REENGINEERING OF MANAGEMENT APPLICABLE TO ENERGY AUTOHTON AND EUROPEAN SYSTEMS

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Abstract: Engineering management: optimal solution. Models of reengineering operațional applied to efficient use of energy. Durable development decision of economics-engineering systems approach.

Key words:models of optimization, deurable development

1. ENGINEERING MANAGEMENT

As a method of the modern management, reengineering requires a new design of the systemic problems in view of process innovation and human resources reshaping. The reengineering of the industrial management uses informatics tools, which supervise the leading of industrial organization so that the technical, economic and financial risks should be under entire control. The reengineering approaches the commercial organization inclusive the companies as a reunion of processes that are subdued by entire innovation (technology, resources, economic activities, management, decisions). The new designed industrial organizations are focused on customers' needs in view of entire resources integration in order to build a new market based on integrated consumption. In this point of view, the organization charts are designed as a matrix where the responsibilities are found at the level of cach employee. The reengineering allows going from management focused on command - control to performance management concentrated on team leader that is based on abilities development in resources allotting and dysfunctional studies through current and forecast activities monitoring. The informatics supervision of entire technical -economical activities allows eliminating the limitation in real process functioning.

The reengineering is used after covering the following: increasing the quality of human factor and training the team that will implement the reengineering in analyzed company, establishing the activities at input and output and pieking out the perturbation points, redesigning of the processes that are increasing the entropy, replacing old equipment with new one, designing working places in ergonomie view, designing the quality of the products that will be turned out in the new industrial organization.

The revolutions in informatics and cognitive fields are considcred as start points of reengineering. These revolutions allow going from the production based on improving the physical properties to innovation of thinking process. As a result of this process, the level of products will be increased with the value of new assimilated knowledge and equipment could be doubled and the price could be cut down to 30%. After all, the customers' problems can be settled without any risk in terms of benefit increasing.

The reengineering is applied entirely to design the new industrial objectives. These methods can be used by companies, which are monopoly of state, too. Applying this method of reshaping at the CONEL Corporation has brought new companies. Figure 1-4 outline the reshaping process at CONEL Corporation. The new managerial structures will be viable if the benefit of the forecast level at the National Energetic System differs from noting. Passing from current managerial structures of CONEL Corporation to new ones (National Company of Electricity, Company of Nuclear Energy and so on) will allow turning up the competitive market of energy and improving customers' supplying with energy in terms of decreasing tariffs.

2. MODELS OF OPERAȚIONAL MANAGEMENT ENGINEERING

Models of reengineering energetic systems are based on mathematics relations. Operațional research uses these relations according to managerial functions and activities.

$$\begin{aligned}
&M_{OPR} = M_{DEV} + M_{COM} + M_{PRO} + M_{HR} + M_{ECA} + M_{DRC}\\
&M_{dev} = E_{search} + E_{forecast} + E_{risck} + E_{catastrophe}\\
&M_{COM} = E_{stock} + E_{expectation} + E_{marketing} \qquad (1)\\
&M_{PRO} = E_{renew} + E_{tribology} + E_{economic\ regime} + E_{quality}\\
&M_{HR} = E_{emphatic} + E_{erfonomics} + E_{standardising\text{-}remuneration\text{-}productivity} + E_{dialogue\ human\ being - computer\ process}\\
&M_{ECA} = E_{ff} + E_{ts} + E_{b}\\
&M_{DRC} = E_{dt} + E_{rdc} + E_{oe}
\end{aligned}$$

where: M_{OPR} = the model of operațional research based on following functions (development DEV; commercial COM; production PRO; human resources HR; economic activities ECA; decision and reverse connection DRC).

The models shared in functions include the efforts (E) on activities such as: search, forecast, risk, catastrophe, stock, expectation, marketing, renewing, tribology, economic regime, quality, emphatic, ergonomics (the relationship between human being - work -environment), standardizing -remuneration - productivity, dialogue human being - computer - process;

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E_{ff} = the effort for gathering financial funds, E_{ts} = the effort for tariff settling down; E_{oe} = the effort for office equipment designing and implementation, E_{dt} = the effort made in order to achieve the direct and reverse connection between settled objectives and working system, E_d = the effort made in order to make up the decision.

This mathematic model constitutes the base for making up the costs and tariffs through cost-benefit centers, which are implemented in National Energetic System.

3. DURABLE DEVELOPMENT DECISION OF THE ECONOMICS - ENGINEERING SYSTEMS

3.1. The pattern of decision models

a. Model based on economic-engineering efforts

$$\begin{aligned} M_{DE} = {} & E_{search} + E_{forecast} + E_{\mathbf{risk}} + E_{catastrophe} + E_{stock} + \\ & + E_{expectation} + E_{marketing} + E_{renew} + E_{tribology} \\ & + E_{economic\ regime} + E_{quality} + E_{emphatic} + E_{ergonomics} + \\ & + E_{standardising\text{-}remuneration\text{-}production} + \\ & + E_{dialogue\ human\ being\text{-}computer\ processs} \\ & + E_{gathering\ funds} + E_{tariffs\ working\ aut} + E_{office\ equipment} + \\ & + E_{decision\ maker\ trening} + E_{direct\ and\ reverse\ connection} + \\ & + E_{decision\ making\ up} = \text{minim} \end{aligned} \quad (1)$$

b. Model based on economic-engineering effects

$$M_{LP} = \max_j \left| \sum_i \frac{p_{ij} p_j}{n_j} \right|; \; M_{WM} = \max_i \min_j p_{ij}$$

$$M_{HW} = \max_i \left(c_{optimism}^{coeficient} A_i + c_{pesimism}^{coeficient} a_i \right); \quad (2)$$

$$A_i = \max_j p_{ij}; \; a_i = \min_j p_{ij};$$

$$M_{DM} = \max_i \min_j p_{ij}; \quad M_{SV} = \min_i \max_j r_{ij};$$

$$r_{ij} = \left(p_{ij}^{max} - p_{ij}^{curent} \right)$$

where: M_{LP} = the model of Laplace decision; p_{ij} = the benefit placed at the intersection between the lines (j) and columns (I) from the matrix of benefits that could be achieved p_j; n_j = the probability of achievement benefits (p_{ij}) depending on the nature of the situations (n_j); = the probability of achievement benefits (p_{ij}) depending on the nature of the situations (n_j); copt, cpes = the optimistic and pessimistic coefficient; M_{HW} = the model of Hurwicz decision; M_{DM} = the model of maximum decision; M_{SV} = the model of Savege decision; r_{ij} = the regret that it has not been able to achieve the performance solution; $p_{ij}^{max}; p_{ij}^{curent}$ = the maximum and current benefits.

Further on, there are shown some application concerning to profitableness of innovations at the level of reshaping energetic installations.

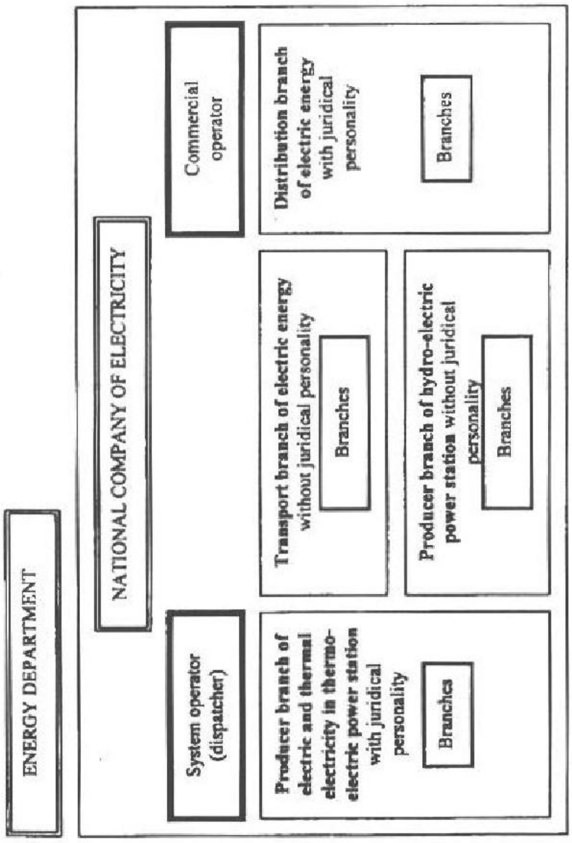

Fig. 1. National Company of Electricity at establishment date

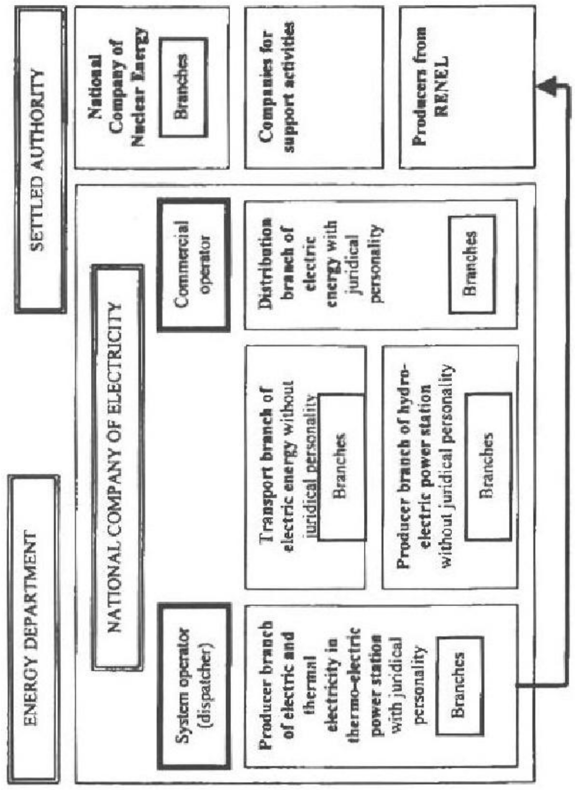

Fig. 2. National Company of Electricit at the second phase of reshaping

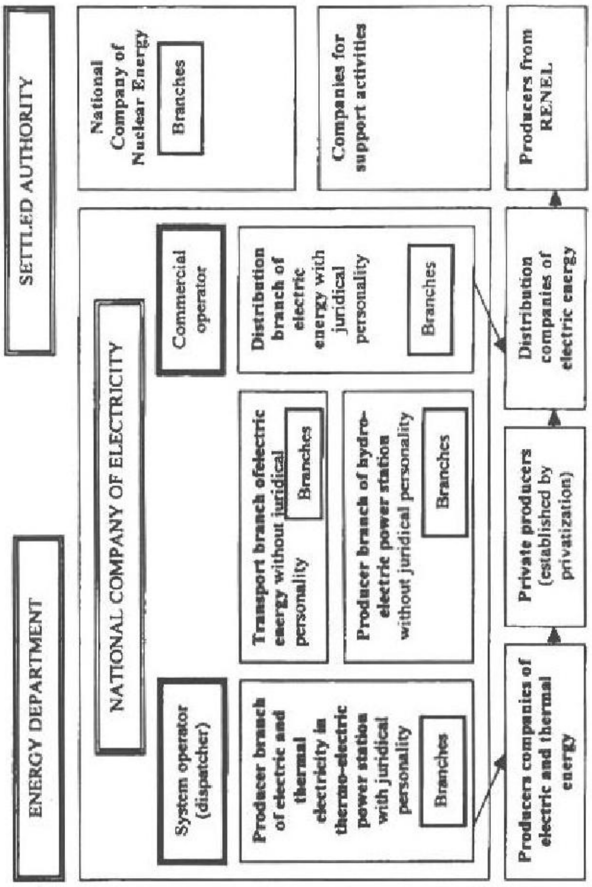

Fig. 3. National Company of Electricity at the third phase of reshaping

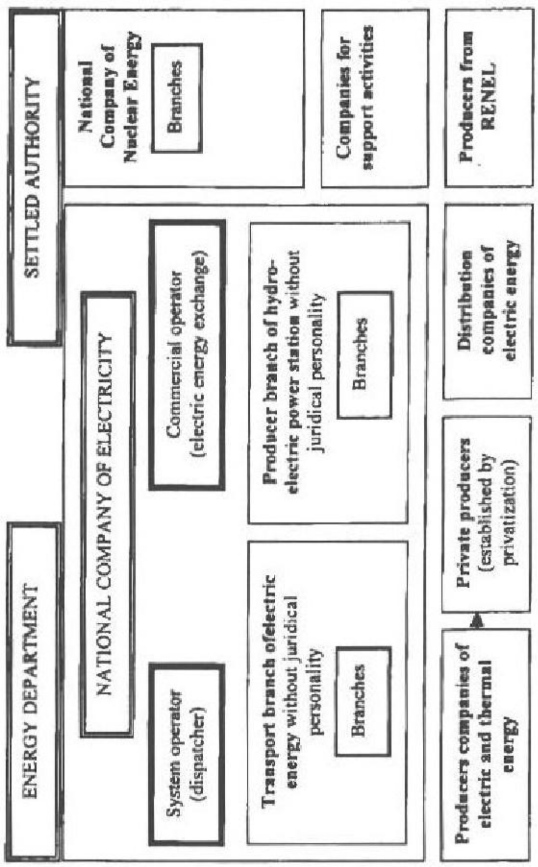

Fig. 4. National Company of Electricity at the end of reshaping

3.2. Application concerning to systems' profitability subdued to durable development

A. There are known:

Installed power:
$P_I = (10000 + 100 \bullet 4)MW = 10400$ MW;
Specific investment:
$I_{sp} = (1000000 + 1000 \bullet 4)$ lei/kW;

Working time:
$t_f = (7000 + 50\text{-}4)$ hours/year = 7200 h/y;

Price of intern energy:
$P_{ei} = 800$ lei/kWh;

Price of extern energy:
$Pee = 100\$/MWh \bullet 8500 \bullet 10^{-3} = 850$ lei/MWh;

Rate of actualization:
$r_a = r_d + r_{inf} = 0{,}24$; $r_a = 24\%$ yearly

$$b_{tac} = \sum_{i=1}^{dv_i} (1 + r_a) = 10 \qquad (3)$$

$C_{tan} = (k_i \cdot i_t) + (p_e \cdot E_p)$;

where $k_i = (0{,}033 \div 0{,}04)$; $I_u = i_{sp} \cdot P_i$;

The analysed branch is developing with a power of prognoses P_p:

$Pp = 2800$ MW; $I_{fulfilled} = 0{,}75\ I_t$; $I_{nonfulfileed} = 0{,}25\ I_t$; $Q_{par} = 3000$ Gcal/year; $t_t = 70000$ lei/Gcal; $C_{opt} = C_{per} = 0{,}5$; $g = 0{,}8$; $d_{vi} = (35\div25)$ years - installation life time; $k_{1ei} = k_{det} = 0{,}5$; P_{ij} = [lei income/lei invested].

The pattern of energy cost is known:

Tabel 1

S_j	S_1	S_2	S_3	S_4	S_5
CTE CET	4	6	1	5	8
CME	3	7	8	9	10
CNE	5	3	2	8	4

Tabel 2

	SEN	SEE	SEM	
C_{fuel}	72%	22%	30%	Din C_{tan}
$C_{operating}$	15%	17%	30%	Din C_{tan}
C_{salary}	7%	21%	8%	Din C_{tan}
$C_{management}$	4%	33%	25%	Din C_{tan}
$C_{sundrey\ expenses}$	2%	5%	7%	Din C_{tan}

B. In is asked:

1. Incomes for the following systems of development energy:

a. power stations with and without thermofication, only for working stations;
b. power stations with and without thermofication, as new energetic objectives.

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2. The costs and electric tariffs in the following situations:
a. the costs and tariffs in actual situations;
b. the costs and tariffs in operational situations
3. Yearly and actualized expense in operational research on function of SE (commercial development, production, human engineering, financial)
4. Economic decision concerning the profitable working of the system
5. Conclusions and operational proposals regarding profitable working of SEN

C. Solution

1. ☞ CTE without thermofication:

$$V_{a1}^{tac} = \left[b_{tac}\left(P_{ee} \cdot P_{impor\tan ţa}\right) - P_{ei} \cdot E_{p\,int\,erne} - \right.$$
$$\left. - k_i \cdot i_m\right] \Rightarrow V_{a1}^{tac} > 0 \Rightarrow$$
$$\Rightarrow V_{a1}^{tac} = \left(P_{ee} \cdot t_t \cdot k_s - k_i \cdot i_{sp} - P_{ei} \cdot t_f\right) \cdot P_i;$$
$$V_{a1}^{tac} = (100 \cdot 7200 \cdot 1{,}5 - 0{,}04 \cdot 100 \cdot 4000 -$$
$$-100 \cdot 7200) \cdot 10400 \cdot 10^3$$
$$V_{a1}^{tac} = 33{,}26 \cdot 10^{10}\ \text{lei/year} \Rightarrow V_{a1}^{tac} > 0,$$

it is advantageous that the objective should be fulfilled $V_{a1}^{tac} = 33{,}26 \cdot 10^{10}$ lei

☞ CET with thermofication:

$$V_{a2}^{tac} = \left(V_{ua}^{tac} + t_t \cdot Q_p \cdot b_{tac}\right) = \left(3.326.336 \cdot 10^3 + \right.$$
$$+ 35000 \cdot 3000 \cdot 10$$
$$V_{a2}^{tac} = 3336{,}8 \cdot 10^8 = 33{,}36 \cdot 10^{10}\ \text{lei/year} \Rightarrow \qquad (5)$$
$$\Rightarrow V_{a2}^{tac} > 0$$

it is advantageous that the objective should be fulfilled.

☞ CET with parțial working:

$V_{b1} = [V_{ua} + k_i \cdot I^{fulfilled} - k^i \cdot I^{unfulfilled}]$
$I^t = i^{sp} \cdot P^i$;
$I^t = 1.004.000 \cdot 10{,}4 \cdot 10^6$;
$V^{b1} = 332{,}6 \cdot 10^{10} + 0{,}04 \cdot 1.004.000 \cdot$ (6)
$\cdot (0{,}27\text{-}0{,}75) \cdot 10{,}4 \cdot 10^6$;
$V_{b1} > 0$ it is advantageous that the objective should be fulfilled.

☞ CET without parțial working:

$V_{b1} = (V_{a1} \cdot t_{ac})$; $V_{b1} = 332{,}6 \cdot 10^{10}$ lei/year

☞ CET without parțial working:

$V_{b2} = V_{a2} – (V_{a1} \cdot b_{tac}) = 332{,}6 \cdot 10^{10}$ lei/year

AII incomes are different from zero, so it is advantageous that the settled objective should be fulfilled.

2. Cost and tariffs of the electric energy:

$$a. C_{sp} = \frac{C_{tan}}{E_p}; t_{ee} = C_{sp} + tva + tdv + profit$$

$$t_{ee} = 1{,}31 \cdot C_{sp} = 1{,}3 \cdot 0{,}5 \cdot \left(\frac{C_{tan}}{E_p}\right) \qquad (7)$$

but: $C_{tan} = k_i \cdot I_t + p_e \cdot E_p$;
$C_{tan} = (k_i \cdot i_{sp}) + (p_e \cdot E_p)$
$C_{tan} = 0{,}04 \cdot 1.004.000 + 100 \cdot 10{,}4 \cdot 10^6 \cdot$
$\cdot k_t = 104004{,}016 \cdot 10^4 \cdot k_t$;
Replacing in formula will result:
$t_{ee} = 357{,}29$ lei/kWh

$$b. C_{sp}^{tac} = \frac{C_{tac}}{\left(q_i \cdot E_p \cdot d_{vi}\right)}; \qquad (8)$$

$$t_{ee} = C_{sp}^{tac} + t_{poluare} + r_{fe}; \ t_{ee} = 1{,}31 \cdot C_{sp}^{tac} \cdot 0{,}5;$$

$$t_{ee} = 1{,}31 \cdot C_{sp}^{tac} \cdot 0{,}5 = 0{,}655 \cdot \frac{C_{tac}}{\left(q_i \cdot E_p \cdot d_{vi}\right)} \qquad (9)$$

$$C_{sp}^{tac} = \frac{104040{,}72 \cdot 10^4}{0{,}8 \cdot 33 \cdot 1040 \cdot k_t} \Rightarrow t_{ee} = 323{,}4\ \text{lei/kWh}$$

3.3. Expenses on functions of SEN-SEE-SEM

Table 3

	SEN	SEE	SEM
C_{DEV}	$0{,}04 \times C_{tac} = 41{,}62 \times 10^6$	$0{,}05 \times C_{tac} = 52{,}02 \times 10^6$	$0{,}30 \times C_{tac} = 312{,}12 \times 10^6$
C_{PRO}	$0{,}15 \times C_{tac} = 156{,}06 \times 10^6$	$0{,}17 \times C_{tac} = 176{,}87 \times 10^6$	$0{,}15 \times C_{tac} = 156{,}06 \times 10^6$
C_{HR}	$0{,}07 \times C_{tac} = 72{,}83 \times 10^6$	$0{,}21 \times C_{tac} = 218{,}48 \times 10^6$	$0{,}08 \times C_{tac} = 83{,}23 \times 10^6$
C_{ECA}	$0{,}02 \times C_{tac} = 20{,}81 \times 10^6$	$0{,}25 \times C_{tac} = 260{,}10 \times 10^6$	$0{,}07 \times C_{tac} = 72{,}83 \times 10^6$
C_{DRC}	$0{,}03 \times C_{tac} = 31{,}21 \times 10^6$	$0{,}10 \times C_{tac} = 104{,}04 \times 10^6$	$0{,}10 \times C_{tac} = 104{,}04 \times 10^6$
C_{COM}	$0{,}70 \times C_{tac} = 728{,}28 \times 10^6$	$0{,}22 \times C_{tac} = 228{,}89 \times 10^6$	$0{,}30 \times C_{tac} = 312{,}12 \times 10^6$

It can be observed that the achievement of energetic objectives in our country are profitable on account of the net incomes are positive.

Also, it can be observed that what ever mcthod we should use, we will obtain the same optimum solution (CNE). This situation confirms the internațional tendency and, also, shows that in România SEN will be developed economically through designing and construction of CNE.

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