

SOLUTIONS FOR AUTOMATION OF CRITICAL ENGINEERING INFRASTRUCTURE

DEVELOPMENT OF SYSTEM SOLUTIONS AND PLATFORMS. 20 YEARS & MORE



Entels LLC | Moscow | www.entels.ru | www.smart-grid.ru



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- 2. Model solutions automation of electric networks for ROSSETI PJSC
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MACRO TRENDS FOR ENERGY MANAGEMENT BY 2040



- The planet's population will increase by 2 billion and exceed 9 billion people. To ensure the safety of such a number of energy technologies, all energy sectors will undergo a transformation and transition to new technological structures - Industry 4.0.
- Reducing the energy intensity of GDP of all countries will lead to competition in the field of energy.
- The working-age population in Europe will decrease by 8%.
- Coal will continue to be the dominant form of energy production (38% of output), but environmental concerns will lead to a rethink of wise energy use and lead to government regulations.
- After 2035, the sale of vehicles with internal combustion engines will be banned in the European Union..

Peaks of coal consumption by country at 1970-2040



Source: Energy Research Institute of the Russian Academy of Sciences





DEVELOPMENT OF SYSTEM PLATFORMS AND SOLUTIONS

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ENTELS Engineering Center specializes in providing a full range of services for the development and implementation of commercial and technical energy metering systems, telemechanics, dispatch and automated process control systems in housing and communal services distribution networks and large enterprises.

KEY PRODUCTS OF ENTELS

Digital platform ENTEK

■ SOFTWARE → SCADA-system ENTEK, SoftLogic ENLOGIC platform and additional software extension modules

SCADA-system ENTEK

Universal software product for creating of automated control systems, telemechanics, automated process control systems, energy metering, energy monitoring, dispatching and other tasks in the energy sector.

SoftLogic ENLOGIC platform

Communication solutions based on controllers of the EnLogic software platform for creating protocol converters, telemetry and SCADA systems, monitoring systems for digital relay protection systems, etc.

EQUIPMENT
 controllers, servers and complete cabinets for energy metering and control, various measuring sensors, metering devices, special equipment (relay protection terminals, short circuit identifier modules, etc.)

Model solutions

- Comprehensive automation of distribution network facilities
- Automation of power supply to an industrial enterprise
- Automation of transformer substations
- Integrated dispatch and automation of boiler houses
- Automation of electricity storage media and charging stations for electric vehicles, etc.

DEVELOPMENT OF SOFTWARE AND HARDWARE SYSTEMS



The system of software and hardware complexes of Entels LLC is built on the basis of smart metering devices, sensors and various actuators that provide automated online control of the distribution and consumption of resources. Information from metering devices is transmitted to the upper level, to the data collection server. The system is built on the SCADA platform and has a hierarchical structure consisting of three levels.



Lower level (periphery) primary meters (smart meters), sensors, actuators and peripherals



Intermediate level (data collection)

multifunctional controllers (can be virtual) that accumulate information from metering devices and transmit it to the upper level



Upper level (servers and software)

monitoring and control servers and digital workstations provide solutions to the tasks of the energy dispatcher, planning department, analyst, chief power engineer, technologist, and enterprise director

ECONOMIC GOALS OF SYSTEMS IMPLEMENTATION



 $\bigcirc 1$



Eliminating the human factor as a source of abnormal and emergency situations and increasing safety Minimizing energy consumption by switching to more favorable tariffs and identifying leaks, malfunctioning equipment, and theft



Analysis of telemetric data and creation of specialist work profiles (digital assistant)



Reduce operating costs by automating operating cost control



Remote diagnostics of equipment condition



Improved production planning taking into account energy consumption opportunities



Monitoring the work of personnel and equipment in optimal schedules and modes i) 8

Reliable information, online, about the progress of the technological process, the condition of equipment and technological controls



Retrospective information for analysis, optimization and planning of equipment operation for its repair and maintenance



Cost reduction due to automated control of energy consumption and detection of violations of technological discipline and theft

LICENSES, DIPLOMAS AND CERTIFICATES



The company independently develops all software products, has licenses, certificates and other documents confirming ownership for all developments



SCADA system ENTEK Certificate of registration of a software Certificate of registration of a No. 2020615565 dated May 18, 2020

SoftLogic platform "EnLogic" software No. 2009614875 dated 09/08/2009

Services for the implementation of automation systems, development, production and supply of automation cabinets Certificate of conformity to ISO 14001-2016

Services for the implementation of automation systems, development, production and supply of automation cabinets Certificate of conformity to ISO 9001-2015

Licenses of the Federal Service for Technical and Export Control for "Activities for the development and production of means of protecting confidential information" and for "Activities for the technical protection of confidential information"





MODEL SOLUTIONS AUTOMATION OF ELECTRIC NETWORKS FOR ROSSETI PJSC

| www.entels.ru

MODEL SOLUTIONS FOR ELECTRICITY SUPPLY NETWORKS





IEC 104

Electricity metering







* Innovative Russian software for organizing electricity metering, developed for the needs and in accordance with the requirements and specifics of power grid companies of the Russian Federation based on the Pyramid 2.0 software.

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AUTOMATION FOR NETWORK COMPANIES





SOLUTIONS HAVE BEEN IMPLEMENTED AT MORE THAN 50 000 AUTOMATION FACILITIES OF ROSSETI COMPANY

- Supply of power quality controllers and monitoring of measuring instruments
- Implementation of a unified distribution network management system for 20 branches
- Supply of a unified network distributor management system
- Implementation of a unified network distributor management system



¹ Telemechanics+ Automated Electricity Metering System = TM AEMS ² Relay Protection and Automation Devices = RPAD



MODEL SOLUTIONS

AUTOMATION OF PUBLIC ENERGY INFRASTRUCTURE AND URBAN ENVIRONMENT



Transfer of information about power supply modes and emergencies to resource companies Electricity distribution network

- ✓ control of unauthorized opening of the electricity meter
- ✓ electricity consumption

✓ no voltage

Heat distribution network

- ✓ flowing pressure
- ✓ temperature deviation
- ✓ heat consumption

Water and wastewater treatment plant

- ✓ pressure
- ✓ water consumption





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Sending SMS in cases:

- occurrence of accidents
- deviations of energy consumption from planned

Notifying the dispatcher in cases:

- fire, flooding, deviation from normal conditions
- access to equipment and metering devices

IMPLEMENTATION EXAMPLE – KINDERGARTEN AUTOMATION







Displaying the state of the object on GIS, online. Monitoring communications, accidents and energy efficiency of the kindergarten Transfer of information about energy supply modes and accidents to resource supply companies according to the protocol IEC-104 Electricity distribution network

- ✓ control of unauthorized opening of the electricity meter
- ✓ electricity consumption
- ✓ no voltage
- Heat distribution network
- ✓ flowing pressure
- ✓ temperature deviation
- ✓ heat consumption

Water and wastewater treatment plant

- ✓ pressure
- ✓ water consumption

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Sending SMS in cases:

- occurrence of accidents
- deviations of energy consumption from planned

Notifying the dispatcher in cases:

fire, flooding, deviation from normal conditions
 access to equipment and metering devices



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IMPLEMENTATION EXAMPLE – SPORTS COMPLEX AUTOMATION



Transfer of information about power supply modes and emergencies to resource companies

Electricity distribution network

- ✓ control of unauthorized opening of the electricity meter
- ✓ electricity consumption

✓ no voltage

- Heat distribution network
- ✓ flowing pressure
- ✓ temperature deviation
- ✓ heat consumption

Water and wastewater treatment plant

- ✓ pressure
- ✓ water consumption



Sending SMS in cases:

- occurrence of accidents
- deviations of energy consumption from planned

Notifying the dispatcher in cases:

- fire, flooding, deviation from normal conditions
- access to equipment and metering devices











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LIGHTING WITH DIMMING AND ZONE SCENARIOS

Lighting for urban infrastructure of parks, gas stations, industrial areas, railway platforms. Ability to work with LED lamps - work with plans and schedules, built-in additional features and functions.







TELS

Monitoring the energy efficiency of equipment operation

Объект	Направление	Текущий режим работы	Текущее состояние	Ручное управление	Автоматическое управленние текущая команда	Автоматическое управленние следующая команда	Текущая мощность	Расчетная уставка по мощн. текущая	Расчетная уставка по мощн. полная	Ua, B	Ub, B	Uc, B	Контроль ламп
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Automated lighting control system of city of Omsk stations -TSK11



Tasks

- continuous monitoring of parameters and condition of lighting line equipment, prompt detection of damage
- ✓ remote and automatic, scheduled, control of lighting modes
- ✓ automated multi-tariff metering of consumed electricity
- ✓ identification of losses and ineffective operating modes







Domodedovo water utility







- Continuous monitoring of equipment parameters and condition, prompt detection of damage
- ✓ Remote and automatic mode control
- ✓ Automated multi-tariff metering of electricity and water
- ✓ Access control and video recording
- ✓ Identification of losses and ineffective operating modes







Heat supply of city of Yakutsk



- ✓ Continuous monitoring of equipment parameters and condition, prompt detection of damage
- ✓ Remote and automatic mode control
- ✓ Automated multi-tariff metering of electricity and water
- ✓ Access control and video recording
- ✓ Identification of losses and ineffective operating modes





Municipal power grids of city of Veliky Novgorod



A unified distribution network management system, including city and regional branches. Implemented using client-server architecture. More than 400 city substations More than 30,000 electricity meters

Tasks

- ✓ Dispatcher control of the electrical network
- Electric power control for consumers with limitation modes
- ✓ Technical and commercial electricity metering

ENTELS



ELECTROCHEMICAL PROTECTION MANAGEMENT





Electrochemical protection control system «MOSGAZ»

✓ There are more than 5000 objects in the system;

✓ The system provides continuous monitoring of equipment parameters and condition, prompt detection of damage;

- ✓ Remote and automatic mode control;
- ✓ Emergency control;

 \checkmark Identification of losses and ineffective operating modes.







Joint products for automation of electrochemical protection of pipelines with ENERGOMERA corporate group



СТАВРОПОЛЬСКИЙ РАДИОЗАВОД СИГНАЛ

Integration with electrochemical protection equipment of the SIGNAL plant

MANAGEMENT OF GAS FILLING STATIONS

Рг В.Д. 239.8

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Дренажная емкость

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COMPLEX "ATLANT"

Application in automobile gas filling compressor stations of "Natural-gas-based motor fuel of Gazprom" for station automation







MODEL SOLUTIONS AUTOMATION OF INDUSTRIAL ENTERPRISES AND PRODUCTION SITES

| www.entels.ru

AUTOMATED DISPATCH CONTROL SYSTEM











Management of the Syktyvkar timber industry complex "MONDI"



- continuous monitoring of equipment parameters and condition, prompt detection of damage
- remote and automatic control of operating modes
- ✓ monitoring of emergency modes, subtraction of oscillograms of the digital relay protection system
- ✓ identification of losses and ineffective operating modes

AUTOMATED PRODUCTION MANAGEMENT SYSTEM



Tasks solved by the system

- Online operational control of resource consumption (electricity, water, gas);
- ✓ Supervisory control of the state of energy supply to an enterprise with adaptive consumption control;
- ✓ Comparison of planned resource consumption with actual consumption across production lines with warning signals in case of deviation from the reference consumption of a resource;
- ✓ Commercial and technical accounting of resources and reporting to a resource-supplying organization;
- ✓ Dispatch control with establishing a single dispatch panel to manage energy supply to an enterprise.

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LIC-2_1 RomoMoliva	33095438	PD-2	0.03			LIP-4_1 Kopvgop	33093041	PD-4	1.92			Наименование	Не счетчика	Показан
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Kyzep Vulgerus (формовой)	32917650	PD-2	7.80			Робот Дносна батоны	32917633	PD-4	18.08			Печь линия бул.1	643077-08	280885
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Mnemonic diagram of production load dynamics, provides information online

Results

- Reducing energy costs, as part of production costs, by up to 5% depending on the consumption plan;
- ✓ Planning resource costs depending on production load plans;
- ✓ Reducing accident rates and equipment downtime is achieved through operational monitoring of the equipment condition and modes of its use;
- ✓ Possibility to increase production volumes by planning and creating a reference equipment load;
- ✓ Creating reference planning for resource consumption depending on the production plan;
- ✓ Operational control of deviations from reference consumption;
- ✓ Identification of non-productive energy costs.

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ас, куб м	1/5 Котельная-вода				- p.		
	Линия N#2 (батоны)	0.00	0:00	90	4 038,67p.	44,87p.	10,00p.
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33, SBTH	Илапак 2, 2а (батоны)	10042,30	10086,49	44,20	141,43p.		
ээ, кВтч	Кулер КААК (к=30)	1161,69	1165,67	119,19	381,41p.		
35, sBTH	Селектра 1 (батоны)	1875,48	1883,52	8,03	25,71p.		
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33, KBTH	Хартман 3 (батоны)	3621,00	3641,42	20,42	65,36p.		
33, KBTH	Печь (батоны) (к=30)	2444,32	2454,75	312,78	1 000,90p.		
33, KBTH	Шкаф предрасстойки (батоны) (к=30)	1104.51	1108.13	108.48	347.14p.		
33, 8BTH	Шкаф расстойки (батоны) (к=30)	2478.21	2488.16	298.65	955 68p.		
33.8BTH	Робот Диосна батоны (к=80)	383.68	384.97	103.36	330.75p.		
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Report on the cost of production

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Alarm in case of deviation from the norm



Temperature and light monitoring, used to calculate energy consumption costs

WINDOW OF OPPORTUNITIES



Creating reference consumption

Operation of the energy monitoring system

Detection of deviations from reference energy consumption



Notification to the energy engineer in the following cases:

- occurrence of accidents
- deviations of energy consumption from the planned (reference)



Forming of a reference consumption plan to control the balance of electricity

- Planning the energy consumption of an industrial enterprise based on production plans will help identify and eliminate sources of resource loss
- ✓ Special tools make it possible to identify deviations from normal energy supply. These tools are built into the SCADA-system ENTEK to implement operational management tasks and control the consumption of resources.
- ✓ The user can receive information via SMS, Email or an alarm signal on the control panel mnemonic diagram.

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Monitoring of energy consumption with assessment of the main factors of deviation from the normal mode of energy supply





INFORMATION SECURITY

Ensuring information protection for information control systems



INFORMATION SECURITY





* Protocol IEC101/104. Where IEC101 is acronym for IEC 60870-5-101, which is a standard for power system monitoring, control & associated communications for telecontrol, teleprotection, and associated telecommunications for electric power systems. And IEC104 is acronym for IEC 60870-5-104 protocol, which is an analogy to IEC 60870-5-101 protocol with the changes in transport, network, link & physical layer services to suit the complete network access: TCP/IP.

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BUILT-IN INFORMATION SECURITY



Data Acquisition and Transmission Device "ENTEK" with overlaid encryption means - a joint development of "ENTELS" LLC and "InfoTeKS" OJSC intended for building secure local and distributed systems for automatic control and management of technological processes of small automation objects via public communication channels to protect them from computer attacks and unauthorized access to information.

Conclusion on the compatibility of the E2R2 (G) controllers with VipNet information security software systems



Telemechanics system for dispatch control and resource record



Possibilities

For objects of the Substation type, a standard software and hardware complex based on ready-made equipment is used. This allows to create a single information-protected network for all types of objects with minimal costs





NEW SOLUTIONS

Automation of electric energy storage



ELECTRICITY STORAGE MEDIAS MANAGEMENT





* Protocol IEC101/104. Where IEC101 is acronym for IEC 60870-5-101, which is a standard for power system monitoring, control & associated communications for telecontrol, teleprotection, and associated telecommunications for electric power systems. And IEC104 is acronym for IEC 60870-5-104 protocol, which is an analogy to IEC 60870-5-101 protocol with the changes in transport, network, link & physical layer services to suit the complete network access: TCP/IP.

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CENTRALIZED CONTROL OF STORAGE MEDIA WORK

The inclusion of storage medias into centralized monitoring ensures the inclusion and monitoring of all storage medias as part of a single automated dispatch management system network based on a unified set of telemetry data.



CONTROL OF THE STATE OF STORAGE MEDIA AS PART OF THE POWER NETWORK

A centralized collection of information has been organized to monitor and analyze the status and operation of storage media with output of information to the development center of storage media to evaluate the effectiveness of their use and the generation of "big data" analytical data on the operation of storage media from different manufacturers and technologies.



CONDITION MANAGEMENT OF STORAGE MEDIA THROUGH THE ENTIRE LIFE CYCLE Remote maintenance, setting up monitoring scenarios and monitoring the operation of storage media throughout the entire life cycle of storage media operation from a single center of competence.



INCREASING INFORMATION SECURITY

The use of the solution allows to implement data protection when using public communication networks and blocking unauthorized control commands, which ensures information protection of the control system for electrical grid infrastructure facilities

ELECTRICITY STORAGE MEDIAS MANAGEMENT





- Arrival of a control command from the dispatcher of the Automated Dispatch Control System
- Transferring a control command from the Automated Dispatch Control System server to the Front-End Processor (FEP) of a company branch
- Transfer of a control command from the FEP of a company branch to the telemechanics device via the IEC-104 protocol
- IEC-104 protocol identifies control command
- IEC-104, using the protocol for interaction with the security workstation, sends a request to the dispatcher to confirm the command
- The dispatcher confirms or does not confirm the legitimacy of the received control command and the security workstation forwards this information to the IEC-104 protocol
- If the legitimacy of the control command is confirmed, the IEC-104 protocol adds an permitting rule for a certain period of time
- The dispatcher resends the control command via the Automated Dispatch Control System
 - The control command is directly transmitted to automated dispatch management system
- * Protocol IEC101/104. Where IEC101 is acronym for IEC 60870-5-101, which is a standard for power system monitoring, control & associated communications for telecontrol, teleprotection, and associated telecommunications for electric power systems. And IEC104 is acronym for IEC 60870-5-104 protocol, which is an analogy to IEC 60870-5-101 protocol with the changes in transport, network, link & physical layer services to suit the complete network access: TCP/IP.

ELECTRICITY STORAGE MANAGEMENT



MESSENGER FOR WORK CONTROL

- A mobile application of the "Field Service Management Software (FSM)" class is a part of and one of the modules of the Central Receiver/Transmitter "ENTEK" software. It provides interaction on all issues of storage media operation.
- Users install the software on a tablet or smartphone. When performing work and exploitation, they receive the necessary information and register the work. The software includes automatic identification of equipment by QR codes, RFID and NFC tags.
- The messenger simplifies the monitoring and exploitation of storage media. The software works in off-line mode. The mode allows to use the software without a communication channel at the site.
- The software is built into the Central Receiver/Transmitter "ENTEK". It allows to create a unified business process for managing electrical distribution network facilities.



INPLEMENTATION FOR NETWORK CONTROL CENTERS



A standard solution (Hardware-Software Complex) has been developed for storage media automation, ensuring the collection of technological data on a single server from 20 regions.

The solution was implemented as a unified control and management system in 20 branches of ROSSETI Center PJSC , ROSSETI Center and Volga Region as part of the Unified Network Management Center.

A local server has been developed for Group of Companies RUSNANO for centralized monitoring of storage media from all manufacturers in real time with automatic generation of statistics and efficiency diagnostics.

Reports for managers on the current state of equipment, deviations in the operation of storage devices, as well as operating parameters and parameters of electricity, supplied to the network, are generated automatically.



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NEW SOLUTIONS Automation as service of IoT operator

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The potential demand is at the domestic energy and infrastructure markets. Such objects include infrastructure facilities.

- Territorial electric distribution companies;
- Water and wastewater treatment plants, heating suppliers, lighting;
- Social infrastructure educational institutions, hospitals, administrative buildings;
- Energy facilities of industrial enterprises.

Software and hardware system allow to implement telecontrol systems, metering systems, Computer-Aided Process Control System for facilities of the electric grid company and utility infrastructure. Using of normal and cyber-protected mode allows to apply solutions for critically important objects: power grids, water utilities, infrastructure facilities, etc.

TECHNICAL SUPPORT INCORPORATED IN SERVICES OF OPERATOR



The role of the integrator

- installation of equipment at facilities in accordance with standard technical solutions;
- use of ready-made standard technical solutions;
- equipment maintenance;
- setting up solutions for private technical tasks (improving solutions)

This approach allows the customer to:

- receive automation in conformity with the planned result;
- get guaranteed technical support;
- shorten the implementation period;
- simplify exploitation and further development;
- minimize investments in infrastructure and personnel;
- have the opportunity for continuous development.

Advantages

- You can work with the systems from anywhere in the world.
- Outstanding reliability.
- Possibility to combine remote offices and branches in one place.

EP

- There is no need to purchase expensive licensed software.
- There is no need for outsourcing of information technology and programmers.
- There is no degradation and obsolescence of the equipment, it is supplied as part of the service.
- It is possible to transfer all data from your server in office, to a remote server or backward.
- 24/7 technical support.
- Development and updating of software at all stages of the life cycle.
- The performer is responsible for the final result of the work.

* Service Enablement Services (IT politics management, service activation/deactivation)





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