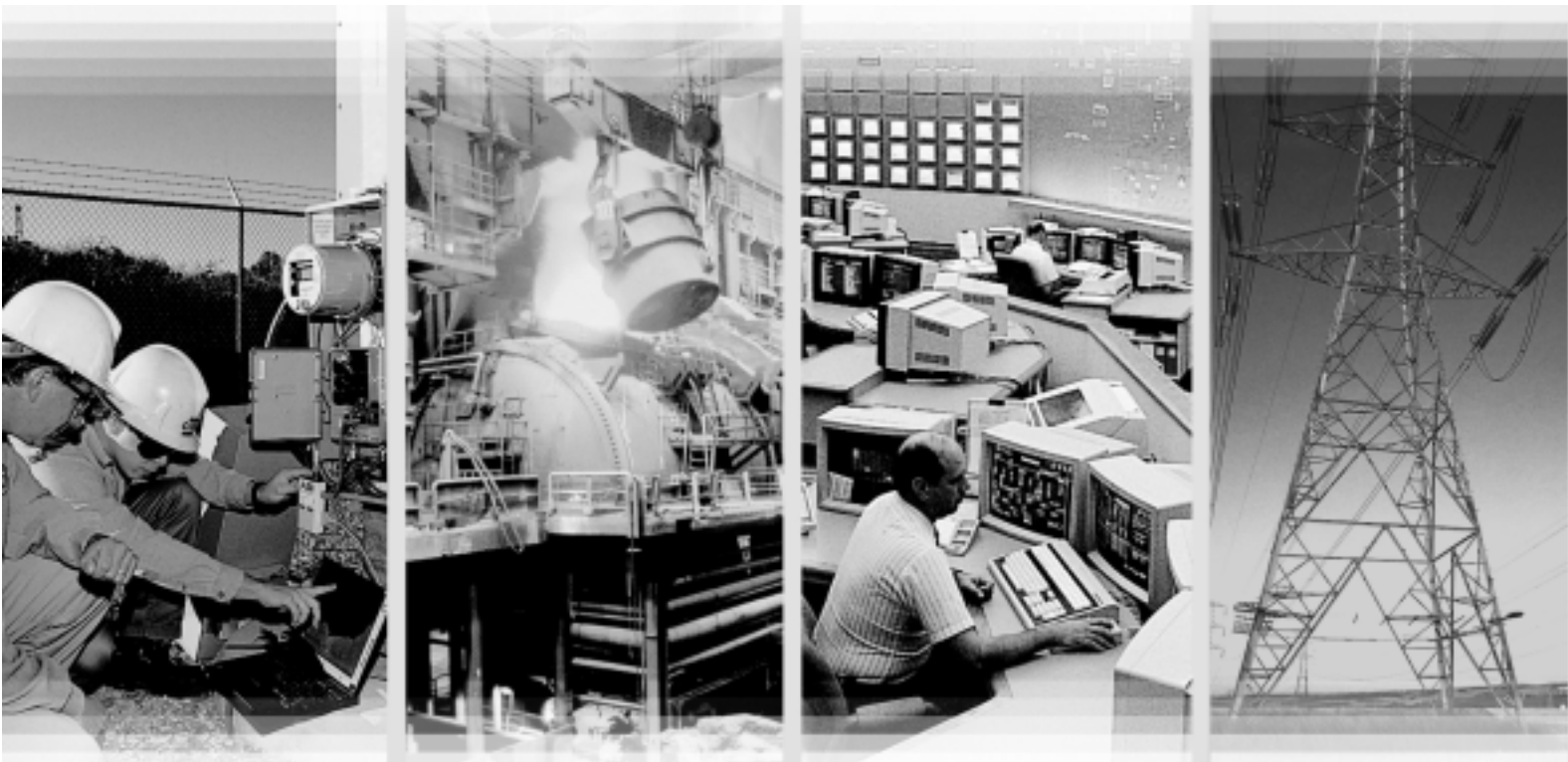


Metering systems (AMR) projects



Reference



Alpha CENTER Brand New Metering Technology from Russia

Russia is one of the biggest producers of energy all over the world and now makes liberalization of the electric power industry. In this background new power companies need only a modern metering system, which can enable them to become the most competitive in the market. And today Elster Metronica is one of the leaders and the main Supplier of the perfect metering solutions in Russia and CIS.

Since 1996 Elster Metronica has been developing metering systems based on innovative digital metering technologies. Today we offer up-to-the-minute Metering technology Alpha CENTER. Alpha CENTER is the metering system that completely meets stringent requirements of Russian Power Industry. Alpha CENTER suits perfectly both large Utilities and Industrial companies with thousands of meters and small enterprises with several meters.

Hardware

Elster Metronica produces and supplies all the necessary equipment for building metering systems:

- High functional, fully programmable solid state electricity meters ALPHA (ALPHA Plus, A1600, A1400, A1000).
- Controllers RTU-300 series (data acquisition, processing and communication units).
- Alpha CENTER program package.
- Communication and essential equipment (Workstations, servers, printers, adapters, cable etc.).

Software

Alpha CENTER metering systems are specially designed for energy and power metering and billing purposes including automated meter reading, data collection, processing, storing, and easy-to-analyze display of received data.

Alpha CENTER is the series of software products; it is based on the principles of client-server architecture (Oracle, Windows NT/2000). The program collects and analyzes data from meters, balances the accounts and integrates it into business administration systems. The system is designed for billing, managing networks or consumption, load management and measuring and analyzing of electricity quality parameters.

Turnkey solutions

Elster Metronica supplies metering systems on a turnkey basis or integrate it in close cooperation with customers. We render support on every stage of metering system implementation, including enterprise investigation, system's installation, adjustment, commissioning, training etc.

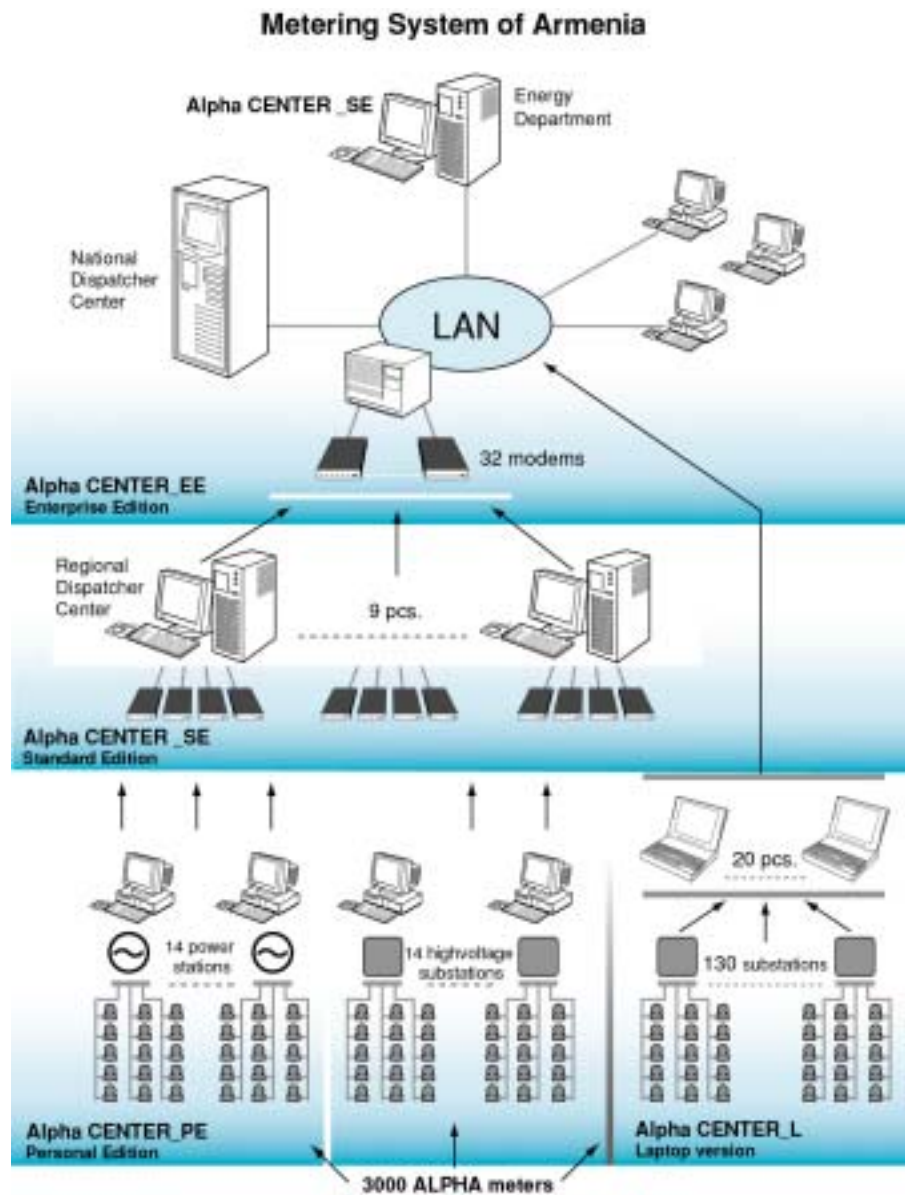
Elster Metronica has wide experience of large-scale AMR projects in Russia and CIS. Further you will find detailed description of some of them.

AMR system of Armenia



In the middle of 2002 the metering system of Armenia was put in commission. Metering project of Armenia metering system began in 1999, when Elster Metronica, Moscow, Russia supplied 3000 meters (are used in system) of A1600 ALPHA type. In the beginning of 2001 year Elster Metronica started introducing it's in-house design - Alpha CENTER metering system. The Alpha CENTER system in Armenia automates electricity metering of whole country and covers 14 power stations and 14 high-voltage substations.

The task of the designed system is to provide all participants of Armenian electricity market with the necessary information about energy generation, distribution and consumption. Specialists of Elster Metronica set the system up and trained Armenian engineers to use the equipment efficiently. The Ministry of Armenia supervises this project and in December the system is being put in commission.



Metering system of Armenia comprises more than 3,000 ALPHA meters

The Customer Company: Oktyabrskaya railroad (Moscow-Sankt-Petersburg-Murmansk)

Starting point:

The railroads in Russia are among the largest power consumers. Millions of kilowatt-hours are spent for hauling operations and functioning of enterprises included in the system of the Ministry of Railways of Russia. Currently, a specific share of expenses for electric bills amounts is nearly up to 15% for railroad networks, including 8% for electrified railroads thus exceeding all other costs being second only to the wages fund.

Main objective: Cutting down the cost of electric bills

In modern conditions, when the federal wholesales market of energy and power (FOREM) is being formed, the main way to cut down the costs is nothing but the provision of railroads with the state-of-the-art time-of-use (TOU) meters, introduction of automated meter reading systems (AMR) and entering the FOREM.

Integrated solution: Installation of TOU meters and AMR

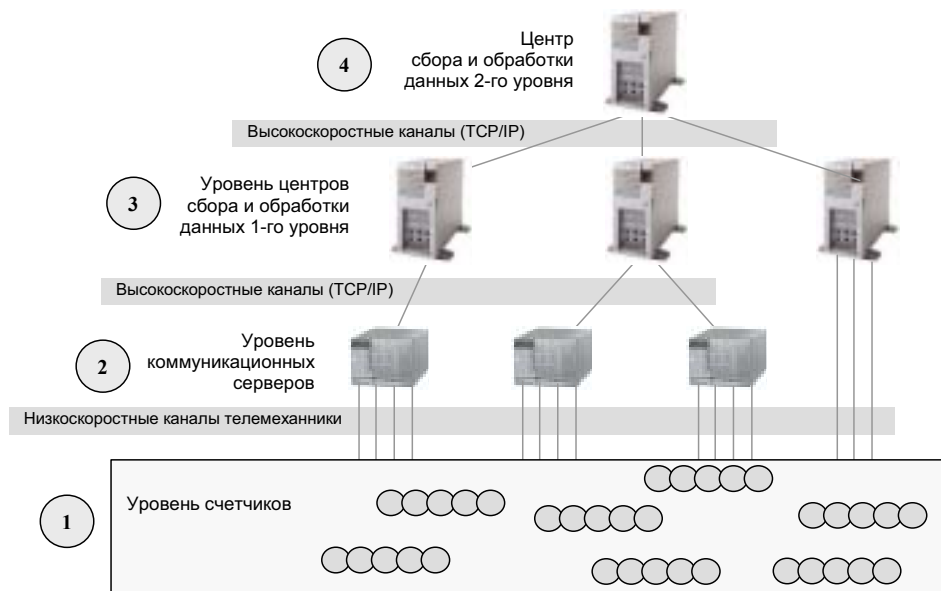
Introduction of new technologies was carried out by stages. During 1997-2000, more than 2,000 electricity ALPHA meters were installed throughout the railroad covering basic commercial billing activities. Total for railroads of Russia it was produced 10,000 ALPHA meters.

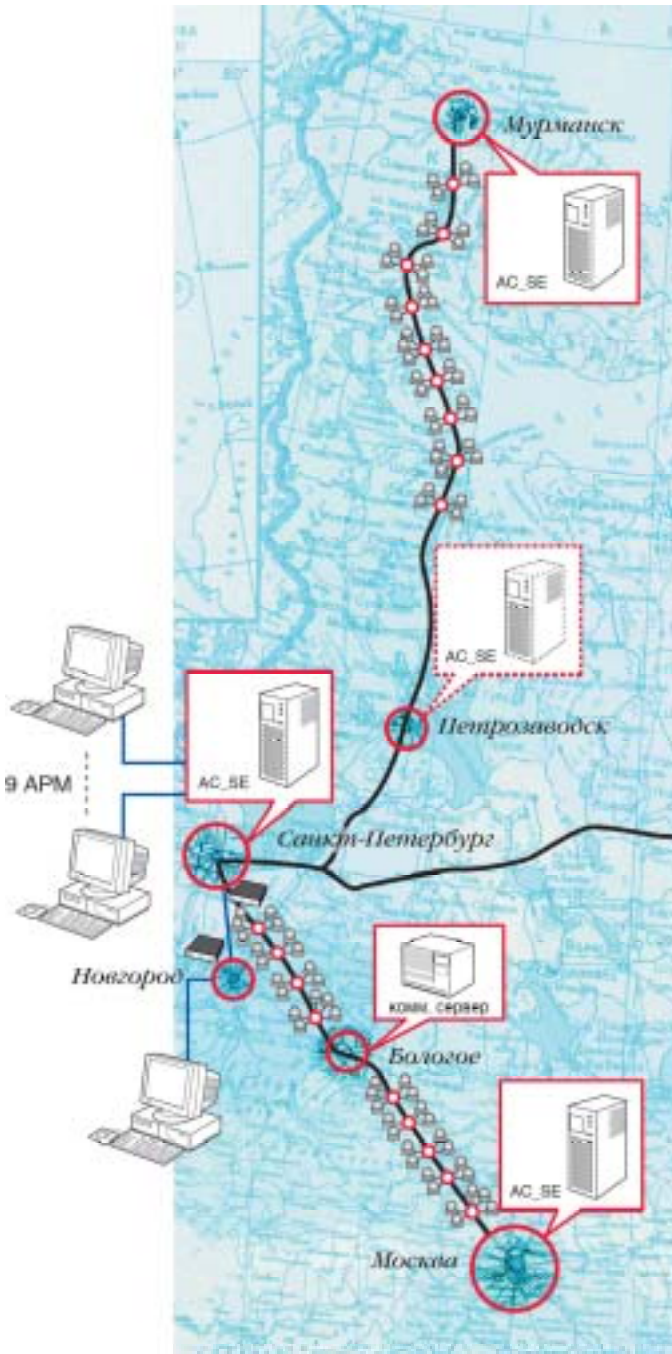
In the year 2000, in the framework of metering automation activities, the Alpha CENTER AMR system was launched. The Alpha CENTER AMR system was designed by Elster Metronica's engineers and programmers with regard to specific needs of large consumer enterprises and power utilities. Data collection and processing centers form the basis of the system.

System structure

In the framework of the project, the data collection and processing system as well as the data display system can be distinguished. The structure of the data collection system is represented by the four-level architecture:

1. Meters level.
2. Communication servers level.
3. 1st-level data collection and processing centers level.
4. 2nd-level data collection and processing centers level.





This architecture made it possible to organize data collection from a vast territory. Currently, three communication servers located in Moscow, Bologoye and Petersburg are collecting data from traction substations spaced at several hundred kilometers. The specific feature of this project is a joint utilization of communication channels with the remote control system that imposes limitations on the meters handling rate (50 Bd). Communication servers collect data according to a schedule that can be flexibly adjusted.

For instance, if the meters interrogation is performed by means of conventional telephone lines (automatic telephone exchange), then in the day-time the lines can be used by the plant personnel, and at night can be switched over to the data collection system.

Every communication server simultaneously collects data from several communication lines. Several communication servers operating in parallel deliver data to one database server (the 1st level data collection and processing center). Data collection and processing are fully automated.

The software package keeps a continuous track of data completeness and performs additional collection of data that are missing. Then these data are automatically involved in calculations. As the result, the system users continuously follow actual power demand conditions. Information in this case can be represented with a various degree of detailing.

The data collection and processing centers are organized on the basis of servers Windows NT. The professional multiuser ORACLE DBMS is used as the database. The software has the client/server architecture. In the Alpha CENTER version 2.05.5 the applications load balancing has been performed, thus making it possible for remote users to communicate with the database using conventional telephone lines. Alongside with this, the entire system has a multi-level data protection system (on the OS level, on the DBMS level, on applications level).

Metering system of Oktyabrskaya railroad (Moscow-Sankt-Petersburg-Murmansk) comprises 2,000 ALPHA meters

Software content

Applied software and maintenance documentation are supplied on CD (415 Mb).

Applied software includes:

- Communication server.
- Calculations server.
- System control modules.
- Package for generation of a basic set of users with an access right differentiation
- Database scheme image (dump) with a completed reference data system.
- Client's software (screen interfaces, reports generating modules).

The delivery includes a coordinated DBMS ORACLE (standard edition) version provided with engineering support for a period of one year and a complete set of applications software installation packages for applications server, communication server and the user workstations.

The advantages of integrated solution represented herein are as follows:

- Parallel data collection
- Parallel calculations and diagnostic system.
- Multiuser mode of operation
- Client/server architecture
- Scalability and extensibility

Final results:

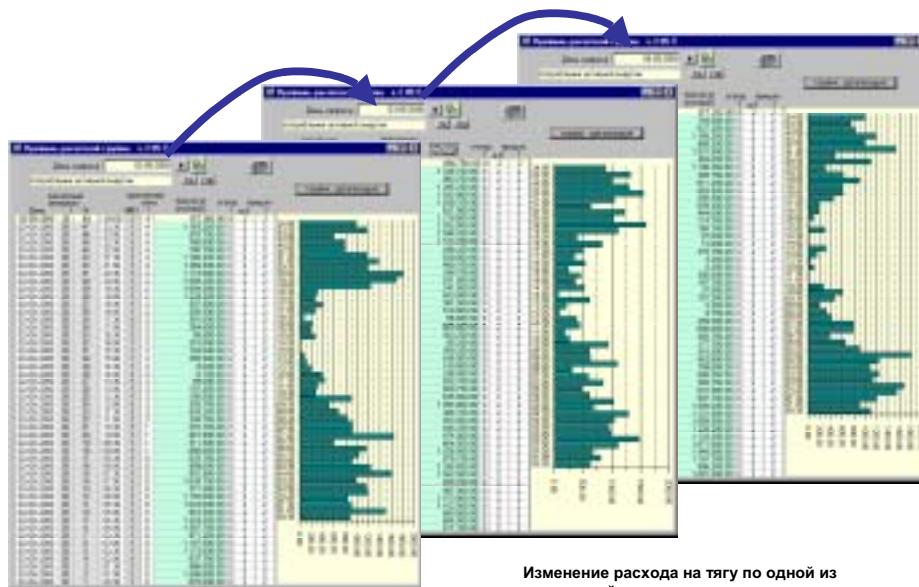
The meters and the system handling expertise testifies to a high efficiency of the solutions applied, namely: reduction in power consumption for hauling operations, overall cutting down of the railroad electric bills costs and reduction in the unit power consumption per unit of cargo conveyed.

These results were obtained due to

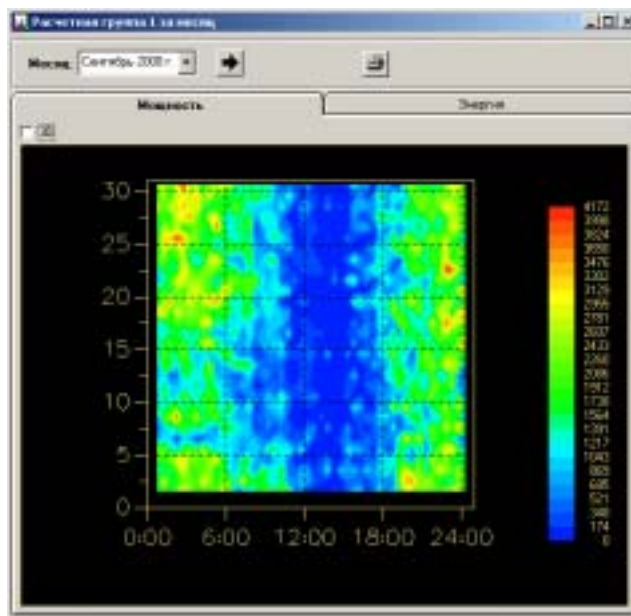
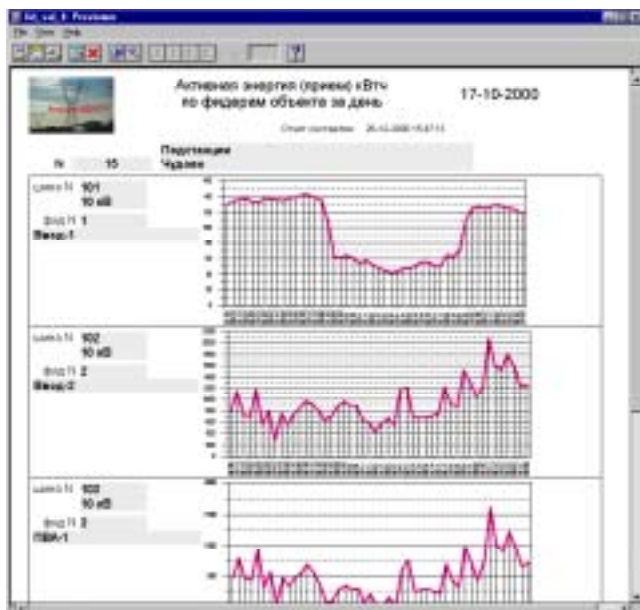
- Increased energy metering accuracy.
- Transition to time-of-use energy billing.
- Reduction of the customer contract demand during the power system peak hours.
- Load control.
- Organization of data collection from the ALPHA meters installed.

Comprehensive energy resources metering

The next step in the work planned to develop the integrated AMR system for Oktyabrskaya railroad will be elaboration of the automated energy resources metering system for the Oktyabrskaya railroad energy-intensive enterprises (depots, terminals, stations). Introduction of this system will allow the enterprise to organize metering of consumed electrical and thermal power, including hot and cold water, gas by means of installation of energy, heat, water and gas meters and, consequently, to proceed with payments for consumed and metered resources in settlements with their suppliers.



Изменение расхода на тягу по одной из подстанций за три дня.



Examples of Alpha CENTER AMR system screens

The Customer Company: Surgutneftegaz (oil & gas)

Surgutneftegaz – one of the leading oil & gas companies in Russia.

Starting point:

In recent years, Surgutneftegaz, like all other Oil and Gas companies, was facing the problem associated with a raised share of expenses in the cost of oil.

Main objective: Cut down the cost of oil at the expense of comprehensive updating of electricity metering

One of the ways to raise the efficiency of energy management at the enterprise is mainly associated with energy resources demand metering, and particularly, the electrical energy. That was the reason why Surgutneftegaz took a decision to carry out comprehensive updating of electricity metering through installation of digital time-of-use meters and organization of advanced automated meter reading system (AMR).

Integrated solution: Installation of time-of-use meters and AMR system introduction

The updating was carried out by stages and finally has been introduced throughout Surgutneftegaz AMR system.

At the first stage of the project the master power-supply sources and some one-part consumers were provided with 2,000 ALPHA meters. The ALPHA meters developed by Elster Metronica were accepted for application as the result of comparison of all electricity metering products available on the market with regard to such features as price/quality, functional capabilities and operation within the AMR system. The ALPHA meters provide electricity and power metering with an accuracy of 0,2S, bidirectional active and reactive energy measurements, storage of billing data for a period of up to 6 months and have digital interfaces for their integration into metering system.

The second stage – integrated AlphaMet solution.

The important task to be solved at the first stage of the ALPHA meters introduction was the formation of a basis for introduction of the AMR system that would be capable of energy and power demand management. In the framework of the AMR system development it has been decided to collect the ALPHA meter readings via various communication channels using the AlphaMet system.

The AMR system allows to perform:

- Active and reactive energy demand metering (including reverse flows) for given time intervals including individual meters, preassigned groups of meters and the whole enterprise with due regard for the time-of-use capability.
- Calculate average (half-hourly) active power (load) values during day- and night-time maximum demand periods including individual meters, preassigned groups of meters and the whole enterprise.
- Generate half-hourly and, if required, three-minute load patterns needed to organize efficient power consumption at the enterprise.

Surgutneftegaz made use of several standard versions of the AMR system organization with regard to the enterprise specific features:

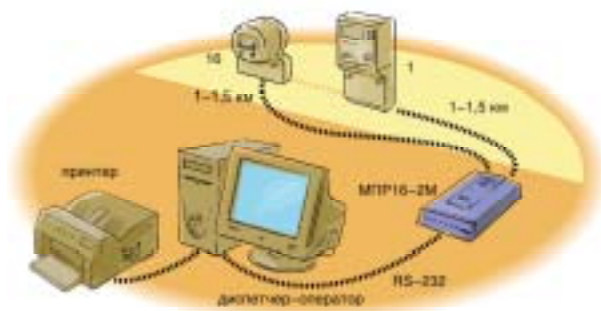
AMR for meters interrogation via optical port

The system of this type was used when the meters were spaced at too large distances, and communication channels were unavailable. In this case the number of meters is not limited since the interrogation is performed "individually" by means of a portable computer via Unicom Probe cable.



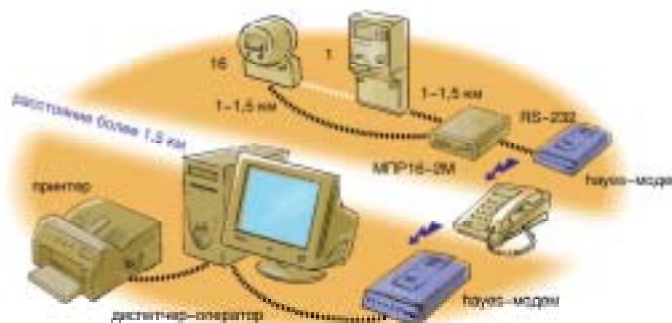
AMR for meters interrogation via multiplexer

For this AMR type the meters interrogation is performed by means of Elster multiplexer which provides possibility for connection of up to 16 meters. In this case the meters are placed at a distance of 1-1.5 km from the computer to which a multiplexer is connected.



AMR for meters interrogation via modem

This way of the system organization was realized at substations having reliable communication channels, the meters were integrated by means of a multiplexer and were placed at a distance of not above 1.5 km from the local computer.



Final results:

Remarkable economic efficiency and reduced cost of oil.

Today, the Metering System system collects and processes data coming from over 2000 energy meters. For the first time, after the meters were installed at master substations, there were obtained virtually true data on the demand quantities and patterns. The forecasting accuracy in energy and power demand remarkably increased and became much more simple.

Expertise in ALPHA meters and AMR system operation at Surgutneftegaz testified to considerable economic efficiency of their application amounting to 88 thous. rubles per one meter p.a. It was attained due to:

- Modernization of commercial and technical billing.
- Remarkable costs reduction due to strict power supervision.
- High forecasting accuracy in probable future demand.
- Optimization of electrical networks performance at the expense of cutting down active energy and power demand.
- Limitations of the power system peak hours active power demand.

A fairly important consequence of the meters and the system introduction is an ever-growing mutual confidence between OAO "Surgutneftegaz" and the Surgut power utilities (who have also installed the AlphaMet system). This became possible due to strict meter data readout supervision mutually performed by the enterprise and by the power utility. Now both, the producer and the customer only enjoy advantages from mutually beneficial cooperation. The former enjoys significant savings in energy demand, and the latter has a reliable client who timely clears the electric bills.

The Customer Company: Kolenergo (power system)

Starting point:

Today, the transition to the market economy requires radical changes in organization and activities in the national power-engineering sector. In recent years, the program for the development of the Russian Federal Wholesales Market of Electrical Energy and Power (FOREM) has been rapidly elaborated. However, this process faces a number of problems, one of them being associated mainly with the necessity to carry out large-scale re-equipment of electricity metering devices and organize automated meter reading systems (AMR).

Main objective: Entering the FOREM

In the framework of transition to the FOREM, Kolenergo outlined its activities as follows:

- Updating of electricity metering. Installation of the time-of-use meters of high class of accuracy 0.2S.
- Elaboration of systems for meters data collection and introduction of higher-level software for data storage and data processing.

New equipment in this case should undergo metrological certification, be certified by the Gosstandart Russian Authorities and be capable to assure proper protection of commercial information.

Integrated solution: Organization of the advanced AMR system

In November, 1999 at "Kolenergo Ltd" an intelligent AMR system with the Alpha SMART distributed data processing system was put into commercial operation. The project lasted as long as two years and included the ALPHA meters installation, arrangement of the automated data collection system and a prolonged period of pilot operation. This article will give you the knowledge of the results obtained during the year after the system was put into commercial operation.

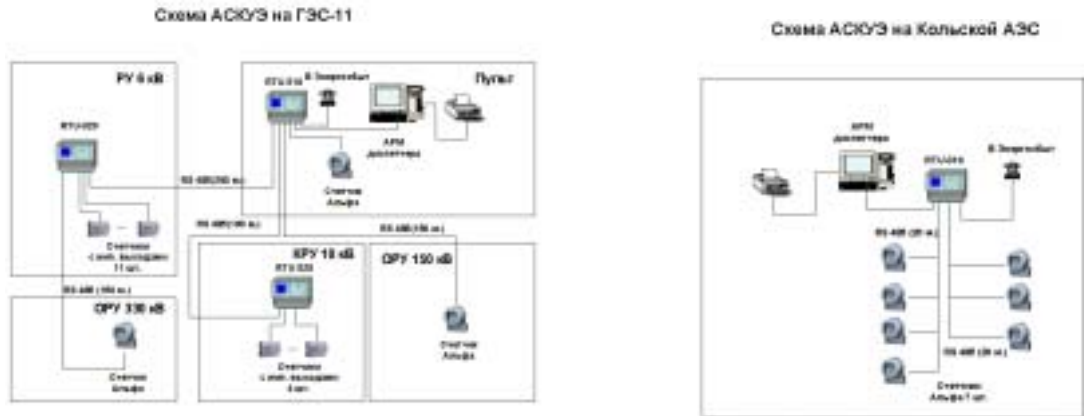
Elster Metronica supplied equipment to "Kolenergo Ltd" substations and performed a full scope of work on the system introduction at these substations, system upgrading to meet the Utility and the North-West Integrated Dispatching Service (IDS) requirements including testing of communication channels and the complete system adjustment.

System structure and functions

The system includes the Kolenergo intersystem connections with the Kolskaya nuclear power plant and Karelenergo. The system integrates two substations: the Kolskaya nuclear power plant and the hydro power plant GES-11.



The meters data are automatically (in 3-minute intervals) delivered from these substations to data collection and data processing units RTU-310. (The system block diagram is given in figures). At substations, the RTU employs interface RS-485 for meter data readout. At the Energosbyt and the Automated Dispatching System (ADS) the dial-up PLC channels are used.



Time-shared RTU data are delivered via dial-up channels to: Energosbyt (once a day) for generation of commercial reports on Kolenergo intersystem connections. These reports are transferred to the Energosbyt billing department.

The substations are provided with the higher-level software that provides the real-time monitoring.

Works performed

Under this project, Elster Metronica, alongside with production and supply of basic equipment, performed the work as follows:

- Development and coordination of the AMR project.
- System upgrading according to Kolenergo and the North-West IDS requirements.
- Supervision of installation, start-up and adjustment.
- Personnel training.
- System certification at the substation and putting into commercial operation.

The company has undertaken to support the system throughout the whole period of its operation. The warranty period for the whole equipment will be 3 years.

Final results

- Volume and validity of the obtained data on energy flows in the AMR system meet requirements set forth in regulatory documents.
- Data stored in the ALPHA meter fully coincide with information read by PCs.
- The AMR sample output reports meet Kolenergo users' requirements.
- Intercomputer data exchange on interstate flows between Kolenergo and the "North-West" Integrated Dispatching Service (IDS) via dial-up channels was organized.
- Data transmitted to the North-West IDS meet the FOREM commercial metering and billing requirements.

System development

The expertise in the Metering system handling testifies to correctness of engineering solutions applied and shows vast prospects for AMR system based on digital meter data transmission. In this connection, a decision was taken to continue further development and improvement of electricity metering by means of the following programs:

- Increase the amount of meters at the Kolskaya nuclear power plant to make it possible to calculate the overall balance of the plant.
- Organize dedicated channels between the substations and the Kolenergo ADS to provide supervision of operating conditions.
- Organize the higher level in Kolenergo and Energosbyt making use of UNIX servers and ORACLE database for billing procedure automation.

Metering systems projects reference list

AMR system Alpha CENTER of "Prospector's Artel Neiva" in Sverdlovsk region

This system combines 5 substations that have time-of-use solid-state A1600 ALPHA meters. The information of power consumption is picked up through the optical port. Then this information is recorded into the computer of the operator's desk and then to the Sverdlovenergosbyt's Power Utility server.

Kirovsk region's metering system

Most of Kirovsk region's industrial enterprises use meters of the ALPHA family and AMR systems for control of electric energy demand produced by Elster Metronica. Such large-scale enterprises as Kirovochepetsky chemical factory, Kirovsky tyre factory, Kirovsky factory of non-ferrous metals processing, Engineering plant "Molot", Kirovsky factory of leatherette processing and others are among them in Kirovsky region. They consume about a quarter of energy output of Kirovskaya power grid.

All plants that installed the AMR systems has a possibility to settle accounts with power system by differential rates as the one-part consumer. The pay-back period was 1 month on average. The next is installation of the system at 2 plants in Kirovsky region. They are the "Engineering plant named after the 1st of May" and "AVITEK".

AMR system AlphaSMART at Permskaya Hydro Power Station

Permskaya Hydro Power Station is the biggest one in Europe. The system consists of about 40 ALPHA meters, 2 controllers of data acquisition and transmission equipment RTU-300 (for substation 500/220 kV and Dispatching Center) and operator's desk. The information about the installed models 63002 is delivered to the SC "Permenergo" and to the Regional Dispatching Center of Ural.

AMR system of Oil-pipe lines "Druzhba"

The system is built on the basis of ALPHA meters, data acquisition and transmission equipment RTU-300, Alpha CENTER Software. The system covers 3 regional oil departments of the oil-pipe line "Druzhba".

Ferganaazot AMR system

In 2001 Elster Metronica accomplished the implementation of AMR system for "Ferganaazot", leader in producing fertilizers in Uzbekistan. The system consists of A1600 meters and AlphaMet 2.20 software.

Integrated AMR system of Astana (Kazakhstan)

At the end of 2001 Elster Metronica accomplished the implementation of AMR system in Astana (new capital of Kazakhstan). The system is built on the basis of the software and hardware produced in Elster Metronica (Alpha CENTER system, A1600 meters and data acquisition and transmission equipment of RTU-300 family).

Metering system of UPG of Russia's central power networks

In 2002 Elster Metronica accomplished the implementation of AMR system for United Power Grid of Russia's central power networks (MES of Center). The system covers 19 regions of central Russia including Moscow and consists of: 500 ALPHA meters, controllers RTU-300, primary and support equipment for AMR, PCs, communication servers, Alpha CENTER software.

Power Utilities

AMR system Surgut networks (1996-97)

Tyumenenergo, Russia, West Sibiria

Equipment: ALPHA polyphase multifunctional meters (500 pcs), software, primary and support equipment for AMR (Automated Meter Reading system)

Solution: AlphaMet ver.2.16

Modernization of metering equipment (1996-97)

Tyumenenergo Russia

Equipment: ALPHA meters (4000 pcs), AlphaMet software, primary and support equipment for AMR, Establishing of Service Center in Tyumen region

Solution: EmfPlus, reading through optoport

Automation of metering in Tbilisienergo (1999-2000)

AES Telasi, Georgia

Equipment: ALPHA meters, software, primary and support equipment for AMR, AMR Alpha SMART

Solution: Alpha SMART

AMR systems of generation of Yarenergo (1999-2000)

Jarenergo, Russia

Equipment: ALPHA meters, software, primary and support equipment for AMR, AMR Alpha SMART

Solution: Alpha SMART

AMR Kolenergo (Appatity, Severo-Nickel, mining and processing enterprise, Murmansk port) (1999 – 2000)

Kolenergo, Russia

Equipment: ALPHA meters, controllers RTU-300, ALPHA meters, software, primary and support equipment for AMR, AMR Alpha SMART, PC, communication servers, data bases. Establishing of Service Center with Calibration and Testing laboratory

Solution: Alpha SMART

AMR system for Power Utilities of Armenia (USAID finance) (1999-2000)

Ministry of Energy of Armenia

Equipment: ALPHA meters (10,000 pcs), controllers RTU-300, ALPHA meters, software, primary and support equipment for AMR, PC, communication servers, data bases, Alpha CENTER (Oracle + Windows NT/2000)

Solution: Alpha CENTER

AMR system MES CENTER (2001-2002)

United Power Grid of Russia

Equipment: ALPHA meters (500 pcs), controllers RTU-300, ALPHA meters, software, primary and support equipment for AMR, PC, communication servers, data bases, Alpha CENTER (Oracle + Windows NT/2000)

Solution: Alpha CENTER

AMR system turnkey project for Dneprohydroenergo (2001-2002) (EBRD finance)

Alstom for Ukraine customers

Equipment: ALPHA meters (350 pcs), controllers RTU-300, ALPHA meters, software, primary and support equipment for AMR, PC, communication servers, data bases, Alpha CENTER (Oracle + Windows NT/2000)

Solution: Alpha CENTER

Industry

Organization of metering in Noyabrsk Oil and Gas company (1996)

Noyabrsk Oil and Gas company, Russia

Equipment: ALPHA meters (400 pcs), AlphaMet software, primary and support equipment for AMR

Solution: EmfPlus, optoport

AMR Surgutneftegas (1997-2000)

Surgutneftegas, Russia

Equipment: ALPHA meters (2000 pcs), software, primary and support equipment for AMR, AMR AlphaMet, PC, communication servers, data bases. Calibration and testing laboratory

Solution: AlphaMet 2.19, dedicated, dialup lines, optoport

Modernization of meters on Tatneft (Oil & Gas) (1999)

Tatneft (Oil & Gas)

Equipment: ALPHA meters (1000 pcs), software, Calibration and testing laboratory

Solution: EmfPlus, AlphaMet

Udmurtneft (Oil & Gas) (2000)

Udmurtneft

Equipment: ALPHA meters (500 pcs), software

Solution: EmfPlus, AlphaMet

AMR systems for Urengoygazprom, Tymentransgaz, Lentransgaz, Mostransgaz, (1996-99)

Gazprom

Equipment: ALPHA meters, software, primary and support equipment for AMR

Solution: EmfPlus, AlphaMet

AMR system for Oil pipeline "Druzba" (1999-2000)

Transneft

Equipment: ALPHA meters (1,000 pcs), controllers RTU-300, ALPHA meters, software, primary and support equipment for AMR, AMR Alpha SMART, PC, communication servers, data bases

Solution: Alpha SMART

AMR for Russian Railways (1996-2004)

Ministry of Railways of Russia

Equipment: ALPHA meters (10000 pcs), controllers RTU-300, ALPHA meters, software, primary and support equipment for AMR, PC, communication servers, data bases, Alpha CENTER (Oracle + Windows NT/2000)

Solution: EmfPlus, Alpha CENTER

In all projects: development of requirements specifications, project specifications, training, verification and commission



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