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ELECTRICITY PRICING IN KAZAKHSTAN

NIS Institutional Based Services Under the Energy Efficiency and Market Reform Project
Contract No CCCN-Q-00-93-00192-00

Kazakhstan Electricity
Delivery Order No 05

Seminar for

State Committee on Pricing and Anti-Monopoly Policy
Almaty, Kazakhstan

Prepared for

U S Agency for International Development
Bureau for Europe and NIS
Office of Environment, Energy and Urban Development
Energy and Infrastructure Division

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DESCRIPTION OF THE TARIFF STUDY

Objective.	To assist the AMC and MECI in the development of a wholesale pricing strategy and an implementation plan to introduce a rational system of wholesale electricity prices
Requested by	AMC and MECI
Funded by	U S Agency for International Development
Cooperating organizations	AMC, MECI, and NES Kazakstanergo
Research period	October 95-March 96 and June 96-October 96, translation in November-December 96
Consultant team	The study was prepared entirely by Hagler Bailly Consulting without the use of local consultants or subcontractors, and without any partnership with another foreign company

Types of tariffs calculated

- Transmission tariffs for the national electric network (220 kV and above, Very High Voltage = VHV)
- Transmission tariffs for the 110 kV network (High Voltage = HV)
- Sales tariffs for customers served by regional network enterprises (Almaty and Taldykorgan)
- Sales tariffs for VHV and HV customers served by a wholesale monopolist (in a transitional period)

GUIDELINES ESTABLISHED BY USAID

USAID defined the scope of work

- **Marginal Cost Pricing** "to develop and design tariff structures that reflect as closely as possible the true economic (marginal) costs to the nation of providing electricity to different customer segments"
- **Transition Period** "to develop an appropriate implementation scheme and schedule for a smooth and efficient transition from the present pricing structure to the new efficiency pricing structure"
- **Support for Restructuring** The tariff reform plan should be consistent with "ongoing restructuring and reform efforts of the government" Therefore a competitive market power pool is supported

The work scope did <u>not</u> include the following

- Analysis of non-payment problems and proposals to cut supplies to non-payers
- Analysis of the coal industry, detailed projections of the cost of mining and transporting coal
- Study of the effect of higher electricity tariffs on economic indicators - for example, inflation
- Projection of a budget for the repair fund for each power station

WHAT IS MARGINAL COST PRICING?

Prices are set administratively on the basis of an estimate of the marginal cost of supplying goods and services The marginal cost is the cost resulting from a small increase in the quantity delivered to end users

- If the calculation is very precise, the marginal cost should be calculated for a particular voltage level and a particular hour Capacity-related costs and energy-related costs are measured separately
- The tariff must be designed to reflect marginal costs as accurately as possible, given the practical constraints on metering and billing Therefore high-voltage tariffs should be complex
  This methodology can be applied to different types of natural monopolies

Cost components of a sales tariff

The marginal cost of electric capacity and energy delivered to a low-voltage customer includes

- the marginal cost of generating capacity required to supply the customer
- the marginal cost of energy from the generating stations used to supply the customer
- the marginal cost of the VHV network capacity required to transmit energy to the customer
- the marginal cost of the HV and low-voltage capacity required to transmit energy to the customer
- an adjustment to all of these costs, based upon actual network losses at each voltage level

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MARGINAL COST COMPONENTS OF A TRANSMISSION TARIFF

Cost of transmission in the VHV network (National Electric Network)

- Capacity cost per kW = Replacement cost of lines and substations / Peak load delivered at 220 kV
- Energy cost per kWh during peak periods = Technical losses in the VHV network
- Energy cost per kWh during off-peak periods = Technical losses in the VHV network

Cost of transmission in the HV network (110 kV portion of the Regional Network)

- Capacity cost per kW = Replacement cost of lines and substations / Peak load delivered at 110 kV
- Energy cost per kWh during peak periods = Technical losses in the HV network
- Energy cost per kWh during off-peak periods = Technical losses in the HV network

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MARGINAL COST COMPONENTS OF A SALES TARIFF

Cost of generating electricity

- Capacity cost per kW = Cost per kW of a new generating unit with a gas combustion turbine
- Energy cost, in each hour = Highest fuel cost per kWh of all generating stations dispatched
- Annual energy cost per kWh = Average of the hourly energy costs, over 8760 hours

Cost of transmission in the VHV network (National Electric Network)

- Capacity cost per kW = Replacement cost of the lines and substations / Peak load delivered at VHV
  Energy cost per kWh during peak periods = Technical losses in the VHV network
  Energy cost per kWh during off-peak periods = Technical losses in the VHV network

Cost of transmission in the HV and low voltage network (Regional Network Companies)

- Capacity cost per kW = Replacement cost of the lines and substations / Peak load at customer meters
- Energy cost per kWh during peak periods = Technical losses in the HV and low voltage networks
- Energy cost per kWh during off-peak periods = Technical losses in the HV and low voltage networks

DOCUMENTS AND MODELS USED IN THE TARIFF STUDY

The draft report was written in English and translated into Russian

- The report can be revised, if necessary, on the basis of comments received by Hagler Bailly

Two spreadsheets were developed to calculate tariffs under different assumptions using Lotus 123 Version 5 These spreadsheets were translated into Russian

- Transmission tariffs are calculated in a small spreadsheet named *transit wk4* (for Chapter 3 exhibits)
- Sales tariffs are calculated in a larger spreadsheet named *LRMC wk4* (for exhibits in Chapters 5 & 6)

Two additional spreadsheets were used to prepare tables describing the technical characteristics of the power sector of Kazakstan in 1995 and develop projections to 2000 Russian versions are available

- Load flows and network characteristics are described in *peakload wk4*
- Projections of generating capacity and output are contained in *revenue wk4* (Appendices A,B,C,D)

The Generation Planning Tools model was used to calculate Short Run Marginal Cost

- It would be possible for Hagler Bailly to calculate SRMC under a different scenario
- Several spreadsheets were used to summarize the results (in the exhibits in Chapter 4)

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RECOMMENDATIONS

The State Regulatory Commission should set the exact level of capacity and energy prices

- There should be one set of tariffs for customers directly connected to the VHV network and another set of tariffs for customers directly connected to the HV network
- There should be a program to revalue the networks, based on replacement cost
- Retail customer classes should be redefined according to voltage levels
- Retail tariffs should be raised to the level of Long Run Marginal Cost (LRMC)
- A program of capital investment in 500 kV interconnections between the North and South grids should be pursued to ensure that these regions are fully integrated This would enable the formation of a single power pool and thereby increase the level of competition among generators and imports

Tariff levels

- VHV transmission, peak 228 Tenge/kW/month + 5 4% allowance for energy losses
- VHV transmission, off-peak 228 Tenge/kW/month + 4 4% allowance for energy losses
- VHV+HV transmission, peak 356 Tenge/kW/month + 9 1% allowance for energy losses
- VHV+HV transmission, off-peak 356 Tenge/kW/month + 7 2% allowance for energy losses