariffs also act against redistribution objectives, the lower income consumers paying above, the higher income ones below, marginal cost. Some redistribution could be accomplished through subsidising the low KWh loads of small domestic, commercial and industrial consumers; but typically the costs of electricity are less than 5% of the budget, so the redistribution may be helpful, but slight. Larger consumers, especially in farms and agro-industries,are working with large profit margins, and can afford to pay the full costs of supply.

## III. URBAN-VILLAGE-RURAL DEFINITIONS

3.01 For the purposes of economic and political adminitration, El Salvador is divided into 14 Departamentos, which in turn oversee 261 smaller administrative units known as Municipios. The Municipios have principal centres known as Cabeceras, which are oficially classified as "urban." Outside the Cabeceras the population is classified as "rural." In 1971, the population distributions of the Municipios were as follows:

Table 1

Municipios Classified According to Number of Houses: Urban and Rural

| Number of Houses | Urban (Cabeceras) | Rural |
|---|---|---|
| 200 | 66 | 104 |
| 201 - 400 | 89 | 79 |
| 401 - 600 | 35 | 25 |
| 601 -1000 | 27 | 28 |
| 1001 -2000 | 24 | 10 |
| 2001- 4000 | 8 | 8 |
| 4000 | 12 | 7 |
| | 261 | 261 |
| Total No. of Houses (*) | 260,000 | 440,000 (700,000) |
| Total Population | 1,430,000 | 2,146,000 (3,549,000) |

(*) Approximate. Population figures divided by 5.5, the average family size.

Source: 1971 Census data, collated by Orellana and Bicard in (3).

3.02 It is evident that most of the Cabeceras would be better thought of as villages. Indeed, El Salvador's 'rural' electrification program, the main plans for which began in the early 1960's, was largely aimed at electrifying the Cabeceras plus a number of hamlets in the outlying rural areas.

3.03 Most countries would consider concentrations of 1000 houses or less to be villages. 1/ On this basis 213 of the Cabeceras are villages, a large fraction of which have only been electrified within the past decade.

1/ India and Mexico in fact regard concentrations of 10,000 people or less to be villages.

3.04 Outside these Cabeceras, the population is mostly rural, in the generally accepted sense of the term. Half, perhaps, is clustered into small hamlets, while the remainder is scattered, living on unused land along the roadsides or on the farms of the larger landowners. It is partly a shifting population, on account of the large (but unknown number) of migrant workers who change location between sesons in search of work, the opportunities for which vary according to the seasonal patterns of the output of agriculture and agro-industries;1/ and it is partly a fixed population, on account of the system of land tenure, which permits families to rent or work small plots of land if they also work the land of the large landowners.

3.05 Officially the rural areas are divided into over 2,000 zones known as cantones, in which the hamlets may be thought to form the principal villages with distinct cultural identities. But with important exceptions, it would be a mistake to think of the hamlets in this way. Firstly, not all cantones have such hamlets. Secondly, the cultural identities of the rural people are generally with the cabeceras, a factor which is partly explained by the system of land tenure, and partly by the shifting population . Nevertheless, the hamlets are population concentrations and the larger ones may even form centres of socio-economic growth. A number of the larger ones have been electrified in recent years, and, now that all but four of the cabeceras have been electrified, the future electrification program is to extend service to an increasing number of hamlets.

## IV. URBAN-VILLAGE-RURAL POPULATION GROWTHS

4.01 Like other countries, El Salvador is experiencing a migration of people from rural to urban areas, superimposed on a general growth in population. Between 1961 and 1971, the general population growth was 42% (3½% per year); but the growth of the urban population for the Departamento of San Salvador was 60% (4¾% per year).

4.02 This migration phenomenon is not, however, confined to the capital and the larger cities and towns. Villages are also experiencing an influx of people from the rural areas. In sixteen villages surveyed in our study, having a wide range of social and economic characteristics, the rates of increase in the number of houses over a 10 year period were in the range of 1½ to 5% per year. The following table indicates the situation for the whole country:

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1/ Main crops: Coffee 50%; Cotton 10%; Fruit 10%; Maiz 10%; Sugar 5%; Beans 4%.

Table 2

Population Distributions of the Municipios

| Population Range | Urban (Cabeceras) 1961 | 1971 | Change | Rural 1961 | 1971 | Change |
|---|---|---|---|---|---|---|
| 0- 1000 | 108 | 67 | -41 | 16 | 10 | -6 |
| 1001- 2000 | 76 | 88 | +12 | 44 | 21 | -23 |
| 2001- 3000 | 24 | 31 | + 7 | 39 | 40 | + 1 |
| 3001- 5000 | 28 | 28 | 0 | 57 | 55 | - 2 |
| 5001-10000 | 10 | 28 | +18 | 61 | 67 | + 6 |
| 10001-20000 | 9 | 9 | 0 | 32 | 48 | +16 |
| 20000 (*) | 6 | 10 | + 4 | 12 | 20 | + 8 |
| | 261 | 261 | - | 261 | 261 | - |
| Total Population | 0.98 m. | 1.40m. | (44%) | 1.54m | 2.15m | (40%) |

(*) includes San Salvador (population ≃ 0.75m).

Source: Bicard's paper in (1)

4.03 The number of the smallest Cabeceras (less than 1000 inhabitants) declined substantially, the reason being that their sizes had increased to put them into a larger population bracket (more than 1000 inhabitants). In general, however, the number of small Cabeceras (less than 10,000 inhabitants, say) has kept fairly constant, the main difference being that they are now larger.

4.04 The number of low density rural population areas (less than 10,000 inhabitants/municipio) declined quite markedly, in favour of a large shift towards the rural areas surrounding the larger towns and cities (i.e. Cabeceras with more than 10,000 inhabitants).

4.05 What seems to happen, then, is that the villages (small Cabeceras) are able to hold onto and increase their populations on a par with cities, in the presence of large scale migration from rural areas. The migration is of three kinds:

- towards villages ) on equal terms
- towards cities )
- towards the rural surroundings of cities

In addition to this there may be migration towards the hamlets in the outlying rural areas, tending to reduce the scatter of the rural population yet further. (Though we do not have collated data to substantiate this point.)

4.06 I also found similar but even more marked migration patterns in a trip to Nicaragua with Mr, Russell (EMENA) in March 1972.

Table 3

Urban/Rural Population for Four Departamentos/Municipios in Nicaragua

| | | 1963 | 1971 | 1971/1963% |
|---|---|---|---|---|
| Nicaragua | Total | 1,536,000 | 1,912,000 | 124 |
| | Urban | 627,000 | 917,000 | 146 |
| | Rural | 908,000 | 995,000 | 109 |
| Managua | Total | 319,000 | 504,000 | 158 |
| | Urban | 243,000 | 486,000 | 171 |
| | Rural | 76,000 | 88,000 | 116 |
| Tisma(*) | Total | 3,828 | 2,795 | 73 |
| | Urban | 1,377 | 2,229 | 162 |
| | Rural | 2,415 | 566 | 21 |
| Boaco(*) | Total | 71,615 | 69,355 | 97 |
| | Urban | 9,825 | 15,380 | 158 |
| | Rural | 61,790 | 59,375 | 87 |

(*) Villages electrified in the 1960's under an AID Rural Electrification Co-operative Scheme.

Source: Censos Nacionales, 20 April, 1971.

The interesting point here is that the villages of Boaco (50 Kms from Managua) and Tisma (less than 20 Kms from Managua) were able to hold and increase their populations on a par with Managua, despite a very large migration towards the capital.

4.07 If it is the case, then, that the populations of villages are growing on a par with cities and absorbing some of the migration from rural areas, this has important consequences for infrastructure project analysis (as it has for urban and rural development planning). Instead of such projects being charity for stagnant or declining entities (an approach which you will find permeates the literature on village electrification), with poor prospects of good economic or financial returns, they are likely to find responsive and growing markets, perhaps capable of and willing to meet the costs. Moreover, project costs can be expected to decline substantially over time on account of the economies of scale in serving high density population groups. In fact, this is what we are finding with El Salvador's village electrification program.

## V. THE VILLAGE ELECTRIFICATION PROGRAM

5.01 Practically all the generating and transmission capacity in El Salvador is provided by CEL, who sell electricity to 8 private distribution companies, two industrial customers, and various government agencies. Most of the distribution was and still is of course to the urban areas. In 1960, only about 30 of the 213 villages (small Cabeceras) received public electricity; this was provided exclusively by the private distribution companies, some of which found quite a high rate of growth of demand for electricity (over 10% per year) and were actually able to make a profit on the investment.

5.02 In 1962, under a government directive, CEL initiated a village electrification program. They began with a pilot project to electrify 11 Cabeceras of 14,000 inhabitants and 3,200 homes in Departamento de La Paz. La Paz is a relatively poor area on the coast, with, at that time, poor infrastructure; the agriculture is mainly cotton, corn and cattle. It was forecast that 50% would request electricity, with demands of eleven watts per inhabitant (100 watts/consumer) and 3 KWh per inhabitant per month (30 KWh/consumer/month). 1/

5.03 Following this project, a national plan was launched in 1964 to electrify many more areas. To date, CEL serves 80 Cabeceras exclusively, 14 others in conjunction with the private companies, and in addition serve about 200 hamlets in the rural areas.

5.04 The private companies were also involved with the plan. In 1965/66, Compañia Alumbrado Eléctrico de San Salvador (CAESS), the largest distribution company, extended supplies to 50 Cabeceras and presently serve over 180 hamlets and Cabeceras.

5.05 To date, all but four of the 261 Cabeceras have public electricity supplies together with about 250 hamlets. Our statistics are only concrete for CEL's program, 2/ and we shall shortly elaborate on these. But roughly speaking, for the whole country:

- There were about 20,000 consumers connected since 1962.
- This is about 5% of the village-rural population.
- Aggregate investment since 1962 in distribution networks $\simeq$ \$10 million.
- This is approximately \$450 per consumer.

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1/ In urban areas a typical present day figure is 300 KWh/consumer/month.

2/ Data for some of the private companies were not forthcoming.

## VI. GROWTH OF CEL's PROGRAM

6.01 For the 80 Municipios exclusively within CEL's responsibilities, we have the following statistics on population served.

Table 4

| | Number of Houses 1971 | | | Number Electrified June 1972 | | |
|---|---|---|---|---|---|---|
| | (a) Total | (b) Urban | (c) Rural 1/ | (d) Number | (d)/(a)% | (d)/(b)% |
| Total | 115,000 | 23,000 | 92,000 | 11,143 | 10% | 45% |
| La Paz | 10,000 | 3,700 | 6,400 | 2,140 | 21% | 58% |

Source: Compiled by Bicard in (4)

The aggregate data are contrasted with the data for the 11 Cabeceras of Departamento de La Paz which, as we mentioned above, were the first to be electrified under CEL's program.

6.02 The ratio of number of consumers to number of houses (d/a) is 10%, higher than the national average, but still very low. In La Paz, this ratio is much higher at 21%, as one might expect. But the fact that it is double the average indicates that the number of consumers is growing quite rapidly.

6.03 The ratio of number of consumers to number of houses in the Cabeceras (d/b) is perhaps more meaningful however, since the electrification program was largely (but not wholly) directed to the Cabeceras. According to this ratio about half the effected population became electrified quite quickly, so that CEL's planning assumption that 50% of a newly electrified locality will request electricity seems quite a good one. (See para. 5.02 above.)

6.04 The growth of CEL's program (in these 80 Municipios) was as follows:

1/ Note that Urban/Rural population ratio is 60% in La Paz, as compared to 25% for the total. We do not know as yet if this difference is due to rural-village migration in the last decade.

Table 5

| Year | No. of consumers | Total MWh/month (December) | KWh/consumer/ month | San Salvador KWh/consumer/month |
|---|---|---|---|---|
| 1962 | n.a. | n.a. | n.a. | |
| 1963 | 1,200 | 41.9 | 34.9 | 200 (approx.) |
| 1964 | 1,316 | 50.7 | 38.6 | |
| 1965 | 1,872 | 169.7 | 90.5 | |
| 1966 | 3,382 | 177.6 | 50.2 | |
| 1967 | 5,548 | 435.4 | 78.3 | |
| 1968 | 7,274 | 671.0 | 92.3 | |
| 1969 | 8,241 | 818.9 | 99.5 | |
| 1970 | 9,259 | 935.4 | 101.0 | |
| 1971 | 10,416 | 1,155.5 | 110.0 | 325 |
| **Average** Growth Rate per year | 31% | 35-40% | 15.5% | 8% (approx.) |

6.05 The high rates of growth in number of consumers and in total demand largely reflect, of course, network extensions. They are not good indexes of the time pattern of the consumers' response to the investments. A better index is provided by the rate of growth of demand per consumer, which at 15.5% per year is twice that of the urban areas.

6.06 Consumer-response to the investments has thus been very lively. In addition to a high rate of growth of demand per consumer, the number of consumers being connected to existing networks is about 6% per year, on average, 1/ giving an overall growth rate of demand on existing networks of over 20% per year. Despite this CEL's management said they were disappointed with the program! (though consumer statistics have never been analysed in detail).

6.07 Moreover, the response seems to have been an all-round one, with commerce, industry and farms taking the larger share of the load.

1/ Even though credit facilities for connection and house-wiring (costs $20 to $40) are not available, and CEL do not actively promote sales.

Table 6

Distribution of Consumption

| | CEL's sales to Villages (*) (1972) | | Sales in El Salvador (1971) | |
|---|---|---|---|---|
| Residential | 5.5 GWh | 36% | 170 GWh | 26% |
| Commercial | 3.6 | 24% | 87 | 15% |
| Industrial | 5.3 ** | 35% | 275 | 44% |
| Governmental | 0.6 *** | 5% | 92 | 15% |
| | 15.0 GWh | | 624 GWh | |

* Classified according to tariff types, which often overlap (e.g.residential consumers on commercial tariff and vice-versa).
** Includes 0.3 GWh for irrigation.
*** Public Lighting only

Source: Bicard's Papers in (3) and (4)

The actual rates of expansion in numbers of consumers and consumption per consumer were as follows:

Table 7

Consumer Data for CEL *

| | Number | | | Consumption KWh/consumer/month | | |
|---|---|---|---|---|---|---|
| | 1965 | 1971 | %/Increase/year | 1965 | 1971 | %/increase/year |
| Residential | 1,835 | 11,050 | 34% | n.y.c. | 42 | below 16% |
| Commercial | 209 | 1,538 | 39% | n.y.c. | 195 | |
| Industrial | 37 | 379 | 48% | n.y.c. | 1160 | above 16% |

n.y.c. = not yet compiled

*Source and definitions as in Table 6

From this data it seems that the growth of demands from industries and farms have been higher than domestic consumers, though the latter's response has been high too.

6.08 It seems then, that villages are providing a responsive -- and perhaps an underestimated -- market for electricity. 1/ It is true that demands started from a low level; but the average consumption per consumer has now reached a level typical for San Salvador in the mid' 1950's.

1/ This is true in other countries too. In Ethiopia, e.g., the number of customers in one village (Shashemame - apparently not an exceptional area) grew 5-fold, and sales 6-fold, in the first eight years, even though the initial base was large (500 consumers).

6.09 Nevertheless, financial performance remains poor. CEL's investment in the distribution networks from 1962 to 1971 was about $5 million, or $400 per consumer. The following are financial statistics for 1972.

| | | | |
|---|---|---|---|
| Annual Revenues | | ₡ 1,328,797 | |
| Expenditures | | 1,568,139 | |
| of which: | Depreciation | | 475,043 |
| | Energy | | 699,901 |
| | Maintenance, operation, etc. | | 411,195 |
| Deficit | | ₡ 338,176 | (25% of revenues) |

6.10 It should not be long, however, before the financial returns to past investments should improve. Separate accounts are not kept for each village, but it is likely that the ones which have been electrified for longer periods are showing quite good returns, and that the aggregate financial performance is held back by the newly electrified villages (which are many - recall the large program in the mid to late 1960's). The reasons why financial, and, indeed, economic performance can be expected to improve are:

- improvements in load factors due to increasing numbers of appliances associated with load growth (load factors may be 25% or less in many villages; we are presently measuring them);

- further improvements in load factors due to increasing loads of farms and agro-industries;

- fuller utilization of capacity as more consumers are connected to the existing networks (initial network capacity often sufficient to meet 5 to 10 years growth in new consumers and demand); the above investment cost of $400 per consumer should drop considerably (by about 50%).

There are indeed some indications of increasing profitability:

- Networks in the area of La Paz (CEL's first investment) are already making a profit equal to 6% of total revenues; 1/

- Some private companies have made profits on village electrification for several years.

6.11 In any case the financial losses reflect adverse tariff policies, not poor projects. Tariffs for villages are not much above urban areas, even though costs are initially higher and utilisation much lower in villages. The bulk of the electrical energy is provided by the Rio Lempa, whose flows are highly seasonal; but there is no seasonal element in the tariffs, though water is often in short supply in the dry season. Tariffs are block declining, which reduces financial returns as load grows (and also leads to water wastage in

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1/ CEL: Informe Mensual, December 1972.

dry seasons). There is no exploitation ability-to-pay, say, by removing the declining blocks; though this would improve financial performance and benefit the lower income consumers more. And there is no exploitation of willingness-to-pay, even though it is a willing and rapidly growing market . (See also Parts XI, XII, XIII.) In a separate exercise (reference (4))we have in fact shown how a gradual removal of the block tariffs, and replacing them by a straight KWh charge would probably result in a comfortable and early financial return on the investments.

6.12 It is possible therefore that financial performance could be quite good, if desired; and that the underlying growth of demand and improvements in capacity utilisation are, in any case, likely to improve financial (and economic) performance, despite a system of tariffs poorly related to costs.

## VII. THE DEMANDS IN 16 CABECERAS 1/

7.01 We have studied the demands in 16 Cabeceras, whose characteristics vary in several respects:

- wealth and income;
- agriculture;
- agro-industrial activity;
- population size;
- location and topography;
- quality of infrastructure (roads, water);
- extent of electricity service;
- public and private electricity suppliers;
- profitability of electricity service.

The Cabeceras sampled are listed in Table 8, together with some of their characteristics. 2/

7.02 The level and growth of domestic consumption in these cabeceras is as shown in Table 9 (overleaf).

7.03 The conclusions suggested by the aggregate data are confirmed by this look at individual villages. Consumer response is very high. The growth of demand averages at over 20% per year, sustained over quite long intervals, and is continuing to grow at such rates. The number of consumers doubles every 12 years (6% per year) and the consumption per consumer doubles every 4½ years (16% per year). These growth rates are over twice those of urban areas, and consumption per domestic consumer is now half the level for the average urban domestic

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1/ The information for this section was supplied by Mario Bicard,most of which is in (4).

2/ One preliminary point to note, when interpreting this information, is that there is often little network extension to distort these figures: i.e. they show increasing use of existing networks (with the exception of the Cabeceras electrified before 1962).

Table 8

CHARACTERISTICS OF 16 CABECERAS BEING STUDIED

| Zone | Department | Municipio | Distributing Electric Company | Estimated Profitability of the Area | Agro-Industrial Activity | Number of Farms * | Area * (Ha.) | Main Use of Land (in Ha.) * | | | | | | Infrastructure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Coffee | Corn | Cotton | Rice | Beans | Cattle | Roads ** | Water Running |
| Western | Santa Ana | San Antonio Pajonal | CEL | Lose money | | 205 | 2,990 | - | 267 | - | 1 | 85 | 1,598 | (c) | No |
| | | Candelaria de la Frontera | CEL | Make | (irrigation, etc.) | 973 | 8,618 | 300 | 1,033 | - | 25 | 247 | 3,300 | (a) | Yes |
| | Sonsonate | Juayua | R. de Mathew | | (5 coffee mills) | 742 | 5,852 | 3,945 | 106 | - | - | - | 825 | (b) | Yes |
| | | Salcoatitan | | Lose | | 128 | 1,057 | 619 | 12 | - | - | - | 213 | (b) | Yes |
| | Ahuachapan | Apaneca | CLEA | | | 416 | 4,945 | 2,260 | 56 | - | - | - | 1,023 | (b) | Yes |
| | | Ataco | | Make | (1 coffee mill) | 509 | 5,165 | 2,869 | 85 | - | - | 27 | 1,164 | (b) | Yes |
| | | Tacuba | | Lose | | 1,632 | 14,515 | 1,296 | 898 | - | 8 | 30 | 3,993 | (b) | No |
| | | Turin | | | | 288 | 419 | 107 | 182 | - | 20 | - | 58 | (b) | No |
| Central | La Libertad | Jayague | CEL | Make | (several coffee mills) | 353 | 4,143 | 1,938 | 164 | - | - | 13 | 681 | (c) | No |
| | La Paz | San Francisco Chinameca | | Lose | | 473 | 2,225 | 489 | 182 | - | 6 | 27 | 434 | (c) | No |
| | | San Juan Talpa | | | | 343 | 7,464 | - | 373 | 42 | 38 | 2 | 4,828 | (c) | Yes |
| | | San Juan Tepezontes | | | | 317 | 1,987 | 232 | 246 | - | 60 | 71 | 620 | (c) | No |
| | | San Luis Talpa | | Make | (milk processing) | 174 | 2,283 | - | 622 | 557 | 4 | 3 | 1,004 | (a) | Yes |
| | | Rosario de la Paz | | | (1 rice mill, etc.) | 347 | 1,928 | - | 458 | 615 | 11 | - | 570 | (a) | Yes |
| Eastern | San Miguel | Chirilagua | | Lose | | 1,506 | 14,067 | - | 2,274 | 857 | 118 | 118 | 4,463 | (c) | No |
| | | Sesori | | | | 1,898 | 15,515 | - | 2,728 | - | 151 | 9 | 8,455 | (c) | No |

* According to the Censo Agropecuario of 1961 (the latest available).

** Codification for Roads:

| | |
|---|---|
| Paved | (a) |
| Unpaved: 1st class | (b) |
| Unpaved: 2nd class | (c) |

consumer.(Our sample survey studies of individual households, discussed below, confirm these conclusions too.)

7.04 Expansion is not confined to any one predominant consumer category, but is general, covering all categories:

Table 10

Number of Consumers Classified According to Consumption Level for 12 Cabeceras *

| KWh/month | 1952 | 1962 | 1967 | 1972 |
|---|---|---|---|---|
| 0 - 10 | 189 | 416 | 817 | 880 |
| 11 - 20 | 38 | 144 | 382 | 493 |
| 21 - 50 | 6 | 95 | 244 | 423 |
| 51 - 100 | 1 | 23 | 122 | 213 |
| 101 - 200 | 1 | 15 | 72 | 159 |
| 200 - 500 | 0 | 1 | 18 | 46 |
| 500 | 0 | 0 | 28 | 45 |
| | 245 | 694 | 1,683 | 2,259 |

* Taken from the Cabeceras in Table 8

7.05 Agro-industries and farms are expanding their demands very quickly too. We have not processed all the data on these items as yet, but the following table of numbers of non-domestic consumers indicates the likely growth of demands:

Table 11

Growth in Number of Non-Domestic Consumers for 12 Cabeceras

| | | 1952 | 1962 | 1967 | 1972 |
|---|---|---|---|---|---|
| Commercial | 100 KWh/month | 40 | 103 | 118 | 131 |
| | 100 KWh/month | 11 | 52 | 75 | 135 |
| Industrial and Farms | | n.a. | n.a. | 57 | 81 |
| | Total: | | | 150 | 347 |

Table 9

Domestic Consumption in 16 Cabeceras

| Cabecera | No.of Houses 1971 | Years Electrified | Levels: Total KWh/month 1972 | Levels: No.of Consumers 1972 | Levels: KWh/month Consumers 1972 | Rates of Growth, % / year: Total * KWh/month | Rates of Growth, % / year: No. of Consumers | Rates of Growth, % / year: KWh/month/ Consumer * |
|---|---|---|---|---|---|---|---|---|
| 1. San Antonio Pajonal | 369 | 7 | 3,655 | 167 | 22 | 15% | 9.1% | 4% |
| 2. Candelaria de la Frontera | 603 | 7 | 13,000 | 305 | 43 | 23% | 12.5% | 12.5% |
| 3. Juayua | 1,147 | >20 | n.a. | 601 | n.a. | n.a. | 3.8% | n.a. |
| 4. Salcoatitan | 266 | >20 | n.a. | 90 | n.a. | n.a. | 4.1% | n.a. |
| 5. Apeneca | 575 | >12 | n.a. | 306 | n.a. | n.a. | 2.8% | n.a. |
| 6. Ataco | 930 | >12 | n.a. | 486 | n.a. | n.a. | 2.1% | n.a. |
| 7. Tacuba | 597 | >12 | n.a. | 233 | n.a. | n.a. | 3.8% | n.a. |
| 8. Turin | 529 | >12 | n.a. | 121 | n.a. | n.a. | 7.9% | n.a. |
| 9. Jayaque | 756 | 8 | 7,500 | 187 | 40 | 8% | 3.0% | 5% |
| 10. San Francisco Chinameca | 392 | 11 | 1,777 | 97 | 18 | 13% | 4.9% | 8% |
| 11. San Juan Talpa | 500 | 11 | 5,442 | 152 | 36 | n.a. | 4.8% | n.a. |
| 12. San Juan Tepezontes | 263 | 11 | 2,886 | 106 | 27 | 7% | 3.5% | 3.5% |
| 13. San Luis Talpa | 274 | 11 | 6,103 | 112 | 51 | 20% | 8.0% | 12% |
| 14. Rosario de la Paz | 571 | 11 | 8,991 | 222 | 40 | n.a. | 7.4% | n.a. |
| 15. Chirilagua | 819 | 5 | 7,700 | 145 | 53 | 31% | 21.0% | 10% |
| 16. Sesori | 276 | 6 | 4,202 | 71 | 60 | 60% | 13.9% | 46% |
| Averages** | - | - | - | - | 42 | 22% | 6% | 16% |
| Averages for El Salvador | - | - | - | - | 90 | 10% | 7% | 3% |

* Figures approx. (not obtained by regression).

** Weighted averages of available data.

The number of commercial consumers increased by 40% (7% per year) and the number of farm and industrial consumers by 57% (9.5% per year) over the past five years.

7.06 The villages have differed very greatly in their responses to electrification. We do not know as yet what these differences are due to, but is is evident that many interrelated factors are involved: income levels, village population and population growth; strength of demonstration effects; profitability of local agriculture and industries; quality of complementary infrastructure (water, schools, roads); literacy levels; and prices. Interpreting such factors and their influence on the electrification program is a primary objective of our sample survey of households and businesses, which we are now in the midst of.

## VIII. SOME ASPECTS OF PILOT HOUSEHOLD SURVEYS 1/

8.01 A survey of 400 households in six (or provisionally, seven) of the above municipios has been organised. 2/ The planned division of the sample is as follows: For each municipio:

| | |
|---|---|
| Cabecera: | |
| electrified households | 25 |
| non-electrified households | 15 |
| Rural Areas and Hamlets: | |
| electrified households | 10 |
| non-electrified households | 20 |
| Total for Municipio | 70 |

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1/ The team working on this and who have developed the questionnaires and interviewing procedures are: Lic. Martinez, Lic. Orellana, Ing. Cutie, and Lic. Maria Cristina de Cabrera, plus 8 research students. All the information of this section is original, and has been obtained through their hard work in the field.

2/ About 200 families were interviewed in the pilot phase completed in March this year. The technique is for the sociologists to interview the family, with an assistant to record the results in shorthand fashion; the results are then tabulated and written up at the end of the day (about 5 families/day/pair of interviewers). Formal questionnaires were abandoned after earlier applications had shown that families were suspicious - and sometimes hostile!-to them (Margaret Haswell reports the same experience in India: "Economics of Development in Village India.") Moreover they were too rigid; and the interviewer needed much more scope to obtain the more sensitive information, e.g., on incomes and wealth. Finally, they proved to be long-winded and tedious; an interview is more fun, more efficient and takes much less time.

The sample is weighted towards the electrified households in the Cabeceras, because this is what we are studying and where they mostly are. Comparisons with the non-electrified households will provide a picture of substitution effects; and samples in the rural areas will provide us with village-rural comparisons, and a broader picture of the Municipios.

8.02 A range of social and economic variables are included in the sample, among the important ones being: family income and wealth; family size; family structure; aspirations; literacy levels; access to credit; occupations; expenditure levels; quality of house; water consumption; use of electricity and electrical appliances; and use of substitute energy and appliances. Community level data are also being collected for the Municipios.

8.03 The relation between family income per capita and KWh electricity consumption is shown in Figure 1. The sample is for two Municipios (Salcoatitan and San Luis Talpa) and covers the Cabeceras and the outlying rural areas and hamlets.

8.04 The income level when families begin to consume (the threshold income) is about ¢ 140/capita ($55/capita), which is low relative to El Salvador's average income of $300 per capita. Above this threshold, the income effect on consumption is very large -- about a 5-fold increase in consumption for a 2-fold increase in income (income elasticity 2.5).

8.05 About 80% of our sample (which in the pilot studies was fairly random) finds families with per capita incomes of over $55, most of them well in excess of this. The large gap between actual and threshold incomes means a large potential demand in unelectrified areas; thus rapid increases can be expected after electrification. As we have seen, this is precisely what is happening.

8.06 According to figure 3, the income levels and distribution in the rural areas and hamlets are comparable to those in the Cabeceras. Hence, it is probable that CEL's current policy of electrifying hamlets will also find a responsive market.

8.07 One reason why the rapid growth of demand is sustained is the continual additions to appliance stocks of increasing electrical intensity: lights (50 watts) are quickly followed by more lights and irons (800 watts), radios and TV's (surprisingly commonplace).

8.08 Other factors are important too. For the demand to be so strongly revealed, it must offer:

- lower cost energy for light, heat and power in relation to substitutes; and/or
- more quality and convenience than substitutes (particularly important for lighting and ironing); and/or
- new consumption opportunities, of which television is the primary example.

But we cannot analyse these matters until the field work is completed. (Unfortunately the data on appliance use in the pilot studies were rather poor and need substantial revision.)

8.09 The results of our micro-studies of households so far vindicate the conclusions we reached earlier, by providing an explanation of consumer response in terms of household incomes. Villages and rural areas are poor, but poverty is not uniformly distributed. The 'threshold' income levels at which families decide that electricity (at present prices) fulfills certain needs in their lives are very low. In El Salvador it seems that many village families, although very poor, have incomes above this level, and consequently when electrification takes place there is a lively response, reflected in rapid growth rates of demand.

8.10 To conclude with quite a separate point, in Figure 4 family incomes per capita (to allow for family size) are compared with housing quality. There is little or no correlation - though recall we are dealing with very low incomes, the majority having less than $120 per capita. At first we thought that our measurements of family incomes were in error. But on second thoughts it squares well with experience. There are many anomalies to be seen in consumption at very low income levels; and in the lowest quality houses, quite expensive appliances can often be seen (including television).

## IX. MICRO-STUDIES OF FARMS, AGRO-INDUSTRIES, COMMERCE AND PUBLIC SERVICES 1/

9.01 These studies consist of estimating the costs and benefits of electrifying particular businesses and services (activities). For the more complicated activities, such as sugar and coffee processing, this involves drawing up flow diagrams of the activities and identifying and costing points where power and energy inputs are required. A look at the total profitability of the activity is needed in order to form some judgement as to whether a change in energy supply conditions may result in reduced costs or reduced costs and extra output from the activity. Since we are generally comparing activities of different vintages, it is also often necessary to look at capital, material and labor inputs at various stages, and to cost the whole process out - that is, we need to distinguish between technical advances in energy supply, from other technical advances which may occur in the activity. We believe that data obtained from about 40 such studies covering a representative sample of activity types and sizes, will provide a picture of the economic returns to this aspect of electrification. Examples of activities studied so far are:

- irrigating farms, large and small;
- coffee processing;
- sugar processing;
- refrigeration in shops;
- milk cooling;
- pumping potable water;
- small corn grinding machines (e.g. for tortillas)

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1/ Lic. Maria Luisa Calderon has undertaken this work so far; the data below are taken from this work, which is available in (4). She has now been joined by Ing. Cabrero, who so far has worked mainly on land tenure.

9.02 The alternatives to electrification of an activity take many forms and are often very competitive (if not better in some cases). Examples of alternatives are:

| | |
|---|---|
| (a) Refrigeration | - uncooled drinks and lower sales of refrigerated foods;<br>- kerosene refrigeration;<br>- buying and transporting ice from neighboring towns. |
| (b) Irrigation Water Pumping | - diesel pumps. |
| (c) Potable Water Pumping | - carried by bucket;<br>- bucket well;<br>- manual well pumps;<br>- diesel well pumps |

I ellaborate briefly on each of these cases, to illustrate something of what is involved in this part of the exercise.

(a) Refrigeration (shop)

9.03 The records of one shop showed the following returns from sales of refrigerable goods (drinks and perishable foods):

| | |
|---|---|
| (1) Sales with refrigeration | ¢ 1,354 p.a. |
| (2) Costs other than refrigeration | ¢ 980 p.a. |
| (3) Net profits without refrigeration | 103 p.a. |
| (4) Difference: (1)-(2)-(3) | ¢ 271 p.a. |
| (5) Cost of Refrigerator (¢900, interest rate 10%, depreciation 8%) | ¢ 162 p.a. |
| (6) Cost of Electricity | ¢ 96 p.a. |
| Net Profits | ¢ 13 p.a. |

The cost of kerosene refrigerators and ice-boxes were also calculated, but we found that extra costs would make net profits negative. Going without refrigeration entirely was thus the best alternative.

9.04 The rate of return (to the shop keeper) on using electric refrigeration works out at about 11.5%, assuming constant sales. But even a slow increase of sales of, say, 30% over 5 years, would raise this to a 20% rate-of-return. This is a very good investment, and, given the hot climate and the increasing demands for cold drinks and a better variety and quality of food, suggests why the demand for refrigeration in villages has grown very quickly in El Salvador.

(b) Irrigation

9.05 The increase in farm output and profits following irrigation is very large. Neither depend critically on whether diesel or electric pumps are used, in that irrigation is worthwhile either way. However, since energy and

pump costs form a good fraction of total costs, useful additions to net profits, in the form of cost savings, can be achieved. Table 12 contains information gathered from two farms.

Table 12

Data on Two Farms Using Irrigation

| Farm Characteristics | | Profits and Cost Data (₡ per year) | |
|---|---|---|---|
| I. Diesel pumps | (1) Farm Sales | 18,345 | |
| 5.1 m gallons/year | (2) Costs of Production | | |
| 3 manzanas irrig. | Non-water costs | 6,837 | 80% |
| Cattle | Water: Fixed costs | 450 | 5% |
| | Water: Variable costs | 1,222 | 15% |
| | | 8,509 | 100% |
| | (3) Profits (1)-(2) | 9,836 | |
| | (4) Profits before irrigation | 699 | |
| | Net profitability | 9,137 | |
| II. Electric Pumps (20 HP) | (1) Farm Sales | 92,831 | |
| 33.7 m gallons/year | (2) Costs of Production | | |
| 25 manzanas irrig. | Non-water costs | 35,378 | 75% |
| | Water: Fixed costs | 7,772 | 17% |
| | Water: Variable costs | 3,779 | 8% |
| | | 46,929 | 100% |
| | (3) Profits (1)-(2) | 45,902 | |
| | (4) Profits before irrigation | 1,676 | |
| | Net profitability | 44,225 | |

9.06 In each case the net profitability increased by more than ten-fold after irrigation. The main benefits of electrification are therefore likely to be in the form of resource savings, rather than adding to farm output directly, since output will be roughly the same whether electric or diesel pumps are used.

9.07 We have in fact studied the costs of diesel versus electric pumping by looking at actual contract data for a particular farm of 75 hectares, with the following results: 1/

Table 13

| | Electricity | Diesel | | |
|---|---|---|---|---|
| | 5 centavos/ KWh * | 50 centavos/ gallon * | | 34 centavos/ gallon ** |
| Energy Costs/year | 11,088 | 12,264 | | 10,043 |
| Capital Costs | 35,734 | | 32,047 | |
| Capital Costs/year *** | 5,900 | | 5,900 | |

1/ These data are broken down in considerable detail in Mariza Calderon's paper in (4), and subjected to sensitivity analysis.

* Prevailing tariff for irrigation and at prevailing price of gasoline
** Fuel costs, net of taxes
*** Taking an interest rate of 10% and average depreciation allowances of 6.5% and 8.5% for electric and diesel equipment, respectively. (Diesel plant have shorter lifetimes.)

9.08 At the prevailing fuel tax rates and electricity tariffs, electricity offers useful savings on energy costs; while the capital costs are about the same, once we have allowed for different lifetimes. But diesels can be as cheap if we neglect taxes and/or if electricity is considered underpriced.

9.09 On present prices, however, the rate of return to the farm on electrification, as compared to the next best alternative of diesel pumps, works out to be about 18.5% 1/ Again this is a good return for the farm, and partly explains why the growth of demand for electric pump irrigation has been very high in recent years. 2/

(c) Pumping Potable Water

9.10 There is undoubtedly a very high latent demand for convenient access to potable water in villages and rural areas. Most families interviewed during our study state this to be among their highest priorities. The heavy toil involved with fetching and carrying water is visibly evident and widespread in all parts of the country (including cities). We have found that as much as 20% of a housewife's time can be taken up with this task alone. It is entirely possible that the demand in villages for convenient access to water, at a price to cover costs, has been even more underestimated than that of electricity. (I do not think it has been researched.)

9.11 At the moment the most common source of supply in villages is water carried fromthe nearest standpipe; wells with buckets, manual pumps or diesel or electric pumps are also common. For what we judge to be typical cases, we have costed in detail one of each of these sources; the results are summarised in Table 14. From this information it appears that:

- locally pumped water is cheaper, and the toil very much less, than that carried from standpipes;
- electric pumps look much cheaper;
- but relative costs will vary from case to case, depending on many factors (including the weight (the shadow price) which people put on toil, which in this example we have crudely allowed for by valuing it at the minimum wage rate);
- consumption remains fairly high by village-rural levels even when costs and toil are high.

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1/ According to the following approximate formula: savings in energy costs plus annual depreciation and interest costs of diesels, all divided by total capital costs of electric, equals depreciation plus interest rate of electric.

2/ Demand increased 7-fold since 1966.

Table 14

Costs of Supply of Potable Water (Based on a Study of Five Families)

| ALTERNATIVE SOURCES | | Description | Galls.Consumer/yer | | Energy per 1000 gallons | Share of Energy in Cost * | Cost per 000 gall. | Cost per 000 galls/ metre |
|---|---|---|---|---|---|---|---|---|
| | | | Total | Per Capita | | | | |
| Public Standpipe | | Distance 1 Km.using ox wagon | 25,500 | 6,375 | 2.70 man days | Labor 35% | ¢ 20.47 | not comparable |
| Wells | Bucket | Depth 16.7 m. | 38,864 | 2,739 | 2.71 man days | Labor 80% | ¢ 8.24 | ¢ 0.495 |
| | Manual Pumps | Depth 10 m. | 10,152 | 1,269 | 1.39 man days | Labor 88% | ¢ 4.11 | ¢ 0.411 |
| | Diesel Pumps | Depth 10 m. | 73,425 | 5,479 | 3.73 galls. of diesel | Fuel 64% | ¢ 4.82 | ¢ 0.482 |
| | Electric Pumps | Depth 5.8 m. | 25,500 | 6,375 | 143 KWh | Elect. 43% | ¢ 1.65 | ¢ 0.285 |

* Assuming Labor cost = ¢ 2.6 per day, the minimum wage rate.

9.12 This last point means that the main benefits of pumping are likely to be the reduction in the toil of fetching and carrying water. That is, the main benefit will be resource savings, allowing the family to divert their time and energy to other ends. In addition, there will probably be some important secondary benefits in increased water consumption due to lower supply costs and toil.

9.13 However, these benefits can be provided by diesels too. The added benefits of electric pumping, when they occur, are thus largely the resource savings over diesel pumps. According to the above data these are quite large (over 30% rate of return), but we suspect that other cases will show quite different(lower) savings. The actual level of savings varies from case to case on account of (a) uneven credit facilities; (b) scale and (c) the local availability of second hand equipment (frequently used).

## X. RESUME ON NATURE OF BENEFITS 1/

10.1 Public electricity supplies to villages bring about fundamental changes in energy supply conditions, with three kinds of benefits to individual consumers: 2/

- resource savings due to lower energy costs;
- the value of higher quality energy (e.g. as with light);
- extra output on activity due to cheaper and/or better quality energy.

10.2 In addition it is likely that electrification, in the presence of a supply of other infrastructure projects and employment opportunities,will attract people to the villages, so that they may form counter-attractions to the cities. This is held to be a benefit on account of urban squalor and congestion being worse than village poverty. As we saw earlier, this kind of migration does take place, though it would be exceedingly difficult to isolate electricity's contribution to this. Whatever electricity's contribution, however, this kind of benefit, as perceived by the individuals who face the squalor and poverty, will be implicit in the underlying growth of demand; for if people are attracted to the village partly because of electrification, they will presumably reveal this through consuming electricity. Hence our exercises, which are to scale up the benefits computed at the micro level for a sample of consumers, will automatically allow for these wider benefits associated with the supply of infrastructure projects.

10.3 The three kinds of benefits listed above evidently vary from case to case. Thus for motive power on a small scale, electrification will offer resource savings benefits to the consumer where it is cheaper than diesel;3/ on a large

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1/ I plan to discuss in a later report the work of the anthropologist, Father Falla, who did much to influence our approach to the field work. I have not digested his work as yet; it is available in (3).

2/ Discussed much more fully in notes by Selowsky and myself in (1) and (2).

3/ Since equipment prices and costs are so variable, it is not likely to be universally cheaper or universally more costly, than diesel.

scale, it may cut costs substantially on account of economies of scale, and the higher profits this induces may usefully encourage more output. For lighting and some heating applications (e.g. irons) it may offer quality benefits and extra output (more light, more ironing) even if (as is the case) lighting and ironing costs increase. Quality effects may be important for some agro-industries too, in the form of greater reliability in the output of motive power (lost industrial output can very much exceed maintenance costs if supply is lost for a period). For new goods, like refrigeration and television, the benefits are those of extra output.

10.4 A rough classification of benefits according to activity is as follows:

| | |
|---|---|
| - Commerce | - resource savings and extra output; |
| - Farms (small) | - resource savings (over diesel); |
| - Farms (large) | - resource savings and extra output; |
| - Water Pumping (potable) | - resource savings (over diesel); |
| - Agro-industries (small) | - resource savings, and, perhaps, extra output; |
| - Agro-industries (large) | - resource savings, extra output and quality benefits; |
| - Domestic lighting | - quality effects and extra light; |
| - Ironing | - quality effects; |
| - Radios | - resource savings (over batteries); |
| - Television | - extra output (i.e. extra leisure activity); |
| - Refrigeration | - extra output; |
| - Water pumps | - resource savings (over diesel). |

Since consumer-response to electrification has been strong and persistent, it is evidently because consumers' private valuations of these net benefits are high.

10.5 But what if tariffs were adjusted to reflect costs? Quite likely there would be a reduction in many of the activities where electricity now shows resource savings to the consumer - particularly small HP motors. The threshold income at which families begin to consume would also rise, inducing a cut back in lighting demand and a delay in the introduction of new appliances. But unless tariffs are very substantially below costs, the growth of demand is, I believe, unlikely to be reduced to zero, or even cut substantially, given its fast growth at present; the only exception may be in the marginal hamlets in the outlying rural areas.

## XI. TARIFFS, COSTS AND BENEFITS

11.01 It is clear therefore that, as with electrification in urban areas, the economic returns are closely related to tariff policy. Tariffs too low, or inappropriately structured, discriminate against more efficient alternatives (e.g. diesels for pumping) for certain purposes or overstimulate demand for others. Investment and electrical energy usage, in this situation, is too high (though it is very unlikely that the project would have to be abandoned if tariffs were cost-related: consumer response has been too strong to suggest that it could be cut back so drastically).

11.02 Uneven credit policies for diesel motors, electric and non-electric energy using apparatus, and for electric wiring (connection and wiring costs $20-40 - no credit) must also have uneven effects on resource use; and so must the uneven incidence of taxes on gasoline and electrical appliances. It is not obvious to as how to deal with these as yet. In fact some distortions may have to be accepted, against all arguments about shadow pricing. Thus poor credit for diesels surely doesn't mean that credit should be poor for electricity too; and that if credit facilities could be made good for electricity, but not for diesels, this must simply be put down to an institutional benefit of electrification. In other words, we are dealing in second best worlds, and this must be revealed in our approach to shadow pricing, as well to tariff policy.

11.03 In general, however, more efficient resource allocation with respect to energy use in villages will be attained if tariffs are more cost reflecting - if only because its substitutes are not subsidised. My own preliminary rough estimates of CEL's cost structure is as follows:

Table 15

| | | |
|---|---|---|
| Generation Capacity Costs | ¢ 67.0 p.a. | $ 27 p.a. |
| Transmission Capacity Costs | ¢ 12.0 p.a. | $ 5 p.a. |
| Distribution Capacity Costs * | ¢ 80 to 160 p.a. | $ 32 to $64 p.a. |
| Energy Costs ** - Rainy Season: | | |
| Peak | ¢ 0.0125 per KWh | 0.5 cents/KWh |
| Off-peak | ¢ 0.000 per KWh | 0.0 cents/KWh |
| Energy Costs - Dry Season | | |
| All times | ¢ 0.0125 per KWh | 0.5 cents/KWh |

Notes:

* Varies on account of indivisibilities: In this case, ¢ 160 p.a. initially, but falling to half this when capacity is fully used.

** System's energy supplied by storage of Rio Lempa's flows, which are very low in dry season, high in rainy season. Thermal plant operate extensively in dry season, but only at intermittent peaks in rainy season.

11.04 As compared to this, CEL have the following elements in their tariff structure:

Table 16

Elements in CEL's Tariff Structure (centavos/KWh)

| Consumption Level/month | Domestic | Commercial | Industrial | Irrigation |
|---|---|---|---|---|
| 50 KWh | 12.0 | 15.0 | | |
| 50 - 100 KWh | 11.4 | 13.5 | - | - |
| 100 - 200 KWh | 8.45 | 9.25 | 14 | - |
| 200 - 1,000 KWh | 5.69 | - | 7 to 14 | 5.0 |
| 1,000 - 5,000 KWh | - | - | 6.4 | 5.0 |
| 5,000 - 12,000 KWh | - | - | 5.0 | - |
| 12,000 - 30,000 KWh | - | - | 5.58 | - |

Source: (4)

11.05 Now from Table 15, the average marginal cost per KWh (and also the average cost/KWh) works out at about 10 centavos. If tariffs were to be kept simple (i.e.,no time of day, no two-part charges,etc.), this would be about the level which is appropriate at all levels of consumption, since an extra KWh costs as much to produce whether the consumer is taking 50 KWh or 1000 KWh. On this basis small consumers are being held back unduly ( charges above marginal costs) while large consumers helped unduly (charges below marginal costs).

## XII. TARIFFS AND FINANCE 1/

12.01 CEL's declining block tariffs are also undermining the financial performance of the program. As we saw earlier, consumers are increasing individual consumption quite rapidly, and there are an increasing number of consumers in the high consumption ranges (Table 10, paragraph 7.04). A removal of the block tariff structure would exploit both willingness and ability to pay much more, improve the financial performance and improve economic efficiency in the bargain.

12.02 One other point to note is that, according to the estimates in Table 15, the initial average cost per KWh (i.e.,just after electrification) works out at about 15 centavos/KWh, and drops to about 10 to 8 centavos/KWh as network capacity becomes more fully utilised due to load growth. Now CEL's average tariff, from Table 16, is about 11 centavos/KWh. Thus as load grows, we can therefore expect a much better financial performance; and, quite possibly, a profit, unless block declining tariffs push down the average tariff faster than costs.

## XIII. TARIFFS AND INCOME DISTRIBUTION

13.01 If income redistribution elements are intended in tariffs, block declining tariffs of the above types will likely be working in the opposite direction. It is the higher income consumers who are paying below average marginal costs; the lower income ones are paying more.

13.01 However, subsidised electricity tariffs cannot accomplish much in the form of income redistribution. The statistics that families (including low income families) generally spend less than 5% of their incomes on electricity is supported also by the results of our field work. Nevertheless, every little helps, and if some redistributive elements are required, there are some fairly obvious rules to follow:

- not to subsidise irrigation, farms or agro-industries because their profits are good and they can afford to pay;

- not to use declining block tariffs, or at least make the blocks decline minimally;

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1/ See also paragraph 6.08.

- to offer electricity at below cost only to very small domestic consumers (say less than 100 KWh/month) and to small commerce and cottage industries.

This system would also have the advantage of not costing very much in terms of lost economic efficiency or financial viability.

DAnderson:mds

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Weiner, Arnold, Beach, Montfort (Projects, Asia)
Wyatt, Fish, Russell (EMENA)
Knox, Sheehan, Astrain, Ringskog, Jeurling (Projects, Latin America and Caribbean)
Kaps, Meier, Datas
Morse, Erkman, Bolte (Projects E.Africa)
Thalwitz, Krombach, Bates (Projects W.Africa)
Churchill, Mrs. Mitchell (Transportation Projects)
Yudelman (2 copies) (Agriculture Projects)
Cauas (2 copies) (Development Research Center)
Stevenson, Reutlinger, Keare ( Development Economics)
Stern, Ray, van der Tak
Marcelo Selowsky (Consultant)
Ralph Turvey (Consultant)
Universidad Centroamericana Jose Simeon Canas - El Salvador (5 copies)

## ANNEX

## LIST OF PAPERS AVAILABLE

(1) SELOWSKY "Notes on Village Electrification Study" (All on Methodology)

- Costs and Benefits of Household Demand
- Costs and Benefits of Agro-Industrial Demand
- Empirical Treatment of Irrigation Data
- Miscellaneous Notes on Concrete Poles and Empirical Treatment of Agro-Industrial Data.

(2) ANDERSON "Notes on Village Electrification Study"

- Empirical Basis for Estimating Household Demand Functions and Costs and Benefits
- Various notes (handwritten) on Costs, Household Demand, Agro-Industrial Demand, Community Survey
- Guidelines for Phase I; Phase IIa; Phase IIb

(3) UNIVERSIDAD CENTROAMERICANA JOSE SIMEON CAÑAS: SEMINARIO ELECTRIFICACION RURAL: FASE I (November 1972).

I. Aspectos socioeconómicos pertinentes para electrificación rural (Robles)

1. Evolución del agro salvadoreño o producto y empleo.
2. La evolución de la inversion en electricidad, en relación al PGB, inversión global, presupuesto gubernamental.

II. Desarrollo general del Sector Agropecuario

1. Estructura de la producción Agropecuaria (Cabrero)
   (a) Composición y evolucion del producto agropecuario
   (b) Composición y evolucion del producto agro-industrial.

2. Características económicas de la población en el sector agropecuario en relación a: (Cutié)

   (a) Distribución del ingreso
   (b) Empleo y desempleo
   (c) Migracion

3. Distribución de la infraestructura en el sector agropecuario

   (a) Carreteras y sistema de regadío (Calderón)
   (b) Servicios educacionales y de salud (Cabrera)

4. Elementos demográficos y de vivienda (Orellana)

III. Desarrollo General del Programa de Electrificación Rural

1. Consumo de electricidad a traves del tiempo y por tipo de usuario. Evolución del número de consumidores y del consumo promedio. (Bicard)
2. Evolucion y estructura de tarifas (Bicard)
3. Costos de inversión relevantes para nuevas decisiones de inversión eléctrica (Soderberg).

IV. Consideraciones sobre algunos factores económicos y no económicos determinantes de la demanda electrica.

1. Posibilidad de irrigación por bombeo. Diesel viceversa electricidad. Experiencias concretas. (Calderón)
2. Problemas de la no conexión y sus determinantes. Experiencias de promoción. (Falla, Cabrera, Bicard).
3. Coeficientes de electricidad y sustitutos electricos en el sector agro-industrial (Censo 1961) (Martínez, Beltrán).
4. Evolución de la tenencia de la tierra y su efecto en la demanda por electricidad (Cabrera).

   (a) A través de su impacto en la distribucion del ingreso.
   (b) A través de su impacto sobre la estructura de produccion agropecuaria.

5. Desigualdad en la infraestructura per-capita: por municipios, carreteras, salud, educación, etc. (Cabrera )
6. Elementos e hipótesis socio-antropológicas (Falla).

V. Análisis pre-muestral con dos grupos cantonales (Cutié)

VI. Posibles correlaciones para explicar la composición y evolucion del consumo electrico. (Martínez, Beltran)

VII. Discusión de los siguientes pasos:

(1) Futuras decisiones de inversión relevantes para El Salvador, en el campo eléctrico.
(2) Identificación de las zonas pertinentes.
(3) Requerimientos muestrales para el futuro.

(4) Ibid. SEMINARIO ELECTRIFICACION RURAL: FASE IIa. (March 1973).

I. Estudio Descriptivo (Bicard)

(1) Evolución de las Tarifas Eléctricas en El Salvador desde 1954.
(2) Un Ensayo Sobre el Efecto en la Rentabilidad de CEL en las Tarifas Eléctricas.
(3) Evolucion en el Numero de Consumidores Electricos en 16 Poblaciones.
(4) Evolución en el Consumo Electrico en 12 Poblaciones.

II. Estudio Especialidad: Retrato Actual de la Tenencia de la Tierra en El Salvador y su Influencia en la Demanda Electrica. (Cabrero)

III. Estudio de Microunidades (Calderon)
- Revisión de costos de bombeo diesel versus electricidad; Micro Unidades: cuatro casos de bombeo de agua para consumo familiar; comercio: dos casos de refrigeración; regadío: dos casos bomba eléctrica, dos casos bomba de gasolina; Agro-industrias: dos beneficios de cafe, dos casos de molino mixtamal, uno lechería.

IV. Estudio de las Viviendas y Comunidades (Martínez, Cutié, Cabrera, Orellana) de 13 comunidades rurales en sus aspectos eléctricos, económicos y social.

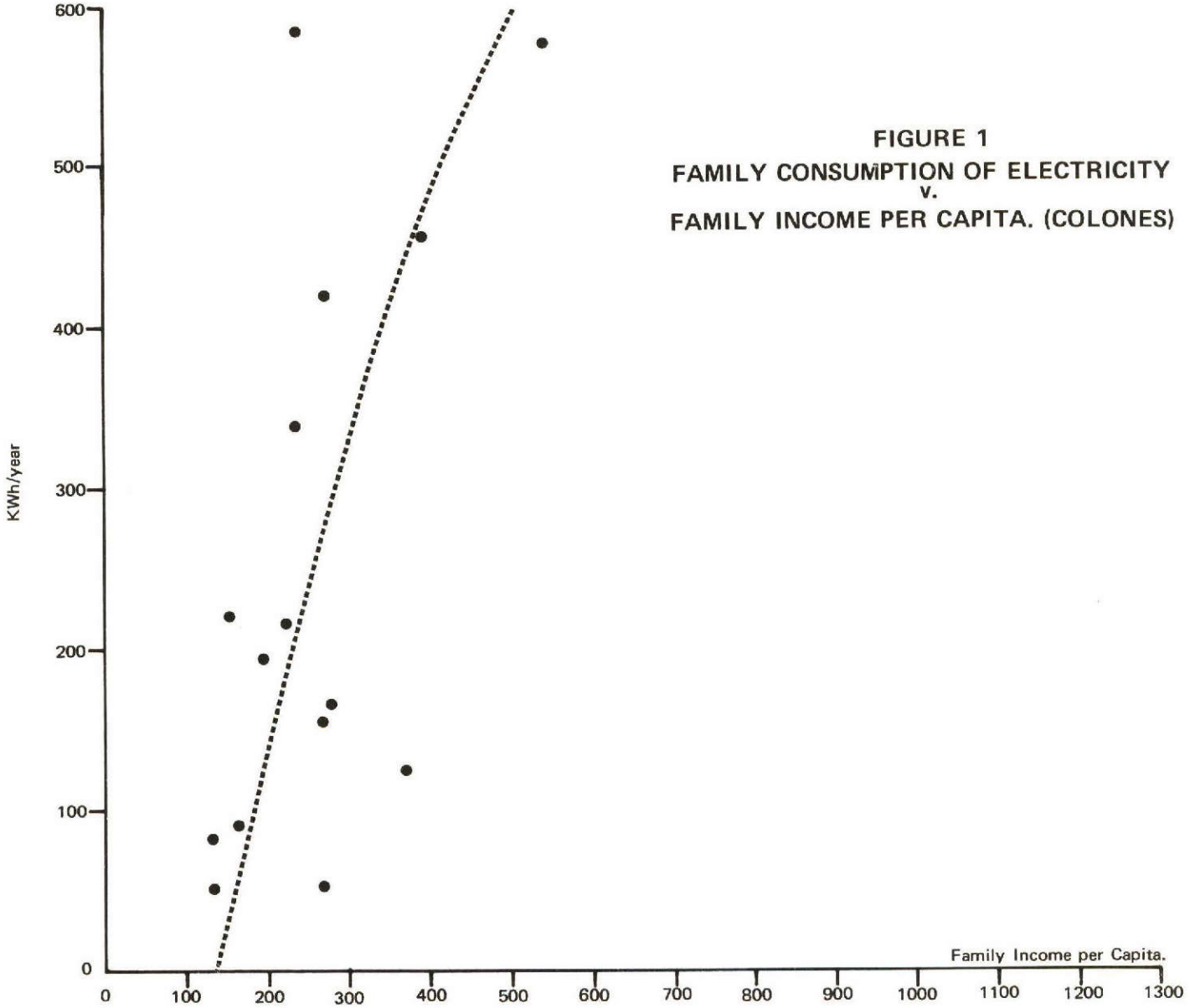



FIGURE 1
FAMILY CONSUMPTION OF ELECTRICITY
v.
FAMILY INCOME PER CAPITA. (COLONES)

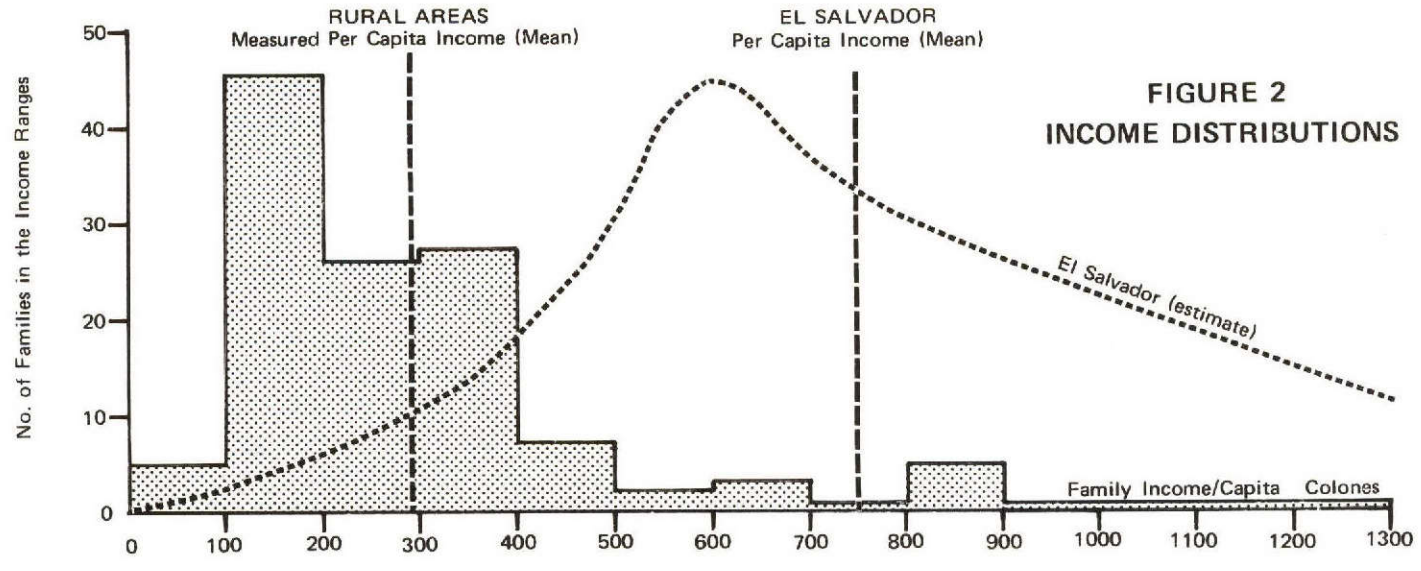
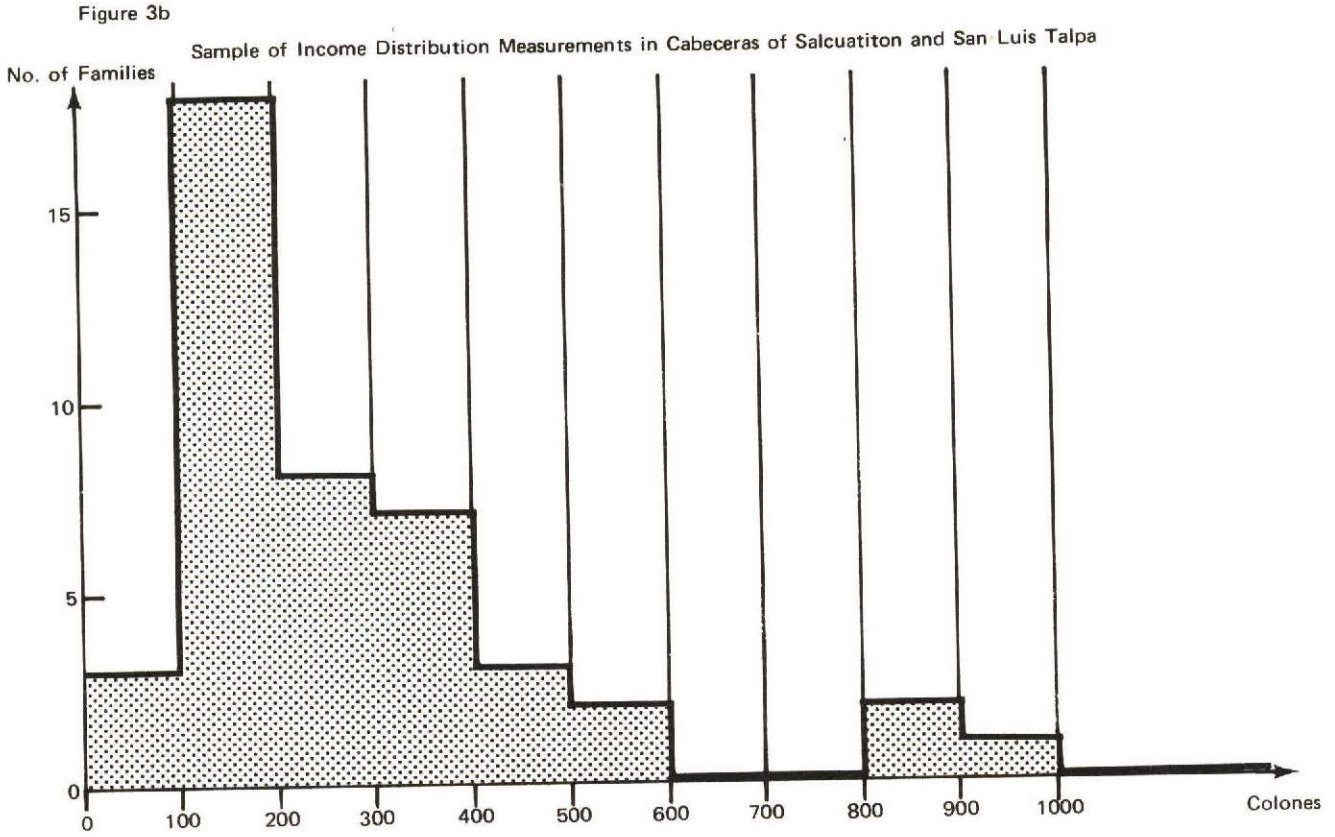



FIGURE 2
INCOME DISTRIBUTIONS

World Bank – 7694

Figure 3a


Figure 3b



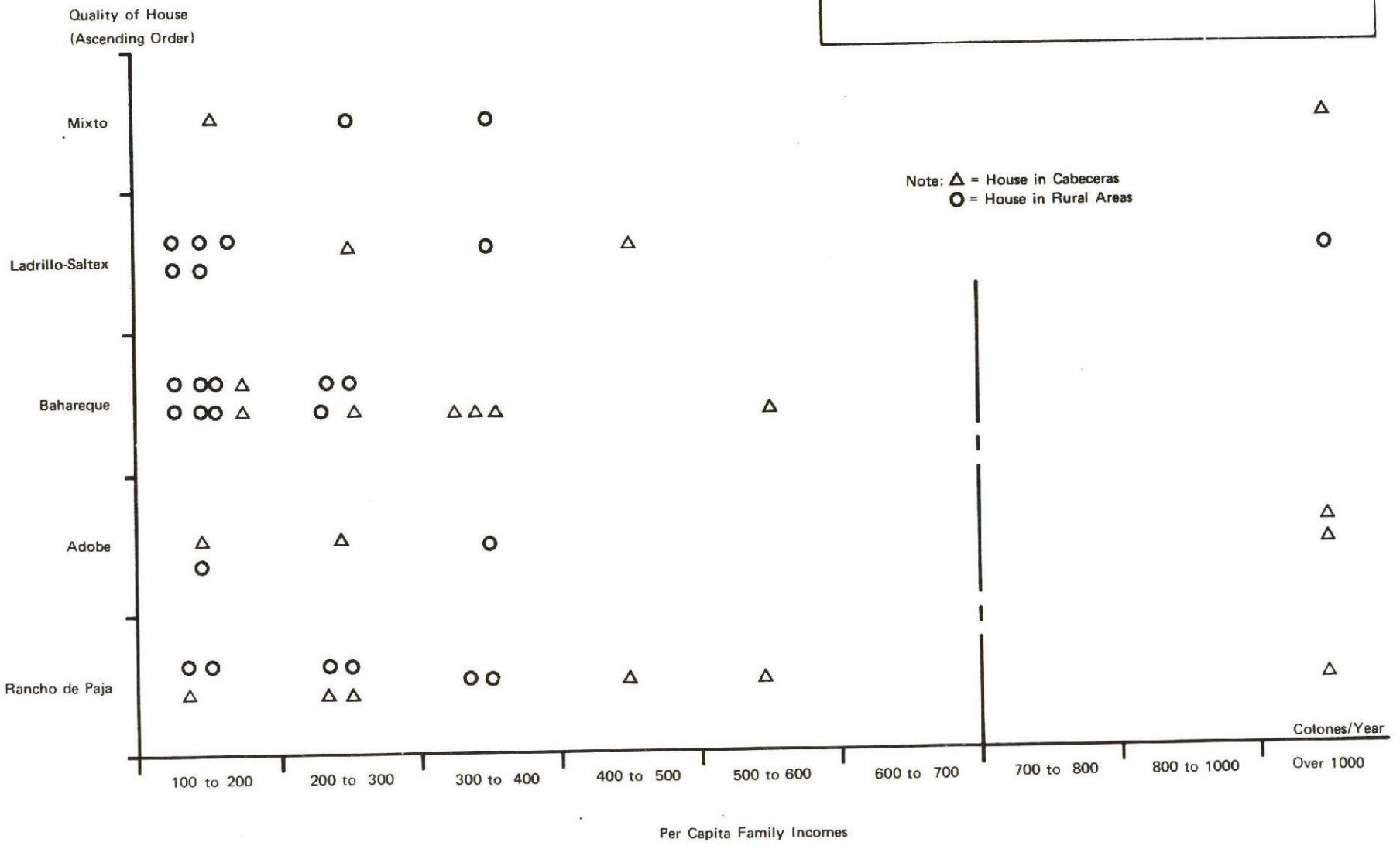

World Bank—7695(R)

FIGURE 4

## SCATTER DIAGRAM OF FAMILY INCOME AND HOUSING QUALITY

Definitions:

| | | |
|---|---|---|
| Mixto | = | Brick, Cement, Iron Frames. |
| Ladrillo-Saltex | = | Brick, Cement, Stone. |
| Bahareque | = | Wood and Mud. |
| Adobe | = | Mud and Compacted Straw Bricks |
| Rancho de Paja | = | Straw Hut |




World Bank—7696(R)

INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

# OFFICE MEMORANDUM

File
Follow-up
Power

TO: See Distribution *

DATE: April 30, 1973

FROM: Y. Rovani

SUBJECT: Public Utility Note No. 4
Standards of Urban Electricity Distribution

Please find attached a draft of Public Utility Note No. 4 on "Standards of Urban Electricity Distribution".

As you already know, there is no policy content in this Note and the primary purpose for circulating it is to get quality inputs and comments from a select panel of readers consisting of power staff particularly experienced in this area as well as other Bank staff of various backgrounds. I am asking you therefore to be kind enough to act in this capacity.

I would appreciate comments to be sent directly to Mr. Berrie by May 14, 1973.

Attachment

* cc: Mr. Willoughby, Mr. van der Tak, Mr. Avramovic, Mr. Dunkerley, Mr. Ribi (through Mr. Krombach), Mr. Wieseman (through Mr. Sheehan), Mr. Minnig (through Mr. Arnold), Mr. Salazar (through Mr. Sheehan).

Mr. Howell, Mr. Friedmann, Mr. Anderson, Mr. Berrie

Files

TWBerrie:jr
IBRD

2nd DRAFT:TWBerrie:jr
April 26, 1973

PUBLIC UTILITY NOTE NO. 4

# STANDARDS OF URBAN ELECTRICITY DISTRIBUTION

## SUMMARY


i. Distribution represents anything from 30% to 50% of total investment in the electric power sector. Considerable benefits might, therefore, come from an explicit consideration of a cost versus quality of service analysis in the design and construction of distribution systems. This is a field little explored either within the Bank or outside but of considerable interest, as future Bank lending for electric power is likely to become increasingly "socially sensitive" i.e. tending to deal with that part of the system nearest to the consumer (distribution), as distinct from the more remote parts (generation and transmission).

ii. Although lending for distribution has always been part of Bank lending, until recently the emphasis has been concentrated on the generation and transmission of electricity. An increasing proportion of loans now contain a distribution element and the proportion of that element is also increasing. Some loans are only for distribution systems and this trend will increase. In these circumstances, it becomes necessary in the appraisal of projects to look more closely than in the past "into the heart of" the distribution problem. There is a need, for example, to study more carefully the Borrowers' and their Consultants' distribution design and engineering practices and, in particular, to form a judgment about the standards of service to which they are planning. Each particular standard of service has its own cost of supply and benefits. In simple terms, a reduction in quality of supply, gives rise to a lower unit cost, which means that more consumers can be supplied and the net benefits that the additional consumers obtain (benefits less costs) at this lower level of supply has to be set against the reduction in the net benefits of all other consumers. Conversely, net benefits from an

improvement in standards to all other consumers has to be set against the net benefits which might otherwise have been provided to additional consumers. A third case is where lower unit costs can mean increased investment in another sector. This is a familiar problem in other sectors e.g. transportation, where the net losses to one class of road user due to lower standards are offset against the gains to other users. Similar techniques for solving such problems can be applied.

iii. This note summarizes the main aspects which any evaluation of a distribution project should include with regard to standards of reliability. The best approach to planning for the long-term lies in establishing, over time, a pricing policy which reflects both the marginal cost of service at the chosen standard of supply and any income-distribution, fiscal, etc. policies intended. Until, however, more reliable measurements can be made of the socio-economic benefits derived from changes in quality of service, heavy reliance must be placed on judgment based on looking into variations in changes in costs. A research project has been started recently by the Public Utilities Department to establish the whole "State of the Art" with respect to what has been done throughout the world on Standards of Urban Electricity Distribution.

Introduction

1. Anyone who has attempted to introduce the concept of quality of electric power service into economic calculations is only too aware of the difficulties of quantifying in monetary terms the comparative benefits experienced by different types of consumer. For example, it is well known that designing a distribution system to produce voltages so low at certain times as to impair the operation of some classes of customers may have no effect at all on other customers.

2. The following questions must therefore be asked: "Should a study be made on the quality of service relating to the average consumer; or should an analysis be made on the quality of service by categories of consumers? If the latter, which categories?".

3. The answer to these questions will vary very much between countries. In a first attempt to deal with this subject it is probably wise to limit the scope by considering only the average or overall quality of service to the three main consumer classes, industrial, commercial and residential, neglecting specialized types in each class; but, perhaps, singling out because of his social importance the type of consumer in low income residential areas.

Quality of Service

4. Many elements can be included within the expression "quality of service". The basic ones are given below:

(a) Continuity of Service (Number and Length of Interruptions to Supply)

(b) Stability of "Frequency" (Change in a technical characteristic of the whole system)

(c) Voltage "Flicker" (Very Rapid Changes in Voltage)

(d) Voltage "Wander" (Quite Slow Changes in Voltage)

(e) Voltage "Gaps" (Short Intervals with Zero Voltage)

(f) Voltage "Unbalance" (Distortion of Voltage)

5. Item 4(b) can be eliminated as a distribution matter on the grounds that it is entirely dependent on generation, and remedy must be sought elsewhere. 4(c) and 4(f) can be eliminated on the grounds that they are produced by specialized consumers who should not be considered for reasons given in paragraph 3 above. Item 4(e) can be eliminated on the grounds that it is mainly caused by apparatus protecting the main and sub-transmission systems, and any consumers likely to find it important also belong to the specialized types discarded in paragraph 3.

6. Two basic elements must, however, be included in the subject of quality of service, namely, items 4(a) and 4(d):

(i) Continuity of Service. (Number and Length of Interruptions to Supply)

(ii) Slow Changes in Voltage.

Continuity of Service

7. Interruptions of electricity supply service are of two main types:

(a) Random, caused by the breakdown of equipment, dry years in hydro-electric systems, years of sudden high demand, etc.

(b) Planned, caused usually by a planned program for maintaining equipment.

Planned interruptions need not be dealt with since the value attached by the consumer in practice to this type of interruption (when he usually receives warning) is probably at least one order of magnitude different than that attached to a random (and therefore sudden) interruption. There is an obvious correlation between the level of planned interruption for maintenance purposes, the level of equipment breakdown and thus the level of random interruption. The effect of this can only be assessed by judgment. Above a threshold of level of maintenance this becomes a second-order effect.

8. It is necessary to decide on some yardsticks with respect to measuring the level and intensity of random interruptions. Examples of these are:

(a) Number of Interruptions per Unit of Time, (say) per year.

(b) Number of Consumers affected by each Interruption.

The level and intensity of interruptions as measured by both of the above yardsticks will depend very much on the structure of the distribution network, its size and complexity, and its basic parameters, e.g. whether 33,000, 11,000 or 3,000 volt distribution systems are being used. Some interesting work has been done in Britain (see Annex 1) on the percentages of total random interruptions taking place and the average time of interruption on each part of the distribution system, characterized by voltage levels.

9. Based on cirteria similar to those described in 8(a) and 8(b) comparative studies can be made between different types of network (differing in equipment, structure or both) with respect to level and intensity of interruptions to service. As a check on the results of these studies, an alternative criterion which is often used in the case of well established networks is the ratio of kWh in the past not supplied, to the number of kWh supplied.

Slow Charges in Voltages

10. Slow variations in voltage in practice usually mean moving over a period of hours towards a lower average level of voltage. It is more difficult to define basic yardsticks for measurement in this case than in the case of the level and intensity of randum interruptions. Some yardsticks, however, could be:

(a) Average Voltage Level at a particular hour.

(b) Standard Deviation of the Variations from a Prescribed Voltage Level

(c) Number of Times a Particular Low Voltage Level occurs per day.

Means of Changing the Quality of Distribution Service

11. Changing the quality of the distribution service has a basic effect on both the cost of the service and the benefits obtained from the service. The cost side is easier to deal with.

12. The following means can be used to change the quality of service:

(a) Changes in the Basic Structure of the Distribution Networks

(b) Changes in the Reliability Level of the Equipment

(c) Changes in the Level of Protection against Faulty Equipment

(d) Using or Not Using Automatic Equipment to Restore Service after Interruptions

(e) Changes in the Methods and Equipment of System Operation

(f) Changes in the Methods and Equipment for Regulating the Voltage.

13. Changes in the basic structure of distribution networks (12(a)) is a system planning problem. For example, a fundamental differential lies between the "radial" system and the "mesh" system. In the radial system each customer has but one supply link, whereas in the mesh system he has more than one. There are, of course, "half-way" stages between radial and mesh designs e.g. when each customer normally only has one supply link but can be connected to another (possibly inferior) link in an emergency. Mesh systems are usually the most capital intensive and radial systems the least. Another large difference lies between basically "overhead" and basically "underground" systems.

14. Changes in the reliability level of the equipment (12(b)) is a matter for the specifiers of electrical equipment (usually the Utilities) and the equipment manufacturers. With the advance of technology and the efficiency of manufacturing processing, it would seem that all arguments now center round the cost of improving the rate of equipment availability from (say) 99.5% to 99.8%.

Perhaps the economies of developing countries cannot afford availability levels above 90%?

15. Changes in the level of protection against faulty equipment (12(c)) is partly a system planning problem and partly an equipment manufacturers' problem. The protection of the system against damage by one of its elements being faulty is the function of special protective apparatus, which comes into service automatically with a degree of success and amount of system disturbance which is basically inversely proportional to the investment cost.

16. The use of automatic equipment to restore service after a service interruption (12d) is becoming increasingly popular with respect to distribution systems e.g. this type of equipment helps to improve the standard of service of radial distribution systems. There is no doubt that the cost of such equipment (which at present tends to be high) will decrease with the advance of technology over the years.

17. Changes in the methods and equipment of system operation (12e) is a matter for the Utilities. It is the complement to changes in the basic structure of the distribution networks (12a), in that it means obtaining a particular standard of security out of an existing network as distinct from designing a particular standard into a future network. Obtaining a particular standard of an existing network often involves improving the efficiency of operation.

18. Changes in the methods and equipment for regulating the voltage (12f) is a regular means of improving the standard of supply by using specialized apparatus on the distribution system. The sole purpose of having this apparatus is to help maintain a given standard of supply with respect to voltage level. Despite its cost, this type of apparatus might make net system savings in that a lower cost design of the distribution system might be made possible for a given standard of supply. Items 12(b), 12(c), 12(d) and 12(e) act only on the level

and intensity of interruptions whilst item 12(f) acts only with respect to the slow changes in voltage. Item 12(a) acts with respect to both. In any case, however, some credible attempt can usually be made to cost the effects of the above changes and relate the costs of the changes to the quality of service.

Consumer Density

19. The quality of service which exists "naturally" from a particular type of network depends on the physical nature of the network (e.g. as indicated in para. 12) and the consumer density. For a given type of network at a given design voltage, the greater the density of consumers, the shorter the length of the distribution circuits, the lower the level of interruptions and the less the voltage variations for an average consumer. Similarly, the less the density of consumers the greater the level of interruptions and the greater the voltage variations. In general, consumers who cost the most to supply per unit of consumption, generally get the worst quality of service and tend to be asked to pay the highest tariff (or consumer contribution). This may well be not the optimum manner of proceeding with respect to the economy as a whole and needs further examination. Typical data on the relative costs for different types of network e.g. radial or mesh type, overhead or underground design, etc. are given in Annex 2.

Marginal Costs and the Improvement in Quality of Service

20. Studies have been made in various countries (mostly in France - see Annex 3) involving different types of distribution systems to determine both the marginal cost per kWh not supplied (defined as the total additional cost required to prevent interrupting the supply of that kWh) and the cost increments per additional kWh sold. A general rule seems to be that the marginal costs for the "benefit" of a given quality of service, represents a higher percentage of average costs in the case of medium voltage distribution than in the case of low voltage distribution. Whether this is because the in-built standby facilities are just not satisfactory (or as needed) on a low voltage distribution system or whether there is a more fundamental reason, remains to be seen.

Benefits

21. Until more reliable measurements can be made of the socio-economic benefits derived from changes in quality of service, heavy reliance must be placed, using judgment, on looking into variations on changes of costs with changes of standard obtained. It may be possible in certain cases to obtain a reliable estimate of what a customer is willing to pay for a given increase in standard of supply, e.g. in the case of certain industrial and commercial customers, which can be used as a yardstick. Until our knowledge of socio-economic benefits grows, the best approach to planning is to endeavor to establish a pricing policy which reflects as closely as possible the long-run marginal cost of supplying service at a particular standard of supply and any income distribution, fiscal, etc. effects which are intended (see Public Utility Note No. 3 on Generating Plant Reserve Margins and Public Utility Note No. .... on Public Utility Pricing). A research project has been started recently by the Public Utilities Department to establish the whole "State of the Art" with respect to what has been done throughout the world on Standards of Urban Electricity Distribution.

Attachments (3

c of this draft to Messrs: Howell, Friedmann

DRAFT:TWBerrie:jr
April 26, 1973

## The Economics of Reliability of Supply - Distribution (Great Britain) 1/

### Percentage of Total Interruptions by Voltage of Distribution System

| Voltage of Distribution System | Number of Consumers Affected | | | | |
|---|---|---|---|---|---|
| | 10 | 100 | 1000 | 10,000 | 100,000 |
| | Percentage of Total Interruptions | | | | |
| 132,000 and above | 5 | 8 | 14 | 50 | 100 |
| 33,000 | 15 | 18 | 28 | 40 | 0 |
| 11,000 | 5 | 26 | 46 | 10 | 0 |
| 200-600 | 35 | 48 | 12 | 0 | 0 |
| Others | 40 | 0 | 0 | 0 | 0 |
| Total | 100 | 100 | 100 | 100 | 100 |

### Percentage of Faults Restored by Time Quoted by Voltage and Type of Distribution System

| Voltage of Distribution System | | Outage Time in Hours | | | |
|---|---|---|---|---|---|
| | | 1 | 10 | 100 | 1000 |
| | | Percentage of Faults Restored by Time Quoted | | | |
| 33,000 | Underground Cables | 2 | 6 | 52 | 95 |
| | Overhead Lines | 43 | 83 | 100 | 100 |
| | Others | 20-60 | 60-80 | 85-95 | 100 |
| | All | 40 | 72 | 9 | 100 |
| 11,000 | Underground Cables | 5 | 23 | 90 | 100 |
| | Overhead Lines | 20 | 90 | 100 | 100 |
| | Others | 10-50 | 65-90 | 100 | 100 |
| | All | 20 | 80 | 100 | 100 |

1/ See paper of the same name by H.J. Sheppard, IEE, London, Conference Publication No. 34, Part 1, October 1967

DRAFT:TWBerrie:jr
April 26, 1973

Annex 2

## Guide Lines to Distribution System Capital Costs in US$ (1968)

| | Cost in US$ (1968) |
|---|---|
| **Overhead Distribution Systems** | |
| **13,800 Volt Primary Circuits, 3 phase** | |
| Wood pole construction, per Km | 2,000 - 5,500 |
| Concrete pole construction, per Km | 3,000 - 6,500 |
| **13,800 Volt Primary Circuits, 1 phase** | |
| Wood pole construction, per Km | 1,500 - 4,000 |
| Concrete pole construction, per Km | 2,000 - 4,500 |
| **100 - 250 Volt Secondary Circuits on Wood Poles** | |
| 3 phase, per pole | 110 - 220 |
| 1 phase, per pole | 90 - 140 |
| **Transformers, Primary to Secondary Circuits** | |
| 3 phase, per KVA | 5 - 16 |
| 1 phase, per KVA | 7 - 13 |
| **Transformers, Pole Mounted** | |
| 3 phase, per KVA | 15 - 50 |
| 1 phase, per KVA | 20 - 45 |
| **Underground Distribution Systems** | |
| Total System, excluding substation, per KVA | 105 - 220 |

April 26, 1973

DRAFT:TWBerrie:jr
April 26, 1973

Annex 3

## Comparison of Marginal Costs for Improving Standard of Service [1/]

### Continuity of Service

Studies involving overhead and underground distribution networks have determined both the marginal costs per kWh not supplied (the additional expense on the distribution network to prevent non-supply of a kWh) and the incremental cost per kWh sold. For a radial system for which the number of kWh not supplied per year would be about 8, the "meshing" together of the system extends that radial network from 4 Km to about 6.5 Km for the same standard of supply, and this would be worth doing if the value attributed to each kWh not supplied is 5 Francs.

Furthermore at 5 Francs attributed to each kWh not supplied, for a "standard" French distribution network, the mesh network was shown to be a better investment than a radial network.

### Variation in Voltage Level

Maximum voltage changes before the average consumer was materially affected were calculated and shown to be 3% of normal declared voltage for underground networks and 10% for overhead networks.

1/ Taken from "Report by the Mixed Group of Experts on the Quality of Distribution Service" UNIPEDE Report V/VI, 1970.

April 26, 1973

INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

File
Power Follow-up.

# OFFICE MEMORANDUM

TO: Mr. Y. Rovani

DATE: April 19, 1973

FROM: E. Friedmann

SUBJECT: AUSTRIA: International Atomic Energy Agency (IAEA)
Meetings, March 27-29, 1973 - Vienna
Nuclear Power Market in Developing Countries
Full Report

1. Following Terms of Reference of March 19, 1973 I travelled to Vienna and spent the period March 26-29 attending a meeting of the sponsoring agencies and IAEA to review progress on the latter's study of "The Market for Small and Medium Size Nuclear Reactors in the Developing World". On arrival, noon March 26, I received over 200 pages of reports on the various subjects scheduled for discussion during the formal meetings of March 27-28. March 29 was dedicated to individual discussions with IAEA staff on subjects not directly related to the Nuclear Power Market Study but particularly useful for the preparation of an up-dated Bank report on nuclear developments due later this year.

Meeting Background

2. The Bank agreed early in 1972 to be one of the sponsors of the IAEA study of the nuclear power market by providing a $50,000 cash contribution; participation as a "friendly critic" at two progress review meetings scheduled at the beginning and the end of the study; and in other ways not involving major demands on the staff.[1/] Within this framework F.H. Howell and I represented the Bank at the first meeting of the sponsors June 5-8, 1972 (see Mr. Howell's memo of July 5, 1972 to Mr. Weiner); and furthermore helped the study by forwarding information on most of the 14 countries surveyed by the Project team and by arranging several half-day briefings in Washington for IAEA teams on their way to their field missions.

3. In addition to the Bank, the Market Study received assistance from IDB, USA Ex-Im Bank, USAID, USAEC, Canada, the Federal Republic of Germany, France, India, Japan, Sweden and the U.K. Annex 1 summarizes this participation in cash contributions and man-weeks of experts provided. The Market Study budget has come to a total equivalent cost of about $550,000. (By far the major contributions have been made by the U.S. and Germany, an interesting indication of their relatively favorable position vis-a-vis the export of nuclear plant.) As expressed in the above mentioned memo. of Mr. Weiner, the Bank staff had reasonable doubts about the need for such an expensive study. Nevertheless, faced with the fact that the study would have been made in any case, it was decided that participation by the Bank at fairly modest cost would enable us to help substantially in orienting the effort in a sound direction, improving working and institutional relations with the U.N. group in general and with the IAEA in particular, and to dispel real or imaginary past misunderstandings regarding the attitude of the Bank towards the application of nuclear power in developing countries. This much I think has been achieved.

1/ The origin of this involvement is explained in Mr. Weiner's memo of February 9, 1972 and Mr. McNamara's letter of February 11, 1972 to Dr. Eklund, the Director General of IAEA.

The Meeting (March 27-28, 1973)

4. The second meeting of sponsors was chaired by Dr. Y. Chernilin (a Russian national who is the acting Director General of IAEA in the absence of Dr. Eklund) and was attended by special representatives of: Canada (1), Japan (1), France (1), the Federal Republic of Germany (6), India (1), Sweden (1), U.K. (2), USA (5), IDB (1), IBRD (1). (See Annex 2.) During the formal meetings which occupied two full days Mr. O.B. Falls, the Project Director, and his staff of IAEA personnel and special consultants, made a systematic presentation of the progress made and the procedures utilized in the Market Study (see program in Annex 3). All presentations were supported by draft reports which, with the modifications suggested during the meetings, are to become appendixes of the final IAEA Report. I brought back copies of these reports for future consultation by interested staff as they contain very interesting methodological material as well as some valuable up-dated data.

5. The following main activities were reported on for the period June 1972 - March 1973:

(i) Seven separate missions have visited 14 developing countries which participated in the survey: Turkey/Greece; Argentina/Mexico; Jamaica/Chile; Korea/Singapore/Philippines; Pakistan/Egypt; Thailand/Bangladesh; and Yugoslavia.1/ Of these missions all except the ones going to Turkey, Greece and Yugoslavia stopped in Washington, D.C. for briefings by Bank, IDB and USAID staff members.

(ii) Draft reports summarizing the data collected in each of the 14 countries have been sent to the respective local authorities for their review and agreement.

(iii) A computer program, Wien Automatic System Planning (WASP), has been developed to evaluate least-cost expansion programs using a set of programs previously utilized by the Tennessee Valley Authority (TVA). Dr. T. Jenkins (TVA) and Dr. D. Joy (USAEC) worked on this adaptation.

(iv) Two modified USAEC computer programs (ORCOST and CONCEPT) have been used for evaluating capital costs of nuclear, oil, gas, and coal-fired plants at various locations and dates. These programs can handle the range of values taken for the cost parameters for each of the individual countries surveyed. Mr. G. Woite from Karlsruhe Nuclear Laboratories, Germany had carried out most of this work.

(v) Load forecasting of the power market had been done with the assistance of Dr. H. Aoki of Japan. The Aoki method utilizes data from over a 100 countries to develop a universal relationship between electricity consumption and GNP per capita. Each individual country is assumed to approach this universal curve in a gradual manner.

1/ Brasil had originally been in this list, but later withdrew. It seems that unresolved difficulties between the local Atomic Energy Commission and the utilities were the real obstacles to implementation of the survey there.

(vi) In addition to the above, careful studies of almost all other important parameters, such as cost trends of nuclear and fossil fuels, power plants operation and maintenance etc. have been carried out.

(vii) Only as late as the week immediately preceding the meeting some actual results regarding the size and number of nuclear units which would appear to be justified in the 14 countries studied began to become available. Sensitivity studies of paramount importance for the analysis of the market were planned for the first half of April.

6. On the whole, the above presentations and reports reflect the results of a very professional effort led by Mr. Falls, an able and dynamic Project leader who put together an excellent team of IAEA staff and consultants from about 10 different countries. The information gathered will be useful in connection with several aspects of our own work program.1/ I consider this a very important side product of the study which should prove of considerable benefit to LDC's utilities and planning bodies, and also to the staff of international bodies such as the Bank which are active in the power sector.

7. In trying to recollect any important suggestions or criticisms made by the representatives of the sponsors, including myself, I find that most of our participation at this second meeting was related to obtaining clarification of the basic data and the methodologies as would be reflected and explained in the final report. The sponsors' contributions were indeed numerous and useful. We had few, if any, disagreements with most of the decisions that had to be made by the IAEA Project staff to cope with incomplete data or other constraints (such as IAEA's limited computer capability). This is understandable as practically all substantive issues which could have produced disagreements had been cleared away at the June 1972 study-launching meeting. A couple of suggestions of some consequence which I made were: (i) That the sensitivity studies include a case with substantially lower costs for low and medium size nuclear plants than those presently estimated. (This is essential in order to inform the suppliers which the market would be if they managed to reach those levels.) (ii) A rather strong criticism of the inadequate and over-simplified procedures which had been proposed for extrapolating the results of the 14-country survey to the rest of the developing world.

Completion of the Study. Preliminary Conclusions

8. The results of the Nuclear Power Market Study will be summarized in a Main Report which will be printed and officially distributed for the next General Assembly of the IAEA in September 1973. The draft of this report will be sent for comment to us during May 1973. Its main chapters will describe:

1/ This includes for FY74 Public Utility Notes and/or Seminars on "Load forecasting techniques", "Recent nuclear power developments", "Alternative computer approaches to system planning", and a policy paper on the "Role of Bank lending for nuclear power".

(i) The projected world market for nuclear power in LDC's, by country (plants to be commissioned before 1990, ordered before 1983).

(ii) The financing requirements associated to those programs in foreign and local currencies.

(iii) The methodological approach.

(iv) The basic cost data (capital, fuel, O & M) utilized.

9. In addition 14 individual country reports, discussing in much more detail each country situation, will be prepared. The drafts will be sent for review and comment to each country and the sponsors late in May 1973. However, the country reports will not be officially distributed without the previous approval of each interested Government.

10. Though the results are not yet available, the preliminary conclusions drawn from the reference cases already studied are very likely to confirm what we have anticipated all along and set out in our December 21, 1970 Study of nuclear power: very few reactors (3 to 5) of less than 600 MW are likely to be economically justified in any of the LDC's during the period covered by the study. On the other hand, during the next decade a substantial number of reactors are likely to be built in the LDC's representing an installed capacity circa 1985 of 35-50,000 MW, and total capital investments of the order of $14-20 billion, largely in foreign currency. It is important to realize that, if the Bank is to continue to assist LDC's in the power sector, it should be prepared to discuss nuclear projects in an increasing number of situations (e.g. see my memo on Yugoslavia's CPP dated April 11, 1973). This subject will be dealt with more thoroughly in the Public Utility Note and the Policy Papers mentioned in paragraph 6.

March 29. Uranium Supply, Nuclear Plant Operating Experience, OECD Energy Study

11. In preparation for my visit I had asked Rurik Krymm, the Senior Power Economist of the Agency, to arrange for discussions between IAEA's staff and myself on a number of other subjects of mutual interest. For this purpose I had meetings with Messrs. Skoeldebrandt (new Head of the Nuclear Power Reactors Division, previously headed by Mr. Munir Khan), Polliart (new Head of the Nuclear Reactors Department, previously headed by C. Rennie), Pedersen (economist), and Joy (computor specialist). In these meetings we reviewed the production of uranium and plans for new enrichment facilities in the USA and Europe;[1] the operating experience of existing nuclear power reactors; recent experience with fast breeder experimental plants; etc. Several recent reports on the above subjects of which some are confidential were kindly passed to me for future study in the Bank. They have been produced by IAEA's and OECD's staff and ad hoc working groups.

1/ European countries and Japan are seriously concerned with this issue, and several options using different technologies and countries of supply are under examination. Broadening of enriched uranium supply options will be of interest to some LDC's which appear concerned with the implications of energy dependency.

12. Discussing the general subject of energy, Mr. Krymm gave me some inside information regarding the importance and magnitude of the OECD project for producing guidelines on a possible international energy policy. A team of 50 specialists is being assembled for this purpose in Paris. The scope of the work is ambitious and comprehensive; in addition to the obvious supply/demand/price aspects it proposes to look into new technologies, environmental aspects, balance of payments, OPEC foreign currency surpluses, conservation, etc. The study would explore world energy trends until 1985 or beyond and is expected to take about two years. It might be advisable to establish contacts through appropriate Bank-OECD channels between the OECD project team and ourselves.

Attachments (3 Annexes)

cc: Messrs: Kirmani, Thalwitz, Weiner, Knox, Wapenhans
Morse, Krombach, Arnold, Sheehan, Wyatt
Chatenay, M. Hoffman, Franco-Holguin
Howell, Berrie, Friedmann

Files

EFriedmann:jr
IBRD

ANNEX 1

## MARKET SURVEY

### A) BUDGET SUMMARY

| | Cash Contribution | Expert Services (b) | Expenses (c) | Total |
|---|---|---|---|---|
| Sponsor Organizations | | | | |
| IBRD | $ 50 000 | $ 850 | $ 400 | $ 51 250 |
| IDB | 25 000 | 700 | 300 | 26 000 |
| IAEA | 20 000 | 157 000 | 20 000 | 197 000 |
| Subtotal | 95 000 | 158 550 | 20 700 | 274 250 |
| Sponsor Countries | | | | |
| Canada | - | 15 120 | 3 720 | 18 840 |
| Federal Republic of Germany | 25 000 | 36 810 | 13 690 | 75 500 |
| France | - | 2 240 | 1 500 | 3 740 |
| India | - | 2 100 | 1 210 | 3 310 |
| Japan | - | 12 600 | 9 450 | 22 050 |
| Sweden | - | 6 020 | 360 | 6 380 |
| United Kingdom | - | 11 340 | 3 880 | 15 220 |
| USA - Ex-Im Bank | 75 000 | 420 | - | 75 420 |
| USAID | 25 000 | 840 | 850 | 26 690 |
| USAEC | 9 120 | 14 890 | - | 24 010 |
| Other | - | - | 850 | 850 |
| Subtotal USA | 109 120 | 16 150 | 1 700 | 126 970 |
| Subtotal Sponsor Countries | 134 120 | 102 380 | 35 510 | 272 010 |
| TOTAL | 229 120 | 260 930 | 56 210 | 546 260 |

(a) All values expressed in US $.
(b) Estimated at rate of US $700 per week.
(c) Travel and per diem based on Agency standards.

### B) EXPERTS

| | Approx. Man Weeks |
|---|---|
| Canada | 13 |
| Federal Republic of Germany | 48 |
| France | 4 |
| India | 3 |
| Japan | 17 |
| Sweden | 9 |
| United Kingdom | 14 |
| United States | 19 |
| | 127 |

# Meeting of Sponsors of Market Survey for Nuclear Power in Developing Countries

IAEA Headquarters, Vienna

27 - 29 March 1973

## Participants

| Country | Organization |
|---|---|
| **Canada** | |
| Dr. Robert F.S. ROBERTSON | Atomic Energy of Canada Ltd. |
| **France** | |
| Mr. Jacques BAUMIER | TECHNICATOME |
| **Germany, F.R.** | |
| Professor A. BOETCHER | Nuclear Research Centre Jülich |
| Dr. J.A. FASSBENDER | " " " " |
| Dr. M. KEMPKEN | Federal Ministry for Research and Technology |
| Dip. Ing. H. TROESCHER | Rheinisch-Westfälische Elektrizitätswerk A.G. |
| Dr. H.A. von ROHR | Permanent Mission of F.R. Germany |
| Dr. H.J. ZECH | Institute for Applied Reactor Physics |
| **India** | |
| Mr. K.S. SUBRAMANIAM | |
| **Japan** | |
| Mr. Y. TAKAOKA | Permanent Mission to IAEA |
| **Sweden** | |
| Mr. Carl-Olof SKYGGE | Asea Atom |

| Country | Organization |
|---|---|
| **UK** | |
| Dr. G.R. BAINBRIDGE | UKAEA |
| Miss R. VINING | Permanent Mission to IAEA |
| **USA** | |
| Mr. George DIETZ | Export-Import Bank |
| Mr. Thomas G. GABBERT | Permanent Mission to IAEA |
| Mr. Clayton NORRIS | Export-Import Bank |
| Hon. Dwight J. PORTER | US Permanent Mission |
| Mr. John RIXSE | AID |
| **International Organizations** | |
| Mr. Alfonso POSADA | IDB |
| Dr. Efrain FRIEDMANN | IBRD |
| **IAEA** | |
| Dr. Y. Chernilin | - Acting Director General |
| Mr. O.B. Falls | - Project Manager |
| Mr. O. Pedersen | - Secretary |

# Meeting of Sponsors of Market Survey for Nuclear Power in Developing Countries

Scientific Secretary - Ole Pedersen
Secretary - Anna Guth

27-29 March 1973

Room A

27 March

| | | |
|---|---|---|
| 10.00 hours | Welcome and opening remarks | Dr. Y. Chernilin |
| | Introduction and brief summary of: | |
| | Progress and experience since June 1972; | |
| | Present status of survey and its budget; | |
| | Plans for completion of survey; | |
| | Purpose of sponsors' meeting (agreement on completion of survey) | O.B. Falls, Jr. |
| 11.00 hours | Intermission | |
| 11.30 hours | Future power demand: | |
| | Load forecasting procedure | J.T. Roberts |
| 12.00 hours | Future power supply: | |
| | 1. Determination of types and size ranges of units and of system reserve requirements including loss of load probability | J.R. Wilson |
| | 2. Determination of lowest cost system expansion programme (WASP computer programme) | D. Joy |
| 13.00 hours | Lunch | |
| 14.30 hours | Review of assumption and methodology for survey: | |
| | 1. Capital costs and ORCOST computer programme | G. Woite |
| | 2. Fossil fuel costs | R. Krymm |
| | 3. Nuclear fuel costs | J.A. Lane |
| | 4. Other technical parameters | J.T. Roberts |

| | | |
|---|---|---|
| 16.00 hours | Intermission | |
| 16.30 hours | 5. Economic methodology and parameters | R. Krymm |
| 17.30 | Adjournment | |

28 March

| | | |
|---|---|---|
| 9.30 hours | Results of a country study | J.R. Wilson |
| 11.00 hours | Intermission | |
| 11.30 hours | Sensitivity of country results to selected parameters | J.P. Karger |
| 13.00 hours | Lunch | |
| 14.30 hours | Outline and summary of general report | J.A. Lane |
| 16.00 hours | Intermission | |
| 16.30 hours | Discussion and conclusion | O.B. Falls, Jr. |

29 March

Group or individual meetings with market survey staff or other Agency staff as desired by sponsors' representatives.

March 23, 1973

FORM NO. 75
(2-60)

INTERNATIONAL BANK FOR
RECONSTRUCTION AND DEVELOPMENT

INTERNATIONAL FINANCE
CORPORATION

INTERNATIONAL DEVELOPMENT
ASSOCIATION

| ROUTING SLIP | Date April 16, 1973 |
|---|---|

| NAME | ROOM NO. |
|---|---|
| Mr. Willoughby | |
| file - | |
| Power | |
| Follow-up | |
| | |
| | |

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|---|---|---|---|
| | To Handle | | Note and File |
| | Appropriate Disposition | | Note and Return |
| | Approval | | Prepare Reply |
| | Comment | | Per Our Conversation |
| | Full Report | | Recommendation |
| XX | Information | | Signature |
| | Initial | | Send On |

REMARKS

From E. Friedmann

INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

# OFFICE MEMORANDUM

TO: Mr. R.J. Cheetham

DATE: April 12, 1973

FROM: E. Friedmann

SUBJECT: PHILIPPINES - Draft Economic Report (Power Sector)

The paragraphs devoted to the Power Sector provide the reader neither with a clear description of the sectoral situation nor an appreciation of significant Government strategies and policies, which the Bank has helped to formulate and develop. These strategies are intended to correct existing central/regional and urban/rural imbalances through a coordinated national electrification plan which takes into account, among others, aspects such as energy dependency on oil imports, the need for overall rural development programs and the problems of private/public utility cooperation.

A detailed discussion of these matters appears in the chapter on the Sector of the appraisal report for the last power loan, 809-PH of 1972. May I suggest that a summary of that chapter, linking some of the sector issues with the country's political/economic problems of balance of trade, income distribution, rural development, regional tensions and the role of public and private companies would be a useful and appropriate way of referring to this sector in the Economic Report.

cc: Messrs: Weiner/Arnold/Beach, van der Tak
Rovani, Howell, Warford/Files

EFriedmann:jr
IBRD

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INTERNATIONAL DEVELOPMENT ASSOCIATION

**Not For Public Use**

Report No. 20a-TU



# APPRAISAL OF THE ISTANBUL POWER DISTRIBUTION PROJECT

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

TURKEY

April 6, 1973

Europe, Middle East and North Africa
Public Utilities Projects Division

## CURRENCY EQUIVALENTS

| | | |
|---|---|---|
| Turkish Lira (LT) | 14 | = US$1.00 |
| Turkish Lira (LT) | 1.00 | = 100 kurus = US¢7.1 |
| Turkish Kurus | 1.00 | = US¢0.071 |

IETT's financial year ends December 31

## WEIGHTS AND MEASURES

| | | |
|---|---|---|
| kW | | = kilowatt (1,000 W) |
| MW | | = megawatt (1,000 W) |
| kWh | | = kilowatt hour |
| GWh | | = Gigawatt hour (1 million kWh) |
| kV | | = kilovolt (1,000 V) |
| Kilometers (km) | 1.0 | = 0.6214 miles (mi) |
| Meters (m) | 1.0 | = 3.281 feet (ft) |
| Cubic meter ($m^3$) | 1.0 | = 35.315 cubic feet (cf) |

## LIST OF ABBREVIATIONS

| | |
|---|---|
| TEK | - Turkish Electricity Authority |
| EdF | - Electricite de France |
| SOFRELEC | - Societe Francaise d'Etudes et de Realisations d'Equipment Electrique |
| IETT | - Istanbul Electricity, Tramway and Tunnel Company |

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

APPRAISAL OF THE ISTANBUL POWER DISTRIBUTION PROJECT

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This report was prepared by Messrs. E.A. Minnig, A.J.D. Hutchins and Y.P. Buphomene, and is based on information provided by IETT, and field mission of June/July 1972.

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REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

APPRAISAL OF THE ISTANBUL POWER DISTRIBUTION PROJECT

## SUMMARY AND CONCLUSIONS

i. This report covers the appraisal of a power distribution project of the Istanbul Electricity, Tramway and Tunnel Company (IETT). The Project comprises the last two years of IETT's construction program for 1972 through 1975, and the proposed loan would finance the foreign exchange cost of the Project together with certain consulting services.

ii. IETT, created in 1939 by Law 3645, is a part of the Municipality of Istanbul but has a separate corporate legal status. It is responsible for all the transport services, for two of the three gas systems and for electricity distribution, all serving Istanbul and a number of areas outside the Municipality of Istanbul. A major objective of the proposed loan is to encourage institutional changes, including the separation of organization, administration and financing of the three services after completion of appropriate studies to be financed by the proposed loan and leading to the regionalization of the distribution of electricity throughout the Greater Istanbul Metropolitan Area.

iii. The transport and gas activities of IETT have both been incurring increasingly heavy losses over the past 20 years. These have so far been supported by the surpluses of the electricity department but at the expense of the expansion and rehabilitation of the electricity system, in which investment has been inadequate. This has resulted in periodic poor quality supply with low voltage and an unacceptably high and increasing number of outages. The Project is designed to reduce these by meeting IETT's most urgent system requirements. A power market study, which will not be financed from the loan as it is to be undertaken by the Government, is included in the Project to deal with the period 1976-1985. This long-range planning study is to be coordinated with the other ongoing urban development planning for Istanbul.

iv. In its present form, with the increasing transport and gas losses expected to continue until these activities can be reorganized, IETT's financial situation, already precarious, is not viable in the future. By itself the electricity operation is viable and profitable at present tariff levels, which the loan would require to be maintained through 1976, and is expected to continue so during the forecast period pending reorganization. IETT's overall financing plan however needs substantial assistance from the Government which has agreed to provide the necessary ad hoc support to enable IETT to maintain transport and gas services at least at their present levels, until these services can be reorganized on a self-supporting basis. By 1971

IETT's credit worthiness had become severely damaged because of its accumulated transport and gas losses and the Government has agreed to make appropriate arrangements for the settlement of over-due 1971 accounts payable mainly to the Government and to the Municipality of Istanbul.

v. IETT's organization is over-centralized, lacks sufficient competent qualified engineers at many levels, and has too high a proportion of ancillary staff not directly productive. However, these problems are already the subject of a consultant's study and despite its shortcoming IETT is the only effective power distribution entity presently available for the Istanbul area. Electricity overall planning and operations are suffering because of a dispute between IETT and the Turkish Electricity Authority (TEK) over jurisdiction in areas outside the municipal boundary. The Government has undertaken that, until a new organization for power distribution throughout the Greater Metropolitan Area is established, the Government will continue to permit IETT to distribute electricity in the area presently served by it. This reorganization should be accomplished by not later than December 31, 1974.

vi. Despite the serious financial and organizational problems involved, the Project is worthwhile because of the metropolitan area's urgent need for a more efficient and reliable power supply and, in particular, for the coordinated expansion on a region-wide basis of the basic public services, several of which were dealt with under IDA Credit 324-TU. The Project, which is expected to correct some of the deficiencies of IETT, would be a continuation of the program started under the Credit and under Loan 844-TU for the Istanbul water supply project; to rationalize the urban development of the Istanbul Metropolitan Area.

vii. The Project would be suitable for a Bank loan of US$14 million equivalent for a term of 20 years, including a grace period of 3-1/2 years.

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

APPRAISAL OF THE ISTANBUL POWER DISTRIBUTION PROJECT

# 1. INTRODUCTION

## A. GENERAL

1.01 The Government of Turkey, on behalf of the Istanbul Electricity, Tramway and Tunnel Company (IETT), has requested a Bank loan of US$14.0 million equivalent to cover the foreign exchange cost of a Project covering the last two years of IETT's 1972-1975 power distribution program. The Project is estimated to cost about US$40 million equivalent.

1.02 The Project is based on a feasibility study of the 34.5-kV system prepared in 1969 by IETT's consultants, Societe Francaise d'Etudes et de Realisations d'Equipment Electrique (SOFRELEC) of Paris, which they updated in 1971 and which was then reviewed and approved by the Turkish Electricity Authority (TEK) and by the Ministry of Energy and Natural Resources. The proposed loan is limited to the foreign exchange element of IETT's electricity construction program for 1974 and 1975 and of various studies to determine the form of the Istanbul Metropolitan Area's longer-term electricity, transport and gas organizations. The Project also includes a study, to be undertaken by the Government, of the area's future electricity expansion and rehabilitation needs for 1976-1985. The transport, electricity and gas studies are to be coordinated with the other ongoing urban development programming, project preparation and investments. These preparatory studies could form the basis of future Bank operations.

## B. ISTANBUL URBAN DEVELOPMENT - STRATEGY AND OBJECTIVES

1.03 The Project was identified in mid-1970 at the time of the investigation by the Bank of Istanbul's urban development problems, and the proposed loan is being considered in the context of the overall urban development planning for Istanbul, of which IDA Credit 324-TU and Loan 844-TU are also a part. Credit 324-TU initiated a Bank/IDA strategy for assisting the Government in the improvement and expansion of Istanbul by initiating appropriate studies to determine priorities and to prepare an integrated urban development program covering selected high-priority projects. The broader objectives of the Bank group assistance in the Istanbul area are to assist the Government to:

(i) improve institutional capabilities in the metropolitan area for integrated planning and the coordinated preparation and implementation of priority investments;

(ii) provide guidance and means of control of future urban growth;

(iii) improve levels of urban services, with special attention given to those who are very poorly served or not served at all; and

(iv) provide financial and technical assistance to fill present gaps while encouraging longer run self-sufficiency.

1.04 The areas of development covered by Credit 324-TU include:

(i) the provision of adequate infrastructure in designated existing squatter settlements and sites and services projects for low-income population as an alternative to squatter settlement;

(ii) development of a new urban cluster for planned urban expansion;

(iii) relocation of the existing wholesale food markets;

(iv) a traffic engineering and control project to improve transport services in the existing networks;

(v) development of procedures for improving ongoing land use and transport decision making; and

(vi) a wastewater disposal project.

1.05 The proposed power distribution loan, like the Istanbul Water Supply Project (844-TU), is directed at the rehabilitation of the existing distribution system and at meeting urgent short-term expansion requirements. At the same time, it lays the groundwork for longer-term investments in the metropolitan area for power distribution and for institutional reforms by including management and power planning studies. The timing of this Project permits early improvements (1974-75) to a seriously deficient existing power distribution system and permits the studies of longer-term (1976-1985) power investments and organizational changes to be closely coordinated with overall studies being carried out under Credit 324-TU.

1.06 Consultants are to assist the Government in the preparation of a program of works which will directly serve or provide the prerequisite system for serving many of the highest priority areas and needs, as measured in terms of present deficiencies. As a part of this work TEK will undertake a tariff and power market study under terms acceptable to the Borrower and the Bank, which will take into account, inter alia, the needs of the low-income population, locational criteria for industry, the investment plans of other plan implementation agencies, and the plans of the Greater Istanbul Master Plan Bureau for the improvement and expansion of the metropolitan area.

1.07 The proposed loan includes studies by consultants of the organizational, administrative and financial aspects of all of IETT's operations. The transport study will be coordinated with the traffic engineering and control study of Credit 324-TU, and will look into the transport operations of IETT and into the most appropriate organization and method of financing public transport in Istanbul. However, until the consultants' recommendations can be implemented, it is expected that IETT will continue to operate public transport services at a loss. The Government has agreed (see 7.16) to provide the support needed to operate these services during this interim period so as to enable IETT to maintain it's transport operations at least at their present level. The transport study under the loan is to be completed by June 30, 1974 and there is to be established as soon as practical thereafter an appropriate organization and arrangements for the financing of a public bus transport system for the Istanbul urban area (see 5.12(iv)).

1.08 Istanbul has three gas systems under two authorities (see 3.04). A review of the gas sector, also to be financed by the proposed loan, has as its objective the making of recommendations regarding future operations. This review, to be completed by June 30, 1974, would include (i) a gas market survey for 1973 to 1987 to determine future requirements, (ii) studies for the improvements in the present service including a possible integration of all 3 gas systems, (iii) the determination of the investment requirements and justification of coal gas production as against liquified propane gas or other sources of energy (see 5.12(iv)).

1.09 Without prejudging the results of the respective studies, it appears likely that the Government should, in consultation with the Municipality and as soon as possible after the review of the recommendations submitted, establish three financially separate organizations, either independent or under a municipal holding company, with respective responsibilities for providing effective and adequate region-wide electricity, transport and gas services and with each organization provided with sound management and separate Boards. With regard to the electricity sector, three organizational alternatives appear to be available to the Government. They are: (i) enlarging the field of IETT's activities to include the Greater Istanbul Metropolitan Area, which covers the entire Province of Istanbul and part of Kocoel province; (ii) transferring IETT's present responsibilities to TEK (the ultimate objective of the TEK Law); (iii) establishing a new regional electricity distribution authority for the enlarged region independent of both the Istanbul Municipality and TEK.

1.10 This appraisal report was prepared by Messrs. E.A. Minnig (Engineer), A.J.D. Hutchins (Financial Analyst) and Y. P. Buphomene (Financial Analyst), and is based on information provided by IETT and its consultants, a field mission in June/July 1972, and assistance given by the Urban Projects Department.

## 2. THE ECONOMY AND THE POWER SECTOR

### The Economy

2.01 The Republic of Turkey, about 780,000 $km^2$ in area, has a population of about 37 million (1972), growing at about 2.6% annually. In 1950, some 4 million people lived in urban settlements of 10,000 or more, but by 1971 the urban population had grown to nearly 14 million or nearly 37% of the total population. Between 1965 and 1970 the Istanbul Metropolitan Area had an influx of some 500,000 immigrants, increasing its population by over 20% to about 2.8 million. Annex 1 shows the basic economic data for Turkey.

2.02 GNP has been growing at about 7% per annum, but the growth rate in the Istanbul Metropolitan Area, which accounts for over 20% of GNP, has been about 11%. GNP per capita nationwide in 1971 was US$330, but for the Istanbul area alone it was about four times as high. Manufacturing has more than doubled its percentage share of total GNP since the early 1950s, whereas the share of agriculture, which still provides employment for most of the working population, has fallen by nearly half. Istanbul is a major center of industrial activity, contributing over 25% of total value added by the manufacturing sector of the economy. It is also Turkey's most important center of international trade, accounting for nearly one-half of all import-export activity.

2.03 The rapid pace of economic development, however, has had its price for Istanbul. The heavy influx of population from rural areas has led to a proliferation of squatter settlements located near employment opportunities. As a result, urban planning and the implementation of projects have lagged behind this rapid growth, mainly for financial reasons. In the power distribution sector, for instance, annual investments for expanding facilities have averaged some TL 50 million at 1971 values over the past 10 years, which is considered to be only about 40% of what should have been invested in order to maintain proper service (see paragraph 6.02).

### Energy Resources

2.04 Turkey has substantial energy resources in the form of coal, lignite, oil and hydro-power, but as yet is not self-sufficient in commercial energy requirements, which in 1971 totaled about 14 million tons of petroleum equivalent. About 30% of all energy requirements had to be imported.

### The Power Sector

2.05 An estimated 15% of all primary energy requirements is satisfied in the form of electricity. Of this, about three-quarters is thermally generated and about one-quarter is hydro. Total capacity of public generating plant in operation at the end of 1971 was about 2,260 MW, of which about 1,985 MW was operated by the Turkish Electricity Authority (TEK), a State

Enterprise created in 1970. In 1971, TEK's interconnected system supplied about 90% of the 9,000 GWh consumed in Turkey, of which IETT, its largest single customer, bought almost 25%. About 240 MW is owned and operated by the private Cukurova Electric Power Company serving the Adana area in the south, and a further 115 MW of generation capacity is installed in small isolated municipalities, villages and industrial plants.

2.06 Electricity consumption in Turkey has grown during the past decade at an average annual growth rate of about 11-12%, doubling about every six years. It is estimated that this growth rate will be sustained in the immediate future. Therefore, Turkey proposes to invest over US$1,700 million in generation and transmission facilities over the next five years. The relationship between GNP/capita and electricity production/capita indicates this to be reasonable, provided that past economic performance can be sustained.

2.07 The Bank in 1969 made a loan of US$25 million (568-TU) to ETIBANK (one of TEK's predecessors) for the construction of 380-kV transmission lines from the 1,200-MW Keban hydroelectric plant, under construction on the Euphrates, to Ankara and Istanbul. A further loan of US$24 million (763-TU) was made to TEK in 1971 for 380-kV substations, 154-kV transmission lines and 34.5-kV secondary transmission lines. The recent Loan (883-TU) and Credit (360-TU) for an aggregate of the equivalent of US$74 million for the Ceyhan Aslantas multipurpose project include the financing of 138 MW of power generating capacity. The first Keban construction phase (600 MW) is expected to be completed in 1974 and the second phase (300 MW) in 1976. However, it is not anticipated that significant amounts of Keban energy will be available to the Istanbul area before 1975. Future developments include a 140-MW lignite-fired steam unit at Tuncbilek, presently under construction; a 600-MW lignite-fired steam plant at Elbistan for which a preliminary design report has been completed and for which Bank finance has been requested by the Government; and an 1,800-MW hydro project at Karakaya downstream of Keban for which a feasibility report is now being prepared.

## 3. THE BORROWER AND THE BENEFICIARY

3.01 The Borrower would be the Republic of Turkey (the Government) and the Beneficiary would be IETT, with which a Loan and a Project Agreement, respectively, would be concluded. A subsidiary Loan Agreement between the Government and IETT will provide for the onlending of the proposed Bank loan to IETT under terms and conditions identical to the Loan Agreement.

### History and Field of Operations of IETT

3.02 The complex history of Istanbul's electricity supply dates from 1910, when a Hungarian company received a 50-year concession covering the European part of Istanbul and its suburbs. SOFINA, a Belgian company acquired the Hungarian company's shares and in 1931 the supply area was extended to include the Asiatic side of the Bosporus and the nearby Princes Islands, with a new concession terminating in 1993. In 1937 the Government repurchased this concession and assets by agreement with SOFINA. For 18 months the Ministry of Public Works operated the facilities until June 16, 1939, when under Law 3645 they were transferred to the Istanbul Municipality and IETT was established to operate them. Annex 2 gives further information on IETT's legislation and present status.

3.03 IETT's public transportation service started operations in 1939 with the "Tunnel" (a short, 570-meter passenger cable-car service from Galata on the Golden Horn, to Beyoglu -- the business district some 60 meters above it), followed in 1942 by a bus and trolley bus service whose areas of operation extend beyond the municipal boundaries. Annex 3 gives further details of IETT's Transportation Department.

3.04 In 1944 the Government purchased the Yedikule (Istanbul) and the Kurbagalidere (Anatolia) gas plants from their owners at the end of their concession periods and transferred both to IETT. In 1962, when the Beyoglu gas plant concession expired, this company's assets were taken over by the Municipality, which has continued to operate them on a "temporary" basis ever since. IETT has no direct responsibility for the latter plant but is represented on its advisory operations committee. Annex 4 gives further details of IETT's Gas Department.

3.05 Thus, IETT's present operations cover electricity distribution, transport (tunnel, bus and trolley bus) and two of the three gas plants in and around Istanbul.

IETT's Legal Status

3.06 IETT is an "autonomous" corporation incorporated under Law 3645 and owned entirely by the Istanbul Municipality. It is operated on a commercial basis as a separate legal entity. Law 3645, however, placed it under the direct control of the Mayor of Istanbul, who at that time was also the Governor. The Mayor still exercises certain controls and administrative restrictions over IETT on such matters as budgetary and financial control (see 7.02) and personnel and salary policy.

3.07 IETT's service area (see Annex 5, Map 10132) for electricity encompasses some 28 municipalities, in addition to the present Municipality of Istanbul, because when IETT took over operations in 1939 the boundaries of the then Istanbul Municipality were much larger than they are now and also covered an area even larger than the SOFINA concession. Post-World War II decentralization reduced the Istanbul municipal area and established the new municipalities but made no changes in Law 3645. IETT is therefore still accountable to the Mayor of Istanbul but is at the same time responsible for distributing electricity to other municipalities. This is a major cause of dissension (see 3.08) and inhibits coherent planning.

3.08 On July 15, 1970, the Turkish Electricity Authority (TEK) was established under Law 1312. This law gives TEK the right to generate, transmit and distribute electrical energy in the whole of Turkey, but Article 27, permits "Municipalities, villages, and other legal entities within the public sector", who had constructed and were operating their own distribution networks prior to the enactment of the law to continue to do so provided, amongst other things, they paid their bills to TEK promptly and remained within their boundaries. They could request TEK to purchase and operate their installations but TEK could only take them over unilaterally in the event of a default in payment for electricity supplied by TEK. The first effect of the TEK Law on IETT concerned its generating facilities which were transferred to TEK in 1971. Unfortunately, Article 27 of the TEK law failed to resolve an earlier dispute between ETIBANK and IETT over service area jurisdiction. IETT and TEK continue to dispute the interpretation of this article.

3.09 TEK's (formerly also ETIBANK's) position is that IETT, as a municipal authority, has no right to serve any area outside the Municipal Area of Istanbul, whereas IETT, backed strongly by the Municipality, cites Law 3645 as its authority for supplying its present service areas, and as a "legal entity within the public sector" cites Article 27 of the TEK Law as its authority for continuing to serve these areas. ETIBANK, for instance, attracted some industrial consumers away from IETT on the outer fringes of the IETT supply area by offering lower tariffs. This resulted in several instances of duplication of facilities in areas where IETT serves the residential load and TEK now serves the industrial load. IETT has had some success in the courts when challenging TEK's right to serve some of these consumers.

3.10 Even under Article 27 of the TEK Law, since the 28 "outside" municipalities concerned in the dispute are served by IETT and not TEK, it would seem that unless and until they apply to TEK for service, TEK will not be in a position to take over responsibility for distribution within their boundaries. IETT has 5-year supply contracts with these 28 municipalities which are renewable and, according to IETT, cannot be legally broken without its consent. It is also probable that any municipality presently served by IETT and contemplating requesting TEK to take over this service would be subject to strong pressure from the Municipality of Istanbul because IETT also provides such municipalities with public transport, which up to now, has been heavily subsidized from power revenues.

IETT's Future

3.11 The TEK/IETT dispute might best be resolved with the formation of a single regional power distribution authority responsible for the Greater Istanbul Metropolitan Area under the selected jurisdiction (see. 1.09). Until the precise format of such an organization can be determined and put into effect, however, the status quo should be maintained. This status quo, although undesirable in the long term, is necessary for the present because any premature take over by TEK would result in litigation and political resistance and, since IETT is currently the only effective supplying authority for the area, such a dispute if prolonged would harm the interests of the consumers and would delay urgent and necessary improvements to the system. The Government has agreed to permit IETT to continue to distribute electricity in the area presently served by it until a new electricity distribution organization covering the Greater Istanbul Metropolitan Area can be set up (see 1.09). IETT presently subsidizes transport and gas out of electricity revenues (see 7.01) as both are incurring heavy losses. The proposed loan includes funds for a study to resolve the long-term organizational and financial problems inherent in operating Istanbul's urban public transport system (see 1.07 and 5.12(ii)) and a review of the gas sector (see 1.08 and 5.12(iii)). IETT will require substantial financial help until these two activities are reorganized (see 7.16). Istanbul Electricity distribution areas will be maintained until the above regional organization can be established.

IETT's Organization

3.12 IETT is managed by a General Manager, who can hold this post until retirement age. He is assisted by advisors (3 "Counsellors" and 3 Assistant General Managers) who have no "line" responsibility and no vote in the Administrative Council (Board). "Line" responsibility theoretically lies with the 5 Vice-Presidents responsible for Electricity, Transport, Gas, Consumer Relations, and "Commercial". Together with the General Manager they constitute the "Board". Annex 6 shows an organigram of IETT.

3.13 The General Manager, formerly a lawyer, was once Deputy Mayor of Istanbul. He took over his present post in 1966. He is competent and has a strong personality, but IETT's management functions are over-centralized with little delegation of responsibility. Few members of top management

have any real authority and responsibility. Head Office senior activity tends to revolve around future "planning" rather than getting down to resolving the many pressing day-to-day management and operational problems.

3.14 IETT employed a total of 11,263 people in December 1971, spread over Head Office and its three services. The Head Office personnel are sub-allocated in IETT's statistics to the three service departments; Annex 7 shows the 1971 departmental groups divided into "staff" and hourly paid "labor" and totaling 6,878 for transport, 670 for gas and 3,715 for electricity. Allocation of available staff between operational duties and auxilliary services and within those categories themselves is out of balance. For example, IETT's Personnel Department responsible for 1,810 "staff" totals 224, but the parallel department responsible for 9,453 "labor" totals 20. Its Purchasing Department employs a total of 594 and its Consumer Relations Department 205, but the Electricity, Transportation and Gas Departments have only 6 engineers directly involved in studies, project design, and preparation of tenders and specifications. The Electricity Department's entire field staff totals only about 1,500.

3.15 The Electricity Department's overall consumer/employee ratio of 180/1 is, on the face of it, not unreasonable; but there is over-staffing in the supporting services and under-staffing in operations, maintenance and construction. Since the services of IETT are limited to distribution and it has always sub-contracted most of its limited construction program, this overall ratio cannot be directly compared with that of other utilities. The ratio of productive to auxilliary employees in the electricity field force is likewise out of balance in that, for example, about 1,450 or 94% are designated "labor" and of these about one-third are non-productive (drivers, guards, cleaners, etc.). In November 1970, 477 employees of the electricity department were taken over by TEK on the transfer to TEK of the Silahtar power station, but as 93 employees were recruited or transferred to electricity from other departments in that year and a further 366 in 1971, IETT virtually replaced the Silahtar personnel by the end of 1971 despite having no generation responsibilities.

3.16 Law 3611 regulates pay scales for civil servants in Turkey and equates technical professional staff (engineers, etc.) employed by the Government, municipalities or their autonomous entities, with general civil servants. This has resulted in a serious shortage of qualified and competent engineers in these entities throughout Turkey. IETT, for example, is about 40% to 50% short in the number of qualified electrical engineers needed to carry out all the functions it should be carrying out, yet it cannot attract competent professional staff because it is able to offer engineers only about half the rates paid by private industry for comparable skills and experience. These ceilings to professional pay scales have been a serious problem in several previous loans and the Bank has already suggested to the Government that professionally qualified technical staff should be excluded from the pay scale restrictions of Law 3611. During negotiations the Government were again urged to modify the application of this law.

In contrast, strong union representation has kept IETT's "labor" pay scales and fringe benefits competitive with those of private industry. This and the natural industriousness of the Turkish worker, combined with an overall shortage of employment in Istanbul, have resulted in IETT's "labor" force being, in general, hard-working and capable.

3.17 Recognizing these problems, IETT had already engaged Electricite de France (EdF) to review its electricity and gas organizational structure and operations. A report in September 1971 analyzed the situation and made various proposals, but no progress has been made since then. The proposed loan includes an amount for the implementation of improved operating procedures, and assurances were obtained from IETT that the agreed recommendations of this study would be implemented and would be coordinated with a similar study now being undertaken by EdF for TEK, so that the systems proposed for both undertakings will be compatible. This will facilitate the integration of regional power distribution activities at a later date in whatever form may finally be decided.

Existing Facilities - Electricity

3.18 IETT purchases all of its power requirements from TEK. TEK presently supplies IETT at 34.5 kV and 10 kV from its 120-MW Silahtar coal-fired thermal plant and from 154/34.5-kV substations at Davutpasa, Yildiztepe and Umraniye on the outskirts of Istanbul and at Tuzla in the south. IETT distributes power at three voltage levels, 34.5 kV, 10 kV and LT (110/190 V or 200/380 V). Annex 8 shows details of its distribution system statistics.

Existing System Operation

3.19 In order to keep down the cost of purchased electricity, IETT operates its 34.5-kV system as a closed ring, thus permitting a transfer of energy between the various TEK 154/34.5-kV substations. This is because under TEK's tariffs each supply point is billed separately on the basis of a predicted maximum demand contracted for annually. Any increase above this demand incurs a price penalty which IETT attempts to minimize by transferring power between supply points on the 34.5-kV system. Although the use of the system in this way has operational and reliability advantages, it also involves increased investment. The alternative would be the operation of the system as a series of non-interconnected rings, thereby reducing investment but at the cost of a slight reduction in reliability.

3.20 The 10-kV system, designed as a radial system, also operates as a ring system but as an open one. Each 10-kV stepdown distribution substation can be fed from either of two adjacent 34.5/10-kV supply points. Since this requires heavier conductors it results in an over-investment of some 10-15%.

3.21 IETT's distribution system suffers from excessive voltage drops and a low power factor, resulting from high reactive power requirements.

While voltage drops can be reduced by improved system design, the low power factor is mainly due to industrial consumers operating induction motors at partial load. The tariffs of IETT and TEK both include penalties for low power factor operation, but they are too low to induce consumers to improve their power factors by installing the necessary capacitors. The Government tariff study review (see 4.07) should therefore pay particular attention to this question.

## 4. THE POWER MARKET

### System Growth - Past and Forecast

4.01 A comparison between IETT's actual and forecast system statistics for 1967-1976 can be summarized as follows:

| | | 1967 | 1971 | 1976 | Annual Growth 1967/71 | Annual Growth 1971/76 |
|---|---|---|---|---|---|---|
| Consumers | - Number | 520,605 | 655,027 | 931,000 | +6% | +7% |
| Maximum Demand | - MW | 282 | 412 | 663 | +10% | +10% |
| Purchased & Generated | - GWh | 1,360 | 1,910 | 3,150 | +10% | +10.5% |
| Sales | - GWh | 1,200 | 1,650/1 | 2,725 | +8% | +10.5% |
| Sales per Consumer | - KWh | 2,300 | 2,520 | 2,900 | +2% | +3% |
| Distribution Losses | | 12% | 14% | 13.5% | | |

/1 Adjusted for a meter reader strike and for illegal connections (see 4.02).

### Actual Sales, 1967-1971

4.02 IETT's past system statistics, shown in Annex 9, page 1, show adjusted estimates for 1969, 1970 and 1971 to take into account a breakdown in IETT's billing machines (1969 and 1970), a meter reader strike (1971) and illegal squatter connections (see 2.03). Under the Construction Law 6785, IETT may not supply power to dwellings constructed without building permits, but most of the squatter areas where buildings were constructed without permits prior to 1966 have since been designated "improvement" areas in which the Ministry of Reconstruction and Resettlement is authorized to finance the construction of power distribution facilities. However, due to lack of funds, the level and quality of services provided by the Ministry have been inadequate and as a result illegal connections are frequently made in these areas. Similarly, illegal connections are frequent in the new squatter areas, which are increasing at a rate of about 10,000 dwelling units per year. Illegal connections in these areas have caused IETT an estimated loss of 25 GWh, 30 GWh and 35 GWh annually in sales during 1969, 1970 and 1971, respectively, with a total loss in revenue for the three years of some TL 24 million. To resolve this serious problem, IETT's management has decided to connect all consumers applying for a supply, whether in

improvement areas or not, and to press for more effective police and municipal aid in detecting and dismantling illegal connections. It is thereby hoped that, by 1976, squatter illegal connections will no longer constitute a major financial problem for IETT.

4.03 In 1971, IETT's industrial sales accounted for about 60% of its total sales, residential sales about 25%, and sales for commercial and government use about 11%; public transport and street-lighting each accounted for about 2%. Hardly any electrical energy is used for domestic space-heating, hot-water preparation or cooking, because of the cheaper coal, coal-gas or bottled gas available. Air-conditioning use is virtually restricted to new hotels.

4.05 Of IETT's 655,000 consumers, 209 are categorized as large industrial consumers (mainly in secondary industries) and in 1970 they had a total connected load of about 103 MW and a maximum demand of about 89 MW. Of these, only the 27 largest have maximum demand in the range of 600-8,000 kW. Maximum demand by area is shown in Annex 10.

4.06 In 1971 the average revenue per kWh of energy sold on the residential tariff was about 28.7 krs (US¢ 2.1). While less than the tariff paid by American or European consumers, this is relatively expensive in relation to income levels in Istanbul; consequently, many prefer to use cheaper, though more inconvenient, fuels. Annex 11 shows sales and revenues by tariff classification.

4.07 IETT's present tariff schedule is shown at Annex 12 and the bulk supply tariff for its purchases from TEK at Annex 13. The main general comment on IETT's tariffs is that the charges do not appear to reflect the variations in the costs of supply, due to seasonal and other factors. This leads to uneconomic use of electricity and misallocation of resources in the power sector which the tariffs could help to alleviate through appropriate differential pricing. Other defects in the IETT tariff include inadequate penalties for low power factor operation (see 3.21) and a minimum charge too low even to cover the cost of meter reading and billing. One result of the present IETT tariff is that residential consumers (who pay 28.7 krs/kWh on average) are probably being subsidized by commercial (47.2 krs/kWh) and industrial (32.9 krs/kWh for small, 32.1 krs/kWh) consumers. IETT's electricity charges are also being used to subsidize transport and gas (see 7.01). The TEK tariff study should suggest improvements in IETT's rate of structure (see 1.06).

Forecast Sales, 1972-1976

4.08 IETT's forecast sales and energy requirements from 1972 through 1976 (Annex 9) show an average overall annual growth rate of 10.5%, compared with 8% in 1967-1971 (see 4.01). This estimate, based on the present pattern of usage, assumes the elimination of the 35 GWh of squatter illegal connections by 1976 (see 4.02), the meeting of the latent demand which IETT has not so far been able to satisfy for financial reasons (estimated at some 25 GWh by 1973) and, in compliance with a recent court decision, the re-integration into the IETT system of the Kartal Cement Factory load taken over by TEK some years ago. The growth estimate for 1972-1976 is conservative. Despite the limitations of available control data and the difficulty of forecasting the effects on future consumption of tariff changes designed to correct past distortions (see 4.07), the short-term forecast is realistic.

## 5. THE PROJECT

### Project Description

5.01 The Project comprises all of the 1974 and 1975 investment program of IETT's Electricity Department. The proposed loan would finance the foreign exchange component of required imported equipment, together with consulting services. Contracts would need to be awarded in mid-1973.

5.02 The Project consists of the expansion of existing and establishment of new 34.5/10 kV primary and 10/0.4 kV secondary substations by some 390 MVA and 160 MVA respectively and the erection and installation of about 110 km primary, 250 km secondary and 470 km low-tension distribution lines and underground cables. In addition, 40 MVAR of capacitators would be procured and installed to improve voltage regulation and the power factor. The Project also includes the procurement of (i) a telemeasuring and teleprint system to form the nucleus of a load dispatching center; (ii) radio and telephone equipment to improve communications; (iii) service vehicles, cable fault locators and construction equipment; (iv) meters; and (v) consulting services. Details of the quantities and location of the facilities are given in Annex 15 and Map 10176 (Annex 14). IETT's own construction staff, assisted by local contractors, can successfully complete the construction of the Project by mid-1976.

Cost Estimates

5.03 The cost estimates for the Project are considered to be reasonable; they are shown in Annex 15, which is summarized as follows:

SUMMARY COST ESTIMATE 1974-1975

| | TL (thousands) | | | | US$ (millions) | | | | % of |
|---|---|---|---|---|---|---|---|---|---|
| | Foreign | Duty | Local | Total | Foreign | Duty | Local | Total | Total |
| 34.5-kV System | 35,252 | 24,605 | 33,090 | 92,947 | 2.52 | 1.76 | 2.36 | 6.64 | 16 |
| 10-kV System | 53,300 | 41,000 | 26,675 | 120,975 | 3.80 | 2.93 | 1.91 | 8.64 | 21 |
| LT System | - | - | 66,500 | 66,500 | - | - | 4.75 | 4.75 | 12 |
| Auxiliary Equipment | 53,060 | 41,895 | 36,035 | 130,990 | 3.79 | 2.99 | 2.57 | 9.35 | 23 |
| Sub-total | 141,612 | 107,500 | 162,300 | 411,412 | 10.11 | 7.68 | 11.59 | 29.38 | 73 |
| Contingencies: | | | | | | | | | |
| Physical | 7,078 | 5,380 | 8,160 | 20,618 | 0.51 | 0.38 | 0.59 | 1.48 | 3 |
| Price | 20,510 | 17,120 | 50,140 | 87,770 | 1.46 | 1.22 | 3.58 | 6.26 | 16 |
| Transport, Insurance | 10,200 | - | - | 10,200 | 0.73 | - | - | 0.73 | 2 |
| Sub-total | 179,400 | 130,000 | 220,600 | 530,000 | 12.81 | 9.28 | 15.76 | 37.85 | 94 |
| Consulting Services: | | | | | | | | | |
| Project | 9,300 | - | 12,000 | 21,300 | 0.67 | - | 0.86 | 1.53 | 4 |
| Management | 1,400 | - | 1,500 | 2,900 | 0.10 | - | 0.11 | 0.21 | ) |
| Transport | 2,100 | - | 600 | 2,700 | 0.15 | - | 0.04 | 0.19 | ) |
| Gas | 2,100 | - | 600 | 2,700 | 0.15 | - | 0.04 | 0.19 | ) 2 |
| Consulting Contingency | 1,700 | - | 1,800 | 3,500 | 0.12 | - | 0.13 | 0.25 | ) |
| TOTAL | 196,000 | 130,000 | 237,100 | 563,100 | 14.00 | 9.28 | 16.94 | 40.22 | 100.0% |
| | 35% | 23% | 42% | 100.0% | | | | | |

5.04 The cost estimates are based on prices ruling at the end of 1971. The physical contingency for unforeseen expenditures is equivalent to 5% of basic costs. On the assumption that fixed price contracts are to be awarded one year ahead of scheduled delivery, an escalation contingency of 6% per annum was allowed on imported equipment and 8% per annum on locally produced equipment, erection, installation and civil works. An additional 6% of the total estimated FOB cost of imported equipment has been included for freight and insurance. No further adjustments has been made to the estimates of costs because of the 1973 devaluation of the US$ since it is too early to determine the effects of this devaluation on costs in Turkey. Customs duties are based on existing tariffs, which vary from 35% of the CIF costs for transformers to 100% for cables. The effect of all these additions is to increase basic costs by about 43% in total.

Procurement and Disbursements

5.05 All materials and equipment financed from the proceeds of the proposed loan (consulting services excepted) would be procured on the basis of international competitive bidding in accordance with the Bank's guidelines. Preferential trade agreements exist between Turkey and the European Economic Community but for items to be procured under the Project no preferential treatment will be granted to EEC suppliers.

5.06 During negotiations agreement was reached with the Government that for purposes of bid evaluation all items under the proposed loan to be procured by international competitive bidding should be evaluated on the basis of the CIF landed cost, except that "preferred" domestic manufacturers would have a preference equivalent to 15% or the customs duty, whichever is less.

5.07 Disbursements would be made for the CIF cost of imported materials and equipment, and for the foreign exchange costs of consulting services provided by foreign consulting firms or the local costs, if consulting services are provided by Turkish consultants. For goods and services procured locally under international competitive bidding, the Bank would disburse the ex-factory cost of goods (excluding taxes) awarded to successful bidders.

5.08 Retroactive financing of consulting services for expenditure incurred after July 1, 1972, in an amount not exceeding US$100,000 equivalent is recommended.

5.09 No disbursements would be made for communications equipment and relay equipment, or for rehabilitation, until studies to determine the requirements, their location and justification have been carried out and approved by the Bank. In particular, the selection of communications equipment should be coordinated with the requirements established under the 1976-1985 power study to ensure compatibility with future development. During negotiations IETT agreed to entrust its engineering consultants with the relevant studies. A disbursement schedule is given in Annex 16. Should there be any savings in Bank-financed items, it is recommended that the equivalent amount be cancelled from the loan.

Consulting Services

5.10 IETT is expected to employ SOFRELEC, the French consultants responsible for the original feasibility study, possibly in conjunction with EIEI, a Turkish consulting organization, to provide the engineering services for the Project, including system design, feasibility studies, issue of invitations to tender and, unless the Bank otherwise agrees, the evaluation of bids and physical supervision of construction. During negotiations IETT agreed that these or other satisfactory arrangements will be completed by May 31, 1973 and that the terms of reference for this assignment will be mutually agreed between IETT and the Bank.

5.11 IETT intends to retain EdF for the proposed management study since they have already reported on the management structure of IETT's electricity and gas operations (see 3.17). During negotiations IETT confirmed that the terms of reference for this assignment would be mutually agreed between IETT and the Bank, and would include the training of seniors and accounting staff; the improvement of work methods with a view to reducing staff; a greater delegation of authority throughout IETT; a study of IETT's inventory reordering and accounting systems and assistance in implementing the changes necessary to meet the requirements for separate departmental accounting and compatibility with the TEK system (see 7.03 and 7.09).

5.12 In addition to the above, IETT will require consultants to carry out (i) the transport study (see 1.07) and (ii) the study on the Istanbul gas service (see 1.08). TEK will be responsible for the Power Market study (see 1.06 and 4.07). The Government has agreed:

(i) to cause a power study to be carried out and completed by December 31, 1974, with the intermediate objective of providing sufficient information by the end of 1973 to determine the precise location of facilities foreseen in 1974 and 1975. This study has not been included for financing out of the loan, as it will be carried out by TEK;

(ii) in consultation with the Municipality and/or IETT, to select by not later than August 31, 1973, consultants acceptable to the Bank for a study, to be completed by June 30, 1974, of the most appropriate organization, administration and means of financing a public transport system serving the Greater Istanbul Metropolitan Area;

(iii) in consultation with the Municipality and/or IETT, to select by not later than August 31, 1973, consultants acceptable to the Bank for a study of the gas sector to be completed by not later than June 30, 1974; and

(iv) to initiate, after exchange of views with the Bank, the necessary institutional, financial and organizational arrangements at the earliest possible date and not later than December 31, 1974, or by such other date as may be agreed by the Bank, which will lead to the establishment of an organization or organizations serving the Greater Istanbul Metropolitan Area with (i) the distribution of electricity, (ii) public transport services and (iii) the manufacture and supply of gas.

Summarized terms of reference of the various studies are given in Annex 29.

Environment

5.13 Istanbul is an historic and beautiful city, with many antiquities. It is geographically convenient and climatically attractive to visitors from both Europe and the Middle East. In the past, little attention has been given to the siting of service and utility facilities so as to minimize their aesthetic impact on the city's architectural features. To avoid further interference with these valuable and interesting assets, it was agreed that the appropriate environmental department of the Master Plan Bureau will be consulted with regard to the siting and design of the facilities comprising the Project.

## 6. JUSTIFICATION

### General

6.01 The rapid economic development of the Istanbul Metropolitan Area (see 2.02) has been accompanied by a corresponding upsurge in the demand for power (see 4.08). Investment in the electricity distribution system has failed to keep pace with IETT's requirements, to the detriment of service quality and reliability. Rehabilitation of the network is urgently needed to meet the present demand for electricity with a reasonable standard of supply. Additionally, system extensions will be needed to meet the projected growth of demand. The Project is designed to satisfy both of these objectives.

6.02 IETT's past investment in its distribution system has been inadequate. Over the period 1961 through 1971, when the demand increased by about 330 MVA, the annual investment averaged only some TL 50 million or US$3.6 million at present exchange rates. IETT has therefore invested an average of about US$108 per KVA during the past 10 years, whereas an investment average of some US$250 per KVA could reasonably have been expected for such a system. The consequences of this inadequate investment in renewal and expansion of IETT's system are apparent in today's increased outages.

### System Outages

6.03 As shown in Annex 17, between 1967 and 1971 system outages increased by 20% annually in number and 24% in duration, compared with a 10% growth rate in sales. In 1971 at least 70% of the outages were due to inadequate facilities. The cost to the economy cannot be measured with any precision but some indicative figures may be given. Thus, according to a survey by the Istanbul Chamber of Industry, local industry on average lost 81 working hours in 1971 as a result of power outages. The value of the resulting loss in industrial output may be conservatively estimated at TL 280 million (see Annex 18). Implementation of the Project would reduce the present excessive number of outages, with the beneficial effects on industrial output resulting in appreciable economic advantages.

### Economic Rate of Return

6.04 It is not practicable to compute a meaningful economic rate of return for this purely distribution Project; however, a financial rate of return has been computed and is likely to be lower than the economic rate of return because no account has been taken of such additional benefits as reduced losses in industrial output, which are difficult to quantify precisely. The financial rate of return on the Project is 30% at present tariff levels, ignoring benefits from reduced outages. Even with tariff levels resulting in a 20% reduction in revenues (the transport subsidy element estimated to be included in the present tariffs), the financial rate of return would still be 14%. The methodology for calculating the rates of return is described in Annex 18.

## 7. FINANCIAL ASPECTS

### IETT's Financial Viability - General

7.01 In its present form and with its present activities, IETT is not financially viable as a corporate entity. Its electricity activity is profitable, but its transport and, to a lesser extent, gas activities, have been incurring increasingly heavy losses over the past 20 years, which have been supported from electricity profits to the detriment of electricity system expansion. In 1971 the electricity surplus was abnormally low (see 7.06) and IETT, being in overall deficit, financed its operations largely by increasing its accounts payable to the point where its local credit-worthiness has been severely damaged and its present financial position is highly precarious. This report accepts the de facto operating situation and assumes that no major change in IETT's legal form or responsibility is likely to be made before 1976, by which time a future organization and means of financing the public transportation and gas services of Istanbul should have been decided (see 1.07 and 1.08). In the interim, however, and irrespective of the proposed loan, IETT will need substantial and continuing assistance, first to regain an acceptable state of credit worthiness and then to meet the annual losses and equipment requirements of its transportation and, to a much smaller degree, its gas activities (see 7.16).

### Present Accounts - Form

7.02 IETT's present Balance Sheets, submitted annually to the Mayor and Istanbul Municipal Council for their acceptance and approval (see Annex 2), are for IETT as a whole and do not show any departmental breakdown of current assets or liabilities other than accounts receivable for electricity and gas. On the other hand, the Income Statements do show departmental income and expenditure and profit and loss, although the methods for allocation of inter-departmental charges require review. Accounting principles, however, have not always been consistently applied from year to year; therefore, complex and substantial adjustments have had to be made to the published accounts to arrive at the comparable accounts in this report. For this reason, no accounts prior to 1969 have been included.

### Accounting Methods

7.03 During negotiations, IETT agreed to prepare complete annual departmental accounts, including separate Balance Sheets, and to open separate departmental bank accounts for 1973 and onwards. The US$100,000 included in the proposed loan for management consulting services includes the necessary assistance to IETT to achieve this and to reorganize its accounting methods, including those for the allocation of charges to departments, in accordance with sound accounting principles and on lines similar

to and compatible with the recently reorganized TEK system. These changes will be of immediate benefit to IETT and will also facilitate any future changes in the organization.

Auditors

7.04 The statutory "auditors" appointed by the Municipal Council (Annex 2) are mainly concerned with budget comparisons. IETT also has some permanent government auditors concerned with observance of fiscal laws, but no external or commercial audit is carried out. During negotiations IETT agreed to have its accounts audited by independent auditors acceptable to the Bank.

Insurance

7.05 IETT is presently self-insured except for marine insurance covering assets in transit and one policy providing third party coverage for electricity (LT 500,000) and gas (LT 250,000) installations. An Insurance Reserve in the Balance Sheet covers some 2-1/2% of the value of Net Fixed Assets excluding land and the tunnel, but this is not separately funded. In view of IETT's financial situation, the Government agreed to take or cause to be taken appropriate action to provide for the repair or replacement of facilities or equipment in the event of a loss not covered by outside insurance.

Past Earnings

7.06 In 1969 and 1970 the disposable surpluses -- i.e., surplus after interest and reserve for expansion required under Law 1312 -- on electricity (LT 102 million and LT 112 million) more or less equalled the combined losses on transport (LT 88 million and LT 96 million) and on gas (LT 13 million and LT 15 million); but in 1971 the electricity disposable surplus dropped to LT 85 million, mainly due to about LT 19 million of 1971 sales being billed in 1972 because of a meter readers' strike, excessive recruiting or transfers which increased the department staff by 11%, and the lag between receiving increases in TEK's charges for purchased electricity and passing on these increases to IETT's consumers. In 1971, therefore, this abnormal reduction in disposable electricity surplus to LT 85 million, combined with increased transport and gas losses of LT 132 million and 20 million, respectively, resulted in an overall IETT loss of LT 67 million. Overall, IETT's electricity tariffs average krs 32.3 per kWh (US¢ 2.3) and have not been increased since 1967 except to pass on TEK's increases. IETT's transport rates were belatedly increased by about 60% in July 1971 and gas rates by about 20% in October 1970. The new transport rates averaged krs 61.7 (US¢ 4.4) per passenger for 1971 and will average about krs 70.0 (US¢ 5) per passenger for a full year. The gas rates averaged krs 70.0 (US¢ 5) per $m^3$. For neither transport nor gas however do these tariffs produce a sufficient gross revenue to cover even departmental personnel cost. The electricity

rates are, if anything, somewhat high and the department's rates of return for 1969, 1970 and 1971 were 35.9%, 36.9% and 25.8%, but these are calculated on unrealistically low asset values. With an approximate revaluation basis at 1971 prices (see 8.08) the 1971 rate of return would have been about 5%, but this would have been more than doubled had the 1971 electricity surplus not been abnormally low. Annex 19 gives details of both actual and forecast Income Statements for 1969 through 1976, both consolidated and departmentally.

Past Balance Sheets

7.07 IETT's published Balance Sheets for 1969, 1970 and 1971 have had to be adjusted in many respects to arrive at the "actual" Balance Sheets shown in Annex 20 (see 7.02). Assets and liabilities have been allocated to departments where possible, but where this has been impracticable these have been shown under "Head Office". Each department is accordingly shown as having a "current account" with Head Office whose balance changes each year according to the department's cash flow (including operating results).

7.08 IETT's fixed assets have been included at the published Balance Sheet values, which would have to be increased by about 2-1/2 times to reach the values at 1971 prices, arrived at by applying to the recorded asset values the same annual indices as were accepted by the Government in 1971 for revaluation of TEK's assets in connection with Loan 763-TU. However, since the reliability of the basis of this calculation is denigrated by incomplete and possibly inaccurate information on dates and values of asset acquisitions, and since IETT's depreciation rates, averaging about 6.5% of gross asset value, are somewhat high, the 1971 values of Net Fixed Assets arrived at in this way can only be regarded as very approximate. A realistic revaluation would entail a physical appraisal but this has not been suggested at this stage because of the uncertainties over the future format of IETT and the extent of its responsibility for its present three activities.

7.09 IETT's net current assets have been negative (Net Liabilities) throughout the past 3 years in spite of abnormally high inventories. In 1971 this negative balance increased sharply by over LT 100 million to LT 129 million despite an increase of LT 27 million in inventories and LT 14 million in cash balances. Accounts payable for taxes, supplies, etc., about doubled to LT 305 million, whereas consumers' accounts receivable for electricity increased by only 26% to LT 98 million, roughly in line with increased billings. Since consumers are billed at intervals varying from 1 month to 6 months depending on their category, this level of accounts receivable which average under three months' billings is acceptable, although on the high side. After the deduction of LT 30 million from the published balance sheet inventory value for obsolete, non-existent and suspense items, it still remained at LT 134 million in 1971, which is equivalent to 13% of gross fixed assets and may well still include a number of old or unsuitable items. The stores accounting procedures are comprehensive and physical

custody of the items is orderly, but there is little contact or cooperation between the engineering staff and the (non-technical) storekeepers; hence unnecessary items tend to be ordered to meet current needs despite the already high stock value. EdF, in the course of its management study, should help IETT improve this situation and reduce the level of its inventories (see 5.11). This should be achievable quite quickly by tighter control over purchasing and stock holding levels, the identification and disposal of redundant or non-moving items, and a closer association between the engineering and the storekeeping staff.

7.10 IETT's equity has been divided to show separately the initial equity (LT 500 million), equivalent to the value of the assets given to it by the Government, and the accumulated losses. The 1971 accumulated net loss shown in Annex 20 is LT 330 million despite an accumulated surplus of LT 640 million for the Electricity Department alone. This LT 330 million loss is LT 128 million less than the loss shown in the published Balance Sheet, which has been adjusted by the net excess of the liabilities already "consolidated" into one "debt" by the Government over those assets of no practicable realizable value but still included in IETT's Balance Sheet. Long-term debt accordingly excludes this "consolidated" Government "debt" and in 1971 the debt was limited to LT 142 million, of which LT 113 million was for transport and LT 29 million for electricity. The debt/equity ratio of 27:73 demonstrates a low level of long-term borrowing.

Overall Forecast Operating and Trading Results

7.11 IETT's overall forecast operating and trading results for 1971 through 1976 (summarized in Annex 21) show a total overall net surplus for the 5 years of only LT 136 million (electricity LT 943 million, transport LT 648 million (loss) and gas LT 160 million (loss). Annual surpluses range from LT 21 million in 1973 to LT 33 million in 1975. The major assumptions used in all the departmental forecasts of both revenue and expenditure are shown after the financial annexes in Annex 28.

Electricity Department Forecast Operating Results

7.12 The forecast income statements and operating results of the Electricity Department from 1972 through 1976 (Annex 22) assume an average annual growth rate in sales of about 10.5% (see 4.01), with no changes in TEK's or IETT's existing tariffs. Since IETT's charges are not under a block tariff system, the return per kWh sold falls only gradually and remains close to krs 40 throughout the period despite the increased consumption. The 1972 revenue is untypical (see 7.06) and in each year's sales figure, an estimate has been included, both in kWh and in revenue at the domestic tariff rate, of the expected illegal consumption in the squatter settlements (see 4.02). The fact that this will be unbilled by IETT is correspondingly reflected under expenses. The losses due to illegal connections are substantial, being

estimated at LT 64 million over the period, rising from LT 10 million in 1971 to LT 17 million in 1973 before declining to zero in 1976. IETT's billings to the Municipality for electricity consumption and for related works are included in the forecasts, but have not been included as accounts receivable in the Balance Sheets even though no payments have been assumed because of the IETT/Municipal dispute over royalties (see Annex 24 note 1 and Annex 26 note 3). All the annual billings to the municipality during the forecast period totaling LT 187 million (rising from LT 32 million in 1972 to 44 million in 1976) have been "written off" directly in the Balance Sheet of the following year as being "non recoverable" and the electricity accumulated surpluses have been reduced accordingly. A summary of the Electricity Department's lowest and highest operating results achieved between 1972-1976 is as follows:

| | Lowest Year 1973 LT millions | Highest Year 1976 LT millions | |
|---|---|---|---|
| Sales revenue | 839 | 1,008 | |
| Other revenue | 68 | 81 | |
| Total operating revenue | 907 | 1,169 | |
| Less operating expenses | 717 | 959 | |
| Net operating income | 190 | 210 | |
| Less interest payable | 4 | 22 | |
| Net surplus | 186 | 188 | |
| Rate of return | 37.6% | 19.2% | 1972/76 average: 25% |
| Approximate rate of return on revalued assets (see 7.08) | 13% | 11% | 1972/76 average: 12% |

Other Departmental Forecast Operating and Trading Results

7.13 IETT's Transportation and Gas Department are both expected to continue to run at increasing losses throughout the forecast period (see Annex 3, page 6, and Annex 4, page 5); again, no tariff increases have been assumed, although the Government and the Municipality might well decide to increase all or any of the electricity, transport and gas tariffs as a means of providing or reducing the additional finance necessary to support the transport and gas operations, etc., pending any reorganization (see 7.16). In summary, the transport and gas results are expected to be as follows:

| | 1972 LT millions | | 1976 LT millions | |
|---|---|---|---|---|
| | Transport | Gas | Transport | Gas |
| Operating income | 213 | 15 | 278 | 12 |
| Operating expenses | 334 | 40 | 406 | 50 |
| Net operating losses | (211) | (25) | (128) | (38) |
| Interest payable | ( 7) | - | ( 5) | (1) |
| Net deficit | (128) | (25) | (133) | (39) |

Financing Plan, 1972-1976

7.14 Although the Government has agreed to initiate action by December 30, 1974 leading to the reorganization of IETT's present activities (see 5.12(iv)), the promulgation of any legislation which might be necessary and the completion of the appropriate institutional changes will be complex and lengthy. The Financing plan therefore assumes that, in practice, IETT will continue to operate throughout the forecast period through 1976 as one multi-purpose legal entity, so it is necessary to look at the sources and applications of funds of the entity, as a whole. In summary, IETT's overall financing plan for 1972 through 1976 is as follows:

| | LT millions | | | | | |
|---|---|---|---|---|---|---|
| | Elec-tricity | Transport | Gas | Head Office | IETT TOTAL | % |
| **Sources** | | | | | | |
| Net cash Generation after debt service | 1,168 | (582) | (128) | - | 458 | |
| Government/Municipal assistance (see 7.16) | - | - | - | 800 | 800 | |
| Working capital (increase) or decrease | (129) | 3 | (4) | (287) | (417) | |
| Transfer from (to) other depts. | (198) | 565 | 146 | (513) | - | |
| Internal resources | | | | | 841 | 66% |
| Customers' contributions | 148 | - | - | - | 148 | 12% |
| Long-term borrowing: | | | | | | |
| Proposed loan | 196 | | | | | |
| Government loan (buses) (see 7.16) | - | 46 | - | - | | |
| Balance of existing bus credit | - | 31 | - | - | 273 | 22% |
| Total Sources | 1,185 | 63/1 | 14 | - | 1,262 | |
| **Applications** | | | | | | |
| Construction, studies and additional buses | 1,167 | 63 | 14 | - | 1,244 | 100% |
| TEK deposits, etc. | 18 | - | - | - | 18 | |
| Total Applications | 1,185 | 63 | 14 | - | 1,262 | |

/1 An additional LT 68 million has been assumed in respect of customs duties, and LT 26 million debt repayment due on the existing loan for Leyland buses, both of which the Government is expected to waive or defer (see Annex 25).

7.15 In view of IETT's overall credit position, long-term loans during the period have been limited to the proposed loan (LT 196 million), a Government loan for buses (LT 46 million) and the drawdown of the remaining LT 31 million of an existing credit for "Bussing"1/ buses, of which the last 83 (out of 130) buses were due for delivery in 1972; additional Government funds may however be provided as loans subject to the debt limitation covenant (7.18(c)). In 1971 IETT's debt service was not covered by net cash generation, but from 1972 onwards it is expected to be covered from 2.3 times (1972) to over 4 times by 1976. IETT's sources and applications of funds for the forecast period through 1976 is shown in detail in Annex 23, which also shows the total contributions to and requirements from IETT's cash resources by each department and by Head Office during the forecast period. The individual departmental "sources and applications of funds" statements are shown separately for electricity (Annex 24), transport (Annex 3, page 7), and Gas (Annex 4, page 4).

Government/Municipal Assistance

7.16 Since IETT is unlikely to be able to negotiate commercial loans on acceptable terms, the LT 800 million required to complete the financing plan has been included in the above sources as "Government and/or Municipal assistance". Financing of LT 46 million (see 7.14) has also been assumed for another 155 new buses and spares (in addition to the above 83 "Bussing" in 1972) needed to carry the assumed increased number of passengers by 1976. 2/ In addition, the LT 94 million more in Government financing of transport capital investments has been assumed to be needed during the interim period before the reorganization of IETT or the formation of new arrangements for providing public transport (see 1.07). These are included directly in the Transportation Department balance sheet forecasts (Annex 3, page 5), which reflect the rescheduling of the existing loan for Leyland buses and do not include any liability for customs duty on either these Leylands or the new buses and spares on the assumption that duty will be waived or deferred until new arrangements are made. On the various bases assumed in Annex 28, the supplementary financial help needed by IETT would therefore total some LT 940 million (about US$ 67 million) over the next 5 years, which roughly breaks down into transport LT 720 million, gas LT 130 million, and working capital LT 90 million (settlement of 1971 overdue accounts payable mainly to the Government and to the Municipality of Istanbul of LT 80 million and an increase in cash of LT 10 million). Annex 25 provides further details and suggests a number of possible methods (including increasing tariffs) open to the Government or the Municipality for raising

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1/ "Bussing" is the manufacturer's trade name.

2/ The need for new buses and spares during 1972-1976 is based on IETT's passenger forecasts.

much of this required finance. The Government is aware of the problems of transport financing for Istanbul, and has agreed to take or cause to be taken all action necessary to enable IETT to maintain its transport and gas services at least at their present levels pending the long term arrangements for these activities.

Forecast Balance Sheets

7.17 IETT's future net fixed assets and work in progress for the 5 years 1972 through 1976 have been forecast on the assumption that depreciation rates will remain at present levels. Asset additions for electricity have been limited to the 1972-1975 program (LT 818 million) and the 1976 program (LT 350 million; 1/ for transport to the purchase of 238 new buses (including the 83 already on order) and spares (LT 63 million); and for gas to minor routine rehabilitation and connections (LT 14 million). Net current asset assumptions include the reduction of the excessive 1971 accounts payable of LT 173 million to a more reasonable level (LT 89 million in 1972), the maintenance of the cash level at about one month's revenue, and the reduction of inventories over the period by LT 10.6 million (8%). Most of the above improvement in working capital is shown in the estimate for 1972, but in practice the remedial action will not be able to affect the position until at least 1973, since the improvement in working capital forms a part of the total LT 940 million of needed supplementary assistance. All of this assistance has been shown in the forecast sheets under "Head Office" as additional capital (i.e., as non-repayable or interest-bearing). The manner in which the assistance is reflected in the actual future balance sheets will, of course, depend on the type of support selected (see 7.16). Details of the Electricity Department and Head Office balance sheets are given in Annexes 26 and 27.

Financial Covenants

7.18 During negotiations the following additional financial conditions were accepted by the Government and IETT and were incorporated in the Project Agreement:

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1/ The total 1975 construction expenditure (LT 249 million) includes LT 50 million for the 1976 requirements, and the 1976 total construction expenditure (LT 307 million) includes almost LT 7 million in final payments for the Project. All studies included in the proposed loan have been retained in electricity work in progress.

(a) In view of IETT's present financial situation and unrealistic balance sheet values of its net fixed assets (see 7.08):

(i) all of IETT's tariffs will be maintained at least at the present levels through 1976; and

(ii) IETT's electricity tariffs will be maintained at a level high enough to provide a surplus (before charging depreciation but after deducting all operating expenses of the department, including a reasonable allocation of Head Office or general overhead, and debt service on loans incurred for electricity purposes) equal to at least 40% of the average of the electricity construction expenditure for the previous year and the planned electricity program for the current year and, moreover, that a shortfall in any one year will be made up in the following year.

(b) Except as the Bank may otherwise agree, IETT's electricity revenues shall not be used for any purpose not relating to its electricity activities unless such revenues exceed the requirements of the above rate covenant (7.18(a)) and such additional amounts as may be required, in the opinion of the Bank, to ensure the effective completion of the Project.

(c) IETT will not incur any future long-term debt unless its net income before depreciation and interest for the year in which the proposed loan is to be incurred or for a later 12 months period ended prior to the incurrance of the debt, whichever is the greater, shall be not less than 1.5 times the maximum debt service requirement for any succeeding fiscal year on all debt including the debt to be incurred.

## 8. RECOMMENDATIONS

8.01 As a result of the negotiations the following conditions were included in the appropriate loan documents:

(a) The Government will permit IETT to continue to distribute electricity in the area presently served by it until a new organization, covering the Greater Istanbul Metropolitan Area can be set up (see 3.11).

(b) Arrangements acceptable to the Bank have or will be made for the engineering services of the Project by May 31, 1973 (see 5.10).

(c) The terms of reference of EdF's management study will be mutually agreed between IETT and the Bank; will include a reorganization of IETT's inventory, reordering and accounting systems; will be coordinated with the similar study being undertaken by EdF for TEK, so that both IETT's and TEK's systems will be similar and compatible (see 3.17 and 5.11).

(d) The Government will cause a power market study of the Istanbul Metropolitan Area to be carried out and completed by December 31, 1974 under terms of reference mutually acceptable to the Government and to the Bank, which shall inter alia include a review of IETT's retail tariff structure; a power market study covering at least 1976 through 1985; and a preliminary survey to determine by December 31, 1973, the precise location of the substations included in the Project (see 1.06 and 5.12(i)).

(e) The Government and/or IETT agreed to engage consultants acceptable to the Bank by not later than August 31, 1973, whose appointment, terms of reference and conditions will be mutually acceptable to the Government and the Bank and whose objective will be to study and make recommendations by not later than June 30, 1974, unless otherwise agreed by the Bank, (i) as to the most appropriate organization, administration and means of financing the public transport system for the Greater Istanbul Metropolitan Area, including the separation of public transport from the distribution of electricity (see 1.07 and 5.12(ii)), and (ii) as to the most appropriate measures to be taken with regard to the manufacture and distribution of gas in Istanbul and including recommendations as to the integration and most appropriate organization and means of financing the present three separate gas systems, including the separation of the gas utility from the distribution of electricity (see 1.08 and 5.12(iii)).

(f) The Government will initiate by not later than December 31, 1974 or by such other date as may be agreed by the Bank and after exchange of views with the Bank, the necessary institutional, financial and organizational arrangements, which will lead to the establishment of an organization or organizations to be responsible for the distribution of electricity public transport services and the manufacture and supply of gas throughout the Greater Metropolitan Area (see 5.12(iv)).

(g) The appropriate environmental department of the Master Plan Bureau will be consulted with regard to the siting and design of the Project (see 5.13).

(h) IETT will prepare separate and complete departmental accounts for fiscal year 1973 and will open separate departmental bank accounts with effect from July 1, 1973 (see 7.03).

(i) IETT will employ external auditors (see 7.04).

(j) The Government will take or cause to be taken, appropriate action to provide for the repair or replacement of facilities or equipment in the event of a loss not covered by outside insurance (see 7.05).

(k) The Government and/or Municipality will take or cause to be taken such action as may be necessary to enable IETT to maintain its transport and gas operations at least at their present levels pending the long term arrangements for these activities (see 7.16).

(l) Electricity tariffs will not be reduced through 1976 and will, if necessary, be increased to a level high enough to provide a surplus (before charging depreciation but after deducting all operating expenses of the department, including a reasonable allocation of Head Office or general overhead, and debt service on loans incurred for electricity purposes) equal to at least 40% of the average of the actual electricity construction program for the previous year and planned electricity construction expenditure for the current year and, moreover, a shortfall in any one year will be made up the following year (see 7.18(a)).

(m) IETT's electricity revenue shall not be used for any purposes not relating to its electricity activities unless such revenues exceed the requirements of the rate covenant and such additional amounts as may, in the opinion of the Bank be required to ensure the effective completion of the Project (see 7.18(b)).

(n) IETT's future borrowing will be subject to a debt limitation covenant requiring cash generation to be 1.5 times any future annual debt service requirements (see 7.18(c)).

8.02 In view of the above conditions and assurances, the Project provides a suitable basis for a Bank loan of US$14 million equivalent for a term of 20 years, including a grace period of 3-1/2 years, and will be relent by the Government to IETT on the same terms in accordance with a subsidiary loan agreement to be concluded.

April 2, 1973

ANNEX 1

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

BASIC ECONOMIC DATA

(Figures are for 1971 except as noted)

| | |
|---|---|
| **AREA** | 780,000 $km^2$ |
| **POPULATION** | |
| Total (1972) | 37.5 million |
| Density | 48 per $km^2$ |
| Growth rate (1965-72) | 2.6% p.a. |
| Urban % of total | 36.8% |
| Urban growth rate | 4.1% p.a. |
| **GROSS NATIONAL PRODUCT** | |
| GNP at market prices | US$11,955 million |
| Growth rate (1965-71, constant prices) | 7.4% p.a. |
| GNP per head | US$330 |
| % of GNP - agriculture | 26.6 |
| - industry | 23.4 |
| - services | 50 |
| Gross investment, % of GNP | 20.2 |
| Imports of goods, % of GNP | 11.4 |
| Exports of goods, % of GNP | 7.4 |
| Government expenditure, % of GNP | 27.3 |
| **PRICES** | |
| Rate of increase in consumer prices (1965-71) (Istanbul) | 8.5% p.a. |
| **LABOR** | |
| Total labor force | 14.8 million |
| % of total - agriculture | 66.2 |
| - industry | 10.1 |
| - services | 23.7 |
| Unemployment, % | 6.0 |
| **BALANCE OF PAYMENTS** | |
| Exports of goods - value | US$885 million |
| - growth rate (1965-70) | 4.7% p.m. |
| Imports of goods - value | US$1,356 million |
| - growth rate (1965-70) | 8.8% p.a. |
| Main exports, % of total - cotton | 26.6 |
| (average 1969-71) - hazelnuts | 15.5 |
| - tobacco | 13.6 |
| **ENERGY** | |
| Energy consumption (coal equivalent) per capita (1970) | 487 kg |
| Electricity consumption per capita | 266 kWh |
| Population with access to electricity (1970) | 37% |

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

IETT LEGISLATION AND DE FACTO STATUS

The regulations ruling IETT have been enacted by Law 3645.

Autonomy

1. According to Article 2 of the Law, IETT is a "General Management" of the Municipality of Istanbul having legal authority and independence of industrial and commercial action in all matters concerning the management of the assets bought back from the concessionaire companies and transferred to the Municipality of Istanbul.

2. According to Article 5 of the Law, IETT is not subject to the regulations which apply to the regular municipal departments concerning public accounting, or the need for tenders for purchases. On the other hand, IETT does not enjoy the "special status" provided by the Turkish law for "semi-government offices".

Budgets, Balance Sheet, and Operating Accounts

3. Article 6 of Law No. 3645 provides that budgets will be drawn up by the IETT and approved by the municipal council. The profit-and-loss accounts and the balance sheets must also be submitted to the municipal council for examination, approval and comments after which a copy is sent to the Ministry of Energy.

Although Article 5 does not require IETT to follow the general regulations for municipal accounting, Article 6 does contain an "auditing" requirement in that two "Auditors" (or controllers) appointed yearly by the municipal council, but not members of it, are responsible for examining the IETT procedures, budgets and accounts. The "Auditors" must review the draft budget balance sheet and the annual revenue account. They must in each case add their comments to these accounts before sending them to the Municipal Council for approval. The "Auditors" must also examine the receipt-and-expenditure vouchers to make sure that they were written at the correct time and in accordance with the appropriate regulations. Their comments and a report of all inquiries and inspections made during the year must be sent to the Municipal Council.

Commitments

4. All commitments in excess of LT 250,000 must be approved by the Mayor, and all major expenditure below this level is approved by the General Manager.

Staff and Appointments

5. (a) Staff regulations, organization charts and any amendments thereto are drawn up by the General Manager and submitted to the Municipal Council for approval.

(b) The General Manager is appointed by the Ministry of Energy from candidates proposed by the Mayor of Istanbul.

(c) The Ministry appoints the vice-presidents and other senior staff on the recommendation of the General Manager submitted through the Mayor.

(d) Monthly paid staff (except senior staff above) are appointed by the Mayor on the recommendation of the General Manager.

(e) All other labour and junior staff appointments are made by the General Manager, with the approval of the Mayor.

(f) All contracts for foreign specialists must be signed by the Mayor.

Professional and Labour Pay Levels

6. Monthly paid staff are all subject to Law 3611 in the same way as other civil servants. Thus engineers, other professional grades and technicians are limited to a pay scale, which provides about half the equivalent salaries paid by private industry for comparable skills. Thus in IETT, as in TEK, the level of professional staff is inadequate both as to quality and to quantity of work achieved. This forces IETT (and TEK) to rely heavily on consultants to organize and carry out projects and planning. Strong labour unions on the other hand result in pay for hourly paid operating staff and labour being competitive with private industry.

Tariff Rates

7. All requests for increases or changes in IETT's tariff structure are prepared by IETT and, after approval by the Mayor and initialing by the Governor of Istanbul, are sent to the appropriate Ministry for agreement or amendment by the Minister.

Other Government Approvals

8. In addition to the staff appointments, pay levels and proposals for rate increases mentioned above, the Government must approve all foreign exchange expenditure and in general has the power to modify any operating, administration or construction procedure or request submitted by IETT. The Government has used these powers to object to the consultants' (SOFRELEC) original recommendation concerning the location of some of the facilities to be supplied under this Project.

IETT's Actual Operating Status

9. IETT is theoretically comparatively free to do business as it chooses, and in fact Municipal supervision is weak, and the municipal "auditors" reports, although often well prepared and relevant, are generally ignored and treated as a matter of form. Real pressure is applied to IETT only at government level, through the rate policies, foreign exchange authorizations and investment help. The strong personality and legal ability of the present General Manager, virtually an indefinite appointment, overshadows the vice-presidents and directors, so that the board tends to be ineffective as a policy-making body.

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

IETT'S TRANSPORTATION DEPARTMENT

1. Public transportation in Istanbul comprises the "tunnel," the bus and trolley bus services of IETT, the ferryboats on the Bosporus Straits and Golden Horn, taxis, and the "dolmus," which are "jitney" taxis plying stated routes, picking up passengers en route according to their services and operating on Istanbul's ancient pattern of narrow and winding streets. Traffic is further complicated by the hilly topography and the division of the city by the Bosporus and the Golden Horn. Inadequate traffic engineering and controls and ineffective enforcement of traffic regulations add to the problem. Bus maintenance problems are such that about one-third of IETT's equipment is not in operation on the average. IETT provides bus services both within and outside the Municipality of Istanbul. The extent of its transport system can be seen from Map 10144 at the end of this Annex.

2. The Transportation Department of IETT has been in operation since 1939, when the Government purchased the assets, rights and obligations of the "Societe des Tramways d'Istanbul" and transferred them to IETT in accordance with Law 3645. Until 1950 the Department operated profitably. Since then, however, the organization has become top-heavy with managers and directors; with steady personnel increases and wastage on unprofitable routes, it has been operating at a progressively increasing loss, largely supported from the profits of IETT's Electricity Department. Buses started operating in 1942 and trolley buses in 1961. The cable railway was closed for electrification from October 1968 through November 1971.

3. The following summarizes the equipment and operating statistics of the Department as of December 31, 1971:

| | | Age (Years) | Nos. | % of Fleet | Average 1971 in Operation | % in Operation |
|---|---|---|---|---|---|---|
| 1) | Equipment | | | | | |
| a) | "Bussing" Buses | 1 | 47 | 6 | 47 | 100 |
| b) | "Leyland" Buses | 2-3 | 300 ) | 49 | 300 | 100 |
| c) | Trolley Buses | 2-3 | 101 ) | | 70 | 69 |
| d) | Other Assorted Buses | 10(+) | 315 | 39 | 129 | 41 |
| | | 20(+) | 44 | 5.5 | | |
| e) | Cable Cars (Tunnel) | | 5 | 0.5 | 4/1 | 100 |
| | | | 811 | 100.0 | 550 | 68 |

/1 From November 1971 only.

| | Actual | | | Forecast 1/ | | | | | 1972/1976 Total |
|---|---|---|---|---|---|---|---|---|---|
| | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | |
| 2) Operating Statistics | | | | | | | | | |
| a) Vehicle Fleet | | | | | | | | | |
| Bus Fleet at Start of Year | 551 | 779 | 738 | 706 | 745 | 780 | 818 | 860 | 706 |
| Additions or on Order | 228 | 11 | 36 | 83 | - | - | - | - | 83 |
| Assumed | | | | | 35 | 38 | 42 | 40 | 155 |
| Scrapped (very old Vehicles) | - | 52 | 68 | 44 | - | - | - | - | 44 |
| Bus Fleet at End of Year | 779 | 738 | 706 | 745 | 780 | 818 | 860 | 900 | 900 |
| Trolley Bus Fleet | 101 | 101 | 101 | 101 | 101 | 101 | 101 | 101 | 101 |
| Cable Car (Tunnel) | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Total | 884 | 843 | 811 | 850 | 885 | 923 | 965 | 1,005 | 1,005 |
| b) Total Average Vehicles in Operation during Year | 526 | 549 | 550 | 590 | 630 | 670 | 720 | 770 | |
| % in Operation | 59 | 65 | 67 | 69 | 71 | 73 | 75 | 76 | |
| c) Passengers (million) per Year | 211 | 244 | 253 | 270 | 288 | 308 | 329 | 351 | |
| Average Passenger (1,000)/Vehicle in Use/Year | 401 | 444 | 463 | 458 | 457 | 460 | 457 | 456 | |
| d) km run (million)/year | 44.9 | 47.1 | 46.9 | 50.4 | 53.8 | 57.6 | 61.7 | 65.9 | |

SOURCE: IETT

1/ These forecasts of IETT's vehicle fleet are based on IETT's estimates of the increase in demand for public transport, which do not necessarily take into account the expected growth in dolmus and private automobiles. These forecasts will be reviewed under the Traffic Engineering and Control Project, which is to be prepared under the Istanbul Urban Development Project (Cr 324-TU).

Future Operations

4. A study included under the Istanbul Urban Development Project (Cr 324-TU) is to examine the traffic engineering and control aspects of the Istanbul urban transport system, including the operations of IETT's bus systems. A complementary study of the organizational, administrative and financial aspects of IETT's bus services is included under the proposed loan, which will make recommendations for institutional changes in IETT's Transportation Department. This appraisal report deals only with the interim period until such recommendations can be examined and acted upon in accordance with the conditions of the proposed loan. During this interim period it has been assumed that IETT will continue to operate much as in the past, with the existing transport tariffs, and will therefore continue to incur increasingly heavy losses. Page 6 of this Annex shows the forecast of the expected transport losses, which should total some LT 648 million during the 5 years through 1976. Naturally, such losses can be reduced by more efficient operation of the system and by increased tariffs, which in 1971 averaged only krs 61.7 or US¢ 4.4 after a 60% increase in July 1971. For a full year this would average krs 75.5 or US¢ 5.4 per passenger and this latter rate has been used in the forecasts. Such a tariff does not even cover the forecast personnel costs of the Department. To the extent that losses are incurred in this interim period, it will be a condition of the proposed loan that the Government or the Municipality will take financial responsibility (see para. 5 below) for maintaining IETT's transport services if the financial support from the electricity operation is terminated.

Future Equipment

5. In 1971, IETT was expecting delivery of the remaining 83 "Bussing" vehicles out of their original order of 130. These have already been financed by a supplier credit of LT 50 million at 15% over 5 years through the local "Bussing" agents, Standard-Belde. On the basis of an expected 7% annual increase in passengers, IETT estimates that an additional 155 new buses will be needed to maintain the present average density of some 460,000 passengers per vehicle in operation per year. It may be assumed that these vehicles will be financed by the Government at 5% and that the first repayment of this loan and any customs duty will be deferred until after completion of the proposed transport reorganization. Alternatively, financing for these vehicles may become available for external sources, such as the Bank or IDA, pending the outcome of the Traffic Engineering and Control Studies to be carried out under Credit 324-TU. The sources and applications of funds for the Transportation Department on page 7 of this Annex assumes that the Government will also defer LT 25.7 million, which is the whole of the "Five-Year credit" part of the LT 51.7 million loan for Leyland buses and which was due for repayment between 1970 and 1974.

6. The total financial assistance required by IETT for transport during the interim period through 1976 is estimated at LT 720 million, made up as follows:

| | | 1972-1976 |
|---|---|---|
| | -----(LT millions)---- | |
| Operating Losses | | 620.2 |
| Debt Service | | 82.6 |
| | | 702.8 |
| Less Depreciation | | 120.3 |
| Net Cash Loss 1972-1976 | | 582.5 |
| Loans: | | |
| New Buses | 46.5) | |
| Deferment of Leyland Loan | 25.7) | 72.2 |
| Deferred Customs Duty: | | |
| Leyland and Spares | 33.3) | |
| New Buses and Spares | 32.0) | 65.3 |
| | | 720.0 |

Source: IETT and Mission Estimates.

7. Apart from reducing the losses by better operating and/or by increasing bus tariffs, Annex 25 makes other suggestions as to how the funds needed by IETT can be found. To meet the total expected cash deficit of LT 582.5 million without other sources of additional funds, the transport tariffs would need to be increased by some 50%. Should the cost of personnel, the largest cost element be over-estimated by 10%, this would result in a reduction of only some LT 150 million in the estimated additional cash requirements for the period 1972 through 1976.

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

TRANSPORT DEPARTMENT

Actual and Forecast Balance Sheets 1972-1976

(LT millions -- LT14 = US$1)

| | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 |
|---|---|---|---|---|---|---|---|---|
| | | Actual | | | | Forecast | | |
| ASSETS | | | | | | | | |
| Gross Fixed Assets in Operation | 247.6 | 273.7 | 297.4 | 324.1 | 332.5 | 341.6 | 351.7 | 361.3 |
| Less Depreciation | 99.3 | 120.9 | 146.9 | 177.5 | 211.4 | 240.8 | 252.9 | 265.2 |
| Net Assets in Operation | 148.3 | 152.8 | 150.5 | 146.6 | 121.1 | 100.8 | 98.8 | 96.1 |
| Work-in-Progress | 0.9 | 0.9 | 0.9 | - | - | - | - | - |
| Net Fixed Assets | 149.2 | 153.7 | 151.4 | 146.6 | 121.1 | 100.8 | 98.8 | 96.1 |
| Current Assets | | | | | | | | |
| Inventories | 43.1 | 43.0 | 50.2 | 51.0 | 50.1 | 49.4 | 48.9 | 48.3 |
| Less Current Liabilities | | | | | | | | |
| Accounts Payable - Suppliers, etc. | (3.8) | (6.6) | (6.7) | (8.0) | (8.0) | (8.0) | (8.0) | (8.0) |
| Municipal Taxes | (1.5) | (1.3) | (1.8) | (2.0) | (2.0) | (2.0) | (2.0) | (2.0) |
| Sub-total Current Liabilities | (5.3) | (7.9) | (8.5) | (10.0) | (10.0) | (10.0) | (10.0) | (10.0) |
| Net Current Assets | 37.8 | 35.1 | 41.7 | 41.0 | 40.1 | 39.4 | 38.9 | 38.3 |
| TOTAL ASSETS | 187.0 | 188.8 | 193.1 | 187.6 | 161.2 | 140.2 | 137.7 | 134.4 |
| EQUITY AND LONG TERM DEBT | | | | | | | | |
| Initial Capital | 171.8 | 171.8 | 171.8 | 171.8 | 171.8 | 171.8 | 171.8 | 171.8 |
| Less Accrued Losses | (557.0) | (645.0) | (741.1) | (873.1) | (1,001.6) | (1,137.5) | (1,266.9) | (1,388.0) |
| Less Loss for Year | ( 88.0) | (96.1) | (132.0) | (128.5) | (135.9) | (129.4) | (121.1) | (133.3) |
| (Negative) Capital Remaining | (473.2) | (569.3) | (701.3) | (829.8) | (965.7) | (1,095.1) | (1,216.2) | (1,349.5) |
| Head Office Current Account | 558.7 | 643.3 | 781.4 | 904.4 | 1,018.6 | 1,120.8 | 1,228.6 | 1,348.4 |
| Net Equity | 85.5 | 74.0 | 80.1 | 74.6 | 52.9 | 25.7 | 12.4 | (1.1) |
| LONG TERM GOVERNMENT LOANS | | | | | | | | |
| "Bussing" 5-year @ 15% Standard Belde | - | 15.0 | 15.0 | 16.8 | 3.4 | - | - | - |
| "Leyland" 5-year @ 5½% - Government 1/ | 25.7 | 25.7 | 25.7 | 25.7 | 25.7 | 25.7 | 25.7 | 25.7 |
| "Leyland" 30-year Credit Including 5-year gross @ nil %-Government | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 |
| Is Bank Open Credit-Buses | 16.5 | 14.8 | 13.0 | 11.2 | 9.4 | 7.6 | 5.8 | 4.0 |
| New Buses 5-year Grace @ 5½% | - | - | - | - | 10.5 | 21.9 | 34.5 | 46.5 |
| Sub-total Long-term Borrowing | 68.2 | 81.5 | 79.7 | 79.7 | 75.0 | 81.2 | 92.0 | 102.2 |
| Customs Duty on Leyland - Unpaid 2/ | 33.3 | 33.3 | 33.3 | 33.3 | 33.3 | 33.3 | 33.3 | 33.3 |
| Total Long-term Debt and Credit | 101.5 | 114.8 | 113.0 | 113.0 | 108.3 | 114.5 | 125.3 | 135.5 |
| TOTAL EQUITY AND LONG-TERM DEBT | 187.0 | 188.8 | 193.1 | 187.6 | 161.2 | 140.2 | 137.7 | 134.4 |

NOTES:

1/ It has been assumed that this loan of which some LT10 million was overdue by 12-31-1971 will be allowed by the Government to be deferred until the Istanbul Transport Sector has been reorganized into a financially viable unit following the results of a study included in the Istanbul Urban Development Credit 324-TU. Until that time, the IETT Transport Department will need continuing substantial financial support from resources outside IETT. Interest on the extended loan has been included in the Debt Service at LT1.4 million per year.

2/ It has been assumed that the Government will allow the customs duty outstanding on the Leyland buses to remain unpaid and without interest, since until the method of winding up IETT's present liabilities for transport is determined at the time of the reorganization (See Note 1) any payment of customs duty on buses or spares would only increase the amount of interim support needed.

November 24, 1972

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

TRANSPORT DEPARTMENT

Forecast Income Statements 1972 - 1976
(LT millions -- LT 14 = US$1)

| | Actual 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | Total 1972/1976 |
|---|---|---|---|---|---|---|---|
| Km ooo Run - Bus | 42,126 | 45,600 | 49,000 | 52,800 | 56,900 | 61,100 | |
| - Trolley Bus | 4,789 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | |
| Sub-Total - Km ooo Run | 46,915 | 50,400 | 53,800 | 57,600 | 61,700 | 65,900 | |
| - Tunnel | 6 | 50 | 50 | 50 | 50 | 50 | |
| Total Km ooo Run | 46,921 | 50,450 | 53,850 | 57,650 | 61,750 | 65,950 | |
| Average Krs per passenger carried | 61.7 | 75.5 | 75.3 | 75.6 | 75.4 | 75.5 | |
| No. of buses & Trolley buses in service | 546 | 586 | 626 | 670 | 718 | 766 | |
| Passengers (million) bus & trolley bus | 246.9 | 264 | 282 | 302 | 323 | 345 | |
| Tunnel | 6.3 | 6 | 6 | 6 | 6 | 6 | |
| Total | 253.2 | 270 | 288 | 308 | 329 | 351 | |
| Operating Direct Income | 156.2 | 204.0 | 217.0 | 233.0 | 248.0 | 265.0 | 1167.0 |
| Other | 7.7 | 9.1 | 11.0 | 13.0 | 15.0 | 17.0 | 65.1 |
| Total Income | 163.9 | 213.1 | 228.0 | 246.0 | 263.0 | 282.0 | 1232.1 |
| Expenditure | | | | | | | |
| Salaries, Wages etc. | 205.3 | 236.0 | 249.0 | 262.0 | 283.0 | 306.0 | |
| Fuel | 23.1 | 25.0 | 28.0 | 30.0 | 32.0 | 35.0 | |
| Electricity | 3.8 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| Materials | 25.7 | 28.6 | 30.6 | 32.6 | 34.6 | 37.6 | |
| Administration & Insurance | 8.2 | 10.0 | 11.0 | 12.0 | 13.0 | 14.0 | |
| Municipal Royalty | 0.3 | - | 1.0 | - | - | 1.0 | |
| Depreciation | 26.4 | 31.0 | 34.3 | 29.8 | 12.5 | 12.7 | |
| Total Operating Expenses | 292.8 | 334.6 | 357.9 | 370.4 | 379.1 | 410.3 | 1852.3 |
| Net Operating Losses | (128.9) | (121.5) | (129.9) | (124.4) | (116.1) | (128.3) | (620.2) |
| Interest on Long-term debt | 3.1 | 7.0 | 6.0 | 5.0 | 5.0 | 5.0 | 28.0 |
| Net Surplus (Deficit) | (132.0) | (128.5) | (135.9) | (129.4) | (121.1) | (133.3) | (648.2) |

November 24, 1972

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

TRANSPORT DEPARTMENT

Forecast Sources and Applications of Funds 1972 - 1976

(LT millions -- LT 14 = US$1)

| | Actual | Forecast | | | | | |
|---|---|---|---|---|---|---|---|
| | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1972-1976 |
| Sources of Funds | | | | | | | |
| H.O and Electricity Dept. Cash Contribution | 137.7 | 122.6 | 113.8 | 101.8 | 107.4 | 119.4 | 565.0 |
| Long-Term Borrowing | | | | | | | |
| Standard Belde - "Bussing" | - | 30.6 | - | - | - | - | 30.6 |
| Government: New Buses 1/ | - | - | 10.5 | 11.4 | 12.6 | 12.0 | 46.5 |
| Total Long-Term Borrowing | - | 30.6 | 10.5 | 11.4 | 12.6 | 12.0 | 77.1 |
| Decrease (Increase) Working Capital | (6.6) | 0.7 | 0.9 | 0.7 | 0.5 | 0.6 | 3.4 |
| Total Sources of Funds | 131.1 | 153.9 | 125.2 | 113.9 | 120.5 | 132.0 | 645.5 |
| Applications of Funds | | | | | | | |
| Net Operating Losses | 128.9 | 121.5 | 129.9 | 124.4 | 116.1 | 128.3 | 620.2 |
| Less Depreciation | 26.4 | 31.0 | 34.3 | 29.8 | 12.5 | 12.7 | 120.3 |
| Net Cash Loss | 102.5 | 90.5 | 95.6 | 94.6 | 103.6 | 115.6 | 499.9 |
| Purchase of new Buses & Spares | 23.7 | 25.8 | 8.4 | 9.1 | 10.1 | 9.6 | 63.0 |
| Debt Service: | | | | | | | |
| Amortization | 1.8 | 30.6 | 15.2 | 5.2 | 1.8 | 1.8 | 54.6 |
| Interest on Long-Term Debt | 3.1 | 7.0 | 6.0 | 5.0 | 5.0 | 5.0 | 28.0 |
| Sub-total Debt Service | 4.9 | 37.6 | 21.2 | 10.2 | 6.8 | 6.8 | 82.6 |
| TOTAL APPLICATIONS OF FUNDS | 131.1 | 153.9 | 125.2 | 113.9 | 120.5 | 132.0 | 645.5 |
| Contribution From H.O. or Electricity /t start of year | 643.3 | 781.4 | 904.4 | 1,018.6 | 1,120.8 | 1,228.6 | 781.4 |
| Increase (Decrease) in Cash Contribution in Year | 137.7 | 122.6 | 113.8 | 101.8 | 107.4 | 119.4 | 565.0 |
| Direct Depreciation charged for H.O. Assets | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 2.0 |
| At End of Year | 781.4 | 904.4 | 1,018.6 | 1,120.8 | 1,228.6 | 1,348.4 | 1,348.4 |

1/ In addition to the above Government loan of LT46.5 million, for 155 additional buses, the forecasts envisage that duty of the order of TL30 million on the buses and spares will be waived and that repayments of existing loans for the purchase of Leyland buses totaling LT25.7 million will also be deferred and that LT33.3 million of outstanding duty on the Leyland vehicles and spares will be waived or deferred without interest until a financially viable reorganization of the Istanbul Transportation sector has been carried out. (See note 1/of Annex 3, page 5).

November 24, 1972

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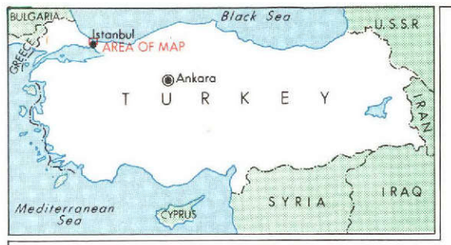
OCTOBER 1972

# TURKEY

# ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

## TRANSPORT SYSTEM




- Bus lines
- Trolley bus lines
- Tunnel
- Sections
- District boundaries
- Municipal boundaries
- Village boundaries
- Istanbul municipal boundary

0 1 2 3 4 5 6 7 8 KILOMETERS
0 1 2 3 4 5 MILES

RUMELI KAVAGI
ORMAN FAKÜLTESI
SARIYER
TOKATKÖYU
DOĞUKAPISI
DERESKI
BÜYÜKDERE
SULTANSUYU
ÇIFTEÇINARLAR
KEFELIKÖY
KIREÇBURNU
BEYKOZ
Trabya
HACIOSMAN
YENIKÖY
PAŞAPAHÇE
İSTİNYE İSKELE
PREVANTORYUM
ÇUBUKLU
AYAZAĞAKÖYÜ
D.D.Y.sitesi
EMIRGAN
KANLICA
MASLAK
SANAYIMAH
AYAZAĞA
SUTERAZISI
D.Y.A.K.
R.HISAR ÜSTÜ
R.HISAR
A.HISAR
Y.LEVENT
SANAYI SITESI
UÇAK SAV. SITESI
AKAÇLAR
ÇELIKTEPE
ETILER
BEBEK
GÜLTEPE
LEVENT
ÇAĞLAYAN
HÜRRIYET MAH.
GÜLBAĞ
HAREKET SITESI
VANIKÖY
KAĞITHANE
ALIBEY KÖYÜ
PROFILO
KÜSTEPE
GAYRETTEPE
KIŞLAÖNÜ
BALMUMCU
DEREBOYU
KURUÇEŞMA
CENGELKÖY
KÜÇÜKKÖY
KARADENIZ MAH.
Esentepe
SILAHDAR
HÜRRIYET TEPESI
POLIGON
DIKILITAŞ
YILDIT TAB.
ORNERTEPE
OKMEYDANI
HASTAHANE
Y.MAH.
ICFERIKÖY
MACKA
BESIKTAS
AKARETLER
A.S.SUBAY OKULU
GAZI OSMAN PS.
KURTULUŞ
DOLAPDERE
EYÜP
UÇŞEHITLER
SÜTLÜKE
KISIKLI
METRIS YOLU
HASKÖY
TAKSIM
TUNNEL
BAGLARBAŞI
ALTUNIZADE
ERZURUM SITESI
ATIŞALAN
R.KIŞLA
GOLDEN HORN
ÜSKÜDAR
ACIBADEM
BAYRAMPAŞA
DRAMAN
ÖRNEK MAH.
CEZAEVIYOLU
EDIRNEKAPI
KARACA AHMET
HAREM
HAREM YOLU
KOŞUYOLU
EMEK SITESI
ESENLER
UNKAPANI
Dortyol
LIBADIYE
ULUBEY ILKOK.
E.ONÜ
I.AĞA
DÖRTYOL
İNCİRLİ BOSTAN
FIKIRTEPESI
KÇ. BAKKAL KÖYÜ
VILAYET
TOPKAPI
Bağcılar
Aksaray
S.AHMET
HASANPAŞA
YENIHAL
Güngören
MÜR.MEY
KADIRGA
ZIVERBEY
GÖZCUBABA
TOZKOPARAN
KOCASINAN
ÇEŞME
TEPEBAĞ
YENIKAPI
ISTANBUL
KADIKÖY
GÖZTEPE
BEYAZEVLER
İÇERENKÖY
K.MUS.PŞ.
GÖĞÜS HST.
KIZILTOPRAK
ÇIFTE HAV.
ERKO SITESI
BOSTANCI YOLU
HALKALI
Senyuvalar
BASIN SITESI
SITE
ÇIRPICI
YEŞILTEPE
YEDIKULE
KAZASKER
F.BAHÇE
ÇIFTE HAV.
BOSTANCI
KARAYOLU
KAUÇUK FAB.
INCIRLI
OSMANIYE
C.BOSTAN
ŞAŞKIN BAK.
ÜST ROS.
BOSTANCI
KÜÇÜK YALI
ZÜMRÜTEVLER
YAKACIK
SAFRAKÖY YOLU
MAHMUT BEYKÖY Y.
HAVA YOLU
AKIL HST.
ŞIRINEVLER
ATAKÖY 4
ZEYTINBUR.
BAKIRKÖY
MALTEPE
KULOĞLU
SOĞANLI SAPAĞI
ANKARA YOLU
CEVIZLIK
ATAKOYÖZ
TAŞOCAĞI
CEVIZLI
CENNET MAH.
HAVAALANI
BASINKÖY
YEŞILYURT
FLORYA
KARTAL
YUNUS
PENDIK
I.E.T.T. KAMPI
KAMPING
YEŞILKÖY
K. ÇEKMECE
SEA OF MARMARA
ALEMDAĞ
SULTANÇIFLIĞI
KEMERDERE
DUDULLU
Ümraniye
ÇAKMAK MAH.
NAMAZGAH

41°
29°

*The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.*

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

IETT'S GAS DEPARTMENT

## IETT's Gas Systems

1. IETT's gas supply is produced in two plants originally purchased in 1944 from a French company. These are:

(a) Istanbul - The Yedikule plant, situated on the European shores of the Sea of Marmara, which produced 11.2 million $m^3$ in 1971 and sold 8.8 million $m^3$ to 11,137 consumers in the suburbs of Fatih, Eminonu, Eyup and Bakirkoy. These include several industrial consumers.

(b) Anatolia - The Kurbagalidere plant, situated at Kadakoy, which produced 7.8 million $m^3$ and sold 5.2 million $m^3$ to 16,288 non-industrial consumers in the suburbs of Uskudor, Kadikoy and Kurba Galidere.

Production and sales from both plants have been dropping consistently since 1965 at about 8% per annum, because of the low calorific values (often below 3,500 to 3,800 calories/$m^3$) and low pressure (reaching the consumer at only 50 mm). The forecasts have assumed that this trend will continue at about 5% per annum. The two IETT gas systems have never operated at a profit since their acquisition. Gas sales are augmented by sales of bi-products -- coke, bitumen and ashes.

## Municipal System

2. Istanbul's third gas plant, located at Pesa, belongs to and is operated by the Municipality of Istanbul, although IETT is represented on its advisory operations committee. The plant serves some 61,000 consumers in the Central Beyoglu area of European Istanbul, east of the Golden Horn. Map 10145 at the end of this Annex shows the coverage of all three systems.

## Operating Statistics

3. Operating statistics of the IETT systems combined are:

| | ACTUAL | | | FORECAST | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 |
| Production ($m^3$ million) | 22.6 | 20.6 | 19.0 | 15.4 | 14.7 | 14.0 | 13.2 | 12.5 |
| Sales ($m^3$ million) | 21.0 | 18.4 | 14.0 | 13.2 | 12.6 | 12.0 | 11.3 | 10.7 |
| Average prices krs/$m^3$ | 53.8 | 55.4 | 70.0 | 70.0 | 70.0 | 70.0 | 70.0 | 70.0 |
| Consumers (1,000) | 37 | 35 | 33 | 31 | 30 | 28 | 27 | 26 |

Gas tariffs were increased by about 20% in October 1970, and the forecasts assume the continuation of these present tariffs.

Equipment Details

4. Equipment details of the two systems are:

| | Istanbul | Anatolia |
|---|---|---|
| Generation: | a) 4 Woodall-Duckham (1948) of 22,000 $m^3$/day (actual capacity | a) Bamag (1952) of 3,000 $m^3$/day |
| | b) 3 Didier (1952) of 54,000 $m^3$/day (theoretical capacity but partially out of service | b) Picard (1956) of 10,000 $m^3$/day |
| | | c) Didier (1963) of 54,000 $m^3$/day (theoretical capacity but partially out of service). |
| | | d) Bamal - used for peaking and standby only. |
| Gasometers: | 1 x 15,000 $m^3$<br>1 x 30,000 $m^3$<br>1 x 50,000 $m^3$ | 1 x 6,000 $m^3$<br>1 x 10,000 $m^3$<br>1 x 30,000 $m^3$ |
| Compressors: | 4 x 5,000 $m^3$/h each<br>2 x 2,500 $m^3$/h each (standby) | 1 x 7,500 $m^3$/h |
| Pipelines: | | |
| Medium Pressure | 31-km steel pipe, serving 6 distribution stations and 3 spurs | 8 km steel pipe, serving 3 substations and 1 spur |
| Low Pressure | 197 km, about 90% steel | 232 km, mainly cast-iron |
| Losses: | 13% - 20% | 20% |

## Future Operations

5. Sales revenue is forecast as continuing to decline at 5% per annum and, as can be seen on page 5 of this Annex, the department will continue to incur increasingly heavy losses each year and these will total about LT 160 million from 1972 through 1976. As in the case of transport, the gross income from sales of gas and bi-products, which for gas normally account for about 1/3 of gross sales, does not cover even the personnel costs of the department. A gas sector study, included in the proposed loan, will examine the problem of the organization of the gas services of Istanbul, their potential viability and future organization. Subject to this survey, it is likely that economies of scale and operations would follow the merger of the present three systems. In any event, gas will be separated operationally from the activities of transport and electricity. Pending the outcome of the study, however, it would be a condition of the proposed loan that the Government and/or the Municipality will take responsibility for the Gas Department's cash losses, estimated at LT 130 million during this period (see page 4 of this Annex) and made up broad as follows:

| | LT Millions |
|---|---|
| Total Losses | 160 |
| Less Depreciation | 30 |
| | LT 130 million |

## Future Plant

6. Pending the outcome of the survey, it has been assumed that no major investment will be made in the IETT gas systems. The Balance Sheets and Sources and Applications (page 4 of this Annex) include only LT 3 million per year to cover routine rehabilitation and connections.

## Tariffs

7. To meet the cash deficit from 1972 through 1976 without additional sources of funds and assuming that the three systems are not merged into one to improve operations, gas tariffs would have to be increased by over 300% because of the falling volume of sales assumed; even at the 1971 level of sales, the increase would have to be about 260%. Increases of this order would doubtless make the service non-competitive.

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

GAS DEPARTMENT

Actual and Forecast Balance Sheets 1972-1976

Sources and Applications of Funds 1971-1976

(LT millions -- LT14 = US$1)

| BALANCE SHEETS | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 |
|---|---|---|---|---|---|---|---|---|
| | | Actual | | | | Forecast | | |
| ASSETS | | | | | | | | |
| Gross Fixed Assets | 84.2 | 88.4 | 95.4 | 98.0 | 101.0 | 104.0 | 107.0 | 110.0 |
| Less Depreciation | 36.7 | 40.2 | 43.9 | 49.9 | 56.1 | 62.5 | 69.0 | 75.7 |
| Net Fixed Assets | 47.5 | 46.2 | 51.5 | 48.1 | 44.9 | 41.5 | 38.0 | 34.3 |
| Work in Progress | 3.8 | 4.3 | 1.3 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Total Fixed Assets | 51.3 | 52.5 | 52.8 | 49.1 | 45.9 | 42.5 | 39.0 | 35.3 |
| Net Current Assets | | | | | | | | |
| Accounts Receivable: Consumers | 2.8 | 6.5 | 5.2 | 2.3 | 2.2 | 2.1 | 2.0 | 1.9 |
| : Other | 0.2 | 0.6 | 1.6 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Inventories | 11.8 | 13.1 | 14.6 | 14.7 | 15.0 | 15.5 | 16.0 | 16.5 |
| Sub-total Current Assets | 14.8 | 20.2 | 21.4 | 18.0 | 18.2 | 18.6 | 19.0 | 19.4 |
| Less Current Liabilities: | | | | | | | | |
| Accounts Payable Suppliers | (10.0) | (10.0) | (16.3) | (10.0) | (10.0) | (10.0) | (10.0) | (10.0) |
| Net Current Assets | 4.8 | 10.2 | 5.1 | 8.0 | 8.2 | 8.6 | 9.0 | 9.4 |
| TOTAL ASSETS | 56.1 | 62.7 | 57.9 | 57.1 | 54.1 | 51.1 | 48.0 | 44.7 |
| EQUITY AND LONG TERM DEBT | | | | | | | | |
| Equity | | | | | | | | |
| Initial Capital | 70.7 | 70.7 | 70.7 | 70.7 | 70.7 | 70.7 | 70.7 | 70.7 |
| Less Accrued Losses 1/ | (53.9) | (69.3) | (83.7) | (104.3) | (129.7) | (158.7) | (190.4) | (225.4) |
| Less Loss for Year | (13.3) | (15.3) | (20.6) | (25.4) | (29.0) | (31.7) | (35.0) | (38.5) |
| Negative Capital Remaining | 3.5 | (13.9) | (33.6) | (59.0) | (88.0) | (119.7) | (154.7) | (193.2) |
| Head Office Current Account | 52.6 | 76.6 | 91.5 | 116.1 | 142.1 | 170.8 | 202.7 | 237.9 |
| Net Equity | 56.1 | 62.7 | 57.9 | 57.1 | 54.1 | 51.1 | 48.0 | 44.7 |
| Long-term Debt | - | - | - | - | - | - | - | - |
| TOTAL EQUITY AND LONG TERM DEBT | 56.1 | 62.7 | 57.9 | 57.1 | 54.1 | 51.1 | 48.0 | 44.7 |

SOURCES AND APPLICATION OF FUNDS

| | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1972/76 |
|---|---|---|---|---|---|---|---|
| Sources of Funds: | | | | | | | |
| IETT Electricity Department | 14.9 | 24.6 | 26.0 | 28.7 | 31.9 | 35.2 | 146.4 |
| (Increase) or Decrease in Working Capital | 6.0 | (2.9) | (0.2) | (0.4) | (0.4) | (0.4) | (4.3) |
| TOTAL SOURCES | 20.9 | 21.7 | 25.8 | 28.3 | 31.5 | 34.8 | 142.1 |
| Applications: | | | | | | | |
| Operating Losses | 20.1 | 24.9 | 28.5 | 31.1 | 34.4 | 37.8 | 156.7 |
| Less Depreciation | 5.7 | 6.0 | 6.2 | 6.4 | 6.5 | 6.7 | 31.8 |
| Net Cash Loss | 14.4 | 18.9 | 22.3 | 24.7 | 27.9 | 31.1 | 124.9 |
| Capital Construction | 6.0 | 2.3 | 3.0 | 3.0 | 3.0 | 3.0 | 14.3 |
| Interest on Current Liabilities | 0.5 | 0.5 | 0.5 | 0.6 | 0.6 | 0.7 | 2.9 |
| TOTAL APPLICATIONS | 20.9 | 21.7 | 25.8 | 28.3 | 31.5 | 34.8 | 142.1 |

NOTE:

1/ 1970 Accrued Losses have been increased by LT2.1 million and those for 1971 reduced by LT0.9 million respectively because of adjustments to the total of assets considered to be of no value and included as losses.

November 24, 1972

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

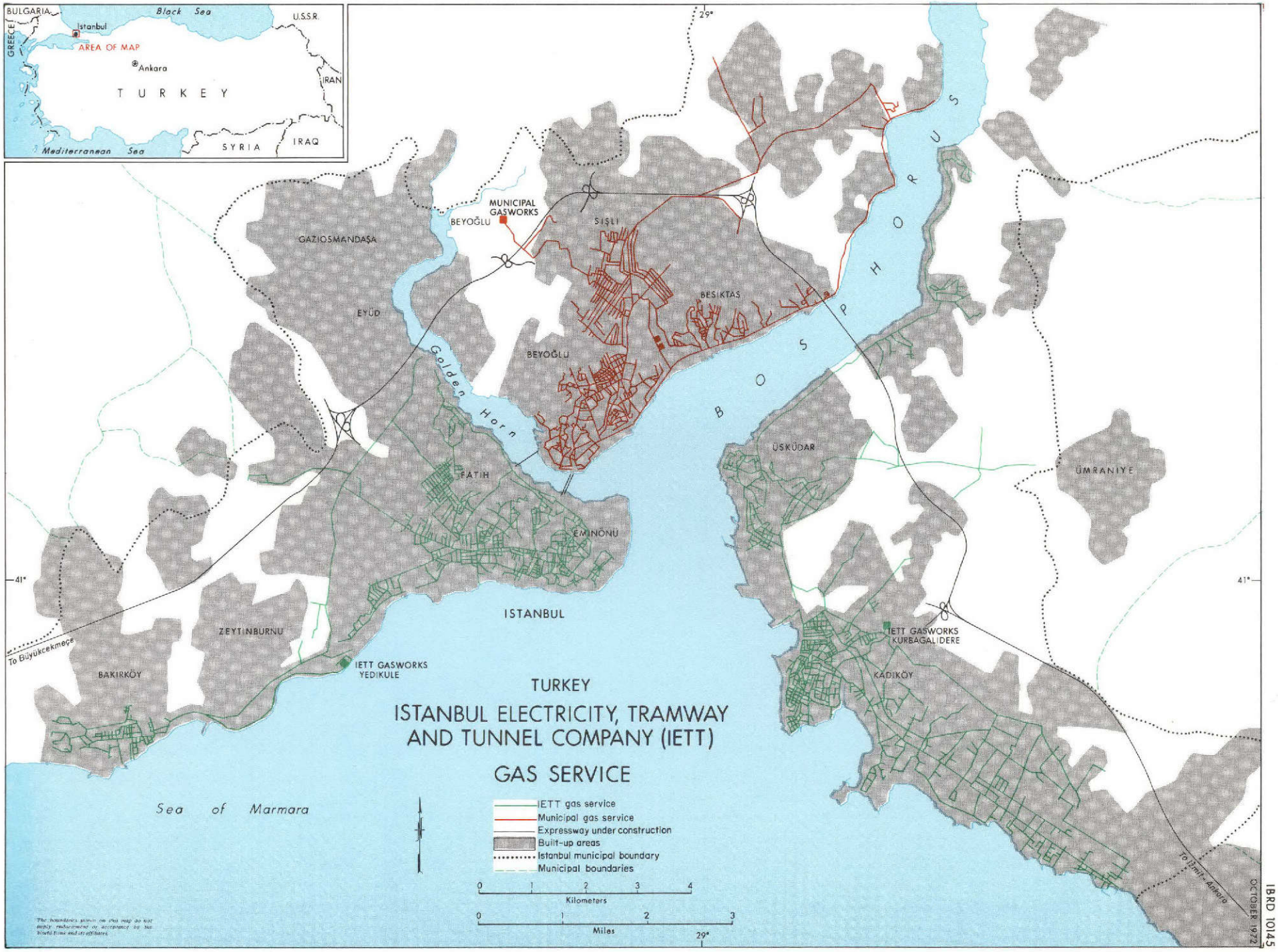
GAS DEPARTMENT

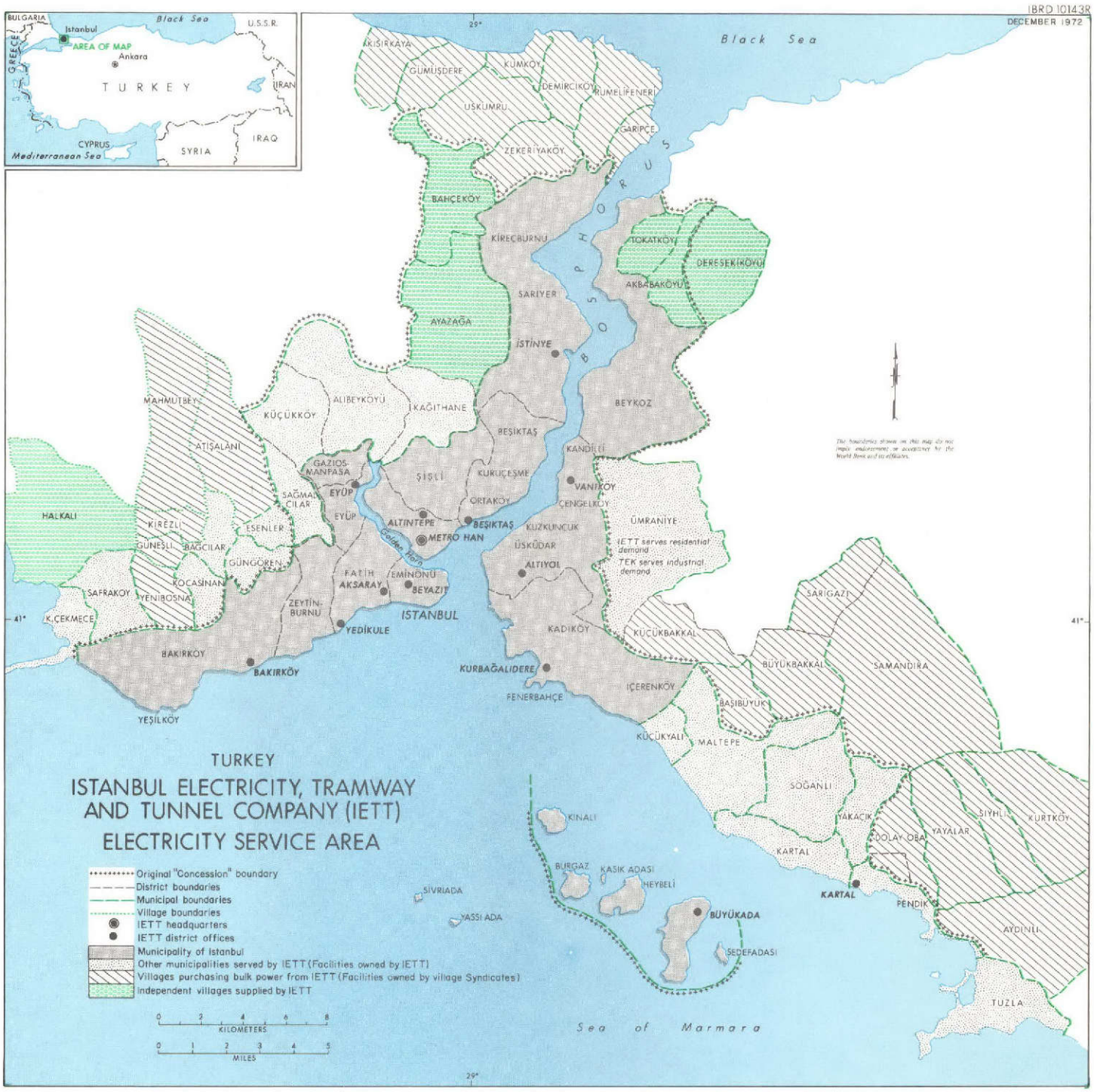
Forecast Income Statements 1972 - 1976

(LT millions -- LT14 = US$1)

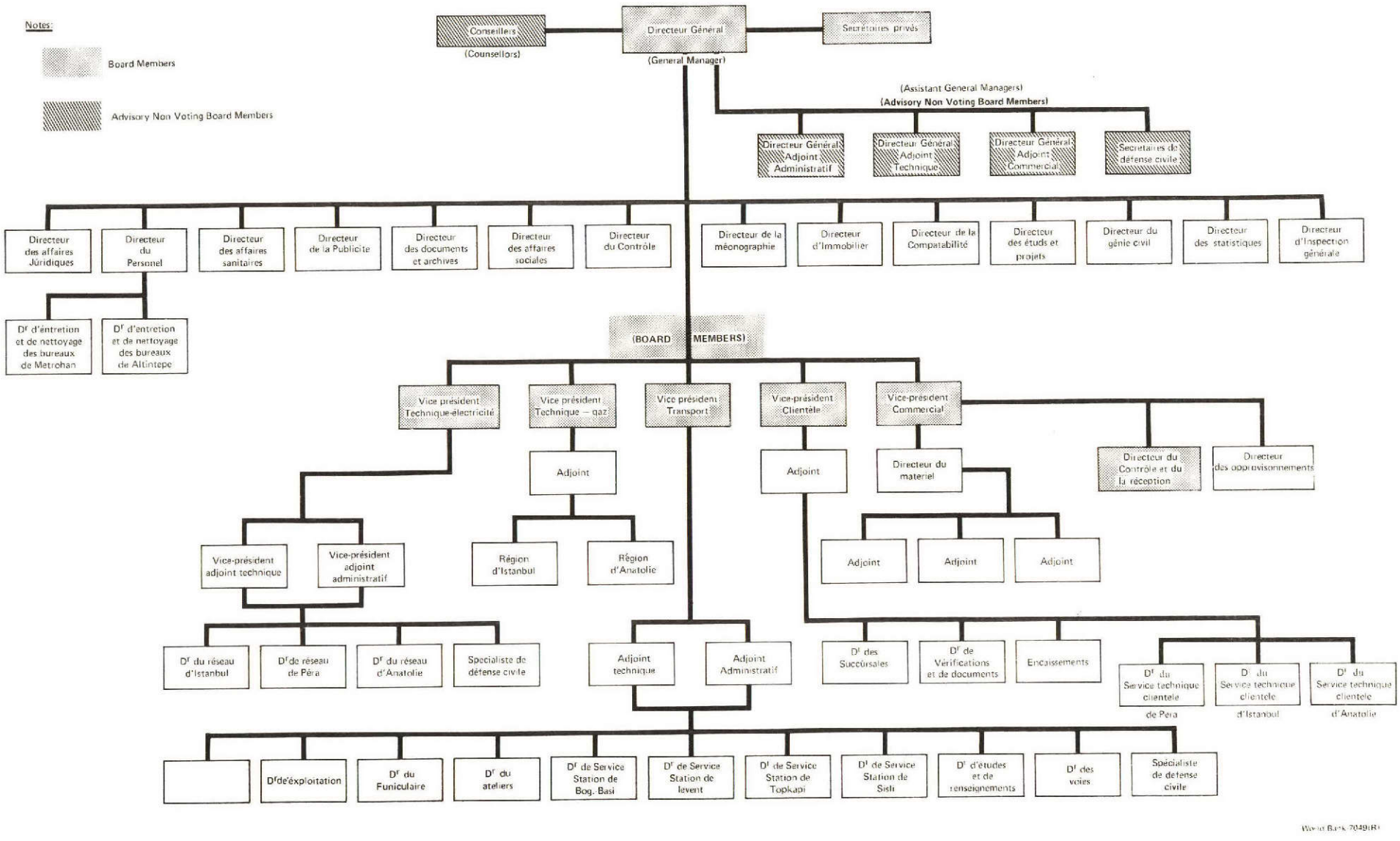
| | Actual 1971 | Forecast 1972 | 1973 | 1974 | 1975 | 1976 | Total 1972/1976 |
|---|---|---|---|---|---|---|---|
| Sales in Millions $m^3$ | 14.0 | 13.2 | 12.6 | 12.0 | 11.3 | 10.7 | |
| Sales Return Krs/$m^3$ | 70.0 | 70.0 | 70.0 | 70.0 | 70.0 | 70.0 | |
| Million $m^3$ Manufactured | 19.0 | 15.4 | 14.7 | 14.0 | 13.2 | 12.5 | |
| Revenue | | | | | | | |
| Sales of Gas | 9.8 | 9.3 | 8.8 | 8.4 | 7.9 | 7.5 | 41.9 |
| Sales of Byproducts | 9.7 | 5.6 | 5.3 | 5.0 | 4.7 | 4.5 | 25.1 |
| Total Operating Revenue | 19.5 | 14.9 | 14.1 | 13.4 | 12.6 | 12.0 | 67.0 |
| Expenditures | | | | | | | |
| Salaries, Wages & Perquisites | 17.3 | 19.0 | 21.0 | 22.0 | 24.0 | 26.0 | |
| Coal | 14.1 | 12.3 | 12.9 | 13.6 | 14.0 | 14.6 | |
| Materials | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | |
| Administrative & Insurance | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | |
| Depreciation | 5.7 | 6.0 | 6.2 | 6.4 | 6.5 | 6.7 | |
| Total Operating Expenses | 39.6 | 39.8 | 42.6 | 44.5 | 47.0 | 49.8 | 223.7 |
| Net Operating Losses | (20.1) | (24.9) | (28.5) | (31.1) | (34.4) | (37.8) | (156.7) |
| Interest on Current Liabilities | 0.5 | 0.5 | 0.5 | 0.6 | 0.6 | 0.7 | 2.9 |
| Net Surplus (Deficit) | (20.6) | (25.4) | (29.0) | (31.7) | (35.0) | (38.5) | (159.6) |

November 24, 1972


BULGARIA
Black Sea
U.S.S.R.
GREECE
Istanbul
AREA OF MAP
Ankara
TURKEY
IRAN
SYRIA
IRAQ
Mediterranean Sea
29°
MUNICIPAL GASWORKS
BEYOĞLU
ŞIŞLI
GAZIOSMANDAŞA
EYÜD
BEŞIKTAŞ
BEYOĞLU
Golden Horn
BOSPHORUS
ÜSKÜDAR
ÜMRANIYE
FATIH
EMINÖNÜ
41°
ISTANBUL
ZEYTINBURNU
To Büyükçekmece
IETT GASWORKS KURBAGALIDERE
IETT GASWORKS YEDIKULE
BAKIRKÖY
KADIKÖY
TURKEY
ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)
GAS SERVICE
Sea of Marmara
IETT gas service
Municipal gas service
Expressway under construction
Built-up areas
Istanbul municipal boundary
Municipal boundaries
0 1 2 3 4
Kilometers
0 1 2 3
Miles
29°
To Izmit - Ankara
OCTOBER 1972
IBRD 10145


IBRD 10143R
DECEMBER 1972
BULGARIA
Istanbul
Black Sea
U.S.S.R.
GREECE
AREA OF MAP
Ankara
TURKEY
IRAN
CYPRUS
Mediterranean Sea
SYRIA
IRAQ
29°
Black Sea
AKIŞIRKAYA
GÜMÜŞDERE
KÜMKÖY
DEMIRCIKÖY
RUMELIFENERI
UŞKUMRU
GARIPÇE
ZEKERIYAKÖY
BAHÇEKÖY
KIREÇBURNU
TOKATKÖY
DERESEKIÖYÜ
AKBABAKÖYÜ
SARIYER
AYAZAĞA
İSTİNYE
BOSPHORUS
BEYKOZ
MAHMUTBEY
ALIBEYKÖYÜ
KÜÇÜKKÖY
KAĞITHANE
BEŞIKTAŞ
ATIŞALANI
KANDILLI
GAZIOSMANPAŞA
ŞIŞLI
KUKUÇEŞME
VANIKÖY
SAĞMALCILAR
EYÜP
ORTAKÖY
ÇENGELKÖY
HALKALI
KIREZLI
ESENLER
ALTINTEPE
BEŞIKTAŞ
ÜMRANIYE
GÜNEŞLI
BAĞCILAR
METRO HAN
KUZGUNCUK
İETT serves residential demand
TEK serves industrial demand
GÜNGÖREN
Golden Horn
ÜSKÜDAR
ALTIYOL
KOCASINAN
FATIH
EMINÖNÜ
SARIGAZI
SAFRAKÖY
YENIBOSNA
AKSARAY
BEYAZIT
ZEYTINBURNU
ISTANBUL
41°
K.ÇEKMECE
YEDIKULE
KADIKÖY
KÜÇÜKBAKKAL
BAKIRKÖY
BAKIRKÖY
KURBAĞALIDERE
BÜYÜKBAKKAL
SAMANDIRA
İÇERENKÖY
FENERBAHÇE
BAŞIBÜYÜK
YEŞILKÖY
KÜÇÜKYALI
MALTEPE
TURKEY
ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)
ELECTRICITY SERVICE AREA
SOĞANLI
KINALI
SIYHLI
KURTKÖY
TAKACIK
YAYALAR
ÇOLAY OBA
KARTAL
BURGAZ
KASIK ADASI
HEYBELI
SIVRIADA
KARTAL
PENDIK
YASSI ADA
BÜYÜKADA
AYDINLI
SEDEFADASI
TUZLA
Sea of Marmara
Original "Concession" boundary
District boundaries
Municipal boundaries
Village boundaries
IETT headquarters
IETT district offices
Municipality of Istanbul
Other municipalities served by IETT (Facilities owned by IETT)
Villages purchasing bulk power from IETT (Facilities owned by village Syndicates)
Independent villages supplied by IETT
0 2 4 6 8
KILOMETERS
0 1 2 3 4 5
MILES
29°

# ORGANIGRAMME DE I. E. T. T.



ANNEX 7

REPUBLIC OF TURKEY
ISTANBUL ELECTRICITY TRAMWAY AND TUNNEL COMPANY (IETT)

Number of IETT Employees

| | 1960 | 1969 | 1970 | 1971 | % Increase 1970 | % Increase 1971 | % of Total Employees 1969 | % of Total Employees 1971 |
|---|---|---|---|---|---|---|---|---|
| Electricity | | | | | | | | |
| Staff | 770 | 909 | 1,002 | 1,179 | 10% | 18% | | |
| Labor | 2,581 | 2,824 | 2,347 | 2,536 | (17%) | 8% | | |
| Total Actual | 3,351 | 3,733 | 3,349 | 3,715 | (10%) | 11% | 32% | 33% |
| Add Silahtar transfers | | | 477 | 477 | | | | |
| Total | | | 3,826 | 4,192 | 2% | | | |
| Transport | | | | | | | | |
| Staff | 453 | 380 | 409 | 517 | 8% | 26% | | |
| Labor | 6,517 | 6,792 | 6,497 | 6,361 | (5%) | (2%) | | |
| Total | 6,970 | 7,172 | 6,906 | 6,878 | (4%) | (1%) | 61% | 61% |
| Gas | | | | | | | | |
| Staff | 109 | 126 | 99 | 114 | (21%) | 15% | | |
| Labor | 767 | 682 | 594 | 556 | (13%) | ( 6%) | | |
| Total | 876 | 808 | 693 | 670 | (14%) | ( 4%) | 7% | 6% |
| IETT Total | | | | | | | | |
| Staff | 1,332 | 1,415 | 1,510 | 1,810 | 7% | 20% | | |
| Labor | 9,865 | 10,298 | 9,438 | 9,453 | ( 8%) | - | | |
| Total Actual | 11,197 | 11,713 | 10,948 | 11,263 | ( 7%) | 3% | 100% | 100% |
| Add Silahtar transfers | | | 477 | 477 | | | | |
| Total | | | 11,425 | 11,740 | ( 3%) | | | |
| Number per employee: | | | | | | | | |
| Electricity consumers: | | | | | | | | |
| - Actual | | 157 | 187 | 186 | | | | |
| - Less Silahtar | | 157 | 164 | 156 | | | | |
| Transport passengers | | 29,400 | 35,400 | 36,800 | | | | |
| Per vehicle in service | | 13.2 | 13.1 | 12.6 | | | | |
| Gas consumers | | 47 | 51 | 50 | | | | |

REPUBLIC OF TURKEY
ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

## Existing Facilities

| | 1967 | 1968 | 1969 | 1970 | 1971 |
|---|---|---|---|---|---|
| Consumption kWh | 1,197,141,618 | 1,338,994,134 | 1,401,052,631 | 1,497,254,027 | 1,555,972,844 |
| Number of customers | 520,605 | 552,968 | 587,575 | 627,863 | 655,027 |
| 1) 35/10-kV transformer stations | | | | | |
| Number of stations | 21 | 22 | 23 | 25 | 27 |
| Number of transformers | 36 | 42 | 46 | 58 | 58 |
| Power of transformers KVA | 390,000 | 456,000 | 483,000 | 678,000 | 678,000 |
| 2) 35/0.4, 10/0.4, 10/0.2-kV Tr. Stations | | | | | |
| Number of stations | 997 | 1,059 | 1,135 | 1,232 | 1,333 |
| Number of transformers | 1,190 | 1,225 | 1,345 | 1,413 | 1,689 |
| Power of transformers KVA | 537,948 | 568,218 | 655,100 | 701,190 | 856,142 |
| 3) Number of 10-kV substations | 63 | 76 | 84 | 98 | 104 |
| 4) Number of 35-kV substations | 11 | 13 | 18 | 23 | 28 |
| 5) Overhead lines (meter) | | | | | |
| 35 kV | 138,776 | 138,994 | 145,727 | 152,301 | 160,653 |
| 10 kV | 37,722 | 44,294 | 44,294 | 47,855 | 52,690 |
| 1 kV | 1,286,963 | 1,412,467 | 1,458,047 | 1,500,146 | 1,558,325 |
| 6) Cables (meter) | | | | | |
| 35 kV | 134,946 | 133,705 | 136,154 | 135,995 | 142,612 |
| 10 kV | 1,178,468 | 1,218,357 | 1,262,202 | 1,320,459 | 1,375,500 |
| 1 kV | 1,952,591 | 2,029,317 | 2,104,860 | 2,173,704 | 2,237,397 |
| 7) Submarine cables (meter) | | | | | |
| 35 kV | 12,352 | 12,352 | 12,352 | 12,352 | 12,352 |
| 10 kV | 29,952 | 29,952 | 29,952 | 29,952 | 29,952 |

ANNEX 8

November 24, 1972

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY TRAMWAY AND TUNNEL COMPANY (IETT)

Generation, Sales, Losses & Cost of Power

(LT millions -- LT 14 = US$1)

| | Actual | | | | | Aver. Annual Growth Rate 1967-71 in % | Forecast | | | | | Average Annual Growth Rate 1971-76 in % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1967 | 1968 | 1969 | 1970 | 1971 | | 1972 | 1973 | 1974 | 1975 | 1976 | |
| **Generation & Purchased Energy (GWh)** | | | | | | | | | | | | |
| Terkoz | 14.9 | 35.0 | - | - | - | - | - | - | - | - | - | |
| Silahtar - IETT Generation | 325.0 | 258.4 | 419.6 | 371.4 | -) | 13.6% | 422.0 | 508.0 | 508.0 | 254.0 | 254.0 | - |
| Purchased from TEK | - | - | - | 91.3 | 543.7) | | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | - |
| Tuzla | 53.5 | 48.1 | 20.5 | 54.2 | 73.5 | 8.0% | - | - | 129.0 | 276.0 | 406.0 | - |
| Aksaray | - | - | - | - | - | - | 508.0 | 508.0 | 508.0 | 610.0 | 610.0 | - |
| Umraniye | 394.5 | 405.1 | 464.3 | 474.4 | 435.1 | 2.5% | 610.0 | 610.0 | 610.0 | 610.0 | 610.0 | - |
| Yildiztepe | 412.9 | 358.8 | 328.5 | 357.9 | 415.4 | 0.2% | 610.0 | 610.0 | 610.0 | 610.0 | 610.0 | - |
| Davutpasa | 157.9 | 399.8 | 430.8 | 440.5 | 446.4 | 29.3% | - | 164.0 | 305.0 | 508.0 | 610.0 | - |
| Altintepe | - | - | - | - | - | - | - | - | - | - | - | |
| Total | 1,358.7 | 1,505.2 | 1,663.7 | 1,789.7 | 1,914.1 | 9.0% | 2,200.0 | 2,450.0 | 2,720.0 | 2,918.0 | 3,150.0 | 10.2 |
| Sales (GWh) | 1,197.2 | 1,338.9 | 1,400.9 | 1,497.1 | 1,648.3 | 8.2% | 1,880.0 | 2,082.0 | 2,300.0 | 2,510.0 | 2,725.0 | 10.6 |
| Losses - in GWh | 161.5 | 166.3 | 262.8 | 292.6 | 265.8 | - | 320.0 | 368.0 | 420.0 | 408.0 | 425.0 | |
| in % of Generation | 11.9% | 11.0% | 15.8% | 16.3% | 13.9% | | 14.5% | 15.0% | 15.4 | 14.0 | 13.5 | |
| **Maximum Demand (MW)** | | | | | | | | | | | | |
| Terkoz | 4.0 | 4.0 | - | - | - | - | - | - | - | - | - | |
| Silahtar | 54.0 | 74.0 | 93.0 | 100.0 | 100.0 | | 100 | 100 | 100 | 50 | 50 | |
| Tuzla | 10.0 | 6.5 | 7.0 | 10.0 | 12.0 | | 13 | 15 | 15 | 15 | 15 | |
| Aksaray | - | - | - | - | - | | - | - | 33 | 78 | 118 | |
| Umraniye | 75.0 | 72.0 | 80.5 | 83.0 | 100.0 | | 100 | 100 | 100 | 120 | 120 | |
| Yildiztepe | 76.0 | 78.0 | 81.0 | 89.0 | 100.0 | | 120 | 120 | 120 | 120 | 120 | |
| Davutpasa | 63.0 | 77.0 | 73.0 | 90.0 | 100.0 | | 120 | 120 | 120 | 120 | 120 | |
| Altintepe | - | - | - | - | - | | - | 44 | 60 | 100 | 120 | |
| Total Diversified | 282.0 | 311.5 | 334.5 | 374.0 | 412.0 | 10.0 | 453.0 | 499.0 | 548.0 | 603.0 | 663.0 | |
| **Average Annual Load Factor in %** | | | | | | | | | | | | |
| Terkoz | 42.5 | 99.9 | - | - | - | - | - | - | - | - | - | |
| Silahtar | 68.7 | 39.9 | 51.5 | 52.8 | 62.0 | | 48.1 | 58.0 | 58.0 | 58.0 | 58.0 | |
| Tuzla | 61.1 | 84.5 | 33.4 | 51.6 | 69.8 | | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | |
| Aksaray | - | - | - | - | - | | - | - | 44.5 | 40.4 | 39.2 | |
| Umraniye | 60.0 | 64.2 | 65.8 | 65.2 | 49.5 | | 58.0 | 58.0 | 58.0 | 58.0 | 58.0 | |
| Yildiztepe | 62.0 | 52.5 | 46.3 | 45.9 | 47.5 | | 58.0 | 58.0 | 58.0 | 58.0 | 58.0 | |
| Davutpasa | 28.6 | 58.5 | 67.4 | 55.9 | 51.0 | | 58.0 | 58.0 | 58.0 | 58.0 | 58.0 | |
| Altintepe | - | - | - | - | - | | - | 42.5 | 58.0 | 58.0 | 58.0 | |
| Total System | 55.0 | 55.2 | 56.8 | 54.6 | 53.2 | - | 55.5 | 56.0 | 56.5 | 55.0 | 54.2 | |
| **Cost of Generation/Purchases (TL Thousands)** | | | | | | | 1/ | 1/ | 1/ | 1/ | 1/ | |
| Terkoz | 1,847 | 4,278 | - | - | - | - | - | - | - | - | - | |
| Silahtar - IETT Generation | 61,328 | 53,110 | 89,163 | 75,905 | 95,257 | | 105,922 | 117,856 | 117,856 | 63,500 | 63,500 | |
| Purchased from TEK | - | - | - | 11,396 | 14,205 | | 15,250 | 15,250 | 15,250 | 15,250 | 15,250 | |
| Tuzla | 8,108 | 7,705 | 3,787 | 8,437 | - | | - | - | 36,120 | 77,044 | 110,026 | |
| Aksaray | - | - | - | - | - | | 117,856 | 117,856 | 117,856 | 138,470 | 138,470 | |
| Umraniye | 50,446 | 48,948 | 51,788 | 53,531 | 74,285 | | 138,470 | 138,470 | 138,470 | 138,470 | 138,470 | |
| Yildiztepe | 51,675 | 43,207 | 40,245 | 43,844 | 64,848 | | 138,470 | 138,470 | 138,470 | 138,470 | 138,470 | |
| Davutpasa | 25,984 | 50,619 | 49,367 | 50,234 | 78,918 | | - | 45,100 | 74,725 | 117,856 | 138,470 | |
| Altintepe | - | - | - | - | - | | - | - | - | - | - | |
| Total | 199,388 | 207,867 | 234,350 | 243,347 | 327,513 | 13.1 | 515,968 | 573,002 | 638,747 | 689,060 | 742,656 | 17.9 |
| **Cost of Generation/Purchased Energy/kWh (in Krs)** | | | | | | | 2/ | 2/ | 2/ | 2/ | 2/ | |
| Terkoz | 12.4 | 12.2 | - | - | - | - | - | - | - | - | - | |
| Silahtar - IETT Generation | 18.9 | 20.6 | 21.2 | 20.4 | - | | - | - | - | - | - | |
| Purchased from TEK | - | - | - | 12.5 | 17.5 | | 25.1 | 23.2 | 23.2 | 25.0 | 25.0 | |
| Tuzla | 15.2 | 16.0 | 18.5 | 15.6 | 19.3 | | 30.5 | 30.5 | 30.5 | 30.5 | 30.5 | |
| Aksaray | - | - | - | - | - | | - | - | 28.0 | 27.9 | 27.1 | |
| Umraniye | 12.8 | 12.1 | 11.2 | 11.3 | 17.1 | | 23.2 | 23.2 | 23.2 | 22.7 | 22.7 | |
| Yildiztepe | 12.5 | 12.0 | 12.3 | 12.3 | 15.6 | | 22.7 | 22.7 | 22.7 | 22.7 | 22.7 | |
| Davutpasa | 16.5 | 12.7 | 11.5 | 11.4 | 17.7 | | 22.7 | 22.7 | 22.7 | 22.7 | 22.7 | |
| Altintepe | - | - | - | - | - | | - | 27.5 | 24.5 | 23.2 | 22.7 | |
| Total | 14.7 | 13.8 | 14.1 | 13.6 | 17.1 | - | 23.5 | 23.4 | 23.5 | 23.6 | 23.6 | - |
| **Cost of Purchased Energy to IETT 3/** | | | | | | | 438,000 | 487,000 | 542,000 | 585,000 | 631,000 | |
| Less 15% Rebate for prompt payment of bill | | | | | | | 7,000 | 7,500 | 8,000 | 9,000 | 10,000 | |
| Plus Penalty for low power factor | | | | | | | 31,150 | 34,300 | 37,800 | 41,650 | 46,200 | |
| Plus Fuel escalation provision | | | | | | | - | - | - | - | - | |
| Total Cost To IETT | | | | | | | 476,150 | 528,800 | 587,800 | 635,650 | 687,200 | 16.0 |

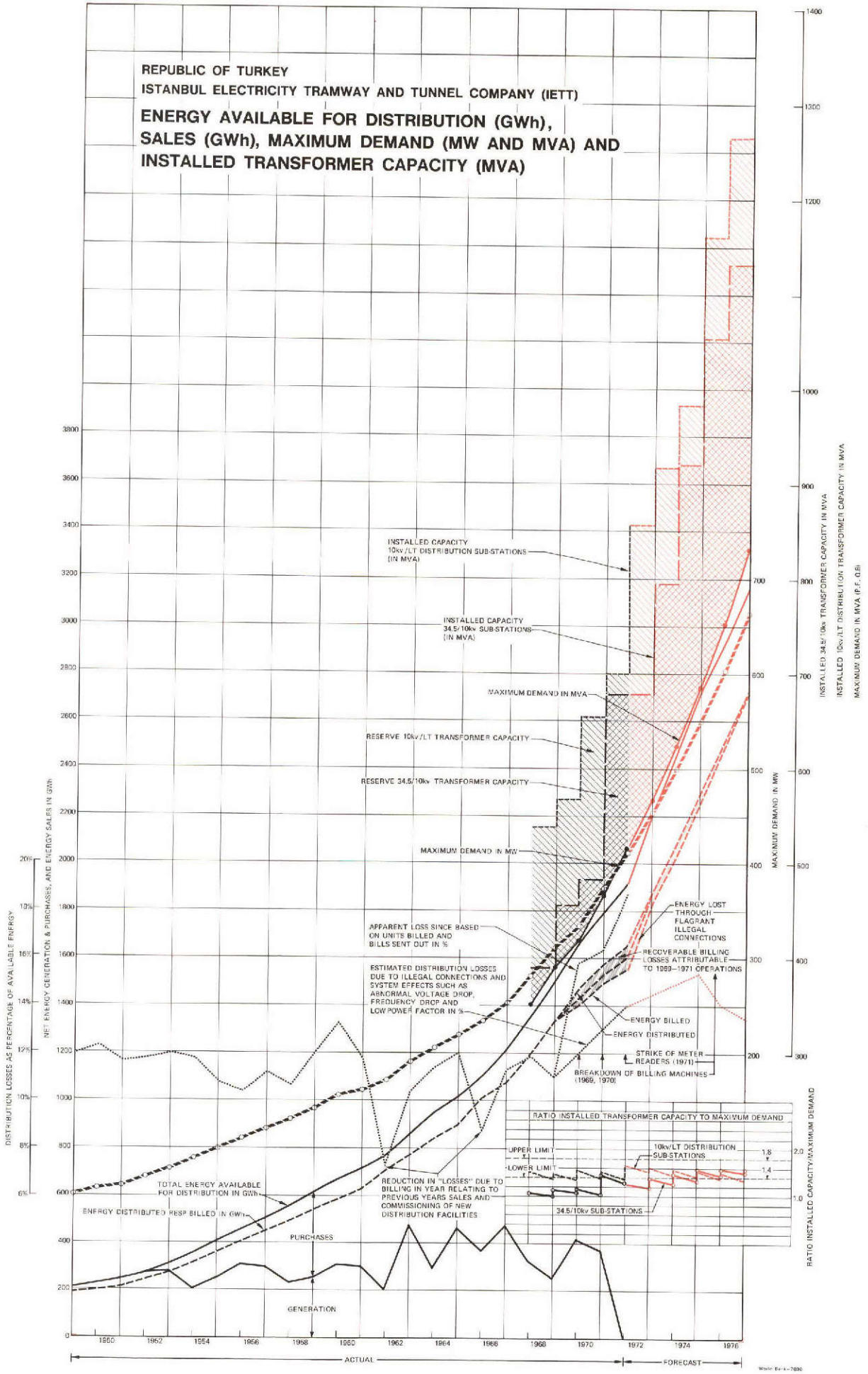
1/ Cost as per existing TEK tariff
2/ Cost per kWh in function of load factor as per TEK tariff
3/ For prompt payment of monthly bill TEK gives its consumers a rebate of 15%. Penalty for late payment is 1%. TEK also imposes a penalty for low power factor considered to be too low providing its consumers with no incentive to improve operations.

November 24, 1972

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY TRAMWAY AND TUNNEL COMPANY (IETT)

# ENERGY AVAILABLE FOR DISTRIBUTION (GWh), SALES (GWh), MAXIMUM DEMAND (MW AND MVA) AND INSTALLED TRANSFORMER CAPACITY (MVA)



REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY TRAMWAY AND TUNNEL COMPANY (IETT)

Maximum Demand in MW

| TEK Supply Points (MW) | 1967 | 1968 | 1969 | 1970 | 1971 | Average Annual Growth Rate 1967-71 in % | 1972 | 1973 | 1974 | 1975 | 1976 | Average Annual Growth Rate 1971-76 in % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Silahtar | 54 | 74 | 93 | 100 | 100 | - | 100 | 100 | 100 | 50 | 60 | - |
| Davutpasa | 63 | 77 | 73 | 90 | 100 | - | 120 | 120 | 120 | 120 | 120 | - |
| Yildiztepe | 76 | 78 | 81 | 89 | 100 | - | 120 | 120 | 120 | 120 | 120 | - |
| Umraniye | 75 | 72 | 80.5 | 83 | 100 | - | 80 | 80 | 80 | 120 | 120 | - |
| Tuzla | 10 | 6.5 | 7 | 12 | 12 | - | 13 | 14 | 13 | 13 | 13 | - |
| Hadimkoy | 4 | 4 | - | - | - | - | - | - | - | - | - | - |
| Altintepe | - | - | - | - | - | - | 20 | 65 | 65 | 80 | 110 | - |
| Aksaray | - | - | - | - | - | - | - | - | 50 | 100 | 120 | - |
| Total | 282 | 311.5 | 334.5 | 374 | 412 | 10.0 | 453 | 499 | 548 | 603 | 663 | 10.0 |
| **Districts (MW)** | | | | | | | | | | | | |
| Bakirkoy | 49 | 53.5 | 56 | 67 | 75 | 11.0 | 84 | 92 | 103 | 115 | 128 | 11.2 |
| Istanbul | 51.5 | 54.5 | 57.5 | 71 | 76.7 | 10.2 | 83 | 88 | 95 | 101 | 109 | 7.2 |
| Eyup | 55.5 | 56.5 | 60 | 66 | 71.3 | 6.2 | 77 | 83 | 89 | 95 | 101 | 7.2 |
| Beyoglu | 70 | 84.7 | 95.5 | 115.1 | 126.5 | 16.0 | 138 | 150 | 165 | 183 | 201 | 9.8 |
| Kalender | 5 | 5.5 | 6 | 7 | 7.7 | 11.2 | 8 | 9 | 10 | 11 | 12 | 9.2 |
| Anatolia North | 10 | 11.5 | 13 | 14.5 | 16 | 12.2 | 17 | 19 | 21 | 23 | 25 | 9.2 |
| Anatolia Central | 15.5 | 19 | 21.5 | 28 | 31.9 | 19.8 | 36 | 41 | 46 | 52 | 59 | 13.0 |
| Anatolia South | 23 | 25.5 | 29 | 35.5 | 39.8 | 14.5 | 45 | 49 | 54 | 60 | 67 | 11.0 |
| Total | 279.5 | 310.7 | 338.5 | 404.1 | 444.9 | 12.0 | 488 | 531 | 583 | 648 | 702 | 9.8 |
| Including Transmission Losses (MW) | 5% 293.5 | 5% 326.2 | 3.3% 349.8 | 3.5% 418.2 | 2% 453.8 | 11.2 | 2% 498 | 2% 542 | 2.2% 596 | 2.4% 655 | 2.5% 720 | 10.0 |
| Diversity in % | 96.1 | 95.5 | 95.7 | 89.4 | 90.8 | | 91.0 | 92.0 | 92.0 | 92.0 | 92.0 | - |
| Maximum Demand on TEK System (MW) | 282 | 311.5 | 334.5 | 374.0 | 412.0 | 10.0 | 453 | 499 | 548 | 603 | 663 | 10.0 |
| **Subdistricts (MW)** | | | | | | | | | | | | |
| Bakirkoy | | | | | | | | | | | | |
| Vellefendi | 20 | 22 | 23 | 24 | 27 | | 28 | 30 | 30 | 30 | 33 | |
| Zeytinburnu | 24 | 26 | 27 | 18 | 21 | | 27 | 32 | 32 | 33 | 35 | |
| Beysol | 5 | 5.5 | 6 | 16 | 16 | | 15 | 15 | 15 | 15 | 15 | |
| Gungoren | - | - | - | 9 | 11 | | 14 | 15 | 15 | 15 | 15 | |
| Safrakoy | - | - | - | - | - | | - | - | 5 | 11 | 15 | |
| Haavalani (Airport) | - | - | - | - | - | | - | - | 6 | 11 | 15 | |
| Total | 49 | 53.5 | 56 | 67 | 75 | 11.0 | 84 | 92 | 103 | 115 | 128 | 11.2 |
| Istanbul | | | | | | | | | | | | |
| BeyazIt | 33 | 34 | 35 | 36 | 36 | | 36 | 36 | 18 | 18 | - | |
| Cibali | 9 | 10 | 11 | 12 | 12 | | 12 | 12 | 11 | 10 | 12 | |
| Samatya | 9.5 | 10.5 | 11.5 | 13 | 13 | | 13 | 10 | 10 | 10 | 12 | |
| Alemdar | - | - | - | - | 5.7 | | 12 | 10 | 10 | 10 | 12 | |
| Aksaray | - | - | - | - | - | | - | 20 | 36 | 38 | 53 | |
| Karagumruk | - | - | - | - | - | | - | - | 10 | 15 | 20 | |
| Total | 51.5 | 54.5 | 57.5 | 71 | 76.7 | 10.2 | 83 | 88 | 95 | 101 | 109 | 7.2 |
| Includes 10 MW for Ulubatli Area | | | | | | | | | | | | |
| Eyup | | | | | | | | | | | | |
| Rami | 9.5 | 10.5 | 11.5 | 13 | 15 | | 15 | 15 | 15 | 15 | 15 | |
| Topkapi | 20 | 21 | 21.5 | 22 | 17.3 | | 17 | 11 | 11 | 11 | 11 | |
| Otakcilar | 8 | 9 | 11 | 11 | 12 | | 12 | 12 | 11 | 11 | 11 | |
| Sagmalcilar | - | - | - | 5 | 8 | | 12 | 15 | 15 | 15 | 15 | |
| Ulubatli | - | - | 6 | (10) 3 | (10) 5 | | (10) 5 | 15 | 15 | 15 | 15 | |
| Silahtar (incl Terkos 8MW 1967 & 1968) | 18.0 | 16 | 10 | 12 | 14 | | 16 | 15 | 10 | 8 | 8 | |
| Maltepe | - | - | - | - | - | | - | - | 10 | 15 | 15 | |
| Alibeykoy | - | - | - | - | - | | - | - | 2 | 5 | 11 | |
| Total | 55.5 | 56.5 | 60 | 66 | 71.3 | 6.2 | 77 | 83 | 89 | 95 | 101 | 7.2 |
| Beyoglu | | | | | | | | | | | | |
| Altintepe | 35 | 33.2 | 39.3 | 43.6 | 40 | | 37 | 37 | 37 | 37 | 37 | |
| Harbiye | - | - | - | | 2 | | 5 | 7 | 8 | 10 | 13 | |
| Tozkoparan | - | - | - | | 3 | | 5 | 7 | 9 | 11 | 13 | |
| Haskoy | - | - | - | | 2.5 | | 5 | 7 | 8 | 10 | 14 | |
| Hurriyettepesi | 19 | 14 | 15.9 | 17.6 | 19.5 | | 21 | 22 | 22 | 22 | 22 | |
| Zincirlikuyu | 8 | 12.5 | 14.2 | 15.8 | 17.5 | | 20 | 22 | 24 | 24 | 24 | |
| Cendre | - | 8 | 9.1 | 10.1 | 11 | | 15 | 16 | 18 | 21 | 22 | |
| Silahtar | 8 | 17 | 17 | 18 | 20 | | 20 | 20 | 14 | 11 | 10 | |
| Arnavutkoy | - | - | - | 10 | 11 | | 10 | 12 | 13 | 15 | 16 | |
| Ucyol | - | - | - | - | - | | - | - | 12 | 12 | 15 | |
| Levent | - | - | - | - | - | | - | - | - | 10 | 15 | |
| Total | 70 | 84.7 | 95.5 | 115.1 | 126.5 | 16.0 | 138 | 150 | 165 | 183 | 201 | 9.8 |
| Includes 10 MW from Vanikoy Area | | | | | | | | | | | | |
| Kalender (IETT Bulk Supply Area) | | | | | | | | | | | | |
| Kalender | n.a. | n.a. | n.a. | n.a. | n.a. | | n.a. | n.a. | n.a. | n.a. | n.a. | |
| Buyukdere | n.a. | n.a. | n.a. | n.a. | n.a. | | n.a. | n.a. | n.a. | n.a. | n.a. | |
| Zekeriyakoy | n.a. | n.a. | n.a. | n.a. | n.a. | | n.a. | n.a. | n.a. | n.a. | n.a. | |
| Total | 5 | 5.5 | 6 | 7 | 7.7 | 11.2 | 8 | 9 | 10 | 11 | 12 | 9.2 |
| Anatolia North | | | | | | | | | | | | |
| Pasabace | 4 | 4.5 | 5 | 5.5 | 6.0 | | 6 | 7 | 9 | 9 | 10 | |
| Vanikoy | 6 | 7 | 8 | (10) 9 | (10) 10.0 | | 11 | 12 | 12 | 12 | 12 | |
| Beyerbeyi | - | - | - | - | - | | - | - | - | 2 | 3 | |
| Total | 10 | 11.5 | 13 | 14.5 | 16 | 12.2 | 17 | 19 | 21 | 23 | 25 | 9.2 |
| Anatolia Central | | | | | | | | | | | | |
| Altiyol | 9 | 10 | 11 | 12 | 10 | | 10 | 10 | 10 | 10 | 10 | |
| Merdivenkoy | 2 | 4 | 5 | 9 | 9 | | 11 | 11 | 11 | 11 | 11 | |
| Muhacirkoy | 4.5 | 5 | 5.5 | 7 | 8 | | 9 | 10 | 11 | 11 | 11 | |
| Selimiye | - | - | - | - | 4.9 | | 6 | 10 | 14 | 14 | 16 | |
| Caddebostan | - | - | - | - | - | | - | - | - | 6 | 11 | |
| Total | 15.5 | 19 | 21.5 | 28 | 31.9 | 19.8 | 36 | 41 | 46 | 52 | 59 | 13.0 |
| Anatolia South | | | | | | | | | | | | |
| Bostanci | 4 | 4.5 | 6 | 7.5 | 8.5 | | 9 | 10 | 11 | 12 | 15 | |
| Maltepe | 7 | 8 | 9 | 10 | 11 | | 12 | 13 | 14 | 16 | 18 | |
| Kartal | 12 | 13 | 14 | 15 | 15 | | 15 | 15 | 15 | 15 | 15 | |
| Tuzla | - | - | - | 3 | 4 | | 5 | 6 | 7 | 8 | 9 | |
| Pendik | - | - | - | - | 1.3 | | 4 | 5 | 7 | 9 | 10 | |
| Total | 23 | 25.5 | 29 | 35.5 | 39.8 | 14.5 | 45 | 49 | 54 | 60 | 67 | 11.0 |

August 23, 1972

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY TRAMWAY AND TUNNEL COMPANY (IETT)

Actual Revenues 1967-1971



| | 1967 | Growth Rate in % 1967/1968 | 1968 | Apparent Growth Rate in % 1968/1969 | 1969 1/ As per IETT Statistics | Estimated Growth Rate in % 1968/1969 | 1969 Estimated | Apparent Growth Rate in % 1968/1969 1/ | 1970 1/ As per IETT Statistics | Estimated Growth Rate in % 1969/1970 Est. | 1970 Estimated | Apparent Growth Rate in % 1970/1978 1/ | 1971 1/ As per IETT Statistics | Estimated Growth Rate in % 1970/1971 Est. | 1971 Estimated | Average Annual Growth Rate in % 1967/71 Apparent 1/ | Average Annual Growth Rate in % 1967/71 Est. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sales in GWh | | | | | | | | | | | | | | | | | |
| Light: Residential | 249.2 | 9.2 | 272.1 | 7.4 | 292.1 | 3/22.8/13.6 | (334.2) 309.2 | 17.7 | 343.7 | 3/15.0/14.6 | (384.4) 354.4 | 1.9 | 350.2 | 3/4.2/3.2 | (400.7) 365.7 4/ | 9.0 | 3/12.5/10.0 |
| Commercial | 88.5 | 20.3 | 106.5 | 19.3 | 127.1 | 19.3 | 137.1 | (4.3) | 121.6 | 1.5 | 129.0 | 6.4 | 129.4 | 4.7 | 135.0 | 10.0 | 11.1 |
| Official Buildings | 35.4 | 17.5 | 41.6 | 8.4 | 45.1 | 8.4 | 45.1 | (0.2) | 45.0 | 5.3 | 47.5 | 8.4 | 48.8 | 2.9 | 48.8 | 8.2 | 8.2 |
| Public Lighting - metered | 28.0 | 5.0 | 29.4 | 5.8 | 31.1 | 5.8 | 31.1 | 1.3 | 31.5 | 3.9 | 32.3 | 6.3 | 33.5 | 6.3 | 33.5 | 4.6 | 4.6 |
| - unmetered | 1.7 | (17.6) | 1.4 | - | 1.4 | - | 1.4 | - | 1.4 | - | 1.4 | 7.1 | 1.5 | 7.1 | 1.5 | (3.6) | (3.6) |
| IETT Internal Use | 1.3 | 7.7 | 1.4 | 7.1 | 1.5 | 7.1 | 1.5 | - | 1.5 | - | 1.5 | (26.7) | 1.1 | (26.7) | 1.1 | (4.0) | (4.0) |
| Total Light | 404.1 | 12.0 | 452.4 | 10.1 | 498.3 | 3/19.5/13.9 | 515.4 | 2.3 | 544.7 | 3/10.3/9.8 | 566.1 | 3.6 | 564.5 | 3/4.1/3.4 | 585.6 | 8.8 | 3/11.2/9.9 |
| Industrial: Small Industries | 277.5 | 16.6 | 323.7 | 18.5 | 383.7 | 24.7 | 403.7 | 10.9 | 425.5 | 12.0 | 452.0 | (1.9) | 417.6 | 0.4 | 453.9 | 10.9 | 13.0 |
| Large Industries | 470.4 | 9.5 | 515.3 | (8.5) 2/ | 472.7 2/ | (8.5) | 472.7 | 2.4 | 484.1 | 2.4 | 484.1 | 9.5 | 530.0 | 9.5 | 530.0 | 3.0 | 3.0 |
| Transport - Trolleybus | 17.1 | (8.2) | 15.7 | (10.8) | 14.0 | (10.8) | 14.0 | (7.9) | 12.9 | (7.9) | 12.9 | (1.6) | 12.7 | (1.6) | 12.7 | (9.8) | (9.8) |
| - Autobus | 2.2 | 68.2 | 3.7 | (24.3) | 2.8 | (24.3) | 2.8 | (3.6) | 2.7 | (3.6) | 2.7 | (11.1) | 2.4 | (11.1) | 2.4 | 2.0 | 2.0 |
| - Railroad | 25.9 | 8.5 | 28.1 | 4.6 | 29.4 | 4.6 | 29.4 | (7.5) | 27.2 | (7.5) | 27.2 | 5.5 | 28.7 | 5.5 | 28.7 | 2.5 | 2.5 |
| Total Industrial | 793.1 | 11.8 | 886.5 | 1.8 | 902.6 | 4.1 | 922.6 | 5.5 | 952.4 | 6.1 | 978.9 | 4.1 | 991.4 | 5.0 | 1,027.7 | 6.0 | 6.8 |
| Unmetered Residential Illegal Connections | - | - | - | - | - | - | 25.0 | - | - | - | 30.0 | - | - | - | 35.0 | - | - |
| TOTAL SALES | 1,197.2 | 11.8 | 1,338.9 | 4.6 | 1,400.9 | 9.3 | 1,463.0 | 6.9 | 1,497.1 | 7.6 | 1,575.0 | 3.9 | 1,555.9 | 4.7 | 1,648.3 | 6.9 | 8.2 |
| REVENUES IN LT (thousands) | | | | | | | | | | | | | | | | | |
| Light: Residential | 65,927 | | 73,932 | | 76,441 | | 80,856 | | 85,688 | | 88,281 | | 100,487 | | 104,846 | | |
| Commercial | 25,360 | | 38,405 | | 47,606 | | 47,606 | | 51,564 | | 54,696 | | 61,058 | | 63,680 | | |
| Official Buildings | 10,266 | | 15,817 | | 17,140 | | 17,140 | | 16,934 | | 17,874 | | 20,104 | | 20,104 | | |
| Public Lighting - metered | 5,189 | | 7,340 | | 7,779 | | 7,779 | | 7,870 | | 8,069 | | 9,558 | | 9,558 | | |
| - unmetered | 318 | | 353 | | 357 | | 357 | | 359 | | 359 | | 439 | | 439 | | |
| IETT Internal Use | 490 | | 681 | | 617 | | 617 | | 664 | | 664 | | 586 | | 586 | | |
| Maintenance Charge Public Lighting | 2,288 | | 2,711 | | 2,814 | | 2,814 | | 3,983 | | 4,000 | | 5,350 | | 5,350 | | |
| Less Rebates | (331) | | (5,232) | | (8,002) | | (8,100) | | (10,073) | | (11,000) | | (12,379) | | (12,500) | | |
| Total Light | 109,507 | | 134,007 | | 144,752 | | 149,069 | | 156,989 | | 162,943 | | 185,203 | | 192,063 | 14.1 | 15.0 |
| Industrial: Small Industries | 71,119 | | 92,705 | | 107,904 | | 113,440 | | 121,580 | | 129,046 | | 137,240 | | 149,106 | | |
| Large Industries | 103,313 | | 133,667 | | 126,515 | | 126,515 | | 129,626 | | 129,626 | | 170,083 | | 170,083 | | |
| Transport - Trolleybus | 3,853 | | 4,101 | | 3,372 | | 3,372 | | 3,100 | | 3,100 | | 3,752 | | 3,752 | | |
| - Autobus | 504 | | 580 | | 674 | | 674 | | 657 | | 657 | | 698 | | 698 | | |
| - Railroad | 5,589 | | 5,114 | | 5,358 | | 5,358 | | 4,956 | | 4,956 | | 6,880 | | 6,880 | | |
| Total Industrial | 184,378 | | 236,167 | | 243,823 | | 843,359 | | 259,919 | | 267,385 | | 318,653 | | 330,519 | 14.6 | 15.8 |
| Other: Meter Rents | 18,157 | | 33,556 | | 39,495 | | 39,495 | | 47,191 | | 47,191 | | 49,673 | | 49,673 | | |
| Various | 4,435 | | 7,451 | | 10,352 | | 10,352 | | 14,290 | | 14,290 | | 13,727 | | 13,727 | | |
| Total Other | 22,592 | | 31,007 | | 49,847 | | 49,847 | | 61,481 | | 61,481 | | 63,400 | | 63,400 | 29.2 | 29.2 |
| TOTAL REVENUE ELECTRICITY OPERATIONS | 316,477 | | 411,181 | | 438,422 | | 448,275 | | 478,389 | | 491,809 | | 567,256 | | 585,982 | 15.7 | 16.8 |
| AVERAGE REVENUE PER kWh SOLD IN krs (100 krs = 1 LT) | | | | | | | | | | | | | | | | | |
| Light: Residential | 26.46 | | 27.17 | | 26.17 | | 26.15 | | 24.93 | | 24.91 | | 28.69 | | 23.67 | | |
| Commercial | 28.66 | | 36.06 | | 37.46 | | 37.46 | | 42.40 | | 42.40 | | 47.17 | | 47.17 | | |
| Official Buildings | 29.00 | | 38.02 | | 38.00 | | 38.00 | | 37.63 | | 37.63 | | 41.20 | | 41.20 | | |
| Public Lighting: metered | 18.53 | | 24.97 | | 25.01 | | 25.01 | | 24.98 | | 24.98 | | 28.53 | | 28.53 | | |
| unmetered | 18.71 | | 25.51 | | 25.50 | | 25.50 | | 25.64 | | 25.64 | | 29.57 | | 29.57 | | |
| IETT Internal Use | 37.69 | | 48.64 | | 41.13 | | 41.13 | | 44.27 | | 44.27 | | 53.27 | | 53.27 | | |
| Average Light | 27.10 | | 29.62 | | 29.05 | | 28.92 | | 28.82 | | 28.78 | | 37.81 | | 32.80 | 5.0 | 5.0 |
| Industrial: Small Industries | 25.63 | | 28.64 | | 28.12 | | 28.10 | | 28.57 | | 28.55 | | 32.86 | | 32.85 | | |
| Large Industries | 21.96 | | 25.94 | | 26.76 | | 26.76 | | 26.78 | | 26.78 | | 32.09 | | 32.09 | | |
| Transport: Trolleybus | 22.53 | | 26.12 | | 24.09 | | 24.09 | | 24.03 | | 24.03 | | 29.54 | | 29.54 | | |
| Autobus | 22.91 | | 15.68 | | 24.07 | | 24.07 | | 24.33 | | 24.33 | | 29.08 | | 29.08 | | |
| Railroad | 21.58 | | 18.20 | | 18.22 | | 18.22 | | 18.22 | | 18.22 | | 23.97 | | 23.98 | | |
| Average Industrial | 23.25 | | 26.64 | | 27.01 | | 27.00 | | 27.29 | | 27.31 | | 32.14 | | 32.16 | 8.0 | 8.0 |
| AVERAGE REVENUE PER kWh DISTRIBUTED | 26.43 | | 30.71 | | 31.30 | | 30.60 | | 31.95 | | 31.23 | | 36.46 | | 35.55 | 8.1 | 7.2 |
| ILLEGAL CONNECTIONS ESTIMATED VALUE IN LT (thousands) | | | | | | | 6,537.5 | | | | 7,473.0 | | | | 10,035 | - | - |
| COLLECTABLE AMOUNT IN FOLLOWING YEAR LT (thousands) | | | | | | | 9,853.0 | | | | 13,420.0 | | | | 18,726 | - | - |
| | | | | | | | | | | | | | | | 655,027 | - | 6.0 |
| NUMBER OF CONSUMERS | 520,605 | | 552,968 | | - | | 587,575 | | - | | 627,863 | | | | | | |
| kWh DISTRIBUTED PER CONSUMER | 2,299.8 | | 2421.2 | | - | | 2,489.8 | | - | | 2,508.5 | | | | 2516.3 | - | 2.0 |

1/ Conforms to Billing Statistics.
2/ Loss to ETIBANK of cement factory load in Kartal.
3/ This growth rate includes estimated consumption through illegal connections in squatter settlements.
4/ Due to lack of meters potential consumers cannot be connected.

August 23, 1972

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAYS AND TUNNEL COMPANY (IETT)

Forecast Energy Sales and Revenues 1972-1976

| SALES IN GWh | 1971 Estimated | Estimated Growth Rate in % 1971/1972 | 1972 Based on Five-month Actual Data | Estimated Growth Rate in % 1972/1973 | 1973 | Estimated Growth Rate in % 1973/1974 | 1974 | Estimated Growth Rate in % 1974/1975 | 1975 | Estimated Growth Rate in % 1975/1976 | 1976 | Average Annual Growth Rate in % 1971/1976 | Average Annual Growth Rate 1967/1971 Est. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Light: | | | | | | | | | | | | | |
| Residential | (400.7)365.7 | 16.0/16.1 1/ | (464.7)424.7 | 14.3/14.4 1/ | (531)486.0 | 11.1/13.2 1/ | (590)550.0 | 10.5/14.9 1/ | (652)632.0 | 10.4/13.9 1/ | 720.0 | 12.2/14.5 3/ | 12.5/10.0 |
| Commercial | 135.0 | 11.1 | 150.0 | 11.0 | 167.0 | 10.8 | 185.0 | 10.5 | 205.0 | 10.2 | 226.0 | 11.0 | 11.1 |
| Official Buildings | 48.8 | 8.6 | 53.0 | 8.5 | 58.0 | 8.5 | 63.0 | 8.3 | 68.1 | 8.1 | 73.6 | 8.3 | 8.2 |
| Public Lighting - metered | 33.5 | 5.1 | 35.2 | 6.0 | 37.3 | 6.0 | 39.5 | 6.0 | 41.9 | 6.0 | 44.4 | 5.9 | 4.6 |
| - unmetered | 1.5 | 6.7 | 1.6 | - | 1.6 | 6.3 | 1.7 | - | 1.7 | 5.9 | 1.8 | 3.8 | (3.6) |
| IETT Internal Use | 1.1 | 9.1 | 1.2 | - | 1.2 | 8.3 | 1.3 | - | 1.3 | 7.7 | 1.4 | 5.0 | (4.0) |
| Total Light | 585.6 | 13.7/13.7 | 665.7 | 12.8/12.8 | 751.1 | 10.6/11.9 | 840.5 | 10.2/13.0 | 950.0 | 12.4/12.4 | 1,067.2 | 11.4/12.8 | 11.2/ 9.9 |
| Industrial: | | | | | | | | | | | | | |
| Small Industries | 453.9 | 17.4 | 533.0 2/ | 15.0 | 613.0 | 14.2 | 700.0 | 12.1 | 784.7 | 10.1 | 863.6 | 12.8 | 13.0 |
| Large Industries | 530.0 | 12.5 | 596.0 2/ | 5.0 | 626.0 | 6.9 | 669.0 | 5.4 | 705.0 | 5.2 | 742.0 | 7.0 (Kartal cement) | 3.0 |
| Transport: Trolleybus | 12.7 | 0.8 | 12.8 | - | 12.8 | - | 12.8 | 0.8 | 12.9 | 0.8 | 13.0 | 0.6 | (9.8) |
| Autobus | 2.4 | 4.2 | 2.5 | 4.0 | 2.6 | 3.8 | 2.7 | 3.7 | 2.8 | 3.6 | 2.9 | 4.0 | 2.0 |
| Railroad | 28.7 | 4.5 | 30.0 | 5.0 | 31.5 | 4.8 | 33.0 | 4.8 | 34.6 | 4.9 | 36.3 | 4.9 | 2.5 |
| Total Industrial | 1,027.7 | 14.3 | 1,174.3 | 9.5 | 1,285.9 | 10.4 | 1,419.5 | 8.5 | 1,540.0 | 7.5 | 1,657.8 | 10.0 | 6.8 |
| Unmetered Residential Illegal connections | 35.0 | - | 40.0 | - | 45.0 | - | 40.0 | - | 20.0 | - | - | - | - |
| TOTAL SALES | 1,648.3 | 14.1 | 1,880.0 | 10.7 | 2,082.0 | 10.5 | 2,300.0 | 9.1 | 2,510.0 | 8.6 | 2,725.0 | 10.6 | 8.2 |
| REVENUES IN LT (Thousands) | | | | | | | | | | | | | |
| Light: | | | | | | | | | | | | | |
| Residential | 104,846 | | 159,687 | | 182,250 | | 205,700 | | 235,736 | | 267,840 | | |
| Commercial | 63,680 | | 82,500 | | 91,433 | | 100,825 | | 111,213 | | 122,040 | | |
| Official Buildings | 20,104 | | 26,500 | | 28,884 | | 31,248 | | 33,641 | | 36,211 | | |
| Public Lighting - metered | 9,558 | | 13,200 | | 13,988 | | 14,812 | | 15,713 | | 16,650 | | |
| - unmetered | 439 | | 600 | | 600 | | 638 | | 638 | | 675 | | |
| IETT Internal Use | 586 | | 678 | | 678 | | 733 | | 733 | | 788 | | |
| Maintenance Charge Public Lighting | 5,350 | | 5,800 | | 6,100 | | 6,400 | | 6,700 | | 7,000 | | |
| Less Rebates | (12,500) | | (13,000) | | (13,500) | | (14,000) | | (14,500) | | (15,000) | | |
| Total Light | 192,063 | | 275,965 | | 310,433 | | 346,356 | | 389,874 | | 436,204 | 18.0 | 15.0 |
| Industrial: | | | | | | | | | | | | | |
| Small Industries | 149,106 | | 219,863 | | 251,330 | | 285,250 | | 317,804 | | 347,599 | | |
| Large Industries | 170,083 | | 235,420 | | 245,392 | | 261,245 | | 274,245 | | 287.525 | | |
| Transport: Trolleybus | 3,752 | | 4,698 | | 4,698 | | 4,698 | | 4,728 | | 4,758 | | |
| Autobus | 698 | | 917 | | 953 | | 988 | | 1,023 | | 1,059 | | |
| Railroad | 6,880 | | 9,300 | | 9,734 | | 10,164 | | 10,622 | | 11,108 | | |
| Total Industrial | 330,519 | | 470,198 | | 512,107 | | 562,345 | | 608,422 | | 652,049 | 14.8 | 15.8 |
| Other: Meter Rents | 49,673 | | 51,000 | | 53,000 | | 57,000 | | 60,000 | | 63,000 | | |
| Various (overhead charged consumers for installation work) | 13,727 | | 14,000 | | 15,000 | | 16,000 | | 17,000 | | 18,000 | | |
| TOTAL REVENUE ELECTRICITY OPERATIONS | 585,982 4/ | | 811,163 4/ | | 890,540 | | 981,701 | | 1,075,296 | | 1,169,253 | 14.9 | 16.8 |
| AVERAGE REVENUE PER KWh SOLD IN Krs (100 Krs = 1 LT) | | | | | | | | | | | | | |
| Light: | | | | | | | | | | | | | |
| Residential | 28.67 | | 37.60 | | 37.50 | | 37.40 | | 37.30 | | 37.20 | | |
| Commercial | 47.17 | | 55.00 | | 54.75 | | 54.50 | | 54.25 | | 54.00 | | |
| Official Buildings | 41.20 | | 50.00 | | 49.80 | | 49.60 | | 49.40 | | 49.20 | | |
| Public Lighting - metered | 28.53 | | 37.50 | | 37.50 | | 37.50 | | 37.50 | | 37.50 | | |
| - unmetered | 29.57 | | 37.50 | | 37.50 | | 37.50 | | 37.50 | | 37.50 | | |
| IETT Internal Use | 53.27 | | 56.50 | | 56.50 | | 56.40 | | 56.40 | | 56.30 | | |
| Average Light | 32.80 | | 41.45 | | 41.33 | | 41.21 | | 41.04 | | 40.84 | 5.0 | 5.0 |
| Industrial: | | | | | | | | | | | | | |
| Small Industries | 32.85 | | 41.25 | | 41.00 | | 40.75 | | 40.50 | | 40.25 | | |
| Large Industries | 32.09 | | 39.50 | | 39.20 | | 39.05 | | 38.90 | | 38.75 | | |
| Transport: Trolleybus | 29.54 | | 36.70 | | 36.70 | | 36.70 | | 36.65 | | 36.60 | | |
| Autobus | 29.08 | | 36.70 | | 36.65 | | 36.60 | | 36.55 | | 36.50 | | |
| Railroad | 23.98 | | 31.00 | | 30.90 | | 30.80 | | 30.70 | | 30.60 | | |
| Average Industrial | 32.16 | | 40.04 | | 39.82 | | 39.62 | | 39.51 | | 39.38 | 2.0 | 8.0 |
| AVERAGE REVENUE PER kWh DISTRIBUTED | 35.55 | | 43.15 | | 42.77 | | 42.68 | | 42.84 | | 42.91 | 3.9 | 7.2 |
| ILLEGAL CONNECTIONS ESTIMATED VALUE IN TL (Thousands) | 10,035 | | 15,040 | | 16,875 | | 14,960 | | 7,460 | | - | - | - |
| NUMBER OF CONSUMERS | 655,027 | | 695,000 | | 742,000 | | 803,000 | | 868,000 | | 931,000 | 7.1 | 6.0 |
| kWh DISTRIBUTED PER CONSUMER | 2,516.3 | | 2,705 | | 2,806 | | 2,864 | | 2,892 | | 2,927 | 3.0 | 2.0 |

1/ Growth rate included estimated consumption through illegal connections.
2/ Kartal Cement factor load transferred from TEK to IETT.
3/ Growth rate includes service of latent demand plus elimination of flagrant illegal connections estimated to total 70 GWh.
4/ 1971 Revenue included LT 18.8 million late billings actually billed in 1972. These have been excluded from the 1972 sales. No income from illegal connections is included above.

August 24, 1972

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

Tariffs

TARIFFS IN EFFECT SINCE APRIL 1, 1972. SUBSEQUENT TEK TARIFF CHANGES (FUEL ESCALATION) PASSED ON TO CONSUMERS.

| | One-Part Tariff | Two-Part Tariff | |
|---|---|---|---|
| | krs per kWh | krs per kW per month | krs per kWh |
| Domestic /1 | 45.68 | 100 | 36.68 |
| Commercial /2 | 62.68 | 200 | 42.68 |
| Official Buildings | 62.68 | 200 | 47.68 |
| Small Industry /3 | 46.68 | 750 | 37.68 |
| Large Industry /4 | 39.68 | 2,500 | 32.68 |
| Street Lighting | 37.68 | - | - |
| Trolleybus | 36.68 | - | - |
| Railroad | 30.70 | - | - |

IETT's consumers are required to pay a deposit equivalent to:

Domestic: One-Part: 3 LT x (number of lamps plus power points)
Two-Part: 2 LT x 3 TL x (number of lamps plus power points)

Commercial: One-Part: 35 LT x (number of lamps plus power points)
Two-Part: 24 LT x TL x (number of lamps plus power points)

Industrial: One-Part: 100 LT per kW installed
Two-Part: 115 LT per kW installed

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/1 Minimum monthly bill LT 5.0.
/2 Minimum monthly bill LT 12.0.
/3 Minimum energy billed based on 400 hrs usage per annum per HP installed.
/4 Minimum energy billed based on 150 hrs usage per annum per HP installed.

A rebate of 5% is accorded consumers purchasing electricity at 10 or 34.5 kW.

In addition to the above tariffs, a tax is levied amounting to 6 krs/kWh for domestic and commercial consumers and 2 krs/kWh for industrial consumers.

Industrial consumers are penalized LT 30 per kW in excess of contracted demand.

The reactive energy charge (low power factor) is computed at one-quarter of the kWh price times (Reactive energy - 1/2 Active energy). Consumers with an installed capacity below 50 kW are not subject to this penalty.

The cost of installing and maintaining meters is added to the monthly bills.

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

Cost of Purchased Power
TEK Tariffs

The tariffs quoted below have been in effect since July 16, 1971.

A. TWO-PART TARIFF

Demand Charge

Contracted Power is charged as follows:

| | | | | |
|---|---|---|---|---|
| 0 - 3,000 kW | LT/kW per year | or | LT/kW per month |
| 3,001 - 10,000 kW | 396 | | 33 |
| 10,001 - 30,000 kW | 372 | | 31 |
| 30,001 - 60,000 kW | 360 | | 30 |
| 60,001 - 100,000 kW | 348 | | 29 |
| 100,001 - kW | 336 | | 28 |

If actual demand in any given month exceeds contracted demand, each kW in excess is billed at LT 40/month.

ENERGY CHARGE

The energy charge is computed on the following basis:

| | |
|---|---|
| 0 - 5 GWh | 20 kurus/kWh |
| 5 - 30 GWh | 19 |
| 30 - 100 GWh | 18 |
| 100 - 200 GWh | 17 |
| 200 - 350 GWh | 16 |
| 350 - GWh | 14 |

B. ONE-PART TARIFF

Price per kWh 38 kurus.

C. REACTIVE POWER (Low Power Factor Penalty)

Of the reactive energy drawn by consumers purchasing electricity at the one or two-part tariff, a charge is billed as follows:

a) each kWh of reactive energy up to 0.75 times the active energy 0.5 kurus/kWh;

b) each kWh of reactive energy between 0.75 to 1.000 times the active energy 2.0 kurus/kWh;

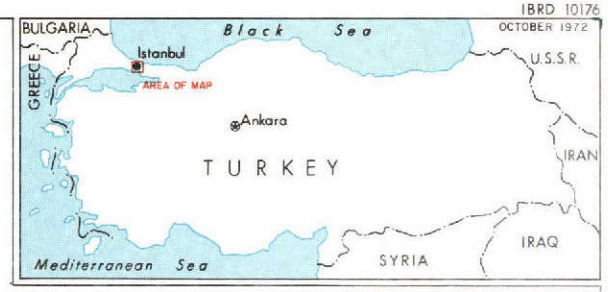
c) each kWh of reactive energy in excess of 1.00 times the active energy 5.0 kurus/kWh.

d) The reactive energy charge is not applied when installed transformer capacity is less than 250 KVA (villages, cooperatives and associations). In all other cases, the installation of measuring instruments, needed to measure reactive energy, have to be made by the consumer.

In applying the above tariffs, a rebate of 15% is made for customers paying the whole of their bill within one month of presentation. Customers paying their bills after one month are subject to a 1% penalty.

0.1 kurus is automatically added to each kWh for the price difference of 50 kurus in the cost of 1 million kcal of fuel used by TEK. As of July 1, 1971, the fuel escalation provision amounted to 1.4 kurus/kWh. No rebate is given on this supplementary charge.

IBRD 10176
OCTOBER 1972




# TURKEY

## ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

## 34.5 KV PRIMARY DISTRIBUTION SYSTEM

| Existing | 1972/73 program | Financed by TEK | 1974/75 program | |
|---|---|---|---|---|
| ■ | | ■ | | 154/34.5 KV substations |
| ○ | ○ | | ○ | 34.5/10 KV substations |
| ——— | ——— | | ——— | 34.5 KV overhead lines |
| - - - - | - - - - | | - - - - | 34.5 KV underground cables |

Municipal boundary of Istanbul
Railways
Roads
Beltway under construction

0 1 2 3 4 5 6 7 8 KILOMETERS
0 1 2 3 4 5 MILES

*The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.*

ZEKERIYA
BUYUKDERE
KALENDER
PASABANCE
UCYOL
ALIBEYKOY
CENDERE
LEVENT
SILANTAR
MURRIYETTEPESI
ARNAVUTKOY
ZINCIRLIKUYUL
YILDIZTEPE
VANIKOY
MAAMUTBEY
ATISALANI
SAGMALCILAR
HARBIYE
HASKOY
ALTINTEPE
RAM
OTAKCILAR
TOZKOPARAN
BEYLERBEYI
HALKALI
KIREZLI
ESENLER
BAGCILAR
GUNGOREN
MALTEPE
CIBALI
KARAGUMRUK
MUHACIRKOY
SAFRAKOY
TOKOPAL
ULUBATLI
UMRANIYE
DAVUTPASA
BEYAZIT
SELIMIYE
AKSARAY
ALEMDAR
SAMATYA
ISTANBUL
ALTIYOL
MERDIVENKOY
HAVAALANI
BESYOL
ZEYTINBURNU
VELIEFENDI
CADE BOSTANI
BOSTANCI
ATAKOY
YESILKOY
MALTEPE
KARTAL
KARTAL
PENDIK
TUZLA
TO IZMIT
Sea of Marmara
Golden Horn
BOSPHORUS
41°
29°

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY TRAMWAY AND TUNNEL COMPANY (IETT)

Investment Program 1974 and 1975
(Base Price End 1971)

(LT Thousands -- LT14 = US$1)

| | | Quantities | | 1974 | | | | 1975 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1974 | 1975 | Foreign Costs | Customs Duties | Local Costs | Total | Foreign Costs | Customs Duties | Local Costs | Total |
| A/1 | 34.5 kV SYSTEM (Inside Municipal Boundary) | | | | | | | | | | |
| | SUBSTATIONS | | | | | | | | | | |
| 1. | BAKIRKOY DISTRICT | | | | | | | | | | |
| 1.1 | Beysol (No additions) | | | | | | | | | | |
| 1.2 | Hauaalani (Airport) | | | | | | | | | | |
| | Civil Works | * | - | - | - | 750 | 750 | - | - | - | - |
| | 34.5 kV Cells | 4 | - | 224 | 144 | 120 | 488 | - | - | - | - |
| | 10 kV Cells | 2 | - | 70 | 45 | 50 | 165 | - | - | - | - |
| | Transformers | 2/15 MVA | - | 1,008 | 380 | 60 | 1,448 | - | - | - | - |
| | Line Connection | 400 m | - | - | - | 100 | 100 | - | - | - | - |
| 2. | ISTANBUL DISTRICT | | | | | | | | | | |
| 2.1 | Karagumruk | | | | | | | | | | |
| | Civil Works | * | - | - | - | 750 | 750 | - | - | - | - |
| | 34.5 kV Cells | 4 | - | 224 | 144 | 120 | 488 | - | - | - | - |
| | 10 kV Cells | 10 | - | 350 | 225 | 250 | 825 | - | - | - | - |
| | Transformers | 2/15 MVA | - | 1,008 | 380 | 60 | 1,448 | - | - | - | - |
| | Cable Connection | 1,000 m | - | 210 | 225 | 100 | 535 | - | - | - | - |
| 3. | EYUB DISTRICT | | | | | | | | | | |
| 3.1 | Maltepe | | | | | | | | | | |
| | Civil Works | * | - | - | - | 750 | 750 | - | - | - | - |
| | 34.5 kV Cells | 4 | 2 | 224 | 144 | 120 | 488 | 112 | 72 | 50 | 244 |
| | 10 kV Cells | 10 | - | 350 | 225 | 250 | 825 | - | - | - | - |
| | Transformers | 2/15 MVA | - | 1,008 | 380 | 60 | 1,448 | - | - | - | - |
| | Line Connection | 800 m | - | - | - | 200 | 200 | - | - | - | - |
| 3.2 | Ulubatli | | | | | | | | | | |
| | Civil Works | - | - | - | - | - | - | - | - | - | - |
| | 34.5 kV Cells | - | - | - | - | - | - | - | - | - | - |
| | 10 kV Cells | - | - | - | - | - | - | - | - | - | - |
| | Transformers | 1/15 MVA | - | 504 | 190 | 30 | 724 | - | - | - | - |
| | Line Connection | - | - | - | - | - | - | - | - | - | - |
| 4. | BEYOGLU DISTRICT | | | | | | | | | | |
| 4.1 | Ucyol | | | | | | | | | | |
| | Civil Works | * | - | - | - | 750 | 750 | - | - | - | - |
| | 34.5 kV Cells | 6 | 1 | 336 | 216 | 180 | 732 | 56 | 36 | 30 | 122 |
| | 10 kV Cells | 10 | 1 | 350 | 225 | 250 | 825 | 35 | 23 | 25 | 83 |
| | Transformers | 2/15 MVA | 1/15 MVA | 1,008 | 380 | 60 | 1,448 | 504 | 190 | 30 | 724 |
| | Line Connection | 400 m | - | - | - | 100 | 100 | - | - | - | - |
| 4.2 | Arnauotkoy | | | | | | | | | | |
| | Civil Works | - | - | - | - | - | - | - | - | - | - |
| | 34.5 kV Cells | 1 | - | 56 | 36 | 30 | 122 | - | - | - | - |
| | 10 kV Cells | - | - | - | - | - | - | - | - | - | - |
| | Transformers | 1/15 MVA | - | 504 | 190 | 30 | 724 | - | - | - | - |
| | Line Connection | - | - | - | - | - | - | - | - | - | - |
| | SUB-TOTAL TO BE CARRIED FORWARD | | | 7,434 | 3,529 | 5,170 | 16,133 | 707 | 321 | 145 | 1,173 |

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

Investment Program 1974 and 1975
(Base Price End 1971)

(LT Thousands -- LT14 = US$1)

| | | Quantities 1974 | Quantities 1975 | 1974 Foreign Costs | 1974 Customs Duties | 1974 Local Costs | 1974 Total | 1975 Foreign Costs | 1975 Customs Duties | 1975 Local Costs | 1975 Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUB-TOTAL CARRIED FORWARD PAGE 1 | | | 7,434 | 3,529 | 5,170 | 16,133 | 707 | 321 | 145 | 1,173 |
| 4.3 | Zincirlikuyu | | | | | | | | | | |
| | Civil Works | - | - | - | - | - | - | - | - | - | - |
| | 34.5 kV Cells | 2 | 1 | 112 | 72 | 60 | 244 | - | - | - | - |
| | 10 kV Cells | - | - | - | - | - | - | - | - | - | - |
| | Transformers | - | - | - | - | - | - | - | - | - | - |
| | Line Connection | - | - | - | - | - | - | - | - | - | - |
| 4.4 | Levent | | | | | | | | | | |
| | Civil Works | - | * | - | - | - | - | - | - | 750 | 750 |
| | 34.5 kV Cells | - | 4 | - | - | - | - | 224 | 144 | 120 | 488 |
| | 10 kV Cells | - | 10 | - | - | - | - | 350 | 225 | 250 | 825 |
| | Transformers | - | 1/15 MVA | - | - | - | - | 504 | 190 | 30 | 724 |
| | Line Connection | - | 400 m | - | - | - | - | - | - | 100 | 100 |
| 4.5 | Haskoy | | | | | | | | | | |
| | Civil Works | - | - | - | - | - | - | - | - | - | - |
| | 34.5 kV Cells | 1 | - | 56 | 36 | 30 | 122 | - | - | - | - |
| | 10 kV Cells | 1 | - | 35 | 23 | 25 | 83 | - | - | - | - |
| | Transformers | 1/15 MVA | - | 504 | 190 | 30 | 724 | - | - | - | - |
| | Line Connection | - | - | - | - | - | - | - | - | - | - |
| 5. | ANATOLIA DISTRICT | | | | | | | | | | |
| 5.1 | Selimiye | | | | | | | | | | |
| | Civil Works | - | - | - | - | - | - | - | - | - | - |
| | 34.5 kV Cells | 4 | - | 224 | 144 | 120 | 488 | - | - | - | - |
| | 10 kV Cells | 2 | - | 70 | 45 | 50 | 165 | - | - | - | - |
| | Transformers | 1/15 MVA | - | 504 | 190 | 30 | 724 | - | - | - | - |
| | Cable Connection | 400 m | - | 84 | 90 | 40 | 214 | - | - | - | - |
| 5.2 | Vanikoy | | | | | | | | | | |
| | Civil Works | - | - | - | - | - | - | - | - | - | - |
| | 34.5 kV Cells | - | - | - | - | - | - | - | - | - | - |
| | 10 kV Cells | - | - | - | - | - | - | - | - | - | - |
| | Transformers | 1/15 MVA | - | 504 | 190 | 30 | 724 | - | - | - | - |
| | Line/Cable Connection | - | - | - | - | - | - | - | - | - | - |
| 5.3 | Caddebostani | | | | | | | | | | |
| | Civil Works | - | * | - | - | - | - | - | - | 750 | 750 |
| | 34.5 kV Cells | - | 4 | - | - | - | - | 224 | 144 | 120 | 488 |
| | 10 kV Cells | - | 10 | - | - | - | - | 350 | 225 | 250 | 825 |
| | Transformers | - | 1/15 MVA | - | - | - | - | 504 | 190 | 30 | 724 |
| | Line/Cable Connection | - | - | - | - | - | - | - | - | - | - |
| 5.4 | Beylerbey | | | | | | | | | | |
| | Civil Works | - | * | - | - | - | - | - | - | 750 | 750 |
| | 34.5 kV Cells | - | 4 | - | - | - | - | 224 | 144 | 120 | 488 |
| | 10 kV Cells | - | 10 | - | - | - | - | 350 | 225 | 250 | 825 |
| | Transformers | - | 1/15 MVA | - | - | - | - | 504 | 190 | 30 | 724 |
| | Line Connection | - | 400 m | - | - | - | - | - | - | 100 | 100 |
| | SUB-TOTAL TO BE CARRIED FORWARD | | | 9,527 | 4,509 | 5,585 | 19,621 | 3,941 | 1,998 | 3,795 | 9,734 |

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

Investment Program 1974 and 1975
(Base Price End 1971)

(LT Thousands -- LT14 = US$1)

| | | Quantities 1974 | Quantities 1975 | 1974 Foreign Costs | 1974 Customs Duties | 1974 Local Costs | 1974 Total | 1975 Foreign Costs | 1975 Customs Duties | 1975 Local Costs | 1975 Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUB-TOTAL CARRIED FORWARD PAGE 2 | | | 9,527 | 4,509 | 5,585 | 19,621 | 3,941 | 1,998 | 3,795 | 9,734 |
| A/2 | 34.5 kV System (Outside Municipal Boundary) | | | | | | | | | | |
| | SUBSTATIONS | | | | | | | | | | |
| 1.0 | BAKIRKOY DISTRICT | | | | | | | | | | |
| 1.01 | Gungoren (No additions required) | | | | | | | | | | |
| 1.02 | Safrakoy | | | | | | | | | | |
| | Civil Works | * | - | - | - | 750 | 750 | - | - | - | - |
| | 34.5 kV Cells | 6 | 2 | 336 | 216 | 180 | 732 | 112 | 72 | 60 | 244 |
| | 10 kV Cells | 16 | - | 560 | 360 | 400 | 1,320 | - | - | - | - |
| | Transformers | 2/15 MVA | 1/15 MVA | 1,008 | 380 | 60 | 1,448 | 504 | 190 | 30 | 724 |
| | Line Connection | 1,000 m | - | - | - | 250 | 250 | - | - | - | - |
| 2.0 | ISTANBUL DISTRICT (No addtions required) | | | | | | | | | | |
| | EYUB DISTRICT | | | | | | | | | | |
| 3.01 | Alibekoy | | | | | | | | | | |
| | Civil Works | * | - | - | - | 750 | 750 | - | - | - | - |
| | 34.5 kV Cells | 4 | - | 224 | 144 | 120 | 488 | - | - | - | - |
| | 10 kV Cells | 10 | - | 350 | 225 | 250 | 825 | - | - | - | - |
| | Transformers | 1/15 MVA | - | 504 | 190 | 30 | 724 | - | - | - | - |
| | Line Connection | 800 m | - | - | - | 200 | 200 | - | - | - | - |
| 3.02 | Sagmalcilar (No additions required) | | | | | | | | | | |
| 4.0 | BEYOGLU DISTRICT | | | | | | | | | | |
| 4.01 | Cendere | | | | | | | | | | |
| | Civil Works | - | - | - | - | - | - | - | - | - | - |
| | 34.5 kV Cells | - | - | - | - | - | - | - | - | - | - |
| | 10 kV Cells | - | - | - | - | - | - | - | - | - | - |
| | Transformers | 1/15 MVA | 1/15 MVA | 504 | 190 | 30 | 724 | 504 | 190 | 30 | 724 |
| | Line Connections | - | - | - | - | - | - | - | - | - | - |
| 5.0 | ANATOLIA DISTRICT | | | | | | | | | | |
| 5.01 | Pendik | | | | | | | | | | |
| | Civil Works | * | - | - | - | 750 | 750 | - | - | - | - |
| | 34.5 kV Cells | 6 | - | 336 | 216 | 180 | 732 | - | - | - | - |
| | 10 kV Cells | 14 | - | 490 | 315 | 350 | 1,155 | - | - | - | - |
| | Transformers | 2/15 MVA | - | 1,008 | 380 | 60 | 1,448 | - | - | - | - |
| | Line Connections | 1,000 m | - | - | - | 250 | 250 | - | - | - | - |
| 5.02 | Maltepe | | | | | | | | | | |
| | Civil Works | - | - | - | - | - | - | - | - | - | - |
| | 34.5 kV Cells | - | - | - | - | - | - | - | - | - | - |
| | 10 kV Cells | - | - | - | - | - | - | - | - | - | - |
| | Transformers | - | 1/15 MVA | - | - | - | - | 504 | 190 | 30 | 724 |
| | Line Connections | - | - | - | - | - | - | - | - | - | - |
| | TOTAL 34.5 kV SUB-STATIONS | | | 14,847 | 7,125 | 10,195 | 32,167 | 5,565 | 2,640 | 3,945 | 12,150 |

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

Investment Program 1974 and 1975
(Base Price End 1971)

(LT Thousands -- LT14 = US$1)

| | | Quantities | | 1974 | | | | 1975 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1974 | 1975 | Foreign Costs | Customs Duties | Local Costs | Total | Foreign Costs | Customs Duties | Local Costs | Total |
| B. | 34.5 kV OVERHEAD LINES | | | | | | | | | | |
| 1. | Cendere-Levent | 20 km | - | - | - | 5,000 | 5,000 | - | - | - | - |
| 2. | Umraniye-Merdivenkoy - Selimiye | 8 km | - | - | - | 2,000 | 2,000 | - | - | - | - |
| 3. | Caddebostani Spur | - | 2 km | - | - | - | - | - | - | 500 | 500 |
| 4. | Vanikoy-Beylerbeyi-Selimiye | - | 6 km | - | - | - | - | - | - | 1,500 | 1,500 |
| 5. | Yildiztepe-Cendere | - | 4 km | - | - | - | - | - | - | 1,000 | 1,000 |
| 6. | Beysol-Savrakoy-Gungoren | 14.6 km | - | - | - | 3,650 | 3,650 | - | - | - | - |
| | TOTAL 34.5 kV OVERHEAD LINES | 42.6 km | 12 km | - | - | 10,650 | 10,650 | - | - | 3,000 | 3,000 |
| C. | 34.5 kV CABLES | | | | | | | | | | |
| 1. | Selmiye-Altiyol | 5 km | - | 1,400 | 1,400 | 500 | 3,300 | - | - | - | - |
| 2. | Altiyol-Umraniye | 7 km | - | 1,960 | 1,960 | 700 | 4,620 | - | - | - | - |
| 3. | Zincirlikuyu-Arnavutkoy | - | 12 km | - | - | - | - | 3,360 | 3,360 | 1,200 | 7,920 |
| 4. | Sagmalcilar-Silahtar | - | 20 km | - | - | - | - | 5,600 | 5,600 | 2,000 | 13,200 |
| 5. | Ulubatli-Davutpasa | 5 km | - | 1,400 | 1,400 | 500 | 3,300 | - | - | - | - |
| 6. | Beyazit-Alemdar | 4 km | - | 1,120 | 1,120 | 400 | 2,640 | - | - | - | - |
| | TOTAL 34.5 kV CABLES | 21 km | 32 km | 5,880 | 5,880 | 2,100 | 13,860 | 8,960 | 8,960 | 3,200 | 21,120 |
| D. | 10 kV SYSTEM | | | | | | | | | | |
| 1. | Cables | 100 km | 110 km | 15,000 | 15,000 | 10,000 | 40,000 | 16,500 | 16,500 | 11,000 | 44,000 |
| 2. | Overhead Lines | 20 km | 17.5 km | - | - | 1,600 | 1,600 | - | - | 1,425 | 1,425 |
| 3. | Distribution Transformer Stations | | | | | | | | | | |
| | i) Normal | 70 | 80 | 3,150 | 1,400 | 350 | 4,900 | 3,600 | 1,600 | 400 | 5,600 |
| | ii) Compact | 40 | 40 | 2,800 | 1,600 | 200 | 4,600 | 2,800 | 1,600 | 200 | 4,600 |
| 4. | Transformers (Standard size 630 KVA | 70 MVA | 80 MVA | 4,410 | 1,540 | 700 | 6,650 | 5,040 | 1,760 | 800 | 7,600 |
| | TOTAL 10 kV SYSTEM | | | 25,360 | 19,540 | 12,850 | 57,750 | 27,940 | 21,460 | 13,825 | 63,225 |
| E. | LT SYSTEM | | | | | | | | | | |
| 1. | Cables | 120 km | 140 km | - | - | 24,000 | 24,000 | - | - | 27,800 | 27,800 |
| 2. | Overhead Lines | 100 km | 110 km | - | - | 7,000 | 7,000 | - | - | 7,700 | 7,700 |
| | TOTAL LT SYSTEM | | | - | - | 31,000 | 31,000 | - | - | 35,500 | 35,500 |

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

Investment Program 1974 and 1975
(Base Price End 1971)

(LT Thousands -- LT14 = US$1)

| | | Quantities | | 1974 | | | | 1975 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1974 | 1975 | Foreign Costs | Customs Duties | Local Costs | Total | Foreign Costs | Customs Duties | Local Costs | Total |
| F. | MISCELLANEOUS EQUIPMENT | | | | | | | | | | |
| 1. | Capacitators (MVAR) | 27 | 13 | 1,540 | 1,650 | 330 | 3,520 | 770 | 825 | 165 | 1,760 |
| 2. | Rehabilitation existing 34.5 kV System /1 | - | - | 2,730 | 2,090 | 3,920 | 8,740 | 2,730 | 2,090 | 3,920 | 8,740 |
| 3. | Telemeasuring System /1 | - | 9 | - | - | - | - | 2,800 | 2,100 | 1,500 | 6,400 |
| 4. | Teleprinter System /1 | | | - | - | - | - | 5,600 | 4,200 | 2,000 | 11,800 |
| 5. | Radio and Telephone Equipment /1, /2 | | | 3,160 | 2,380 | 700 | 6,240 | - | - | - | - |
| 6. | Relay and Protective Equipment /1 | 1,260 | - | 4,500 | 3,380 | 1,500 | 9,380 | - | - | - | - |
| 7. | Current and Potential Transformers | 2,900 | - | 3,350 | 2,500 | 1,000 | 6,850 | - | - | - | - |
| 8. | Service Vehicles (Number) | 114 | - | 8,870 | 6,650 | - | 15,520 | - | - | - | - |
| 9. | Construction Equipment (items) | 40 | - | 770 | 590 | - | 1,360 | - | - | - | - |
| 10. | Cable-Fault Locators | 8 | - | 2,240 | 2,240 | - | 4,480 | - | - | - | - |
| 11. | 3-Phase Meters | 15,250 | 15,255 | 7,000 | 5,600 | - | 12,600 | 7,000 | 5,600 | - | 12,600 |
| 12. | Single Phase Meters | 70,000 | 70,000 | - | - | 10,000 | 10,000 | - | - | 11,000 | 11,000 |
| | TOTAL MISCELLANEOUS EQUIPMENT | | | 34,160 | 27,080 | 17,450 | 78,690 | 18,900 | 14,815 | 18,585 | 52,300 |

/1 For disbursement only after completion of supplementary studies.
/2 10 Telephone Stations; 13 Transmitters; 50 Portable Transmitter/Receivers; 100 Mobile Vehicles sets; 2 Main Stations.

| SUMMARY QUANTITIES | 1974 | 1975 | Total |
|---|---|---|---|
| 34.5 kV SUBSTATIONS | | | |
| New | 7 | 3 | 10 |
| Expansion | 7 | 5 | 12 |
| 34.5 kV Cells | 42 | 17 | 59 |
| 10 kV Cells | 75 | 31 | 106 |
| Transformers | 19/15 MVA | 7/15 MVA | 26 |
| Connections Line (m) | 4,400 | 800 | 5,200 |
| Cable (m) | 1,400 | - | 1,400 |
| 34.5 kV OVERHEAD LINES (km) | 42.6 | 12 | 546 |
| 34.5 kV CABLES (km) | 21 | 32 | 53 |
| 10 kV SYSTEM | | | |
| Cables (km) | 100 | 110 | 210 |
| Overhead Lines (km) | 20 | 17.5 | 37.5 |
| Distribution Transformers Stations | 110 | 120 | 230 |
| Distribution Transformers (MVA) | 70 | 80 | 150 |
| LT SYSTEM | | | |
| Cables (km) | 120 | 140 | 260 |
| Overhead Lines | 100 | 110 | 210 |

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

Investment Program 1974 and 1975

Summary

(LT Thousands -- LT14 = US$1)

| | 1974 | | | | 1975 | | | | Total 1974-1975 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Foreign Costs | Customs Duties | Local Costs | Total | Foreign Costs | Customs Duties | Local Costs | Total | Foreign Costs | Customs Duties | Local Costs | Total |
| 34.5 kV SYSTEM | | | | | | | | | | | | |
| Substations | 14,847 | 7,125 | 10,195 | 32,167 | 5,565 | 2,640 | 3,945 | 12,150 | 20,412 | 9,765 | 14,140 | 44,317 |
| Overheadlines | - | - | 10,650 | 10,650 | - | - | 3,000 | 3,000 | - | - | 13,650 | 13,650 |
| Cables | 5,880 | 5,880 | 2,100 | 13,860 | 8,960 | 8,960 | 3,200 | 21,120 | 14,840 | 14,840 | 5,300 | 34,980 |
| TOTAL 34.5 kV SYSTEM | 20,727 | 13,005 | 22,945 | 56,677 | 14,525 | 11,600 | 10,145 | 36,270 | 35,252 | 24,605 | 33,090 | 92,947 |
| 10 kV SYSTEM | 25,360 | 19,540 | 12,850 | 57,750 | 27,940 | 21,460 | 13,825 | 63,225 | 53,300 | 41,000 | 26,675 | 120,975 |
| LT SYSTEM | - | - | 31,000 | 31,000 | - | - | 35,500 | 35,500 | - | - | 66,500 | 66,500 |
| MISCELLANEOUS EQUIPMENT | 34,160 | 27,080 | 17,450 | 78,690 | 18,900 | 14,815 | 18,585 | 52,300 | 53,060 | 41,895 | 36,035 | 130,990 |
| SUB-TOTAL (Price Base End 1971) | 80,247 | 59,625 | 84,245 | 224,117 | 61,365 | 47,875 | 78,055 | 187,295 | 141,612 | 107,500 | 162,300 | 411,412 |
| CONTINGENCIES | | | | | | | | | | | | |
| Physical 5% | 4,013 | 2,985 | 4,215 | 11,213 | 3,065 | 2,395 | 3,945 | 9,405 | 7,078 | 5,380 | 8,160 | 20,618 |
| Price Increase Foreign 6% p.a. | 10,110 | 7,390 | - | 17,500 | 11,000 | 9,730 | - | 20,730 | 20,510 | 17,120 | - | 37,630 |
| Local 8% p.a. | - | - | 21,540 | 21,540 | - | - | 28,000 | 28,000 | - | - | 50,140 | 50,140 |
| TOTAL CONTINGENCIES | 14,123 | 10,375 | 25,755 | 50,253 | 14,065 | 12,125 | 31,945 | 58,135 | 27,588 | 22,500 | 57,100 | 108,388 |
| TRANSPORT AND INSURANCE 6% | 5,630 | - | - | 5,630 | 4,570 | - | - | 4,570 | 10,200 | - | - | 10,200 |
| SUB-TOTAL CONSTRUCTION COSTS | 100,000 | 70,000 | 110,000 | 280,000 | 80,000 | 60,000 | 110,000 | 250,000 | 179,400 | 130,000 | 220,600 | 530,000 |
| CONSULTING SERVICES | | | | | | | | | | | | |
| Project | 4,650 | - | 6,000 | 10,650 | 4,650 | - | 6,000 | 10,650 | 9,300 | - | 12,000 | 21,300 |
| Organization and Management Study | 700 | - | 750 | 1,450 | 700 | - | 750 | 1,450 | 1,400 | - | 1,500 | 2,900 |
| Transport Study | 2,100 | - | 600 | 2,700 | - | - | - | - | 2,100 | - | 600 | 2,700 |
| Gas Study | 2,100 | - | 600 | 2,700 | - | - | - | - | 2,100 | - | 600 | 2,700 |
| Contingency | 1,050 | - | 1,050 | 2,100 | 650 | - | 750 | 1,400 | 1,700 | - | 1,800 | 3,500 |
| TOTAL CONSULTING SERVICES | 10,600 | - | 9,000 | 19,600 | 6,000 | - | 7,500 | 13,500 | 16,600 | - | 16,500 | 33,100 |
| TOTAL PROJECT | 110,600 | 70,000 | 119,000 | 299,600 | 86,000 | 60,000 | 117,500 | 263,500 | 196,000 | 130,000 | 237,100 | 563,100 |
| TOTAL PROJECT IN US$ EQUIVALENT | | | | | | | | | 14,000,000 | 9,300,000 | 16,920,000 | 40,220,000 |

Note

This estimate does not take into account February 1973 Currency Exchange-Rate changes.
The February 1973 devaluation of the U.S. dollars occurred after the above cost estimate was complied, but it is too early to determine the extent if any, of its effects on costs.

February 16, 1973

ANNEX 16

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

Disbursement Schedule

(LT 14.0 = US$1)

| Calendar Year | Quarter | (LT Million) IETT Financed Foreign | IETT Financed Local | Loan Financed Foreign | Total | US$(000) Bank Loan | US$(000) Undisbursed | Bank Year | Fiscal Quarter |
|---|---|---|---|---|---|---|---|---|---|
| 1972 | 1 | | 25.6 | - | | | | 1972 | 3 |
| | 2 | | 25.6 | - | | | | | 4 |
| | 3 | 6.1 | 25.6 | - | | | | 1973 | 1 |
| | 4 | 6.2 | 25.6 | - | | | | | 2 |
| | | 11.3 | 102.4 | - | 113.7 | | | | |
| 1973 | 1 | | 33.5 | - | | | | | 3 |
| | 2 | | 33.6 | - | | | 14,000 | | 4 |
| | 3 | | 33.5 | 34.8 | | 2,486 | 11,514 | 1974 | 1 |
| | 4 | | 33.6 | 42.7 | | 3,050 | 8,464 | | 2 |
| | | 6.6 | 134.2 | 77.5 | 218.3 | | | | |
| 1974 | 1 | - | 47.0 | 43.9 | | 3,136 | 5,328 | | 3 |
| | 2 | - | 47.0 | 18.4 | | 1,314 | 4,014 | | 4 |
| | 3 | - | 47.0 | 25.8 | | 1,843 | 2,171 | 1975 | 1 |
| | 4 | - | 48.0 | 2.4 | | 171 | 2,000 | | 2 |
| | | - | 189.0 | 90.5 | 279.5 | | | | |
| 1975 | 1 | - | 44.5 | 1.0 | | 71 | 1,929 | | 3 |
| | 2 | - | 44.5 | 8.7 | | 622 | 1,307 | | 4 |
| | 3 | - | 44.5 | 10.9 | | 779 | 528 | 1976 | 1 |
| | 4 | - | 44.6 | 0.6 | | 43 | 485 | | 2 |
| | | - | 178.1 | 21.2 | 199.3 | | | | |
| 1976 | 1 | - | - | - | | - | 485 | | 3 |
| | 2 | - | - | 4.5 | | 321 | 164 | | 4 |
| | 3 | - | - | 2.3 | | 164 | - | 1977 | 1 |
| | | - | - | 6.8 | 6.8 | | | | |
| Total LT(Million) | | 17.9 | 603.7 | 196.0 | LT Million 817.6 | 14,000 | | | |

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

Electricity Outages: Causes and Duration 1/

| | | 1967 | | | 1968 | | | 1969 | | | 1970 | | | 1971 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number of Outages | Total Duration in Minutes | Average Duration in Minutes | Number of Outages | Total Duration in Minutes | Average Duration in Minutes | Number of Outages | Total Duration in Minutes | Average Duration in Minutes | Number of Outages | Total Duration in Minutes | Average Duration in Minutes | Number of Outages | Total Duration in Minutes | Average Duration in Minutes |
| 1. | GENERATION AND TRANSMISSION | 94 | 1453 | 15.5 | 52 | 1271 | 24.4 | 103 | 7833 | 76.0 | 86 | 3402 | 39.6 | 80 | 3114* 2/ | 39.3 |
| 2. | 34.5 kV and 10 kV SYSTEM | | | | | | | | | | | | | | | |
| 2.1 | Due to external reasons | | | | | | | | | | | | | | | |
| | Distribution Substations | 29 | 2740 | 94.5 | 103 | 5033 | 48.9 | 98 | 10422 | 106.3 | 63 | 4957 | 78.7 | 30 | 2479 | 82.6 |
| | Submarine Cables | - | - | - | - | - | - | 6 | 774 | 129.0 | 5 | 650 | 130.0 | 4 | 270 | 67.5 |
| | Overhead Lines | 16 | 456 | 28.5 | 22 | 1671 | 75.6 | 47 | 3801 | 80.9 | 42 | 3783 | 90.1 | 65 | 4198 | 64.6 |
| | Cable Joints | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | Storms causing short circuits | 23 | 831 | 36.1 | 20 | 643 | 32.2 | 23 | 692 | 30.1 | 8 | 512 | 64.0 | 7 | 217 | 31.0 |
| | Water and Snow damage | 4 | 650 | 162.5 | 11 | 620 | 56.4 | 7 | 1960 | 280.0 | 11 | 1774 | 161.3 | 5 | 520 | 104.0 |
| | Rats | 14 | 846 | 60.4 | 19 | 740 | 38.9 | 4 | 130 | 32.5 | 17 | 825 | 48.5 | 10 | 359 | 35.9 |
| | Accidents | 1 | 60 | 60.0 | 1 | 110 | 110.0 | 1 | 60 | 60.0 | 1 | 1 | 1.0 | - | - | - |
| | Sub-Total | 87 | 5583 | 64.2 | 176 | 8817 | 50.1 | 186 | 17839 | 95.9 | 147 | 12502 | 85.0 | 121 | 8043 | 66.5 |
| 2.2 | Due to technical reasons | | | | | | | | | | | | | | | |
| | Cables | | | | | | | | | | | | | | | |
| | Faulty cable joints | 9 | 380 | 42.2 | 13 | 2965 | 228.1 | 6 | 265 | 44.2 | 2 | 90 | 45.0 | 5 | 165 | 33.0 |
| | Cable faults | 213 | 17663 | 82.9 | 315 | 26318 | 83.5 | 314 | 38206 | 121.7 | 312 | 29325 | 94.0 | 354 | 30388* | 85.8 |
| | Submarine cable joints | 1 | 75 | 75.0 | - | - | - | - | - | - | - | - | - | - | - | - |
| | Submarine cable faults | 6 | 170 | 28.3 | 2 | 61 | 30.5 | 3 | 18 | 6.0 | 1 | 53 | 53.0 | 7 | 305 | 43.6 |
| | Sub-Total | 229 | 18288 | 79.9 | 330 | 29344 | 88.9 | 323 | 38489 | 119.2 | 315 | 29468 | 93.5 | 366 | 30858 | 84.3 |
| | Overhead Lines | | | | | | | | | | | | | | | |
| | Insulators | 5 | 600 | 120.0 | 50 | 4379 | 87.6 | 13 | 1193 | 91.8 | 9 | 1946 | 216.2 | 6 | 449 | 74.8 |
| | Conductor break | 6 | 556 | 92.7 | 8 | 298 | 37.3 | 20 | 852 | 42.6 | 15 | 433 | 28.9 | 3 | 271 | 90.3 |
| | Conductor contact | 8 | 1088 | 136.0 | 29 | 1283 | 44.2 | 20 | 2195 | 109.8 | 6 | 290 | 48.3 | 16 | 1070 | 66.9 |
| | Connections | - | - | - | 3 | 233 | 77.7 | 2 | 160 | 80.0 | 7 | 521 | 74.4 | 6 | 570 | 95.0 |
| | Sub-Total | 19 | 2244 | 118.1 | 90 | 6193 | 68.8 | 55 | 4400 | 80.0 | 37 | 3190 | 86.2 | 31 | 2360 | 76.1 |
| | Substations | | | | | | | | | | | | | | | |
| | Transformers | - | - | - | 8 | 405 | 50.6 | 16 | 1120 | 70.0 | 79 | 7919 | 100.2 | 73 | 6626* | 90.8 |
| | Switchgear | 39 | 2505 | 64.2 | 51 | 4357 | 85.4 | 71 | 6265 | 88.2 | 33 | 2022 | 61.3 | 24 | 2277 | 94.9 |
| | Relays | 84 | 2737 | 32.6 | 115 | 4991 | 43.4 | 66 | 3455 | 52.3 | 97 | 3349 | 34.5 | 264 | 10513* | 39.8 |
| | Faulty operation | - | - | - | 12 | 245 | 20.4 | - | - | - | 1 | 38 | 38.0 | - | - | - |
| | Sub-Total | 123 | 5242 | 42.6 | 186 | 9998 | 53.8 | 153 | 10840 | 70.8 | 210 | 13328 | 63.5 | 361 | 19416 | 53.8 |
| | Temporary Network Outages (Other) | | | | | | | | | | | | | | | |
| | Cables | 48 | 2585 | 53.9 | 48 | 3242 | 67.5 | 41 | 2215 | 54.0 | 55 | 2023 | 36.8 | 91 | 4460 | 49.0 |
| | Submarine cables | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | Overhead lines | 13 | 684 | 52.6 | 30 | 1206 | 40.2 | 19 | 1222 | 64.3 | 14 | 245 | 17.5 | 34 | 1532 | 45.1 |
| | Sub-Total | 61 | 3269 | 53.6 | 78 | 4448 | 57.0 | 60 | 3437 | 57.3 | 69 | 2268 | 32.9 | 125 | 5992 | 47.9 |
| | Total 34.5 kV and 10 kV System | 519 | 34626 | 66.7 | 860 | 58800 | 68.4 | 777 | 75005 | 96.5 | 778 | 60756 | 78.1 | 1004 | 66669 | 66.4 |
| 3. | LOW TENSION NETWORK | | | | | | | | | | | | | | | |
| | Transformers | 21 | 1980 | 94.3 | 18 | 2750 | 152.8 | 47 | 2540 | 54.0 | 265 | 12625 | 47.6 | 525 | 23342* | 44.5 |
| | Switchgear | 25 | 1030 | 41.2 | 13 | 570 | 43.8 | 17 | 570 | 33.5 | 18 | 1195 | 66.4 | 106 | 3670 | 34.6 |
| | Outages caused by animals | 1 | 30 | 30.0 | 5 | 425 | 85.0 | - | - | - | 1 | 25 | 25.0 | 1 | 20 | 20.0 |
| | Cables | 43 | 2685 | 62.4 | 98 | 8175 | 83.4 | 91 | 7470 | 82.1 | 72 | 6660 | 92.5 | 59 | 4030 | 68.3 |
| | Water and snow damage | - | - | - | 3 | 70 | 23.3 | 10 | 280 | 28.0 | - | - | - | 1 | 15 | 15.0 |
| | Overhead Lines | 40 | 2325 | 58.1 | 105 | 4761 | 45.3 | 169 | 12740 | 75.4 | 597 | 35741 | 59.9 | 839 | 61734* | 73.6 |
| | Kites on Overhead Lines | 9 | 390 | 43.3 | 27 | 1192 | 44.1 | 20 | 2200 | 110.0 | 6 | 295 | 49.2 | 12 | 630 | 52.5 |
| | Overloads | 744 | 21315 | 28.6 | 385 | 12358 | 32.1 | 589 | 19625 | 33.3 | 375 | 18200 | 48.5 | 657 | 20405* | 31.1 |
| | Short circuit originating from consumer | 235 | 6700 | 28.5 | 269 | 9628 | 35.8 | 255 | 7906 | 31.0 | 131 | 3877 | 29.6 | 65 | 2017 | 31.0 |
| | Various | 48 | 2500 | 52.1 | 232 | 7070 | 30.5 | 219 | 6220 | 28.4 | 386 | 11375 | 29.5 | 433 | 10890 | 25.2 |
| | Temporary Network Outages (Other) | 498 | 16780 | 33.7 | 430 | 16774 | 39.0 | 730 | 22349 | 30.6 | 976 | 27403 | 28.1 | 929 | 25208 | 27.1 |
| | Total L.T. System | 1664 | 55735 | 33.5 | 1585 | 63773 | 40.2 | 2147 | 81900 | 38.1 | 2827 | 117396 | 41.5 | 3627 | 151961 | 41.9 |
| | Total Outages | 2277 | 91814 | 40.3 | 2497 | 123844 | 49.6 | 3027 | 164738 | 54.4 | 3691 | 181554 | 49.2 | 4711 | 221744 | 47.1 |
| | IETT Sales in GWh | 1197.2 | | | 1338.9 | | | 1463.0 | | | 1575.0 | | | 1648.3 | | |
| | kWh Sold Per Outage | 525779 | | | 536203 | | | 483316 | | | 426714 | | | 349883 | | |
| | kWh Sold Per Minute Outage | | 13039 | | | 10811 | | | 8881 | | | 8675 | | | 7433. | |
| | Growth Rate of Sales in % | - | | | 11.8% | | | 9.3% | | | 7.7% | | | 4.7% | | |
| | Growth Rate of Outages (Number) in % | - | | | 9.7% | | | 21.2% | | | 21.9% | | | 27.6% | | |
| | Growth Rate of Outages (Duration) in % | | | | | 34.9% | | | 33.0% | | | 10.2% | | | 22.1% | |

Notes:- 1. The above statistics are to be used with caution since no information is available on the number of consumers affected by each outage.

2. Outages marked * can be reduced by rehabilitation, design and improved maintenance procedures. Reduction of outages by 70% not unreasonable.

August 21, 1972

REPUBLIC OF TURKEY

INSTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

## Calculation of the Financial Rate of Return on the Project

1. For the purpose of calculating the financial rate of return, the Project was assumed to consist of the whole of IETT's proposed 1972-75 distribution program. The financial rate of return is defined as the discount rate at which the present worth of the Project's capital and operating costs over its life equals the present worth of the benefits in the form of attributable revenues.

### Assumptions

2. The calculation was made on the following assumptions:

(i) Project life of 25 years;

(ii) for the main calculation, tariff levels for both the sales and purchase of energy were assumed to remain as at present, but the effect on the rate of return of a 20% reduction in sales tariffs was also calculated;

(iii) annual operating costs were taken as the estimated increases attributable to the expansion of operations as a result of the Project, net of the savings resulting from the improved efficiency of operations with the new equipment. Incremental maintenance costs were likewise calculated net of the savings in maintenance expenses through the replacement of old and dilapidated plant, subject to high maintenance costs, by up-to-date equipment (this results in negative incremental maintenance costs after 1973, indicating net savings in system maintenance costs as a result of the Project). Annual costs were assumed to remain constant from 1976-77, when it is assumed that the Project facilities would be fully utilized;

(iv) the annual benefits were calculated by multiplying incremental kWh sales attributable to the Project each year by the forecast average revenue per kWh for that year and deducting the cost of purchased power to give the net revenue. Because of the time lag in project

implementation, no benefits were attributed to 1972. Attributable sales were assumed to remain constant at the 1976 level in subsequent years but average net revenue per kWh was assumed to decline from the 1976 figure of 17.7 kurus to 16.4 kurus in 1983.

3. The streams of costs and benefits resulting from these assumptions are shown in the table below. The discount rate which equalizes the present worths of costs and benefits, assuming maintenance of current tariff levels, is 30%. With tariff levels for power resulting in a 20% reduction in revenues (the transport subsidy element estimated to be included in the present tariffs), this becomes 14%.

| | Costs, LT Millions | | | | Benefits, LT Millions | |
|---|---|---|---|---|---|---|
| | | | | | Net Revenues | |
| Year | Capital | Operating | Maintenance | Total Costs | (a) | (b) |
| 1972 | 115.3 | 4.0 | 7.0 | 126.3 | - | - |
| 1973 | 180.1 | 8.0 | 3.2 | 191.3 | 119.0 | 60.3 |
| 1974 | 250.3 | 11.6 | - 8.4 | 253.5 | 153.0 | 76.8 |
| 1975 | 213.0 | 13.1 | - 9.1 | 217.0 | 195.0 | 99.8 |
| 1976 | 5.0 | 17.1 | - 8.1 | 14.0 | 238.0 | 122.9 |
| 1977 | | 15.1 | - 8.1 | 7.0 | 234.0 | 120.2 |
| 1978 | | 15.1 | - 8.1 | 7.0 | 234.0 | 120.2 |
| 1979 | | 15.1 | - 8.1 | 7.0 | 230.0 | 117.5 |
| 1980 | | 15.1 | - 8.1 | 7.0 | 227.0 | 114.8 |
| 1981 | | 15.1 | - 8.1 | 7.0 | 225.0 | 112.1 |
| 1982 | | 15.1 | - 8.1 | 7.0 | 223.0 | 110.7 |
| 1983-1996 | | 15.1 | - 8.1 | 7.0 | 221.0 | 109.4 |

Net revenues (a) assume present tariffs for sale and purchase of electricity.
Net revenues (b) assume present tariff for purchase but 20% reduction in tariff for sale of electricity.

Other Benefits

4. The above calculation takes no account of other benefits attributable to the Project. The most important of these are likely to be reduced losses of industrial output through the improvement in system reliability and consequent reduction in power outages. These cannot be calculated with any degree of precision, but some idea of their significance may be derived from the results of a survey made by the Istanbul Chamber of Commerce. This concluded that in 1971 the power supply to industry in Istanbul failed for 81 hours during working hours. Industrial enterprises worked, on average, about 11-1/2 hours per day after allowing for three, two and single shift operation. The value added by industry in Turkey in 1971 is estimated at about LT 41,000 million, of which some 30% or LT 12,000 million may be attributed to the

Istanbul region. Assuming 300 working days in the year, average value added per hour was about LT 3.5 million. The cost to the economy of the loss of 81 hours production would therefore have been LT280 million. This figure does not include indirect losses due to voltage drops not resulting in actual outages which could also result in:

(i) poor lighting, thus increasing the accident rate;

(ii) the need to renew or repair burnt-out motors; and

(iii) decrease of productivity.

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

Actual Income Statements 1969-1971 - All Departments and Consolidated

(LT millions -- LT 14 = US$1)

| | ELECTRICITY | | | TRANSPORT | | | GAS | | | IETT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1969 | 1970 | 1971 | 1969 | 1970 | 1971 | 1969 | 1970 | 1971 | 1969 | 1970 | 1971 |
| Sales of Units 1/ | 1,426.0 | 1,527.2 | 1,591.0 | 44.9 | 47.2 | 46.9 | 21.0 | 18.4 | 14.0 | - | - | - |
| Millions of Consumers - Passengers | 587.6 | 627.9 | 655.0 | 211.2 | 244.2 | 253.2 | 0.00 | 0.035 | 0.033 | - | - | - |
| Purchases Electricity GWh | 1,244.1 | 1,418.4 | 1,914.1 | | | | - | - | - | - | - | - |
| Generation Electricity: Gas 1/ | 419.6 | 371.4 | - | - | - | - | 22.6 | 20.6 | 19.0 | - | - | - |
| Sales Return krs per unit 2/ | 27.7 | 27.8 | 32.3 | 46.7 | 47.2 | 61.7 | 53.8 | 55.4 | 70.0 | - | - | - |
| Purchase Cost krs per kWh | 11.7 | 11.8 | 17.1 | - | - | - | - | - | - | - | - | - |
| Revenue | | | | | | | | | | | | |
| Sales Electricity, Tickets & Gas | 395.1 | 424.4 | 513.9 | 98.6 | 115.3 | 156.2 | 11.3 | 10.2 | 9.8 | 505.0 | 549.9 | 679.9 |
| Other Operating Revenue 3/ | 49.8 | 61.5 | 63.4 | 4.6 | 5.7 | 7.7 | 6.5 | 5.6 | 9.7 | 60.9 | 72.8 | 80.8 |
| Total Operating Revenue | 444.9 | 485.9 | 577.3 | 103.2 | 121.0 | 163.9 | 17.8 | 15.8 | 19.5 | 565.9 | 622.7 | 760.7 |
| Expenditure | | | | | | | | | | | | |
| Salaries, Wages & perquisites | 75.9 | 86.1 | 102.9 | 128.3 | 142.7 | 205.3 | 12.1 | 13.1 | 17.6 | 216.3 | 241.9 | 325.8 |
| Fuel 4/ | 65.7 | 59.7 | - | 14.5 | 18.1 | 23.1 | 10.7 | 9.9 | 14.1 | 90.9 | 87.7 | 37.2 |
| Purchases of Electricity | 145.2 | 167.4 | 327.5 | 3.5 | 3.3 | 3.8 | - | - | - | 148.7 | 170.7 | 331.3 |
| Materials | 8.8 | 9.0 | 7.4 | 13.8 | 20.7 | 25.7 | 1.3 | 1.2 | 1.0 | 23.9 | 30.9 | 34.1 |
| Administrative & Insurance 5/ | 5.6 | 6.4 | 6.5 | 6.0 | 6.7 | 8.2 | 1.1 | 0.8 | 1.2 | 12.7 | 13.9 | 16.7 |
| Municipal Royalty | 0.7 | 0.7 | 0.7 | 0.3 | 0.3 | 0.3 | - | - | - | 1.0 | 1.0 | 1.0 |
| Estimated Loss due to Illegal Connections 6/ | 6.5 | 7.5 | 10.0 | - | - | - | - | - | - | 6.5 | 7.5 | 10.0 |
| Depreciation | 23.0 | 24.8 | 27.2 | 21.9 | 22.1 | 26.4 | 5.4 | 5.6 | 5.7 | 50.3 | 52.5 | 58.5 |
| Total Operating Expenses | 331.4 | 361.6 | 482.2 | 188.3 | 213.9 | 292.8 | 30.6 | 30.6 | 39.6 | 550.3 | 606.1 | 814.6 |
| Net Operating Income | 113.5 | 124.3 | 95.1 | (85.1) | (92.9) | (128.9) | (12.8) | (14.8) | (20.1) | 15.6 | 16.6 | (53.9) |
| Interest on Long-Term Debt | 11.5 | 11.9 | 9.8 | 2.9 | 3.2 | 3.1 | 0.5 | 0.5 | 0.5 | 14.9 | 15.6 | 13.4 |
| Net Surplus or (Deficit) | 102.0 | 112.4 | 85.3 | (88.0) | (96.1) | (132.0) | (13.3) | (15.3) | (20.6) | 0.7 | 1.0 | (67.3) |
| 5% Legal Reserve for Expansion 7/ | - | - | 25.0 | - | - | - | - | - | - | - | - | 25.0 |
| Other Adjustments | | | | | | | | | | | | |
| Maximum Disposal Surplus (Deficit) | 102.0 | 112.4 | 60.3 | (88.0) | (96.1) | (132.0) | (13.3) | (15.3) | (20.6) | 0.7 | 1.0 | (92.3) |
| Average Net Fixed Assets | 316.2 | 337.0 | 368.3 | | | | | | | 501.3 | 551.8 | 587.4 |
| Return on Average Net Fixed Assets | 35.9% | 36.9% | 25.8% | - | - | - | - | - | - | 3.1% | 3.0% | - |
| Depreciation @ % Gross Fixed Assets | 6.5% | 6.3% | 6.3% | | | | | | | | | |

Notes:

1/ a) "Units" comprise GWhs for Electricity Millions of kilometers for transport and Millions $M^3$ for Gas.
b) GWhs of Electricity sold include 25, 30 and 35 GWhs in 1969, 1970 and 1971 respectively estimated to have been used through authorized connections (See Note 6).

2/ Average returns are shown in krs per kWh, passenger and $M^3$ respectively for electricity, transport and gas. Transport tariffs were increased by some 60% from 7-1-1971.

3/ "Other Operating Revenue" includes meter rentals, advertising rental income on buses, etc., sales of coke, tar, ash and other gas byproducts, and profit or loss on sales of scrap or assets if any.

4/ Total generation expenses for Silahtar for 1969, 1970 and 1971 were TL Million 89.2, 75.9 and nil respectively since Silhartar was sold to TEK in late 1971. Cost per kWh generated in 1969 and 1970 were Krs 21.2 and 20.4 respectively,

5/ Total IETT insurance of LT Millions 4.6, 4.5 and 6.2 in 1969, 1970 and 1971 respectively is almost entirely by transfer to a reserve which is not funded and so provides no protection in view of IETT's financial position.

6/ The estimated value of the energy lost through illegal connections to an estimated 140,000 unathorized dwellings housing as many as one million squatters. Sales have been increased by like amounts.

7/ TEK law 1312 of 1970 requires the allocation of at least 5% of "gross electricity sales to third parties" to a special reserve, which may only be used for new distribution construction, such a reserve is therefore unavailable for any other purpose such as the support of transport or gas activities.

November 24, 1972

ANNEX 19

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

Actual and Forecast Balance Sheets 1969-1976 - All Departments and Consolidated

(LT Millions — LT14 = US$1)

| | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 |
|---|---|---|---|---|---|---|---|---|
| | ACTUAL | | | | | FORECAST | | |
| ASSETS | | | | | | | | |
| Gross Fixed Assets | | | | | | | | |
| Electricity | 473.9 | 532.4 | 563.7 | 666.2 | 794.5 | 1,073.7 | 1,321.0 | 1,623.5 |
| Transport | 247.6 | 273.7 | 297.4 | 324.1 | 332.5 | 341.6 | 351.7 | 361.3 |
| Gas | 84.2 | 88.4 | 95.4 | 98.0 | 101.0 | 104.0 | 107.0 | 110.0 |
| Head Office | 39.0 | 40.1 | 44.2 | 44.2 | 44.2 | 44.2 | 44.2 | 44.2 |
| Total Gross Fixed Assets | 844.7 | 934.6 | 1,000.7 | 1,132.5 | 1,272.2 | 1,563.5 | 1,823.9 | 2,139.0 |
| Less Depreciation | | | | | | | | |
| Electricity | 154.6 | 177.6 | 181.9 | 208.4 | 241.4 | 283.6 | 342.9 | 418.6 |
| Transport | 99.3 | 120.9 | 146.9 | 177.5 | 211.4 | 240.8 | 252.9 | 265.2 |
| Gas | 36.7 | 40.2 | 43.9 | 49.9 | 56.1 | 62.5 | 69.0 | 75.7 |
| Head Office | 22.4 | 23.9 | 25.2 | 26.8 | 28.4 | 30.0 | 31.6 | 33.2 |
| Total Depreciation | 313.0 | 362.6 | 397.9 | 462.6 | 537.3 | 616.9 | 696.4 | 792.7 |
| Net Fixed Assets | 531.7 | 572.0 | 602.8 | 669.9 | 734.9 | 946.6 | 1,127.5 | 1,346.3 |
| Work in Progress | | | | | | | | |
| Electricity | 3.8 | 8.4 | 6.0 | 17.2 | 107.2 | 107.5 | 109.5 | 113.8 |
| Transport | 0.9 | 0.9 | 0.9 | - | - | - | - | - |
| Gas | 3.8 | 4.3 | 1.3 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Total Work-in-Progress | 8.5 | 13.6 | 8.2 | 18.2 | 108.2 | 108.5 | 110.5 | 114.8 |
| Total Fixed Assets in Operation | 540.2 | 585.6 | 611.0 | 688.1 | 843.1 | 1,055.1 | 1,238.0 | 1,461.1 |
| Intangible Assets & TEK Deposit - Electricity | 39.4 | 22.1 | 18.2 | 25.0 | 27.5 | 30.5 | 33.0 | 36.0 |
| Loan to Cooperative - Head Office | 28.7 | 28.9 | 26.6 | 25.4 | 24.7 | 23.0 | 21.8 | 20.6 |
| Total Investments | 68.1 | 51.0 | 44.8 | 50.4 | 52.2 | 53.5 | 54.8 | 56.6 |
| Total Fixed Assets | 608.3 | 636.6 | 655.8 | 738.5 | 895.3 | 1,108.6 | 1,292.8 | 1,517.7 |
| Net Current Assets 1/ | | | | | | | | |
| Head Office Cost | 25.5 | 34.9 | 49.0 | 118.9 | 101.8 | 110.0 | 105.4 | 102.7 |
| Head Office Other | (74.1) | (73.4) | (158.0) | (79.0) | (85.5) | (92.0) | (99.0) | (106.0) |
| Electricity | 3.5 | (30.1) | (67.0) | 27.3 | 43.6 | 20.1 | 14.8 | 62.0 |
| Transport | 37.8 | 35.1 | 41.7 | 41.0 | 40.1 | 39.4 | 38.9 | 38.3 |
| Gas | 4.8 | 10.2 | 5.1 | 8.0 | 8.2 | 8.6 | 9.0 | 9.4 |
| Total Net Current Assets | (2.5) | (23.3) | (129.2) | 116.2 | 108.2 | 86.1 | 69.1 | 106.4 |
| TOTAL ASSETS | 605.8 | 613.3 | 526.6 | 854.7 | 1,003.5 | 1,194.7 | 1,361.9 | 1,624.1 |
| EQUITY AND LONG TERM DEBT | | | | | | | | |
| Original Equity | | | | | | | | |
| Electricity | 309.7 | 309.7 | 309.7 | 309.7 | 309.7 | 309.7 | 309.7 | 309.7 |
| Transport | 171.8 | 171.8 | 171.8 | 171.8 | 171.8 | 171.8 | 171.8 | 171.8 |
| Gas | 70.7 | 70.7 | 70.7 | 70.7 | 70.7 | 70.7 | 70.7 | 70.7 |
| Subtotal Original Equity | 552.2 | 552.2 | 552.2 | 552.2 | 552.2 | 552.2 | 552.2 | 552.2 |
| Government/Municipal Assistance - Head Office | - | - | - | 300.0 | 370.0 | 450.0 | 560.0 | 800.0 |
| Customers Contributions - Electricity | 120.4 | 140.5 | 163.0 | 187.3 | 214.0 | 243.4 | 275.7 | 311.3 |
| Sub-Total Contributions/Assistance | 120.4 | 140.5 | 163.0 | 487.3 | 584.0 | 693.4 | 835.7 | 1,111.3 |
| Accrued Profits (Losses) - Head Office | 4.3 | 4.3 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 |
| - Electricity | 507.5 | 598.0 | 642.4 | 805.7 | 957.6 | 1,106.3 | 1,255.3 | 1,399.0 |
| - Transport | (645.0) | (741.1) | (873.1) | (1,001.6) | (1,137.5) | (1,266.9) | (1,388.0) | (1,521.3) |
| - Gas | (67.2) | (84.6) | (104.3) | (129.7) | (158.7) | (190.4) | (225.4) | (263.9) |
| Net Accrued Profits (Losses) 2/ | (200.4) | (223.4) | (330.8) | (321.4) | (334.4) | (346.8) | (353.9) | (382.0) |
| TOTAL EQUITY | 472.2 | 469.3 | 384.4 | 718.1 | 801.8 | 898.8 | 1,034.0 | 1,281.5 |
| Long-term Debt | | | | | | | | |
| Electricity | 32.1 | 29.2 | 29.2 | 23.6 | 93.4 | 181.4 | 202.6 | 207.1 |
| Transport | 101.5 | 114.8 | 113.0 | 113.0 | 108.3 | 114.5 | 125.3 | 135.5 |
| Total Long-term Debt | 133.6 | 144.0 | 142.2 | 136.6 | 201.7 | 295.9 | 327.9 | 342.6 |
| Inter departmental Financing | | | | | | | | |
| To or (From) - Electricity | (603.7) | (722.2) | (805.3) | (799.0) | (843.3) | (892.6) | (907.9) | (810.4) |
| - Transport | 558.7 | 643.3 | 781.4 | 904.4 | 1,018.6 | 1,120.8 | 1,228.6 | 1,348.4 |
| - Gas | 52.6 | 76.6 | 91.5 | 116.1 | 142.1 | 170.8 | 202.7 | 237.9 |
| - Head Office | (7.6) | 2.3 | (67.6) | (221.5) | (317.4) | (399.0) | (523.4) | (775.9) |
| Net Balances | - | - | - | - | - | - | - | - |
| TOTAL EQUITY AND LONG TERM DEBT | 605.8 | 613.3 | 526.6 | 854.7 | 1,003.5 | 1,194.7 | 1,361.9 | 1,624.1 |

NOTE:

1/ For details of Net Current Assets, see Annexes 22 (Electricity), 26 (Head Office), 3 page 5 (Transport), and 4 page 4 (Gas).

2/ The accrued net loss for 1971 has been reduced by LT Million 127.8 being the consolidated debts etc. which will not be repaid to the Government (LT 296.3 million) less fictitious assets (LT 168.5 million). The equivalent net reduction of accumulated losses in 1969 was LT 191.9 million.

February 16, 1973

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY TRAMWAY AND TUNNEL COMPANY (IETT)

Summary of Forecast Operating Results

(LT Millions --LT 14 = US$1)

| | Actual 1/ | Forecast | | | | |
|---|---|---|---|---|---|---|
| | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 |
| Electricity 2/ | | | | | | |
| Operating Revenue | 577.3 | 845.0 | 907.5 | 996.7 | 1082.8 | 1169.2 |
| Operating Expenditure | 482.2 | 642.0 | 717.3 | 800.0 | 874.7 | 959.2 |
| Net Operating Income | 95.1 | 203.0 | 190.2 | 196.7 | 208.1 | 210.0 |
| Transport 3/ | | | | | | |
| Operating Revenue | 163.9 | 213.1 | 228.0 | 246.0 | 263.0 | 278.0 |
| Operating Expenditure | 292.8 | 334.6 | 357.9 | 370.4 | 379.1 | 406.3 |
| Net Operating (Loss) | (128.9) | (121.5) | (129.9) | (124.4) | (116.1) | (128.3) |
| Gas 4/ | | | | | | |
| Operating Revenue | 19.5 | 14.9 | 14.1 | 13.4 | 12.6 | 12.0 |
| Operating Expenditure | 39.6 | 39.8 | 42.6 | 44.5 | 47.0 | 49.8 |
| Net Operating (Loss) | (20.1) | (24.9) | (28.5) | (31.1) | (34.4) | (37.8) |
| Total Net Operating Income or (Loss) | (53.9) | 56.6 | 31.8 | 41.2 | 57.6 | 43.9 |
| Interest | | | | | | |
| Electricity | 9.8 | 8.0 | 4.6 | 11.2 | 18.8 | 22.0 |
| Transport | 3.1 | 7.0 | 6.0 | 5.0 | 5.0 | 5.0 |
| Gas | 0.5 | 0.5 | 0.5 | 0.6 | 0.6 | 0.7 |
| Total Interest | 13.4 | 15.5 | 11.1 | 16.8 | 24.4 | 27.7 |
| Net Surplus or (Loss) | | | | | | |
| Electricity | 85.3 | 195.0 | 185.6 | 185.5 | 189.3 | 188.0 |
| Transport | (132.0) | (128.5) | (135.9) | (129.4) | (121.1) | (133.3) |
| Gas | (20.6) | (25.4) | (29.0) | (31.7) | (35.0) | (38.5) |
| Total Net Surplus or (Loss) | (67.3) | 41.1 | 20.7 | 24.4 | 33.2 | 16.2 |

1/ For details see Annex 19.
2/ For details of Electricity Forecast Income Statements, see Annex 22
3/ For details of Transport Forecast Income Statements, see Annex 3, page
4/ For details of Gas Forecast Income Statements, see Annex 4, page

February 16, 1973

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY TRAMWAY AND TUNNEL COMPANY (IETT)

Electricity Department

Forecast Income Statements

(LT Millions -- LT14 = US$1)

| | Actual | Forecast | | | | | Total |
|---|---|---|---|---|---|---|---|
| | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1972/1976 |
| Sales GWhs 1/ | 1,591.0 | 1,880 | 2,082 | 2,300 | 2,510 | 2,725 | |
| Purchases of Electricity GWhs | 1,914.1 | 2,200 | 2,450 | 2,720 | 2,918 | 3,150 | |
| Sales return krs. per kWh 2/ | 32.3 | 41.5 | 40.3 | 40.2 | 40.1 | 39.9 | |
| Purchase cost krs. per kWh | 17.1 | 23.7 | 21.6 | 21.6 | 21.8 | 21.8 | |
| Revenue | | | | | | | |
| Sales of Electricity - Billed | 503.9 | 765.0 | 822.5 | 908.7 | 998.3 | 1,088.2 | 4,582.7 |
| Estimated Illegal Connections - Unbilled | 10.0 | 15.0 | 17.0 | 15.0 | 7.5 | - | 54.5 |
| Subtotal - Electricity Sales | 513.9 | 780.0 | 839.5 | 923.7 | 1,005.8 | 1,088.2 | 4,637.2 |
| Other operating revenue | 63.4 | 65.0 | 68.0 | 73.0 | 77.0 | 81.0 | 364.0 |
| Total Operating Revenue | 577.3 | 845.0 | 907.5 | 996.7 | 1,082.8 | 1,169.2 | 5,001.2 |
| Expenditure | | | | | | | |
| Salaries, Wages & Perquisites | 102.9 | 106.7 | 119.6 | 133.6 | 148.3 | 166.8 | |
| Purchases of Electricity | 327.5 | 476.1 | 528.5 | 588.0 | 635.5 | 687.0 | |
| Materials | 7.4 | 8.5 | 9.2 | 10.4 | 12.2 | 16.6 | |
| Administrative & Insurance | 6.5 | 7.0 | 7.8 | 8.6 | 9.7 | 10.9 | |
| Municipal Royalty 3/ | 0.7 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | |
| Depreciation 4/ | 27.2 | 27.7 | 34.2 | 43.4 | 60.5 | 76.9 | |
| Subtotal - Operating Expenses | 472.2 | 627.0 | 700.3 | 785.0 | 867.2 | 959.2 | 3,938.7 |
| Estimated Loss due to Illegal Connections | 10.0 | 15.0 | 17.0 | 15.0 | 7.5 | - | 54.5 |
| Total Adjusted Operating Expenses | 482.2 | 642.0 | 717.3 | 800.0 | 874.7 | 959.2 | 3,993.2 |
| Net Operating Income | 95.1 | 203.0 | 190.2 | 196.7 | 208.1 | 210.0 | 1,008.0 |
| Interest on Long-Term Debt | 9.8 | 8.0 | 4.6 | 11.2 | 18.8 | 22.0 | 64.6 |
| Net Surplus | 85.3 | 195.0 | 185.6 | 185.5 | 189.3 | 188.0 | 943.4 |
| 5% Legal Reserve for Expansion 7/ | 25.0 | 38.0 | 40.8 | 45.2 | 49.6 | 54.1 | |
| Net Maximum Disposable Surplus | 60.3 | 157.0 | 144.8 | 140.3 | 139.7 | 133.9 | |
| | | | | | | | Average |
| Average Net Fixed Assets in Operation | 368.3 | 419.8 | 505.5 | 671.6 | 884.1 | 1,094.5 | 793.4 |
| Operating Return | 25.8% | 48.3% | 37.6% | 29.3% | 23.5% | 19.2% | 25% |
| Operating Expenses as % of Operating Income | 82% | 74% | 77% | 79% | 80% | 82% | |
| Average Net Fixed Assets in Operation (Revalued) 5/ | 959.0 | 925.0 | 948.0 | 1,051.0 | 1,201.0 | 1,346.0 | 1,173.0 |
| Operating Return (on revalued assets) | 5.0% | 15% | 13% | 13.0% | 12% | 11% | 12% |
| Adjusted Depreciation on revalued assets (Approximately) 6/ | 72.0 | 89.0 | 96.0 | 105.0 | 122.0 | 137.0 | |
| Adjusted Net Operating Income (Approx.) | 49.0 | 140.0 | 127.0 | 135.0 | 147.0 | 150.0 | 140.0 |

1/ GWh's sold include estimated illegal connection usage for the years 1971 through 1975 of 35, 40, 45, 40 and 20 GWhs respectively.

2/ Sales return krs/kWh are shown for sales including estimated illegal connections consumption at domestic tariff rates.

3/ Royalties shown are based on IETT's interpretation, and the de facto acceptance of this position by the mayor. However, the municipality withholds payment of electricity bills in view of the municipal controllers interpretation of IETT's liability for outstanding royalties.

4/ Forecast depreciation for 1972 has been adjusted to exclude the depreciation on Silahtar sold to TEK in 1971.

5/ See Annex 26.

6/ The amount of annual depreciation that would be charged on the revalued assets can only be approximately estimated because the extent to which Silahtar had been retired by 1971 is not known. The legal average rate of about 6.5% has been maintained as for the forecasts at present book values.

7/ See Annex 19 note 7.

February 16, 1973

TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

Forecast Sources and Applications of Funds Statement 1972 - 1976 - Consolidated

(LT millions -- LT 14 = US$1)

| | 1971 Actual | 1972 | 1973 | 1974 Forecast | 1975 | 1976 | TOTAL 1972 - 1976 Electricity % | Electricity | Transport | Gas | Head Office (General) | IETT | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SOURCES | | | | | | | | | | | | | |
| Net Cash generation: | | | | | | | | | | | | | |
| Electricity - Operating Profit | 95.1 | 203.0 | 190.2 | 196.7 | 208.1 | 210.0 | | 1008.0 | | | | 1008.0 | |
| Transport - Operating (Loss) | (128.9) | (121.5) | (129.9) | (124.4) | (116.1) | (128.3) | | | (620.2) | | | ( 620.2) | |
| Gas - Operating (Loss) | ( 20.1) | ( 24.9) | ( 28.5) | ( 31.1) | ( 34.4) | ( 37.8) | | | | (156.7) | | ( 156.7) | |
| Net Operating Profit (Loss) | ( 53.9) | 56.6 | 31.8 | 41.2 | 57.6 | 43.9 | | 1008.0 | (620.2) | (156.7) | - | 231.1 | |
| Plus Depreciation - Electricity 1/ | 27.2 | 27.7 | 34.2 | 43.4 | 60.5 | 76.9 | | 242.7 | | | | 242.7 | |
| - Transport 1/ | 26.4 | 31.0 | 34.3 | 29.8 | 12.5 | 12.7 | | | 120.3 | | | 120.3 | |
| - Gas | 5.7 | 6.0 | 6.2 | 6.4 | 6.5 | 6.7 | | | | 31.8 | - | 31.8 | |
| Total Depreciation | 59.3 | 64.7 | 74.7 | 79.6 | 79.5 | 96.3 | | 242.7 | 120.3 | 31.8 | - | 394.8 | |
| Net Cash Generation | 5.4 | 121.3 | 106.5 | 120.8 | 137.1 | 140.2 | 70% | 1250.7 | (499.9) | (124.9) | - | 625.9 | 56% |
| Electricity Consumers Contributions | 22.5 | 24.3 | 26.7 | 29.4 | 32.3 | 35.6 | 13% | 148.3 | - | - | - | 148.3 | 12% |
| Government/Municipal Assistance | - | 300.0 | 70.0 | 80.0 | 110.0 | 240.0 | | - | - | - | 800.0 | 800.0 | |
| Longterm Borrowing: | | | | | | | | | | | | | |
| Electricity - Proposed Bank Loan | - | - | 77.5 | 90.5 | 21.0 | 6.8 | 17% | 196.0 | | | | 196.0 | |
| Transport - Government | - | - | 10.5 | 11.4 | 12.6 | 12.0 | | | 46.5 | | | 46.5 | |
| - Suppliers Credit (Standard-Belde) | - | 30.6 | - | - | - | - | | | 30.6 | | | 30.6 | |
| Total Borrowing | - | 30.6 | 88.0 | 101.9 | 33.8 | 18.8 | | 196.0 | 77.1 | - | - | 273.1 | 22% |
| Electricity 2/ - Increase (decrease) Working Capital | 36.9 | ( 94.3) | (16.3) | 23.5 | 5.3 | ( 47.2) | | ( 129.0) | | | | ( 129.0) | |
| - Transport | ( 6.6) | 0.7 | 0.9 | 0.7 | 0.5 | 0.6 | | | 3.4 | | | 3.4 | |
| - Gas | 6.0 | ( 2.9) | ( 0.2) | ( 0.4) | ( 0.4) | ( 0.4) | | | | ( 4.3) | | ( 4.3) | |
| - Head Office 3/ | 67.8 | (109.5) | ( 26.5) | ( 28.6) | ( 32.1) | ( 36.1) | | | | | (232.8) | ( 232.8) | |
| Total Decrease (Increase) Working Capital | 104.1 | (206.0) | ( 42.1) | ( 4.8) | ( 26.7) | ( 83.1) | | ( 129.0) | 3.4 | ( 4.3) | (232.8) | ( 362.7) | |
| TOTAL SOURCES OF FUNDS | 132.0 | 270.2 | 249.1 | 327.3 | 286.5 | 351.5 | | 1466.0 | (419.4) | (129.2) | 567.2 | 1484.6 | |
| APPLICATIONS | | | | | | | | | | | | | |
| Capital Investment Program: | | | | | | | | | | | | | |
| Electricity - Construction | 62.7 | 113.7 | 218.3 | 279.5 | 249.3 | 306.8 | 100% | 1167.6 | | | | 1167.6 | |
| Transport - Additional Buses | 23.7 | 25.8 | 8.4 | 9.1 | 10.1 | 9.6 | | | 63.0 | | | 63.0 | |
| Gas - Minor Construction | 6.0 | 2.3 | 3.0 | 3.0 | 3.0 | 3.0 | | | | 14.3 | | 14.3 | |
| Head Office - Equipment | 4.4 | - | - | - | - | - | | | | | - | - | |
| Total Capital Investments | 96.8 | 141.8 | 229.7 | 291.6 | 262.4 | 319.4 | | 1167.6 | 63.0 | 14.3 | - | 1244.9 | 100% |
| Electricity Legal Deposits & Prepayments | 5.9 | 6.8 | 2.5 | 3.0 | 2.5 | 3.0 | | 17.8 | - | - | - | 17.8 | |
| Debt Service | | | | | | | | | | | | | |
| Amortization - Electricity | - | 5.6 | 7.7 | 2.5 | - | 2.3 | | 18.1 | - | - | - | 18.1 | |
| - Transport | 1.8 | 30.6 | 15.2 | 5.2 | 1.8 | 1.8 | | | 54.6 | - | - | 54.6 | |
| Sub-Total Amortization | 1.8 | 36.2 | 22.9 | 7.7 | 1.8 | 4.1 | | 18.1 | 54.6 | - | - | 72.7 | |
| Interest - Electricity | 9.8 | 8.0 | 4.6 | 11.2 | 18.8 | 22.0 | | 64.6 | - | - | - | 64.6 | |
| - Transport | 3.1 | 7.0 | 6.0 | 5.0 | 5.0 | 5.0 | | - | 28.0 | - | - | 28.0 | |
| - Gas | 0.5 | 0.5 | 0.5 | 0.6 | 0.6 | 0.7 | | - | - | 2.9 | - | 2.9 | |
| Sub-Total Interest | 13.4 | 15.5 | 11.1 | 16.8 | 24.4 | 27.7 | | 64.6 | 28.0 | 2.9 | - | 95.5 | |
| Total Debt Service | 15.2 | 51.7 | 34.0 | 24.5 | 26.2 | 31.8 | | 82.7 | 82.6 | 2.9 | - | 168.2 | |
| Sub-Total Applications | 117.9 | 200.3 | 266.2 | 319.1 | 291.1 | 354.2 | | 1268.1 | 145.6 | 17.2 | - | 1430.9 | |
| Increase or (decrease) in Cash - Head Office | 14.1 | 69.9 | (17.1) | 8.2 | ( 4.6) | ( 2.7) | | 197.9 | (565.0) | (146.4) | 567.2 | 53.7 | |
| TOTAL APPLICATIONS | 132.0 | 270.2 | 249.1 | 327.3 | 286.5 | 351.5 | | 1466.0 | (419.4) | (129.2) | 567.2 | 1484.6 | |
| Cash at Start | 34.9 | 49.0 | 118.9 | 101.8 | 110.0 | 105.4 | | - | - | - | - | 49.0 | |
| Cash at End | 49.0 | 118.9 | 101.8 | 110.0 | 105.4 | 102.7 | | - | - | - | - | 102.7 | |

Notes: 1/ 1971 through 1976 electricity and transport depreciation include an annual amount of LT 1.2 million and 0.4 million for depreciation of Head Office assets.

2/ Electricity includes consumers' deposits

3/ Head Office sources have in each year been reduced by the amount of the Municipal electricity bills not included as paid (see Annex 24 - Note 1). These total LT 186.8 million for 1971/1976.

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ANNEX 23

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

ELECTRICITY DEPARTMENT

Forecast Sources and Application of Funds

(LT Millions -- LT14 = US$1)

| | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | Total 1972-1976 | % |
|---|---|---|---|---|---|---|---|---|
| | Actual | | | | | | | |
| SOURCES | | | | | | | | |
| Net Operating Income | 95.1 | 203.0 | 190.2 | 196.7 | 208.1 | 210.0 | 1,008.0 | |
| Depreciation | 27.2 | 27.7 | 34.2 | 43.4 | 60.5 | 76.9 | 242.7 | |
| Net Cash Generation | 122.3 | 230.7 | 224.4 | 240.1 | 268.6 | 286.9 | 1,250.7 | 70% |
| Consumer's Contributions | 22.5 | 24.3 | 26.7 | 29.4 | 32.3 | 35.6 | 148.3 | 13% |
| Consumer's Deposits | 17.8 | 16.5 | 8.0 | 13.0 | 13.0 | 14.0 | 64.5 | |
| (Increase) or Decrease in Net Current Assets | 19.1 | (110.8) | (24.3) | 10.5 | (7.7) | (61.2) | (193.5) | |
| Sub-total Local Sources | 181.7 | 160.7 | 234.8 | 293.0 | 306.2 | 275.3 | 1,270.0 | |
| Long-term Borrowing: | | | | | | | | |
| Proposed Loan IBRD | - | - | 77.5 | 90.5 | 21.2 | 6.8 | 196.0 | 17% |
| Total Sources of Funds | 181.7 | 160.7 | 312.3 | 383.5 | 327.4 | 282.1 | 1,466.0 | |
| APPLICATION OF FUNDS | | | | | | | | |
| Construction - Others | 62.7 | 113.7 | 218.3 | 279.5 | 50.0 | 300.0 | 350.0 | ) |
| Construction and Studies - Project | - | | | | 199.3 | 6.8 | 817.6 | ) 100% |
| Legal Deposits and Prepayments | 5.9 | 6.8 | 2.5 | 3.0 | 2.5 | 3.0 | 17.8 | |
| Sub-total | 68.6 | 120.5 | 220.8 | 282.5 | 251.8 | 309.8 | 1,185.4 | |
| Debt Services | | | | | | | | |
| Amortization: | | | | | | | | |
| USAID (D.L.F.) | - | 5.6 | 7.7 | 2.5 | - | - | 15.8 | |
| Proposed Loan | - | - | - | - | - | 2.3 | 2.3 | |
| Sub-total Amortization | - | 5.6 | 7.7 | 2.5 | - | 2.3 | 18.1 | |
| Interest | | | | | | | | |
| USAID (D.L.F.) | 0.6 | 0.5 | 0.2 | - | - | - | 0.7 | |
| Government Balances | 9.2 | 7.5 | 1.7 | 1.5 | 5.3 | 7.6 | 23.6 | |
| Proposed Loan | - | - | 2.7 | 9.7 | 13.5 | 14.4 | 40.3 | |
| Sub-total Interest | 9.8 | 8.0 | 4.6 | 11.2 | 18.8 | 22.0 | 64.6 | |
| Total Debt Service | 9.8 | 13.6 | 12.3 | 13.7 | 18.8 | 24.3 | 82.7 | |
| Sub-total Applications | 78.4 | 134.1 | 233.1 | 296.2 | 270.6 | 334.1 | 1,268.1 | |
| Increase or (decrease) in Cash | 103.3 | 26.6 | 79.2 | 87.3 | 56.8 | (52.0) | 197.9 | |
| Total Applications of Funds | 181.7 | 160.7 | 312.3 | 383.5 | 327.4 | 282.1 | 1,466.0 | |
| CONTRIBUTIONS TO H.O. OR OTHER ACTIVITIES | | | | | | | | |
| At Start of year | 722.2 | 805.3 | 799.0 | 843.3 | 892.6 | 907.9 | 805.3 | |
| Increase (decrease) in Cash Generated | 103.3 | 26.6 | 79.2 | 87.3 | 56.8 | (52.0) | 197.9 | |
| Depreciation on H.O. Assets | (1.2) | (1.2) | (1.2) | (1.2) | (1.2) | (1.2) | (6.0) | |
| Municipal Unpaid Bills 1/ | (31.1) | (31.7) | (33.7) | (36.8) | (40.3) | (44.3) | (186.8) | |
| Balance of Silahtar | 12.1 | - | - | - | - | - | - | |
| At End of year | 805.3 | 799.0 | 843.3 | 892.6 | 907.9 | 810.4 | 810.4 | |

NOTE:

1/ Bills to the Municipality for electricity and allied services are not presently being paid, because the municipal treasurer claims that these are more than offset by additional royalties due from IETT in accordance with the terms of the original SOFINA concession. IETT claims that these terms do not apply to IETT in its present form. The estimates assume that the present impasse will continue, so Municipal bills have been written off accrued profits each year in the Balance Sheets (Annex 26) through the Head Office account.

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REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

Government/Municipal Assistance:
A Suggested Financing Plan -- 1972-1976

1. This suggested financing plan calls for direct Government/Municipal assistance of some LT 800 million to IETT during the next five years to cover the estimated operating expenses for IETT's transport and gas services, and increases in working capital. The plan also includes financing in the amount of LT 46 million for 155 new buses estimated to be required by 1976 (83 "Bussing" vehicles due for delivery in 1972 are already financed by a supplier credit). The above requirements are estimates and could be effected either way by operating conditions, growth and policy decisions on the purchase of new buses.

2. The actual Government/Municipal financing required for IETT's transport and gas services during 1972-1976 is estimated to be on the order of LT 940 million if one includes an assumed deferment of repayments of existing Government loans for Leyland buses and spares bought in 1969 (LT 26 million) and the estimated value of an assumed waiver or deferment of additional buses and spares bought during the period (LT 68 million). The total requirements for Government/Municipal assistance during the period could be allocated roughly as follows:

| | | Transport | Gas | General | Total |
|---|---|---|---|---|---|
| | | (LT million) | | | |
| Net Operating Loss and Debt Service | | 580 | 130 | | |
| Increased Working Capital: | | | | | |
| Payment of Overdue 1971 Account payable | | | | 80 | |
| Increase in Cash Balance to 1 month's sales | | | | 10 | |
| | | 580 | 130 | 90 | 800 |
| Government Funds - New Buses | | 46 | | | 46 |
| Sub-total (included in Finance Plan) | | 626 | 130 | 90 | 846 |
| Not in Financing Plan Separately but Assumed in Transport Balance Sheets: | | | | | |
| Deferred Repayment - Leyland Loan | | | | | |
| Overdue 12/31/71 | 15 | | | | |
| Due 1972/1973 | 11 | 26 | | | |
| Waived Custom Duty: | | | | | |
| Leyland Buses Overdue 12/31/71 | 34 | | | | |
| New Buses and Spares | 34 | 68 | | | 94 |
| Total Assistance | | 720 | 130 | 90 | 940 |

3. Although the assistance needed to support IETT transport and gas operations is large, the sum required need not necessarily all be found in cash or from the Government's or Municipality's own resources. In addition to the LT 94 million already shown as being found by waiver of duty or by deferment of capital repayments of the loan for buses and spares, part of the remaining LT 846 million might be, for example, financed from any or all of the following resources:

(i) Increases in electricity and/or transport and/or gas tariffs or a temporary surcharge or tax on electricity bills to support transport during the interim period before reorganization. A 5% tax (or increase) on electricity sales would produce same LT 225 million in the period and a 10% increase in fares some LT 115 million. A 50% transport tariff increase would be needed to produce the LT 583 million cash loss over the 5 years (see Annex 3, page 4).

(ii) Absorbing the Gas Department into the existing Municipal Gas Department, thereby reducing IETT's requirements by some LT130 million of operating cash loss. Economies of scale could well result in the ultimate cost of such a merger to the municipality treasury being materially less than LT 130 million estimated for IETT's operating cash losses.

(iii) The Municipality taking over the IETT gas assets and offsetting their value against funds required to pay existing debts and to support the transport operations. The Government might lend the Municipality funds for this acquisition of assets to the extent that cash has to be provided.

(iv) TEK should not require its customary deposit for the purchase of power by IETT which is a municipal organization whose power activities are sound and profitable. By 1976, the estimate for this deposit included in the forecasts is LT 36 million, which would be saved by TEK waiving its deposit requirement from IETT.

(v) Payment by the Municipality of its electricity consumption and other bills, presently being withheld because of a dispute over whether or not IETT is required to pay royalties to the Municipality in accordance with the original concession agreement of SOFINA, the original Belgian concessionaire, would provide about LT 190 million more for IETT over the forecast period. The Municipality would, however, require the resources to pay these bills.

(vi) Settlement of the squatter illegal connection problem, so as to enable IETT to bill for the electricity consumed by the squatters, could provide up to LT 150 million over the period.

(vii) Assistance from external financing agencies, such as the Bank/IDA, pending the outcome of the Traffic Engineering and Control Studies to be carried out under the Istanbul Urban Development Project, Credit 324-TU.

4. These and other measures for assisting IETT should be considered by the Government and the Municipality until the Transportation and Gas Departments can be reorganized on a financially viable basis (see 1.08, 1.09 and 5.09 and Annexes 3 and 4).

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

Electricity Department Balance Sheets

(LT Millions -- LT14 = US$1)

| | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 |
|---|---|---|---|---|---|---|---|---|
| | ----------Actual-------- | | | ----------Forecast---------- | | | | |
| ASSETS | | | | | | | | |
| Gross Fixed Assets 1/ | 473.9 | 532.4 | 563.7 | 666.2 | 794.5 | 1073.7 | 1321.0 | 1623.5 |
| Less Depreciation 2/ | 154.6 | 177.6 | 181.9 | 208.4 | 241.4 | 283.6 | 342.9 | 418.6 |
| Net Fixed Assets in Operation | 319.3 | 354.8 | 381.8 | 457.8 | 553.1 | 790.1 | 978.1 | 1204.9 |
| Work in Progress 3/ | 3.8 | 8.4 | 6.0 | 17.2 | 107.2 | 107.5 | 109.5 | 113.8 |
| Total Fixed Assets | 323.1 | 363.2 | 387.8 | 475.0 | 660.3 | 897.6 | 1087.6 | 1318.7 |
| Intangible Assets | 29.6 | 9.8 | - | - | - | - | - | - |
| Deposits with TEK | 9.8 | 12.3 | 18.2 | 25.0 | 27.5 | 30.5 | 33.0 | 36.0 |
| Total Fixed Assets & Investments | 362.5 | 385.3 | 406.0 | 500.0 | 687.8 | 928.1 | 1120.6 | 1354.7 |
| Net Current Assets | | | | | | | | |
| Accounts Receivable - Consumers | 76.2 | 98.2 | 124.1 | 184.5 | 198.3 | 219.2 | 241.0 | 253.7 |
| - Others | 5.2 | 6.6 | 9.0 | 10.0 | 11.0 | 12.0 | 13.0 | 14.0 |
| Inventories | 66.2 | 61.1 | 69.6 | 59.0 | 59.0 | 59.0 | 59.0 | 59.0 |
| Sub-Total Current Assets | 147.6 | 165.9 | 202.7 | 253.5 | 268.3 | 290.2 | 313.0 | 326.7 |
| Current Liabilities - Taxes & Duties | ( 13.1 ) | ( 20.5 ) | ( 36.7 ) | ( 24.2 ) | ( 22.7 ) | ( 62.1 ) | ( 85.2 ) | ( 45.7 ) |
| - Supplies | ( 67.1 ) | ( 95.8 ) | ( 135.5 ) | ( 88.0 ) | ( 80.0 ) | ( 73.0 ) | ( 65.0 ) | ( 57.0 ) |
| Consumers Security Deposits | ( 63.9 ) | ( 79.7 ) | ( 97.5 ) | ( 114.0 ) | ( 122.0 ) | ( 135.0 ) | ( 148.0 ) | ( 162.0 ) |
| Sub-Total Current Liabilities | ( 144.1 ) | ( 196.0 ) | ( 269.7 ) | ( 226.2 ) | ( 224.7 ) | ( 270.1 ) | ( 298.2 ) | ( 264.7 ) |
| Total Net Current Assets | 3.5 | (30.1) | (67.0) | 27.3 | 43.6 | 20.1 | 14.8 | 62.0 |
| TOTAL ASSETS | 366.0 | 355.2 | 339.0 | 527.3 | 731.4 | 948.2 | 1135.4 | 1416.7 |
| EQUITY, LONGTERM DEBT & CURRENT A/C | | | | | | | | |
| Equity | | | | | | | | |
| Original Equity | 309.7 | 309.7 | 309.7 | 309.7 | 309.7 | 309.7 | 309.7 | 309.7 |
| Customers Contributions | 120.4 | 140.5 | 163.0 | 187.3 | 214.0 | 243.4 | 275.7 | 311.3 |
| Accrued Surplus 4/ | 405.5 | 485.6 | 557.1 | 610.7 | 772.0 | 920.8 | 1066.0 | 1211.0 |
| Profit for Year | 102.0 | 112.4 | 85.3 | 195.0 | 185.6 | 185.5 | 189.3 | 188.0 |
| Total Equity | 937.6 | 1048.2 | 1115.1 | 1302.7 | 1481.3 | 1659.4 | 1840.7 | 2020.0 |
| Longterm Debt | | | | | | | | |
| Proposed Loan | - | - | - | - | 77.5 | 168.0 | 189.2 | 193.7 |
| Due to Government | 13.4 | 13.4 | 13.4 | 13.4 | 13.4 | 13.4 | 13.4 | 13.4 |
| USA -- AID (D.L.F.) | 18.7 | 15.8 | 15.8 | 10.2 | 2.5 | - | - | - |
| Total Longterm Debt | 32.1 | 29.2 | 29.2 | 23.6 | 93.4 | 181.4 | 202.6 | 207.1 |
| Sub-Total Equity & Longterm Debt | 969.7 | 1077.4 | 1144.3 | 1326.3 | 1574.7 | 1840.8 | 2043.3 | 2227.1 |
| Accumulated Contribution for Head Office Assets and for other Department losses. | (603.7) | (722.2) | (805.3) | (799.0) | (843.3) | (892.6) | (907.9) | (810.4) |
| TOTAL EQUITY, LONGTERM DEBT & CURRENT A/C | 366.0 | 355.2 | 339.0 | 527.3 | 731.4 | 948.2 | 1135.4 | 1416.7 |
| Revalued Assets 5/ | | | | | | | | |
| Net Fixed Assets in Operation | 962.0 | 999.0 | 918.0 | 932.0 | 964.0 | 1138.0 | 1264.0 | 1428.0 |
| Average Net Fixed Assets in Operation | 950.0 | 981.0 | 959.0 | 925.0 | 948.0 | 1051.0 | 1201.0 | 1346.0 |

Notes: 1/ 1971 assets exclude LT 33.8 million, the gross value of Silahtar generating station taken over by TEK in 1971.

2/ 1971 accumulated depreciation excludes LT 21.7 million, the accumulated depreciation on Silahtar.

3/ Includes cost of all studies included in proposed loan.

4/ In each year the "Accrued Surplus" has been reduced by the amount of the Municipal bills remaining unpaid and has also been adjusted for any changes in liabilities subject to cancellation. In 1970 and 1971 the net decreases were LT 21.9 million and LT 40.9 million respectively. From 1972 through 1976 the Municipal bills have been assumed to be the only adjustment necessary (see Annex 24) for the amounts. The TEK Law reserve (see Annex 19 note 7) is not shown because for 1972-1976 construction expenditure will constantly exceed the reserve made.

5/ The estimated revaluation of the Electrical Department fixed assets can only be regarded as a rough indication of their value on a 1971 basis. The revised values have been calculated by using the same annual revaluation factors as have been previously used for the revaluation of TEK's assets in 1971. These factors were accepted by TEK and by the Government in connection with Loan 763-TU, but the determination of a realistic value for IETT's present assets would require a comprehensive physical check and a valuation at current prices by a consultant. This has not been suggested in view of the uncertainties of IETT's future operations. The depreciation rates used by IETT are those complying with the Turkish Law, and result in an average overall annual rate of some 6.5% of the electricity assets. This is high for a distribution company, but the revalued assets have also been depreciated at this legal average rate and to this extent their revaluation should also be somewhat understated. However, this could well be set off by the inclusion of assets in poor physical condition or not still physically existing. This is presently unknown and could only be determined by physical inspection. The 1971 revaluation given again excludes Silahtar at its sale price to TEK of LT 132 million

ANNEX 27

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

Actual and Forecast Balance Sheets 1969-1976 - Head Office

(LT million -- LT14 =US$1)

| | Actual | | | Forecast | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 |
| ASSETS | | | | | | | | |
| Gross Fixed Assets | 39.0 | 40.1 | 44.2 | 44.2 | 44.2 | 44.2 | 44.2 | 44.2 |
| Loss Depreciation | 22.4 | 23.9 | 25.2 | 26.8 | 28.4 | 30.0 | 31.6 | 33.2 |
| Net Fixed Assets | 16.6 | 16.2 | 19.0 | 17.4 | 15.8 | 14.2 | 12.6 | 11.0 |
| Loan to Cooperative and Legal Deposit | 28.7 | 28.9 | 26.6 | 25.4 | 24.7 | 23.0 | 21.8 | 20.6 |
| Current Assets - Cash | 25.5 | 34.9 | 49.0 | 118.9 | 101.8 | 110.0 | 105.4 | 102.7 |
| Accounts Receivable | 9.7 | 9.0 | 14.7 | 10.1 | 11.4 | 12.4 | 13.0 | 14.2 |
| Subtotal Current Assets | 35.2 | 43.9 | 63.7 | 129.0 | 113.2 | 124.4 | 118.4 | 116.9 |
| CURRENT LIABILITIES | | | | | | | | |
| Suspense Accounts, Deposits and Provisions | (47.8) | (44.4) | (55.4) | (59.0) | (64.0) | (69.0) | (74.0) | (79.0) |
| Government Taxes, Employees, Stamp Duty, etc. | (8.1) | (7.7) | (55.6) | (16.0) | (17.0) | (18.0) | (19.0) | (20.0) |
| Municipal Taxes, etc. | (3.7) | (2.1) | (27.7) | (5.0) | (5.5) | (6.0) | (6.5) | (7.0) |
| Suppliers Accounts Payable | (7.4) | (4.5) | (3.5) | (3.0) | (3.5) | (4.0) | (4.5) | (5.0) |
| Staff Insurance & Miscellaneous Funds | (12.8) | (19.5) | (8.8) | (6.1) | (6.9) | (7.4) | (8.0) | (9.2) |
| Bills of Exchange Outstanding | (4.0) | (4.2) | (21.7) | ( -) | ( -) | ( -) | ( -) | ( -) |
| Subtotal Current Liabilities | (83.8) | (82.4) | (172.7) | (89.1) | (96.9) | (104.4) | (112.0) | (120.2) |
| Net Current Assets | (48.6) | (38.5) | (109.0) | 39.9 | 16.3 | 18.0 | 6.4 | (3.3) |
| TOTAL ASSETS (NET) | (3.3) | 6.6 | (63.4) | 82.7 | 56.8 | 55.2 | 40.8 | 28.3 |
| Equity and Current Accounts | | | | | | | | |
| Government/Municipal Assistance (Equity) | - | - | - | 300.0 | 370.0 | 450.0 | 560.0 | 800.0 |
| Accumulated Reserve | 4.3 | 4.3 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 |
| Current Accounts - Electricity | 603.7 | 722.2 | 805.3 | 799.0 | 843.3 | 892.6 | 907.9 | 810.4 |
| - Transport | (558.7) | (643.3) | (781.4) | (904.4) | (1,018.6) | (1,120.8) | (1,228.6) | (1,348.4) |
| - Gas | (52.6) | (76.6) | (91.5) | (116.1) | (142.1) | (170.8) | (202.7) | (237.9) |
| TOTAL EQUITY AND CURRENT ACCOUNTS | (3.3) | 6.6 | (63.4) | 82.7 | 56.8 | 55.2 | 40.8 | 28.3 |

February 16, 1973

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

MAJOR ASSUMPTIONS USED FOR FINANCIAL FORECASTS

1. Revenue Accounts

(a) Electricity Department (Annex 22)

(i) Revenue - Sales of GWh + approximately 11% annually, Tariffs unchanged; Sales pattern unchanged.

(ii) Salaries & Wages - Number of staff unchanged, labor + 3% annually. Salaries and wagers per employee + 10% annually.

(iii) Purchases of Electricity - GWhs for increased sales adjusted for distribution losses, declining to 13.5% by 1976; TEK tariff unchanged.

(iv) Depreciation - Rates unchanged per Law 213; e.g., Substations 4%, Network 8%.

(v) Interest - USAID at 3-1/2%; Advance from Ministry of Urban Development for squatter electrification at Nil %, Proposed Loan 7-1/4%, Short-term interest at 10%, Government Departments at 1971 amount of LT 5.0 million for 1972.

(b) Transport Department (Annex 3, page 6)

(i) Revenue - Forecast Passengers + 7% annually, Tariff 1970 average plus 60% for 1971 increase = krs 75.5 per passenger. No further increase in tariff assumed.

(ii) Salaries & Wages - Labor increase total of 500 to man new buses. Salaries and wages per employee + 10% annually.

(iii) Materials - LT 47,000 per vehicle with the number of buses increased to carry forecast passengers at present average density of 450 passengers per vehicle. Price escalation of 5% annually.

(iv) Depreciation - At average of 20% per annum for 5 years.

(v) Interest - "Is Bank" overdraft facility at 10-1/2, Standard-Belde 5-year credit for "Bussing" at 15%, Government for "Leyland" LT 25.7 million 5 years at 5-1/2% (repayment deferred); remaining LT 26 million at Nil % over 25 years (repayment deferred). Government for new buses at 5-1/2% - (repayment deferred). Duty deferred or cancelled at Nil interest. Government consolidated debt at 1971 amount of LT 2.5 million per year.

(c) Gas Department (Annex 4, page 5)

(i) Revenue Sales - Sales in Million $m^3$ declining annually at present rate of (-) 5%, Tariffs unchanged.

Biproducts - at 60% of Sales Revenue.

(ii) Salaries and Wages - No change in number, salaries and wages per employee + 10% annually.

(iii) Coal - 117.65% Sales (i.e., losses) = gas manufactured at 1971 price + 10% annually.

(iv) Depreciation - Continuing present average of 5% annually.

2. Balance Sheets

(a) Electricity Department (Annex 26)

(i) Fixed Assets - 1971 + Project + 1976 construction of LT 350 million

(ii) Work-in-Progress - Includes all study costs under the loan.

(iii) Consumers accounts receivable - 3 months' sales, excluding municipality (4% of Electricity Sales).

(iv) Inventories - Reduced in 1972 and maintained at that level.

(v) Taxes and Duties - IETT pays custom duty but with 2 years' credit, Taxes one month after due, Rural electrification contribution due to TEK reduced progressively from 1971 80% to 33%.

(vi) Accounts payable - Mainly one month TEK's bill, and reduction in 1970 coal outstandings fully paid in 1976.

(vii) Accrued Profit - Reduced each year by Municipal sales.

(viii) Long-term debt due Government - This comprises LT 8 million imprest funds for electricity construction in squatter settlements plus LT 5.4 million mainly of "exchange risk" of original SOFINA purchase Terms. No repayment is envisaged in the period and neither is interest bearing.

(b) Transport Department (Annex 3 page 5)

(i) Fixed Assets - Increased over period by 238 buses at LT 300,000 each.
(ii) Inventories - Increased by 20% value of buses purchases for spares, less 10% per annum for usage and old stock.
(iii) Accounts payable - 15% of inventories for fuel, etc.
(iv) Long-term debt - Assumed deferment of all existing "Leyland" debt repayment installments due 1970 through 1975.

(c) Gas Department (Annex 4, page 4)

(i) Fixed Assets - LT 3 million annually for general rehabilitation.
(ii) Inventories - Maintained at 15% of Gross Fixed Assets.
(iii) Consumers' accounts receivable - Improved to 3 months' billings from over 6 months.

REPUBLIC OF TURKEY

ISTANBUL ELECTRICITY, TRAMWAY AND TUNNEL COMPANY (IETT)

OUTLINE SCOPE OF WORK FOR CONSULTING SERVICES

Project Implementation

1. Paragraph 3.16 of the Appraisal Report mentions that IETT is short of qualified electrical engineers and that this is due to the effect of Law 3611. By equating the pay scales for engineers with those of civil servants and setting them both at a relatively low level, this Law makes it impossible for IETT to attract and employ qualified and experienced personnel. To alleviate the problem and to ensure timely execution of the Project, IETT, as mentioned in paragraph 5.07, is arranging with SOFRELEC and EIEI to provide the necessary engineering services. These would include:

(i) feasibility studies to determine the requirements, location, justification and priority of investments in:

a) communication equipment;

b) relay and protective equipment; and

c) rehabilitation of the 34.5 kV, 10 kV and LT distribution system;

(ii) system design, specifically to achieve the greatest possible standardization of substations, with a view to reducing design costs in later development and expansion phases;

(iii) preparation of tender documents and specifications;

(iv) issuance of bidding documents;

(v) analysis of bids; and

(vi) contract administration and supervision.

Management Study

2. Paragraph 3.17 of the Appraisal Report stated that IETT had in 1970 engaged the services of EdF to review the organizational structure of its electricty and gas operations. A report prepared in September 1971 analyzed the existing structure and procedures and made alternative proposals for improvement. Since this report was issued, discussions between IETT and EdF took place as to which of the alternative proposal best adapted for IETT's purposes should be selected for implementation. The EdF report, however, did

not study the management of IETT's transport operations since it was excluded from their Terms of Reference. In order to achieve a suitable form of separation of the organization, management, finance and operations of IETT's electricity, and gas activities, a review of the EdF proposals needs to be made. This review should take into account, insofar as IETT's electricity operations are concerned, the results of a similar study carried out by EdF for TEK. The immediate objectives are to implement, at the earliest possible date, procedures designed to improve operational efficiency.

3. Terms of Reference for the completion of the EdF study can be summarized as follows:

(i) review of the organizational proposals made in the September 1971 study for the Electricity Department in coordination with the EdF study made for TEK;

(ii) selection of a proposal meeting IETT's immediate requirements, consistent with the regionalization of electricity distribution and compatible with TEK's organizational structure and procedures, so as to facilitate a transfer of IETT Electricity to TEK should this be the ultimate objective of the Turkish Authorities;

(iii) based on the ultimate slection of an organizational structure, establish an accounting system and procedures designed to provide management with immediate accurate period information. Specifically, a cost accounting system needs to be established; and

(iv) adaption of the accounting system and procedures selected for IETT's Electricity Department to its other departments.

The immediate objective is a complete separation of accounts of the three services at an early date.

Power Market Study

4. With the ultimate objective in mind of regionalizing the distribution of power, it is considered essential that a power market survey be carried out, covering the greater Istanbul Metropolitan Area. This area coincides practically with the Istanbul Provincial Boundary. It is not considered economically sound to restrict such a survey to the Istanbul Municipal Area, leaving out distribution to adjacent municipalities, since investments required to meet the power demand of individual areas would undoubtedly be larger than the investments covering the same requirements but for an integrated region. Paragraph 3.09 of the Appraisal Report mentions the duplication of distribution facilities in the past. A further important reason for a power market survey is that the facilities in the proposed program for 1974 and 1975 could then be checked for compatibility with developments after 1975. It is also

important that the survey of the power market take into account the short- and long-run urban development objectives which are being supported by Credit 324-TU, a "Project for the Preparation of an Integrated Urban Program for Istanbul, Turkey". Among the objectives which are relevant to the power market survey are, particularly:

(i) the provision of guidance and means of control for future urban growth; and

(ii) the improvement of urban services, with special attention given to those residents who are poorly served or not served at all. In this connection, Credit 324-TU provides inter alia for

a) the preparation of projects to bring adequate infrastructure to designated existing squatter settlement areas, and sites and services projects for low-income population as an alternative to squatter settlement;

b) the development of a new urban cluster for planned urban expansion and the relocation of the existing wholesale food markets.

5. The Terms of Reference for such a study can be summarized as follows:

(i) to carry out a power market survey for the Greater Istanbul Metropolitan Area, covering the period 1976-1985. In particular, to analyze the power distribution requirements in the period 1974-75 by areas and by type of consumer. This survey, in adequate detail, is to be coordinated with other relevant studies now under way and will contain a program of priorities, depending on criteria of need agreed upon by the Bank/IDA and the Government;

(ii) to analyze the existing criteria and to establish reliability criteria consitent with the needs of specific areas to be served;

(iii) to establish design and operating criteria to minimize, in combination with (ii) above, the investments needed; and

(iv) on the basis of the results of the power market survey, to carry out the preliminary design of a distribution system to meet the requirements at minimum cost;

(v) on the basis of the preliminary design and the analysis of priorities in (i), to locate facilities required in 1974 and 1975 to ensure compatibility with present needs and future development;

(vi) on the basis of the results achieved in the preliminary design, to prepare a program of de ail requirements and a feasibility report including cost estimates of the needs to cover the years 1976-1979, inclusive. This report could form the basis of future lending operations;

(vii) to review IETT's present tariff structure and make recommendations as to any changes needed to improve operations and equity in the incidence of rates to consumers. Specifically, this review should cover the charges made for reactive power, the cost of supply to the various consumer categories, and the advisability of introducing a block tariff system. This tariff review should demonstrate the magnitude of indirect loading incorporated in the present tariffs offset the losses of IETT's other operations.

The proposed power market survey will also benefit TEK in the design of the high-voltage transmission system and the location of step-down transformer sub-stations required to meet the projected load of the area.

Transport Study

6. Initially it was proposed to include under the Terms of Reference of the Traffic Engineering and Control Study financed by Credit 324-TU an investigation of the administrative, organizational and financial problems associated with IETT's transport system leading to the improvement of IETT's public transport services. At the request of the Turkish Authorities, consultant assistance for this aspect was excluded, because it was considered that Turkish Government personnel could carry out this work. Unfortunately, Turkish personnel with the necessary qualifications could not be found to carry out the study of IETT's transport operations. Because of IETT's precarious financial situation, resulting largely from its transport activities, provision to study the administration, organization and financing of IETT's bus services has been included in the proposed loan. The proposed loan will be closely coordinated with the study of IETT's bus operations, which are included in the traffic engineering and control study mentioned above.

7. The Terms of Reference of such a study can be summarized as follows:

(i) to analyze IETT's present transport administration, organization and financing procedures and to make recommendations for improvements;

(ii) to develop an accounting system and cost accounting principles related to the organization, methods and procedures recommended in (i);

(iii) to investigate and make recommendations concerning the tariff levels and structure which would enable IETT to earn an acceptable return on its investments (with or without subsidies) and to meet the demands of the various categories of consumers on an equitable basis.

Gas Study

8. Paragraph 3.04 of the Appraisal Report mentions the existence of three separate gas plants and distribution systems, two of which (the outside) systems) are operated by IETT; the central system is operated by the Municipality. Istanbul's gas services may benefit from consolidation under one authority. The central municipal gas system serves nearly twice as many consumers as IETT's combined systems. A rationalization of operations could (a) reduce the two European gas plants from two to one; (b) result in reductions in operating, maintenance and general services costs; and (c) improve the quality of service to prevent a further loss of consumers to alternative fuel sources.

9. The Terms of Reference for such a study can be summarized as follows:

(i) to carry out a gas market survey, 1973-1987, to determine future production needs and the level of investments required to meet forecast demand;

(ii) on the basis of the analysis of the EdF report dated September 1971, to make recommendations providing for improvements of IETT's present service area which would be compatible with the requirements of a consolidated gas sector;

(iii) to determine the advantages and disadvantages, if any, of consolidating Istanbul's three gas systems into one;

(iv) to make recommendations on the organization of an integrated gas system, to include management procedures, accounting system and cost accounting principles;

(v) to establish the investment requirements of a consolidated gas service in comparison with the investment requirements of the separate systems;

(vi) to determine the justification of coal gas production vis-a-vis Liquified Propane Gas (LPG);

(vii) to determine the justification of continuing the present gas supply service with consideration given to alternative sources of energy, including potential new sources of natural gas;

(viii) to determine the effect of completely or partially abandoning the gas services on the demand for electricity or bottled gas and to estimate the cost involved to the consumer of changing from gas to electricity or LPG; and

(ix) to analyze the cost of production, distribution, operations and maintenance to determine the level of tariffs which would need to be charged to meet operating expenses (including depreciation) and provide for a reasonable rate of return on investments. Included in this aspect should be a revaluation of the assets of all gas facilities currently in service.