ECONOMICAL AND MANAGERIAL CONCEPTS APLLAIED TO SUSTAINABLE DEVELOPMENT OF ENERGY SYSTEMS

CARABULEA A., L., G., POPPER M., CIRICĂ I. R., MORAR A.,
PĂZITOR T., PĂCUREANI I. R., VĂDAN M., STELEA N.

Abstract - The dynamic changes of the competitive energy market requires the reconfiguration of current design of energy objectives into a new vision dictated by the "Project Management" shaped according to the concept of operational research required by the sustainable development of systems subject to renewal. In this vision the present paper addresses two issues, namely, building up the revenue-cost budget based on the growth of the effect generated by each designer who applies in practice the convergent engineering and the presentation of the new methods of calculation of the efforts necessary to achieve without risk the domestic energy objectives compared with the international ones.

1. SAMPLE FORMULATION AND GOAL OF THE APPROACH TO THE DEVELOPMENT OF THE BUDGET AT THE LEVEL OF ISPE

The revenue and cost budget at the level of energy objectives design taking into account the particularities of ISPE may be conducted in two distinct variants, namely.

V_1 = Variant based on primary elements and calculation elements of expenses and revenues.

V_2 = Variant based on the elements of operational research that allows the quantification of revenues and expenses starting from the mathematics of the real fact.

The first budget variant operates with the value efforts that allow to cover the general activities, the activities called direct and indirect activities, including the different and unexpected activities.

A second option calls for all the real events that occur frequently in the design proces of ISPE and allows the quantification of the revenues and costs on six operation of the real fact research, such as: sustainable development operator, commercial operator production (design) operator, human resource reconfiguration operator, economic-financial operator and holistic communication – decision operator. This option will get I.S.P.E. close to the forms of designing energy objectives in Europe and will change the ways to increase the total revenue that will allow to avoid the aggressive financial risks.

The following shows the logistics of developing the revenue and cost budget at the level of ISPE company based on the variants described above and highlights both the shortcomings and the advantages of the budget solutions established in traditional coordinates and innovative coordinates.

2. MODELING EFFORTS AND EFFECTS

2.1. General structural model of the A.S.E. type

a) revenue estimate models

$$V_{total} = V_{internal} + V_{external} = \sum_{i=1}^{n} p_{\substack{price\,i\\internal\\products}} \cdot N^{internal}_{products\,i} + \sum_{j=1}^{m} p_{\substack{price\,j\\exported\\products}} \cdot N^{exported}_{products\,j}$$

$$p_{\substack{internal\\price}} = c_{\substack{internal\\cost}} + t^{internal}_{axes} + p^{internal}_{profit}$$

$$p_{\substack{external\\price}} = c_{\substack{realized\\cost}} + t^{export}_{axes} + p^{programmed}_{profit}$$

$$V_{total} = \left[C_{total\ costs} + p_{realized\ profit}\right]$$

b) Models for quantifying the costs

$$C_{tan} = [C_{material} + C_{labor} + C_{other\ unforeseen\ costs}]$$

$$C_{materials} = [C_{consumables} + C_{energy} + C_{depreciation} + C_{service} + C_{transport} + C_{telephone} + C_{post} + C_{protocol} + C_{\substack{advertising\ and\\publicity}} + C_{guard} + C_{extra}]$$

$$C_{labor} = [C_{salaries} + C_{ins} + C_{unemployment} + C_{health} + C_{accidents} + C_{labor\ chamber} + C_{other\ cost}]$$

c) Profit planet and carried out

$$p_{\substack{programmed\\profit}} = \left[V_{\substack{total\\programmed}} - C_{\substack{total\\programmed}}\right]$$

$$p_{\substack{realized\\profit}} = \left[V_{\substack{total\\realized}} - C_{\substack{total\\realizeded}}\right]$$

After this system of drawing up the budget the costs are divided into four categories, namely general costs, direct costs, indirect costs and unforeseen expenses.

The budget built on structure of these expenses is inconsistent, does not cover the total cost, whereas a suite of new activities dictated by the formation of new methodologies for building budgets are omitted from the quantification of the final costs.

In calculating project costs and the traditional design units ones we can use two classes of models, namely.

1. *Models based on primary elements*

$$C^{\text{primary elements}}_{\text{t materials}} = \Big[C_{\substack{\text{basic and auxiliary materials from outside} \\ \text{less than value of recoverable waste}}} + C_{\substack{\text{water and} \\ \text{energy fuel}}} + C_{\substack{\text{fixed assets} \\ \text{depreciation}}} + C_{\substack{\text{miscellanea and} \\ \text{unpredictable}}} + C_{\text{salaries}} + C_{\text{ins}} + C_{\substack{\text{building and} \\ \text{ground tax}}} + C_{\substack{\text{new} \\ \text{technique}}} \Big]$$

2. Models based on calculation elements

$$C^{\text{calculation elements}}_{\substack{\text{materials} \\ \text{and human} \\ \text{resources}}} = \Big[C_{\substack{\text{direct for materials} \\ \text{without savings} \\ \text{from valorizing} \\ \text{recoverable waste}}} + C_{\substack{\text{salaries for} \\ \text{directly} \\ \text{productive} \\ \text{personnel}}} + C_{\substack{\text{maintenance} \\ \text{repairs}}} + C_{\substack{\text{general} \\ \text{ISPE} \\ \text{departments}}} + C_{\substack{\text{ground and} \\ \text{building tax}}} + C_{\substack{\text{failed} \\ \text{projects}}} + C_{\substack{\text{distribution} \\ \text{and market} \\ \text{study}}} + C_{\substack{\text{new} \\ \text{technique}}} + C_{\substack{\text{miscellanea} \\ \text{and} \\ \text{unforeseen}}} \Big]$$

The methods for determining the final price on performed activities and for achieved projects are mainly the following: the normative method, the standard-cost method, the cost -computer hour method the direct-cost method. These methods apply both to quantify the current activities and for forecasting the direct design forecast cost. It would be useful for the anticipatory cost methods to be the subject of a comprehensive study at the level of ISPE.

2.2. Operational research models structured on real events

The new structure model for calculating the revenue-cost budget measured in operational research are the following calculating configurations:

a) Models for calculating the updated total and annual income

$$V^{\text{annual}}_{\text{income}} = \Big[C^{\text{total annual}}_{\text{costs}} + p^{\text{annual}}_{\text{profit}} \Big]$$

$$V^{\text{updated}}_{\substack{\text{total} \\ \text{income}}} = \Big[C^{\text{updated}}_{\text{total costs}} + p^{\text{updated}}_{\text{total profit}} \Big]$$

b) Models for calculating the total updated cost and the annual ones in operational research

$$C_{\text{tac}} = \sum_{i=1}^{dv} (1 + r_a)^{-i} C_{\tan\ i}; \qquad r_a = [r_d + r_i + r_r]$$

where:
r_a = updated rate, which indicates a decrease in time of the value of money consists of the interest rate (r_d), the inflation rate (r_i) and the risk rate (r_r).
$C_{\tan\ i}$ = Total annual costs expressed in terms of efforts needed to achieve real events.

The models to estimate the annual expenses in operational research can be synthetically presented as follows:

$$C_{\tan\ i} = [C_{DD} + C_{CC} + C_{PR} + C_{RU} + C_{EF} + C_{DC}]$$

$$C_{DD} = \Big[C_{\substack{\text{information} \\ \text{search}}} + C_{\substack{\text{forecast activities} \\ \text{and analysed systems}}} + C_{\substack{\text{risk+catastrophy} \\ \text{+chaos}}} \Big]$$

$$C_{CC} = \Big[C_{\substack{\text{materials +} \\ \text{fuels +} \\ \text{energy}}} + C_{\substack{\text{shorter} \\ \text{wait}}} + C_{\substack{\text{study} \\ \text{competitive} \\ \text{market}}} \Big]$$

$$C_{PR} = \Big[C_{\substack{\text{innovation} \\ \text{technologies} \\ \text{and working} \\ \text{methods}}} + C_{\substack{\text{optimal operating} \\ \text{state of analysed} \\ \text{system}}} + C_{\substack{\text{quality of} \\ \text{products} \\ \text{and processes}}} \Big]$$

$$C_{RU} = \Big[C_{\substack{\text{intensive} \\ \text{learning}}} + C_{\substack{\text{efficient} \\ \text{ergonomy}}} + C_{\substack{\text{working posts} \\ \text{designing}}} + C_{\substack{\text{information} \\ \text{dialogue}}} + C_{\substack{\text{stimulating} \\ \text{creativity}}} \Big]$$

$$C_{EF} = \Big[C_{\substack{\text{formation} \\ \text{funds}}} + C_{\substack{\text{price} \\ \text{design}}} + C_{\substack{\text{strategy} \\ \text{birotics}}} \Big]$$

$$C_{DC} = \Big[C_{\substack{\text{training managers} \\ \text{as holders of} \\ \text{resources}}} + C_{\substack{\text{decision design of} \\ \text{anticipatory management} \\ \text{of analysed units}}} + C_{\substack{\text{developing communication} \\ \text{with clients and resource suppliers}}} \Big]$$

The models for calculating cost on real detailed events have the following mathematical structures:

$$C_{\substack{\text{information} \\ \text{search}}} = \sum_{i=1}^{n} N_{\substack{\text{number of} \\ \text{searches}}} \cdot s_{\substack{\text{salariu} \\ \text{mediu anual}}} \cdot t_{\substack{\text{timpul} \\ \text{de} \\ \text{cautare}}}$$

$$C_{\text{forecast}} = \Big[C_{\substack{\text{explorative} \\ \text{forecast}}} + C_{\substack{\text{normative} \\ \text{forecast}}} \Big] = \Big[\text{Cost}_{\substack{\text{study of} \\ \text{estimation of tendency of} \\ \text{developing analysed} \\ \text{systems}}} + \text{Costul}_{\substack{\text{implementing} \\ \text{best solution of} \\ \text{sustainable} \\ \text{development}}} \Big]$$

$$C_{\text{risc}} = [p_{\text{enl}} \cdot E_{\text{nl}} + i_{sp} \cdot P_{av}] = [200 p_{ei} \cdot t_{av} \cdot P_{av} + i_{sp} P_{av}] = \Big[200 p_{ei} \frac{t_f}{365} \cdot 0{,}25 P_i + i_{sp} \cdot 0{,}25 \cdot P_i \Big]$$

where:
p_{ei} = price of power at national level (lei/ kWh), t_f = operating time of the system; p_{en}, = price of the not delivered power equal to 200 Pei; E_{nl} = not delivered power; i_{sp} = the specific investment to restore the installation destroyed by the aggressive risks; p_{av} = power on failure

If the failure power is (0.25 P_i), the system should be prepared with sums of taking over the risk. If the power (p_{av}) exceeds (0.25 P_i) then the system undergoes the catastrophe phase, which can deteriorate into chaos when ($P_{av} = P_i$). The other expenses of the new model called commercial efforts have in their structure the following calculation relations:

$$C_{\substack{\text{materials +}\\ \text{fuel +}\\ \text{energy}}} = \sum_{i=1}^{d} M_{\substack{\text{var iouse}\\ \text{materials (i)}}} p^{\text{price of}}_{\substack{\text{each}\\ \text{material}}} + \sum_{j=1}^{t} B_j p_j + \sum_{r=1}^{s} E_r p_r$$

where B_j = types of purchased fuel; p_j = the differential price of the purchased fuel in the conditions of the circumstantial market favourable to the purchaser; E_r = purchased power; p_r = power tariff.

The cost on the reduction of expectations is calculated as follows:

$$C_{\substack{\text{decreased}\\ \text{wait}}} = \left[C_{\substack{\text{for new methods}\\ \text{of labor applied}\\ \text{with delay}}} + C_{\substack{\text{increasing human contribution}\\ \text{(passing from two hours of actual}\\ \text{labor to eight hours as provided}\\ \text{by law)}}} \right]$$

Production costs are determined by means of the following operational models:

$$C_{\substack{\text{innovation technologies}\\ \text{and working methods}}} = \left[C_{\substack{\text{reengineering design and}\\ \text{operational of objectives}}} + C_{\substack{\text{improved}\\ \text{working methods}}} \right]$$

$$C_{\substack{\text{optimal operation state}\\ \text{of analysed system}}} = \left[C_{\substack{\text{loading workplaces}\\ \text{with loads up to}\\ \text{80\% of capacity}}} + C_{\substack{\text{ma int enance and}\\ \text{repairs}}} + \right.$$

$$\left. + C_{\text{depreciation}} + C_{\substack{\text{endowing workplaces}\\ \text{with efficient}\\ \text{inf ormation systems}}} \right]$$

$$C_{\text{quality}} = \left[C_{\substack{\text{designing}\\ \text{quality}}} + C_{\substack{\text{removing}\\ \text{nonconformity}}} \right]$$

$$C_{\substack{\text{designing}\\ \text{quality}}} = \left[C_{\substack{\text{cost elaboratio n}\\ \text{managerial quality}\\ \text{manual}}} + \right.$$

$$\left. + C_{\substack{\text{costincreasedquality}\\ \text{by designing and processes}}} \cdot C_{\substack{\text{removing}\\ \text{nonconformity}}} \right]$$

$$C_{\text{nonquality}} = \left[C_{\substack{\text{cost nontrainin g}\\ \text{personnel from}\\ \text{quality perspective}}} + C_{\substack{\text{cost inefficien t and}\\ \text{incomplete inf ormation}\\ \text{system}}} + \right.$$

$$+ C_{\substack{\text{cost risks(billing errors}\\ \text{+penalties+}\\ \text{+decisions nonconformable}\\ \text{with reality)}}} + C_{\substack{\text{cost client}\\ \text{inquiries}}} +$$

$$\left. + C_{\substack{\text{cos t repairing failure}\\ \text{caused by nonquality}\\ \text{designs}}} \right]$$

The costs of intensive learning and the ergonomic ones are determined considering that every three years the entire human resource body reconfigures professionally. The costs of the significant economic and financial activities which are found in the actual design processes are calculated as follows:

$$C_{\substack{\text{formation}\\ \text{funds}}} = C_{\substack{\text{crincrea sin g}\\ \text{production}\\ \text{in dynamics}}} + C_{\substack{\text{ensuring increased}\\ \text{salaries in}\\ \text{own funds}}} + C_{\substack{\text{quic ker increase}\\ \text{of productivity than}\\ \text{initial provisions}}}$$

The management indicators that enable the application of this approach with a view of making up own funds have the following mathematical structures:

$$i^{p}_{\text{production}} = \frac{P^{\text{designed}}_{\text{production 2007}}}{P^{\text{realized}}_{\text{production 2006}}} > i^{fs}_{\substack{\text{salaries}\\ \text{fund}}} = \frac{F^{\text{salaries}}_{\text{fund 2007}}}{F^{\text{salaries}}_{\text{fund 2006}}} >$$

$$> i^{NA}_{\substack{\text{Number}\\ \text{of employees}}} = \frac{N^{\text{employees}}_{2007}}{N^{\text{employees}}_{2006}}$$

$$i^{P_m}_{p_m} = \frac{P^{\text{labor}}_{\text{productivity 2007}}}{P^{\text{labor}}_{\text{productivity 2006}}} > i^{S_m}_{\substack{\text{average}\\ \text{salary}}} = \frac{S^{\text{average}}_{\text{salary 2007}}}{S^{\text{average}}_{\text{salary 2006}}}$$

Hence: $i^{P}_{p} > i_{sf} > i^{NA}; i^{P_m}_{p_m} > i_{sm}$ = diferences enabling the creation of the funds of the examined units.

The costs for the design of the prices of the designed products are determined by the relations:

$$p^{\text{int ernal}}_{\text{price}} = \frac{C_{tac}}{g_i N_p \cdot dv} + t^{\text{int ernal}}_{\text{axes}} + p^{\text{int ernal}}_{\text{profil}};$$

$$p^{\text{export}}_{\text{price}} = \left(p^{\text{external}}_{\text{price}} - p^{\text{int ernal}}_{\text{price}}\right) N^{\text{export}}_{\text{products}}$$

The costs for the office equipment and new information systems are calculated as follows:

$$C_{\substack{\text{birotics new}\\ \text{inf ormation systems}}} = (0{,}1 \div 0{,}15) C_{\text{tan i}} \; [\text{lei / year}]$$

Costs for the decision making and communication are calculated by the operative relations of the form:

$$C_{\substack{\text{training}\\ \text{efficient}\\ \text{decision mar ker s}}} = \left[C^{\text{int roducing}}_{\substack{\text{convergent}\\ \text{engineering}}} + C^{\text{pregatirea}}_{\substack{\text{speciala}\\ \text{a managerilor}}} \right]$$

$$C_{\substack{\text{designing}\\ \text{decisions}}} = C^{\text{cos ts}}_{\substack{\text{choo sin g optimal}\\ \text{decision var iant}}} + C^{\text{cos ts}}_{\substack{\text{applying}\\ \text{final decision}}}$$

$$C_{\substack{developing\\ communication}} = C_{intranet} + C_{internet}$$

The cost on decisions design can be differential depending on the models used in the formation of the solution for the development of real activities, namely: spending on decisions based on economic-engineering efforts as resulted from the above, decisions based on significant effects called of resources savings and decisions based on information entropy, which quantifies the effects of disturbances injected into the analyzed systems.

The application in practice of these new models for quantification the efforts based on operational research is different from design to operation, whereas the restrictions involved are not competing. The setting of the structure of the annual and multi-annual budget based on cost determined in operational research design allows overcoming crisis situations dictated by lack of funds.

3. ILLUSTRATION ON THE CALCULATION OF COSTS AND REVENUES WITHIN THE ASE STRUCTURE

3.1. I.S.P.E budget, structure in 2006

The application of the current models of the A.S.E.type for calculating the costs of design has led to the results in the table that follows:

BVC 2006
(th. RON)

Table 1

No.	Explanations	Aproved 2006
0	1	2
I	**TOTAL REVENUE ***	**33.130**
II	**TOTAL COSTS ***	**28.800**
	Material costs	**7.810**
	- consumable materials	900
	- electric power, water	800
	- depreciation	1.400
	- other material costs (repairs, service, transport, tel, mail protocol, advertising and publicity, service, security costs, etc.)	4.710
	Labour costs	**20.990**
	- wages (including meal tickets)	14.650
	- insurance + unemployment + health + accidents + labour chamber	4.240
	- other labour costs	2.100
III	**RAW PROFIT**	**4.330**

* The values that do not include sub-designers, that equally affect both the revenues and costs.

3.2. Calculating the costs and revenues on real events dictated by operational research

The applications conducted at the European level and not only allow the assessment of the levels of operational research expenses based on the following guidelines:

$$C_{tac} = \sum_{i=1}^{dv} (1 + r_a)^{-i} \, (C_{DD} + C_{CC} + C_{PR} + C_{RU} + $$
$$+ C_{EF} + C_{DC})_i$$

$$C_{DD} = (C_{search} + C_{forecast} + C_{\substack{risk+catastrophe+\\+chaos}}) = 1{,}10\; C_{DD}^{2006}$$

$$C_{CC} = \left(C_{\substack{materials\\ fules\\ energy}} + C_{\substack{decreased\\ wait}} + C_{\substack{study\\ competitive\\ market}} \right) = 1{,}10\; C_{CC}^{2006}$$

$$C_{PR} = \left[C_{re} + C_{economic\ state} + C_{quality} \right] = 1{,}10\; C_{PR}^{2006}$$

$$C_{RU} = \Big[C_{\substack{invatare\\ intensiva}} + C_{ergonomie} + C_{\substack{proiectarea\\ posturilor}} + C_{\substack{dialog\\ informatic}} + $$
$$+ C_{\substack{stimularea\\ creativitatii}} \Big] = 1{,}10\; C_{RU}^{2006}$$

$$C_{EF} = \left[C_{\substack{formation\\ own\\ funds}} + C_{\substack{designing\\ prices}} + C_{\substack{birotics\\ strategy}} \right] = 1{,}10\; C_{EF}^{2006}$$

$$C_{DC} = \left[C_{\substack{training\\ managers}} + C_{\substack{designing\\ decision}} + C_{\substack{developing\\ communication}} \right] = 1{,}10\; C_{DC}^{2006}$$

The revenues are determined by the relation:

$$V_{total}^{2007} = 1{,}10 \left(C_{total}^{2006} + p_{profit}^{2006} \right) = C_{COP}^{2007} + p_{profit}^{2007}$$

4. PANEL OF SWITCHING FROM THE CURRENT BUDGET STRUCTURE TO THE BUDGET STRUCTURE DESIGNED IN OPERATIONAL RESEARCH

The panel of switching from the current ASE structure of the budget at the level of I.S.P.E. in operational research is presented in Tables (2), (3), (4) specifying also the structure of the budgets by departments designing power plants.

Table 2

Category	Subcate-gory	Account	ACCOUNT NAME
Sus-tainable Develope-ment	Search	628.06	Acquiring books, magazines, th. docum.
	Forecast	621.01	Collaborators – legal persons
		621.02	Collaborators – with civil contract
	Risk	613	Cost on insurance premiums
		628.09.2	Cost on military security

	Catastrophe	604.02.2	Other not stored costs
		628.03	Fireproof impregnation works
Commercial costs	Reduced waiting	600.01.1.04	Perishables
		612	Cost on fees, locations and rents
		624	Cost on transport of goods and personnel
		628.09.7	Parking lot and Circulation fees
		628.09.9	Other expenses of the nature of the above
		654	Losses on debt
		663	Losses on debt relating to participants
	Resources	600.01.1.01	Local coal cost
		600.01.1.02	Import coal cost
		600.01.1.03	Coal transport cost
		600.01.2.01	Local fuel oil cost
		600.01.2.02	Import fuel oil cost
		600.01.2.03	Import fuel oil transport cost
		600.01.2.04	Local fuel coil transport cost
		600.01.4	Other technological fuels costs
		604.01.1.01	Local gas costs for the population
		604.01.1.02	Local gas costs for the economic agents
		604.01.2	Import gas costs
		604.01.3	Import gas transport costs
		604.02.1	Secondary resources costs
		600.01.3	Reactives – heavy water costs
		6011.1	Oils
		6011.2	Chemicals
		6011.3.5	Other auxiliary materials
		6012	Not technological comb. costs
		6018.5	Other material costs
		604.01.1.03	Not technological objectives gas costs
		605.01	Energy from abroad
		605.03	Technological water
		605.04	Not technological water
		608	Packaging expenses
		6013	Expenditure on packaging materials
	Marketing study	623.01	Protocol expenses
		623.02	Expenditure on advertising and publicity
		628.01	Printing services, book binfing, catalogue

Table 3

Category	Subcate-gory	Account	ACCOUNT NAME
Communi-cation decision	Decision making	614	Costs of studies and researches
		628.08	Technical assistance for other units
		628.09.1	Technical and accounting expertise
	Hierarchical communi-cation	625	Travel expenses, postings, transfers
		626	Postal expenses and fees for telecommunications Travel expenses, postings, transfers
	Managerial training	628.09.3	Training costs
		625	Travel expenses, postings, transfers
Production costs	Reengi-neering	602	Inventory objects costs
		603	Expenditure on hutments and arranged. prov.
		605.02	Energy from technology tests
		6011.03.2	Annual repair materials
		6011.03.3	Overall repair materials
		6011.03.4	Retrofitting materials
		6014.1	Maintenance spare parts cost
		6014.2	Annual spare parts repair cost
		6014.3	Spare parts overall repair costs
		6014.4	Spare parts retrofitting costs
		6018.1	Other maintenance material costs
		6018.2	Other annual repair material costs
		6018.3	Other annual overall repair material costs
		6018.4	Other retrofitting material costs
		611.01.1	Maintenance and other repair works
		611.01.2	Annual repair works conducted by third parties
		611.02.1	Overall repair (excluding retrofitting)
		611.02.2	Overall repair for retrofitting
		635.01	Buinding and ground tax
		635.04	Development tax per MWh
		635.05	Development tax per Gcal
		635.06	State ground usage tax
	Economic regime	628.04	Licences paid from the production fund
		658.04	Other operation costs
	Quality	6011.03.1	Maintenance materials
		628.05	Labour protection costs
		628.09.4	Device marking check tax
		628.09.6	Recording tax
		635.02	Means of transport tax
		635.07	Stamp duty
		635.08	Prorate cost
Personal	Information dialogue	641	Wages
	Ergonomic places	628.07	Photo, dyeing, disinfection, deratization services
		628.09.5	Salubrity tx

Table 4

Category	Subcate-gory	Account	ACCOUNT NAME
Economic	Tariff grounding	631	Wage tax
		6451.01	Social insurance cost
		6451.02	Health insurance cost
		6452	Unemployment cost 5%
		6458.1	Other social and health insurance cost
		635.03	VAT cost on free items
		635.09	Other tax costs
		635.10	Special road tax
		658.01	Coas tax
		658.03	Jiului Valley salary costs
	Fund grounding	6458.2	Financial recovery fund costs
		6811.1	Immobilization depreciation costs
		6811.2	Immobilization depreciation costs
		622	Commission cost
		627	Banking and related services costs
		664	Yielded temporary investment costs
		668	Other financial costs
		6712	Donations and subsidies granted
		6714	Losses from various debtors
	Information birotics	626	Post and telecommunication tax
		628.02	Data processing services, computer system information

The structure built in operational research avoids the crisis situation dictated by the lack of funds during the whole year of the forecast. This advantage is due to the fact that all the costs are quantified on real events both at the level of the design unit and at the level of the projects carried out for the designing and achievement of the designed energy objectives. If the managers prepare the conditions for passing to the new structure, then the total risks will be eliminated and supplementary funds will emerge from applying the acquired information and applied in various projects to which are added the general savings of removing the damage. In addition, increasing the working time by eliminating the expectations and increased productivity due to computerization will generate significant profits.

5. STRUCTURE OF ISPE BUDGET IN 2007 IN OPERATIONAL RESEARCHES

The budget designed on actual income and cost shaped in operational research has the structure in Table (5). The increases provided at the level of the income and cost in 2007 are 10%.

Table 5

No.	Name of the efforts	Value
I	Total income (th. RON)	$1{,}10\ V^{2006}_{total}$
II	Total cost (th. RON)	$1{,}10\ C^{2006}_{total}$
	- Sustainable development cost	$1{,}10\ C^{2006}_{DD}$
	- Commercial activities cost	$1{,}10\ C^{2006}_{CC}$
	- Production cost	$1{,}10\ C^{2006}_{productie}$
	- Human resources costs	$1{,}10\ C^{2006}_{resursele\ umane}$
	- Economic and financial activities cost	$1{,}10\ C^{2006}_{economico\ financiare}$
	- Decision making and communication cost	$1{,}10\ C^{2006}_{decizie\ si\ comunicare}$
III	- Total profit	$1{,}10\ p^{2006}_{total}$
IV	Allocation of total cost and income on real events design is based on key statisrics	Calculation is performed for heads of department based on actual projects

The allocation of the income and cost on real events in the design objectives of energy is achieved by the following indicative schedule.

A. Operative structure of the income

$V^{total}_{\substack{achievable\\ income}} = (4 \div 10)\,\%$ of the value of the objectives ordered plus the income from the actions of improving and diversifying the design, including the income from export activities =365 · 10[9] lei.

$$V^{2007}_{DD} = V_{\substack{information\\ search}} + V_{\substack{generated\\ forecast}} + V_{\substack{removing\\ risks,\\ catastrophes\\ and\ chaos}} = 1{,}1\,V^{2006}_{DD}$$

$$V^{2007}_{CC} = V_{\substack{material\ and\ fuel\\ acquisition\ under\\ favourable\ conditions\\ of\ competitive\ market}} + V_{\substack{increasing\ useful\\ working\ time\\ from\ 2\ hours\ in\\ Romania\ to\ 6\ hours\\ in\ Europe}} + V_{\substack{knowledge\ of\\ maximum\ demand\\ of\ products\ and\ selling\\ at\ maximum\ prices}} = 1{,}1\,V^{2006}_{CC}$$

$$V^{2007}_{PR} = V_{\substack{generated\ by\\ longer\\ operating\\ time}} + V_{\substack{increase\ in\\ efficiencies\\ and\ decrease\\ in\ specific\\ consumptions}} + V_{\substack{increase\\ in\ quality\ of\\ all\ activities}} = 1{,}1\,V^{2006}_{CC}$$

$$V^{2007}_{RU} = V_{\substack{generated\\ from\ renewing\\ knowledge\\ bz\ learning}} + V_{\substack{increasing\\ productivity\\ due\\ to\ ergonomy\\ of\ workplaces}} + V_{\substack{indesign\ process\\ computerization}} = 1{,}1\,V^{2006}_{RU}$$

$$V^{2007}_{EF} = V_{\substack{supplementary\\ funds\ by\\ correcting\ the\\ indicators\ and\\ their\ annual\\ increase}} + V_{\substack{designing\ prices\\ and\ generating\\ funds\ by\\ designing\ more}} + V_{\substack{building\\ funds\ by\\ shortening\\ the\ working\ time\\ by\ means\ of\\ birotics}} = 1{,}1\,V^{2006}_{EF}$$

$$V^{2007}_{DC} = V_{\substack{generating\\ income\\ by\ managing\\ resources\ with\\ pertinent\ decisions}} + V_{\substack{supplementary\\ funds\ based\ on\\ improving\ energy\\ business}} = 1{,}1\,V^{2006}_{DC}$$

6. COST STRUCTURE IN OPERATIONAL RESEARCH

$$C^{2007}_{tan} = 320 \cdot 10^9 lei \Rightarrow 32 \cdot 10^6 RON$$

$$C^{2007}_{DD} = (C_{\substack{search\ for\\ information}} + C_{forecast} + C_{\substack{risk\\ catastrophe\\ chaos}}) = 1{,}1\,C^{2006}_{DD}$$

$$C^{2007}_{CC} = (C_{\substack{material\\ fuel\\ energy}} + C_{\substack{removing\\ wait}} + C_{\substack{studzing\\ competitive\\ market}}) = 1{,}1\,C^{2006}_{CC}$$

$$C^{2007}_{DER} = (C_{renewal} + C_{\substack{economic\\ state}} + C_{quality}) = 1{,}1\,C^{2006}_{PR}$$

$$C^{2007}_{RIC} = (C_{learning} + C_{ergonomy} + C_{\substack{designing\\ posts}} + C_{\substack{information\\ dialogue}} + C_{\substack{encouraging\\ creativity}}) = 1{,}1\,C^{2006}_{RU}$$

$$C^{2007}_{EGF} = (C_{\substack{formarea\\ fonds}} + C_{\substack{designing\\ prices}} + C_{\substack{birotics\\ strategy}}) = 1{,}1\,C^{2006}_{EF}$$

$$C^{2007}_{DC} = (C_{\substack{decision\\ making}} + C_{\substack{designing\\ decisions}} + C_{\substack{developing\\ communication}}) = 1{,}1\,C^{2006}_{DC}$$

The allocation of these costs on actual events of the six operators is done by calculating each category of cost and reporting on the resulting distribution keys that can be used from year to year if they take into account the undergoing changes.

This way one can correlate without risks the income with the actual costs and can estimate the final profit with negligible errors.

Further on we show the calculation mode of the costs by operators of the research of the actual fact.

$$C_{DD} = k_{DD} \cdot C_{tan} = (k_{search\ for\ information} + k_{forecast} + k_{risk\ catastrophe\ chaos})\, C_{DD}$$

$$C_{CC} = k_{CC} \cdot C_{tan} = (k_{fuel,\ material,\ energy} + k_{decreased\ wait} + k_{market\ study})\, C_{CC}$$

$$C_{PR} = k_{PR} \cdot C_{tan} = (k_{innovation} + k_{economic\ state} + k_{quality})\, C_{PR}$$

$$C_{RU} = k_{RU} \cdot C_{tan} = (k_{learning} + k_{ergonomy} + k_{post\ designer} + k_{information\ dialogue} + k_{encouraging\ creation})\, C_{RU}$$

$$C_{EF} = k_{EF} \cdot C_{tan} = (k_{own\ funds} + k_{designing\ prices} + k_{birotics\ strategy})\, C_{EF}$$

$$C_{DC} = k_{DC} \cdot C_{tan} = (k_{training\ managers} + k_{designing\ decision} + k_{developing\ communication})\, C_{DC}$$

For example, we write the relations for calculating the keys in the previous relations:

$$k_{DD} = \frac{C_{DD}}{C_{tan}}; \quad k_{CC} = \frac{C_{CC}}{C_{tan}}; \quad k_{PR} = \frac{C_{PR}}{C_{tan}};$$

$$k_{RU} = \frac{C_{RU}}{C_{tan}}; \quad k_{EF} = \frac{C_{EF}}{C_{tan}}; \quad k_{DC} = \frac{C_{DC}}{C_{tan}};$$

The data for calculating the keys in the structure of each player in the events are determined on a statistical view of the factors that cause expenses, actual revenue, respectively.

The final form of the revenue-cost budget will include the values of the income and cost mentioned in Tables (6-1) and (6-2).

Table 6

$C_{DD} \Rightarrow 48 \cdot 10^9$ lei > (profit 15% reinvested for development)	
$C_{search} \Rightarrow 10 \cdot 10^9$ lei	
$C_{forecast} \Rightarrow 6 \cdot 10^9$ lei	
$C_{risk,\ catastrophe,\ chaos} \Rightarrow 4 \cdot 10^9$ lei	
$C_{CC} \Rightarrow 30 \cdot 10^9$ lei	
$C_{materials,\ fuel,\ energy} \Rightarrow 0{,}03\ Ctan = 0{,}03 \cdot 320 \cdot{=}12 \cdot 10^9$ lei	
$C_{rreducing\ wait} \Rightarrow 3 \cdot 10^9$ lei	
$C_{study\ of\ competitive\ market} \Rightarrow 7 \cdot 10^9$ lei	
$C_{PR} \Rightarrow 16 \cdot 10^9$ lei	
$C_{renewal} \Rightarrow 20 \cdot 10^9$ lei	
$C_{economic\ state} \Rightarrow 2 \cdot 10^9$ lei	
$C_{quality} \Rightarrow 4 \cdot 10^9$ lei	
$C_{RU} \cong 0{,}67\ C_{tan} \cong 216 \cdot 10^9$ lei	
$C_{learning} \Rightarrow 42 \cdot 10^9$ lei	
$C_{ergonomy} \Rightarrow 5 \cdot 10^9$ lei	
$C_{designing\ posts} \Rightarrow 160 \cdot 10^9$ lei	
$C_{information\ dialogue} \Rightarrow 4 \cdot 10^9$ lei	
$C_{research\ encouragement} \Rightarrow 5 \cdot 10^9$ lei	
$C_{EF} \Rightarrow 5 \cdot 10^9$ lei	
$C_{fund\ g.} \Rightarrow 12 \cdot 10^9$ lei	
$C_{price\ design} \Rightarrow 1 \cdot 10^9$ lei	
$C_{birotics\ strategy} \Rightarrow 2 \cdot 10^9$ lei	
$C_{CD} \Rightarrow 5 \cdot 10^9$ lei	Programmed profile of 15% can grow based on the increase in internal revenue and revenue from exporting the projects (projects for drawing revenue from European funds)
$C_{fm} \Rightarrow 3 \cdot 10^9$ lei	
$C_{pd} \Rightarrow 1 \cdot 10^9$ lei	
$C_{dc} \Rightarrow 1 \cdot 10^9$ lei	

The synthetic structure of the revenue-cost budget at the level of ISPE for 2007 in operational research may be followed in the table (6-2).

BVC-2007

(Lei and th.RON)

Table 6

No.	Name of estimated revenues and costs	Total value
1	Total revenue (internal and external)	$365 \cdot 10^9$ lei / $36{,}5 \cdot 10^6$ RON
2	Total costs	$330 \cdot 10^9$ lei / $33 \cdot 10^6$ RON
	Sustainable development cost	$48 \cdot 10^9$ lei / $4{,}8 \cdot 10^6$ RON
	Commercial costs, including those destined to the study of the competitive market	$30 \cdot 10^9$ lei / $3 \cdot 10^6$ RON
	Production cost (design and other productive services)	$16 \cdot 10^9$ lei / $1{,}6 \cdot 10^6$ RON
	Human resources reconfiguring cost	$216 \cdot 10^9$ lei / $21{,}6 \cdot 10^6$ RON
	Economic-financial activity costs	$5 \cdot 10^9$ lei / $0{,}5 \cdot 10^6$ RON
	Holistic communication – decision cost	$5 \cdot 10^9$ lei / $36{,}5 \cdot 10^6$ RON
3	Programmed profit 15% from total costs	$48 \cdot 10^9$ lei / $4{,}8 \cdot 10^6$ RON

* The potential revenue may grow by about $50 \bullet 10^9$ lei in reducing wait and in increasing productivity.

This structure ensures both the development of design activities and the cover of the shares that come to stakeholders every year.

7. EXAMPLES OF CALCULATION IN THE ENTREPRENEURIAL VIEW BASED ON OPERATIONAL RESEARCH

7.1. Determination of optimal variant of sustainable development of the NPS objectives

- **Calculation data**

Installed power: $P_1 = 3700$ [MW]
Operating time: $t_f = 6500$ [h/yr]
Loading degree: $g_i = 0.9$
Specific investment: $i_{sp} = 1.5\text{-}10^6$ [lei/kWinst]
Depreciation quota: $k_{amor} = 4\%$ of the investment per year
Lifetime: $d_u = 35$ [yrs]
Domestic energy prices: $p_{ei} = 2000$ [lei / kWh]
External energy price: $p_{ext} = 100$ [USD/MWh]
Price not delivered energy: $p_{nl} = 200\ p_{ei} = 4 \cdot 10^5$ [lei/kWh]
The probability of damage to the plant: $p_{av} = \frac{1}{365} = 0{,}0027$
In case of power failure:
$P_{av} = 0.25 P_i = 927.5$ [MW]
Power of a unit: $P_g = 700$ [MW]

Specific fuel consumption:
q = 0.5 [kg cc/kWh]
Conventional fuel price:
p_{cc} =140 [USD/t cc]
Calendar time: t_c = 8760 [h]
Programmed profit: 1% of the evened specific cost
Capital formation rate:
r_{fc} = 1.01 [lei income/invested leu]
$T_{network-distribution}$ = 3 [USD / MWh]
Personnel norm/ MW: i_p = 2.4 [man/MWh]
Return rate: r_a = (10÷30) %

- **Requirements**

1) To determine the optimal design variant of the sources of energy production;
2) Performance indicators to determine the profitability of the solution in the design and operation conditions;
3) Interpreting the results and commenting on the way they may apply to the NPS subjected to development.

- **Resolution**

1) **The optimal development variant of power systems as designed by the efficient technical economic and financial management**

$C_{tac} = \sum_{i=1}^{dv} (1+r_a)^{-1} \cdot C_{tan\,i}$ [lei during the lifetime of the power equipment]

$C_{tan\,i} = \lfloor k_{amor} \cdot I_t + p_{ei} \cdot E_p \rfloor$ [lei/yr]

$$I_t = i_{sp} \cdot P_i = 1{,}5 \cdot 10^9 \left[\frac{lei}{MWinst}\right] \cdot 3700[MW] \cong$$
$$\cong 5565 \cdot 10^9 \text{ [lei]}$$

$E_p = t_f \cdot P_i = 6510 \cdot 3700 = 24.152.100$ [MWh/yr]
$P_i = 3700$ [MW]; $P_g = 700$ [MW]
$P_{iI} = 5x700 = 3500$
$\Rightarrow P_{echivalare} = 700$ [MW]
$P_{iII} = 6x700 = 4200$ [MW]

We will have two classes of costs:

$$C_{tan\,I} = k_{depreciation} \cdot i_{sp} \cdot P_{iI} + p_{ei} \cdot t_f \cdot P_{iI} + C^{quatitative}_{equivalence}$$

$$C_{tan\,II} = k_{amortizare} \cdot i_{sp} \cdot P_{iII} + p_{ei} \cdot t_f \cdot P_{iII} + C^{quantitative}_{equivalence}$$

$$C_{tan\,I} = k_{depreciation} \cdot i_{sp} \cdot P_{iI} + k_{depreciation} \cdot i_{sp} \cdot P_{echI} + p_{ei} \cdot E_{echI} = 0{,}04 \cdot 1{,}5 \cdot 10^9 \cdot 3500 + 2 \cdot 10^6 \cdot 6510 \cdot 3500 + 0{,}04 \cdot 1{,}5 \cdot 10^9 \cdot 700 + 2 \cdot 10^6 \cdot 700 = 45{,}57 \cdot 10^{12}\left[\frac{lei}{yr}\right]$$

$$C_{tan\,II} = k_{amortizare} \cdot i_{sp} \cdot P_{iII} + p_{ei} \cdot t_f \cdot P_{iII} + (R_{II} - R_I) = 0{,}04 \cdot 1{,}5 \cdot 10^9 \cdot 4200 + 2 \cdot 10^6 \cdot 6510 \cdot 4200 + 1{,}52 \cdot 10^{12} = 56{,}456 \cdot 10^{12}\left[\frac{lei}{yr}\right]$$

$$C_{tac\,I} = \sum_{i=1}^{dv} (1+r_a)^{-1} \cdot C_{tan\,I} = \sum_{i=1}^{35} (1+0{,}2)^{-i} \cdot 45{,}6 \cdot 10^{12} = 1330 \cdot 10^{12} \text{ [lei]}$$

$$C_{tacII} = \sum_{i=1}^{dv} (1+r_a)^{-i} \cdot C_{tanII} = \sum_{i=1}^{35} (1+0{,}2)^{-i} \cdot 56{,}46 \cdot 10^{12} = 164{,}675 \cdot 10^{12} \text{ [lei]}$$

The calculation of risks is carried out by applying the following models:

$$R_I = p_{nI} \cdot E_{nII} + i_{sp} \cdot P^{risc}_{avI} = 200 \cdot p_{ei} \cdot \frac{t_f}{365} \cdot \frac{P_{iI}}{4} + i_{sp} \cdot \frac{P_{iI}}{4} = 200 \cdot 2 \cdot 10^6 \cdot \frac{6510}{365} \cdot \frac{3500}{4} + 1{,}5 \cdot 10^9 \cdot \frac{3500}{4} = 7{,}55 \cdot 10^9 \left[\frac{lei}{yr}\right]$$

$$R_{II} = p_{nI} \cdot E_{nI,II} + i_{sp} \cdot P^{risc}_{avII} = 200 \cdot p_{ei} \cdot \frac{t_f}{365} \cdot \frac{P_{iII}}{4} + i_{sp} \cdot \frac{P_{iII}}{4} = 200 \cdot 2 \cdot 10^6 \cdot \frac{6510}{365} \cdot \frac{4200}{4} + 1{,}5 \cdot 10^9 \cdot \frac{4200}{4} = 9{,}066 \cdot 10^{12} \left[\frac{lei}{yr}\right]$$

The cost analysis leads to the conclusion that the realization of a power plant with 5 power units of 700 MW each becomes feasible in terms of total updated costs.

2) **The calculation of performance indicators to determine the sustainable development profitability of power systems**

$$r^p_{fc} = \frac{E^{value}_{Economy} + R^{value}_{Risck}}{i_{sp} \cdot P^{V.opt}_i} = \frac{12{,}857 \cdot 10^{12} + 7{,}55 \cdot 10^{12}}{1{,}5 \cdot 10^9 \cdot 3500} = 3{,}88 \succ 1{,}01 \left[\frac{\text{lei income}}{\text{leu invested}}\right]$$

$$E^{value}_{Economy} = 1{,}01 \cdot i_{sp} \cdot P^{V.opt}_i + R^{Value}_{Risk} = 1{,}01 \cdot 1{,}5 \cdot 10^9 \cdot 3500 + 7{,}55 \cdot 10^{12} = 12{,}857 \cdot 10^{12} \text{ [lei]}$$

$$R^{value}_{Risk} = p_{enI} \cdot E^{vopt}_{nI} + i_{sp} \cdot P^{vopt}_{av} = 4 \cdot 10^8 \cdot \frac{6510}{365} \cdot \frac{3500}{4} + 1{,}5 \cdot 10^9 \cdot \frac{3500}{4} = 7{,}55 \cdot 10^9 \text{ [lei]}$$

$$\bar{p}_{ei} = \frac{C^{vop}_{tac}}{g_i \cdot E^{vop}_p \cdot d_v} + t_{\substack{retea\ de\ transport\\ si\ distributie}} + p_{profit\ programat} = 660 \text{ [lei/kWh]}$$

$$E_{\substack{Information\\ entropy}} = 3{,}32 \cdot (-p_s \cdot \lg p_s - p_i \cdot \lg p_i) \left[\frac{bits}{event}\right]$$

$$V = (p_{ext} - \bar{p}_{ei}) \cdot E_p = (3000 - 660) \cdot 3500 \cdot 10^3 = 8{,}01 \cdot 10^{12} \text{[lei]}$$

$$C_{icomputerization} = 0{,}2\cdot(k_{depreciation}\cdot I_t + p_{ei}\cdot E_p) =$$
$$= 0{,}2\cdot(0{,}04\cdot 1{,}5\cdot 10^9\cdot 3500 + 2\cdot 10^6\cdot 3500) =$$
$$= 1412\cdot 10^6\ [lei]$$

3) Interpretation of results

The computer assisted optimum is achieved with minimum total cost and the calculated rate of capital formation is higher than that proposed. Their difference generates savings based on the transformation of risk into profit.

In addition, the 700 MW units accepted have a minimum specific fuel consumption and need every year a quantity of fuel.

$B_c = q\text{-}\ E^{opt}\cdot c_{sp} = 0{,}3\cdot E^{opt}\cdot 130$

The total updated costs were equated in terms of quantity and quality and correspond to a real calculation based on real facts modeling.

The quantitative equivalence is carried out by adding to the solution with the lowest different production of investments and expenses.

The qualitative equivalence is performed at the variant with maximum power, by adding the difference between the value risks that can occur in the two variants.

The final solution generates total revenues (V + R) = 15.56 x 10^{12} lei, which justifies the practical implementation of the guidelines of POSDRU program upon the development of the energy objectives of the NPS.

7.2. The technical and economic justification of the expert informaiton systems assisting the project managers in designing and operating energy objectives

• **Calculation data:**

$P_i = 2500$ [MW]

$t_f = 7000$ [h/yr]

$g_i = 0{,}8$ $k_i = 3\%$

$p_{ei} = 1900\cdot 10^3$ [lei/MWh]

$p_{et} = 900000$ [lei/Gcal]

$i_{sp} = 1{,}5\cdot 10^9$ [lei/$MW_{installed}$]

$i_{personal} = 2{,}4$ [om/MW]

$p_{eext} = 100\cdot 30000 = 3{,}0\cdot 10^6$ [lei/MWh]

$p_{eneliv} = 200\cdot p_{ei} = 200\cdot 1900 =$
$= 380\cdot 10^6$ [lei/MWh]

$$p_{a\,var\,ie} = \frac{1}{365} = 2.74\cdot 10^{-3}$$

$$t_{a\,var\,ie} = p_{a\,var\,ie}\cdot t_f = 2{,}74\cdot 10^{-3}\cdot 7000 = 19{,}18\,[h/an]$$

$$p_{cc} = 50\cdot 30000 = 1{,}5\cdot 10^6\,[lei/t_{cc}]$$

$r_a = 0{,}1$; $d_v = 35$ ani; $K_{info} = 0{,}22$; $S_{med} =$
$= 6\cdot 10^6$ [lei/om/month]; $p_{wear} = 0{,}5$; $p_{reparatii} =$
$= 0{,}5$; $p_{success} = 0{,}8$; $p_{failure} = 0{,}2$; $t_{neluc} =$
$= 1600$ [h/an]; $t_c = 8760$ [h/yr]

To determine:

1) The potential energies and powers to be produced in the power facilities provided with expert systems;
2) The Indicators of economical operation of the installations supervised by expert systems;
3) The efficient operation conditions of the expert systems;
4) The determination of information entropy by considering the wear / repairs and the power production with some frequency, in the conditions in which there is a loss of activity at the level of the staff;
5) Commenting the calculated indicators, including the specification of the conditions for the implementation of expert systems in the generation, transmission and use of electricity installations.

• **Resolution:**

1) The calculation of the power and energy produced in the facilities supervised by expert systems

$P_i = P_{max\,max} = 2500$ [MW]

$P_{ec} = 0{,}8\cdot P_i = 2000$ [MW]

$P_{ef} = (0{,}8 \div 0{,}5)\cdot P_i = (2000\div 1250)$ [MW]

$E_{max\,max} = t_c\cdot P_i = 8760\cdot P_i = 21{,}9$ [MW] -
this energy is taken into account in the strategic operation planning in perspective of the new energy objectives.

$E_{ef} = t_{ef}\cdot P_{ef} = 7000\cdot P_{ef} = 100\cdot 10^6$ [MWh]

$V_{max\,max} = p_{ei}^{SEN}\cdot E_{max\,max} = 4{,}75\cdot 10^9$ [lei]

$V_{ef} = p_{ei}^{SEN}\, E_{ef} = (26600\div 166326)\cdot 10^9$ [lei]

$p_{max\,max} = [V_{max\,max} - C_{max\,max}]$

$C_{depreciation} = i_{sp}\cdot P_i\cdot k_i = 1{,}5\cdot 10^9\cdot 2501\cdot 0{,}03 =$
$= 112{,}54\cdot 10^9$ [lei]

$C_{operation} = p_{ei}\cdot P_i = 33260\cdot 10^9$ [lei]

$E_{comb}^{valorica} = 65\cdot 30000\cdot 0{,}2\cdot q\cdot E_{ec} = 884{,}35\cdot 10^9$,
where q = 500 [kgcc/MWh].

($E_{comb}^{valorica}$ = possible fuel saving from the loading of units to 80% of the maximum power).

2) Indicators of economic operation of the supervised system expert

$$R_{risk}^{value} = p_{enl}\cdot E_{nl} + i_{sp}\cdot P_{av} = 200\cdot p_{ei}\cdot t_{a\,var\,ie}\cdot P_{a\,var\,ie} +$$
$$+ i_{sp}\cdot P_{a\,var\,ie} = 5995\cdot 10^9\ [lei]$$

$$I_i = i_{sp}\cdot P_i = 1{,}5\cdot 10^9\cdot 2501 = 3751{,}5\cdot 10^9\ [lei]$$

$$r_{fc} = \frac{E_{value}^{economic} + R_{risk}^{value}}{I_i} =$$
$$= \frac{9495\cdot 10^9}{3751{,}5\cdot 10^9} \cong 2{,}3\ [\text{lei income/leu invested}]$$

$E_{economic}^{energy} = 0{,}8\cdot E_{max\,max} = 17{,}52$ [MW]

$E_{sb}=p_{cc}\cdot E_{comb}\cdot t_f\cdot P_i=$
$= 4{,}42\cdot 10^6\cdot 2\cdot 10^{-6}\cdot 7000\cdot 2501\cdot 10^3=$
$=1547{,}62\cdot 10^6$ [MW]

$E_p = S_{med}\cdot 12\cdot k_i\cdot i_{personal}\cdot P_i =$
$= 6\cdot 10_6\cdot 12\cdot 0{,}6\cdot 2{,}4\cdot 10^{-3}\cdot 2501\cdot 10^3 =$
$=\cdot 259{,}3\cdot 10^6$ [MW]

$E_{si} = p_{eint}\cdot k_{info}\cdot 0{,}12\cdot t_f\cdot P_i =$
$= 1900\cdot 0{,}22\cdot 0{,}12\cdot 7000\cdot 2501\cdot 10^3 =$
$= 878{,}15\cdot 10^6$ [MW]

$E_{cplant} = E_{sb}+E_p+E_{si}=2685{,}07\cdot 10^6$ [MW]

$E_{cnetwork}= p_{ei}\cdot k_{info}\cdot c_{losses}\cdot 0{,}88\cdot t_f\cdot P_i =$
$= 1900\cdot 0{,}22\cdot 0{,}5\cdot 0{,}88\cdot 7000\cdot 2501\cdot 10^3=$
$= 3219{,}89\cdot 10^6$ [MW]

$E_{cconsumer} = 1900\cdot 0{,}5\cdot 0{,}2\cdot 0{,}88\cdot 7000\cdot 2501\cdot 10^3=$
$=2927{,}17\cdot 10^6$ [MW]

$E_{ec}=E_{cplant}+E_{cnetwork}+E_{cconsumer}=8832{,}13\cdot 10^6$ [MW]

$C_{info}=0{,}1\cdot C_{tan}=0{,}1\cdot 33372{,}54\cdot 10^9=3337{,}254\cdot 10^9$ [lei]

$$b_{tac} = \left[\sum_{i=1}^{d_v}(1+r_a)^{-i}\right] = 4{,}947586$$

$C_{tac} = C_{tan}\cdot b_{tac} = 33372{,}54\cdot 10^9\cdot 4{,}947586 =$
$= 165{,}113\cdot 10^{12}$ [lei]

$$c_{sp2} = \frac{C_{tac}}{g_i\cdot P_i\cdot t_f\cdot d_v} = 1336 \text{ [lei/kWh]}$$

3) The efficient operation conditions of expert systems

The efficient operation of expert systems has to be correlated with the application of the following actions:

a) Starting up the cold standby units is carried out in increasing order of the empty running consumption;

b) Upon increasing the charge, the loading is performed in order of increasing the supplementary specific consumptions;

c) The discharge is carried out in reverse order;

d) The starting up and shutdown should be strictly managed so that the total fuel consumption by units and power plant should be minimal;

e) If the total consumption is minimal it means that the expected fuel saving was carried out and we managed to include the power plant among the units which contribute to covering the load curve. So, the power plant is able to meet the system requirements and be included into the order of merit which provides the minimum total consumption and the adequate quality of the energy produced and sold at competitive prices.

4) Calculating entropy

• **Block diagram**

$$p_{scomb} = \frac{(t_{an}-t_{ide})}{t_{an}} = \frac{8760-300}{8760} = 0{,}9657$$

$p_{incomb} = 1 - p_{scomb} = 1 - 0{,}9657 = 0{,}0342$

$$p_{sbenzi} = \frac{(t_{an}-t_{ibt})}{t_{an}} = \frac{8760-200}{8760} = 0{,}9771$$

$p_{ibenzi} = 1 - p_{sbenzi} = 1 - 0{,}9771 = 0{,}0228$

$$p_{slack} = \frac{(t_{an}-t_{ilack})}{t_{an}} = \frac{8760-333}{8760} = 0{,}9619$$

$p_{ilack} = 1 - p_{slack} = 1 - 0{,}9619 = 0{,}0380$

$e_{comb} = -3{,}32\cdot(p_{scomb}\cdot\log(p_{scomb}) +$
$+ p_{incomb}\cdot\log(p_{incomb})) = 0{,}2244$

$e_{bands} = -3{,}32\cdot(p_{sbands}\cdot\log(p_{sbands}) +$
$+ p_{inbands}\cdot\log(p_{inbands})) = 0{,}1571$ [bits/ev]

$e_{lack\ human\ resources} = -3{,}32\cdot(p_{slack}\cdot\log(p_{slack}) +$
$+ p_{inlack}\cdot\log(p_{inlack})) = 0{,}2319$ [bits/ev]

$e_{discharge} = e_{comb} + e_{bands} + e_{lack} + e_{discharge} =$
$= 0{,}5996$

$$p_{srep} = \frac{(t_{an}-t_{icz})}{t_{an}} = \frac{8760-800}{8760} = 0{,}9086$$

$p_{inrep} = 1 - p_{srep} = 1 - 0{,}9086 = 0{,}0913$

$e_{rep} = -3{,}32\cdot(p_{srep}\cdot\log(p_{srep}) + p_{inrep}\cdot\log(p_{inrep})) =$
$= 0{,}4398$ [bits/ev]

$e_{tg} = -3{,}32\cdot(p_{neuzuratg}\cdot\log(p_{neuzuratg}) + p_{uzuratg}\cdot$
$\cdot\log(p_{uzuratgi})) = 0{,}6089$ [bits/ev]

$e_{thermomec} = e_{rep} + e_{tg} + e_{lack\ human\ resources} = 1{,}3079$

$$p_{sdesc} = \frac{(t_{an}-t_{ide})}{t_{an}} = \frac{8760-300}{8760} = 0{,}9657$$

$p_{indesc} = 1 - p_{sdesc} = 1 - 0{,}9657 = 0{,}0342$

$$p_{ssgm} = \frac{(t_{an}-t_{igm})}{t_{an}} = \frac{8760-400}{8760} = 0{,}9543$$

$p_{insgm} = 1 - p_{ssgm} = 1 - 0{,}9543 = 0{,}0456$

$$p_{ssfn} = \frac{(t_{an}-t_{ifn})}{t_{an}} = \frac{8760-500}{8760} = 0{,}9429$$

$p_{insfn} = 1 - p_{ssfn} = 1 - 0{,}9429 = 0{,}0570$

$e_{desc} = -3{,}32\cdot[(p_{sdesc}\cdot\log(p_{sdesc}) +$
$+ p_{indesc}\cdot\log(p_{indesc})] = 0{,}2149$ [biți/ev]

$e_{sgm} = -3{,}32\cdot[(p_{ssgm}\cdot\log(p_{ssgm}) +$
$+ p_{insgm}\cdot\log(p_{insgm})] = 0{,}2659$ [biți/ev]

$e_{sfn} = -3{,}32\cdot[(p_{ssfn}\cdot\log(p_{ssfn}) + p_{insfn}\cdot\log(p_{insfn})] =$
$= 0{,}3175$ [biți/ev]

$e_{electric} = e_{sfn} + e_{sgm} + e_{desc} = 0{,}7965$ [biți/ev]

$e_{totalb} = e_{discharge} + e_{thermomec} + e_{electric} =$
$= 2{,}6775$ [bits/ev]

• By pipeline diagram:

$$p_{srepcaz} = \frac{(t_{an}-t_{icz})}{an} = \frac{8760-800}{8760} = 0{,}9086$$

$p_{inrepcaz} = 1 - p_{srepcaz} = 1 - 0{,}9086 = 0{,}0913$

$$p_{sreptg} = \frac{(t_{an}-t_{itg})}{an} = \frac{8760-700}{8760} = 0{,}9200$$

$p_{inreptg} = 1 - p_{sreptg} = 1 - 0{,}9200 = 0{,}0799$

$e_{repcaz} = -3{,}32\cdot[(p_{srepcaz}\cdot\log(p_{srepcaz}) + p_{inrepcaz}\cdot$
$\cdot\log(p_{inrepcaz})] = 0{,}4499$ [bits/ev]

$e_{reptg} = -3,32 \cdot [(p_{sreptg} \cdot \log(p_{sreptg}) + p_{inreptg} \cdot$
$\cdot \log(p_{inreptg})] = 0,4955$ [bits/ev]
$e_{caz} = -3,32 \cdot [(p_{neuzurac} \cdot \log(p_{neuzurac}) + p_{uzurac} \cdot$
$\cdot \log(p_{uzurac})] = 0,4867$ [bits/ev]
$e_{thermomec} = e_{repcaz} + e_{reptg} + e_{tg} + e_{caz} = 1,968$ [bits/ev]
$e_{totalc} = e_{discharge} + e_{thermomec} + e_{electric} =$
$= 3,3436$ [bits/ev]

Optimal diagram (with minimal information entropy) is the block one:

$e_{standard1} = 2,0285$
$e_{standard2} = 1,4968$

$$level_1 = 1 - \frac{e_{etalon1}}{e_{totalb}} = 0,2655$$

$$level_2 = 1 - \frac{e_{etalon2}}{e_{totalb}} = 0,4376$$

$g_{organization1} = 1 - level_1 = 0,7345$
$g_{organization2} = 1 - level_2 = 0,5624$

*

Introducing expert systems is justified only where costs are lower than future earnings due to the implementation of these systems. At the NPP these systems are necesary and for ensuring a high level of reliability. The optimal entropy is 0.26, and the best degree of organization 0.73. The main indicators that favor the use of expert systems are:

- The energies and powers should be carried out in economic regimes.
- The values of the indicators of profitability justifies the design, implementation and operation of expert systems in the power production, transport and use
- The determination of the total income when exporting energy is carried out in determining the economic system by the technical-economic distribution of the tasks by units and power plants so that the order of merit should be carried out (minimum specific fuel consumption, correlated with the minimization of the total costs and competitive price of energy at the market should be optimized).
- The expert systems implemented at the level of energy production facilities generate revenue both through the sale of energy at the level of the NPS and by the export of energy in the European interconnected supervised system.
- These savings must be greater than the costs for developing computerization, which is a source of income for the new investments required by designing and implementing neuroexpert systems.

7.3. Profitability of energy management in the design of the economic and financial reengineering

- **Calculation:data**

$P_i = 1005$ [MW],
Structure of expenses reflected in the cost of energy in the year of the analysis:

- Fuels: (72÷30)%
- Materials: 4,5%
- Depreciation: 8%
- Wages: 2%
- Miscellanea: 13,5%

The data provided in the contract of excellence for the year that follows refers to the following provisions:
Increase in power production:
+30%
Decrease in specific consumption:
-2% Increase in the depreciation by extending the fixed funds:
+5%
Increase in various expenses:
+10%
Increase in labour productivity by implementing expert systems:
+25%
Increase in electric power price:
+3%
Increase in profit:
+10%

The costs in the reference year are $45 \cdot 10^9$ lei. The produced and sold power is $3.2 \cdot 10^6$[MWh]. The subsidiary will apply next year two commercial strategies:
S1 - Selling electric power directly to existing consumers A,B,C, D without resorting to the unique consumer the NPS;
S2 - Selling electric power through the NPS and directly to external consumers.

- Domestic electricity prices
  $p_{ei} = 2000$ [lei / kWh] and external
  $p_{ee} = 100$ [USD /kWh] with
  1 USD = 32000 lei;
- The power delivery can be ensured both at peak hour and irrespective of the consumption hour required by the buyers.
- The demands of the consumers A, B, C, D in power and energy and the required state can be followed in the table below:

Consumer states	**A**	**B**	**C**	**D**
Electric power [MWh]	$1,2 - 10^6$	$1,1 - 10^6$	$0,6 - 10^6$	$0,3 - 10^6$
Demanded power [MW]	350	300	250	150
Imposed state	Irrespective of the consumption hour i_0	i_0	Peak hour v	I_0

Price of not delivered energy $p_{nl} = 200 \cdot p_{ei} = 200.000$ [lei/kWh], failure time: $t_{av} = p_{av} \cdot t_f = t_f/365$, $i_{sp} = 1,5 \cdot 10^6$ [lei/kW installed], power in case of failure: $P_{av} = 0,25 \cdot P_i, t_f$

- **To determine:**

1. The structures of the tariffs applied to the NPS and the choice of prices for each strategy so that the income

should cover the risks and ensure the programmed profits.

2. The structure of the cost for electricity in the forecast year and the salary increase that staff involved in carrying out the contract of excellence may get.

3. The prices for each procedure requested by consumers (regardless of hours and peak hour of the NPS).

4. The revenues and risks such as profitability of the subsidiary should generate programmed profits.

5. Commenting on the results considering the establishing of the best economical financial development strategy of the subsidiary under analysis.

- **Resolution**

1. The structure of the tariffs applied in the national power system. In the NPS the following rates are used:

- tariff (A) is the binominal type differential by voltage (HV), (MY), (LV) under the form:

$$t_{AIT}^{V}=\left(\frac{A_{V}^{IT}}{t_f}+b_{V}^{IT}\right),\ t_{AMT}^{V}=\left(\frac{A_{V}^{MT}}{t_f}+b_{V}^{MT}\right),\ t_{AJT}^{V}= =\left(\frac{A_{V}^{JT}}{t_f}+b_{V}^{JT}\right)(lei/kWh)$$

$$t_{AIT}^{IV}=\left(\frac{A_{IV}^{IT}}{t_f}+b_{IV}^{IT}\right),\ t_{AMT}^{IV}=\left(\frac{A_{IV}^{MT}}{t_f}+b_{IV}^{MT}\right),\ t_{AJT}^{IV}= =\left(\frac{A_{IV}^{JT}}{t_f}+b_{IV}^{JT}\right)(lei/kWh)$$

- tariff (B) is a differential monomial type and operates with relations of the form:

$$t_{BIT}^{V}=\left(\frac{F_{IT}^{V}}{E_{IT}^{V}}\right),t_{BMT}^{V}=\left(\frac{F_{MT}^{V}}{E_{MT}^{V}}\right),t_{BJT}^{V}=\left(\frac{F_{JT}^{V}}{E_{JT}^{V}}\right)(lei/kWh)$$

$$t_{BIT}^{IV}=\left(\frac{F_{IT}^{IV}}{E_{IT}^{IV}}\right),t_{BMT}^{IV}=\left(\frac{F_{MT}^{IV}}{E_{MT}^{IV}}\right),t_{BJT}^{IV}=\left(\frac{F_{JT}^{IV}}{E_{JT}^{IV}}\right)(lei/kWh)$$

- tariff (D) is a simple monomial and operates with relations of the form:

$$t_{CIT}=\left(\frac{A_{C}^{IT}}{t_f}+b_{IT}\right),t_{CMT}=\left(\frac{A_{C}^{MT}}{t_f}+b_{MT}\right),t_{CJT}= =\left(\frac{A_{C}^{JT}}{t_f}+b_{JT}\right)(lei/kWh)$$

- tariff (E1) applies to consumers who take over the energy from the system during the day, and night, including Saturday and Sunday with the relations of the form:

$$t_{E1-Z1}^{IT}=\left(\frac{F_{E1-Z1}^{IT}}{E_{IT-Z1}}\right),t_{E1-Z1}^{MT}=\left(\frac{F_{E1-Z1}^{MT}}{E_{MT-Z1}}\right),t_{E1-Z1}^{JT}= =\left(\frac{F_{E1-Z1}^{JT}}{E_{JT-Z1}}\right)(lei/kWh)$$

$$t_{E1-N}^{IT}=\left(\frac{F_{E1-N}^{IT}}{E_{IT-N}}\right),t_{E1-N}^{MT}=\left(\frac{F_{E1-N}^{MT}}{E_{MT-N}}\right),t_{E1-N}^{JT}= =\left(\frac{F_{E1-N}^{JT}}{E_{JT-N}}\right)(lei/kWh)$$

- tariff (E2) applies to consumers who take over the energy from the system during the day, and night, except for Saturday and Sunday:

$$t_{E2-Z1}^{IT}=\left(\frac{F_{E2-Z1}^{IT}}{E_{IT-Z1}}\right),t_{E2-Z1}^{MT}=\left(\frac{F_{E2-Z1}^{MT}}{E_{MT-Z1}}\right),t_{E2-Z1}^{JT}= =\left(\frac{F_{E2-Z1}^{JT}}{E_{JT-Z1}}\right)(lei/kWh)$$

$$t_{E2-N}^{IT}=\left(\frac{F_{E2-N}^{IT}}{E_{IT-N}}\right),t_{E2-N}^{MT}=\left(\frac{F_{E2-N}^{MT}}{E_{MT-N}}\right),t_{E2-N}^{JT}= =\left(\frac{F_{E2-N}^{JT}}{E_{JT-N}}\right)(lei/kWh)$$

- Tariff (A) comprises variant (A2) as the differential binomial by voltages and different durations of use for the maximum power:

$$t_{A2}^{ITV}=\left(\frac{A_{A2}^{ITV}}{t_{fV}}+b_{A2}^{ITV}\right),\ t_{A2}^{MTV}=\left(\frac{A_{A2}^{MTV}}{t_{fV}}+b_{A2}^{MTV}\right),\ t_{A2}^{JTV}= ; =\left(\frac{A_{A2}^{JTV}}{t_{fV}}+b_{A2}^{JTV}\right)(lei/kWh)$$

$$t_{A2}^{IT\,IV}=\left(\frac{A_{A2}^{IT\,IV}}{t_{f\,IV}}+b_{A2}^{IT\,IV}\right),\ t_{A2}^{MT\,IV}=\left(\frac{A_{A2}^{MT\,IV}}{t_{f\,IV}}+b_{A2}^{MT\,IV}\right),\ t_{A2}^{JT\,IV}= =\left(\frac{A_{A2}^{JT\,IV}}{t_{f\,IV}}+b_{A2}^{JT\,IV}\right)(lei/kWh)$$

- The binomial differential tariff (A33) is optional and applies to the hourly areas and durations of peak power use by the mathematical relations of the form:

$$t_{A33\ short\ use\ times}^{IMJ(peak)}=\left(\frac{A_{A33}^{IMJ}}{t_{f\ mic}}+b_{A33}^{IMJ}\right)(lei/kWh);$$

$$t_{A33\ rated\ hours}^{IMJ(peak)}=\left(\frac{A_{A33}^{IMJ}}{t_{rated\ hours}}+b_{A33}^{IMJ}\right)(lei/kWh);$$

$$t^{IMJ(peak)}_{A33\,dip\,hours} = \left(\frac{A^{IMJ}_{A33}}{t_{f\,dip\,hours}} + b^{IMJ}_{A33} \right) (lei/kWh);$$

$$t^{IMJ(peak)}_{A33\,daverage\,use\,times} = \left(\frac{A^{IMJ}_{A33}}{t_{f\,DM}} + b^{IMJ}_{A33} \right) (lei/kWh)$$

$$t^{IMJ(peak)}_{A33\,long\,use\,times} = \left(\frac{A^{IMJ}_{A33}}{t_{f\,big}} + b^{IMJ}_{A33} \right) (lei/kWh)$$

■ The special tariffs resort to the leveled costs and marginal costs and are applied taking into account the following relations for calculation:

$$t^{COP}_{S} = \frac{F_{COP}}{E_{CON}} = \frac{[C_{DD} - C_{CC} - C_{PR} - C_{PE} - C_{AE} - C_{DC}]}{t_f \cdot P_f} (lei/kWh)$$

$$t^{COP}_{m\,arginale} = \frac{\text{increased costs}}{\text{increased production by ao unit}} (lei/kWh).$$

2. The structure of the energy cost for the following year looks like this:

$C_{fuel} = 72\% \cdot 1,3 \cdot 0,98k_t = 91,7 \cdot k_t = 91,7$

$C_{various\ materials} \Rightarrow 4,5 \cdot 1,3\ k_t \Rightarrow 5,85\ k_t \Rightarrow 5,85$

$C_{depreciation} \Rightarrow 8\% \cdot 1,05\ k_t \Rightarrow 8,4\ k_t \Rightarrow 8,4$

$C_{wages} \Rightarrow 2 \cdot 1,30/1,25\ (1 + c_s)k_t \Rightarrow$

$\Rightarrow 2,40\ k_t + 2,40\ c_s \Rightarrow 2,4 + 2,4\ c_s$

$C_{various} \Rightarrow 13,5 \cdot 1,1\ k_t \Rightarrow 14,85\ k_t \Rightarrow 14,85$

$123,2 + 2,4\ c_s$

Relating the new structure to the produciton of next year results c_s (higher wages).

$$R_t \Rightarrow \frac{123,2\% - 2,4c_s\%}{1,3\%} = 94\% \Rightarrow c_{s1} = \frac{123,2 - 122,2}{2,4} = \frac{1}{2,4} = 0,42 = 42\%$$

So the annual salary increase may be 42% if the management contract provisions are met.

The electric power prices demanded by consumers are determined as follows:

$$p_{mB} = \left(\frac{A \cdot P}{E} + b \right) [lei/kWh]; \quad A = \frac{C_{fixe}}{P_f} [lei/kW];$$

$b = C_{variabile}/E_{vanduta}$ [lei/kWh].

where:

$$A = \frac{0,28 \cdot C_{tan}}{P_f} = \frac{0,28 \cdot 45 \cdot 10^9}{1005 \cdot 10^3} [lei/kW];$$

= power tax

$$b = \frac{0,72 \cdot C_{tan}}{E_p} = \frac{0,72 \cdot 45 \cdot 10^9}{3,2 \cdot 10^9} [lei/kW];$$

= energy tax

$$p_{mA} = \left(\frac{A^{A}_{i0} \cdot P_A}{E_A} + b_{i0A} \right) = 900 [lei/kWh];$$

$$p_{mB} = \left(\frac{A^{B}_{i0} \cdot P_B}{E_B} + b_{i0B} \right) = 910 [lei/kWh];$$

$$p_{mC} = \left(\frac{A^{C}_{i0} \cdot P_C}{E_C} + b_{i0C} \right) = 1000 [lei/kWh];$$

$$p_{mD} = \left(\frac{A^{D}_{i0} \cdot P_D}{E_{BD}} + b_{i0D} \right) = 840 [lei/kWh];$$

4. The revenues and risks related to the energy subsidiary

The revenue from the power plant and the power system based on the export of electricity is calculated as follows

$$V_{CET} = (p_{ee} - p^{CET}_{ei}) E_{vanduta} = (100 \cdot 34000 \cdot 10^{-3} - 900) \cdot 3,2 \cdot 10^9 = 2500 \cdot 3,2 \cdot 10^9 [lei/yr],$$

$$V_{SENt} = (p_{ee} - p^{SEN}_{ei}) E_{vanduta} = (34000 - 2000) \cdot 3,2 \cdot 10^9 = 1400 \cdot 3,2 \cdot 10^9 [lei/yr].$$

The direct export without intermediate is more advantageous, even if the (4 ÷ 6) USD / MWh fee is paid for transport and supply-ditribution.

The net income carried out when the power plant is directly involved in export has the value:

V^{net}_{max} = (1500 - 840) · 3,2 · 10^9 [lei/yr], iar

V^{net}_{min} = (1300 - 1000) · 3,2 · 10^9 [lei/yr].

In this context the economic and commercial activities become profitable if they cover the total risks (economic, technical, financial on the production - competitive market relationship).

$$R_{total\ risk} = p_{enl} \cdot E_{nl} + i_{sp} \cdot P_{av} = (200 p_{ei} \cdot \frac{t_f}{365} + i_{sp}) \frac{P_i}{4} \prec V_{net\ min\ im}$$

5. The analysis of the calculation results of the profitability of the energy subsidiary leads to the following findings:

- The tariffs applied in the NPS have to be correlated to those practised at the level of European energy sector in order to even the differences with a view to speeding up the total interconnection of the Romanian system with that of the European Union.
- The annual salary increase can be ensured especially from applying and carrying out the contract of excellence.

- The strategy that ensures maximum profitability of the subsidiary resulting from the sale of energy both domestically and for export directly to real consumers without recourse to intermediaries. Exports of energy at the top provides a maximum rate of formation of capital in income in lei per leu spent.

The practical orientating measures to increase the performance of the national power system relates to the following steps:

- Changing of the primary conventional sources with renewable ones leads to the decrease in electricity costs by 50% while simultaneously transforming miners into farmers growers of plants that can turn into biofuels.
- Operation of power equipment at economic tasks (0.8 Pi) monitored by using programmable logic controllers and filters that eliminate the harmful effects of harmonics 3 and 5 facilitate the transformation of risks in significant savings while reducing network losses by 15%.
- Reconfiguring the human resource through intensive learning and selection of the quality human factor based on the information instructions of the software based on the theory of cardinals is a source of success in implementating the POSDRU program.
- The practical application of the development of the NPS based on the alternative scenario regarding the efficient use of all the renewable resources, including of the entrepreneurial managers and efficient developers will lead to the profitable development of the whole Romanian system on the horizon (2020÷2035) leading to increased competitiveness of the local energy sector, in both the domestic energy market in the Balkan area, and in earning the deserved place among the advanced countries in the area of Central Europe.
- If the share of fuels in the energy cost is reduced to 30%, then the final tariff drops to 50% of the current price of electricity.

8. REFERENCES

[1]. J. Cutler Cleveland - Encyclopedia of Energy. Elsevier Academic Press – Amsterdam – 2004

[2]. M. Warner - International Encyclopedia of Bussiness and Management, Second Edition London 2002

[3]. A. Carabulea – Models of to optimization of energy system – Elsevier Amsterdam – Second Edition 2009 I.S.B.N. 973-27-0075-0

[4]. A. Carabulea – Approach to solved the vulnerability of energy systems – world energy congress – Montreal Canada – SED – 2010