RISK MANAGEMENT OF ENERGY MARKET

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ABSTRACT: In the paper the authors define the risk classes and model the holistic risk of the design and operation of power objectives. The calculation models of the technological and managerial risks are presented at the level of the central power objectives and the computer assisted power networks. The risks of the competitive energy market are presented and commented starting from the Energy and Risk World Congress Documents, insisting upon the consequences and anticipatory vulnerabilities, insisting upon building up the quality of the human factor. We build information diagrams for the prevention and diminishing the risks in the neurogenexpert conception. At the end we perfomi a calculus of the efficiency of the neurogenoexpert systems destined to the anticipatory removal of the vulnerabilities in the conceptual structure and of the funcțional one in the systems sensitive to the risk of the competitive energy market.

Key words: holistic risk, economic financial risk, competitive market risk, total risk modeled in operational researches

1. HOLISTIC RISK MODELS BUILT IN THE CONCEPTION OF OPERAȚIONAL RESEARCHES

a) Total risks

$$r_t = \left[C_{tacp}^{cop} - C_{tacr}^{cop}\right] \gtrless 1 \qquad (1)$$

$r_t > 1$ profit indicator
$r_t < 1$ risk indicator
$r_t = 1$ balance indicator

b) Costs modelled in operational research

$$C_{tacp}^{cop} = \sum_{i=1}^{dv} (1+r_a)^{-i} \left[C_{DD} + C_{CC} + C_{PR} + C_{RU} + + C_{EF} + C_{DC} + c_p R_t\right]_p$$
$$C_{tacr}^{cop} = \sum_{i=1}^{DV} (1+r_a)^{-i} \left[C_{DD} + C_{CC} + C_{PR} + C_{RU}^{(2)} + + C_{EF} + C_{DC} + c_p R_t\right]_r \qquad (2)$$

Where: = programmed value efforts (p) and realized respective (r), r_a = rate of return of total costs developed during the lifetime of power objectives (lt).

c) risks according to operational research domains

$$r_{DD} = \left[C_{DDp} - C_{DDr}\right] \gtrless 1 \quad r_{RU} = \left[C_{RUp} - C_{RUr}\right] \gtrless 1$$
$$r_{CC} = \left[C_{CCp} - C_{CCr}\right] \gtrless 1 \quad r_{EF} = \left[C_{EFp} - C_{EFr}\right] \gtrless 1 \qquad (3)$$
$$r_{PR} = \left[C_{PRp} - C_{PRr}\right] \gtrless 1 \quad r_{DC} = \left[C_{DCp} - C_{DCr}\right] \gtrless 1$$

The operational research costs are calculated with mathematical models of the form:

$$C_{DD} = \left[C_{\substack{search}}^{information} + C_{\substack{prevention\\costs}}^{vulnerability} + C_{\substack{power\\objective\\development}}^{\substack{resource\\monitoring\\costs\ on}}\right];$$
$$C_{CC} = \left[C_{\substack{acquisition\\costs}}^{\substack{material\\resource}} + C_{\substack{reduction\\costs}}^{\substack{unproductive\\time}} + C_{\substack{study\\costs}}^{\substack{competitive\\market}}\right];$$
$$C_{PR} = \left[C_{\substack{renewal\\costs}}^{\substack{technological\\struture}} + C_{costs}^{economic} + C_{\substack{and\ power\\process\ costs}}^{\substack{product\\quality}}\right]; \qquad (4)$$
$$C_{EF} = \left[C_{\substack{formation\\costs}}^{fund} + C_{\substack{design\\costs}}^{price} + C_{\substack{strategy\\costs}}^{birotic}\right];$$
$$C_{DC} = \left[C_{\substack{making\\costs}}^{decision} + C_{\substack{training\\costs}}^{manager} + C_{\substack{building\\costs}}^{\substack{enterprise\\culture}}\right].$$

Where: the costs (C) are calculated for the following activities: sustainable development (C_{SD}); commercial activities (C_{CC}); production activities (C_{PR}); human resources activities (C_{HR}); developing the funds of the power unit (design, operation, development) (C_{EF}) in the profitable economic and financial conception, activity of holistic decision-communication (C_{DC}).

2. COMPLEX VULNERABILITIES MODELS

a) Modeling risks at the level of the power processes of equipment design and operation

$$r_{vc} = p_{av} C_{consequences}^{failure} = \left[C_{stocks}^{excessive} + C_{works}^{refuse} + C_{revision}^{project} + + C_{\substack{computer\\systems}}^{old} + C_{invoices}^{erroneous} + C_{funds}^{penaltyies} + C_{\substack{study\\revision}}^{quality} + + C_{inquiries}^{consumer} + C_{\substack{resource\\nonquality}}^{human} + C_{\substack{state\\restoring}}^{operating}\right] \qquad (5)$$

These costs for covering the causes leading to vulnerabilities have to be provided in the budget if no preventive measures are taken to remove them at the workplace (design, operation, energy market). The failure probability p_{av} = 1/365 if there are no statistical data laid down from the observation of the vulnerabilities unfolding.

The value risk at the level of each project and at the level of the operation of the equipment from a technological and managerial point of view is determined as follows:

$$r_{val} = p_{enl} \cdot E_{nl} + i_{sp} P_{av} = \left[200 p_{ei} t_{av} P_{av} + i_{sp} P_{av}\right] \quad P_{av} = 0{,}25\ P_i \tag{6}$$

p_{av} = 0,25 P_i

p_{av} > p reserved power leads to catastrophe situations

p_{av} = p installet power leads to chaos

t_{av} = specific investment (6)

E_{nl} = power not delivered to the competitive market

The risk of operating the overcharge or undercharged equipment is quantified by the funds necessary to purchase more fuel. The charging of power units at the economic power (P = P) benefits from minimum power consumptions without affecting the quality of power and of power processes.

The synthetic indicators of the quality of the electric and thermal power including those of the power processes with human resources destined to monitoring the economic state with minimum vulnerabilities can be surveyed on the table below:

Electric power	Thermal power	Energy proceses	Human resources
$f^{frequency}$ = constant	$T^{thermal}_{fluid\ temperature}$ = ct	$\eta^{increasing}_{aggregate\ efficiency}$ increasing	Figh emphatic level
$U^{voltage}$ = constant	$p^{thermal}_{fluid\ pressure}$ = ct	$c^{specific}_{fuel\ consumption}$ = minimum	Ergonomic level tied with productivity
$R^{power}_{risk} = 0$	$r^{thermal}_{power\ risk}$ = 0	$e^{information}_{entropy}$ = minimum	Creation level on project innovation ensuring profit

Information entropy quantifies the level of the real operation of the power units if calculated at the level of the equipment, at the level of the power plant, at the level of the network and at the level of the competitive market with a relation of the form:

$$e^{information}_{entropy} = -3{,}32\left(p^{success}_{probability} \cdot \lg p^{success}_{probability} + p^{failure}_{probability} \cdot \lg p^{failure}_{probability}\right) \tag{7}$$

The success (p_s) and failure (p_f) probabilities in the operation of the complex power structures can be calculated as follows:

$$p_s = t^{operating}_{time} \Big/ t^{calendar}_{time}\ ;\ p_i = (1 - p_s) = \frac{t^{failure}_{time}}{8760} \tag{8}$$

Entropy minimizing depends also on the training of the human resources involved in the design and operation processes as well as in those of knowing the trend of the energy market.

b) Vulnerability models at the level of the energy market

1. Design and trends in modeling the vulnerabilities of the energy markets

The vulnerabilities known under the name of energy market risks refer mainly to operațional risk, credit risk, liquidity risk, legal risk, energy sale price risk connectivity risk, volatility, time risk, risk of the free rate of tariff change and the risk assumed by introducing the expert systems for diminishing vulnerabilities on the entire design - operation line of the holistic risk sensitive equipment.

The operațional risk can decrease on the basis of maximizing the incomes of each power production unit. Credit risk exposure calls also for the current and potențial exposure. Current exposure indicates possible loss of the firms upon missing counterpart. Potențial exposure relates to the replacement and potențial settlement.

Market liquidity risk arises in the situation where a position of risk cannot be eliminated quickly and affects other economic and financial positions. Legal risk arises when a transition cannot be done because the law changed during unfolding the contract.

Global risk in the market may be reduced if energy sales rate is below competitive prices. Risk of connectedness reflects damage caused by the changes intervening in the prices of basic energy.

Volatility risk occurs upon changing the shape and volume of the product offered to the competitive market.

Risk of time indicates the possible recorded damage if prices change over time. Exchange rate risk arises upon changing the rates of discount for the future cash flow.

2. Energy pricing models based on the new guidelines of operațional research regarding the reduction of vulnerabilities in the risk-sensitive systems.

a) Pricing model of energy produced in plants

$$t_{cop} = \left[\frac{C_{tac}}{g_i \cdot E_p \cdot d_v} + \overset{network}{tax} + \overset{distribution}{tax} + \overset{supply}{tax} + p_{profit}\right] \left[lei/kWh\right] \tag{9}$$

Where: C_{tac} = Total expenditure shaped in the operațional research design; g_i = degree of energy loading of aggregates, E_p = produced energy; d_v = lifetime of equipment in operation.

b) Pricing models of energy transited in network:

$$t_{e_1} = \frac{C_{\text{network operation}}}{E_{\text{transited energy}}};\ \frac{1}{gfr}$$

$$t_{e_2} = \frac{C_{\text{loss costs}}}{E_{\text{consumed power}}}\left[lei/kWh\right] \tag{10}$$

$$t_{e_3} = t_{e_1} + t_{e_2} = \frac{C_{\text{operation}} + C_{\text{loss}}}{E_{\text{transited energy}}}\left[lei/kWh\right]$$

Tariff $t_{e3} = (t_{e1} + t_{e2})$ = will not exceed the network tax (t network); gfr = degree of network loading.

c) Rates of delivery energy to the consumer

$$t^{\text{peak}}_{\text{binomial}} = \left[\frac{\left(T^{\text{power}}_{\text{tax}}\right)^{I.M.J.}_{V}}{\left(t^{\text{operating}}_{\text{time}}\right)_{V}} + \left(T^{\text{energy}}_{\text{tax}}\right)^{I.M.J.}_{V}\right]\left[lei/kWh\right] \tag{11}$$

$$t^{\text{off peak}}_{\text{binomial}} = \left[\frac{\left(T^{\text{power}}_{\text{tax}}\right)^{I.M.J.}_{IV}}{\left(t^{\text{function}}_{\text{time}}\right)_{IV}} + \left(T^{\text{energy}}_{\text{tax}}\right)^{I.M.J.}_{IV}\right]\left[lei/kWh\right]$$

Where: H. M. L. - high, medium and low voltage installation under which energy is delivered to consumers calling forthe binomial structure of the tariff, at peak (V) and outside the peak (IV). If consumers prefer monomial tariffs, then they apply in practice models of the form:

$$t^{V}_{I.M.J.} = \frac{F^{V}_{I.M.J.}}{E^{V}_{I.M.J.}}\left[lei/kWh\right];$$
$$t^{IV}_{I.M.J.} = \frac{F^{IV}_{I.M.J.}}{E^{IV}_{I.M.J.}}\left[lei/kWh\right] \tag{12}$$

Where: (F) - represents the invoice of rating energy in a monomial system. In applying these rates one takes into account the short, medium and long durations of the operating of power plants involved in power supply to consumers in the competitive market. These rates will be lower than those achieved in the European market if it is intended to exceed competition levels to achieve the pre-calculated revenues.

Monomial rate bills (FM) and binomial ones (FB) are calculated as:

$$F_m = p_m \cdot E_m;$$
$$Fb = \left[T^{\text{power}}_{\text{tax}} \cdot P^{\text{supplied}}_{\text{power}} + T^{\text{energy}}_{\text{tax}} \cdot E_{\text{consumed}}\right] \tag{13}$$

The invoices for quantifying the costs at the level of the distribution-supply facilities operating together with the power transmission networks and the power production plants are have complex structures as they include powers and energies available to consumers under contract.

3. INNOVATIVE COMPUTER SYSTEMS FOR REDUCING VULNERABILITIES IN THE RISK - SENSITIVE ENERGY STRUCTURES

Innovative computer systems designed to significantly reduce vulnerabilities (risk, catastrophe, chaos) are specialized software products capable of anticipator/supervision in real time (using a knowledge base) the activities in the funcțional structure of the disrupted power systems. The applications of these software products reiate to the diagnosis of monitored installations in order to determine in real time the behavior of each device on the pathway provider-consumer of primary and processed energy resources, training the human resources involved in the actual processes and building decisions that ensure the achievement of all performance parameters at the level of all the supervised equipment, which facilitates risk reduction and turning the potențial losses into substanțial savings of resources. The assessment criteria of the software products that provide a significant reduction in risk are mainly the following: the speed of multiprocessor structures, operating reliability, efficiency of solution based on clarity, appropriateness to the field of application in terms of minimum cost. The benefit of anticipator/ expert systems grow if at the level of equipment design and operation in the structure of the power unit we use three interactive strategies: restructuring processes in the design of industrial reengineering, competitive strategy and protocol-based energy business reconsideration.

The structure of an anticipatory expert system and of the algorithm for calculating the tariff of energy transport in a power system is shown in Figure (4.1.) and (4.2.).

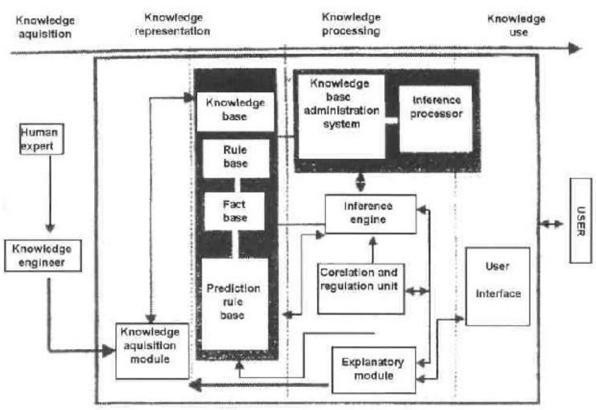

Fig. 4.1

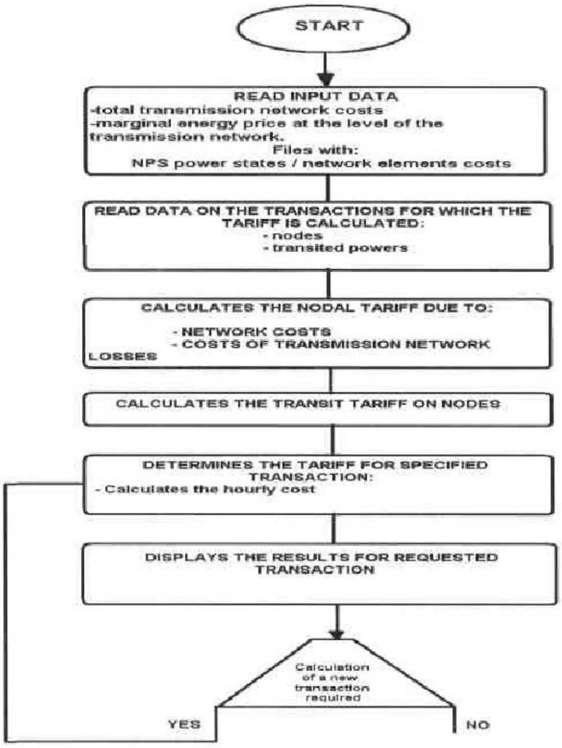

Fig. 4.2

Anticipatory expert systems applicable to power plants called risk monitors can be used to the monitoring of technological activities, to the anticipatory supervision of economic and financial vulnerabilities, of risks arising from human activities, to the optimization of the facility maintenance approaches, inspections and testing operations as a response to the emergencies including project assessment carried out by designing units.

In order to extend risk monitors to power plants of any kind we start from the results obtained in the operation of nuclear power stations to takeover the approaches that can be applied in other types of units who wish to produce energy with minimal risk.

The risk monitoring programs in the design and operation of nuclear power plants ensuring maximum profit call for the logistic model of probability analysis of energy facilities security. This model enables risk assessment at the level of the specific configuration of operating a new power plant or an operating one. The risk monitors carry out in real time instantaneous risks by evaluating the configuration of the components of a power plant to which it reports when risks occur at the level of the operating equipment.

The risk program Software-Monitor has the following operațional functions: planning maintenance works, risk assessment during a long period of cumulated time, archiving and connecting records to the previous configuration of the power plant, analyzing the precursor type events and those related to design changes in order to minimize the total risk, detect the human error and changing the conditions in which the operator will act to eliminate vulnerabilities, indicating the operating time of the power plant in a default configuration (including indication of equipment that can be put into service before the failed ones so that the risk does not increase).

The level of risk is presented by a thermometer which turns Green / Yellow / Orange / Red with increasing risk.

The colors indicate minimal risk (green), the highest risk (red) and intermediate risk (yellow and orange). The new risk monitors will have in addition to the existing ones complex functions such as: more complex sensitivity analysis, algorithm for determining the maximum operating power in a given configuration, risk assessment of equipment triggering by combined deterministic and probability methods.

Risk indicators supervised by computer screens are calculated as:

$$\begin{aligned}
&1.\ \text{Indicator (PSI)} = \frac{\log(\text{Current risk})}{\log(\text{Reference risk})}\\
&2.\ \text{Indicator (PRI)} = (1 - \text{PSI}) \qquad (4\text{-}1)\\
&3.\ \text{Indicator (risk factor)} = \frac{\text{Current risk}}{\text{Reference risk}}
\end{aligned}$$

The reference risk is associated to the power plant when the equipment is available to ensure operating reliability of the unit. It decreases when the equipment is taken out of operation and increases when the aggregate are put back into operation. Indicator PSI = 10 indicates low risk, and PSI = 0 is major risk. If the major risk PRI indicator appears if IP = 10 times the minimum risk when PRI = 0. The risk factor (FR) increases or decreases depending on the changes in the reference risk.

A performance risk monitor EOOS (Equipment Auto of Service) is a software program that uses as input the basic elements of the probability analysis on risk assessment. The expert system should act as the operator that maintains a low risk for a particular configuration of the power plant and function as planner aiming at planning the future activities of the power plant (unavailability of equipment, new structure prediction, testing and inspection to reduce vulnerabilities).

The Risk Monitor Operator assists the operator in summarizing information on risk assessment to determine operating reliability conditions of power plants. This expert system gives the operator decision support by calling on the following information: a quantitative indication of risk, specifying the maximum time allowed of power plant unavailability starting from the constant risk level, the rapid calculation of risk for any potențial configuration. The capability of risk monitors (EOOS) to carry out sensitivity analysis is used by the operator to assess the proposed configuration changes and to prioritize the activities to minimize risk.

The EOOS expert system - planner assists the human factor in planning activities so that the operating reliability of the power plant should be ensured fully based on risk assessment. If the combined effect of the simultaneous deployment of multiple activities (maintenance, testing) is negative as regards the availability of the equipment of the power plant when the planner allocates an intense effort to risk assessment and preventive building of the potențial configuration of the considered power plant.

The efficient operation of risk monitors requires human resource training by calling on the fuzzy modeling of human behavior in terms of increased domestic and external vulnerabilities of the power plant and operators, computer assisted using programmable logic controllers.

In addition to this significant step in eliminating the vulnerability of human resources from the risk monitor management structure we further present the fuzzy logic algorithm for modeling the behavior of the human factor in various risk factors. This approach starts with building models of human resource training through intensive learning and practice management examples of units equipped with risk monitors.

a) Modeling the value theory of human resource training in the design of operational research

$$C_{tac} = \sum_{i=1}^{dv} (1 + r_a)^{-i} \Big(C_{DD} + C_{CC} + C_{SYSTEM} + $$

$$+ C_{\substack{human\\resource}} + C_{EF} + C_{DC} \Big)_i = f(X_M, E_{XM}, H_{ii})$$

$$X_{ME}(X) = \begin{cases} 0 \text{ if } x > 1000 \\ 1 - \dfrac{1}{(x-1000)^2} \text{ if } x > 1000 \end{cases}$$

$$P(E_{XM}) = \int_{R_n} X_{ME}(X)\, dP(x) \qquad (4\text{-}2)$$

$$H_I = H_i^{nf} + H_i^{f} = -\sum_i p_i l_n p_i + \sum_i p_i S[X_{EM}(x_i)]$$

$$d = H_{i1} - H_{i2}$$

Where:
- C_{tac} = the total expenditure up to the actual computer systems by hybrid expert structures. These costs are disseminated in the following classes of activities:
- C_{cpr} = cost of search-forecasting-risk;
- C_{sam} = cost of stock-pending-marketing;
- C_{erc} = cost of equipment - economic system - quality;
- C_{ing}= human engineering costs;
- C_{bfc} = cost of office-finance-accounting;
- C_{cid} = reverse connection - decision;
- X_M = the characteristic function of a set (M) of shaped events;
- C4; H_i^{nf}; H_i^{f} = nonfuzzy entropies (NF) and fuzzy entropies (f);
- pi □ (0,4 □ 0,5) = limits of success;
- S [X_EM (x)] = degree of uncertainty;
- d = distance between the optimum solution and the real one determined at the level of the funcțional states due of the supervised system.

The optimal solution is selected based on minimum information entropy (Hi).

To minimize the fuzzy distance between two sets of possible states of the evolution of a system for optimal variant we start from the analysis of controls (A_1, A_2), which oversees the operating system:

$R(A_1) = [S_1; l1(T_{\alpha 1})_{\alpha \in M}; F_{g1}]$

$R(A_2)=[S_2; l2(T_{\alpha 2})_{\alpha \in M}; F_{g2}]$

The distance (d) is minimized if:

Card S_1 = Card S_2 (4-3)

$$\left[\text{Card}S = \sum_i X_M(X_i) \right] \text{si } T_1 \prec T_2; I_1 \prec I_2;$$

$F_{g1} < F_{g2}$;

Where:
S = internai states of the modeled system;
I = inițial state;
F_g = final states;
Ti = Fuzzy matrix of transition states.

The arrow < shows that status indicators (1) are finer than the similar indicators (2) through which passes the analyzed system.

The performance function of the desired state is shaped by the mathematical relationships of the form:

$$F_{pi} = \lim_{t \to \infty} \{P[x(t+1)]\}_i = \frac{1}{S(t)} = p_i$$

$$F_{pj} = \lim_{t \to \infty} \{E[x(t+1)]\}_j = p_j$$

The optimal behavior of the supervised system upon the occurrence of an event (E) with the probability (P) is on the condition $p_j<0,5<p_j$. The programmable devices enable the determining of the most relevant values of the variables to optimize the system structure controlled by the intelligent neuro-fuzzy type structures.

Any optimal solution expressed qualitatively has to be covered in written operațional research costs on the functions from the system driven by fuzzy hybrid structures.

Decision modeling of complex systems without and with memory can be done starting from the structure of membership functions and control system, written as:

a) Systems without memory:

$X_{SXM}(SX_M/s_x, x_t) = X_s(S_{tM}/x_t)$;

$X_y(Y_t/_t, x_t) = X_y(Y_t/x_t)$;

b) Systems with memory

$$X_s(S_{t+1}) = \overset{\sup.\min}{s \in S}[S_x(S_t), X_s(S_t M / S_t, x_t)]$$

$$X_Y(Y_t) = \overset{\sup.\min}{st \in S}[X_s(S_t), X_Y(Y_t M / S_t, x_t)] \qquad (4\text{-}4)$$

c) Control systems

X_f = [x(t), C, X(t+1)] = $X_{S(t+1)}$[x(t+1)]

The phases of implementation of the control system takes up as follows:

- determining the inițial state and then apply the observation operator in order to achieve the new status closer to the final solution

- writing the characteristic function Xs (x)
- calculating the cardinal for the set of supervised states.

If there is no distinction between cardinals, then the two states are identical. Their singling out will be carried out on the basis of entropy values calculated for each set of variables and events of acceptable state structure.

The best condition of the whole system is given by the intersection of the goals (S) with the restrictions (R) of the model applied to the profitability of the whole system supervised by neuro-fuzzy structures.

The fuzzy decision is the following mathematical kernel:

$$D^{simpla}_{ecizie} = S \cap R;\ X_D(x) = \inf.(X_S; X_R);\ x \in X$$

$$\inf.X_{Sa}, \inf.X_{Rb})$$

$$D^{complexa}_{ecizie} = \left(\bigcap_{a \in A} Sa\right)\left(\bigcap_{b \in R} Rb\right) \qquad (4\text{-}5)$$

$$X_D^C = \min(\inf X_{Sca}; \inf X_{Rmb})$$

The symbol $\bigcap$ stands for the set of goals (S) and restrictions (R) in symmetric correlations. The crossed goals and restrictions are included in the end in the same space X of the alternatives.

The understanding of how to construct the fuzzy decision and that of implementing the specific instances may be carried out by pursuing the numerical application which follows:

X	1	2	3	4	5
X_{S1}	0	0,1	0,2	0,3	0,4
X_{S2}	0,1	0,2	0,3	0,4	0,5
X_{R1}	0,3	0,4	0,5	0,6	0,7
X_{R2}	0,4	0,5	0,6	0,7	0,8

By applying the fuzzy decision model to the previous matrix the following solution results:

X	1	2	3	4	5
X_D	0	0,1	0,2	0,3	0,4

The vagueness of the fuzzy decision stems from the imprecision of the goals and restrictions. The optimal solution is determined on the structure of the following variant: (X □ S; X_D □0,4), which is equivalent to the smallest distance to the opti-optimorum variant.

The reshaped human resources at the level of the NPS in the neurogenetic design

This model has to be applied in practice if there are the right conditions, as follows:

- Groups of experts interconnected by a computer structure of neurogenoexpert systems (expert systems + neural networks + genetic algorithms);
- Reduction of the intermediate control levels by the implementation of anticipator/ neuroexpert systems;
- The convergence between the correlated perspectives of the technological and managerial approaches and the economic-engineering ones based on operațional research models;
- Designing and applying an interactive innovation strategy holistically based on
- The employees are ready to rule themselves on the basis of the knowledge obtained both from inside the company and from the experience of human resource control at the level of the internațional power systems.
- The activities have to be computer aided and renewed on the basis of the intelligent knowledge processors of the reconfigured human resources.

4. CONCLUSIONS

The main issues developed in the innovative material addressing risks of energy structures production - design - competitive market refer to the risk models built in the holistic design at the level of the technological and managerial and economic-financial structure without neglecting the modernization of the overall vulnerabilities assessment systems.

The risks of the competitive market were developed starting from the documents of the "Risk Congress" held in the U.S. recently. Addressing vulnerabilities has been enriched by the concept of training of human resources applied internationally.

The reengineering of the human resources at the level of the National Power System must take the empathy models (intensive learning), ergonomie designs that allow computer aided job design and complete redesigning of the posts (rating, pay aceording to results and productivity).

The risk related to the lack of training of the human resources can lead to catastrophe and chaos which can practically be overcome by the knowledge and application the Hammer design of trening managers and employees of a power system under unprecedented change.

Training the new generation of specialists and senior teams working in the NPS on the details of the new changes should be achieved through increased academic training (master's and doctoral courses both at home and abroad), by increasing the skills of computing performance and stimulating creativity with appropriate wages that can be covered with good results at work.

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