

MODELLING OF ELECTRICITY SECTOR OF KAZAKHSTAN

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Introduction. The project's main objective is the modeling of the electricity sector in Kazakhstan. The demand growth in the last years could be compensated so far by reactivation and retrofit of existing old reserve capacities from the Soviet era. Translated into choices for system development the decisions are on technologies of new capacity, availability and costs of resources, and the transmission network. All these aspects can be addressed with the detailed electricity sector model.

Model Description. Kazakh energy system was represented in GAMS modelling framework. This model was developed in collaboration with the German Institute for Development Economics (DIW Berlin). The basis of this model includes a technical and economic analysis of power system of Kazakhstan. It can be used to evaluate the level of utilization of electrical networks, the possibility of electric energy storage, as well as to determine the most advantageous from an economic point of view, the electricity flows. The purpose of creating this model is to optimize solutions to benefit both for the generation of power plants, and for consumers, given the characteristics of the transmission of electrical energy. Different levels of demand for each node and each hour of the day should be provided with sufficient supply [1].

Results and discussion. The model setup for this project includes four basic equations. The objective function (1) determines the cost minimal generation dispatch. In this model only the variable generation costs are considered. They are calculated by the sum of all generation levels of a power plant (p), at each node (n) at all given hours (t) multiplied with the marginal generation costs (MC) of the respective power plant. The linear constraints are the generation constraint (2), the energy balance (3), and transmission constraints on the flows (4).



Figure 1. Schematic map of Kazakhstan with drawing of lines and nodes in accordance with the interactive map of the power system of KEGOC.

In the course of this work was performed data collection on the generation, distribution and consumption of electrical energy. There are 15 large enterprises-consumers of electricity, 24 big cities-consumers (population more than 70 000 people), 34 generating power plants and 48 distribution substations [2]. In order to make all the information in the model were created nodes and line power system. For the convenience of the system of Kazakhstan was conditionally divided into regions corresponding to the classification of the energy system in the separation of KEGOC.

Conclusions. The nodal version of model of Electricity sector of Kazakhstan has been developed. Now it is clearly possible to test and evaluate the advantages and disadvantages of the power system. Total turned 145 nodes and 212 lines, which are included in the list of parameters for the model in GAMS.

References.

1. Jonas Egerer, Roman Mendeleevitch (2013). Report "Electricity Model of Kazakhstan".
2. KEGOC, 2013 Annual report, Downloadable at <http://www.kegoc.kz/invest/reporting/annual-reports/1676>.