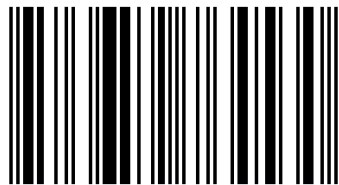Self-organization - ability of IT Systems optimum to complicate the structure. The paradigm self-organizing IT Systems, as the newest concept of dynamic adaptation of Smart-MES system to conditions of any production is described. This IT technology represents multistage automatic transformation of the usual engineering text of a formulation of a technological task to an executive program machine code with simultaneous formation of all elements of big System from a database to reports. Possibility of construction intellectual and multiagent is given IT Systems. The Theory of accidents of the NPP as reflection of the theory of accidents and the logician of the prevention of accidents by means of Smart-MES system is formulated. The integral calculus of an excessive consumption of fuel at combined heat and power plant and on state district power station is described, and also experience of introduction of Smart-MES system for power plants is given. Work is written for IT specialists, for scientists, for technologists and for the leading personnel of all industrial enterprises of all branches, especially for nuclear and thermal power plants. Bye SQL - Hi Self-organization in IT!

The self-organizing Smart-MES

Vladimir Chernov

Igor Chernov

Chernov Vladimir Fyodorovich, CEO of Firm InformSystem, Yekaterinburg, Russia. I ended ULTI. I worked in SNIILP, the Beloyarsk NPP, PKB ACS, 4 years in the Czech Republic for Dukovana's NPP. In 2002 with Chernov I.V. created Firm InformSystem and developed the Self-organizing information Smart-MES "MES-T2 2020" System.

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Table of contents

1. Introduction

Andrey Masalovich, the President of Consortium "Inforus" on one of IT exhibitions somehow declared: "I addressed to stand-attendants of IT (Information Technologies), looked for in FTP (Federal Target Program) an export component, but as it appeared not that the export component in one IT solution was not, but they and replications would not sustain. That is any pilot project developed for any region will not be able to be installed in the neighboring region without cardinal alteration".

The academician Andrey Petrovich Yershov on it told: "You know, we analyze separate IT components here, but we forget that the sum of components forms a vector, and the vector has a new quality - the direction. And so, we do not lag behind - we go not there".

Above the provided statements were sounded in 2004. And what now? After all it was always meant that all advanced information technology goes from Moscow. But here two Specifications (2009) for calculation of TEI - Technical-Economic Indicator (in one case got to me: PGU in Mosenergo, in other: State district power station in OGK-2), developed for tenders by the Moscow IT organizations, it is obvious under itself.

I give some excerpts: "characteristics of the equipment have to be in the form of quantitative dependences" (i.e. polynoms), "at creation of a complex the following program modules", "development of a program code" are developed. But these IT organizations at the same power plants and for the same purpose carried out development and deployment of a program code already earlier.

Such was and 20 years ago and proceeds now. And what actually new and innovative? Anything. The new equipment at power plant will be added and TEI (Technical-Economic Indicators) are again necessary the Specification with the tender for calculation realization and with development of a new program code.

But to develop presently a program code of direct action for calculation of TEI of work of the equipment of power plant and for other repartitions it is profanation. The same and use of polynoms for characteristics of the equipment.

On the Open Systems portal in Leonid Chernyak's article "Adaptability" [7] the following is told:

"Sooner or later the software nevertheless has to come to the following round of evolutionary development and find two new qualities peculiar to difficult technical systems and live organisms, - an adaptability and adaptability. Complexity of the organization and behavior is called the main property of systems of the future. At the same time they have to be under construction of simple and not really reliable components, to be simple for the user, the administrator and the designer. And for this purpose they have to be executed on the Self-* technology, i.e. to be self-configured, self-regulated, self-adapted".

That's it according to these recommendations our self-organizing Smart-MES system is also created. It is clear that we, without knowing all these sophisticated scientific forecasts, long went the way, but left where follows and much earlier other IT developers in Russia and abroad. Also it is not terrible at all and not offensively that our system on advantage is not understood and not accepted. The main thing that this bar of IT is so highly raised by us that will already not reckon with it not possibly. And it means

that we made revolution in technology of development of big information systems.

Firm InformSystem (Russia, Yekaterinburg) developed innovative Smart-MES system (MES System) of "MES-T2 2020" (The certificate of Rospatent No. 2014618991 on the state registration of the computer program, 2014) for realization of technology of economy of fuel and for increase in energy efficiency of thermal and nuclear power plants at automation of calculations of the actual and standard TEI in real time. It is intended also for realization of technology of accident-free operation of nuclear power units and which can provide the prevention of all emergencies on the NPP, combined heat and power plant and state district power station. This system can be involved in multiagentny technology for cognitive management of the Generating and Network companies.

The methodology of creation of Smart-MES system is focused on easy realization of any algorithms without traditional programming, i.e. without use of programmers. It contains full set of modern opportunities. These are text projects of tasks, self-adjustment and self-organization of all system, the analyst, the schedule and optimization.

And now we will show that our system corresponds to the Self-* technology. For this purpose we will compare it to a live organism, i.e. to the person.

The person, being born, is able to do nothing and knows nothing though in his organism all foundations and components for future skill and future erudition are laid. However, in it initially there are restrictions of talent, i.e. vocational guidance. Thus, if he is fated to be an actor, he will never be the scientific or good engineer. The person studies gradually all life, even when starts working. Gains knowledge of people by means of textbooks, i.e. by means of certain instructions and algorithms.

Our Smart-MES is also initially empty, i.e. on what is not capable, but in it all prerequisites for future concrete realization are put in the form of the EXE module (the executive file). MES (Manufacturing Execution System - a control system of productions) is that orientation which depending on training can be used in various production directions. Training of Smart-MES is carried out gradually and can always be carried out, even after when it starts bringing real benefit. Text projects of tasks in this case act as textbooks. The EXE module absorbs these projects in itself and by that skill and erudition is gained. And all this is absolute without programming.

And now, as they say, find some differences. It appears, they simply are not present. Therefore it is easily possible to draw a conclusion that our Smart-MES system is identified with a live organism, i.e. it - is adaptable and adaptive.

So it turned out that when great IT and scientists make plans an ocean, we simple IT engineers independently already realized these plans in "metal", i.e. at us not only the unique concept of self-organization of IT systems is developed, and the Smart-MES system is ready to introduction at any power plants in Russia and abroad and on other process productions.

The question of reality of advance of a tendency of the self-organizing IT systems well described S. A. Martynov in the book "Innovative Economy (Road Map 2040)" [5]: "Anybody and nothing is capable to resist to idea which time came!" But here a question only in the one who will use this ready idea: Russia or West, Government or Oligarchs? And time for the self-organizing IT certainly came since stagnation in IT was excessively tightened.

2. A paradigm of the self-organizing Smart-MES system

Self-organization is understood as the irreversible process bringing in result of cooperative interaction of subsystems to formation of more effective structures from a position of computer system. Use of a phenomenon of self-organization is a necessary condition of maintenance of competitiveness of system and creation of new competitive advantages. The phenomenon of self-organization of our system is the unusual phenomenon and very rare fact, i.e. it that it is difficult to comprehend.

Thus, ability of IT systems to complicate own structure is called as self-organization. The firm of Information Systems developed revolutionary technology of creation of such self-organizing IT systems which can be used for development of systems of any level: ERP, MES, SCADA.

Self-organization introduces new quality in system. For example, Smart-MES as a result of self-organization can easily calculate 1000 tasks from 500000 indicators for only 10 sec. The same quantity of tasks without self-organization will pay off about two hours, i.e. somewhere by 500 times more long.

The self-organizing Smart-MES system represents self-organization of the second degree. But it is possible to create self-organization and the third degree, it when the multiagentny system consists of the self-organizing systems of the second degree. Here the first degree makes self-adjustment and the easiest adaptability, the second degree provides the greatest speed of calculations, the third - allows independent functioning of system without participation of the person.

However, the science "Synergetrics" claims that the self-organizing IT systems in the nature cannot be since the self-organization paradigm has no relation to IT. But IT and scientists declare long ago that the future behind the self-organizing systems. Here it is only not clear, why future? What there will be other element IT base or brains at IT developers will be much better?

There is such impression that IT and scientists saw enough of the western software which always was in huge authority, and draw this strange conclusion about a self-organization inaccessibility in IT. And already created self-organizing Smart-MES system is not allowed to practical use not to destroy the myth about impossibility of this self-organization. To whom is it favorable? It is clear that to IT monopolists. After all if to give to this system life, it will quickly patch a set of holes, and to monopolists it will be very sad due to the lack of a bottomless feeding trough.

And now about a self-organization paradigm. To be fair it is necessary to notice that in self-organization this "egoism" is not present and there cannot be it it is simple a word-play. Self-organization is only that development happens in a bifurcation point - and subjectively it seems that it. Though at it constantly there are objective processes. Thus, in the nature no self-organization is present, as well as there are no others, and there is a process of communication with disappearance of one and the birth of other phenomenon. But conditionally it is called - self-organization.

By G. Haken's [6] definition, self-organization - spontaneous formation of the high-ordered structures from germs or even chaos, spontaneous transition from the disorder state to ordered due to joint, cooperative (synchronous) action of many subsystems. Self-organization acts as a source of evolution of systems as it serves as the beginning of

process of emergence of qualitatively new and more difficult structures in development of system.

And now the same words in relation to Smart-MES. Self-organization of system - "spontaneous" formation of the high-ordered structures of a machine code from the text disorder description of tasks due to joint action of many subsystems of the EXE module. Self-organization of Smart-MES acts as a source of evolution of system as it serves as the beginning of process of emergence of qualitatively new and more difficult structures in development of system that provides the easiest adaptability and the highest speed of calculations.

As we see, practically too most. Thus, I easily applied the general principles of self-organization to our IT system. After all if in the nature there is no self-organization, and there is a convention meaning a certain development, I am quite free to apply this term to IT system especially as the uniform judgment among scientists about this self-organization in general is not present.

On the other hand, there is a developed Smart-MES system. But how shortly to characterize its opportunities? For this purpose there has to be the corresponding thesaurus, and its that just and is not present, since our system in this class - only. All concepts: plug-and-play, self-adaptable, self-configured, self-checked, self-restored, self-scaled - are incomplete reflection of possibility of system. For this reason the term "Self-organizing System" especially as at superficial comparison with a self-organization paradigm, is much in common is also entered.

Achievements of Russia entirely depend on new technologies, on their modeling and forecasting both on the scale of the separate enterprise, and on the scale of all Russia. And all this to well self-organizing Smart-MES system.

But it cannot quickly be checked, and to believe very difficult because of the settled mentality of neglect to domestic IT development. But this situation all the same will ever change.

Smart-MES is manufacturing execution system which connects together all business processes with productions of the enterprise, quickly providing objective and detailed information to the management of the company. The methodology of creation of Smart-MES is focused on easy realization of any algorithms in any quantity without programmers. It contains full set of modern opportunities. It both text projects of technological tasks, and self-adjustment of all system, and self-organization according to the current context, both analytics, and graphics, and optimization. And all this is possible in any configuration the client server.

The Smart-MES system is initially not focused on the solution of any specific objectives, but in it all prerequisites for future concrete realization are put in the form of the EXE module. The EXE module gains ability to solve specific objectives, being trained for some seconds. The EXE module includes means of control and means of functioning by results of this control [1].

Control is carried out in the course of transformation of text projects of tasks which structure very simple and consists of the description of columns and lines of the table. One table corresponds to one task with a set of algorithms of calculation with a screen form and the report.

At compilation of projects all databases, screen forms, settlement DLL programs, reports are automatically created. In order that the system was adapted and could function at concrete power plant, except the EXE module and text projects of anything else it is not necessary. If in the course of functioning of system it is necessary to make change or addition, the text project is corrected and compilation on the functioning system is

started. In this case all changes will rise on the places without loss of the current technological information. The special advantage of this technology also that it provides absolute program reliability at any amount of the realized technological algorithms of calculation for any production.

The system conditionally consists of basis and a superstructure. The basis is an executive EXE module which has no technological stuffing. The superstructure is text projects of technological tasks. The basis is always invariable since is the developer's prerogative. The superstructure is subject to continuous changes and is a prerogative of technologists for development of production tasks. Text projects of technological tasks define area of their use and provide real functioning of the EXE module.

The concept of self-organization of the developed Smart-MES system for many years advances modern outlook of creation of other MES systems.

The technology of creation of the self-organizing IT systems surely has to include five stages:

1) translation of a problem definition into the technologist's meta language;

2) transformation of meta language on macrolanguage (self-adjustment);

3) transformation of all tasks on macrolanguage in one task (self-organization);

4) transformation of a uniform task on a programming language;

5) transformation of a programming language to the resulting machine code.

The first stage occurs with the assistance of the person, and all others are carried out automatically. Further is more detailed about each stage.

1) Translation of a problem definition into the technologist's meta language.

In this case tool means (The designer of text projects) for operating by templates for the purpose of the maximum simplification of a set of algorithms of technological tasks which are presented in the tabular form is used. For example: columns designate types of the equipment and a result, and lines - indicators.

2) Transformation of meta language on macrolanguage.

This stage makes full self-adjustment of system. As a result all elements are automatically formed: databases, reference books, the menu of tasks, screen forms, calculations on macrolanguage and reports. This stage is necessary for debugging of algorithms in the interpretation mode since at the subsequent stages she is not possible. Here to each cage of a screen form the algorithm of calculation of this indicator is put in compliance.

3) Transformation of all tasks on macrolanguage in one task.

This stage makes self-organization of system. All tables of separate tasks in a special way connect in one big table to reformatting of addressing in all algorithms of calculation of indicators, creating one general task with the most difficult structure.

4) Transformation of a uniform task on a programming language.

During this transformation all multiple recursions therefore process of full calculation happens for one pass from top to down are liquidated. At this stage as a programming language there can be any language: Pascal, Xi, etc. In Smart-MES system Pascal is used.

5) Transformation of a programming language to the resulting machine code.

Here the corresponding translator from the used programming language is used. As a result the program DLL which is used as an application server turns out.

Ignoring of any of the listed stages will not yield desirable result of true self-organization of system with possibility of adaptation for concrete production and high speed of calculations.

Two unique languages of the top and lower levels of system are necessary for realization of the self-organizing system. Language of the top level, or engineering meta language, is necessary for technologists for a formulation of algorithm of a task. It is most approached to a natural language. Language of the lower level, or macrolanguage, is necessary for interpretative debugging of algorithms.

In addition to the self-organizing system the dispatcher of a context who will constantly analyze the current production context can be used and in case of need will automatically make changes to text projects of technological tasks, i.e. will execute the first stage and will start self-organization of all system. So the system will start adapting for all changes without participation of the person.

But if the separate self-organizing systems to present these as agents with an interconnection under special protocols, the self-organizing multiagentny system will turn out.

The main objective of any self-organization is achievement of constructive extrema of any aspects. Otherwise this self-organization to the nature would be and is not necessary. After all self-organization is resulted by development of everything. Therefore when scientists in the field of IT appropriate various distinctive characteristics to the self-organizing systems, it can only be apprehended, as their hypothetical attitude. After all

they alive did not see any self-organizing program system since are very far from them on the practical level.

When I contacted one of scientific patriarchs on the self-organizing systems and declared to him that we developed this most self-organizing system for a long time, reaction was very far from the expected. I by naivety thought that the scientist who wrote the mass of articles on this subject, will be glad for simple Russian engineers who in this plan overtook itself the USA, and will wish to learn how we managed to reach life such. But this scientist only struck a pose of an inaccessibility and filled up with the thought-up criteria.

I, naturally, did not consider it necessary something to prove. After all, apparently, when on scales on the one hand there is a naked thought-up theory, and with another - the ready working system, certainly, the system would have to draw. But there is it not so. Everywhere the corporate interests, but not interests of Russia work. Otherwise our most perspective system would not become dusty more than 3 years on the shelf, and would be long ago in great demand in power industry.

And now directly about the self-organizing Smart-MES. Here answer such question. When the system in an initial state is able to do nothing and suddenly after training everything is able. When the system has no as a part of any really operating task, has no database, has no screen forms, has no reports, has no realized algorithm of a technological task, and after compilation of the text in engineering language, everything appears. That is self-organization or not?

Say to me that it is elementary work of algorithm of transformation of the text to the making systems. I do not argue. And who told, what at biological systems self-organization happens without algorithms? After all if there is no algorithm, there is no extremum of the purpose of self-

organization also, therefore, there is no self-organization also. Another thing is that these algorithms are made by the nature.

Thus, extrema of the purpose of self-organization of Smart-MES are: minimization of actions of the technologist at adaptation of system to specific working conditions and maximizing speed of calculation of technological algorithms. And these extrema in system are not simply easily reached, and have such values which to surpass simply not perhaps.

Minimization of actions of the technologist is provided with the built-in tool means "The designer of projects" of technological tasks in text form. Each task in engineering language is formulated in a tabular look with which the person interacts. The maintenance of columns of the table and its line is separately described. All algorithms are designed from templates. Designation of indicators have writing, habitual for technologists, with the top and lower indexes.

Maximizing speed of calculation is provided with four multiple transformation of a problem definition to an executive machine code. Here it is necessary to stop especially on optimization of a machine code by the principle of one pass from top to down. For example, when the problem in MS Excel is solved, always happens that arguments in the top cages pay off below. Thus, there is a need of repeated pass of the table. In our case it does not occur since at the time of transformation to a machine code the order of calculation changes for future single pass.

The main competitive advantage of a phenomenon of self-organization of Smart-MES is almost instant transition of mathematical model of power plant or other enterprise from a situation "as is" to a situation "as has to be". This change happens at rate of functioning of the system and actually with the minimum participation of the person. The phenomenon of self-organization provides boundless development of

system regarding technological functionality which can be used both at the level of power plants in all shops, and at the level of the Generating and Network companies.

And now present a situation when the system itself reacts to change of the current context and instantly starts self-organization. In this case the effect of a context can have extensive influence on marketing and consumer decisions especially in market conditions of uncertainty.

Generally, this phenomenon of self-organization when all huge system in any configuration is developed from the usual text by pressing of one button or if you wish, a voice signal, it is actually difficult to comprehend. Maybe for this reason management of the Generation companies does not decide to attract this system to the operational accounting of an excessive consumption of fuel at power plants. Probably, so far it is simpler to IT management to operate with the existing western technologies, which not in leaders for a long time.

The similar phenomenon of self-organization of system allows to refuse development of various programs in general. And in this case thousands of programmers will be compelled to pass into other spheres, for example, in bigger scale to produce toys and manuals. All production sphere will be easily blocked by the self-organizing system. After all to provide any expeditious calculations in any quantity and any complexity at any enterprise, it is enough to reflect of it in the text. More it is necessary nothing. All the rest will be made by self-organization of this system.

And the most important, self-organization does not enter new mistakes into the new created system since it operates with new meta information, and the main hrebetny skeleton of system remains invariable. Absolute reliability of a production system is guaranteed to these.

3. The newest concept of dynamic adaptation of Smart-MES

In the Penza article "Methods of Adaptation and Generation of Development of the Software" [13], it is told: "Development of more powerful programming languages and object libraries, use of Case-design tools and creation of program systems, unfortunately, did not give the expected effect against grandiose opportunities of modern computers and computer networks owing to passivity of program and technical systems and a weak changeability of the created software".

But the firm of Information Systems developed the Innovative Dynamic Self-organizing Smart-MES for a long time.

Very strange picture when scientists state about strong lag of development software turns out, we most software already created this. So our article "Automated Control System for Production of Power Plant of MES-T2 2007" [2] in which questions of full self-adjustment of Smart-MES are taken up is published in the collection of materials of the third international conference "Management of Development of Large-scale Systems (MLSD'2009)". And it in a root disproves passivity software and its weak changeability.

The next generations of development are given in the Penza article software:

1) software turnkey;
2) software with installation and installation;
3) software with the built-in means of completion;
4) software on the basis of design, and self-adjusted software;
5) Self-organizing software.

In this article it is told that "it is essential to increase quality and term of operation with basic decrease in labor input and costs of creation and support of systems allows only self-organizing software. Is self-organizing software, capable long (potentially infinite) time to be adequate to environment on the basis of adaptation to changes of environment (the solved tasks, objects of interaction) and the internal organization of system (volume of data, their placement etc.)".

And now we will show that our Smart-MES system completely corresponds self-organizing software, agrees essentially new properties given in the Penza article. Thus for a decade of the formation this system took place the transferred all five generations of development software from "turnkey" to "Self-organizing". And so:

1) "The self-organizing system has to be autonomous, active, intensive, and capable independently function in a certain changing environment".

The Autonomous System (AS) has to have own purpose - longer existence that demands its adaptation (adaptation) and a survival in the changing environment. The EXPERT is one of the most important conditions of a survival performance of a certain useful function by her for environment.

Our Smart-MES externally consists of the EXE file (the Designer ARM) and a set of text descriptions - Projects of technological tasks. The designer as the newborn child, regarding technological functionality is absolutely empty, i.e. for performance of concrete useful work it should be trained. Training process, as well as the person, occurs through the text. Training of the Designer is carried out in real time at rate of performance of useful work by it and happens constantly, as well as the person. Now the field of activity of Smart-MES extends on process productions, but the

same principles of training can be underlain in creation of system and for discrete productions.

2) "The self-organizing system has to be the organization opened at all levels: structural, functional, interface and data structures".

By the definition accepted by IEEE POSIX 1003.0 Committee, the system which realizes open specifications on interfaces, services (service of the environment) and the supported formats of data is called as open information system. Main properties of open systems: expansibility, scalability, shipping, interoperability, ability to integration, high readiness.

Our Smart-MES possesses all these properties. In it standard interfaces of access to databases are used, completely there are no restrictions on quantity and dimension of technological tasks. It carries out interaction, both with the lower level of data collection, and with the top level of business processes. In Smart-MES all services are adjusted after its training for concrete use.

3) "The self-organizing system has to function mainly on the basis of own purpose and internal requirements taking into account nonspecific influences of environment".

The requirement is a need for any benefit. The benefit for system is existence of its correct constant working capacity. It as at the person a main objective - to be full and healthy.

Our Smart-MES, using the current ZIP archiving, in case of failure for any reason she automatically restores herself as there is a regeneration at live organisms. In this case to it global damage or removal of all databases and settings is not even terrible.

4) "The self-organizing system has to provide a correctness and high level of reliability and efficiency of functioning in the changing environment".

Our Smart-MES as it was already told above, in a starting position consists of two philosophical elements: basis (EXE) and superstructure (Text). Basis - a program skeleton or essence of information system. A superstructure - set of the algorithms in engineering language generated by basis and which are actively influencing it. In other words, the EXE module prepares the Text, in this Text, it forms databases and templates of screen forms and reports, and also DLL programs for calculations, and, using this environment, the EXE module functions for performance of production tasks.

Thus, the EXE module is completely a prerogative of the Developer and to concrete technological object has no relation. The text on the contrary is a prerogative of the User who in engineering language formulates technological tasks for concrete object. It reaches independent continuous development of system and technological functionalities, as provides the highest level of reliability and efficiency of Smart-MES.

5) "The self-organizing system has to provide interaction with environment at the semantic level and provide the simple interface of interaction hiding high internal complexity of system from environment".

Our Smart-MES provides the language of a formulation of technological tasks which is most approached to reality in a tabular look. The maintenance of columns (Equipment) and is separately described lines (Indicators). The description of lines includes: designation, unit of measure, name and algorithm of calculation. Designation of an indicator is written in a natural look: Rp - a vapor pressure. The algorithm of calculation registers in a usual look: $Ni = Ei/ti$.

6) "The self-organizing system has to have ability eventually to provide to environment (users) more and more ample opportunities according to the solution of tasks, the organization and data processing".

Our Smart-MES constantly develops by release of new versions. Therefore, for acquisition of new system functionality it is rather simple to Users to replace the EXE file. The text allows Users to increase technological functionality without restrictions.

7) "The self-organizing system has to have ability to arise and be formed in the natural way without participation of programmers and developers".

Our Smart-MES allows creation of the big working system from pressing of one button. In this case at compilation of the Text all components are automatically created: databases, reference books, menu, screen forms, reports, DLL programs and Application server.

However, in the Penza article the strange conclusion is drawn that "now practically there are no program systems at which the specified properties would rather accurately be shown. Thus, creation of program systems of this class is business of the future and, perhaps, will mark itself the third revolution in the software area".

And so, note all scientists and, especially, in the field of informatics, the third revolution in the software area came true for a long time, and it was marked by the birth of the Innovative Dynamic Self-organizing Smart-MES "MES-T2 2020" System. It is a pity that in scientific community annoyingly passed this fact.

We reached impossible, i.e. double high-speed, apparently, mutually exclusive effect: at adaptation of System for any power plant and at the solution of any problems of TEI (Technical-Economic Indicator).

It is known that this still managed to be settled to nobody two clashing problems. It, as water and ice. This Wednesday either liquid, or firm. But we could make this Wednesday at the same time both liquid, and firm.

So, if the System for calculation of TEI easily adapted for various power plants, it has the low speed of the solution of tasks because of the interpretative mechanism of calculation. The tasks realized "in a forehead" i.e. without possibility of flexible adaptation have the high speed of performance. This fact to experts is known long ago.

But our Smart-MES system both easily adaptable, and high-speed.

That we managed to realize innovative means, completely overturns all earlier existing outlook about the big information and operating Systems. These our innovations still are fully not realized.

Perhaps, for this purpose there are objective reasons. In this case, for a choice of program realization the crucial role is played, first of all, by the size of the IT company and its image, but not innovations.

4. Smart-MES as SAPR of the self-organizing IT systems

The firm of Information Systems presented the Smart-MES system developed and approved by it as SAPR (system of the automated design) for fast generation of the big self-organizing systems for the industry. This system easily realizes any mathematical models for the purpose of increase in profit and for the purpose of optimum expected development of the enterprise. This system can be involved in multiagentny technology for realization of cognitive functions of management of any industrial company. This system will allow to come nearer as much as possible to realization of intellectual opportunities due to the easiest adaptability and the highest speed of calculation.

It would seem, SAPR is intended for automation of design of objects, but the program is the same object. This SAPR Smart-MES will easily cope with any settlement tasks and with any mathematical models, especially for the enterprises with continuous nature of production.

This SAPR generates self-organizing systems which in the nature except our Smart-MES are not present more. Any SAPR is intended for search of the best decision by a trial and error method. Therefore no other system can be carried to SAPR since it does not allow to realize instantly a set of options software. The Smart-MES system due to the self-organization opposite easily it allows.

SAPR Smart-MES allows to generate the self-organizing systems for realization of any dynamic economical and technological mathematical models in any quantity and any volume for any enterprises of any industry, including the defensive. Thus at once it is necessary to notice that 1000 tasks on average on 500 indicators at the expense of the superspeed of

Smart-MES pay in only 10 seconds that when modeling difficult dynamic objects is simply invaluable.

The self-organizing system for itself creates all structural components which allow it to function in concrete mission. For this purpose the system consists of the basic EXE module and superstructures in the form of text projects. The EXE module designs these superstructures and on them carries out double bifurcation (high-quality reorganization), creating automatically all elements of big system: databases, screen forms, reports, settlement DLL programs.

Why this open source software of SAPR Smart-MES is capable to solve many problems quickly? First, this technology of self-organization is already realized by us and there is a ready working prototype. Secondly, it is not possible to repeat independently realization of this technology almost since at us on it iterative decade of tests and mistakes left. Thirdly, for repetition of this technology it is necessary to be completely free from the western IT paradigm which and close does not create the prerequisite for self-organization, but such experts of unit and all of them at us. Fourthly, the systems only self-organizing in modern market economy are capable to provide production progress by means of instant adaptability to constantly changing conditions. Fifthly, for development of technological functionality in system programmers are not necessary. Sixthly, SAPR will allow to generate a set of the self-adjusted systems at the concrete enterprise.

What will the open source software of SAPR Smart-MES allow? First, it is possible to use free of charge ready software and independently to realize at itself at the enterprise various technological and economic calculations in any volume and to use them in the interactive mode or in real time with elements of optimization and with analytics. And also to realize functioning of system in any multiuser configuration. But good

instructions and training are for this purpose necessary. Secondly, it is possible to use free of charge our source texts and creatively to process them, having provided thereby further development software from already reached level. But detailed descriptions of all subprogrammes of system and training are for this purpose necessary.

What now it prevents this perspective software SAPR of Smart-MES to be shown on light? As always stirs indifference and ignorance of officials which are very far from IT, and stirs experts in IT tunnel thinking because of the western IT paradigm based on SQL (language of the structured inquiries). Both that, and another it is possible to overcome only at the top level at desire something to change in modern conditions.

Here you only imagine, what power SAPR gives. We provide it a package of in advance prepared text projects of technological tasks, and after pressing one button all huge system is automatically developed and comes to life. We palm off on it other package, and it develops other system nearby. Data of systems can be as much as necessary. And on all this some seconds are required only. The system is not afraid of neither viruses, nor the most cruel intervention of the layman since having revealed an incorrectness at all, it independently restores herself.

But the most important that the historical chance to take the leading positions in IT on creation of the self-organizing systems for the industry is provided to Russia, or this chance will be lost. Realization of self-organization in IT it absolutely other outlook which needs to be imparted from higher education institutions that experts for IT did not duplicate the western technologies and would not work on their canons, and would create the domestic IT industry based on the principles of self-organization. In the West long ago work on this problem, but unsuccessfully because of incorrectly chosen paradigm. That we incidentally managed to solve this problem, is a great luck for Russia, and not to use it means elementary

wrecking and treachery of interests of Russia, especially in the conditions of opposition with the West.

It is necessary to understand one that progress in IT is relentless, but a question only in the one who will head it: Russia or West. Now Russia has all opportunities to use our practices and to extend our experience in all industries, but the most important in the defensive industry where the new weapon is created. Quickly realized self-organizing mathematical models are necessary for each type of weapon and for each strategy. And SAPR Smart-MES easily will provide it without traditional programming, without heap of system glitches, with an unprecedented speed of calculations and with the easiest adaptability to new conditions.

Any set of mathematical dependences attached to economy or to technology is model. But the program which either is used ready is necessary for real functioning of model, or is specially developed. But in our progressive time to create the new program it is the sheer marasmus when for this purpose there are powerful Smart-MES tools. Why these programs after all are still developed with attraction of huge staff of programmers? Yes because management fondly believes that they will create the program better than Smart-MES system.

But it is not real, and that is why. Any model is only the approached description of object since to create the identical copy in the form of virtual model simply not perhaps, but it is possible by means of infinite iterations to come nearer to it. And for this purpose the tools have to be self-organizing as it is necessary to provide the easiest adaptability and the highest speed of performance of calculations. But the similar self-organizing systems, except us the created Smart-MES, in the world are not present. And on its creation decade of work of the best programmers of Yekaterinburg left.

In this case the platform does not matter since more here we speak not about concrete program realization, and about the principles which can easily be used in various other platforms. This realization in the form of Smart-MES "MES-T2 2020" system can be considered as the ready working prototype or a sample.

Once again I will notice that it is better to make our system it is impossible (the user interface or other lotions does not mean here) since at us so the easiest adaptation and the highest speed of calculation is reached. To come nearer to our opportunities, probably, really, but why to spend for it the mass of efforts when all the same not to catch up with us and more simply to use our ready system and technology on the scale of all Russia, including defense industry.

Now about our adaptation. At such easiest adaptation the technologist's plan without participation of programmers is instantly realized into the working software. Necessary current changes in algorithms of calculation or addition of new tasks are instantly realized at rate of functioning of system without loss of the current technological data. For designing of the text project of tasks ready templates are used, and engineering language of the technologist is available even to the school student. The conceptual line in the project consists of trivial components: designation of an indicator, the name, a unit of measure and algorithm of calculation, thus all indicators in algorithm have designations, habitual for technologists. Where it is even simpler?

In the course of self-organization of system to which gives rise of people or other mechanism, two points of bifurcation in which there is a change of structure from simple to difficult and from chaos to orderliness meet. In the first point of bifurcation self-adjustment of all system, i.e. transformation of text projects to all components of system is carried out: databases, screen forms, reports, interpretative calculations, etc. In the

second point of bifurcation interpretative calculations of a set of tasks will be transformed to one task in machine codes with their optimization.

In this case the greatest possible speed of calculation is carried out by formation of one program on DLL (dynamically connected library) for all tasks without excess analyses with one pass from top to down. Manually it is not possible to write such huge program including millions of indicators simply but if it is possible, its expeditious correction will not be real at all. At us it is generated automatically.

Models are necessary for improvement of the current functioning of the enterprises for the purpose of increase in productivity and profit and for their expected development. And, therefore, and for progress of all Russia. And for this purpose already developed self-organizing Smart-MES system best of all approaches. But, unfortunately, the paradigm of the existing IT community in Russia does not allow dissidents to lean out.

The paradigm is that unites IT community. Now at very long influence of the western paradigm on minds of IT community led to stagnation and rotting of this paradigm. And the new Russian IT paradigm for the industry is not present. But the technology of creation of the self-organizing systems could be this paradigm.

In our country for needs of IT for one million enterprises in the industry, in the scientific sphere and in defense industry the trillionth sums are annually obviously and implicitly spent, and Russia could spend for it one thousand times less, having used open self-organizing software. Here also there would be a rapid general progress. And programmers would not multiply ideologically outdated western software, and developed the domestic. And we not simply would catch up with the USA, and through it easily would jump.

SAPR Smart-MES contains the developed system functionality from various methods of optimization (dynamic programming, a simplex method, etc.) to various analytics. The generated systems can function in various configurations the client server with three-unit structure with the SQL Server and without it. In this case the application server is generated automatically. There is the graphic vector editor for formation of schemes of treelike structure. Also possibility of placement of calculations and analytics is available the Internet. In this case the SQL application and the Web application are adjusted automatically.

Philosophical concepts successfully are suitable for figurative representation of SAPR Smart-MES: basis and superstructure. In this case the basis is presented by the EXE Module, and a superstructure - text projects of tasks. The basis creates a superstructure, and the superstructure defines Basis and its functioning.

Thus, the technology of the self-organizing systems marks revolutionary revolution which can quite bring Russia out of IT crisis.

But so far at us in Russia progress simply marks time because of global corruption and because of absolute unwillingness of the leadership of Russia to meet requirements of unknown innovators. Already decently become dusty unique innovative Smart-MES system can be a striking example. And such examples many thousands. After all the most awful that ingenious development can be lost on eyelids for future generations.

In the book "Innovative Economy (Road Map 2040)" [5] Svyatoslav Martynov writes: "And reasons for alarm are:

1. The few people - carriers of sacral knowledge are not young any more and pupils of middle age are not present or nearly is not present.

2. Only the qualified team can realize a grand design (in an ideal already with experience of certain achievements).

3. Introduction of global innovations possibly only at nonresistance of national elite".

In the present time this most national elite simply tries not to notice the revolutionary revolution which is already made by us in the sphere of IT.

But on the other hand we will ask a simple question and how to national elite to reveal this most ingenious development? How to emit them rational grain from the mountain of garbage? But it can be defined only at the level of experts. And that experts are just not present these and cannot be. Because if such experts would be, the Russian economy would be already ahead of the planet only long ago. After all the real experts because of indifference of officials left for a long time in the USA and successfully work for Uncle Sam. And those who themselves carried to experts, i.e. those who takes out the conclusion, are simply approximate to the power and no more than that.

In the people there is an opinion that the standing innovation independently will open the way of itself. Otherwise - it not standing. In the government consider that investors will define that it is favorable to them. But let's not confuse "iron" to software. If the innovative device is obliged to make profit, IT directly - never. Therefore to hope for investors in advance of perspective IT is useless.

Here consciously all talk on design features of SAPR Smart-MES since they are useless falls. On any my argument in reply I will hear one thousand denials. The criticism is important and very necessary, when it in detail. For example, none of IT specialists plainly will not explain need of a DB of SQL? After all if IT process can be carried out much better without these SQL, apparently, about what to speak? An, no! The western canons will drive consciousness of domestic IT specialists for a long time.

5. Structure and possibilities of Smart-MES system

The logical structure of Smart-MES system consists of two parts. To the first part there corresponds the designer ARM (the automated workplace). The designer always one for any appendices, is the EXE file. To the second part there correspond appendices, these are templates with an open code for their further development and change as each appendix is unique. In the Designer models of information objects are described. Everything that we described in the Designer, is realized in appendices. We can correct everything that described in the Designer - changes instantly through compilation will appear in appendices without reprogramming.

Structurally Smart-MES includes four components: Designer ARM, SQL application, Graphic editor, Web application [2]. The basic is the Designer ARM. The SQL application and the Web application work on its settings. The Smart-MES system has no means of data collection directly from sensors, and carries out their import from the automated means of the lower level existing at power plant: PCS, ASKUE (electric power), ASKUT (heat), ASKUG (gas), etc. In the absence of any basic data manual daily input with the subsequent transformation of the minute calculations given on level is used.

The designer ARM carries out full adaptation of Smart-MES to conditions of concrete power plant and the client server without SQL DB (database) can be exploited in the multiuser configuration. In this case the designer ARM carries out two functions: as a workplace of the administrator of system for introduction of various corrections and as the client with a set of functions. In this case there is one very important feature: the client server of three-unit structure is used. The similar configuration without SQL DB cannot be in one other system, this our

know-how. Advantages of such configuration the client server are: lack of SQL DB, high speed of calculation, huge number of analytics and other opportunities.

The configuration the client server of three-unit structure without SQL DB is a new word in development of information technologies. When everything is universal passed on the client server with the western SQL DB, we gave unlimited opportunities to our configuration the client server with direct access to a DB without use of sluggish SQL language. In our case there is a server of information databases, an application server and the "fat" client. All calculations are carried out by an application server on the DLL program.

The SQL application realizing a configuration the client server with SQL DB turns on the SQL server, the "thin" client and an application server on the DLL program. In this case the SQL server is used what is preferred by power plant. At the beginning of functioning all settings and databases, and Smart-MES system in a configuration download to the SQL server from the Designer ARM the client server with SQL DB is ready to work.

The graphic editor was developed by us as the independent software product for creation of archival thermal and electric circuits of hierarchical structure in a vector format with possibility of submission of dynamic information (The certificate of Rospatent No. 2002610180 on the state registration of the computer program, 2002). At creation of Smart-MES system the graphic editor was integrated into it.

The web application is the exotic software product. He allows to post online all calculations of TEI with manual input of basic data and with analytics.

Such multilateral realization of Smart-MES system allows to satisfy many requirements of the Generation company for economy of fuel for the purpose of increase in energy efficiency of power plants and considerably to increase its appeal to investors. In the same system tasks of the prevention of all emergencies are easily realized.

The program then will be useful at power plants when it is capable to adapt for all changes quickly. But after all even simple calculations of TEI not always have transparent realization, not to mention continuous changes in technology of the power plant.

Process of drawing up calculation in the text project in Smart-MES system and debugging of these calculations is carried out easily. In calculations all indicators have the designations habitual for technologists, and all algorithms of calculations can be accompanied easily. Changes can easily be made to technological tasks by technologists of power plants.

We developed the theory of mathematical modeling of any combined heat and power plants, state district power station, hydroelectric power station, the NPP and it is realized in practice in the form of the innovative self-organizing Smart-MES system for calculation of TEI and production management of power plant with minimization of an excessive consumption of fuel.

The theory of modeling consists some main Postulates directed on implementation of functioning of full mathematical model of the power plant including expeditious calculations of the actual and standard TEI with possibility of optimization of resources by method of dynamic programming.

Postulate 1. Designation of all technological indicators has to be in a look: <Indicator> [<Object> <Number>]. The indicator is a usual engineering alphabetic writing of technological parameter. The object is a

symbol of the Boiler <K>, Turbin <T>, etc. Number is station number of the equipment. For example: Qk_br\ug [K8] - Development is warm a copper No. 8 on coal and gas, Ettsi\sn [T5] - the Expense e/e on SN of shopping center of t No. 5. All settlement algorithms have to be formulated with use of these designations of indicators. For example: Qk_br \at = [Dop \at * [ipp-ipv] +dpr \at * [ikv-ipv]] *1e-3+qotop.

Postulate 2. All technological calculations have to be made out in the form of the text Project. The project of a task has to consist of two main parts: Objects and Indicators. Objects are a description of columns of screen and calculation tables. Indicators are a description of lines of screen and calculation tables in a look: Designation, Unit of measure, Name and Algorithm of calculation.

Postulate 3. All system has to be adjusted automatically at compilation of text Projects of tasks. That is, databases, screen and calculation tables, reports and the conductor of tasks have to be generated automatically. The executive Module has to remain invariable and has to function on settings of system.

Postulate 4. According to the generated calculation tables the DLL program with optimization of a code for the general calculation of half-hour, daily and monthly tasks has to be created automatically. In the DLL program all calculation has to be made for one pass from top to down. Dynamic optimization of diversity has to be made on this DLL program.

Postulate 5. All standard schedules of work of the equipment have to be entered in a graphic look and automatically be digitized for their use in calculations.

Postulate 6. All technological algorithms in mathematical model have to correspond to the current calculations of PTO of power plant executed, for example, in MS Excel.

The Smart-MES system has some instruments of optimization of resources of power plant.

Need of optimization of TEI at power plants is defined by existence of diversity of adoption of the operating technological decision by the operational personnel. The power plant is faced, apparently, by a simple task: To implement the plan of delivery of the electric power and heat on the existing working equipment at a minimum of expenses of fuel. Now still the person without operational accounting of an excessive consumption of fuel, i.e. absolutely in the dark tries to carry out this task. It follows from this that the predominating criterion function on fuel consumption minimization is not carried out at all.

Here it should be noted, as existence of powerful optimization does not solve this problem without the current accounting of an excessive consumption of fuel on half-hour intervals. Optimization in this case speaks as it is necessary to make, and the account shows that as a result of management it turned out, i.e. the account is feedback. But now there is no this feedback, therefore, and there is no optimum control. And on the other hand even at the accounting of an excessive consumption of fuel, but in the absence of optimization also there cannot be this optimum control. Very gloomy picture of today turns out: there is neither optimization of resources, nor the accounting of an excessive consumption of fuel. Let's note also that the accounting of an excessive consumption of fuel are half-hour calculations of a difference of the actual fuel consumption and a standard cost in real time with granting monitoring analytics for BCP.

And now about instruments of optimization of TEI is more detailed. There are two approaches to optimization: local and the general. Local optimization considers only part of the equipment without coordination with other part, for example, optimization of loading of turbines. The general optimization operates at once with all model of power plant.

Certainly, the general optimization most correctly defines the best decision since considers all processes in interrelation. In Smart-MES system general optimization is realized.

It is possible to carry to instruments of optimization: Linear optimization by a simplex method, Dynamic optimization and HOP optimization.

Linear optimization. The task for this optimization represents system of the linear equations and criterion function. This task does not exist somewhere aside, and directly joins in mathematical model of power plant. By the way, such problems of linear optimization in calculations can be as much as necessary, united in uniform model of power plant for expeditious calculation in real time of the actual and standard TEI. All these systems of the linear equations decide modernized a simplex method which surely leads to the concrete decision.

Dynamic optimization. This optimization though is not present at the body of mathematical model of power plant, but operates with all this model. The dynamic optimizer contains data of the defining factors for which possible minimum and maximum values are set, and given to minimax strategy for which the minimum or maximum values with their ranging on a priority are also set. The essence of dynamic optimization is that for all defining factors alternately with a certain TEI values from minimum to maximum are set and the resulting indicators on full model pay off with their fixing. Thus, all combinations of the defining factors are checked. The second stage is the choice of optimum option from all variety according to minimax strategy.

HOP optimization. This type of optimization also operates with full model of power plant. Both in it, and in above the described options the model of power plant represents a full set of calculations of the actual and

standard TEI. CRG (Characteristic Relative Growth) is the schedule of differentials of an indicator (dy/dx) from minimum to the maximum value (x), and optimization is definition of an extremum of this schedule. The task as follows is formulated: To find such distribution of resources at which the increase in power of the electric power at a certain size will require the smallest increase in expenses of fuel.

Innovative Smart-MES by all these types of optimization has the adjusted tools, i.e. they are not realized "in a forehead", and can change easily in use.

But it is necessary to stop especially on shares of influence on economy of fuel of optimization of resources and the accounting of an excessive consumption of fuel. So, optimization of resources can give economy of fuel in only 3%, and the accounting of an excessive consumption of fuel has opportunity to save more than 10% of fuel. Here the interesting picture appears that at realization of optimization of resources and without an excessive consumption of fuel even these 3% can and be not reached since everything can eat an uncontrolled excessive consumption of fuel. And here, joint realization and the accounting of an excessive consumption of fuel, and optimization of resources easily will give economy of fuel more than 13%.

Specification of the tool program Smart-MES complex:

1) The PTO professional Complex - the version 6.x, in structure:
   * the Designer ARM (the Automated Workplace)
     - The founder of System for any power plant
     - Designer of Projects with automatic control of the Complex
     - Processing of standard schedules on the equipment
     - Import of data from ASKUE, Excel, dBase, Access, SQL server
     - Export of data to Excel and Word for any reports
     - The designer for preparation of daily and monthly magazines

- Designer of reports, generator of composite reports

- Calculation of indicators for changes, days, months and calculation for any period

- The review of Indicators with digital and graphic analytics

- Agent Security (Prevention of Emergencies)

- Test of the equipment and the Regime card on the equipment

- The dynamic Optimizer with minimax strategy

- Plotter CRG (Characteristic Relative Growth)

- Operational Magazines with graphic analytics

- Expeditious Monitoring and Forecasts

- The express - the Analysis

* Processing of chart tapes by means of the scanner

* the Agent on the Prevention of Emergencies in real time

* Manager of Archives of databases, projects, settings, etc. files

* Examples: over 150 Projects with 3000 standard schedules

* Documentation (Book 2005, 2006 in electronic form, book 2007 in printed form)

2) The Client / Server 2 appendix - the version 7.x

Uses settings of the Designer ARM versions 6.x

* Works on three-unit structure with SQL - Servers: Oracle, MS SQL Server, Sybase, SQLBase, Interbase, MySQL and others

3) WEB - The appendix for the Internet - the version 7.x:

Uses settings of the Designer ARM versions 6.x

* Preparation of a DB and settings for placement for IIS WEB - Server

* CGI - a script (performance of calculation on the Internet)

4) Graphic Thermal power plant Graf system - the version 5.x:

* the Graphic editor for Monitoring of Indicators of TEI

* Examples: about 400 schemes and forms on KTTs, ETs and HTs

6. Intellectuality of Smart-MES system

The intellectual system is capable to synthesize the purpose, to make the decision to action, to provide action for achievement of the purpose, to predict values of parameters of result of action and to compare them with actual data, forming feedback, to correct the purpose or management. For this purpose it possesses a stock of knowledge and has methods of the solution of tasks.

The production activity contains two main processes in the Generation company.

1) Ensuring power generation and heat each power plant according to their schedule of delivery at a zero excessive consumption of fuel. By us it is proved that optimization of resources in this process plays a smaller role, than elimination of an elementary human factor in an excessive consumption of fuel which can be reached only by half-hour calculations of the actual and standard TEI in real time with monitoring of an excessive consumption of fuel for BCP (Block Control panel).

2) Forecasting of purchase of fuel for each power plant according to plans of delivery of the electric power and heat. In this case for decrease in penalties it is necessary to calculate precisely the sizes of necessary fuel with breakdown according to the schedule diagram.

Production of power plant is described as follows:

$$B = f(E, Q), \qquad\qquad (1)$$

where: B - amount of fuel, t.u.t.;

$\qquad$ Э - quantity of the electric power, MW · h;

$\qquad$ Q - amount of heat, Gcal.

At optimum production and at a zero excessive consumption of fuel to each couple (E, Q) on a half-hour piece there corresponds strictly certain amount of fuel (B).

Having the knowledge base with a set of various combinations (E, Q, B) for half-hour intervals and the plan of delivery (E, Q), the Smart-MES system will instantly calculate (B) for any period. In this case specific fuel consumption and other difficult calculations for planning and forecasting are not necessary at all.

The same concerns also the current production. Also according to the knowledge base, but with other set of combinations (E, Q, Ri) according to the schedule of delivery (E, Q) the system will choose an optimum set of operating modes of the equipment (Ri - thermal loadings of coppers, electric loadings of turbine units, etc.). In this case there is no need to solve optimizing problems of loading of the equipment and highly skilled technologists for management of power plant are not required. There is enough only in real time by means of Smart-MES to control an excessive consumption of fuel.

Training or formation of the knowledge base of Smart-MES happens in the current production. On half-hour intervals at a zero excessive consumption of fuel and at optimum loading of the equipment fixation of this cut (E, Q, B, Ri) in the knowledge base is made. The full cycle of training of system, naturally, will require one year because of various seasonal requirements of the electric power and heat.

In practice management of power plant with use of Smart-MES looks as follows. On BCP of power plant monitoring of Smart-MES represents in real time of graphics and value of minute and half-hour excessive consumption of fuel. If there is a minute excessive consumption of fuel, changes are quickly made to production. If there is no excessive

consumption of fuel on a half-hour piece, and this production cut is absent in the knowledge base of system, he automatically registers in base. The list of technological parameters of a cut is adjusted in advance. In the transitional modes (day, night) process of fixation of a cut is also made after installation of zero value of an excessive consumption of fuel.

Upon transition out of one production situation to another (change of necessary number of power generation and heat) from the knowledge base in monitoring of Smart-MES it will be brought some advising cut options (a set of technological parameters) to operation personnel of BCP for the purpose of simplification of fast acceptance of the operating influence. If the suitable option is not present, the dynamic optimizer for search of optimum loading of the equipment is started. In the course of training need to use the optimizer gradually will be reduced.

Thus, intellectual Smart-MES, using the schedule of delivery of the electric power and heat, by means of the knowledge base will unmistakably prompt the best decisions in concrete production situations, and monitoring of the current excessive consumption of fuel in real time will promote its economy. And it already the highest level of the organization of management of power plant.

The power plant works effective when the actual excessive consumption of fuel for each half an hour and, therefore, in a month, completely is absent. Now at one power plant the exact actual excessive consumption of fuel which has to turn out only integral calculus from half-hour TEI [4] is not known. And that excessive consumption of fuel which appears in monthly reports, is far from reality since monthly calculations of an excessive consumption of fuel are made by incorrect techniques, including the distorted standard schedules by polynoms. Thus the excessive consumption of fuel should not be confused with its burnout which is dictated by technology.

For some reason, when the speech comes about the software for calculation of TEI of power plants, the question of need of existence of intellectual opportunities is not even considered. Therefore at all power plants there are dull and methodologically miscalculations of TEI which not only do not bring any benefit and profit, and do obvious harm, hiding huge reserves of increase in energy efficiency of combined heat and power plant and state district power station.

Everyone will tell that it is possible to do without navigator if of course well you know the district. And if you do not know? And if the blind? And if you do not suspect where traffic jams, and it is necessary urgently? And so the Smart-MES system at power plant is the same navigator. Thus, the system supplies the operational personnel with intellectual additional sight without which now it simply is active in a darkness with a candle in hands.

The concept "intelligence" and scientific and uneducated is treated by all in own way. Accurate uniform definition is not present and cannot be. If there is no clear understanding even as the person thinks. Usually say that this scientist has big intelligence since he knows much. And here about the working drunk so will not tell though he provided with the innovations wellbeing of plant. But if there is no concrete definition of intelligence for the person, it especially cannot be and for system.

Here we will not give all variety of statements on intelligence in general and artificial in particular. And I will state the laconic definition: The intelligence is characterized by existence of dynamic memory of knowledge at system. You only observe a tiger as he prepares for attack. Well, unless it due to the lack of intelligence? Yes, at everyone it the, at someone bigger or smaller. But it all the same intelligence.

The intelligence of the person is conditionally subdivided on behavioural and into the creative. The behavioural intelligence is focused on service of itself, and creative on service of others. The behavioural intelligence is base for creative intelligence. The intelligence surely includes three components: knowledge base (memory), training and use. In this case training happens constantly.

And now we will prove that Smart-MES has intelligence. For this purpose it has to have all components of intelligence as the person, i.e. has to have an existence of the behavioural and creative mechanism, and everyone has to have the knowledge base, and have possibility of training and use of this knowledge in real time.

The behavioural Smart-MES mechanism turns on the adaptable device based on compilation of text projects of technological tasks for formation of the knowledge base of algorithms of calculation and all settings. It is also training of Smart-MES for performance of various behavioural functions: formation of screen forms and reports, performance of calculations and analytics. Such training happens in the course of functioning of Smart-MES. It reaches full constant identity of mathematical model to real production at power plant.

The creative Smart-MES mechanism turns on the device of formation of the knowledge base of half-hour technological cuts of the modes of the equipment with the set parameters of power generation and heat at a zero excessive consumption of fuel. Automatic training and granting the optimum modes of the equipment is carried out in real time. Here the creative mechanism is based on the behavioural Smart-MES mechanism.

As we see, this design of Smart-MES completely corresponds to a design of intelligence of the person. Therefore, Smart-MES has

intelligence. The objection that intelligence of the person creates something new, i.e. possesses creativity, is also easily parried. Only here it is necessary to consider one subtlety that the composer trained in music can compose generally various, but music, and not to design plants in any way.

Creativity of Smart-MES is that it, using the knowledge base about technological cuts, can precisely predict volumes of necessary fuel for any period. Any calculations not to master such accuracy. It completely creativity of Smart-MES. Here, as well as in music, there can be successful options and not really.

And now about innovative break. As it was already told that now at all power plants of all Generation companies the operational personnel regarding an enormous excessive consumption of fuel operates these power plants blindly, providing the most irrational fuel consumption. Whether they need to save fuel or it is not necessary to carry out directives of the Russian President on increase in energy efficiency of power plants it already on conscience of management of the Generation companies at all.

But Smart-MES due to the intelligence is capable to create conditions for a complete elimination everywhere of the existing huge excessive consumption of fuel. Ignoring of this fact does harm not only to investors, not only image of the Ministry of Energy of the Russian Federation, but also all Russia in general.

However, in the letter from Department of an operating control and management in power industry of the Ministry of Energy of the Russian Federation No. 10-2382 of 22.10.2013 signed by the Deputy director Bobyliov P.M. it is said that for introduction of the developed technologies on MES-T2 2020 MES System it is necessary to participate in tenders. Also it is reported that the Ministry of Energy according to the Law No.

135-FZ has no right to carry out the actions violating competition conditions.

Thus, the Ministry of Energy responsible for economy of energy resources, simply elementary withdrew from recognition existence of the developed intellectual innovative technology of economy of fuel on thermal power plants which can easily prevent a further uncontrolled expense of fuel which sizes are equivalent to annual losses in 100 billion rubles.

The question with the tender sounds simply ridiculously since the intelligence was equated due to a misunderstanding to bolts and nuts. It is equivalent as though in the past between various account with bones would announce the tender. And here the modern computer appeared before all of them. So it would be thrown simply bones because of denseness. Is not present, it is better we will patiently wait when we are politely invited for implementation of innovative break.

Well and why in general the intelligence is necessary in calculations of TEI? Question strange, but lawful. For example, you as what expert will prefer to employ to yourself: with intelligence or without? And there is other question: The overpayment for intelligence is justified or not? Probably, anybody to overpay to the janitor for special intelligence and will not be. But really management of the Generation companies really considers, what automation of calculations of TEI of power plants a place only on distant boondocks? But whether the most valuable tools what the correct and expeditious calculations of TEI are are time, including also an excessive consumption of fuel, to use in the benefit for receiving additional profit. Here that not to do without intelligence.

The intelligence surely operates with memory. In our case if at a certain structure of the working equipment and the plan of delivery of the

electric power and heat once by means of various optimizing mechanisms and high qualification of the expert, the best operating modes of the equipment at a zero excessive consumption of fuel were set, at a similar situation, why is repeatedly long to look for this best decision? Whether it is simpler than it to take simply from memory?

And now present that for various production situations in memory all information on optimum loading of resources collected over time, then this highly skilled expert for routine operational management of power plant simply is not necessary any more, and he can be used in other top-level quality. And the power plant will successfully continue to function with the maximum energy efficiency. With use of the same memory then it will be already simple to predict elementary authentically and purchase of fuel for any period.

We say that we will introduce Smart-MES system with intelligence. We are answered that we accept MS Excel with adjustment of results. We say that at power plant very big excessive consumption of fuel and we prove it. We are answered that you are not technologists and it do not understand. We say that the Generation companies by means of our system will be able easily to increase annual profit from each power plant by 300 million rubles. We are answered that all power plants various and it cannot simply be. Generally, the sheer dissonance! And at this time at power plants persistently rivet development with ideology of day before yesterday day.

Here you come on any power plant and ask what size of the current excessive consumption of fuel, for example, since the beginning of month with breakdown on days and on half an hour? Any expert of it will not tell since simply this account traditionally is not kept. And so across all Russia. The operational personnel regarding the current excessive consumption of fuel operates power plant simply blindly. And all this overexpenditure it is

reserved joins in tariffs. Not the huge excessive consumption of fuel, but its economy, owing to elementary adjustment appears in monthly reports.

Naturally, this poor outlook quickly will not exchange since it took root into minds many years together with MS Excel which it was simply not able, and will not be able.

In scientific community there is a secret competition regarding conceptual determination of intellectuality and self-organization for computer program systems but with existence they this intellectuality and self-organization in the nature still do not have of which, except our Smart-MES.

But I am an engineer I will dare to argue with scientists and at all to disprove their definitions which are considered by them in isolation from each other. I am intellectuality and I consider self-organization only in close interrelation and I consider that without intellectuality there is no self-organization, and without self-organization there is no intellectuality. Therefore if there is a self-organization, that is and intellectuality.

I will give definitions of intelligence and self-organization from Wikipedia. Intelligence - the quality of mentality consisting of ability to adapt for new situations, ability to training on the basis of experience, to understanding and application of abstract concepts and use of the knowledge for management of environment. Self-organization - process of streamlining of elements of one level in system at the expense of internal factors, without external specific influence. But unless ability to adapt and process of streamlining not of the same order?

Let's tell, the adult, certainly, has intelligence and self-organization, and here the baby does not possess them. And for this purpose that it would possess them, it should be learned long. But in the baby mechanisms of

perception of this doctrine are already put. As a result of training and self-organization there is an intelligence.

The concept - artificial intelligence, when there is no natural intelligence since the intelligence is the acquired properties of a brain, i.e. the mechanism capable to remember and operate with this knowledge is for some reason entered. And in this case there is no difference or it is a biological brain, or it is the computer with the program capable to be trained. Therefore existence of the term "Artificial intelligence" is the most main error of a scientific world.

After all still nobody proved that if computer system to train 20 years the same as the baby, and to enclose in it as much dynamic information, she will not be capable to create something new.

And now I will give only two of a set of foggy definitions of scientists:

1) In the book "Informodinamika or Way to the World of Open Systems" [14] it is told: "The intelligence is, first of all, process. When the knowledge stops being process, and the context is predetermined - the intelligence disappears".

But how the intelligence can disappear? After all it or is, or it is not present. Another thing is that it is possible to speak about the level and quality of intelligence since at all live if there was a training process, it is obligatory to eat intelligence, and it does not disappear anywhere. As well at information systems, it is possible to speak only about I.Q.

2) In the lecture "Information and Self-organization of Systems" it is told: "The system is self-organizing if it without purposeful influence from the outside finds information or functional structure. Example. One

macrostructure (ice) when heating passes into other macrostructure (liquid) with absolutely other properties".

Here it is so healthy! The elementary physics was equated to self-organization. But without intelligence there cannot be a self-organization. And it only natural physical, biological and other processes at the level of micro and a macrocosm.

Generally, each scientist in the thesis and in the articles tries to present the new conceptual material concerning intellectuality and self-organization of computer information systems and in a separation from each other. But as it is possible to give these concepts, without having at itself behind the back the slightest experience of development of similar systems. After all not concepts, and those directions financed by the State which are headed by these scientists are terrible, giving an incorrect vector to development of information technologies. And it is similar to diversion since because of it the domestic IT science marks time.

Very strange picture turns out that these all doctors and candidates of science IT developers with the huge experience teach us how it is necessary to develop system, and what system is considered intellectual, and what self-organizing.

Let's return again to the baby and it is representable that his 20 years kept in the closed space and only fed. And what his biological brain something will think? Absolutely not. Therefore, at the heart of intellectuality and self-organization training lies. So, when there is this intellectuality? It appears at once after the first lessons of training when the biological or artificial brain starts receiving information when this information stacks its internal mechanisms of self-organization on shelves when there is the return reaction by results of this training.

Therefore scientists should not exaggerate useless definitions of artificial intelligence, and to enter its quantitative conceptual measures. For example: Baby, Child, School student, Student, Engineer, Scientist, Academician. And at once it will become clear to all that, let us assume, this system has intelligence of the School student. After all for some reason in computer graphics left from two-colored representation of the world long ago, i.e. black and white. And it gave sharp break in development. And in such important issue as informatization, the science got stuck only in this framework - there is an intelligence or not intelligence.

After all if the system has opportunity to be trained, I.Q.s big, than at the person are subject to it. Here we will tell if the person was trained for the engineer-miner, it is possible to retrain quickly it on the engineer-architect? Yes, never. And here system it is possible.

Our Intellectual Self-organizing Smart-MES System also is such. It, as well as the person, is trained through the Text. In an initial state is a baby, but in some seconds after training it already has intelligence. If necessary she again can instantly become a baby and to be ready to perception of other intelligence.

The internal machine code of intelligence of Smart-MES after training is not known in advance at all since it creates it itself by means of self-organization. The system has no restrictions on training level. In it the Text of any size can be put. So far our system is focused for process productions. But on this technology of self-organization it is very easy for Smart-MES to create and for discrete productions.

7. Smart-MES system as Informdynamics wreath

Whether not too this demand for a wreath is self-confident and whether smells slightly of usual adventurism and ignorance here, and even a certain narrow-minded neglect to the newest science of "Informdynamics"? Absolutely not. The matter is that Smart-MES was developed by the turn, even without suspecting that the latest science is in parallel formed.

Here before me the Book - "Informdynamics or the Way to the World of open systems" [14] which is devoted to formation of fundamentals of new science of "Informdynamics". In Chapter 8. "Engineering of systems of an intellectual orientation" two systems are given: "qWord" and "Tekram" as models of achievement of Informdynamics. Let's note that these systems are developed for discrete productions.

But if the Smart-MES system which was initially created for power plants and for process productions, has methodologically the best realization, it and is a wreath. Here it is necessary to tell that some questions which in the Book are designated as not feasible, in our Smart-MES and are successfully realized long ago. Below separate excerpts from the Book are shortly considered and comparison with our system is given.

1) The book - part 8.1. Three main approaches.

"We will not consider the approaches connected with design of difficult information system in universal algorithmic language of this or that level. It proceeding from notorious bulkiness of the received decisions, their too obvious cybernetic level and a known problem of impossibility of

a little effective correction of structures of information bases at design approach, inevitable for languages."

In Smart-MES, on the contrary, correction of structures of a DB on the basis of engineering META of language of the text Project of technological tasks is very effectively carried out. Correction of structures of databases which can be caused by expansion of technological functionality of system, is made at any time without loss of technological information.

2) The book - part 8.3. Second approach. Ideology of tool system.

"Both with practical, and from the theoretical point of view the tool qWord system as realization of technology of open control systems of data is represented not less interesting. One of the main provisions of qWord-technology - full integration of tool and applied systems into a whole."

In Smart-MES tool and applied parts of system are structurally located in one executive Constructor_ARM.exe module which is intended for a complete set of the workstation of the administrator responsible for correction of algorithms of technological tasks, in a configuration the client server, but also the client server can carry out functions of workstations of technologists in a configuration. A configuration SQL application the client server and the Web application work on the settings which are created in Constructor_ARM.exe.

3) The book - part 8.3.6. The tool concept - the qWord technology.

"Let's note only that it not the compiler, qWord generated system and constantly accompanies it - supports process of its existence. In general CRR approach demands existence of the interpreter, differently the same object approach which is inevitably following from compilation will turn out. qWord actually is the virtual computer."

Our Smart-MES contains both the compiler, and the interpreter. As a result of compilation of text Projects of technological tasks all databases, all settings for formation of screen forms and reports, all calculation tables for operation of the interpreter and the DLL program for performance of calculations without interpretation are created. The interpreter is used only at a stage of debugging of technological calculations. All work of compilation without creation of DLL programs takes some seconds. In this case presence of the Designer of Projects of technological tasks and their compilation with creation of all information environment of system is a clear advantage of Smart-MES.

4) "It is characteristic that it is simply impossible to break structure of system any actions of the user, the truth it is possible to achieve very high degree of its inefficiency and it will be very difficult. Here we receive qualitatively other tool for work with information and other technology not only in development, but also in approach to use of IS."

The question in a damage of structure in Smart-MES in general is not necessary since all structure is quickly created at compilation of Projects with recovery of data from a DB of the previous calculations.

5) The book - part 8.3.8. Problems of spontaneous bases.

"With the advent of the first applied products of tool technology there was also a temptation to train system in a natural language of the person, using the same tools and technology. And expenses, and it is obvious - considerable, will pay off overall performance of appendices. However here all also came to an end without having begun."

But in all this Smart-MES it is successful and excellently solved. Thus, task statements of technologists in a format: Designation of an indicator, the Unit of measure, the Name of an indicator, Algorithm of calculation of an indicator - in the same way are also entered in text

Projects of tasks by means of the Designer of Projects who is a part of the executive Constructor_ARM.exe module. And, the algorithm of calculation is formed in a usual engineering view with use of designations of indicators habitual to the technologist.

6) "Among other things, there was extremely important rather unexpected, but general fact. Since some and very small level of a full automation and naturalness of the interface, the user stops thinking not only about logic of data, but also about logic of PS, i.e. external logical model and about logic of own work. It turns out that more simply and much more effectively nevertheless to force the user to acquire a necessary minimum of the system diploma for the benefit of its own activity."

In our Smart-MES everything is executed harmoniously and clearly for technologists. The person thinks better and operates with concept - the table. In our case one table corresponds to one subtask where the column designates the concrete equipment, and a line - a technical and economic indicator of this equipment.

7) The book - part 8.3.9. Why in Cache '-technologies?

"All that is possible in Cache' - technologies perhaps and in other technologies but only if the Designer of System manages to overcome all traps and traps which construction are an integral part of more rich languages."

Our Smart-MES does not use Cache'-technology since it is simply not necessary to it, but all issues are resolved when using rich META language. Naturally, it was given not at once, and another to pass our way simply not perhaps since our previous experience and our brains are for this purpose necessary.

8) "If someone has a desire to overcome difficulties - overcome. It will turn out (at success of such fight) maybe better in some aspects, and, generally, the same, but very much and very even not cheap. Now, coming back to the first approach, it is possible to answer a question, than Cache' - the technology is better any another for work with opened (i.e. real) systems? This lack of need to overcome difficulties better."

Before final development of Smart-MES "MES-T2 2020" we developed the Program Complexes "Technological Office", "MES-T2 2007", "MES-T2 2010". It was not aspiration to reach some beforehand set result. This simply creative innovative creation. And when say that Cache'-technology is better any another for work with open systems, I will tell that this absolutely incorrect statement. And example of it, our Smart-MES.

9) The book - part 8.5. Self-improvement of ISU.

"Systems possess opportunity to develop, change the structure after change of problem area and set of tasks that, apparently, where it is most important together than the taken cunnings and specific receptions in systems of AI, especially if to speak about real, but not toy situations, formally designed habitats of system chess, logical, etc."

Our Smart-MES was created at once with need of the maximum control of all elements of system for power plants. But something concrete, peculiar only to power plant, in a kernel the system absolutely is not present. Therefore Smart-MES can be easily used for any process productions: power industry, chemical industry, oil and gas industry, metallurgy, etc. But it is not intended for discrete productions, for warehouses and for accounts department at all.

10) "In the transferred systems the mechanism of development of structure of system obviously appears only in case of multiple interaction

of active components - both system, and users, i.e. is well identified only in big and difficult systems."

The mechanism of development of structure is involved in our Smart-MES from the very beginning of adaptation of this program Complex to concrete realization. Thus, at the beginning the Complex is represented simply empty, i.e. absolutely anything is not present neither databases, nor screen forms, reports. And all this automatically starts being created after compilation of the first text Project of a task. By drawing up new Projects all Smart-MES system can infinitely increase.

11) "In all considered cases the natural structure organizing system is obviously and accurately shown. Over a layer of static data there is a hierarchy from three virtual computers of management of hierarchy of data. Let's remind, it: a) actually model of data (MD), i.e. realization of the B* trees mechanism, display of data to physical structures of memory; b) model of metadata (abstract MD), that in Cache' TMMD is called; c) generator of abstract MD. In order that this system of virtual computers could create itself, the fourth layer of a superstructure - the virtual tool computer which is necessary for self-creation of both a tool layer, and appendices is required."

Our Smart-MES also has all these layers of models with only that difference that the B* trees mechanism is not used and Cache is not used'. After all all ingenious - is simple. And at us the outer user side of system looks so simple, and its internal contents, but it not for users is submitted so difficult.

12) "As literally the same hierarchy of virtual computers arises from absolutely various concepts, naturally there is an assumption that such structure of high-organized information systems not a consequence of some

approach or approaches, but a consequence of such device of the phenomenon, information phenomenon."

It is possible to agree with it completely! We, developing the Smart-MES and without knowing a basis of "Informdynamics" at all, other developers of systems of other orientation came to the same results, as. In this case, probably, there is a general need of emergence of Self-organizing Intellectual Systems.

13) The book - part 12.6.2. Destruction at a metrization of data

"As we already spoke above, specialists in the theory of management and all know, the experts programmers creating and accompanying information systems too know - it is necessary to correct simply model of data and to restructure a DB own hands, and it is even better - something adaptive and algorithmic. And to call all this the system founded on knowledge or intellectual."

In this case it is necessary to recognize that we also are such experts programmers who developed the best in the world Self-organizing Innovative Smart-MES System for power plants. It is possible to speak about its technical and intellectual capabilities long. But I will stop only on some. Calculation of 20000 indicators with unique algorithms of calculation with use of 300 standard schedules is made less than in 1 second. Entering of any changes into structure and algorithms of calculations is carried out in 5 seconds. The intelligent mechanism is capable to register automatically in the Knowledge base technological cuts of power plant with a zero excessive consumption of fuel and to advise the operational personnel optimum options of loading of the equipment.

Uniqueness of innovative Smart-MES system is that it consists of a huge set of the KNOW-HOW:

1) The description of ARM (the automated workplace - a set of technological tasks) on simple human META language of the 4th generation in the form of the text Project;

2) Automatic control of all System of calculations from the text description of ARM, i.e. automatic creation of Conductor ARM, the Menu of tasks, Information databases, Screen tables and Reports;

3) Automatic creation of settlement DLL programs and SQL Server of the Appendix;

4) Automatic digitization of standard schedules of power characteristics of the equipment of any complexity;

5) High-speed debugging of calculations of Indicators for their digital values;

6) Realization of optimizing tasks modernized the Simplex method;

7) Automatic control of operation of application the Client/server on 3-unit structure with any SQL Server (MS SQLServer, Oracle, Interbase, MySQL, Informix, Sybase, SQLBase, PostgreSQL);

8) Automatic control of work of the Web application for the Internet on the IIS Web Server;

9) Dynamic modeling of work of power plant and optimization of resources on minimax strategy with variable number of the optimized factors;

10) Automatic construction CRG (characteristic of relative growth) on real model of power plant.

The special role Smart-MES is played by two moments: DLL calculations and Self-adjustment of the Complex for any power plants: Combined heat and power plant, state district power station, PGU, hydroelectric power station, NPP; and also for any process productions.

8. The Multiagent self-organizing Smart-MES system

Multiagent systems and the multiprocessor computers are urged to increase possibilities of information technologies. But if computers, including even gadgets, already all became the multiprocessor, multiagent systems for industrial productions are practically not present. Why? Yes because program agents have to be self-organizing, and anybody in the world is not able to do it. But we incidentally managed to solve this problem.

You only present a great number of "dead" identical program agents who else are not able to do anything. And here they start coming to life, taking from "shelf" for themselves a task, i.e. a set of text projects, and by means of self-organization are instantly trained in skills. They exchange words among themselves under the protocol: "the first, first, I the second, assumed functions of the account" or "everything, everything, me lined, assume my functions of management". According to the current production context agents independently quickly can change the skills. Thus the agent "kills" himself and from "shelf" takes the next task for self-organization and is again ready to action.

It is not possible to destroy such multiagent system since like Zmey Gorynych at whom at an chop off of the head grows new, and at system in case of death of one agent, his place is taken by another. What function is carried out by this or that agent anybody out of system does not know. In this case there is a two-level self-organization: at the level of the agent and at the level of all system.

The agent (Latin agere) everything is considered that works. But it is supposed that computer agents have some other attributes which differ from usual computer programs [8]. Such as: ability to function under an

off-line control, to perceive the environment, to exist during the long period of time, to adapt for changes and to possess ability to assume achievement of the objectives, put by others. The agent who acts is called as the rational agent so that it was possible to reach the best result or, in the conditions of uncertainty, the best expected result.

Multiagent technologies allow to solve problems for which frequent and unpredictable changes are characteristic and difficult dependences between elements take place. Unlike traditional systems in which the solution is found by means of the centralized, consecutive and determined algorithms, in multiagent systems the decision is reached as a result of the distributed interaction of a great number of agents - the autonomous program objects aimed at search, perhaps, not so much optimum, how many the most adequate and actual decision on each timepoint.

Thus, one and too software Smart-MES is used as agents for coppers, for turbines, for holiday of heat and for holiday of the electric power, for the accounting of losses and for the accounting of own needs, for chemical water treatment, for station actual TEI and for standard TEI. Here the given agents do not substitute the existing PCS, and them supplement. These agents can control a condition of pipelines and wear of the equipment, and many other things. All agents are among themselves connected by protocols of a constant exchange. All agents work in parallel in real time and all in a complex are aimed for achievement of the maximum profit on electricity generation and heat.

Thus I will not claim that this multiagent system will at once solve all problems of power plants, but it will allow the generation companies to be ahead of the planet of all.

Here before me the monograph about Stewart Russell and Peter Norviga's intellectual agents [9]. All modern achievements are presented in

this book and the ideas which became incentive to development of artificial intelligence as sciences of design of rational agents are stated. In this book it is told that the artificial intelligence is not magic and not science fiction, but an alloy of methods of science, equipment and mathematics.

Thus, the science about intellectual agents is, modern gigahertz and gigabyte computers are, the self-organizing Smart-MES system is. Remains very little, namely, to realize this alloy, for example, in the environment of power industry.

After all we want it or not, not to stop progress on multiagent technologies any more, but it is possible to appear easily on its roadside, losing thus multi-billion profits on lack of intellectual management of power plants. I remember how 20 years ago ideas of PGU hard moved ahead, and now they became, nearly panacea of energy efficiency. But many years for increase of economy of Russia are dullly missed.

On the SmartGrid of the power engineering specialist of the future portal under the direction of "FGC UES" at full speed there is a discussion of questions of introduction of multiagent control systems for intellectual networks.

In the article "Use of Multiagent Systems in Power Industry" [10], it is told: "The beginning of development of specialized expert systems and artificial neural networks became the appeal of power industry to area of artificial intelligence. Systems (IAC) can become the following TEI in this direction multiagent. Expect the flow of information following an energy stream from transition to intellectual networks (Smart Grid)".

Well, really the generation companies will allow that networks were intellectual, and power plants and would remain in "bast shoes".

Creation of multiagent systems for the industry, unfortunately, still remains a prerogative only of scientists since agents with self-organization are for this purpose necessary, and they are not present. Even for the West the multiagent technology for the industry is exotic.

And meanwhile, the Firm of Information Systems developed and approved the self-organizing Smart-MES system which can be involved in multiagent technology for realization of cognitive functions of management of any power plant and any industrial enterprise.

However, in "FGC UES" development and deployment of multiagent system at which self-organization functions are declared is planned. But to tell - one, and really to make is absolutely another. And here neither huge state investments, nor huge team of developers will not help. As a result it for certain will be pseudo the multiagent system consisting of "lame" agents.

We on realization of this self-organizing system needed 10 years as a result of which seven generations were developed software, and we developed them, without representing final part, and is absolute in a separation from researches of scientists. As a result only the last generation became deification of self-organization in IT. To create similar system, knowing our principles of self-organization, now it is possible much quicker, but they should be known. Here roles a platform, neither a programming language, nor a database do not play. To create without us something similar or even the best, probably, it is possible. But miracles do not happen.

For example, we will remember Tesla. He claimed that in the condenser consisting of the earth and an upper atmosphere is concentrated energy in thousands of times the exceeding all needs of the electric power for the world, and that everyone can use on its technology it as much as

necessary. Neither power plants, nor power supply networks are not necessary. But monopolists of the USA destroyed all its practices. And now anybody cannot repeat them. And time so, it is given simply for a bluff.

And I will dare to declare that our technology of self-organization ON is similar to technology of obtaining energy from air at Tesla. Only at Tesla it marked revolution in power, and at us in IT. And relation to them of monopolists and state just the same, i.e. regrettably short-sighted.

It is asked, than agents differ from services, or in other words: why the multiagent system is necessary?

Here simple example. For development of the major state decision two teams are gathered. In the first (services) experts only from one corporation, and in the second (agents) - from different corporations are involved. And how you think, what team had the best and more weighed decision? Naturally, at the second since this team was not limited to the settled principles only of one corporation.

Thus, first, services use the determined algorithms, and agents work in the conditions of incompleteness of information and therefore use intuition. Secondly, above services there is an operating arbitrator who coordinates their work, and over agents the arbitrator is not present, and they function absolutely independently. Thirdly, each service has accurate mission, and for the agent it not essentially since he can perform any tasks, possessing self-organization and self-training.

And now about management of power plant. It is absolutely clear to all that the person operates power plant much worse, than automatic system with intelligence elements. Though the person also uses intuition, but he is not able to operate with thousands of factors in the conditions of uncertainty, providing thus implementation of the daily schedule of delivery of the electric power and heat at a minimum of expenses and in the

absence of thus accident. In other words, main objective of management of power plant this providing the maximum profit.

The usual automatic system in the conditions of constantly changing market of the electric power will not pull it since in this case it is necessary to make not optimum decisions, but the best taking into account all risk factors exactly at present.

The matter is that electricity generation and heat is so unique because of impossibility of their accumulation. In other words, if it is developed the electric power and heat it is more, than for it it is paid, these are simply thrown out money spent on the spent too much fuel is useless. But multiton power coppers have a big lag effect, and it means that if fuel supply, but sharp steam still is stopped some time will be useless to be developed. Therefore in management the principle of the intuitive advancing influence has to be used that the person is not able to provide.

Here it is necessary to understand that at power plant there is a set of sites which needs to be operated in interrelation, and the great number of agents who are capable to assume management of any site has to be for this purpose involved, thus the quantity of sites and number of agents can not coincide. In this case agents quickly use the principles of mutual assistance.

It was told about intuition which, as well as the person, program agents have to possess above. But unless it is possible? Intuition - the direct comprehension of truth without logical analysis based on the previous experience. But subconsciously the person in the conditions of uncertainty operates with probabilistic methods which are given for intuition.

In the agent Bayes's theorem for this purpose can be used [11]:

$P(A|B) = P(B|A) \cdot P(A)/P(B)$, where

$P(A|B)$ - probability of a hypothesis of A at approach of an event of B;

P(B|A) - probability of approach of an event of B at the validity of a hypothesis of A;

P(A) - aprioristic probability of a hypothesis of A;

P(B) - probability of approach of an event of B.

This simple equation is the cornerstone of all modern systems of artificial intelligence for a probabilistic or intuitive conclusion. Bayes's rule allows to calculate unknown probabilities from known conditional probabilities.

Uncertainty arises at power plants and because of economy of efforts, and due to the lack of knowledge. Uncertainty cannot be avoided in difficult and dynamic productions. Existence of uncertainty means that many simplifications, possible in a deductive logical conclusion, become any more admissible.

The agent can count probabilities of not observed objects on power plants and use them for adoption of the best decisions in comparison with what are accepted by simple logical service.

The power break declared by JSC FGC UES in power industry regarding IT assumes use of nonconventional approaches since if they usual, no break can be, and without innovative IT power having dug no more than visibility.

"FGC UES" holds the second year the All-Russian competition "Energy-breakthrough", for the purpose of attraction of breakthrough projects in the field of intellectual power, urged to combine efforts and knowledge of representatives of different areas of science and equipment for creation of power of the future. But the power of the future assumes use of IT of the future.

But what actually has "FGC UES" by results of competition for 2014? On competition 270 projects were submitted, from them with IT are

connected 67 that makes 25%. 12 projects became finalists, from them with IT are connected 9 that makes 75%. It would seem, the good tendency towards IT is observed. Also we will notice that among all projects which are not connected with IT only 1,5% received attention. It means that the vector "Energy-breakthrough" is really directed towards intellectual power which is naturally possible only with intellectual IT.

By the way, among 9 finalists in the field of IT, there was also our project: The self-organizing information Smart-MES "MES-T2 2020" System. Other 8 projects are connected with monitoring, with exercise machines and with diagnostics. Here I will notice that only our only project is most approached to realization of intellectuality in power, but he did not take a prize.

It would seem, the absolute nonsense is observed. "Energy-breakthrough" in search of intellectuality and a multiagent rejects this most perspective intellectuality and a multiagent, having equated them to "bolts and nuts". Why? And to it there is an explanation.

All experts in power industry can conditionally be divided into two groups. Production workers and technologists who are far from IT treat the first group. Experts of IT who are far from electrical power technology treat the second group. Here at once it should be noted that all experts of IT in Russia were learned on the western ideologies in IT since domestic simply is not present.

And here on court the Russian innovative IT system realized not on the western canons is presented to the commission. Naturally, in this case owing to the competence only IT specialists can have opinion. But this system is alien to them since they do not see in it habitual western terms and brands. In this case, undoubtedly the verdict can be only negative.

9. New understanding of Smart-MES system for power plants

In Russia more than 300 power plants which are distributed between the Generation companies function and are territorially scattered. All combined heat and power plants and state district power station different in technology and structure of the equipment. Power plants treat category of process production, i.e. every minute for power generation and heat a certain amount of fuel is burned. The general for all power plants is approach of technologists to their management, i.e. technologists conditionally work with technological cuts which are dictated by the plan of delivery of the electric power and heat in concrete periods of days and taking into account their feasibility.

These cuts differ on duration and on number of the parameters participating in management depending on structure of the working equipment. But it is possible to allocate the general principle of management. At power plant there are stable and transition processes. For the stable and slowly changing processes it is possible to accept cut duration in half an hour, and for transition processes - one minute.

The purpose of functioning of the Generation company and power plant is the profit. The size of profit is in direct dependence on quality of implementation of the plan of delivery of the electric power and heat, on expenses of fuel and fail-safety.

At management of power generation and heat it is necessary to achieve a zero excessive consumption of fuel in each current cut by optimization of loading of the equipment. In other words, for each developed quantity of the electric power and heat there are settlement standard costs of fuel, and its actual expenses should not exceed these

standards. For this purpose the system solves the following technological problems:

1) The automated data input from the existing means of collection of information.

On each of 300 power plants there are funds of data collection from sensors of pressure and temperature and from electric power counters: ASKUE, ASKUT, ASKUG (the automated systems of the commercial accounting of the electric power, heat, gas), the PCS, "Bee", "Delta" and others. All of them have different developers, various ideology and the databases. Intervals of poll of sensors - of several seconds. Therefore from all these databases it is necessary to collect necessary information in uniform base with restoration of missing signals in necessary intervals of time - minute or half an hour.

2) Manual input of daily allowance and monthly data.

Monthly data input is used for an institution of planned indicators for monthly tasks. Daily input is used for missing initial parameters of the automated input and for conditional and constant indicators. In this case daily values are transformed to half-hour and minute databases. And if necessary for bigger reliability they can be processed by regression dependences together with parameters in which there are sensors.

3) Calculation TEI (technical-economic indicators) of the equipment and power plant in general.

All technological tasks are made out in the form of text projects on simple engineering meta language of the technologist by means of tool means "The designer of projects" [3] where algorithms are formed by means of templates. The project includes two main descriptions of a task in a tabular look: the description of columns with station numbers of the same equipment (a copper, the turbine) and the description of lines with initial

and settlement indicators of this equipment in the following look: designation, unit of measure, name, algorithm of calculation.

After compilation of projects databases, screen forms, reports and settlement DLL programs are automatically created. As a result full calculation of TEI (calculation of the actual and standard TEI, holiday of heat, costs of own needs and losses of the electric power and heat) of any power plant is carried out less than 1 second.

4) Monitoring of the current excessive consumption of fuel and other indicators on BCP (block control panel).

Expenses of fuel make more than 50% in prime cost of the electric power and heat therefore minimization of these expenses is the main criterion function of production management of power plant. Only elimination of an excessive consumption of fuel uncontrollable now will give economy of more than 10% of its expenses.

The excessive consumption of fuel comes to light as a result of full calculation of TEI. Continuous monitoring of the current excessive consumption of fuel on BCP creates compulsory motivation of the operational personnel in economy of fuel. In the absence of monitoring any highly skilled personnel allows an excessive consumption of fuel on each technological cut since he knows nothing about this overexpenditure.

The excessive consumption of fuel in a month is summarized from all overexpenditures in each cut. The monthly and daily calculations of an excessive consumption of fuel existing now are methodologically incorrect because of curvilinearity of standard schedules. Ignoring of it conducts to concealment of a reserve of increase in energy efficiency of power plants.

5) Development of recommendations about optimum loading of the capital equipment.

There are some approaches of optimization: a simplex method of the decision of system of the linear equations, a method of dynamic optimization on full model of power plant with minimax strategy, the CRG (Characteristic of Relative Growth) of Optimization method. It should be noted that the decision of system of the linear equations is realized as a usual technological task on the text project.

6) Calculation of necessary expected amount of fuel.

For calculation of expected amount of fuel specific costs of fuel of power generation are usually used and is warm. But there is more exact method of calculation which uses information on technological cuts in the knowledge base at a zero excessive consumption of fuel. For this purpose it is enough to set the planned schedule of delivery of the electric power and heat, and also data on the working equipment.

7) The analysis and identification of false operations of signals and operator's mistakes at emergencies.

In this case with the minimum interval of the automated data input current state of discrete parameters is compared to the previous. At identification of change its correctness is analyzed. In case of an incorrectness the message is issued for BCP. Also analog parameters can be in addition involved. Algorithms of a correctness are described also in text projects to similarly technological tasks.

8) Representation of retro and current analytics of initial and settlement indicators.

For analytics the set of tools is presented: the review of indicators with control for other analytical tools, the operational magazine, expeditious monitoring, the express analysis with possibility of creation of hierarchical schemes without graphic editor. By an analytics call the magazine on the set indicator for all units of the concrete equipment is

automatically formed of a screen form and the schedule is output. The analytics can be looked through in a section of half an hour in days, in a section of days in a month, in a section of months in a year, and also in a section of watches in a month.

9) Transfer of necessary data on the top level.

On the Internet any information can be transferred, including also operational data on an overexpenditure to fuel and the main current indicators of power plant.

10) Formation of monthly reporting documents.

Reporting documents are formed as monthly tasks in the form of the text project. Monthly data turn out accumulation of daily data, and daily and replaceable - accumulation half-hour. Monthly data on watches are formed of data on changes on the basis of the schedule of watches.

11) Creation of electric and thermal graphic circuits with a conclusion of dynamic information.

The graphic vector editor allows to create hierarchical technological schemes with representation of power primitives, drawings and texts. It is possible to bring the current analog and discrete information to these schemes.

12) Current modification of algorithms of technological tasks.

All vitality of system is provided with ease of entering of any changes by technologists into structure of calculations and in algorithms of tasks. All changes are made by means of correction of text projects with the subsequent their compilation.

Scheme of functioning of Smart-MES system
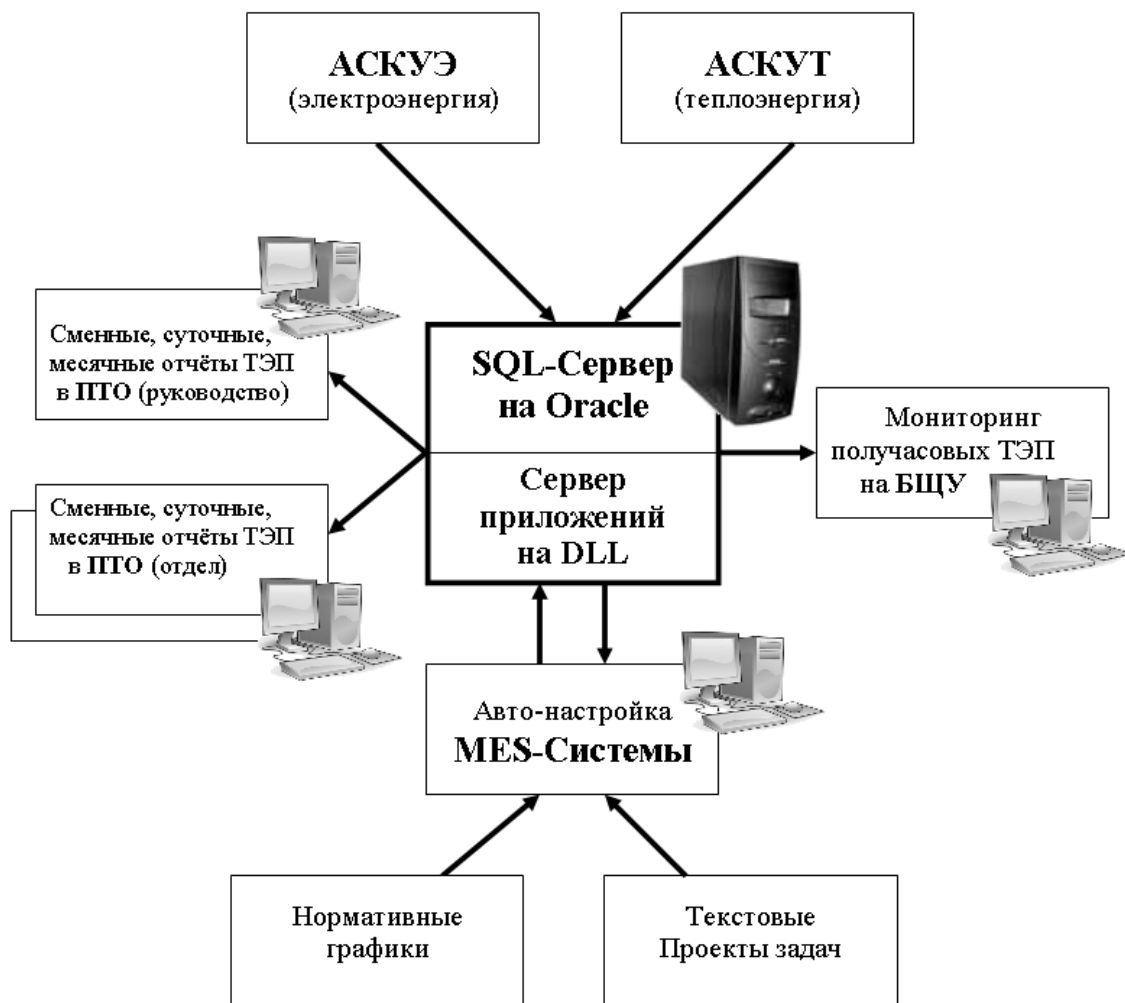
10. Rejection of the self-organizing Smart-MES system

To us it was declared that this lies about self-organization and any this system which is not self-organizing time is a task for a configuration, and intellectual systems do not happen in principle.

The strange thing turns out that terminology is much more important than the essence of this system which nobody surpassed in adaptation and high-speed characteristics. Our Smart-MES system is already developed and approved, and from what nickname will obtain, it will become better or worse not.

But there is a scientific world which thinks out concepts and problems, with them connected. Same concerns also the concepts "Self-organizing System" and "Intellectual System". To these concepts scientists attribute various criteria. In other words, if the system corresponds to these criteria, this system can quite approach under this concept. Then it is only necessary to prove it. Only trouble that different scientists appropriate to these concepts different criteria.

But when we developed innovative system, and scientists say that the self-organizing system can be created only in the far future why to us, comparing the theory of scientists to our engineering realization, not to be indignant and not to show to the whole world that she already is.

G. Haken [6] declares: "We call system self-organizing if it without specific influence from the outside finds new functional structure". In our system in addition to technologically empty EXE module there is a text where in engineering language technological tasks are formulated, and this text is simply a source of knowledge, i.e. nonspecific influence. That's it it also served as a subject of the most severe criticism. Thus, it is claimed that

time is the text in which parameters are specified, it is allegedly elementary specific influence, therefore, the system is far from self-organization.

Well, it is necessary to defend the engineering pride, time got into a scientific jungle. Here we will not speak in detail about the person who is trained by 20 years, but he is the self-organizing system. The critic noticed, apparently, superficial discrepancy. But it was actually fair about five years ago when this system was called "Plug-and-play", and it was just previous generation. Now it grew to self-organization when it independently makes transformation of multitask structure in single-task in general without external influences. In this case the self-adjustment is used only at a stage of task debugging. The result of self-organization functions as an application server of the general calculation on the DLL program.

I will try it to explain. All calculation of the actual and standard TEI with automatic data input and with an exit to standard specific fuel consumption makes some tens tasks of various means of the lower level. Such as: actual and standard calculations for coppers and for turbines, calculations for fuel, calculations of holiday of heat, calculations of balances, calculations of losses and costs of own needs of the electric power and heat, calculations of emissions, well, etc.

Each such task has a screen form in a tabular view where the column corresponds to object (a copper, the turbine, etc.) with the station number, and a line - to an indicator. To this screen form there corresponds other table with algorithms of calculation. Process of the solution of a task looks as follows. At start of a task basic data are read out in a form from information database, calculation is started and then the result registers back in the same information base.

But our researches showed, what even the consecutive automatic call of all tasks on performance is pretty long process. Therefore it was decided

to integrate all tasks into one, and for this purpose it was necessary to connect somehow all screen forms and calculation tables in one big screen form and in one huge calculation table. Here present that there are 40 tables of various dimension, on average on 10 columns and till 50 lines, and these are 40*10*50=20000 indicators.

At the maximum number of columns in 20 resulting table will be already dimension 20 on 2000. And that's it this organization allowed to reduce calculation time for some orders. So these 20000 indicators now pay off less than 1 second. It is not possible to execute these calculations in principle quicker. Why such speed is necessary? It is necessary for performance of tasks of optimization of resources by method of dynamic programming on full model of power plant when for a certain period it is necessary to count as much as possible options.

Thus, process of self-organization of system by automatic transformation of all tasks from the text projects issued in engineering language by means of templates includes the following stages:

1) Transformation of all tasks from engineering language on mnemonic language;

2) Transformation of all tasks in mnemonic language in one task;

3) Transformation of a total task from mnemonic language on Pascal;

4) Transformation of Pascal to a machine code with formation of DLL.

But let's return again to terminology "The self-organizing system" applicable to information systems in definition of modern scientists. Shortly I give these criteria:

1) The self-organizing system has to be autonomous and active;

2) The self-organizing system has to be the organization opened at all levels;

3) The self-organizing system has to function on the basis of own purpose;

4) The self-organizing system has to provide a correctness and high level of reliability;

5) The self-organizing system has to provide interaction at the semantic level;

6) The self-organizing system has to give more and more ample opportunities;

7) The self-organizing system has to arise and be formed without participation of programmers.

And so under each point it is possible to subscribe that Smart-MES have all this. Therefore it, certainly, is self-organizing. And why then critics and scientists do not blow a fanfare? Everything is very simple when already there is in the nature a self-organizing Smart-MES system, to their further infinite and pointless fabrications, naturally, the place is not present.

But why power plants need this self-organizing Smart-MES system in particular and power industry in general? Though actually it is suitable for any industry, especially with continuous nature of production, but I speak about power industry because I am closely connected more than 30 years with it and well I know it.

The matter in the past would sound so: why the bulb when there is a candle is necessary? For a candle it is necessary nothing, and for a bulb the power plant is necessary. But with a bulb progress is possible, and with a candle is not present. And with the self-organizing system further progress is possible, and with the existing software at power plants he is not possible in principle, like a candle.

Here it is necessary to stop especially on thermal power plants which are more mobile in respect of progress in comparison with the NPP and with hydroelectric power station. After all at all combined heat and power

plants and state district power station there is a big percent of the outdated and worn-out equipment to which modern PGU and other technologies in addition are established. Here also such mad hybrid old with turns out new which in total it is necessary to watch in real time, making constant calculations of the actual and standard TEI. But at one power plant it is not present.

But only continuous search of a reserve of increase of profitability of power plants will allow the Generation companies to increase the profit. And for this purpose already there is a self-organizing Smart-MES system which can easily reveal and provide these reserves.

It is considered to be that the scientific world prepares "soil" for future development of the industry. And if scientists of IT predict emergence of the self-organizing system as revolutionary break not only in IT for the industry, but also the industry which not especially shines with innovative development, probably, it has to deserve attention from the leadership of Russia.

But here, the Firm InformSystem developed the Intellectual Self-organizing Smart-MES System for a long time, but it not demanded lies on the shelf and becomes dusty. Or perhaps at all power plants for calculation of TEI other self-organizing systems are already involved? But except ours in the world similar systems simply are not present. Or perhaps at all power plants of IT do progress miracles? But then would not be at power plants of a huge excessive consumption of fuel. Or perhaps it is also not present, this most notorious overexpenditure? But, unfortunately, nobody knows it and does not wish to know since at one power plant there is no elementary operational accounting of an excessive consumption of fuel (the fact - the standard) which comprises big reserves of increase of profitability of thermal power plants. This uncontrollable excessive consumption of fuel in

a year across Russia is equivalent to 100 billion rubles which dullly jump out station pipes, poisoning the atmosphere with harmful emissions.

Just in Moscow in YIP RAHN passed the XII All-Russian meeting on problems of management [1] in which Works more than 1000 articles of scientists from all Russia are published, including also our Report: "The new concept of a self-adjustment of MES-T2 2020 MES System for management of any process production and power plants". There is a wish to notice that except us, none of great scientists did not offer the ready principles of creation of the self-organizing information systems.

However scientists declare that the self-organizing systems existing now in the nature (not in IT) have the physical nature in which self-organization is carried out at the expense of unformalized, until the end of not understood physical processes. And here Aristotle's philosophy as the concept of "self-organization" implies action of internal, i.e. Aristotelean, driving forces comes out on top: causa formalis (formal reason) and causa finalis (target reason). Proceeding from it, for scientists and interesting the problem of use of this device in the field of informatics, namely, for creation of the self-organizing information systems [12] is represented important.

Of course, ridiculously to watch these tortures of scientists and it is offensive for Russia in general. Ridiculously because such information system is already created by us (Registration in Rospatent No. 2014618991 of 04.09.2014 of the program: The self-organizing information Smart-MES "MES-T2 2020" System). And it is offensive because this greatest achievement of engineering thought to be stuck in different structures of power industry and governmental bodies for a long time, but everything is useless. Probably, has to pass some time for judgment of the come true revolution in IT.

And now about the Aristotelean principles of self-organization which are realized in our Smart-MES system.

Self-organization is the main process of evolution of difficult systems consisting of irreversible consecutive processes of streamlining. Evolution of self-organization of systems of a teleologichn in the sense that in itself conducts to more perfect structure and dynamics of information. One of founders of synergetrics G. Haken [6] defines this concept as follows: "We call system self-organizing if it without specific influence from the outside finds new functional structure".

Whether the new functional structure at self-organization of Smart-MES system without specific influence is so created from the outside? Here as specific influence it is understood such which imposes to system structure.

It is simpler to analyse it on our real system in which in a starting position there is no database, there are no reference books, there is no menu of tasks, there are no screen forms, there are no reports, there are no the realized algorithms of production calculations, i.e. it is absolutely technologically empty EXE program and in general without structure. In addition to it there is a text where in engineering language the technological task is formulated, and this text is simply a source of knowledge, i.e. nonspecific influence. Further the EXE program itself to be trained to this knowledge of this text and the working system with all necessary attributes and with all system structure is created.

Then the trained system starts living, carrying out technological calculations and analyzing the current production context. At change of a context she makes changes to the installations or further is improved, by absorption of new knowledge.

Thus, the Aristotelean driving force of causa formalis (the formal reason) of self-organization consists in transformation of chaos, i.e. lack of harmony, in harmonous efficient system. Other driving force of causa finalis (the target reason) of self-organization is focused on realization of the easiest adaptive opportunities and on high-speed royal characteristics.

Now let's fluently look at the actual reaction of the official government institutions which are responsible for development of IT and the industry to emergence of the unique self-organizing system.

In the letter No. 14-PG-MON-5087 of 19.03.2014 from Department of science and technologies of the Ministry of Education and Science of the Russian Federation it is told: "You can address to Fund of development of the Center of development and commercialization of new technologies - Skolkovo Foundation".

In the letter No. P11-5898-OG of 24.03.2014 from Development department of branch of IT of the Ministry of Telecom and Mass Communications of the Russian Federation it is told: "We recommend to you to send detailed information on your project to venture funds".

In the letter No. OG-D19-2075 of 25.03.2014 from Department of innovative development of the Ministry of Economic Development of the Russian Federation it is told: "We recommend to address to the organization the coordinator of a technological platform".

In the letter No. PG-12-1972 of 22.05.2014 from Strategic development department of Minpromtorg of the Russian Federation it is told: "We recommend to you to participate in competitive procedures of purchase".

So that scientists strenuously puzzle over creation of similar system if it is necessary to nobody? It is clear that scientists see further production workers and officials. They perfectly understand that creation of artificial

intelligence not possibly without self-organization. After all what would not be power of computer facilities without the self-organizing information system not to manage since in this case different researches and experiments have to be conducted without programmers.

Our self-organizing Smart-MES system is capable to absorb an infinite number of algorithmic knowledge without programming. And according to the law of dialectic materialism change of quantity will surely result in new quality, and it already and there is a new creativity which progress in all industry will follow.

But why the power industry ignores this the most powerful self-organizing tools which were created especially for them and with direct participation of technologists from power plants?

Simply Generation companies already got used that money to them flows in pockets. I remember that at once after reorganization one manager accurately declared that now no optimization is necessary to them at all. It is much simpler to them to buy cheaper fuel and more expensively to sell the electric power, thus to have a decent margin.

However, already other time when fuel price only grows, and prices of electricity restrain the state. In this case actually no-cost technology of economy of fuel on Smart-MES would be by the way. Especially as it to technologists of combined heat and power plant and state district power station without developers and the more so without programmers allows to reveal quickly the hidden reserves of profitability of power plant by automation of all repartitions of logistics.

But if the network companies strenuously introduce recently various Smart-Grid and Multi-Agent technologies, power plants not to be a weak link, should not lag behind. Also the multipurpose self-organizing Smart-MES system which introduction in the ideological plan will allow the

Generation companies to leave for a long time behind itself the network companies is for this purpose already developed and approved.

In this case progressive true harmony in all power industry of Russia will also be reached.

In the developed international situation vulnerability of the strategic information systems installed at the domestic enterprises is very high. There is an opinion that use of the "bugs" capable to paralyze the software at power plants does Russia by the hostage in hands of the western states. After all if all listens to the USA, there is no guarantee that all western software is not larded by "bugs".

What is "bug" and than it differs from a virus. Everything is simple. The virus is written at the ordinary hacker level, and "bugs" are established in software at the state level by intelligence services. If it is possible to get rid of a virus, of "bug" not perhaps. If the virus is visually shown, "bug" never.

Now, when at Russia there are 70% of the western software, it can be a collapse prolog in the all-Russian scale. For example, Russia can be brought down pressing one button, having given command on the Internet to all "bugs" to action since by means of same "bugs" all cherished secrets about each power plant are in archives of the West for a long time. The software under the influence of "bugs" will be paralyzed, introducing chaos and an emergency at the same time on all power plants. And all power plants at once will stop, and behind them and all industry.

It is possible to trust or not to trust, it is possible to calm itself thought, what after all still anything similar is not present. Everything is correct since there did not come time of "X" yet. But for some reason the government first of all transfers to domestic software of civil service, without caring of the Generation companies.

11. Principles of Smart-MES system as global project

The principles of the self-organizing Smart-MES system developed by us for power plants with success can be used for the global project suitable for any industry.

Project purpose

Creation of the self-organizing information system for all industry which would allow to realize and change instantly any most difficult algorithms of calculations in engineering language without programming, completely organizing from scratch all elements of big system: databases, screen forms, reports, DLL programs for calculation, analytics and optimization.

Relevance of a problem

Self-organization of system does not demand traditional programming at creation of programs for any difficult calculations and for mathematical modeling. Writing and correction of algorithms in simple engineering language will allow technologists to make experiments on mathematical model without participation of programmers. It in turn will strongly reduce time from a plan before realization, and also will reduce costs of development of various software and its correction.

Assessment of importance of the tasks solved in the project

Fast realization of any calculations and creation of any mathematical models without programming allows to accelerate realization of production technologies. The similar self-organizing system is not present in Russia, abroad. Scientists just predict in the far future emergence of the self-organizing systems as the major scientific achievement in IT. We already

developed this system and creations of the self-organizing systems of the industry of Russia are ready to transfer all technology.

Novelty of ideas and technical solutions

1) The description of a set of technological tasks on simple META language;

2) Automatic control of system from the text description of the Project;

3) Automatic creation of high-speed settlement DLL programs;

4) Built-in realization of optimizing tasks;

5) Automatic Client-Server SQL applications control;

6) Automatic Web applications control.

Realization of System is possible in 2 modifications: Client-Server with 3-unit structure without SQL Server and Client-Server with 3-unit structure with the SQL Server.

The description of the principles which are the cornerstone of the project

Structurally the system includes four components: Designer ARM, SQL application, Graphic editor, Web application. The basic is the Designer ARM. SQL applications and WEB work on settings of this Designer ARM. The system has no means of data collection directly from sensors, and carries out their import from the existing automated means of the lower level.

The designer ARM carries out full adaptation of system to specific conditions and can be exploited in the multiuser configuration of Client-Server without SQL Server. The similar configuration without SQL Server cannot be in one other System, since this our know-how. Advantages of such configuration of Client-Server are: lack of the SQL Server, 10 times more calculation speed, huge number of analytics and other opportunities.

In system all aspects are executed on technology of a radical innovation. The special role in innovative system is played by two moments: self-organization of all complex and DLL program for calculation.

Self-organization of a complex does opportunity deployment of the big automated system from pressing of one button. Thus text Projects of technological tasks will be transformed to necessary components of a complex. All tuning of a complex is performed for some seconds automatically.

Unique DLL programs are automatically created in machine codes at compilation of text Projects. It reaches the highest speed of calculations.

It is possible to speak much and about intellectual opportunities of system with use of technological cuts, and about CRG (characteristic of relative growth) of optimization, and about the built-in simplex method of the solution of problems of linear programming, and about the solution of optimizing tasks by method of dynamic programming with minimax strategy, and about innovative algorithms of the prevention of emergencies.

But I will stop only on two important moments, i.e. the system is completely our own development which analogs are not present even abroad, and improbable ease of modification of technological tasks by technologists.

In the course of long system development we carried out draft adaptation of a complex at two tens combined heat and power plants, state district power station and the NPP for calculation of TEI.

The existing obstacles in a problem solution

This system is developed long ago by us for power industry. But after reorganization all power industry "sat down" on the western IT having the untwisted brands. Therefore the most powerful development of small

firm arouses mistrust. To break through on the market in the Generation companies and at power plant without corruption communications and without support by the Country leaders simply became possible not.

Scientific and technical reserve

Use of self-organization is a necessary condition of maintenance of competitiveness of system and creation of new competitive advantages. Self-organization of our system is the unusual phenomenon and very rare fact, i.e. it that it is difficult to comprehend.

Extremum of the purpose of self-organization of Smart-MES system are: minimization of actions of the technologist at adaptation of system to specific conditions and maximizing speed of calculation of technological algorithms.

Minimization of actions of the technologist is provided with the built-in tool means "The designer of projects" of technological tasks in text form. Each task in engineering language is formulated in a tabular look with which the person interacts.

Maximizing speed of calculation is provided with four multiple transformation of a problem definition to an executive machine code.

And the most important, self-organization does not enter new mistakes into the new created system since it operates only with new meta information, and the main ridge skeleton of system remains invariable. Absolute reliability of production program system is guaranteed to these.

The expected scientific and technical result of the project

In what uniqueness of technology of creation of the self-organizing systems? Everything is very simple. She was born not as a result of thoughtful scientific researches of academicians, and in the course of long-term creative activity of simple Russian engineers. And we, eventually,

achieved absolute self-organization of system with the adaptation and high-speed characteristics, best in the world. The structure of such system is unlike one western technology.

In this case the text in engineering language is compiled, and as a result of multistage processing all templates and DLL for calculation are created. In other words, absolutely empty EXE pig in the technological plan prepares the text, it processes and then with the received material functions.

This process of self-organization completely coincides with training of the person, but with three huge distinctions. First, the person is trained 20 years, and system some seconds. Secondly, the trained person for himself does not prepare texts since is not able, and the system, on the contrary, easily does it. And in the third, the person, having trained once, it is not capable to be retrained completely any more, and the system easily and is instantly capable to nullify all knowledge and to load new, but besides, it is capable to operate with a set of various knowledge at the same time.

Possibilities of this self-organizing system are simply huge which are defined by the following 4 main components: Main Module, SQL Module, Graphic Module and WEB Module.

The main Module has the Designer of Projects tools for fast preparation of texts with algorithms of calculations in engineering language. These tools process all prepared texts, optimizing the resulting machine code. The same Main Module carries out all generated calculations with granting the developed analytics. Besides it provides functioning of the multiuser system on 3-unit structure (the server of databases, an application server, the fat client) without the DB SQL Server.

Why the self-organizing system is necessary in principle? The matter is that scientists, analyzing stages of development of program systems, predicted emergence of self-organizing systems as the benefit for the whole world in the future. But irrespective of them we already created such system. Therefore self-organization is command of a century. And we were lucky to be the first. It turned out because we refused at once all western dogmas of creation of the big systems based on their SQL databases.

The idea was put following here manually not to create any component of system which treat: the menu of tasks, screen forms, reports, calculations in machine codes, reference books, databases and analytics. Special engineering language of a tabular form was for this purpose developed. The knowledge of this language is not required at all since it is formed automatically of templates in the Designer of Projects. Thus, there is a multistage transformation of statement of a technological task to a real machine code.

Though this system was also developed for calculation of TEI TD (Technological Department) of power plants, but actually as a result it turned out that on it it is possible to realize in general any calculations for economy, for defense industry, for oil and gas and chemical industry, and even to build experiments on creation of artificial intelligence. And if it is short, our principle of self-organization is suitable in general for any program systems.
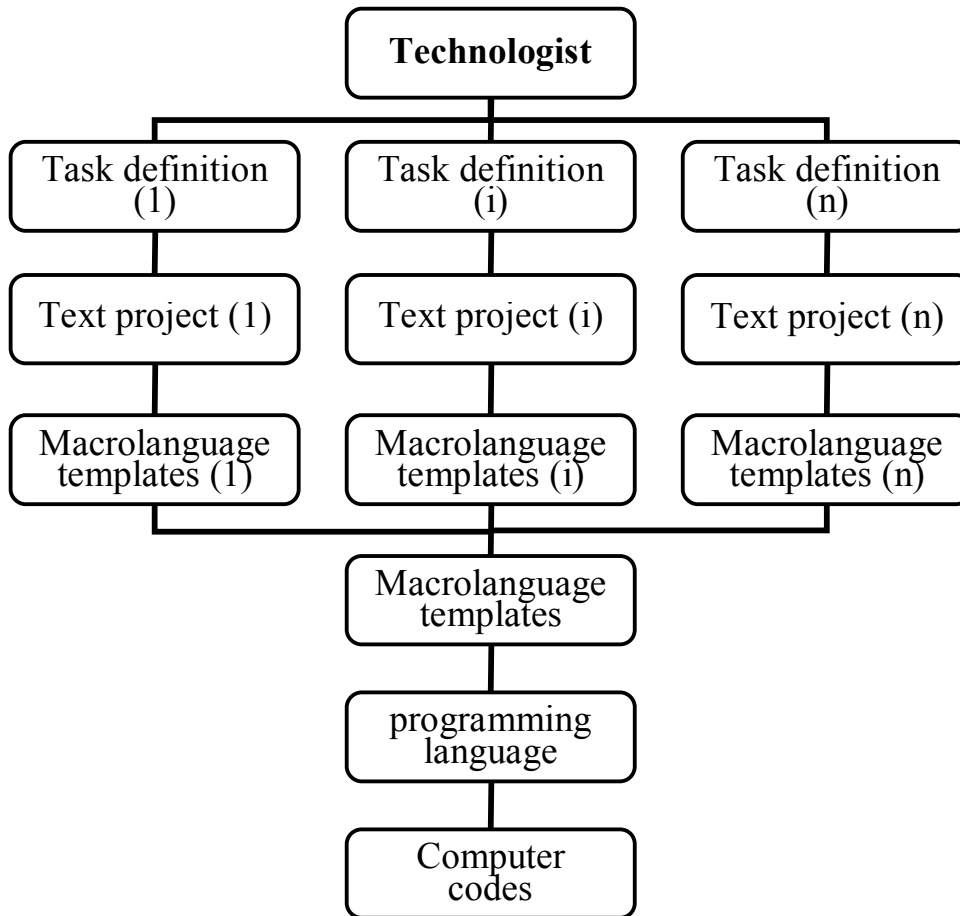
This principle of self-organization allowed us to improve as much as possible adaptation and high-speed characteristics of system which in the future will provide significant progress in IT.

Now it is safely possible to declare that it is not possible to create other system with easier adaptation functionality, as well as it is not possible to create more high-speed system.

Justification of a choice of technical solutions

Self-organization of big system allows to realize a huge circle of plans in general without traditional programming.

In this case 5-fold transformation of a problem definition to a machine code by the following scheme is used:

```
                        ┌──────────────────┐
                        │   Technologist   │
                        └──────────────────┘
         ┌─────────────────────┼─────────────────────┐
┌──────────────────┐ ┌──────────────────┐ ┌──────────────────┐
│  Task definition │ │  Task definition │ │  Task definition │
│       (1)        │ │       (i)        │ │       (n)        │
└──────────────────┘ └──────────────────┘ └──────────────────┘
┌──────────────────┐ ┌──────────────────┐ ┌──────────────────┐
│ Text project (1) │ │ Text project (i) │ │ Text project (n) │
└──────────────────┘ └──────────────────┘ └──────────────────┘
┌──────────────────┐ ┌──────────────────┐ ┌──────────────────┐
│  Macrolanguage   │ │  Macrolanguage   │ │  Macrolanguage   │
│  templates (1)   │ │  templates (i)   │ │  templates (n)   │
└──────────────────┘ └──────────────────┘ └──────────────────┘
         └─────────────────────┼─────────────────────┘
                        ┌──────────────────┐
                        │  Macrolanguage   │
                        │    templates     │
                        └──────────────────┘
                        ┌──────────────────┐
                        │   programming    │
                        │    language      │
                        └──────────────────┘
                        ┌──────────────────┐
                        │    Computer      │
                        │     codes        │
                        └──────────────────┘
```

1) The problem definition will be transformed to the tabular text Project.

2) Engineering language of the Project will be transformed to interpretative macrolanguage language with simultaneous creation of databases and templates of screen forms and reports.

3) All tasks on macrolanguage will be transformed to one general task.

4) The general task on macrolanguage will be transformed to a programming language, for example, by Pascal.

5) The programming language will be transformed to a machine code DLL.

The expected results

The self-organizing system possesses the easiest properties of adaptation to various conditions and has the highest speed of performance of calculations.

So 20000 (40 tasks) the most difficult calculations of the actual and standard technical and economic indicators of PTO of average power plant with use of 300 graphic power characteristics of the equipment are realized less than in 1 second. Entering of any changes into algorithms of calculation happens in 5 seconds.

12. Difficulty of creation and ease of use of Smart-MES

By and large, whether without difference difficultly or whether it is easy for Generation company to create system for automation of calculations of TEI since she all the same will not finance its full development because in the market enough organizations proposing ready solutions. And as for this Smart-MES system, whether that it is possible to create the similar? It is possible! But whether it will be better than this? Never! Why? It is not possible to repeat all our innovations simply!

At system the main technical characteristics it is functionality, an adaptability and speed of calculation. Naturally, it is possible to object, what supposedly why huge speed? On the server so there are powerful processors so programs work quickly enough. Here everything depends on the tasks set for system. If confused automation of calculations of TEI is simply necessary, any system really will approach. After all and MS Excel copes with it. If the Generation company prefers to have additional profit then our Smart-MES is necessary from introduction of system. And speed is necessary for realization of optimizing and intellectual tasks with use of full economic-mathematical model of power plant and for automation of calculation of the actual and standard TEI in real time, and also for the prevention of emergencies.

There is a bewilderment that, and in this case emergencies. All the matter is that on our Smart-MES any analysis algorithms of a correct mutual condition of discrete and analog parameters according to technological process that is necessary for the prevention of emergencies are very easily realized as any calculations of TEI for any power plant in unlimited number, and. But after all and the big uncontrollable excessive consumption of fuel in real time can also be an emergency harbinger. In

addition and wear of pipelines has to be coordinated with the working pressure of water and couple.

Now in each Generation company the steady design was created, i.e. there is an IT manager, and there is the pocket IT firm. This IT firm successfully introduces ASKUE, the PCS, ERP. Here it is also asked, why they need still some Smart-MES which the IT manager and IT firm is not wished to be seen in an emphasis. After all only present a dreadful situation that introduction of Smart-MES in a year at once will begin to bring to the Generation company huge additional economic effect, and these IT firms constantly "milk" some years the Generation company, and I pound is not here. The IT manager cannot recognize it in any way.

The matter is that IT policy in the Generation company the IT manager since he should understand information technologies directs. But to it that is more convenient to work with the pocket IT firm because of worthy economic feedback. And not to allow to a feeding trough of other IT developers to the course there are various lethal receptions, type: they have a system not of that platform, they have an outdated database, and, in end, for them does not work anywhere. After these recommendations no director of the Generation company and will want to hear about this IT developer any more.

But in this case the major subject is simply consciously substituted. After all the Generation company exists for generation of profit from delivery of the electric power and heat, but not for implementation of the academic IT projects. Therefore, everything that is capable to increase profit without big expenses, it is necessary to introduce urgently. But it easily is solved with "iron" since all management of the Generation companies is closer to technologists, and they are absolutely far from information technologies. Especially, very seldom happens that the computer program on production can make profit.

And so, we, taking into account my extensive experience in power industry and taking into account practical draft introduction of Smart-MES on a number of combined heat and power plant, state district power station and the NPP, noticed two negative features, characteristic for all thermal power plants of Russia. After all these two awful features represent our domestic power plants in the world market in scary unattractive light before foreign investors. Well, tell on favor, what stupid has to be an investor to put blood in antediluvian power plants where even there is no elementary accounting of an excessive consumption of fuel and where at all the emergency is not diagnosed.

The first negative feature consists in total absence of the operational accounting of an excessive consumption of fuel which corresponds to a difference between the actual expense and a standard cost of fuel for concrete periods which should not be more than half an hour. In this case an excessive consumption of fuel on each interval, especially at night at the lowered loading, it will be obligatory for many reasons. The complex analysis of all these reasons with the subsequent their minimization will surely lead to elimination of this overexpenditure through compulsory motivation of the operational personnel on economy of fuel.

The second negative feature concerns absence of the prevention of an emergency which can arise at any moment of or because of wear of the equipment, or because of spontaneous operation of automatic equipment, or because of a mistake of the person. In this case it is not necessary to confuse to antiemergency automatic equipment which does not allow accident. If automatic equipment worked, it says that the emergency already existed a long time which led to an equipment stop with violation of a production cycle. In case of timely detection of an emergency it is possible to eliminate easily its reason without violation of this production cycle, and, therefore, and without loss of profit.

But after all by means of our Smart-MES system these two negative features can easily be corrected with receiving average additional annual profit in 300 million rubles from each power plant. But the Ministry of Energy of the Russian Federation instead of assistance in an explanation to the Generation companies of importance of elimination of these century defects concerning a huge excessive consumption of fuel and continuous accidents simply frankly ignores their existence, thereby, doing huge harm to policy of the Russian President on increase in inflow of investments into Russia.

Long ago passed those times when for us the fact of draft introduction therefore earlier we with ease agreed to realization of calculations of TEI for low price was the major and even participated in foolish competitions. In the present time we categorically do not participate in these archaic competitions since to us did not stick any more to behold as the hi-tech product is stupidly equated by the commission from bureaucrats to bolts and nuts.

In this case all our reasonings concerning prospects of introduction of our most urgent software product the very simple. If the Generation companies need additional profit and if they wish that their power plants functioned without accidents then they will face our Smart-MES. And otherwise, that for the sake of vain to throw beads.

Therefore our today's policy is directed on intensive promoting in analytical press releases of various parties of our innovative Smart-MES system and on opening of vicious backward practice of functioning of today's power industry.

Here it is pertinently courageous to declare that we have great difficulties with search of the real Customer. And what Smart-MES "died"? By no means! The matter is that the most important feature of Firm of

Information Systems consists in its floodability. And Smart-MES is constantly modernized, comprehended according to new realities and patiently waits for the hour of triumph. And at once at the first introduction the latest Smart-MES version will be realized already: "MES-T2 2020". For now the cost of its introduction constantly only grows. It will pass for 10 million rubles soon.

But all the same this sum is so ridiculous in comparison with the guaranteed average profit in 300 million rubles. Here you can declare with a grin that it only silly imaginations of my incompetence. It quite agrees that I am not a technologist and was not at the helm power plants. But I successfully in the past introduced the automated systems on 7 nuclear power units, and we completely developed perspective Smart-MES which analogs are not present even abroad. We tested the previous versions of this system at ten combined heat and power plants, state district power station and the NPP. So I am down on to all calculations of the actual and standard TEI.

Now I appeal to your reason, and let's analyse a situation in power plants, using the principle of "A black box", i.e. there are entrances: fuel and water, is also exits: electric power and heat. The essence of technological process in it "A black box" is not important at all. The approved standards for concrete power plant show that development of a certain quantity of the electric power and heat in each interval of time requires quite concrete amount of fuel. But actually that of this fuel turns out more. Why? If it not the mistake in standards, means it flaws of technological process.

Now we will look that is created with this excessive consumption of fuel (the Fact - the Standard) within a day. It appears that in the afternoon this overexpenditure is close to zero. It follows from this that standards absolutely correct. But if at night the excessive consumption of fuel reaches

30% of its actual expense, therefore, not everything is fine with management at power plant. So and in this case my incompetence in technology. But these half-hour calculations are not present at one power plant, especially there are no constant calculations, and they are necessary in transitional working hours of power plant. Here it is necessary to consider a lag effect of power coppers since at decrease in need for the electric power reduction of supply of fuel should be made with some settlement advancing.

Now we will go further. Here the Smart-MES system works and Monitoring on BCP provides operational analytics on the current excessive consumption of fuel. In need of system additional tools for optimum loading of the equipment are started. Here already there is an opportunity to fix technological cuts with a zero Excessive consumption of fuel. And on the basis of these cuts it is already easily possible to predict also need for fuel.

Here to you and complex solution of the problem of economy of fuel!!!

Now, when the income from sale of the electric power and heat is actually stopped because of regulation of tariffs by the State, for increase in profit it is necessary to cut expenses, and more on fuel. But in all Generation companies there is a huge uncontrollable excessive consumption of fuel which on average on each combined heat and power plant and state district power station is equivalent 300 million rubles a year as it was already told above. Thus there is an unjustified excess of harmful emissions in the atmosphere at night more than for 30%. Economic annual losses from ignoring by management of introduction of no-cost perspective energy saving technology on Smart-MES system for each Generation company make 5 - 20 billion rubles. And in general across Russia it already pours out in more than 100 billion rubles.

For the Management and for Investors of the Generation companies I give an intelligible explanation of an uncontrollable source of their multi-billion losses. Development of a certain quantity of the electric power and heat every minute requires strictly certain amount of fuel which easily is defined by calculations of standard values in real time. All fuel which is spent over calculated values, is an overexpenditure. Type excuses that is technological overburning, are from crafty since simply at power plants elementary there is no Smart-MES for an operating control over this overexpenditure. That's it for this reason since completely there is no current settlement information, in general anything not possibly to prove.

Here it is necessary to distinguish strictly work of power plant during the day period with the maximum loading and work of power plant during the night period with half loading. Between these periods there are slow transition processes for decrease in delivery of the electric power and for increase, too most happens and to fuel. But thus surely it is necessary to consider a huge thermal lag effect of multiton power coppers, and also penalties for short delivery of the electric power according to the established daily schedule. By us it is investigated that during the day period the excessive consumption of fuel completely is absent, and in the night reads off scale for 30%. Therefore, all losses of profit happen exactly at night.

But there is more to come. At night, when people peacefully sleep, all power plants is useless for itself plentifully irrigate surrounding clean air with harmful emissions that for people is simply deadly factor. It turns out that the Generation companies because of a huge uncontrollable excessive consumption of fuel not only lose multi-billion profit, but also harmful influence all population of Russia.

And now too most on fingers. The excessive consumption of fuel in every minute is equal to a difference of the actual and standard cost of fuel

in this minute: $dBi=Bfi-Bni$. But in the afternoon it looks so: $Bfi-Bni=0$, and at night through day fuel consumption so: $0.8Bfi-0.5Bni=0.3Bfi$. It means that when at night the need for the electric power decreases twice, the actual fuel consumption is cut for only 20%. Therefore, 30% of the actual day fuel consumption are useless the multi-billion profit departs to pipes, and together with it also. And has to be at night, as well as in the afternoon, i.e. so: $0.5Bfi-0.5Bni=0$. But, tell how it is possible to hit the mark, without seeing the purpose?

I give an unpretentious example with a pan. Let's assume, there is a task to gather a full pan of water with the minimum modulation, and you easily do it since see edges of a pan. But here the second task will be more difficult. It is necessary to gather strictly a half of a pan, and for an incomplete filling - death. In this case all on pain of this death more than a half since where this half not to see because mark that is not present will always pour water in a pan obviously.

Same most occurs on all thermal power plants where risks the Smart-MES system has to carry out a role of this, and her that anywhere and is not present. After all when the operational personnel on BCP constantly sees the current constant fuel consumption in comparison with calculated standard values, it involuntarily has a compulsory motivation to think over and ask a question: why right now the actual expense is more than standard.

In this case all focus here that all deviations from standards can be observed in real time, and, therefore, appears opportunity quickly and in due time to interfere with technological process for minimization of the current losses, well and for rescue of multi-billion profit.

It is for some reason clear to all that when the person has a road accident, he urgently should be carried to hospital on operation since

otherwise the lethal outcome is possible. But now on all thermal power plants go on the way of this lethal outcome of rather huge excessive consumption of fuel since with the existing monthly calculations of TEI do not hurry to adjust normal and healthy production. But thus all costs of funeral services for a funeral of multi-billion profit enter tariffs and are for some reason shifted to all consumers of the electric power and heat.

All in power industry with a clever look argue on specific costs of fuel of the released electric power and heat which in monthly miscalculations turn out distorted and bring nobody any benefit. And nobody wishes even to hear about a huge excessive consumption of fuel. In the Ministry of Energy of the Russian Federation frankly say that this business of the Generation companies.

How so? Our native Generation companies supplying us with the electric power and heat because of miscalculations in techniques at early boundaries of socialism the Ministry of Energy of the Russian Federation, now sustain multi-billion losses, and the State declares that creep out from them the created denseness and completely denies the methodical assistance in market conditions.

It is good still that our Firm in due time revealed all these flaws and now blows to all Russia: Where you rush, Russia? Stop is useless to throw out many and many billions in pipes!

The firm InformSystem opened the basic innovative principles of creation of Smart-MES and compared them with outdated which it is engaged now move ahead in the Generation companies for realization of mathematical model of calculation of TEI of power plants.

For creation of mathematical model of power plant two principles of creation of structure of calculations are possible: linear principle (database) and rectangular principle (table). Linear - all calculations are attached to

database indicators. Rectangular - calculations are presented on-tasks in the table form, as in MS Excel. Linear - for a long time outdated, and tabular - the most progressive since the person thinks of settlement categories only on-tasks in the form of the table, i.e. a column (object: copper, turbine) and line (indicator).

It is unnatural to think of linear settlement category without binding to a specific objective for the person in general. And, therefore, creation of mathematical model of power plant with several thousand indicators on the linear principle is marasmus. After all the person should work with this model, to serve it, to make changes to algorithms of calculation and to carry out their debugging on figures.

Realization of tabular on-tasks approach to calculations with a uniform database in big information system is much more difficult. Here innovative approaches which are successfully used in Smart-MES system are necessary.

Those Generation companies which on ignorance choose linear realization of mathematical model, doom themselves to technological difficulties in advance. However, at big financing they, perhaps, are also surmountable, but as innovations here definitely does not smell.

13. Theory of accidents of the NPP as reflection of the theory of accidents

The firm InformSystem proves justice, offered by it, theories of accidents of the NPP, using the principle of analogy to the available and recognized theory of accidents [15]. But the theory of technogenic and natural disasters does not give opportunity of management of development of these accidents, she only explains them and gives the chance of forecasting. And our theory of accidents of the NPP opposite gives the chance on timely prevention of development of an emergency.

The science defines concept analogy as similarity in properties or signs. The conclusion by analogy is a conclusion as a result of which the knowledge used for a formulation of a scientific hypothesis is reached. But the knowledge gained by analogy (even unconditional or strict) always is only probable. Their reliability has to be confirmed by practice.

Accident is the damage of the car, machine, the equipment, the building, a construction which is followed by violation of production and connected with danger to human lives. Accident is a major accident with the big human victims, i.e. an event with very tragic consequences. Distinction between accident and accident consists in weight of consequences and presence of the human victims.

Any accident or accident cannot happen for any one reason. All accidents are a result of action of several reasons and set of adverse factors. The most frequent option, it when the mistakes made at design interact with the mistakes made at installation and are aggravated with misuse.

The terms "accident" and "theory of accidents" were entered by Rene Tom and Christopher Ziman in the early seventies. Accident in this context

means sharp high-quality change of object at smooth quantitative change of parameters on which it depends. The important advantage of the Theory of accidents is that it does not demand detailed mathematical models and can describe situations not "quantitatively", and is "qualitative".

The theory of accidents is applied to heart beat researches, in geometrical and physical optics, embryology, linguistics, psychology, economy, hydrodynamics, geology and the theory of elementary particles, to modeling of activity of a brain and mental disorders, revolts of prisoners in prisons, to behavior of exchange players, influence of alcohol on drivers of vehicles.

And here the theory of accidents for practical use is not suitable for the NPP. For this purpose also the newest theory of accidents as reflection of the theory of accidents is offered. The concept "incorrect indignation" which unites any technological changes which break the normal course of production on the NPP is entered into theories of accidents: wear of the equipment, failure of automatic equipment, operator's mistake, i.e. quite discrete changes. In this case, wear of the equipment, including and corrosion of pipelines, have to be considered in total with the current loading.

Thus, the theory of accidents accurately formulates development of any accident as slow building of various quantitative factors and high-quality instant transition to other state. In other words, the gradual increase in potential energy conducts in a certain point to spasmodic transition it in kinetic energy.

Using a method of analogy to the theory of accidents and that accident and accident is related concepts, we will formulate the theory of accidents of the NPP: The emergency by means of gradual strengthening of

incorrect indignations at a set of their certain critical weight instantly turns into destructive accident.

Therefore development of any accident on any production and, especially, on the NPP surely has two phases:

1) Emergence of an emergency which begins with the first incorrect indignation and gradually acquires new these incorrect indignations before creation of a certain critical weight by them. This period can take some time up to several years. The size of critical weight cannot simply be foreknown.

2) The created critical mass of incorrect indignations instantly leads to destructive accident, and on the NPP in addition with radioactive emissions and to irreparable moral and physical consequences for all society.

But the most terrible and awful here that on the NPP constantly not one always develops, and some emergencies, forming itself certain branches, being in different stages of development. These branches can be crossed, then the number of incorrect indignations gathered in them is summarized, in TEI thereby, coming nearer to critical weight or at once it creating.

The set of branches of emergencies exists the proof that on the NPP always, wear of all equipment is. Nobody will deny that wear, as well as corrosion, have over the years an adverse effect on normal functioning of the NPP, so, these factors are, according to the theory of accidents - incorrect indignations. But wear and corrosion is always, and in total with loadings they represent, in fact, rudiments of various branches of emergencies.

On the NPP for prevention of transition of an emergency to destructive accident there is a multiecheloned protection. It works when approaching accumulation of number of incorrect indignations to critical weight, i.e. is close by the time of emergence of destructive accident. On the one hand, it is very good that safety of the NPP is ensured by reliable protection. But on the other hand, the calm hope only for this protection is called as extreme carelessness since according to the theory of probability even the most reliable mechanisms sometimes bring.

Therefore, the theory of accidents gives the chance in general development of an emergency not to bring excessively, i.e. to protection operation. Here idea very simple. If the appeared incorrect indignations quickly to reveal and eliminate, approach of critical mass of these incorrect indignations will not be at all, and, therefore, and protection will never work. Thus, the NPP will become - accident-free.

We developed axioms of the latest theory of accidents on nuclear power plants on the basis of which the accident-free technology of operation of power units and which from other positions ensures absolute safety of the NPP is formulated.

"Rosenergoatom" approves the following: "The system of the account, classification and the analysis of events of low level (harbingers of emergencies) allowing to reveal beforehand outlined negative tendencies in safety and to take the necessary correcting measures operates on all NPPs".

Here at once there are questions: And where the analysis of wear of the equipment and aging of pipelines in total with loadings, and where the analysis of errors of action of the operator, and where the analysis on false and spontaneous operation of automatic equipment? And all this in the general interrelation with all processes on the power unit. On one NPP it simply is not present. And when, after the next emergency stop of the

power unit, write that the emergency prime cause becomes clear, it speaks about ignorance of bases of the theory of accidents. No prime cause of accident in the nature exists, and there is a set of the incorrect indignations which reached emergency critical weight.

For example: the pipeline is broken off. What in this case prime cause: or an elevated pressure in a pipe, or large volume of a rust? It appears neither that and nor another, but only set of these factors. Or at the fire usually say that the reason in conducting short circuit. It categorically is not right, since actually the reason in a complex of factors: easily combustible environment, the raised current, failure of the current machine gun and existence of a source of fire because of conducting isolation breakdown.

Thus, the knowledge of the theory of accidents will allow not to allow not simply and close destructive accident, and to create in general accident-free technology of operation of the NPP. In this case, as it was already told, incorrect indignation we will call any change worsening the production technology: wear of the equipment, operator's mistake, false operation, etc.

Axioms of the latest Theory of accidents:

1) Accident consists of two phases: long emergency and transient destructive accident. The emergency can last for years, since single incorrect indignation. Gradually it acquires new incorrectnesses. When their quantity gains a certain critical weight, the emergency turns into destructive accident. Protection on the NPP actually work at the latest stage of an emergency.

2) Never one incorrect indignation leads to destructive accident. Emergence of this destructive accident requires two and more incorrect

indignations making critical weight. Each accident is characterized by the critical weight.

3) New incorrect indignation on the NPP can be as a rudiment of a new emergency, well addition to already available emergency. Thus, on the NPP always there are some branches of these emergencies which can be crossed or develop independently. Critical weight can be created gradually or in TEI when crossing emergencies when their already gained masses develops.

Now on all NPPs completely there is no diagnostics of an initial stage of an emergency. Therefore the seeming quiet situation on the power unit is actually very dangerous. It means that actually all personnel on all nuclear power plants, work in the conditions of an emergency since wear of the concrete equipment is already incorrect indignation.

Now present an initial idealistic picture when on the power unit everything is normal, i.e. absolutely there are no all incorrect indignations. In this case for simplicity we will not consider wear of the equipment. And here production is started. All changes in real time are watched by Smart-MES system, and will constantly check these changes for a correctness. At identification of the first incorrect indignation the system right there reports on BCP for timely elimination of this incorrectness.

Naturally, it is at once done everything possible for giving to production of a normal technological state. And incorrect indignation is removed. On the power unit again a normal quiet production situation before emergence of the following incorrectness.

And now we will analyse it according to the theory of accidents. If all arising incorrect indignations are liquidated at once at their emergence, creation of critical mass of incorrectnesses is simply excluded, and, therefore, and protection which work on a closing stage of an emergency,

will never be involved. And it means that the power unit urgently also will never stop.

In this situation it is quite possible to say that functioning of the NPP became absolutely safe, i.e. simply accident-free.

And now present prospects which are promised by this accident-free technology of the NPP. The questions connected with possible radioactive emissions remained far behind. Society prefers to all combined heat and power plants, state district power station and hydroelectric power station only the NPP, as the most environmentally friendly. The nuclear power industry of Russia got a second wind, having outdone nuclear technologies of the western countries, especially the USA.

But in this situation, the arising bureaucratic formal replies, not simply show a strong lag effect of thinking of nuclear scientists, but also the indifference they slow down economic development of Russia. The short sense of these formal replies is that at us supposedly and so everything is good and it is necessary nothing to us. And meanwhile nuclear power units urgently stop, subjecting society of radiation hazard since and deeply echeloned protection ever can refuse.

There are some Theories somehow connected with accident, it: The theory of reliability, the Theory of safety, the Theory of risk, and that's it still for some reason is not present the Theory of accidents. But after all such Theory which would describe development of any accidents, has to be. After all when this mechanism then it is possible and to fight against it is known. And times of the Theory of accidents are not present for this reason power plants catastrophically collapse, doing harm not only to the Generation companies, but also Russia in general.

The following excerpts are taken from scientific articles on the Internet:

"The theory of reliability operates with a random variable of time between consecutive refusals - for unique accidents this size to strive for infinity (besides, act as the reasons of accidents not only refusals of equipment, but also badly formalizable mistakes of the person, and poorly predictable off-design external influences)"

"Optimistical results PAS (probabilistic analysis of safety) on the CNPP played then a mean soothing joke. Past mistakes were eliminated, the PAS tools were improved in the highly specialized branch direction for reduction of influence of neopredelennost. Today PAS - the recognized specialized additional tool of an assessment of compliance in nuclear power"

"The time cycle of existence of HPF (hazardous production facility) includes both regular functioning, and emergency events. Accidents of catastrophic character in a limit can finish life cycle of HPF. The most rough analysis of known dangers of accidents on HPF indicates preference of execution of the operating safety rules received in the empirical way from tragic experience of last industrial accidents"

"Set of the knowledge containing in safety rules (including high-quality indicators and quantitative indices), it is impossible to change for results of the analysis of dangers and a quantitative assessment of risk. The first order the past and prevent known failures in the present, and the second look for tears in the future. The acceptable risk of accident cannot serve as the only criterion of safety of object"

Here the brightest excerpts of a current state are given in scientific community of the question connected with accidents. Also notice it is not told about nature of development of the accident anywhere. Everywhere accident is represented the such instantly arising destructive process. But actually it is far absolutely not so.

Accident as a live organism develops gradually, but not at once. In it the fundamental main total mistake of scientists who from the hopelessness to accident attract both the Theory of risk, and a safety rule also consists. After all for the Chernobyl NPP according to the Theory of risk of accident should not have been, and it take and happen. After that scientists with aplomb declared that now all of them considered that. But it is the complete lie and nonsense, as well as lie that if to work strictly according to instructions, and accidents will never be.

For descriptive reasons descriptions of an essence of accident we will follow the simplest example: Explosion of the house because of gas leak. It is absolutely clear to all that for the fact of the explosion there have to be three components: gas leak, the closed volume and a source of fire. Lack of any will provide an utter impossibility of the explosion. But the corresponding explosive concentration of gas at leak is created not at once, and gradually. And it is very easy to watch leak of gas, but the corresponding sensors in apartments are not present. It is possible to speak of course here and about probability of explosion, and about instructions gas use which all have and which nobody read and if read, long ago forgot. But that it is simpler - to put for accident prevention sensors with automatic overlapping of gas. In this case and the Theory of risks is not necessary and instructions are not necessary. And the most important, billions of rubles from lack of need to build new housing the victim will be saved. And human lives in general are invaluable.

But power plant millions times more difficult more dynamically than the reviewed example. How hundreds of people can, working at different sites, to provide thousands of obvious and implicit various situations? Especially as now the existing environment of the operational personnel at all power plants "is quite ordinary". Therefore to them the Theory of

accidents with the corresponding realization in the form of Smart-MES system also has to come to the help.

For some reason scientific minds consider that if on nuclear and thermal power plants there is a protection against accidents, everything is all right with this phenomenon. But they forget about a commercial component of this fact. Any operation of antiemergency protection surely conducts to financial losses. But protection can not work then losses are incommensurable. After all nobody will object that it is better not to allow operations of protection at all. Here for this purpose that the Theory of accidents is also necessary, it is necessary to understand an essence of any accident then it will be easy to fight against it.

It is necessary to realize accurately that never one reason of any incorrectness leads to accident. It accurately shows above the given example. Also it is necessary to understand that accident includes two phases of the development: the first is an emergency, the second - destructive accident. The emergency proceeds slowly and not considerably, since one factor of an incorrectness and gradually acquiring other factors. With achievement of critical mass of these incorrectnesses the emergency turns into already visible accident, protection are engaged in diagnosing and which prevention.

Thus destructive accident is threshold function without possibility of return to initial positions, and the emergency is not such threshold function and at any stage it can be returned to a normal state, i.e. not to bring a situation to operation of protection. The task consists only in that at the beginning of development of this emergency to reveal the first incorrectness and in due time to report about it for the subsequent its elimination without loss of the mode and rate of works at power plant.

Let's follow for persuasiveness still an example with the metal pipeline. It is clear that over time the pipe unevenly rusts under the influence of hostile environment, and, therefore, from it its durability falls. But in order that on this pipeline there was an accident to its gap, two factors, this current state of the rusting metal and existence in the pipeline of pressure exceeding the current durability of a pipe are necessary. But after all the pipe rusts gradually for years, therefore, and working pressure it is necessary to reduce constantly then there will be no these gaps. But behind it at power plants there is no current control, and same one thousand sites.

On nuclear power plants there is (at least, in my stay was) a function of registration of initiative signals which are necessary for clarification of the prime cause of operation of antiemergency protection. But, as a rule, it did not bring any positive results. However, working in Czechoslovakia for Dukovana's NPP, I as much as possible increased the allowing possibility of this function without loss of initiative signals, but, however, any more messages are not right here. Initiative signals do not show the reason of the beginning of an emergency, and inform only on a closing stage therefore they are absolutely useless for the analysis and blamestorming session.

After all if only one incorrect parameter can be the cause of the beginning of an emergency, the task of the prevention of accidents has to consist in timely diagnostics and identification of this signal. But as to make it nobody knows since still and did not face science of such task because of the distorted concept of the accident which they also did not conjecture.

Many years ago I was at conference on the prevention of accidents at the Moscow institute on nuclear power where many years were engaged in this subject huge number of scientists. And here one of global development consisted in fixation of technological cuts on the NPP at operation of

antiemergency protection, i.e. accumulation of the knowledge base about accidents with the subsequent recognition of dynamic images. Now it seems so ridiculous and ridiculous when to us elementary other approaches to realization of this major problem are known.

Let's consider the current technological state of power plant and we will assume that at present everything is correct, i.e. everything regularly works. Here means that all and discrete, and analog parameters function according to the established regulations. But suddenly for any reason incorrectly works one parameter from several tens of thousands. The task consists in expeditious diagnosing of this parameter. But how to define its correctness?

Here it is necessary to understand an essence of the most technological process, namely its start or a stop. For start of any process specific actions are carried out in strict sequence, i.e. we cannot execute the following TEI is not executed previous yet, considering that still more previous are already executed, and all the subsequent wait for the performance. And if we agree with it, and at all power plants so really and is then for definition of a correctness of operation of any parameter absolutely there is no need to analyze a condition of all parameters, and it is quite enough to check only the adjacent.

In this case the logical condition of a correctness of change of parameter looks as follows:

$k_i = +K(i-1) \& -K(i+1)$, where:

i - current TEI,

k - one current parameter,

K - set of parallel parameters,

$(+K, -K)$ - it is conditionally included, switched off.

Thus, change of parameter correctly if all previous adjacent parameters are included, and all subsequent adjacent parameters are switched off.

There is one feature that for definition of a correctness of change of parameter a logical condition of a correctness identical both at start of technological process, and at its stop. Thus, having described similar logical conditions for each parameter, its correctness of change easily is defined.

On the Internet met the phrase that scientists and engineers cannot understand how there is an accident. But it only proves justice and fidelity of our Theory of accidents on which follows that emergence of accident requires some reasons. Never one reason will lead to accident.

There was an explosion of ammunition in a warehouse near Samara. It also the largest accident. It is possible to introduce, of course, the seditious idea that for urgent utilization of several million ammunition on purpose, for example, to cover up tracks of mass plunder, elementary simulated accident with suicide bombing. Or the fire in the largest house is also accident. And it is ridiculous then from firemen to hear that short circuit of conducting was the reason. But all this from ignorance of the Theory of accidents according to which follows that at least two reasons or two incorrect indignations are necessary for any accident.

The serious perception us the created Theory of accidents by all public services will allow to look absolutely in a new way at these destructive processes and to keep billions of rubles which are necessary for creative activity of society. According to this Theory some incorrect indignations which appear spontaneously during various periods are necessary for accident. And if we in due time liquidate the first indignation, we will rescue the NPP from accident.

On the basis of the 40 years' operating experience of nuclear power installations by Smutnevy V. I. work (Practical culture of safety of operation of the NPP) is written [16] which all officials and the organizations try not to notice.

In this work Smutnev V. I. wrote the following: "-potentially dangerous difficult technological system operating by the natural principles and laws which cannot neither change nor cancels the block of the NPP any person in the world, whatever high position he held. These laws should be known, understood and carried out certainly".

In the work Smutnev V. I. gives the following fundamental axioms of culture of nuclear operation:

1) The car (the block of the NPP) interacts not only (and not so much) with the person operator, but with a certain managing director of community.

2) The car "does not know" also cannot know laws of human society.

3) The car represents always absolutely rigidly determined (cause and effect) system.

4) Instructions and service regulations of the block of the NPP are always relative (moderately relativities of knowledge the person of laws of operation of the machine at the moment).

5) Hierarchical structure of the operating community interacting with car (the block of the NPP) - objectively nondeterministic system.

6) The operator - the person with all physiological, mental and social features of the person in general.

All that is told Smutnevy V. I. will be coordinated with our Theory of accidents.

For an example we will consider a human body. In the person constantly there are processes which do not depend on him and therefore

directly he is not able to operate them. Let's tell, a digestive tract, blood system, airways. But the organism at any malfunctions (incorrect indignations) gives to the person about it a signal, for example, through pain. The person can react, taking medicine, or not to react. At timely not reaction the number of these incorrect indignations will collect, in the same way as on the power unit, and the person gets to reanimation, and on the NPP work protection. Further the person can not survive, and on the NPP of protection can not ensure absolute safety from radioactive emissions.

But unlike a human body on the modern NPPs diagnostics about incorrect indignations completely is absent. And, apparently, quite obvious that is better in advance, i.e. in the germ, to prevent development of an emergency, than to be helpless witnesses of already come true fact of sudden operation of protection. But it is no secret that the emergency muffling of the reactor with intensive branch of warmth, i.e. a far emergency situation, conducts to reduction of a resource of the reactor. And it everything huge financial losses.

As the person should not rely on saving reanimation, and "Rosatom" should not be content with protection on the NPP what they would not be. If the person in due time accepts a pill, on the power unit the indignation incorrectness in a look also in due time has to come to light and be eliminated: wear of the equipment in combination with loadings, spontaneous operation of automatic equipment and wrong actions of the operator. Then the person quietly without reanimation lives up to an old age, and the power unit without operation of protection will quietly function before the termination of service life.

Smutnevy V. I. in the work reflected the main thought that though the operator and operates processes on the power unit, but he is not able to capture all variety of internal processes, so and cannot assess correctly and in due time the current situation which is imperceptible for the operator

undergoes changes. Therefore here it is necessary to apply other approach on monitoring in interrelation of all least changes on their correctness, it is also necessary for ensuring absolute safety of the NPP to direct philosophy of views of its fail-safety.

All this is subject to Smart-MES system which, using the Theory of accidents and having boundless opportunities for the easiest adaptation to any NPP, can reveal in advance and in due time report about incorrect changes on the power unit, creating thereby favorable aura round the NPP. If all incorrect indignations are eliminated at once, they will not collect, and, therefore, business will never reach operation of protection. Thus, over time for safety of the NPP the role of protection will leave on a background since power units will become in general accident-free, and protection will be only for reinsurance.

After all if the offered technology of the prevention of emergencies from safety results in fail-safety of the NPP, it will already revive absolutely other relation of society to nuclear power in general, and at the international level all countries will prefer to have only the accident-free Russian NPPs.

14. Logic of the prevention of accidents by means of Smart-MES

"There is a logic of intentions and the logician of circumstances, and the logic of circumstances is stronger than logic of intentions" - I.V. Stalin. But is also logic of the prevention of these circumstances.

The production activity at power plants uses logic of intentions, and accidents at the same power plants happen according to logic of circumstances. But time of the logician of circumstances is stronger than logic of intentions, accident if she in accordance with the circumstances is fated to be not to stop any more. And now all means at power plants are focused only on decrease in consequences of already come true accident. But there is a question: Why in general to allow this accident when there is a logic of the prevention of circumstances, i.e. accidents?

By the way, all predictors and psychics use logic of the prevention of circumstances for a long time. Here both creation of planets, and zodiac signs, and national signs are considered. But if to predict natural accident quite difficult, to predict modern industrial accident - simply elementary. Why at power plants which treat category dangerous, especially nuclear power plants, the logic of the prevention of circumstances, namely accidents is not used? Yes because, nobody knows how to do it. And after all we have ready decisions for a long time.

Let's review an unpretentious example. There are three discrete parameters "A, B,C" which surely in a strict order should be switched on and off, and violation of this order causes an emergency. Tens of thousands of similar discrete parameters are concentrated on power plants, and to catch one, especially - some spontaneous incorrect operations, at first sight, very difficult issue which is not resolved by still large branch institutes. In

this case, various shifts in the form of duplication, do not solve a problem on fast identification of this spontaneous, so, incorrect operation. But the fact of the prevention of an emergency, well and, therefore, accidents also depends on timely detection.

In this case very simple algorithm is offered. For detection of spontaneous operation it is not necessary to analyze all technological cut, i.e. a mutual condition of all parameters at all. It is quite enough to analyze a condition only of adjacent parameters. If this state is correct, everything is normal, and otherwise, it is spontaneous operation, so, is an emergency. In this case it is meant that there are strict and accurate regulations of start and a stop, both separate sites of power plant, and power plant in general. And it actually is.

And now, we will return to our example and we will agree to designate: a, b, c - is switched off (an initial state); A, B, C - is included (a final state). Also we will describe in brackets of a condition of adjacent parameters at consecutive inclusion "a, b, c" for definition of their correctness: A(b); B(A,c); C(B). Everything is very simple! Now at switching off: A, B, C - is included (an initial state); a, b, c - is switched off (a final state). Also we will describe in brackets of a condition of adjacent parameters at consecutive switching off "A, B, C" upside-down for definition of their correctness: c(B); b(A,c); a(b).

Here is observed the interesting fact that conditions of adjacent parameters changes of concrete discrete parameter, absolutely identical at various directions. And now we will simulate spontaneous change of parameter "B" at all included and at all switched-off parameters. Conditions of adjacent parameters in this case in both options will be the following: b(A,C); B(a,c). As we see, in both cases there is no coincidence to a correct condition of adjacent parameters which correspond: b(A,c); B(A,c). Here also the emergency is revealed, so and accident is prevented!

Together with discrete parameters surely there are also analog parameters with the lower and top settings. In case of identification of an incorrect situation to the operator council or the instruction to action is given for BCP, or even the operating influence can be automatically made for preservation of a former situation. All this is easily described in meta language in text projects of problems of Smart-MES system.

Thus, there are two tasks: as it is instant among one hundred thousands potential indignations on the power unit instantly to reveal incorrect indignation and how to train system to carry out all these actions for recognition of an emergency. After all in this case realization which are used in the PCS, do not approach. Here the principle of neurodynamic programming of recognition of a dynamic image has to be used.

The analysis on a correctness of indignations simply looks as follows. There is the previous technological cut and current in which indignations or changes come to light. In the presence of this change it is checked for a correctness, for example, by the following already earlier told method.

If we consider the directed connected sequence of managing directors of parameters: A, B, C - that rule of a correctness of change for the B parameter will be the following: B = [A] & [-C], where: [A] - a set of the adjacent already involved parameters, [-C] - a set of not involved parameters adjacent yet. Here parameters are understood as any possible indignation.

Accident - spontaneous development of technological process at power plant contrary to will of the person which is directed on destructive activity. Accident always arises suddenly. Accident if arose, not to prevent it any more. In this case actions of the person are directed only on decrease

in its consequences. Both the natural phenomena, and wear of the equipment, and a human factor can be a source of accident.

Before accident always there is an emergency which if in due time to find, it is possible and to prevent accident, so and to keep huge financial means of the Generation company. The emergency has the long period of the maturing. It develops gradually unlike the accident which already proceeds immediately.

It as a twig which you gradually bend. If you stop it bending, i.e. eliminate the reason of its bending, it will adopt the initial provision and will be same magnificent, as before. But if you do not eliminate the reason in time, the twig elementary, eventually, will break, and then it already as a twig simply is no good, and it is necessary to buy a new twig.

All 300 thermal power plants in Russia with huge wear of the equipment represent constructions from many thousands of bent twigs which are not in a steady state. Thus, to enough one twig to pass the side of a legal bend and all this design will instantly collapse. And it means that there was an accident of power plant to the human victims. In the dry rest from carelessness and short-sightedness of management - the Generation company is ruined, and the management in prison.

I can be objected that at us everything so is provided. On what I as the expert in nuclear and thermal power industry, I will tell that then there would be no accidents and on the Chernobyl NPP, and on Sayano-Shushenskaya hydroelectric power station, and other smaller accidents at power plants. Accident is such piece which can be, and can not be. In this case neither scheduled preventive maintenance of the equipment, nor experience of the operational personnel not a hindrance to accident emergence if she is fated to be owing to confluences of many circumstances.

For example: At power plant in one and too time various experts on various sites for various reasons independently from each other departed from regulations a little. In same it is a high time on several technological sites analog parameters strongly came nearer to inadmissible borders. And in the same time, as ill luck would have it, on several pipelines there were fistulas. Besides, the high-voltage wire for some reason broke. Here to you and emergency. If in time not to settle, everything will blaze. But after all factors are separately quite admissible also anything terrible. Danger is constituted by set of these situations which cannot be controlled by the person since the Smart-MES system is for this purpose necessary.

Let's take, for example, pressure testing of the pipeline which becomes for determination of its readiness for a heating season. But after all irrespective of it shabby pipelines are broken off at the most inappropriate moment. And small accident can cause larger and already with the human victims. At power plants different branches of pipelines have the degree of wear, and, therefore, can sustain with guarantee only certain values of temperature and pressure. But to the person not in power constantly to control it.

On power plants of one thousand discrete parameters, signaling condition of latches and various switches. Yes, there are various circuit blocking. However, all operational personnel for some reason passes serious training on exercise machines and check on sanity. Therefore, protection against "fool" is not present. And differently, training on other technology why is necessary. After all each power plant from 300 - unique. But than that, apparently, it is simpler: the beginner sat down on BCP and began to move "levers", and Smart-MES politely prompts to it that it is necessary to do and in what sequence. Here that and any fool will quickly learn to operate the most difficult equipment optimum.

Generally, the power plant is difficult dynamic object of very increased danger where the operational personnel is not protected in any way. Yes it cannot be also protected. For this purpose there has to be a guarantee of impossibility of accident. And only Smart-MES which is capable to reveal any emergency can provide this guarantee and in due time to warn about it for the subsequent its elimination.

Innovative Smart-MES in real time is capable to control both wear of the equipment, and value of settlement sizes TEI, and conditions of discrete parameters. But the most important that all this becomes in total. The main advantage of this system that all this is realized quickly and simply. At any time the personnel of power plant can elementary correct and increase analysis algorithms of an emergency.

For operation of Smart-MES special preparation since initially it was focused for technologists is almost not necessary. All system is developed from pressing of one button. At this moment text drafts of the analysis of emergencies are compiled in all components of system: menu, database, screen forms, reports, dll-programs, etc.

In a final type of Smart-MES, being advising, it is almost capable to carry out many repartitions from optimization of resources and forecasting of purchases of fuel to a complete elimination of an excessive consumption of fuel and the prevention of all emergencies, creating thereby other creative environment of functioning of power plant.

We are convinced that in Russia the safest nuclear reactor under which "pan" for localization of consequences of accident is located. Undoubtedly it is necessary, but as the extreme safety mechanism. Well, and where system of the guaranteed prevention of all emergencies?

All means for safety of the NPP can conditionally be divided on static (passive) and into dynamic (active). And so, on all NPPs in Russia

only passive security aids which quietly are waiting in the wings are used to work at the right time. But under the law of meanness can not work. A striking example - accident in the Moscow subway.

Figuratively it can be compared to war where at passive protection the group sits in an entrenchment and waits when attack, and at active protection uses scouts that at attack in due time to leave aside and in general to avoid collision. In this case it is clear to all that the knowledge is always better than all situation in advance, than absence of information. And the Smart-MES system can provide it. Then there will be no situations with sudden stops of power units to which all Russian NPPs are subject.

In the letter No. 9/04/3100 of 08.07.2013 from JSC Rosenergoatom Concern it is told: "The concept of deeply echeloned protection based on use of system of physical barriers is applied to safety of the NPP. For timely detection of defects on the NPP the modern diagnostic aids allowing to prevent equipment failures and prevention of their development into accidents are used".

Why then nuclear power units suddenly stop if everything on the NPP is provided? Or after all in Rosatom not everything is all right? And how to make that there was everything as it is necessary, do not know even in YIP RAHN (Institute of problems of management of V. A. Trapeznikov the Russian Academy of Sciences).

Recently in Moscow passed the XII All-Russian meeting on problems of management (VSPU-2014) in YIP RAHN for which we prepared two reports: "Technology of the prevention of emergencies on nuclear power plants with use of MES-T2 2020 MES System and "The new concept of a self-adjustment of MES-T2 2020 MES System for management of any process production and power plants". Thus at a selection stage the first report was rejected, and the second was approved.

I did not know in the beginning how it is possible to disregard such important problem as safety of the NPP, and then understood that himself deals with this problem of YIP RAHN long ago and unsuccessfully, and competitors are not necessary to it. For VSPU-2014 scientists from YIP RAHN on subject of the NPP prepared three reports: "Evolution of the NPP PCS for VVER, problems, unresolved questions, new threats and the possible directions of development", "Automation of nuclear power plants - YIP RAHN'S experience" and "Integration of databases by development of systems of the top (block) level of industrial control system of the NPP".

But in these reports words it is not told about possibility of creation of the accident-free NPPs. A little it is said in the first report about need of development of the NPP PCS of the fourth generation, and that technical means of the PCS modern programmatically do not suit for the NPP. It is also told that unification and reduction of the nomenclature of means and the software, increase of self-diagnostics of the PCS and its security, ensuring participation in the maneuverable modes is necessary for maintenance of frequency in a power supply system, ensuring cybersafety.

Here it is so healthy, it appears, cybersafety is very necessary, and nuclear safety, turns out, not really. Or YIP RAHN simply does not know how to come nearer to her. When "Rosatom" claims that on all NPPs with diagnostics everything is all right, and YIP RAHN declares the return, but without the specific proposals directed on increase in safety of the NPP, the conclusion arises only one that problems are.

In the summary to our report the following is told:

The firm of Information Systems suggests to look at a problem of safety of the NPP a little on the other hand, i.e. not since the end as now, and since beginning, or to consider not a final stage of an emergency when work protection, and an initial stage when this emergency just arises.

Usually, when protection works, on initiative signals try to understand the emergency prime cause. But after all this prime cause can be revealed in advance, without bringing process to protection operation. Actually at once some emergency branches can arise, and anybody about it does not even suspect. When in any branch incorrect indignations gain critical weight, it and means that it would already be time for protection to work. But why it is necessary to keep the production, most difficult and dangerous to all people, in the constant internal suspense when it is possible to extinguish in general all arising incorrect indignations at their emergence. And it means that creation of critical mass of incorrectnesses in principle will not be possible, and, therefore, and protection will never work and the compelled stops of the power unit will not be, but there will be also no danger to the people in general.

In above the specified letter the director of production and operation of the NPP of "Rosenergoatom" declared that the accident risk makes 0,00001 in a year on the reactor. But this figure of probability of accidents is good only for constructive comparisons, but not for calm of the people. Actually according to probability theory it sounds as follows. The probability of emergence of destructive failure of the nuclear power unit very small, but this accident can happen to radiation emissions at any time.

Therefore dynamic safety of the NPP on Smart-MES system which in real time looks through every second all situation on the power unit concerning both wear of the equipment, and false operation of automatic equipment, and the operator's mistakes is necessary. Thus, the system works in an advancing, constantly trying to discover all incorrectnesses, for their timely elimination.

Why Smart-MES system? Because its self-organization allows to modernize instantly in real time algorithms of diagnostics.

It would be time to pass to "Rosatom" to automatic control of nuclear power units on the NPP and to the Generation companies on state district power station and combined heat and power plant. It was historically most strictly forbidden to design computer-controlled power units. The argument was that at an emergency of people, got used to inaction, will not be able to interfere in due time for prevention of development of accident.

It is clear that then there was no our self-organizing Smart-MES, there was no our theory of accidents, there was no our algorithm of cognitive diagnostics of emergencies and it was not simple powerful computers. But now it everything is. All of us made for you and for you, dear nuclear scientists and power engineering specialists, for the modern NPPs and for "Rosatom", for modern state district power stations and combined heat and power plant and for the Ministry of Energy. Take, use our innovations which will make any power plants the best in the world and design the computer-controlled accident-free NPPs of power units.

But today's archaic BCP with systems of SIUR and SIUT look simply ridiculously. After all if suddenly work protection and the power unit for the unclear reasons stops, there is a question and where there was this operation personnel and why allowed a power unit stop? The answer is very simple. This personnel at accident is simply useless.

Actually the human factor only disturbs, and during the work of the NPP it is not necessary at all. All processes on the NPP computers on multiagent technology have to operate. And the dispatcher has to have only two buttons: to start and stop the power unit.

15. Accident is result of game of the Person with the Nature

The theory of Games is a mathematical theory of conflict situations. Conditionally, we will call a production activity of power plant game of the Person with the Nature. In this game each party wishes to win. The person, operating power plant, seeks to make at any cost the maximum profit for the Generation company through power generation and it is warm, without paying attention to Game of the opponent, i.e. Nature. And the Nature also wishes to prevail through wear of the equipment, a rust of pipelines, various breakages, breakdowns in windings of transformers, spontaneous operations of the operating automatic equipment and a mistake of the Person.

In this game without Smart-MES the Person has no chances. Eventually, the Nature all the same wins and there is an accident. When it occurs, nobody knows. But if the Person does not use Smart-MES for a constant control over this conflict situation, it surely will occur. In this case scheduled preventive maintenance will not help - they, perhaps, is a little bit removed accident, but can it and approach.

Let's present, for example, a pipe. It constantly rusts, it rusts unevenly. But time it rusts constantly, so the size of possible maximum pressure in this pipe falls constantly. And if not to watch it, finally will break off it. And consequences of this accident depend on where it was established.

Let's consider how it can easily be controlled. Let's accept for the new pipeline: K=1, and for the maximum working pressure (Pm): $Kp=Pi/Pm <=1$ where - pressure in "i" put Pi after initial start of the pipeline. Let's accept also a condition of an accident-free situation: $K*Kp <=1$. And, "K" increases every day by size: $1/(S*365)$, where S - duration

of service life advanced in years. It follows from this that in "i" day of operation of the pipeline admissible working pressure has to be the following: Pi=Pm / (1+i/(S*365)).

But times of a similar constant control are not present at one power plant, than bigger wear of the equipment, subjects probability of emergence of accidents of different degree only increases. Wear at many power plants exceeds 50%, and they work at full capacity. Besides, even on nuclear power plants operation of the power units which fulfilled the planned resource lasts.

Yes, the commission draws the positive conclusion on extension. Yes, is not enough for the electric power and the people it is necessary to work somewhere. But the commission cannot know that becomes in pipes. And even their control can not reveal the defects which appeared over time. Even if there will be an accident on the NPP, all State will pay for it, but on thermal power plants accident will lead that in general to huge losses of Generation companies. Besides the new tendency of expansion of power plants perspective power units PGU especially demands a constant control over loadings of the outdated equipment.

The person in Game with the Nature always loses because the Nature has no concept pity, she cannot grease the palm, it does not accept kickbacks. She can only be outwitted a constant control over a situation and timely intervention for replacement of the outdated equipment. After all emergence of fistula on the pipeline is one of forms of manifestation of an initial stage of accident. But happens that carries all turbine with much bigger consequences, than during it to replace.

The nature in the theory of statistical decisions is considered as a certain uninterested instance which behavior is not known, but, in any case, does not contain an element of conscious counteraction to plans of the

Person. However, in the conditions of uncertainty from the point of view of trouble-free optimum operation it is difficult for Person to make the reasonable decision for the maximum prize. For the description of an success of the applied strategy the concept of risk is entered into theories of decisions. In our case it is risk of accident. At calculation of the risk corresponding to each strategy in these conditions the general usefulness for the Person of this state of nature is considered. At a choice of optimum strategy in unknown conditions with known probabilities it is possible to use not only an average prize, but also average risk which, certainly, needs to be turned into a minimum.

Proceeding from three below the listed facts, I call into question absolute safety of all NPPs in Russia and abroad on which there is no accident-free technology on Smart-MES system.

I give these facts from the Internet and from the press who do not demand a denial.

First fact: "on June 7, 2013 at 19:45 the power unit No. 4 of the Leningrad NPP is stopped by operation of automatic equipment in the regular mode in compliance design algorithms. After clarification of the reasons of operation of automatic equipment the power of the power unit will be restored"; "on June 9, 2013 at 02:10 the power unit No. 2 of the Balakovo NPP is switched-off from a network by operations of automatic equipment. Shutdown of the power unit happened in full accordance with design algorithm and production schedules of safe operation".

Second fact: VNIIAES main activities listed on the site do not provide work on accident-free technology on MES System at all. Except the PCS other Systems are not created.

Third fact: In AIF No. 23 5-11 of June, 2013 in the article "It Is Reliable, as a Wall" it is told: "Our nuclear scientists constructed the safest

NPP in China. The Tianwan NPP which is considered one of the most reliable and safe nuclear power plants in the world" became one more object of national pride. But in this article words it is not told about accident-free technology on MES System since it there simply is not present.

Conclusion: Very deplorable picture turns out. We for the whole world say that we ahead of the planet of all on safety of the NPP, and a row right there nobody notices the developed accident-free technology on Smart-MES system and in an emphasis does not see. Here you only ponder in above the provided phrase: "After clarification of the reasons of operation of automatic equipment …" It means that antiemergency protection suddenly worked, and nobody knows why. But protection according to the theory of probability can ever not work, despite duplication.

Also notice, for some reason in nuclear power in general emphasis is placed only on safety, but not on fail-safety. But same different approaches. Safety does not exclude accidents at all, and fail-safety in principle excludes any accidents. Well, and what it is more reliable and better?

Today's NPPs can be compared to the fancy car with one hundred safety cushions which do not guarantee against possibility of the accident. Yes, the person can be rescued, but the car will be rumpled. Yes, and pillows can refuse. And now present a situation that safety cushions are not present in general since accident or collision in principle are not possible because of the advancing prevention, same it is certainly repeatedly safer for all.

Say to me that from a meteorite all the same not to escape. But so after all it is possible to reach marasmus since perish and from an icicle.

In this case all ingenious is simple, and the more simply, the better. Well, where it is even simpler if not to bring a situation to accident in general, and to extinguish all indignations at the time of their emergence. But they should be able to be revealed in due time, and just the Smart-MES system excellently is able to do it.

According to our theory of accidents, protection work at emergence of several indignations which uncontrolledly appear in various periods, and it can be also years, for example, metal corrosion. Once again I will put on it emphasis that one indignation never leads to protection operation, and, therefore, and to accident.

You only ponder upon an essence everywhere of the existing barbarous approach to test of outdated pipelines by method of pressure testing of a network of heat supply, i.e. for clarification of an unusable section of the pipe, it is pumped up an elevated pressure. And that turns out in practice. Test, for example, the kilometer site of the underground route, and there is a lot of rusty places. But breaks through always one weakest site. Break off a pipe, replace its small site, bury and again test. Then breaks through other site, well, etc.

And that it would seem more simply: to keep account of all sites of pipelines and under laws of physics and chemistry every month to reduce the maximum admissible pressure. If working pressure is more current maximum, it is necessary or to reduce working pressure, or to change all section of the pipe. Also notice, in this case two indignations work: corrosion of metal and pressure of the heat carrier.

On the NPP there can suddenly be hundreds of indignations: wear of the equipment, spontaneous operation of automatic equipment, wrong actions of operation personnel, short circuit and other natural indignations. Only the Smart-MES system can trace in due time behind all this variety.

In this case I how many do not call into question all progressive technical solutions of the modern NPPs. I say only about one that it is possible to make even better that it is already time to pass from blind protection of power units of the NPP to the intellectual prevention of emergencies on already ready Smart-MES system.

Here very strange picture turns out that nobody will tell that accidents it is an integral part of technology of nuclear and thermal power plants. None of tops of "Rosatom" will not make bold to declare that accidents on the NPP were and will always be since the wave of indignations right there will rise. But that in practice it also occurs. After all the fact of operation of antiemergency protection against destructive accident with huge emissions of deadly radiation is divided figuratively by a share of millimeters.

And what on Sayano-Shushenskaya hydroelectric power station accident could not be prevented? Yes, it is easy. But all of us for some reason better will heroically restore with use of huge public funds, than we will in advance a little think and will decide to introduce ready innovations.

After all accident in our life it not some exotic, but ordinary category with threshold irretrievable function. Let's tell, the person incidentally cut a finger. It too accident. Earlier everywhere taught safety measures. It is also the correct approach, but within the NPP strict observance by the personnel of regulations is not enough because of the most difficult technology. To the aid the intelligent mechanisms put in Smart-MES system have to be called.

It would seem that more simply, time from accidents not to get to anywhere, time accident is an integral part of any production, especially the NPP, it is necessary to diagnose development of an emergency simply in due time. Then all Russian NPPs will be not simply safe, and accident-free!

We on other formulated the questions connected with accident rate of the NPP and entered new concepts: internal and external accidents which were Russia, actually secret for all society.

In this case external (destructive) accident is followed by radioactive emissions, and internal accident on the NPP is characterized by operation of antiemergency protection and the emergency stop of the power unit. However, "Rosatom" never used the term "internal accident", applying the calming words of type: there was an unplanned stop of the power unit, automatic equipment worked in the regular mode, radiation level in norm.

But any sudden violation of a production cycle also is accident. In this case the size of this accident since for the NPP this any internal accident can develop into external accident with big tragedies is absolutely unimportant. This unsteady transition is blocked reliably by the multiecheloned protection. Then of that to be afraid? Why not to tell to the people the truth? That there was the next accident on the NPP, protection worked, and all can sleep peacefully so far.

After all at normal operation nuclear power plants do not constitute danger to the personnel, the population and environment. However emergencies (incidents) and accidents can influence safety of the NPP.

According to recommendations of IAEA for an importance assessment from the point of view of safety of the events occurring on nuclear installations and objects the International scale of nuclear events of INES is used. She estimates all emergency events on nuclear objects on a 8-ball scale. Events are taken for zero level, insignificant for safety. Further levels 1 (anomaly), 2nd (incident), the 3rd follow (serious incident). Levels, starting with the fourth, are described as accident. the 4th is an accident without great risk outside a platform, the 5th - accident with risk outside a platform, the 6th - serious accident, the 7th - a major accident.

Thus, according to the glossary of "Rosatom": Accident on the NPP - breakdown of service of nuclear power plant at which there was an exit of radioactive materials for the borders provided by the project. The term "Accident" is understood as the event connected with radiation consequences.

But here a word meaning "Accident" on Business to the dictionary: Failure, breakage, damage, failure, violation of a normal rhythm of work.

The strange picture turns out. For example, the rupture of the turbine on a thermal power plant is the largest accident, and on nuclear power plant it only incident (violation) and even not incident. Why such discrepancy? After all the same accident on Sayano-Shushenskaya hydroelectric power station claimed many lives. Why there are double standards in power industry for thermal power plant and the NPP? Everything is very simple. Probably, for decrease in intensity in society to have to tell sweet lie about the NPP.

In the Report on safety (2012) "Rosatom" writes: In 2011 on the NPP in Russia 45 violations are registered. All happened violations in work of the NPP are estimated on the International scale of nuclear events of INES, as the NPPs which are not influencing safety and not being incidents.

And if instead of 45 violations would sound - 45 internal accidents. These are 4-5 accidents on each NPP, i.e. every quarter on each of 10 NPPs on accident. Or in Russia every week on the NPP there are internal accidents. What would be food for "Green"! All this is equivalent as managed with the people at the Chernobyl accident which learned about everything in the latest turn, and for many it already was late.

It can be compared to the house apartments in which periodically flare up. And firemen of all calm that supposedly fire extinguishing systems are provided everywhere. But to inhabitants it is for some reason

all the same disturbing. And it is simple to make that that apartments in principle did not flare up.

And on the NPP it is necessary to carry out that there were no internal accidents in general, then need for INES scale completely will disappear. After all if there are no internal accidents, therefore, there will be no destructive external accidents also. Then that the people really will be able to sleep peacefully.

And for this purpose there are all technical capabilities: both the Theory of accidents, and accident-free technology of operation of the NPP, and easily adaptable Smart-MES system, but is necessary political will of the Leadership of Russia. After all it is not necessary for "Rosatom" as it absolutely does not have sense to change be available technologies.

But "Rosatom", expanding construction of the NPP abroad, probably not up to the end considers mentality of that local population which considerably differs from us. It we can suffer for years adversities and we will not tell anything openly. And that local the population has no authorities, especially at counter-propaganda of the USA. The Ignalina NPP which was built with great dispatch by Russia and I including in Lithuania, closed, and nobody peeped. And if abroad on the NPPs which were constructed by Russia, the series of internal accidents begin, Russia will instantly lose the powerful market.

On the site of "Rosatom" the following is written: The NPPs of the Russian Federation are operated reliably and safely that is confirmed by results of regular checks, both independent bodies (Rostekhnadzor), and the international organizations (VAO NPP, etc.). Over the last 5 years on the Russian NPPs it is not recorded any serious violation of safety classified above zero (minimum) level by the international scale of INES. By criterion of reliability of work of the NPP Russia came to the second place

in the world among the countries with the developed nuclear power, having outstripped such developed states as the USA, Great Britain and Germany.

But here a small ill luck - it is not specified, and who on the first that a place? Also it appears is Japan. Here so paradox! The country where the most reliable NPPs, now forever there will be with a label "Fukushima". It says only about one that all these notorious criteria of reliability of work of the NPP are in practice the complete fiction and self-complacency.

Whether but imaginary criteria of reliability which do not bear any responsibility are necessary to society? It is quite obvious that society needs only accident-free technologies. And in this case there should not be a place to corporate interests and bureaucracy, namely it and is observed in "Rosatom" where already on a threshold the accident-free technologies offered by us on the basis of the newest Theory of accidents created in Information Systems are swept aside.

The video "The Atom Horizons of August 31, 2013" in which with aplomb is narrated about new technology of rejuvenation of the NPP is distributed in the Internet. But if is more concrete, this technology concerns rejuvenation of the case of the reactor of the NPP by method of its annealing. This rejuvenation allows to prolong a metal resource from 30 to 100 years. In the same place it is told that all NPPs working in Russia - station of the first and second generation. The majority of them will reach the design resource soon. Therefore, in 2016 the Kurchatov institute will start rejuvenation of the NPP.

Everything is seemingly healthy and remarkable! New power units of the NPP it is not necessary to build. It is quite enough to rejuvenate the old. But the NPP - same not only the reactor, and generally - people who involuntarily become hostages of this rejuvenation.

It is equivalent as established to the aged man instead of worn-out heart new from the young donor. It is possible of course for advertizing for knocking-out of huge public financing to proclaim that the aged man was rejuvenated and to it active life for 100 years is prolonged. But it is clear to all that, how many it is taken away by the nature, he is so much and will live. After all except heart there are still vessels hammered with cholesterol, there are smoked lungs, there is a liver poisoned with alcohol and it is a lot of still that is the grown old.

And at power plant there is a huge mass of pipelines and other production equipment which wears out even before the reactor. And the production technology of the electric power and heat becomes outdated. After all for some reason the decrepit and emergency house is preferred to be taken down and build new with use of the latest technologies and materials. And this rejuvenation of reactors at one-sided approach focuses in nuclear branch in general to freeze progress for many years.

But in this case the probability of increase in number of emergencies which can lead, eventually, and to destructive accident with radiation emissions sharply increases. After all besides the reactor there is a radiation first contour of heat exchange. And simple people who from benefits of the NPP have nothing except a headache, have to be for some reason involuntarily involved to the sphere of terrible potential infection? But here the priority of the person as always costs on the last place, and has to be on the first.

After all if bonus is awarded by the Russian Federation to founders of materials for nuclear reactors and for methods of extension of terms of their operation, for some reason our accident-free technology of operation of the NPP which allows to exclude in general any emergencies, is in the sheer shelter. Can because it infringes on many corporate interests since need and for these materials, and for technology of extension of term of

operation, and for a catcher of the melted radioactive fuel completely disappears.

All today's safety of the NPP is directed on prevention of hit of radiation materials in environment at emergence of an emergency. For this purpose also especially strong technologies are created. But if to exclude in general possibility of emergence of any emergencies, and, therefore, and different overloads then will worry there is nothing. And society will perceive in a different way the NPP.

But on the other hand extension of service life of the reactor same noble and favorable cause. And here the personnel of the NPP in this case should not be endangered. For this purpose it is necessary to control simply constantly process of emergence of an emergency therefore there should not be an operation of antiemergency protection at all. Therefore the NPP has to be accident-free.

Thus, process of extension of service life of the NPP has to be not only from rejuvenation of the reactor, but also from continuous diagnostics of all incorrectnesses on the NPP according to our Theory of accidents and the developed technology of accident-free operation of the NPP on Smart-MES.

After all that our system regarding the easiest adaptation to any power plant and regarding the highest speed of calculation for instant identification of incorrect indignation is able, is not able any system in the world. And it means that all nuclear power plants have no 100% of protection against emergence of emergencies at any time which can arise and from wear of the equipment, and from false operation of automatic equipment, and from the operator's mistakes.

But it says only about one that at such indifferent relation to a problem of the prevention of emergencies from "Rosatom" and from the

Country leaders in general, says only about one that all forgot lessons of Chernobyl at all. Therefore I will remind.

In the night of April 26, 1986 on the fourth block of the Chernobyl NPP (Ukraine) there was the largest nuclear accident in the world, to partial destruction of an active zone of the reactor and an exit of splinters of division out of zone limits. 190 tons of radioactive materials were released into the atmosphere. 8 of 140 tons of radioactive fuel of the reactor appeared in air. Other dangerous substances continued to leave the reactor as a result of the fire lasting nearly two weeks. People in Chernobyl underwent radiation by 90 times bigger, than when falling a bomb to Hiroshima. Accident was resulted by radioactive infection in a radius of 30 km. The territory of 160 thousand square kilometers is polluted. The northern part of Ukraine, Belarus and the West of Russia suffered. 19 Russian regions with the territory of nearly 60 thousand square kilometers and with the population 2,6 million people underwent radiation pollution.

According to the most conservative estimates, the cost of elimination of consequences of accident on the CNPP cost to the Soviet Union over 300 billion dollars. According to the estimates of the government of Belarus, by 2016 expenses on elimination of consequences of Chernobyl will reach 235 billion dollars. The institute of Research and Development and Power (the former USSR) counted that the price of Chernobyl will be 358 billion dollars. The institute noted that this figure exceeds the cost of all nuclear energy developed in the USSR till 1986.

Yes, one accident crossed out economy of all nuclear industry. Is it better to spend a trifle for introduction of Smart-MES system, than to lose everything at always possible destructive accident.

Accidents at power plants only in one 2013 are given below.

10.01.13. Bucharest, on January 10. One of power units on the Romanian NPP "Chernavoda" yesterday, on January 9, was automatically disconnected. The exact reason of it is still unknown.

12.01.13. Because of accident at heatstation giving of heat in several residential districts of Pavlodar decreased at once. On operational information, accident on CHPP-3 led to a stop at once of two heating coppers from four operating.

12.01.13. The first power unit of the Kola NPP in Murmansk region is stopped because of automatic operation of electric protection of the transformer. The radiation background in the territory of station does not exceed norm.

18.01.13. On the power unit of N2 of the Rostov NPP today in 16:52msk there was a shutdown of the generator to the subsequent unloading of the power unit. Power of reactor installation of the power unit is reduced to 40%. Violations of limits and conditions of safe operation of the equipment are not present. The reasons of shutdown become clear.

21.01.13. The first power unit of the Kalinin NPP in the Tver region was stopped because of operation of emergency protection on the night of January 21.

14.02.13. The second power unit of the Rostov nuclear power plant in the evening on February 13 was switched-off for the reason that the protective system of the generator worked. Operation of the power unit is restored on February 14, reactor power gradually increases to regular indicators.

25.02.13. In Pakistan failure of the equipment of power plant of HUBCO practically disconnected all country.

29.03.13. In Donetsk region the Uglegorsk thermal power plant in Svetlodarsk blew up. Explosion happened to the subsequent ignition at 15:14. Divisions of GU GSChS evacuated from a dangerous zone of 10 people. Scales and causes of the fire are established.

05.04.13. Today because of malfunction the turbogenerator of the first power unit of the Balakovo NPP was disconnected (Saratov region).

Automatic equipment stopped and unloaded the block. At the enterprise assured that on the international scale of an assessment of nuclear events (INES) the incident is "out of a scale" and is qualified as "not important for environment and the population; violations of limits and conditions of safe operation are not present; the radiation situation around an arrangement of station remains without changes".

07.06.13. At 19:45 the power unit No. 4 of the Leningrad NPP is stopped by operation of automatic equipment in the regular mode in compliance design algorithms. After clarification of the reasons of operation of automatic equipment the power of the power unit will be restored.

09.06.13. The power unit No. 2 of the Balakovo NPP is switched-off at 02:10 from a network by operations of automatic equipment. Shutdown of the power unit happened in full accordance with design algorithm and production schedules of safe operation without remarks. Thus damage of the equipment, deterioration of a radiation situation was not.

24.06.13. Incident happened on the French NPP of Byuzhe. As the company operator of Électricité de France station reported, the fire broke out in the second half of day in one of machine halls because of an electric generator overheat. Immediately the reactor of the NPP was stopped.

05.07.13. On the South Korean nuclear power plant Hanul located in the district Uldzhin of Kensan-Pukto's province there was a reactor stop. The company operator of Korea Hydro & Nuclear Power station reported that the reactor stopped for technical reasons.

04.08.13. On nuclear power plant in the south of Alabama, unplanned emission of carbon dioxide which is used for suppression of fire at ignitions happened the USA. On the NPP state of emergency was declared, however her owner of Alabama Power Company reported that nobody suffered, and there is no danger to property, life or health of employees or inhabitants.

06.08.13. In the Czech Republic there was an accident on the NPP. On nuclear power plant Temelin last night there was a leak of radioactive water.

11.09.13. The third power unit of the Leningrad NPP is stopped after operation of gas protection of the transformer, the radiation background at station and the adjacent territory does not exceed natural background natural values.

29.09.13. On the Beloyarsk NPP there was the next emergency situation. Eyewitnesses report about explosion and a black smoke over the NPP. The only power unit of station works over the term established by the project, failures and incidents at it not a rarity. Official information on incident is absent, but, most likely, this time did without emission of radiation.

26.10.13. One of the Ukrainian NPPs urgently stopped work. Why automatic equipment worked - still it is not known. All three blocks of the Southern Ukrainian nuclear power plant stopped.

26.10.13. Incident on Slovenian nuclear power plant "Krshko" when in the reactor some fuel cores were damaged, does not constitute danger and threats for environment.

12.11.13. On the largest American NPP there was an accident. On Okoni nuclear power plant the power unit cooling system failed, leak of radioactive water does not manage to be stopped.

24.11.13. At ten o'clock 29 minutes the power unit No. 4 of the Kola NPP is stopped by operation of automatic equipment because of false operation of protection on heat carrier temperature. The stop is made according to design algorithm. Violations of limits and conditions of safe operation of power units of the Kola NPP were not. The radiation background at station and the adjacent territory remains without changes.

25.11.13. On the NPP near Tver there was a fire. Ignition began in the machine hall of the first power unit of Kalinin station.

10.12.13. The power unit No. 1 of the Kursk NPP was stopped by action of automatic protection.

We see that accidents, as if them did not call official structures, happen and will occur.

16. Integral calculus of an excessive consumption of fuel

The integral calculus gives rich mathematical apparatus for modeling and research of the processes happening in power industry. The interval between calculations is less, the integral calculus of indicators of dynamic production is more exact. For power plants, according to experts, this interval has to make half an hour.

The excessive consumption of fuel corresponds to a difference between actual and standard fuel consumption on the released electric power and heat power.

$$\Delta B = \int_{t1}^{t2} B(t)dt - [\int_{t1}^{t2} Э(t)b_э(t)dt + \int_{t1}^{t2} Q(t)b_m(t)dt]$$

$$\Delta B = \int_{t1}^{t2} \{B(t) - [Э(t)b_э(t) + Q(t)b_m(t)]\}dt$$

$$Перерасход = Факт - Норматив$$

ΔB - an excessive consumption of fuel (t.u.t.),

B - actual fuel consumption (t.u.t.),

E - the actual released electric power / 1000 (one thousand kWh),

be - standard specific fuel consumption on the electric power (g/kWh),

Q - the actual released heat / 1000 (Gcal),

bt - standard specific fuel consumption on heat (kg/Gcal).

Calculation of an excessive consumption of fuel on a half-hour interval is much more exact, than monthly calculation. Calculation of specific costs of fuel of electricity generation and heat in monthly

calculations is similar to use of average temperature on hospital for establishment of the diagnosis to the patient.

The power plant functions for receiving profit. Therefore, at implementation of the plan for delivery of the electric power and heat, in reports not "beautiful" data on fuel usage as now occurs, and true have to be provided. It will allow to see and fix problems at power plant, and, therefore, considerably to increase profit.

Calculation of indicators for an excessive consumption of fuel has to be made only on each half-hour interval. All replaceable, daily, decade, monthly, quarter and annual TEI (Technical and Economic Indicators) have to turn out from half-hour values by an accumulation method (summation, averaging or weighing), but not calculation for formulas. Monthly calculations are not right since for calculation of standard TEI nonlinear power characteristics of the equipment are used.

Let's consider two options of calculation of the actual and standard TEI of power plants: the 1st option - calculations of TEI are carried out on the entire periods; the 2nd option - calculations of TEI are carried out only on the half-hour periods, and on all others (change, days, month, quarter, year) TEI turn out accumulation.

The first option which exists at all power plants, the most inexact now. And, the bigger period (month, quarter, year), the big inaccuracy of calculation of TEI. It is connected also with nonlinear characteristics of standard schedules.

The second option corresponds to the most exact calculation as dynamic process at power plants on consumption of fuel and on electricity generation and heat goes continuously. And therefore, in each interval of time a certain amount of fuel is spent for production of certain quantities of the electric power and heat, as well as there are quite certain standards of

fuel consumption according to external conditions which constantly change: day and night, winter and summer, air temperature, etc.

The main economic indicator at power plants is the excessive consumption of fuel as it defines a reserve of increase in profitability. But inaccuracy of definition of this indicator which practically is always exposed to adjustment for the purpose of providing the acceptable reporting data for the management of the Generation companies, actually deprives of them this reserve, and, therefore, and prospects on increase in profit.

Let's review an unpretentious example of calculation of arithmetic-mean value by both options, using the following nonlinear schedule from sequences (x, y): (0, 0.4), (1, 0.5), (2, 1), (3, 2), (4, 4).
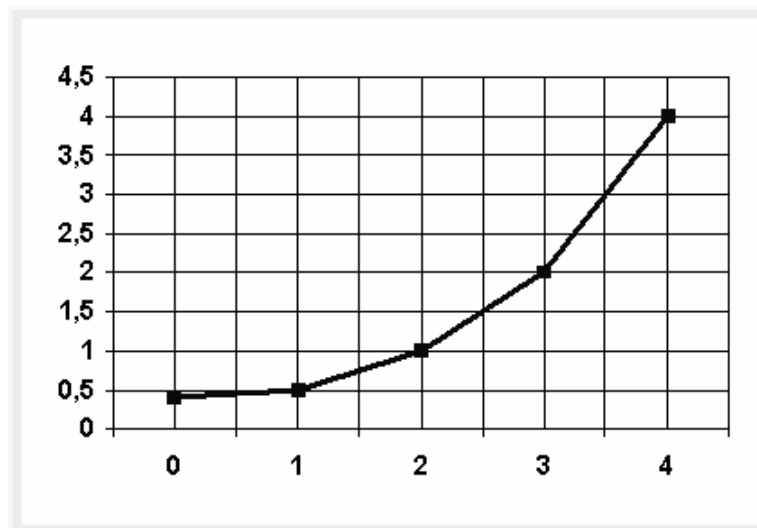
By the first option: $Y = f((1+4)/2) = f(2.5) = 1.5$ (incorrect)
By the second option: $Y = (f(1)+f(4))/2 = (0.5+4)/2 = 2.25$ (true)

Total the divergence makes: $(2.25-1.5)/2.25*100 = 33\%$, it speaks about a huge error of calculation of an excessive consumption of fuel by the first option, existing now at all power plants.

And now present that in calculations of an excessive consumption of fuel hundreds of nonlinear standard schedules are used. And besides, at a

number of power plants not only for calculation of standard TEI standard schedules are used, but also for calculation of the actual TEI they are used. TEI miscalculations everywhere exist when it is told about need of increase in profitability of power plants. And it is necessary to begin, first of all, with reliable calculations of TEI. But at power plants instead of looking for and eliminating etiologies, use anesthetizing (adjustment of results of calculation).

We proved by method "by contradiction" a constant big excessive consumption of fuel at all power plants contrary to their satisfactory monthly reporting data.

The method "by contradiction" consists in the following. The complete list of various situations with the consecutive proof of their insolvency is considered. That option for which this proof does not exist, and is true.

We give the following possible situations of an excessive consumption of fuel for all month with half-hour calculations of indicators, and these calculations within a month about one and a half thousand.

All sizes (them 1440) on an excessive consumption of fuel have values:
1) all close to zero;
2) all positive;
3) all negative;
4) part positive and part the negative. Negative - mean economy of fuel.

The technological situation in power plant constantly changes: day and night, air temperature, etc., and an excessive consumption of fuel pays off and consequently, depends on one hundred indicators. The monthly excessive consumption of fuel actually consists of half-hour

overexpenditures. Zero value of an excessive consumption of fuel means that its actual expense corresponds to the standard.

Power plants always show small value of economy or an excessive consumption of fuel in monthly reports on fuel usage. For adjustment of this result there is a certain number of side play parameters by means of which it is easily possible to provide any final figures.

Time we have monthly values about zero, then first of all it is necessary to consider options 1 and 4. Option 1 in general is improbable because blindly it is impossible to trace and establish hundreds of parameters equal to standard values within a month. Option 4 approximately of the same order - cannot be compensated absolutely accurately all overexpenditures the extent of economy in their total equal values.

Option 3 it in general a fantasy when during a time to speak about quality of standards in general. There is option 2. Thus, the excessive consumption of fuel in a month turns out summation of overexpenditures for each half an hour, and it is very big reserve of energy efficiency which power plants involuntarily hide.

For increase in profitability of power plant it is impossible to work without half-hour reliable calculations of an excessive consumption of fuel and without quick search of the best technological decisions.

From the Generation companies the active objection follows: we supposedly have no excessive consumption of fuel and cannot be, and opposite, at all power plants constantly there is its economy. On state district power station and combined heat and power plant strictly watch it.

But let's not hurry and quietly we will understand everything. As speak in the courtroom: let's operate only with the facts.

Fact 1. The excessive consumption of fuel pays off as a difference between the actual fuel consumption and a standard (settlement) cost: dB = Vfakt - Vnorm. Standard TEI, including and a standard cost of fuel, at all power plants pay off only at the end of the month on the saved-up daily indicators. These standard indicators are traditionally necessary for filling of the monthly model 15506-1. Therefore: the excessive consumption of fuel per every day, not to mention a half-hour overexpenditure, simply is not known.

Fact 2. Standard monthly TEI pay off on the saved-up daily indicators. The standard cost of fuel is defined as the sum of fuel consumption on power generation and is warm:

Vnorm = (E*be + Q*bq)/1000, where:

E, Q - the actual development (holiday) of the electric power and heat,

be, bq - specific fuel consumption on development (holiday) of the electric power and heat. For calculation of specific fuel consumption hundreds of curvilinear standard schedules are used.

Proceeding from an axiom for the curvilinear schedule:

$$F\left(\sum_{i=1}^{n}(xi)/n\right) \neq \sum_{i=1}^{n}\left(F(xi)\right)/n$$

it is possible to draw a conclusion that procedure (accumulation, and then calculation) is not equal to procedure (calculations, and then accumulation).

Naturally, calculation when calculations of indicators on small intervals of time, and then their accumulation are perfromed will be correct. Thus, calculation which exists now: daily accumulation and monthly

calculation - in a root it is not right. Therefore: receiving standard TEI on the daily (monthly) period by method of integration (accumulation) from half-hour (minute) calculations will be absolutely correct.

Fact 3. From the theory of integral calculus it is known that the less time intervals, the are more exact result of dynamic process. It means that calculations of data for days and their accumulation in a month will not yield the correct result. Therefore: calculations of TEI and excessive consumption of fuel have to be made only on half-hour (minute) intervals.

Fact 4. The standard schedules used in monthly calculations of TEI traditionally turned out by a polinomization method from natural measurements. But polynoms bring distortion of real technological process. From here perhaps also there is an imaginary economy of fuel. Therefore: half-hour calculations of TEI have to use natural standard schedules without polynoms.

Fact 5. Operation personnel, implementing the plan of delivery of the electric power and heat, can know the current fuel consumption. And here the flowing size of an excessive consumption of fuel to it is not known. Thus, regarding an excessive consumption of fuel it operates power plant blindly, i.e. it is obviously inefficient. Therefore: on BCP of power plant there has to be a monitoring of the current excessive consumption of fuel.

Fact 6. The excessive consumption of fuel allowed for half an hour further only will collect. No imaginary economy (according to experts) compensates further this overexpenditure. Therefore: if there is at calculations (without adjustment) an economy of fuel, it means that there are flaws at algorithms of calculation of TEI, including also polynoms of standard schedules.

Fact 7. Operation personnel, operating blindly power plant, cannot provide a zero excessive consumption of fuel. For example, here before us

the daily schedule of an excessive consumption of fuel. If in the afternoon half-hour overexpenditures are close to zero, at night they read off scale for 30%. Therefore: only the human factor is guilty of a big excessive consumption of fuel at power plant.

Перерасход топлива

Fact 8. For determination of the size of an excessive consumption of fuel also we will use daily data with half-hour calculations. So, for example, the excessive consumption of fuel in days is equal 200 t.u.t. at the actual fuel consumption 2474 t.u.t. Therefore: the excessive consumption of fuel corresponds 8%. If for calculation to use natural standard schedules, this overexpenditure will be even more. And it makes a reserve of increase of energy efficiency of power plant.

Fact 9. The solution of a question of optimization of resources without realization is higher than the listed moments is simply the myth. All methods of optimization, including and HOP-optimization, are based on standard schedules. But their correctness as it was stated above, questionable. Simple approximate researches of use of optimization gave economy of fuel of only 2-3%. Therefore: only sharing of the current control of an excessive consumption of fuel in real time with optimization of resources will give really advantageous effect.

Conclusion: In modern calculations of TEI at all power plants the most negative sides above the listed facts are collected. Under these conditions to speak about increase of energy efficiency of thermal power

plants in general it is problematic. The exit consists only in introduction of no-cost technology of economy of fuel on Smart-MES system.

The fact of dismissal of the whole change because of the allowed big excessive consumption of fuel on a thermal power plant is known. It is equivalent when fined blind because of transition by it are expensive in not put place. So supply with sight operation personnel on BCP, then it is not necessary to draw deplorable conclusions on the monthly fact of an excessive consumption of fuel. Much more simply and the cheapest way, operating power plant every minute and everyone half an hour, to control its current overexpenditure.

At the end of the month at each power plant fill the model of 15506-1 of 121 indicators and send it to the management of the Generation company. But why in the Generation company to know efficiency of each copper and other hundreds of indicators in a section of coppers and turbines. And here really important indicator: the excessive consumption of the main fuel - in the model 15506-1 is not present. So a mistake it or intention because of ignorance how precisely to consider it? Really, when the technique on the model 15506-1 was formed, the Smart-MES system was not. But now is!

And at all power plants continue, as well as 10 years ago, not to operate, and blindly to fix an uncontrollable excessive consumption of fuel.

Unique feature of thermal power plants is that, developing the electric power and heat power, they have no opportunity to accumulate them. Thus, the electric power and heat have to be used right there for commercial purposes, i.e. in the market of the electric power and heat the Generation company has to receive money for them. In other words, the volume of power generation and heat completely is defined by their demand in the market.

Once again I will repeat that the electric power and heat it is necessary to develop exactly so much, for money, and differently it simply losses of in vain spent fuel how many will be paid. Thus, a certain quantity of the electric power and heat is strictly regulated by a certain amount of fuel according to concrete technology of the most this power plant.

But the paradox of all modern thermal power plants is just that it that the most strict regulations on them and do not exist. The operational personnel, operating power plant for implementation of the schedule of delivery of the electric power and heat, does not know in real time at all, how many it is necessary to spend fuels in each concrete time span (minute, half an hour). It works blindly, being guided only by the ability and experience.

Tragicly would be to rely on the driver who operates the express without the controlling devices, relying only on rails. All perfectly understand it, and it does not even raise questions and doubts.

But why do not understand the Generation companies what to operate difficult dynamic production what the thermal power plant is, without operating control behind an excessive consumption of fuel it is also tragicly dangerous both in financial sense, and in ecological.

By electricity generation and heat fuel is spent, but nobody knows, how many it is used in each interval of time - much or a little. If the lower bound naturally is established by necessary number of delivery of the electric power and heat, the upper bound is controlled by nothing, and has to be controlled by standards. Thus, this technology provokes to an uncontrolled excessive consumption of fuel, and, therefore, and to thriftless and unnecessary financial losses which are commensurated by the sizes with the profit of the Generation company.

Dynamics of an excessive consumption of fuel increases at the transitional moments - day and night. It is necessary to trace accurately and quickly an operational excessive consumption of fuel at increase and decrease of deliveries of the electric power and heat. In the present time it occurs "in the dark" power plants. And if to tell more roughly, the gloom and denseness regarding realization of automation of calculations of TEI and an excessive consumption of fuel in modern market conditions on thermal power plants is similar to actions of the arrogant easy rider, undertaken to facet diamonds.

There is an exact science - mathematics which elementary shows that the area of difficult dynamic process in time regarding an excessive consumption of fuel has to be defined only by integral calculus and in any way differently if of course losses matter. And the interval of time spans of calculation is less, the accuracy is higher. In the present time for calculation of an excessive consumption of fuel the area of a rectangle with a time interval in one month is stupidly used simply, i.e. dynamics of process is not considered at all, and it is the most gross and ignorant blunder.

Very strange picture turns out that all the time the branch science was mistaken and persistently continues to be mistaken regarding the correct calculation of an excessive consumption of fuel thermal power plants. And their most important delusion is that a thermal power plant, having huge percent of wear of the equipment, is capable to have in separate time intervals economy of fuel, i.e. by some miracle, working without operational current information, to spend fuels less, than it is regulated by standards. But same simply nonsense.

And times of it in principle cannot be, even more horrific and gloomy image turns out. Every minute at power plant there is an excessive consumption of fuel, but nobody sees it, and, therefore, something cannot simply be undertaken for its decrease. The total excessive consumption of

fuel in a month, naturally, consists of minute overexpenditures. Also it turns out as a result such what turn out, i.e. completely depends on will of god.

And this dull loss of a half of profit by the Generation company in the form of an uncontrolled huge excessive consumption of fuel became possible only thanks to incorrect initial messages of branch science. But whether it is time to think again. The after all excessively burned fuel in Russia would be enough in addition for 30 new thermal power plants or it is easily possible to reduce the volume of harmful emissions in the atmosphere which there correspond 30% at night by 10%.

Practically on all thermal power plants there are automated systems of the commercial accounting of the electric power (ASKUE), is warm (ASKUT) and fuels, for example: gas (ASKUG). And where automated system of the commercial accounting of an excessive consumption of fuel (ASKUPT)? Here ideologists of power industry for market conditions did not finish something. After all if the size of a 10% annual excessive consumption of fuel is in terms of money equal to profit of the Generation company, it not jokes that for average power plant makes 300 million rubles, and, therefore, for the medium-sized Generation company - 4 billion rubles. And it everything dull losses!!!

Naturally, it is necessary to prove still this fact of a 10% excessive consumption of fuel, but it a bit later, and now we will consider ASKUPT essence, i.e. the commercial accounting of an excessive consumption of fuel. If systems of ASKUE, ASKUT, ASKUG are independent and independent systems, ASKUPT is completely dependent on these systems since it is based on them.

ASKUPT in the form of Smart-MES system uses data of ASKUE, ASKUT, ASKUG and perfroms constant calculations of the actual and

standard TEI of which the current excessive consumption of fuel is result. All analytics is given monitoring for BCP for possibility of expeditious detection of the fact of this excessive consumption of fuel and for timely intervention in production. Thus, ASKUPT provides operative technological feedback for increase in energy efficiency of power plants.

Well, and now about the fact of a 10% excessive consumption of fuel. The uncontrollable excessive consumption of fuel as it was already told above, is present every minute so that the monthly calculations existing now show even its ephemeral economy, this overexpenditure does not disappear anywhere, and it simply is noticeably reflected in profit of the Generation company. But why then this excessive consumption of fuel is adjusted to zero in monthly calculations, and obviously it is not shown in reports? And it is simple because in such look it is necessary to nobody. After all this excessive consumption of fuel belongs to the last period and with it already to make nothing. And adjust because it is necessary to receive specific fuel consumption on the electric power and heat according to the actual consumption of this fuel for planning of its purchases the next month. Thus, in plans put this excessive consumption of fuel in advance.

Let's not speak, it is ethic or unethical to shift mismanagement of power plants regarding existence of a huge excessive consumption of fuel which impudently enters tariffs, on consumers of the electric power and heat since everything is regulated by the market. But, seemingly, that the market that in general is not present the present at which surely there has to be a deficiency of consumers that for it there was a tariff fight. And time is taken for any price, to speak about the real market of the electric power and heat so far rather early.

Not to reveal a huge actual and uncontrollable excessive consumption of fuel the existing incorrect monthly calculations of TEI in the methodical plan. The Smart-MES system is for this purpose necessary.

With its help we on an average thermal power plant revealed the following explainable regularities.

1) The excessive consumption of fuel is present on each half-hour interval, therefore, it is and on each minute interval. This results from the fact that the operational personnel operates power plant blindly regarding an excessive consumption of fuel. And really it is not possible to operate according to standards, without having the current information on an excessive consumption of fuel.

2) An excessive consumption of fuel at night much more, than in the day. So, at night the overexpenditure reaches 30%. It is clear that at night loading of power plant falls. And at the power plant excess fuel, even is uncontrolledly in vain burned at its general reduction at this time.

Now on all thermal power plants there was a paradoxical picture. If power generation and heat is strictly regulated by schedules of their delivery, here fuel costs of their development are absolutely regulated by nothing, and have to be regulated by standards in real time. And you still want to tell, what if there is no restriction on fuel expenses, there is no its overexpenditure? Here that also consists in it the main nonsense of market understanding of work of power plant.

Only the automated system of the commercial accounting of an excessive consumption of fuel (ASKUPT) is capable to bring an order with uncontrolled and with irresponsible squandering of constantly rising in price fuel.

But the generation companies will have to understand eventually that if they now have profit at a rate of P, and could actually without expenses have very easily and 2*P. But for this purpose the personnel of power plant has to have a motivation.

Motivation - process of creation of system of the conditions influencing behavior of the person, sending it to the party, necessary for the organization, regulating its intensity, borders inducing to show integrity, persistence, diligence in achievement of the objectives. The compulsory motivation is based on application of the power and threat of deterioration of satisfaction of needs of the worker in case of non-performance of relevant requirements by it.

Here the statement on the Internet concerning economy of fuel: "In Soviet period for economy of fuel awards relied the personnel of power supply systems. Now such incentive is not present and incentive to save fuel with such growth of tariffs - too is not present. By the way, the salary of ordinary employees of stations does not depend on growth of tariffs and practically does not grow, stopped at the level of 2008."

Thus, nobody saves fuel on power plants, and does not even think to save. Fuel is spent so much, how many it is spent for implementation of the schedule of delivery of the electric power and heat. The motivation of economy of fuel at the operational personnel completely is absent. But the most interesting in that, as the Generation companies that have nothing to reproach employees of power plant since according to monthly reporting data at all power plants of an overexpenditure fuels are not present, and there is even its economy, i.e. power plants on paper work completely according to standards, though with use of methods of adjustment.

Here to such unfavourable conclusions the Generation companies tired out themselves, persistently ignoring need of realization of an operating control behind an excessive consumption of fuel in real time.

But if is absolutely not present at the operational personnel of motivation and opportunity to save fuel why to create for it this motivation forcibly? That is from the worker it is possible to ask only when the

feasible task is accurately set. And in the present time in all Generation companies the task for power plants looks the next comic way: It is necessary to provide implementation of the schedule of delivery of the electric power and heat and whenever possible to try to spend less for it very expensive fuel. Here such nonsense is present at all power plants!

But same it is very easy, quickly and it is actually without expenses possible to correct. And in this case the compulsory motivation of economy of fuel will sound as follows: Here for you on monitoring the current excessive consumption of fuel is removed every minute, and it is necessary that it was always zero. That's all!!! Well, and time the task is accurately set, it undoubtedly will be surely executed. And then 10% of an excessive consumption of fuel will disappear, and on each power plant there will be an additional annual profit in 300 million rubles which small part can be directed on awarding of especially zealous employees.

Compulsoriness of this motivation still is and that the excessive consumption of fuel already becomes address, but not as now absolutely faceless. At any time it is possible to analyse who and when allowed a huge excessive consumption of fuel, and to find out the reason: either it is negligence, or it is the technological miscalculation which immediately should be eliminated.

Thus, the compulsory motivation of economy of fuel of thermal power plants can give by a simple and no-cost method sharp jump of increase in energy efficiency of power plants and return on production Wednesday emulative spirit for bigger percent of economy of fuel for the benefit of the Generation companies.

Opportunity in real time to control settlement indicators which can be emergency harbingers at power plant becomes another the positive accompanying moment of this compulsory motivation. It is simple to

control thousands of indications of temperatures and pressure of people is not able. For this purpose the description of their ties among themselves in total with discrete parameters and with continuous control in real time, and also with issue of preliminary preventions to the operational personnel is necessary.

In this case management of the Generation companies can sleep peacefully since the true excessive consumption of fuel completely is absent, people with enthusiasm work, achieving Stakhanov results, possible malfunctions are constantly controlled, without bringing power plant to accident.

In this case the compulsory motivation of economy of fuel solves at once two major problems: social and innovative. The social problem is based on equitable distribution of an award according to result of economy of fuel. Innovative modernization provides in real time interrelation of the lower level of the automated data collection with the top level of acceptance strategic business of decisions.

The innovative Model of functioning of a thermal power plant simply looks as follows:

Fuel Fact $\rightarrow$ Steam $\rightarrow$ Electric power $\rightarrow$ Fuel Norm

In this case, innovation is that in real time no more than half an hour pays off with an interval standard fuel which is compared to the actual. It never was, and now is not present on one thermal power plant in Russia. The actual fuel consumption on each time interval is always more or is equal to a standard cost. The problem of functioning of this Innovative Model consists in that on each time interval the actual fuel consumption was close to the standard. In this case the most optimum option of receiving the maximum profit by the Generation companies due to big economy of fuel will be reached.

Here the solution of a question of optimization of loading of the equipment expands possibilities of this Model only a few, but in any way it does not substitute. Now on thermal power plants the steady following situation is observed. In the afternoon at the maximum loading of the equipment the actual fuel consumption is close to standard, and at night at the lowered loading the actual expense exceeds standard more than for 30%. Thus, at night power efficiency of power plants sharply falls.

Say to us that it occurs because of 10 ton coppers. But there is a simple concept - management with an advancing, i.e. considering a big lag effect of power coppers, it is necessary to reduce their loading slightly earlier, than the need for the electric power will fall.

The mathematical Model of power plant represents full calculations of the actual and standard technical and economic indicators (TEI) which expeditious half-hour calculations of a standard cost of fuel are result. In this case management of power plant looks as follows. At the end of each half an hour the actual fuel consumption and standard is known. Further management at excess of the actual expense over the standard is directed on elimination of this divergence at implementation of the schedule of delivery of the electric power and heat. But in the same way this analysis can be made and with an interval one minute. Then the delay of the operating influence will be minimum.

All this is realized quickly by easily adaptive and high-speed Smart-MES system which contains a big set of analytical, optimizing and intelligent convenient tools.

17. Experience of introduction of Smart-MES system for power plants

The Smart-MES system appeared as MES System for automation of production management of power plant in 2007. Before, this System represented the Tool adjusted program Complex under the name "Technological Office". In 2008 understanding of ideology of creation of big Systems on the basis of the newest innovative development of "MES-T2 2007", now "MES-T2 2020" came. This ideology represents very simple structure from various set of technological tasks in the form of blocks: INPUT block, block CALCULATION, block REPORT. Thus, naturally, each task entering any block has the data input in a screen form, calculation of indicators and the printing of reports which are created automatically.

The Smart-MES system has no fixed set of technological tasks at all. All necessary tasks individually for each power plant are written in the form of text Projects, and all system is automatically adjusted at compilation of these Projects. For acceleration of initial creation of Projects, in the Complex there is a tool means "the Founder of System" allowing to generate for concrete power plant a basic configuration from calculations actual and standard TEI (Technical and Economic Indicators) by power industry techniques. At compilation of Projects DLL programs for high-speed calculation are also automatically created.

The main objective providing successful introduction of the Complex consists in optimum distribution of all technological tasks of three blocks: INPUT, CALCULATION, REPORT. Thus by all means there will be some redundancy of number of indicators. But such splitting daily allowance and monthly tasks allows to automate information processing as much as

possible. In this case the INPUT block is responsible for import of data from other Systems of the lower level and for manual data input. The block CALCULATION represents one general DLL program which is automatically generated from all Projects intended for calculations. The block the REPORT carries out analytical functions and submits general reports in various cuts.

In what there was our delusion at the previous stages at adaptation of the TD (Technological Department) Complex at power plants? We simply by inexperience followed the tastes of technologists of power plants who provided us the existing calculations in MS Excel and would wish to see result in a similar look. But, if technologists communicated with MS Excel ten years and to it stuck, realization of the same calculations on other system was perceived by them simply in bayonets. I.e. figuratively speaking instead of the system had one entrance and one exit, at us it turned out that the system has a set of entrances and a set of exits in which the User simply got confused. It would seem, everything is so automated and everything is so simple, at operation the system turned out unsuccessfully configured.

Therefore the order of realization was changed according to above the described blocks.

We developed the set of provisions which have to be recorded in the Contract for introduction of the PTO (it is production technical department) program Complex for calculation of the actual and standard TEI of power plant on Smart-MES system.

Still, because of our inexperience and indispensable desire and in everything to please all, introduction of the PTO Complex was carried out at default in the Contract below the given positions that led to vague results and continuous approaches "on a rake" at our benevolent initiatives. Huge

opportunities of Smart-MES for realization of problems of management of power plant in which it is possible to drown simply with an indispensable growth of appetite of PTO of power plant without financial security, remain indifferently from the Generation companies.

Obligatory clauses of the contract:

1. The customer has to promote the Developer of system in every possible way.

We heard the following statements of employees of PTO: We will not do it, there is no time, are occupied, it are not obliged for a low wage.

2. The customer provides all necessary and reliable information with real calculations for a control example at delivery of the PTO Complex.

We met a situation of check of results of calculation on the current data, but not when materials are given out 8 months ago. During this time the customer so changed initial calculations in MS Excel what it is not necessary to speak about correctness of calculations by new system.

3. Training of the personnel of PTO is made from the first stage: Delivery and inspection.

We were puzzled with unwillingness to be trained in work on the Complex before its final delivery. Well, and at the end on it already there is no time.

4. Standard schedules of power characteristics of the equipment have to be reliable.

We saw a huge divergence (to 30%) the approved standard schedules with the current results on MS Excel macroes.

5. Entrance signals of the automated means of data collection have to be reliable.

We got acquainted with the automated means of data collection at which the current values differ from nominal to 4 times.

6. The performer does not bear responsibility for the incomplete and provided by power plant doubtful information.

We realized the helplessness at the requirement power plant of truthful calculations at incorrect entrance information. We offered and realized use of correction coefficients, perfectly realizing absurd of a situation.

7. At the first stage the concrete list of tasks and reports without possibility of further additions at the subsequent stages is formed.

We felt irrepressible appetite when understanding unlimited opportunities of System at scanty financing.

Concrete money and, generally the very insufficient is allocated for introduction of the Program. For concrete money also concrete work, very concrete, but not in general has to be performed, it seems - everything has to be realized. And it "everything" has to be accurately stipulated at the beginning of the conclusion of the Contract for introduction of the PTO Complex.

Justification of total absence of differences of introduction of Smart-MES system for realization of calculations of TEI at any power plants is given below: Combined heat and power plant, state district power station, hydroelectric power station and NPP.

Power generation and heat at power plants belongs to the sphere of process productions, and the program Smart-MES Complex was initially developed for automation of calculations of TEI of process productions, but with a bias on power industry. And such bias is caused by that the CEO of Firm InformSystem Chernov V. F. more than 10 years directly worked at nuclear power plants in Russia and abroad.

Process production is characterized by that each indicator of each equipment pays off on the unique formula, and such indicators some thousands. This type of tasks cardinally differs from tasks like "Warehouse", "Accounts department", etc. as have no concept about performance of the same operations over a set of records, i.e. in general there is no selection.

And now we will consider structure of various power plants with the uniform principle of work, i.e. impact of motive energy on the turbine. A source of this motive energy is: for combined heat and power plant and state district power station - the power boiler, for the NPP - the nuclear reactor, for hydroelectric power station - the river. That is, from the point of view of the principle of "A black box" - there is an entrance and there is an exit and that occurs in this box for calculation of all-station TEI not so important. Naturally, calculation of TEI of the nuclear reactor differs from calculation of TEI of a power copper, but also calculations for each type of turbines differ, as well as calculations of coppers depend on fuel type. Besides, the equipment combination at all power plants differs.

From everything is higher told, it is obvious that it is impossible to create uniform mathematical model at least for any circle of power plants. All power plants, and their more than 300, have unique technology both, therefore, the and only the mathematical model of calculation of TEI of the working equipment.

When the Generation companies get under charm of major companies with existence at them allegedly ready calculations for coppers and turbines, it is similar to when the sculptor for the creation chooses in advance prepared hands and feet. The creative System has to be molded from a piece of pliable clay.

As the talented sculptor and high-quality clay in this case the Smart-MES system without any rigidly sewn up calculations for coppers and turbines, but with convenient and flexible tools on fast designing of any unique systems for any power plant is represented. And here the structure and the sizes do not play value.

Let's shortly remind about above to the described realization. All tasks are formulated in simple META language in the form of text Projects, and all system is automatically adjusted from these Projects.

By us it is defined the new duration and structure of stages of introduction of Smart-MES system for realization of calculations of TEI PTO (PTO Complex) at power plants with the general them lasting 12 months.

To below to the provided simple scheme of introduction of the PTO Complex we went long enough, undergoing, naturally, failures. Having developed plug-and-play tool means, we believed that power plants from first minutes of introduction will actively take in it part. But power plants did not want to appreciate our powerful innovations and remained to them indifferent that us could not but nonplus.

It would seem, all of us do correctly, considering that I in nuclear power worked a long time. Created the convenient and simple tool for the technologist of PTO, but something we constantly miss, probably, simply usual human factor.

So, the Contract provides introduction of the PTO Complex in the 4th stage with below the given dlitelnost of separate stages:

1) Delivery (purchase) of Smart-MES system and inspection (collection of information on the existing tasks, standard schedules and import of data) - 1 month;

2) Adaptation of the PTO program Complex in the form of separate tasks (designing of tasks and an institution with digitization of standard schedules) - 5 months;

3) Coordination of all problems of PTO in system with import of data and delivery of the PTO Complex in trial operation - 3 months;

4) Trial operation of the PTO Complex by the personnel of power plant, preparation of magazines, control of analytics and delivery of system in commercial operation - 3 months.

Adaptation of the PTO Complex to conditions of concrete power plant is understood as writing of the Complex of Projects with calculations of the actual and standard TEI and an institution of power characteristics of the equipment in a graphic view with their subsequent digitization. All system of calculations is automatically adjusted at compilation of these Projects.

Coordination of tasks in system provides functioning of the PTO Complex with one entrance. It means that the automated and manual data input is realized in one ARM, forming thereby a uniform basis of basic data. Everything other ARM is simply information are joined with these basic data.

Trial long operation will allow PTO personnel to master full-scale work on a program Complex, every day solving TEI problems on real data.

Call me somehow from power plant and ask a strange question: How much is your Program? I ask a counter question: You need the Program which only counts TEI or Smart-MES system which in addition to calculation of TEI, promotes receiving profit in 300 million rubles? My counter question obviously nonplused my interlocutor. He probably did not expect to hear that the program still can make profit. But if Smart-MES

easily allows to get such huge profit, the question of the price of introduction of this system is in general the tenth importance.

There was at us one case from nearby Tyumen CHPP-1. To us they suggested to realize calculations of TEI for 1,5 million rubles supposedly do not allocate any more. By that moment we needed to work MES System in addition earlier we did not face PGU. We also agreed for this scanty sum how to be told, because of sports interest, considering that combined heat and power plant nearby. Naturally, we easily realized half-hour calculations of the actual and standard TEI. But here an ill luck, on the termination of the contract it became clear that the standard schedules provided to us differ from the macroes put at them in MS Excel. And entrance signals from means of data collection of ASKUE and ASKUT do not correspond to nominal rates at all. On our offer, in common to lick everything into shape, i.e. to correct flaws of the combined heat and power plant, under the additional agreement, did not find understanding. Here also everything hung in mid-air, without having reached real full-scale introduction.

Thus, since 2010 we do not participate in realization simply empty and to nobody the necessary monthly calculations of TEI any more. We introduce only no-cost technology of economy of fuel of power plants on Smart-MES system, naturally, through expeditious calculations of TEI. We also do not participate in competitions any more on automation of calculations of TEI if power plants all the same, what program is introduced. We cooperate only with those who wishes to introduce our innovative Smart-MES system and by all means wishes to get from it the greatest possible additional profit.

Though there is a proverb that for free and vinegar is sweet, however the Generation companies for free wish to receive not so sour vinegar, namely sweet high-quality "candy" for automation of calculations of TEI of power plants. Why this most free "candy" prospers in power industry?

Everything is elementary simple. Financing allocates the Management to which no business is present before this automation of calculations of TEI as in the existing its look now it does not bring any benefit, not to mention profit. And the requirement that it was "candy", employees of PTO and IT who have to finance well no relation and influence put forward.

Here some bright examples from our unfavourable practice.

SVERDLOVSK combined heat and power plant. Somehow we decided to do much good for local combined heat and power plant and to introduce the PTO Complex on MES System absolutely free of charge. In the management of combined heat and power plant of opponents was not. Well, we quickly also realized calculations of standard TEI for their calculations in MS Excel, got standard schedules and began to verify results of calculation. They do not go. Made additional possibility of calculation for their polynoms, instead of real standard schedules. Calculations went. Specified by it that their polynoms do not correspond to the last standard schedules.

But here us unexpected attack of the conductress of group of the accounting of PTO which declared to us was taken aback that with us stops all contacts because of the low wage. We run to the head of the technical engineering department with this news. On what he only also declared to us that supposedly she will have done with the youthful follies soon, and we should wait. But we needed to do nothing how to retire back home. And, naturally, further this mission we stopped in general. Our rush was not estimated … Here if the combined heat and power plant paid 10 million rubles, the management surely would show political will for a successful completion of all this work.

TYUMEN CHPP-1. (already spoke, but I will repeat) From PTO of combined heat and power plant we were prevailed upon to be realized

automation of calculations of TEI for 1,5 million rubles at the operating minimum price in 5 million rubles. We agreed, but about it further strongly regretted since combined heat and power plant to which we made incredible concessions and with soul got down to business, simply pull us threats, allegedly we did not finish something there.

But we not easy realized all calculations of the actual and standard TEI according to the contract and the provided materials, and free of charge carried out at the request of combined heat and power plant the most powerful modernization of all software for half-hour calculations of TEI in real time with operational analytics that at us it was not earlier realized. But instead of gratitude were hit "on ears" because of the compelled suspension of works on fault of the combined heat and power plant.

After completion of work by us clear that the standard schedules provided to us do not correspond to macroes in Excel, and entrance signals do not correspond to nominal rates. On our offer to continue collaboration for correction of defects of the combined heat and power plant in the additional agreement refusal followed. Well, then we had to take the leave simply …

KASHIRA GRES. We won tender "Programming of the specifications and technical documentation on fuel usage of JSC Kashira GRES - 4 in 2006" for the sum of 200 thousand rubles as the only participant, it is seen such gawks for such scanty sum except us was not. We, naturally, realized everything according to the contract on our program complex in time. But after all it is only standard TEI.

We went to the director of state district power station and everything explained that in order that the system worked, are in addition necessary: calculation of the actual TEI and costs of own needs and losses of the electric power and heat that under the contract is not provided at all and the

separate contract is for this purpose necessary. He assured us that it will easily solve.

But to our surprise competition on introduction of our program Complex "Technological Office" was again announced. We again won it, but his statement for a long time got stuck in OGK which was not approved.

SUMMARY. Thus, we ceased to push luck and for cheap contracts, naturally more, we do not undertake. We also completely ceased to participate in competitions on automation of calculations of TEI since understood that power plants do not need progress. Understood also that still Generation companies and do not need additional annual profit in 300 million rubles from each power plant.

In the world there are only two financial criterion functions on automation of calculations of TEI. The first - to pay less for this automation. The second - to get more profits on this automation. And these two functions are not compatible. In the present time in all Generation companies the first criterion function which is regulated by the held competitions prospers. Thus, the Generation companies, deciding on modernization of calculations of TEI, even do not think of profit. There is it or because of ignorance of opportunities of software, or because of elementary disbelief that automation of calculations of TEI is capable to bring also huge profit.

Let's review examples of these two options taking into account their cost and profit.

The first option which is used now: C1 cost = 3 million rubles, profit of P1 = 0 million rubles.

The second option on Smart-MES: C2 cost = 10 million rubles, profit of P2 = 300 million rubles.

In the first option the look falls at once on cost, and at zero profit there is a natural desire that this cost was even less. In the second option the look falls already on profit, and in this case the size of cost is not so important.

Let's give indexes of profitability of these options.

First option: J1 = P1/C1 - 1 = 0/3 - 1 =-1.

Second option: J2 = P2/C2 - 1 = 300/10 - 1 = 29.

But from theoretical economy it is known that at J > 1 innovative project is considered economically effective. Otherwise (<1) the project is inefficient J. In the conditions of rigid deficiency of means the preference has to be given to those innovative solutions for which the profitability index is highest.

Here so arrived … It appears according to science the Generation companies implement the most inefficient projects on automation of calculations of TEI, and they ignore highly profitable project on Smart-MES system so far. But it is interesting why? In this case only two versions of the answer are possible: the first - they very much want to feed the pocket firm, the second - they do not trust in possible profit.

As for profit, so it is easy to check it. It is enough to execute four half-hour calculations of an excessive consumption of fuel: in the winter and in the summer, day and night. Average value will turn out around 10%. But time this excessive consumption of fuel completely depends on lack of the current control of it, therefore, influence of this uncontrollable human factor by means of Smart-MES system and compulsory motivation can be minimized. Here to you and profit. But there are still problems with the

prevention of emergencies which are easily realized on this system, and it is already additional huge profit.

Let's say it is possible to object that with a size of profit of 300 million rubles we got excited a little. And what the profit in 30 million rubles it is not enough that the project was quite profitable, after all it only economy of fuel in 1%? And if to take for payback of the project in one year, the cost of profitable introduction of Smart-MES can quite reach the same 30 million rubles.

It is important to understand to the Generation companies that introduction of automation of calculations of TEI of an old sample under a new mask it is already simple over ignorance, especially in market conditions when anybody to a step does not make without benefit for himself. And meanwhile the Generation companies continue to lean on realization of this profitless technology in vain persistently.

This system we developed a long time since looked for the best innovative solution. And here it is found is Smart-MES "MES-T2 2020". All previous versions which we tested at power plants, were only landmark. It agrees that they spoiled our image since they actually not everywhere work and not through our fault. But without costs probably it is impossible. After all in our understanding any stage was the best realization in due time. So, before reorganization of power industry we the next versions under the names "Technological Office" and "MES-T2 2007" it is skilled introduced according to the reduced adaptation scheme at the following power plants: CHPP Chepetsk Mechanical Plant, Kola NPP, Sosnogorsky combined heat and power plant, Perm CHPP-9, Angarsk CHPP-9, Biysk combined heat and power plant, Vorkuta CHPP-2, Kashira GRES, Seaside state district power station, Sverdlovsk combined heat and power plant, Norilsk CHPP-1, Norilsk CHPP-2, Norilsk CHPP-3, Yelabuga combined heat and power plant, Tyumen CHPP-1.

Very shortly about technology of economy of fuel. We noticed a huge excessive consumption of fuel at introduction of MES System on the Tyumen CHPP-1. And, in the afternoon it is close to zero, and in the night reads off scale for 30%. But nobody knows about it since at one power plant is not present half-hour (especially is not present constant) calculations of an excessive consumption of fuel (the actual expense - a standard cost). But if the operational personnel on BCP in real time constantly sees the current analytics on an excessive consumption of fuel, it has a compulsory motivation to look for ways on reduction of this overexpenditure.

Clever people from above with aplomb declared that our feasibility report (Feasibility study) is advertizing. But there can be it partly and so. After all the feasibility report is formed before development for investment justification, and our feasibility report on energy saving technology is made after development of MES System at the expense of own resources. Therefore this fact it is seen people from above and it is unclear. And we invested in development of the Smart-MES system, best in the world, for process productions more than 100 million rubles. But we offer not system, but technology which without our system not simply to realize. Here we see completely the fault, time we cannot convince management of the Generation companies of prospects of our Smart-MES.

For these years we took the following steps to parts of introduction and promoting of our development:

1. Honest participation in competitions. We a few years ago participated in 4 competitions and at the level of power plants them won. But results of competition for some reason without explanation were not approved by the management of the Generation companies. Explanation here the very simple: Proceeding from corporate interests, the winner in advance probably was planned, but he in honest competition did not

manage to win. We drew a natural conclusion: Innovations are necessary to nobody. Therefore we simply stopped participating in this farce further.

2. Reduction of price of introduction to 0. We made a failure attempt of free introduction of MES System. We quickly agreed with management of Sverdlovsk combined heat and power plant and realized calculations of standard TEI. But need any time of double calculations in their MS Excel and on the new program for check of its working capacity did not suit the conductress of group of the accounting of PTO since she demanded increase in a salary. But, as the head of the technical engineering department declared, money is not present, and thus everything successfully decayed. Therefore we drew a natural conclusion that the size of the price does not influence a choice of our MES System.

3. Providing data on transcendental profitability. All theses of management of the Generation companies about need for introduction of innovations their good profitability are lie. We at introduction of MES System declared profitability of 18750% which by 1000 times exceeds the accepted canons of an index of good profitability. But we do not observe turn of demands for introduction. Therefore conclusion: in the existing market conditions in power industry other economic laws work.

4. Guaranteeing multi-billion profit. We on figures proved that at introduction of our technology of economy of fuel by means of MES System the additional profit for each Generation company will make 5 - 20 billion rubles. But when investors are extremely not happy with the sizes of the profit, management of the Generation companies works absolutely formally and cynically, without noticing energy saving technologies since the Russian mentality of management the stranger and the accurately distinguishes pockets. Therefore at increase the specific IT manager of anything actually will not get the general profit of the Generation company. But time it is the only expert in this sphere, he manages the IT policy

favorable only to himself. Conclusion: the profit is not necessary to IT management.

5. We proclaimed the following option based on the ultrahigh price of introduction of Smart-MES system at which "kickback" makes 95%. Let's assume that the price of development and deployment of Smart-MES system for realization of expeditious calculations of TEP for the purpose of economy of fuel over 10% is discussed of 100 million rubles. Here our participation - 5 million rubles and services of the representative of the Generation company - 95 million rubles. And if to discuss the price of 200 million rubles, services of this representative will pull on 190 million rubles. And in the presence in the Generation company of 10 power plants this representative of the Generation company personally itself will have already about 2 billion rubles which are easy for mastering in one year.

Thus, all possible options in our fatherland were ineffectual.

In what in this case difference from others the similar existing schemes of introduction of new calculations of TEI? The basic and the most important difference is that now any calculation of TEI at one power plant in one Generation company does not make obvious profit. And introduction of technology of economy of fuel on Smart-MES is capable to provide profit of 300 million rubles. Therefore even if to increase introduction cost to 300 million rubles, the enormous index of profitability, equal 100% that is not present at introduction of any serious innovation will turn out.

Our MES System is tested at ten power plants. On our site (www.Inform-System.ru) there is a demonstration version on which it is easily possible to look at work of MES System and algorithms of calculation of the actual and standard TEI for the following power plants: Vorkuta CHPP-2 of "KES", Yelabuga CHPP Tatenergo, Kashira GRES of

"Interrao", Kola NPP "Rosenergoatom", Perm CHPP-9 of "KES", Seaside DGK GRES, Sverdlovsk CHPP KES, Sosnogorsky CHPP KES, Norilsk CHPP-1 of "NTEK", Angarsk CHPP-9 of "Ikrutskenergo", CHPP Biyskenergo, Tyumen CHPP-1 "Fortum".

After a gallop from our site of the DEMO of Constructor2012.exe and after installation by means of start of AutoRun.exe and a choice "PTO Complex" the System will be installed in local option with BDE. Start "the Designer ARMOV", and the program with algorithms for the Tyumen CHPP-1 is ready to calculations. Cause the Half-hour Analytics point in the Analytics Menu and will see information on an excessive consumption of fuel. In the Control Menu the Manager of Systems point will choose power plant and install System on this power plant.

Thus, at introduction of Smart-MES system of negative results in principle cannot be by us since I have an extensive experience of introduction of Systems on nuclear power plants. I introduced Systems on 7 power units in due time: on the Beloyarsk NPP, the 2nd on the Ignalina NPP and the 4th on Dukovana's NPP in the Czech Republic. Without these Systems in principle it is not possible to start these power units and the more so their operation is not possible.

After introduction of Smart-MES at such innovative scope of economy of fuel and reduction for 30% of harmful emissions in the atmosphere for certain there will be no release from investors at this Generation company.

On the Internet many experts introduce the "seditious" idea that the Russian corporations strongly were disappointed in large program systems, especially foreign since they did not equal hopes for improvement of operational performance at total absence of profitability. But at socialism all knew that any computer program of the top level if makes any profit,

only very much indirectly. Why under capitalism it suddenly has to make profit? After all the mentality of management to software did not change at all. It was and remains ignorant, and because of it and scornful.

However when large western IT brands offer the systems and promise transcendental profit on introduction, to them already unconditionally trust since at them these systems functions worldwide. But after a year of operation are convinced that under our conditions it is simply thrown out money.

Actually everything is very simple. Any program has to have ability quickly to react to change of a production context, especially in our developing economy. But it is not present in one western program since at them this economy is already developed, and, therefore, and it is stable. That's it this adaptability is also put in our Smart-MES system which self-organization will instantly consider all new realities in algorithms of calculation. So, it long will not become outdated, and will long make profit.

The question costs about risk and about mentality. At once I will tell that to overpersuade someone it is unpromising since only the mentality is a brake of introduction of innovations, and all talk on risks of introduction of IT is no more than reflection of this mentality.

Further it is compelled to repeat a little in the context of mentality.

A few years ago we suggested to introduce absolutely free of charge our system at Sverdlovsk CHPP JSC TGC-9 IES-Holding at us in Yekaterinburg, i.e. completely without financial, and, therefore, without the main risk. All of us realized calculations of TEP and pointed to their mistakes in calculations. But instead of gratitude received "slap in the face" from the head of group of the account which refused to contact further to us without increase to it salaries. The head of the technical engineering

department on it only helplessly made a helpless gesture. We naturally retired, and the irreplaceable uchyotchitsa returned to favourite MS Excel.

A little earlier at the request of PTO of the Tyumen CHPP-1 of JSC Fortum we undertook realization of calculations of TEP at the price by 10 times smaller today's, i.e. at the minimum financial risk. Everything was realized by us with automatic data input from their systems of ASKUE and the PCS and with half-hour calculations of the actual and standard TEI.

But when time came to hand over system, it became clear that the power characteristics of the equipment provided to us incorrect, and entrance signals widly of the mark. By means of program "crutches" we proved that from our party everything is right. But as a result the system was thrown since the combined heat and power plant refused to continue work through the additional agreement for elimination station a mistake.

And even earlier we performed work for Kashira GRES of JSC INTER RAO-electrogeneration (was in OGK-1 earlier) on programming of the specifications and technical documentation on fuel usage on our system. When everything was handed over successfully, it became clear that the girl whom we trained, on a floor of year from PTO transferred to KTTs for training. Result: system - in a recycle bin.

But the most incredible thing was in JSC NTEK (Norilsk). They at the beginning of development of system bought complexes for 3 combined heat and power plants for the purpose of independent adaptation. In some years again invited us for realization of ten tasks, according to TZ. We were sure that at them all calculations of TEI are already realized, and we should walk only a hand of the master and to help them to adjust additional tasks. But on arrival to our horror it appeared that they have in general all on zero. And time at us is no more than one month of two for 3 combined heat and power plants which are scattered territorially. We had to involve

the generator of projects of the actual and standard TEI in system and on their basis to involve additional tasks.

For high-quality debugging of all complex we addressed with the offer on the additional agreement. On what bureaucratic refusal and the requirement about need received everything to execute in accuracy according to TZ. Well, unless it is possible so with experts? We needed only to answer: is. We took it literally and threw out 90% of calculations from system, made protocols for each combined heat and power plant with the list of all tasks of TZ where at delivery collected signatures under each task of the protocol. On a selection committee all of us perfectly showed and showed all protocols from all combined heat and power plants, but added that with calculations of 3-that (power) they have no full system.

We faced similar mentality at two tens combined heat and power plants, state district power station and the NPP.

Especially I was struck by contact with my native Beloyarsk NPP where I was on the staff the 4th years at construction and start of BN-600 and where I together with TsNIIKA introduced the URANIUM complex. The head of the technical engineering department invited us to show them our system that we also made with their SQL server on Oracle. It seems everything was pleasant, and applicants of others are not present. But during competitive selection we were not passed due to the lack of the admission, but the Tomsk polytechnical university passed, seemingly, in general without experience with power plants regarding calculations of TEI.

But on the Kola NPP we also conducted work without admission and to us and on the NPP in general presence is not necessary since I on them worked 10 years and all secrets I know. After the Beloyarsk NPP I

introduced systems on the Ignalina NPP (2 power units) and on Dukovana's NPP (The Czech Republic, 4 power units) at the request of Minpribor.

And where you here from everything are higher than the told saw risks? They simply are not present, and there is a usual mentality of indifference. And not to allow at introduction of Smart-MES of the similar relation, we accepted the following rules.

We carry out all introductions only without intermediaries. Before signing of the contract we demand to provide us all production materials by calculations of TEI with control examples, including entrance signals, and with the instruction in the contract of guarantees of their fidelity. We carry out only half-hour (constant) calculations of the actual and standard TEI with monitoring of analytics on an excessive consumption of fuel on BCP for compulsory motivation of the operational personnel on economy of this fuel. All replaceable, daily and monthly TEI for reports are formed only by accumulation of half-hour TEI. After signing of the contract by us up to end operation more any materials us are not accepted. And all additions and changes are made out only through additional agreements.

Here before me the fresh Specification on purchase of services in earlier introduced program complex (PC) for PTO of Verhnetagilskaya GRES of JSC INTER RAO-Elektrogeneration in 2014. In TZ in the general requirements it is told: item 2.1. Ensuring steady functioning of the introduced software, maintenance of relevance of data and reduction of the algorithms of its work to changeable service conditions caused by need of users, or change and expansion of interfaces of interaction with system. Term of 10 months.

In other words earlier introduced software does not possess the present possibilities, and, therefore, it will not possess them further. These purchases can be infinite since life constantly changes.

And here we see that systems without possibility of expeditious adaptation to new conditions without developer everywhere take root. If the personal computer require 10 months, Smart-MES will require some minutes without additional financing since all this will be easily made by technologists in real time.

18. Slightly in more detail about Smart-MES system

This chapter is a certain superficial confirmation of existence of Smart-MES system since its absence completely depreciates everything above the told. For more mistrustful on our site (www.Inform-System.ru) there is a full-scale demonstration DEMO2020 version.

So, the Smart-MES system can act both as MES System, and as CASE System, and in a role GPS System. Actually it simply unites them.

Smart-MES as MES System

MES (Manufacturing Execution System) - Manufacturing execution system. MES is the dynamic information system operating effective execution of production operations collects and uses data for optimization of productions. Using exact current data, MES regulates, initiates and records work of the enterprise for a measure of emergence of events. MES provides the most important information on a production activity of the enterprise.

Existence of a large number of the equipment, interrelations and the hidden rules forces to create production model which is the cornerstone of MES of system and is its integral part. The product of the class MES has to have, at least, the modules realizing logic in technological language.

Due to fast reaction to the occurring events and applications of mathematical methods of compensation of deviations from the production schedule, MES of system allow to optimize production and to make it more profitable.

MES is a link between the ERP systems focused on financial and economic activities and an operational production activity of the enterprise at the level of shop, a site or the production line.

In our case of MES it is intended not for discrete, and for process productions.

Smart-MES as CASE System

CASE (Computer Aided Software Engineering) - The automated Programming. Systems of intellectual design and improvement of control systems are intended for use of the so-called CASE technologies focused on the automated development of design decisions on creation and improvement of systems of organizational management.

The CASE technology represents set of methodologies and tools of analysts, developers and programmers, the automated system intended for automation of processes of design and maintenance on all its life cycle.

Smart-MES as GPS System

GPS (General Problem Solver) - Universal solver of tasks. GPS - Expert system and system of support of decision-making. The GPS system is intended for realization of technologies of information support of processes of adoption of administrative decisions on the basis of application of economic-mathematical modeling and the principles of artificial intelligence.

The expert system allows to realize modeling of reasonings of experts. With its help the manager can study logic of course of processes, diagnose their current and make optimum decisions.

Designer ARM

The designer ARM (the automated workplace) plays the central role in the program Smart-MES Complex as is a basis of any ARM including carrying out calculations. The Designer's body ARM switched on all tools for control and the additional functions applied in further work ARM.

In other words, the Designer ARM is at the same time used:

• for control (Adaptation) of tasks where adjusting information of concrete ARM is formed;

• for start on performance and works of tasks with use of this adjusting information.

On the basis of the Designer ARM all internal Utilities and ARMs of technological calculations are executed.

Functional structure of the Designer ARM

The designer ARM in use carries out the following main functions:

• technological calculations (minute, half-hour, hour, replaceable, daily, monthly);

• storage of basic and settlement data in special information databases (Minute, Half an hour, Hours, Days, Month);

• formation of output printing forms;

• accumulation of daily information and formation of monthly data;

• submission of any list of indicators in the form of graphic information in days on hours, in a month on days or in a year on months;

• input of the schedules containing characteristics of the equipment and obtaining values of parameter from the schedule both in the autonomous mode, and in the course of performance settlement ARM;

• maintaining reference information.

The main technical solutions in the Designer ARM

1. The designer ARM is a ready-made product, but demanding preparation for operation at the concrete enterprise, i.e. settings. Formation of adjusting information is made in some stages by means of the software which are a part of the software product. After carrying out control the software product is represented by the Designer ARM, carrying out collecting and processing of the technical and economic indicators having the general information base and working with use and under control of adjusting information, i.e. serviceable.

2. Owing to heterogeneity of processing equipment and types of the main technological scheme of power plants and other enterprises in the delivered software product control for model of power plant (enterprise) is realized.

3. Owing to heterogeneity of algorithms of tasks the control of each ARM including both external control ARM, and control of algorithms of calculation (an institution of formulas) is provided in the delivered software product.

4. Control of algorithm of calculation (an institution of formulas of calculation and their editing) is made by means of special tool means - the Designer of Projects. Access to the Designer of Projects is provided in the Designer ARM, i.e. the user, having started a concrete automated workplace, always has access to calculation formulas for their input, viewing and editing.

5. In the software product standardization of calculations, i.e. standard computing algorithms is realized. Treat them: calculation of enthalpies of steam and water with use of the equations of a thermodynamic condition of water and water vapor, calculation of the average values, etc.

6. In a program complex it is switched on some tools for control of printing forms allowing the user most to create and adjust printing forms of various complexity in a form and, meeting his requirements, according to the contents.

7. Possibility of change of adjusting information does any settlement automated workplace correct and suitable, i.e. the user, having loaded an automated workplace can add to an automated workplace new functions, modify calculation formulas, insert new indicators into a form or remove unnecessary indicators, change appearance of a screen form, change printing forms, etc.

8. The complex included possibility of use of graphic dependences (schedules) containing characteristics of the equipment of power plant (enterprise). And, there is a possibility of obtaining value from the schedule as in the course of performance of a task (for example "Calculation of standard TEI"), and it is autonomous.

9. The complex included possibility of archiving of the current information, and saving of information, both in current, and in long-term archive is provided. The similar organization of creation of copies guarantees fast recovery of data in case of their destruction (for example: in the course of hardware failure).

10. ARM which are carrying out calculations are conditionally divided on a temporary sign - daily and monthly. And for daily allowance ARM opportunity to carry out calculations or only for days, or for changes and days, or in minutes, half an hour and hours is provided. The choice of the temporary mode of calculations remains for the user and is defined by it in the course of control of a complex.

11. In a complex possibility of storage of information for the previous reporting period (for daily allowance ARM such period is month,

for monthly ARM - year) is included. The user can return to calculations of the previous reporting period for the purpose of viewing or editing at any moment.

12. Each automated workplace of a complex included a set of additional service functions and the built-in tools which create the convenient interface allowing to make work with the computer is simpler and more effective.

13. The user can at desire add the offered list of settlement tasks by creation new ARM, make their control and include in a complex.

14. For realization of calculations the User uses simple META-language of writing of Projects of tasks.

Designer of Projects

The designer of Projects is a new word in creation of difficult program systems in a simple text view with automatic control of all program complex.

Now it is not obligatory for user to know all knowledge of the manual ARM control (the Automated Workplace).

It is not necessary for the user:

1. to prepare the Menu of tasks,

2. to create screen and calculation tables,

3. to get the list of the equipment (Global control) and the list of Indicators on these equipment (Reference book "Indicators"),

4. to establish accumulation signs for Indicators,

5. to adjust screen forms and reports for the press,

6. to establish connection of data of a screen form with Indicators of information databases Days or Month,

7. to bring formulas of calculation of Indicators to calculation tables in language of the technologist or in the programmer's language,

8. to conduct debugging of calculations in the Processor of calculations.

The user needs to know only one what exactly he needs to calculate, and then the desire to state very simple rules of writing of calculations, in text form with use, with use of special symbols. All other tuning will be performed by the Designer of Projects at the Compilation stage.

Indicators and Objects

Indicators and Objects are the basic concepts at creation of the Project and the most difficult in understanding.

Indicators are that belongs to Object. The object is characterized by the Indicators. Indicators comprehensively define Object.

The object is the larger size, than Indicators. One Object possesses a set of various indicators.

Indicators of this Object participate in calculations. Or we count value of the Indicator of concrete Object.

The equipment or technological site of power plant which are characterized by operational performance can act as Objects.

As Object it is also possible to present a column of a screen form which has the Indicators - lines of a screen form.

Each Object is characterized by the number. For the equipment it is station number. For a screen form it is serial number of a column.

In the designer ARM the Indicator and Object represent a whole and register in the following look: Р [О№],

where: П - The indicator, represents a set of digital, Russian and English symbols except for special symbols and a gap.

About - Object no more than 10 Russian and English symbols.

No - digital number of Object.

Total length of writing - P[ONo] has to be no more than 20 symbols.

The indicator and Object, further simply the Indicator, in the Complex can be presented in several forms. In the reference book "Indicators" the Indicator is a key field and has an appearance - P[O] since the name and other characteristics of the Indicator are identical to all numbers of this Object. In the information databases "Days" and "Month" the Indicator is also a key field, but has a full appearance - P[ONo].

In the Indicator Project has some types of representation. A usual type of representation of the Indicator - the Item. For designation of the Indicator with direct addressing from the Project the look - P?No. For designation of the Indicator from information database the general view - P{O}, or with direct addressing - P{ONo}.

For representation of Indicators in screen forms and reports with use of the lower and top indexes, and the Greek alphabet a certain set of rules of writing of the Indicator is used.

Project of technological tasks

The project is formed language, in text form on META, according to the following scheme:

Heading of the screen table:
<Name of a task> Name закладки&Имя of the screen table

Line of the screen table:

Object! Indicator @ Unit Izmir. # Hiring. indicator { D, H$ calculation Formula

or

Object! Indicator @ Unit Izmir. # Hiring. indicator { D, N/min, max$ calculation Formula

or

Object! Indicator @ Unit Izmir. # Hiring. indicator { D, N | No $ calculation Formula

or

Object! Indicator @ Unit Izmir. # Hiring. indicator { D, N/min, max | No $ calculation Formula

where:

D - Number of decimal signs of rounding at result. If D it is not specified, the automatic choice of accuracy of rounding - 4 significant figures is used.

N - accumulation Parameter (by turns, daily, monthly and journal). If the N is not specified, accumulation is not made. For summation of N = 1. For calculation of arithmetic-mean value of N = 2. For calculation of the average value of N = the Indicator on which weighing is made.

min - the Minimum value of an indicator for color indication.

max - the Maximum value of an indicator for color indication.

No. - an arrangement Order in analytical schedules.

In a screen form will be presented: An indicator, the Name of the Indicator, the Unit of measure and Values of an indicator on Objects.

The formula of calculation is written to one line with use of the following rules:

GrafY […], GrafX […], GrafYM […] - the Standard schedule;

GrafY [No., X, Z] - Definition of Y on X and Z or GrafY [No., X, 0] - Definition of Y on X.

GrafX [No. 1, GrafY [No. 2, X, Z], Z] - the Nomogram from two schedules No. 1 and No. 2. At first Y on X and Z one schedules is defined, then is determined by X by the found Y and Z other schedules.

GrafYM [No.1, No.2,…, No.n, X, Z, P, P1, P2,…, Pn] - The multiple schedule, i.e. definition of Y on X and Z, and on family of schedules No.1, No.2,…, characterized by parameter P with the fixed P1,P2 values, …

E [...] - the Sum on group of Objects of Indicators or works of Indicators;

P […,…] - the Average value on group of Objects. On the second place the indicator on which weighing is made is specified.

%1,2:. %3-6:.... - - - A choice from Object No.

Arithmetic signs → + - */; Degree ^;

Brackets - [];

Operators separate →;

Direct addressing: P? No., where P - an indicator, No. - number of object.

Example with a choice on Objects and with the appeal to schedules:

%3,4,5,8: Null;

%6: dnt (res) i = 0.0085 * dtresi \t * Nti * 1e-3;

G ~ oi\in = GrafY [0, Nt, Gt];

dnti\rt = GrafY [0,G ~ oi\in, Qti];

dnti\r2 = GrafY [0,P2, Gtsnd\vkh];

dnti = [dnti\rt + dnti\r2] * 1.021 + dnt (res) i;

A = Nti - dnti;

GrafY [0, a, G ~ ti];

At first sight it looks very subtly. But actually for designing of the Project templates are used.

19. Bye SQL - Hi Self-organization of IT Systems!

SQL - (structured query language - language of the structured inquiries) - the formal nonprocedural programming language applied to creation, modification and a data control in any relational database operated by the corresponding database management system (DMS).

SQL is convenient for banking systems, for accounting systems, for warehouse systems, i.e. there where the principles of selection and the same operations over a set of records are necessary.

SQL does not suit for calculation of TEI of the enterprises with continuous nature of production at all: power industry and other branches where each indicator pays off on the unique algorithm.

It is possible to object of course, as in our Smart-MES system also there is a SQL application. But I the opponent to use it though his control is carried out completely automatically. The matter is that IT specialists of the Customer are ground under the western software and SQL of a database. And when we had no SQL application, our System was simply swept aside without desire to penetrate into an essence of innovations. Therefore we also developed it.

I suggest to consider two configurations of Client-Server with 3-unit structure. The first option with SQL the Oracle database, and a database, the second without SQL, but with usual BDE (Borland Database Engine - a cursor of the Borland databases). In both options the application server on DLL (Dynamic Link Library - library of dynamic configuration) which in both cases is generated automatically is used.

As a result we receive that the option without SQL of a database carries out calculation much quicker, than with SQL a database. It and is clear since work with SQL goes through interpretation, and with BDE we

have direct access to a database. Then the question arises: And why it is necessary this SQL a database? What we have a prize, I use it? Absolutely any.

After all if all technologies connected with SQL are in stagnation long ago, self-organization of IT Systems already stays on a steep slope. So far our self-organizing Smart-MES System exists in proud loneliness. But surely there will be followers and self-organization of IT Systems will gain steam.

What is the self-organizing IT System? Same not concrete realization, but this other outlook, is other philosophy of creation of Big Systems, it is a quantum leap from stagnation to progress. Yes, this philosophy is not clear yet and is not obvious. Yes, so far all are indifferent to this philosophy. Well, anyhow, when all years the western IT paradigm dominated everywhere. Another also cannot be.

In this case also the fact of successful introduction of Smart-MES System on concrete production, for example, at power plant since its great opportunities will be used in scanty percent will not help.

There has to be a general reconsideration in the field of IT for the industry. Here the Management of Russia has to be connected, but the same IT specialists conceiving of the western IT categories sat down there.

So far the exit consists only in the broadest promoting of Self-organization of IT System. Benefits from which use it would seem are obvious, but the lag effect of global thinking interferes with it.

Therefore it is necessary to be simply optimists, the after all self-organizing System is already created, it exists, it is Smart-MES "MES-T2 2020".

When the path is blazed, following much more simply.

20. Conclusion

Dmitry Medvedev at a meeting of the government paid 25.10.2013 special attention to a question of development of information technologies. The chairman of the cabinet is sure that depends on the correct vector of development of IT technologies the future of Russia and its competitiveness in the international market.

It is considered to be that our market of information technologies lags behind from foreign approximately for about five years. But also concerning import software scientists also draw a conclusion that now practically there are no program systems with properties of self-organization. Thus, creation of the program self-organizing systems is a matter of the distant future and, perhaps, will mark itself the third revolution in the PO area.

But it appears that the third revolution in the PO area already came true, and it was marked by development in the Ekaterinburg Firm InformSystem of the innovative self-organizing Smart-MES "MES-T2 2020" system. This system already now with huge success can be used for realization of technology of economy of fuel at any combined heat and power plants and state district power station and for implementation of absolutely accident-free operation of the NPP.

Thus, regarding creation of the self-organizing production MES Systems Russia not simply does not lag behind foreign technologies, and considerably of them is ahead. But this fact is not realized in the Generation companies yet. And could use it for increase in the profit and the image. After all that Smart-MES can, far cannot any other system, in Russia, abroad.

We are invited often to participate in competitions and are interested about our positive introduction. But we do not participate in fictitious competitions any more and we do not open our last experience yet. We will cooperate only with those who will rely on us who will want to get additional profit on economy of fuel who together with us will be interested in success.

Essence of technology of the creation self-organizing software

This technology represents multistage automatic transformation of actually book engineering text of a formulation of a technological task to an executive program code with simultaneous formation of all elements of big System from a database to reports. In the course of this transformation easily readable text of a task will be transformed at first to interpreter language for debugging of tasks, and then to Pascal with optimization of a code and, at last, to the DLL program. And all this occurs for some seconds without participation of the person.

In other words the System is trained in concrete skills for some seconds. Thus the volume of the put knowledge is limited to nothing. All this knowledge it is possible to remove and load the new instantly. Such dynamism gives huge opportunities to scientists in creation of artificial intelligence for realization of heuristic functions. This technology can be used in any industry, including space and military. After all new technological problems are solved quickly and without programming.

In this case the computer platform has no value. The Smart-MES system developed by us or MES System (Manufacturing Execution System - a control system of productions) is only a prototype and the proof of feasibility of the principles of self-organization of Systems.

Shortly about Smart-MES "MES-T2 2020" system

The system externally consists of the executive module and a set of text descriptions. The executive module regarding technological functionality is absolutely empty, i.e. for performance of concrete useful work it should be trained. Process of training happens through the Text.

Thus, in the philosophical plan our System in a starting position consists of two logical elements: basis (EXE) and superstructure (Text). The basis represents a program skeleton or essence of information System. The superstructure is a set of the algorithms in engineering language generated by basis and which are actively influencing it. In other words, EXE prepares the Text, in this Text it forms databases and templates of screen forms and reports, and also DLL for calculations, and, using this environment, EXE functions for performance of production tasks.

Here the executive module is completely a prerogative of the developer and to concrete technological object has no relation. The text on the contrary is a prerogative of the user who in engineering language formulates technological tasks for concrete object. It reaches independent continuous development of system and technological functionality, as provides the highest level of reliability and efficiency of Smart-MES.

This System provides the language of a formulation of technological tasks which is most approached to reality in a tabular look. Our System constantly develops by release of new versions. Therefore, for acquisition of new system functionality it is rather simple to Users to replace EXE. The text allows Users to increase technological functionality without restrictions.

Thus, Smart-MES allows creation of the big working System from pressing of one button. In this case at compilation of the Text all components are automatically created: databases, reference books, the

menu, screen forms, reports, DLL for calculation and the Application server.

Smart-MES includes the 4th components: Designer ARM, SQL application, Web application and Graphic Editor. Entering of any changes into algorithms of calculation is carried out in 5 seconds. 20000 technical and economic indicators pay off less than one second.

Main advantages of Smart-MES system:

1) The description of a set of technological tasks on simple human META language in a text editor in the form of the Project;

2) Automatic control of all system from the text description, i.e. automatic creation of the Conductor of tasks, Information databases, Screen tables and Reports;

3) Automatic creation of high-speed settlement DLL programs;

4) Realization of optimizing tasks: Simplex method, HOP-method (Characteristic Relative gain) and method of Dynamic programming;

5) An automatic application tuning the Client/Server with any SQL Server (MS SQL Server, Oracle, Interbase, MySQL, Informix and dr) on 3-unit structure;

6) The automatic Web applications control for calculations on the Internet.

Realization of Smart-MES System is possible in 2 modifications: Client-Server with 3-unit structure without SQL Server and Client-Server with 3-unit structure with the SQL Server. the 3-unit structure means that in both cases there is an application server of the general calculations of TEI which is executed on the DLL program formed automatically. Client-Server with the SQL Server works with any SQL Server (Firebird, MS SQL-Server, Oracle, Interbase, MySQL, PostgreSQL, etc.). The structure

of Client-Server with the SQL Server is automatically adjusted on settings of the Complex.

The main innovations in Smart-MES are: adaptability and speed. Easy adaptation of Smart-MES to any enterprise is reached by that all technological tasks are made out in the form of text Projects on very simple META language, and all making Smart-MES systems (Databases, Screen Forms, Reports, Settlement DLL Programs) are automatically generated at compilation of these Projects. The highest speed of performance of the general calculations, i.e. at once all tasks of the actual and standard TEI, is provided with one DLL program which is automatically generated with optimization of a code. In other words, it is simply impossible to execute calculation quicker.

Important competitive advantage is also that Smart-MES is the only domestic self-organizing system intended for power industry and other any process productions. Its difference from foreign systems is that it easily adaptable and high-speed.

Practical use of the self-organizing Smart-MES

The intellectual self-organizing Smart-MES system, using the schedule of delivery of the electric power and heat, by means of the knowledge base will unmistakably prompt the best decisions in concrete production situations, and monitoring of the current excessive consumption of fuel in real time will promote its economy. And it already the highest level of the organization of management of power plant.

In multiagentny system one and too software Smart-MES it can be used as agents for coppers, for turbines, for holiday of heat and for holiday of the electric power, for the accounting of losses and for the accounting of own needs, for chemical water treatment, for station actual TEI and for standard TEI. These agents can control a condition of pipelines and wear of

the equipment, and many other things. All agents are among themselves connected by protocols of a constant exchange. All agents work in parallel in real time and all in a complex are aimed for achievement of the maximum profit on electricity generation and heat.

The serious perception us the created Theory of accidents and possibility of the self-organizing Smart-MES system according to the prevention of emergencies will allow to look absolutely in a new way at these destructive processes and to keep billions of rubles which are necessary for creative activity of society. According to this Theory some incorrect indignations which appear spontaneously during various periods are necessary for accident. And if we in due time liquidate the first indignation, we will rescue the NPP from accident.

In modern calculations of TEI at all power plants the most negative sides are collected. Under these conditions to speak about increase of energy efficiency of thermal power plants in general it is problematic. The exit consists only in introduction of no-cost technology of economy of fuel on the self-organizing Smart-MES system. Calculation of indicators for an excessive consumption of fuel has to be made only on each half-hour interval. All replaceable, daily, decade, monthly, quarter and annual TEI (Technical and Economic Indicators) have to turn out from half-hour values by an accumulation method (summation, averaging or weighing), but not calculation for formulas. The monthly calculations of TEI existing everywhere are not right since for calculation of standard TEI nonlinear power characteristics of the equipment are used.

The Innovative Self-organizing Smart-MES System can easily solve all these and many other problems.

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