MONITOR
ELECTRIC

Real-Time Information Systems for Control Centers

About

Monitor Electric JSC is a Russia-based software development company, specializing in creating advanced solutions and applications for real-time control center management. Our major products are:

- SCADA/EMS/DMS systems CK-2007C, CK-11 for control centers of electric utilities, Transmission System Operators (TSO) and Independent System Operators (ISO) of any size
- Operator training simulator Finist
- Electronic logbooks for control centers Hedgehog-2
- Power Market management systems (MMS)

Monitor Electric offers to its clients a wide range of services – from software sales to IT infrastructure planning and deployment. Among our main customers are:

- System Operator of the Unified Power System of the Russian Federation (SO UPS) and its subsidiaries
- Regional Transmission Operators (RTO)
- Electric power industry enterprises and generation utilities in the Russian Federation and abroad

Today, companies using software developed by Monitor Electric can be found in every large city of Russia. Besides, Monitor Electric is maintaining effective partner relationships with foreign companies. Our products have already been successfully deployed in Belarus, Georgia and the USA. Partnership projects with other countries are under way.

Over the recent years, Monitor Electric has become an established leader in development, deployment and maintenance of sophisticated information systems for the electric power industry in the Russian Federation. To achieve this, we had to implement a modern software development cycle, which is no less complicated than car manufacturing. Presently, half of the resources of our company are involved in industrial software development. We adhere to world-class software development technology. This allows us to compete with IT giants and to design and deliver products for the electric power industry that our customers grew to appreciate and to rely on in the most critical tasks.

Demand for our solutions and expertise is growing as investors realize the necessity of modernizing the IT-infrastructure of the electric power industry. We deploy our products in both individual energy utilities and large electric power management organizations.

Today, we successfully carry out complete turnkey information technology projects as well as individual customer projects for design, integration, implementation and support of computer systems. Our vast experience in software development and system design allows us to find optimal solutions for our customers based on our own and third party software. Our company keeps growing. We are strengthening our core areas of expertise and exploring new ones. However, the main principle of our company remains the same – only quality solutions.

Head Office, Pyatigorsk

Monitor Electric does not just develop software – we often upgrade and even build from scratch the whole control center infrastructure for our customers. For many of our clients, regardless of their geographic location, we offer 24×7 Problem Resolution Support.

Monitor Electric has over 150 employees located in five branches: in the cities of Moscow, Voronezh, Smolensk, Krasnodar and Pyatigorsk. Our best specialists are professionals with many years of experience in software development for electric power industry. However, the majority of people working at Monitor Electric are rather young. We recruit the most talented people to work with us and then make sure that they continue to improve and grow. We encourage our employees to obtain advanced degrees in Electrical Engineering and Computer Science, attend conferences and workshops, receive additional training at our own education center.

We collaborate with colleagues from the USA, Germany, Spain and other countries. Together we strive to use our development and integration expertize to deliver the best possible products and services to our customers.

Engineering Center, Pyatigorsk

Company Structure

Structurally, the company has two main production units. The first focuses on the tasks associated with the software design and development; the second deals with deployment and maintenance of automated systems for control centers.

The work process of the major production divisions is based on the principle of a balanced matrix: functional structure based on the vertical management is harmonized with the system of horizontal connections of the project organization of works.

A considerable part of the company's business operations deals with customer support and software maintenance. Technical support is closely integrated with development and, once discovered, the problem is quickly escalated to the appropriate developer.

Moscow branch

Smolensk branch

Krasnodar branch

Voronezh branch

Geographically, the company is located in five Russian cities:

- Company headquarters are located in **Pyatigorsk**. The head office and the engineering center are situated here. The office houses the following departments : administration, software development unit, maintenance service, marketing department and training center.

- **Moscow** Office interfaces with some of Monitor Electric's largest customers. Some of our best engineers and developers also work there to make sure that the customers are getting the best service we can provide

- Monitor Electric **Smolensk** Branch employs graduate students and faculty members of Moscow Power Engineering Institute (Smolensk branch). Their key responsibilities include technological analysis of projects, power systems data engineering and engineering support.

- Company branch in **Voronezh** works on the development of graphic systems for the software products. It also participates in projects implementation within its core competence.

- The main activity of **Krasnodar** team is the software development for automated dispatch control systems together with the other divisions of the company.

Our US partner is Monitor Electric, LLC. It promotes the company products, adapts them to the North American market, supports product deployments and accumulates the expertise to be used in further product development.

Partnerships and Associations

Our company pays a lot of attention to partnership relations. The complexity and research intensity of technological business processes for power industry control centers, standardization trends and unification make cooperation the only possible effective business model that gives each vendor the opportunity to derive the most benefit.

The technological partnership with Microsoft allowed Monitor Electric implement a new generation project and to create a high-performance real-time data warehouse, with MS SQL Server as a primary tool. In 2008, Monitor Electric was awarded the title of The Best *Microsoft Partner* in *The strategic industry partnership* category.

IBM is another important technological partner of our company. Main area of cooperation – Enterprise Service Bus - based (ESB-based) software products integration systems; main group of products – IBM WebSphere. Monitor Electric staff has undergone IBM professional certification and is using IBM solutions for own software development.

Monitor Electric is a member of such international associations as:
- UCA International Users Group, including:
  › CIMug
  › IEC61850ug
  › OpenSmartGridug
- CIM working group affiliated with Non-commercial Partnership "Science and Engineering Board of Unified Power System".
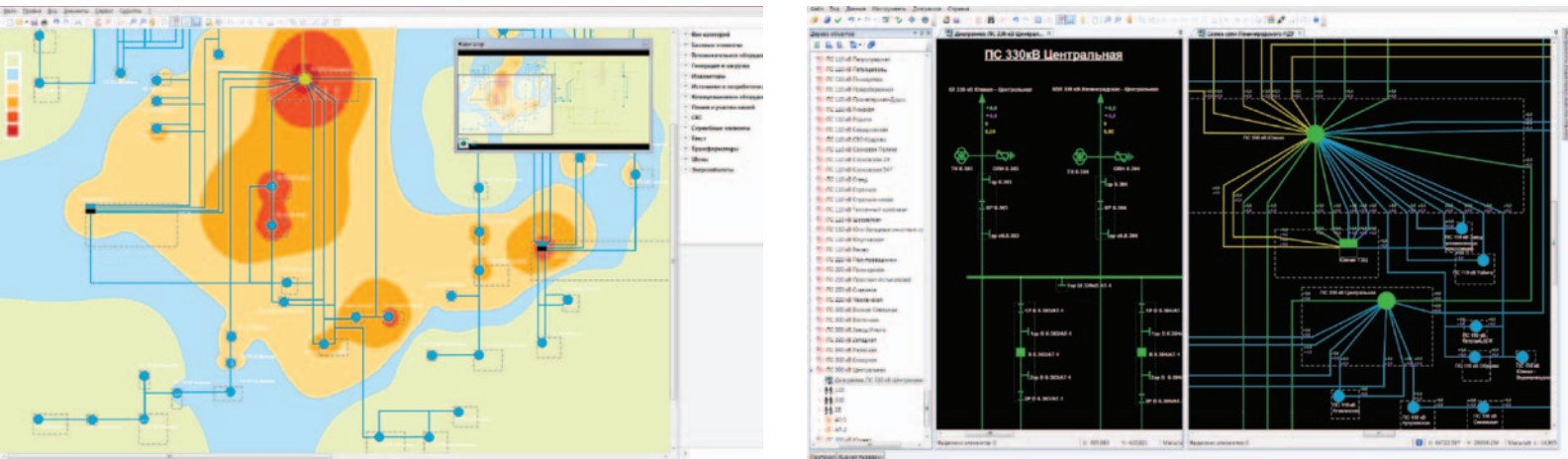
CK -11

CK-11 is a multipurpose information technology platform with configurable set of applications, which is designed for building automated systems of operational and supervisory control for power system control centers and power facilities. It is based on the Common Information Model (CIM), which is implemented with IEC 61970 and IEC 61968, along with the set of ready to use functional components and integration tools.

The set of applications depends on the range of problems solved at a control center and can be changed during operation.

The fundamental principle governing the entire architecture of the platform, ensuring its flexibility and openness is the use of international standards and systems, information and software integration means based on its functional components.

CK-11 is a new generation of industrial automated systems for control centers of power generation, transmission and distribution utilities, repair and maintenance control systems, fault management systems, operational personnel training systems.
CK-11 is designed to be deployed in complex multi-level control centers.

CK-11 Key Features

- Operational and technological supervision of power systems now can advance from monitoring of current state to proactive control (which means foreseeing events and initiating corresponding actions). This is achieved by the following features:

  › Substantial time savings and optimization of operational planning process, which results in fast decision-making and higher quality of power system supervision
  › Significantly increased accuracy of calculations based on real-time data received from power objects
  › New class of online process modeling and proactive reliability analysis applications integrated with SCADA
  › New environment, which allows shift personnel to master their skills in short terms

- Distributed configurable information infrastructure, which can interconnect control systems of multiple control centers, regardless of their level and location
- State estimation for more reliable operation of online applications for poorly observable power systems
- Automatic conversion of full physical models of power systems into computation models
- Open platform for application integration based on international standards and technologies, which makes user less dependent on a single software manufacturer
- Simultaneous execution of multiple applications that support different versions of CIM
- Modern and multifunctional graphical user interface for one-line diagrams, trends, 3D animation, video walls, and mobile devices

CK -2007C

Operational and informational software complex CK-2007C is a high-performance real-time platform, which is delivered with SCADA, EMS, DMS and MMS applications in various configurations.

The software complex is used by generating, grid, marketing companies and system operators as the basis for the construction of operational technological control and management systems in situational centers, data centers and control centers.

CK-2007C is a firm foundation for creating local systems of automation at industrial plants, control centers for engineering and technological systems and buildings. This is a powerful software and technical platform for the development of information systems and creation of solutions for industrial enterprises.
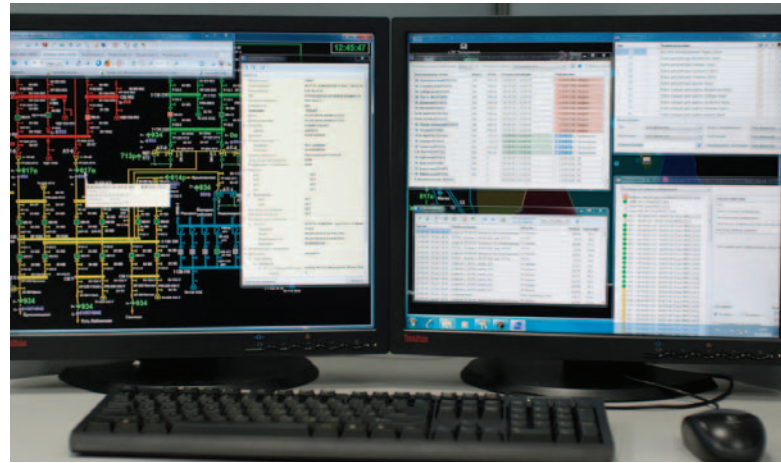
OTS FINIST

FINIST is an advanced operator training simulator designed by Monitor Electric. Operator training simulator FINIST combines state of the art training features with high-fidelity power system model. FINIST has a sophisticated model of the power system available. It allows the simulator to accurately model a wide range of system behaviors: disturbances, outages, faults, system partitioning, restoration, etc. FINIST is designed to seamlessly operate with industry supervisory control and data acquisition energy management systems (SCADA/EMS). This increases the realism of the simulation as the operators train using the same SCADA system they use for real system controls. FINIST has a sophisticated set of tools to configure, conduct and evaluate the training session to achieve maximum realism and training effectiveness.

FINIST grew out of our many years' experience at building simulators for electric power industry. The internal data storage, communication between FINIST modules as well as external interfaces are in CIM (IEC 61970) format and related family of protocols.
This software can be used for the following tasks:
- Training of operational personnel. FINIST is applicable for any level of training: newbies education, skills support training, complicated emergency response drills and post-accident remedial program trainings
- Analysis of power system behavior in each particular case, including state analysis, equipment outage requests handling, testing of automatic emergency response system efficiency, reliability evaluation of forecasted power system state, etc.
- Exploration of cause-effect relation of the events in the power system
- Evaluation of operator actions, including remedial ones
- External systems debugging with the use of dynamic power system model. They are integrated into FINIST software solution then
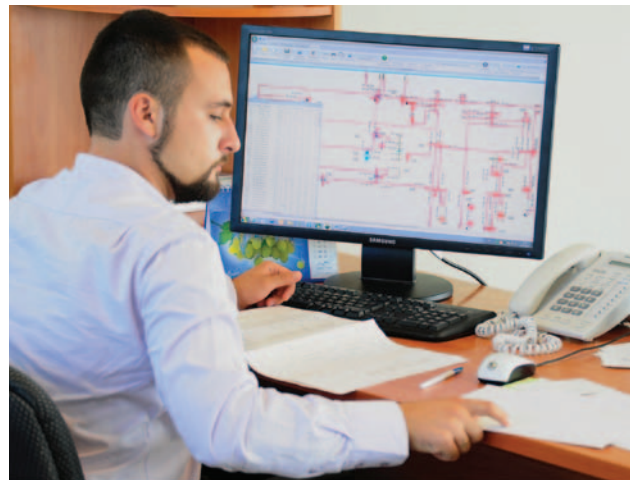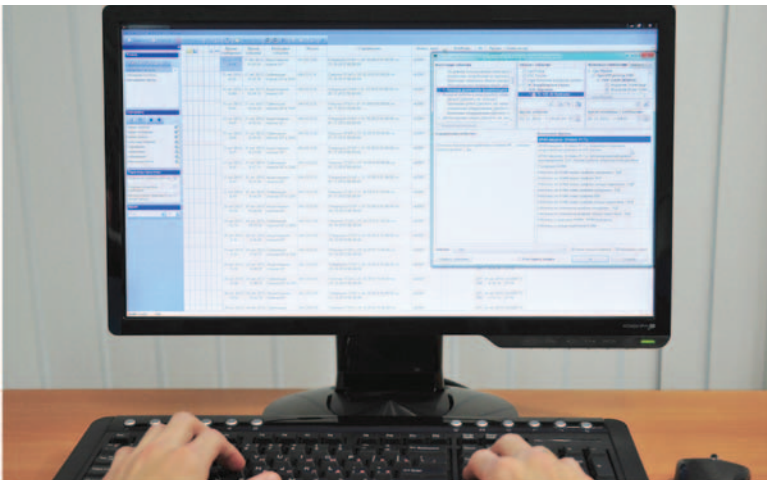
Hedgehog-2

Electronic logbook Hedgehog-2 is a time-saving software package designed for control center operators and managers. This solution provides shift personnel with a unique opportunity to automate the routine log-maintenance work and to simplify operational record keeping and analysis.

Hedgehog-2 allows tracking and managing real-time data of various events such as power system state change, equipment outage, relay or special protection scheme operation, communication or computing equipment failure, dispatcher directives, neighboring system personnel inquiries, etc.

The electronic logbook Hedgehog-2 offers:

- Reliable record keeping
- Secure data storage, backup and replication
- Simultaneous multi-user access, per user and per-role access authorization and privileges
- Classification and categorization of the variety of operational information handled by shift personnel and other logbook users
- Simplified record entry; ability to attach files in various formats to each entry
- Event subscription, cellphone text-message, instant message (IM) or email based notification of responsible personnel
- Flexible integration with the enterprise resource planning and other company process automation software
- Easy past event information retrieval: this turns the logbook archive into a readily accessible storage of past operational experience
- Significant record keeping time savings and optimization of shift personnel work process

Sophisticated security system based on modern requirements and corporate security standards ensures a reliable data protection against unauthorized log access, entry deletion, alteration and forgery.

The logbook assigns a unique digital signature to every entry as well as to the whole log. This way, unauthorized entry manipulation cannot pass undetected. To simplify security control, the logbook security system maintains a specialized audit log – all transactions are recorded in the system.

Hedgehog-2 has a triple-level data access authorization system. Moreover, to ensure information security, the logbook maintains multiple backups as well as on- and off-site replication copies of the entries and other key data. The logbook automatically synchronizes the data between the original and the replicas.

CK-Proxy

CK-Proxy is designed to serve as data gateway for telemetry data exchange via internationally standardized protocols based on TCP/IP protocol. It provides initial data processing and routing at the application layer of data exchange.
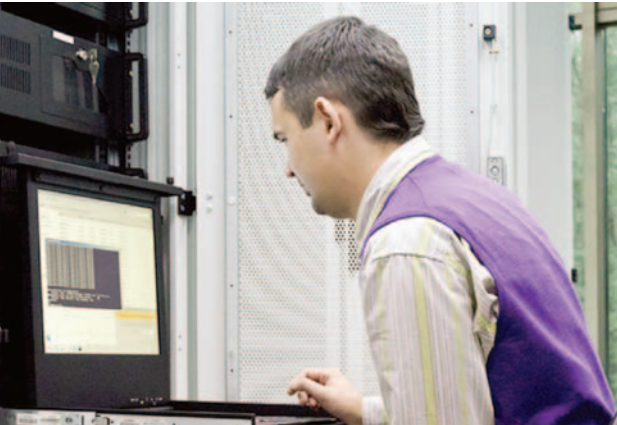
Communication front-end CK-Proxy is generally used to address one of the following tasks in any combination:

- IT security gateway

 It is located in the demilitarized zone of the company security system and supports data exchange modes, under which a minimum number of connections is established, initiated by a data exchange participant located in the secure network. CK-Proxy ensures control of data exchange at the application layer by defining a list of allowed data exchange hosts with specification of IP-address, protocol, and set of allowed for reception and transmission parameters for each node. It supports real-time monitoring of received and retransmitted data flows.

- Protocol convertor

CK-Proxy converts received data packets into a different protocol format for transmission to the recipient. At the core level CK-Proxy presents transmitted data in a standardized format so that all combinations of conversion are possible subject to compliance of transmitted parameters entities.

- Multiplexer / demultiplexer of data flows

It can be used when the automated system (SCADA, industrial control system, etc.) cannot provide data and commands exchange simultaneously in several directions. CK-Proxy solves this problem by establishing a single connection to the automated system and the required number of connections to the other data exchange parties.

MMS

Our company has been actively developing software for the electric power market during recent five years. We have successfully developed support systems for Russian Power Market, which are used by both market participants and regulators:

- MODES-Terminal and MODES-Centre are unit commitment systems for planning of generating equipment employment
- SRT SDK is a system for distribution and transfer of operator's commands for power system balance under emergency conditions and in case of imbalance of forecast and actual load and generation during the day
- System Operator Terminal is a set of tools for operational personnel aiding in taking decisions in case of deviations from scheduled power system operation
- Commercial Operator Terminal is a software package, which is designed for technical and financial accounting at generating company based on the results of an operating day

Projects and Solutions
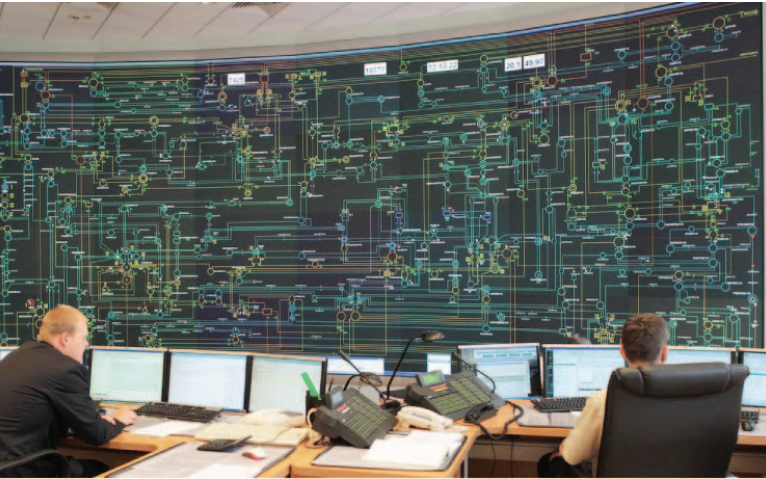
For system operators:

Automated Supervisory Control Systems

Software:
- SCADA/EMS CK-11
- Operational and informational software complex CK-2007C
- Electronic Logbook Hedgehog-2
- Emergency Operator LogBook
- Operator Training Simulator Finist
- Communication Processor CK-Proxy

Automated System for Emergency Control Centers

Software:
- Operational and informational software complex CK-2007C
- Emergency Operator LogBook

For grid companies (transmission and distribution):

Automated Systems for Supervisory and Technological Control at Grid Control Centers

Software:
- SCADA/EMS CK-11
- Operational and informational software complex CK-2007C
- Electronic Logbook Hedgehog-2
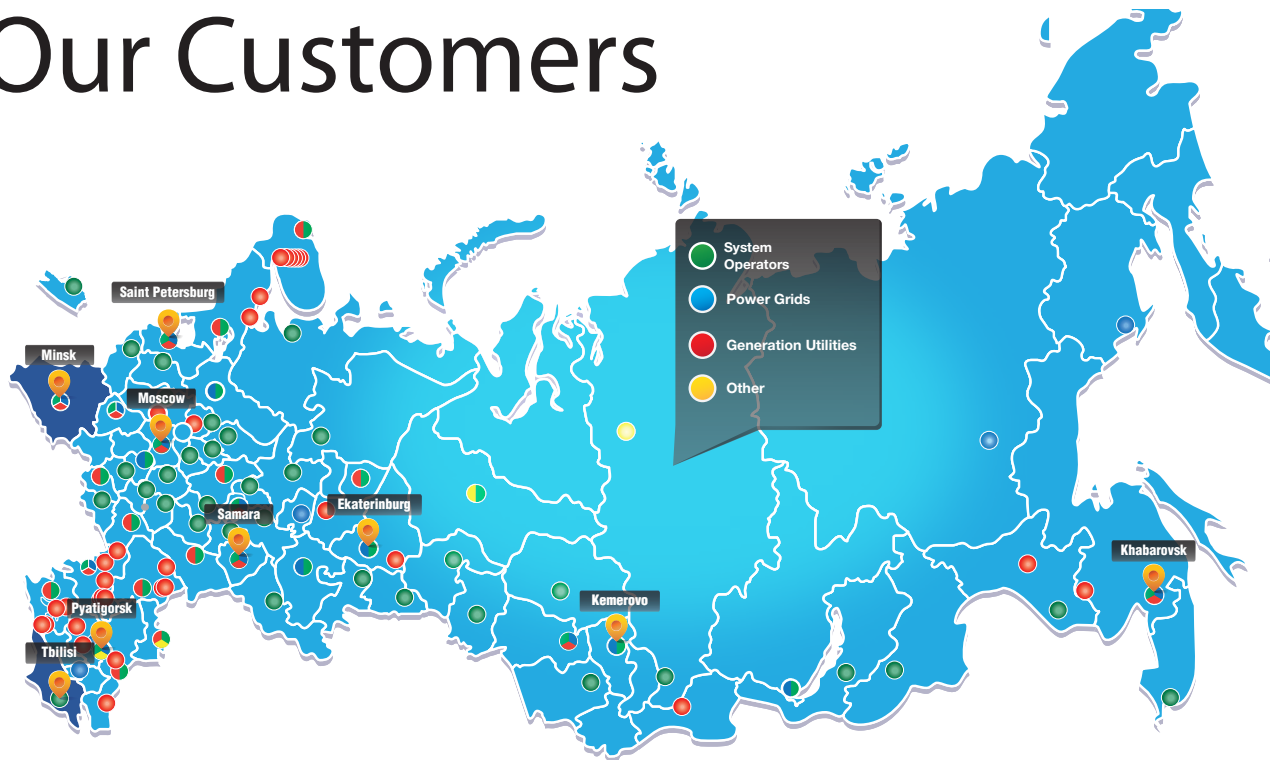- Operator Training Simulator Finist
- Communication Processor CK-Proxy

Automated System for Emergency Control Centers

Software:
- Operational and informational software complex CK-2007C
- Emergency Operator LogBook

Our Customers

Activity of over 100 control centers has been automated with the help of our software; hundreds of local automation systems have been created.

Among our customers:

Foreign companies:
› Belarus Main Control Center (ODU Belarusi)
› Belarus Gomelenergo
› Georgian State Electric System (GSE)
› USA SERC Reliability Corporation (SERC)

Russian companies:
› System Operator of the United Power System (SO UPS)
› Federal Grid Company (FGC)
› RusHydro
› Rosenergoatom
› Lukoil Oil Company
› 1st Territorial Generation Company (TGC-1)
› SIBECO
› TGK-13
› 6th Wholesale Power Market Generating Company (OGK-6)
› Far Eastern Generating Company
› Mosenergo
› Lenenergo
› Interregional Distribution Grid Company of South (IDGC of South)
› Interregional Distribution Grid Company of the North Caucasus (IDGC of the North Caucasus)

› Interregional Distribution Grid Company of Volga (IDGC of Volga)
› Interregional Distribution Grid Company of Center & Volga Region (IDGC of Center & Volga Region)
› Inter RAO Group
› Inter RAO – Electric Power Plants
› RAO Eastern Energy Company
› Far East Distribution Grid Company
› Magadanenergo
› Yakutskenergo
› Grid Company (Kazan)
› Irkutskenergo
› Irkutsk Grid Company
› Bashkirenergo
› Samara Distribution Grids
› Interregional Power Supply Company
› Tyumen Power Supply Company
› Moscow United Electric Grid Company
› Yantarenergo
› National Research University "Moscow Power Engineering Institute"
› RUSNANO
› Vankorneft